# City of Santa Paula

*City Council*

MAYOR LESLIE CORNEJO
VICE MAYOR PEDRO A. CHAVEZ
COUNCILMEMBER JENNY CROSSWHITE
COUNCILMEMBER CARLOS JUAREZ
COUNCILMEMBER ANDY SOBEL

CITY COUNCIL REGULAR MEETING OF THE
SANTA PAULA CITY COUNCIL

WEDNESDAY, APRIL 3, 2024

6:30 PM - City Council Regular Meeting

SANTA PAULA CITY HALL
970 VENTURA STREET
SANTA PAULA, CA 93060

JULIE LATSHAW, CITY CLERK
DAN SINGER, CITY MANAGER
MONICA CASTILLO, CITY ATTORNEY

## CITY COUNCIL REGULAR MEETING

You are invited to participate in all Regular City Council meetings. Agendas are posted in the front of Santa Paula City Hall, 970 Ventura Street, Santa Paula, 72 hours in advance of the scheduled meetings. The City Council's regular meetings start at 6:30 p.m. the first and third Wednesday of each month in the City Hall Council Chambers located at 970 Ventura Street in Santa Paula. Special and Closed Sessions vary by date and time.

**HOW TO PARTICIPATE IN PERSON DURING THE MEETING:** If you wish to speak at a City Council meeting, please fill out a ***Public Comment Form*** noting your name and address and submit the form to the City Clerk. Include the Agenda item number, when appropriate. ***Public comments are limited to 3 minutes.***

1. ***Items Not on the Agenda*:** If you wish to discuss an item which is not scheduled on the Agenda, you may address the City Council during *Public Comment*. Please realize that due to the limitations placed on the City Council by provisions of the *California Government Code*, the City Council ordinarily cannot take action on any item that is not on the agenda. Because of these restrictions, expect that matters that you identify during public comment may be referred to staff or considered on a future agenda.
2. ***Agenda Items:*** Items being considered by the City Council may appear on the Consent Calendar, as an Action Item, or as a Public Hearing. Public comments on each type of item are handled differently, as explained below:
    a. For items appearing on the Consent Calendar, please submit a Public Comment Form before the Council takes action on the Consent Calendar. Items that receive a Public Comment Form may be pulled from the Consent Calendar by the Mayor and discussed separately by the City Council.
    b. For items appearing as an Action Item, the Mayor will announce the Agenda item and request the staff report, the staff member responsible will give a brief summary of the report; the City Council will have an opportunity to ask questions of staff; members of the public will be given an opportunity to comment on the item and ask additional questions (all members of the public should speak directly into the microphone at the speaker's platform); and the City Council will discuss the item and then take appropriate action.
    c. For items on which a Public Hearing is scheduled, the Mayor will open the public hearing and receive the staff report; members of the public will be given an opportunity to comment on the item and ask additional questions (all members of the public should speak directly into the microphone at the speaker's platform); the City Council will discuss the item; and the Mayor will close the public hearing after City Council action.

**HOW TO PARTICIPATE BEFORE THE MEETING:** Members of the public are encouraged to submit email correspondence on any agenda item by sending an email to cityclerk@spcity.org. All public correspondence received by 3:00 p.m. (PT) on the meeting date will be provided to the legislative body before the meeting. Public Comments received after 3:00 p.m. will be provided to the legislative body the next day.

Your Participation in this meeting is in the public domain; meetings are cablecast; minutes of this meeting will reflect your participation in this meeting and are posted on the city's website.

***PLEASE NOTE:*** *Be advised that if you bring a legal challenge to an action, you may be limited to raising only those issues you or someone else raised at the meeting described in this Agenda, or in written correspondence delivered to the City Council at or before the meeting. Any action is subject to the ninety-day time period set forth in Code of Civil Procedure § 1094.6.*

*In compliance with the **Americans with Disabilities Act**, if you need special assistance to participate in this meeting, please contact the City Clerk at (805) 933-4208. Notification 48 hours before the meeting will enable the City to make reasonable arrangements to ensure accessibility to this meeting. (28 CFR 35, 102-35.104 ADA Title II). Written materials distributed to the City Council within 72 hours of the City Council meeting are available for public inspection immediately upon distribution in the City Clerk's office.*

**HOW TO VIEW ON YOUR TELEVISION, COMPUTER, OR MOBILE DEVICE:** Watch from home live on the local Channel 10, or view the live feed on the city website at the following link: https://www.spcity.org/523/Public-Meeting-Agendas
NOTE: Special and Closed Sessions are not recorded and not available on Channel 10 or live feed on the city website.

**REGULAR MATTERS - COUNCIL CHAMBERS**

**1. CALL TO ORDER**
REMINDER: in order to minimize distractions during public meetings, all personal communication devices should be turned off or put in a non-audible mode.

**2. INVOCATION**

**3. FLAG SALUTE**

**4. ROLL CALL**

**5. PUBLIC COMMENT**
At this time, members of the public may comment on any item not appearing on the agenda that is within the subject-matter jurisdiction of the City Council. A Public Comment Form must be submitted to the City Clerk prior to the beginning of the Public Comment period in order to be recognized to speak. Individuals submitting Public Comment Forms after the beginning of the Public Comment period will not be allowed to speak at this time, but may be recognized to speak by the Mayor at the conclusion of the meeting. Individual Councilmembers may briefly respond to Public Comments or ask questions for clarification. The City Council may direct staff to report to the City Council on the item at a later meeting. For items appearing on the Agenda, the public will be invited to make comments at the time the item comes up for City Council consideration. If a member of the public wishes to address a Consent Calendar item, please submit a Public Comment Form for that item. It may then be discussed separately by the Council, and the public will be invited to make comments at that time. At all times, please use the microphone and write your name and address on the Public Comment Form provided.

**6. PRESENTATIONS**

6.A ARBOR DAY PROCLAMATION

6.B GUN VIOLENCE RESTRAINING ORDER - PRESENTATION

6.C **CITY MANAGER'S DEPARTMENT REPORT - NOVEMBER 2023 - FEBRUARY 2024**
**RECOMMENDATION:**

Staff recommends that the City Council:

1. Receive and file the Department Report for City Manager's Department for November 2023 - February 2024.

**Presented by:** Dan Singer, City Manager

## 7. CITY COUNCIL REPORTS

## 8. CITY MANAGER REPORTS

## 9. CONSENT CALENDAR

Background information has been provided to the City Council on all matters listed under the Consent Calendar and these items are considered to be routine by the City Council and are normally approved by one motion. If discussion is requested by a Councilmember on any item, or a member of the public wishes to comment on an item, that item may be removed from the Consent Calendar for separate action.

### 9.A SECOND READING AND ADOPTION OF ORDINANCE NO. 1336, APPROVING (1) ADDENDUM NO. 4 TO THE FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT (EIR) FOR EAST AREA 1 SPECIFIC PLAN AMENDMENT NO. 4 AND A GENERAL PLAN AMENDMENT, (2) EAST AREA 1 SPECIFIC PLAN AMENDMENT NO. 4, AND (3) A GENERAL PLAN AMENDMENT.

**RECOMMENDATION:**

Staff recommends that the City Council:

1. Conduct the second reading of and adopt Ordinance No. 1336, approving (1) Addendum No. 4 to the Final Supplemental Environmental Impact Report (EIR) for East Area 1 Specific Plan Amendment No. 4 and a General Plan Amendment, (2) East Area 1 Specific Plan Amendment No. 4, and (3) a General Plan Amendment.

## 10. PUBLIC HEARING

- Verification of posting notice by City Clerk
- Declaration of conflicts (if any)
- Declaration of ex parte contacts (if any)
- Open public hearing
- Staff presentation
- Public comments
- Close public hearing
- Discussion and action

### 10.A RESOLUTION NO. 7507 APPROVING THE ISSUANCE OF MULTIFAMILY REVENUE BONDS BY THE CALIFORNIA PUBLIC FINANCE AUTHORITY IN SUPPORT OF AN AFFORDABLE 166 UNIT MULTIFAMILY DEVELOPMENT, CITRUS FLATS APARTMENTS

**RECOMMENDATION:**

Staff recommends that the City Council:

1. Hold a public hearing pursuant to the federal Tax Equity and Fiscal Responsibility Act (“TEFRA”)
2. Adopt Resolution No. 7507 approving the issuance of multifamily housing revenue bonds for the Citrus Flats Apartments in an amount not to exceed $55 million and authorize the City to become a non-charter member of the California Public Finance Authority.

## 11. ACTION ITEMS

### 11.A RESOLUTION NO. 7508 OF THE CITY OF SANTA PAULA AUTHORIZING A CITY AFFORDABLE HOUSING FUND LOAN TO FLT TELEGRAPH PARTNERS, L.P. ("PARTNERSHIP") IN THE AMOIUNT OF $5,500,000; AND THE DEFERRAL OF DEVELOPMENT IMPACT FEES AND WATER IN LIEU FEES IN AN AMOUNT NOT TO EXCEED $5,157,949

**RECOMMENDATION:**

Staff recommends the City Council adopt Resolution No. 7508 authorizing a City Affordable Housing Fund loan to FLT Telegraph Partners, L.P. ("Partnership") in the amount of $5,500,000; and the deferral of Development Impact Fees and Water In-Lieu Fees in an amount not to exceed $5,157,949.

**Presented by:** James Mason, Community & Economic Development Director

### 11.B 2024 WASTEWATER COLLECTION SYSTEM AND WATER RECYCLING FACILITY MASTER PLAN

**RECOMMENDATION:**

Staff recommends that the City Council:

1. Receive and file the 2024 Wastewater Collection System and Water Recycling Facility Master Plan

**Presented by:**

Becca Bugielski, PE, MKN & Associates, Inc.
Michael Nunley, PE, MKN & Associates, Inc.

## 12. ITEMS FOR FUTURE AGENDAS

### 12.A FUTURE AGENDA ITEMS

**RECOMMENDATION:**

Staff recommends City Council review future agenda items.

## 13. ADJOURNMENT

State of California )-

County of Ventura )- ss

City of Santa Paula )-

I declare under penalty of perjury that I posted this City Council Agenda on the bulletin board near the front door of City Hall, 970 Ventura Street, Santa Paula, California.

On_____at_____Signed:_____

Julie Latshaw

City Clerk

**CITY OF SANTA PAULA**
**MEMORANDUM**

To: Honorable Mayor and Members of the City Council

From: Dan Singer, City Manager

Subject: CITY MANAGER'S DEPARTMENT REPORT - NOVEMBER 2023 - FEBRUARY 2024

Date: April 3, 2024

Agenda Item: 6.C

---

## RECOMMENDATION:

Staff recommends that the City Council:

1. Receive and file the Department Report for City Manager's Department for November 2023 - February 2024.

**Presented by:** Dan Singer, City Manager

---

## BACKGROUND:

### City Manager

- Led efforts related to the Union Oil Building, including the execution of a Transfer Agreement to donate the property to the City along with a $2-million-dollar maintenance grant.
- Worked with the City Attorney on efforts to update Council's Manual of Procedural Guidelines for Conduct of the City Council and Constituent Body/Commission Meetings.
- Applied for and obtained a national grant from the National League of Cities (NLC) to work on efforts in partnership with the Ventura County Community Foundation (VCCF) related to the Isabella Project and early education in Santa Paula.
- Worked with Council, the Executive Team and consultants to conduct a preliminary community survey on the wants and desires of the community related to streets, capital improvement projects, and local control issues within Santa Paula. This effort is ongoing and additional community outreach will be ramping up in April.

### Management Analyst

Administrative

- Continued oversight, tracking and execution of objectives in Council's 2-Year Strategic Plan.

- In partnership with our Emergency Services Coordinator, assisted with emergency declarations and efforts related to the FEMA flood events from January-March 2023.
- Continued oversight of the City's transition to joining the Clean Power Alliance (CPA).
- Provided community outreach, research and analysis related to a consideration in adjusting City Council meeting start times.

Economic Development

- Worked with Ventura County and multiple stakeholders to support the County's 150 th Anniversary jubilee event which took place in Santa Paula on October 21, 2023.
- Coordination and oversight of activities related to the Property Business Improvement District (PBID) to effectuate beautification and improvements to the downtown corridor.
- Provided support to the Parks & Recreation Dept. related to requests for Council sponsorship for the Labor Day and Holiday Parades.
- Developed a professional services agreement with the Chamber of Commerce to support several of Council's 2-Year Strategic Plan objectives related to economic development in Santa Paula.

Grants

- Applied for and awarded a United States Department of Transportation Safe Streets and Roads for All (SS4A) Grant in the amount of $280,000.
- Applied for and awarded an Alcohol Beverage Control (ABC) Grant in the amount of $28,108.
- Continued to work with the Broadband committee to explore broadband options and utilize $192,050 in Local Agency Technical Assistance (LATA) grant funds to explore opportunities for Broadband High-Speed Internet by funding the development of a Broadband Strategic Plan for the City.
- Applied for a $30,000 grant from T-mobile for a downtown kiosk on behalf of the Property Business Improvement District.
- Continued to work with Public Works and VCTC to utilize $1,482,877.50 in TDA Article 3 grant funds to engineer and construct up to 2.48 miles of new bike trails in Santa Paula which would connect to the existing bike trail pathway, allowing multi-modal access from west end of Santa Paula to the east end.

Legislative Affairs

- Attended the League of California Cities Conference in September to stay abreast of legislative issues that are currently, or anticipated to be, the focus of future legislation by the county, state or federal government.
- Worked with the Mayor, Merchant McIntyre and our Public Works Director to successfully advocate for and now be awarded just under $1M dollars in Federal funding support from Congresswoman Julia Brownley, Senator Padilla and Senator Feinstein for the Mesa Tanks project.

- Drafted letters of Opposition based on Council's adopted Legislative platform for AB309 and AB1637.

Public Information

- Established an ad hoc Communications Committee to focus on citywide communications efforts and assist with the City's upcoming website redesign.
- Continued communications and support to all departments through Channel 10 content, Take 5 newsletter, social media, website updates and design and press releases.
- Coordinated with Public Works weekly outreach and communications efforts for the Harvard Blvd. Water/Sewer & Pavement Project.
- Assisted with outreach efforts related to recruitment for the Chief of Police, Union Oil Building, various committees/commissions, employment opportunities, community programs, etc.
- Assisted with support for various ribbon cutting ceremonies throughout the City including the Boys & Girls Club Restroom remodel and SPIRIT of Santa Paula and coordination of a $1M State gift of funds for the new Sportspark by State Senator Limon and Assemblymember Bennett.

Management Fellows

- Created a consistent set of bi-monthly business workshops in collaboration with SCORE, EDC, and WEV. Workshops such as how to boost social media presence and how to start a business were provided.
- Continued oversight of local Business Roundtable events in partnership with CEDD as part of Council's 2-Year Strategic Plan. Meeting attendance continues to increase.
- PBID – Supported the up-lighting project and created a downtown newsletter to keep business owners informed on a quarterly basis.

**Human Resources Department**

- Hosted Holiday Employee Luncheon and Employee Service Recognition Breakfast.
- Recognized and celebrated the 2023 Employee of the 4th Quarter.
- Developed and introduced an Early Separation Notification and Police Officer Hiring Incentive Program.
- Partnered with California Lutheran University to offer discounted tuition rates to City employees pursuing graduate or professional programs.
- Successfully recruited and onboarded:
  Community and Economic Development - Code Enforcement Inspector
  Finance - Accounting Specialist
  Information Technology - Information Technology Analyst
  Parks and Recreation - Recreation Program Coordinator
  Police - Chief of Police; Public Safety Dispatcher (2); Police Officer (7); Records Technician; Community Services Officer
  Public Works - Administrative Analyst; Water System Operator

**Information and Technology Department**

- Worked with HR to recruit and hire a new IT Analyst.
- Worked with contractors supporting IT-related portions of the Mesa Tank replacement, parking lot gate entry system, and Police Station remodel projects.
- Installed equipment to add the Limoneira water tank to our automated water control systems.
- Added equipment to support hosting a language interpreter in the Council video control room.

**City Clerk's Office**

- Processed 15 City Council agendas and minutes.
- Attended 4 Bid Openings.
- Posted updated Maddy Act for yearend 2023, and continue to update as changes are made.
- Continue to advertise and accept applications for Commissions, Committees, and Boards.
- Administered 11 Oaths of Office.
- Processed 70 Public Records Requests.
- Processed and Posted 5 Notice of Publications.
- Have begun the process of the Annual Fair Political Practice Commission Form 700.

**ANALYSIS:**

None

**STRATEGIC PLAN:**

None

**FISCAL IMPACTS:**

None

**OPTIONS:**

None

**ATTACHMENTS:**

**CITY OF SANTA PAULA**
**MEMORANDUM**

To: Honorable Mayor and Members of the City Council

From: James Mason, Community & Economic Development Director

Subject: SECOND READING AND ADOPTION OF ORDINANCE NO. 1336, APPROVING (1) ADDENDUM NO. 4 TO THE FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT (EIR) FOR EAST AREA 1 SPECIFIC PLAN AMENDMENT NO. 4 AND A GENERAL PLAN AMENDMENT, (2) EAST AREA 1 SPECIFIC PLAN AMENDMENT NO. 4, AND (3) A GENERAL PLAN AMENDMENT.

Date: April 3, 2024

Agenda Item: 9.A

---

**RECOMMENDATION:**

Staff recommends that the City Council:

1. Conduct the second reading of and adopt Ordinance No. 1336, approving (1) Addendum No. 4 to the Final Supplemental Environmental Impact Report (EIR) for East Area 1 Specific Plan Amendment No. 4 and a General Plan Amendment, (2) East Area 1 Specific Plan Amendment No. 4, and (3) a General Plan Amendment.

---

**BACKGROUND:**

**PROCEDURAL FACTS:**

Limoneira Lewis Community Builders, LLC ("Developer" or "Applicant") has applied for a fourth amendment to the East Area 1 Specific Plan (hereafter, "EA1 SPA") and a third amendment to the current Development Agreement ("DA Amendment") for the planned community development known as the Harvest at Limoneira (hereafter, "Harvest"). Amendments to text in the General Plan referring to the current EA1 Specific Plan are also required to ensure the proposed EA1 SPA is consistent with the General Plan ("General Plan Amendment" or "GPA").

On January 29, 2024, the Planning Commission and City Council held a joint study session regarding the DA Amendment. At a special meeting that same evening, the Planning Commission held a public hearing and adopted Resolution No. 3858, recommending City Council (i) approve Addendum No. 3 to Environmental Impact Report (EIR) for the EA1 Specific Plan Amendment and (ii) adopt an ordinance approving the DA Amendment subject to Council approval of EA1 Specific Plan Amendment No. 4.

On February 13, 2024, the City Council, after a noticed public hearing, adopted Resolution No. 7500 approving EIR Addendum No. 3, and introduced and waived first reading of

Ordinance No. 1333 approving the DA Amendment subject to Council approval of EA1 Specific Plan Amendment No. 4. On February 21, 2024, the City Council adopted Ordinance No. 1333.

On February 27, 2024, the Planning Commission adopted Resolution No. 3859 recommending that the City Council (1) approve Addendum No. 4 to the Final Supplemental Environmental Impact Report (EIR) for East Area 1 Specific Plan Amendment No. 4 and a General Plan Amendment, and (ii) adopt an ordinance to approve East 1 Specific Plan Amendment No. 4 and the General Plan Amendment.

On March 20, 2024, the City Council, after a noticed public hearing, adopted Resolution No. 7505 approving Addendum No. 4 to the Final Supplemental Environmental Impact Report (EIR) for East Area 1 Specific Plan Amendment No. 4 and a General Plan Amendment; and introduced and waived the first reading of Ordinance No. 1336 titled: "An Ordinance Approving (1) Addendum No. 4 to the Final Supplemental Environmental Impact Report (EIR) for East Area 1 Specific Plan Amendment No. 4 and a General Plan Amendment, (2) East Area 1 Specific Plan Amendment No. 4, and (3) a General Plan Amendment." Council directed staff to make corrections to Specific Plan Amendment No. 4 and EIR Addendum No. 4 (Attachments E and F, respectively). Ordinance No. 1336 now returns to tonight's meeting for second reading and adoption with corrections incorporated.

## ANALYSIS:

## PROJECT OVERVIEW

### East Area 1 Specific Plan Amendment

*Approved East Area 1 Specific Plan (EA1 SP-3)*

The East Area 1 Specific Plan (EA1 SP-3) was first approved by the City Council in 2008, and was later amended in February 2015, November 2015, and June 2021. A land use map of the approved plan is attached as Attachment A.

As currently approved, the East Area 1 Specific Plan reserves approximately 80 acres in the northern portion of the Specific Plan area as open space; allows development of up to 1,500 residential units complemented by parks, schools, and other public facilities; and allows for a small amount of neighborhood commercial and business park uses. Primary access to the Specific Plan area is currently provided by Hallock Drive. Santa Paula Street will be extended from the west by a new bridge that will go over Santa Paula Creek to provide additional access in accordance with the approved Specific Plan.

The existing East Area 1 Specific Plan is organized by districts and neighborhoods. The Open Space District includes the open space and agricultural preserve areas in the northern portion of the Specific Plan area and open space buffer areas along Santa Paula Creek and Haun Creek on the western and eastern edges of the Specific Plan area, respectively. The Haun Creek and Foothill Residential Neighborhoods are located in the eastern portion of the Specific Plan area. The Santa Paula Creek Residential Neighborhood is located in the western portion of the Specific Plan area. In addition to these residential neighborhoods, the Specific Plan established a Civic District in the southwestern portion of the Specific Plan area that includes an approximate 35-acre community park (Sports Park) and sites for school facilities, and the

Hallock Center District along the southern edge of the Specific Plan area, where development of residential, commercial and business park uses are allowed.

To date, approximately 600 homes have been built in the Haun Creek Neighborhood and Hallock Center District. The first phase of the Sports Park located in the western portion of the Specific Plan area is currently under development. Since approval of the November 2015 Specific Plan Amendment, Santa Paula Unified School District determined the northern site in the Civic District reserved for development of an elementary school was no longer needed and residential development of this site with 121 of the previously approved 1,500 residential units was approved by the City on June 16, 2021.

*Proposed East Area 1 Specific Plan Amendment (EA1 SPA)*

The proposed EA1 SPA would amend the current East Area 1 Specific Plan and is referred to as the East Area 1 Specific Plan Amendment ("EA1 SPA"). (See Exhibit A to Attachment C [Proposed Ordinance]). The plan amendment is in response to the increased need for additional housing in Santa Paula and Ventura County. In addition, recent plans for commercial and business park development within the City's 95-acre East Gateway planning area, located immediately south of the East Area 1 Specific Plan area has reduced the demand for commercial and business park uses in the East Area 1 Specific Plan area. The below table shows the proposed EA1 SPA land uses in comparison to the approved land uses.

| Land Use | Approved[a] | | | Proposed[b] | | | Change |
|---|---|---|---|---|---|---|---|
| | acres | units/size | du/ac | acres | units/size | du/ac | |
| Residential | | | | | | | |
| Haun Creek Neighborhood/Hallock Center East (Phase I) | 86.2 | 632 du | 7.3 | 86.2 | 707 du[c] | 8.2 | 75 du |
| Foothill Neighborhood (Phase II) | 98.0 | 492 du | 5.0 | 98.0 | 554 du | 5.7 | 62 du |
| Santa Paula Creek Neighborhood (Phase III) | 50.0 | 376 du | 7.5 | 50.0 | 489 du | 12.2 | 113 du |
| Hallock Center West (Phase I) | 0 | 0 du | 0 | 17.9 | 300 du | 16.8 | 300 du |
| *Subtotal* | *234.2* | *1,500 du* | *6.4* | *252.1* | *2,050 du* | *8.1* | *550 du* |
| Commercial/Industrial | | | | | | | |
| Light Industrial – Hallock Center West | 13.5 | 25,000 sf | - | 0 | 0 sf | - | -25,000 sf |
| Commercial – Hallock Center West | 4.4 | 215,000 sf | - | 0.2 | 10,000 sf | - | -205,000 sf |
| *Subtotal* | *17.9* | *240,000 sf* | - | *0.2* | *10,000 sf* | - | *-230,000 sf* |
| Civic/Institutional | | | | | | | |
| Schools – Civic District[d] | 19.2 | - | - | 8.3 | - | - | -10.9 ac |
| Fire – Hallock Center District | 1.0 | - | - | 1.5 | - | - | 0.5 ac |
| *Subtotal* | *20.2* | - | - | *9.8* | - | - | *-10.4 ac* |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Open Space, Parks, and Agriculture | | | | | | | |
| Public Athletic Fields (OS-3) | 37.8 | - | - | 37.8 | - | - | 0 ac |
| Parks/Greenways (OS-2) | 55.2 | - | - | 55.2 | - | - | 0 ac |
| Open Space Preserve (OS-1) | 77.3 | - | - | 77.3 | - | - | 0 ac |
| Agricultural Preserve (AG) | 55.0 | - | - | 55.0 | - | - | 0 ac |
| *Subtotal* | *225.3* | - | - | *225.3* | - | - | *0 ac* |
| **TOTAL** | **497.6** | | | **497.6** | | | **0 ac** |

Notes:

a – Approved land uses as defined in 2015 East Area 1 SP SEIR

b – Proposed land uses as defined in the 2024 Draft Proposed East Area Specific Plan SP-3

c - The Haun Creek West Neighborhood includes the 10.4 acre site previously reserved for development of an elementary school and approved for development of 121 residential units

d – Reflects Santa Paula Unified School District previously declining use of one of two available school sites and prior City approval of residential units on this site

Attachment B identifies the approved tentative tract maps and shows existing and planned development within the Specific Plan Area. The proposed amendment to the East Area 1 Specific Plan would increase the number of housing units allowed within the Haun Creek, Foothill and Santa Paula Creek Neighborhoods and Hallock Center District by 550 units from 1,500 to 2,050 units, as shown in Attachment B. The 2,050 units include 1,750 single-family units and potentially 300 apartment units (150 duplexes). Assisted living units would no longer be developed.

It should be noted that the proposed EA1 SPA restates land use changes to the Specific Plan approved in June 2021; namely, the reduction of 19.2 acres reserved for development of school facilities by the Santa Paula Unified School District (SPUSD) to a 8.3-acre site. This reduction was due to the SPUSD decision not to use the site for a school, and not that of the City or Applicant. Except for up to 10,000 square feet of commercial uses, all commercial, industrial, and institutional uses in the Hallock Center District are proposed for elimination. No changes to the approximately 225 acres of park and open space areas are proposed. The number of acres provided for the Community Park (Sports Park) and neighborhood parks would also remain the same.

**Proposed General Plan Amendment**

The 2040 General Plan contains references to the approved EA1 SPA. To make the general plan consistency finding needed for approval of the proposed EA1 SPA, these references in the 2040 General Plan must be updated to conform to the proposed EA1 SPA.

The proposed amendments to the General Plan (See Exhibit B to Attachment C [Proposed Ordinance]) would change the description of the EA1 Specific Plan in the Land Use Element. The new description would reflect the permitted increase in residential units from 1500 to 2050, the reduction of acres reserved for SPUSD school facilities, the elimination of light industrial uses, and the reduction of permitted commercial uses to 10,000 square feet.

The amendments would also revise the Public Services and Utilities Element to remove

references to the K-8 elementary school site that the SPUSD decided not to use.

**ENVIRONMENTAL REVIEW:**

The Project has been the subject of comprehensive environmental review since 2008 conducted in conformance with the requirements of the California Environmental Quality Act (CEQA). An Environmental Impact Report (EIR) analyzing the impacts of the East Area 1 Specific Plan as originally proposed and approved was certified in 2008 (2008 EIR). The City prepared two addendums to the 2008 EIR evaluating minor changes to the approved project. In 2015, the City prepared a Supplemental EIR (2015 SEIR) to analyze an amendment to the approved Specific Plan involving reconfiguration of the approved uses. Since 2015, the City has also prepared two additional Addendums to the 2015 SEIR and 2008 EIR evaluating minor changes to the approved Specific Plan.

CEQA authorizes the preparation of an Addendum to a previously certified EIR if the proposed changes to a project can be addressed by changes or additions to the EIR, but none of the conditions requiring preparation of a Subsequent EIR set forth in State CEQA Guidelines section 15162 have occurred. An addendum to an EIR is appropriate where:

1. No substantial changes are proposed in the Project that would require major revisions of the previous EIR due to the occurrence of new significant effects or a substantial increase in the severity of previously identified significant impact;
2. No substantial changes in circumstances under which the Project is undertaken would occur that would require major revisions of the previous EIR due to the occurrence of new significant environmental effects or a substantial increase in the severity of previously identified effects; and
3. No new information of substantial importance has been discovered that was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was prepared.

Here, an Addendum to the previously certified EIR for the Project is appropriate because a review of current conditions and the amended Project demonstrates the following:

1. The amended Project would not have one or more significant effects not discussed in the previous EIR;
2. Significant effects previously examined would not be substantially more severe than shown in the Final EIR;
3. There are no new mitigation measures or alternatives previously found not to be feasible that would now in fact be feasible that would substantially reduce one or more significant effects of the amended Project, and that the amended Project proponents decline to adopt; and
4. No new mitigation measures or alternatives that are considerably different from those analyzed in the previous EIR that would substantially reduce one or more significant effects on the environment, and that the amended Project proponents decline to adopt, are recommended.

(State CEQA Guidelines, § 15162(a).)

The City has prepared EIR Addendum No. 4 (Addendum No. 6 to the 2008 EIR and Addendum No. 4 to the 2015 SEIR) evaluating the proposed fourth amendment to the approved Specific Plan. Based on the information contained in this Addendum, the proposed

changes to the Project allowed by the proposed Specific Plan Amendment, if approved, would not result in any new significant impacts or any substantial increase in severity of the significant impacts identified in the 2008 EIR and 2015 SEIR as updated by the previously prepared Addendums. Additionally, no new information of substantial importance has been identified that indicates the amended Project would result in any new significant impacts or any substantial increase in the severity of the significant impacts identified in the Final EIR.

**PUBLIC NOTIFICATION:**

Before the City Council held a public hearing on March 20, 2024, a Notice of Public Hearing was published in the Santa Paula Times, mailed to persons within 300 feet of the exterior boundaries of the subject property, and posted in a conspicuous place on the property affected in compliance with state law and SPMC § 16.204.010(C).

**STRATEGIC PLAN:**

Though this item does not promote a specific objective in the City's 2-Year Strategic Plan, it furthers the following general goal: "Create an environment within the City in which our residents feel safe and which promotes the City as a location of choice for living, working, visiting and recreating."

**FISCAL IMPACTS:**

LLCB has submitted a Harvest at Limoneira Projected Fiscal Impacts and Assumptions memorandum dated June 30, 2023 and prepared by Stanley R. Hoffman Associates. (See Attachment D.) This memorandum updates the prior analysis with the proposed 2,050 units in East Area 1. The memorandum assesses East Area 1 and the Santa Paula Gateway Project (East Area 2) combined and is based on a seven-year fiscal forecast (2023-2029) for these areas. The memorandum concludes that when East Area 1 and 2's revenue surplus is matched against the City obligations, net City benefits (annual positive cash flow) are projected throughout the forecasted development-period and at buildout.

The City and its financial consultants have not had sufficient opportunity to peer review the fiscal impact analysis in detail and is not prepared to opine on its validity at this time.

**OPTIONS:**

In addition to the recommended action, the City Council has available to it the following alternative options:

1. Do not adopt Ordinance No. 1336

**ATTACHMENTS:**

Att A - Approved EA1 Land Use Map.pdf
Att B - Development Plan
Att C - Ordinance No. 1336 - EA1 SPA No. 4 & GPA.pdf
Att D - LLCB Fiscal Analysis.pdf
Att E - SPA 4 Corrections

Att F - EIR Addendum 4 Corrections

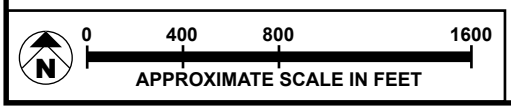
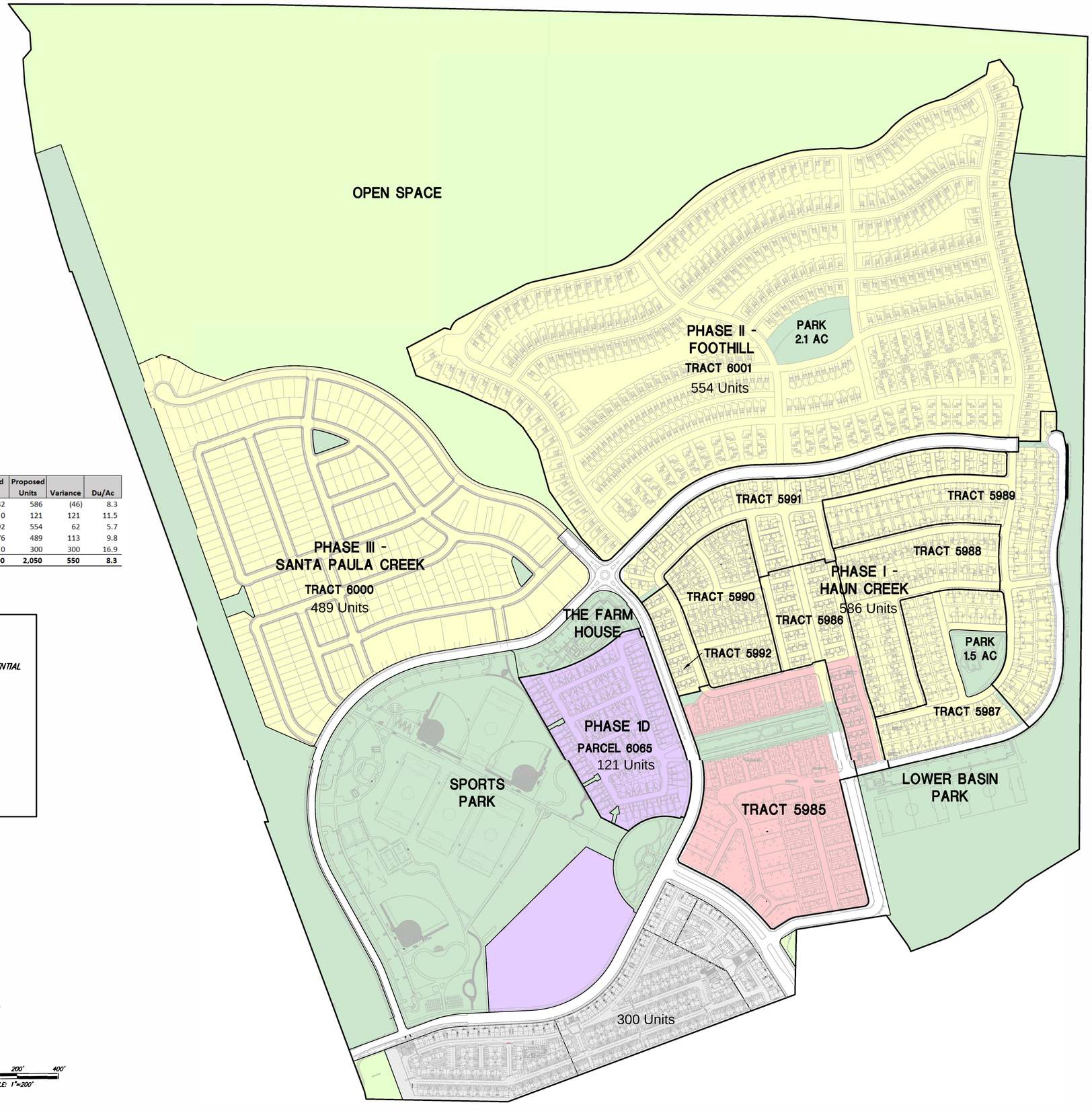



FIGURE **2-1**

Approved Land Use Plan



114-001-16




| Area | Acres | Approved Units | Proposed Units | Variance | Du/Ac |
|---|---|---|---|---|---|
| Phase I - Haun Creek / Hallock | 71 | 632 | 586 | (46) | 8.3 |
| Phase I - Elementary School Site | 11 | 0 | 121 | 121 | 11.5 |
| Phase II - Foothill | 98 | 492 | 554 | 62 | 5.7 |
| Phase III - Santa Paula | 50 | 376 | 489 | 113 | 9.8 |
| Commercial - Hallock | 18 | 0 | 300 | 300 | 16.9 |
| **Total** | **247** | **1,500** | **2,050** | **550** | **8.3** |

*LAND USE DATA*

- *HALLOCK CENTER*
- *NEIGHBORHOOD RESIDENTIAL*
- *COMMERCIAL*
- *CIVIC – SCHOOL*
- *OPEN SPACE – AG*
- *OPEN SPACE – PARK*

200' 100' 0' 200' 400'

*GRAPHIC SCALE: 1"=200'*

HARVEST

– AT LIMONEIRA –

# ATTACHMENT C

Ordinance No. 1336 – EA1 SPA No. 4 & GPA

**ORDINANCE NO. 1336**

**AN ORDINANCE APPROVING (1) ADDENDUM NO. 4 TO THE FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT REPORT (EIR) FOR EAST AREA 1 SPECIFIC PLAN AMENDMENT NO. 4 AND A GENERAL PLAN AMENDMENT, (2) EAST AREA 1 SPECIFIC PLAN AMENDMENT NO. 4, AND (3) A GENERAL PLAN AMENDMENT**

The City Council of the City of Santa Paula does ordain as follows:

SECTION 1: The City Council finds and declares that:

A. On February 26, 2008, the City Council certified the East Area 1 Final Environmental Impact Report (SCH#2006071134) (the "2008 EIR").

B. On March 3, 2008, the City Council approved the East Area 1 Specific Plan in accordance with Government Code § 65450, et seq. (the "Specific Plan"). The City Council also approved a Pre-Annexation Agreement and Development Agreement.

C. Following a special election in June 2008, the City Council adopted Resolution No. 6508 on July 7, 2008 finding that voters approved Measure G amending Section III (F) of the Land Use Element of the Santa Paula General Plan and Section III (G) of the Land Use Element to the General Plan (the "2008 General Plan Amendment").

D. Together, the 2008 General Plan Amendment, Specific Plan, and Pre-Annexation Agreement and Development Agreement allowed development of what is commonly known as Harvest at Limoneira ("Harvest") or "East Area 1", a master-planned residential development in Santa Paula, California.

E. In 2010 and 2013, the City prepared Addendum Nos. 1 and 2, respectively, to the 2008 EIR evaluating minor changes to the project.

F. In February 2015, the City certified a Supplemental EIR ("2015 EIR") that analyzed an amendment to the Specific Plan ("Specific Plan Amendment No. 1") to revise the land use plan and regulating plan as defined in the Specific Plan, a Master Vesting Tentative Map to subdivide the Specific Plan Area to facilitate the development allowed by the approved Specific Plan, and an Amended and Restated Development Agreement.

G. On or about September 21, 2015, Limoneira Lewis Community Builders, LLC ("Developer" or "Applicant") became the successor in interest to the rights and obligations of Limoneira Company pertaining to the Development Agreement.

H. In November 2015, the City approved a second amendment to the Specific Plan ("Specific Plan Amendment No. 2") to adjust setback and landscaping requirements and to authorize the Planning Director to make administrative adjustments to setback requirements.

I. In June 2021, the City approved a third amendment to the approved Specific Plan ("Specific Plan Amendment No. 3") which expanded the range of residential land uses allowed in the Civic District and Hallock Center Zones to include single-family residential uses and reflected that Santa Paula Unified School District no longer planned development of an elementary school on a 10.9-acre site in the Civic District. A second 8.2 acre site for school facilities was unaffected.

J. The Applicant has applied for a fourth amendment to the approved Specific Plan ("Specific Plan Amendment No. 4") and a General Plan Amendment ("GPA"), and a third amendment to the Development Agreement ("DA Amendment No. 3") to increase the number of units in the Specific Plan area by 550 units from 1500 units to 2050 units, among other changes.

K. On February 13, 2024, the City Council adopted Resolution No. 7500 approving Addendum No. 3 to the EIR ("Addendum No. 3") for DA Amendment No. 3 and introduced and waived first reading of Ordinance No. 1333 approving DA Amendment No. 3 subject to Council approval of Specific Plan Amendment No. 4 ("DA Ordinance").

L. On February 21, 2024, the City Council adopted the DA Ordinance.

M. The proposed Specific Plan Amendment No. 4 would increase the number of residential units allowed by 550 units from 1,500 to 2,050 units and remove the 25,000 square feet of light industrial and 205,000 square feet of commercial development currently allowed by the Specific Plan in the Hallock Center District. This amendment is a reduction from 215,000 square feet commercial uses and would leave 10,000 square feet for commercial uses in the District.

N. The proposed GPA would amend the 2040 General Plan to conform to the proposed Specific Plan Amendment No. 4.

O. The City has prepared a fourth Addendum to the EIR ("Addendum No. 4") to evaluate Specific Plan Amendment No. 4 and the GPA (together, "Amended Project"). Based on the analysis and findings in Addendum No. 4, which are incorporated by reference into this Resolution, Staff has determined no new significant impacts are likely to result from the proposed Amended Project.

P. On February 27, 2024, the Planning Commission at a duly noticed public hearing adopted Resolution No. 3859 recommending that City Council approve Addendum No. 4 to the EIR ("EIR Addendum") and adopt an ordinance approving Specific Plan Amendment No. 4 and the GPA .

Q. On March 20, 2024, the City Council held a public hearing pursuant to the Santa Paula Municipal Code (SPMC) and provisions of Government Code Section 65355, notice of which was provided in accordance with Government Code Section 65090 and 65091, at which hearing all persons wishing to testify in connection with the EIR

Addendum and the Amended Project were heard and at which time the Amended Project was comprehensively reviewed.

SECTION 2: *Required Specific Plan Findings*. Pursuant to Santa Paula Municipal Code (SPMC) § 16.216.070, the City Council makes the following findings to approve the proposed Specific Plan Amendment No. 4:

A. The proposed Specific Plan Amendment promotes public health, safety, and general welfare, and serves the goals and purposes of SPMC Title 16, as follows:

1. SPMC Title 16 allows for the establishment and administration of Specific Plan Zones in Chapters 16.25 and 16.216 and establishes a designation of SP-3 for EA1SP on the General Plan and Zoning maps.

2. The Specific Plan Amendment would provide a mechanism by which the Harvest can provide for diverse housing use types in accordance with the General Plan Housing Element and SPMC Title 16.

3. The Specific Plan Amendment would serve the goals and purpose of SPMC Title 16 because it would permit development at Harvest consistent with the standards and requirements of SPMC Title 16 and provide diverse housing.

B. The proposed Specific Plan Amendment is consistent with the goals, policies, and objectives of the City's General Plan as follows:

1. East Area 1 is identified in the concurrently proposed General Plan as a Specific Plan for future urban development. The amendment would increase urban development within the City by up to 550 residential units.

2. The Specific Plan Amendment provides for land uses consistent with those identified in the concurrently proposed General Plan for the Harvest site. The proposed General Plan designates the project site as a 501-acre development with up to 2,050 residential units, 25,000 square feet of light industrial, 10,000 square feet of commercial, and approximately 8.3 acres of institutional uses. Proposed public facilities include an approximate 8.3 acre site set aside for the Santa Paula Unified School District.

3. The concurrently proposed General Plan contains a number of relevant Goals, Objectives, and Policies in the Land Use Element. The proposed Specific Plan Amendment is consistent with Land Use Element Goal 3 because it will provide for a full range of housing opportunities to the community. It is consistent with Land Use Element Policies 3.1, 3.2, 3.3, and 3.5 because it promotes a balance of diverse land uses, while leaving sufficient land for amenities to

enrich citizens' quality of life such as parks and open space; provides for a full range of housing types; and encourages multi-family residential development within walking distance of commercial services and public amenities.

C. The proposed Specific Plan Amendment will not adversely affect surrounding properties because, among other reasons in the record:

1. East Area 1 is organized by three planning areas or zones: the Civic District, the Hallock Center, and the Neighborhood. The Neighborhood area consists of three neighborhood subareas: Haun Creek, Foothill, and Santa Paula Creek. As shown in Figure 2.4 of Addendum No. 4, the amendment would distribute the additional 550 potential residential units across the three zones and neighborhood subareas increasing overall density negligibly from 6.4 du/acre to 7.8 du/acre. This increase in density will not result in adverse impacts for reasons described in subsections 2 through 3 below.

2. No adverse impact to infrastructure would result because the existing infrastructure serving East Area 1 has the capacity to accommodate the additional 550 units proposed, as discussed in Section 3.11: Utilities and Service Systems, of Addendum No. 4.

3. In terms of traffic impacts, the changes in the land uses allowed in the Specific Plan area would result in a small reduction in the amount of Daily, AM and PM Peak Hour traffic generated by the Project as shown in Table 3.2-1: Change in Trip Generation of Addendum No. 4. Neighborhood serving commercial uses in the Hallock Center would reduce the need for Harvest residents and Sports Park visitors to drive into the City.

4. In terms of roadway noise, the proposed Specific Plan Amendment would replace most of the previously approved commercial, industrial, and institutional uses with residential uses, which would result in a reduction in truck traffic (i.e., delivery trucks, passenger vehicles, and school buses) and associated vibration effects within the Specific Plan Area.

5. In terms of aesthetics, the development standards and design guidelines in the proposed amendment ensure that the amendment will not substantially degrade the existing visual character of the Specific Plan area or create a new source of substantial light or glare.

SECTION 3: *Required General Plan Amendment Findings*. The City Council makes the following findings pursuant to SPMC §16.212.050:

A. *The proposed amendment is in the public interest, and there will be a community benefit resulting from the amendment.* In order to amend the Specific Plan as proposed, the approved General Plan must be consistent with the proposed Specific Plan amendment. The amendments to the General Plan attached as Exhibit B to this Resolution would therefore allow for implementation of the proposed Specific Plan Amendment. If approved, the Specific Plan Amendment will result in a community benefit because it will ensure the Applicant installs and pays for East Area 1's infrastructure including a future Santa Paula Creek Bridge, completes and funds a community sports park, and provides for the orderly and phased development of East Area 1 all in the public interest.

B. *The proposed amendment is consistent with the other goals, policies, and objectives of the General Plan.* The proposed amendments are textual amendments for consistency with the concurrently proposed Specific Plan Amendment and do not modify the goals, policies, and objectives of the approved General Plan. The amendment is therefore consistent with the other goals, policies, and objectives of the General Plan.

C. *The proposed amendment does not conflict with provisions of the City's Development Code.* The proposed amendments are textual amendments for consistency with the concurrently proposed Specific Plan Amendment and do not modify or conflict with the City's Development Code.

D. *In the event that the proposed amendment is a change to the land use policy map, the amendment will not adversely affect surrounding properties.* There is no change to the land use policy map, which currently designates the East Area 1 site as "Specific Plan". This finding is therefore inapplicable.

E. *Whether the amendment requires voter approval in accordance with either General Plan Section III(F) (the SOAR Initiative) or General Plan Section III(G) (the 81 Acre Initiative). Amendments requiring voter approval cannot become effective without an affirmative vote from a majority of registered voters at a regular or special election.* The textual amendments to the General Plan for consistency with the concurrently proposed Specific Plan Amendment do not require voter approval. This finding is therefore inapplicable.

SECTION 4: *Senate Bill 18 Tribal Consultation*. On December 13, 2023, notice of the proposed Specific Plan Amendment was sent to appropriate tribes pursuant to SB 18. The 90-day tribal consultation period ended March 12, 2024. No comments were received.

SECTION 5: *Environmental Assessment*. The City Council makes the following findings:

A. An Environmental Impact Report (EIR) analyzing the impacts of the EA1 Specific Plan as originally proposed and approved was certified in 2008 (2008 EIR). The City prepared two addendums to the 2008 EIR evaluating minor changes to the approved project. In 2015, the City prepared a Supplemental EIR (2015 SEIR) to

analyze an amendment to the approved Specific Plan involving reconfiguration of the approved uses. Since 2015, the City has also prepared two additional Addendums to the 2015 SEIR and 2008 EIR evaluating minor changes to the approved Specific Plan (these documents are collectively referenced herein as the "Final EIR").

B. The California Environmental Quality Act (CEQA) authorizes an addendum to a previously certified EIR if, as a result of changes to the project at issue in the EIR, changes or additions to the EIR are needed, but none of the conditions permitting preparation of a Subsequent EIR set forth in State CEQA Guidelines section 15162 have occurred.

C. The City has prepared EIR Addendum No. 4 to the 2015 SEIR ("EIR Addendum No. 4").

D. EIR Addendum No. 4 is appropriate because the Amended Project demonstrates the following:

1. The Amended Project would not have one or more significant effects not discussed in the Final EIR;

2. Significant effects previously examined would not be substantially more severe than shown in the Final EIR;

3. There are no new mitigation measures or alternatives previously found not to be feasible that would now in fact be feasible and that would substantially reduce one or more significant effects of the Amended Project; and there are no new mitigation measures or alternatives that the Amended Project proponents decline to adopt; and

4. No new mitigation measures or alternatives that are considerably different from those analyzed in the previous EIR that would substantially reduce one or more significant effects on the environment, and that the Amended Project proponents decline to adopt, are recommended.

SECTION 6: *Approval*. The City Council hereby:

A. Adopts the findings and analysis in Council Resolution No. 7505 approving EIR Addendum No. 4, which is incorporated by this reference as if fully set forth herein.

B. Approves East Area 1 Specific Plan Amendment No. 4 attached as Exhibit "A" and the General Plan amendments attached as Exhibit "B", which are incorporated by these references as if fully set forth herein.

SECTION 7: *Reliance on the Record*. Each and every one of the findings and determinations in this Ordinance are based on the competent and substantial evidence,

both oral and written, contained in the entire record relating to the Project. The findings and determinations constitute the independent findings and determinations of the City Council in all respects and are fully and completely supported by substantial evidence in the record as a whole.

SECTION 8: *Severability*. If any part of this Ordinance or its application is deemed invalid by a court of competent jurisdiction, the City Council intends that such invalidity will not affect the effectiveness of the remaining provisions or applications, and to this end the provisions of this Ordinance are severable.

SECTION 9: *Notice*. The City Clerk is directed to certify the passage and adoption of the Ordinance, make a note of the passage and adoption in the records of this meeting, and within fifteen days after the passage and adoption of this Ordinance cause it to be published and posted in accordance with California law.

SECTION 9: This Ordinance will become effective on the 31st day following its passage and adoption.

PASSED AND ADOPTED this _____ day of April 2024.

_____

Leslie Cornejo, Mayor

ATTEST:

_____

Julie Latshaw, CMC, City Clerk

APPROVED AS TO FORM:

_____

Monica Castillo, City Attorney

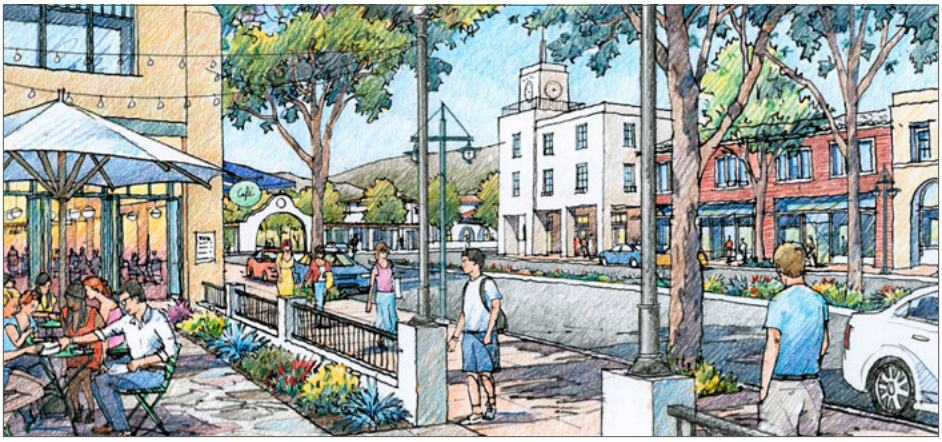
**EXHIBIT A**

East Area 1 Specific Plan Amendment No. 4

[attached behind]

# East Area 1 Specific Plan SP-3

## Santa Paula, California



# Acknowledgements


**City Council:**

Leslie Cornejo, Mayor
Pedro Chavez, Vice Mayor
Jenny Crosswhite, Councilmember
Carlos Juarez, Councilmember
Andy Sobel, Councilmember

**Planning Commission:**

Aaron Dunkel, Chairperson
Maria Grace Kelly, Vice Chairperson
Austin Auger, Commissioner
Jason Herber, Commissioner
Noel Kiesewetter, Commissioner

**Appointed Officials:**

Dan Singer, City Manager
Monica Castillo, City Attorney

**City Staff:**

James Mason, Community & Economic Development Director
Clete J. Saunier, Public Works Director
Christy Ramirez, Finance Director
Don Aguilar, Chief of Police
Gregory Barnes, Director of Parks and Recreation
Julie Latshaw, City Clerk

# East Area 1
# Specific Plan SP-3

## Santa Paula, California

**Original Specific Plan Approved February 2008**

*Prepared by*

HDR | Town Planning

**Amended January 2015 and November 2015**

*Prepared by*

Sargent Town Planning

*in association with:*

Meridian Consultants, LLC
Jensen Design & Survey
MJS Design Group, Inc.
Fehr & Peers Transportation Consultants

**Amended June 2021 and March 2024**

*Prepared by*

Meridian Consultants, LLC

*in association with:*

Jensen Design & Survey

# Table of Contents


## 1. Introduction

1.1. Introduction to the Specific Plan . . . . . 1-1
1.2. Specific Plan Area . . . . . 1-2
1.3. Background . . . . . 1-2
1.4. Relationship to the Santa Paula General Plan . . . . . 1-3
1.5. Specific Plan Preparation and Adoption . . . . . 1-3
1.6. Overview of the Specific Plan . . . . . 1-4
1.7. Organization of the Specific Plan. . . . . 1-6

## 2. Form and Character

2.1. Overview of Land Use Plan . . . . . 2-1
2.2. Circulation Plan. . . . . 2-6
2.3. Grading Concept . . . . . 2-6
2.4. Land Use Policies and Objectives . . . . . 2-8

## 3. Infrastructure and Public Services

3.1. Existing Utilities and Infrastructure . . . . . 3-1
3.2. Transportation . . . . . 3-1
3.3. Water Supply . . . . . 3-1
3.4. Wastewater Master Plan . . . . . 3-8
3.5. Drainage Master Plan . . . . . 3-10
3.6. Electricity . . . . . 3-14
3.7. Gas. . . . . 3-14
3.8. Telephone . . . . . 3-14
3.9. Cable . . . . . 3-14
3.10. Solid Waste . . . . . 3-14
3.11. Public Safety Services . . . . . 3-15
3.12. Schools . . . . . 3-15
3.13. Parks and Recreation . . . . . 3-15
3.14. Goals, Policies and Programs . . . . . 3-17

## 4. Implementation

4.1. Introduction. . . . . 4-1
4.2. Specific Plan Regulatory Approach . . . . . 4-1
4.3. Implementation Schedule . . . . . 4-1
4.4. Infrastructure and Public Facilities/Services . . . . . 4-1
4.5. Financing Plan . . . . . 4-3
4.6. Methods and Procedures for Implementation . . . . 4-3
4.7. Specific Plan Approvals. . . . . 4-3
4.8. Administration . . . . . 4-3
4.9. Submission, Review and Approval Requirements . . 4-4
4.10. Maximum Development Yield and Density Transfers . . . . . 4-9

## 5. Development Standards

5.1. Purpose and Applicability . . . . . 5-1
5.2. Regulating Plan. . . . . 5-6
5.3. Land Use Regulations . . . . . 5-8
5.4. Building Setback and Height Standards . . . . . 5-15
5.5. Parking and Service Standards . . . . . 5-16
5.6. Thoroughfare Design Standards . . . . . 5-19
5.7. Landscape Standards . . . . . 5-35
5.8. Historic Features . . . . . 5-44

## 6. Design Guidelines

6.1. Design Guidelines Overview . . . . . 6-1
6.2. Neighborhood Design Guidelines . . . . . 6-2
6.3. Hallock Center and Civic District Design Guidelines . . . . . 6-21
6.4. Architectural Design Guidelines . . . . . 6-26

## Appendices

**A** Approved Administrative Modifications

# Table of Contents

## Tables


2-1 East Area 1 Land Use Summary . . . . . 2-2

3-1 Sumary of Ultimate Domestic Water Land Uses and Demands . . . . . 3-2
3-2 Summary Wastewater Generation for Sewer . . . . . 3-8

5-1 Allowed Land Uses and Permit Requirements . . . 5-10
5-2 Minimum Building Setbacks . . . . . 5-15
5-3 Maximum Building Heights . . . . . 5-15
5-4 Thoroughfare Categories and Types. . . . . 5-20

6-1 Sign Guidelines . . . . . 6-35


## Figures


1-1 Regional Location Map . . . . . 1-1
1-2 Specific Plan Area Location . . . . . 1-1
1-3 View of the Specific Plan Area and Vicinity. . . . . 1-2
1-4 Overhead View of the Specific Plan Area and Vicinity . . . . . 1-2

2-1 Rendering of Santa Paula Street . . . . . 2-2
2-2 East Area 1 Illustrative Plan . . . . . 2-3
2-3 Rendering of Park Blocks . . . . . 2-4
2-4 Rendering of a Typical Neighborhood Street . . . . . 2-5
2-5 Rendering of the Haun Creek Greenway . . . . . 2-5
2-6 Conceptual Grading Plan . . . . . 2-7

3-1 Water Well Field Schematic Layout . . . . . 3-3
3-2A Domestic Water Schematic Layout . . . . . 3-4
3-2B Recycled Water Schematic Layout . . . . . 3-5
3-3 Water Quality Plan . . . . . 3-6
3-4 Wastewater System Schematic Layout . . . . . 3-9
3-5 Existing Drainage Areas . . . . . 3-11
3-6 Drainage Master Plan . . . . . 3-13
3-7 Public Services and Civic Uses . . . . . 3-16

4-1 East Area 1 Phasing Guide . . . . . 4-2

5-1 Regulating Plan. . . . . 5-7
5-2 Parking Convenience and Duration . . . . . 5-18
5-3 Thoroughfare Type Diagram . . . . . 5-21
5-4 Master Street Tree Plan . . . . . 5-37
5-5 Historic Features . . . . . 5-45

6-1 Vertical Configuration of Materials. . . . . 6-27
6-2 Visible Support of Projecting Elements. . . . . 6-27
6-3 Window Configurations . . . . . 6-29
6-4 Shopfront Assembly. . . . . 6-30
6-5 Storefront Configurations . . . . . 6-31
6-6 Fence Height and Placement . . . . . 6-31

This page intentionally left blank.

## 1.1 Introduction to the Specific Plan

This East Area 1 Specific Plan ("EA1SP") was prepared in conformity with Government Code §§ 65451, et seq. Together with zoning regulations adopted by the Santa Paula Municipal Code ("SPMC"), and other Applicable Law, this EA1SP sets forth the regulations for East Area 1.

Pursuant to Government Code § 65450, a specific plan must include text and a diagram or diagrams which specify all of the following in detail:

- The distribution, location, and extent of the uses of land, including open space within the area covered by the plan.
- The proposed distribution, location, extent, and intensity of major components of public and private transportation, sewage, water, drainage, solid waste disposal, energy and other essential facilities proposed to be located within the land area covered by the plan and needed to support the land uses described in the plan.
- Standards and criteria by which development will proceed, and standards for the conservation, development, and utilization of natural resources, where applicable.
- A program of implementation measures including regulations, programs, public works projects and financing measures necessary to carry out the above items.
- A discussion of the relationship of the EA1SP to the General Plan.

This EA1SP is compatible and consistent with the goals and policies outlined in the General Plan. The EA1SP will further the goals and policies of the General Plan as more fully described below.

This EA1SP was prepared to provide the essential relationship between the policies of the Santa Paula General Plan and actual development in the Project area. By functioning as a regulatory document, the EA1SP provides a means of implementing the Santa Paula General Plan. All future development within the EA1SP boundaries must be consistent with the standards set forth in this document.

**Figure 1-1: Regional** Location Map

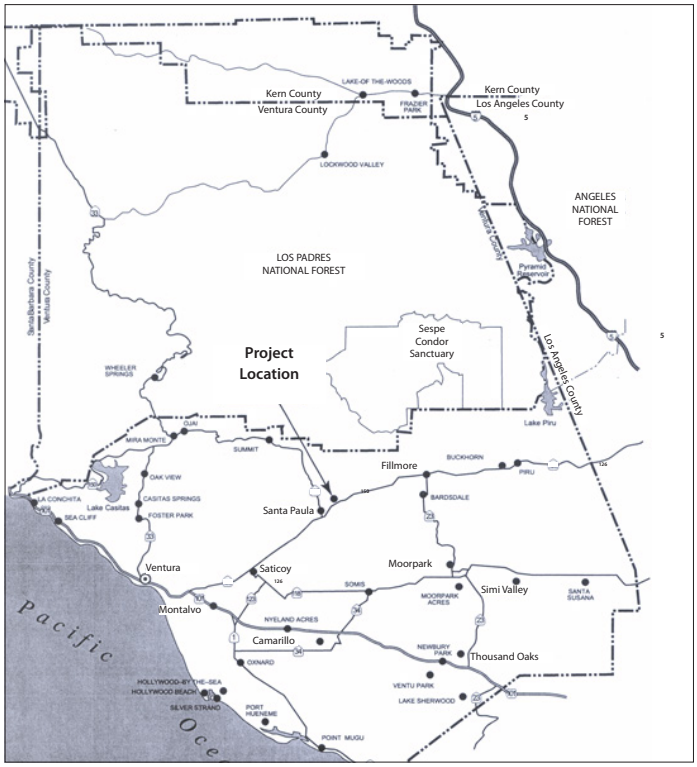
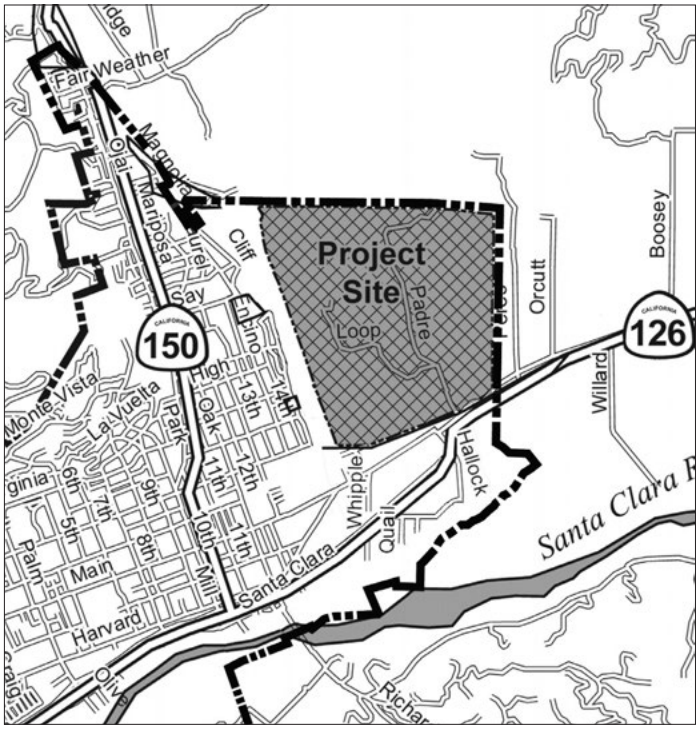



**Figure 1-2: Specific Plan A**rea Location



## 1.2 Specific Plan Area

The EA1SP regulates real property (approximately 501 acres) located in the City of Santa Paula, County of Ventura, State of California, described as follows (the "Specific Plan Area"): The site is located east of Santa Paula Creek, north of Telegraph Road, west of Haun/Orcutt Creeks and south of the Topatopa Mountains.

Figures 1-1 (Regional Location Map), 1-2 (Specific Plan Area Location), 1-3 (View of the EA1 Area and Vicinity) and 1-4 (Overhead View of the EA1 Area and Vicinity) identifies the project in relation to the immediate specific plan vicinity and region.

## 1.3 Background

The City of Santa Paula is located directly west of the City of Fillmore, east of the City of San Buenaventura and north of the Santa Clara River. The Specific Plan Area is bounded on the north by hillside agricultural land, on the west by Santa Paula Creek, on the south by a small number of single-family homes on Texas Lane, the Santa Paula Branch Rail Line and State Route 126 (SR 126), and on the east by Haun Creek. Regional access is provided by SR 126 with local access provided from Hallock Drive and Telegraph Road.

The City of Santa Paula is located in the heart of the Santa Clara River Valley and surrounded by groves of oranges, lemons and avocados. The historical significance of the citrus industry led the City to be known as the Citrus Capital of the World. Haun Creek is the eastern edge of the City of Santa Paula and the agricultural land to the east is included in the Santa Paula-Fillmore Greenbelt, adopted by the cities of Santa Paula and Fillmore and the County of Ventura to preserve open space and agriculture in the Santa Clara River Valley.

Santa Paula is a city steeped in cultural diversity and a blended heritage, which made it the unique community it is today. Celebrated for its sense of tradition and architectural integrity, the City is a virtual showcase of classic architectural styles, from American Farmhouse, Mission and California Bungalows, to the more ornate Queen Anne and English Tudor.

Santa Paula's colorful history can be traced through its diverse residential areas, as well as classic commercial buildings like the Limoneira Building, the Mill Building, and the California Oil Museum. This historic character provides a foundation of residential and commercial architectural design themes to build upon within the Specific Plan Area.

**Figure 1-3: View of the Specific Plan Area** and Vicinity

**Figure 1-4: Overhead View of the Specific Plan Area** and Vicinity

The City of Santa Paula was founded and continues to be largely sustained by agriculture and its associated industry. The downtown commercial center of the City grew from the proximity to the railroad and the residential areas spread northward into the hills. The Santa Clara River and Santa Paula Creek acted as natural boundaries to the City's growth.

Except for the northern portion of the Specific Plan Area , the land slopes gently to the southeast with slopes of less than 5 percent on a majority of the southern portion of the Specific Plan Area. The steep hills in the northern portion of the Specific Plan Area have slopes between 15 and 30 percent. A transitional plateau between these steep hills and the lower portion of the Specific Plan Area contain slopes between 5 and 15 percent.

The Specific Plan Area includes three different basic geologic formations. The northern steep portion is comprised of a bedrock formation of silts and sands prone to erosion. Alluvium and older alluvium deposits, relatively rocky in character, form the flatter portions of the Specific Plan Area.

The Specific Plan Area overlies a portion of the Santa Paula and Fillmore groundwater basins. Water for the existing agricultural operations is provided by onsite wells.

The Specific Plan Area was utilized for intensified agricultural activities for many years. The established orchards and related farm buildings and improvements – including nine small single family homes occupied by farmworkers – are the dominant features of the Specific Plan Area.

Santa Paula Creek forms a boundary between the Specific Plan Area and the existing developed portions of the City of Santa Paula. Haun Creek is the eastern boundary of the City of Santa Paula, forms a natural edge to the Specific Plan Area and the beginning of the large agricultural greenbelt area that extends eastward to the City of Fillmore. Some remnants of native vegetation are present both in Haun Creek and in the steeper hills on the northern portion of the Specific Plan Area.

This EA1SP includes comprehensive development guidelines and implementation measures to ensure the creation of a vibrant, livable community with readily accessible amenities and attractive streetscapes and public places.

A network of dedicated open space is provided along Santa Paula and Haun Creeks, and through the preservation of the northern portion of the Specific Plan Area.

## 1.4 Relationship to the Santa Paula General Plan

A specific plan is a tool for implementation of the General Plan and, therefore, must be consistent with the City's General Plan (Government Code §§ 65450, *et seq*.).

As shown in Section 1.6.3 (Consistency with the General Plan), the EA1SP is consistent with the goals, policies, and programs in the General Plan. The EA1SP also conforms to the Government Code requirements for specific plans (see Chapter 4 for more discussion).

The City's 2040 General Plan Land Use Element identified the Specific Plan Area as one of five potential expansion areas and included guidance for the planning of this area. The General Plan required the preparation of a specific plan along with market and fiscal impact studies before annexation. After the City Council approved EA1SP in February 2008, voters amended the General Plan in 2008 to allow the EA1SP to regulate the Specific Plan Area following annexation. The City Council approved an amendment to the EASP1 in 2015 to refine the land use plan concurrent with approval of a master tentative tract map to implement the Specific Plan.

## 1.5 Specific Plan Preparation and Adoption

The General Plan required the preparation of a specific plan along with market and fiscal impact studies before annexation. Preparation of the EA1SP began with the East Area 1 Steering Committee ("Committee"). At the direction of the Committee and property owner, a design team prepared different designs for public consideration. Among other things, the design team's efforts incorporated aerial photography; surveying; title research; review of applicable law; review of relevant environmental data; review of circulation and utility infrastructure; survey and interviews with community leaders and local residents; and other, similar, matters.

Thereafter, the Committee held a series of public meetings in 2006 to solicit public input from the property owners, City residents, City staff, other City officials, and other public agencies. Among other things, the Committee received information related to land use, circulation, economic development, and design.

On March 2, 2006, the Committee considered a conceptual design which reflected public input and forms the basis for the EA1SP. Shortly thereafter, the property owner filed an application with the City. An Environmental Impact Report (EIR) was prepared to evaluate the potential environmental effects of the proposed project as required by the California Environmental Quality Act (CEQA). On February 26, 2008, the City Council certified the Final EIR and approved the EA1SP, subject to voter approval in accordance with applicable law. On June 3, 2008, voters amended the General Plan to include East Area 1 within the City Urban Restriction Boundary (CURB). In March 2011, the Ventura Local Agency Formation Commission approved reorganization of the City's boundaries, thus allowing annexation of East Area 1 within the City's jurisdiction. This change was recorded in February 2013.

The City Council approved an amendment to the the approved EA1SP (2008 EA1SP) in January 2015 (Amendment No. 1) to address the addition of three parcels to the proposed East Area 1 annexation.

In February 2015, a second amendment to the 2008 EAISP (Amendment No. 2) to refine the land use plan concurrent with approval of a master tentative tract map, Tract Map No. 5854, to implement the Specific Plan. In November 2015, a third amendment to the 2008 EA1SP (Amendment No. 3) was approved adjusting setback and landscaping requirements and authorizing the Community and Economic Development Director to approve administrative adjustments to setback requirements.

In June 2021, a third amendment to the 2008 EA1SP (Amendment No. 4) was approved expanding the range of residential land uses allowed in the Civic District and Hallock Center Zones to include single-family residential uses and reflecting that Santa Paula Unified School District no longer planned development of an elementary school on the 10.9-acre site in the Civic District.

This EA1SP is the fourth amendment to the 2008 EA1SP (Amendment No. 4), which increases the number of permitted residential units by 550 units from 1,500 units to 2,050 units, and reduces the amount of commercial development allowed.

## 1.6 Overview of the Specific Plan

### 1.6.1 Purpose and Authority of the Specific Plan

This EA1SP is intended to provide for the orderly and efficient development of the Specific Plan Area in accordance with the General Plan. In conjunction with the General Plan, this EA1SP implements the plan for the physical development of the Specific Plan Area and provides the regulatory requirements for all future development within the Specific Plan Area.

### 1.6.2 Specific Plan Scope and Goals

This EA1SP implements General Plan goals and policies by establishing land use designations, traffic circulation patterns, development policies, and infrastructure necessary to support the planned intensity of development. To achieve this purpose, this EA1SP has the following goals:

- Provide a single comprehensive plan for managing land use development, infrastructure, open space, and other resources to accommodate projected business growth, while protecting the area's natural resources.
- Identify appropriate locations and intensity for development considering constraints related to water supply, infrastructure availability, and environmental considerations.
- Provide policy and implementation direction for the Specific Plan Area to implement the General Plan's contemplated land use of the Specific Plan Area.
- Provide clear design guidelines and standards to allow for flexibility in the implementation and build-out of planned development within the Specific Plan Area.

### 1.6.3 Consistency with the General Plan

As shown below, the EA1SP is consistent with all applicable provisions of the General Plan.

A. **Land Use Element.** The Land Use Element Map designates East Area 1 as Specific Plan.

B. **Open Space and Conservation Element.** The EA1SP provides more than 225 acres of open space areas. The open space is accessible to the public. The EA1SP conserves natural resources by providing buffers from Santa Paula and Haun Creeks and preserve views of the highest visible hillsides by restricting development to the lower portion of the project site.

C. **Safety Element.** Development will occur in the non-high fire zone of the site reducing the fire hazard of this area. The EA1SP includes 100 foot buffers along Santa Paula Creek, reducing the flooding risk of this area. Flows from the project will not exceed existing conditions and will address historic flooding issues associated with Haun Creek at State Route 126.

D. **Circulation Element.** The EA1SP provides for the extension of Santa Paula Street over Santa Paula Creek and improvement of Hallock Drive south of the project site, thus providing improved circulation to and from the project site and remainder of Santa Paula. Hallock Drive provides primary access to the Specific Plan Area from SR-126 and Telegraph Road with the planned extension of Santa Paula Street providing secondary access and direct access to the existing community located west of Santa Paula Creek. The Ventura County Fire District has approved secondary emergency access for use until the extension of Santa Paula Street through construction of the future Santa Paula Creek Bridge is completed. The streets within the project site are designed to balance the needs and serve pedestrians, cyclists and motorists. The plan includes a pedestrian network, including trails,, encouraging people to walk whenever possible to satisfy their daily needs.

E. **Noise Element.** The EA1SP provides for neighborhoods that are designed to encourage walking and biking as an alternative to driving. This is intended to reduce automobile trips and related community noise levels. Construction activities are subject to SPMC regulations as may be amended which restrict construction activities to during the work week.

F. **Housing Element.** The EA1SP will provide up to 2,050 residential units, with a variety of single family homes and multifamily units. This will add new housing to the City's housing stock in inventory. Compliance with the inclusionary housing requirements set forth in the SPMC as may be amended will be accomplished by providing the City with public benefit housing down payment program assistance funding of $500,000 in accordance with Section 8.7.1 of the East Area 1 Development Agreement, with an in-lieu inclusionary housing fee of $6.5 million in accordance with Section 8.7.2 of the East Area 1 Development Agreement. In addition, the 2024 amendment to the Development Agreement (2024 Development Agreement) provides that for each unit in excess of the first 1,500 units, the Master Developer must pay $500 per unit unto the Down Payment Assistance Program, and an additional contribution of $5.5 Million into the City's Affordable Housing Trust Fund to be used for an off-site affordable housing project commonly known as Rise Santa Paula located at 18004 East Telegraph Road. Should the City not finance Rise Santa Paula for any reason, the Master Developer will either fund a replacement off-site affordable housing project or pay in-lieu fees at $15,000 per unit in accordance with Section 8.7.2 of the 2024 Development Agreement.

## 1.7 Organization of the Specific Plan

This EA1SP is organized to include all elements of a specific plan required by the Government Code. In addition, it provides additional guidance on design elements intended to ensure the development of a sustainable new community.

The Illustrative Plan presented in Figure 2-2 presents the community design for East Area 1. This EA1SP is organized into six sections addressing various topics important to the planning of the Specific Plan Area and the elements required by the Government Code in specific plans.

1. **Introduction.** This introduction section describes the intent and purpose of the Specific Plan and the context of East Area 1 within the City and the Santa Clara River Valley, including an overview of the relationship of EA1SP to the Santa Paula General Plan. The section also describes the land use goals, policies and objectives for East Area 1.
2. **Form and Character.** This section summarizes and illustrates the intended form, character and land uses of the East Area 1 community. This EA1SP places a primary emphasis on a human-scale public realm, the town scale and pedestrian orientation of buildings, and providing a range of housing choices within comfortable walking distance of neighborhood services, school facilities, and parks.
3. **Infrastructure and Services.** This section identifies and describes the infrastructure systems and public services planned to support the development permitted in East Area 1 by this EA1SP.
4. **Implementation.** The section describes the process and the roles and responsibilities of the City and the Master Developer for implementing this EA1SP.
5. **Development Standards.** This section provides for minimum setback and maximum height standards for buildings, along with standards for the design of parking, neighborhood streets, and landscaping.
6. **Design Guidelines.** This section provides guidelines and recommendations for massing buildings and organizing them on the lot, as well as guidelines for architectural and landscape design. As with the development standards in Section 5, the emphasis of these guidelines is the shaping of streetscapes to provide a comfortable pedestrian-oriented neighborhood environment.

## 2.1 Overview of Land Use Plan

### 2.1.1 Development Concept

As set forth below, the EA1SP includes comprehensive development guidelines and implementation measures. The development concept will be implemented through the Development Standards and Design Guidelines in Sections 5 and 6 of this Plan, respectively, which guides the design and construction of all improvements, and the location and nature of all land uses within the Specific Plan Area. The Development Standards and Design Guidelines are intended to ensure that all buildings, related site improvements, and public improvements work together to define a pedestrian-oriented public realm – harmonious with each other in scale and architecture – and to create attractive, walkable neighborhoods in character with Santa Paula's historic neighborhoods.

### 2.1.2 Land Use Plan

East Area 1 is characterized by a unique range and combination of land uses, building scales and streetscape designs, organized into three distinct planning areas – the Civic District, the Hallock Center and the Neighborhood. The Neighborhood planning area, in turn, consists of three neighborhood subareas: the Haun Creek Neighborhood, the Foothill Neighborhood, and the Santa Paula Creek Neighborhood (see Figure 2-2, East Area 1 Illustrative Plan). East Area 1 also provides four open space designations that regulate the design and use of common open space areas: the Agricultural Preserve, the Open Space Preserve, Parks/Greenways, and Sports Park. Finally, there are two special frontage overlays that provide some additional standards and guidelines for selected street frontages: the East Center Overlay, and the Pedestrian Priority Overlay (see Figure 5-1, Regulating Plan). Table 2-1 identifies the type and intensity of uses allowed within these planning areas, and Figures 2-1, 2-3, 2-4, and 2-5 illustrate the envisioned design character.

**Figure 2-1: Rendering of Santa Paula Street**

*View of Santa Paula Street as it passes by the Haun Creek Neighborhood towards the Foothill Neighborhood.*

1. **The Hallock Center** is the main entry to East Area 1, whether arriving via Hallock Drive from Telegraph Road and Highway 126 to the south, or via Santa Paula Street from the west. Hallock Center is planned to include single and multi-family housing types. Neighborhood serving commercial uses are also allowed in Hallock Center. The Hallock Drive entry into East Area 1 focuses on a new civic green, which includes the Harvest Entry Park and Sports Park community facilities adjacent to the Civic District, near the center of East Area 1. Hallock Center also includes the existing packing house building located on the northwest corner of Hallock Drive and Telegraph Road.

   The northerly edge of Hallock Center is defined by an east-west green in which the historic Ranch Well House is the central landmark, and its east edge is defined by the historic palm-lined ranch entry drive.

2. **The Civic District**, generally located in the southwest quadrant of East Area 1, includes a large sports park.

3. **The Neighborhood** planning area consists of three distinct neighborhood subareas, the Haun Creek Neighborhood, the Santa Paula Creek Neighborhood, and the Foothill Neighborhood.

   The Haun Creek Neighborhood is located in the southeast quadrant of East Area 1. This neighborhood is intended to include a variety of single-family detached residences. The Haun Creek Neighborhood emphasizes its connection to the permanent open space environment of Haun Creek and the Perimeter Trail along its east edge – as well as the Santa Paula/Fillmore Greenbelt beyond – while also focusing inward to a central neighborhood green.

   The Santa Paula Creek Neighborhood is located in the

**Table 2-1: East Area 1 Land Use Summary**

| Land Use | Quantity | |
|---|---|---|
| **Residential Uses** | | |
| Hallock Center and Neighborhood [1] | 2,050 | units |
| **Total** | **2,050** | **units** |
| **Non-Residential Uses** | | |
| Commercial | 10,000 | sf |
| School Facilities | 8.3 | acres |
| **Undeveloped Land** | | |
| Agricultural Preserve | 55.0 | acres |
| Open Space Preserve | 77.3 | acres |
| Parks/Greenways | 55.2 | acres [2] |
| Sports Park | 37.8 | acres |
| **Total** | **225.3** | **acres** |

[1] Up to 10,000 square feet of commercial uses allowed in the Hallock Center District subject to Director approval under Section 4.8.3. Commercial uses also allowed in the existing historic Packing House building at 18245 E. Telegraph Road.

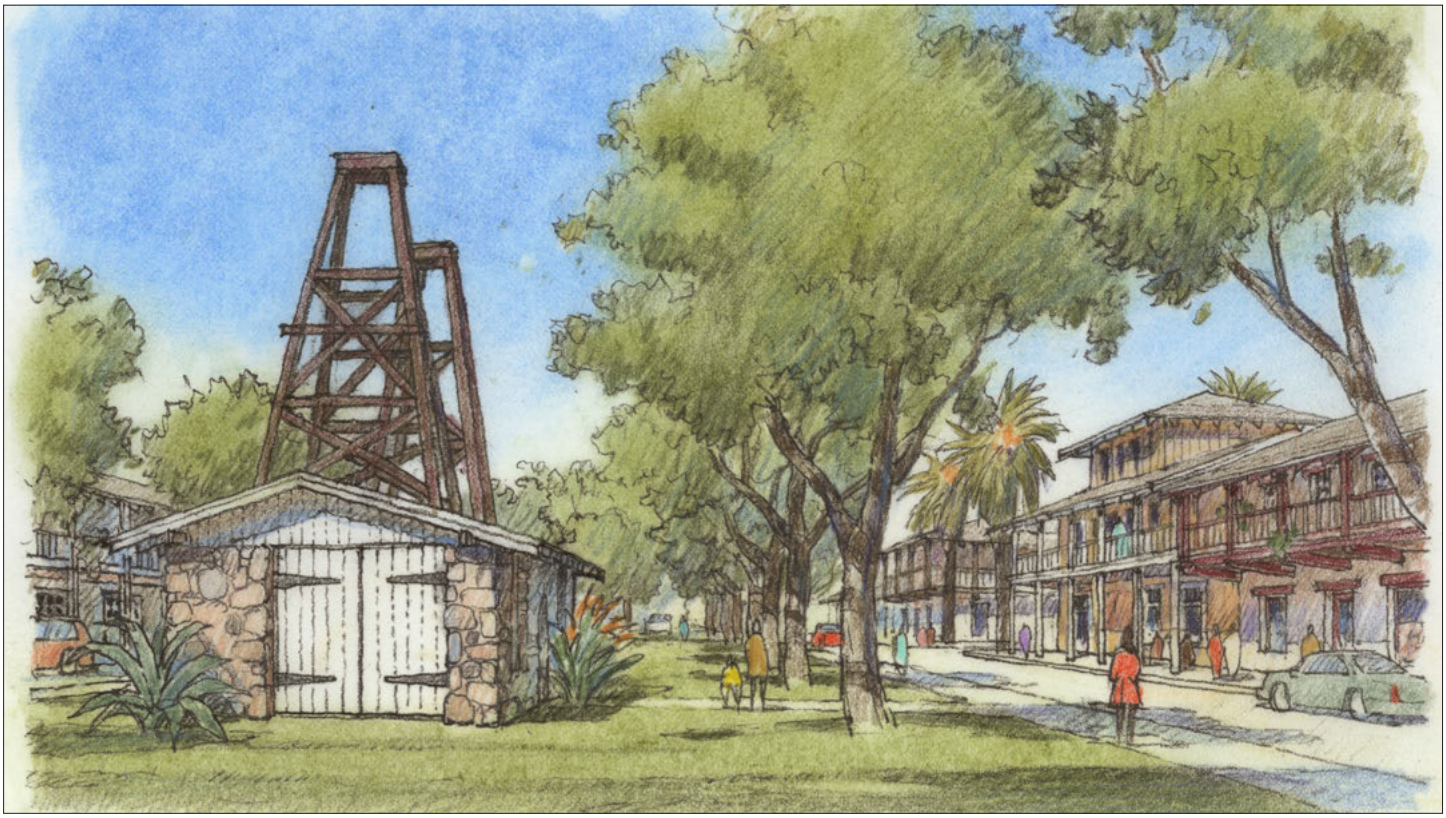
[2] Comprised of the 27.9 acre Haun Creek Greenway, 19.3 acre Santa Paula Creek Greenway, and 8.0 acres of public park space

**Figure 2-2: East Area 1 Illustrative Plan**

northwest quadrant of East Area 1, along the east bank of Santa Paula Creek, north of the Civic District and west of the foothills. Similar to the Haun Creek Neighborhood in its street layout, this neighborhood emphasizes connections to the permanent open space of Santa Paula Creek and the bluffs to the north and east. It is planned to include a range of single-family residences. The neighborhood is flanked by parks and open space including a broad open space buffer along Santa Paula Creek, and park space along the north edge of the Civic District. The Perimeter Trail runs through the linear park along the creek, the Hallock Trail runs along the foot of the east side of Hallock Drive, connecting to trailheads leading to the foothills to the north and to the Santa Paula Branch Line Trail to the south. The neighborhood is anticipated to include a neighborhood park and one or more smaller neighborhood greens.

The Foothill Neighborhood occupies the northeast quadrant of East Area 1. This neighborhood rises from the relatively flat terrain of the southerly half of East Area 1 up the shallower portions of the slopes of the hills to the north. Development is limited to those portions of the foothills that require only moderate grading, leaving the steeper and more visible portions of the hills untouched and in agricultural production. This neighborhood will be characterized by a range of single-family detached residences. The Perimeter Trail runs along the north edge of this neighborhood, connecting to multiple trailheads leading to recreational trails in the foothills to the north and to the Haun Creek Greenway to the east.

**Figure 2-3: Rendering of Park Blocks**



*The historic Well House is the landmark of the Park Blocks in the heart of the Haun Creek Neighborhood.*

**Figure 2-4: Rendering of a Typical Neighborhood Street**

*Houses face tree-lined street with street-facing windows and frontage types such as porches and stoops.*

**Figure 2-5: Rendering of the Haun Creek Greenway**

*Houses overlooking Haun Creek Greenway along the eastern edge of the Haun Creek Neighborhood.*

## 2.2 Circulation Plan

Circulation is provided by a network of thoroughfares designed with the principle of using interconnected and a varied pattern of context sensitive thoroughfares to serve a variety of situations and programmatic objectives to the plan area. The Specific Plan Area's circulation system consists of a hierarchical arrangement of specific thoroughfare types within a range of neighborhood environments. The depth and versatility of the proposed thoroughfare network is described and illustrated in more detail in Section 2.2, in Table 5-4 and in Figure 5-3. In general, the circulation plan has five major thoroughfare classifications: major entry, major, residential collector, residential and other (which includes: alley, paseo, and trails). Greater discussion of project thoroughfares is contained in Section 5.6.

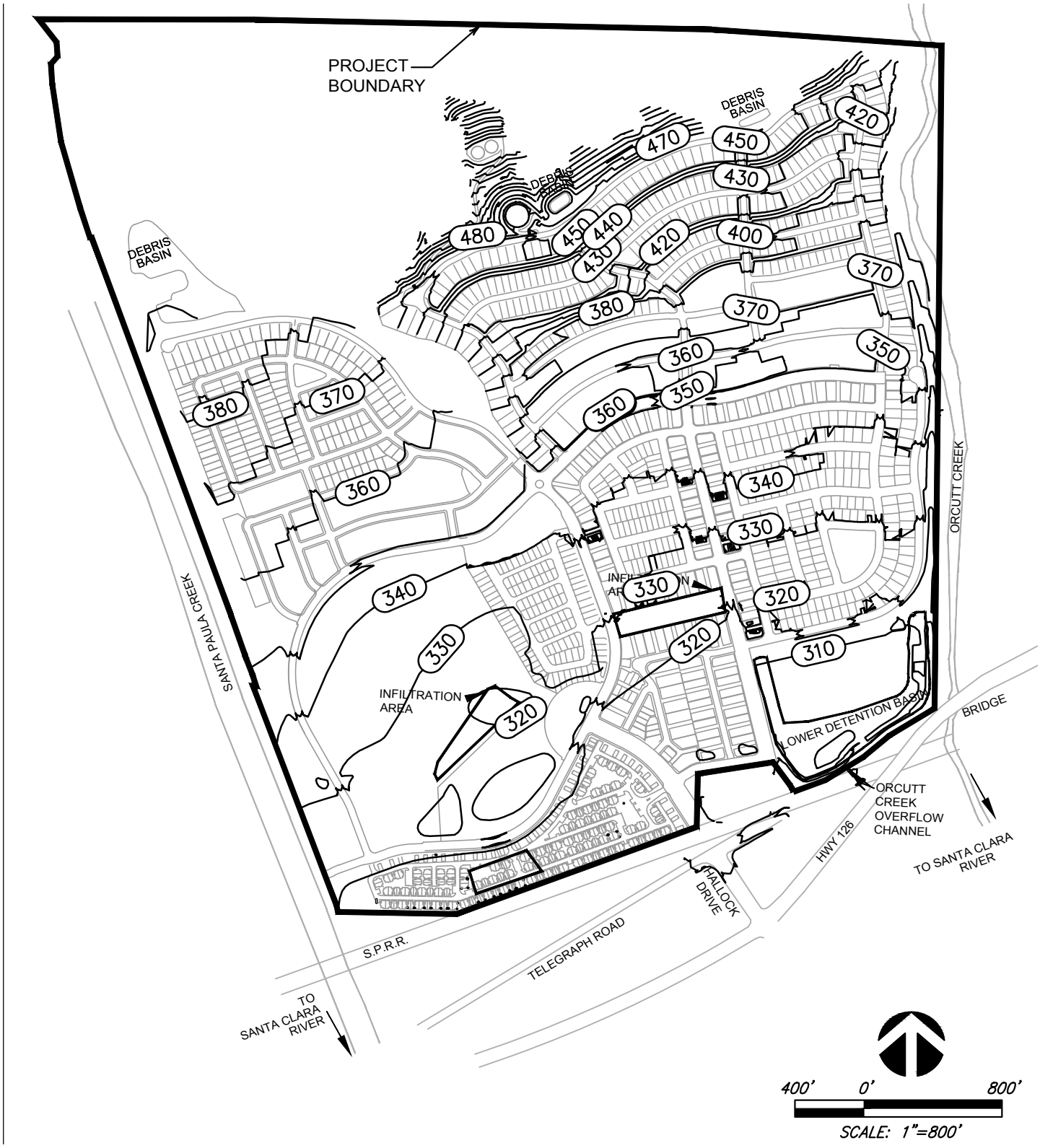
The layout of streets within the four planned phases of specific plan development will be reviewed as each Master Developer submits tentative map requests or Map Revisions to the City in accordance with this EA1SP.

## 2.3 Grading Concept

The Conceptual Grading Master Plan (Figure 2-6) addresses the lower and middle elevation zones where development is permitted while leaving the steeper upper elevation zone ungraded. The lower elevation zone will be graded to roughly 2% land gradient, thus yielding roadways and blocks in the lower areas of generally grades of 1 % to 3%. Elevations will remain unchanged with minor variations to account for shrinkage of the soils and recontouring of drainage surfaces. Cuts and fills will be in the magnitude of 6′ – 10′ in the lower plate, predominantly resulting from over excavation and recompaction of the existing soil to create appropriate conditions for development.

In the middle elevation zones, the terracing of the land will occur in the northernmost areas as shown on the Regulating Plan (Figure 5-1). Cuts and fills will be in the magnitude of 36′ in the middle elevation zone to form the land into terraces. Roadway grades in the middle elevation zone will vary between 2% and 8% with some limited roadway segments approaching a 12% grade. All grading must be accomplished pursuant to a grading plan approved by the Director.

**Figure 2-6: Conceptual Grading Plan**




Source: Jensen Design & Survey, Inc. 2022.

## 2.4 Land Use Policies and Objectives

East Area 1 is planned and designed to incorporate the following:

- Establish an interconnected network of walkable streets and blocks similar to those existing in Santa Paula. Santa Paula's historic community fabric is based on a network of streets that provides multiple routes for pedestrians, cyclists and motorists to move throughout the community. East Area 1 incorporates such a network, ensuring that the size, scale and pattern of new development will be consistent with Santa Paula's heritage of walkable, town-scale neighborhoods and districts.
- Establish a variety of development intensities and a mix of uses. Santa Paula's older neighborhoods located adjacent to downtown and in McKevett Heights include a variety of development intensities and uses, providing a range of housing choices within the same neighborhood and within walking distance of neighborhood-serving commercial and civic uses. East Area 1 has been planned to have these same characteristics.
- Conserve natural resources. The land use plan provides buffers from Santa Paula and Haun Creeks and preserves views of the highest most visible hillsides located in the northern portion of East Area 1 and of the Santa Clara River to the south by restricting development to the lower portion of East Area 1. The plan conserves the natural open space that surrounds Santa Paula by providing a significant increment of the City's future housing within compact, walkable neighborhoods.
- Develop East Area 1 as a series of pedestrian-oriented neighborhoods served by civic facilities and neighborhood-serving retail commercial uses to encourage people to walk as an alternative to driving for many of their daily needs.
- Connect East Area 1 with the rest of town, particularly existing downtown Santa Paula, with streets that accommodate automobile traffic, and routes for pedestrians, bicyclists and transit.
- Integrate East Area 1 into the greater community as part of Santa Paula's eastern gateway through new street connections including extending Santa Paula Street and Hallock Drive into East Area 1.
- Create a mixed-use community providing a variety of housing types and lifestyle choices.
- Provide various open space types and locations that will encourage and support informal social activity and recreation and reinforce the community's identity and connection to its natural and agricultural surroundings.

### 2.4.1 Plan-Wide Policies

The EA1SP seeks to implement the following policies:

- Neighborhoods have a clear center. Each neighborhood has a discernible center. This is often a square or green and sometimes a busy or memorable street corner.
- Neighborhoods are structured around an approximate 5-minute walk from center to edge. Most dwellings are within a five-minute walk of the neighborhood center to promote walking and alternatives to driving. Such a structure uses blocks that are between 220 and 800 feet in length depending upon the context and scale of a particular neighborhood or district.
- Shops and Offices are adjacent. Non-residential uses are integrated to promote walkability and reduce the amount of traffic generated by residents.
- Small and strategically dispersed neighborhood parks. Neighborhood parks are planned to be accessible to all homes, typically serving a radius of one to four blocks, enabling activity at a compatible scale with the surrounding neighborhood. Trailheads to the adjacent hills to the north are also provided where appropriate.
- Small ancillary buildings are accommodated. Lots are designed so as to accommodate future small ancillary buildings in the rear, such as a home office, craft workshop, or second unit (e.g., "granny flat").

- Variety of dwelling types. A wide variety of single-family detached homes of many types and sizes and multifamily units are allowed to provide the young and old, singles and families with housing choices that are suitable to their lifestyle.
- A site for school facilities is located close enough to neighborhoods to allow students to walk from their home. For those that choose to drive, and for students from other parts of Santa Paula, the school site is integrated into the planned civic district to provide easy and safe access for drivers as well.
- Streets are balanced to serve pedestrians, cyclists and motorists. Streets are balanced and scaled to their context and role for use by motorists while creating an environment suitable for pedestrians and bicycles with on-street parking and rows of shade trees. The width of the paved area for vehicles, curb radii and sidewalk widths are scaled appropriately. A range of traditional neighborhood street types provides several options within the following categories: mixed-use, residential, corridor, rural.
- Buildings create outdoor rooms. Buildings of all types are located to positively shape and activate public space, particularly around greens, squares and plazas.
- Parking is accommodated while maximizing the public realm. Off-street parking is carefully designed to minimize intrusion into the pedestrian environment of the streetscapes, particularly in Hallock Center and the central portion of the community.
- Neighborhoods provide a variety of places for gathering. Each neighborhood is organized around public spaces scaled to their particular context and character, adding identity and a sense of place within the overall plan area.

### 2.4.2 Plan-Wide Objectives

In addition to the above plan-wide policies, the following objectives apply to the entire Specific Plan Area:

- The Specific Plan Area is planned to combine residential neighborhoods, civic uses, and neighborhood-serving commercial uses, interconnected and integrated at the scale of a neighborhood and at the scale of a block to maximize walkability, provide multiple route-choices, and generate neighborhoods with long-term value. These neighborhoods and districts are surrounded by an open space district that includes open space buffers along Santa Paula and Haun Creeks and agricultural and open space areas in the northern portion of East Area 1.
- East Area 1 provides a variety of housing options to maximize the benefits to existing and future residents.
- East Area 1 provides a sufficient concentration of housing to support viable neighborhood-serving commercial uses in the City's adjacent East Gateway Planning Area.
- Using proximity, walkability, and a sufficient concentration of resident and neighborhood-serving uses in East Area 1, the EA1SP maximizes the capture of trips within the Specific Plan Area to reduce external traffic-generation and minimize the need for new infrastructure.

### 2.4.3 Objectives by Specific Plan Area

In addition to the above objectives, the following objectives complement the Development Standards and Design Guidelines for each Planning Area:

**A. Hallock Center**

- Generate frontages along the extension of Santa Paula Street for residential building types and building types that enable neighborhood serving commercial uses.
- Reserve commercial frontage for neighborhood-serving uses along Hallock Drive.
- Locate buildings near or at frontage lines, depending upon the context of a particular block, helping to spatially define a varied mixed-use streetscape.

**B. Civic District**

- Provide a site for additional school facilities integrated with a new Sports Park.
- Extend Santa Paula Street into East Area 1 to enhance access to Downtown Santa Paula for residents of East Area 1 and access to the Sports Park and school facilities for residents of existing neighborhoods to the west of Santa Paula Creek.

**C. Neighborhood**

- Utilize residential street types that support walkability and define appropriately scaled blocks to provide multiple pedestrian and bicycle routes to Hallock Center and the Civic District.
- Provide public spaces that are defined by adjacent streets and buildings, creating an "outdoor room effect."
- Structure the pattern of blocks on lengths of 400 to 600 feet, breaking longer blocks with pedestrian paseos or mid-block playgrounds.
- Set buildings back from frontage lines, depending upon the context of a particular block, helping to define a more suburban streetscape and produce a variety of front yard designs that create an authentic sense of neighborhood.
- Provide a variety of single family residences to produce a varied neighborhood pattern.
- Integrate Haun Creek and the Specific Plan Area's eastern boundary with lower-intensity development that opens to the natural and agricultural open space to the east.
- Connect streets and pedestrian connections to multiuse trails along Santa Paula Creek, Haun Creek and into the foothills to the north.
- Concentrate development in areas that only require moderate grading, leaving the steepest areas in agricultural production.
- Concentrate hillside development within the lower slope areas to the south to reduce the quantities of grading required in the upper areas to the north.
- In steeper slope areas provide street and block patterns that conform to the natural terrain to reduce required grading.

**D. Open Space Districts**

- Create a substantial landscape buffer of 150 feet to 280 feet along Santa Paula Creek and a naturalized landscape buffer along Haun Creek
- Provide athletic fields with dual use as a retention area for Haun Creek flood flows.
- Preserve hillside open space and active agricultural land in an agricultural preserve.
- Intersperse parks throughout the residential neighborhoods.
- Provide community park accessible by City residents and the planned elementary and high schools.
- Provide pedestrian trail connectivity throughout.

See Section 5.2.1 for more detailed descriptions of the various building zones and overlays and open space zones.

## 3.1 Existing Utilities and Infrastructure

Developing the Specific Plan Area requires improving existing infrastructure and services. Basic utilities, including water and sewer, already exist on-site.

The Government Code requires that a specific plan include text and diagrams that specify "the proposed distribution, location, and extent and intensity of major components of public and private transportation, sewage, water, drainage, solid waste disposal, energy, and other essential facilities proposed to be located within the area covered by the plan and needed to support the land uses described in the plan."

This section of the Specific Plan fulfills this requirement and meets the SPMC requirements, as may be amended, for the preparation of specific plans. In addition, this section facilitates orderly development by identifying "backbone" utility infrastructure needed to support the proposed development.

## 3.2 Transportation

As set forth in the Circulation Plan, addressed in Section 2.1.3, the Specific Plan Area will be developed with a number of different transportation elements.

## 3.3 Water Supply

### 3.3.1 Domestic Water Master Plan

**A. Existing Conditions.** The water supply for the East Area 1 Specific Plan Area was originally supplied by four water wells within the Specific Plan Area. These wells supplied water for both domestic consumption and agricultural irrigation uses. Three existing wells are located within the Specific Plan Area adjacent to Orcutt Creek. Two of these wells are agricultural wells for the site, and the third is a well that supplies water to an adjoining property to the east located outside the Specific Plan Area. The fourth well is located within an existing pump house at the center of Pump House Lane.

One of these wells has been upgraded from an agricultural well to a domestic well (Well 6). Prior to upgrading the well, a well evaluation study was prepared, and this study was reviewed and approved by the City's Public Works Department. The second well adjacent to Well 6 has been abandoned. The fourth well on Pump House Lane will remain as a dedicated private agricultural well providing water to the agricultural preserve area on the hillside in the northern portion of the Specific Plan area.

**B. Domestic Water Demands.** The estimated annual average water demand for the uses allowed by the Specific Plan is 741 acre-feet per year (AFY). The estimated demand for residential uses is based on a domestic demand of 64 gallons per capita per day (gpcd) and an average household size of 3.5 people per residential unit (See Table 3-1). This demand rate was determined by using one complete year (2022) of water meter readings for 316 occupied single-family residences within East Area 1. The water meter readings averaged 51 gpcd for these 316 homes. The demand rate was increased 25% to 64 gpcd for purposes of estimating the water demand for the residential uses allowed by the Specific Plan.

Of the total annual demand, 534 AFY is potable water demand and 207 AFY is non-potable water demand for irrigation of private parks and the Santa Paula Sports Park. The Specific Plan Area overlies two groundwater basins: the Santa Paula and Fillmore Basins. The 741 AFY of water needed for the uses allowed by the Specific Plan will include approximately 365 AFY of groundwater from the Santa Paula Basin and approximately 376 AFY of groundwater from the Fillmore Basin. The amount of water to be pumped from the Fillmore Basin is limited to the amount historically used for agricultural purposes.

The agricultural preserve located in the northern portion of the Specific Plan Area will be irrigated with water pumped from the existing agricultural well on Pump House Lane. The estimated demand for the agricultural preserve is approximately 122 AFY.

**C. Well Field System.** The City's Potable Water System Master Plan identifies the need for a new well field in the Santa Paula Basin within the Specific Plan Area and an upgrade of the existing well in the Fillmore Groundwater Basin to provide the water needed for the use allowed by the Specific Plan. Figure 3-1 provides a schematic layout of the planned Domestic Water Well Field Master Plan. Two new wells are planned near the western edge of the

Specific Plan Area, adjacent to Santa Paula Creek. The existing well adjacent to Orcutt Creek will be upgraded.

The easterly well (well 6) in the Fillmore Basin will be designed with a capacity to pump 1,000 gallons per minute (gpm). The 376 AFY of water from the Fillmore Basin can be pumped with this well by running this well approximately 5.6 hours a day, 365 days per year. Well 6 will have point source water treatment to meet State Waterboard requirements.

Well 7, the southwest well, will be designed with a capacity to pump 2,500 gpm, and Well 8, located north of Well 7, will be designed with a capacity to pump at 1,500 gpm. Well 7 will have a treatment facility that will treat water from both Well 7 and Well 8 prior to this water entering the City domestic system. Running these wells approximately 9 hours per day will provide 365 AFY of water.

**D. Water Storage and Delivery System.** The East Area 1 Domestic Water Master Plan has a double zone system as shown in Figure 3-2a. All new wells will feed a new 3.0-million-gallon (MG) in-ground concrete tank set at a bottom elevation of 458 feet for the City and East Area 1's 200 zone. A new 20" feeder and fill line will proceed from the intersection of Santa Paula Street and Grant Line through the bridge northeast in Santa Paula Street through the Specific Plan Area, terminating at the new 3.0 MG concrete tank. This new tank will serve as a source for domestic consumption in East Area 1 and will provide additional water storage for the City.

Lots within the Specific Plan Area below the 330 contour elevation will be serviced from this tank, which requires a minimum of 1.99 million gallons of storage. This leaves a surplus of 1.01 million gallons for the City's 200 zone. The surplus already accounts for the new demand of 123 AFY estimated for the East Gateway Planning Area (East Area 2), located immediately south of East Area 1. The tank site will provide a domestic supply system comprised of 8" through 20" mains within the Specific Plan Area. This distribution system will connect to the City's existing water system over the Santa Paula Street Bridge to the west, and within the Hallock Drive and Telegraph Road intersection.

**Table 3-1: Water Demand**

| Land Use | Amount | Area (acres) | Demand Rates | Annual Demand (AF) | Average Daily Flow (GPM) | Maximum Day Demand (GPM) (1.5* ADD) | Peak Hour Demand (GPM) (2.7* ADD) |
|---|---|---|---|---|---|---|---|
| **Residential** [1] | **2,050 units** | | | | | | |
| Santa Paula Creek Neighborhood | 489 units | | 64 gpd per person | 122.7 | 76.1 | 114.1 | 205.4 |
| Foothill Neighborhood | 554 units | | 64 gpd per person | 139.0 | 86.2 | 129.3 | 232.7 |
| Haun Creek Neighborhood | 707 units | | 64 gpd per person | 177.4 | 110.0 | 165.0 | 296.9 |
| Hallock Center | 300 units | | 64 gpd per person | 75.3 | 46.7 | 70.0 | 126.0 |
| **Civic/Institutional** | | | | | | | |
| School Site and Private Recreation Facilities | | 10.94 | 1.81 AFY per acre | 19.8 | 12.3 | 18.4 | 33.1 |
| **Commercial** | 10,000 sf | | 15.1 gal/sq.ft./yr | 0.5 | 0.3 | 0.4 | 0.8 |
| **Other Water Consumption** [2] | | | | | | | |
| Santa Paula Sports Park | | 37.8 | 2.22 AFY per acre | 83.9 | 52.0 | 78.0 | 140.5 |
| Parks/Greenways | | 55.2 | 2.22 AFY per acre | 122.5 | 76.0 | 114.0 | 205.1 |
| Agriculture Preserve (irrigated) [3] | | 55.0 | No water use | 0.0 | 0.0 | 0.0 | 0.0 |
| Open Space Preserve (not irrigated) | | 77.3 | No water use | 0.0 | 0.0 | 0.0 | 0.0 |
| | | | | | | | |
| **Total Water Demand** | | | | **741.1** | **459.4** | **689.2** | **1,240.5** |

Source: Jensen Design & Survey, 2022.

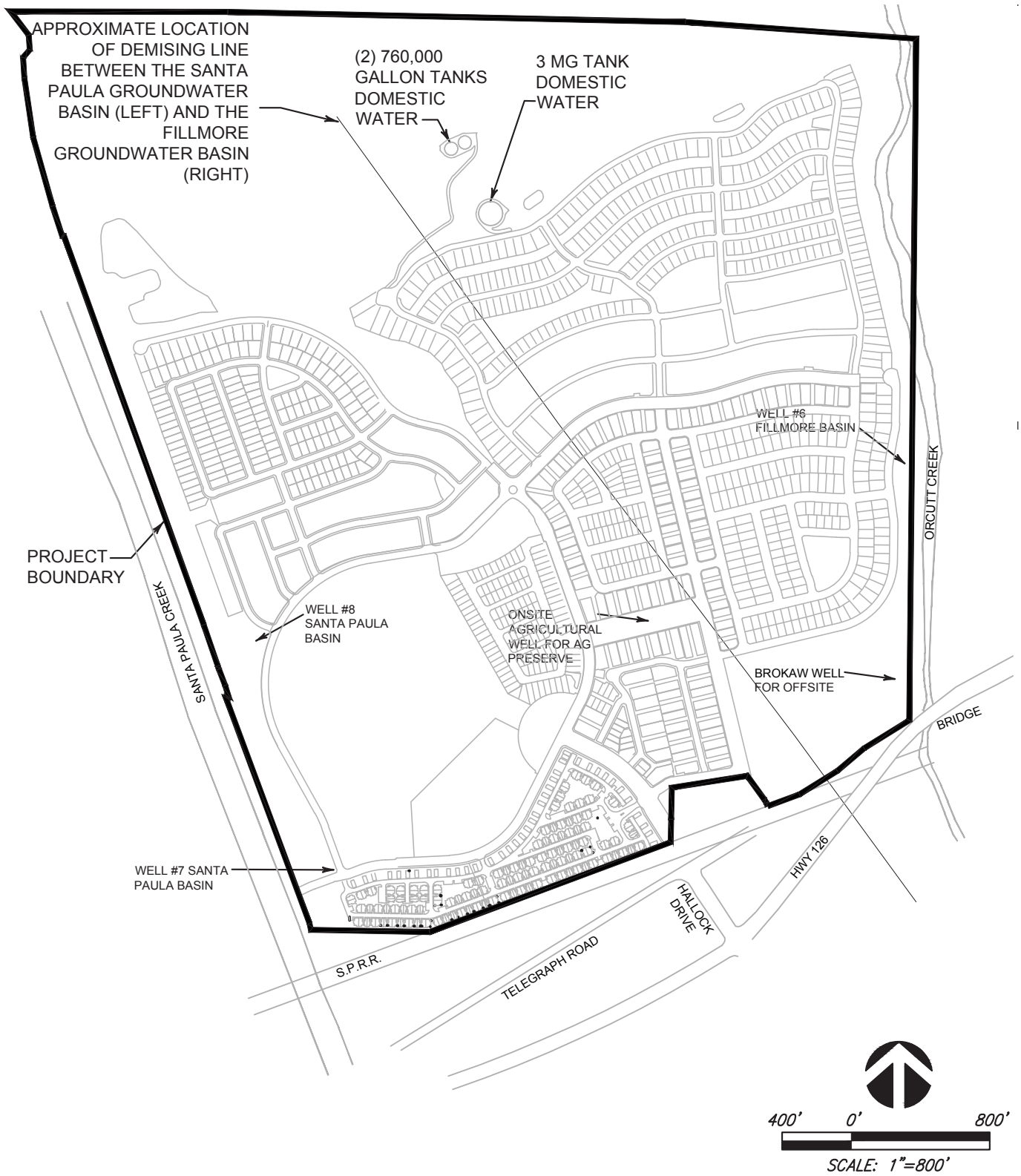
*Notes: Totals in table may not appear to add exactly due to rounding in the model calculations.*

1 Demand is estimated at 3.5 residents per dwelling for all proposed dwellings per the City of Santa Paula Water Master Plan (single-family attached, single-family detached, and multifamily). Actual Tract Usage was measured for the year of 2022 and averaged per house at 51 gpd/person with a 25% reserve added on, which equates to 64 gpd/person.

2 Estimate of water demand for agricultural uses is based on use over the last five years that was required to irrigate 336 acres of land under production (816.3 AFY/405 acres = 2012 AFY/acre).

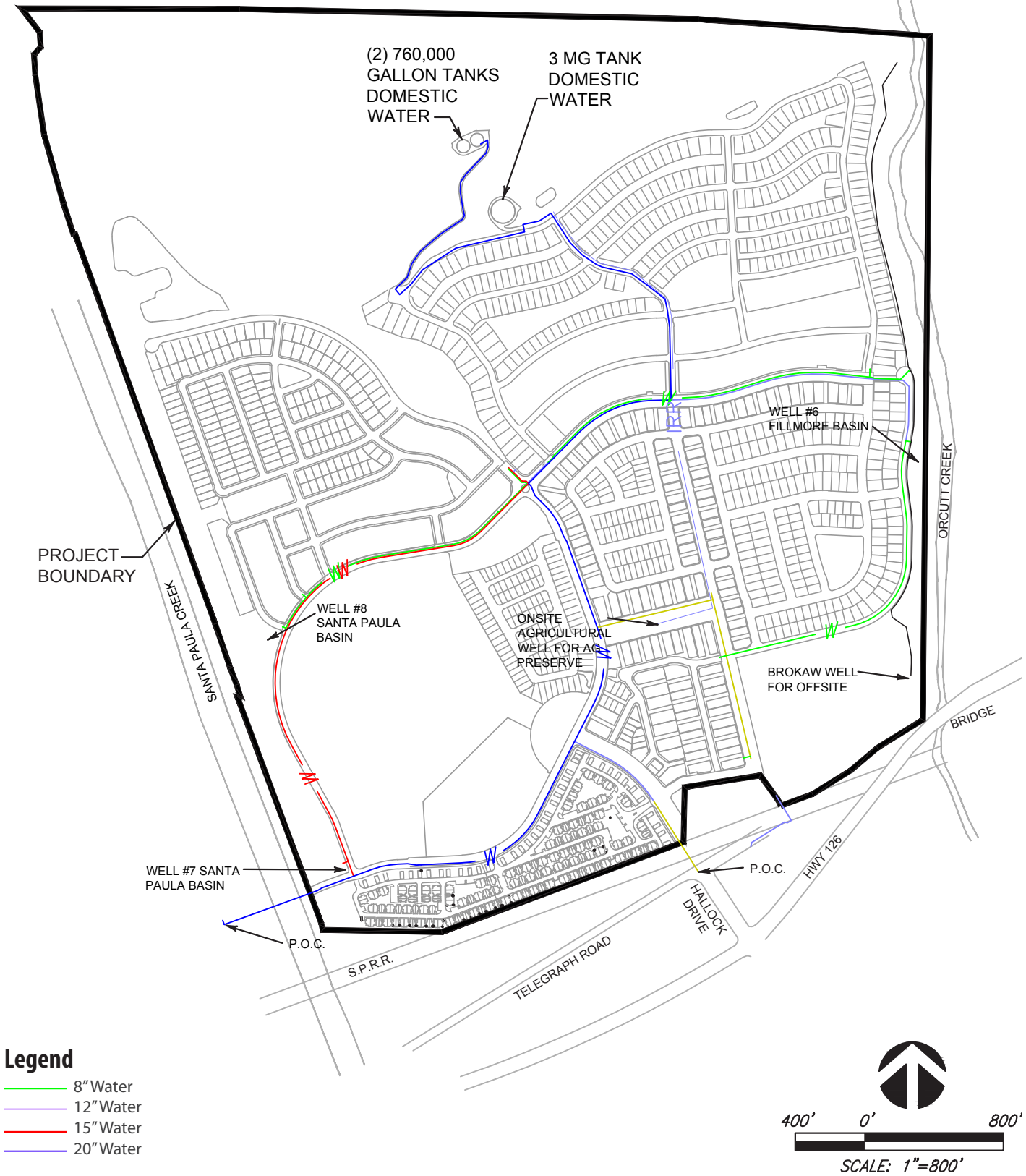
3 Agricultural Preserve that is irrigated will be irrigated from an agricultural well in Pump House Lane privately operated and not part of the City domestic system.

**Figure 3-1: Water Well Field Schematic Layout**



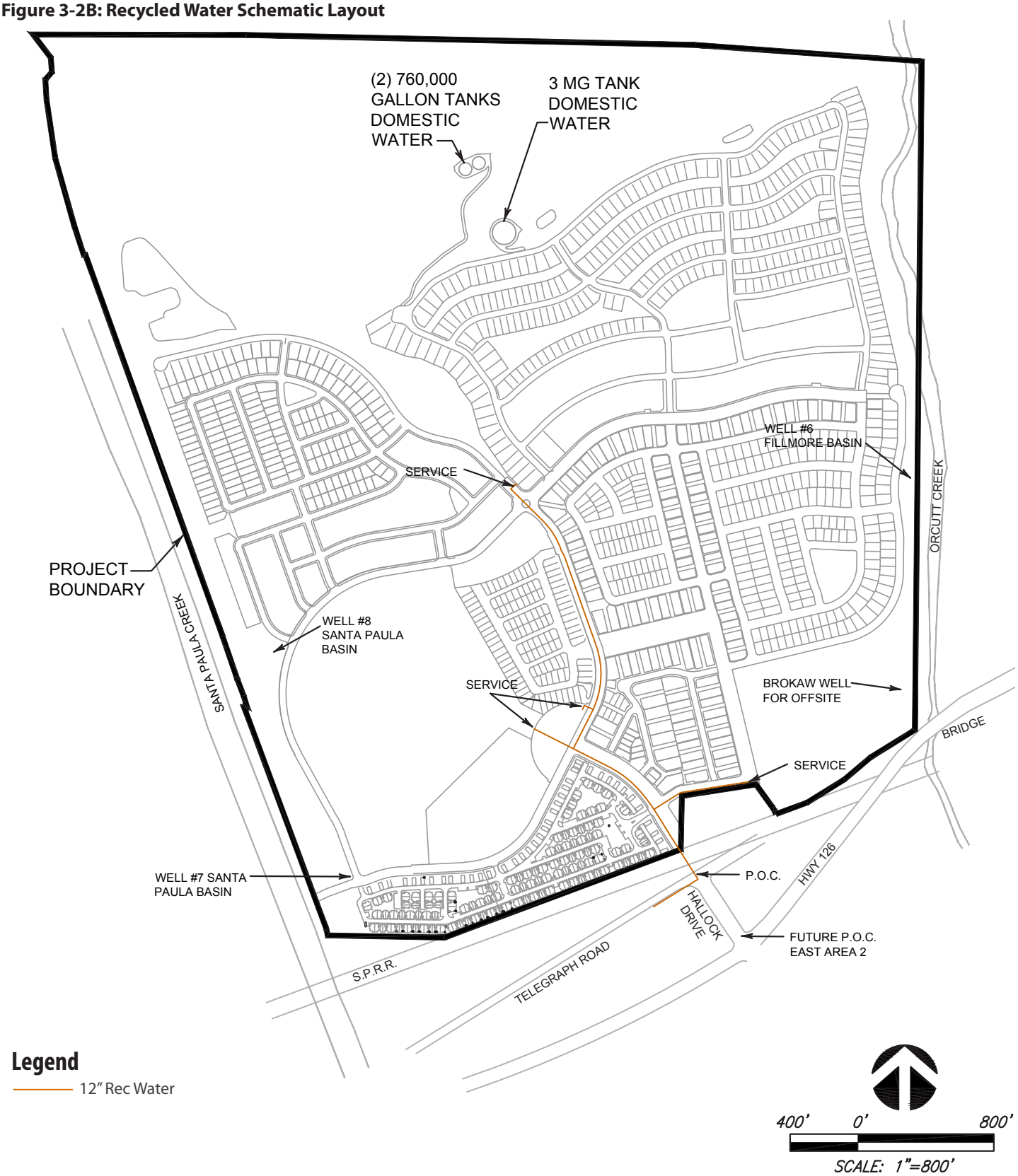

Source: Jensen Design & Survey, Inc. 2021.

**Figure 3-2A: Domestic Water Schematic Layout**



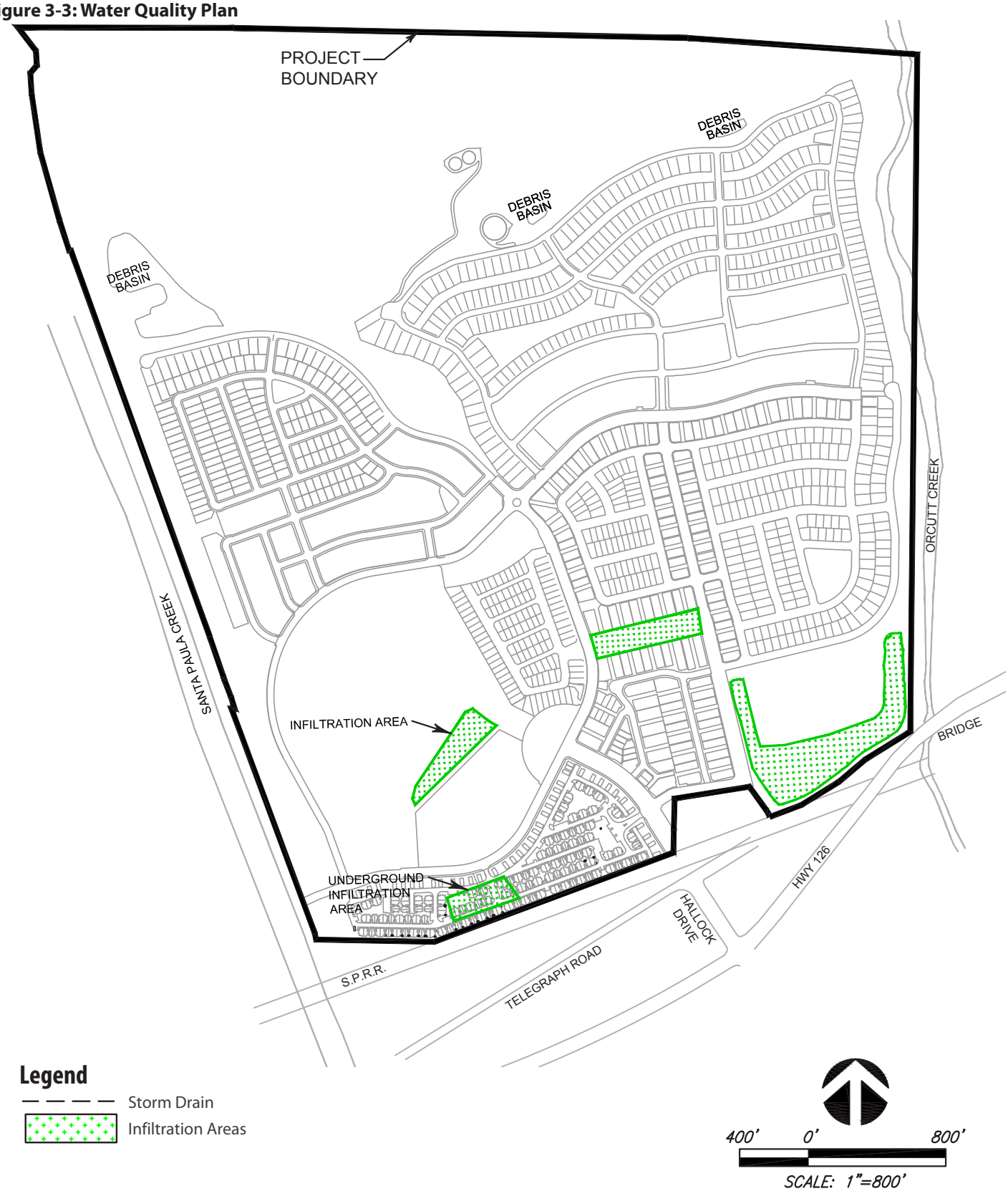

Source: Jensen Design & Survey, Inc. 2021.

**Figure 3-2B: Recycled Water Schematic Layout**




Source: Jensen Design & Survey, Inc. 2021.

**Figure 3-3: Water Quality Plan**




Source: Jensen Design & Survey, Inc. 2021.

Two additional 0.76 MG tanks will be constructed as illustrated in Figure 3-2A. These tanks will be located at an elevation of 588 feet in order to provide the required flows and pressures to elevations above 330 feet. Water levels in the tank will create a new 300' pressure zone within East Area 1 that is independent of the City's system and will act as the primary source for domestic consumption and fire storage. This tank will be supplied via a booster station located at the 3 MG tank site. Project demands require 0.68 MG storage, resulting in 0.84 MG of surplus storage.

### 3.3.2 Recycled Water Plan

**A. Existing Conditions.** Currently there are no recycled water systems in the eastern portion of Santa Paula that can serve East Area 1.

**B. Recycled Water Plan.** The Recycled Water Plan is shown on Figure 3-2B. According to the City's Potable Water System Master Plan, a future recycled water system conveyance plan will include a line in Telegraph Road, delivering recycled water to a point of connection (POC) near the intersection of Hallock Drive and the VCTC railroad right-of-way.

EA1SP contemplates construction of a new recycled water distribution system. This distribution system will be comprised of a single 12" main to meet the higher irrigation flow demands of school facilities and large landscape/park areas. The recycled water will terminate at the end of Hallock Drive at the open space preserve and at the Soccer Field/Detention Area. The estimated demand for recycled water in East Area 1 is 207 AFY, which includes the Sports Park and the Soccer Field Detention Area located in the southeast portion of the Specific Plan Area.

### 3.3.3 Water Quality Plan

**A. Existing Conditions.** Most of the Specific Plan Area is currently in agricultural use. There are no existing water quality systems or devices. However, the site is pervious; the vadose zone acts as a water quality filtration system for storm runoff.

**B. Water Quality Treatment System.** The site will provide three debris/detention basins upstream of the residential areas and storm drain system, bioswales for passive treatment through the streets and park areas, as well as two detention basins. The system is planned as shown in the Water Quality Exhibit Figure 3-3. These detention basins will serve dual roles of flood protection and water quality treatment. Flood protection is discussed in the drainage section. The detention basins will be sized to treat 10% of the Q50 (50 year storm event) from the storm drain system. All storm waters shall be cleaned prior to infiltration in accordance with the applicable National Pollution Discharge Elimination System Requirements (NPDES) regulations at time of development.

## 3.4 Wastewater Master Plan

### 3.4.1 Existing Conditions

The existing wastewater system in East Area 1 consists of only onsite septic service for the existing nine farm worker housing units onsite. The nearest sewer is an 8" line located near the intersection of Hallock Drive and Telegraph Road. The City's Wastewater System Master Plan addresses the provision of wastewater collection facilities to serve the Specific Plan Area.

### 3.4.2 Wastewater System Master Plan

The City's Wastewater System Master Plan identifies and describes the improvements required to provide adequate service for the uses allowed by the Specific Plan. The Wastewater System Master Plan for the East Area 1 Specific Plan is shown in Figure 3-4.

The connection of East Area 1 to the City's system will be via a new lift station located south of SR-126 at the end of old Hallock Drive Extension. The existing lift station on Lemonwood Drive would still operate as was intended. The flows from the existing lift station will be pumped to the new lift station location via a new force main in Lemonwood. The new lift station will then pump the effluent under Santa Paula Creek via a directional drilled pipeline underneath Santa Paula Creek. A 15" main will be extended from East Area 1 at Hallock Drive and Telegraph Road, down Telegraph Road to a private property where an easement has been obtained, into the new lift station under Highway 126. Other improvements along Lemonwood include a force main from the existing Lemonwood Station 1 to the new lift station, and a gravity main to intercept a portion of off-

**Table 3-2: Wastewater Generation**

| Land Use | Amount | | Area (acres) | Sewer Generation Rates [6,7] | Average Daily Water Flow (GPM) | Average Daily Wastewater Flow (GPM)[5] | Peak Daily Wet Wastewater Flow (GPM) (3xADWF) | Peak Hour Flow (GPM) (2xADWF) |
|---|---|---|---|---|---|---|---|---|
| **EAST AREA ONE** | | | | | | | | |
| **Residential** | 2,050 | units | | | | | | |
| Santa Paula Creek Neighborhood | 489 | units | | 48 gpcd [7] | - | 57.1 | 171.2 | 114.1 |
| Foothill Neighborhood | 554 | units | | 48 gpcd [7] | - | 64.6 | 193.9 | 129.3 |
| Haun Creek Neighborhood | 707 | units | | 48 gpcd [7] | - | 82.5 | 247.5 | 165.0 |
| Hallock Center | 300 | units | | 48 gpcd [7] | - | 35.0 | 105.0 | 70.0 |
| **Civic/Institutional** | | | | | | | | |
| School Site and Private Recreation Facilities | | | 10.94 | 1.81 AF/YR/acre | 12.3 | 9.2 | 27.6 | 18.4 |
| **Commercial** | 10,000 | sf | | 15.1 gal/SF/YR | 0.3 | 0.2 | 0.6 | 0.4 |
| **EAST AREA ONE SUBTOTAL** | | | | | **12.6** | **248.6** | **745.8** | **497.2** |
| | | | | | | | | |
| **OFF-SITE (EAST GATEWAY PROJECT AREA)** | | | | | | | | |
| Residential [1] | 8 | | | 85 gpcd [7] | - | 1.7 | 5.0 | 3.3 |
| Light Industrial [2] | 186,008 | | 14.2 | 2.49 gal/SF/YR | 0.9 | 0.7 | 2.0 | 1.3 |
| East Gateway North (Retail) [3] | 20,574 | | 2.1 | 2.49 gal/SF/YR | 0.1 | 0.1 | 0.2 | 0.1 |
| East Gateway South (Retail) [3] | 326,511 | | 32.6 | 2.49 gal/SF/YR | 1.5 | 1.2 | 3.5 | 2.3 |
| Industrial [2] | 764,478 | | 58.5 | 15.1 gal/SF/YR | 22.0 | 16.5 | 49.4 | 32.9 |
| Highway Commercial [4] | 600,039 | | 55.1 | 15.1 gal/SF/YR | 17.2 | 12.9 | 38.8 | 25.9 |
| **OFF-SITE (EAST GATEWAY PROJECT AREA) SUBTOTAL** | | | | | **41.7** | **32.9** | **98.8** | **65.9** |
| **TOTAL** | | | | | **54.3** | **281.5** | **844.7** | **563.1** |
| **FLOW TO LEMONWOOD LIFT STATION #2[8]** | | | | | **54.3** | **281.5** | **844.6** | **563.1** |

Source: Jensen Design & Survey, 2022.

*Notes: Totals in table may not appear to add exactly due to rounding in the model calculations.*

1 Assuming 1 unit per parcel.

2 FAR=0.30 per East Gateway EIR Appendix 2.0.

3 FAR=0.23 per East Gateway Specific Plan.

4 FAR=0.25 per East Gateway EIR Appendix 2.0.

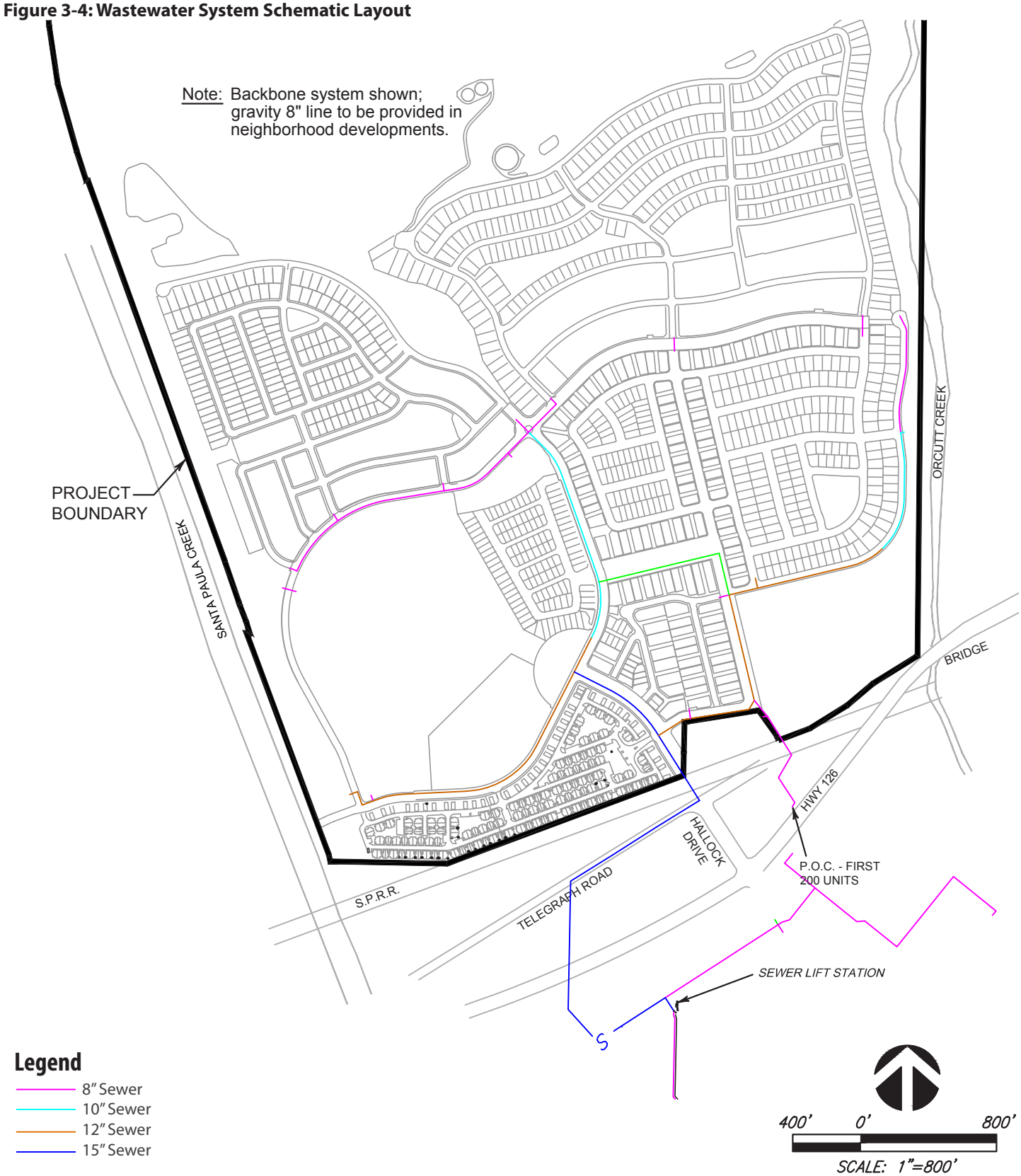
5 Demand rates per 75% water demand - applicable to all land uses.

6 3.5 people per household.

7 Calculated Water Demand based on 2022 water meter readings is 64 gpd/capita - residential sewer flow would be 75% of 64 = 48 gpd/capita.

8 Inflow in final condition post project improvements.

**Figure 3-4: Wastewater System Schematic Layout**




Source: Jensen Design & Survey, Inc. 2021.

site flows and convey these flows to the new lift station. The new lift station will convey flows across Santa Paula Creek in a newly constructed force main under Santa Paula Creek to a new upsized gravity sewer main along Santa Clara Street to 12th Street.

Average wastewater generation for the uses permitted by the East Area 1 Specific Plan is estimated at approximately 0.36 million gallons per day (MGD). This is based on 48 gallons per day per capita and an average household size of 3.5 people as identified in the City of Santa Paula Wastewater Master Plan. (See table 3-2.) The flow is approximately 75% of the water demand. The lift station will be sized to handle project flows, and flows generated by existing and new uses, in the East Gateway Project Area. The estimated wastewater generated by the East Gateway Planning Area will generate approximately 0.046 MGD, which will also be directed to the new lift station.

## 3.5 Drainage Master Plan

### 3.5.1 Existing Conditions

Most of the Specific Plan Area is currently in agricultural use. The existing topography of the surrounding area defines four major separate drainage sub-areas. These areas, described below, make up a total drainage area of over 2,900 acres.

**A. Orcutt Canyon Creek Drainage.** The Orcutt Creek Drainage is comprised of approximately 2,456 acres and is the largest drainage area east of East Area 1. The Orcutt Creek Drainage area is shown in Figure 3-5. The drainage area is linear and situated in a north-south direction with Orcutt Creek, a natural creek, conveying water to Santa Clara River. The Orcutt Creek Drainage is roughly 1 mile wide and over 4.5 miles long, stretching well up into the Topatopa foothills and mountains. The elevation varies from 4,600 feet at the northern end of the drainage area to an elevation of 300 feet at the Highway 126/Orcutt Creek Bridge.

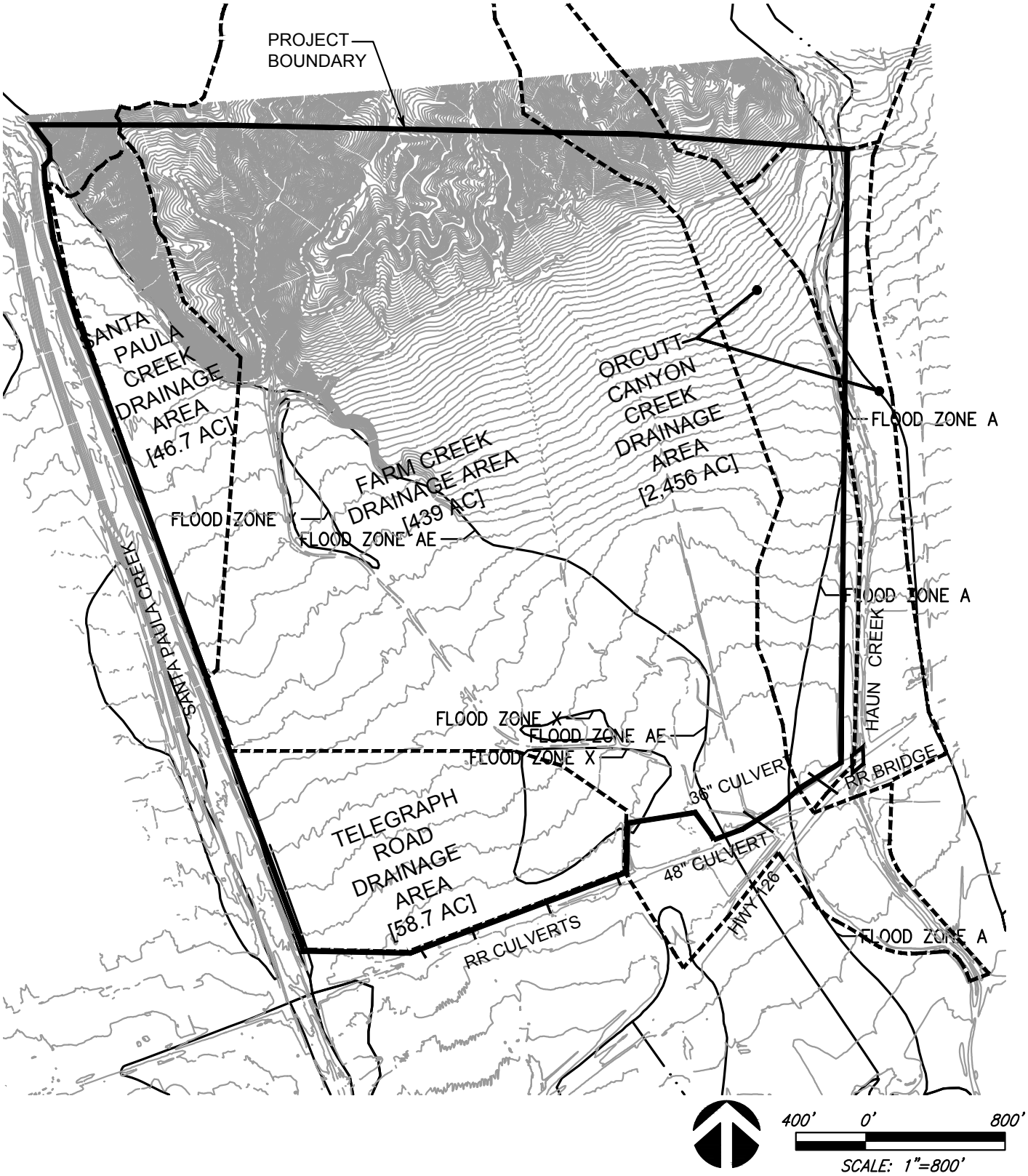
Within the Specific Plan Area, only about 70 acres currently drains to the Orcutt Creek drainage area with an additional 2,386 acres being off-site drainage upstream of the project. This 70 acres drains to Orcutt Creek through an existing 36" CMP at the southeast corner of the site. This pipe discharges upstream of the railroad bridge.

**B. Farm Creek Drainage.** The Farm Creek Drainage is comprised of over 408 acres and is the second largest drainage area associated with the Specific Plan Area. Of this 408 acres, roughly 330 acres are in East Area 1. The remaining 78 acres consists of offsite areas. The Farm Creek Drainage Area is shown in Figure 3-5. The Farm Creek drainage area is roughly trapezoidal in shape and stretches into the foothills of the Topatopa Mountains, with an upper elevation of 980 feet to a low elevation of 300 feet at Highway 126. The Farm Creek Drainage has several natural and man- made drainage devices that convey drainage. Concrete drainage ditches were installed throughout the orchard areas to better direct the flows and control damage caused by unabated flows. The system of natural drainage courses in the foothills and the man-made concrete ditches in the orchard areas combine and form a shallow rip rap reinforced channel near the southern edge of East Area 1. This channel exits the site via a 48" culvert under an existing fence to a large 12'x4' double box culvert under Highway 126, roughly 600 feet west of the Orcutt Creek/Orcutt Creek crossing, and flows parallel to Orcutt Creek for approximately 2,000 feet before converging with Orcutt Creek.

**C. Overland Drainage.** The area defined as Overland Drainage includes approximately 59 acres, as shown in Figure 3-5. The Overland Drainage is roughly rectangular in shape and is wholly contained within the Specific Plan Area . The Overland Drainage is bounded by Santa Paula Creek to the west and the existing VCTC railroad to the south. The VCTC railroad sits atop a berm that varies from at grade to 5 feet tall. Four existing culverts cross under the VCTC railroad and convey drainage flows onto property located between the VCTC railroad and Telegraph Road. This flow is directed to an unimproved open ditch drainage channel that runs perpendicular to Telegraph Road through a box culvert under Highway 126 and through Lemonwood Drive to the Santa Clara River.

**D. Santa Paula Creek Drainage.** Approximately 47 acres of the northwest portion East Area 1 identified in Figure 3-5 currently drain to Santa Paula Creek through four 18-inch CMP outlets into the slope of Santa Paula Creek spaced out along 2,740 feet of East Area 1 westerly property boundary. Existing site topography shows 47 acres of drainage area

**Figure 3-5: Existing Drainage Areas**




Source: Jensen Design & Survey, Inc. 2021.

associated with these four inlets from the very northwest portion of the site.

E. **Existing FEMA Floodplain Conditions.** The Specific Plan Area currently has three floodplain designations according to the 2010 FIRM (Flood Insurance Risk Map) maps as shown on Figure 3-5. The Federal Emergency Management Agency ("FEMA") designates the western portion of East Area 1 as Zone A99 with small islands designated as Zone X. The easterly portion has a Zone A designation generated by Orcutt Creek. Zone A99 is defined by FEMA as "an area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined." This designation is due to the Army Corps channel improvements to Santa Paula Creek. A LOMR (Letter of Map Revision) to remove the Zone A designation and a CLOMR (Conditional Letter of Map Revision) to remove the Zone A99 designation will be processed with the project through local agencies and FEMA. A Zone X determination is an area of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood. This designation area will also be altered once a LOMR is filed.

### 3.5.2 Drainage Master Plan

The East Area 1 drainage system is designed to meet or exceed the storm drainage requirements of the Ventura County Watershed Protection District (Orcutt Creek/Orcutt Creek), and the City of Santa Paula on-site drainage systems, where applicable. The Drainage Master Plan for East Area 1 is illustrated in Figure 3-6.

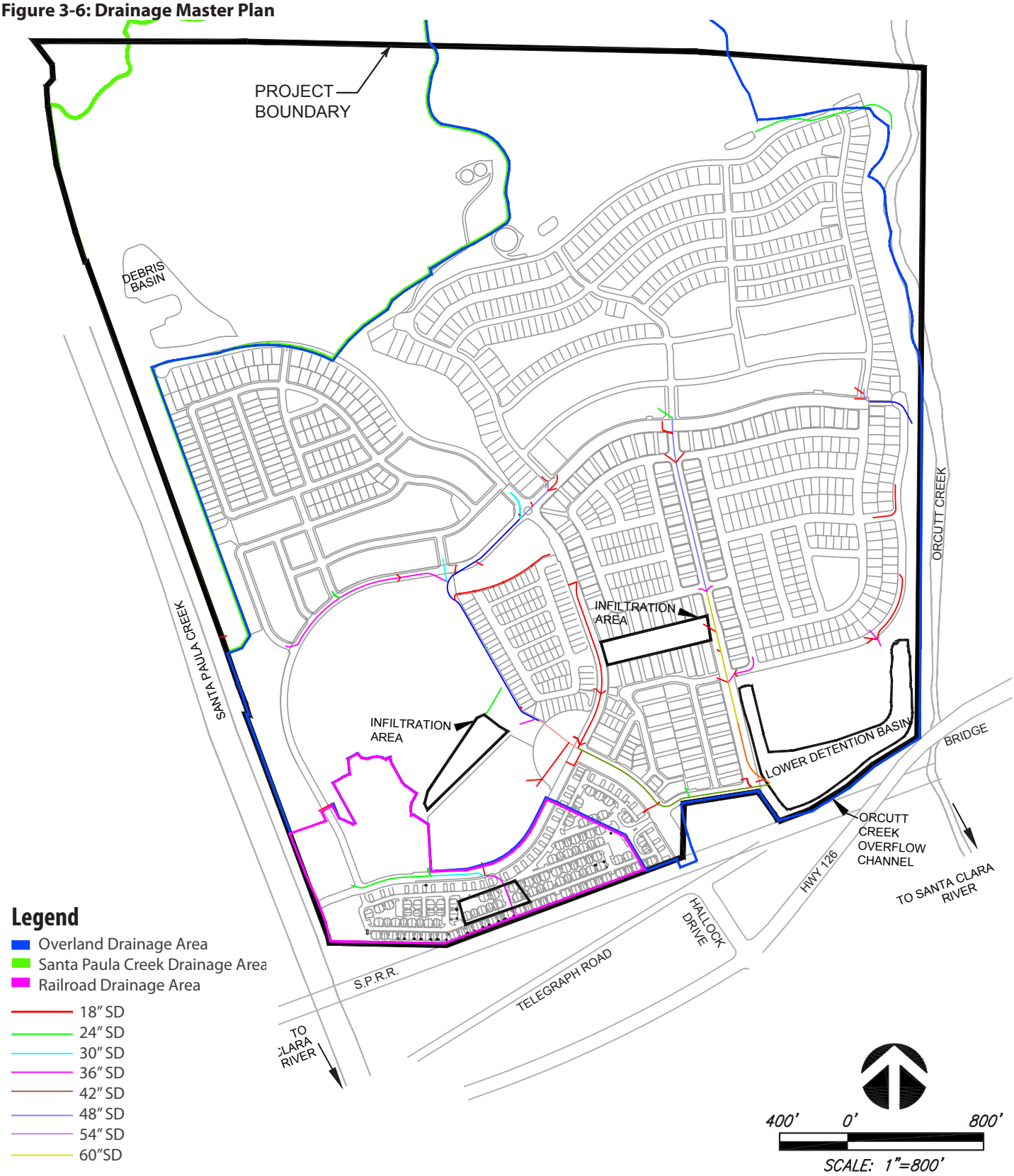
The majority of Orcutt Creek is located outside of the Specific Plan Area boundary. The East Area 1 Drainage Master Plan includes grading to provide appropriate protection from flood flows in Orcutt Creek and help convey these flows downstream. Planned improvements include grading to convey overflow from Orcutt and a bypass channel along the detention basin frontage separate from the detention basin. The site grading will allow over flows from Orcutt Creek to be conveyed down to the Highway where there will be a diversion structure to allow water into the basin as well as to a bypass channel on site directing flow into a new trapezoidal channel running westerly along the south property line of the project. This overflow channel will join with reduced flows from the onsite detention basin upstream of the Railroad bridge and be directed under the Railroad to the existing double box culvert under the Highway. The flows will then be conveyed southerly in an existing ditch to the confluence with the Santa Clara River (see Figure 3-6).

A. **Orcutt Canyon Creek Drainage Area and Farm Creek Drainage.** The Orcutt and Farm Creek Drainage Areas located within the Specific Plan Area will be combined into a single drainage area by the design of the Grading and Drainage Master Plans. The Orcutt Drainage area will remain unchanged for the upstream off-site areas. The Grading Master Plan will change the existing drainage pattern of the portions of the Specific Plan Area located immediately adjacent to Orcutt Creek/Orcutt Creek. The Grading Master Plan will not increase the amount of East Area 1 draining to Orcutt Creek.

Flows from the tributary areas located north of the Specific Plan Area will be directed from the two debris basins located on the northern edge of the development area to storm drains within the development area. Onsite flows from the remaining onsite drainage areas will be conveyed in these same storm drain systems and outlet to the detention basin located at the southeast corner of East Area 1. The flows from this basin flows will outlet through an engineered structure into a parallel channel to Orcutt Creek. This basin area totals 27.8 acres and will allow for infiltration of water as well as attenuate peak storm events so that post project runoff will not exceed existing condition runoff. The basin will be graded to allow for water to pond in each storm event to a water surface elevation below the elevation of the soccer fields.

The easterly portion of this drainage area will be directed to an infiltration area in the 35-acre community park in the Civic District. This infiltration/detention basin will also assist in meeting infiltration requirements and reducing peak storm events.

**Figure 3-6: Drainage Master Plan**




Source: Jensen Design & Survey, Inc. 2021.

**B. Overland Drainage Area and Santa Paula Creek.** The existing Overland Drainage area will be reduced to 26.7 acres. Flows will be collected in a storm drain system and outlet through a rip rap/velocity dissipater structure located along the southerly property line just north of the railroad and west of Hallock Drive.

The outflow from the most westerly debris/detention basin, as well as the north westerly portion of the project will be conveyed to the several existing outfalls located along the edge of Santa Paula Creek. Overland flows along the westerly 160 feet of the property will flow through the linear landscape buffer area along Santa Paula Creek before exiting the site and entering Santa Paula Creek. A total of 192 cubic feet per second (cfs) in a 100-year event enters Santa Paula Creek in the existing condition. The improvements constructed pursuant to the proposed condition will reduce the peak flows into Santa Paula Creek in a 100 year event to 109 cfs. The storm drain systems for the Overland Drainage Area and Santa Paula Creek are shown in Figure 3-6.

Stormwater conveyance and treatment requirements must meet City of Santa Paula and State Water Resources Control Board MS4 Requirements. The treatment types include bioswales, bioretention cells, infiltration trenches, permeable pavement, and/or detention basins as needed based on the proposed site plan layout.

## 3.6 Electricity

Electricity in Santa Paula is supplied by Southern California Edison Company (SCE). High voltage, 66 kilovolt, transmission lines exist crossing Ojai Road (SR 150), along a portion of 12th Street south of Orchard Street, and along the south side of the railroad tracks east of 12th Street. A Southern California Edison substation, (the "Wakefield Substation"), is located south of the railroad tracks at the intersection of 12th Street and the railroad tracks. SCE will service and maintain the project area's electrical facilities. The EA1SP includes relocation of transmission mains along the Santa Paula Creek side of the project. New local serving electrical lines will be placed underground. All conduits will be with full encasement. The East Area 1 Specific Plan includes energy conservation related design standards to reduce electric energy consumption. In addition, all development in EA1SP will observe the following setback requirements for residences (including private residential yards), school facilities, and designated recreational facilities: 100 feet from 100-110kV lines and 150 feet from 220-230 kV lines.

## 3.7 Gas

The Southern California Gas Company (SCG) provides natural gas in Santa Paula. SCG serves much of Southern California with a network of transmission and distribution lines. An existing 12-inch high-pressure supply line runs east-west in Telegraph Avenue (SR126). This line feeds pressure reducing stations supplying the City. Major distribution lines run from these stations. These in turn, branch into the network of smaller gas mains in all of the streets. Service connections will be provided and maintained throughout the East Area 1 Specific Plan area as needed.

## 3.8 Telephone

Telephone service and maintenance to the area is provided by Verizon. Telephone facilities will be located underground within the streets rights-of-way. No overhead telephone facilities will be permitted.

## 3.9 Cable

Cable television is provided in the area by Time Warner. This company will serve the East Area 1 Specific Plan area. Cable television facilities will be located underground within public rights-of-way, or easements on private property.

## 3.10 Solid Waste

Solid waste collection services are provided in the City of Santa Paula by an exclusive franchise agreement with Athens Services through 2047. All materials are disposed of at the Toland Road Landfill, operated by the Ventura Regional Sanitation District, or other permitted solid waste disposal facility.

The City participates in a curbside recycling program, which includes the recycling of paper (egg cartons, paper, cards, cardboard), glass (food and beverage containers), metal (aluminum cans/trays & foil, metal cans, etc.) and plastic ( #1 – 7). Curbside pickup of food waste and yard trimmings is provided, as well as community drop-off events for residents to dispose of large items, household hazardous waste, and motor oil and filters.

The City is required to have trash, recycling, and organics service with the provision of three separate containers and adequately sized enclosures for all single family, multi-family and commercial units. All construction projects shall comply with SB 1383 and the Green building code to divert a minimum of 65% of total waste generated away from the landfill.

## 3.11 Public Safety Services

Fire and Police Protection Services will be provided by the Ventura County Fire District (VCFD) and Santa Paula Police Department (SPPD). The VCFD provides the City with fire prevention, rescue, and basic emergency medical services; hazardous materials mitigation; and disaster planning coordination.

The Ventura County Fire District has two fire stations located on the East and West sides of town. VCFD Station 29 is located on the Eastside at 114 S. 10th Street. VCFD Station 26 is located on the Westside at 536 W. Main Street (refer to Figure 3-7).

The majority of the Specific Plan Area is designated in the "low-range area" of the Fire Hazard Zones. However, the northernmost portion of the Specific Plan Area is designated as a "High Fire Hazard" area. This area is comprised of steep terrain and will be retained as irrigated avocado fields, thus reducing the fire hazard of this area.

The Santa Paula Police Department (SPPD) currently operates out of a 4,728 square foot facility on 10th Street (refer to Figure 3-7).

## 3.12 Schools

The EA1SP includes a site for school facilities. The Civic District provides an approximately 8.3-acre site (not including streets and parks) for additional school facilities.

## 3.13 Parks and Recreation

### 3.13.1 Existing Conditions

The Santa Paula park system includes two neighborhood parks, nine mini-parks, and two special interest parks, defined in the 2040 General Plan as facilities with a particular use that serves the entire community. The largest park is George Harding Park, which comprises 13 acres. Most of the other parks in the City are between one and six acres.

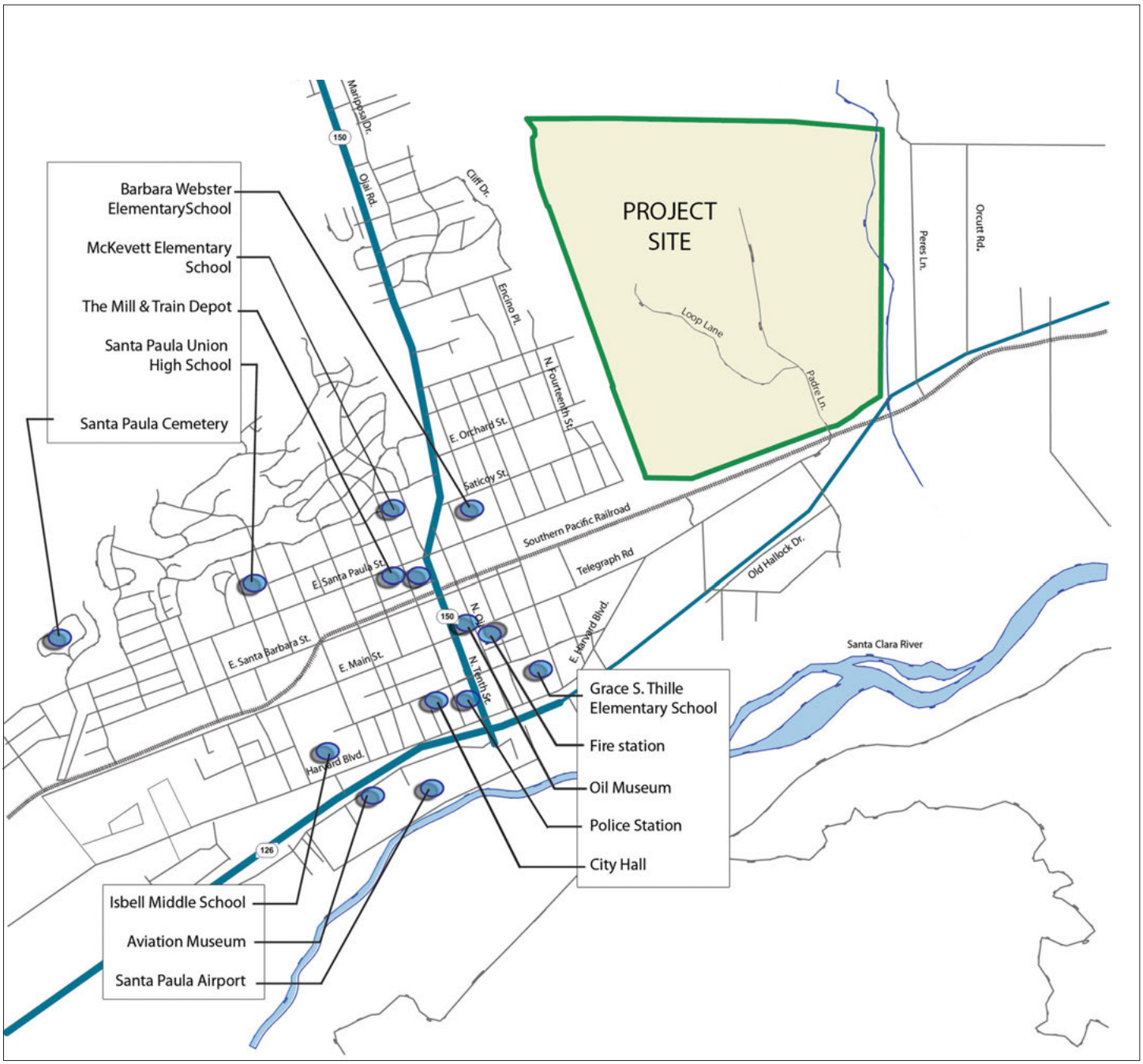
A portion of the Santa Paula Branch Line Recreational Trail is currently planned. In addition, the City has a Class I bikeway near Cemetery Road, south of Santa Paula Street, and several Class II bikeways.

The City's goal is to provide 5 acres of parkland per 1,000 residents. Based on Santa Paula's projected 2040 population of approximately 39,600, a total of 198 acres of parkland would be required to achieve this desired standard. Existing and approved parks plus future parks identified in the City's 2040 General Plan would yield a total of approximately 440 acres of parkland, which would exceed the City's goal.

### 3.13.2 Park and Open Space Plan

The EA1SP includes recreational amenities and open spaces that will contribute to both the desirability and livability of the community. These areas will provide a diverse variety of spaces for family- and community-oriented recreation. The parks vary in size to accommodate a number of different amenities so that each park has its own character and provides a combination of passive and active recreation opportunities within the Specific Plan Area. The green spaces include play fields, formal plazas, community and neighborhood parks, pocket parks, and large greenways that run the full length of the community along the creek fronts, with hiking trails.

**Figure 3-7: Public Services and Civic Uses**




Source: HDR Town Planning, 2007.

Approximately 225.3 acres (45%) of the East Area 1 Specific Plan area will consist of undeveloped land, consisting of open space uses (including parks and greenways, the Santa Paula Sports Park, and open space preserve) and agricultural preserve. A total of approximately 88.0 acres will be parkland that includes the following: approximately 55.2 acres of neighborhood parks and greenways in the three Neighborhoods and Civic District, and the 37.8-acre Sports Park. Each park will be fully accessible via an integral system of sidewalks and multi-use paths, all of which meet current accessibility standards. Approximately 77.3 acres will remain open space preserve. Approximately 55.0 acres will remain in active agricultural operations and will not be open to the public. Refer to Section 5.9 for additional details regarding the development standards for the open space and park areas. Table 2-2 provides an undeveloped land summary.

## 3.14 Goals, Policies and Programs

### 3.14.1 Goals

1. To provide the level of public services desired by the residents at a reasonable cost.
2. To ensure the provision of public services keeps pace with new development.

### 3.14.2 Policies

**A. General:**

1. Development must provide for orderly urban expansion.
2. Public facilities should be located and designed so that noise, light, odors, and appearances do not adversely affect nearby land uses.
3. Builders are encouraged to use designers familiar with sustainable practices when conceiving their projects in order to gain the greatest amount of benefit from these systems.
4. Sustainable development is encouraged.

**B. Water Conservation:**

1. Developers must employ the efficient use of water and reduced water demand by requiring water-conserving design and equipment in new construction and by encouraging water-conserving landscaping and other conservation measures.
2. The majority of landscaping for both public and private projects must employ low water demand/ drought tolerant native plants.
3. In any turf areas within public spaces, street medians or landscaping barriers, hydro tension-meters and automatic irrigation systems (or similar technology) must be used to achieve the most effective use of water applied to turf.
4. The East Area 1 Specific Plan requires the use of water conservation measures to reduce water demand. These include the use of high-efficiency clothes-washing machines, ultra-low-flow toilets, low-flow shower heads, and evapotranspiration sensor based irrigation controllers, and other such devices to reduce domestic water consumption.

**C. Drainage and Flood Control:**

1. Natural drainage systems will be encouraged where feasible to preserve and enhance natural features.
2. Improve the quality of urban storm water runoff and quality of groundwater recharge through the use of appropriate mitigation measures including, without limitation, infiltration/sedimentation basins, oil/grit separators, and other best management practices (such as storm water retention).
3. Require new development to adequately mitigate increases in storm water peak flows and/or volume. Peak water discharge into the Santa Clara River and Orcutt Creek cannot exceed existing conditions. Mitigation measures must consider impacts on adjoining properties and impacts on groundwater recharge related to existing and proposed water wells.
4. Engineered drainage plans must incorporate a collection and treatment system for storm water runoff

consistent with the Ventura Countywide Stormwater Quality Urban Impact Mitigation Plan.

5. Development must mitigate risks from floods.

**D. Police Protection:**

1. Public safety issues must be considered in all aspects of project design, including crime prevention through design.

**E. Fire Protection:**

1. Development must incorporate designs, systems and practices for fire safety, prevention and suppression.
2. All proposed developments must be reviewed for compliance with fire safety standards in accordance with the SPMC as may be amended and any VCFD requirements.

**F. Grading:**

1. Retain significant natural hillsides and ridgelines where feasible, while allowing for required street access and Neighborhoods.
2. Provide contour grading of significant slopes
3. Round edges of manufactured slopes to blend into natural terrain, where feasible.
4. Avoid "estate" pad sizes to reduce grading.

## 3.14.3 Programs

1. Complete on-site water distribution lines in the East Area 1 Specific Plan Area to serve individual parcels. Pipe connections will include adequate looping to provide redundancy for the system.
2. Place fire hydrants at most intersections and every 350 feet. Fire hydrant locations will be reviewed and approved by Ventura County Fire District.
3. Complete on-site sewer mains in the East Area 1 Specific Plan Area to serve individual parcels. Determine the location and size of utility lines during the design of each neighborhood subarea.
4. Complete a storm water collection system that connects into Santa Paula Creek and/or Orcutt Creek. The storm water collection system for the Specific Plan Area will primarily consist of storm water inlets with underground piping systems, which will discharge low flows into pretreatment areas such as bio-filters (vegetated swales/ strips).
5. Construct storm drain detention facilities to mitigate the increase of the developed condition peak flow over the undeveloped peak flow. The detention sites may consist of detention basin(s), dual use basins, and/or underground storage. Any detention basin deeper than 18 inches will be designed to avoid the need for perimeter fencing.
6. Submit development plans to the police department and fire department to ensure to the extent practical that design of the project facilitates public safety.
7. Install utilities underground to secure such utilities from damage.

## 4.1 Introduction

This section addresses Government Code § 65451 which requires that specific plans include a program for implementation including regulations, conditions, programs and additional measures necessary to implement the plan.

The responsibilities and procedures required for implementing the EA1SP are identified in this section, including responsibility for capital improvements and financing and the regulations that will govern its implementation.

Public and capital facilities adjacent to the Specific Plan Area are required to support EA1SP development, including public roadway and signal improvements. Private infrastructure within the Specific Plan Area required to support development include water mains, sewer trunk lines, new roadways, dry utility conduits within roadways, and drainage. The Master Developer will finance and/or construct all such improvements.

Recreational amenities will be provided on-site. Contributions towards maintaining Transportation, Fire, Police, and Library services will be made through payment of development impact fees.

## 4.2 Specific Plan Regulatory Approach

The implementation procedures set forth in this section are intended to ensure the development of East Area 1 in accordance with the planning and design intent of this EA1SP and Applicable Law.

This EA1SP applies to all lands within the Specific Plan Area All development proposals within the Specific Plan Area boundaries must be consistent with this EA1SP, the General Plan, and SPMC, as may be amended. The Development Standards and Guidelines, presented in Sections 5 and 6 of this EA1SP, contain development regulations which are mandatory for all properties within the Specific Plan Area.

## 4.3 Implementation Schedule

It was anticipated that development of the Specific Plan Area would occur in four (4) phases, as shown in Figure 4-1 (Phasing Guide) over approximately ten (10) years and be completed by 2020. However, due to outside forces, the Plan Area could not be completed by then and extensions were granted subject to further unavoidable delays beyond the Master Developer's and City's control. In order to coordinate infrastructure and financing needs, the phasing of the EA1SP Area is designed to meet the following objectives:

- Orderly build-out based upon market and economic conditions.
- Providing adequate infrastructure and public facilities concurrent with development of each phase.
- Protection of public health, safety and welfare.

The infrastructure improvements will be matched to meet the needs of each phase of development.

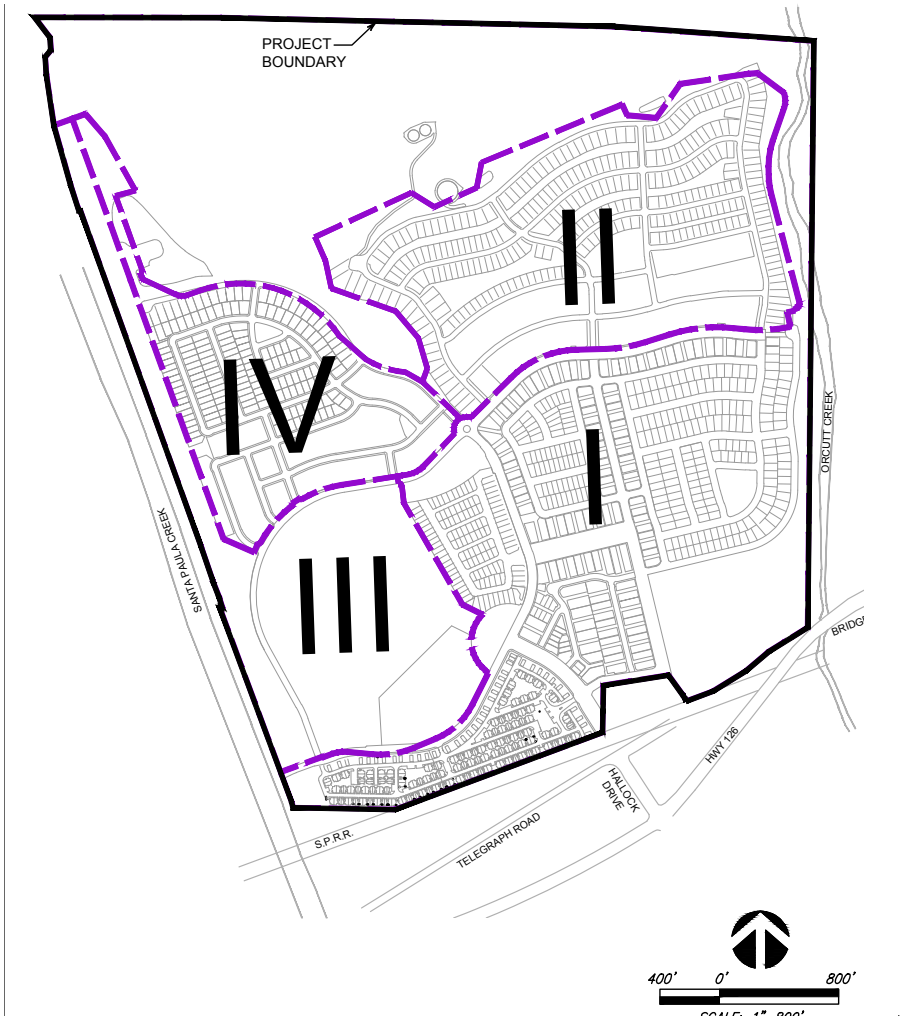
## 4.4 Infrastructure and Public Facilities/Services

Consistent with Applicable Law, this section provides an overview of the parties involved in the implementation, ownership, and long-term maintenance responsibilities for the private infrastructure and public facilities/services required to support the Specific Plan Area. Related to the text below, please see Figure 3-2A (Domestic Water Schematic Layout), Figure 3-2B (Recycled Water Schematic Layout), Figure 3-4 (Sewer System Schematic Layout), Figure 3-6 (Drainage Master Plan), and Figure 5-3 (Thoroughfare Categories).

Development will require the extension of existing infrastructure and services into the Specific Plan Area to provide water, wastewater disposal, storm drainage, roads, public safety services and solid waste services. The Master Developer is responsible to provide the required infrastructure improvements to serve the plan area.

Domestic water demands are comprised of potable water demand and non-potable water demand for irrigation of parks and agricultural preserves. The City would supply the portions of the project overlaying the respective groundwater basins with water from those basins (Santa Paula and Fillmore

**Figure 4-1: East Area 1 Phasing Guide**




*Source: Jensen Design & Survey, Inc., 2021.*

Basins). Several new field wells are required and well upgrade in the Fillmore Groundwater Basin to serve the project. Improvements/upgrades to the water delivery system will be implemented. The development will also construct a new recycled water distribution system in anticipation of the City developing a recycled water system and line in Telegraph Road which would deliver recycled water to appoint of connection near the intersection of Hallock Drive and the VCTC railroad right-of–way.

The development will provide three upstream debris/detention basins, bioswales for passive treatment of water quality through the streets and park areas and includes two detention basins.

To accommodate wastewater disposal, the EA1SP requires the construction of a new lift station near the SR 126 Bridge on Lemonwood Drive. The lift station will allow flows to cross Santa Paula Creek in a newly constructed 10" force main to a new sewer main constructed in Santa Clara to 12th Street.

A drainage master plan will be implemented by the Master Developer that meets or exceed the storm water drainage requirements of the Ventura County Watershed Protection District (see Figure 3-6) and City utilities such as electricity, gas, telephone, and cable will be installed per EA1SP requirements. Southern California Edison (SCE) will service and maintain the project area's electrical facilities. The plan includes energy

conservation related to design standards to reduce electric consumption.

The circulation system consists of a hierarchical deployment of particular thoroughfare types for specific physical applications (Figure 5-3 Thoroughfare Categories) to provide a highly connected multi-modal circulation network. This system will be constructed by the Master Developer.

## 4.5 Financing Plan

The financing and maintenance plan for the EA1SP anticipates the timely completion of public facilities, streets, utilities, and other necessary capital improvements, as well as the proper maintenance of these facilities. The Master Developer(s) of the EA1SP will fund project infrastructure and public facilities through the following activities:

- Fund new on-site and off-site public infrastructure and services needed to support the EA1SP development;
- Phase on-site improvements to ensure they are constructed when necessary and when funds are available to construct public improvements; and
- Provide for reimbursements from other development for infrastructure costs that the EA1SP area is required to advance.

Individual Permitee(s) will fund project infrastructure and public facilities by paying development impact fees in accordance with Applicable Law.

## 4.6 Methods and Procedures for Implementation

The procedures, regulations, standards and specifications described in this EA1SP supersede any conflicting portions of the SPMC, as may be amended. Any development regulation and building requirement not addressed in this EA1SP is subject to Applicable Law.

## 4.7 Specific Plan Approvals

The Specific Plan Area is zoned as "SP-3." This EA1SP amends and restates the previously approved specific plan (adopted in February 2008, as amended by Amendment Nos. 1 through 3) in its entirety; the Specific Plan Area, however, will continue to be zoned "SP-3"; this EA1SP must be adopted by ordinance.

## 4.8 Administration

### 4.8.1 Introduction

The EA1SP applies to any of the following within the Specific Plan Area boundaries:

- Land use activity;
- New buildings and signage
- Modifications/additions to existing buildings and signage
- Subdivision of land or a building; and
- Improvements to a site.

All required permits/approvals must be obtained before the proposed use, and any structures related to the proposed use, are constructed, otherwise established or put into operation. Unless specified otherwise, the EA1SP will be administered and enforced by the Director, Planning Commission, and City Council. Applications must be processed and approved by the applicable requirements and findings of this EA1SP.

### 4.8.2 Municipal Code Reference

In the event of a conflict between the SPMC and the Specific Plan, this EA1SP takes precedence over the SPMC, as may be amended. The Director is authorized to provide administrative determinations regarding the Specific Plan. Such administrative determinations must be in writing and may be appealed in accord with the SPMC, as may be amended.

This EA1SP provides the entire zoning for the EA1 Area. The entire property is zoned "SP-3," and the applicable zoning regulations for the EA1 are those set forth in this EA1SP.

### 4.8.3 Director Authority

A. The Director has the authority to implement the EA1SP in accordance with Applicable Law.

B. The Director has the authority to interpret the EA1SP. In the event that a specific use or type of use is not listed as a permitted use, the Director has authority to determine whether the proposed use is similar to a permitted use and whether the use is permitted, permitted subject to conditions, permitted as a temporary use, or prohibited. In

determining "similarity," the Director must make all of the following findings:

- The proposed use meets the intent of, and is consistent with, the goals, objectives and policies of the general plan and the Specific Plan;
- The proposed use does not adversely impact the public health, safety and general welfare of the City's residents; and
- The proposed use shares characteristics common with, and is not of greater intensity or density or does not generate more environmental impacts than those uses listed in the permitted uses section.

C. Any applicant, interested person, or public official may appeal Project Clearance or Specific Plan Amendment decisions of the Director to the Planning Commission in accordance with the Santa Paula Municipal Code.

### 4.8.4 Amendments

A. This EA1SP may be amended in the same manner as required for the adoption of a specific plan.

B. The City may initiate amendments to any portion of this EA1SP.

C. The following changes to this EA1SP require an amendment:

- Changes to the text or maps other than the addition of information that does not change the effect of any regulation.
- Changes in any Specific Plan Area boundary.
- Changes in standards or regulations, including landscaping and design standards.

### 4.8.5 Administrative Modifications

A. The Director is authorized to make technical corrections, in a form approved by the City Attorney, to maps, diagrams, tables, and other similar documents that may be required to reconcile the changes made by this EA1SP with the Project Approval and Applicable Law.

B. In addition, the Director is authorized to make the following technical amendments, in a form approved by the City Attorney:

- Realignment or modifications to internal streets serving the project, lot lines, easement locations and grading adjustments, if approved by the City Engineer.
- Minor modification to design criteria such as paving treatments, architectural details and related criteria.
- Minor modification to landscape treatments, fencing, lighting, trails, and entry treatments, provided the modifications are in substantial conformance with the purpose and intent of the specified design criteria.
- Minor expansions or reductions (10%) of the geographic area covered by a given Neighborhood.
- Minor expansions or reductions (not to exceed 25%) of the required setbacks set forth in Table 5-2, Minimum Building Setbacks.

### 4.8.6 Miscellaneous

Any time limit established by this EA1SP may be extended by mutual agreement between the applicant and the Director, or with the approval of the Planning Commission or the City Council, as the case may be.

### 4.8.7 Noticing

All noticing required by Applicable Law will be accomplished at the cost of the applicant seeking a Project Clearance, or other action in accordance with Applicable Law.

## 4.9 Submission, Review and Approval Requirements

### 4.9.1 Tentative and Final Subdivision Map

All subdivision maps of any type must be submitted, reviewed and approved in accordance with the SPMC, as may be amended, and the California Subdivision Map Act. For projects requiring a tentative or parcel map(s), the provisions and procedures of the EA1SP apply, unless otherwise provided for in the SPMC, as may be amended. A tentative map or parcel map may be processed concurrently with the EA1SP. Applications for tentative and final subdivision maps, parcel maps, and lot line adjustments must be filed with the Planning Director in accordance with the SPMC, as may be amended.

### 4.9.2 Map Revision Approvals

**A. Purpose.** The provisions of this section set forth findings, procedures, and fees for changes to Vesting Master Tentative Map 5854 and subsequent recorded final maps (Map Revisions). Map Revisions are authorized by compliance with this section in order to facilitate and expedite implementation and build-out of planned development within the Specific Plan Area.

Map Revision applications may consist of applications for certificates of correction (COC), lot line adjustments (LLA), record map modifications (RMM)/amending maps (AM), tentative parcel maps (TPM), tentative maps (TM), and any related final map clearances (MC).

**B. Fees.** The fee or fees established by city council resolution for processing, recording or other services related to Map Revisions must be paid by the Permittee.

**C. Materials for Filing.**

**a. COC/LLA/RMM/AM Applications.** Any Permittee proposing a COC/LLA/RMM/AM pursuant to this section must submit the following information, as applicable:

- 1 copy of the Planning Permit Application.
- 2 copies of a Preliminary Title Report prepared within 60 days before the application date for all parcels.
- 10 copies of a site plan showing: (a) existing lot lines; (b) proposed lot lines; (c) location of all structures on all parcels; and (d) distances between buildings and proposed lot lines.
- 1 copy of above exhibits reduced to 11" x 17".
- 2 copies of draft Owner's Certificates (final versions to be signed and notarized) for each property owner and holder of record title interest.
- 2 copies of draft Grant Deed.
- 2 copies of draft Partial Reconveyance
- 2 copies of proposed draft Modified Deed of Trust
- 2 copies of Certificate of Conformity or Certificate of Modification
- 2 copies of Notice document (if applicable).
- Applicable fees.
- Agreement for Payment of Processing Fees and Consultant Costs for Major Projects (signed).

**b. TPM/TTM/MC Applications.** Any Permittee proposing a TPM/TTM pursuant to this section should submit the following information, as applicable:

- 1 copy of the Planning Permit Application.
- 10 copies of the Tentative Map, including a statement by the applicant on the plans that "The design of the subdivision and the type of improvements will not conflict with easements acquired by the public at large for access through, or use of, property within the proposed subdivision."
- 10 copies of a preliminary landscape plans for common areas.
- 1 copy of above exhibits reduced to 11" x 17".
- 2 copies of a Preliminary Title Report prepared within the past 3 months for all parcels.
- 2 copies of a Hydrology Report for the site (include Flood Plain Map as applicable).
- 2 copies of a Geotechnical Report (soils/liquefaction/fault activity) for the site.
- 2 copies of a description of the proposed method and plan for sewage disposal.
- 3 copies of a description of the proposed method and plan for domestic water service and storm water disposal (required for Vesting Maps).

- 1 copy of the City of Santa Paula Environmental Questionnaire.
- Applicable fees.
- Agreement for Payment of Processing Fees and Consultant Costs for Major Projects (signed).

**D. Applicant.** An application for a Map Revision must be signed by all parties having any record title interest in real property identified specifically as part of the requested revision. In order to initiate the Map Revision review process, the Permittee(s) must submit a complete application consistent with the Materials for Filing section identified above.

**E. Review Process.** A complete Map Revision application must be submitted by the Permittee(s) to the Director. The application must be forwarded by the Director for review by the Development Review Committee (including the Public Works Director) within five business days of its receipt.

The Director must conduct environmental review in compliance with the California Environmental Quality Act (CEQA). Any Map Revision requiring a Supplemental and/or Subsequent Environmental Impact Report (EIR) must be referred to the Planning Commission.

**F. Approval Procedure.** The Director is the decisionmaker for certificates of correction, lot line adjustments, tentative parcel maps, and final parcel map/ map clearances. The City Council is the decisionmaker for record map modifications/ amending maps and tentative maps.

**G. Relationship of Map Revision to Approved Map.** Map Revisions will supersede the lot configuration contained in the Approved Final Map applicable to such individual lot(s). Except as affected by a Map Revision, all other provisions of the Approved Final Map will continue in full force and effect.

**H. Map Revision Expiration.**

1. A Map Revision remains valid if it meets all requirements of this EA1SP.
2. A Map Revision expires 36 months after the approval date, unless the City grants a time extension in accordance with this section.
3. The Director may grant a 36 month extension, for good cause shown, before the initial time period expires.
4. Upon a Map Revision expiration, all map entitlements revert back to the previously recorded map instrument.

### 4.9.3 Development Plan Review

Before the City issues any residential, commercial or institutional building permits for any specific phase, a Development Plan must be approved for such development.

The primary purpose of the Design Review, as set forth in SPMC Chapter 16.226 as may be amended, is to determine that individual tracts are being developed in a manner that conforms to the goals and standards specified by this EA1SP and to ensure compatibility with all applicable City regulations.

### 4.9.4 Individual Project Approvals

Individual Project applications must be reviewed by the Director for their consistency with the Specific Plan, including the Design Guidelines and Development Standards.

**A. Project Clearances**

1. Unless otherwise exempt, the Director must issue a Project Clearance before the City can issue a grading permit or building permit.
2. The Director cannot issue a Project Clearance unless an Individual Project complies with all applicable provisions of this EA1SP and other Applicable Law.

**B. Findings.** A Project Clearance must include written findings by the Director that the Individual Project complies with all applicable provisions of this EA1SP and may only be issued if all of the following specific findings can be made:

1. That the proposed development conforms to the applicable policies of the General Plan and the applicable provisions of the zoning regulations within the SPMC, as may be amended.

2. That the proposed development is located on a legally created lot.

3. That the subject property is in compliance with all laws, rules, regulations pertaining to subdivisions, permitted uses, design guidelines, development standards, and any other applicable provisions of this EA1SP.

**C. Covenant.** A Project Clearance must include a requirement that the Permittee either submit evidence of the Permittee's previous acceptance of all recorded Project Approval conditions of approval, or if new conditions of approvals are imposed in the Project Clearance process, record a new agreement (against only those lot(s) affected by the Individual Project) concerning new specific information/ conditions contained in the Project Clearance (e.g., Agreement to Comply with Conditions of Approval) before the City issues Occupancy Clearance for that Individual Project.

The agreement must be in a form approved by the City Attorney and include provisions requiring it to run with the land and be binding on any subsequent owners, heirs or assigns. After recordation, a copy bearing the County of Ventura Recorder's number and date must be given to the Director for attachment to the subject case file.

**D. Advisory Determination.** An applicant may request, at the applicant's cost, that the Director conduct a preliminary review of an Individual Project application for an advisory non-binding determination of compliance with the provisions contained in this EA1SP.

**E. Director's Review.** In approving a Project Clearance for an Individual Project, the Director may impose only those applicable conditions of approval/mitigation measures that were previously imposed in connection with the Project Approval, with the exception that new conditions may be imposed as necessary to ensure that previously imposed Project Approval conditions of approval are effectively implemented for the Individual Project being reviewed (e.g., construction notifications, construction buffering requirements, construction monitoring efforts).

In approving a Project Clearance, the Planning Commission may impose applicable conditions of approval/mitigation measures that were previously imposed in connection with the Project Approval as well as any new conditions of approval/ mitigation measures associated with new potentially significant environmental impacts identified through CEQA analysis. In addition, new conditions may be imposed as necessary to ensure that previously imposed Project Approval conditions of approval are effectively implemented for the Individual Project being reviewed (e.g., construction notifications, construction buffering requirements, construction monitoring efforts).

1. Referral to Public Works Director. After receiving a Project Clearance application, the Director will transmit a copy of the application to the Public Works Director and Building Official requesting comment. The Public Works Director will make the determinations required by the EA1SP and provide a written determination on the Individual Project to the Director.

2. Compliance with Environmental Guidelines. Upon receipt of an application for Project Clearance, the Director must determine whether the Individual Project/Map Revision is consistent with CEQA.

3. Development Configuration Matching Project Approval. If the Individual Project is consistent with the development reflected on Figure 2-3 and the Director determines that the Project Clearance complies with all other applicable requirements of the EA1SP, the Director may impose any applicable conditions of approval/ mitigation measures appropriate for the Individual Project and may issue a Project Clearance conditioned upon the implementation of those conditions/mitigation measures.

4. Development Configuration Consistent with Environmental Guidelines. If the Individual Project, while not consistent with the development reflected in Figure 2-3, is consistent with the requirements of the EA1SP, the Director may impose applicable conditions of approval/ mitigation measures and issue a Project Clearance conditioned upon compliance with those conditions/ mitigation measures.

5. Development Configuration Inconsistent with Environmental Guidelines for which an EIR is not Required. If the Individual Project conforms to the requirements of the EA1SP, but requires additional environmental analysis under CEQA, the Director must inform the Applicant that an additional environmental assessment will be required for the Project and require a deposit from the applicant to proceed with additional Individual Project review. The Director may then conduct an environmental review in compliance with CEQA and take appropriate action as to a Project Clearance.

6. Development Configuration Inconsistent with Environmental Guidelines for which an EIR is Required. If the Individual Project conforms to the requirements of the EA1SP, but requires a Supplemental or Subsequent Environmental Impact Report (EIR) in order to comply with CEQA, the Planning Commission is the decision maker for Project Clearance.

7. Finding of Inconsistency. If the Director finds the Individual Project is inconsistent with Applicable Law, including the EA1SP, the Director must deny the application in writing. The written denial will identify the reasons for inconsistency. The Permittee may amend its application or appeal the Director's decision in accordance with the SPMC § § 16.206.010, et seq., as may be amended.

8. Referral to Planning Commission. The Director may determine on a case-by-case basis that the public interest would be better served by holding a public hearing before the Planning Commission to determine whether the Director should issue a Project Clearance.

**F. Relationship of Project Clearance to Project Approval**

1. Upon the City issuing a Project Clearance, plans for each such approved Individual Project will supersede the plans contained in the Project Approval originally applicable to such Individual Project's lot. Except where inconsistent with the approved Individual Project, all other provisions of the Project Approval apply to the Individual Project.

2. Each Project Clearance constitutes a "Project Approval" as defined by Applicable Law; no amendment of the East Area One Project Approval is required in association with approval of a Project Clearance.

**G. Relationship of Project Clearance to Approved Map**

1. An application for an Individual Project may include a Map Revision in order to better configure lots to the proposed building and/or parking areas. The City may approve such Map Revisions concurrent with the Project Clearance. Map Revisions may be processed as a certificate of correction, record map modification/ amending map, lot line adjustment, parcel map, or tentative map, as applicable, in accordance with the provisions of this EA1SP.

2. Map Revisions approved concurrent with the Project Clearance will supersede the lot configuration contained in the Approved Project applicable to such individual lot. Except as affected by a Project Clearance, all other provisions of the Approved Project will continue in full force and effect.

3. Expiration of a Project Clearance for an Individual Project does not affect the validity of a certificate of correction, record map modification/ amending map, lot line adjustment, parcel map, or map.

**H. Rights Granted Under Project Clearance.** A Project Clearance indicates compliance with the EA1SP and the Applicable Law.

**I. Project Clearance Expiration**

1. A Project Clearance for an Individual Project expires 24 months after the approval date, unless within such period physical construction of the Individual Project is substantially commenced, and/or the beginning of the authorized use commenced, or the City grants a time extension in accordance with this section.

2. The Director may grant a one year extension, for good cause shown, before the initial time period expires.

3. Upon a Project Clearance expiration, all entitlements revert back to Figure 2-3.

### 4.9.5 Utility Plan

A Utility Plan must be submitted for City approval. All utility service connections and aboveground mounted equipment (such as backflow prevention devices) must be screened from view and painted in earthtone or other colors compatible with the surrounding area (red is prohibited). Screening may include a combination of landscaping, fencing, walls, or lattice. All gas and electrical meters must be concealed and/or painted to match the surroundings. Utility transformers must be placed in underground vaults unless proven to be technically infeasible. All transformers and vaults that must be located in the right-of-way must be installed below grade unless otherwise approved by the City. If not installed below grade, such facilities must be screened from public view.

### 4.9.6 Landscape Plan

The Permittee must prepare a detailed landscape plan for each Individual Project that identifies existing landscaping, proposed new landscaping (trees, shrubs, groundcovers by species), size of plant materials, and location of landscaping. Landscaping must consist of drought-tolerant native and/or Mediterranean type species which provides adequate enhancement of the property and screening from surrounding areas. The use of invasive plants is prohibited. Landscaping must be used to soften building masses, to reinforce pedestrian scale, and to provide screening along public street frontages and within parking areas.

Figure 2-3 is illustrative of the essential form that the East Area 1 is intended to take, including landscape and recreational areas. Front Yard landscape for individual lots is identified in Section 5.7.1.D (front Yard Landscapes). As building and parking lot coverage are anticipated to change and evolve as the Specific Plan Area is built out, the landscape coverage requirements for Individual Projects may similarly evolve.

## 4.10 Maximum Development Yield and Density Transfers

The maximum development yield from all of the East Area 1 Area subject to this Specific Plan is 2,050 dwelling units. During site development plan review, minor adjustments to planning area boundaries, and road alignments, may require adjustment of the Planning Area density allocations defined in Table 2-1.

Requests by Neighborhood Builder(s)/Developer(s) for density transfers between neighborhoods may be submitted for City consideration and approval, subject to prior authorization by the Master Developer. Any approval by Planning Director for density transfer between neighborhoods cannot exceed the potential maximum of each individual planning area, providing that the maximum total development potential of the entire project is not exceeded.

Density transfers are subject to the following provisions:

1. The density transfer meets the provisions of the Development Standards and occurs within the development envelope on the approved Land Use Plan and Grading Plan of this Specific Plan;
2. The transfer is consistent with the integrity of the subject zone category in terms of overall intensity;
3. There would be no major impacts on approved infrastructure plans, including major changes to the approved circulation plan or pedestrian network;
4. Land use compatibility and Neighborhood integrity are not compromised.

This page intentionally left blank.

# 5.1 Purpose and Applicability

## 5.1.1 Purpose

These Development Standards, along with the Design Guidelines in Section 6, are intended to implement the development of Santa Paula's East Area 1 Specific Plan ("EA1SP") in a manner that successfully creates neighborhoods with pedestrian-oriented streets, a variety of housing types and an economically vital mixed-use area, and that achieves the related goals and objectives identified in Section 2 of this Specific Plan (Form and Character).

The purpose of this section is to provide development standards for project review and approval by the Director for all buildings, structures and attendant site improvements proposed for construction within the EA1SP area. These Standards, along with the Guidelines in Section 6, are intended to complement the Santa Paula Municipal Code (SPMC).

## 5.1.2 Applicability of Development Standards and Guidelines

**A. Applicability.** These Standards apply to all proposed development, subdivisions, and land uses within the EA1SP area, except for school facilities, which are reviewed and permitted by the State of California through a special permitting and procedures process.

**B. Relationship of the EA1SP's regulations to zoning and other local ordinances.** This Specific Plan provides the zoning for the entire EA1SP area. The entire property is zoned "SP-3", and the applicable zoning regulations for East Area 1 are those set forth in this Section 5 of the Specific Plan.

C. **Standards**. The development standards (Zoning Regulations) in Sections 5-2 through 5-4 of this Specific Plan include the Regulating Plan (zoning maps), and lists of allowed land uses (Table 5-1), minimum setback standards (Table 5-2), and maximum height standards (Table 5-3) for each zone.

Section 5.5 provides standards for the number, location and configuration of required parking facilities, and Section 5.6 provides standards for the design of public and private streets. Section 5.7 provides standards for the public and private landscapes of East Area 1.

Throughout this section, the word "must" denotes a standard or requirement that has the force of zoning, while the terms "should" and "recommended" denote a guideline or recommendation.

**D. Design Guidelines.** Are provided in Section 6.

### 5.1.3 Definitions

In addition to the defined terms set forth above in this EA1SP, unless the contrary is stated or clearly appears from the context, the following definitions govern the construction of the words and phrases used in this EA1SP. Words and phrases not defined by this chapter have the meaning set forth elsewhere in the SPMC or applicable law.

**Adverse Impact:** The negative consequences of the use of a building on adjacent lots, usually as a result of noise, vibration, odor, pollution, or socioeconomic disruption.

**Applicable Law:** All federal, state and local laws including, without limitation, Ordinance No. 1255, which approved the 2008 EA1SP and the 2015 Development Agreement. Applicable Law also includes, without limitation, entitlements and agreements affecting the Specific Plan Area.

**Arcade:** A series of arches - curved or square - linked together and supported by columns on the outer side - covering the pedestrian way along a building Frontage. As distinct from a Gallery (see below) an Arcade generally supports habitable interior space at the upper floors, whereas galleries support roofs or open Porches.

**Building Type:** A structure defined by the illustrated combination of building configuration, disposition and function. These are prototypical arrangements of architectural and site design elements, illustrating ways in which the intended building scale and character may be achieved through design.

**Carriage Unit:** A Carriage unit is an auxiliary housing unit, as allowed by the Neighborhood (N) zone, located above or adjacent to the garage of the primary housing unit on the lot, with the front door and access directed towards an alley. A carriage unit constitutes a residential second unit in compliance with the Government Code Section 65852.2 and, as provided by the Government Code, is not included in the maximum density limitations established by this specific plan. Carriage units are between 375 square feet and 700 square feet in floor area, and should be provided with an off-street parking space.

**Civic Building:** A building designed for occupancy by public or quasi-public uses that provide important services to the community. Buildings may be publicly owned and operated, semipublic, or privately owned and operated.

**Development Configurations:** Building locations, sizes, and uses, including related parking and landscaping.

**Director:** The Planning Director, Community Development Director, or designee.

**Dooryard:** A yard between the street and a building, raised above the grade of the sidewalk adjacent and/or bounded by a low garden wall built on the frontage line(s).

**Educational institution:** A building or complex of buildings that accommodates a primary or secondary school, college, trade school, or similar public or private educational institution..

**Facade:** The vertical surface of a building that is set parallel to a Frontage Line and facing a street.

**Frontage Line:** The property lines of a lot fronting a street or other public way, or a park, green or paseo.

**Frontage Type:** These are prototypical arrangements of architectural and site design elements, illustrating ways in which the intended streetscape character - and appropriate degrees of privacy for adjoining buildings - may be achieved through design.

**Gallery:** A roofed promenade, one- or two-story, extending along the facade of a building and supported by columns on the outer side, generally covering the sidewalk.

**Half-Story:** A story under a gable, hip, or gambrel roof, plates of which are not more than 3 feet above the nearest floor.

**Health/Athletic Club:** A fitness center, gymnasium, health and athletic club, which may include any of the following: exercise machines, weight facilities, group exercise rooms, sauna, spa or hot tub facilities; indoor tennis, handball, racquetball, archery and shooting ranges and other indoor sports activities, indoor or outdoor pools.

**Individual Project:** A discretionary project proposed for the Specific Plan Area that substantially conforms to the EA1SP, but requires a discretionary permit such as a conditional use permit, Map Revision, or other, similar, action.

**Indoor Recreation Center:** An establishment providing indoor amusement and entertainment services for a fee or admission charge, including: bowling alleys, coin-operated amusement arcades, electronic game arcades (video games, pinball, etc.), ice skating and roller skating, pool and billiard rooms as primary uses.

Four or more electronic games or amusement devices (e.g., pool or billiard tables, pinball machines, etc.) in any establishment, or a premises where 50 percent or more of the floor area is occupied by electronic games or amusement devices, are considered a commercial recreation facility; three or fewer machines or devices are not considered a land use separate from the primary use of the site.

**Live-Work or Work-Live Unit:** An integrated dwelling unit and working space, occupied and utilized by a single household in a structure that has been designed or structurally modified to accommodate joint residential occupancy and work activity, and which includes:

1. Complete kitchen space and sanitary facilities in compliance with the SPMC; and
2. Working space reserved for and regularly used by one or more occupants of the unit.

The difference between live-work and work-live units is that the "work" component of a live-work unit is secondary to its residential use, and may include only commercial activities and pursuits that are compatible with the character of a quiet residential environment; while the work component of a work-live unit is the primary use, to which the residential component is secondary.

**Map Revision:** Any changes to Vesting Tentative Map No. 5854 or subsequent maps proposed by a Permittee in accordance with the EA1SP.

**Master Developer:** An individual or legal entity who controls or owns the Specific Plan Area; is responsible for managing the development and disposition of the property from initiation and design of the EA1SP that guides development for the entire site to final buildout; obtains financing and approvals; oversees site preparation and infrastructure development; and controls and contracts for the phased implementation by specialized builders/developers with experience required to complete the approved plan.

**Neighborhood Builder / Developer:** Someone who contracts with the Master Developer to build or develop a specific Neighborhood or portion of a Neighborhood contained in the Master Plan or Specific Plan.

**Net Floor Area:** The enclosed area of a building, excluding unglazed porches, arcades and balconies.

**Parking Determination:** The Director makes a Parking Determination to identify the number and location of required Parking Spaces in compliance with the requirements of the Development Standards. Parking Determinations are required before issuing a Live-Work License, and for projects located in the Civic District (CD) and Neighborhood (N) zones.

**Parking District:** An area where parking has rules and restrictions that are commonly managed by an entity.

**Parking Spaces:** See Section 5.5.D.

**Paseo:** A pedestrian alley. Paseos are located and designed to reduce the required walking distance within a neighborhood.

**Permittee:** An individual or legal entity who owns one or more portions of the Specific Plan Area and seeks discretionary approvals in accordance with the EA1SP.

**Personal Service:** Establishments that provide non-medical services to individuals as a primary use. Examples of these uses include: barber and beauty shops, clothing rental, dry cleaning pick-up stores with limited equipment, home electronics and small appliance repair, laundromats (self-service laundries), locksmiths, massage as permitted by the SPMC, nail salons, pet grooming with no boarding, shoe repair shops, tailors, tanning salons.

These uses may also include accessory retail sales of products related to the services provided.

**Porch:** A roofed structure, that is not enclosed, attached to the Facade of a building.

**Primary Building:** A building that accommodates the primary use of the site.

**Project Clearance:** The Director's or, if applicable, the Planning Commission's, review and verification of an Individual Project's conformance with the requirements of the EA1SP.

**Residential:** Premises used primarily for human habitation. Units cannot be less than 375 square feet in net area.

**Restaurant:** A retail business selling ready-to-eat food and/or beverages for on- or off-premise consumption. These include eating establishments where customers are served from a walk-up ordering counter for either on- or off-premise consumption ("counter service"); and establishments where customers are served food at their tables for on-premise consumption ("table service"), that may also provide food for take-out, but does not include drive-through services, which are separately defined and regulated.

**Secondary Building:** A building that accommodates the secondary use of the site subject to size requirements identified in the Neighborhood (N) zone.

**Setback:** The mandatory distance between a property line and a building or appurtenance. This area is to be left free of structures that are higher than 3 feet, except as noted in Section 5.4, Setback and Height Standards.

**Smart Growth:** A planning and development theory that promotes town-centered and pedestrian oriented development patterns as alternative to suburban "sprawl." Smart Growth principles include: range of housing choices; walkable neighborhoods; strong sense of place; predictable and fair development decisions; mix of land uses; preserved open space and natural beauty; variety of transportation choices; compact building design.

**Story:** A habitable floor level within a building, typically 8' to 12' high from floor to ceiling. Individual spaces, such as lobbies and foyers may exceed one story in height. In Shopfront spaces, the ceiling height of the first story may be as high as 16'.

**Studio - Art, Dance, Martial Arts, Music, etc:** Small scale facilities, typically accommodating no more than two groups of students at a time, in no more than two instructional spaces. Larger facilities are included under the definition of "Schools - Specialized Education and Training." Examples of these facilities include: individual and group instruction and training in the arts; production rehearsal; photography, and the processing of photographs produced only by users of the studio facilities; martial arts training studios; gymnastics instruction, and aerobics and gymnastics studios with no other fitness facilities or equipment.

Also includes production studios for individual musicians, painters, sculptors, photographers, and other artists.

**Sustainable Development:** Development that balances the fulfillment of human needs with the protection of the natural environment so that these needs can be met not only in the present, but in the indefinite future. The way communities are planned and laid out is fundamental to sustainability. Community sustainability requires a transition from poorly-managed sprawl to land use planning practices that create and maintain efficient infrastructure, ensure close-knit neighborhoods and sense of community, and preserve natural systems. Key planning principles of sustainable land use planning include: design comprehensive, mixed-use neighborhoods instead of isolated pods, subdivisions and developments; make neighborhoods as pedestrian-friendly and as bicycle friendly as possible; create mass transit systems to link neighborhoods, employment centers and other "nodes"; create communities that contain the full range of development densities and land-uses; avoid large tracts with the same density or land-use.

**Tower:** A portion of a building with the primary purpose of providing access to a view which is distant or otherwise blocked. Towers are at least one story higher than the rest of the building and are less than 600 sq.ft. in footprint. Its massing may have vertical proportions, i.e. its height to the eave may be greater than any of its horizontal exterior dimensions.

**Townhouse:** A building with two or more single-family dwellings located side by side, with common walls on the side lot lines, the facades reading in a continuous plane.

**Traditional Neighborhood Design:** A development pattern that reflects the characteristics of small, older communities of the late 19th and early 20th centuries. Traditional Neighborhood Design is characterized by neighborhoods with a discernible center located within a 5-minute walk from most residences. Each neighborhood provides a variety of dwelling types and land uses, interconnected network of narrow, walkable streets, neighborhood parks, and a distinct sense of place.

## 5.2 Regulating Plan

To implement the vision for East Area 1 as outlined in Chapter 2, the Development Standards and Design Guidelines in this EA1SP are differentiated and organized by zones. Each zone is characterized by a unique range and combination of land uses, building scales and streetscape designs, as described below and mapped on Figure 5-1, Regulating Plan.

**A. Hallock Center (HC) Zone**

Hallock Center is the walkable neighborhood center, designed to support a range of neigborhood-serving retail commercial, and housing options, as well as substantial pedestrian activity. Accordingly, design priorities include wide, shaded sidewalks, minimal driveway cuts, and well-screened off-street parking. Buildings may be up to 3-stories, should front directly onto sidewalks, with access to services and parking via alleys or shared-driveways.

**B. Neighborhood (NC) Zone**

The Neighborhood Zone accommodates a mix of single-family housing types, ranging from larger and smaller detached houses. Buildings may be up to 2.5 stories, should front on the street, and should provide at least one curbside visitor parking space per unit.

The street network should provide multiple through routes and blocks should be walkable in scale and pattern. Streets should serve as vehicular, pedestrian and bicycle circulation routes and should generally include sidewalks and parkway strips on both sides of the street. Streets abutting Santa Paula Creek, Haun Creek and on the hillside – where pedestrian volumes are expected to be lower – should provide a sidewalk on at least one side of each street. Streets should also provide pedestrian and bicycle connections to trailheads and greenways, providing residents with views of the surrounding hills, opens spaces and greenbelt.

**C. Civic District (CD) Zone**

The Civic District includes a site for school facilities and a Sports Park. The park perimeter should be naturally landscaped with large trees to spatially contain this large open space, incorporating a multi-use trail that provides safe pedestrian and bicycle connections from the surrounding neighborhoods to the school facilities, parks, and adjacent neighborhoods.

**D. Pedestrian-Priority Overlay**

This overlay is provided to enhance pedestrian, bicycle and vehicular safety along busier streets. It is recommended that vehicular access to lots along these designated frontages be provided via alleys or drives that allow vehicles to turn around on site and avoid backing into these busy streets.

**E. Agricultural Preserve (AG).**

The AG zone applies to areas intended to remain in active agricultural operation.

**F. Open Space 1 (OS-1).**

The OS-1 zone applies to areas intended to remain undeveloped and natural in character. Pedestrian, bicycle and equestrian trails are allowed.

**G. Open Space 2 (OS-2).**

The OS-2 zone applies to areas intended for passive and active recreation and accommodates a range of greenways, community parks, neighborhood parks and squares. Development is limited to trails, unlit athletic fields, playground equipment, small open structures such as picnic shelters, and structures necessary to support the specific purposes of each individual open space site.

**H. Open Space 3 (OS-3).**

The OS-3 zone applies to areas reserved for athletic facilities for joint use by the adjacent school facilities and the general public and may include lighted athletic fields and structures for indoor and outdoor athletic activities.

**Figure 5-1: Regulating Plan**

## 5.3 Land Use Regulations

### 5.3.1 Purpose

This section identifies the land use types allowed in each Zone, as defined in the Regulating Plan (Section 5.2) and specifies the type of City approval required for each allowed land use type.

### 5.3.2 Allowed Land Uses and Planning Permit Requirements

**A. Allowed land uses.** A parcel or building within the EA1 Area area should be occupied only by the land uses listed in Table 5-1 and shown on Figure 5-1 (Regulating Plan). Definitions of listed use types are in the SPMC, Chapter 16.05, except where a specific type is defined by Section 5.1.3 (Definitions) of these Development Standards and Guidelines. If a use type is not defined in this section, or in the SPMC, the Director can determine the correct definition, giving deference to common usage.

**1. Establishment of an allowed use.**

a. Any one or more land uses identified in Table 5-1 as being allowed within the Neighborhood (N) zone may be established on any parcel within that Area, subject to the planning permit requirement listed in the table, and in compliance with all applicable requirements of these Development Standards and Guidelines.

b. If a parcel is proposed for development with two or more of the land uses listed in the tables at the same time, the overall project is subject to the highest permit level required by the tables for any individual use. For example, a new mixed-use building proposed with a permitted use on the second floor and a use requiring Conditional Use Permit approval on the ground floor would require Conditional Use Permit approval for the entire project.

**2. Use not listed.**

a. A land use not listed in Table 5-1, that is determined by the Director to not be included in Section 5.1.3 (Definitions) under the definition of a listed land use, is prohibited within the Specific Plan Area, except as otherwise provided in Subsection A.3 below.

b. A land use that is listed in the table, but not within the Neighborhood (N) zone is prohibited within that Area, except as otherwise provided in Subsection A.3.

3. **Similar and compatible use may be allowed.** The Director may determine that a proposed use not listed in Table 5-1 is allowable as follows:
   a. Required findings. A determination that a proposed use is similar to, and compatible with a listed use and consequently may be allowed, requires that the Director first make all of the following findings:
      1. The characteristics of, and activities associated with the use are similar to one or more of the listed uses, and will not produce greater impacts than the uses listed for the applicable zone;
      2. The use is consistent with the purposes of the applicable zone;
      3. The use is consistent with the General Plan and the EA1SP;
      4. The use will be compatible with the other uses allowed in the zone; and
      5. The use is not listed as allowed in another zone.
   b. A determination of "similar use" and the findings supporting the determination may be in writing.
4. **Permit requirements and development guidelines.** When the Director determines that a proposed, but unlisted, use is similar to a listed use, the proposed use will be treated in the same manner as the listed use in determining where it is allowed, what permits are required, and what other guidelines and requirements of these Development Standards and Guidelines apply.

**B. Permit requirements.** Table 5-1 identifies land uses as described below:

1. Permitted subject to compliance with all applicable provisions of these Development Standards and Guidelines. These are shown as "P" land uses in the table;
2. Allowed subject to the approval of a Conditional Use Permit, and shown as "CUP" land uses in the table;
3. Prohibited in particular Neighborhood zones, and shown as an "X" in the table.

### 5.3.3 Additional City Approval Requirements

**A. Additional City approval requirements.** Any land use identified as allowed by Table 5-1 may require other City permits, licenses, and approvals, including without limitations a building permit.

**B. Initiation of non-residential use.** The initiation of a non-residential use in a Live-Work or Work-Live unit requires that a business license and a Zoning Clearance be obtained from the City. Before issuing a Zoning Clearance, the Planning Director or designee may determine: (i) that the nature of the business, the goods being produced, and services being rendered on the premises will not create an adverse impact on adjoining properties; and (ii) that the number and location of required parking spaces complies with the requirements of these Development Standards and Guidelines.

**C. Landscape Master Plan.** The landscape design of the public realm and within the Open Space 2 (OS-2) and Open Space 3 (OS-3) zones shall be determined through a Landscape Master Plan and the Final Map process.

### Table 5-1: Allowed Land Uses and Permit Requirements

| Land Use Type [1] | Permit Required by Zone | | | | | | | Reference to SPMC and additional EA1SP regulations |
|---|---|---|---|---|---|---|---|---|
| | CD | HC | N | AG | OS-1 | OS-2 | OS-3 | |
| **AGRICULTURAL USE TYPES** | | | | | | | | **Ch. 16.15, Table 15-1** |
| Fruit/Agriculture Stand(s) | X | P [4] | X | X | X | X | X | |
| Agricultural equipment and supplies, sales, repair | X | X | X | X | X | X | X | |
| **AUTOMOTIVE / VEHICLE-RELATED USE TYPES** | | | | | | | | **Ch. 16.15, Table 15-1** |
| Parts, sales, without installation | X | X | X | X | X | X | X | |
| Parts, sales with installation | X | X | X | X | X | X | X | |
| Repair (minor) - lube/tune, window tinting | X | X | X | X | X | X | X | |
| Vehicle leasing/rental | X | X | X | X | X | X | X | |
| Vehicle storage, including RV's and Boats (Outdoor only) | | | | | | X | | |
| **BOARDING AND LODGING USE TYPES** | | | | | | | | **Ch. 16.15, Table 15-1** |
| Bed and Breakfast Inn | X | P | X | X | X | X | X | |
| Congregate Care Housing Facility | X | P | X | X | X | X | X | |
| Hotel | X | P | X | X | X | X | X | |
| Conference Facility | CUP | X | X | X | X | X | X | |
| **EATING / DRINKING USE TYPES** | | | | | | | | |
| Cafe, Delicatessen (no alcoholic beverage sales) | X | P [2] | X | X | X | X | X | |
| Restaurant (without drive-through) | X | P [2] | X | X | X | X | X | |
| Restaurant (can include dining on public right-of-way) | X | CUP [2] | X | X | X | X | X | |
| **ENTERTAINMENT / RECREATION USE TYPES** | | | | | | | | **Ch. 16.15, Table 15-1** |
| Auditorium, convention hall, theater | CUP | X | X | X | X | X | X | |
| Batting cage(s), driving range, similar outdoor facility | CUP | X | X | X | X | X | X | |
| Billiard/Pool Hall | X | P | X | X | X | X | X | |
| Bowling Alley | X | X | X | X | X | X | X | |
| Cultural Center | CUP | X | X | X | X | X | X | |
| Health/Athletic Club | X | P | X | X | X | X | X | |
| Indoor Recreation Center | X | P | X | X | X | X | X | |
| Library or Museum | CUP | CUP | X | X | X | X | X | |
| Massage Establishment | X | CUP | X | X | X | X | X | Ch. 119 of Title XI |
| Skate Park or Rink | CUP | X | X | X | X | X | X | |
| Slot Car Racing | X | X | X | X | X | X | X | |
| Theater, Cinema (movie) | X | CUP | X | X | X | X | X | |
| Theater, Stage | CUP | CUP | X | X | X | X | X | |

**Key to Zone Symbols**

| | |
|---|---|
| CD | Civic District |
| HC | Hallock Center |
| N | Neighborhood |
| AG | Agriculture Preserve |
| OS-1 | Open Space 1 |
| OS-2 | Open Space 2 |
| OS-3 | Open Space 3 |

**Key to Permit Types**

| | |
|---|---|
| P | Permitted Use |
| CUP | Conditional Use Permit required |
| X | Use not allowed |

**Notes:**

1. Definitions of listed use types are in the SPMC, Chapter 16.05, except where a specific type is defined by Section 5.1.3 (Definitions) of these Development Guidelines. If a use type is not defined in this section, or in the SPMC, the Director can determine the correct definition, giving deference to common usage.
2. Limited to lots fronting Hallock Drive.
3. Not allowed on ground floor within 50 ft. of street corner on Hallock Main Street.
4. Permitted in East Center Overlay (See Figure 5-1)

### Table 5-1: Allowed Land Uses and Permit Requirements (continued)

| Land Use Type [1] | Permit Required by Zone | | | | | | | Reference to SPMC and additional EA1SP regulations |
|---|---|---|---|---|---|---|---|---|
| | CD | HC | N | AG | OS-1 | OS-2 | OS-3 | |
| **MEDICAL USE TYPES** | | | | | | | | **Ch. 16.15, Table 15-1** |
| Blood bank | X | CUP | X | X | X | X | X | |
| Day Care Home - large family - adult or child | X | CUP [3] | X | X | X | X | X | Ch. 16.60 |
| Day Care Home - small family - adult or child | X | CUP [3] | X | X | X | X | X | |
| Child Day Care Center | X | CUP [3] | X | X | X | X | X | |
| Clinic - outpatient | X | CUP [3] | X | X | X | X | X | |
| Community Care Facility | CUP | CUP [3] | X | X | X | X | X | Ch. 16.64 |
| Convalescent Home or Hospital | CUP | CUP [3] | X | X | X | X | X | |
| Medical Laboratory | X | CUP | X | X | X | X | X | |
| Medical Office | X | P [3] | X | X | X | X | X | |
| Urgent Care Facility | X | P [3] | X | X | X | X | X | |
| **PERSONAL SERVICE / FINANCIAL USE TYPES** | | | | | | | | **Ch. 16.15, Table 15-1** |
| ATM, Bank, Savings and Loan, Credit Union | X | P [2] | X | X | X | X | X | |
| Barber/Beauty/Nail | X | P | X | X | X | X | X | |
| Dance/Music School/Martial Arts studio | CUP | P [2] | X | X | X | X | X | |
| Dry Cleaner (without on-site cleaning facility) | X | P [2] | X | X | X | X | X | |
| Dry Cleaner (with on-site cleaning facility) | X | P [2] | X | X | X | X | X | |
| Laundromat | X | CUP | X | X | X | X | X | |
| Repair: leather, luggage, shoes | X | P | X | X | X | X | X | |
| **PROFESSIONAL AND ADMINISTRATIVE USE TYPES** | | | | | | | | **Ch. 16.15, Table 15-1** |
| Medical, Dental, Optometry, Chiropractic | X | P [3] | X | X | X | X | X | |
| Business, Professional | X | P [3] | X | X | X | X | X | |
| Veterinary | X | CUP | X | X | X | X | X | |
| **RESIDENTIAL USE TYPES** | | | | | | | | **Ch. 16.13, Table 13-1** |
| Academic Housing | X | P | X | X | X | X | X | |
| Dwelling - Multiple Family | P | P | P | X | X | X | X | |
| Dwelling - Live/Work | X | P | X | X | X | X | X | |
| Dwelling - Single Family | P | P | P | X | X | X | X | |
| Home Occupation | X | P | P | X | X | X | X | Ch. 16.230 |
| Second Unit - Carriage Unit | X | X | P | X | X | X | X | Ch. 16.13, Div. 4 |
| Senior Housing | CUP | P | P | X | X | X | X | In any dwelling |

**Key to Zone Symbols**

| | |
|---|---|
| CD | Civic District |
| HC | Hallock Center |
| N | Neighborhood |
| AG | Agriculture Preserve |
| OS-1 | Open Space 1 |
| OS-2 | Open Space 2 |
| OS-3 | Open Space 3 |

**Key to Permit Types**

| | |
|---|---|
| P | Permitted Use |
| CUP | Conditional Use Permit required |
| X | Use not allowed |

**Notes:**

1. Definitions of listed use types are in the SPMC, Chapter 16.05, except where a specific type is defined by Section 5.1.3 (Definitions) of these Development Guidelines. If a use type is not defined in this section, or in the SPMC, the Director can determine the correct definition, giving deference to common usage.
2. Limited to lots fronting Hallock Drive.
3. Not allowed on ground floor within 50 ft. of street corner on Hallock Main Street.
4. Permitted in East Center Overlay (See Figure 5-1)

### Table 5-1: Allowed Land Uses and Permit Requirements (continued)

| Land Use Type [1] | Permit Required by Zone | | | | | | | Reference to SPMC and additional EA1SP regulations |
|---|---|---|---|---|---|---|---|---|
| | CD | HC | N | AG | OS-1 | OS-2 | OS-3 | |
| **RETAIL / COMMERCIAL USE TYPES** | | | | | | | | **Ch. 16.15, Table 15-1** |
| Antique sales | X | P | X | X | X | X | X | |
| Art gallery, studio | X | P | X | X | X | X | X | |
| Auction (within a building, excluding livestock) | X | CUP | X | X | X | X | X | |
| Automotive | X | CUP [4] | X | X | X | X | X | |
| Bakery (can include on-premises baking) | X | P | X | X | X | X | X | |
| Books | X | P | X | X | X | X | X | |
| Clothing / Apparel | X | P | X | X | X | X | X | |
| Candy | X | P | X | X | X | X | X | |
| Convenience / mini-market (up to 5,000 sq ft floor area) | X | CUP [2,4] | X | X | X | X | X | |
| Fabric, crafts | X | P | X | X | X | X | X | |
| Flowers | X | P | X | X | X | X | X | |
| Furniture, furnishings, appliances | X | P | X | X | X | X | X | |
| Groceries / market (up to 35,000 sq ft floor area) | X | CUP | X | X | X | X | X | |
| Hardware | X | P | X | X | X | X | X | |
| Home Improvement, lumber, garden | X | P | X | X | X | X | X | |
| Jewelry | X | P | X | X | X | X | X | |
| Music, instruments | X | P | X | X | X | X | X | |
| Nursery/Garden supply | X | P | X | X | X | X | X | |
| Office supplies, equipment | X | P | X | X | X | X | X | |
| Pets | X | P | X | X | X | X | X | |
| Pharmacy | X | P | X | X | X | X | X | |
| Plumbing supplies, equipment | X | P | X | X | X | X | X | |
| Warehouse retail | X | P | X | X | X | X | X | |
| **SERVICE COMMERCIAL USE TYPES** | | | | | | | | **Ch. 16.15, Table 15-1** |
| Catering | X | P | X | X | X | X | X | |
| Cleaning / Janitorial | X | P | X | X | X | X | X | |
| Copy center / Postal center | X | P | X | X | X | X | X | |
| Equipment rental, sales, service | X | CUP | X | X | X | X | X | |
| Interior Design | X | P | X | X | X | X | X | |
| Laboratory (film, medical, dental) | X | P | X | X | X | X | X | |
| Photography shop/studio, film processing | X | P | X | X | X | X | X | |
| Painting, publishing | X | P | X | X | X | X | X | |
| Travel agency | X | P | X | X | X | X | X | |

**Key to Zone Symbols**

| | |
|---|---|
| CD | Civic District |
| HC | Hallock Center |
| N | Neighborhood |
| AG | Agriculture Preserve |
| OS-1 | Open Space 1 |
| OS-2 | Open Space 2 |
| OS-3 | Open Space 3 |

**Key to Permit Types**

| | |
|---|---|
| P | Permitted Use |
| CUP | Conditional Use Permit required |
| X | Use not allowed |

**Notes:**

1. Definitions of listed use types are in the SPMC, Chapter 16.05, except where a specific type is defined by Section 5.1.3 (Definitions) of these Development Guidelines. If a use type is not defined in this section, or in the SPMC, the Director can determine the correct definition, giving deference to common usage.
2. Limited to lots fronting Hallock Drive.
3. Not allowed on ground floor within 50 ft. of street corner on Hallock Main Street.
4. Permitted in East Center Overlay (See Figure 5-1)

### Table 5-1: Allowed Land Uses and Permit Requirements (continued)

| Land Use Type [1] | Permit Required by Zone | | | | | | | Reference to SPMC and additional EA1SP regulations |
|---|---|---|---|---|---|---|---|---|
| | CD | HC | N | AG | OS-1 | OS-2 | OS-3 | |
| **INDUSTRIAL USE TYPES** | | | | | | | | **Table 21-1** |
| Alcohol and alcoholic beverage manufacturing | X | CUP | X | X | X | X | X | |
| Automotive repair/tune-up shop | X | X | X | X | X | X | X | |
| Assembly (small scale - electronics, small appliances) | X | P | X | X | X | X | X | |
| Day Care center - employer-sponsored child | X | P | X | X | X | X | X | Ch. 16.60 |
| Distribution (low intensity, local distribution) | X | CUP [4] | X | X | X | X | X | |
| Farm vehicle sales, storage, repair and auction | X | X | X | X | X | X | X | |
| Food Processing | X | CUP [4] | X | X | X | X | X | |
| Manufacturing (small scale, electronics, small appliances) | X | CUP [4] | X | X | X | X | X | |
| Motion Picture Studio | X | CUP | X | X | X | X | X | |
| Office as accessory to primary industrial use | X | P | X | X | X | X | X | |
| Telecommunications Facilities | X | CUP | X | X | X | X | X | Ch. 16.50 |
| Trade School | X | CUP | X | X | X | X | X | |
| Wholesaling | X | CUP [4] | X | X | X | X | X | |
| **OTHER USE TYPES** | | | | | | | | |
| Antenna, satellite or dish | X | CUP | X | X | X | X | X | Ch. 16.05.020 |
| Antenna, wireless communications | X | CUP [3] | X | X | X | X | X | **Ch. 16.15, Table 15-1** |
| Assembly hall | CUP | X | X | X | X | X | X | Ch. 16.62 |
| Civic building (community center, fire station) | CUP | CUP | CUP | X | X | CUP | CUP | Ch. 16.23 |
| Club, lodge, meeting hall | CUP | X | X | X | X | X | X | |
| Educational institution | P | X | X | X | X | X | X | |
| News rack | CUP | CUP | X | X | X | X | X | Ch. 16.68 |
| Trade / Technical School | CUP | CUP | X | X | X | X | X | |

**Key to Zone Symbols**

| | |
|---|---|
| CD | Civic District |
| HC | Hallock Center |
| N | Neighborhood |
| AG | Agriculture Preserve |
| OS-1 | Open Space 1 |
| OS-2 | Open Space 2 |
| OS-3 | Open Space 3 |

**Key to Permit Types**

| | |
|---|---|
| P | Permitted Use |
| CUP | Conditional Use Permit required |
| X | Use not allowed |

**Notes:**

1. Definitions of listed use types are in the SPMC, Chapter 16.05, except where a specific type is defined by Section 5.1.3 (Definitions) of these Development Guidelines. If a use type is not defined in this section, or in the SPMC, the Director can determine the correct definition, giving deference to common usage.
2. Limited to lots fronting Hallock Drive.
3. Not allowed on ground floor within 50 ft. of street corner on Hallock Main Street.
4. Permitted in East Center Overlay (See Figure 5-1)

This page intentionally left blank.

## 5.4 Building Setback and Height Standards

### 5.4.1 Purpose

This section identifies building setback and height standards that regulate how individual buildings shape the public realm. The standards vary according to the Neighborhood (N) zone as shown on the Regulating Plan.

Table 5-2 provides the minimum setbacks for primary buildings. For the Hallock Center (HC) zone, the primary street setback is regulated according to use (commercial and residential).

Table 5-3 provides building heights to top of roof/parapet and, for the N zone, to the bottom of the eave.

.

**Table 5-2: Minimum Building Setbacks [1, 2]**

| Building Type | East Area 1 Zones | | | |
|---|---|---|---|---|
| | CD | HC | | N |
| | | Commercial | Residential | |
| Primary Street Setback | 10 ft.; 30 ft. max. | 0-10 ft. | 10 ft. | 10 ft. |
| Side Street Setback | 10 ft. | 0 ft. | 10 ft. | 10 ft. |
| Side Yard Setback | 10 ft.[3] | 0 ft. | 5 ft. | 5 ft. |
| Rear Yard Setback | 10 ft.[3] | 5 ft. | 10 ft. w/o alley<br>3 ft. w/ alley | 10 ft. w/o alley<br>3 ft. w/ alley |

1 All development in the Specific Plan Area, including residences and private residential yards, school facilities, and designated recreational facilities, must be setback a minimum of 100 feet from 100-110kV lines and 150 feet from 220-230 kV lines.

2 No more than 35% of the residential units can be built at the minimum primary street setback criteria.

3 Residential development within CD Zone subject setback requirements similar to HC and N zones.

**Table 5-3: Maximum Building Heights**

| Building Type | East Area 1 Zones | | |
|---|---|---|---|
| | CD | HC | N |
| Max. Height to Top of Roof/Parapet | 3 stories / 50 ft. | 3 stories / 40 ft. | 2.5 stories / 30 ft. |
| Max. Height to Bottom of Eave | | | 22 - 28 ft. |

## 5.5 Parking and Services Standards

**A. Parking location and access.** Vehicle parking in the East Area 1 will be provided on streets, in public parking lots, and on private lots. Parking for residents and for employees of businesses will be provided off-street, at the rear of the lot, and generally accessed by alleys. Parking for guests of residents will be provided on the streets abutting and nearby the lot. Parking for greens and parks will be provided on the abutting streets, with additional parking for events accommodated on surrounding streets and facilities as specified in Section 5.5.1 (Parking Strategies). Parking for customers of businesses will be provided on the streets abutting and nearby the business, to the extent possible, with supplemental off-street parking provided in parking lots or parking structures behind the buildings and accessed by alleys as described below. Parking in alleys is prohibited.

B. Off-street parking requirements. Individual Projects must provide and/or demonstrate access to parking spaces at the following minimum recommended ratios, to be approved at Project Clearance by the Director:.

1. **Single dwellings, townhouses, live-work and work-live units.** 2 parking spaces per house, townhouse, live-work or work-live units; at least one space may be enclosed. Each carriage unit, when provided, may be provided with one off-street parking space, which may be enclosed, covered, or open, in addition to those required for the principal dwelling.

2. Multi-dwelling buildings.

   a. 1 parking space per apartment or condominium for efficiency and 1-bedroom units in a multi-family building, which may be enclosed, covered or open. This requirement also applies to carriage units of up to one bedroom located behind single-family residences.

   b. 1.5 parking spaces per apartment or condominium for 2-bedroom units in a multi-family building, which may be enclosed, covered or open. This requirement also applies to carriage units of up to two bedrooms located behind single-family residences.

   c. 2 parking spaces per apartment or condominium for units of 3 or more bedrooms in a multi-family building, which may be enclosed, covered or open.

   d. Provide visitor parking per SPMC parking requirements. Curbside parking along the front of the lot may count toward that requirement.

3. **Office.** 1 parking space per 300 s.f. of office space provided in shared parking facilities consisting of a combination of on-street spaces and off-street spaces (surface lots or structures).

4. Retail. 1 parking space per 300 s.f. of retail space provided in shared parking facilities consisting of a combination of on-street spaces and off-street spaces (surface lots or structures).

5. Restaurants. Sit-down establishments. 1 parking space per 80 s.f. of customer service area and 1 parking space per every 250 s.f. of food preparation area. Shared parking agreements are encouraged for restaurants of 1,000 s.f. or more.

6. Entertainment. The Director can make a Parking Determination identifying the number and location of required parking spaces in compliance with the requirements of these Development Guidelines.

7. Civic/Institutional. The Director can make a Parking Determination identifying the number and location of required parking spaces in compliance with the requirements of these Development Guidelines.

8. Alternative Requirements. The number of required parking spaces may be reduced if the Director finds that such reduction is justified based on substantial evidence including, without limitation (a) a Parking Demand Analysis demonstrating that parking required for certain uses or combination of uses is less than the number of parking spaces which would otherwise be required for such uses; and/or (b) measures such as Transportation Demand Management programs, implemented individually or in conjunction with owners and/or tenants of other projects; and/or (c)

other similar measures.

9. **Parking Demand Analysis.** The Director and Public Works Director must confirm the number of parking spaces will be adequate for each Individual Project based on the above parking ratio requirements. Permittees with land uses not identified above and/or submitted with the request for Alternative Requirements identified above must submit a parking demand memorandum. The parking demand memorandum will be evaluated based upon the following:
   - The Director and Public Works Director may use reasonable methods to determine the appropriate number of parking spaces for Individual Projects which include use of recognized data sources such as the Institute of Transportation Engineers' (ITE) Parking Generation or Urban Land Institute's (ULI) Shared Parking.
   - The Director's determination must reflect the anticipated effect of the proximity of the Individual Project to mass transit facilities, the effect of interaction of on-site mixed-use development, and implementation of other transportation demand management measures.

C. **Services and utilities.** All utility entrances and meters, and all trash and recycling receptacles, cannot be located closer to the front of the lot than parking is permitted. Wall-mounted devices may be screened from public views and/ or integrated into the architecture of the building, as approved through the Master Developer Design Review process (see Section 4.9.4). Ground mounted devices may be screened with landscaping.

D. Parking spaces. Parking Spaces may be a minimum of 9 feet x 19 feet, except that in off-street parking lots of more than 10 spaces, up to 20 percent of the spaces may be a minimum of 8 feet x 16 feet. The parking requirement may be accommodated on the lot and on the street on the corresponding frontage, or on another site by way of a shared parking proposal approved by the Director. Pairs of on-site parking spaces for use by employees of a single business, or for use by residents of a single dwelling unit, may be provided in tandem configuration (one behind the other) when approved by the Director.

*Off-street surface lot or parking garage*

*On-street parallel parking*

### 5.5.1 Parking Strategies

Fundamental to the successful development and operation of the various neighborhoods and districts is the utilization of a parking strategy distinct from current, conventional practice. This plan identifies the approach for the Hallock Center Area and the Civic District, as well as one for the residential neighborhoods as described below:

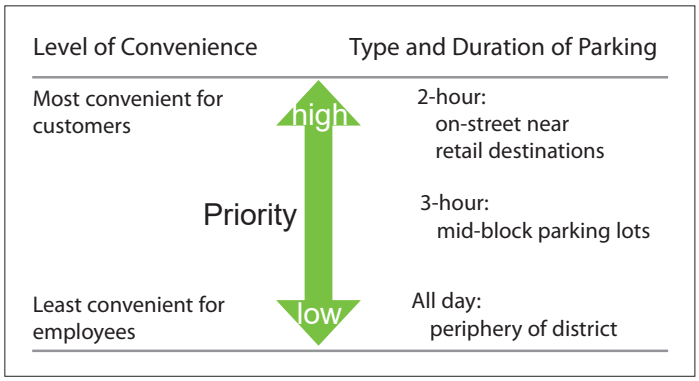
**A. Residential Development.** All parking for dwellings is provided on-site as identified in the Design Guidelines (Section 6.1). This includes the acknowledgement that on-street parking suffices for guest parking along with the need to minimize curb cuts to maximize on-street spaces;

B. **Non-Residential Development.** All parking for commercial or civic uses is to be strategically dispersed in a way that maximizes its use, throughout the day and evening, allowing it to be shared by a variety of businesses and uses. Through a combination of public off-street and on-street parking, the district-wide parking needs are satisfied.

This approach to non-residential parking consists of the following:

1. **Park-Once Program.** The parking needs of uses in the Hallock Center (HC) and Civic District (CD) Areas may be addressed through a park-once strategy whereby non-residential parking is shared on off-street surface lots or garages and on-street parking.

**Figure 5-2: Parking Convenience and Duration**



*On-street diagonal parking*

*Example of typical loading and delivery practices for non-residential uses similar in scale and intensity to those anticipated in the EA1 area.*

# 5.6 Thoroughfare Design Standards

## 5.6.1 Purpose

This section provides the standards for the design of main streets and avenues in East Area 1. Each street type provides requirements for both the traveled way (parking lanes, travel lanes, medians) and the pedestrian way (sidewalks, trails, curbside landscaping). All streets and avenues are designed to foster an attractive and comfortable pedestrian environment and are designed to strengthen the character of their context.

Figure 5-3 provides an overview of all allowed thoroughfare types and their locations within the Specific plan Area. Each type is described in detail on the following pages.

## 5.6.2 Approach

The approach to thoroughfares and thoroughfare design is based on the fundamental practice of using an interconnected and varied pattern of context-sensitive thoroughfares to serve a variety of situations based on the urban design and programmatic objectives for the plan area. The plan-area's circulation system consists of a hierarchical deployment of particular thoroughfare types for specific physical applications. Across the plan area, these types range from plan-wide connectors to very short streets defining a public space to pedestrian passages and alleyways. Such a wide range of types serves to both organize and define specific contexts, generating a system that accommodates vehicular traffic. The following characteristics are associated with this approach:

- Mixed land uses in close proximity to one another and relatively compact development.
- A highly-connected multi-modal circulation network. Building entries front directly on to thoroughfares without parking between entries and the public right-of-way.
- Building, landscape and thoroughfare design that is pedestrian-scale, providing architectural and urban design detail with size and design appreciated by persons who are traveling slowly and observing from the street level.
- Thoroughfares and other public spaces that contribute to 'place-making' – the creation of unique locations that are compact, mixed-use and pedestrian-oriented with a strong civic character and lasting economic value.

Further, the following policies specifically inform the design, execution and maintenance of thoroughfares in the plan area:

- Limited lane widths to appropriately calm traffic.
- Two-way traffic and on-street parking to maximize frontage and mobility options.
- Tighter curb radii to calm traffic and thus improve pedestrian safety and walkability.
- Ample sidewalks and generous streetscapes to maximize appeal and image.
- Compatible lighting that is responsive to its context while providing safety and appeal.

### 5.6.3 Thoroughfare Types

Based on the above, the plan area uses thoroughfare types in several categories to create the palette of blocks that comprise the proposed development. In support of EA1SP goals, the thoroughfare types are identified at a general level as to their overall category. Each category receives the appropriate number of thoroughfare types to address the needs of the plan as to specific purpose and function. To further illustrate the depth and versatility of the proposed thoroughfare network, each of the 5 categories and their corresponding thoroughfare types are summarized in Table 5-4. Figure 5-3 identifies the locations of the thoroughfare categories.

**Table 5-4: Thoroughfare Categories and Types**

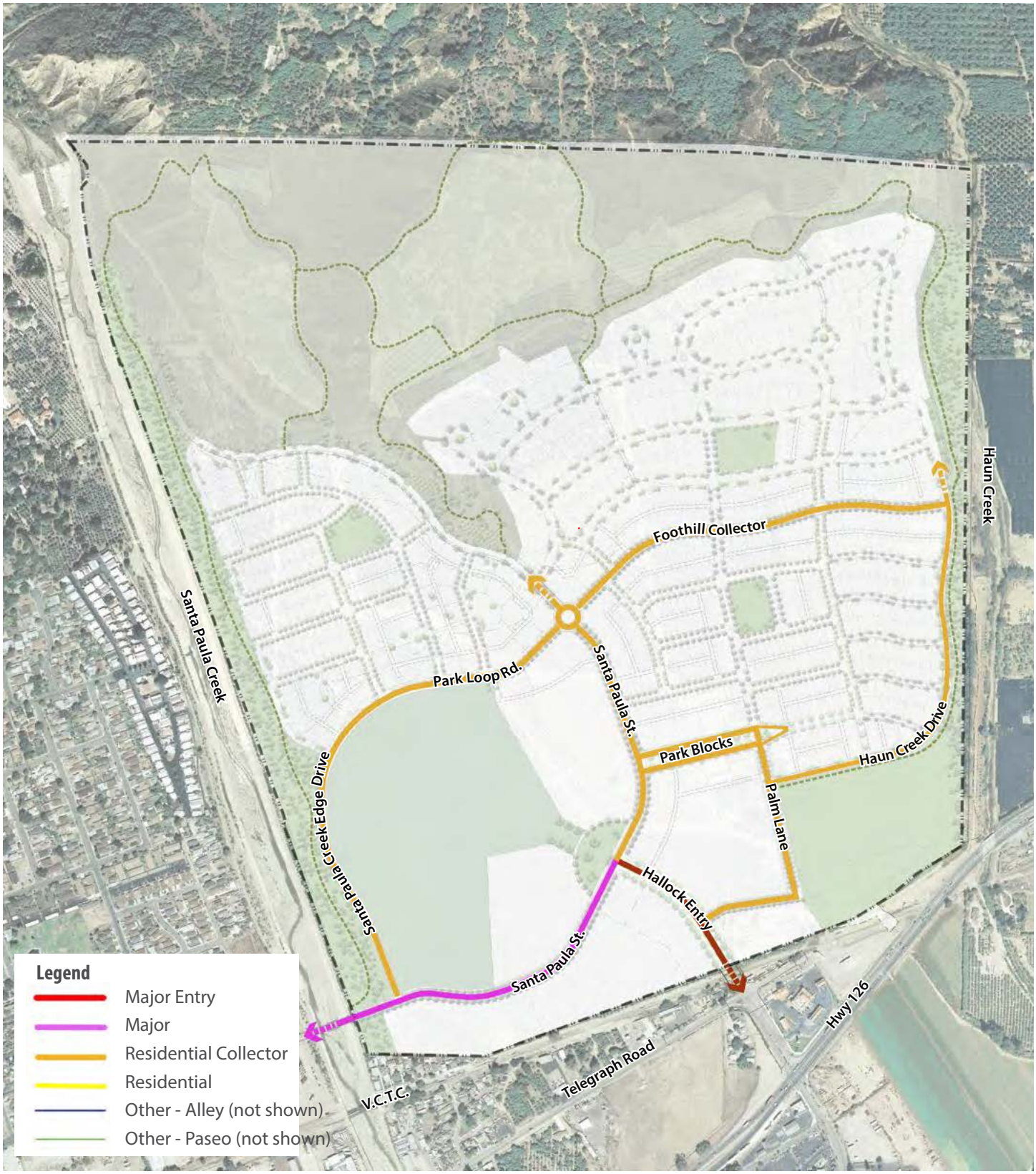
| Classification | Thoroughfare Type |
|---|---|
| Major Entry | Hallock Commercial Street |
| Major | Santa Paula Street |
| | Santa Paula Creek Bridge |
| Residential Collector | Santa Paula Creek / Haun Creek Edge Drives |
| | Central Park |
| | Park Blocks |
| Residential | Palm Avenue |
| | Neighborhood Streets |
| | Neighborhood Edge Drive |
| Other | Alley |
| | Paseo |
| | Trail I |
| | Trail II |

*Source: Jensen Design & Survey, Inc., 2022*

### 5.6.4 New Street Names

New streets must be named in accordance with City of Santa Paula Resolution No. 6276.

**Figure 5-3: Thoroughfare Type Diagram**

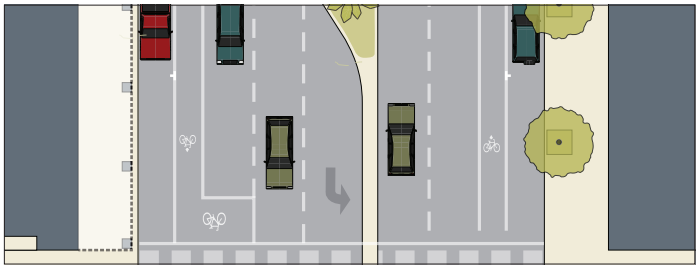


### 5.6.5. Hallock Entry

| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Major Entry | -- |
| Right-Of-Way (ROW) Width | -- | 120 feet |
| Curb-to-Curb Pavement Width | across entire street, incl. median | 92 feet |
| | to median | 38 feet |
| Desired Operating Speed | -- | 25 mph |
| Corner Curb Radius | -- | 13 feet |
| Travel Lanes | four, 2-each direction | 12 feet |
| Medians | planted median & left-turn lane | 16 feet |
| Parking Lanes | parallel, both sides, marked | 8 feet |
| Addtional Transportation Provision | bicycle lanes, both sides | 6 feet |
| Walkways | sidewalk, both sides | 6 feet |
| Curbside Landscaping | parkway tree wells | 8 feet |
| Typical Street Tree Spacing | see section 5.7 | 30' on center |
| Typical Street Lighting | single-head column (see section 5.6.16 ) | 60' on center both side, aligned |

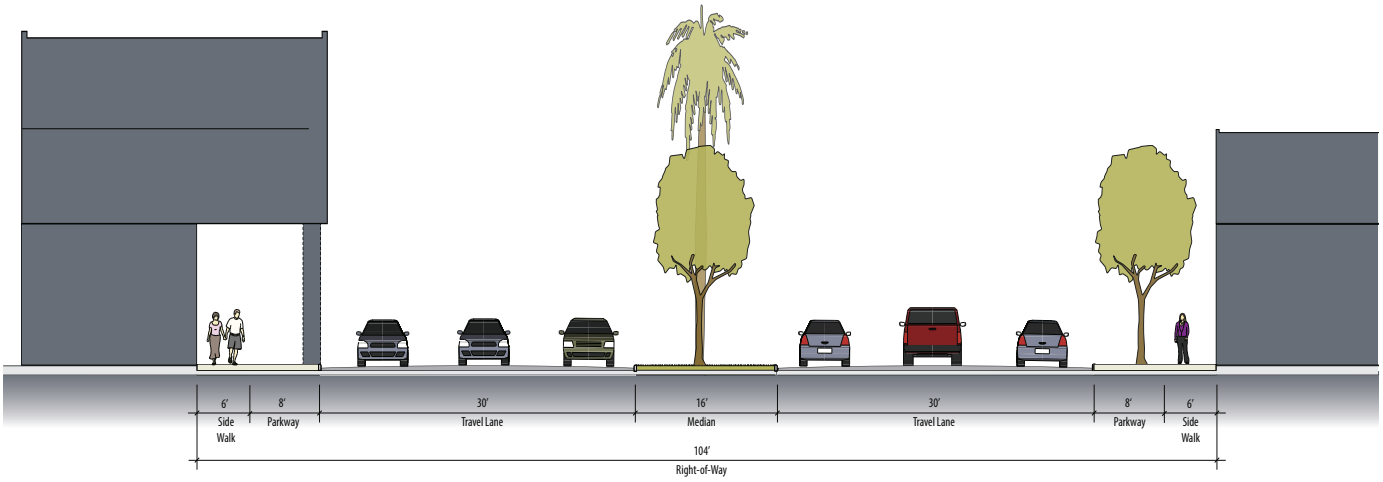
The Hallock Entry serves as the Gateway into East Area 1, as well as a direct link to the Santa Paula Sports Park and the mixed-use Hallock Center. Its character is heavily pedestrian-oriented and has buildings with shopfronts built to the street.

*Artist's rendition of Hallock Entry.*



*Typical plan view of Hallock Entry*

*Actual cross-section*

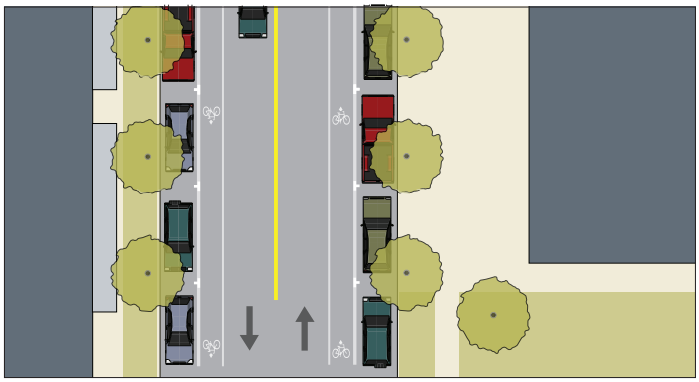


## 5.6.6. Santa Paula Street

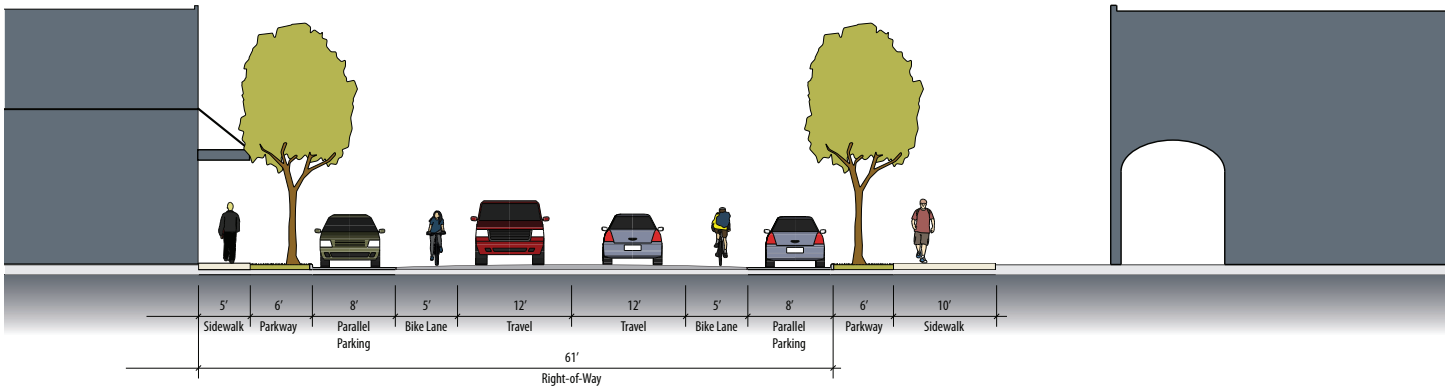
| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Major | -- |
| Right-Of-Way (ROW) Width | -- | 61 feet |
| Curb-to-Curb Pavement Width | | 50 feet |
| Desired Operating Speed | -- | 30 mph |
| Corner Curb Radius | -- | 13 feet |
| Travel Lanes | two, 2-way | 12 feet |
| Medians | -- | -- |
| Parking Lanes | parallel, both sides | 8 feet |
| Additional Transportation Provision | bicycle lanes, both sides | 5 feet |
| Walkways | sidewalk, south side | 5 feet |
| | multi-use trail, park/school side | 10 feet |
| Curbside Landscaping | continuous planting strip | 6 feet |
| Typical Street Tree Spacing | see section 5.7 | 30' on center |
| Typical Street Lighting | single-head column (see section 5.6.16 ) | 120' on center, staggered |

Santa Paula Street is the major east/west thoroughfare in the southern portion of East Area 1, serves as a gateway from downtown across a new bridge over Santa Paula Creek and defines the southern edge of the Civic Park. Parallel parking on both sides, and sidewalks separated from the curb with continuous landscaping including trees.

*Artist's rendition of Santa Paula Street.*



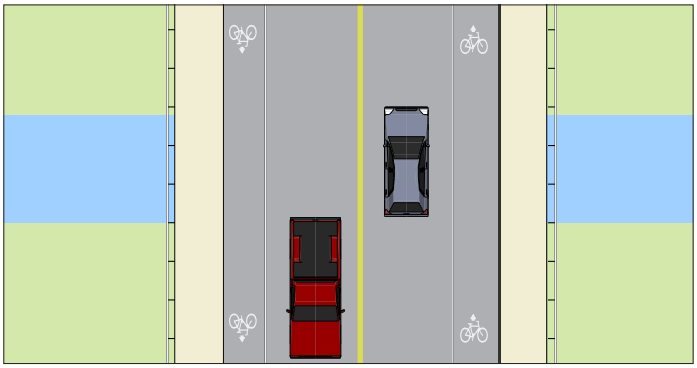
*Typical plan view of Santa Paula Street.*



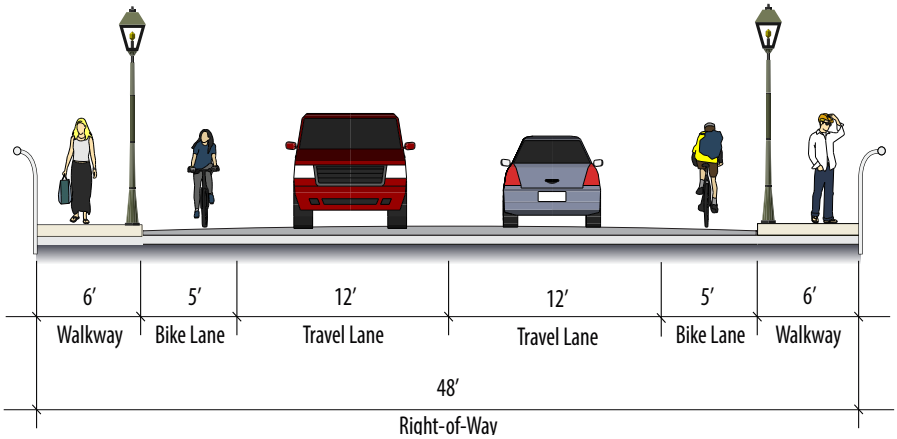
## 5.6.7. Santa Paula Creek Bridge

| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Major | -- |
| Right-Of-Way (ROW) Width | -- | 48 feet |
| Curb-to-Curb Pavement Width | -- | 36 feet |
| Desired Operating Speed | -- | 25 mph |
| Corner Curb Radius | -- | -- |
| Travel Lanes | Two, 2-way | 12 feet |
| Medians | Center Turn Lane | -- |
| Parking Lanes | No | -- |
| Additional Transportation Provision | bicycle lanes, both sides | 5 feet |
| Walkways | sidewalk on both sides | 6 feet |
| Curbside Landscaping | -- | -- |
| Typical Street Lighting | single-head column (see section 5.6.16 ) | 60' on center, aligned |

Santa Paula Creek Bridge serves as the eastern Gateway from downtown and consists of one vehicular travel lane and one bike lane in each direction. Curb-tight sidewalks provide pedestrian access from existing neighborhoods to the Civic and Hallock Center Districts, as well as the Neighborhood. 5' bike lanes will be provided on both sides of the bridge to tie into East Area 1's trail system and provide for a safe crossing of Santa Paula Creek.



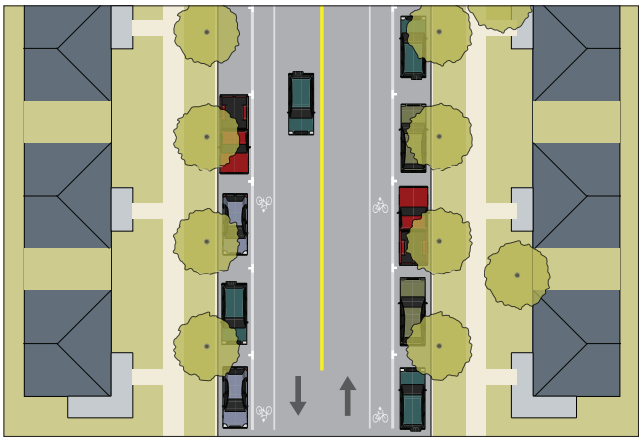
*Typical plan view of Santa Paula Creek Bridge.*



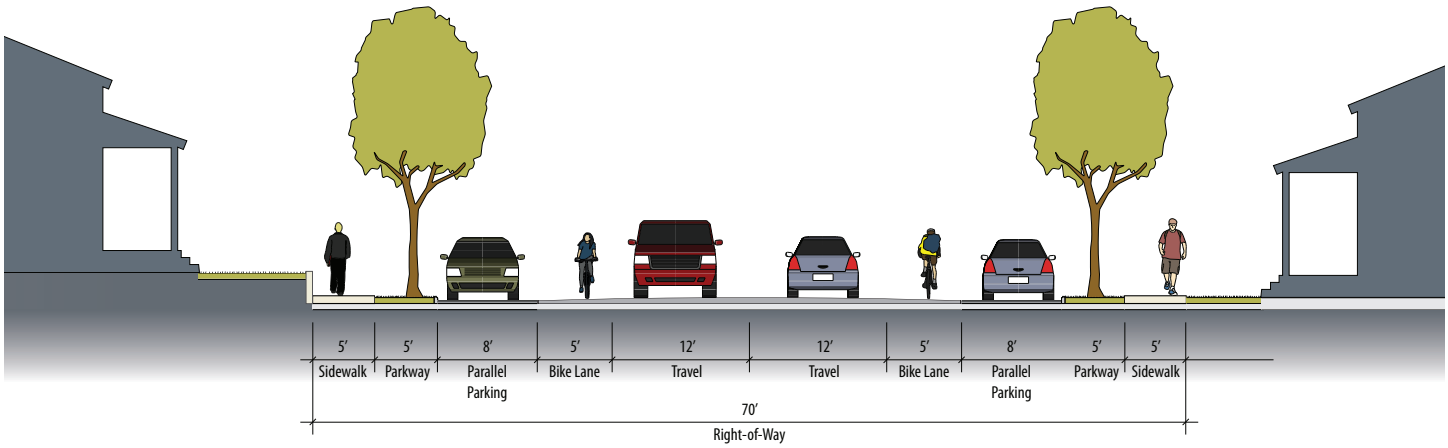
## 5.6.8. Foothill Collector

| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Residential Collector | -- |
| Right-Of-Way (ROW) Width | -- | 70 feet |
| Curb-to-Curb Pavement Width | across entire street | 50 feet |
| Desired Operating Speed | -- | 30 mph |
| Corner Curb Radius | -- | 13 feet |
| Travel Lanes | Two, 2-way | 12 feet |
| Medians | -- | -- |
| Parking Lanes | parallel, both sides | 8 feet |
| Additional Transportation Provision | -- | -- |
| Walkways | sidewalk, both sides | 5 feet |
| Curbside Landscaping | continuous planting strip | 5 feet |
| Typical Street Tree Spacing | see section 5.7 | 30' on center |
| Typical Street Lighting | single-head column (see section 5.6.16 ) | 120' on center, staggered |

The Foothill Collector connects the Civic District to the Haun Creek. The buildings fronting the street are varied, and include townhouses along the eastern half, and mostly single family houses. The street has parallel parking and sidewalks separated from the curb with continuous planting strips on both sides.



*Typical plan view of the Foothill Collector.*

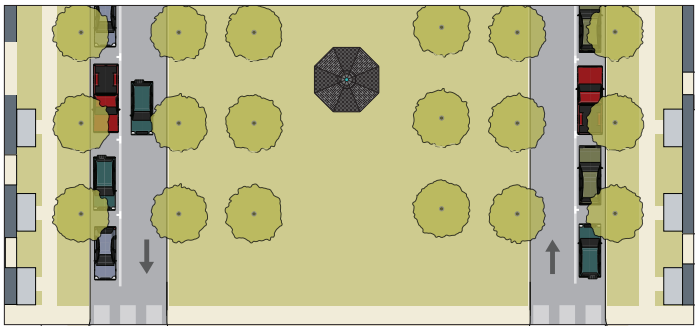


## 5.6.9. Park Blocks

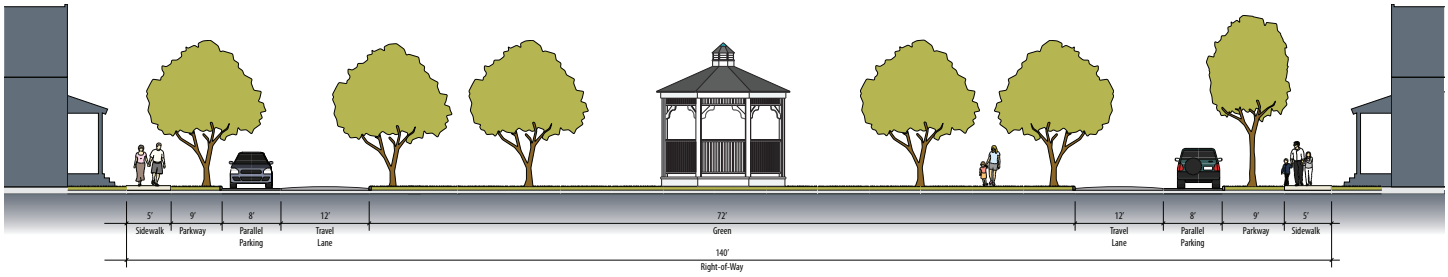
| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Residential Collector (w/ Median) | -- |
| Right-Of-Way (ROW) Width | -- | 140 feet |
| Curb-to-Curb Pavement Width | across entire street | 112 feet |
| | to median | 20 feet |
| Desired Operating Speed | -- | 25 mph |
| Corner Curb Radius | -- | 13 feet |
| Travel Lanes | two, 2-way | 12 feet |
| Medians | Park Blocks | 72 feet |
| Parking Lanes | parallel, both sides | 8 feet |
| Additional Transportation Provision | -- | -- |
| Walkways | sidewalk, both sides | 5 feet |
| Curbside Landscaping | continuous planting strip | 9 feet |
| Typical Street Tree Spacing | see section 5.7 | 30' on center |
| Typical Street Lighting | single-head column (see section 5.6.16 ) | 60' on center on building side |

Running east from the Santa Paula Sports Park, Park Blocks accommodates the historic Well House and is lined with residential and mixed-use buildings. The streets on either side of the greens allow one-way traffic and parallel parking on one side. The sidewalks are located on the building side of the streets and are separated from the curb by continuous planting strips.

*Artist's rendition of Park Street.*



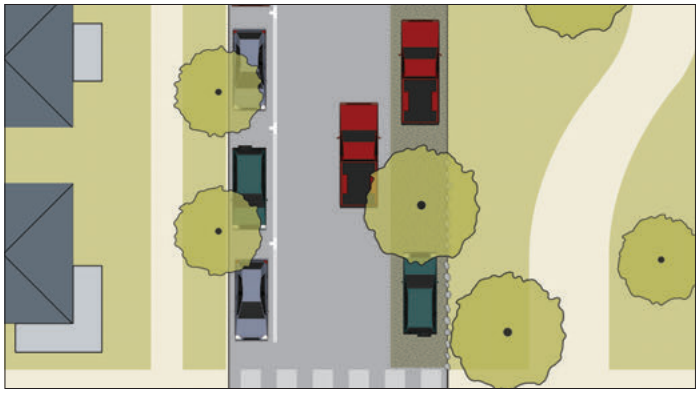
*Typical plan view of the Park Blocks.*



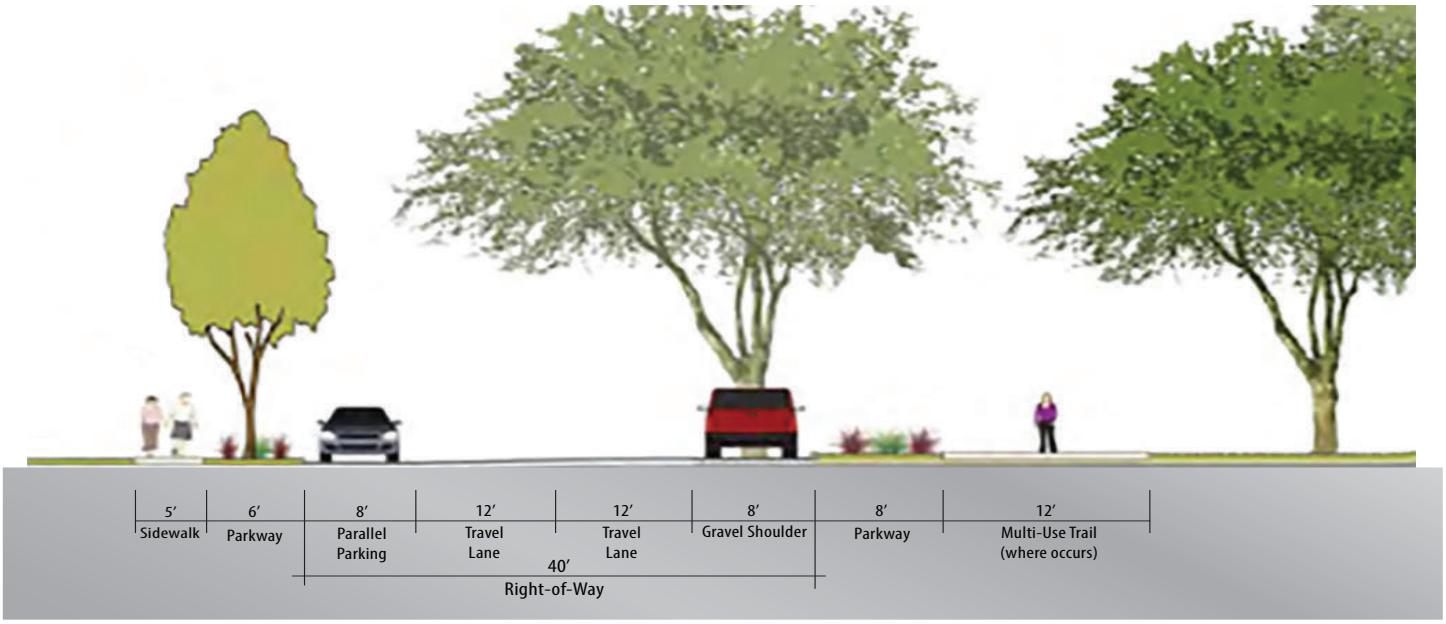
### 5.6.10. Santa Paula Creek and Haun Creek Edge Drives

| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Residential Collector | -- |
| Right-Of-Way (ROW) Width | -- | 40 feet |
| Curb-to-Curb Pavement Width | across entire street | 40 feet |
| Additional Curb Detail | River Cobble or Rolled Curb Edge in lieu of Curb, (park / edge side) | |
| Desired Operating Speed | -- | 25 mph |
| Corner Curb Radius | -- | 13 feet |
| Travel Lanes | two, 2-way | 12 feet |
| Medians | -- | -- |
| Parking Lanes | (park side) | 8 feet |
| Additional Parking Details | parkable gravel shoulder (edge side) | 8 feet |
| Additional Transportation Provision | multi-use trail along creek and park | 12 feet |
| Walkways | sidewalk on creek side | 5 feet |
| Curbside Landscaping | Parkway / bioswale, development side | 10-15 feet |
| Additional Landscaping | Tree planters in gravel shoulders between parking spaces | 6 feet minimum |
| Typical Street Tree Spacing | see section 5.7 | 30' on center |
| Typical Street Lighting | single-head column (see section 5.6.16 ) | 150' on center on building side |

The Santa Paula Creek Edge Drive and Haun Creek Edge Drive are characterized by a curb, parkway and sidewalk along the developed side of the street, and a greenway on the other side of the street. A multi-use trail is envisioned running through the greenway providing pedestrian and bicycle access to the trail network in the hills.



*Typical plan view of the Santa Paula Creek/Haun Creek Edge Drive.*



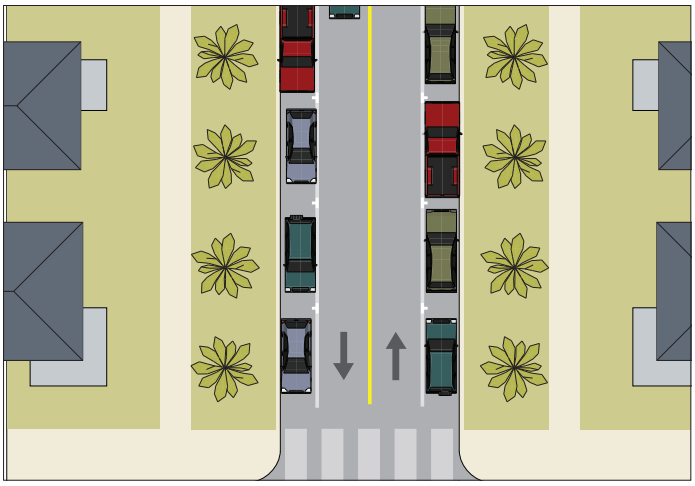

*Actual Cross-section for Santa Paula Creek Drive*

## 5.6.11. Palm Avenue

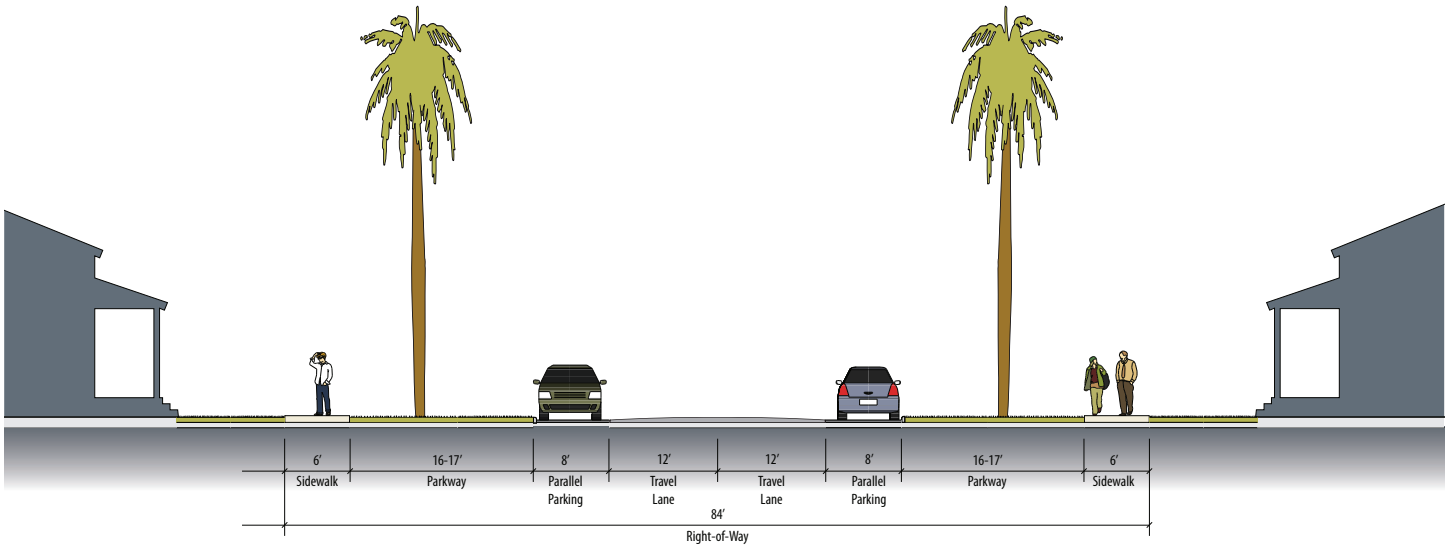
| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Residential | -- |
| Right-Of-Way (ROW) Width | -- | 84 feet* |
| Curb-to-Curb Pavement Width | -- | 40 feet |
| Desired Operating Speed | -- | 25 mph |
| Corner Curb Radius | -- | 10 feet |
| Travel Lanes | two, 2-way | 12 feet |
| Medians | -- | -- |
| Parking Lanes | parallel, both sides | 8 feet |
| Additional Transportation Provision | -- | -- |
| Walkways | sidewalk, both sides | 6 feet* |
| Curbside Landscaping | cont. planting with exist. palms | 16-17 feet* |
| Typical Street Tree Spacing | see section 5.7 | 25′ on center if replaced |
| Typical Street Lighting | single-head column (see section 5.6.16 ) | 90′ on center, aligned |

** Exact dimensions to be determined at the Tentative Map level.*

Palm Avenue is a residential street east of and parallel to Hallock Street. It is lined with higher-density residential buildings. Its wide right-of-way accommodates the existing palm trees as well as wide sidewalks that provide for a comfortable pedestrian route from the Park Blocks to the greenway to the south and east.



*Typical plan view of Palm Lane.*



## 5.6.12. Neighborhood Street

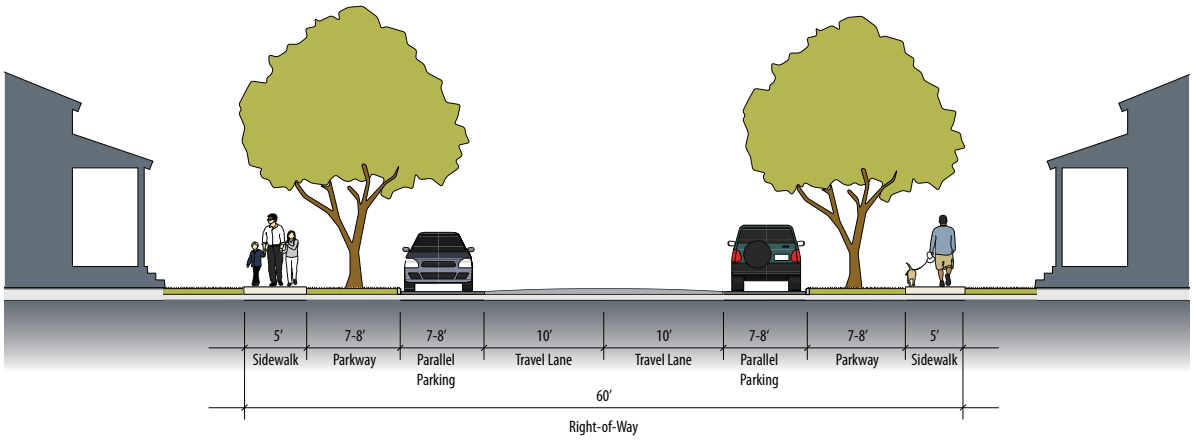
| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Residential | -- |
| Right-Of-Way (ROW) Width | -- | 60 feet* |
| Curb-to-Curb Pavement Width | -- | 34-36 feet |
| Desired Operating Speed | -- | 25 mph |
| Corner Curb Radius | -- | 10 feet |
| Travel Lanes | two, 2-way | 10 feet |
| Medians | -- | -- |
| Parking Lanes | parallel, both sides | 7-8 feet* |
| Additional Transportation Provision | -- | -- |
| Walkways | sidewalk, both sides | 5 feet* |
| Curbside Landscaping | continuous parking strip | 7-8 feet* |
| Typical Street Tree Spacing | see section 5.7 | 30' on center |
| Typical Street Lighting | single-head column (see section 5.6.16 ) | 150' on center, staggered |

** Exact dimensions to be determined at the Tentative Map level.*

Neighborhood Streets are designed for low traffic volumes and traffic speeds of 25 miles per hour or less. Their primary function is to provide local access to adjacent land uses, which vary throughout the area, depending on the location.

Sidewalks and curbside parking are provided on one or both sides. Sidewalks are separated from the curb by parkway strips planted with tree rows in many cases, to shade the sidewalks, to buffer pedestrians from traffic, to provide opportunities for stormwater infiltration, and to help avoid cross-slopes on sidewalks that can present barriers to users of wheelchairs and children's wheeled vehicles.

*Artist's rendition of a typical Neighborhood Street.*



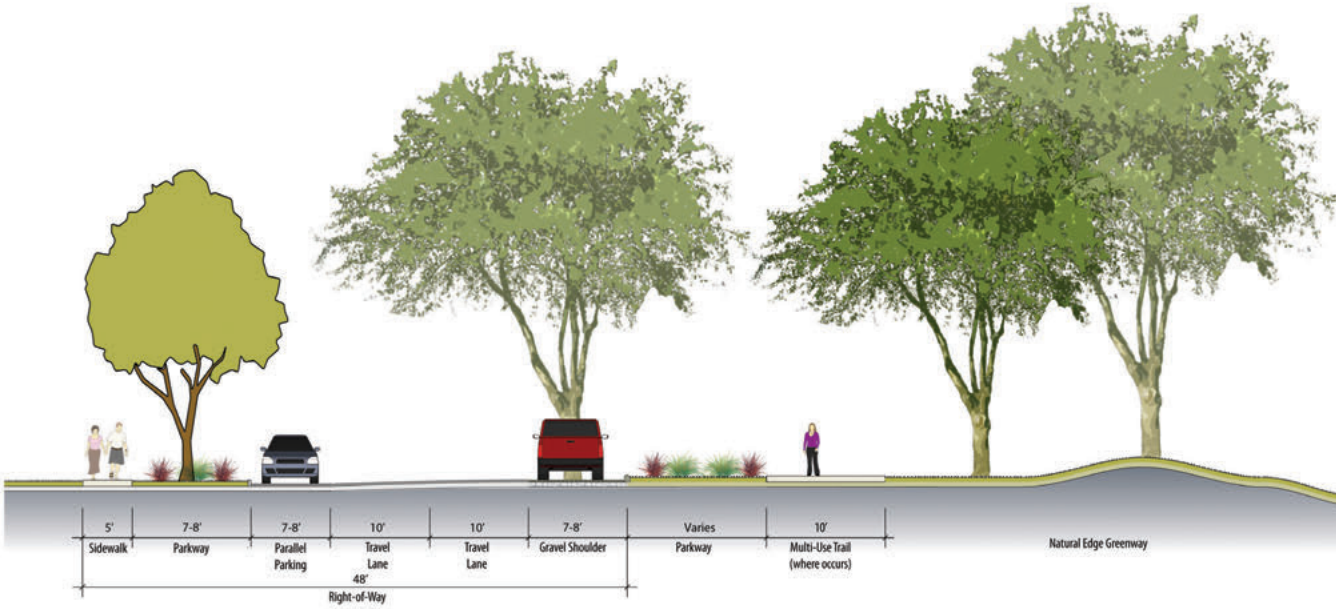
### 5.6.13. Neighborhood Edge Drive

| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Residential | -- |
| Right-Of-Way (ROW) Width | -- | 48 feet* |
| Curb-to-Curb Pavement Width | across entire street | 34-36 feet |
| Additional Curb Detail | River Cobble or Rolled Curb Edge in lieu of Curb, (edge side) | |
| Desired Operating Speed | -- | 25 mph |
| Corner Curb Radius | -- | 10 feet |
| Travel Lanes | two, 2-way | 10 feet |
| Medians | -- | -- |
| Parking Lanes | (development side) | 7-8 feet* |
| Additional Parking Details | parkable gravel shoulder, (edge side)** | 7-8 feet* |
| Additional Transportation Provision | multi-use trail along creek and park | 10 feet |
| Walkways | sidewalk on development side | 5 feet |
| Curbside Landscaping | Parkway / bioswale, development side | 7-8 feet* |
| Additional Landscaping | Tree planters in gravel shoulders between parking spaces | 6 feet |
| Typical Street Tree Spacing | see section 5.7 | 30' on center |
| Typical Street Lighting | single-head column (see section 5.6.16 ) | 150' on center on building side |

* *Exact dimensions to be determined at the Tentative Map level.*
*** Optional*

The Neighborhood Edge Drive is a low speed, low velocity roadway, accommodating local traffic and providing a comfortable route for bicycling or walking. Additional pedestrian and bicycle accommodation is provided by the multi-use trail in the adjacent Greenway.

*Typical plan view of Neighborhood Edge Drive.*

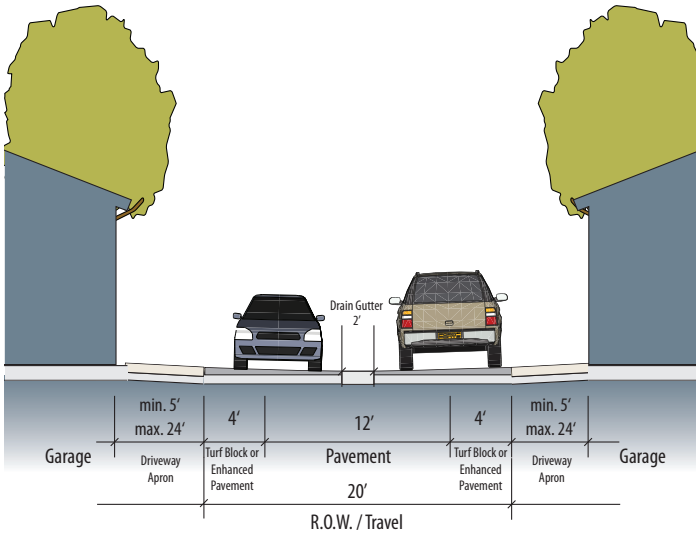


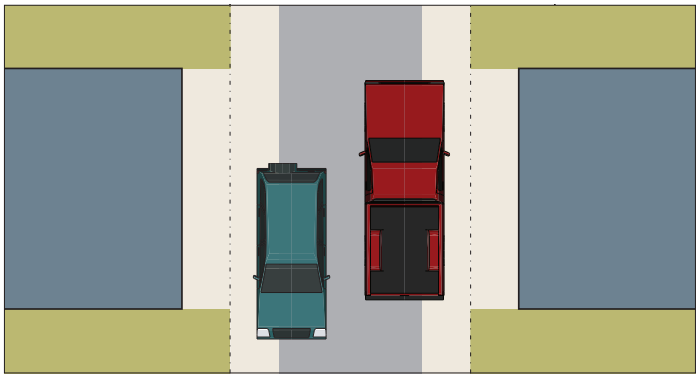
## 5.6.14. Alley

| Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Street Classification | Alley | |
| Right-Of-Way (ROW) Width | -- | 20 feet |
| Pavement Width | -- | 12 - 20 feet |
| Desired Operating Speed | -- | 5 mph |
| Corner Curb Radius | -- | -- |
| Travel Lanes | one, 2-way | 20 feet |
| Medians | -- | -- |
| Bicycle Access / Provision | -- | -- |
| Additional Transportation Provision | -- | -- |
| Walkways | -- | -- |
| Curbside Landscaping | see section 5.7 | -- |
| Street Lighting | Garage-mounted lights | -- |

Alleys are located in the rear of lots and provide the primary vehicular access to residential property. Garages are oriented to and accessed from Alleys. Garages may be located a minimum of 4 feet from the rear property line and may be set back further to allow for parking in front of the garage (maximum setback: 24 feet). The entire 20-foot alley right-of-way is driveable, however, a four foot strip on both sides may be enhanced pavement. Enhanced pavement may be permeable and can be made of brick, stone or grass pavers, porous concrete, or similar materials. Trash cans, gas and electric meters and other utilities are located in the Alleys.

*Illustrative example of an Alley.*



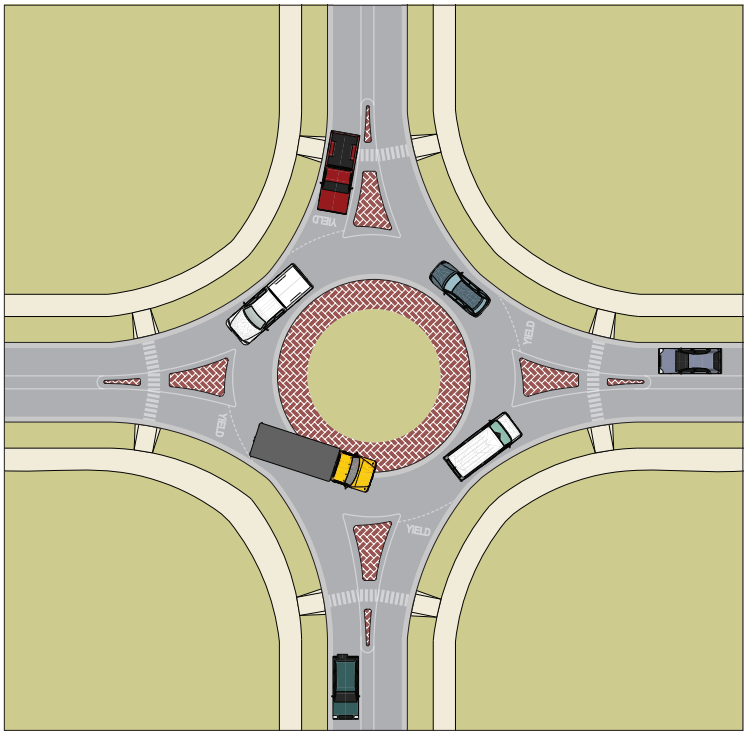



*Typical plan view of an Alley.*

## 5.6.15. Roundabout

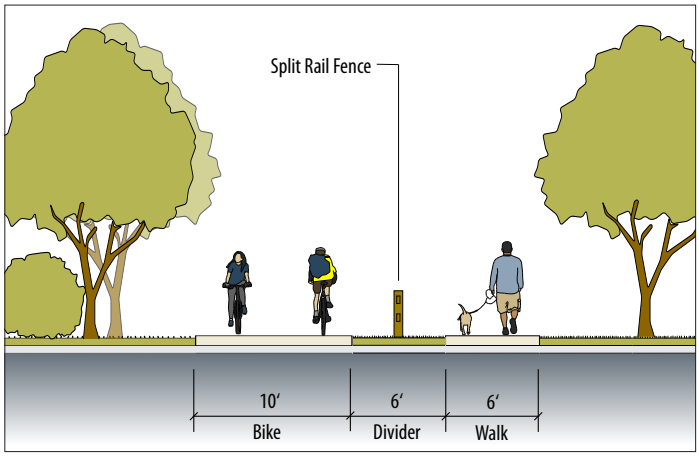
| Thoroughfare Design Guidelines | | |
|---|---|---|
| | Notes | Dimension |
| Right-Of-Way (ROW) Width | -- | varies |
| Curb-to-Curb Pavement Width | -- | varies |
| Desired Operating Speed | -- | 15 mph |
| Corner Curb Radius | -- | varies |
| Travel Lanes | two, 2-way | varies |
| Medians | -- | optional |
| Parking Lanes | -- | -- |
| Additional Transportation Provision | -- | -- |
| Walkways | sidewalk, both sides | 5 feet minimum |
| Curbside Landscaping | continuous planting strip | 8 feet minimum |
| Typical Street Tree Spacing | see section 5.7 | varies |
| Typical Street Lighting | Per street standards, none in roundabout | -- |

Roundabouts are circular intersections whose features include a central island, truck aprons or mountable curbs, a circulatory roadway and splitter islands at each approach. Roundabouts are a safe and efficient traffic calming device which can be used at many of the same locations as traffic signals or stop controls. Roundabouts should be used where physical conditions allow, including approach grades and right of way width. Crosswalks should be located between 1-3 car lengths behind the yield line. A landscaped central island reinforces the geometry, encourages pedestrians to cross at designated crossing locations and helps to integrate the traffic device with the surrounding streetscape. Landscape design, design of the approach road and roundabout may provide visibility of the roundabout from a distance that will allow approaching drivers to see the roundabout in all weather and lighting conditions. Roundabout designs will require a case-by-case study of the design speed, geometry, capacity, existing conditions, and other factors, by the Public Works Director, or designee.




*Typical plan view of a Roundabout.*

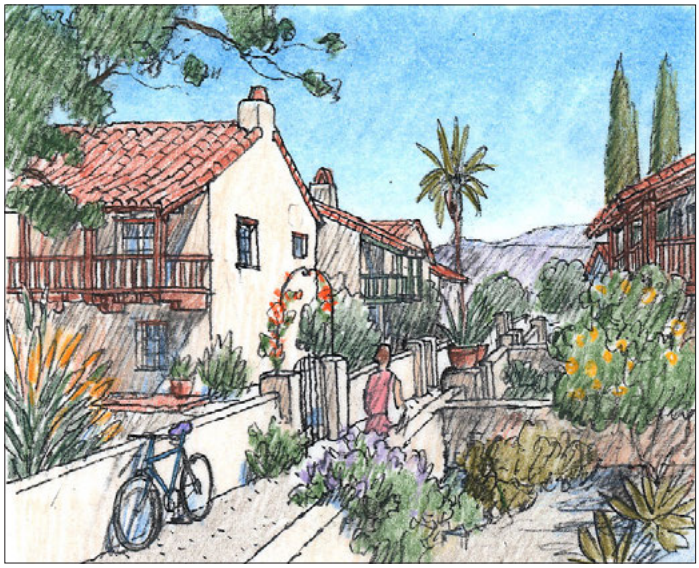
## 5.6.16. Trail




The trail is either paved or decomposed granite designed for use by pedestrians and/or cyclists. The trail will include a split rail fence to separate adjacent street traffic from trail use.

The trail pathways will meander nearly the entire west and east edges, and portions of the north edge, of the East Area 1 development.

## 5.6.17. Paseo



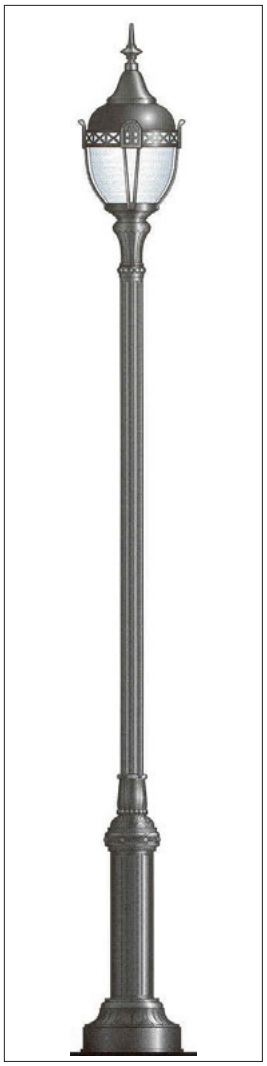
A pedestrian connector that passes between buildings and provides short cuts through long blocks or where the terrain is too steep for a street. Paseos may also connect parking lots in the rear with the building frontages.

## 5.6.19. Street Lighting Guidelines

Streets and other public spaces throughout East Area 1 may be carefully scaled and detailed for the safety and comfort of pedestrians. The location and scale of street trees, street lights, street furniture, and special accent pavement may be focused on creating comfortable spaces to walk, visit, and rest. Typical streetlights may be of the type illustrated on this page.

Spacing of luminaires shall be dictated by photometric studies performed by qualified consultants.

Recommended pole types include concrete or aluminum poles as manufactured by King Luminaire, Lumec/Philips, or similar. Poles with a distinct base element are recommended. Luminaires should be down-directed, cut-off type to avoid night sky illumination, and provided with high-efficiency lamps - LEDs are recommended.



*Single-Head Column*

# 5.7 Landscape Standards

## 5.7.1 Purpose

**A. General requirements.** Landscapes should preserve and promote the aesthetic character and value of East Area 1 in the following ways:

1. The landscape – including streets, greens, parks and front yards – should define, unify and enhance the public realm.
2. The landscape should be sensitive to its environmental context and utilize plant species that reduce the need for supplemental irrigation water.
3. Front yards should be landscaped with drought-tolerant plant materials and permanent underground low-flow irrigation systems.
4. Off-street parking should be screened and landscaped.
5. All landscapes should be in accordance with local and State Firescape guidelines, fire safe plant lists, and City of Santa Paula Resolution 3675.

**B. Landscape for thoroughfares.** Street trees should be consistent with species identified in the Street Tree Plan, Figure 5-5. Large trees with arching canopies should be planted in rows in continuous parkway strips or individual tree wells parallel to the adjacent curb on both sides of the street and in street medians where appropriate. Consistency in tree species and spacing should be used to establish a strong street identity.

**C. Community Plant Palettes**

**1. Hallock Center and Civic District**

**a. Dominant Trees** - 36" box minimum size

| | |
|---|---|
| *Cinnamomum camphora* | Camphor Tree |
| *Pistacia chinensis* | Chinese Pistache |
| *Platanus a. 'Bloodgood'* | London Plane Tree |
| *Washingtionia Robusta* | Mexican Fan Palm |

**b. Background Trees** - 24" box minimum size

| | |
|---|---|
| *Magnolia grandiflora* | Southern Magnolia |
| *Pinus eldarica* | Afghan Pine |
| *Pyrus calleryana* | Evergreen Pear |

**c. Accent Trees** - 24" box minimum size

| | |
|---|---|
| *Lagerstroemia indica* | Crape Myrtle |
| *Olea europaea'Swan Hill'* | Fruitless Olive |
| *Prunus c. 'Krauter Vesuvius'* | Purple Leaf Plum |
| *Pyrus calleryana* | Flowering Pear |

*Common area green*

*Tree-lined street*

*Open space*

**2. Neighborhood Palette A**

**a. Dominant Trees** - 24" box minimum size

| | |
|---|---|
| *Arbutus 'Marina'* | Hybrid Strawberry Tree |
| *Koelreuteria paniculata* | Goldenrain Tree |
| *Pinus canariensis* | Canary Island Pine |
| *Pinus pinea* | Italian Stone Pine |
| *Pistacia chinensis* | Chinese Pistache |
| *Platanus a. 'Bloodgood'* | London Plane Tree |
| *Quercus wislizenii* | Interior Live Oak |
| *Rhus lancea* | African Sumac |
| *Ulmus parvifolia 'Drake'* | Evergreen Elm |

**b. Background Trees** - 24" box minimum size

| | |
|---|---|
| *Liquidamber s. 'Festival'* | American Sweet Gum |
| *Liriodendron tulipifera* | Tulip Tree |
| *Magnolia grandiflora 'St. Mary's'* | Southern Magnolia |
| *Pyrun calleryana* | Flowering Pear |

**c. Accent Trees** - 24" box minimum size

| | |
|---|---|
| *Cercis occidentalis* | Western Redbud |
| *Lagerstroenia indica* | Crape Myrtle |
| *Olea europaea 'Swan Hill'* | FruitlessOlive |
| *Prunus c. 'Krauter Vesuvius'* | Purple Leaf Plum |
| *Pyrus calleryana* | Flowering Pear |

**2. Neighborhood Palette B**

**a. Dominant Trees** - 24" box minimum size

| | |
|---|---|
| *Arbutus 'Marina'* | Strawberry Tree |
| *Koelreuteria paniculata* | Golden rain Tree |
| *Platanus racemosa* | Western Sycamore |
| Quercus wislizenii | Interior Live Oak |
| *Rhus lancea* | African Sumac |
| *Ulmus parvifolia 'Drake'* | Evergreen Elm |

**b. Background Trees** - 24" box minimum size

| | |
|---|---|
| *Liriodendron tulipifera* | Tulip Tree |
| *Magnolia grandiflora 'St. Mary's'* | Southern Magnolia |
| *Pinus eldarica* | Afghan Pine |
| *Pyrun kawakamii* | Evergreen Pear |

**c. Accent Trees** - 15 gallon minimum size

| | |
|---|---|
| *Cercis occidentalis* | Western Redbud |
| *Lagerstroenia indica* | Crape Myrtle |
| *Prunus c. 'Krauter Vesuvius'* | Purple-Leaf Plum |

*Drake Elm*

*Trees in parkway*

*Median tree planting*

**Figure 5-4: Master Street Tree Plan**

**Legend:**

- Cinnamomum camphora - Camphora Tree
- Magnolia grandiflora - Southern Magnolia
- Plananus acerfolia 'Bloodgood' - London Plane Tree
- Quercus virginiana - Southern Live Oak
- Washington Robusta - Mexican Fan Palm
- Tipuana tipu - Tipu Tree
- Pheonix canariensis - Existing Canary Island Date Palm
- Ulmus parvifolia 'Drake' - Drake Elm
- Arbutus x Marina - Hybrid Strawberry Tree
- Pyrus calleryana 'Aristocrat' - Aristocrat Pear
- Lophostemon confertus - Brisbane Box
- Pistacia chinensis - Chinese Pistache
- Olea europea 'Swan Hill' - Fruitless Olive Tree
- Lagerstromia indica - Crape Myrtle
- Koelreuteria bipinnata - Chinese Flame Tree
- Jacaranda mimosifolia - Jacaranda

Source: MJS Design Group, Inc, 2014

**2. Neighborhood Palette C**

**a. Dominant Trees** - 24" box minimum size

| | |
|---|---|
| *Arbutus 'Marina'* | Hybrid Strawberry Tree |
| *Cinnaomoum camphora* | Camphor Tree |
| *Koelreuteria paniculata* | Goldenrain Tree |
| *Pinus canariensis* | Canary Island Pine |
| *Pistacia chinensis* | Chinese Pistache |
| *Platanus a. 'Bloodgood'* | London Plane Tree |
| *Quercus wislizenii* | Interior Live Oak |
| *Rhus lancea* | African Sumac |

**b. Background Trees** - 24" box minimum

| | |
|---|---|
| *Liquidamber s. 'Festival'* | American Sweet Gum |
| *Liriodendron tulipifera* | Tulip Tree |
| *Magnolia grandiflora 'St. Mary'* | Southern Magnolia |
| *Pyrus calleryana* | Flowering Pear |

**c. Accent Trees** - 15 gallon minimum

| | |
|---|---|
| *Cercis occidentalis* | Western Redbud |
| *Lagerstroemia indica* | Crape Myrtle |
| *Olea europaea 'Swan Hill'* | Fruitless Olive |
| *Prunus c. 'Krauter Vesuvius'* | Purple Leaf Plum |
| *Pyrus calleryana* | Flowering Pear |

**4. Parks**

**a. Trees** - 85% 24" box, 15% 15 gallon

| | |
|---|---|
| *Arbutus 'Marina'* | Strawberry Tree |
| *Cedrus deodara* | Deodar Cedar |
| *Cercis occidentalis* | Western Redbud |
| *Cinnamomum camphora* | Camphor Tree |
| *Koelreuteria paniculata* | Goldenrain Tree |
| *Lagerstroemia indica* | Crape Myrtle |
| *Liquidamber s. 'Festival'* | American Sweet Gum |
| *Liriodendron tulipifera* | Tulip Tree |
| *Magnolia grandiflora* | Southern Magnolia |
| *Pinus canariensis* | Canary Island Pine |
| *Pinus eldarica* | Afghan Pine |
| *Pinus pinea* | Italian Stone Pine |
| *Pistacia chinensis* | Chinese Pistache |
| *Platanus a. 'Bloodgood'* | London Plane Tree |
| *Platanus racemosa* | Western Sycamore |
| *Pyrus calleryana* | Evergreen Pear |
| Quercus wislizenii | Interior Live Oak |
| *Rhus lancea* | African Sumac |
| *Ulmus parvifolia 'Drake'* | Evergreen Elm |

*Commercial Plaza*

*Tot lot at park*

*Active recreation at park*

**5. Open Space and Transition Lands**

**a. Trees** - 15 gallon minimum size

| | |
|---|---|
| *Aesculus californica* | California Buckeye |
| *Heteromeles arbutifolia* | Toyon |
| *Platanus racemosa* | Western Sycamor |
| *Quercus berberidifolia* | Interior Scrub Oak |
| *Quercus lobata* | Valley Oak |
| *Quercus wislizenii* | Interior Live Oak |

**b. Large Shrubs** (5' + Tall) - minimum 1 gallon

| | |
|---|---|
| *Abelia "Edward Goucher"* | Glossy Abelia |
| *Baccharis sp.* | Coyote Bush |
| *Calyccanthus occidentalis* | Spice Bush |
| *Camellia japonica* | Japanese Camellia |
| *Ceanothus species* | California Lilac |
| *Cotoneaster lacteus* | Cotoneaster |
| *Dodonaea viscosa* | Hopseed Bush |
| *Escallonia fradesii* | Escallonia |
| *Fiejoa sellowiana* | Pineapple Guava |
| *Ilex cornuta* | Chinese Holly |
| *Juniperus chinensis* | Juniper |
| *Ligustrum texanum* | Texas Privet |
| *Photinia fraserii* | Red-tip Photinia |
| *Pittosporum tobira* | Mock Orange |
| *Podocarpus macrophyllus* | Yew Pine |
| *Prunus laurocerasus* | English Laurel |
| *Rhamnus californica* | Coffeeberry |
| *Rhamnis ilicifolia* | Hollyleaf Redberry |
| *Viburnum "Spring Bouquet"* | Viburnum |
| *Xylosma congestum* | Shiny Xylosma |

**c. Medium Shrubs** (3' – 5' Tall) - minimum 1 gallon

| | |
|---|---|
| *Azalea species* | Southern Azalea |
| *Berberis thunbergii* | Japanese Barberry |
| *Buxus japonica* | Boxwood |
| *Callistemon 'Little John'* | Dwarf Bottlebrush |
| *Camellia sasanqua* | Sasanqua Camellia |
| *Ceanothus sp.* | California Lilac |
| *Cistus sp.* | Rock Rose |
| *Dietes bicolor* | Butterfly Iris |
| *Grevellia noelii* | Grevillea |
| *Nandina domestica* | Heavenly bamboo |
| *Pennisetum rubrum* | Red Fountain Grass |
| *Raphiolepis indica sp.* | India Hawthorn |
| *Rose sp.* | Rose |

*Parking with permeable paving*

*Neighborhood green*

*Plaza*

**d. Small Shrubs** (1' – 3' Tall) - minimum 1 gallon)

| | |
|---|---|
| *Agapanthus africanus* | Lily of the Nile |
| *Artemesia sp.* | Artemesia |
| *Baccharis "Pigeon Point"* | Dwarf Coyote Bush |
| *Ceanothus sp.* | Dwarf Ceanothus |
| *Cotoneaster dammeri* | Bearberry Cotoneaster |
| *Hemerocallis hybrid* | Evergreen Daylily |
| *Heuchera sanguinea* | Coral Bells |
| *Juniperus horizontalis* | Juniper |
| *Lantana montevidensis* | Lantana |
| *Lavendula spp.* | Lavender |
| *Liriope gigantea* | Liriope |
| *Mahonia aquifolium "Compacta"* | Dwarf Oregon Grape |
| *Nandina "Harbor Dwarf"* | Dwarf Heavenly Bamboo |
| *Pittosporum t. "Wheeler's* | Dwarf"Dwarf Mock Orange |
| *Raphiolepis 'Clara'* | India Hawthorn |
| *Rosemarinus prostrata* | Dwarf Rosemary |
| *Salvia gregii* | Salvia |
| *Santolina rosmarinifolia* | Santolina |
| *Zauschneria canum* | California Fuchsia |

**e. Groundcovers and Perennials -** minimum 1 gallon or flatted rooted cuttings:

| | |
|---|---|
| *Arctostaphylos sp.* | Dwarf Mazanita |
| *Baccharis "Twin Peaks"* | Dwarf Mazanita |
| *Coprosma "Verde Vista"* | Coprosma |
| *Gazania sp.* | Gazania |
| *Hypericum calycinum* | St. Johns Wort |
| *Iris douglasiana* | California Iris |
| *Juniperus confeta* | Shore Juniper |
| *Myoporum pacificum* | Myoporum |
| *Trachelospermum jasminoides* | Star Jasmine |

**f. Vines** (minimum 1 gallon):

| | |
|---|---|
| Campsis radicans | Blood-Red Trumpet Vine |
| Clytostoma sp. | Violet Trumpet Vine |
| Ficus pumila | Creeping Fig |
| Lonicera japonica | Japanese Honeysuckle |
| Parthenocissus quinquefolia | Virginia Creeper |
| Parthenocissus tricuspidata | Boston Ivy |
| Rosa sp. | Climbing Rose |
| Wisteria sinensis | Wisteria |

**g. Turf** (seeded or sodded)

Water conserving tall-type fescue

Parks: GN 1 hybrid bermuda

**6. Open Space Slopes**

a. **Shrubs** -1 gallon minimum size

| | |
|---|---|
| *Arcotostaphylos spp.* | Mazanita |
| *Baccharis spp.* | Coyote Bush |
| *Calyccanthus occidentalis* | Spice Bush |
| *Ceanothus cuneatus* | Buckthorn |
| *Cercis occidentalis* | Western Redbud |
| *Fremontodendron californicum* | Flannel Bush |
| *Heteromeles arbutifolia* | Toyon |
| *Lupinus albifrons* | Bush Lupine |
| *Mahonia spp.* | Oregon Grape |
| *Quercus berberidifolia* | Interior Scrub Oak |
| *Rhamnis californica* | Coffeeberry |
| *Rhamnus ilicifolia* | Hollyleaf Redberry |

**7. Creek Edge Conditions**

**a. Trees** -15 gallon minimum size

| | |
|---|---|
| *Aesculus californica* | California Buckeye |
| *Junglans californica* | Black Walnut |
| *Populus fremontii* | Fremont Cottonwood |
| *Quercus wislizenii* | Interior Live Oak |

**b. Shrubs** - 1 gallon minimum size

| | |
|---|---|
| *Arcotostaphylos man. 'Dr. Hurd'* | Dr. Hurd's Manzanita |
| *Arcotostaphylos 'Green Supreme'* | Green Supreme Bearberry |
| *Baccharis pilularis 'Pigeon Point'* | Dwarf Coyote Bush |
| *Berberis aquifolium* | Mahonia |
| *Berberis a. var. repens* | Creeping Mahonia |
| *Ceanothus species* | Ceanothus |
| *Cercis occidentalis* | Western Redbud |
| *Epilobium canum* | California Fuschia |
| *Fremontodendron californicum* | Flannel Bush |
| *Heteromeles arbutifolia* | Toyon |
| *Lonicera hispidula var. vacillans* | Pink Wild Honneysuckle |
| *Muhlenbergia rigens* | Deergrass |
| *Ribes aureum* | Golden Current |
| *Ribes sanguinium* | Red-Flowering Current |
| *Rosa californica* | California Wild Rose |
| *Rubus ursinus* | California Blackberry |

8. **Community Olive Groves.** Privately Maintained by the Landscape Maintenance District

   **a. Grove:**

   Olea europaea 'Swan Hill' – Olives planted at 20' on-center

   **b. Background Trees:**

| | |
|---|---|
| Pinus eldarica | Afghan Pine |
| Pinus halepensis | Aleppo Pine |
| Populus italica | Lombardy Poplar |
| Pyrus calleryana | Flowering Pear |

   **c. Complimentary Shrubs:**

| | |
|---|---|
| Lavendula spp. | Lavender |
| Ornimental Non-Invasive Grasses | Grasses |
| Prunus caroliniana | Carolina Laurel Cherry |
| Rosemarinus prostrate | Dwarf Rosemary |

9. **Community Grape Vineyard.** Privately maintained and installed and managed by a specialty Contractor.

10. **Prohibited Plants.** The following plants are prohibited since they are inconsistent with the planting scheme.

Aegilops triuncialus
Ailanthus altissima
Atriplex semibaccata
Brassaia nigra
Broussonetia papyrifera
Carprobrodus edulis
Centayrea species
Cortaderia selloana
Cynara cardunclus
Cynara skolymus
Cynondon dactylon
Cytisus
Delairea odorata
Foeniculum vulgare
hedera helix
Leontodon taraxacoides
Lolium species
Melilotus spp.
Mesembryanthemum nodiflorum
Oxalis pes-caprae
Picris echiodeso
Rhynchelytrum repens
Ricinus communis
Salsola salina

Silybum marianum
Spartium junceum
Tribulus terrestris
Tamarix spp.
Xanthium strumarium

**D. Front Yard Landscapes.** Planting in yard areas fronting on streets shall be appropriate to the scale, orientation, and purpose of the yard. Front yards must contribute to distinctive streetscapes throughout the residential portions of the community. Landscaping, hardscaping, and low walls or fences that are built adjacent to the streets will define the character of the various neighbor hoods within the community. Appropriate materials and designs for specific frontage yard types are listed below.

- Landscapes of drought tolerant and California native plant materials are encouraged.
- Lawn / Turf should be kept to a minimum and generally reserved for areas intended for active play.
- Shrubs and ground covers must be planted at the foundation of the building facade.
- 50% of the yard may be hardscape that may be designated access to the garage and for guest parking, front walks and courtyards. Hardscape may include brick, stone, in terlocking concrete pavers, textured concrete and/or impressed patterened concrete. The balance of the yard must be landscaped. Hardscape may be used for driving and parking of automobiles.

1. **Single Family Front Yards:** Drought tolerant groundcover and massed native shrubs and perennials are recommended between the building and the sidewalk. Rock and hardscape accents and limited turf areas may also be included. At facades, low shrubs and/or ground cover must be planted against the facade. At garden walls, low shrubs and wall vines, or taller shrubs or hardy perennials, should be planted against the wall.

2. **Single Family Attached Front Yards:** Turf, groundcover, and low shrubs may be planted in the area between the buildings and the sidewalk, but should not exceed fifteen feet in width. Shrubs must be massed or configured as maintained hedges. Three shapes, sizes and types must be planted as buffers and as definers of the edge of the private space, but at all times should be in proportion to the height and mass of the building facade.

**E. Fuel Modification Measures.** Fire-safe landscapes should reduce the chance of ignition. If ignited, they should minimize the amount of heat generated and the ability to transmit fire to structures. A fire safe landscape that incorporates horizontal and vertical separation between plants minimizes the transmission of fire from plant to your home.

Refer to the Ventura County Fire District Fire Hazard Reduction Program for a Plant Reference Guide and Prohibited Plant List.

## 5.8 Historic Features

To reinforce the EA1SP's connection with local tradition and history the following historic features are identified to be retained (see Figure 5-5 for locations):

1. The Well House, Park Avenue

2. The Packing House, 18245 East Telegraph Road

3. The Palm Trees, along both sides of Padre Lane

**Structures To Be Preserved In Situ:**

1. **The Well House.** Retain and rehabilitate the well house in situ within a proposed open space. Rehabilitate the well house for public use. The rehabilitation of the building must conform to the Secretary of the Interior's Standards for Rehabilitation.

2. **The Packing House.** Retain and rehabilitate the packing house in situ. The rehabilitation of the building must conform to the Secretary of the Interior's Standards for Rehabilitation.

**Landscape Features To Be Preserved In Situ:**

3. **The Padre Lane Palm Trees.** To the greatest extent possible retain the palm trees in situ to preserve a distinctive component of the ranch which is visible from East Telegraph Road. The palm trees must be incorporated into continuous planting strips. If the trees require removal for health and safety reasons, their condition must be evaluated by a certified arborist before their removal. Selective tree removal to accommodate cross streets is permitted.

**Structures To Be Removed:**

4. **The Barn.**

5. **The Superintendent's House.**

**Figure 5-5: Historic Features**

This page intentionally left blank.

# 6.1 Design Guidelines Overview

## 6.1.1 Design Objectives and Intent

The purpose of this section is to provide design guidelines for review and approval by the Director of individual projects for all buildings, structures and attendant site improvements proposed for construction within the Specific Plan Area.

As described in Chapter 2, development within East Area 1 neighborhoods will be characterized by a diverse range of well-designed housing types and well landscaped walkable neighborhood streets. These Design Guidelines identify the most important design considerations in achieving that goal.

The key to well-designed housing on walkable neighborhood streets is the design of the building frontages, front yards and streetscapes. Accordingly, these are the primary focus of these design guidelines. The main design elements that will compose the streetscape of East Area 1 include:

- **Well composed building facades** with windows overlooking the street and a pedestrian-scale main entry welcoming visitors, whether single family homes and small multi-family buildings in the neighborhoods, or larger multi-family buildings, neighborhood shops, and institutional buildings in the Hallock Center and Civic District.
- **Beautifully landscaped front yards** of each individual building and lot, as well as collectively of all the buildings along each street, whether the front yards and driveways of homes in the neighborhoods, or front yards and shopfronts in Hallock Center and the Civic District.
- **The landscape of streets** themselves – whether wider streets with trees in planters or parkway streets in the Hallock Center, the Civic District and along neighborhood avenues, or narrower streets and lanes of more varied designs throughout the neighborhood.

It is envisioned that working within the parameters established by these guidelines, a wide and interesting variety of architecture, landscape, and street configurations will be developed, unified by a few simple design principles:

- **Streetscapes should be richly landscaped,** integrating street and front yard plantings with architecture and site design, providing shade for pedestrians and distinctive and valuable addresses for each property.
- Every building frontage should have **clear, attractive front entries** that welcome the visitor from the street.
- Building facades and frontages should **emphasize the human scale**, managing and balancing larger elements – such as garage doors and driveways – with human-scale design elements such as front walks, forecourts, porches, balconies, trellises and other building and site design elements.

## 6.1.2 Organization of Design Guidelines.

To provide an organized set of recommendations for applying these principles to the design of each building and lot – while allowing and encouraging creative design of each type of housing that may be proposed for East Area 1 – these Guidelines are organized as described below.

These are recommendations (guidelines) not standards, and they by no means represent all design possibilities for making high quality neighborhood frontages, but they do identify the key considerations that should be taken into account when designing new streets and housing for the neighborhoods and districts of East Area 1.

- **Neighborhood Design Guidelines (Section 6.2)**

  This section provides general guidelines regarding site organization, building massing, and frontage design for pedestrian-oriented neighborhoods.

- **Hallock Center and Civic District Guidelines (Section 6.3)**

  This section provides general guidelines regarding site organization, building massing, and frontage design for the Hallock Center and the Civic District.

- **Architectural Design Guidelines (Section 6.4)**

  This section provides general architectural guidelines, with recommendations for building materials, configurations and detailing of walls, doors and windows, roofs, and architectural elements.

## 6.2 Neighborhood Design Guidelines

### 6.2.1 Site Design and Massing Guidelines

**A. Introduction.** The lot organization and massing design of the homes within the neighborhoods will create streetscapes of varying pattern and character, but which are consistently attractive, comfortable neighborhood spaces for walking, playing, bicycling and visiting with neighbors. This section provides design guidelines to help ensure that the architecture of the homes, landscaping of the front yards, and the design and landscaping of the streets themselves are balanced, coordinated and integrated to achieve this objective.

**B. Design Guidelines for Frontage Composition.** Garages and drives – given their large size relative to front doors and pedestrian walks – have the potential to dominate the streetscape and disrupt pedestrian movements along the street or from the street to the front doors of homes. On wider lots it is relatively simple to avoid such disruptions, and as lots get narrower greater design finesse is required to retain a balance in favor of human scale architecture and frontages.

The following basic design principles inform these guidelines, which have been prepared to help ensure such a balance:

1. Visitor access and entry – front doors and the walks and frontage spaces leading to them from the street – should be given as much, or more, emphasis than vehicular access and entry.
2. Driveway pavement should be as narrow as practical and carefully integrated into the front yard design.
3. Portions of front yards not occupied by driveways, should be carefully landscaped in ways that welcome visitors – and or create useful outdoor play or activity areas for the residents – and help to de-emphasize views of driveway pavement for passing pedestrians.
4. The massing and composition of homes should de-emphasize garage doors and balance them with human-scale architectural elements, such as porches, balconies, entry courts and dooryards.
5. When garage doors are located close to the street – and/or comprise a significant percentage of the facade width – their design, materials and detailing should make them an integral and contributing element to the architecture of the home.

**C. Balancing Pedestrian and Vehicular Access.** The guidelines of this section are organized by a number of basic lot configuration scenarios, of which there are no doubt many variations, combinations and hybrids. The aforementioned design principles apply to the following scenarios.

- **Garage Back (see Section 6.2.2.1).** This configuration naturally emphasizes the front door and entry by pulling it close to the street and naturally de-emphasizes the larger garage door by pushing it back.
- **Garage Forward – Front Access (see Section 6.2.2.2).** This configuration requires careful attention to the front door entry spaces to ensure that they are not overshadowed by the larger, closer garage. A number of techniques for emphasizing the visitor entry and balancing the garage with other architectural elements are illustrated and recommended.
- **Garage Forward – Side Access (see Section 6.2.2.3).** This configuration turns the garage to the side, in most cases generating an entry drive through which visitors approach the front door. Design and detailing of that drive as an "entry court" is recommended, as is the provision of balconies or arcades to add human scaled elements to this court.
- **Garage Rear - Front or Side Access (see Section 6.2.2.4).** This configuration places the garage at the rear of the lot, which not only allows the front yard to be almost entirely devoted to visitor entry and resident use, it also enables the provision of a second dwelling unit over the garage.
- **Garage Rear - Alley Access (see Section 6.2.2.5).** Similar to the previous configuration, this configuration places the garage at the rear of the lot, but with access from the alley, enabling the front yard to be entirely devoted to visitor entry and resident use. It also enables the provision of a second dwelling unit over the garage.
- **Hillside Lots (see Section 6.2.2.6).** Sloping lots, some on sloping streets, offer unique opportunities for massing houses and providing access for pedestrians and cars along these frontages.

*Garage back: Covered front entry porch prioritizes human/visitor entry. (See Section 6.2.2.1)*

*Garage rear: Front entry porch and porte cochere. (See Section 6.2.2.4)*

### 6.2.1.1 Garage Back

**A. Description.** This configuration applies primarily to single family homes – and potentially also to duplexes – with front door located closer to the street than the garage. In this situation, balancing the appearance of vehicular entry and pedestrian entry is simpler, but close attention should still be paid to emphasizing visitor entry. This scenario more naturally emphasizes the main entry of the home by bringing it forward, so fewer offsetting design elements may be needed to complete the composition.

**B. Design Guidelines.**

1. Emphasize the front entry to the home with architectural elements such as porches, stoops or balconies. Consider Define the entry yard should be well defined and landscaped to extend a welcoming gesture to the street.
2. Large-scale elements over garage doors – including balconies, projecting rooms and double or triple windows – help balance that facade composition.
3. Simple restrained massing is recommended rather than the alternative technique of adding many small gables and projections.
4. Where practical, a pair of one-car garage doors rather than a single double door can improve the scale of the facade. Double garage doors can also be simply designed to mimic the scale of a pair of single doors.

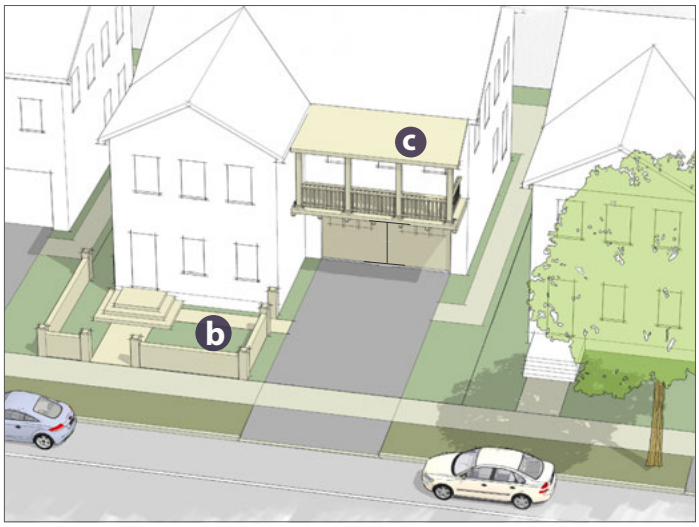
*Front porch and garage door designed with panels and small windows.*

*Garage is scaled back, both in mass and location, related to the nicely-massed front facade of the home, which includes a covered stoop entry.*

*Front porch and single (or tandem) car garage.*

*Front porch and 2-car garage, with garage doors colored to match architectural composition of the home.*

*Porch and entry on 50' lot.*




*Dooryard, entry stoop, and projecting balcony on 50' lot.*

*Dooryard and overhang elements on 50' lot.*

*Projecting garage with Mediterranean architecture on 50' lot.*

KEY

**Garage recessed back from house entry.**

- **a** Entry Porch / Stoop (covered), 6'- 8' depth
- **b** Dooryard or Entry Court with low fence or wall
- **c** Projecting architectural element
- **d** Single doors separated by column

### 6.2.1.2 Garage Forward - Front Access

**A. Description.** This configuration applies primarily to single-family homes – and might also apply to duplexes – where the garage is closer to the street than the front entry of the residence(s) and faces the street. In general, the Garage Back configuration is preferable to this one.

**B. Design Guidelines.**

1. Provide architectural and site design elements that bring the pedestrian entry visibly forward to balance the scale and appearance of the garage and drive. These generally include front or side porches, and/or front or side entry courts.
2. Locate street-facing garages in two-story buildings, with windows and strong architectural elements above, around or beside the garage doors to help balance their scale. Any potential scale benefits of "scaling down" the garage to a single story element are lost when that small facade is dominated by a garage door.
3. Consider using one or two single-bay garage doors rather than a single two-car door. Street-facing three-car garages are discouraged.
4. Garages may be set back approximately 10 feet with no parkable driveway to allow the front entry of the home to be closer to the street. In such cases, visitors may park on the street in front of the garage, replacing one of the temporary parking spaces that would otherwise have been provided on the driveway.

*Enclosed entry court and landscaping balances human / visitor entry with vehicular entry. Enhanced paving material of parking apron contributes with the facade composition.*

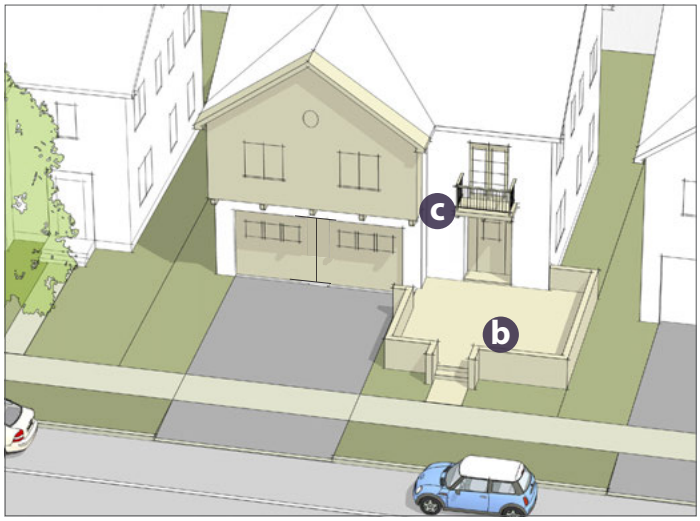
*Balcony over garage with side access entry court to left. Single garage doors contribute to the architectural composition of the home.*

*Balcony over single garage door, porch entry (on 25' wide lot)*

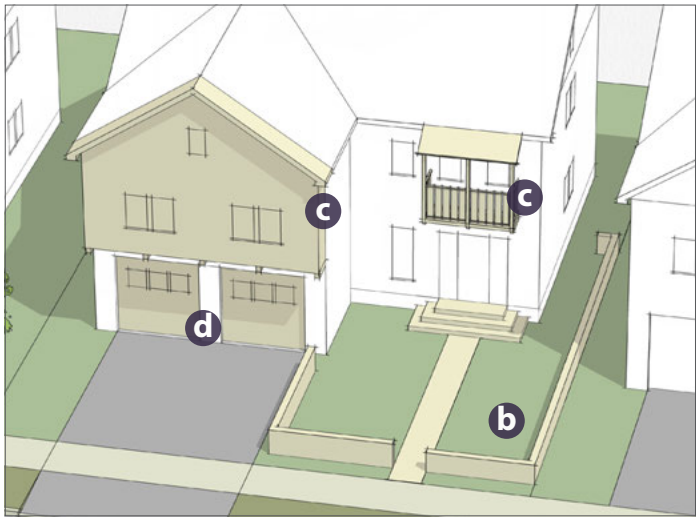
*Recessed balcony above garage, and elegant garage door*

*Single garage, with covered porch and entry walk (on 25' lot)*

*Double garage, balcony, side entry court on 30-35' lot*




*Double garage, with projecting gable and dooryard on 40-45' lot*




*Double garage, balcony, side entry court on 30-35' lot*

KEY

**Garage recessed back from house entry.**

- **a** Entry Porch (covered), 6'- 8' depth
- **b** Dooryard or Entry Court with low fence or wall
- **c** Projecting architectural element
- **d** Single doors separated by column
- **e** Enhanced Garage Door Material

### 6.2.1.3 Garage Forward - Side Access

**A. Description.** This configuration applies exclusively to single-family homes, generally on lots wider than 55 feet, and includes a garage with doors facing the side yard rather than the street. This helps to minimize the visual dominance of garage doors in the facade composition of the house, and can generate a pleasant forecourt for the house.

**B. Design Guidelines.**

1. Conceive of the driveway/backout area as a forecourt for the home – which it almost invariably is, since pedestrian approach the front door is through that space – and its design should include some form of enhanced pavement and low enclosing landscaping or a wall near the street.

2. Set back the garage at least 10 feet, and design the entry drive from the street to the court to be as narrow as practical.

3. For two-story garage masses, one significant architectural element – such as a trellis, balcony or projected rooms – is recommended over the garage door(s) to help balance the garage door and reinforce the appearance of the garage court as a forecourt for the home.

4. A garage for a third car may be provided at the rear of the garage court – facing the street and adjacent to the front entry to the home. That façade should be carefully designed to balance the scale of the garage door and the main entry. Because the front door is surrounded by garages in this configuration, it is especially important that the design of the garage doors themselves be integrated with and contribute to the architecture of the house.

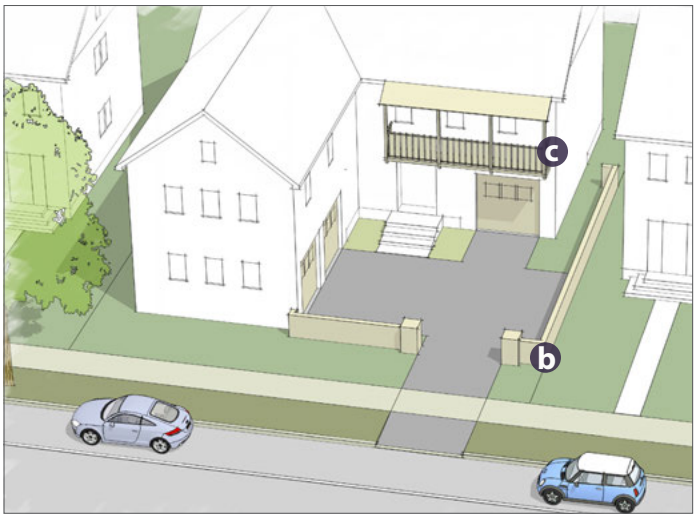
5. Provide street facing windows or other architectural elements in the street-facing facade of the garage, so that a blank wall does not face the street.

6. Side access garages – except perhaps on corner lots, where garages toward the rear of the lot may be accessed from the side street – are not recommended on lots less than 55 feet wide.

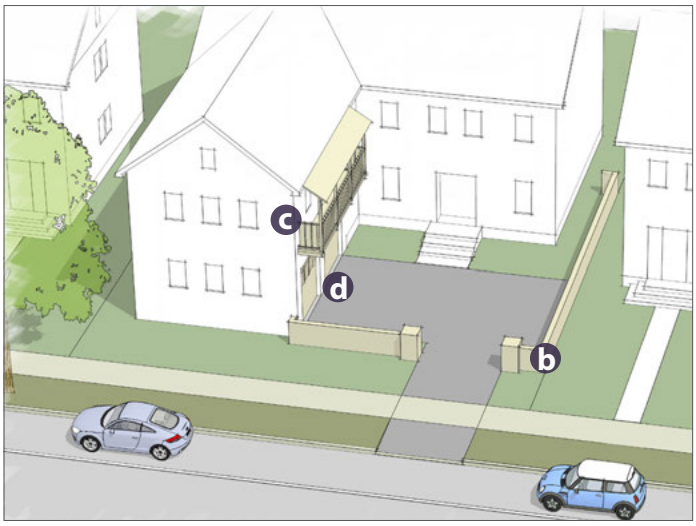
*Two car garage rotated 90 degrees to street; third garage faces street*

*Garage forward - second floor porch over single garage doors*

*Two car garage rotated 90 degrees to street; large porch entry*




*Side Access: Dooryard parking court and projecting elements*




*Side Access: Dooryard parking court and projecting elements*

KEY

**Garage recessed back from house entry.**

- **a** Entry Porch (covered), 6'- 8' depth
- **b** Dooryard or Entry Court with low fence or wall
- **c** Projecting architectural element
- **d** Single doors separated by column
- **e** Enhanced Garage Door Material

### 6.2.1.4 Garage Rear - Front or Side Access

**A. Description.** This configuration is applicable to single family houses on wider lots – generally over 55 feet – and may also apply to multi-family housing of many types where parking is located behind the building. This scenario enables a wide range of front yard design options. A drive from the street along one side of the lot provides access to a garage toward the rear of the house or lot. In the case of multi-family types the side drive may provide access to rear parking lots, carports or garages. This configuration can yield very attractive streetscapes, and when applied to single-family homes can provide very pleasant side yard areas for play or other outdoor activities. This scenario very naturally emphasizes the façade and main entry. The following guidelines apply to the site planning, architecture and front yard design of this scenario.

**B. Design Guidelines.**

1. Set the garage back 40 feet or more from the frontage line, with a narrow driveway leading from the street to the garage. Narrow bands of landscaping are recommended on either side of the driveway, and may be provided down the middle as well between the wheels of the vehicles.
2. Design driveways to be no wider than 10 or 12 feet.
3. For garages that house 2 or more cars, the driveway pavement may widen directly in front of the garage to provide back out and maneuvering area.
4. Garage doors may face toward the street, although side-access garages may also be provided on very wide lots, sharing back out and maneuvering room with the front-facing garage.
5. A porte-cochere over the driveway near the front of the house may be provided as an attractive way to emphasize the architecture of the façade, and to enclose the side drive space as a semi-private outdoor space for the home. This area may also be fenced and gated, providing a very safe area for small children to play.

*Split drive track reduces drive dominance*

*Porte cochere at side of house frames drive to garage*

*Alley Loaded Garage with Rear Yard Unit above*

*Garage Rear with porte cochere and dooryard*

*Porte cochere a classic covered porch entry*

*Garage Rear with porte cochere pergola and front porch*

KEY

**Garage recessed back from house entry.**

- **a** Entry Element
- **b** Split-paving drive with landscape strip
- **c** Porte Cochere
- **d** Enhanced Garage Door Material

### 6.2.1.5. Garage Rear - Alley Access

**A. Description.** This configuration is applicable to single family houses on wider lots – generally over 55 feet – and may also apply to multi-family housing of many types where parking is located behind the building. This scenario enables a wide range of front yard design options. A drive from the street along one side of the lot provides access to a garage toward the rear of the house or lot. In the case of multi-family types the side drive may provide access to rear parking lots, carports or garages. This configuration can yield very attractive streetscapes, and when applied to single-family homes can provide very pleasant side yard areas for play or other outdoor activities. This scenario very naturally emphasizes the façade and main entry. The following guidelines apply to the site planning, architecture and front yard design of this scenario.

**B. Design Guidelines.**

1. Alley-accessed parking may be provided in a garage, carport, uncovered, or any combination of the above.
2. Open parking and carport parking should be screened from the view of the street, especially on the side-street side of corner lots.
3. Parking should be set back five feet from the alley right-of-way in order to provide sufficient back-up space from parking on the opposite side of the alley.
4. Rear yard fences along the alley should also be setback at least five feet from the alley to provide sufficient back-up space from parking on the opposite side of the alley and to provide some space for landscaping.
5. Habitable space – including second residential units – may be located above or adjacent to the garage and:
   - Alley-facing view windows are strongly recommended to provide eyes on the alley space and enhance security.
   - Alley-facing balconies or bay windows may also be provided for this purpose.

*Alley-Accessed Garage: Two-car garage with apron and alley landscaping.*

*Alley-Accessed Garage: Two-car garage for primary residence and uncovered space for Second Unit.*

*Alley-Accessed Garage: Two-car garage for primary residence and one-car garage for Second Unit.*

### 6.2.1.6. Hillside Lots

**A. Description.** In addition to the guidelines in the previous sections, which also apply to lots on sloping terrain, the following guidelines suggest specific strategies for houses on hillside lots.

**B. Design Guidelines.**

1. Front yards should connect from the street to the front entry, whether that entry is above or below the street.
2. Garages may be accessed at street grade, or by way of driveways that slope either up or down.
3. Lots that slope from side to side offer the opportunity to access the garage from the low side of the lot, in many cases allowing the garage to be below the ground living floor of the home and the front door of the home accessed directly from the street on the high side of the lot.
4. When the garage is located below the main living floor, a tandem garage and service spaces may occupy that lower level.

*Garage at street level on lot that slopes up to rear. Front yard is elevated with stairs leading to front door.*

*Home takes advantage of the lots sloping terrain to tuck forward-facing garage into the basement level, screened by a projecting balcony above.*

*Front-access garage entered at low side of lot, with living room facing front yard.*

*Garage court entry on downhill corner lot.*

## 6.2.2 Neighborhood Housing Types

### 6.2.2.1 Houses, Duplexes, Triplexes, Quadplexes

**A. Description.** The following guidelines apply to the site planning, architecture and front yard design for lots that provide access to on-site parking from the rear alley. Such access enables high quality frontages and high "curb appeal" while delivering development intensities that provide as little as 10 feet of frontage per residence.

**B. Design Guidelines.**

1. Design small multi-family building types to be compatible in scale and character with houses.
2. Provide direct access from the street – or from a shared entry court, entry garden or "rosewalk" – to the front entry of each unit in order to provide each unit with a clear address. Multiple upper floor units may share an internal or external stair.
3. These building types are generally limited to 2 stories, but may be up to 2 1/2 stories, with third floor space located within the second story roof mass, expressed by two-story eaves and dormers.

*Alley-loaded single family houses with porch frontages and side yards.*

*Alley loaded quadplex with common front porch to 4 unit entries.*

*Alley-loaded single family houses with raised front yards and covered entries.*

*An alley-loaded triplex, with units accessed from both the side street and fronting street.*

### 6.2.2.2 Townhouses

**A. Description.** These product types are attached dwellings that each have their own frontage.

**B. Design Guidelines.**

1. To provide each unit with a clear address, direct access from the street – or from a shared entry court, entry garden or "rosewalk" – to the front entry of each unit is recommended.

2. Depending on the context, town houses may be massed as "house-form" buildings for compatibility with nearby houses – recommended for the Central Neighborhood Area – or as "block-form" buildings for compatibility with nearby apartment buildings or mixed-use buildings – recommended for the Hallock Center Area.

3. Such attached dwellings – if provided with a flexible ground floor space with larger windows fronting the street – may be suitable for live-work (or "flex") occupancy, with the ground floor either occupied by a small business or used as an integral part of the residence. In such cases, more hardscape can be provided within the front setback to emphasize the business use, if so desired. This type is recommended for the Hallock Center Area only.

*House-form townhouses with porch frontages.*

*House-form townhouses fronting a shared entry garden or "rosewalk", with small porches defining the entry to each residence.*

*House-form townhouses with dooryards and balconies.*

*House-form townhouses with overhanging second story balconies and step-up entries.*

### 6.2.2.3 Apartment Buildings and Courtyard Buildings

**A. Description.** Apartment buildings and Courtyard Buildings in the Neighborhood contain more than four dwellings and are massed and designed as house-scale buildings. Courtyard Buildings are a group of attached or detached dwelling units arranged to share one or more common courtyards, with pedestrian visitor access taken from the courtyard, Primary Street, and/or Side Street. The courtyard is intended to be a semi-public outdoor area that is visible from and accessed from the Primary Street.

**B. Design Guidelines.**

1. Each building should have a clear front entry from the street, which may lead to the dwellings inside by way of a courtyard, garden, or lobby and corridors.
2. Visitor parking – ideally on the street – should be conveniently located near the entry.
3. Resident parking should generally be located behind the buildings. Parking may also be located beside/between buildings, and if so should be screened with a low wall or hedge roughly aligned with the building face at the back of sidewalk.
4. Ground floor units may or may not have their own independent entries from an adjoining street, courtyard, shared garden or "rosewalk."
5. Apartment and courtyard buildings may be up to two stories tall and up to 100 feet wide. Portions of the building that face the Primary Street should be no wider than 60 feet and should be separated from adjacent, Primary Street facing buildings by an opening to the sky that is at least 15 fifteen wide and provides access from the street to the courtyard. In general the facades of wider buildings should be organized into increments of 25 to 30 feet in width, to maintain a residential scale.
6. Recommended frontage types include porch, stoop, forecourt and courtyard.

*Hillside house-scale apartment buildings, with common entry.*

*A house-scale apartment building with corner, double-story porch and entrance stoop.*

*House-scale, detached buildings arranged around a shared courtyard.*

## 6.2.3. Neighborhood Frontage

### 6.2.3.1 Front Yards

**A. Description.** Front yards define the appearance of a neighborhood, define the image and "curb appeal" of each house or small multi-family building, provide the pathway through which visitors enter the home, and in many cases provide a useful outdoor living space in which the residents can play or visit with neighbors. Buildings with well landscaped front yards – and the well landscaped streets that they front – increase in value over time, as the landscape matures, often helping to offset the natural aging and weathering of the house itself.

**B. Design Guidelines.**

1. Yards with edges defined by low plantings, walls or fences are recommended to create a strong foreground for the house.
2. A walk directly from the street to the front door – passing through the defined front yard space – is generally recommended. When this is not practical – due to the lot layout, a narrow lot width, or sloping terrain – a walk connecting the front door to the driveway is recommended.
3. Landscapes of drought tolerant and California native plant materials are encouraged as an alternative to turf and shrubs.
4. Natural modular paving materials – such as brick and stone – and synthetic materials that faithfully simulate such natural materials are encouraged as an alternative to plain concrete for walks and driveways.

*Enhanced front entry and driveway pavement.*

*A front yard planted with drought tolerant landscape.*

*Lush front yard landscaping with dooryards on downhill sloping lots*

### 6.2.3.2 Garages and Drives

**A. Description.** Like every other design element of an East Area 1 home – large garage doors and paved areas should be well integrated into the architectural composition through their scale, composition, material and detailing. When such large elements are necessarily in the foreground of the streetscape composition of the house, the quality of the materials, design and detailing becomes critical to the success of the overall design of the house.

**B. Design Guidelines.**

1. Whenever possible make garage doors an integral element of the facade composition by aligning or otherwise composing second floor openings and projecting elements in relation to the garage door.
2. Provide garage doors with windows that relate to the other windows on the facade provides a simple unifying design element.
3. Employ garage doors with panels that provide vertical as well as horizontal emphasis to relieve their essential horizontality and to relate to the vertical proportions of other openings.
4. Use garage doors constructed of natural materials – or synthetic materials that faithfully simulate natural materials – particularly for forward projecting garage configurations.
5. Design driveways to be an integral element of front yard design. The pavement should be no larger than necessary, and its materials, colors, textures and configuration should be integrated with the overall yard and house design.

*Double-garage door designed to appear as four small bays.*

*Garage door materials and design integrated with building entry architecture and landscape.*

### 6.2.3.3 Frontage Types

This section describes a range of frontage prototypes that are applicable to the neighborhood. Other types are also allowed, and inventive combinations of the types shown are encouraged. The intention of these frontage types is to provide a varied and attractive streetscape, oriented and scaled particularly to the pedestrian, and to provide an appropriate degree of privacy for the front rooms of each building in relation to passers-by.

**A. Porch.** A roofed, unenclosed room attached to the exterior of a building that provides a physical transition between the sidewaalk and the building. Porches may be provided on buildings that are set back from the Primary and/or Side Street property lines and may encroach into the front yard and side street yard.

*Example of a porch frontage type.*

**B. Stoop.** A stair and landing leading directly from the sidewalk or front yard to a building entrance. The ground floor of the building is raised to provide privacy for the rooms facing the public street. This frontage type is ideal for ground floor housing that is near the street.

*Example of a stoop frontage type.*

**C. Dooryard.** An elevated or at-grade garden or terrace in the front yard setback that is enclosed by a low wall located at or near the property line. For raised Door Yards, access from the sidewalk to the Door Yard is via a stair or ramp.

The Door Yard can accommodate a variety of activities, ranging from dining patios for commercial uses to patios for residential uses. In addition, the interior building spaces are separated from the adjacent sidewalk by the depth of the Door Yard and in the case of raised Door Yards, by the terrace height.

*Example of a dooryard frontage type.*

## 6.3 Hallock Center and Civic District Design Guidelines

### 6.3.1 Site Design and Massing Guidelines

A. **Introduction.** Residential buildings, such as apartment buildings, have small front yards, provide street-facing windows, and are accessed via porches, stoops, and lobbies.

Tree-lined streets are designed for vehicles and pedestrians, providing a comfortable walking environment for pedestrians while slowing vehicular traffic down.

This section provides design guidelines to help ensure that the architecture of the buildings and their frontages and the design and landscaping of the streets themselves are balanced, coordinated and integrated to achieve this objective.

## 6.3.2 Hallock Center and Civic District Building Types

Specific guidelines for Apartment and Courtyard Buildings and Commercial Buildings in the Hallock Center Civic Districts are provided below. All other residential building types allowed in these Districts shall follow the applicable neighborhood design guidelines above.

### 6.3.2.1 Apartment Buildings and Courtyard Buildings

**A. Description.** Apartment buildings and Courtyard Buildings in the Hallock Center contain more than four dwellings and may be massed and designed as either house-form buildings or block-form buildings. Courtyard Buildings in the Hallock Center consist of attached dwelling units arranged around one or more common courtyards, with pedestrian visitor access taken from the courtyard, Primary Street, and/or Side Street. The courtyard is intended to be a semi-public outdoor area that is visible from and accessed from the Primary Street.

**B. Design Guidelines.**

1. Each building should have a clear front entry from the street, which may lead to the dwellings inside by way of a courtyard, garden, or lobby and corridors.
2. Visitor parking – ideally on the street – should be conveniently located near the entry.
3. Resident parking should generally be located behind the buildings. Parking may also be located beside/between buildings, and if so should be screened with a low wall or hedge roughly aligned with the building face at the back of sidewalk.
4. Ground floor units may or may not have their own independent entries from an adjoining street, courtyard, shared garden or "rosewalk."
5. Apartment and courtyard buildings may be up to three stories tall and up to 100 feet wide. In general the facades of wider buildings should be organized into increments of 30 to 40 feet in width, to maintain a small town or village center scale.
6. Recommended frontage types include porch, stoop, forecourt and courtyard.

*Three-story units face a shared courtyard arranged around a fountain.*

*Two-story units face shared courtyard arranged around a fountain and landscaped with potted plants.*

*A three-story urban apartment building facing a large shared courtyard.*

### 6.3.2.2 Commercial Buildings

**A. Description.** These one- to three-story buildings are designed for occupancy by retail, service, and/or office uses. The upper floor may be accessed directly from the street via a stair or through a street-level lobby. Ground floor setbacks between zero and ten feet are recommended for retail uses, with large storefront windows facing a wide sidewalk and on-street parking. Alternatively storefronts may face into forecourts or paseos between buildings.

**B. Design Guidelines.**

1. Facades should generally be designed based on 20 to 35 shopfront bays, with upper floor windows stacked or otherwise organized in relation to the shopfronts.
2. Good quality masonry or smooth plaster is recommended, particularly at the ground floor where pedestrians pass along the building face.
3. Awnings or other projections are recommended above shopfronts, to provide shade for pedestrians and to reduce glare on shopfront windows.
4. Parking should generally be located behind the buildings. Parking may also be located beside/between buildings, and if so should be screened with a low wall or hedge roughly aligned with the building face at the back of sidewalk.
5. The primary visitor entry to upstairs residences or offices should be a prominent element of the street facade.
6. Additional entries for tenants and visitors may also be provided directly from the parking areas.

*A new mixed-use building with ground-floor storefronts that employs pilasters to divide its facade into vertical bays.*

*A three-story mixed-use building designed in a traditional Mediterranean architectural style.*

*A new mixed-use building comprised of simple masses and street-facing windows and entries.*

### 6.3.3. Hallock Center and Civic District Frontage Types

This section describes a range of frontage prototypes that are applicable to the Hallock Center and Civic District. Other types are also allowed, and inventive combinations of the types shown are encouraged. The intention of all frontage types is to provide a varied and attractive streetscape, oriented and scaled particularly to the pedestrian, and to provide an appropriate degree of privacy.

**A. Stoop.** A stair and landing leading directly from the sidewalk or front yard to a building entrance. The ground floor of the building is raised to provide privacy for the rooms facing the public street. This frontage type is ideal for ground floor housing that is near the street.

*Example of a stoop frontage type.*

**B. Dooryard.** An elevated or at-grade garden or terrace in the front yard setback that is enclosed by a low wall located at or near the property line. For raised Door Yards, access from the sidewalk to the Door Yard is via a stair or ramp.

The Door Yard can accommodate patios for residential uses. In addition, the interior building spaces are separated from the adjacent sidewalk by the depth of the Door Yard and in the case of raised Door Yards, by the terrace height.

*Example of a dooryard frontage type.*

**C. Forecourt.** Forecourts are created by setting back a portion of a building's facade, typically the central portion. Forecourts typically provide access to a central lobby of a larger building, but may also be combined with other frontage types that provide direct access to the portions of the facade that are close to the sidewalk. Larger Forecourts may accommodate vehicular access.

**D. Arcade.** Arcades are facades with a ground floor colonnade that supports the upper stories of the building or, for one-story buildings, the roof. Arcades contain ground-floor shopfronts, making them ideal for retail or restaurant use, as the arcade shelters the pedestrian while shading the storefront glass, preventing glare that might obscure views of merchandise.

Vines may be located at the arcade columns and should be planted on grade in vine pockets located between the columns and the property line. Planter boxes or pots may be placed in between the columns to provide enclosure for such uses as cafe seating.

**E. Gallery.** Galleries are facades with ground floor colonnades that support a cantilevered shed roof or a deck that covers the sidewalk. Galleries contain ground floor storefronts, making them ideal for retail use. Railing on top of the gallery is only required if the gallery roof is accessible as a deck.

Landscaping may be located at the gallery columns and if present, should be planted on grade in vine pockets located between the columns and street curb. Planter boxes or pots may be placed in between columns to provide enclosure for such uses as cafe seating, provided that adequate throughway access is maintained.

# 6.4 Architectural Design Guidelines

## 6.4.1 Purpose and Applicability

**A. Purpose and applicability.** The guidelines in this section provide direction for the design of buildings, appurtenances and site elements within the Specific Plan area. The materials, methods, and forms are standard. All other materials, methods, and forms are prohibited, unless explicitly approved in writing through the Development Plan Review process (see Section 4.9.3), based on a finding that they conform to the design intent of this Specific Plan or are otherwise required by law.

B. **Relationship to Urban Guidelines**. The Building Setback and Height Standards in Section 5.4 define the location and massing of buildings and site elements on the lots, focusing on the relationship of the building to the lot, the block and the neighborhood. These Architectural Design Guidelines define the permitted range of architectural design possibilities, ensuring a degree of authenticity and cohesion for the overall urban design.

**C. Range of materials.** Within each style, a range of finish materials - from affordable to fine - are permitted. With any combination of building type and architectural style, the skilled architect will be able to design a wide range of buildings, accommodating a broad range of uses, household types and construction budgets.

1. A key attribute required of all buildings within the Specific Plan area is that they genuinely draw from the pre-1940 tradition of building in the County. Authentic, natural building materials for a building's skin and other visible elements are preferred. These include wood (Note: The use of wood may be approved by the Ventura County Fire District), brick, smooth plaster, stone, tile, slate, and naturally weathering metals, as listed in these Guidelines. Such materials age gracefully, while many synthetic materials do not. Synthetic materials proposed for use within the Specific Plan area will be evaluated and approved for use only if:
   a. The material faithfully simulates the appearance of the natural material it imitates; and
   b. The material has a demonstrated ability to weather gracefully, aging similarly to or better than the natural material it imitates.
2. It is specifically intended that houses within the Specific Plan area not be conventional "tract houses" to which a few "special details" are applied. The scale and detailing of the stylistic elements of the architecture may be appropriate to the chosen architectural style.
3. While most materials and styles are permitted within all zones, it is intended that the Civic District (CD) zone be characterized by heavier materials, such as brick, stone and stucco, while the Neighborhood (N) zone be characterized by a greater use of wood or wood- simulating cementitious boards. Note: The use of wood may be approved by the Ventura County Fire District.

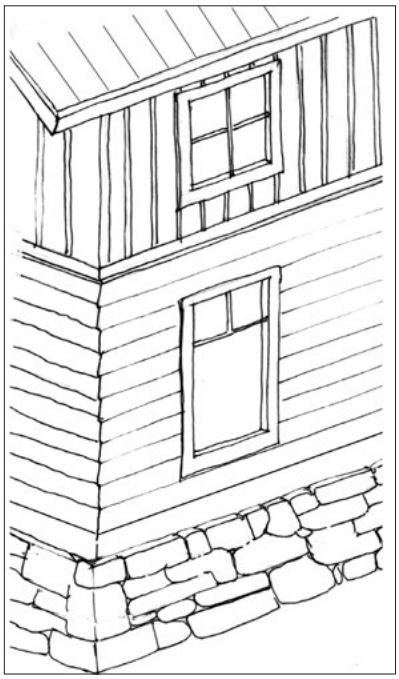
**D. Conflicting requirements.** The materials, configurations and methods in this section apply to buildings, appurtenances and site elements throughout the Specific Plan area.

## 6.4.2 Walls

**A. Materials.**

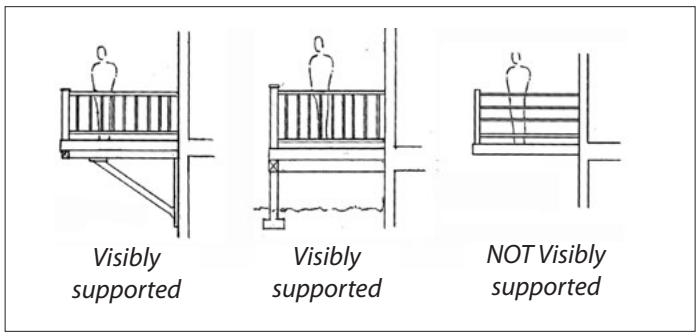
1. Building walls may be clad in wood clapboard, wood shingle, wood drop siding, wood board and batten, stucco, brick or stone. Additionally, walls may be clad in cementitious siding simulating permitted wood materials if approved through the Development Plan Review process (see Section 4.9.3). Note: The use of wood may be approved by the Ventura County Fire District.
2. Building walls may be trimmed in wood, cementitious boards simulating wood, stone, or cast stone.

**Figure 6-1: Vertical Configuration of Materials**



*Lighter materials above heavier ones.*

**Figure 6-2: Visible Support of Projecting Elements**




**B. Configurations.**

1. Two or more wall materials may be combined on one facade only with one above the other - lighter materials above those more substantial (e.g. wood above stucco or masonry, or stucco above masonry). See Figure 6-1.
2. All building elements that project from the building wall by more than 16 inches, including without limitation decks, balconies, porch roofs and bays, may be visibly supported by brackets, posts, or beams that are sized at minimum six inches in nominal width or diameter. See Figure 6-2.
3. Exterior chimneys may be finished in brick, stone, or stucco.
4. Walls clad in wood may be stained or painted with colors approved through the Development Plan Review process (see Section 4.9.3).

10. The undercroft of decks and porches may be enclosed with lattice or vertical pickets.

**C. Methods.**

1. Clapboard cannot exceed six inches to the weather. Shingles may not exceed eight inches to the weather. Drop siding cannot exceed ten inches to the weather. Board and batten cannot exceed twelve inches and four inches to the weather, alternately.
2. Board trim at corners and around openings cannot exceed six inches, except at the front door surround, which may be of any size or configuration approved through the Development Plan Review process (see Section 4.9.3). Board trim may be applied directly to the sheathing.
3. Brick and cut stone may be laid in true bonding pattern.
4. River and rubble stone may be laid in the natural manner, with smooth or beaded mortar joints. Stone for these areas may be cut with a smooth surface or cut with a textured surface (split-faced stone) and may be in a running bond (coursed) or Ashlar style.
5. Brick and cut stone mortar joints may be struck.
6. Stucco may be smooth, semi-smooth and sand finish only.

7. Exposed wood may be painted or stained.

### 6.4.3 Miscellaneous Building Elements

**A. Materials.**

1. Posts and porches may be made of wood.
2. Columns, piers, and arches may be made of or clad in wood, brick, cast stone, or stucco.
3. Foundation piers may be made of brick, stone, or concrete.
4. Stoops may be made of brick, stone, or concrete.
5. Balconies may be made of wood, wrought iron, or metal. Balconies may be open or covered.
6. Porch, balcony and other railings may be made of wood, wrought iron, or metal.
7. Window boxes, if provided, may be made of finished painted wood, and may be supported by visible brackets, detailed in a manner consistent with porch or eave details of the house.
8. Entry coverings may include canvas awnings, or projected shed or gabled roofs supported by brackets made of wood, wrought iron or metal.
9. Bay windows may be made of materials identical to or compatible with the building's wall finish and windows.

**B. Configurations.**

1. Porches may be elevated a maximum of 36" above average adjacent grade.
2. Front porch depth may vary depending on the buildings' architectural style. The porch length may vary but cannot be less than its depth.
3. Stoops may have a minimum depth of 6 feet and a minimum length of 5 feet.
4. Balconies encroaching into the public right-of-way may provide at minimum 10 feet clear in height above the sidewalk. Such balconies may be at least 6 feet deep.
5. Colonnades and arcades may have a depth of 8 feet from the building face to the inside column face; the outside column face may be within 24 to 30 inches from the face of curb. Colonnades and arcades may provide at minimum 10 feet clear in height above the sidewalk.
6. Spindles and balusters on balconies, porches, and decks cannot exceed six inches on center, or as required by the SPMC as may be amended, whichever is less. Standard pipe rails, horizontal and vertical, are prohibited.
7. Bay windows cannot be wider than 8 feet and may have a height that is equal to or greater than its width. Bays may be a minimum of three feet from any building corner or other bay. The bay's street facing facade may consist of at least 50% transparent glazing.
8. All mechanical and electrical equipment - including, without limitation, air-conditioning units, antennas, and satellite dishes - whether roof-mounted, ground-mounted or otherwise, shall be completely screened from public view. Such equipment and related screening may be shown on drawings submitted for Development Plan Review see Section 4.9.3).
9. Parapet walls along the frontage may be articulated with corbelled patterned brick, projected cornices, or projected roofs.
10. There may be a physical demarcation/band separating the Shopfront area from the upper portion of the facade.

**C. Methods.**

1. Foundation piers cannot be less than 12 inches x 12 inches.
2. Masonry and stucco arches (square or round) cannot be less than 12 inches in depth. Piers cannot be less than 12 inches by 12 inches. Wood posts cannot be less than 5-1/2 inches by 5-1/2 inches and may be articulated at their base and top.

### 6.4.4 Roofs

**A. Materials.**

1. Roofs of buildings primarily clad in wood or wood-simulating cementitious siding may be finished with concrete tile or dimensional composition shingles faithfully simulating wood shingles or shakes.
2. Roofs of primarily stucco buildings may be finished with clay tile, concrete tile faithfully simulating clay tile, slate, or dimensional composite shingles simulating slate roofing.
3. Roofs of primarily brick or stone buildings may be finished with clay tile, concrete tile faithfully simulating clay tile, wood shingles, or dimensional composition shingles.
4. Narrow standing seam metal roof may be used if approved through the Development Plan Review process (see Section 4.9.3).
5. Gutters and downspouts may be made of galvanized steel, wood, copper, or painted aluminum.

**B. Configurations.**

1. Building roofs may be gabled or hipped, except for styles where flat roofs are typical. Flat roofs may be accompanied by parapet walls.
2. Shed (monopitch) roofs can only be attached to the principal building walls, with a minimum slope of 2:12.
3. Skylights may be flat (non-bubble) only, and are discouraged within roofs visible from the public way.
4. Dormers may be placed not closer than 36 inches to building sidewalls or another dormer.
5. Gutters may be half-round or ogee.
6. Canvas awnings may cover balconies or shopfronts but only in shed configurations. Quarter sphere or quarter cylinder configurations are prohibited.
7. Parapet walls may be used to conceal flat roof (minimum slope) areas. Parapets may be faced with a pitched roof appropriate to the historic style. Exceptions include Shopfront canopy roofs and bay window roofs, which may have a minimum slope without a parapet.

**C. Methods.**

1. Overhanging eaves may have exposed rafter tails at the tip, or may be finished with a profiled cornice, as shown for each permitted house style herein.
2. Exposed rafter tails may have a minimum nominal dimension of three inches by four inches.
3. Brackets, when provided at eaves, may have a minimal nominal dimension of five inches.

### 6.4.5 Windows and Doors

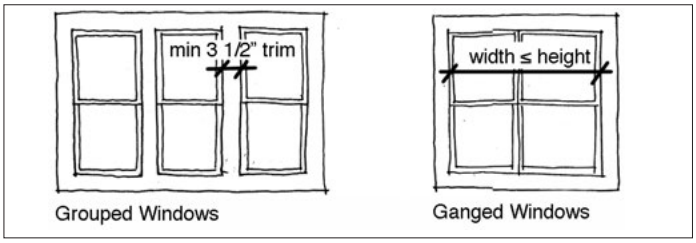
**A. Materials.**

1. Windows and doors may be made of wood, vinyl-clad wood, aluminum-clad wood, fiberglass or metal.
2. Glazing may be clear glass with not more than 10 percent daylight reduction (tinting). Glazing cannot be reflective (mirrored).
3. Windows may have the following accessories: shutters sized to match their openings, opaque canvas awnings (except quarter sphere and quarter cylinder configuration), and planter boxes supported by visible brackets.

**B. Configurations.**

1. Window openings may have vertical proportions, or may be square. See 6-3.
2. Windows may additionally be circular, elliptical, octagonal or hexagonal - recommended maximum two per facade.
3. Total fenestration for facades cannot be more than 33 percent of the facade area, except within shopfronts.
4. Windows may be recessed not less than two inches from the building facade.
5. Garage doors cannot be wider than sixteen feet.

**Figure 6-3: Window Configurations**



**C. Methods.**

1. Windows on facades may be double hung, single hung, or hinged casement. On side or rear elevations, windows may be horizontal sliders to be located at least six feet from the facade. Horizontal sliders are prohibited on the side facades of corner buildings.
2. Circular or hexagonal windows may additionally be pivoted or hopper configuration.
3. Dormer windows may be hinged casement or hopper configuration, or may be fixed.
4. Mullions may be on the exterior of the windows.
5. All windows above the first floor may be of a consistent proportion and arranged in a grid pattern.
6. Doors can only be side hinged, except garage doors facing an alley which may be overhead, and sliding glass doors which may face backyards or sideyards.

### 6.4.6 Shopfronts

Shopfronts are composed of storefronts, entrances, awnings or sheds, signage, lighting, cornices, and other architectural elements (see Figure 6-4: Shopfront Assembly, and Figure 6-5: Storefront Configurations). Shopfronts are created by inserting storefronts with substantial glazing into the ground floor facade of a building. The facade is aligned with the property line, although partially recessed storefronts, such as recessed entrances, are also common. All regulations regarding doors and windows in Section 6.4.5 apply to the doors and windows that are a part of a Shopfront.

**A. Materials**

1. Storefront infill assemblies may be made of painted or varnished wood. When approved by the Director, they may additionally be made of aluminum-clad wood or painted metal.

**B. Configurations**

1. At minimum 50% of the facade area between 2 and 10 feet above the ground floor may consist of transparent fenestration.
2. Shopfronts may be at minimum 10 feet tall. A solid base or bulkhead may be provided with a maximum height of 24 inches above sidewalk grade.
3. A cornice or horizontal band may be provided to differentiate the Shopfront from upper levels of the building. In limited instances where storefronts include entablature trim, the horizontal band may be omitted with the approval of the Director.
4. Storefront infill assemblies may be painted in semi-gloss or matte colors.
4. Awnings and shed roofs are allowed to be incorporated in the shopfront area over entries or storefront assemblies.
5. Lighting may be mounted on the storefront wall, preferably centered on the piers between windows/doors or centered above the windows/doors of the shopfront. In instances where projected shed roofs are used over entries the lighting may be mounted in the underside of the shed element.

**Figure 6-4: Shopfront Assembly**

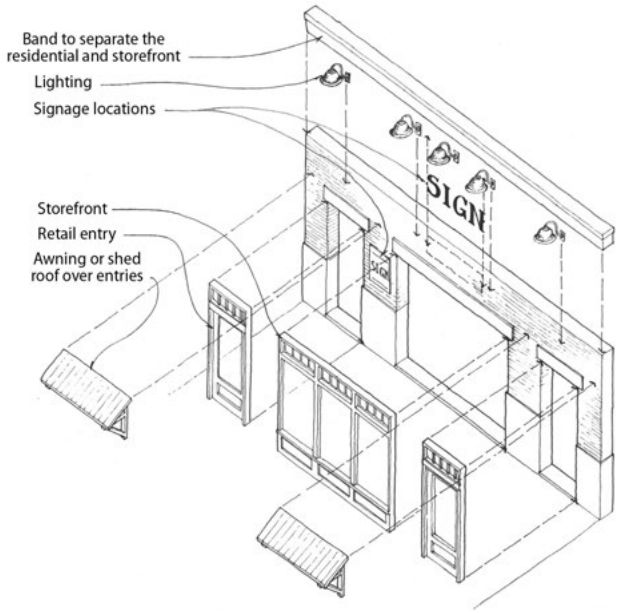
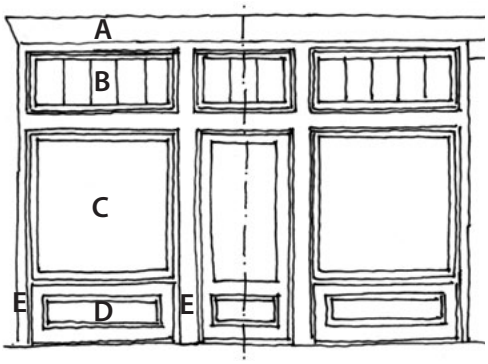


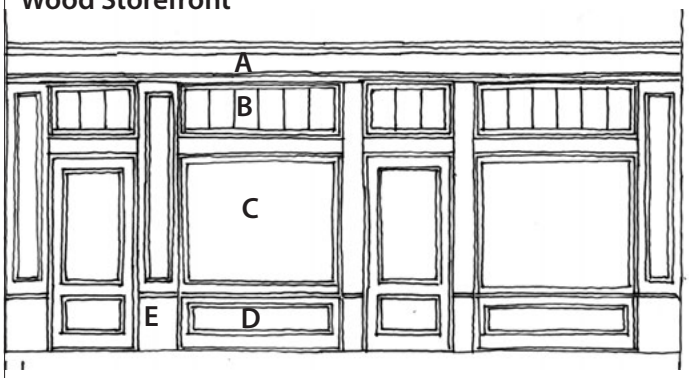
**Figure 6-5: Storefront Configurations**

### Stucco or Masonry Storefront



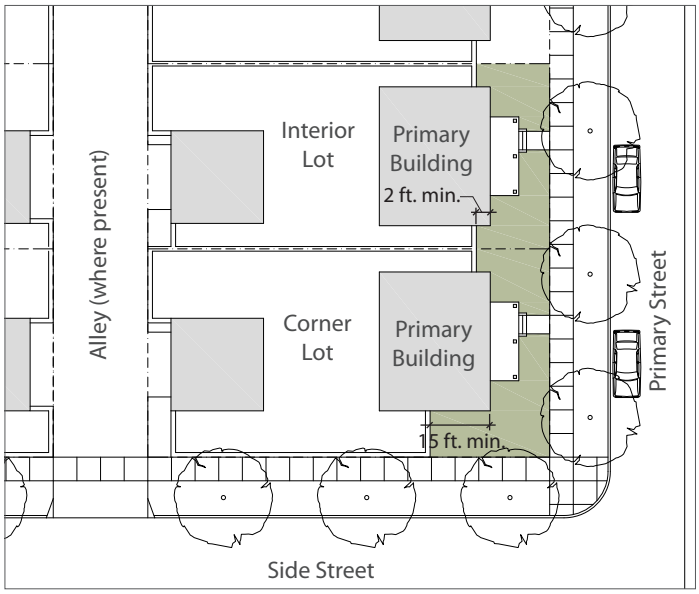

A Header may either be 4 or 5 brick course high, and project out 1 inch from face of the building.
B Transom windows may be equally divided and consistent across the facade.
C Shopfront windows may be equal in size and recessed a minimum of 2 inches from stucco, masonry or wood piers as adjacent materials.
D Base panels or bulkhead cannot exceed 24 inches in height.
E The brick mould may be equal at the top and sides, with interior divisions of equal to or twice the size of the sides.

### Wood Storefront




A Entablature may consist of architrave, frieze and cornice.
B Transom windows may be equally divided and consistent across the facade.
C Shopfront windows may be equal in size and recessed a minimum of 2 inches from stucco, masonry or wood piers as adjacent materials.
D Base panels or bulkhead should not exceed 24 inches in height.
E Pier bases may align with horizontal elements on the shopfront, such as sills.

**Figure 6-6: Fence Height and Placement**




**Legend**

Frontage Setback Area.

## 6.4.7 Fences and Garden Walls

**A. Materials**

1. Garden walls, and retaining walls exposed to public view, should be made of slumpstone blocks or clad in brick, stone,or stucco compatible with the design of the principal building.
2. Fences and trellises should be made of finished wood, vinyl, or wrought iron. Wrought iron fences should have iron posts and/or brick or stone piers.

**B. Configurations**

1. Garden walls cannot be less than six inches wide and capped by a top, overlapping the wall below by not less than 1/2-inch on each side. Exceptions to this requirement may be allowed in accordance with the Development Plan Review process (see Section 4.9.3).

2. Wood and vinyl fences and gates on Frontages may be constructed with vertical pickets or lattice with no more than 3-inch gaps in between. Wrought iron fences and gates may be made of wrought iron, or steel bar that faithfully simulates true wrought iron, with bars with no less than a four-inch space between.
3. Fences built parallel to the frontage between houses or other structures should be set back a minimum two feet behind the facade line, except walls that are an integral part of the architecture of the house, which may be flush with the facade or set back from it as approved through the Development Plan Review process (see Figure 6-6).
4. Wood and vinyl fences at interior side and rear property lines should provide fronts to both sides of the property line ("good neighbor fencing"), for example by alternating members from one side of the fence to the other.
5. Retaining walls within the frontage setback area - and to the line of the side yard enclosing fence or wall - may be made of slumpstone block or clad in materials as specified in these Architectural Design Guidelines. Retaining walls behind the fence line and substantially obscured from views from the public way may be relieved of this requirement.
6. Parking, utilities, trash receptacles and similar service functions and equipment should be screened from public view by opaque walls or fences meeting the requirements of this EA1SP.
8. Trash receptacles should be screened from public view by opaque walls or fences meeting the requirements of these Guidelines and City regulations.
9. Fence and Wall Height:
   a. Fences and garden walls within frontage setback areas may be between 30 inches and 42 inches high (see Figure 6-6). The frontage setback area is defined as the front yard area within the Primary Street setback. For corner lots, the frontage setback area also includes the area between the Primary Building, the Side Street property line, and a distance of fifteen (15) feet behind the Primary Street facing facade line
   b. Rear yard and side yard fences and garden walls behind the frontage setback area may be up to 6 feet high (see Figure 6-6).
   c. Retaining walls along Primary Street and Side Street frontages may be up to three feet high, as approved through the Development Plan Review process (see Section 4.9.3).
   d. Parking lots that abut and/or are visible from street views should be screened by a wall or fence 36" to 48" in height, enhanced with landscaping.

### 6.4.8 Signage

**A. Sign design.** The following design criteria should be used in reviewing the design of individual signs. Substantial conformance, as determined by the Director, with each of the following design criteria is required before a sign permit or Building Permit can be approved.

1. Color. Colors on signs and structural members may be harmonious with one another and relate to the dominant colors of the buildings on the site. Contrasting colors may be utilized if the overall effect of the sign is still compatible with building colors.
2. Design and construction.
   a. Except for banners, flags, temporary signs, and temporary window signs conforming with the requirements of this section, each sign may be constructed of permanent materials and may be permanently attached to the ground, a building, or another structure by direct attachment to a rigid wall, frame, or structure.
   b. Each permanent sign may be designed by a professional (e.g., architect, building designer, landscape architect, interior designer, or others whose principal business is the design, manufacture, or sale of signs), or who is capable of producing professional results.

c. Each permanent sign may be constructed by persons whose principal business is building construction or a related trade including sign manufacturing and installation, or others capable of producing professional results. The intent is to ensure public safety, achieve signs of careful construction, with neat and readable copy, and durability, to reduce maintenance costs and prevent dilapidation.

3. Materials and structure.

   a. Sign materials (including framing and supports) may be representative of the type and scale of materials used on the site where the sign is located. Sign materials may match those used on the building(s) on site and any other signs on the site.

   b. Signs should not include reflective material.

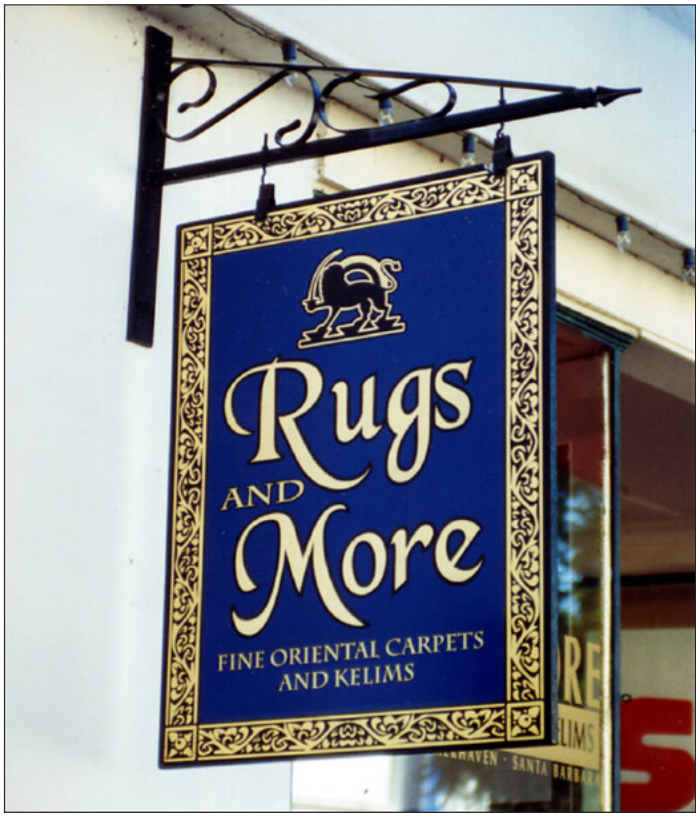
   c. Materials for permanent signs may be durable and capable of withstanding weathering over the life of the sign with reasonable maintenance.

   d. The size of the structural members (e.g. columns, crossbeams, and braces) may be proportional to the sign panel they are supporting.

4. Street address. The Fire Chief or Director may require that a sign include the street address of the site, where it determines that public safety and emergency vehicle response would be more effectively served than if the street address were displayed solely on one or more buildings on the site.

5. Copy design guidelines. The Planning Department does not regulate the message content (copy) of signs. However, the following principles of copy design and layout are identified to enhance the readability and attractiveness of signs. Copy design and layout should be reviewed by Planning for consistency with these principles.

   a. Sign copy relates only to the name and/or nature of the business or commercial center.




*Examples of projecting signs*

b. Copy is conveyed briefly or by logo, symbol, or other graphic manner to increase the readability of the sign and thereby enhance the identity of the business.

c. The area of letters or symbols does not exceed 40 percent of the background area in commercial districts or 60 percent in residential districts.

d. Freestanding signs contain the street address of the parcel or the range of addresses for a multi-tenant center.

6. Sign lighting. Sign lighting may be designed to minimize light and glare on surrounding rights-of-way and properties.

a. External light sources should be directed and shielded so that they do not produce glare off the site, on any object other than the sign.

b. Sign lighting should not blink, flash, flutter, or change light intensity, brightness, or color.

c. Colored lights should not be used at a location or in a manner so as to be confused or construed as traffic control devices.

d. Neither the direct nor reflected light from primary light sources should create hazards for pedestrians or operators of motor vehicles.

e. For energy conservation, light sources may be hard-wired fluorescent or compact fluorescent lamps, or other lighting technology that is of equal or greater energy efficiency. Incandescent lamps are prohibited.

**B. Sign maintenance.**

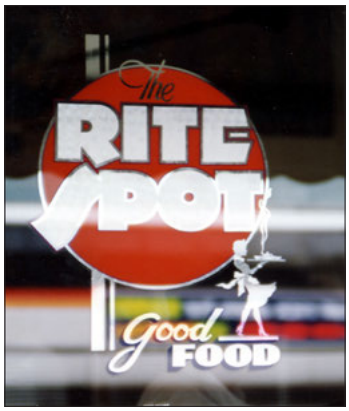
1. Each sign and supporting hardware, including temporary signs and awning signs, may be maintained in good repair and functioning properly at all times. Any damage to a sign or its illumination, including the failure of illumination may be repaired within 14 days from the date of damage or failure.

2. A repair to a sign may be of materials and design of equal or better quality as the original sign.

3. When an existing sign is removed or replaced, all brackets, poles, and other supports that are no longer required may be removed.

**C. Sign Guidelines by Zone.** Signs are allowed within the Neighborhood (N), Hallock Center (HC) and Civic District (CD) zones. Each sign may comply with the guidelines provided in Table 6-1.

*Example of a wall mounted sign*



*Examples of window signs*

**Table 6-1: Sign Guidelines**

**Residential**

| Allowed Sign Types | Maximum Sign Height | Maximum Number of Signs Allowed per Parcel | Maximum Sign Area Allowed per Parcel | Notes |
|---|---|---|---|---|
| Wall or freestanding | Wall signs: below edge of roof; Freestanding: 48 in. | 1 of either allowed type per entrance or street frontage | 12 sf each; 24 sf total all signs | |

**Non-Residential**

| Allowed Sign Types | Maximum Sign Height | Maximum Number of Signs | Maximum Sign Area | Notes |
|---|---|---|---|---|
| Awning | Should be entirely on awning valence; lettering max 66% of valence height; valence height max 18 inches. | 1 sign max per each separate awning valence. | 50% of the area of the valence front. | |
| Projecting or Suspended | 16 inches. Bottom of sign should be no closer than 8 ft above side-walk surface below. | 1 sign allowed per business frontage with pedestrian entrance | 6 sf No dimension greater than 3 ft | Sign may be redwood sandblasted, hand carved, or architecturally designed equivalent. |
| Wall | 2 ft below parapet or eave. Individual letters 18 inches; | 1 sign allowed per business frontage with pedestrian entrance. | 1 sf per lf of primary business frontage Side street or rear entrance wall sign max 50% of the pri-mary sign area. | Mounting 1-story: above 1st floor windows Mounting multi-story: between windows |
| Window - Permanent | Within window area | 1 sign allowed per window | 15% of total window area. | |
| Window - Temporary | Within window area | 1 sign allowed per window (in addition to Permanent Window sign, if exists) | 25% of total window area. | Allowed for display a maxi-mum of 15 days at 1 time, up to 3 times in 12-month period. |

This page intentionally left blank.

*This page intentionally left blank.*

# APPENDIX A

## Approved Administrative Modifications

*This page intentionally left blank.*

| ADMINISTRATIVE MODIFICATIONS<br>APPROVED THROUGH FEBRUARY 2018 | | | |
|---|---|---|---|
| **Modification** | **Date** | **Section** | **Comments / Actions** |
| (1) Revise bridge cross section and extend Class I Bike Lane East of Bridge | 4/7/2016 | SP - 5.6.7 | Public Works Approved the extension of the Bike Lane with crossing to the park at Park Loop Rd (Now Harvest Loop) 6' walkway on the north side, two (2) 15' travel lanes, and a 12' class I bike lane on the south side of the bridge, for a total ROW of 48' to meet with existing City & County bike lanes. |
| (2) Haun Creek Drive (Now Autumn Path Lane) Cross Section Revisions. Also street changed from public street to private street | 4/7/2016 | SP - 5.6.10 | Tree Wells to be used in lieu of tree planters in gravel shoulders. Multi-Use Trail will now be curb adjacent. Trees within Haun Creek Linear Park will be located in back of multi-use trail with minimum spacing of 75' on center. The street was also changed to a cul-de-sac with no connection to Foothill Collector. |
| (3) A portion of Palm Lane (Now Limoneira Lane) was changed from a public street to a private street. | 4/7/2016 | SP - 5.6.11 | Palm Lane, from Haun Creek Drive to Park Blocks was change to a private street. |
| (4) Hallock Parkway Right-of-Way Width and Cross Section Revision | 6/23/2016 | SP - 5.6.5 | Curb adjacent parking eliminated. Right-of-Way reduced from 120' to 104'. Cross Section is now 16' median, 30 travel lanes, 8' parkways, 6' sidewalks. |
| (5) Neighborhood Streetlight Spacing | 8/23/2016 | SP - 5.6.19 | Spacing will be determined by photometric study to be reviewed and approved by Public Works Department |
| (6) Water reservoir locations, size and types were modified. | 8/23/2016 | SP - 3.3 | The 3MG tank will now be a pre-stressed concrete structure which will be partially buried. The 2 MG reservoir was reduced to 1.5 MG and the location was moved to northwest of the 3MG reservior due to geologic constraints. |
| (7) Roundabout Harvest Loop/Santa Paula Street | 2/23/2017 | SP - 5.6.10 10'-12' min parkway 5.6.15 8' min parkway 5.6.17 Trail II | For peds/bikes to allow for a 12' trail, expansion from 10' trail. 8' parkway at roundabout, 10'-12' parkway down to Santa Paula Street will be amended to be 8'. |
| (8) Street Light Standard | 2/23/2017 | SP - 5.6.19 | Where street lights required to be placed in areas that will be altered with future development in the near future, standard street lights will be placed on Telegraph Road in lieu of Nostalgic Street light poles as required in the Specific Plan. |
| (9) Hallock Drive Cross Section Change | 9/7/2017 | SP - 5.6.5 | Amend to 4'-8" parkway, 5' sidewalk, and 1'-2" planter for vines from 4'x4' tree wells and 14' walkways |
| (10) Cluster Product Drive Approach | 2/1/2018 | SP - 6.2.1.4 | Public Works Approves a 24' Drive Approach for cluster product. |

## EXHIBIT B

General Plan Amendments. City Council approves the following amendments to the 2040 General Plan.

A. The introductory paragraphs under subheading ”Specific Plans” and the description of the “SP-3 East Area 1 Specific Plan” on Page 2-32 of the Land Use Element of the 2040 General Plan is amended as follows (where ~~stricken~~ text denotes deletions, and underlined text additions):

“**Specific Plans and Expansion Areas**

**Specific Plans**

A specific plan is a regulatory tool that local governments use to guide development in a localized area and to systematically implement the General Plan. Specific plans contain detailed development standards, distribution of land uses, infrastructure requirements, and implementation measures for the development of a specific geographic area.

The City requires specific plans for all expansion areas prior to development, except for annexations of minor acreage within areas that are already substantially developed. Details regarding siting, design, infrastructure, provision of open space, and financing are established through the specific plans. Each specific plan must address locations for land uses identified by the Land Use Element, as well as mitigation of environmental impacts and design standards for new development.

As of ~~2019~~ 2024 the following specific plans have been adopted. The locations of these specific plans are shown in **Figure 2-1** (page 2-20). Development regulations for these areas are established within each specific plan as summarized below.

**SP-3 East Area 1 Specific Plan**. East Area 1 encompasses approximately 501 acres located east of Santa Paula Creek, west of Haun/Orcutt Creeks, south of the Topatopa Mountains, and north of Telegraph Road. At buildout, the Specific Plan anticipates ~~1,500~~ 2,050 residential units, 25,000 square feet of light industrial, ~~215,000~~ 10,000 square feet of commercial, and ~~20.2~~ 8.3 acres of institutional uses. ~~Public facilities to be provided include a police substation, an elementary school, a high school, and a post-secondary institution/community college~~. These 8.3 acres are set aside as a site for school facilities for use by the Santa Paula Unified School District. A total of 225.3 acres of open space will also be provided, including agricultural preserve, open space preserve, parks/greenways and public athletic fields.[6]”

B. Footnote 6 on Page 2-32 of the Land Use Element of the 2040 General Plan is amended as follows (where stricken text denotes deletions, and underlined text additions):

"6 East Area 1 Specific Plan, Table 2-1 (~~January 2015~~ February 2024)"

C. The second to the last paragraph of Subsection 1, Overview, of Section E, Education, on page 6-13 of the Public Services and Utilities Element of the 2040 General Plan is amended as follows (where stricken text denotes deletions, and underlined text additions):

> "~~The East Area 1 Specific Plan identifies a site for a K-8 school centrally located in the Specific Plan area. The Specific Plan also designates land in the Civic District for additional high school facilities. The high school site adjoins planned public athletic fields.~~ The East Area 1 Specific Plan identifies a site for a future Santa Paula Unified School District facility centrally located in the Specific Plan area. Under California law, public school districts are independent of city governments; however, cooperation between school districts and cities is required in the planning, design and construction of new schools, school facilities, major additions to existing school facilities, and recreation and park facilities in the community."

# ATTACHMENT D

Applicant Fiscal Impacts Analysis

STANLEY R. HOFFMAN ASSOCIATES

11661 San Vicente Boulevard Suite 306
Los Angeles, California 90049
310.820.2680, 310.820.8341 fax
www.stanleyrhoffman.co

# Memorandum

**To:** David Lauletta, Vice President - Regional Planned Communities
Lewis Management Corporation

**From**: Bravish Mallavarapu, Director and Principal Economist

**Date:** June 30, 2023

**Subject:** ***Harvest at Limoneira Projected Fiscal Impacts and Assumptions***

**SRHA Job No.:** 1391

This memorandum is an update to the analysis prepared previously in March 2022 presenting the projected fiscal impacts to the City of Santa Paula for Harvest at Limoneira and the assumptions for the projected impacts. Harvest at Limoneira includes the combined annexed areas formerly known as East Area 1 and Santa Paula Gateway Project (East Area 2). The following fiscal analysis is based on the current land use phasing for Harvest at Limoneira and a new 35-acre sports park.

## Fiscal Impacts

**Table 1** summarizes the projected cumulative fiscal impacts to the City for Harvest at Limoneira. Table 1 also includes estimated net new street maintenance costs; as well as the projected net City benefits when these new obligations are subtracted from the projected surplus for Harvest at Limoneira. Based on the current development agreement, it is assumed that approximately two-thirds of the sports park maintenance costs would be borne by the city with the balance by the School District. Compared to the 2016 study, **the study area has undergone a major reallocation of property tax revenues**, with the City General Fund share decreasing from 16.06% to 3.84% of the 1% property tax, while a newly created allocation for the Ventura County Fire District now receives 14.44% share of the 1 percent property tax.

**Table 1**
**Summary of Phased Projected Fiscal Impacts**
**Harvest at Limoneira Fiscal Analysis, City of Santa Paula**
(In Constant 2023 Dollars)

| Category | 1<br>2023 | 2<br>2024 | 3<br>2025 | 4<br>2026 | 5<br>2027 | 6<br>2028 | 7<br>2029 | 7-Year Total<br>Undiscounted |
|---|---|---|---|---|---|---|---|---|
| **A. HARVEST AT LIMONEIRA GENERAL FUND CUMULATIVE FISCAL IMPACTS** | | | | | | | | |
| Recurring Revenues | $970,821 | $1,184,109 | $2,316,050 | $3,287,003 | $3,879,684 | $4,317,370 | $4,725,025 | $20,680,062 |
| Recurring Costs | 682,513 | 842,046 | 1,197,989 | 1,871,065 | 2,347,138 | 2,729,422 | 3,019,280 | $12,689,455 |
| ***GENERAL FUND CUMULATIVE SURPLUS (CS)*** | **$288,307** | **$342,062** | **$1,118,061** | **$1,415,938** | **$1,532,546** | **$1,587,948** | **$1,705,745** | **$7,990,607** |
| ***General Fund Revenue to Cost Ratio*** | **1.42** | **1.41** | **1.93** | **1.76** | **1.65** | **1.58** | **1.56** | |
| *Cumulative Housing Units* | 586 | 707 | 957 | 1,557 | 1,855 | 2,109 | 2,348 | |
| *Cumulative Non-Residential Square Feet* | 0 | 0 | 130,000 | 461,560 | 461,560 | 461,560 | 461,560 | |
| ***MINUS*** | | | | | | | | |
| **B. NET NEW CITY CUMULATIVE FISCAL OBLIGATIONS** | | | | | | | | |
| Two-Thirds of New Sports Park Maintenance | $0 | $0 | $608,653 | $608,653 | $608,653 | $608,653 | $608,653 | $3,043,265 |
| New Street Maintenance Obligation (net Gas Tax) | 63,022 | 52,630 | 58,564 | 29,073 | 1,020 | (20,794) | (41,320) | $142,196 |
| LESS CFD No. I IA-A Special Tax B @ $93 per unit | (54,498) | (65,751) | (89,001) | (121,551) | (144,801) | (168,423) | (190,650) | (834,675) |
| ***TOTAL NET NEW CITY CUMULATIVE OBLIGATIONS (CO)*** | **$8,524** | **($13,121)** | **$578,216** | **$516,175** | **$464,872** | **$419,436** | **$376,683** | **$2,350,786** |
| ***EQUALS*** | | | | | | | | |
| **C. NET CITY CUMULATIVE FISCAL BENEFIT (CS-CO)** | **$279,783** | **$355,183** | **$539,845** | **$899,763** | **$1,067,674** | **$1,168,512** | **$1,329,062** | **$5,639,821** |
| **D. VENUTRA COUNTY FIRE DISTRICT** | | | | | | | | |
| Property Tax (14.4 % of 1% Property Tax) | **$575,602** | **$694,455** | **$1,053,073** | **$1,592,954** | **$1,928,684** | **$2,173,015** | **$2,399,257** | **$10,417,040** |

Sources: Stanley R. Hoffman Associates, Inc.
City of Santa Paula, Adopted *Revenue and Expenditure Report, Fiscal Year 2022-2023*
Lewis Management Company

**Harvest at Limoneira General Fund Cumulative Fiscal Impacts.** As shown in Panel A of Table 1, a recurring surplus to the City General Fund is projected for all years of development and after buildout of the Harvest at Limoneira project. The Year 1 surplus of about $288,307 increases to the projected surplus of about $1.705 million at buildout in Year 7. **The total projected cumulative surpluses over the 7-Year period are about $7.99 million in undiscounted dollars.** This updated analysis does not include the property tax revenues foregone by the City General Fund now accruing to the Ventura County Fire District, and therefore, also does not include fire services costs.

**Net New City Cumulative City Fiscal Obligations.** Panel B of Table 1 presents the City's projected annual obligations for approximately two-thirds share of operations and maintenance costs for the new sports park in Harvest at Limoneira, the City's net new obligation for public street maintenance offset by projected state gasoline tax from the project, and net revenues collected by the City from CFD No. I IA-A Special Tax B used for landscape maintenance, tree maintenance, streetlights, and catch basins.

Accounting for the above, City net new obligations are projected at $8,524 in Year 1 and increase to $376,683 at buildout. The total City net new obligations over the 7-Year period are projected at about $2.35 million in undiscounted dollars. This accounts for $834,675 in CFD revenues over this period.

In Year 3, with the City's approximately two-thirds O&M cost share of the new sports park (or about 23.33 acres), the City's sports park obligation is estimated at $608,653 for the remainder of the 7-Year period. The total City obligations over the 7-Year period for the sports park are projected at about $3.04 million in 2023 undiscounted dollars. According to the project development agreement, the sports park is the joint responsibility between the City and School District, and therefore the balance one-third of sports park O&M costs are borne by the School District.

Net annual street maintenance costs are estimated at $63,022 in Year 1 and continue to decline over the 7-year period as the State Gas tax increases constantly with population growth, and offsets increasing portions of these street maintenance costs. Gas tax offsets these costs completely after Year 5. Cumulatively, net City obligations for street maintenance over the 7-year period are projected at about $142,196 in undiscounted 2023 dollars.

**Net City Cumulative Fiscal Benefit**: As shown in Panel C of Table 1, when the Harvest at Limoneira revenue surplus is matched against the City obligations, net City benefits are projected throughout the development-period and at buildout. *The lowered share of City General Fund property tax revenue from tax rate area (TRA) reallocations between the City and the Ventura County Fire District since 2016, has the effect of reducing overall property tax revenues relative to projected development-related costs.* The net benefits increase from $279,783 in Year 1 to $1.33 million at buildout. **The total net City benefit over the 7-year period is projected at $5.64 million in undiscounted dollars.**

**Ventura County Fire District**: As shown in Panel D of Table 1, a large portion of the property tax revenues previously going to the City General Fund prior to the TRA reallocations now accrues to the Ventura County Fire District. These revenues increase from about $575,602 in Year 1 to $2.34 million by Year 7 for a cumulative 7-year total of $10.42 million in undiscounted dollars.

**Detailed Fiscal Impacts.** Table 2 presents the detailed projected cumulative fiscal impacts to the City General Fund, the new City cumulative fiscal obligations and the net City cumulative fiscal benefit of Harvest at Limoneira.

## Table 2
## Detailed Projected Phased Fiscal Impacts
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula
(In Constant 2023 Dollars)

| Category | 1<br>2023 | 2<br>2024 | 3<br>2025 | 4<br>2026 | 5<br>2027 | 6<br>2028 | 7<br>2029 | Percent of Buildout |
|---|---|---|---|---|---|---|---|---|
| **A. HARVEST AT LIMONEIRA GENERAL FUND CUMULATIVE FISCAL IMPACTS** | | | | | | | | |
| **General Fund Annual Recurring Revenues** | | | | | | | | |
| Property Tax | $153,008 | $184,602 | $279,931 | $423,443 | $512,688 | $577,637 | $637,777 | 13.5% |
| Residential Property Transfer Tax: | | | | | | | | |
| Initial Sale | 404 | 1,358 | 3,362 | 4,526 | 3,835 | 2,791 | 2,584 | 0.1% |
| Turnover | 6,575 | 7,933 | 11,295 | 15,821 | 19,656 | 22,447 | 25,031 | 0.5% |
| Property Tax in Lieu of VLF [1] | 453,523 | 559,127 | 849,207 | 1,328,905 | 1,627,209 | 1,844,303 | 2,045,325 | 43.3% |
| Retail Sales and Use Tax (On-Site and Off-Site) | 109,037 | 131,552 | 447,568 | 582,842 | 646,440 | 692,724 | 735,581 | 15.6% |
| Non-Retail Sales and Use Tax | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0% |
| Franchise Fee Tax | 52,327 | 63,132 | 87,817 | 130,209 | 159,376 | 182,057 | 203,399 | 4.3% |
| Transient Occupancy Tax | 0 | 0 | 306,600 | 306,600 | 306,600 | 306,600 | 306,600 | 6.5% |
| Business License Tax | 0 | 0 | 3,413 | 16,959 | 16,959 | 16,959 | 16,959 | 0.4% |
| Animal Licenses | 935 | 1,129 | 1,517 | 2,065 | 2,586 | 2,992 | 3,373 | 0.1% |
| Fines and Forfeitures | 6,081 | 7,337 | 10,206 | 15,132 | 18,522 | 21,158 | 23,638 | 0.5% |
| Rents and Concessions | 12,048 | 14,536 | 19,540 | 26,600 | 33,316 | 38,538 | 43,452 | 0.9% |
| Other Revenue from Other Agencies | 22,244 | 26,837 | 36,076 | 49,111 | 61,510 | 71,151 | 80,223 | 1.7% |
| Charges for Recurring Services | 59,628 | 71,940 | 100,069 | 148,375 | 181,611 | 207,457 | 231,776 | 4.9% |
| Other Revenues | 1,957 | 2,361 | 3,285 | 4,871 | 5,962 | 6,810 | 7,608 | 0.2% |
| Overhead Transfers In | 93,052 | 112,266 | 156,163 | 231,546 | 283,414 | 323,748 | 361,699 | 7.7% |
| **Total Recurring Revenues** | **$970,821** | **$1,184,109** | **$2,316,050** | **$3,287,003** | **$3,879,684** | **$4,317,370** | **$4,725,025** | **100.0%** |
| **General Fund Annual Recurring Costs** | | | | | | | | |
| General Government | $149,716 | $184,711 | $262,791 | $410,437 | $514,868 | $598,726 | $662,309 | 21.9% |
| Police | 435,833 | 525,826 | 731,431 | 1,084,506 | 1,327,442 | 1,516,352 | 1,694,107 | 56.1% |
| Fire [2] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0% |
| Buildings and Grounds Maintenance | 51,226 | 61,804 | 85,970 | 127,470 | 156,024 | 178,227 | 199,120 | 6.6% |
| Street Maintenance | 4,534 | 4,534 | 5,607 | 5,607 | 5,607 | 5,607 | 5,607 | 0.2% |
| Other Public Works | 35,073 | 42,316 | 58,861 | 87,275 | 106,825 | 122,028 | 136,332 | 4.5% |
| Neighborhood Parks Maintenance | 0 | 0 | 0 | 55,800 | 111,600 | 167,400 | 167,400 | 5.5% |
| Building & Safety | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0% |
| Planning | 2,250 | 9,814 | 27,095 | 56,771 | 77,190 | 93,068 | 108,008 | 3.6% |
| Community Services | 3,880 | 13,042 | 26,233 | 43,199 | 47,582 | 48,013 | 46,396 | 1.5% |
| **Total Recurring Costs** | **$682,513** | **$842,046** | **$1,197,989** | **$1,871,065** | **$2,347,138** | **$2,729,422** | **$3,019,280** | **100.0%** |
| **HARVEST AT LIMONEIRA** | | | | | | | | **7-Year Total Undiscounted** |
| **GENERAL FUND CUMULATIVE SURPLUS (CS)** | **$288,307** | **$342,062** | **$1,118,061** | **$1,415,938** | **$1,532,546** | **$1,587,948** | **$1,705,745** | **$7,990,607** |
| **GENERAL FUND REVENUE TO COST RATIO** | **1.42** | **1.41** | **1.93** | **1.76** | **1.65** | **1.58** | **1.56** | |
| *Cumulative Housing Units* | *586* | *707* | *957* | *1,557* | *1,855* | *2,109* | *2,348* | |
| *Cumulative Non-Residential Square Feet* | *0* | *0* | *130,000* | *461,560* | *461,560* | *461,560* | *461,560* | |
| ***MINUS*** | | | | | | | | **7-Year Total Undiscounted** |
| **B. NEW CITY CUMULATIVE FISCAL OBLIGATIONS** | | | | | | | | |
| Two-Thirds of New Sports Park Maintenance [3] | $0 | $0 | $608,653 | $608,653 | $608,653 | $608,653 | $608,653 | **$3,043,265** |
| *plus* | | | | | | | | |
| New Net Street Maintenance Costs | | | | | | | | |
| Street Maintenance Costs [4] | $113,349 | $113,349 | $140,186 | $140,186 | $140,186 | $140,186 | $140,186 | $927,629 |
| (LESS) State Gasoline Tax Revenue [5] | ($50,327) | ($60,719) | ($81,622) | ($111,113) | ($139,166) | ($160,980) | ($181,506) | ($785,433) |
| Net New Street Maintenance Obligation | $63,022 | $52,630 | $58,564 | $29,073 | $1,020 | ($20,794) | ($41,320) | $142,196 |
| *equals* | | | | | | | | |
| (LESS) CFD No. I IA-A Special Tax B Revenue @ $93 per unit [6] | ($54,498) | ($65,751) | ($89,001) | ($121,551) | ($144,801) | ($168,423) | ($190,650) | ($834,675) |
| *equals* | | | | | | | | |
| **TOTAL NEW CITY CUMULATIVE OBLIGATIONS (CO)** | **$8,524** | **($13,121)** | **$578,216** | **$516,175** | **$464,872** | **$419,436** | **$376,683** | **$2,350,786** |
| ***EQUALS*** | | | | | | | | **7-Year Total Undiscounted** |
| **C. NET CITY CUMULATIVE FISCAL BENEFIT (CS-CO)** | **$279,783** | **$355,183** | **$539,845** | **$899,763** | **$1,067,674** | **$1,168,512** | **$1,329,062** | **$5,639,821** |
| **D. VENUTRA COUNTY FIRE DISTRICT** | | | | | | | | **7-Year Total Undiscounted** |
| Property Tax (14.4 % of 1% Property Tax) | **$575,602** | **$694,455** | **$1,053,073** | **$1,592,954** | **$1,928,684** | **$2,173,015** | **$2,399,257** | **$10,417,040** |

Note: 1. Property tax in-lieu of the Vehicle License Fee (PTVLF) is based on cumulative increase of new valuation since project inception.
2. Based on the Tax Rate Area (TRA) allocations for the study area, Fire Services provided by the Ventura County Fire District are funded directly by a share of 14.4 percent of the 1 percent property tax, and not by the City General Fund.
3. Based on the project development agreement, the operations and maintenance (O&M) costs of the sports park is a shared responsibility between the City and the school district. It is assumed that the City is responsible for approximately two-thirds of the O&M costs, with the balance one-third borne by the school district.
4. O&M costs for streets obtained from the 2016 study adjusted for inflation for 2023.
5. State gasoline tax is earmarked for road related expenditures.
6. East Area 1 falls within the boundaries of CFD No. 1 IA-A, and will be charged "Special Tax B" at $93 per residential unit for landscape maintenance, tree maintenance, street lights, and catch basins.

Sources: Stanley R. Hoffman Associates, Inc.
City of Santa Paula, Adopted *Revenue and Expenditure Report, Fiscal Year 2022-2023*
Lewis Management Company

## Development Description

**Table 3** presents the development description after buildout for Harvest at Limoneira. The phased units, population, non-residential square feet, employment, park acres and road square feet are included in **Table 4**.

**Acres.** Harvest at Limoneira includes approximately 632.7 gross acres, with about 547.9 gross acres located in East Area 1 and about 84.9 acres located in the Santa Paula Gateway Project.

**Residential Development.** As shown in Panel B of Table 3, Harvest at Limoneira includes a total of 2,348 residential units with an estimated population of 7,032 after buildout. East Area 1 includes a total of 2,050 units (1,750 single family units and 300 apartments), while East Area 2 includes a total of 298 units (250 apartments, including 50 active adult units, and 48 townhomes).

**Non-Residential Development.** Harvest at Limoneira, East Area 2, includes a total of 461,560 square feet, including supermarket and GAFO retail (Area B), 100-room hotel (Area C), and hospital, medical and general office, and an assisted living center (Area D), as shown in Panel C of Table 3. Total employment generated by these uses is estimated at 1,093 after buildout.

**Publicly Maintained Infrastructure.** As shown in Panel E of Table 3, a total of 674,160 square feet of publicly maintained streets are estimated for the total Harvest at Limoneira project after buildout, with about 81 percent of the new roadways located in East Area 1. About 8.37 acres of neighborhood parks are in East Area 1 after buildout. Also, a 35-acre community sports park is planned in East Area 1, with the City responsible for approximately two-thirds and the School District for the balance one-third O&M costs, according to the project development agreement.

## Assessed Valuation and Property Tax After Buildout

**Table 5** includes the estimated assessed valuation, General Fund property tax and General Fund property tax in lieu of VLF for Harvest at Limoneira.

**Assessed Valuation.** Values per unit are provided by the developer. As shown in Panel B of Table 5, residential valuation in East Area 1 is estimated at about $1.35 billion after buildout. Combined with the estimated residential and non-residential valuation in East Area 2 of $309.19 million, total Harvest at Limoneira valuation after buildout is estimated at about $1.54 billion. For East Area 1, when the estimated assessed valuation <u>at project inception</u> of $45.12 million is subtracted from the new overall project valuation, net new valuation (since project inception) is estimated at about $1.31 million. For East Area 2, when the current assessed valuation of $22.25 million, in constant 2023 dollars, from the County Assessor 2020-2021 tax roll is subtracted from the new valuation, net new valuation is estimated at about $286.93 million at project buildout (development projected to commence starting 2025).

**Property Tax.** Based on the total assessed valuation, the one percent property tax levy is projected at about $16.61 million after buildout. Based on the tax rate area in which the project is located, the City General Fund receives about 3.84 percent of the basic one percent levy for a total of $637,777 after buildout.

**Property Tax in Lieu of VLF.** As part of the State's 2004-2005 budget agreement, the State began to allocate property tax revenues to cities and counties to offset the State reduction of VLF. Property tax in lieu of VLF is projected based on the net increase in assessed valuation from the proposed project since inception, which is estimated at the Citywide average of $1,283 per million of new assessed valuation. Based on this assumption and the project's net assessed valuation increase, projected property tax in lieu of VLF is projected at about $1.68 million for EA1 and $368,263 for EA2 after buildout for a total of $2.05 million for Harvest at Limoneira.

**Table 3**
**Development Summary After Buildout**
**Harvest at Limoneira Fiscal Analysis, City of Santa Paula**

| Category | | East Area 1 (EA1) | Santa Paula Gateway (EA2) | TOTAL HARVEST AT LIMONEIRA |
|---|---|---|---|---|
| **A. Gross Acres** | | 547.9 | 84.9 | 632.7 |
| **B. Residential Development** | | | | |
| **Residential Units** | | | | |
| Single Family Units | | 1,750 | 48 | 1,798 |
| Apartments | | 300 | 250 | 550 |
| ***TOTALS*** | | **2,050** | **298** | **2,348** |
| **Population** | **Persons Per Household** | | | |
| Single Family (incl. Townhomes) | 3.33 | 5,823 | 160 | 5,983 |
| Apartments | 1.91 | 572 | 477 | 1,049 |
| | | **6,395** | **637** | **7,032** |
| **C. Non-Residential Development** | | | | |
| **Non-Residential Square Feet** | | | | |
| Super Market (EA2 -B) | | 0 | 30,000 | 30,000 |
| GAFO Retail (EA2-B) | | 0 | 55,000 | 55,000 |
| 100 Room Hotel (EA2-C) | | 0 | 45,000 | 45,000 |
| Hostpital Uses (EA2-D) | | 0 | 160,560 | 160,560 |
| Medical Office (EA2-D) | | 0 | 71,500 | 71,500 |
| Future Pad (Office Use) (EA2-D) | | 0 | 9,500 | 9,500 |
| Assisted Living (EA2-D) | | 0 | 90,000 | 90,000 |
| Total Square Feet | | 0 | 461,560 | 461,560 |
| **Employment** | **Square Feet Per Employee** | | | |
| Super Market (EA2 -B) | 500 | 0 | 60 | 60 |
| GAFO Retail (EA2-B) | 500 | 0 | 110 | 110 |
| 100 Room Hotel (EA2-C) | 2 Rms/Emp | 0 | 50 | 50 |
| Hostpital Uses (EA2-D) | 350 | 0 | 459 | 459 |
| Medical Office (EA2-D) | 250 | 0 | 286 | 286 |
| Future Pad (Office Use) (EA2-D) | 250 | 0 | 38 | 38 |
| Assisted Living (EA2-D) | 1,000 | 0 | 90 | 90 |
| Total Employment | | 0 | 1,093 | 1,093 |
| **D. Service Population** | | | | |
| Population | | 6,395 | 637 | 7,032 |
| Employment at 50% of Total | | 0 | 547 | 547 |
| Total Service Population | | 6,395 | 1,184 | 7,579 |
| **E. Publicly Maintained Infrastructure** | | | | |
| Public Roads Square Feet | | 545,100 | 129,060 | 674,160 |
| Public Signalized Intersections | | 2 | 0 | 2 |
| Neighborhood Public Park Acres | | 8.37 | 0 | 8.37 |

Sources: Stanley R. Hoffman Associates, Inc.
Lewis Management Companny

## Table 4
## Phased Residential Units and Non-Residential Square Feet
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula

| Category | 1<br>2023 | 2<br>2024 | 3<br>2025 | 4<br>2026 | 5<br>2027 | 6<br>2028 | 7<br>2029 |
|---|---|---|---|---|---|---|---|
| **Cumulative Residential Units** | | | | | | | |
| Single Family Units | 586 | 707 | 807 | 1,007 | 1,305 | 1,559 | 1,798 |
| Apartments | 0 | 0 | 250 | 500 | 550 | 550 | 550 |
| Total Residential Units | **586** | **707** | **1,057** | **1,507** | **1,855** | **2,109** | **2,348** |
| **Cumulative Population** | **1,950** | **2,352** | **3,162** | **4,305** | **5,391** | **6,237** | **7,032** |
| **Cumulative Non-Residential Square Feet** | | | | | | | |
| Super Market (EA2 -B) | 0 | 0 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| GAFO Retail (EA2-B) | 0 | 0 | 55,000 | 55,000 | 55,000 | 55,000 | 55,000 |
| 100 Room Hotel (EA2-C) | 0 | 0 | 45,000 | 45,000 | 45,000 | 45,000 | 45,000 |
| Hostpital Uses (EA2-D) | 0 | 0 | 0 | 160,560 | 160,560 | 160,560 | 160,560 |
| Medical Office (EA2-D) | 0 | 0 | 0 | 71,500 | 71,500 | 71,500 | 71,500 |
| Future Pad (Office Use) (EA2-D) | 0 | 0 | 0 | 9,500 | 9,500 | 9,500 | 9,500 |
| Assisted Living (EA2-D) | 0 | 0 | 0 | 90,000 | 90,000 | 90,000 | 90,000 |
| **Total Square Feet** | **0** | **0** | **130,000** | **461,560** | **461,560** | **461,560** | **461,560** |
| **Cumulative Employment** | 0 | 0 | 220 | 1,093 | 1,093 | 1,093 | 1,093 |
| **Cumulative Service Population** | | | | | | | |
| Population | 1,950 | 2,352 | 3,162 | 4,305 | 5,391 | 6,237 | 7,032 |
| Employment at 50% of Total | 0 | 0 | 110 | 547 | 547 | 547 | 547 |
| **Total Service Population** | **1,950** | **2,352** | **3,272** | **4,851** | **5,938** | **6,783** | **7,578** |
| **Cumulative Park Acres** | | | | | | | |
| Neighborhood | 0.00 | 0.00 | 0.00 | 2.79 | 5.58 | 8.37 | 8.37 |
| **Cumulative Public Road Square Feet** | 674,160 | 674,160 | 674,160 | 674,160 | 674,160 | 674,160 | 674,160 |

Sources: Stanley R. Hoffman Associates, Inc.
Parkstone Companies
Lewis Operating Corporation

## Table 5
## Projected Assessed Valuation, Property Tax and Property Tax VLF
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula
(In Constant 2023 Dollars)

| Category | 1<br>2023 | 2<br>2024 | 3<br>2025 | 4<br>2026 | 5<br>2027 | 6<br>2028 | 7<br>2029 |
|---|---|---|---|---|---|---|---|
| **PROPERTY TAX** | | | | | | | |
| **East Area 1** | | | | | | | |
| Total Residential Valuation [1] | $398,487,000 | $480,768,445 | $631,238,301 | $852,228,012 | $1,026,034,799 | $1,195,183,824 | $1,351,810,445 |
| 1 percent Property Tax | $3,984,870 | $4,807,684 | $6,312,383 | $8,522,280 | $10,260,348 | $11,951,838 | $13,518,104 |
| EA1 City General Fund Share [2] | $153,008 | $184,602 | $242,378 | $327,232 | $393,969 | $458,918 | $519,058 |
| **East Area 2** [3] | | | | | | | |
| Residential Valuation | $0 | $0 | $53,300,000 | $106,600,000 | $165,218,000 | $165,218,000 | $165,218,000 |
| Non-Residential Valuation | $0 | $0 | $44,500,000 | $143,968,000 | $143,968,000 | $143,968,000 | $143,968,000 |
| *EA 2 Total Valuation* | $0 | $0 | $97,800,000 | $250,568,000 | $309,186,000 | $309,186,000 | $309,186,000 |
| 1 percent Property Tax | $0 | $0 | $978,000 | $2,505,680 | $3,091,860 | $3,091,860 | $3,091,860 |
| EA2 City General Fund Share [1] | $0 | $0 | $37,553 | $96,211 | $118,719 | $118,719 | $118,719 |
| **Total Harvest at Limoneira** | | | | | | | |
| Total Valuation | $398,487,000 | $480,768,445 | $729,038,301 | $1,102,796,012 | $1,335,220,799 | $1,504,369,824 | $1,660,996,445 |
| 1 percent Property Tax | $3,984,870 | $4,807,684 | $7,290,383 | $11,027,960 | $13,352,208 | $15,043,698 | $16,609,964 |
| **Total City General Fund Share [1]** | **$153,008** | **$184,602** | **$279,931** | **$423,443** | **$512,688** | **$577,637** | **$637,777** |
| **PROPERTY TAX IN LIEU OF VLF** | | | | | | | |
| **East Area 1** | | | | | | | |
| Total Valuation | $398,487,000 | $480,768,445 | $631,238,301 | $852,228,012 | $1,026,034,799 | $1,195,183,824 | $1,351,810,445 |
| Minus Valuation at Project Inception [4] | $45,123,015 | $45,123,015 | $45,123,015 | $45,123,015 | $45,123,015 | $45,123,015 | $45,123,015 |
| Net New Valuation | $353,363,985 | $435,645,430 | $586,115,286 | $807,104,997 | $980,911,784 | $1,150,060,809 | $1,306,687,430 |
| PTVLF @ $1,283 per $1million net new valuation | $453,523 | $559,127 | $752,247 | $1,035,875 | $1,258,946 | $1,476,040 | $1,677,062 |
| **East Area 2** | | | | | | | |
| Total Valuation | $0 | $0 | $97,800,000 | $250,568,000 | $309,186,000 | $309,186,000 | $309,186,000 |
| Minus Valuation at Project Inception [4] | $0 | $0 | $22,252,895 | $22,252,895 | $22,252,895 | $22,252,895 | $22,252,895 |
| Net New Valuation | $0 | $0 | $75,547,105 | $228,315,105 | $286,933,105 | $286,933,105 | $286,933,105 |
| PTVLF @ $1,283 per $1million net new valuation | $0 | $0 | $96,961 | $293,030 | $368,263 | $368,263 | $368,263 |
| **Total Harvest at Limoneira PTVLF** | **$453,523** | **$559,127** | **$849,207** | **$1,328,905** | **$1,627,209** | **$1,844,303** | **$2,045,325** |

1. Represents the projected valuation of total new development.
2. The City of Santa Paula receives a share of 3.84 percent of the 1% propoerty tax for tax rate area (TRA) 04028.
3. Fiscal impacts, including revenues and costs for East Area 2, are not assessed until after 2025 when the area is projected to develop.
4. This represents the assessed valuation of the land parcels and development in 2016 within East Area 1 prior to project inception in constant 2023 dolalrs, and assessed valuation for East Area 2 in 2021 in constant 2023 dollars.

Source: Stanley R. Hoffman Associates, Inc.

## Sales and Use Tax

As shown in Panel C of Table 6, sales and use tax is projected at $751,151 after buildout of Harvest at Limoneira. On-site Taxable sales for EA2 are projected at about $21.4 million based on the taxable sales per square foot factors shown in Table 6. Use tax is projected at 23 percent of projected sales tax based on the latest 2022 information from the California Department of Tax and Fee Administration (CDTFA). Total off-site taxable sales associated with household and employee spending is estimated at $39.7 million. Total sales and use tax at buildout for Harvest at Limoneira is estimated at $751,151.

**Table 6**
**Projected Sales and Use Tax**
**Harvest at Limoneira Fiscal Analysis, City of Santa Paula**
(In Constant 2023 Dollars)

| | FACTORS | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| | | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 |
| **ON-SITE TAXABLE SALES** | | | | | | | | |
| **EAST AREA 2** | | | | | | | | |
| Cumulative Square Feet | | | | | | | | |
| Super Market | | 0 | 0 | 30,000 | 30,000 | 30,000 | 30,000 | 30,000 |
| GAFO Retail | | 0 | 0 | 55,000 | 55,000 | 55,000 | 55,000 | 55,000 |
| ***Total*** | | **0** | **0** | **85,000** | **85,000** | **85,000** | **85,000** | **85,000** |
| Cumulative Taxable Sales | Taxable Sales per Sq.Ft. | | | | | | | |
| Super Market | $72 | $0 | $0 | $2,160,000 | $2,160,000 | $2,160,000 | $2,160,000 | $2,160,000 |
| GAFO Retail | $350 | 0 | 0 | 19,250,000 | 19,250,000 | 19,250,000 | 19,250,000 | 19,250,000 |
| ***Total On-Site Taxable Sales*** | | **$0** | **$0** | **$21,410,000** | **$21,410,000** | **$21,410,000** | **$21,410,000** | **$21,410,000** |
| *Sales Tax* | 1% | $0 | $0 | $214,100 | $214,100 | $214,100 | $214,100 | $214,100 |
| Use Tax (@ 23.0% Sales Tax) | 23.0% | $0 | $0 | $49,243 | $49,243 | $49,243 | $49,243 | $49,243 |
| ***On-Site Sales and Use Tax Total*** | | **$0** | **$0** | **$263,343** | **$263,343** | **$263,343** | **$263,343** | **$263,343** |
| **OFF-SITE TAXABLE SALES** | | | | | | | | |
| **EAST AREA 1** | | | | | | | | |
| Households Retail Spending Capture [1] | 50% | $8,864,812 | $10,695,259 | $14,042,638 | $18,958,814 | $22,825,350 | $26,588,269 | $30,072,612 |
| **EAST AREA 2** | | | | | | | | |
| Households Retail Spending Capture | 50% | $0 | $0 | $0 | $2,371,442 | $3,675,469 | $3,675,469 | $3,675,469 |
| Employee Retail Spending Capture | 50% | $0 | $0 | $935,000 | $4,645,250 | $4,645,250 | $4,645,250 | $4,645,250 |
| ***Total EA1 and EA2*** | | $8,864,812 | $10,695,259 | $14,977,638 | $25,975,506 | $31,146,068 | $34,908,987 | $38,393,331 |
| *Sales Tax* | 1% | $88,648 | $106,953 | $149,776 | $259,755 | $311,461 | $349,090 | $383,933 |
| Use Tax (@ 23.0% Sales Tax) | 23.0% | $20,389 | $24,599 | $34,449 | $59,744 | $71,636 | $80,291 | $88,305 |
| ***Total Off-SiteSales and Use Tax*** | | **$109,037** | **$131,552** | **$184,225** | **$319,499** | **$383,097** | **$429,381** | **$472,238** |
| ***TOTAL SALES AND USE TAX*** | | **$109,037** | **$131,552** | **$447,568** | **$582,842** | **$646,440** | **$692,724** | **$735,581** |

1. Represents 50% of the total household spending on retail sales tax generating expenditures.

Sources: Stanley R. Hoffman Associates, Inc.

**Transient Occupancy Tax**

Transient occupancy tax (TOT) is projected at $306,600 after buildout of the hotel planned for Harvest at Limoneira. Based on *a web-based survey of room rates*, hotel room receipts are based on an average room rate of $120 per night and an average occupancy rate of 70 percent, as shown in Table 7. The City's TOT rate is 10 percent of gross room receipts.

**Table 7**
**Projected Transient Occupancy Tax After Buildout**
**Harvest at Limoneira Fiscal Analysis, City of Santa Paula**
(In Constant 2023 Dollars)

| Number of Rooms | Average Nightly Room Rate [1] | Annual Room Receipts at 70% Occupancy [1] | Estimated Annual TOT at 10% of Room Receipts |
|---|---|---|---|
| 100 | $120 | $3,066,000 | **$306,600** |

Note: 1. The average nightly room rate and average occupancy rate are based on a online survey of room rates for Santa Paula and surrounding areas in Ventura County.

Sources: Stanley R. Hoffman Associates, Inc.

**Fiscal Assumptions**

Table 8 presents the revenue assumptions and Table 9 presents the cost assumptions for Harvest at Limoneira fiscal projections. Fiscal assumptions are based on the *City of Santa Paula, Revenue and Expenditure Report, Fiscal Year 2022-2023* and discussion with City staff and consultants. Supporting fiscal assumption tables are presented in Appendix A.

## Table 8
## Summary of Recurring Revenue Factors [1]
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula
(In Constant 2023 Dollars)

| Fund and Category | Fiscal Year 2022-23 | Projection Basis | Projection Factor |
|---|---|---|---|
| **A. GENERAL FUND** | | | |
| Property Taxes | $1,017,000 | Assessed Valuation (AV) | 3.8% GF allocation of 1% levy |
| Real Property Transfer Tax | $125,000 | Property Turnover Rate<br>and<br>AV of Turnover Amount | 3.0% annual residential turnover rate<br>0.0% annual non-residential turnover rate [4]<br>$0.55 per $1,000 AV of turnover |
| Property Tax in Lieu of Motor Vehicle License Fees (MVLF) | $3,783,163 | AV | $1,283 per $1,000,000 increase assessed valuation |
| Sales and Use Tax | $3,300,000 | Sales Tax Based on Taxable Sales<br>Use Tax Based on Sales Tax | 1.0% of taxable sales<br>23.0% of sales tax |
| Franchise Fee Tax | $925,000 | Service Population = 34,466 | $26.84 per service population |
| Transient Occupancy Tax | $110,000 | Room Receipts | 10% of room receipts |
| Business License Fee | $133,000 | Employment = 8,572 | $15.52 per employee |
| Animal Licenses | $15,000 | Household Population = 31,267 | $0.48 per capita |
| Fines and Forfeitures | $107,500 | Service Population = 34,466 | $3.12 per service population |
| Rents and Concessions | $194,175 | Population = 31,423 | $6.18 per capita |
| Other Revenue from Other Agencies | $358,496 | Population = 31,423 | $11.41 per capita |
| Charges for Services (excluding one-time charges) | $1,054,051 | Service Population = 34,466 | $30.58 per service population |
| Other Revenues | $34,600 | Service Population = 34,466 | $1.00 per service population |
| Overhead Transfers In:<br>(@ 75 percent of projected revenues) | $1,644,903 | Service Population = 34,466 | $47.73 per service population |
| **B. GAS TAX FUND** | | | |
| State Gasoline Tax | $811,100 | Population = 31,423 | $25.81 per capita |

Sources: Stanley R. Hoffman Associates, Inc.
City of Santa Paula, Adopted *Revenue and Expenditure Report, Fiscal Year 2022-23*
City Finance Department

## Table 9
## Summary of General Fund Cost Factors
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula
(In Constant 2023 Dollars)

| General Fund | Fiscal Year 2022-23 Budget Amount | Fiscal Year 2022-23 Net Cost | Projection Basis | Projection Factor |
|---|---|---|---|---|
| General Government | $4,569,988 | $3,427,491 | Citywide Overhead Costs Adjusted by 75% | 28.1% of direct General Fund costs |
| Police | $7,704,315 | $7,704,315 | Service Population = 34,466 | $223.53 per service population |
| Buildings and Grounds Maintenance | $905,542 | $905,542 | Service Population = 34,466 | $26.27 per service population |
| Other Public Works: | | | | |
| Street Maintenance | | | Case Study: East Area 1 | $107,163 total annual cost - East Area 1 |
| | | | General Fund Share = 4% of total costs | $4,287 General Fund annual cost - East Area 1 |
| | | | Case Study: Santa Paula Gateway Project | $25,372 total annual cost - Santa Paula Gateway |
| | | | General Fund Share = 4% of total costs | $1,015 General Fund annual cost - Santa Paula Gateway |
| | | | | $132,535 total Harvest at Limoneira annual costs |
| | | | | $5,301 total General Fund annual costs |
| Other Public Works | $908,000 | $620,000 | Service Population = 34,466 | $17.99 per service population |
| Building & Safety [1] | $751,177 | ($1,302,509) | Service Population = 34,466 | $0.00 per service population |
| Planning | $933,548 | $647,548 | Service Population = 34,466 | $18.79 per service population |
| Community Services | $1,017,951 | $1,017,951 | Population = 31,423 | $32.40 per capita |
| Parks Maintenance | | | | |
| Neighborhood Parks | | | Park Acres | $20,000 per park acre |
| New Sports Park | | | Case Study | $710,851 net annual O&M costs |
| | | | Total Sports Park Acres = 35 | $20,310 per park acre |
| | | | Acres Allocated to East Area = 11.67 | 33.3% Harvest at Limoneira share of new sports park |
| | | | *times* | |
| | | | Annual O&M per Acre = $20,310 | |
| | | | *equals* | |
| | | | Harvest at Limoneira Share = $236,950 | |
| | | | *plus* | |
| | | | City Annual O&M = $473,901 | 66.7% City share of new sports park |
| | | | Total Annual O&M = $710,851 | |

1. Building and safety costs are not projected in this analysis, as there are no net costs to the City, and are assumed to be covered by processing fees.

Sources: Stanley R. Hoffman Associates, Inc.
City of Santa Paula, Adopted *Revenue and Expenditure Report, Fiscal Year 2022-23*
City Finance Department

## APPENDIX A
## SUPPORTING TABLES FOR FISCAL ASSUMPTIONS

### Table A-1
### Summary of City General Assumptions
### Harvest at Limoneira Fiscal Analysis, City of Santa Paula

| Assumption | Description |
|---|---|
| | **2023 Population and Housing** [1] |
| 31,267 | Household Population |
| 156 | Group Quarters |
| 31,423 | Total Resident Population |
| | |
| 9,449 | Occupied Housing Units (Households) |
| 9,735 | Total Housing Units |
| | |
| 3.31 | Average Household Size |
| | |
| | **2023 Estimated Employment** [2] |
| 8,572 | Total Employment |
| *times* | |
| 71% | Estimated Share of Total Employment Commuting into the City [3] |
| *equals* | |
| 6,086 | Estimated Employment Commuting into the City [3] |
| | |
| | **2023 Estimated Service Population** |
| 31,423 | Total Population |
| *plus* | |
| 3,043 | Estimated Employment at 50 Percent of Employment from Outside the City [4] |
| *equals* | |
| 34,466 | Estimated Total Service Population |

Note: 1. Population and housing estimates are January 1, 2023 estimates provided by the California Department of Finance (DOF).
2. The total employment estimate is for 2023 based on an interpolation of the 2016 and 2045 estimates from the Southern California Association of Governments, (SCAG) *RTP 2020 Growth Forecast*.
3. The total estimated City employment is weighted by 71 percent based on the Census Bureau's Longitudinal Employer-Household Dynamics (LEHD) Survey estimates of the share of total employment that commutes into the City, as shown in Appendix Table A-2 and Appendix Table A-3.
4. The total estimated employment from outside the City was weighted by 50% to account for the estimated less frequent use of City public services by employment versus population.

Sources: Stanley R. Hoffman Associates, Inc.
State of California, Department of Finance, *E-5 Population and Housing Estimates for Cities, Counties and the State--January 1, 2021-2023,* Sacramento, California, May 2023
Southern California Association of Governments (SCAG), Adopted 2020 Regional Transportation Plan (RTP) Growth Forecast
U.S. Census Bureau, Longitudinal Employer-Household Dynamics (LEHD) Program, *OnTheMap for Santa Paula, California*, 2020.

**Table A-2**
**Employment Working and Living in Santa Paula**
**Harvest at Limoneira Fiscal Analysis, City of Santa Paula**

| Category | Total | Working and Living in Santa Paula | |
|---|---|---|---|
| | | Amount | Percent [2] |
| Employment [1] | 5,430 | 1,592 | 29% |

Note: 1. Employment is based on the Longitudinal Employer-Household Dynamics (LEHD) program which shows where people live and where people work, as shown in Appendix Table A-3.
2. Based on the LEHD data, about 71 percent of the total employment in the City represents workers commuting into the City.

Sources: Stanley R. Hoffman Associates, Inc.
U.S. Census Bureau, OnTheMap Application and Longitudinal Employer-Household Dynamics (LEHD) Origin-Destination Employment Statistics, Santa Paula, California, 2020

## Table A-3
## General Fund Revenues
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula
(In Constant 2023 Dollars)

| Revenue Category | Fiscal Year 2022-23 | One-Time Fees/Permits | Recurring Revenues Not Projected in This Fiscal Analysis | Projected Net Recurring Revenues |
|---|---|---|---|---|
| **A. GENERAL FUND** | | | | |
| **Property Taxes** | *$1,017,000* | *$0* | *$0* | *$1,017,000* |
| **Real Property Transfer Tax** | *$125,000* | *$0* | *$0* | *$125,000* |
| **Property Tax In Lieu of MVLF** | *$3,783,163* | *$0* | *$0* | *$3,783,163* |
| **Property Tax In Lieu of Sales Tax** | *$0* | *$0* | *$0* | *$0* |
| **Sales & Use Taxes** | *$3,300,000* | *$0* | *$0* | *$3,300,000* |
| **Franchise Fee Tax** | *$925,000* | *$0* | *$0* | *$925,000* |
| **Transient Occupancy Tax** | *$110,000* | *$0* | *$0* | *$110,000* |
| **Business License Fee** | *$133,000* | *$0* | *$0* | *$133,000* |
| **Licenses & Permits** | | | | |
| Animal Licenses | $15,000 | $0 | $0 | $15,000 |
| Building Permits | 900,000 | 900,000 | 0 | 0 |
| Miscellaneous Permits | 0 | 0 | 0 | 0 |
| Electrical/Plumbing/Mechanical/Development-Related | 1,153,686 | 1,153,686 | 0 | 0 |
| Hazmat Permits/CUPA | 0 | 0 | 0 | 0 |
| Fire Annual Permits | 0 | 0 | 0 | 0 |
| Fire New Construction | 0 | 0 | 0 | 0 |
| Special Events Permits | 22,000 | 0 | 22,000 | 0 |
| *Subtotal Licenses & Permits* | *$2,090,686* | *$2,053,686* | *$22,000* | *$15,000* |
| **Fines and Forfeitures** | *$107,500* | *$0* | *$0* | *$107,500* |
| **Investments and Rents** | | | | |
| Investment Earnings | $140,000 | $0 | $140,000 | $0 |
| Community Center Endowment | 8,500 | 0 | 8,500 | 0 |
| Rents and Concessions | 194,175 | 0 | 0 | 194,175 |
| Rents from Railroad Depot | 2,000 | 0 | 2,000 | 0 |
| Rents from Utilities | 11,865 | 0 | 11,865 | 0 |
| Southdown Royalty | 0 | 0 | 0 | 0 |
| *Subtotal Investments & Rents* | *$356,540* | *$0* | *$162,365* | *$194,175* |
| **Revenue From Other Agencies** | | | | |
| Motor Vehicle In-Lieu | $0 | $0 | $0 | $0 |
| P.O.S.T. Reimbursement | 15,000 | 0 | 0 | 15,000 |
| State Mandated Costs | 0 | 0 | 0 | 0 |
| State Reimbursement - Mutual Aid | 0 | 0 | 0 | 0 |
| Miscellaneous Grant Funding | 25,000 | 0 | 25,000 | 0 |
| Proposition 172-1/2 Sales Tax for Public Safety | 343,496 | 0 | 0 | 343,496 |
| *Subtotal Revenue From Other Agencies* | *$383,496* | *$0* | *$25,000* | *$358,496* |
| **Charges For Current Services** | | | | |
| Recreation Administration and User Fees | $45,000 | $0 | $0 | $45,000 |
| Zoning, Subdivision, Environmental Review and Planning Fe | 40,000 | 40,000 | 0 | 0 |
| Public Works Fees and Permits | 72,500 | 72,500 | 0 | 0 |
| Fire Safety Inspections and Special Services | 0 | 0 | 0 | 0 |
| School Resource Officer | 263,251 | 0 | 263,251 | 0 |
| Attorney Services Fees | 0 | 0 | 0 | 0 |
| Sale of Reports, Maps, Publications | 5,000 | 0 | 0 | 5,000 |
| Fingerprints | 0 | 0 | 0 | 0 |
| Miscellaneous Police Services | 500 | 0 | 0 | 500 |
| Police False Alarm Charges | 20,000 | 0 | 20,000 | 0 |
| Contract Planning Fees Reimbursement | 0 | 0 | 0 | 0 |
| Park Reservation Fees | 500 | 0 | 0 | 500 |
| Parks and Field User Fees | 12,000 | 0 | 0 | 12,000 |
| Filming Fees | 34,000 | 0 | 34,000 | 0 |
| Facilities Cleanup | 500 | 0 | 0 | 500 |
| Miscellaneous Department Reimbursements | 990,551 | 0 | 0 | 990,551 |
| *Subtotal Charges for Current Services* | *$1,483,802* | *$112,500* | *$317,251* | *$1,054,051* |
| **Other Revenues** | | | | |
| Reimbursements for Damages | $0 | $0 | $0 | $0 |
| Fee Study Update and East Area Permitting | 0 | 0 | 0 | 0 |
| Workers Compensation Reimbursement-Miscellaneous | 0 | 0 | 0 | 0 |
| Cable TV Announcements | 100 | 0 | 0 | 100 |
| Utility Application Fee | 25,000 | 0 | 0 | 25,000 |
| City Donations | 0 | 0 | 0 | 0 |
| Miscellaneous | 9,500 | 0 | 0 | 9,500 |
| *Subtotal Other Revenues* | *$34,600* | *$0* | *$0* | *$34,600* |
| **Overhead Transfers** | | | | |
| Overhead From-Parkland Facilities | $68,888 | $0 | $0 | $68,888 |
| Overhead From-Traffic Impact | $45,940 | 0 | 0 | 45,940 |
| Overhead From Gas Tax Fund | $263,759 | 0 | 0 | 263,759 |
| Overhead From LTF | $46,134 | 0 | 0 | 46,134 |
| Overhead From Sewer Fund | $622,749 | 0 | 0 | 622,749 |
| Overhead From Water Fund | $1,017,528 | 0 | 0 | 1,017,528 |
| Overhead From Equip Maint | $128,206 | 0 | 0 | 128,206 |
| *Subtotal Overhead Transfers* | *$2,193,204* | *$0* | *$0* | *$2,193,204* |
| **TOTAL GENERAL FUND** | *$16,042,991* | *$2,166,186* | *$526,616* | *$13,350,189* |
| **B. GAS TAXES** | | | | |
| State Gasoline Tax | *$811,100* | *$0* | *$0* | *$811,100* |

Sources: Stanley R. Hoffman Associates, Inc.
City of Santa Paula, *Revenue and Expenditure Report, Fiscal Year 2022-23 Estimates*
City Finance Department

## Table A-4
## Tax Rate Area (TRA) Property Tax Allocations: TRA 04018
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula

| Agency[1] | | City of Santa Paula TRA 04028 |
|---|---|---|
| 1045 | EL SCH GEN ST PAULA | 21.5% |
| 2010 | UNIFIED SCH-ST PAULA | 15.3% |
| 2015 | VTA COM COLLEGE GEN | 5.5% |
| 2019 | VTA COLLEGE CHILD CTR | 0.0% |
| 4001 | COUNTY GENERAL FUND | 18.0% |
| 4002 | ERAF 92-93 SHIFT | 4.0% |
| 4004 | ERAF 93-94 SHIFT | 9.7% |
| 4005 | VENTURA CO OFFICE EDUC | 2.4% |
| **6001** | *** FIRE PROTECTION DIST** | **14.4%** |
| 6100 | * VCWPD ADMIN | 0.2% |
| 6120 | * VCWPD ZONE | 2.5% |
| 7586 | BLANCHARD/SANTA PAULA LIB | 1.8% |
| 7770 | UNITED WTR CONS DIST | 0.6% |
| **8050** | **CITY SANTA PAULA** | **3.8%** |
| | **TOTAL** | **100.0%** |

Sources: Stanley R. Hoffman Associates, Inc.
Ventura County Auditor Controller, Property Tax Division,
AB 8 TRA History Report, 2022-2023 Tax Year

## Table A-5
## Estimated Annual Turnover Rate
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula
(In Constant 2023 Dollars)

| City of Santa Paula | Owner Occupied Housing Units | Percent of Total |
|---|---|---|
| **A. Estimated Owner Occupied Turnover Units, 2010-2019** | | |
| Year Moved In, 2010-2019 | | |
| Moved in 2015 or later | 360 | |
| Moved in 2010 to 2014 | 1,085 | |
| Total Moved In, 2010-2019 | 1,445 | |
| **B. Estimated Turnover Rate** | | |
| Estimated Annual Owner Occupied Turnover Units, 2010-2019 [1] | 161 | |
| Total City Owner Occupied Units [2] | 4,658 | 100.0% |
| **Estimated Annual Turnover Rate, 2010-19 [1]** | **161** | **3.0%** |

Note: 1. The annual turnover rate is based on the assumption of 9 years for the 2010-2019 period.
2. Total City owner occupied units are from the American Community Survey, as referenced below.

Sources: Stanley R. Hoffman Associates, Inc.
U.S. Census Bureau, 2019 *American Community Survey (ACS) 5-Year Estimate, Tenure by Year Householder Moved Into Unit, Report B25038, Santa Paula, California*

**Table A-6**
**Calculation of Use Tax Factor**
**Harvest at Limoneira Fiscal Analysis, City of Santa Paula**

| Category | 2022 Half-Year Amount |
|---|---|
| **A. Santa Paula Sales Tax** | |
| Point-of-Sale | $1,499,500 |
| County Pool | 344,169 |
| State Pool | 637 |
| Total Sales Tax | $1,844,306 |
| **B. Calculation of Use Tax Factor** | |
| County Pool plus State Pool | $344,806 |
| *divided by* | |
| Point-of-Sale | $1,499,500 |
| *equals* | |
| **Estimated Use Tax Factor** | **23.0%** |

Sources: Stanley R. Hoffman Associates, Inc.
California Department of Taxation and Fee Administration (CDTFA)

## Table A-8
## Summary of General Fund Expenditures
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula
(In Constant 2023 Dollars)

| General Fund Expenditures | Fiscal Year 2022-23 Total | General Government | Departmental Costs |
|---|---|---|---|
| General Government | | | |
| City Council | $114,533 | $114,533 | |
| City Clerk | 130,096 | 130,096 | |
| City Attorney | 394,000 | 394,000 | |
| City Manager | 610,362 | 610,362 | |
| Administration - PERS and Employee Relations | 387,492 | 387,492 | |
| Administration - Risk Management | 1,064,018 | 1,064,018 | |
| Administration - IT | 797,202 | 797,202 | |
| Finance | 722,544 | 722,544 | |
| Non-Departmental Administration | 349,743 | 349,743 | |
| Non-General Government | | | |
| Police | $7,704,315 | | $7,704,315 |
| Buildings and Grounds Maintenance | 905,542 | | 905,542 |
| Other Public Works | 908,000 | | 908,000 |
| Building and Safety | 751,177 | | 751,177 |
| Planning | 933,548 | | 933,548 |
| Community Services | 1,017,951 | | 1,017,951 |
| **General Fund Total** | **$16,790,521** | **$4,569,988** | **$12,220,534** |

**B. CALCULATION OF GENERAL GOVERNMENT OVERHEAD COSTS**

| | | |
|---|---|---|
| General Government Expenditures | **$4,569,988** | |
| | *divided by* | |
| Direct General Fund Costs | | **$12,220,534** |
| | equals | |
| Current General Government Overhead Costs Share of Direct Costs | | **37.4%** |
| **75% Marginal Increase in General Government Overhead Costs Share of Direct Costs** | | **28.1%** |

Note: 1. Fiscal Year 2021-2022 expenditures are provided by City Finance staff.
2. General government costs for the project are not assumed to increase on a one-to-one basis. Therefore, the fiscal analysis projects general government overhead costs at a marginal rate of 75 percent, or 26.7 percent of direct recurring costs.

Sources: Stanley R. Hoffman Associates, Inc.
City of Santa Paula, *Revenue and Expenditure Report, Fiscal Year 2022-23 Estimates*
City Finance Department

## Table A-9
## Calculation of General Fund Net Building and Safety, Planning and Public Works Costs
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula
(In Constant 2023 Dollars)

| Category | | Fiscal Year 2022-23 |
|---|---|---|
| **A. BUILDING AND SAFETY NET COSTS** | | |
| Total Building and Safety Costs | | $751,177 |
| | *minus* | |
| One-Time Permits and Fees | | |
| Building Permits | | $900,000 |
| Miscellaneous Permits | | 0 |
| Electrical/Plumbing/Mechanical/Development-Related | | 1,153,686 |
| Total One-Time Fees | | $2,053,686 |
| | *equals* | |
| Net Recurring Building and Safety Costs | | ($1,302,509) |
| | *divided by* | |
| City Service Population [1] | | 34,466 |
| **Net Building and Safety Cost Factor per Service Population [2]** | | **($37.79)** |
| **B. PLANNING NET COSTS** | | |
| Total Planning Costs | | $933,548 |
| | *minus* | |
| One-Time Permits and Fees | | |
| Design Review | | 16,000 |
| Zoning and Subdivision Fees | | 105,000 |
| Environmental Review Fees | | 25,000 |
| Contract Planning Fees | | 115,000 |
| Plan Check Fees | | 25,000 |
| Total One-Time Fees | | $286,000 |
| | *equals* | |
| Net Recurring Planning Costs | | $647,548 |
| | *divided by* | |
| City Service Population [1] | | 34,466 |
| **Net Planning Cost Factor per Service Population** | | **$18.79** |
| **C. PUBLIC WORKS NET COSTS** | | |
| Other Public Works Costs | | $908,000 |
| | *minus* | |
| One-Time Permits and Fees | | |
| Permit Issuance, Inspection | | $193,000 |
| Oversize/Overweight Permits | | 5,000 |
| Hazardous Material Permits | | 57,000 |
| Construction Plan Check | | 29,000 |
| Subdivision Map Approval | | 3,500 |
| Studies and Investigations | | 500 |
| Total One-Time Fees | | $288,000 |
| | *equals* | |
| Net Recurring Other Public Works Costs | | $620,000 |
| | *divided by* | |
| City Service Population [1] | | 34,466 |
| **Other Public Works Cost Factor per Service Population** | | **$17.99** |

Note: 1. Service population is based on the estimated Santa Paula resident population plus employment weighted at 50%.

2. Building and safety costs are not projected in this analysis, as there are no net costs to the City, and are assumed to be covered by processing fees.

Sources: Stanley R. Hoffman Associates, Inc.
City of Santa Paula, *Revenue and Expenditure Report, Fiscal Year 2022-23 Adopted.*

## Table A-10
## Estimated Annual Street Maintenance Costs
## Harvest at Limoneira Fiscal Analysis, City of Santa Paula
(In Constant 2023 Dollars)

| Year | Square Feet of Streets [1] | Annual Cost per Square Foot [2] | | | Maintenance Schedule [2] | | | Total Maintenance Cost |
|---|---|---|---|---|---|---|---|---|
| | | Slurry Seal | Cape Seal | Grind & Overlay | Slurry Seal at 7 Years | Cape Seal at 14 Years | Grind & Overlay at 21 Years | |
| **East Area 1** | | | | | | | | |
| 1 | 545,100 | $0.96 | $1.28 | $2.12 | $525,073 | $700,098 | $1,155,161 | $2,380,332 |
| **Santa Paula Gateway Project** | | | | | | | | |
| 1 | 129,060 | $0.96 | $1.28 | $2.12 | $124,318 | $165,758 | $273,500 | $563,577 |
| **TOTAL** | 674,160 | | | | $649,392 | $865,856 | $1,428,662 | $2,943,909 |

**B. ANNUALIZED STREET MAINTENANCE COST (annualized over 21 years)**

| | |
|---|---|
| East Area 1 | **$113,349** |
| Santa Paula Gateway | **$26,837** |
| **TOTAL** | **$140,186** |

Note: 1. Street square feet for East Area 1 is provided by Jensen Design and Survey Inc. Square feet for the Santa Paula Gateway Project is provided by Lewis Management Company.
2. Costs per square foot and the maintenance schedule for slurry seal, cape seal and grind & overlay are provided by City public works staff.

Sources: Stanley R. Hoffman Associates, Inc.
Lewis management Corporation

# ATTACHMENT D

Technical Revisions to Specific Plan Amendment No. 4

# ATTACHMENT F

Technical Revisions to EIR Addendum No. 4

| TABLE 3.12-1<br>CONSTRUCTION GHG EMISSION COMPARISONS | | | |
|---|---|---|---|
| Construction Year | Adopted Specific Plan | Proposed Specific Plan Amendment | Difference |
| First Year | 7,317.4 | 3,911.0 | 3,406.4 |
| Second Year | 9,247.7 | 3,191.0 | 6,056.7 |
| Third Year | 8,803.9 | 3,005.0 | 5,798.9 |
| Fourth Year | 6,692.9 | 2,957.0 | 3,735.9 |
| Fifth Year | 5,730.2 | 2,895.0 | 2,835.2 |
| Sixth Year | 5,579.7 | 2,786.0 | 2,793.7 |
| Seventh Year | 5,528.0 | 2,839.0 | 2,689.0 |
| Eighth Year | 5,463.0 | 2,741.0 | 2,722.0 |
| Ninth Year | 5,768.9 | 2,904.0 | 2,864.9 |
| Tenth Year | 5,954.3 | 2,948.0 | 3,006.3 |
| Eleventh Year | — | 141.0 | — |
| **Total Emissions** | **66,086.0** | **30,318.0** | **35,768.0** |
| Annualized over Project Lifetime | 2,202.9 | 1,010.6 | 1,192.3 |

Refer to **Appendix B** of this Addendum for Air Quality and Greenhouse Gas CalEEMod Output Sheets.

*Abbreviation: MTCO2e = metric tons of carbon dioxide emissions*

As shown in **Table 3.12-1,** construction emissions resulting for the proposed changes in the Specific Plan would decrease by approximately 1,192 MTCO2e per year when compared to the 2015 East Area 1 SP SEIR. The resulting construction emissions would be less than those identified previously in the 2015 East Area 1 SP SEIR. Impacts from construction emissions were previously found to be less than significant without mitigation.

## *Operation*

The amendment as currently proposed would allow the development of up to 10,000 square feet of commercial uses in the Hallock Center District to facilitate the provision of neighborhood-oriented retail commercial uses for residents and visitors to the Sports Park in the Civic District. Based on technical guidance provided by the Governor's Office of Planning and Research on evaluating transportation impacts in CEQA, adding local-serving retail development improves retail destination proximity, which shortens trips and reduce vehicle miles traveled (VMT). For this reason, adding local-serving retail commercial development would further reduce GHG emissions.

The Specific Plan Amendment as originally proposed would result in a decrease of approximately 1,351 MTCO2e per year as shown in **Table 3.12-2: Operational GHG Emissions.** This represents a decrease of approximately 4.8% in GHG emissions due to the changes in land use. Additionally, a 4.6-metric tons of CO2e per year per service population threshold was used to determine significance of GHG emissions in the SEIR. The proposed Project is estimated to result in an increase in population of ~~6,786~~ 6,171, resulting in a ratio 4.~~0~~ 35 of CO2e per year, which is below the 4.6 CO2e per year threshold.

**CITY OF SANTA PAULA**
**MEMORANDUM**

To: Honorable Mayor and Members of the City Council

From: James Mason, Community & Economic Development Director

Subject: RESOLUTION NO. 7507 APPROVING THE ISSUANCE OF MULTIFAMILY REVENUE BONDS BY THE CALIFORNIA PUBLIC FINANCE AUTHORITY IN SUPPORT OF AN AFFORDABLE 166 UNIT MULTIFAMILY DEVELOPMENT, CITRUS FLATS APARTMENTS

Date: April 3, 2024

Agenda Item: 10.A

---

## RECOMMENDATION:

Staff recommends that the City Council:

1. Hold a public hearing pursuant to the federal Tax Equity and Fiscal Responsibility Act ("TEFRA")
2. Adopt Resolution No. 7507 approving the issuance of multifamily housing revenue bonds for the Citrus Flats Apartments in an amount not to exceed $55 million and authorize the City to become a non-charter member of the California Public Finance Authority.

---

## BACKGROUND:

The City Council is being asked to conduct a public hearing pursuant to the federal Tax Equity and Fiscal Responsibility Act ("TEFRA") and adopt a resolution which would approve the issuance of multifamily housing revenue bonds (the "Bonds") by the California Public Finance Authority ("CalPFA") for the purpose of financing the construction of an affordable residential housing development to be located at 18004 East Telegraph Road in the City of Santa Paula (the "Project"). The purpose of the resolution is to authorize the financing to meet a requirement of the Internal Revenue Code of 1986 (the "Code").

The Code requires that the "applicable elected representatives" of the jurisdiction in which a project to be financed with "private activity bonds" is situated, adopts a resolution approving the issuance of such "private activity bonds" after holding a public hearing which has been noticed in a newspaper of general circulation in such jurisdiction. The City Council is being asked to hold such public hearing which has been noticed as required by the Code. The proposed resolution would act as the approval by the "applicable elected representatives" with respect to the proposed Project.

The adoption of this resolution is one of the steps in the process of financing the proposed Project. The Project has secured a "private activity bond" allocation from the California Debt Limit Allocation Committee ("CDLAC") and prior to the issuance of bonds, CalPFA will need to adopt a resolution which would approve the execution and delivery of certain bond documents

that will reflect the terms of the Bonds.

**ANALYSIS:**

The CalPFA is a joint powers authority formed to assist local governments, non-profit organizations, and businesses with the issuance of both taxable and tax-exempt debt, and would be the issuing agency for the proposed bonds under this approval. In order for the CalPFA to have the authority to serve as the issuer of the bonds for the Project, it is necessary for the City of Santa Paula to become a non-charter member of the CalPFA. Attached to this report is a copy of the Joint Exercise of Powers Agreement to be executed by a designated signatory of the City.

The Joint Exercise of Powers Agreement provides that the CalPFA is a public entity, separate and apart from each member executing such agreement. The debts, liabilities and obligations of the CalPFA do not constitute debts, liabilities or obligations of the members executing such agreement.

The Bonds to be issued by the CalPFA for the Project will be the sole responsibility of the Borrower, and the City will have no financial, legal, moral obligation, liability or responsibility for the Project or the repayment of the Bonds for the financing of the Project. All financing documents with respect to the issuance of the Bonds will contain clear disclaimers that the Bonds are not obligations of the City or the State of California but are to be paid for solely from funds provided by the Borrower.

**STRATEGIC PLAN:**

The issuance of the bonds and construction of the project create additional affordable housing in the City, aligning with 2023-25 City Council Strategic Plan Core Values of Diversity/Inclusivity and Equity and enhancement of economic opportunities and community vitality.

**FISCAL IMPACTS:**

The Bonds would be tax-exempt private activity bonds for the purposes of the Internal Revenue Code and, as such, require the approval of the elected body of the governmental entity having jurisdiction over the area where the project to be financed is located. The City will not be under any obligation to repay the Bond indebtedness. This action does not create any additional debt.

**OPTIONS:**

As an alternative to Staff's recommendation, the City Council has the following option:

1. Do not adopt Resolution No. 7507. If the resolution is not approved, the Project will not be constructed in the City.

**ATTACHMENTS:**

A - CC Resolution No. 7507 - New Member TEFRA - Arrive Santa Paula

B - Joint Exercise of Powers Agreement Relating to the California Public Finance Authority inc. Signature Page

# ATTACHMENT A

RESOLUTION NO. 7507

**RESOLUTION NO. 7507**

**A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF SANTA PAULA APPROVING THE ISSUANCE BY THE CALIFORNIA PUBLIC FINANCE AUTHORITY OF EXEMPT FACILITY BONDS FOR A QUALIFIED RESIDENTIAL RENTAL PROJECT IN AN AGGREGATE PRINCIPAL AMOUNT NOT TO EXCEED $55,000,000 FOR THE PURPOSE OF FINANCING OR REFINANCING THE ACQUISITION AND CONSTRUCTION OF ARRIVE SANTA PAULA AND CERTAIN OTHER MATTERS RELATING THERETO**

WHEREAS, FLT Telegraph, LP or a partnership of which Red Tail Multifamily Development, LLC (the “Developer”) or a related person to the Developer is the general partner, has requested that the California Public Finance Authority (the “Authority”) adopt a plan of financing providing for the issuance of exempt facility bonds for a qualified residential rental project pursuant to Section 142(a)(7) of the Internal Revenue Code of 1986 (the “Code”) in one or more series issued from time to time, including bonds issued to refund such exempt facility bonds in one or more series from time to time, and at no time to exceed $55,000,000 in outstanding aggregate principal amount (the “Bonds”), to finance or refinance the acquisition, construction, improvement and equipping of a multifamily rental housing project located at 18004 East Telegraph Road, Santa Paula, California (the “Project”); and

WHEREAS, the Project is located within the City of Santa Paula (the "City"); and

WHEREAS, the City proposes to become an Additional Non-Charter Member of the Authority pursuant to Section 12 of the Joint Exercise of Powers Agreement (the "Agreement") relating to the California Public Finance Authority; and

WHEREAS, pursuant to Section 147(f) of the Code, the issuance of the Bonds by the Authority must be approved by the City because the Project is located within the territorial limits of the City; and

WHEREAS, the City Council of the City (the "City Council”) is the elected legislative body of the City and is the applicable elected representative under Section 147(f) of the Code; and

WHEREAS, pursuant to Section 147(f) of the Code, the City Council has, following notice duly given, held a public hearing regarding the issuance of the Bonds, and now desires to approve the issuance of the Bonds by the Authority; and

WHEREAS, the City Council understands that its actions in holding this public hearing and in approving this Resolution do not obligate the City in any manner for payment of the principal, interest, fees or any other costs associated with the issuance of the Bonds, and said City Council expressly conditions its approval of this Resolution on that understanding.

NOW, THEREFORE, BE IT RESOLVED, by the City Council of the City of Santa Paula as follows:

Section 1. The City hereby requests to become an Additional Non-Charter Member of the Authority pursuant to Section 12 of the Agreement. The Agreement is hereby approved and the Mayor of the City and all other proper officers and officials of the City, or a designee thereof, are hereby authorized and directed to execute the Agreement.

The City Council hereby approves the issuance of the Bonds by the Authority for the purposes of financing the Project. It is the purpose and intent of the City Council that this Resolution constitute approval of the issuance of the Bonds by the Authority for the purpose of Section 147(f) of the Code by the applicable elected representative of the governmental unit having jurisdiction over the area in which the Project is located.

Section 2. The City Manager or designees are hereby authorized and directed, jointly and severally, to do any and all things and execute and deliver any and all documents, certificates and other instruments which they deem necessary or advisable in order to carry out, give effect to and comply with the terms and intent of this Resolution and the financing transaction approved hereby. Any actions heretofore taken by such designees are hereby ratified and approved.

Section 3. The City Council expressly conditions its approval of this Resolution on its understanding that the City shall have no obligation whatsoever to pay any principal, interest, fees or any other costs associated with the Authority's issuance of the Loan for the financing of the Project.

Section 4. This Resolution shall take effect from and after its passage and approval.

**PASSED AND ADOPTED** at a regular meeting of the City Council of the City of Santa Paula held on this 3rd day of April, 2024.

_____
Leslie Cornejo, Mayor

ATTEST:

_____
Julie Latshaw, City Clerk

APPROVED AS TO FORM:

_____
Monica Castillo, City Attorney

# ATTACHMENT B

JOINT EXERCISE OF POWERS AGREEMENT RELATING TO THE CALIFORNIA PUBLIC FINANCE AUTHORITY INC. SIGNATURE PAGE

Res 14-09

# JOINT EXERCISE OF POWERS AGREEMENT
# RELATING TO THE CALIFORNIA PUBLIC FINANCE AUTHORITY

THIS AGREEMENT, dated as of May 12, 2015, among the parties executing this Agreement (all such parties, except those which have withdrawn as provided herein, are referred to as the "Members" and those parties initially executing this Agreement are referred to as the "Charter Members"):

## WITNESSETH

WHEREAS, pursuant to Title 1, Division 7, Chapter 5 of the California Government Code (in effect as of the date hereof and as the same may from time to time be amended or supplemented, the "Joint Exercise of Powers Act"), two or more public agencies may by agreement jointly exercise any power common to the contracting parties; and

WHEREAS, each of the Members is a "public agency" as that term is defined in Section 6500 of the Joint Exercise of Powers Act; and

WHEREAS, each of the Members is empowered by law to promote economic, cultural and community development, including, without limitation, the promotion of opportunities for the creation or retention of employment, the stimulation of economic activity, the increase of the tax base, and the promotion of opportunities for education, cultural improvement and public health, safety and general welfare; and

WHEREAS, each of the Members may accomplish the purposes and objectives described in the preceding preamble by various means; and

WHEREAS, each Member is also empowered by law to acquire, construct, improve, operate and dispose of real property for a public purpose; and

WHEREAS, the Joint Exercise of Powers Act authorizes the Members to create a joint exercise of powers entity with the authority to exercise any powers common to the Members, as specified in this Agreement and to exercise the additional powers granted to it in the Joint Exercise of Powers Act and any other applicable provisions of the laws of the State of California; and

WHEREAS, a public entity established pursuant to the Joint Exercise of Powers Act is empowered to issue or execute bonds, notes, commercial paper or any other evidences of indebtedness, leases, installment sale or other financing agreements or certificates of participation therein (herein "Bonds"), and to otherwise undertake financing programs under the Joint Exercise of Powers Act or other applicable provisions of the laws of the State of California to accomplish its public purposes; and



Kings County Agreement No. 15-041

WHEREAS, the Members have determined to specifically authorize a public entity authorized pursuant to the Joint Exercise of Powers Act to issue Bonds pursuant to the Joint Exercise of Powers Act or other applicable provisions of the laws of the State of California; and

WHEREAS, it is the desire of the Members to use a public entity established pursuant to the Joint Exercise of Powers Act to undertake the financing and/or refinancing of projects of any nature, including, but not limited to, capital or working capital projects, purchase or acquisition of property, receivables, commodities, bonds, other revenue streams or assets of any kind, liability or other insurance, or retirement programs, or facilitating Members use of existing or new financial instruments and mechanisms; and

WHEREAS, by this Agreement, each Member desires to create and establish the "California Public Finance Authority" for the purposes set forth herein and to exercise the powers provided herein;

NOW, THEREFORE, the Members, for and in consideration of the mutual promises and agreements herein contained, do agree as follows:

**Section 1. Purpose.**

This Agreement is made pursuant to the provisions of the Joint Exercise of Powers Act. The purpose of this Agreement is to establish a public entity for the joint exercise of powers common to the Members and for the exercise of additional powers given to a joint powers entity under the Joint Powers Act or any other applicable law, including, but not limited to, the issuance of Bonds for any purpose or activity permitted under the Joint Exercise of Powers Act or any other law. Such purpose will be accomplished and said power exercised in the manner hereinafter set forth.

**Section 2. Term.**

This Agreement shall become effective in accordance with Section 17 as of the date hereof and shall continue in full force and effect until such time as it is terminated in writing by all the Members; provided, however, that this Agreement shall not terminate or be terminated until all Bonds issued or caused to be issued by the Authority (defined below) shall no longer be outstanding under the terms of the indenture, trust agreement, resolution or other instrument pursuant to which such Bonds are issued.

**Section 3. Authority.**

A. CREATION AND POWERS OF AUTHORITY.

Pursuant to the Joint Exercise of Powers Act, there is hereby created a public entity to be known as the "California Public Finance Authority" (the "Authority"), and said Authority shall be a public entity separate and apart from the Members. Its debts, liabilities and obligations do not constitute debts, liabilities or obligations of any Members.

B. BOARD.

The Authority shall be administered by the Board of Directors (the "Board," or the "Directors" and each a "Director") whose members shall be, at all times, members of the Board of Supervisors (the "Board of Supervisors") of Kings County, California, with each such Director serving in his or her individual capacity as Director of the Board. The term of office as a member of the Board shall terminate when such member shall cease to be a member of the Board of Supervisors and the successor to such member of the Board of Supervisors shall become a member of the Board.

Notwithstanding the preceding paragraph, the Board may by resolution or bylaws provide for changes in the qualifications, composition and number of Directors, the appointment of Directors, successors, their respective terms of office and any other provisions relating to the qualification and office of the Directors, including provision for alternative Directors (in which case all references in this Agreement to any Director shall be deemed to refer to and include the applicable alternate Director, if any, when so acting in place of a regularly appointed Director).

The Board shall be the administering agency of this Agreement and, as such, shall be vested with the powers set forth herein, and shall administer this Agreement in accordance with the purposes and functions provided herein.

Directors shall not receive any compensation for serving as such, but shall be entitled to reimbursement for any expenses actually incurred in connection with serving as a Director, if the Board shall determine that such expenses shall be reimbursed and there are unencumbered funds available for such purpose.

C. OFFICERS; DUTIES; OFFICIAL BONDS.

The officers of the Authority shall be the Chair, Vice-Chair, Secretary and Treasurer (defined below). The Board, in its capacity as administering agent of this Agreement, shall elect a Chair, a Vice-Chair, and a Secretary of the Authority from among Directors to serve until such officer is re-elected or a successor to such office is elected by the Board. The Board shall appoint one or more of its officers or employees to serve as treasurer, auditor, and controller of the Authority (the "Treasurer") pursuant to Section 6505.6 of the Joint Exercise of Powers Act to serve until such officer is re-elected or a successor to such office is elected by the Board.

Subject to the applicable provisions of any resolution, indenture, trust agreement or other instrument or proceeding authorizing or securing Bonds (each such resolution, indenture, trust agreement, instrument and proceeding being herein referred to as an "Indenture") providing for a trustee or other fiscal agent, and except as may otherwise be specified by resolution of the Board, the Treasurer is designated as the depositary of the Authority to have custody of all money of the Authority, from whatever source derived and shall have the powers, duties and responsibilities specified in Sections 6505, 6505.5 and 6509.5 of the Joint Exercise of Powers Act.

The Treasurer of the Authority is designated as the public officer or person who has charge of, handles, or has access to any property of the Authority, and such officer shall file an official bond with the Secretary of the Authority in the amount specified by resolution of the Board but in no event less than $1,000.

The Board shall have the power to appoint such other officers and employees as it may deem necessary and to retain independent counsel, consultants and accountants.

The Board shall have the power, by resolution, to the extent permitted by the Joint Exercise of Power Act or any other applicable law, to delegate any of its functions to one or more of the Directors or officers, employees or agents of the Authority and to cause any of said Directors, officers, employees or agents to take any actions and execute any documents or instruments for and in the name and on behalf of the Board or the Authority.

D. MEETINGS OF THE BOARD.

(1) Ralph M. Brown Act.

All meetings of the Board, including, without limitation, regular, adjourned regular, special, and adjourned special meetings shall be called, noticed, held and conducted in accordance with the provisions of the Ralph M. Brown Act (commencing with Section 54950 of the Government Code of the State of California), or any successor legislation hereinafter enacted (the "Brown Act").

(2) Regular Meetings.

The Board shall provide for its regular meetings; provided, however, it shall hold at least one regular meeting each year. The date, hour and place of the holding of the regular meetings shall be fixed by resolution of the Board. To the extent permitted by the Brown Act, such meetings may be held by telephone conference.

(3) Special Meetings.

Special meetings of the Board may be called in accordance with the provisions of Section 54956 of the Government Code of the State of California. To the extent permitted by the Brown Act, such meetings may be held by telephone conference.

(4) Minutes.

The Secretary of the Authority shall cause to be kept minutes of the regular, adjourned regular, special, and adjourned special meetings of the Board and shall, as soon as possible after each meeting, cause a copy of the minutes to be forwarded to each Director.

(5) Quorum.

A majority of the Board shall constitute a quorum for the transaction of business. No action may be taken by the Board except upon the affirmative vote of a majority of the Directors present at the meeting, except that less than a quorum may adjourn a meeting to another time and place.

E. RULES AND REGULATIONS.

The Authority may adopt, from time to time, by resolution of the Board such bylaws, policies or rules and regulations for the conduct of its meetings and affairs as may be required.

**Section 4. Powers.**

The Authority shall have the power, in its own name, to exercise the common powers of the Members and to exercise all additional powers given to a joint powers entity under any of the laws of the State of California, including, but not limited to, the Joint Exercise of Powers Act, for any purpose authorized under this Agreement. Such powers shall include the common powers specified in this Agreement and may be exercised in the manner and according to the method provided in this Agreement. The Authority is hereby authorized to do all acts necessary for the exercise of such power, including, but not limited to, any of all of the following: to make and enter into contracts; to employ agents and employees; to acquire, construct, improve, own, maintain and operate, or provide for maintenance and operation, and sell, lease, pledge, assign, mortgage or otherwise dispose, of any property, improvements, commodities, leases, contracts, receivables, bonds or other revenue streams or assets of any kind; to exercise the power of condemnation; to incur debts, liabilities or obligations; to receive gifts, contributions and donations of property, funds, services, and other forms of assistance from person, firms, corporations and any governmental entity; to sue and be sued in its own name; to establish and collect fees; to form public benefit nonprofit corporations or other affiliate entities to accomplish any of its purposes; to make grants, loans or provide other financial assistance to governmental, nonprofit and for profit organizations to accomplish any of its purposes; and generally to do any and all things necessary or convenient to accomplish its purposes. The boundaries of the Authority shall encompass the boundaries of all the Members and the powers of the Authority may be exercised anywhere within those boundaries or to the extent permitted by the laws of the State of California, including, but not limited to the Joint Exercise of Powers Act, outside of those boundaries, which may be outside of the State of California, provided that the power of condemnation may only be exercised within the jurisdictional boundaries of the Charter Members.

Without limiting the generality of the foregoing, the Authority may issue or cause to be issued Bonds, and pledge any property, contracts or revenues as security to the extent permitted under the Joint Exercise of Powers Act, or any other applicable provision of law.

The manner in which the Authority shall exercise its powers and perform its duties is and shall be subject to the restrictions upon the manner in which a California county could exercise such powers and perform such duties. The manner in which the Authority shall exercise its powers and perform its duties shall not be subject to any restrictions applicable to the manner in which any other public agency could exercise such powers or perform such duties, whether such agency is a party to this Agreement or not.

**Section 5. Fiscal Year.**

For the purposes of this Agreement, the term "Fiscal Year" shall mean the fiscal year as established from time to time by resolution of the Board, being, at the date of this Agreement, the period from July 1 to and including the following June 30, except for the first Fiscal Year which shall be the period from the date of this Agreement to June 30, 2015.

**Section 6. Disposition of Assets.**

At the end of the term hereof or upon the earlier termination of this Agreement as set forth in Section 2, after payment of all expenses and liabilities of the Authority, all property of the Authority both real and personal shall automatically vest in the Members in the manner and amount determined by the Board in its sole discretion and shall thereafter remain the sole property of the Members; provided, however, that any surplus money on hand shall be returned in proportion to the contributions made by the Members.

**Section 7. Bonds.**

From time to time the Authority shall issue Bonds, in one or more series, for the purpose of exercising its powers and raising the funds necessary to carry out its purposes under this Agreement.

The services of bond counsel, financing consultants and other consultants and advisors working on the projects and/or their financing or refinancing or on post-issuance compliance or administration may be used by the Authority. The expenses of the Board shall be paid from the proceeds of the Bonds, payments made by Bond obligors or other third parties, or any other unencumbered funds of the Authority available for such purpose.

**Section 8. Bonds Only Limited and Special Obligations of Authority.**

The Bonds, together with the interest and premium, if any, thereon, shall not be deemed to constitute a debt of any Member or pledge of the faith and credit of the Members or the Authority. The Bonds shall be only special obligations of the Authority, and the Authority shall under no circumstances be obligated to pay the Bonds except from revenues and other funds pledged therefor. Neither the Members nor the Authority shall be obligated to pay the principal of, premium, if any, or interest on the Bonds, or other costs incidental thereto, except the Authority from the revenues and funds pledged and available therefor, and neither the faith and credit nor the taxing power of the Members nor the faith and credit of the Authority shall be pledged to the payment of the principal of, premium, if any, or interest on the Bonds nor shall the

Members or the Authority in any manner be obligated to make any appropriation for such payment.

No covenant or agreement contained in any Bond or related document shall be deemed to be a covenant or agreement of any Director, or any officer, employee or agent of the Authority in his or her individual capacity, and neither the Board of the Authority nor any Director or officer thereof executing the Bonds shall be liable personally on any Bond or be subject to any personal liability or accountability by reason of the issuance of any Bonds.

**Section 9. Accounts and Reports.**

All funds of the Authority shall be strictly accounted for. The Authority shall establish and maintain such funds and accounts as may be required by good accounting practice and by any provision of any Indenture (to the extent such duties are not assigned to a trustee of Bonds). The books and records of the Authority shall be open to inspection at all reasonable times by each Member.

The Treasurer of the Authority shall cause an independent audit to be made of the books of accounts and financial records of the Authority by a certified public accountant or public accountant in compliance with the provisions of Section 6505 of the Joint Exercise of Powers Act. In each case the minimum requirements of the audit shall be those prescribed by the State Controller for special districts under Section 26909 of the Government Code of the State of California and shall conform to generally accepted auditing standards. When such an audit of accounts and records is made by a certified public accountant or public accountant, a report thereof shall be filed as a public record with each Member and also with the county auditor of each county in which a Member is located; provided, however, that to the extent permitted by law, the Authority may, instead of filing such report with each Member and such county auditor, elect to post such report as a public record electronically on a website designated by the Authority. Such report if made shall be filed within 12 months of the end of the Fiscal Year or Years under examination.

The Treasurer is hereby directed to report in writing on the first day of July, October, January, and April of each year to the Board and the Members which report shall describe the amount of money held by the Treasurer for the Authority, the amount of receipts since the last such report, and the amount paid out since the last such report (which may exclude amounts held by a trustee or other fiduciary in connection with any Bonds to the extent that such trustee or other fiduciary provided regular reports covering such amounts.)

Any costs of the audit, including contracts with, or employment of, certified public accountants or public accountants in making an audit pursuant to this Section, shall be borne by the Authority and shall be a charge against any unencumbered funds of the Authority available for that purpose.

In any Fiscal Year the Board may, by resolution adopted by unanimous vote, replace the annual special audit with an audit covering a two-year period.

**Section 10. Funds.**

Subject to the applicable provisions of any Indenture, which may provide for a trustee or other fiduciary to receive, have custody of and disburse Authority funds, the Treasurer of the Authority shall receive, have the custody of and disburse Authority funds pursuant to the accounting procedures developed under Sections 3.C and 9, and shall make the disbursements required by this Agreement or otherwise necessary to carry out any of the provisions of purposes of this Agreement.

**Section 11. Notices.**

Notices and other communications hereunder to the Members shall be sufficient if delivered to the clerk of the governing body of each Member; provided that, to the extent permitted by law, the Authority may provide notices and other communications and postings electronically (including, without limitation, through email or by posting to a website).

**Section 12. Additional Members/Withdrawal of Members.**

Qualifying public agencies may be added as parties to this Agreement and become Charter Members upon: (1) the filing by such public agency with the Authority of an executed counterpart of this Agreement, together with a copy of the resolution of the governing body of such public agency approving this Agreement and the execution and delivery hereof; and (2) adoption of a resolution of the Board approving the addition of such public agency as a Charter Member. Upon satisfaction of such conditions, the Board shall file such executed counterpart of this Agreement as an amendment hereto, effective upon such filing.

Qualifying public agencies may also be added as Non-Charter Members ("Additional Members") of the Authority upon: (1) the filing by such public agency with the Authority of a resolution of the governing body of such public agency requesting to be added as an Additional Member of the Authority, and (2) adoption of a resolution of the Board approving the addition of such public agency as an Additional Member. An Additional Member may limit in the aforementioned resolution the scope of its Additional Membership to what is necessary or appropriate to facilitate the financing or refinancing of one or more specified projects or programs.

A Member may withdraw from this Agreement upon written notice to the Board; provided, however, that at least one Member shall be a Charter Member and no such withdrawal shall result in the dissolution of the Authority so long as any Bonds remain outstanding. Any such withdrawal shall be effective only upon receipt of the notice of withdrawal by the Board, which shall acknowledge receipt of such notice of withdrawal in writing and shall file such notice as an amendment to this Agreement effective upon such filing.

**Section 13. Indemnification.**

To the full extent permitted by law, the Board may authorize indemnification by the Authority of any person who is or was a Director or an officer, employee or other agent of the Authority, and who was or is a party or is threatened to be made a party to a proceeding by

reason of the fact that such person is or was such a Director or an officer, employee or other agent of the Authority, against expenses, including attorneys fees, judgments, fines, settlements and other amounts actually and reasonably incurred in connection with such proceeding, if such person acted in good faith in a manner such person reasonably believed to be in the best interests of the Authority and, in the case of a criminal proceeding, had no reasonable cause to believe the conduct of such person was unlawful and, in the case of an action by or in the right of the Authority, acted with such care, including reasonable inquiry, as an ordinarily prudent person in a like position would use under similar circumstances. The Board may purchase a policy or policies of insurance in furtherance of any indemnification obligation created or otherwise in protection of Directors, officers, employees or other agents.

**Section 14. Contributions and Advances.**

Contributions or advances of public funds and of the use of personnel, equipment or property may be made to the Authority by the Members for any of the purposes of this Agreement. Payment of public funds may be made to defray the cost of any such contribution or advance. Any such advance may be made subject to repayment, and in such case shall be repaid, in the manner agreed upon by the Authority and the Member making such advance at the time of such advance. It is mutually understood and agreed to that no Member has any obligation to make advances or contributions to the Authority to provide for the costs and expenses of administration of the Authority, even though any Member may do so. The Members understand and agree that a portion of the funds of the Authority that otherwise may be allocated or distributed to the Members may instead be used to make grants, loans or provide other financial assistance to governmental units and to nonprofit organizations to accomplish any of the governmental unit's or nonprofit organization's purposes.

**Section 15. Immunities.**

All of the privileges and immunities from liabilities, exemptions from laws, ordinances and rules, and other benefits which apply to the activity of officers, agents or employees of Members when performing their respective functions within the territorial limits of their respective public agencies, shall apply to the same degree and extent to the Directors, officers, employees, agents or other representatives of the Authority while engaged in the performance of any of their functions or duties under the provisions of this Agreement.

**Section 16. Amendments.**

Except as provided in Sections 3B and 12 above, this Agreement shall not be amended, modified, or altered, unless the written consent of each of the Charter Members is obtained; provided that no amendment shall materially adversely affect the interests of any Additional Member unless the negative consent of that Additional Member is also obtained. To obtain the negative consent of each such Additional Member, the following negative consent procedure shall be followed: (a) the Authority shall provide each such Additional Member with a notice at least sixty (60) days prior to the date such proposed amendment is to become effective explaining the nature of such proposed amendment and this negative consent procedure; (b) the Authority shall provide each such Additional Member who did not respond a reminder notice with a notice at least thirty (30) days prior to the date such proposed amendment is to become

effective; and (c) if no such Additional Member objects to the proposed amendment in writing within sixty (60) days after the initial notice, the proposed amendment shall become effective with respect to all Members.

**Section 17. Effectiveness.**

This Agreement shall become effective and be in full force and effect and a legal, valid and binding obligation of each of the Members on the date that the Board shall have received from two of the Charter Members an executed counterpart of this Agreement, together with a certified copy of a resolution of the governing body of each such Charter Member approving this Agreement and the execution and delivery hereof.

**Section 18. Partial Invalidity.**

If any one or more of the terms, provisions, promises, covenants or conditions of this Agreement shall to any extent be adjudged invalid, unenforceable, void or voidable for any reason whatsoever by a court of competent jurisdiction, each and all of the remaining terms, provisions, promises, covenants and conditions of this Agreement shall not be affected thereby, and shall be valid and enforceable to the fullest extent permitted by law.

**Section 19. Successors.**

This Agreement shall be binding upon and shall inure to the benefit of the successors of the parties hereto. Except to the extent expressly provided herein, no Member may assign any right or obligation hereunder without the consent of the other Members.

**Section 20. Miscellaneous.**

This Agreement may be executed in several counterparts, each of which shall be an original and all of which shall constitute but one and the same instrument.

The section headings herein are for convenience only and are not to be construed as modifying or governing the language in the section referred to.

Wherever in this Agreement any consent or approval is required, the same shall not be unreasonably withheld.

This Agreement shall be governed under the laws of the State of California.

This Agreement is the complete and exclusive statement of the agreement among the Members, which supercedes and merges all prior proposals, understandings, and other agreements, whether oral, written, or implied in conduct, between and among the Members relating to the subject matter of this Agreement.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed and attested by their duly authorized representatives as of the day and year first above written.

Charter Member:

COUNTY OF KINGS

By _____
Richard Fagundes, Chairman
Kings County Board of Supervisors

ATTEST:

By _____
Catherine Venturella
Clerk of the Board

Charter Member:

HOUSING AUTHORITY OF THE
COUNTY OF KINGS

By _____
Richard Fagundes, Chairman

ATTEST:

By _____
Jennifer Molina
Clerk of the Housing Authority Board

IN WITNESS WHEREOF, the Additional Members hereto have caused this Agreement to be executed and attested by their proper officers thereunto duly authorized.

Dated: _____

Additional Member Name:

_____

By:
Its:

ATTEST:

_____

By:
Its:

**CITY OF SANTA PAULA**
**MEMORANDUM**

To: Honorable Mayor and Members of the City Council

From: James Mason, Community & Economic Development Director

Subject: RESOLUTION NO. 7508 OF THE CITY OF SANTA PAULA AUTHORIZING A CITY AFFORDABLE HOUSING FUND LOAN TO FLT TELEGRAPH PARTNERS, L.P. ("PARTNERSHIP") IN THE AMOIUNT OF $5,500,000; AND THE DEFERRAL OF DEVELOPMENT IMPACT FEES AND WATER IN LIEU FEES IN AN AMOUNT NOT TO EXCEED $5,157,949

Date: April 3, 2024

Agenda Item: 11.A

---

## RECOMMENDATION:

Staff recommends the City Council adopt Resolution No. 7508 authorizing a City Affordable Housing Fund loan to FLT Telegraph Partners, L.P. ("Partnership") in the amount of $5,500,000; and the deferral of Development Impact Fees and Water In-Lieu Fees in an amount not to exceed $5,157,949.

**Presented by:** James Mason, Community & Economic Development Director

---

## BACKGROUND:

*Project History*

The entitled by-right development proposed by Red Tail Multifamily Land Development ("Red Tail"), located on the currently vacant 11.28-acre parcel at 18004 East Telegraph Road (south of East Telegraph Road and east of Whipple Road), will provide, via new parcel map, 298 new apartment units on two new parcels. 166 of the units (56% of the total unit count for the project) are proposed as deed-restricted affordable apartments situated on one new parcel, with the remaining 132 units designated as market-rate apartments on another new parcel. The project has been designed so that each parcel (component) could stand alone and meet all City codes and requirements, while no readily discernible visual difference exists between the designated areas.

*By-Right Entitlement*

On October 7, 2020, the Santa Paula City Council adopted Ordinance No. 1305 amending Chapter 16.15 of the Santa Paula Municipal Code to permit all housing 'by-right' in all Commercial zones (C-N, C-O, CBD, C-G and C-LI) without discretionary review consistent with the purpose and intent of Government Code Sections 65583.2(h) and (i).

By-right entitlement is intended to be the easiest path to qualify for development under the zoning codes of local jurisdictions. Such entitlements have been heavily promoted via new and updated California housing legislation over the past several years in an effort to meet the state's serious housing shortfall. By-right entitlements are often described as ministerial – a common legal term that also refers to a lack of discretionary approval. To be clear, a development qualified for by-right entitlement must still acquire the necessary permits (grading, construction, stormwater, etc.) in order to proceed.

In addition to providing such by-right entitlement, Ordinance No. 1305 also replaced all C-H (Commercial-Highway) zoning in the Santa Paula Municipal Code with the C-LI (Commercial-Light Industrial) designation. The project parcel at 18004 East Telegraph Road (APN: 107-0-042-015) was thus changed from C-H to C-LI zoning, thereby making residential use permitted by-right onsite.

*Affordable Housing Partnership*

Red Tail is partnering with Affordable Housing Access ("AHA") ( www.ahaccess.org) for development of the 166-unit affordable portion of the project. AHA is a 501(c)(3) nonprofit corporation. Founded in 1999, its mission is creating and preserving quality affordable housing and empowering low-income individuals and communities through social services and community building. AHA specializes in partnerships with a wide range of developers, owners, investors, lenders, social service providers, public charities and government to leverage their own capabilities. AHA and its developer partners have constructed, or acquired and rehabilitated, more than 20,000 affordable housing apartments and homes throughout the West.

*Financing Information & Tax Credit Application Deadline*

Red Tail/AHA will apply for tax-exempt bonds and federal and state tax credits to finance the construction of the 166 affordable units in the project, however, they anticipate a financing gap which requires additional funding. Worthy of note is that Red Tail/AHA is not requesting waiver or deferral of any fees related to the 132 market-rate units of the overall project.

Projects requesting private activity bonds and federal/state tax credits are scored competitively. For a project to be competitive, public funds are critical and further enhance the project's likelihood of obtaining a bond and credit allocation, per California Tax Credit Allocation Committee ("TCAC") regulations Section 10325 (A)(i). Essentially, the more support a local jurisdiction provides, the more likely the applicant will receive federal and state support.

Additionally, Ventura County is within the Central Coastal Region, wherein only 5.2% of all available bond and tax credit awards statewide are allocated per TCAC regulation 10315(i). Without the requested public funding, this project cannot feasibly be built.

The application deadline for the first round of TCAC funding is April 23, 2024. Again, as these applications are scored competitively and funds are limited, it is critical that the Red Tail/AHA application is submitted in Round 1, as Round 2 will almost certainly be over-subscribed. To be clear, Red Tail/AHA's request for financial assistance from the City is a key component of their TCAC application.

*Financial Assistance Request*

On June 29, 2023, the City of Santa Paula received an initial request from Red Tail/AHA for financial assistance in funding for the development of the 166-unit affordable housing portion of their project at 18004 East Telegraph Road, now known as "Citrus Flats." Since that time, staff has worked closely with Red Tail/AHA and the City's Red Tail Project and Affordable Housing Trust Fund Subcommittees to intensively review and refine the assistance request to a potential total of $10,657,949, while also preserving the highest possible scoring for the competitive TCAC funding application.

This project's funding recommendation will be an amount up to $10,657,949 comprised of City Affordable Housing Funds and deferral of Development Impact Fees and Water In-Lieu Fees (as set forth below) to assist with development. The funding will be contingent upon documentation of final Loan terms; the attached pro forma (Attachment C); and valid funding commitments from all other sources identified on the pro forma. The project will also include eight (8) project-based vouchers from the Santa Paula Housing Authority (Area Housing Authority of Ventura County).

Composition and approval of the requested financial assistance, as detailed below, is what is being considered at tonight's meeting.

**ANALYSIS:**

*Loan Composition*

The requested loan funding is comprised of three parts:

- City Affordable Housing Fund Loan: $5,500,000
- Development Impact Fee Deferral ("DIF") Loan: $2,975,986
- Water in Lieu Deferral ("WIL") Loan: $2,181,963 (not to exceed)

*Loan Terms*

As proposed, the City would provide Red Tail/AHA with funding from its Affordable Housing Fund as secured by the recently adopted Development Agreement with Limoneira-Lewis Community Builders. The City Affordable Housing Fund Loan will accrue interest at a simple interest rate of 4.0% per annum with a loan term of 55 years. Principal and accrued and unpaid interest on the City Affordable Housing Fund Loan will be payable when sufficient residual cash flow (see Repayment Source below) is available to pay a portion of the City Affordable Housing Fund Loan. The principal balance of the City Affordable Housing Fund Loan will self-defease over a 40-year period, commencing in Year 16 of the loan term, in conjunction with the 55-year restricted covenant term.

The DIF Loan and the WIL Loan will accrue interest at a simple interest rate of 4.0% per annum. Principal and accrued and unpaid interest on each of the DIF Loan and the WIL Loan will be payable when sufficient residual cash flow (see Repayment Source below) is available to pay a portion of the applicable loan. The loan term for each of the DIF Loan and the WIL Loan will be 55 years.

The closing of the City Loans will be concurrent with the closing of the tax credit and tax-exempt bond financing administered by TCAC. Following the closing of the initial financing of the Project, Applicant will not incur additional debt obligations (other than the permanent financing of the Project following conversion of construction financing), or increase existing

obligations, without the written approval of the City.

The City of Santa Paula loan structure will not be in conflict with State of California LIHTC underwriting guidelines.

*Repayment Source*

The repayment source for the DIF Loan, the WIL Loan and the City Affordable Housing Fund Loan is 50% of the residual cash flow after Applicant's payment in full of all deferred developer fees and of allowable expenses per the guidelines set forth in the California TCAC Qualified Allocation Plan and related regulations adopted by the Committee. The DIF Loan, the WIL Loan and the City Affordable Housing Fund Loan will be secured by a subordinated lien on the real property, and the Loans will be repaid, and the City's lien on the real property released, on a capital event.

Pending approval by the City Council of the above-mentioned conditions via Resolution 7508 (Attachment A), the City will provide Applicant a letter of interest confirmed for 270 days following the TCAC award of 4% Low Income Housing Tax Credits (Attachment B).

*Loan Interest Options for Council Consideration*

Loans made by cities to affordable housing projects in the State of California are subject to strict guidelines in regards to TCAC scoring. Per Cal Code of Reg. Title 4, Division 17, Chapter 1, Section 10325:

*Loans must be "soft" loans, having terms (or remaining terms) of at least 15 years, and below market interest rates and interest accruals, and are either fully deferred or require only residual receipts payments for at least the first fifteen years of their terms. Qualified soft loans may have annual fees that reasonably defray compliance monitoring and asset management costs associated with the project.* ***The maximum below-market interest rate allowed for tiebreaker purposes shall be the greater of four percent (4%) simple, or the Applicable Federal Rate if compounding.***

Pursuant to review by staff and legal counsel, as well as independent financial advisory review of the proposed loan terms by the City's municipal advisors, NHA Advisors, staff analyzed two interest rate approaches; a 4% *simple* interest calculation and a 3.44% *compounding* rate. Each option has distinct advantages and disadvantages to the City and the developer with simple interest being most predictable but resulting in a lesser accrual over the full term of the loan.

As shown in Attachment E, the potential financial benefit between simple and compounding interest is largely de minimis until Year 15-16, when the accrued interest gap widens to an eventual difference of approximately $15,000,000 over the life of the loan. That said, there is high likelihood that a capital event will occur by Year 15-16, rendering the interest accrual moot, as the City would be made whole at that point.

Red Tail/AHA remains steadfast that the proposed 4% simple interest rate is well above the industry standard and a capital event will likely occur by Year 15-16 (possibly as soon as Year 12-13, depending on market forces) as it is a common exit strategy of tax credit investors following the statutory tax credit delivery and recapture period, and that a compounding interest calculation would derail the project pro forma.

Rather than jeopardize the project's affordable housing funding timeline, staff is recommending approval of the loans at 4% simple interest. However, it remains within the Council's purview to alter the interest calculation at this meeting if they see fit to do so.

*City Affordable Housing Fund Loan Details*

At their regular meeting on February 21, 2024, the City Council adopted Ordinance No. 1333, approving an EIR Addendum for the East Area 1 project and Amendment No. 3 to the Development Agreement (Harvest at Limoneira project). A major component of the amended agreement involves the Harvest at Limoneira project developer, Limoneira Lewis Community Builders, LLC, providing a contribution of $5,500,000 to the City Affordable Housing Fund in order to satisfy the requirements of the City's Inclusionary Housing Ordinance triggered by their request to increase their allowed units by 550. The City would then pass that amount to the Red Tail/AHA project in the form of a "soft" loan.

Section 8.7.2 of the approved Development Agreement states:

**Inclusionary Housing**. In lieu of providing Very-Low-, Low-, and Moderate-Income housing within the Project, Developer will make the following contributions to the City's Affordable Housing Trust Fund, which must be used by the City for constructing affordable housing. For the first 1,500 residential dwelling units within the Project, Developer shall contribute a total of $6,500,000 to the City's Affordable Housing Trust Fund, which will be paid at a per unit rate of no less than $4,642.86 upon issuance of a certificate of occupancy for each market-rate residential unit. *For the additional 550 residential dwelling units described in Section 2.2, Developer shall meet or exceed its obligation to construct or fund affordable housing units under the City's Inclusionary Housing Ordinance by providing the gap financing identified by the City as necessary for the successful development of the affordable multi-family rental housing project in the City proposed by Red Tail Multifamily Land Development, LLC, consisting of 36 very-low income units, 130 low-income units, and 132 market-rate units to be located at 18004 East Telegraph Road (APN: 107-0-042-015) ("Red Tail Project").* ***Specifically, Developer shall contribute a total of $5,500,000 to the City's Affordable Housing Trust Fund, which shall be paid no later than 30 days before City enters a loan or equivalent instrument to fund the Red Tail Project (the "Red Tail Payment Trigger").*** *Should the Red Tail Payment Trigger not occur for any reason, in lieu of making the $5,500,000 payment specified above, Developer will (i) contribute a total of $5,500,000 plus an annual increase of $400,000 per year commencing on January 1, 2025, up to a maximum payment of $8,250,000 to the City's Affordable Housing Trust Fund to be used for alternative offsite rental housing development of at least 50 very-low and low-income units, as determined by City (a "Replacement Project Contribution"), or if no Replacement Project Contribution has been made prior to issuance of the 1,501st certificate of occupancy, (ii) pay an in lieu fee to the City's Affordable Housing Trust Fund of $15,000 per unit prior to issuance of each certificate of occupancy. City agrees to reasonably cooperate in providing documentation at Developer's request to ensure appropriate treatment of this contribution for tax purposes, at no risk or cost to the City.*

By structuring this way, the City actually doubles the amount of affordable housing that would otherwise have been triggered by the 550 additional Harvest at Limoneira units. Under the City's Inclusionary Housing Ordinance, 83 affordable units (15% of the 550 additional units) would have been required. Here, the City gains 166 affordable units – 39% (42 units) of the City's Very-Low Income requirement, and 103% (124 units) of the City's Low-Income

requirement under the current (6th Cycle) Southern California Association of Governments ("SCAG") RHNA allocation.

*DIF/WIL Deferrals*

Waiver of City fees is a common tool in assisting the development of affordable housing and meeting Regional Housing Needs Assessment ("RHNA") goals in California. However, City staff remains keenly aware of the City's urgent financial and budgetary needs, and the related inability to accommodate fee waivers, as other larger cities might, in facilitating the construction of affordable housing. As such, staff has worked with Red Tail/AHA on fee deferrals only, to ensure the City can benefit from increased affordable housing supply without the detriment of waived fees that the City budget cannot realistically support. A full breakdown of the proposed fee deferrals for both the affordable and market-rate portions of the project is provided as Attachment D.

The City's certified 2021-2029 Housing Element also provides direction regarding fee deferrals. Section B.11 of Chapter 5: *Housing Action Plan* states:

"To the extent feasible, the City will defer the payment of development impact fees for 15 years, which would allow affordable housing projects to count that as a public funding source, which helps increase competitiveness when applying for low income housing tax credit allocations."

While development fee deferrals have not been utilized in past affordable housing projects, the City's new Housing Element policy not only establishes that expectation as a new "tool" toward achieving affordability, but is also consistent with trends across the state as to how local jurisdictions can partner with developers to achieve affordable housing units.

**STRATEGIC PLAN:**

This project supports the City Council-adopted policy to support the acquisition, rehabilitation and/or new construction of rental projects that focus on populations earning 60% or less of the area median income, and that provide affordable housing to assist these populations.

**FISCAL IMPACTS:**

Significant current and future (deferred) permitting/development fees and property tax revenues for the project, along with potential sales tax revenues generated by several hundred new City residents living onsite, would be lost if the project could not be completed.

Availability of new affordable (and market-rate) housing may also factor heavily into siting and feasibility of multiple nearby commercial developments (and their associated sales tax revenue) currently proposed or under consideration.

**OPTIONS:**

In addition to the recommended action, the City Council has the following available alternative options, both of which may have significant impacts on the project's state funding applications and overall feasibility:

1. Continue the item in order to obtain further information; or

2. Deny the applicant's request and direct staff to prepare a determination of denial

**ATTACHMENTS:**

A - City Council Resolution No. 7508.pdf
B - City Funding Award Letter - Draft.pdf
C - Citrus Flats Project Pro Forma 03.22.2024.pdf
D - Citrus Flats Fee Breakdowns.pdf
E - Simple vs. Compounding Interest Calculations.pdf

# ATTACHMENT A

CC RESOLUTION NO. 7508

**RESOLUTION NO. 7508**

**A RESOLUTION OF THE CITY OF SANTA PAULA AUTHORIZING THE CITY AFFORDABLE HOUSING FUND LOAN TO FLT TELEGRAPH PARTNERS, L.P. ("PARTNERSHIP") IN THE AMOUNT OF $5,500,000; AND THE DEFERRAL OF DEVELOPMENT IMPACT FEES AND WATER IN LIEU FEES IN AN AMOUNT NOT TO EXCEED $5,157,949**

**WHEREAS**, on February 15, 2023, the Citrus Flats affordable housing project, located at 18004 East Telegraph Road ("Property"), received all non-discretionary (By-Right Zoning) and required discretionary (Affordable Housing Plan) approvals and entitlements from the City, including an affordable housing project for 166 affordable units and 1 Manager's unit ("Project"); and

**WHEREAS**, on June 27, 2023, the acquisition of the Property was officially completed by the Partnership; and

**WHEREAS**, on February 21, 2024, the City Council adopted Ordinance No. 1333, approving an EIR Addendum for the East Area 1 project and Amendment No. 3 to the Development Agreement (Harvest at Limoneira project) which provides for a commitment to fund $5,500,000 to the City Affordable Housing Fund; and

**WHEREAS**, there is still a need for other City assistance for this project including the deferral of City Development Impact Fees (DIF) and Water In Lieu (WIL) fees and Low Income Tax Credits for the balance of the financing.

**NOW, THEREFORE**, the City Council of the City of Santa Paula hereby finds, determines, declares, and resolves as follows:

1. The City Council has considered the full record before it, which includes, but is not limited to, the supporting documentation, testimony by staff and the public, and other materials and evidence submitted or provided to it. Furthermore, the recitals set forth above are found to be true and correct and are incorporated herein by reference.

2. The City Council hereby authorizes its staff to reserve $5.5 million from the City Affordable Housing Fund for the construction of the Project.

3. The City Council further authorizes its staff to defer payment of Development Impact Fees in the amount of $2,975,986 and Water In Lieu fees in an amount not to exceed $2,181,963.

4. The City Council hereby directs City staff to finalize loan documents, regulatory agreements, and other necessary documents to the satisfaction of the City Manager and City Attorney.

5. The City Council hereby authorizes the City Manager or designee authority to execute the loan documents and other necessary documents, on behalf of the City, once it is determined by City staff that all other funding sources have been committed to the development.

6. The City Manager hereby designates the City Clerk as the custodian of the documents and other materials which constitute the record of proceedings upon which the decision herein is based.

PASSED AND ADOPTED this 3rd day of April, 2024.

_____
Leslie Cornejo, Mayor

ATTEST:

_____
Julie Latshaw, CMC, City Clerk

APPROVED AS TO FORM:

_____
Seth Merewitz, Interim City Attorney

# ATTACHMENT B

CITY FUNDING AWARD LETTER (DRAFT)

April 3, 2024

FLT Telegraph Partners, L.P.
2082 Michelson Drive, 3rd Floor
Irvine, CA 92612
Attention: Ron Wu

**RE: Award of Funds for Citrus Flats (18004 East Telegraph Road)**

Dear Mr. Wu:

The City of Santa Paula has received a request for up to $10,657,949 in funding for the development of a 166-unit affordable housing community, located at 18004 East Telegraph Road in Santa Paula. This project supports the City Council adopted policy to support the acquisition, rehabilitation and/or new construction of rental projects that focus on populations earning 60% or less of the area median income, and that provide affordable housing to assist these populations. This project's funding recommendation will be an amount up to $10,657,949 in City Affordable Housing Funds and deferral of Development Impact Fees and Water in Lieu fees (as set forth below) to assist with development. Funding approval was presented to City Council at a City Council meeting on April 3, 2024.

The funding will be contingent upon documentation of final Loan terms; the attached pro forma; and valid funding commitments from all other sources identified on the pro forma for the Project.

**Applicant:** FLT Telegraph Partners, L.P.

**Loan Amount:** City Affordable Housing Fund Loan - $5,500,000

Development Impact Fee Deferral ("DIF") Loan - $2,975,986

Water in Lieu Deferral ("WIL") Loan – Not to exceed $2,181,963

**Loan Terms:** The City Affordable Housing Fund Loan will accrue interest at a simple interest rate of 4.0% per annum. The City Affordable Housing Fund Loan term will be 55 years. Principal and accrued and unpaid interest on the City Affordable Housing Fund Loan will be payable when sufficient residual cash flow (see Repayment Source below) is available to pay a portion of the City Affordable Housing Fund loan. The principal balance of the City Affordable Housing Fund Loan will self-defease over a 40-year period, commencing in Year 16 of the loan term.

The DIF Loan and the WIL Loan will accrue interest at a simple interest rate of 4.0% per annum Principal and accrued and unpaid interest on each of the DIF Loan and the WIL Loan will be payable when sufficient residual cash flow (see Repayment Source below) is available to pay a portion of the applicable loan. The loan term for each of the DIF Loan and the WIL Loan will be 55 years.

DRAFT

The closing of the City Loans will be concurrent with the closing of the tax credit and tax-exempt bond financing administered by TCAC. Following the closing of the initial financing of the Project, Applicant will not incur additional debt obligations (other than the permanent financing of the Project following conversion of construction financing), or increase existing obligations, without the written approval of the City.

The City of Santa Paula loan structure will not be in conflict with State of California LIHTC underwriting guidelines.

**Repayment Source:** The repayment source for the DIF Loan, the WIL Loan and the City Affordable Housing Fund Loan is 50% of the residual cash flow after Applicant's payment in full of all deferred developer fees and of allowable expenses per the guidelines set forth in the California Tax Credit Allocation Committee's Qualified Allocation Plan and related regulations adopted by the Committee. The DIF Loan, the WIL Loan and the City Affordable Housing Fund Loan will be secured by a subordinated lien on the real property, and the Loans will be repaid, and the City's lien on the real property released, on a capital event.

Pending the above-mentioned conditions, this letter of interest is confirmed for 270 days following the TCAC award of 4% Low Income Housing Tax Credits.

We are pleased to support the development of Citrus Flats and look forward to its completion. This project will add greatly needed affordable units to the community which will serve low-income households.

Sincerely,

| | |
|---|---|
| Dan Singer<br>City Manager<br>Date: | James Mason<br>CED Director<br>Date: |
| Christy Ramirez<br>Finance Director<br>Date: | Seth Merewitz<br>Interim City Attorney<br>Date: |

# ATTACHMENT C

CITRUS FLATS PROJECT PRO FORMA
03.22.2024

| | |
|---|---|
| Developer: | **Red Tail Acquisitions LLC** |
| Property Name: | **Santa Paula Apartments** |
| Property Location: | **18004 East Telegraph Rd, Santa Paula, CA** |
| Property Type: | **Family** |

## Sources of Funds

| | Construction/Lease- Up | Permanent |
|---|---|---|
| Construction Loan | 45,800,000 | - |
| Hard Debt | | 28,300,000 |
| Seller Land Note | 1,280,000 | 1,280,000 |
| **DIF** | **5,157,949** | **5,157,949** |
| Inclusionary Housing Funds | - | 5,500,000 |
| State Tax Credit | - | - |
| LIHTC Equity | 16,281,874 | 31,960,000 |
| Deferred Developer's Fee | - | 7,820,311 |
| Fund Accrual Adjustment Pre Conversion | - | - |
| **Total Sources of Funds** | **68,519,822** | **80,018,260** |

## Unit Mix

| Type | Total Units | Manager Units | Square Footage | FMR Rent | Rent Subsidy |
|---|---|---|---|---|---|
| Studio | - | - | - | - | |
| 1BR | 60 | - | 656 | 2,011 | |
| 2BR | 32 | 1 | 883 | 2,414 | |
| 3BR | 56 | 1 | 1,168 | 3,310 | |
| 4BR | 18 | - | 1,378 | 3,867 | |
| **Total** | 166 | 2 | 157,828 | | - |

## Uses of Funds

| | Construction/Lease- Up | Per Unit | Permanent | Per Unit |
|---|---|---|---|---|
| Acquisition | 3,600,000 | 21,687 | 3,600,000 | 21,687 |
| Hard Cost | 46,431,183 | 279,706 | 46,431,183 | 279,706 |
| Hard Cost Contingency | 2,263,784 | 13,637 | 2,263,784 | 13,637 |
| Interest Costs | 3,354,229 | 20,206 | 3,887,718 | 23,420 |
| Other Soft Costs | 11,770,627 | 70,907 | 11,845,627 | 71,359 |
| Soft Cost Contingency | 100,000 | 602 | 100,000 | 602 |
| Reserves | 1,000,000 | 6,024 | 2,668,231 | 16,074 |
| Developer Fee | - | - | 9,221,717 | 55,553 |
| **Total Uses of Funds** | **68,519,822** | 412,770 | **80,018,260** | 482,038 |

## 1st Mortgage

| | | | |
|---|---|---|---|
| Lender Name | Tax Exempt Loan | | |
| Loan Amount | 28,300,000 | Annual Payment | 1,928,044 |
| Amortization (years) | 40 | | 160,670 |
| Term (Years) | 40 | | |
| Anticipated Rate | 6.250% | | |
| Type of Repayment | Hard | | |

## Soft Debt City DIF

| | | | |
|---|---|---|---|
| Lender Name | **DIF** | | |
| Loan Amount | 5,157,949 | | |
| Amortization (years) | Interest only | | |
| Term (Years) | 55 | | |
| Anticipated Rate | 4.000% | | |
| Type of Repayment | Residual | | |

## Developer Fee Payment Schedule

| | Amount | |
|---|---|---|
| At Closing | $0 | |
| During Construction | $0 | |
| Post Construction pre Conversion | $0 | |
| Conversion | $0 | |
| 8609 | $1,401,406 | |
| **Total Cash Developer Fee** | **$1,401,406** | 84.80% |
| Deferred Developers Fee | $7,820,311 | |
| Total Developers Fee | $9,221,717 | |
| Percent Developer Fee Paid | 15.20% | |
| Maximum Developer Fee per CTCAC (Paid) | **$4,201,659** | |

## Property Level Tax Credit Qualification

| | |
|---|---|
| Zip Code | 93060 |
| Census Tract | 4 |
| QCT | No |
| DDA | No |
| Rural | No |
| LIHTC Pricing | $0.8700 |
| LIHTC Tax Credit Rate | 4.00% |
| State Credit Pricing | $0.00 |
| State Tax Credit Rate | 13.00% |
| 10 Year LIHTC (99.99%) | 36,760,240 |

## Soft Debt City Inclusionary Housing Funds

| | |
|---|---|
| Lender Name | Inclusionary Housing Funds |
| Loan Amount | 5,500,000 |
| Amortization (years) | Interest only |
| Term (Years) | 55 |
| Anticipated Rate | 4.000% |
| Type of Repayment | Residual |

## Equity Installments

| | LP Interest | 99.99% |
|---|---|---|
| *Benchmark* | *Percent* | *Amount* |
| Closing | 20.00% | 6,392,000 |
| 25% Completion | 0.00% | - |
| 50% Completion | 5.00% | 1,598,000 |
| 100% Completion | 25.00% | 7,990,000 |
| Conversion | 45.00% | 14,382,000 |
| 8609's | 5.00% | 1,598,000 |
| *Total* | 100.00% | 31,960,000 |

## Soft Debt Land Sale Carryback

| | |
|---|---|
| Lender Name | Seller |
| Loan Amount | 1,280,000 |
| Amortization (years) | Interest only |
| Term (Years) | 30 |
| Anticipated Rate | 4.00% |
| Type of Repayment | Residual |

| | |
|---|---|
| Developer: | **Red Tail Acquisitions LLC** |
| Property Name: | **Santa Paula Apartments** |
| Property Location: | **18004 East Telegraph Rd, Santa Paula, CA** |
| Property Type: | **Family** |

## Source of Funds

| | Rehab and Lease Up | Permanent |
|---|---|---|
| Construction Loan | 45,800,000 | - |
| Hard Debt | | |
| Tax Exempt Loan | - | 28,300,000 |
| Soft Debt | | |
| Seller Land Note | 1,280,000 | 1,280,000 |
| DIF | 5,157,949 | 5,157,949 |
| Inclusionary Housing Funds | | 5,500,000 |
| State Tax Credit | | - |
| LIHTC Equity | 16,281,873 | 31,960,000 |
| NOI | | |
| Deferred Developer's Fee | - | 7,820,312 |
| Repayment of Construction Loan | | - |
| Fund Accrual Adjustment Pre Conversion | | - |
| **Total Sources of Funds** | **68,519,822** | **80,018,261** |

## Use of Funds

| | Rehab and Lease Up | Permanent | Per Unit |
|---|---|---|---|
| Land | 3,600,000 | 3,600,000 | 21,687 |
| Other Acquisition Costs | - | - | - |
| Structures (Hard Costs) | 35,915,524 | 35,915,524 | 216,359 |
| Offsite Improvements | 379,027 | 379,027 | 2,283 |
| On-Site Improvements | 3,420,949 | 3,420,949 | 20,608 |
| General Requirements | 2,382,930 | 2,382,930 | 14,355 |
| Contractor Overhead | 794,310 | 794,310 | 4,785 |
| Contractor Profit | 2,382,930 | 2,382,930 | 14,355 |
| Contractors Insurance | 452,757 | 452,757 | 2,727 |
| Hard Cost Contingency | 2,263,784 | 2,263,784 | 13,637 |
| Payment & Permformance Bond | 452,757 | 452,757 | 2,727 |
| FFE | 250,000 | 250,000 | 1,506 |
| Architectural | 1,100,000 | 1,100,000 | 6,627 |
| Survey & Engineering | - | - | - |
| Construction Loan Interest | 3,354,229 | 3,887,718 | 23,420 |
| | - | - | |
| Post Construction Completion Loan Interest | - | - | - |
| Other Construction Period Expenses | 509,000 | 509,000 | 3,066 |
| Permanent Financing Expenses | - | 75,000 | 452 |
| Legal Fees | 200,000 | 200,000 | 1,205 |
| Operating Reserves | | 1,502,231 | 9,050 |
| Replacement Reserves | | 166,000 | 1,000 |
| Leaseup Operating Reserve | 500,000 | 500,000 | 3,012 |
| Loan Contingency Reserve | 500,000 | 500,000 | |
| Reports & Studies | 101,950 | 101,950 | 614 |
| Agency and Other Fees | 701,728 | 701,728 | |
| Impact Fees | 9,157,949 | 9,157,949 | 55,168 |
| Soft Cost Contingency | 100,000 | 100,000 | 602 |
| Developer Fees | - | 9,221,718 | 55,553 |
| **Total Uses of Funds** | **68,519,822** | **80,018,261** | **474,798** |

Developer: **Red Tail Acquisitions LLC**
Property Name: **Santa Paula Apartments**
Property Location: **18004 East Telegraph Rd, Santa Paula, CA**
Property Type: **Family**

| | Bdrm | Bth | AMI | # of units | sq.ft. | Max 60% Rents | Util. Allowance | Gross Rent | Max LIHTC Rent | Max LIHTC Rents before UA | Assumed Rents | HAP Overhang |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3.3% | 1 | PBV | 30% | 2 | 656 | $1,494 | $69 | | 747.00 | $747 | $2,143 | 2,930 |
| 6.7% | 1 | | 30% | 4 | 656 | $1,494 | $69 | | 747.00 | $747 | $678 | - |
| 10.0% | 1 | | 40% | 6 | 656 | $1,494 | $69 | | 996.00 | $996 | $927 | - |
| 10.0% | 1 | | 50% | 6 | 656 | $1,494 | $69 | | 1,245.00 | $1,245 | $1,176 | |
| 10.0% | 1 | | 60% | 6 | 656 | $1,494 | $69 | | 1,494.00 | $1,494 | $1,425 | - |
| 60.0% | 1 | | 70% | 36 | 656 | $1,494 | $69 | | 1,743.00 | $1,743 | $1,674 | |
| 60 | | | 60% | | | | | | | | | |
| 6.5% | 2 | PBV | 30% | 2 | 883 | $1,794 | $96 | | 897.00 | $897 | $2,559 | 3,516 |
| 6.5% | 2 | | 30% | 2 | 883 | $1,794 | $96 | | 897.00 | $897 | $801 | - |
| 12.9% | 2 | | 40% | 4 | 883 | $1,794 | $96 | | 1,196.00 | $1,196 | $1,100 | - |
| 12.9% | 2 | | 50% | 4 | 883 | $1,794 | $96 | | 1,495.00 | $1,495 | $1,399 | |
| 12.9% | 2 | | 60% | 4 | 883 | $1,794 | $96 | | 1,794.00 | $1,794 | $1,698 | - |
| 48.4% | 2 | | 70% | 15 | 883 | $1,794 | $96 | | 2,093.00 | $2,093 | $1,997 | |
| 32 | | Mngr | 60% | 1 | | | | | | | | |
| 3.6% | 3 | PBV | 30% | 2 | 1,168 | $2,072 | $123 | | 1,036.00 | $1,036 | $3,518 | 5,210 |
| 7.3% | 3 | | 30% | 4 | 1,168 | $2,072 | $123 | | 1,036.00 | $1,036 | $913 | - |
| 10.9% | 3 | | 40% | 6 | 1,168 | $2,072 | $123 | | 1,381.00 | $1,381 | $1,258 | - |
| 10.9% | 3 | | 50% | 6 | 1,168 | $2,072 | $123 | | 1,726.00 | $1,726 | $1,603 | |
| 10.9% | 3 | | 60% | 6 | 1,168 | $2,072 | $123 | | 2,072.00 | $2,072 | $1,949 | - |
| 56.4% | 3 | | 70% | 31 | 1,168 | $2,072 | $123 | | 2,417.00 | $2,417 | $2,294 | |
| 56 | | Mngr | 60% | 1 | | | | | | | | |
| 11.1% | 4 | PBV | 30% | 2 | 1,378 | $2,311 | $151 | | 1,155.00 | $1,155 | $4,102 | 6,196 |
| 11.1% | 4 | | 40% | 2 | 1,378 | $2,311 | $151 | | 1,541.00 | $1,541 | $1,390 | - |
| 11.1% | 4 | | 50% | 2 | 1,378 | $2,311 | $151 | | 1,926.00 | $1,926 | $1,775 | |
| 11.1% | 4 | | 60% | 2 | 1,378 | $2,311 | $151 | | 2,311.00 | $2,311 | $2,160 | |
| 55.6% | 4 | | 70% | 10 | 1,378 | $2,311 | $151 | | 2,696.00 | $2,696 | $2,545 | |
| 0.0% | 4 | | 80% | 0 | 1,378 | | $151 | | 3,082.00 | | | |
| 18 | | | 60% | | | | | | | | | |
| | | | | **166** | 155,777 | $300,812 | | $0 | | $295,606 | $296,859 | 17,852 |
| *Income Averaging* | | | *59.76%* | | | $3,609,744 | Compare Rent Level for Income Averaging | | | $3,547,272 | $3,562,308 | 214,224 |

Common Area Sq. Ft. 2,800 158,577

2023 Jun-23 Ventura

| **Area Median Income (50%)** | | **0.00%** | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|---|
| 2023 | | 123,500 | 46,500 | 53,150 | 59,800 | 66,400 | 71,750 | 77,050 |
| 2022 | | 115,400 | 43,900 | 50,200 | 56,450 | 62,700 | 67,750 | 72,750 |
| | % Increase | 107.02% | 105.92% | 105.88% | 105.93% | 105.90% | 105.90% | 105.91% |
| | | 100% | 30% | 40% | 50% | 60% | 70% | 80% |
| 0 | Studio | 2,325.00 | 697.00 | 930.00 | 1,162.00 | 1,395.00 | 1,627.00 | 1,860.00 |
| 1 | 1BR | 2,491.25 | 747.00 | 996.00 | 1,245.00 | 1,494.00 | 1,743.00 | 1,993.00 |
| 2 | 2BR | 2,990.00 | 897.00 | 1,196.00 | 1,495.00 | 1,794.00 | 2,093.00 | 2,392.00 |
| 3 | 3BR | 3,453.75 | 1,036.00 | 1,381.00 | 1,726.00 | 2,072.00 | 2,417.00 | 2,763.00 |
| 4 | 4BR | 3,852.50 | 1,155.00 | 1,541.00 | 1,926.00 | 2,311.00 | 2,696.00 | 3,082.00 |

| | | 2020 FMR |
|---|---|---|
| 4 | | |
| 2 | | |
| 4 | | 1,269 |
| | | 1,519 |
| 2 | | 1,923 |
| 5 | | 2,690 |
| | | 3,189 |

Developer: **Red Tail Acquisitions LLC**
Property Name: **Santa Paula Apartments**
Property Locatic **18004 East Telegraph Rd, Santa Paula, CA**
Property Type: **Family**

| **Permanent Must Pay Debt** | **Tax Exempt Loan** | | **DIF** | **Inclusionary Housing Funds** |
|---|---|---|---|---|
| Amount | 28,300,000 | | 5,157,949 | 5,500,000 |
| Interest Rate | 6.25% | | 4.00% | 4.00% |
| Amortization (Yrs) | 40 | | Residual | Residual |
| Term (Yrs) | 40 | | - | |

| | **Pro Forma** | **PUPA** | **Comments** |
|---|---|---|---|
| Gross Rental Income | 3,348,084 | 20,169 | |
| HAP Overhang Income | 214,224 | 1,291 | |
| Other Income | - | - | |
| Vac. & Credit Loss | (178,115) | 5.0% | |
| **EGI** | **3,384,193** | 20,387 | |
| **Operating Expenses (OPEX):** | | | |
| G&A | 48,140 | 290 | |
| Management Fee | 135,368 | 4.0% | |
| Payroll | 337,500 | 2,033 | |
| R&M | 110,390 | 665 | |
| Utilities | 199,200 | 1,200 | |
| Insurance | 157,700 | 950 | |
| RE & Other Taxes | 3,320 | 20 | |
| Ground Rent | - | - | |
| Reserves | 49,800 | 300 | |
| Other Expenses | 35,000 | 211 | |
| **Total Expenses** | **1,076,418** | 6,484 | |
| **NOI / OPEX Ratio** | **2,307,775** | **32%** | |
| Tax Exempt Loan | 1,928,044 | 11,615 | |
| DIF | - | - | |
| Inclusionary Housing Funds | | | |
| **Total Debt Service** | **1,928,044** | 11,615 | |
| **Inc/Exp - 1st Mtg Only** | **1.13** | | |
| **Inc/Exp - All Mtg Debt** | **1.13** | | |
| **DSCR - 1st Mtg Only** | **1.20** | | |
| **DSCR - All Mtg Debt** | **1.1970** | | |

Developer: **Red Tail Acquisitions LLC**
Property Name: **Santa Paula Apartments**
Property Location: **18004 East Telegraph Rd, Santa Paula, CA**
Property Type: **Family**

| Factor | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 | Year 9 | Year 10 | Year 11 | Year 12 | Year 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2.5% | Gross Rental Income | 3,348,084 | 3,431,786 | 3,517,581 | 3,605,520 | 3,695,658 | 3,788,050 | 3,882,751 | 3,979,820 | 4,079,315 | 4,181,298 | 4,285,831 | 4,392,976 | 4,502,801 |
| 2.5% | Tenant Assistance payments | 214,224 | 219,580 | 225,069 | 230,696 | 236,463 | 242,375 | 248,434 | 254,645 | 261,011 | 267,536 | 274,225 | 281,080 | 288,107 |
| 2.5% | Laundry and Vending Income | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5.0% | Vac. & Credit Loss | (178,115) | (182,568) | (187,132) | (191,811) | (196,606) | (201,521) | (206,559) | (211,723) | (217,016) | (222,442) | (228,003) | (233,703) | (239,545) |
| | **EGI** | **3,384,193** | **3,468,797** | **3,555,517** | **3,644,405** | **3,735,515** | **3,828,903** | **3,924,626** | **4,022,742** | **4,123,310** | **4,226,393** | **4,332,053** | **4,440,354** | **4,551,363** |
| | Operating Expenses | | | | | | | | | | | | | |
| 3.0% | G&A | 48,140 | 49,584 | 51,072 | 52,604 | 54,182 | 55,807 | 57,482 | 59,206 | 60,982 | 62,812 | 64,696 | 66,637 | 68,636 |
| 3.0% | Management Fee | 135,368 | 138,752 | 142,221 | 145,776 | 149,421 | 153,156 | 156,985 | 160,910 | 164,932 | 169,056 | 173,282 | 177,614 | 182,055 |
| 3.0% | Payroll | 337,500 | 347,625 | 358,054 | 368,795 | 379,859 | 391,255 | 402,993 | 415,082 | 427,535 | 440,361 | 453,572 | 467,179 | 481,194 |
| 3.0% | R&M | 110,390 | 113,702 | 117,113 | 120,626 | 124,245 | 127,972 | 131,811 | 135,766 | 139,839 | 144,034 | 148,355 | 152,806 | 157,390 |
| 3.0% | Utilities | 199,200 | 205,176 | 211,331 | 217,671 | 224,201 | 230,927 | 237,855 | 244,991 | 252,341 | 259,911 | 267,708 | 275,739 | 284,012 |
| 3.0% | Insurance | 157,700 | 162,431 | 167,304 | 172,323 | 177,493 | 182,818 | 188,302 | 193,951 | 199,770 | 205,763 | 211,936 | 218,294 | 224,842 |
| 3.0% | RE Taxes | 3,320 | 3,420 | 3,522 | 3,628 | 3,737 | 3,849 | 3,964 | 4,083 | 4,206 | 4,332 | 4,462 | 4,596 | 4,734 |
| 0.0% | Ground Rent | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 1.0% | Reserves | 49,800 | 50,298 | 50,801 | 51,309 | 51,822 | 52,340 | 52,864 | 53,392 | 53,926 | 54,466 | 55,010 | 55,560 | 56,116 |
| 3.0% | Other Expenses | 35,000 | 36,050 | 37,132 | 38,245 | 39,393 | 40,575 | 41,792 | 43,046 | 44,337 | 45,667 | 47,037 | 48,448 | 49,902 |
| | **Total Expenses** | 1,076,418 | 1,107,037 | 1,138,549 | 1,170,978 | 1,204,352 | 1,238,699 | 1,274,048 | 1,310,427 | 1,347,868 | 1,386,400 | 1,426,058 | 1,466,873 | 1,508,880 |
| | **NOI** | **2,307,775** | **2,361,760** | **2,416,969** | **2,473,427** | **2,531,163** | **2,590,204** | **2,650,578** | **2,712,314** | **2,775,443** | **2,839,992** | **2,905,995** | **2,973,481** | **3,042,483** |
| | **Debt Service** | | | | | | | | | | | | | |
| | Tax Exempt Loan | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) |
| | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | **Total Debt Service** | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) |
| | **Available Cash Flow** | 379,731 | 433,716 | 488,925 | 545,384 | 603,119 | 662,160 | 722,534 | 784,271 | 847,399 | 911,949 | 977,951 | 1,045,437 | 1,114,439 |
| | Priority ILP | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) |
| 3.0% | Priority MGP | (19,920) | (20,518) | (21,133) | (21,767) | (22,420) | (23,093) | (23,786) | (24,499) | (25,234) | (25,991) | (26,771) | (27,574) | (28,401) |
| 50.0% | Deferred Developer Fee | (352,311) | (405,699) | (460,292) | (516,116) | (573,199) | (631,568) | (691,249) | (752,272) | (814,665) | (878,458) | (943,680) | (800,803) | - |
| | DIF Residual Recepits (25%) | - | - | - | - | - | - | - | - | - | - | - | (52,390) | (269,635) |
| | Inclusionary Housing Funds (25%) | - | - | - | - | - | - | - | - | - | - | - | (52,390) | (269,635) |
| | Seller Land Note | - | - | - | - | - | - | - | - | - | - | - | - | (51,200) |
| | **Distributable Cash Flow** | - | - | - | - | - | - | - | - | - | - | - | 104,780 | 488,069 |
| | **Deferred Developer Fee** | | | | | | | | | | | | | |
| | Deferred Fee Beginning | 7,820,312 | 7,468,001 | 7,062,302 | 6,602,010 | 6,085,894 | 5,512,695 | 4,881,127 | 4,189,878 | 3,437,606 | 2,622,941 | 1,744,484 | 800,803 | - |
| | Payment | (352,311) | (405,699) | (460,292) | (516,116) | (573,199) | (631,568) | (691,249) | (752,272) | (814,665) | (878,458) | (943,680) | (800,803) | - |
| | Deferred Fee Ending | 7,468,001 | 7,062,302 | 6,602,010 | 6,085,894 | 5,512,695 | 4,881,127 | 4,189,878 | 3,437,606 | 2,622,941 | 1,744,484 | 800,803 | - | - |
| | DSCR | 1.20x | 1.22x | 1.25x | 1.28x | 1.31x | 1.34x | 1.37x | 1.41x | 1.44x | 1.47x | 1.51x | 1.54x | 1.58x |
| | **DIF** | | | | | | | | | | | | | |
| | DIF | 5,157,949 | 5,364,267 | 5,570,585 | 5,776,903 | 5,983,221 | 6,189,539 | 6,395,857 | 6,602,175 | 6,808,493 | 7,014,811 | 7,221,129 | 7,427,447 | 7,581,374 |
| | Interest Rate | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% |
| | Annual Interest Calculation (Simple) | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 |
| | Annual Interest Paid | - | - | - | - | - | - | - | - | - | - | - | (52,390) | (269,635) |
| | Accrued Interest | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 206,318 | 153,928 | (63,317) |
| | **Inclusionary Housing Funds** | | | | | | | | | | | | | |
| | Inclusionary Housing Funds | 5,500,000 | 5,720,000 | 5,940,000 | 6,160,000 | 6,380,000 | 6,600,000 | 6,820,000 | 7,040,000 | 7,260,000 | 7,480,000 | 7,700,000 | 7,920,000 | 8,087,610 |
| | Annual Defeasing | | | | | | | | | | | | | |
| | Interest Rate | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% |
| | Annual Interest Calculation (Simple) | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 |
| | Annual Interest Paid | - | - | - | - | - | - | - | - | - | - | - | (52,390) | (269,635) |
| | Accrued Interest | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 220,000 | 167,610 | (49,635) |

Developer:
Property Name:
Property Location:
Property Type:

| Factor | | Year 14 | Year 15 | Year 16 | Year 17 | Year 18 | Year 19 | Year 20 |
|---|---|---|---|---|---|---|---|---|
| 2.5% | Gross Rental Income | 4,615,371 | 4,730,755 | 4,849,024 | 4,970,250 | 5,094,506 | 5,221,868 | 5,352,415 |
| 2.5% | Tenant Assistance payments | 295,310 | 302,693 | 310,260 | 318,017 | 325,967 | 334,116 | 342,469 |
| 2.5% | Laundry and Vending Income | - | - | - | - | - | - | - |
| 5.0% | Vac. & Credit Loss | (245,534) | (251,672) | (257,964) | (264,413) | (271,024) | (277,799) | (284,744) |
| | **EGI** | **4,665,147** | **4,781,776** | **4,901,320** | **5,023,853** | **5,149,449** | **5,278,185** | **5,410,140** |
| | Operating Expenses | | | | | | | |
| 3.0% | G&A | 70,695 | 72,816 | 75,001 | 77,251 | 79,568 | 81,955 | 84,414 |
| 3.0% | Management Fee | 186,606 | 191,271 | 196,053 | 200,954 | 205,978 | 211,127 | 216,406 |
| 3.0% | Payroll | 495,630 | 510,499 | 525,814 | 541,588 | 557,836 | 574,571 | 591,808 |
| 3.0% | R&M | 162,111 | 166,975 | 171,984 | 177,144 | 182,458 | 187,932 | 193,570 |
| 3.0% | Utilities | 292,532 | 301,308 | 310,347 | 319,658 | 329,247 | 339,125 | 349,298 |
| 3.0% | Insurance | 231,588 | 238,535 | 245,691 | 253,062 | 260,654 | 268,474 | 276,528 |
| 3.0% | RE Taxes | 4,876 | 5,022 | 5,172 | 5,328 | 5,487 | 5,652 | 5,822 |
| 0.0% | Ground Rent | - | - | - | - | - | - | - |
| 1.0% | Reserves | 56,677 | 57,244 | 57,816 | 58,394 | 58,978 | 59,568 | 60,164 |
| 3.0% | Other Expenses | 51,399 | 52,941 | 54,529 | 56,165 | 57,850 | 59,585 | 61,373 |
| | **Total Expenses** | 1,552,114 | 1,596,610 | 1,642,408 | 1,689,543 | 1,738,057 | 1,787,989 | 1,839,382 |
| | **NOI** | **3,113,033** | **3,185,165** | **3,258,912** | **3,334,310** | **3,411,392** | **3,490,196** | **3,570,758** |
| | **Debt Service** | | | | | | | |
| | Tax Exempt Loan | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) |
| | | - | - | - | - | - | - | - |
| | | - | - | - | - | - | - | - |
| | **Total Debt Service** | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) | (1,928,044) |
| | **Available Cash Flow** | 1,184,990 | 1,257,122 | 1,330,869 | 1,406,266 | 1,483,349 | 1,562,153 | 1,642,715 |
| | Priority ILP | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) | (7,500) |
| 3.0% | Priority MGP | (29,253) | (30,131) | (31,035) | (31,966) | (32,925) | (33,912) | (34,930) |
| 50.0% | Deferred Developer Fee | - | - | - | - | - | - | - |
| | DIF Residual Recepits (25%) | (287,059) | (7,437,317) | - | - | - | - | - |
| | Inclusionary Housing Funds (25%) | (287,059) | (7,970,916) | - | - | - | - | - |
| | Seller Land Note | (51,200) | (51,200) | (51,200) | (51,200) | (51,200) | (51,200) | (51,200) |
| | **Distributable Cash Flow** | 522,918 | (14,239,942) | 1,241,134 | 1,315,600 | 1,391,724 | 1,469,540 | 1,549,085 |
| | **Deferred Developer Fee** | | | | | | | |
| | Deferred Fee Beginning | - | - | - | - | - | - | - |
| | Payment | - | - | - | - | - | - | - |
| | Deferred Fee Ending | - | - | - | - | - | - | - |
| | DSCR | 1.61x | 1.65x | 1.69x | 1.73x | 1.77x | 1.81x | 1.85x |
| | **DIF** | | | | | | | |
| | DIF | 7,518,058 | 7,437,317 | - | - | - | - | - |
| | Interest Rate | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% |
| | Annual Interest Calculation (Simple) | 206,318 | - | - | - | - | - | - |
| | Annual Interest Paid | (287,059) | (7,437,317) | - | | | | |
| | Accrued Interest | (80,741) | (0) | - | - | - | - | - |
| | **Inclusionary Housing Funds** | | | | | | | |
| | Inclusionary Housing Funds | 8,037,975 | 7,970,916 | - | - | - | - | - |
| | Annual Defeasing | | | | | | | |
| | Interest Rate | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% | 4.00% |
| | Annual Interest Calculation (Simple) | 220,000 | - | - | - | - | - | - |
| | Annual Interest Paid | (287,059) | (7,970,916) | - | - | - | - | - |
| | Accrued Interest | (67,059) | 0 | - | - | - | - | - |

| | |
|---|---|
| Developer: | **Red Tail Acquisitions LLC** |
| Property Name: | **Santa Paula Apartments** |
| Property Location: | **18004 East Telegraph Rd, Santa Paula, CA** |
| Property Type: | **Family** |

| | | |
|---|---|---|
| Construction Term | 18 | |
| Loan Term | 24 | |
| NOI as Source | no | 100% |
| Conversion Month | 22 | |

| **CAPITAL SOURCES** | | | Current Budget | |
|---|---|---|---|---|
| **Must Pay Debt** | | | | |
| Tax Exempt Loan | | | 28,300,000 | |
| | | | | |
| | | | | |
| **Other Debt and Equity** | | | | |
| **DIF** | | | **5,157,949** | DIF |
| Inclusionary Housing Funds | | | 5,500,000 | |
| Seller Land Note | | | 1,280,000 | |
| **Other Financing** | | | | |
| | | | | |
| | | | | |
| State Tax Credit | | 0 | | |
| LIHTC Equity | | 31,981,409 | **31,960,000** | |
| | % Compl. | % Funded | | |
| At Closing | 0% | 20.00% | | |
| 25% Completion | 25% | 0.00% | | |
| 50% Completion | 50% | 5.00% | 9 | |
| 100% Completion | 100% | 25.00% | 18 | |
| Conversion | | 45.00% | 22 | |
| 8609 | | 5.00% | 26 | |
| NOI Post Construction before Conversion | | | 0 | |
| Deferred Developer Fee | **1,401,406** | 84.80% | 7,820,312 | |
| **Subtotal** | | | **80,018,261** | |
| Construction Loan | | 45,727,670 | 45,800,000 | |
| **TOTAL** | | | **125,818,261** | |

| | |
|---|---|
| Developer: | **Red Tail Acquisitions LLC** |
| Property Name: | **Santa Paula Apartments** |
| Property Location: | **18004 East Telegraph Rd, Santa Paula, CA** |
| Property Type: | **Family** |

| | | | | | |
|---|---|---|---|---|---|
| **CAPITAL USES** | | | | | **Construction Eligible** |
| Land | 293,343 | Cost Per Unit | | 3,600,000 | |
| Demolition/Relocation | 279,706 | Less Contigency | | | |
| Carrying Costs | 239,250 | Hard Cost Only Const. | | | |
| Buyer Fund RR credited to Seller | | | | 0 | |
| Other Acquisition Costs Ineligible | $ 307.07 | Cost Per Sq. Ft. | | | |
| Improvements | $ 292.80 | Less Contigency | | | |
| Buyers Paydown of HUD Debt | $ 250.45 | Hard Cost Only Const. | | | |
| Other Acquisition Costs Eligible (Buyer Commission) | | | | | |
| **Total Acquisition Costs** | | | | **3,600,000** | |
| Offsite Improvements | **0.00%** | Eligible | | 379,027 | 0 |
| On-Site Improvements | **100.00%** | Eligible | | 3,420,949 | 3,420,949 |
| Construction Costs | | | | 35,915,524 | 35,915,524 |
| General Requirements | | | 6.0% | 2,382,930 | 2,382,930 |
| Contractor Overhead | | | 2.0% | 794,310 | 794,310 |
| Contractor Profit | | | 6.0% | 2,382,930 | 2,382,930 |
| FFE and Miscellaneous / Inclusionary Excess | | | | 250,000 | 250,000 |
| Payment & Permformance Bond | | | 1.0% | 452,757 | 452,757 |
| Contractors Insurance | | | 1.0% | 452,757 | 452,757 |
| Construction Contingency | | | 5.0% | 2,263,784 | 1,131,892 |
| **Total Hard Costs** | **279,706** | | 53,147,427 | **48,694,967** | **47,184,048** |
| **Relocation** | 293,343 | | | | |
| Temporary | | | | | |
| Permanent | | | | | |
| **Architectural** | | | | | |
| Architectural - Design | | | | 980,000 | 980,000 |
| Architectural - Supervision | | | | 120,000 | 120,000 |
| **Survey & Engineering** | | | | | |
| Surveys & Engineering | | | | | 0 |
| **Construction Period Expenses** | | | | | |
| Construction Loan Interest | 7.00% | | 3,887,718 | 3,887,718 | 3,110,174 |
| Other Interest Costs | | | 0 | | 0 |
| Post Construction Completion Loan Interest | | | 0 | 0 | 0 |
| Lender Origination Fee | 1.00% | Of Loan Amount | | 458,000 | 458,000 |
| Lender Plan & Cost Review / Inspections | | | | 11,000 | 11,000 |
| Construction Loan Title and Recording | | | | | 0 |
| Construction Loan Interest Contingency | | | | | 0 |
| Real Estate Taxes & Insurance | | | | 40,000 | 40,000 |
| **Permanent Financing Expenses** | | | | | |
| Guarantee Fee | 0.00% | See bond fees below | | 0 | 0 |
| Perm Loan Closing Costs | | | | | 0 |
| Perm Loan Title & Recording | | | | 75,000 | |
| Issuance Fees - Filing | | | | | 0 |
| Issuance Fees - Issuer Fee | | | | | 0 |
| **Legal Fees** | | | | | |
| Construction Lender Legal Fees | $0 | | | | 0 |
| Perm Loan Legal | | | | | 0 |
| Borrower Legal | | | | 200,000 | 200,000 |
| Syndicator Legal | | | | | 0 |
| Issuance Fees - Legal | | | | | 0 |
| **Reports and Studies** | | | | | |
| Appraisal(s) | | | | 7,500 | 7,500 |
| Market Study | | | | 10,000 | 10,000 |
| Physical Needs Assessment | | | | | 0 |
| Environmental Studies | | | | 10,000 | 10,000 |
| Other - Materials Testing | | | | 50,000 | 50,000 |
| Development | | | | 24,450 | 24,450 |
| **Other** | | | | | |
| CTCAC Fees | | | | 109,110 | 0 |
| CTCAC Performance Deposit | | | | 156,200 | 0 |
| Bond Fees | | | | 208,918 | 0 |
| Syndicator Fees | | | | 60,000 | 0 |
| Organization | | | | 2,500 | 0 |
| Building Fees and Permits | | Included in Impact Fees | | | 0 |
| Development Impact Fees | | | 55,168 | 9,157,949 | 9,157,949 |
| Accounting | | | | 15,000 | 15,000 |
| Marketing | | | | | 0 |
| Housing Authority | | | | 150,000 | 0 |
| Soft Cost Contingency | 0.63% | | | 100,000 | 100,000 |
| **TOTAL - Soft Costs** | | | | **15,833,345** | **14,294,073** |
| **Capitalized Reserves** | | | | | |
| Operating Reserve | | 6 months | | 1,502,231 | 0 |
| Leaseup Operating Reserve | | | | 500,000 | 0 |
| Loan Contingency Reserve | | | | 500,000 | 0 |
| Replacement Reserves | $1,000 | Per Unit | | 166,000 | 0 |
| **Developer Costs** | | | | | |
| **Developer Fee (A)** | 13.34% | | | 9,221,718 | 9,221,718 |
| **TOTAL** | | | | **80,018,261** | **70,699,840** |

**Tax Credit Analysis** Updated: 4/24/2014

**Determination of Eligible and Qualified Basis**

**Basis & Credits**

| | Rehabilitation | Acquisition |
|---|---|---|
| Total Requested Eligible Basis | **$70,699,840** | **$0** |
| Total Requested Eligible Basis | 70,699,840 | 0 |
| Total Adjusted Threshold Basis: | 96,420,996 | 0 |
| Lower Btwn Threshold and Eligible Basis: | 70,699,840 | 0 |
| Total Ineligible Basis: | 0 | 0 |
| Eligible basis voluntary excluded | 0 | 0 |
| Total Basis Reduction: | 0 | 0 |
| Total Requested Unadjusted Eligible Basis: | 70,699,840 | 0 |
| QCT or DDA Adjustment: | 130.00% | 100.00% |
| **Adjusted Eligible Basis** | **91,909,792** | **0** |
| Total Adjusted Eligible Basis: | 91,909,792 | 0 |
| Applicable Fraction: | 100.00% | 100.00% |
| Qualified Basis: | 91,909,792 | 0 |
| **Total Qualified Basis:** | **91,909,792** | |
| Total Credit Reduction (from the point system): | 0 | 0 |
| **Total Adjusted Qualified Basis:** | **91,909,792** | |

**Determination of Federal Credit**

| | | |
|---|---|---|
| Adjusted Qualified Basis, After Credit Reduction | 91,909,792 | 0 |
| Applicable Percentage: | 4.00% | 4.00% |
| Subtotal Annual Federal Credit: | 3,676,392 | 0 |
| **Approved Max Annual Federal Credit:** | | |
| Total Combined Annual Federal Credit: | 3,676,392 | |
| **Approved Combined Annual Federal Credit = CORE Original Request:** | | |
| Maximum Federal Credit: | 36,763,917 | |
| **Maximum Federal Credit Amount:** | | **0** |
| **Ownership:** | **99.99%** | |
| **Federal Tax Credit Pricing:** | **$0.8700** | |
| **Tax Credit Equity Amount:** | **31,981,409** | |
| **Original Request Equity Amount:** | | **0** |
| **Investor Name (Date) LOI:** | | |
| **Estimated Syndication Net Proceeds Per Cent Pricing ($0.01):** | | |

**California Tax Credit**

| | |
|---|---|
| Eligible Basis | 91,909,792 |
| California Tax Rate | 30.00% |
| Calculated Credit Amount | 27,572,938 |
| California Tax Credit Pricing | 0 |
| California Tax Credit | 0 |

Red Tail Acquisitions LLC
Santa Paula Apartments
18004 East Telegraph Rd, Santa Paula, CA
CDLAC Tie Breaker Calculations

## CDLAC TIE BREAKER

| | | |
|---|---|---|
| Public Benefit Numerator | | $48,837,800 |
| Cost-Adjusted Bond and State Credit Allocation Denominator | ÷ | $37,922,784 |
| **Tiebreaker** | | **128.782%** |

| Numerator | | |
|---|---|---|
| A. Unit Production Benefit | $ | 10,512,500 |
| B. Rent Savings Benefit | $ | 28,113,300 |
| C. Special Needs Population Benefit | $ | - |
| D. Extremely Low Income Benefit | $ | 120,000 |
| E. Sustainability Benefit | $ | 5,887,000 |
| F. Opportunity Benefit (Greater of F or G Only) | $ | - |
| G. Comp. Comm. Revitalization Benefit | $ | 4,205,000 |
| **Public Benefit** | **$** | **48,837,800** |

| Denominator | | | |
|---|---|---|---|
| Bond Request | $ | 39,050,000 | |
| State Credits | $ | - | |
| Total Allocations | $ | 39,050,000 | |
| **Adjustments** | | | |
| Prevailing Wages | | 0% | No |
| Construction Type | | 0% | V |
| SWBD * .25 | | 2.89% | |
| **Cost-Adjusted Allocation** | **$** | **37,922,784** | |

### A. Unit Production Benefit

| Bedroom Count | Adjustment Factor | Actual LI Unit Count | Adjusted Unit Count | Adjusted Units |
|---|---|---|---|---|
| 0 | 0.90 | 0 | 0 | 0 |
| 1 | 1.00 | 60 | 60 | 60 |
| 2 | 1.25 | 31 | 39 | 48.75 |
| 3 | 1.50 | 55 | 49 | 73.5 |
| 4 | 1.75 | 18 | 16 | 28 |
| **Total** | | **164** | **164** | **210.25** |

If over 30%, excess counted as 2 bedroom
If over 10%, excess calculated as 2 bedrooms

| | | |
|---|---|---|
| Adjusted Units | | 210.25 |
| Benefit Multiplier | × $ | 50,000 |
| **Unit Production Benefit** | **$** | **10,512,500** |

### B. Rent Savings Benefit

| | | |
|---|---|---|
| Average AMI of Units without Federal Rental Assistance: | | 59.76% |
| Average is less than 40%: | | FALSE |
| Monthly Rent Savings | $ | 156,185 |
| Benefit Multiplier (12 months × 15 years) | × | 180 |
| **Rent Savings Benefit** | **$** | **28,113,300** |

### C. Special Needs Population Benefit

| | | |
|---|---|---|
| Units serving Special Needs, Homeless, or Veterans: | | 0 |
| Maximum (50% of Low-Income Units): | | 82 |
| Special Population Quantity | | 0 |
| Benefit Multiplier | × $ | 10,000 |
| **Special Needs Population Benefit** | **$** | **-** |

### D. Extremely Low Income Benefit

| | | |
|---|---|---|
| Units serving Extremely Low Income Households: | | 6 |
| Maximum (50% of Low-Income Units): | | 82 |
| Special Population Quantity | | 6 |
| Benefit Multiplier | × $ | 20,000 |
| **Extremely Low Income Benefit** | **$** | **120,000** |

### E. Sustainability Benefit

| | | | |
|---|---|---|---|
| Transit Site Amenity Points | | 4 | 4 |
| Benefit Multiplier | × $ | 4,000 | |
| Bedroom-Adjusted Low-Income Units | × | 210.25 | |
| **Transit Benefit** | **$** | **3,364,000** | |
| Walkable Amenity Count | | 3 | |
| Benefit Multiplier | × $ | 4,000 | |
| **Walkability Benefit** | **$** | **2,523,000** | |

Project has:

| | | |
|---|---|---|
| an award of HCD TOD funding | | |
| an award of HCD AHSC funding | | |
| a transit stop w/in 1/4 mile w/ service every 30 min | | (No bus stop within 1/4 mile currently) |
| a transit stop w/in 1/2 mile w/ service every 15 min | | |
| Eligible: | FALSE | |
| Bedroom-Adjusted Low-Income Units | × | 0 |
| Benefit Multiplier | × $ | 25,000 |
| **Mass Transit Benefit** | **$** | **-** |
| **Sustainability Benefit** | **$** | **5,887,000** |

### F. Opportunity Benefit (Greater of F or G Only)

| | | |
|---|---|---|
| Project meets the CDLAC new construction definition | | Yes |
| Project is Large Family housing type | | Yes |
| Project is Permanent Supportive Housing | | No |
| Opportunity Area Designation | | Low Resource |
| Eligible: | | TRUE |
| Benefit Multiplier | $ | - |
| Bedroom-Adjusted Low-Income Units | × | 210.25 |
| **Opportunity Benefit** | **$** | **-** |

### G. Comprehensive Community Revitalization Benefit (Greater of F or G Only)

| | |
|---|---|
| Project is a component of the Area's Community Revitalization Plan | Yes |

| | | |
|---|---|---|
| Eligible: | | TRUE |
| Bedroom-Adjusted Low-Income Units | | 210.25 |
| Benefit Multiplier | × | $ 20,000 |
| **Comprehensive Community Revitalization Benefit** | | **$ 4,205,000** |

**Statewide Basis Delta**

| | | |
|---|---|---|
| County: | | Ventura |
| 2-Bedroom Ventura County Basis Limit | | $ 432,800 |
| Statewide Median Basis Limit | | $ 388,000 |
| **25% of Statewide Basis Delta** | | **2.89%** |

# ATTACHMENT D

FEE BREAKDOWNS

Exhibit A- Total Development Impact Fees, Plan Check and Building Permit Fees

## Citrus Flats

| Total Development Impact Fees and Other Fees | | | | |
|---|---|---|---|---|
| **City DIFs** | | | | |
| **Fee** | **Cost Per Unit/Sq Ft** | | **Total Fee** | |
| Law Enforcement | $ | 918 | $ | 152,373 |
| General Gov't | $ | 668 | $ | 110,876 |
| Library Expansion | $ | 2,257 | $ | 374,733 |
| Public Meeting | $ | 1,477 | $ | 245,142 |
| Parkland | $ | 9,443 | $ | 1,567,520 |
| Storm Drain Facilities | $ | 1,124 | $ | 186,599 |
| Water Distribution Facilities | $ | 5,151 | $ | 854,998 |
| Sewer Collection Facilities | $ | 3,582 | $ | 594,569 |
| Traffic Impact | $ | 5,059 | $ | 839,834 |
| **Total** | **$** | **29,679** | **$** | **4,926,644** |
| | | | | |
| **Other Fees** | | | | |
| School Fees | Res $4.79, Com $0.78 | | $ | 755,246 |
| Water In-Lieu | $30,461.65 per acre foot | | $ | 2,181,963 |
| Plan Check/ Building Permit Fees | | | $ | 1,294,096 |
| **Total** | | | **$** | **4,231,305** |
| | | | | |
| **Total Fees** | | | **$** | **9,157,949** |
| **Per Unit** | | | **$** | **55,168** |

## Market Rate

| Total Development Impact Fees and Other Fees | | | | |
|---|---|---|---|---|
| **City DIFs** | | | | |
| **Fee** | **Cost Per Unit/Sq Ft** | | **Total Fee** | |
| Law Enforcement | $ | 918 | $ | 121,164 |
| General Gov't | $ | 668 | $ | 88,167 |
| Library Expansion | $ | 2,257 | $ | 297,981 |
| Public Meeting | $ | 1,477 | $ | 194,932 |
| Parkland | $ | 9,443 | $ | 1,246,461 |
| Storm Drain Facilities | $ | 1,124 | $ | 148,380 |
| Water Distribution Facilities | $ | 5,151 | $ | 679,878 |
| Sewer Collection Facilities | $ | 3,582 | $ | 472,790 |
| Traffic Impact | $ | 5,059 | $ | 667,820 |
| **Total** | **$** | **29,679** | **$** | **3,917,573** |
| | | | | |
| **Estimated Other Fees** | | | | |
| School Fees | Res $4.79, Com $0.78 | | $ | 641,375 |
| Water In-Lieu | $30,461.65 per acre foot | | $ | 1,522,070 |
| Plan Check/ Building Permit Fees | | | $ | 1,030,930 |
| **Total** | | | **$** | **3,194,375** |
| | | | | |
| **Total Fees** | | | **$** | **7,111,948** |
| **Per Unit** | | | **$** | **53,878** |

Exhibit B- Affordable Fees Paid and Fees Deferred and Total Soft Loans

## Fees Paid

| Fee | % | | Total Fee |
|---|---|---|---|
| Building Permits and Plan Check Fees | 100% | $ | 1,294,096 |
| *Paid DIFs (excluding Library)* | *35%* | *$* | *1,575,925* |
| Library Expansion | 100% | $ | 374,733 |
| School Fees Paid | 100% | $ | 755,246 |
| **Total Fees Paid** | **44%** | **$** | **4,000,000** |

## Fees Deferred

| Fee | % | | Total Fee |
|---|---|---|---|
| DIFs Deferred (Soft Note) | 65% | $ | 2,975,986 |
| Total DIFs Deferred | | $ | 2,975,986 |
| Water Fee Deferred | 100% | $ | 2,181,963 |
| Total Water Fee Deferred | | $ | 2,181,963 |
| **Total Deferral Note** | **56%** | **$** | **5,157,949** |
| **Total Fees** | | **$** | **9,157,949** |

## City Affordable Housing Fund Loan

| | | |
|---|---|---|
| **City Affordable Housing Fund Loan** | **$** | **5,500,000** |

## Total Soft Loans

| | | |
|---|---|---|
| **Total Soft Loans** | **$** | **10,657,949** |
| **Per Unit** | **$** | **64,205** |

# ATTACHMENT E

SIMPLE VS. COMPOUNDING
INTEREST CALCULATIONS

| | Total DIF Loan Growth - Base | | Total DIF Loan Growth - Alt | | | |
|---|---|---|---|---|---|---|
| | Rate | 4% | Applicable Federal | 3.44% | | |
| Year | Amount Outstanding (Period Beg) | Interest Accrual | Amount Outstanding (Period Beg) | Interest Accrual | $ Interest Accrual Difference (Alt-Base) | Difference (Alt-Base) As % of Original $5.157M |
| 1 | $ 5,157,949 | $ 206,318 | $ 5,157,949 | $ 177,433 | $ (28,885) | -0.56% |
| 2 | $ 5,364,267 | $ 206,318 | $ 5,335,382 | $ 183,537 | $ (22,781) | -0.44% |
| 3 | $ 5,570,585 | $ 206,318 | $ 5,518,920 | $ 189,851 | $ (16,467) | -0.32% |
| 4 | $ 5,776,903 | $ 206,318 | $ 5,708,770 | $ 196,382 | $ (9,936) | -0.19% |
| 5 | $ 5,983,221 | $ 206,318 | $ 5,905,152 | $ 203,137 | $ (3,181) | -0.06% |
| 6 | $ 6,189,539 | $ 206,318 | $ 6,108,289 | $ 210,125 | $ 3,807 | 0.07% |
| 7 | $ 6,395,857 | $ 206,318 | $ 6,318,415 | $ 217,353 | $ 11,035 | 0.21% |
| 8 | $ 6,602,175 | $ 206,318 | $ 6,535,768 | $ 224,830 | $ 18,512 | 0.36% |
| 9 | $ 6,808,493 | $ 206,318 | $ 6,760,598 | $ 232,565 | $ 26,247 | 0.51% |
| 10 | $ 7,014,811 | $ 206,318 | $ 6,993,163 | $ 240,565 | $ 34,247 | 0.66% |
| 11 | $ 7,221,129 | $ 206,318 | $ 7,233,728 | $ 248,840 | $ 42,522 | 0.82% |
| 12 | $ 7,427,447 | $ 206,318 | $ 7,482,568 | $ 257,400 | $ 51,082 | 0.99% |
| 13 | $ 7,633,765 | $ 206,318 | $ 7,739,968 | $ 266,255 | $ 59,937 | 1.16% |
| 14 | $ 7,840,082 | $ 206,318 | $ 8,006,223 | $ 275,414 | $ 69,096 | 1.34% |
| 15 | $ 8,046,400 | $ 206,318 | $ 8,281,637 | $ 284,888 | $ 78,570 | 1.52% |
| 16 | $ 8,252,718 | $ 206,318 | $ 8,566,526 | $ 294,688 | $ 88,371 | 1.71% |
| 17 | $ 8,459,036 | $ 206,318 | $ 8,861,214 | $ 304,826 | $ 98,508 | 1.91% |
| 18 | $ 8,665,354 | $ 206,318 | $ 9,166,040 | $ 315,312 | $ 108,994 | 2.11% |
| 19 | $ 8,871,672 | $ 206,318 | $ 9,481,352 | $ 326,158 | $ 119,841 | 2.32% |
| 20 | $ 9,077,990 | $ 206,318 | $ 9,807,510 | $ 337,378 | $ 131,060 | 2.54% |
| 21 | $ 9,284,308 | $ 206,318 | $ 10,144,889 | $ 348,984 | $ 142,666 | 2.77% |
| 22 | $ 9,490,626 | $ 206,318 | $ 10,493,873 | $ 360,989 | $ 154,671 | 3.00% |
| 23 | $ 9,696,944 | $ 206,318 | $ 10,854,862 | $ 373,407 | $ 167,089 | 3.24% |
| 24 | $ 9,903,262 | $ 206,318 | $ 11,228,269 | $ 386,252 | $ 179,935 | 3.49% |
| 25 | $ 10,109,580 | $ 206,318 | $ 11,614,522 | $ 399,540 | $ 193,222 | 3.75% |
| 26 | $ 10,315,898 | $ 206,318 | $ 12,014,061 | $ 413,284 | $ 206,966 | 4.01% |
| 27 | $ 10,522,216 | $ 206,318 | $ 12,427,345 | $ 427,501 | $ 221,183 | 4.29% |
| 28 | $ 10,728,534 | $ 206,318 | $ 12,854,846 | $ 442,207 | $ 235,889 | 4.57% |
| 29 | $ 10,934,852 | $ 206,318 | $ 13,297,052 | $ 457,419 | $ 251,101 | 4.87% |
| 30 | $ 11,141,170 | $ 206,318 | $ 13,754,471 | $ 473,154 | $ 266,836 | 5.17% |
| 31 | $ 11,347,488 | $ 206,318 | $ 14,227,625 | $ 489,430 | $ 283,112 | 5.49% |
| 32 | $ 11,553,806 | $ 206,318 | $ 14,717,055 | $ 506,267 | $ 299,949 | 5.82% |
| 33 | $ 11,760,124 | $ 206,318 | $ 15,223,322 | $ 523,682 | $ 317,364 | 6.15% |
| 34 | $ 11,966,442 | $ 206,318 | $ 15,747,004 | $ 541,697 | $ 335,379 | 6.50% |
| 35 | $ 12,172,760 | $ 206,318 | $ 16,288,701 | $ 560,331 | $ 354,013 | 6.86% |
| 36 | $ 12,379,078 | $ 206,318 | $ 16,849,032 | $ 579,607 | $ 373,289 | 7.24% |
| 37 | $ 12,585,396 | $ 206,318 | $ 17,428,639 | $ 599,545 | $ 393,227 | 7.62% |
| 38 | $ 12,791,714 | $ 206,318 | $ 18,028,184 | $ 620,170 | $ 413,852 | 8.02% |
| 39 | $ 12,998,031 | $ 206,318 | $ 18,648,354 | $ 641,503 | $ 435,185 | 8.44% |
| 40 | $ 13,204,349 | $ 206,318 | $ 19,289,857 | $ 663,571 | $ 457,253 | 8.87% |
| 41 | $ 13,410,667 | $ 206,318 | $ 19,953,428 | $ 686,398 | $ 480,080 | 9.31% |
| 42 | $ 13,616,985 | $ 206,318 | $ 20,639,826 | $ 710,010 | $ 503,692 | 9.77% |
| 43 | $ 13,823,303 | $ 206,318 | $ 21,349,836 | $ 734,434 | $ 528,116 | 10.24% |
| 44 | $ 14,029,621 | $ 206,318 | $ 22,084,270 | $ 759,699 | $ 553,381 | 10.73% |
| 45 | $ 14,235,939 | $ 206,318 | $ 22,843,969 | $ 785,833 | $ 579,515 | 11.24% |
| 46 | $ 14,442,257 | $ 206,318 | $ 23,629,802 | $ 812,865 | $ 606,547 | 11.76% |
| 47 | $ 14,648,575 | $ 206,318 | $ 24,442,667 | $ 840,828 | $ 634,510 | 12.30% |
| 48 | $ 14,854,893 | $ 206,318 | $ 25,283,495 | $ 869,752 | $ 663,434 | 12.86% |
| 49 | $ 15,061,211 | $ 206,318 | $ 26,153,247 | $ 899,672 | $ 693,354 | 13.44% |
| 50 | $ 15,267,529 | $ 206,318 | $ 27,052,919 | $ 930,620 | $ 724,302 | 14.04% |
| 51 | $ 15,473,847 | $ 206,318 | $ 27,983,539 | $ 962,634 | $ 756,316 | 14.66% |
| 52 | $ 15,680,165 | $ 206,318 | $ 28,946,173 | $ 995,748 | $ 789,430 | 15.31% |
| 53 | $ 15,886,483 | $ 206,318 | $ 29,941,921 | $ 1,030,002 | $ 823,684 | 15.97% |
| 54 | $ 16,092,801 | $ 206,318 | $ 30,971,923 | $ 1,065,434 | $ 859,116 | 16.66% |
| 55 | $ 16,299,119 | $ 206,318 | $ 32,037,357 | $ 1,102,085 | $ 895,767 | 17.37% |

**CITY OF SANTA PAULA**
**MEMORANDUM**

To: Honorable Mayor and Members of the City Council

From: Clete Saunier, Public Works Director

Subject: 2024 WASTEWATER COLLECTION SYSTEM AND WATER RECYCLING FACILITY MASTER PLAN

Date: April 3, 2024

Agenda Item: 11.B

---

## RECOMMENDATION:

Staff recommends that the City Council:

1. Receive and file the 2024 Wastewater Collection System and Water Recycling Facility Master Plan

**Presented by:**

Becca Bugielski, PE, MKN & Associates, Inc.
Michael Nunley, PE, MKN & Associates, Inc.

---

## BACKGROUND:

The City provides wastewater collection services for approximately 31,000 customers with wastewater treatment at the City's Water Recycling Facility (WRF). The City's wastewater collection system consists of approximately 59 miles of gravity collection system piping ranging in diameter from 6 inch to 42 inch, less than 1 mile of force main, approximately 1,190 manholes, and three lift stations. The WRF has been in operation continuously since 2010 and is designed to treat wastewater flows up to 4.2 million gallons per day (MGD) with a peak operating capacity of 7.0 MGD. The WRF produces high quality wastewater effluent through the membrane bioreactor treatment process which is released into percolation ponds which recharge the Santa Paula groundwater basin.

Cities rely on Wastewater Master Plans to evaluate system capacity and conditions and to provide comprehensive recommendations for replacements and improvements to the sewer system and treatment facilities. The City last developed a Wastewater Master Plan in June 2012 and in May 2023 the Council approved a contract with MKN and Associates to develop the City's 2024 Wastewater Collection System and Water Recycling Facility Master Plan (Master Plan). The final plan is being presented to Council and recommends current and future improvements through 2040 informed by measurements of existing sewer flows, condition assessments, estimates of population growth and development, and recent innovations in hydraulic modeling, asset management and mapping. The Master Plan includes detailed mapping of the sewer system and development of a digital hydraulic model that can

be used to evaluate impacts of development and population growth. The consultant worked with the Community Development Department to identify and quantify development potential throughout the City including recent additions to the Harvest Development. Based on detailed measurements of existing sewer flows and water use, the consultant developed estimates of future sewer flows associated with future development as well as regional population growth estimates. These estimated flows were input into the sewer model and the model was used to identify system improvements needed to serve existing customers, anticipated Citywide growth and development. In addition, condition assessments were used to identify failing system components and potential upgrades to provide better system management and operations. A detailed condition assessment was performed at the WRF. MKN walked through with plant staff and observed each process and its operations. They then reviewed the new flows projected in ultimate scenarios and ran calculations to review the capacity of each treatment process based off the City's planned growth. A detailed list of maintenance and capacity projects was then produced.

**ANALYSIS:**

MKN developed a collection system hydraulic model in *Bentley SewerCAD* that included the major trunk sewers greater than 10 inches in diameter and other critical connection points throughout the system (flows from new development areas). The model was updated to include current infrastructure improvements and model settings were configured to simulate various flow conditions. Within the hydraulic model, scenarios were developed and evaluated with a focus on the following performance areas: Gravity Pipeline Capacity, Lift Station Pumping Capacity, Force Main Velocities. Based on an evaluation of existing, near term, and ultimate flow conditions, collection system pipeline upgrade projects were identified to increase pipeline capacity to serve existing and buildout flow conditions.

MKN performed a capacity evaluation and condition assessment of the WRF. Various capital improvements were identified. Many major projects were completed in the past several years, including membrane replacements and aeration basin cleaning and repairs. The current Blower Replacement Project will provide major upgrade to the other large condition assessment concerns at the WRF. Upgrading the headworks screening system is necessary to provide redundancy for both existing and future flow conditions. Installation of an additional flow equalization basin to provide emergency storage is also recommended. Additionally, expansion of membrane basins 7 and 8 is proposed to enhance the facility's capacity to provide redundancy under ultimate future flow and loading conditions.

A comprehensive condition assessment and walkthrough with operation staff identified various needs at the WRF. Improvements included building maintenance, coating improvements, and a series of minor repairs around the facility.
A complete list of recommendations are identified in the attached report: WRF Master Plan Report - Attachment 1.

**STRATEGIC PLAN:**

The Project supports the currently adopted Strategic Plan in achieving the following goals:

Infrastructure, Transportation & Mobility

*Goal: Maintain and develop the City's infrastructure to be safe, sustainable, innovative and cost efficient.*

**FISCAL IMPACTS:**

The Master Plan identifies a total of $27.2 million in current and future capital improvements through 2040. The Master Plan identifies $5.8 million in capital improvements needed to address collection system deficiencies to serve existing flow conditions, $2.8 million in capital improvements needed to address collection system deficiencies to serve future flow conditions, $14.8 million in capital improvements needed to address existing operations at the WRF, and $3.8 million in improvements needed to address future growth at the WRF. These capital improvement estimates can be used to inform customer rate analysis as well as development impact fees for improvements. If individual developments are proposed that differ from the model inputs, the sewer system model can be used to evaluate specific development impacts and to identify associated impacts to the sewer system. Additional funding for needed projects will be generated over time through sewer rates as well as development impact fees for improvements tied to specific developments.

**OPTIONS:**

The Council has the following available alternative options to staff's recommendations:

1. Do not receive and file the 2024 Wastewater Collection System and Water Recycling Facility Master Plan, provide alternative guidance and request staff to return to Council with a revised Master Plan at a future meeting.

**ATTACHMENTS:**

Attachment 1 - 2024 Wastewater Collection System and WRF Master Plan Report.pdf
Attachment 2 - 2024 WWCS and WRF Master Plan Appendices.pdf

# ATTACHMENT 1

## 2024 Wastewater Collection System and Water Recycling Facility Master Plan Report

# Wastewater Collection System and Water Recycling Facility Master Plan

March 2024

**Prepared for:**
City of Santa Paula
866 E. Main Street
Santa Paula, CA 93060

**Prepared by:**
MKN & Associates, Inc.
121 North Fir St., Ste. G
Ventura, CA 93001

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# City of Santa Paula

# Wastewater Collection System and Water Recycling Facility Master

## Final Draft - March 2024

DRAFT


**City Board**

Leslie Cornejo – Mayor

Pedro Chavez – Vice Mayor

Jenny Crosswhite – Councilmember

Carlos Juarez – Councilmember

Andy Sobel - Councilmember

**City Staff**

Clete Saunier – Public Works Director

**Ventura Regional Sanitation District**

Pete Chartier - CPO

**MKN Staff**

Becca Bugielski, PE – Project Manager

Mike Nunley, PE – Principal Engineer

Robert Lepore, GISP – Senior Planner

Chris Haugen, EIT – Assistant Engineer

Luis Garcia, EIT – Assistant Engineer

Prepared by:

Becca Bugielski, PE
Project Manager
MKN & Associates, Inc.

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# TABLE OF CONTENTS, LIST OF TABLES, AND FIGURES

## Table of Contents

TABLE OF CONTENTS, LIST OF TABLES, AND FIGURES ..... i
EXECUTIVE SUMMARY ..... xi
1.0 INTRODUCTION AND OVERVIEW ..... 1-1
1.1 Project Purpose ..... 1-1
1.2 Study Area ..... 1-1
1.3 Scope of Work ..... 1-1
2.0 LAND USE AND FUTURE GROWTH ..... 2-1
2.1 Land Use ..... 2-1
2.2 Existing Sewered Parcels ..... 2-3
2.3 Future Development ..... 2-3
3.0 EXISTING AND PROJECTED WASTEWATER FLOWS ..... 3-1
3.1 Water Recycling Facility Historical Flows ..... 3-1
3.2 Wastewater Flow Conditions ..... 3-3
3.3 Flow Monitoring Study ..... 3-5
3.4 Wastewater Return Factors ..... 3-10
3.5 Wastewater Unit Flow Factors ..... 3-11
3.6 Future Sewer Flow ..... 3-12
4.0 EXISTING SYSTEM OVERVIEW ..... 4-1
4.1 Gravity Collection System ..... 4-1
4.2 Lift Stations ..... 4-1
4.3 Description of Water Recycling Facility ..... 4-5
5.0 EVALUATION CRITERIA ..... 5-1
5.1 Gravity Collection System Criteria ..... 5-1
5.2 Lift Station Criteria ..... 5-2
5.3 WRF Criteria ..... 5-2
6.0 HYDRAULIC COMPUTER MODEL ..... 6-1
6.1 Model Development ..... 6-1
6.2 Hydraulic Model Flow Validation ..... 6-3
7.0 HYDRAULIC ANALYSIS – EXISTING CONDITIONS ..... 7-1
7.1 Gravity Collection System Hydraulic Analysis ..... 7-1
8.0 LIFT STATION CONDITION ASSESSMENT ..... 8-1
8.1 Condition Assessment ..... 8-1

DRAFT

9.0 HYDRAULIC ANALYSIS – FUTURE CONDITIONS ..... 9-1
9.1 Gravity Collection System Hydraulic Analysis ..... 9-1
10.0 WATER RECYCLING FACILITY EVALUATION ..... 10-1
10.1 Historical Flows and Loadings ..... 10-1
10.2 Condition Assessment ..... 10-6
10.3 Capacity Evaluation ..... 10-13
11.0 CAPITAL IMPROVEMENT PLAN ..... 11-1
11.1 Capital Improvement Plan Development ..... 11-1
11.2 Capital Improvement Plan Projects ..... 11-5

DRAFT

## List of Tables

Table 2-1: Existing Development of Land Use Types ..... 2-1
Table 2-2: Sewered Parcels by Land Use in the City's SOI ..... 2-3
Table 2-3: Land Inventory Summary (Within City SOI) ..... 2-4
Table 2-4: Expansion Areas Summary ..... 2-5
Table 3-1: Historical WRF Influent Flows ..... 3-3
Table 3-2: Existing Flow Conditions & Peaking Factors ..... 3-5
Table 3-3: Flow Meter Locations ..... 3-7
Table 3-4: Flow Monitoring Results ..... 3-8
Table 3-5: Preliminary Wastewater Return Factors ..... 3-11
Table 3-6: Future Unit Flow Factors ..... 3-12
Table 3-7: Near-Term Development Wastewater Flow ..... 3-12
Table 3-8: Ultimate Development Wastewater Flow ..... 3-13
Table 3-9: Estimated Total Future Wastewater Flow Conditions ..... 3-14
Table 4-1: Collection System Pipeline by Size ..... 4-1
Table 4-2: Influent Lift Station Equipment Summary ..... 4-7
Table 4-3: Headworks Major Equipment Summary ..... 4-8
Table 4-4: Equalization Basins Major Equipment Summary ..... 4-9
Table 4-5: Anoxic Basins Major Equipment Summary ..... 4-9
Table 4-6: Aerobic Basins Major Equipment Summary ..... 4-10
Table 4-7: MBR Feed and MLSS Channels Major Equipment Summary ..... 4-11
Table 4-8: MBR Modules and Tanks Major Equipment Summary ..... 4-12
Table 4-9: UV Disinfection System Major Equipment Summary ..... 4-13
Table 4-10: CIP Storage Tanks and Foam Spray System Major Equipment Summary ..... 4-14
Table 4-11: Solids Handling Equipment Major Equipment Summary ..... 4-15
Table 4-12: Odor Control System Major Equipment Summary ..... 4-16
Table 4-13: Onsite Water Reuse System Major Equipment Summary ..... 4-16
Table 4-14: Percolation Ponds Major Equipment Summary ..... 4-17
Table 5-1: Design Standards for Gravity Sewer Pipe ..... 5-1
Table 7-1: Existing Scenario Gravity Collection System Pipe Deficiencies ..... 7-5
Table 7-2: Recommended Improvements to Address Existing Scenario Flows ..... 7-8
Table 7-3: Lift Station Pump Capacity for Existing Flows ..... 7-9
Table 7-4: Force Main Evaluation for Existing Flows ..... 7-9
Table 8-1: Harding Park Lift Station Condition Assessment Summary ..... 8-2

DRAFT

Table 8-2: Harvest Lift Station Condition Assessment Summary ..... 8-3
Table 8-3: Lemonwood 1 Lift Station Condition Assessment Summary ..... 8-4
Table 9-1: Near-Term Scenario Gravity Collection System Pipe Deficiencies ..... 9-6
Table 9-2: Recommended Improvements to Address Near-term Scenario Flows ..... 9-9
Table 9-3: Ultimate Scenario Gravity Collection System Pipe Deficiencies ..... 9-12
Table 9-4: Recommended Improvements to Address Ultimate Scenario Flows ..... 9-15
Table 10-1: 2008 Raw Influent Design Criteria ..... 10-1
Table 10-2: Historical Influent $BOD_5$ and Total Suspended Solids Concentrations ..... 10-2
Table 10-3: Historical Influent $BOD_5$ and Total Suspended Solids Concentrations ..... 10-2
Table 10-4: Existing Influent Flows and Loadings ..... 10-3
Table 10-5: Historical Influent $BOD_5$ and TSS Loadings (2019-2023) ..... 10-3
Table 10-6: Effluent Limits (Table 8 of WDR No. R4-2018-0022-A01) ..... 10-5
Table 10-7: Treated Effluent $BOD_5$ and TSS Monthly Average and Daily Max Concentrations ..... 10-6
Table 10-8: Estimated Future Influent Flows and BOD and TSS Loadings ..... 10-14
Table 10-9: Estimated Future Influent BOD and TSS Loadings ..... 10-14
Table 10-10: Influent Lift Station Capacity (Three Pumps Operating) ..... 10-15
Table 10-11: Headworks Primary Screen & Grit Removal Capacity (Two Screens) ..... 10-15
Table 10-12: Headworks Primary Screen & Grit Removal Capacity (One Screen) ..... 10-16
Table 10-13: Headworks Fine Screening Capacity (Two Screens) ..... 10-16
Table 10-14: Headworks Fine Screening Capacity (One Screen) ..... 10-16
Table 10-15: Equalization Basins ..... 10-16
Table 10-16: Primary and Secondary Equalization Basins ..... 10-17
Table 10-17: Trussell MBR Design Parameters ..... 10-17
Table 10-18: MBR Design Evaluation Parameters ..... 10-18
Table 10-19: Influent Fractions and Coefficients ..... 10-18
Table 10-20: Aeration and Anoxic Basin - Required Volumes (2 Trains in Service) ..... 10-19
Table 10-21: Blower Air Flow Requirements ..... 10-19
Table 10-22: Membrane Flow Capacity (15 gpd/SF All Membranes Operating) ..... 10-20
Table 10-23: UV Disinfection Capacity (4 Banks Per Channel) ..... 10-20
Table 10-24: UV Disinfection Capacity (5 Banks Per Channel) ..... 10-20
Table 11-1: Cost Estimate Classification Matrix ..... 11-2
Table 11-2: Pipeline Unit Construction Costs ..... 11-4
Table 11-3: Project Ranking ..... 11-4
Table 11-4: Operation and Maintenance Projects Allowance ..... 11-8

DRAFT

Table 11-5: CIP Cost Summary ..... 11-9
Table 11-6: Collection System Capital Improvements ..... 11-10
Table 11-7: Lift Stations Capital Improvements ..... 11-11
Table 11-8: Water Recycling Facility Capital Improvements ..... 11-12
Table 11-9: 15-Year CIP Summary ..... 11-14

DRAFT

List of Figures

Figure 1-1: Study Area Boundary Map ..... 1-2
Figure 2-1: Existing Land Use Map ..... 2-2
Figure 2-2: Development Potential Map ..... 2-6
Figure 3-1: Average Monthly WRF Influent Flow and Rainfall from 2014 to 2022 ..... 3-2
Figure 3-2: Typical Flow Meter Installation ..... 3-5
Figure 3-3: Flow Meter Locations ..... 3-6
Figure 3-4: Flow Meter Schematic ..... 3-7
Figure 3-5: FM01 - Hourly Flow Conditions ..... 3-8
Figure 3-6: FM02 - Hourly Flow Conditions ..... 3-9
Figure 3-7: FM 03 - Hourly Flow Conditions ..... 3-9
Figure 3-8: FM04 - Hourly Flow Conditions ..... 3-10
Figure 4-1: Existing Collection System ..... 4-2
Figure 4-2: Lift Locations and Sewersheds ..... 4-3
Figure 4-3: Harding Park Lift Station ..... 4-4
Figure 4-4: Harvest Lift Station ..... 4-4
Figure 4-5: Lemonwood Lift Station ..... 4-4
Figure 6-1: Sewer Flow Allocation ..... 6-1
Figure 6-2: Modeled Gravity Collection System ..... 6-2
Figure 7-1: Gravity Pipeline Velocities during Existing PHDWF Conditions ..... 7-3
Figure 7-2: Gravity Pipeline Velocities during Existing PHWWF Conditions ..... 7-4
Figure 7-3: Existing PHDWF Pipeline d/D Deficiencies ..... 7-6
Figure 7-4: Existing PHWWF Pipeline d/D Deficiencies ..... 7-7
Figure 9-1: Gravity Pipeline Velocities during Near-term PHDWF Conditions ..... 9-2
Figure 9-2: Gravity Pipeline Velocities during Near-term PHWWF Conditions ..... 9-3
Figure 9-3: Near-term PHDWF Pipeline d/D Deficiencies ..... 9-7
Figure 9-4: Near-term PHWWF Pipeline d/D Deficiencies ..... 9-8
Figure 9-5: Gravity Pipeline Velocities during Ultimate PHDWF Conditions ..... 9-10
Figure 9-6: Gravity Pipeline Velocities during Ultimate PHWWF Conditions ..... 9-11
Figure 9-7: Ultimate PHDWF Pipeline d/D Deficiencies ..... 9-13
Figure 9-8: Ultimate PHWWF Pipeline d/D Deficiencies ..... 9-14
Figure 10-1: Loadings per capita for $BOD_5$ and TSS ..... 10-4
Figure 11-1: Collection System and Lift Station CIP Project Locations ..... 11-13

DRAFT

## Appendices

Appendix A: Flow Monitoring Study

Appendix B: Detailed Flow Verification

Appendix C: Waste Discharge Requirement and Cease-and-Desist Order

Appendix D: Trussell Technologies, Inc., Evaluation of Biological Design and Process Sizing Technical Memorandum

Appendix E: Lift Station Condition Assessment

Appendix F: Treated Effluent Monthly Average Monitoring Results 2019-2023

Appendix G: WRF Condition Assessment Checklist

Appendix H: WRF Condition Assessment Photos

Appendix I: MBR Process Design Calculations

Appendix J: Annual Major Service and Replacement Budget

DRAFT

## List of Acronyms

| | |
|---|---|
| AF | Acre Feet |
| AWTF | Advanced Water Treatment Facility |
| ANSI | American National Standards Institute |
| AACE | Association for Advancement of Cost Estimating International |
| AV | Avenue |
| ADF | Average Daily Flow |
| ADWF | Average Dry Weather Flow |
| AWWF | Average Wet Weather Flow |
| BOD5 | Biological Oxygen Demand |
| BL | Boulevard |
| CIP | Capital Improvement Plan |
| CDO | Cease-and-Desist Order |
| COD | Chemical Oxygen Demand |
| CIP | Clean-in-Place |
| CFR | Code of Federal Regulations |
| CCI | Construction Cost Index |
| $ft^3$ | Cubic foot |
| $ft^3/hr$ | Cubic Foot per Hour |
| d/D | Depth over Diameter |
| DBOF | Design-Build-Operate-Finance |
| DEM | Digital Elevation Model |
| DO | Dissolved Oxygen |
| DS | Dry Solids |
| DIP | Ductile Iron Pipe |
| E | East |
| ENR | Engineering News-Record |
| EQ | Equalization |
| EX | Existing |
| fps | Feet per Second |
| FM | Flow Meter |
| ft | Foot |
| gal | Gallons |
| gpd | Gallons per Day |
| GPDU | Gallons per Day per Housing Unit |
| GPD/SF | Gallons per Day per Square Foot |
| GPH | Gallons per Hour |
| gpm | Gallons per Minute |
| GIS | Geographic Information System |
| GBT | Gravity Belt Thickener |
| HVAC | Heating, Ventilation, and Air Conditioning |
| HZ | Hertz |
| HDPE | High Density Polyethylene |
| HP | Horsepower |
| Hr | Hour |
| HMI | Human Machine Interface |
| H2S | Hydrogen Sulfide |
| in | Inches |
| I/I | Inflow and Infiltration |
| ILS | Influent Lift Station |
| LS | Lift Station |
| LF | Linear Foot |
| L | Liter |
| LS | Lift Station |
| MMF | Maximum Month Flow |
| MBR | Membrane Bioreactor |
| mg/L | Milligrams per Liter |
| MG | Million Gallons |
| MGD | Million Gallons per Day |
| ML | Mixed Liquor |
| MLSS | Mixed Liquor Suspended Solids |
| MKN | MKN & Associates, Inc. |
| MRP | Monitoring and Reporting Program |
| N | North |
| ppm | Parts per Million |
| PDDWF | Peak Day Dry Weather Flow |
| PDF | Peak Day Flow |
| PDWWF | Peak Day Wet Weather Flow |
| PHDWF | Peak Dry Weather Flow |
| PHWWF | Peak Wet Weather Flow |
| PF | Peaking Factor |
| P | Phase |
| PVC | Polyvinyl Chloride |
| ppd or lbs/d | Pounds per Day |
| lbs/hr | Pounds per Hour |
| psi | Pounds per Square-Inch |
| PFD | Process Flow Diagram |
| PLC | Programmable Logic Controller |
| RR | Railroad |
| RV | Recreational Vehicle |
| RHNA | Regional Housing Needs Assessment |
| RWQCB | Regional Water Quality Control Board |
| R&R | Rehabilitation and Replacement |
| RAS | Return Activated Sludge |
| RO | Reverse Osmosis |
| RPM | Revolutions Per Minute |
| SP | Santa Paula |
| SRT | Solids Retention Time |
| S | South |
| SOI | Sphere of Influence |
| sf | Square Foot |
| SS | Stainless Steel |
| SCFM | Standard Cubic Feet per Minute |
| SOR | Standard Oxygen Requirement |
| ST | Street |
| SCADA | Supervisory Control and Data Acquisition |
| TDS | Total Dissolved Solids |
| TDH | Total Dynamic Head |
| TKN | Total Kjeldahl Nitrogen |
| TMDL | Total Maximum Daily Loads |
| TN | Total Nitrogen |

DRAFT

| | |
|---|---|
| TSS | Total Suspended Solids |
| UV | Ultra-Violet |
| USGS | United States Geological Survey |
| UWMP | Urban Water Management Plan |
| VFD | Variable Frequency Drive |
| VRSD | Ventura Regional Sanitation District |
| VSS | Volatile Suspended Solids |
| V | Volts |
| VAC | Volts Alternating Current |
| WAS | Waste Activated Sludge |
| WDR | Waste Discharge Requirements |
| WWMP | Wastewater Master Plan |
| WRF | Water Recycling Facility |
| W | West |
| yrs | Years |

DRAFT

## Previous Studies and Reports

The following reports, studies, and other resources were reviewed during preparation of this Master Plan:

1. Wastewater System Master Plan Amendment Harvest at Limoneira (East Area One) dated March 2023 and prepared by Jensen Design & Survey, Inc.
2. 2020 Urban Water Management Plan (UWMP) dated July 2021 and prepared by MKN & Associates, Inc.
3. City of Santa Paula 2040 General Plan dated March 2020 and prepared by City of Santa Paula.
4. City of Santa Paula Wastewater System Master Plan dated June 2012 and prepared by City of Santa Paula.
5. Trussell Technologies, Inc., Evaluation of Biological Design and Process Sizing Technical Memorandum dated 2008 and prepared by Trussell Technologies, Inc.
6. City of Santa Paula Water Recycling Facility Record Drawings dated 2008 and prepared by Pacific Advanced Civil Engineering (PACE).

DRAFT

# WASTEWATER COLLECTION SYSTEM AND WATER RECYCLING FACILITY MASTER PLAN EXECUTIVE SUMMARY

## Introduction and Overview

The City of Santa Paula is located approximately 17 miles inland from the Pacific Ocean in central Ventura County and lies within the Santa Clara River Valley, approximately 65 miles northwest of Los Angeles, 44 miles southeast of Santa Barbara, 12 miles east of the City of San Buenaventura and approximately 9 miles west of the City of Fillmore. The current wastewater service area boundary encompasses approximately 5.4 square miles (3,456 acres) within the City limits and serves an estimated population of 30,389.

The City's wastewater service area is primarily single- and multi-family residential land uses, with some light commercial and industrial land uses. The City owns and operates approximately 59 miles of wastewater collection pipelines, three lift stations, and a Water Recycling Facility, which provides treatment and disposal of the City's wastewater.

### OBJECTIVES

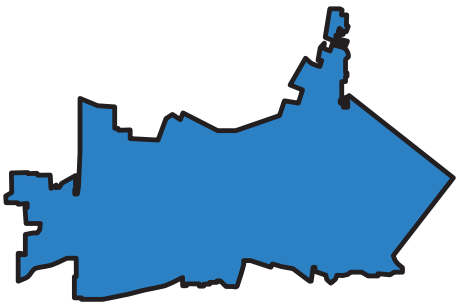
- Evaluate Infrastructure Needs through City Buildout (2040)
- Consider Impacts from Future Flows and Loadings
- Ensure System Redundancy
- Deliver Capital Improvement Plan

In 2023, the City authorized Michael K. Nunley (MKN) to prepare a comprehensive update to 2012 Wastewater Master Plan (Master Plan). This Master Plan includes the following major focus areas:

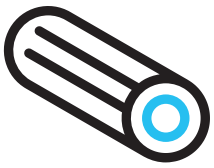
- Introduction and Overview
- Land Use and Future Growth
- Existing and Projected Flows and Loadings
- Collection and Treatment System Overview
- Collection System Analysis
- Condition Assessment
- Water Recycling Facility Evaluation
- Capital Improvement Plan

DRAFT

### Wastewater System Overview

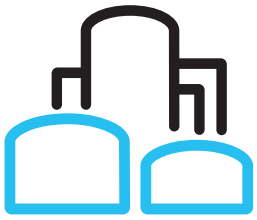


3,000 plus-acre service area



59 Miles of Pipeline

Three Lift Stations



2.5 MGD WRF

# Existing and Buildout Wastewater Flows

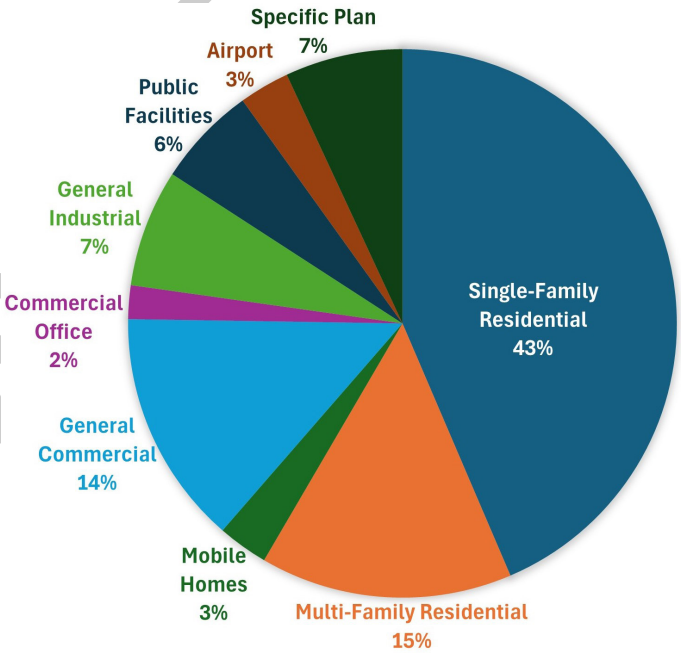
Based on the City's historical WRF influent flow data, flow monitoring data, and previous reports existing wastewater flow conditions were established as follows: average day flow of 2.6 MGD, peak hour dry weather flow of 5.2 MGD, and peak hour wet weather flow of 7.7 MGD.

MKN reviewed data from the 2020 Census, 2020 Urban Water Master Plan (UWMP), 2021-2029 Housing Element and, Land Use Element. Based on an evaluation of the service area population, major planned developments, limited infill development, and expansion areas a total of 4,600 dwelling units were assumed to be constructed at full buildout of the City.

MKN developed future flow estimates for the City's approved development projects, current specific plan areas, vacant properties, and expansion areas. This established buildout wastewater flow.

Based on the findings in the Master Plan, it is anticipated the average day wastewater flows will increase by 38% at full buildout of the City (including expansion areas).

**Existing Customer Land Uses (Acres)**




**Anticipated Growth by Development Type**

DRAFT

CITY OF SANTA PAULA

# WASTEWATER COLLECTION SYSTEM AND WATER RECYCLING FACILITY MASTER PLAN EXECUTIVE SUMMARY

## Collection System Evaluation

MKN developed a collection system hydraulic model in Bentley SewerCAD that included the major trunk sewers greater than 10-inches in diameter and other critical connection points throughout the system (flows from new development areas). The model was updated to include current infrastructure improvements and model settings were configured to simulate various flow conditions.

Within the hydraulic model, scenarios were developed and evaluated with a focus on the following performance areas:

- Gravity Pipeline Capacity
- Lift Station Pumping Capacity
- Force Main Velocities

Based on an evaluation of existing, near-term, and ultimate flow conditions recommended collection system pipeline upgrade projects were identified to increase pipeline capacity to serve existing and buildout flow conditions.

### FINDINGS

- **Majority of existing trunk collection system has sufficient capacity to serve existing and buildout flow conditions**
- **A total of 19 collection system pipeline upgrade projects identified to increase capacity**
- **Lift stations have sufficient pumping capacity to serve existing and future flow conditions**
- **A total of 3 rehabilitation projects identified to increase reliability of existing lift stations**

DRAFT

## Lift Station Condition Assessment

As part of the Master Plan, MKN visited the three lift stations sites with operations staff to observe existing conditions. During these visits, MKN observed the general configuration of the lift stations and reviewed the following items:

- Configuration / Pumps
- Lift Station Safety Features
- Flood Resilience, Backup Power
- Wet Well Structure, Coatings, Instrumentation
- Access
- Bypassing Provisions
- Site Features

Based on these observations and input from operations staff, MKN developed a list of CIPs to address observed physical deficiencies at each lift station to improve system reliability and extend the useful life of the existing equipment.

CITY OF SANTA PAULA



# Water Recycling Facility Condition Assessment and Evaluation

A visual condition assessment of the WRF was performed to review the condition of existing structures and equipment to determine necessary condition-based upgrades and improvements. MKN observed the general configuration of the WRF and reviewed the following items:

- Mechanical
- Instrumentation
- Electrical
- Structural
- Safety

In addition, MKN performed a comprehensive evaluation of the existing WRF capacity, including treatment and hydraulic capacity of process equipment and the disposal capacity of the percolation ponds for existing and ultimate flows. MKN reviewed existing relevant reports and used available information to estimate existing and ultimate flows and loadings ("strength of wastewater") based on WRF records and typical duty factors.

## FINDINGS

- **Condition assessment revealed various repairs needed to extend design life of equipment.**
- **A total of 17 rehabilitation projects identified to increase reliably of existing WRF**
- **Hydraulic and treatment evaluations identified improvements necessary for efficient operation during future loading conditions**
- **A total of three WRF projects identified to increase capacity**

DRAFT

# Capital Improvement Plan

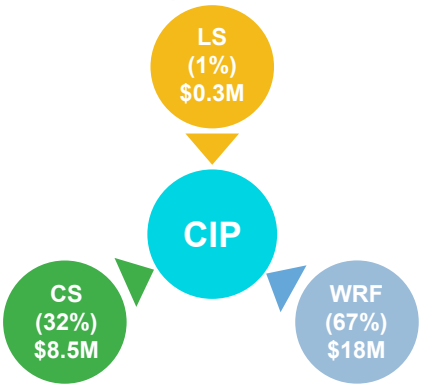
Based on the evaluations and findings of the Master Plan effort the CIP was prepared. The cost estimating approach assumed fully inclusive capitalization with costs derived from similar wastewater projects adjusting for inflation, size, complexity, and location. Project prioritization was based on the following:

- Projects to address existing capacity deficiencies
- Projects to address condition-based deficiencies
- Projects to address near-term capacity deficiencies
- Projects to address buildout capacity deficiencies

Based on coordination with City staff, the recommended projects were identified. The proposed CIP allocates funds in proportions of 1% for Lift Station (LS) Projects, 32% for Collection System (CS) Projects, and 67% for Water Recycling Facility (WRF) Projects over the next 15-year budgeting period with an annual breakdown.

## CIP SUMMARY

- 39 Projects Identified
- 3 Categories of Projects
- 15 Year Delivery Schedule
- 27.5 million Total CIP




DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# 1.0 INTRODUCTION AND OVERVIEW

This section provides an overview of the City of Santa Paula's (City) goals, study area, and scope of work for the Wastewater Collection System and Water Recycling Facility Master Plan (Master Plan).

## 1.1 Project Purpose

The purpose of this Master Plan was to identify improvements to the City's existing wastewater collection, treatment, and disposal facilities necessary to meet existing and future wastewater conditions and to develop a comprehensive improvement program to assist the City in long-term planning and budgeting. The planning horizon for this Master Plan is the build-out timeframe estimated to occur in the year 2040 per the City's adopted General Plan.

## 1.2 Study Area

The City is located approximately 17 miles inland from the Pacific Ocean in central Ventura County within the Santa Clara River Valley, approximately 65 miles northwest of Los Angeles, 44 miles southeast of Santa Barbara, 12 miles east of the City of San Buenaventura and approximately 9 miles west of the City of Fillmore. The current wastewater service area boundary encompasses approximately 5.4 square miles (3,456 acres) within the City limits and serves an estimated population of 30,389 as reported by the California Department of Finance for 2020. The City's wastewater service area is primarily single- and multi-family residential land uses, with some light commercial and industrial land uses. The City owns and operates approximately 59 miles of wastewater collection pipelines, three lift stations, and a Water Recycling Facility (WRF), which provides wastewater treatment and disposal.

**Figure 1-1** provides an overview of the current City limits, Sphere of Influence (SOI), and General Plan Expansion Areas. These combined areas define the limits of the "Study Area" for the Master Plan.

## 1.3 Scope of Work

The following describes the scope of work completed to prepare the Master Plan.

<u>Data Collection and Review</u>

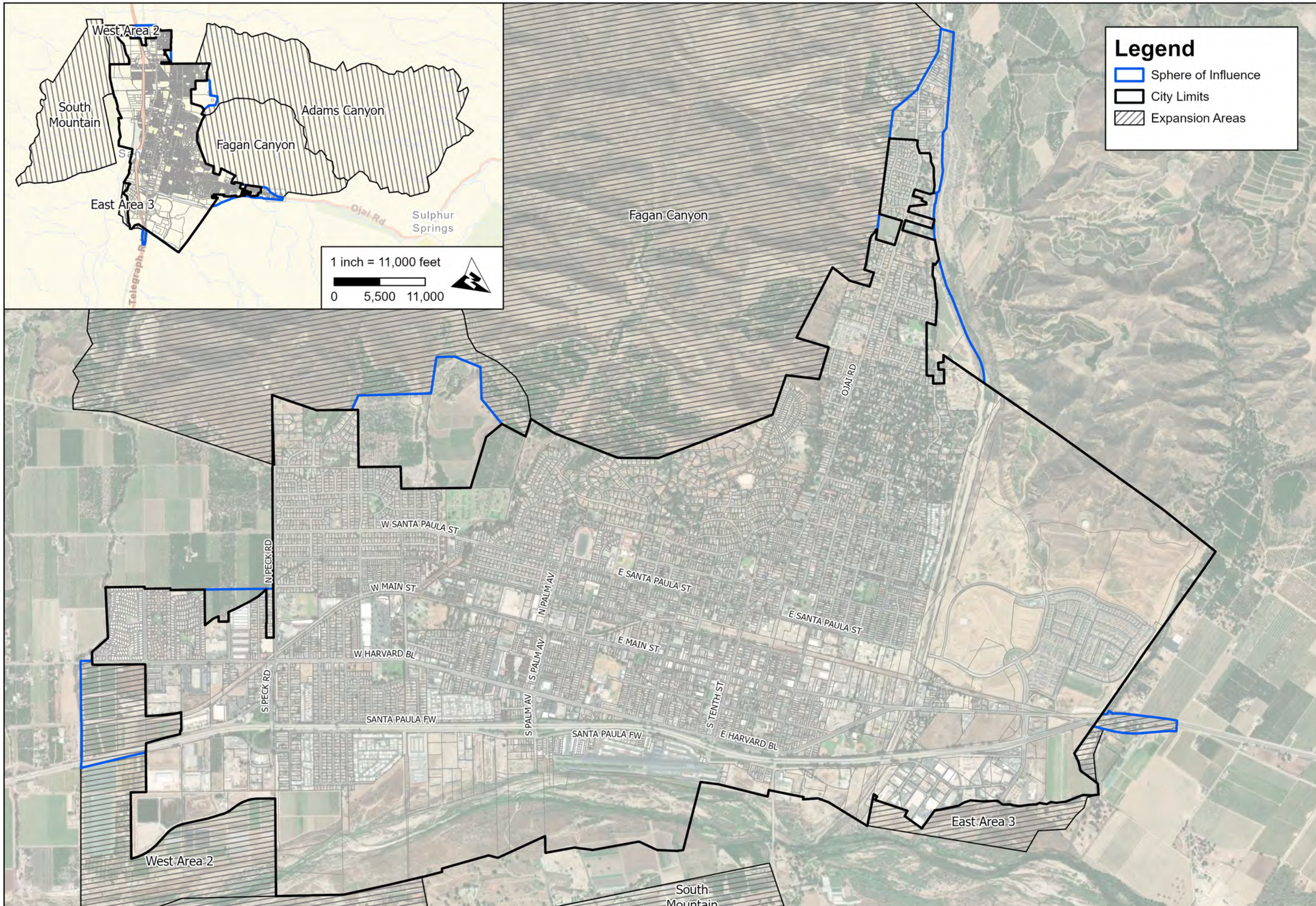
MKN reviewed and utilized the following information to develop the Master Plan:

- ❑ Approved General Plan and development plans
- ❑ Sewer system mapping
- ❑ As-built records for collection system improvements not included in the current mapping

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 1-1:

Study Area Boundary Map

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

Flow Monitoring Study

MKN coordinated with Gold Coast Environmental to perform flow monitoring within the City's wastewater collection system over a four-week dry-weather period. MKN performed the following tasks as part of the flow monitoring study:

- Coordinated placement of four flow meters throughout the City's collection system to obtain representative flow information
- Coordinated sewer pipeline cleaning with Ventura Regional Sanitation District (VRSD)
- Prepared a collection system/flow monitoring site map showing the existing collection system, parcels and flow monitoring basin areas
- Received and reviewed weekly flow monitoring data provided by Gold Coast Environmental
- Collected daily rainfall data from the City
- Completed a comprehensive analysis of the flow monitoring data including a summary of the estimated average day and peak hour flows

The data from the flow monitoring study was used to determine average day conditions, and dry-weather peak hour flow conditions within the City's collection system, and used in the development of sewer generation rates. For wet weather conditions, MKN utilized a conservative wet-weather peaking factors based on available information provided by the City.

Wastewater System Mapping

Currently the City does not have their wastewater collection system data stored in Geographic Information System (GIS) or a hydraulic model. However, the City has an existing AutoCAD wastewater collection system basemap. The hydraulic model was developed using the AutoCAD basemap including information such as pipe geometry, elevations, pipe diameter, pipe material and pipe roughness coefficients. MKN completed the following tasks to develop the hydraulic model:

- Imported the existing AutoCAD layers into SewerCAD
- Added elevation data from available AutoCAD mapping and available asbuilts
- Verified elevation data with one meter resolution Digital Elevation Model (DEM) ground scan of the Santa Paula area from United States Geological Survey (USGS)

Development of Wastewater Generation Rates

To develop wastewater generation rates for residential, commercial, and industrial land uses within the Study Area, MKN acquired water billing data for all area users, assigned the users to a GIS parcel layer, developed per acre

DRAFT

demand factors based on land use, and estimated a preliminary wastewater generation value based on the assumption that a certain percentage of water consumed returning to the collection system as wastewater. The preliminary wastewater generation values were compared to the newly acquired flow monitoring data and return factors were adjusted as required to match recorded flow data. Once the return flow percentage was developed, wastewater generation rates for the various user categories were generated based on their water consumption.

Wastewater Flows and Allocation

MKN created a GISlayer to identify the parcels that are located upstream of each sewer manhole (otherwise referred to as a "sewershed") that were included in the hydraulic model. Each sewershed area was assigned with a sewer manhole identification number. This process allowed for automated assignment of calculated flows to manholes throughout the collection system. This allocation method has been successfully applied to other collection system modeling/master planning projects that MKN has worked on for other public agencies. Once the flow allocation process was completed, MKN imported the average daily flow (ADF) data into the collection system model.

Future Development and Expansion

MKN worked with City staff to determine the potential growth and/or redevelopment areas for the City. The City provided information with respect to where growth was anticipated to occur and the number of potential units and/or land uses. MKN developed a GIS layer to document the locations of growth, which was used to assign the future flows to locations in the updated hydraulic model. Conceptual facilities (pipeline upgrades) were sized to serve the projected growth areas and included in the model analyses.

Hydraulic Analysis

MKN developed design criteria based on City and industry standards to: 1) evaluate the existing wastewater collection system, 2) identify deficiencies to serve existing and future flows, and 3) develop recommended system improvements to address identified deficiencies. The analysis included evaluation of both the gravity collection pipelines and lift stations. With a hydraulic model developed for the Study Area, MKN ran the following model simulations to identify capacity deficiencies to serve both existing and future flow conditions:

- Existing Flow Conditions
  - Average Day Flow (ADF)
  - Peak Dry Weather Flows (PHDWF)
  - Peak Wet Weather Flows (PHWWF)
  - Capital Improvement Plan Projects Identified to Correct System Deficiencies
- Near-Term Flow Conditions
  - Average Day Flow (ADF)

DRAFT

- Peak Dry Weather Flows (PHDWF)
- Peak Wet Weather Flows (PHWWF)
- Capital Improvement Plan Projects Identified to Correct System Deficiencies

- Ultimate Flow Conditions
  - ADF
  - PHDWF
  - PHWWF
  - Capital Improvement Plan Projects Identified to Correct System Deficiencies

MKN used the results of the above noted evaluation to develop a City buildout collection system implementation plan with a prioritization schedule.

Lift Station Assessment

MKN completed a limited hydraulic evaluation and visual inspection of the existing lift stations including wet wells, piping, valves, control panels, and site civil improvements to document existing conditions and potential deficiencies.

WRF Capacity Analysis

MKN performed a comprehensive capacity evaluation of the existing capacity of the WRF including hydraulics, treatment, and disposal limitations of existing plant processes to serve existing and ultimate conditions. MKN reviewed existing relevant reports and available information to estimate existing and ultimate flows and loadings (strength of wastewater) based on plant records and typical duty factors. The following tasks were performed as part of the WRF capacity analysis:

- Summarize existing influent flows, loadings, and treated effluent quality
- Review design criteria for existing plant equipment
- Identify capacity deficiencies

WRF Condition Assessment

A condition assessment of the WRF was performed to review the condition of existing structures and equipment to determine necessary condition-based upgrades and improvements. As part of this effort, MKN visited the WRF site to document existing equipment conditions and interview the plant operators. MKN developed a comprehensive list of condition-based deficiencies.

DRAFT

Capital Improvement Project Plan

MKN developed a capital improvement project (CIP) plan for the existing collection and treatment systems that included capital projects needed to: 1) resolve existing system deficiencies, and 2) accommodate future expansion (assumed to occur by buildout). MKN developed a project list identifying the size and location of required facilities, priorities, possible cost-sharing between existing and future users, triggers (e.g. what flows or number of equivalent dwelling units), and estimated project schedules.

Estimated construction costs for the improvements were developed based on current market cost information and recent local bids for similar projects. The estimated costs include estimates for project administration, design, construction management and project contingency. MKN developed figures depicting the locations of the recommended CIPs for existing and future conditions.

Master Plan Report

A draft version of the Master Plan was compiled to summarize the efforts and results for the tasks described herein. After a consolidated set of comments were received from the City, MKN revised the draft Master Plan and presented an overview of the findings and recommendations at a regularly scheduled City council meeting. Comments on the draft Master Plan were integrated into the Final Master Plan.

DRAFT

# 2.0 LAND USE AND FUTURE GROWTH

This section provides an overview of the existing land uses, potential development, and future population growth within the Study Area.

## 2.1 Land Use

The City is one of the oldest cities in Ventura County, with existing land uses that reflect over 120 years of building and development. The largest land use is comprised of residential development and approximately 44% of the City is dedicated to single-family residential, multi-family residential, and mobile homes. Commercial development and industrial development make up another 11% and 7% of the City's land use, respectively, with another 17% apportioned to specific plans for future development already located within the City's SOI.

The City's SOI includes approximately 7,300 parcels. **Figure 2-1** and **Table 2-1** provide a summary of the 2040 General Plan land uses within the City's SOI.

**Table 2-1: Existing Development of Land Use Types**

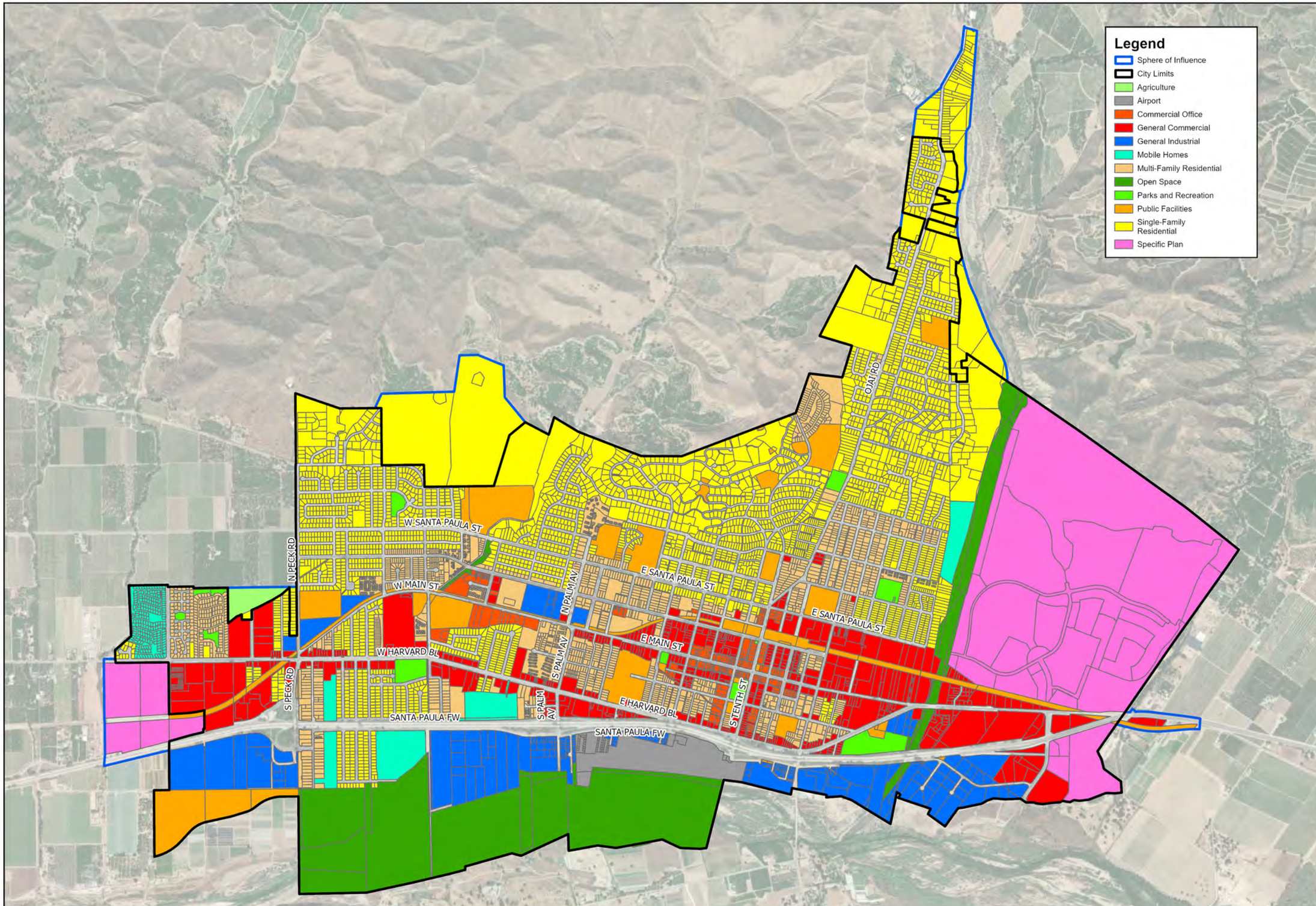
| Land Use Category | Gross Acres | Percent of Total |
|---|---|---|
| Single-Family Residential | 1,074 | 32% |
| Multi-Family Residential | 334 | 10% |
| Mobile Homes | 82 | 2% |
| General Commercial | 349 | 10% |
| Commercial Office | 43 | 1% |
| General Industrial | 244 | 7% |
| Public Facilities | 73 | 2% |
| Parks and Recreation | 11 | <1% |
| Open Space | 168 | 5% |
| Agriculture | 368 | 11% |
| Airport | 53 | 2% |
| Specific Plan | 584 | 17% |
| **Total** | **3,382** | **100%** |

Notes:
1. City of Santa Paula 2040 General Plan, Section 2: Land Use Element

**Figure 2-1** provides an overview of the existing land uses within the SOI.

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 2-1:

Existing Land Use Map

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

## 2.2 Existing Sewered Parcels

The City's land uses can be divided into sewered and un-sewered parcels. Sewered parcels are parcels that are connected to the collection system and generate wastewater flow that is collected at the WRF. Sewered parcels include occupied residences, public facilities, commercial businesses and offices, and industrial facilities. Un-sewered parcels are parcels that are not connected to the collection system and include vacant lots, open space, and parks. Since the City does not maintain data to indicate which properties are connected to the collection system, MKN assumed that every parcel tied to an existing water billing account (excluding irrigation uses) within the City's SOI was a sewered parcel. All other parcels were considered un-sewered and not included in the collection system analysis, unless identified with future development potential. To identify sewered parcels, MKN reviewed 2022 billing records and assigned each billing account to the parcel it overlapped. Table 2-2 provides a summary of sewered parcels by land use type in the City's SOI.

Table 2-2: Sewered Parcels by Land Use in the City's SOI

| Land Use | Number of Parcels | Acreage |
|---|---|---|
| Single-Family Residential | 3,405 | 829 |
| Multi-Family Residential | 1,890 | 278 |
| Mobile Homes | 6 | 57 |
| General Commercial | 499 | 266 |
| Commercial Office | 178 | 40 |
| General Industrial | 99 | 130 |
| Public Facilities | 23 | 114 |
| Airport | 9 | 47 |
| Specific Plan | 12 | 124 |
| **Total** | **6,121** | **1,885** |

Of the City's approximately 7,300 total parcels and 3,382 acres, 6,121 parcels covering an area of 1,885 acres were considered sewered parcels for the Master Plan.

## 2.3 Future Development

To estimate potential future residential, commercial, and industrial development within the City, MKN worked with the City's Community and Economic Development department to review existing planning documents to identify properties and/or areas with future development potential within the City's SOI. MKN also reviewed and considered areas identified as expansion areas for future annexation into the City's SOI. The planning information used to identify potential future development included the following documents:

- 2021 - 2029 Housing Element
- 2040 General Plan – Land Use Element

The only future development outside of the City's SOI included in the Master Plan capacity evaluation included the expansion areas as identified in the 2040 General Plan.

DRAFT

### 2.3.1 2021 – 2029 Housing Element

The City is required to prepare a Housing Element every eight years to identify and address housing needs, housing goals, policies, and programs. Based on forecasted growth of households in the City, the Regional Housing Needs Assessment (RHNA) determined that 657 new housing units would need to be constructed prior to the end of 2029. In response to the RHNA, the City demonstrated a significant surplus in housing capacity to meet this housing need, as summarized in **Table 2-3**.

**Table 2-3: Land Inventory Summary (Within City SOI)**

| Development Type | Total Housing Units |
|---|---|
| Approved / Pending Projects[1] | 676 |
| Vacant Residential Sites | 117 |
| Vacant Commercial Sites[2] | 812 |
| **Total Future Housing Capacity** | 1,605 |
| RHNA Housing Units Required | 657 |
| **RHNA Surplus / (Deficit)** | 948 |

Notes:
1. Excludes Specific Plan developments
2. The 2021 – 2029 housing development identified vacant commercial sites for residential development
3. The East Area 1 Specific Plan was not included in the land inventory summary. In addition, this did not include any future expansion area developments

### 2.3.2 2040 General Plan – Land Use Element

The 2040 General Plan is a fundamental policy document for the City, providing the framework for managing the City's physical and economic resources now and in the future. As part of the 2040 General Plan, the City developed a Land Use Element to guide how the City plans, develops and supports land use, which includes information on future specific plan projects and potential expansion areas to the City's SOI.

The Land Use Element identifies the following two Specific Plan developments within the City's SOI that are currently under construction or soon-to-be constructed:

- SP-3 East Area 1 Specific Plan: The largest anticipated future development project within the City's SOI is the East Area 1 Specific Plan ("Harvest at Limoneira"). This Project encompasses approximately 495 acres in east Santa Paula, with an anticipated build out of 2,050 housing units. Per the "Wastewater System Master Plan Amendment – Harvest at Limoneira (East Area One)" report, 520 units were occupied in November 2022, leaving 1,530 housing units left to be developed for the future condition
- SP-4 East Gateway Specific Plan: The East Gateway Specific Plan Area in east Santa Paula includes 670,000 square feet of general commercial space

The Land Use Element also identified several expansion areas beyond the City's current SOI that are considered to have potential for future annexation and development. **Table 2-4** below provides a summary of the different Expansion Areas and development potential.

DRAFT

| Table 2-4: Expansion Areas Summary | |
|---|---|
| **Expansion Area** | **Development Potential[1]** |
| Adams Canyon | 495 Housing Units<br>1 School Site (Assumed 15 acres)<br>1 Resort Hotel (Assumed 100 Housing Units) |
| Fagan Canyon | 450 Housing Units<br>1.8 Acres General Commercial |
| East Area 3 | 5.1 Acres General Commercial<br>2.8 Acres General Industrial |
| West Area 2 | 57.5 Acres General Commercial |
| South Mountain | N/A[2] |

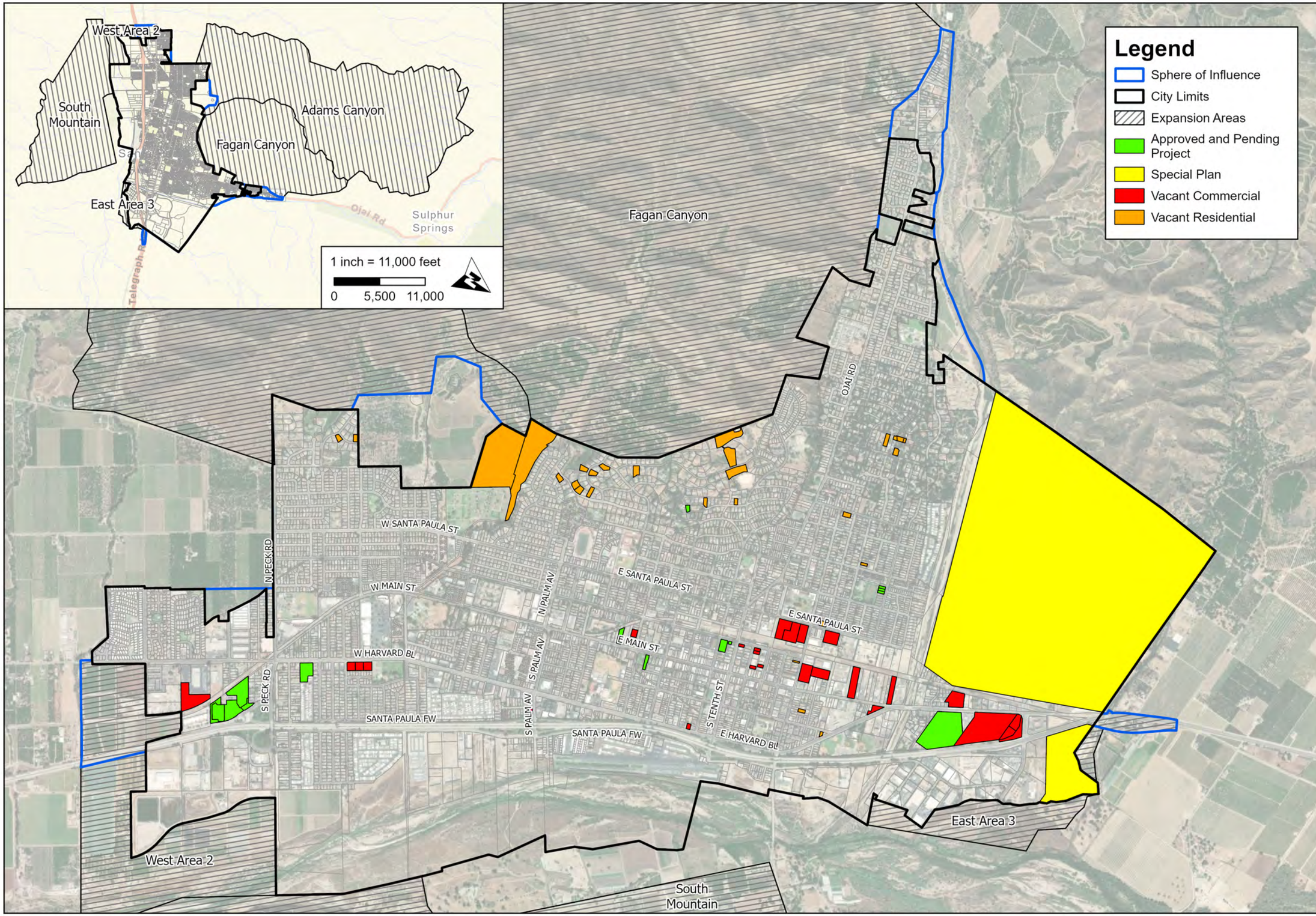
Notes:
1. Development potential for each expansion area only included development anticipated to have a substantial return sewer flow. The level of proposed development provided is preliminary and is subject to change once a future specific plan is developed
2. No development that will result in substantial return sewer flows is anticipated

**Figure 2-2** provides an overview of the locations throughout the City that have future development potential and were evaluated for the Master Plan.

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 2-2:

Future Development Map

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# 3.0 EXISTING AND PROJECTED WASTEWATER FLOWS

This section provides an overview of the estimated existing and future flow conditions within the Study Area including flow validation through a flow monitoring study.

## 3.1 Water Recycling Facility Historical Flows

This section provides an overview of the historical influent wastewater flows from the Water Recycling Facility (WRF). Historical influent wastewater flows are typically composed of wastewater flow form residential, commercial, and industrial uses and inflow / infiltration (I/I). I/I flows occur due to precipitation events and groundwater infiltration. Inflow is the water entering a collection system and service connections from manhole covers, roof and foundation drains, or cross connections from storm sewers and catch basins. Infiltration is groundwater entering a collection system through cracks in manhole walls, defective pipes, pipe joints, or connections. While inflow varies rapidly with rainfall conditions with flows rising and falling within minutes or hours of a significant precipitation event, infiltration is relatively constant over a period of days, weeks, or even months in areas of high groundwater near sewer services.

The City has not conducted a recent I/I study, but potential inflow and infiltration impacts to WRF influent wastewater flows can be inferred by comparing precipitation to wastewater flows and calculating the difference between wet weather and dry weather peak daily flows. **Figure 3-1** provides a comparison between total precipitation and average monthly WRF effluent flows.

Based on **Figure 3-1**, there does not appear to be a consistent correlation between significant precipitation events and higher than average monthly influent wastewater flows. However, VRSD staff have observed significant I&I at the WRF when the City receives more than 1 inch of rain.

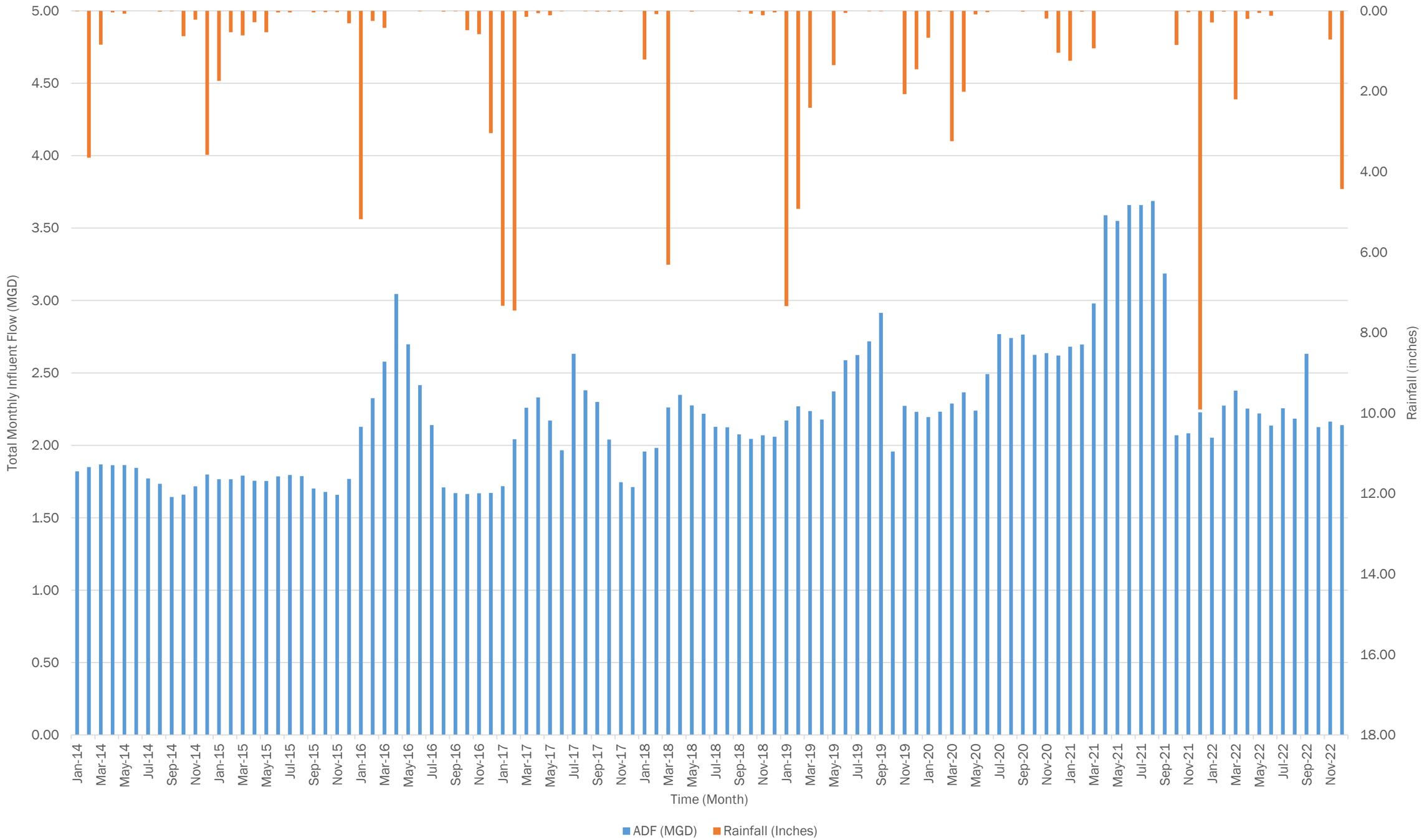
**Table 3-1** provides a summary of the historical wastewater influent records from 2014 to 2022. Peaking factors in the table below were determined by taking the ratio of the flow condition above the peaking factor row to the ADF.

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

Figure 3-1: Average Monthly WRF Influent Flow and Rainfall – 2014 to 2022



THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

| Table 3-1: Historical WRF Influent Flows | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | Existing Flows[1] |
| Influent Flow Rate (MGD) and Flow Condition Peaking Factors | | | | | | | | | | |
| ADF | 1.79 | 1.75 | 2.24 | 2.08 | 2.13 | 2.38 | 2.50 | 3.01 | 2.23 | 2.58 |
| MMF | 1.87 | 1.80 | 3.05 | 2.63 | 2.35 | 2.91 | 2.77 | 3.69 | 2.63 | 3.00 |
| Peaking Factor | 1.05 | 1.03 | 1.36 | 1.26 | 1.10 | 1.23 | 1.11 | 1.23 | 1.18 | 1.16 |
| ADWF | 1.78 | 1.73 | 2.72 | 2.13 | 2.13 | 2.50 | 2.56 | 3.27 | 2.26 | 2.71 |
| Peaking Factor | 1.00 | 0.99 | 1.21 | 1.02 | 1.00 | 1.05 | 1.03 | 1.09 | 1.01 | 1.05 |
| AWWF | 1.79 | 1.77 | 2.01 | 1.87 | 2.11 | 2.26 | 2.37 | 2.49 | 2.18 | 2.34 |
| Peaking Factor | 1.00 | 1.01 | 0.89 | 0.90 | 0.99 | 0.95 | 0.95 | 0.83 | 0.98 | 0.91 |
| PDDWF | 2.36 | 3.21 | 7.04 | 4.74 | 3.67 | 3.33 | 3.82 | 4.93 | 4.66 | 5.68 |
| Peaking Factor | 1.32 | 1.83 | 3.14 | 2.27 | 1.72 | 1.40 | 1.53 | 1.64 | 2.09 | 2.20 |
| PDWWF[2] | 2.24 | 3.24 | 5.10 | 3.75 | 7.75 | 3.23 | 3.48 | 4.19 | 4.59 | 4.69 |
| Peaking Factor | 1.25 | 1.85 | 2.27 | 1.80 | 3.64 | 1.36 | 1.39 | 1.39 | 2.05 | 1.82 |
| PDF | 2.36 | 3.24 | 7.04 | 4.74 | 7.75 | 3.33 | 3.82 | 4.93 | 4.66 | 5.68 |
| Peaking Factor | 1.32 | 1.85 | 3.14 | 2.27 | 3.64 | 1.40 | 1.53 | 1.64 | 2.09 | 2.20 |
| PHWWF | - | - | - | - | - | - | - | - | - | 7.74 |

Notes:
1. Existing flow conditions were based on a three-year average from 2020 to 2022
2. Months with cumulative rainfall over 0,25 inches were considered wet months

DRAFT

## 3.2 Wastewater Flow Conditions

The following wastewater flow conditions were used to evaluate the City's collection, treatment, and disposal systems to serve existing and future flows.

### 3.2.1 Average Day Flow

Average Day Flow (ADF) is the average daily wastewater flow over the course of a year and is obtained by averaging the monthly flows conveyed to the WRF through the course of a year and converting to a daily flow rate. The ADF was determined using a three-year annual average from 2020 to 2022 influent WRF flows.

### 3.2.2 Maximum Month Flow

Maximum Month Flow (MMF) is the average daily flow during the month featuring the highest cumulative flow.

### 3.2.3 Average Dry Weather and Wet Weather Flows

Average Dry Weather (ADWF) and Wet Weather (AWWF) Flows are the average daily flow rates experienced during dry and wet weather months respectively. Consideration of average dry and wet weather flows allows analysis of

treatment systems at appropriate flow rates and temperatures for the dry and wet season. Precipitation of 0.25 inches or more per month was assumed to identify wet weather months.

### 3.2.4 Peak Day Dry Weather Flow and Wet Weather Flow

Peak Day Dry Weather Flow (PDDWF) and Wet Weather Flow (PDWWF) represent the highest daily flow rates experienced at the WRF during dry and wet weather months, respectively.

### 3.2.5 Peak Day Flow

Peak Day Flow (PDF) represents the maximum daily flow rate experienced at the WRF and issued to design or evaluate hydraulic retention times for certain treatment processes.

### 3.2.6 Peak Hour Dry Weather Flow

Peak Hour Dry Weather Flow (PHDWF) is the maximum flow experienced within one hour during dry conditions and is one of two flow conditions typically used for sizing collection system gravity pipe and lift stations. The existing peak dry hour flow conditions were based on the results of the flow monitoring study. As identified in **Table 3-4**, PHDWF peaking factors of 1.7 to 2.2 were observed during the flow monitoring study and the flow meters observed an average peaking factor of 2.0.

### 3.2.7 Peak Hour Wet Weather Flow

Peak Hour Wet Weather Flow (PHWWF) is the maximum flow experienced within one hour during wet conditions and is one of two flow conditions typically used for sizing collection system gravity pipe and lift stations. The existing peak wet hour flow conditions were based on a peaking factor of 3.0 identified in the design criteria of the previous 2012 WWMP and verified by the results of the updated flow monitoring study.

DRAFT

**Table 3-2** provides a summary of the wastewater flow conditions utilized to evaluate the City's existing collection system and WRF facilities to serve existing and future flow conditions.

| Table 3-2: Existing Flow Conditions & Peaking Factors | | | |
|---|---|---|---|
| Flow Condition | MGD | GPM | Peaking Factor |
| ADF | 2.58 | 1,792 | - |
| MMF | 3.00 | 2,083 | 1.16 x ADF |
| ADWF | 2.71 | 1,882 | 1.05 x ADF |
| AWWF | 2.34 | 1,625 | 0.91 x ADF |
| PDDWF | 5.68 | 3,944 | 2.20 x ADF |
| PDWWF | 4.69 | 3,257 | 1.82 x ADF |
| PDF | 5.68 | 3,944 | 2.20 x ADF |
| PHDWF | 5.16 | 3,583 | 2.00 x ADF |
| PHWWF | 7.74 | 5,375 | 3.00 x ADF |

## 3.3 Flow Monitoring Study

This section describes the flow monitoring study completed as part of the Master Plan effort.

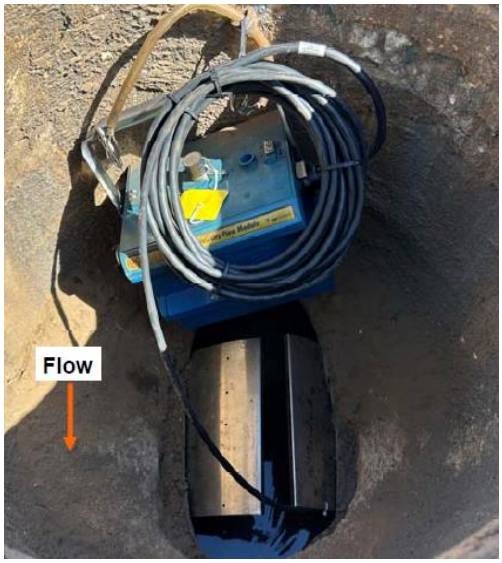
### 3.3.1 Flow Monitoring Equipment

To verify preliminary flow conditions and confirm a PHDWF peaking factor for the hydraulic model, a flow monitoring study was completed. MKN's subconsultant (Gold Coast Environmental), performed a flow monitoring study by placing four flow monitoring devices in sewer manholes at key locations throughout the Study Area over a 14-day monitoring period.

Gold Coast Environmental installed temporary Teledyne Isco 2150 Area-Velocity flow meters, as shown in **Figure 3-2**.

**Figure 3-3** provides an overview of the four flow meter-locations and associated sewersheds.

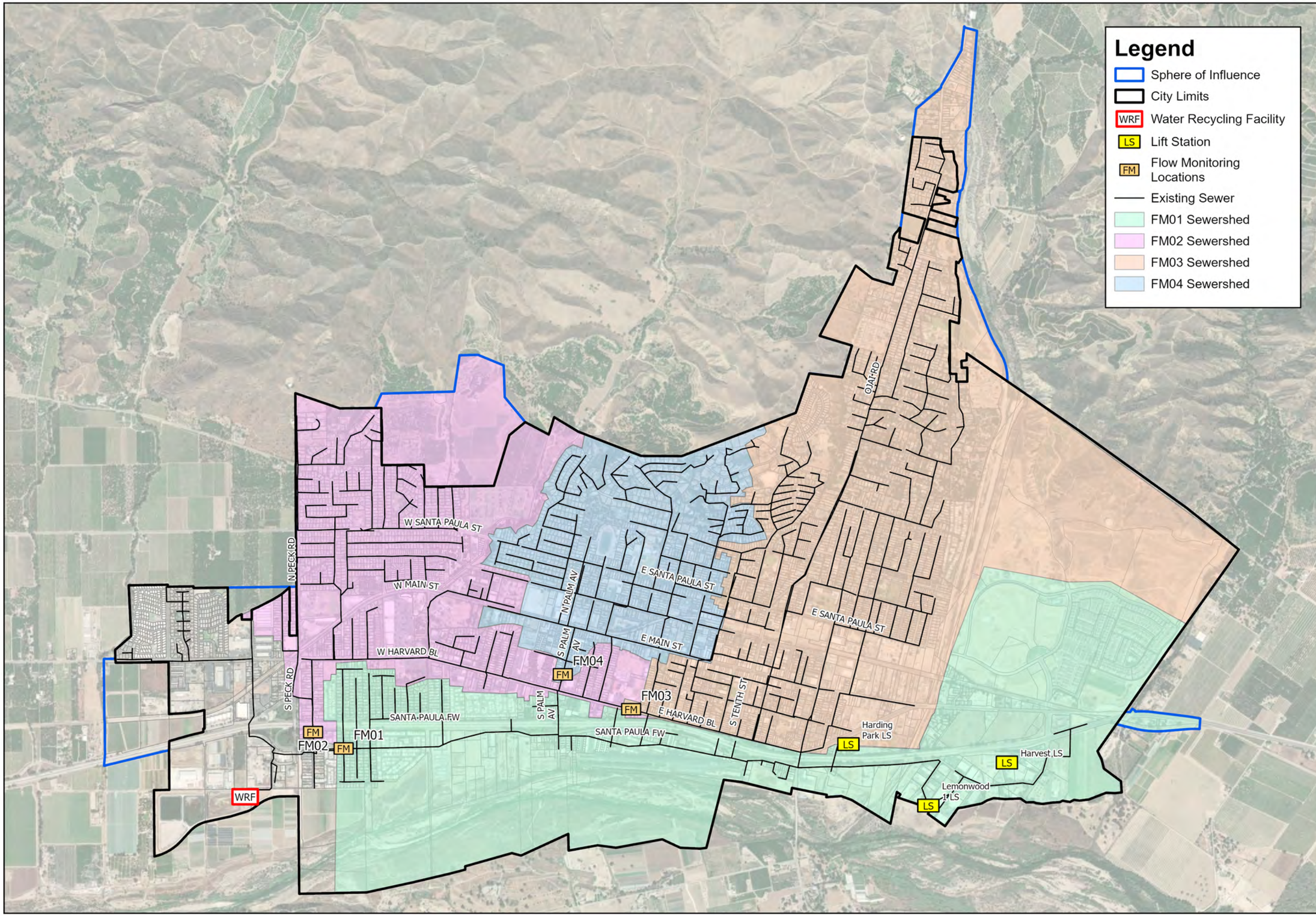
**Figure 3-2: Typical Flow Meter Installation**




DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 3-3:

Flow Monitoring Locations

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

The flow meters were programmed to acquire and store depth of flow and velocity readings at 15-minute intervals. Level measurements were acquired using a submerged pressure transducer mounted in the flow stream and velocity measurements were acquired using a doppler ultrasonic sensor. The meters were installed in the selected manholes from July 11 to July 25, 2023. The Golden State Environmental flow monitoring study is included in **Appendix A. Table 3-3** provides an overview of the flow meter locations, the size of the pipeline, and the estimated number of parcels upstream of each flow meter.

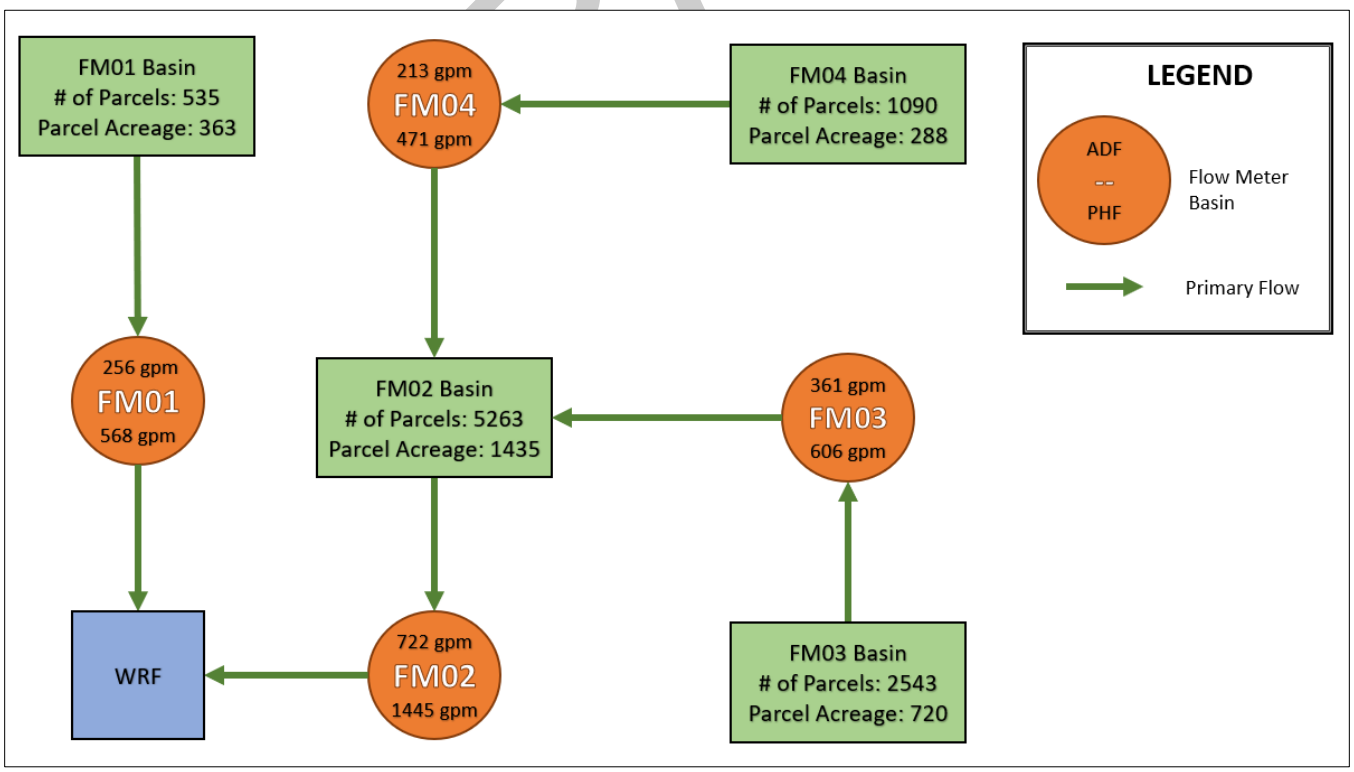
**Table 3-3: Flow Meter Locations**

| Flow Meter | Location | Pipe Diameter (inches) | Sewered Parcels[1] | Basin Area (Acre)[2] |
|---|---|---|---|---|
| FM01 | 416 Dartmouth Road | 24 | 535 | 363 |
| FM02 | 500 Acacia Road[3] | 24 | 5,263 | 1,435 |
| FM03 | 520 Harvard Boulevard | 18 | 2,543 | 720 |
| FM04 | 224 South Palm Avenue | 15 | 1,090 | 288 |

Notes:
1. Basin area only includes acreage for existing "sewered" parcels
2. FM02 sewershed includes the FM03 and FM04 sewersheds.

The flow meters captured flow data for approximately 95% of all sewered parcels within the City's SOI. **Figure 3-4** provides a schematic overview of the flow meter placement within the collection system and identifies upstream and downstream meter placements. Each circle includes the flow meter name, the measured average day, and peak hour flows.

**Figure 3-4: Flow Meter Schematic**




DRAFT

### 3.3.2 Flow Monitoring Results

**Table 3-4** includes a summary of the flow results for the flow monitoring study. The table lists the recorded average day flow (ADF) in gallons per day (GPD) and gallons per minute (GPM); peak hour flow (PHF) in GPM, and flow depth for the flow monitoring period.

**Table 3-4: Flow Monitoring Results**

| Parameter | Units | Flow Meter | | | |
|---|---|---|---|---|---|
| | | FM01 Dartmouth | FM02 Acacia | FM03 Harvard | FM04 Palm |
| Pipe Diameter | Inches | 24 | 24 | 18 | 15 |
| Average Daily Flow | GPD | 368,907 | 1,040,397 | 519,725 | 307,423 |
| | GPM | 256 | 722 | 361 | 213 |
| Average Flow Depth | Inches | 6.65 | 6.32 | 21.28 | 8.68 |
| Peak Hour Flow | GPM | 568 | 1,445 | 606 | 471 |
| Peak Hour Flow Depth | Inches | 8.55 | 8.62 | 23.91 | 10.38 |
| Peak Hour Peaking Factor (PHF/ADF) | - | 2.2 | 2.0 | 1.7 | 2.2 |
| Peak Instantaneous Flow (5-minute data) | GPM | 574 | 1,477 | 637 | 471 |

The following figures graphically depict the overall consistency of flow data collection during the flow monitoring study.

**Figure 3-5: FM01 - Hourly Flow Conditions**

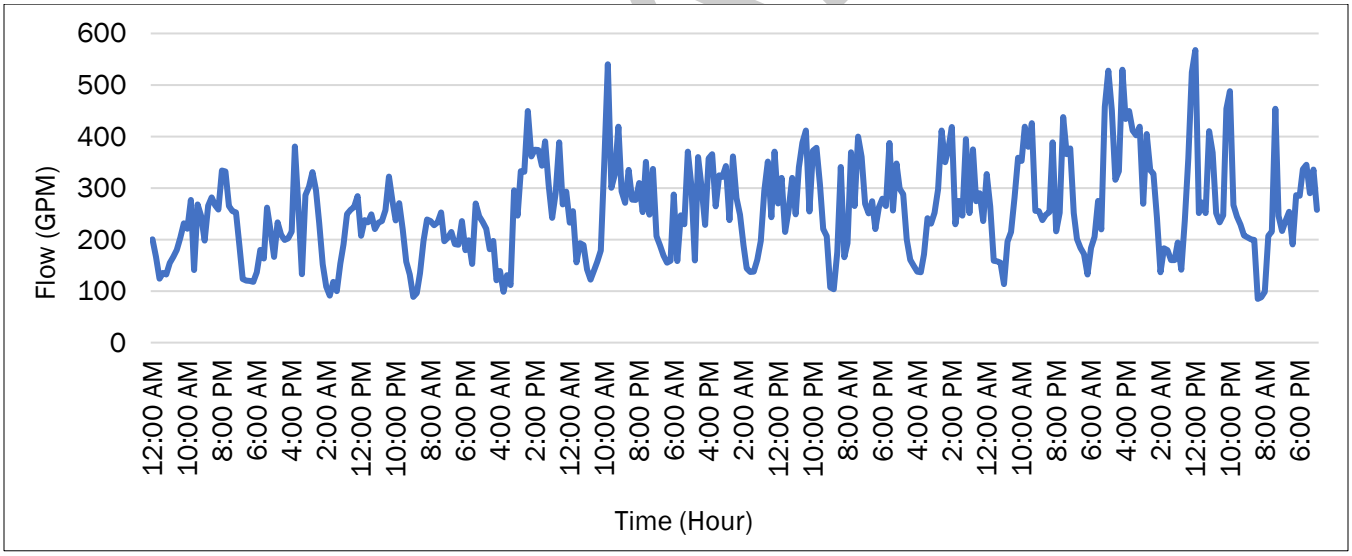


Figure 3-6: FM02 - Hourly Flow Conditions

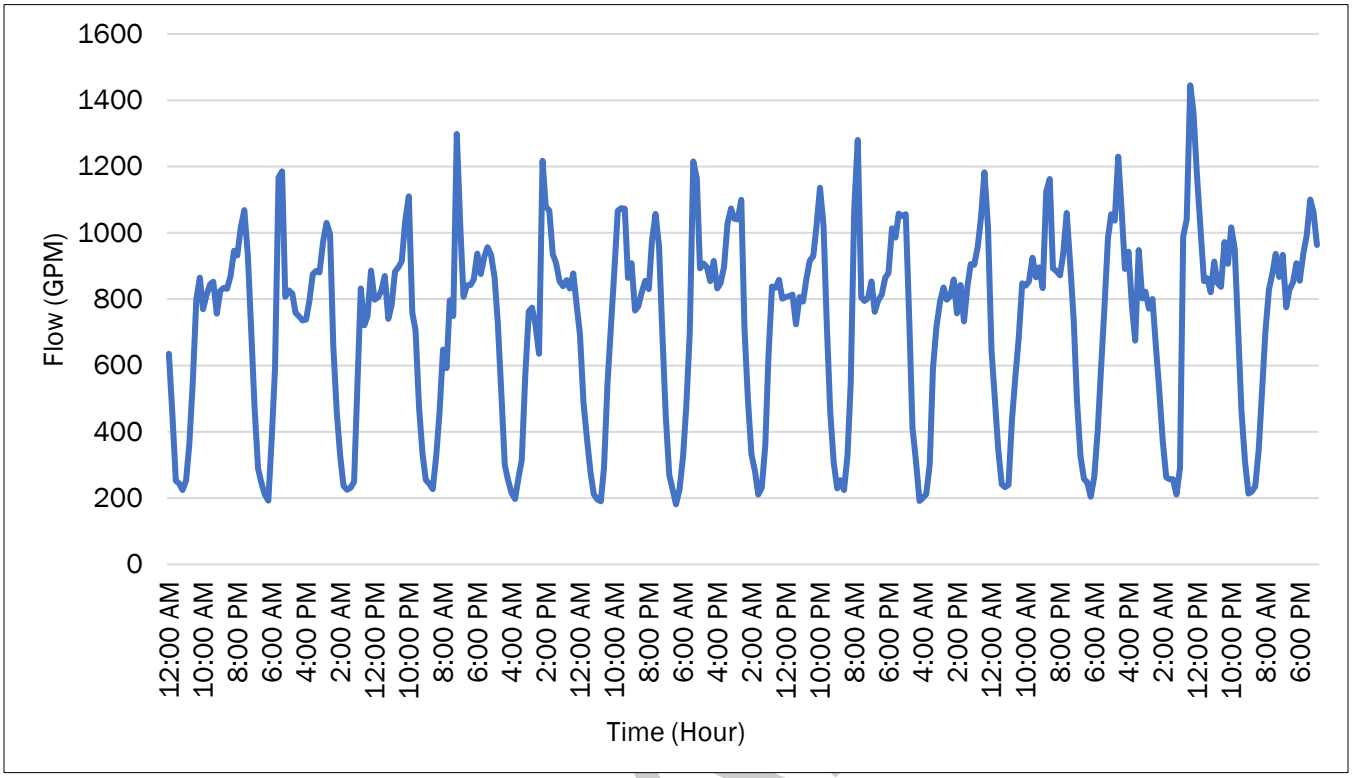



Figure 3-7: FM 03 - Hourly Flow Conditions

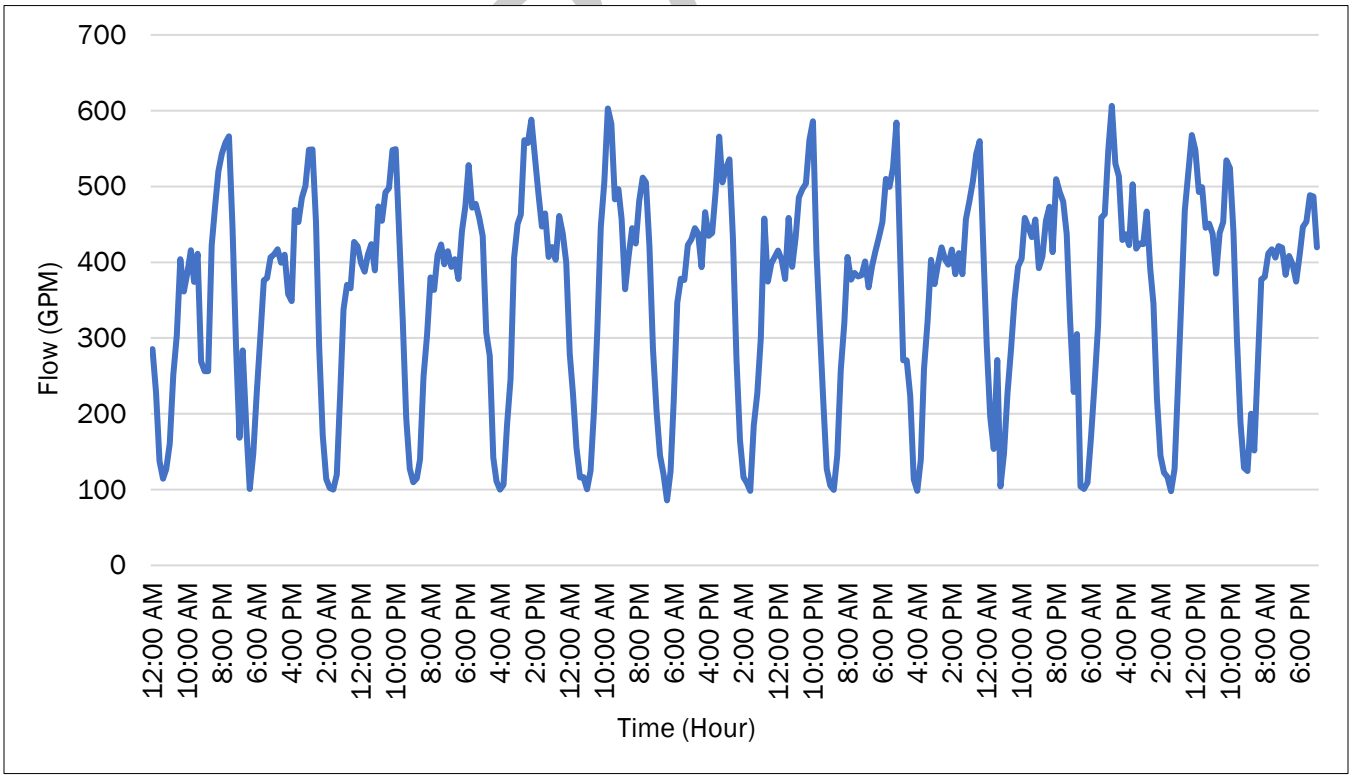
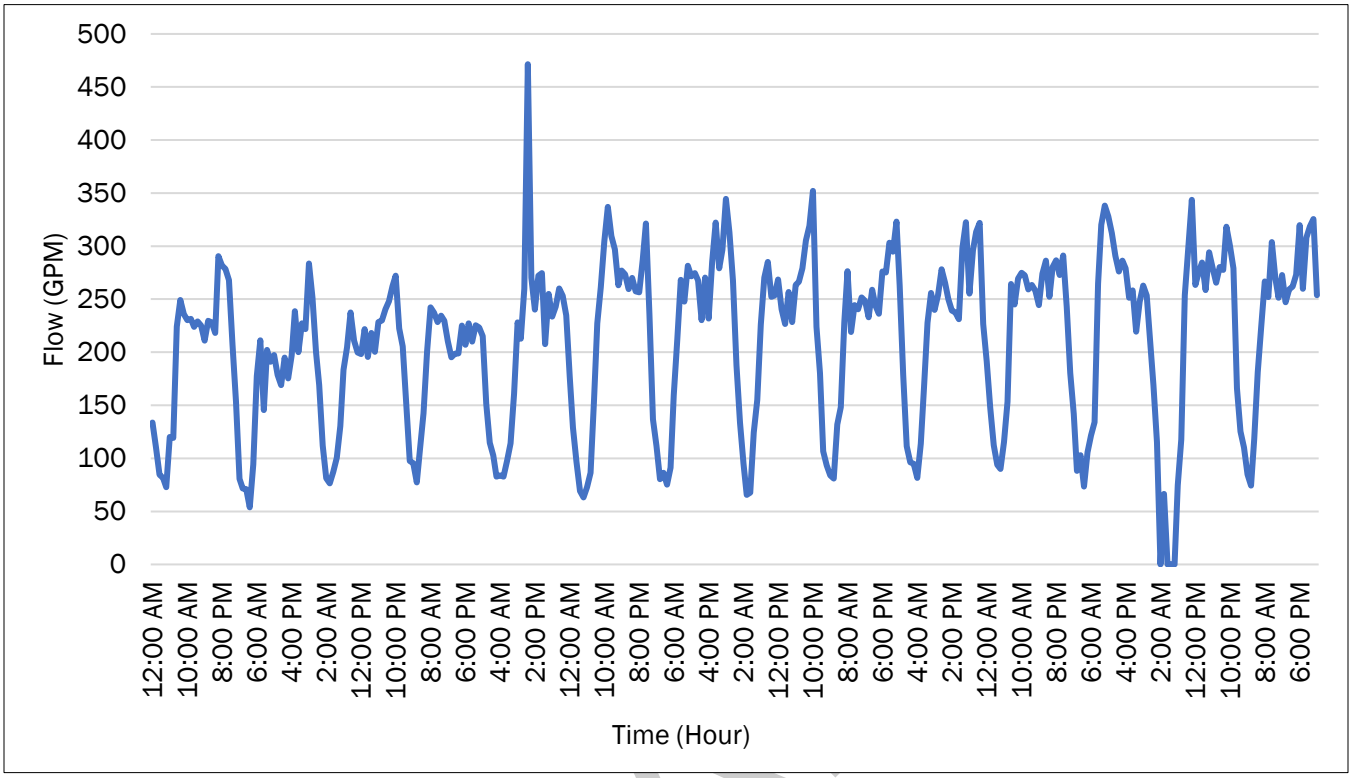


Figure 3-8: FM04 - Hourly Flow Conditions




The flow monitoring study collected baseline dry weather flow conditions within the Study Area. Existing dry weather peak hour flow conditions were based on the results of the flow monitoring study and do not include any increase in flow from rain events.

MKN was not scoped to complete wet-weather flow monitoring for this project and PHWWF conditions were based on information from factors from the City's Wastewater System Master Plan dated June 2012. To verify observed pipeline capacity deficiencies during PHWWF conditions, the City may consider completing a more comprehensive I/I in the future and updating the PHWWF conditions within the hydraulic model.

## 3.4 Wastewater Return Factors

To estimate the distribution of wastewater flows across the collection system and estimate future wastewater demand, MKN assigned a water to wastewater return factor to each sewered parcel based on its land use. To determine the return factor for each land use type, MKN developed preliminary wastewater return factors in **Table 3-5** based on the existing ADF from **Section 3.3.1**, 2020 to 2022 water billing data, 2020 to 2022 WRF ADF, and sewered parcel information from **Table 2-2**. These return factors were then assessed using the flow monitoring study.

| Table 3-5: Preliminary Wastewater Return Factors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land Use | Number of Parcels | Acreage | Average Day Demand (MGD)[1] | Average Day Demand (GPM)[1] | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
| Single-Family Residential | 3,405 | 829 | 1.19 | 827 | 80% | 0.95 | 662 |
| Multi-Family Residential | 1,890 | 278 | 0.81 | 562 | 90% | 0.73 | 505 |
| Mobile Homes | 6 | 57 | 0.14 | 99 | 85% | 0.12 | 84 |
| General Commercial | 499 | 266 | 0.43 | 300 | 95% | 0.41 | 285 |
| Commercial Office | 178 | 40 | 0.07 | 52 | 95% | 0.07 | 49 |
| General Industrial | 99 | 130 | 0.11 | 80 | 95% | 0.11 | 76 |
| Public Facilities | 23 | 114 | 0.12 | 81 | 80% | 0.09 | 65 |
| Airport | 9 | 47 | 0.01 | 5 | 85% | 0.01 | 4 |
| Specific Plan | 12 | 124 | 0.11 | 74 | 85% | 0.09 | 63 |
| **Total** | **6,121** | **1,885** | **2.99** | **2,078** | **86%** | **2.58** | **1,792** |
| | | | | | **WRF ADF[2]** | **2.58** | **1,792** |

Notes:
1. Potable water usage was calculated using a three-year average from 2020 to 2022 water billing data. Water usage that did not result in return wastewater flows was not included in this average (ex: hydrant testing, landscaping-specific meters, water losses, etc.)
2. Actual existing average daily flow calculated from influent WRF data from 2020 to 2022

The preliminary return factors identified in **Table 3-5** are based on typical return factors MKN has used on similar wastewater planning projects. From 2020 to 2023, the average day water demand was 2.99 MGD and the average day flow to the WRF was 2.58 MGD, resulting in an overall average return factor of 86%. A detailed flow verification is included in **Appendix B**.

## 3.5 Wastewater Unit Flow Factors

The following wastewater flow factors were used for estimating future wastewater flow associated with near-term and ultimate development projects. The water and wastewater unit demand factors were developed from the City's 2020 UWMP, Wastewater System Master Plan Amendment – East Area 1, and the water to wastewater return factors identified in **Table 3-5**. The unit factors are summarized in **Table 3-6** below.

DRAFT

| Table 3-6: Future Unit Flow Factors | | | | |
|---|---|---|---|---|
| Flow Category | Water Demand Factor | Return Factor[1] | Wastewater Flow Factor (GPDU) (gpm) | Source |
| Residential | 308 gal per day / housing unit[2] | 80% | 246 gal per day / housing unit | 2020 UWMP |
| Residential (East Area 1 Only) | 224 gal per day / housing unit[3] | 80% | 179 gal per day / housing unit | Wastewater System Master Plan Amendment – East Area 1 |
| Commercial | 2.49 gal per year / SF | 95% | 2.37 gal per year / SF | 2020 UWMP |
| Industrial | 15.1 gal per year / SF | 95% | 14.3 gal per year / SF | 2020 UWMP |
| School | 1.81 AF per year / acre | 80% | 1.45 AF per year / acre | 2020 UWMP |

Notes:
1. Return factors from Table 3-12
2. 88 gallons per day per capita x 3.5 capita per housing unit = 308 gal per day / housing unit
3. 64 gal per day per capita x 3.5 capita per housing unit = 224 gal per day / housing unit

## 3.6 Future Sewer Flow

Future wastewater flows within the City's SOI will consist of redevelopment of underutilized parcels, new development of vacant land, and new development within the City's expansion areas. These future flows are described below.

### 3.6.1 Near-Term Flows

Wastewater flows within the City's SOI are expected to increase within the next five years as pending development projects are constructed. Near-Term flows include approved and pending development projects identified in the 2021 – 2029 Housing Element, as well as approved and pending specific plans identified in the Land Use Element of the 2040 General Plan. A summary of the estimated wastewater flows associated with near-term development projects is shown in **Table 3-7**.

| Table 3-7: Near-Term Development Wastewater Flow | | | |
|---|---|---|---|
| **Future Development** | **Unit** | **Wastewater Flow Factor** | **Wastewater Flow (gpm)** |
| Approved / Pending Projects | | | |
| *Housing Units* | 676 | 246 gal per day / housing unit | 115 |
| East Area 1 Specific Plan | | | |
| *Housing Units* | 1530 | 179 gal per day / housing unit | 190 |
| East Gateway Specific Plan | | | |
| *General Commercial (SF)* | 670,000 | 2.37 gal per year / SF | 3 |
| | | **Total Wastewater Flow (gpm)** | **309** |
| | | **Total Wastewater Flow (mgd)** | **0.44** |

Notes:
1. GPM = Gallons per Minute
2. MGD = Million Gallons per Day
3. SF = Square Feet

DRAFT

### 3.6.2 Ultimate Flows

Ultimate flows are associated with build-out within the existing City SOI and the City's expansion areas. These are classified as projects expected to occur at some point in the future, but these projects are at the early planning stages. Ultimate flows include vacant residential and commercial sites identified in the 2021 – 2029 Housing Element, as well as expansion areas identified in the Land Use Element of the 2040 General Plan. A summary of the estimated wastewater flows associated with ultimate development projects is shown in **Table 3-8**.

**Table 3-8: Ultimate Development Wastewater Flow**

| Future Development | Unit | Wastewater Flow Factor | Wastewater Flow (gpm) |
|---|---|---|---|
| Vacant Residential Sites | | | |
| *Housing Units* | 117 | 246 gal per day / housing unit | 20 |
| Vacant Commercial Sites | | | |
| *Housing Units*[1] | 812 | 246 gal per day / housing unit | 139 |
| Adams Canyon Expansion Area | | | |
| *Housing Units* | 595 | 246 gal per day / housing unit | 102 |
| *School (Acres)* | 15 | 1.45 AF per year / acre | 13 |
| Fagan Canyon Expansion Area | | | |
| *Housing Units* | 450 | 246 gal per day / housing unit | 77 |
| *General Commercial (SF)* | 78,401 | 2.37 gal per year / SF | 0 |
| East Area 3 Expansion Area | | | |
| *General Commercial (SF)* | 222,156 | 2.37 gal per year / SF | 1 |
| *General Industrial (SF)* | 121,968 | 14.3 gal per year / SF | 3 |
| West Area 2 Expansion Area | | | |
| *General Commercial (SF)* | 2,504,700 | 2.37 gal per year / SF | 11 |
| | | **Total Future Development Wastewater Flow (gpm)** | **367** |
| | | **Total Future Development Wastewater Flow (mgd)** | **0.53** |

Notes:
1. Per the 2021 – 2029 Housing Element, the City identified vacant commercial lots for future residential development.
2. GPM = Gallons per Minute
3. MGD = Million Gallons per Day
4. SF = Square Feet

DRAFT

### 3.6.3 Future Sewer Flow Summary

**Table 3-9** provides a summary of the total future water flows associated with the City's near-term projects (pending projects) and ultimate projects (vacant sites and expansion areas).

| Table 3-9: Estimated Total Future Wastewater Flow Conditions | | | | | | |
|---|---|---|---|---|---|---|
| Flow Condition | ADF[1] | | PHDWF[2] | | PHWWF | |
| | MGD | GPM | MGD | GPM | MGD | GPM |
| Existing | 2.58 | 1,792 | 5.16 | 3,584 | 7.74 | 5,375 |
| Near-Term | 3.02 | 2,100 | 6.05 | 4,201 | 9.07 | 6,301 |
| Ultimate | 3.55 | 2,468 | 7.11 | 4,935 | 10.66 | 7,403 |

Notes:
1. PHDWF = 2.0 x ADF per Table 3-2
2. PHWWF = 3.0 x ADF per Table 3-2
3. ADF = Average Day Flow
4. PHDWF = Peak Hour Dry Weather Flow
5. PHWWF = Peak Hour Wet Weather Flow
6. MGD = Million Gallons per Day
7. GPM = Gallons per Minute

DRAFT

# 4.0 EXISTING SYSTEM OVERVIEW

This section provides an overview of the City's existing wastewater collection, treatment and disposal systems.

## 4.1 Gravity Collection System

The City's existing collection system includes 59 miles of gravity sewer pipelines (ranging from 6-inch to 42-inch diameters), 1,190 manholes, three lift stations, and associated force mains. **Figure 4-1** provides an overview of the collection system and an inventory of the existing gravity collection system by diameter is provided in **Table 4-1**.

Table 4-1: Collection System Pipeline by Size

| Diameter (Inches) | Length | | |
|---|---|---|---|
| | Feet | Miles | % of total |
| 6 | 82,360 | 15.7 | 26% |
| 8 | 172,970 | 32.7 | 55% |
| 10 | 18,090 | 3.4 | 6% |
| 12 | 13,280 | 2.5 | 4% |
| 15 | 2,870 | 0.5 | 1% |
| 18 | 8,510 | 1.6 | 3% |
| 20 | 1,050 | 0.2 | < 1% |
| 21 | 3,070 | 0.9 | 1% |
| 24 | 7,650 | 1.5 | 2% |
| 30 | 490 | 0.1 | < 1% |
| 33 | 130 | <0.1 | < 1% |
| 36 | 170 | <0.1 | < 1% |
| 42 | 1,330 | 0.3 | < 1% |
| **Total** | 311,970 | **59.1** | **100%** |

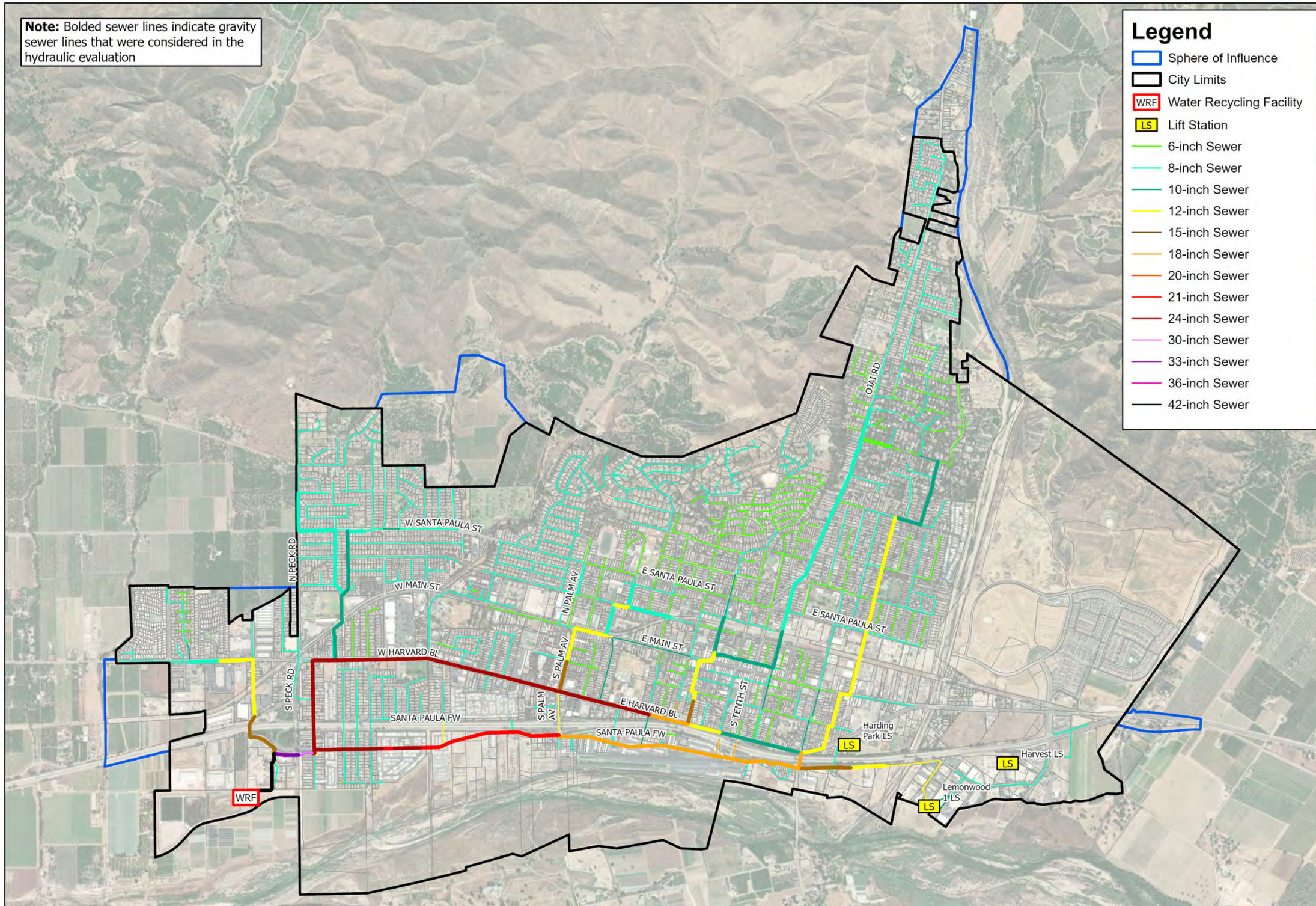
DRAFT

## 4.2 Lift Stations

There are a total of three (3) lift stations within the City's existing collection system including the Harding Park, Harvest (Lemonwood No. 2), and Lemonwood No. 1 lift stations. **Figure 4-2** shows the lift station locations and sewersheds.

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 4-1:

Collection System Map

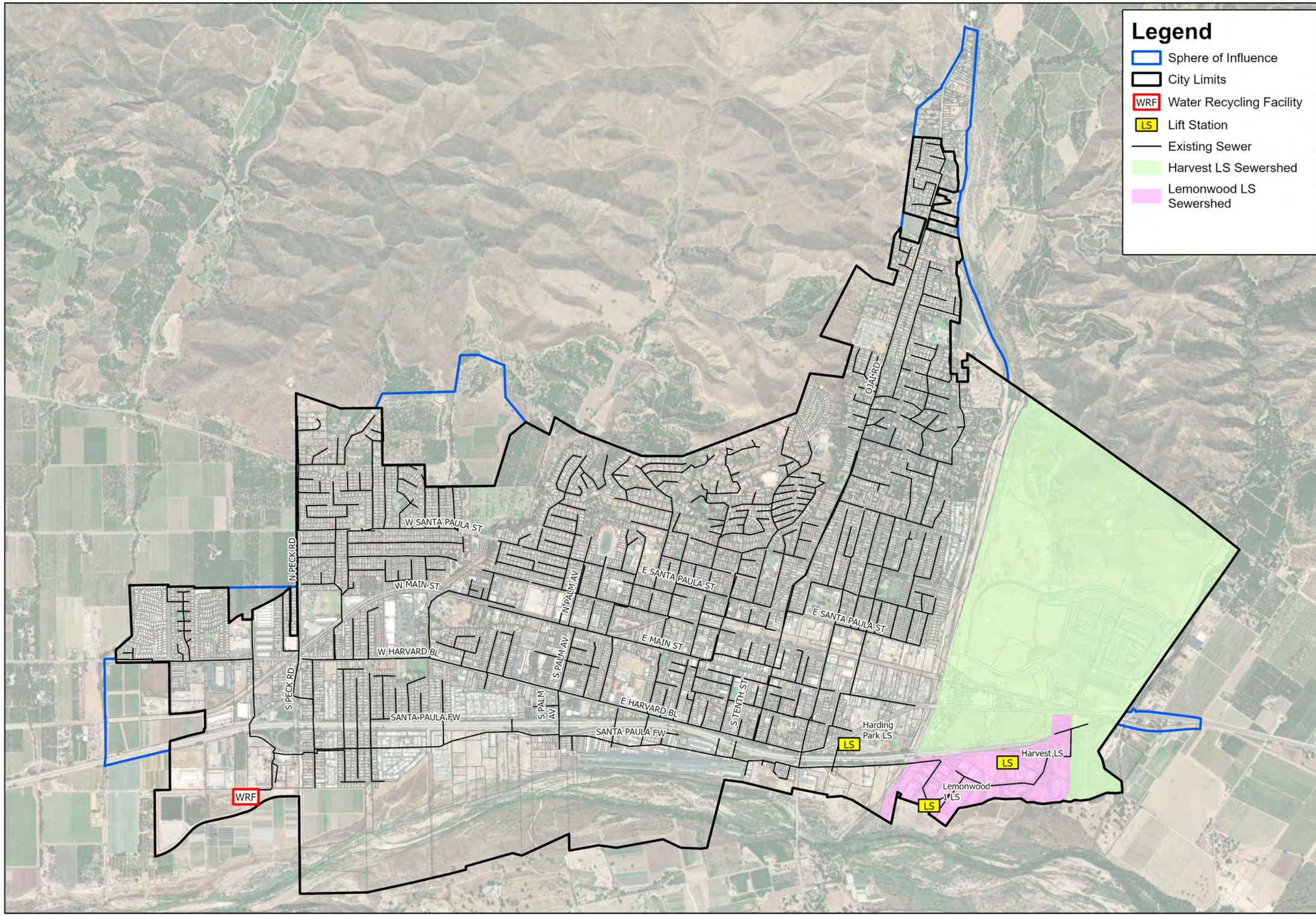
1 inch = 2,200 feet

0 1,100 2,200

mkn

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 4-2:

Lift Station Sewersheds

1 inch = 2,200 feet

0 1,100 2,200

mkn

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

### 4.2.1 Harding Park Lift Station

Figure 4-3: Harding Park Lift Station

The Harding Park Lift Station is located in a parking lot planter, 15 feet northeast of the Harding Park restroom. This lift station collects flows from the Harding Park restroom and a residential home located on the premises of the park. A photo of the lift station wet well and valve vault is shown in **Figure 4-3**.

Access to the lift station is through the park's parking lot. This station has a two submersible pumps controlled by floats as the primary level sensors. The wet well can be accessed through a steel hatch cover set at grade.

### 4.2.2 Harvest Lift Station

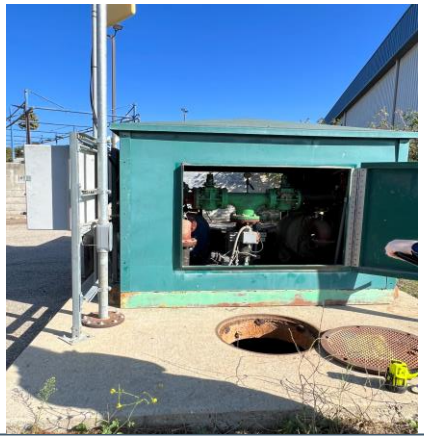
The Harvest Lift Station is located on Old Hallock Drive, south of Highway 126, adjacent to an RV storage yard. This lift station collects mainly residential flows from the adjacent neighborhood. A photo of the lift station wet well and valve vault is shown in **Figure 4-4**.

Figure 4-4: Harvest Lift Station

The gated lift station is the newest station in the City, approximately three years old. This station houses three 15-horsepower (HP) submersible pumps. For level sensing, this system has both primary and backup level sensors. The primary is a pressure transducer and four floats act as backup level sensors. These devices, when triggered, send a signal to a PLC controller to activate the pumps.

### 4.2.3 Lemonwood 1 Lift Station

Figure 4-5: Lemonwood Lift Station



The Lemonwood 1 Lift Station is located south of Highway 126 in Lemonwood Industrial Park. This lift station collects industrial and commercial flows. A photo of the lift station wet well in shown in **Figure 4-5**.

Access is achieved by vehicle off Quail Court through a fenced gate entrance. This lift station consists of a 6-foot diameter wet well with two suction lift pumps, set at grade over the wet well and are controlled by a level sensor. Bypass provisions at the lift station are evident. A manual transfer switch was present along with a portable generator, to provide back-up power if needed.

DRAFT

## 4.3 Description of Water Recycling Facility

The WRF was constructed in 2010 under a design-build-operate-finance (DBOF) agreement. Phase I was completed at that time and was intended to treat an average day flow of 3.4 MGD. The facility was planned to accommodate a future Phase II expansion that would treat a total of 4.2 MGD on an average day flow basis. Currently, both the plant and collection system are operated under a contract with Ventura Regional Sanitation District (VRSD), who is responsible for daily management and permitting compliance.

**Figure 4-6** depicts the process flow schematic for the WRF. Raw wastewater enters the influent lift station via a 42-inch diameter HDPE gravity sewer line. Raw influent is directed to two separate concrete channels in the headworks screening structure. These channels direct flow through coarse screening, grit removal, and fine screening equipment prior to discharge to the pre-anoxic basin splitter channel. From there, the pre-anoxic basin diversion channel controls flow into any combination of the three anoxic basins where denitrification of a mixture of raw screened wastewater and recycled activated sludge flow is achieved. Subsequently, the water progresses to the aerobic basins for oxidation of organic carbon and nitrification. Separate aeration zones allow the operators to control air flow to different areas within the basins. Mixed liquor is pumped to the membrane tank forebay/channel and distributed to the membrane bioreactor (MBR) tanks. Following MBR filtration, the tertiary-treated water undergoes Ultraviolet (UV) disinfection before flowing into a concrete splitter box, then to onsite percolation ponds for disposal. Some treated effluent is reclaimed for on-site water reuse, particularly for operations like equipment washdown. The WRF was designed to serve recycled water users in the future but users have not yet been identified.

Waste Activated Sludge (WAS), is transferred from the membrane tank effluent channel to one of three aerated sludge digestion basins. In these basins, volatile organics are further oxidized. The sludge's volume is decreased through a gravity belt thickener and the sludge undergoes dewatering via a screw press before being transported offsite for disposal.

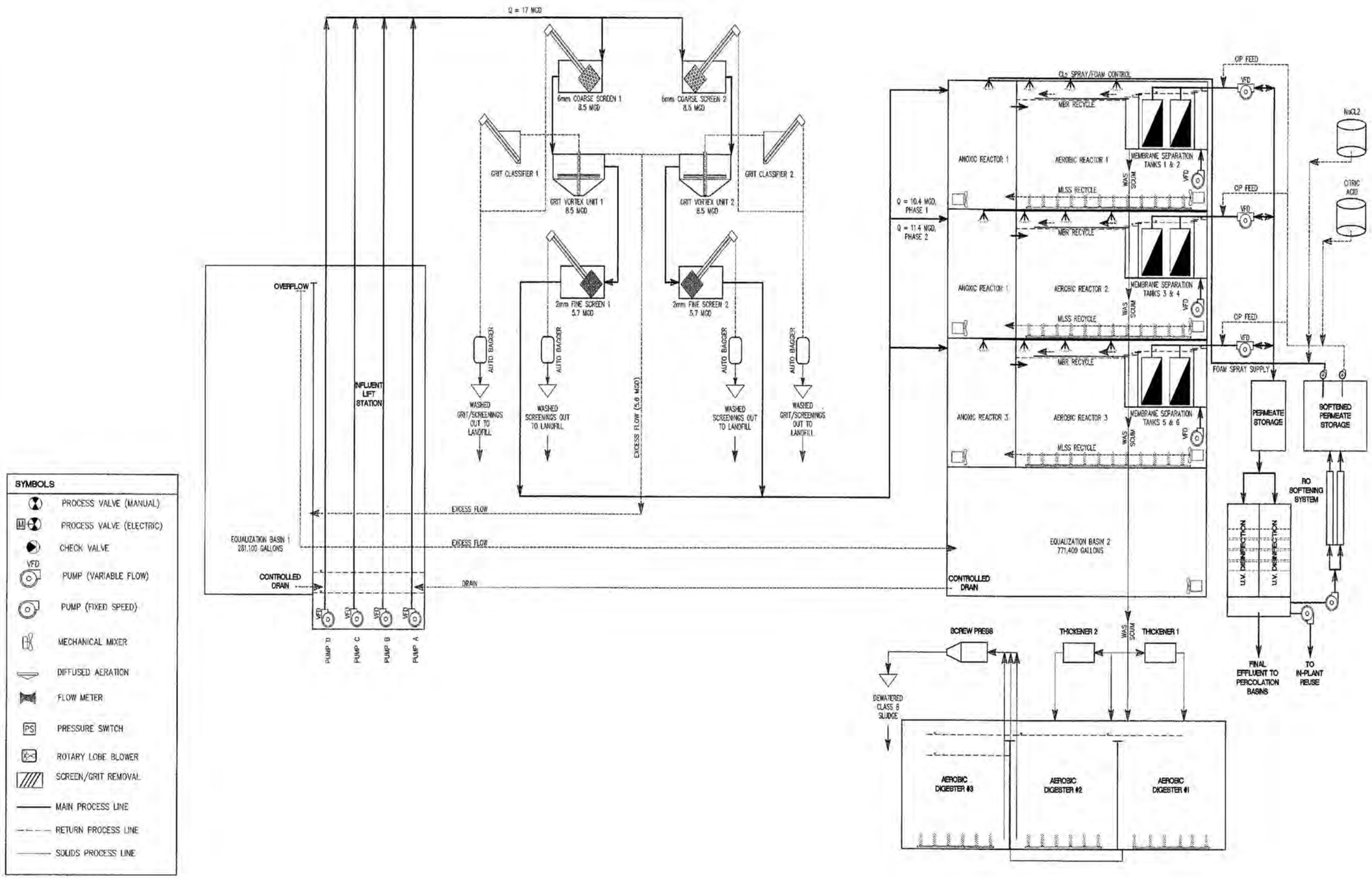
The WRF is operated in accordance with Waste Discharge Requirements (WDR), Order No. R4-2018-0022-A01, in tandem with a Cease-and-Desist Order (CDO), Order No. R4-2018-0023-A01, attached as **Appendix C**. These regulations were adopted by the Los Angeles Regional Water Quality Control Board (RWQCB) on February 8, 2018 and amended in May 2022.

As discussed later in this report, the City is currently developing a chloride removal system to improve WRF effluent quality prior to percolation. The CDO is the basis for implementing this project.

### 4.3.1 Influent Lift Station

An open-channel Doppler flowmeter monitors flows entering the facility through a metering manhole situated on the 42-inch diameter influent gravity pipeline prior to entering the influent lift station (ILS). The influent sewer lift station was constructed to accommodate a firm peak flow capacity of 17.0 MGD (11,800 GPM) even when one pump is out of service.

DRAFT




**City of Santa Paula**

**Wastewater Collection System and Water Recycling Facility Master Plan**

Figure 4-5:

WRF Process Flow Schematic

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

The station is comprised of a concrete wet well equipped with four pumps with variable frequency drives (VFDs). Excess flow above the capacity of the pumps causes an increase in the wet well level and is passively diverted into the two equalization basins by flowing over an overflow weir. Gated outlets within the surge equalization basins enable stored sewage to be redirected back to the ILS when flows are lower, then subsequently pumped through the headworks.

The ILS pumps connect to a 16-inch diameter ductile iron pipe (DIP) riser, which then manifolds into a 24-inch DIP force main. The force main transports raw sewage to the headworks inlet. The flow rate of the influent is measured at the outlet of the headworks structure. Details for the ILS major equipment are summarized in **Table 4-2**.

**Table 4-2: Influent Lift Station Equipment Summary**

| Equipment | Quantity | Manufacturer | Description |
|---|---|---|---|
| Pumps | 4 | Flygt | ❑ Provide the hydraulic head to lift the influent wastewater to the headworks<br>❑ 3,900 gpm at 35 ft TDH<br>❑ 45 HP, 480 VAC, 3P, 60 Hz<br>❑ Model NP3202-616 LT, 12-inch diameter straight discharge |
| Plug Valves | 4 | Val-matic | ❑ Allow pump isolation for maintenance or removal<br>❑ Model #VM-5816R |
| Swing-Flex Check Valves | 4 | Val-matic | ❑ Prevent the process flow from reversing backwards into the pump impeller<br>❑ Model VM-516 |
| Flap Gates | 2 | Waterman | ❑ Acts as a check valve for the process tank drain lines<br>❑ Model SSF-41 |

### 4.3.2 Headworks

The headworks system at the WRF utilizes two-stage screening coupled with a dedicated grit removal system. Raw wastewater is pumped from the lift station to the enclosed headworks building which also houses the sludge thickening and dewatering systems as well as the aerobic digester blowers. Each headworks train is composed of an 8.5 MGD coarse screening unit, an 8.5 MGD vortex grit separation unit, and a 6.9 MGD fine screening unit. This parallel arrangement provides redundancy and allows for maintenance of screening equipment without diverting unscreened sewage downstream.

In the headworks, wastewater flows into one of the two headworks trains where it goes through a coarse screen, grit removal chamber, and a fine screen in this sequence prior to continuing to the next treatment process.

As solids collect on both the coarse and fine screens, a collection trough with screw-type compactor and washer receives screenings from the screens and discharges them into a bagging system for offsite removal.

Following the coarse screen process, the wastewater flows through a vortex-type grit chamber. Settled grit is pumped to a cyclone vortex-type grit classifier and periodically extracted to prevent excessive hardening. With a

DRAFT

spray wash system, the grit classifier cleanses organics from the grit and mitigates odors. Grit is discharged to a horizontal conveyor equipped with an automated bagging system for convenient disposal. Any remaining water within the classifier is returned to the vortex chamber for further processing.

The fine screens provide a final stage of inorganic solid removal and prevent damage to downstream membranes. **Table 4-3** summarizes the major equipment associated with the headworks building.

**Table 4-3: Headworks Major Equipment Summary**

| Equipment | Quantity | Manufacturer | Description |
|---|---|---|---|
| Primary Screen | 2 | Huber | ❑ Remove, convey, and dewater screened material down to 6-mm in size<br>❑ 480 VAC, 3 Phase, 60 Hz, 2 HP<br>❑ 11 MGD max rated capacity<br>❑ Model Rotomat (Ro2) 1600/6 |
| Vortex Grit Chamber | 2 | Westech | ❑ 8.5 MGD rated capacity<br>❑ 10 ft diameter (concrete formed)<br>❑ Model GVR-10 |
| Grit Classifier | 2 | Westech | ❑ 11-inch screw classifier<br>❑ Includes 250 GPM capacity Hydrocyclone seperator<br>❑ Model GSF3-100 |
| Primary Screen Conveyor | 2 | JDV Conveyor | ❑ 125 $ft^3$/hr at10 RPM<br>❑ 1.5 HP, constant speed motor<br>❑ Model U355 B/SS |
| Fine Screen | 2 | Huber | ❑ Remove, convey, and dewater screened material down to 2-mm in size<br>❑ 480 VAC, 3 Phase, 60 Hz, 2 HP<br>❑ 6.9 MGD max rated capacity<br>❑ Model Rotomat (Ro2) 1800/2 |
| Fine Screen Conveyor | 2 | JDV Conveyor | ❑ 125 $ft^3$/hr @10 RPM<br>❑ 1.5 HP, constant speed motor<br>❑ Model U355 B/SS |
| Slide Gates | 6 | Waterman | ❑ Controls flow into the Headworks structure, overflow, and flow out of the Headworks structure<br>❑ Hand wheel operated<br>❑ Model SS-256-1-Y-X, SS-254-1-Y, SS-251-1-Y |

DRAFT

### 4.3.3 Primary and Secondary Equalization Basins

The WRF features two interconnected equalization (EQ) basins designed for management of short-term diurnal peak flows. These basins operate in series and provide a combined storage capacity of 1.05 million gallons.

The primary EQ basin, situated adjacent to the east wall of the influent lift station, is comprised of an epoxy-coated concrete tank measuring 40-feet wide by 45-feet long by 23-feet maximum liquid depth, with a working volume of 281,100 gallons. This volume was sized to attenuate a peak flow of up to 10.4 MGD over a 10-hour period per *Trussell Technologies, Inc., Evaluation of Biological Design and Process Sizing* Technical Memorandum (2008)

included in **Appendix D**. Should the excess peak flow exceed the capacity of the first basin, a gravity overflow enables screened and de-gritted wastewater to flow to the second, larger EQ basin located adjacent to the west wall of the ILS. EQ basin #2 measures 38-feet wide by 118-feet long by 23-feet maximum liquid depth, offering an additional working volume of 771,400 gallons of storage. Both basins are equipped with gated drains that feed back to the influent lift station for pumping to the headworks. **Table 4-4** summarizes the major equipment associated with the EQ basins.

**Table 4-4: Equalization Basins Major Equipment Summary**

| Equipment | Quantity | Manufacturer | Description |
|---|---|---|---|
| Slide Gates | 2 | Waterman | ❑ Controls flow into and out of each of the EQ basins<br>❑ Electrically actuated, 460V/3P/60Hz<br>❑ Model SS-291-1 |

### 4.3.4 Anoxic Basins

Screened raw wastewater enters the anoxic basin diversion channel. Within this channel, manually controlled slide gates regulate the flow over three weirs, each corresponding to an anoxic basin. The anoxic basins provide denitrification of incoming screened wastewater and Recycled Activated Sludge (RAS) from the membrane basins. Each of the anoxic basins measure approximately 38 feet long by 28 feet wide by 21.7 feet in maximum liquid depth with an average working volume of approximately 172,800 gallons each. **Table 4-5** summarizes the major equipment associated with the anoxic basins.

**Table 4-5: Anoxic Basins Major Equipment Summary**

| Equipment | Quantity | Manufacturer | Description |
|---|---|---|---|
| Anoxic Mixer | 3 | Flygt | ❑ Provides mixing energy for the influent prior to entering the aerobic basin<br>❑ Gear driven mixer per Model #4640 w/11° angle mount & 25 ft. mast length<br>❑ 5300 GPM, 4 HP, 460V/3P/60 Hz |
| Diversion Channel Slide Gates | 3 | Waterman | ❑ Model #SS-254-1-Y-NRS |
| Mud Valves | 6 | Waterman | ❑ Controls nutrient loading into each tank as well as means of controlling overflows<br>❑ Three 6-inch valves and three 12” valves<br>❑ Model MV-11 |

### 4.3.5 Aeration Basins

Biological oxidation, including carbon removal and nitrification of incoming ammonia, occurs within the aeration basins. These basins each measure approximately 72 feet in length by 38 feet in width by 21.7 feet maximum liquid depth and possess a working volume of approximately 59,400 $ft^3$ (~444,000 gallons each).

Aeration is provided by four dedicated blowers and a zoned fine bubble diffuser system. Within each basin, there are a total of 69 fine-pore diffuser panels organized into three zones, with decreasing diffuser density as water progresses through the basin. The initial zone ensures thorough mixing of influent from the anoxic basin and mixed

DRAFT

liquor channel through intense aeration. Subsequent zones maintain adequate oxygen levels for biomass growth and activity while optimizing the growth of organisms that promote aerobic digestion without causing foaming or settling issues. DO sensors allow the operators to manually adjust blower speed via VFDs. The City is currently implementing an ammonia control project to automate blower operations.

Return activated sludge (RAS) troughs are integrated into the basin centerline structure, serving as both weirs and channels to regulate high water levels and return mixed liquor to the Anoxic Basins and to the front end of the Aerobic Basins. Each aerobic basin features a 4 HP, 4,700 GPM mixed liquor suspended solids recycle pump, directing a portion of mixed liquor from the back of the aerobic basin back into the anoxic basin.

From the end of the aerobic basins, wastewater is pumped to the membrane bioreactor (MBR) forebay channel using the MBR feed pumps. **Table 4-6** summarizes the major equipment associated with the aerobic basins.

**Table 4-6: Aerobic Basins Major Equipment Summary**

| Equipment | Quantity | Manufacturer | Description |
|---|---|---|---|
| MBR Feed Pump | 3 | Flygt | ❑ Pumps water from the end of the aerobic tanks to the MBR feed channel above<br>❑ 11,000 GPM at 3.3 ft TDH per pump<br>❑ 27 HP VFD 460V/3P/60 Hz, tube mounted<br>❑ Model PL7055 |
| RAS Pump | 3 | Flygt | ❑ Pumps RAS from the aerobic basin to the anoxic basin<br>❑ 4,700 GPM at 0.9 ft TDH per pump<br>❑ 4 HP, 480V/3P/60 Hz,, 16" flange mount<br>❑ Model PP4640 |
| Aeration Diffusers | 207 | Aerostrip (now OVIVO) | ❑ Entrain air into aerobic basin using fine bubbles<br>❑ Polyurethane membrane fine pore diffuser panels 470#/HR SOR per tank<br>❑ Aerostrip® Model Q3.5 |
| Aeration Blowers | 4 | K-Turbo | ❑ Provides aeration to each aerobic basin's aeration panels<br>❑ 800-1, 400 SCFM at 11.5 psi, 75 HP VFD, 460V/3P/60 Hz<br>❑ Model TB75-0.8S |

The aeration basins were cleaned, repaired, and malfunctioning/broken diffusers and aeration piping were replaced over the past three years.

### 4.3.6 Mixed Liquor (ML) Collection and Mixed Liquor Suspended Solids (MLSS) Recycle Channels

The effluent from each of the MBR feed pumps is directed into the ML collection channel for distribution to each membrane basin. The water level is equalized between the forebay and each operated MBR tank by utilizing 24-inch diameter mud valves. RAS enters the MLSS recirculation channel for distribution back to the Anoxic Basins and Aeration Basins.

DRAFT

Both the ML collection and MLSS recirculation channels contain a network of fine bubble tube aeration diffusers. The diffusers scour the membranes to help prevent fouling and ensure that any solids in channels remain suspended, preventing accumulation of settled sludge. Each of the 72 fine bubble tube diffusers (36 in each channel) delivers 3 to 10 SCFM, with a maximum capacity of 17 SCFM. Air for this process is delivered by the membrane blowers. **Table 4-7** summarizes the major equipment associated with the ML collection and MLSS recirculation channels.

**Table 4-7: MBR Feed and MLSS Channels Major Equipment Summary**

| Equipment | Quantity | Manufacturer | Description |
|---|---|---|---|
| WAS Pumps | 2 | Flygt | ❑ 480 GPM at 25 ft TDH<br>❑ 5 HP VFD, 460V/3P/60 Hz<br>❑ 4 inch diameter straight discharge<br>❑ Model NP3102 |
| Mud Valves | 6 | Waterman | ❑ Controls flow into the MBR Tanks<br>❑ Manually actuated<br>❑ Model MV-11 |
| Slide Gates | 3 | Waterman | ❑ Controls flow into and out of the aerobic basins<br>❑ Manually actuated<br>❑ Model SS-252-1 |
| Channel Aeration | 72 | EDI | ❑ Keeps secondary processed water and sludge suspended in each of the channels<br>❑ Model T-Series |

### 4.3.7 MBR Basins

The WRF performs biological treatment in three parallel process trains with six membrane bioreactor (MBR) basins. After passing through the aerobic basins, MLSS is pumped into the ML collection channel which distributes flow into each pair of membrane basins.

The membranes are submerged within the membrane basins and rely on VFD-equipped rotary lobe suction pumps (permeate pumps) that create a vacuum on the permeate side of the membranes. These pumps discharge treated wastewater to a common 24-inch diameter DIP header leading to the UV tank structure.

During the permeate extraction process, solids form a sludge layer on the membranes. To prevent excessive buildup, the membrane modules' operation includes periodic backflushing with permeate water, facilitated by the permeate pumps. Membrane blowers also provide scouring of the membrane surface through diffusers mounted at the bottom of the membrane basins.

DRAFT

The membrane filtration modules also have a clean-in-place (CIP) system for both maintenance and recovery cleaning, carried out within the tanks. Maintenance cleaning involves periodic injection of low doses of sodium hypochlorite and citric acid into the membrane module permeate/back-flush lines.

Mixed liquor continually overflows to the ML recirculation channel for diversion back to the aerobic basins or for pumping Waste Activated Sludge (WAS) to the aerobic digesters. **Table 4-8** summarizes the major equipment associated with the MBR modules and tanks.

**Table 4-8: MBR Modules and Tanks Major Equipment Summary**

| Equipment | Quantity | Manufacturer | Description |
|---|---|---|---|
| MBR Feed Pump | 3 | Flygt | ❑ Pumps water from the back end of the aerobic tanks to the MBR feed channel above<br>❑ 11,000 GPM at 3.3 ft TDH, 27 HP VFD, 460V/3P/60 Hz, tube mounted<br>❑ Model PL7055 |
| Mud Valves | 6 | Waterman | ❑ Controls flow into the MBR Tanks<br>❑ Manually actuated<br>❑ Model MV-11 |
| Membrane Filtration Modules | 24 | Koch Membrane Systems | ❑ 1,500 M2 Hollow-Fiber Microfilter Module<br>❑ Model Puron |
| Permeate Pumps | 6 | Vogelsang | ❑ Draws water through the permeable membrane fibers and pumps the water to the UV tank structure<br>❑ 1,420 GPM at 14.5 PSI, 25 HP VFD, 460V/3P/60 Hz<br>❑ Piggyback mounted motor<br>❑ Gooseneck suction and discharge<br>❑ Model VX186-520QD |
| Membrane Blower | 3 | K-Turbo | ❑ Provides aeration to each of the membrane modules for scouring of built-up cake on the membrane fibers<br>❑ 2,200-4,700 SCFM @ 6.5 PSI, 200 HP VFD, 460V/3P/60 Hz<br>❑ Model TB200-0.6T |

DRAFT

### 4.3.8 UV Disinfection System

Permeate is disinfected using ultraviolet (UV) disinfection prior to discharge to percolation ponds or reuse within the WRF. The process exposes the wastewater to UV light which damages the genetic material of microorganisms, preventing their ability to reproduce, and rendering them non-infectious. The WRF uses a low pressure ultra-high output amalgam lamp to accomplish their disinfection.

This disinfection process is performed within covered concrete channels that receive flow from the 24-inch diameter DIP membrane permeate header. This flow enters the UV tank structure and discharges into a pre-UV channel wet well through which has manually controlled slide gates to control flow into the UV channels. The UV modules are positioned within a concrete channel. There are a total of 10 banks for both concrete channels with each bank

containing thirty-six UV lamps for contact disinfection. Maintaining the water level within the channel is crucial for the disinfection system to ensure full submersion of the UV lamps, as it requires an adequate contact time with UV radiation. To maintain lamp submergence, water level is regulated by weirs and a level gate. The PLC adjusts the number of activated lamps based on flow rate and baffles within the channels direct flow for optimal contact. After exiting the UV channel, treated water is discharged for plant reuse or is discharged into the 30-inch effluent pipeline that feeds the diversion structure, which then directs flow to all three percolation ponds. **Table 4-9** summarizes the major equipment associated with the UV Disinfection System.

**Table 4-9: UV Disinfection System Major Equipment Summary**

| Equipment | Quantity | Manufacturer | Description |
|---|---|---|---|
| UV Modules | 10 | IDI-Ozonia | ❑ Two parallel trains. Each train contains 5 x 36 400-Watt lamp modules.<br>❑ Aquaray 3X High output vertical lamp UV disinfection |
| UV Air Flush-out Compressor | 1 | IDI-Ozonia | ❑ Compressor provides air for UV lamp cleaning operation<br>❑ 120 VAC |
| Automatic Level Gate | 2 | IDI-Ozonia | ❑ Fluid filled counter-weight tank |
| Channel Weir Gates | 2 | Waterman | ❑ Model SS-254-1-Y |
| UV Dip Tank | 1 | N/A | ❑ Precast epoxy lined UV cleaning/dip tank |

### 4.3.9 CIP Storage Tanks and Foam Spray System

The Clean-In-Place (CIP) storage tanks hold potable water designated for membrane module maintenance and recovery cleaning purposes. The two CIP storage tanks provide a storage capacity of 16,200 gallons per tank. Additionally, the water serves for the foam control system, which uses a spray system to reduce biological foaming in the basins.

Water is extracted from each CIP tank through two pumps: one for the CIP cleaning process and another for supplying the foam spray system. For each of these systems, there is one primary pump and one backup pump (for a total of four pumps), allowing them to alternate to reduce wear and provide redundancy. **Table 4-10** summarizes the major equipment associated with the CIP storage tanks and foam spray system.

DRAFT

| Table 4-10: CIP Storage Tanks and Foam Spray System Major Equipment Summary | | | |
|---|---|---|---|
| **Equipment** | **Quantity** | **Manufacturer** | **Description** |
| CIP Pumps | 2 | Marlow | ❑ Self-priming pump with 3-inch by 3-inch connections, 7.31-inch Impeller 79 GPM (Maintenance), 291 GPM (Recovery) at 14.5 PSI, 5HP, 1750 RPM VFD, 460V/3P/60 Hz |
| Chemical Metering/Injection Pumps | 2 | N/A | ❑ 130 GPH at 100 PSI Chemical metering motor driven pumps w/ electric diaphragm ProMinent<br>❑ Model Sigma/3 S3Ca w/ 10,000 mL calibration column and PVC/Viton injection valve/lance |
| Foam Spray Pumps | 2 | Marlow | ❑ Self-priming pump w/ 3-inch by 3-inch connections 7.31-inch IMP, 250 GPM at 14.5 PSI, 5HP, 1750 RPM VFD, 460V/3P/60 Hz |
| Foam Spray Nozzles | 270 | Bete | ❑ Full cone spray angle PVC nozzles,<br>❑ Model Maxipass MP218 |
| Storage Tank Drain - Mud Valves | 2 | Trumbull | ❑ Non-rising stem SS Mud Valves |

### 4.3.10 Sludge Handling System

WAS is thickened, aerobically digested, and dewatered prior to being hauled offsite for disposal. Two gravity belt thickeners (GBTs) can receive WAS from the WAS pumps. Polymer is added to enhance the thickening process.

Three 58-foot by 38-foot by 23-foot aerated sludge digestion basins receive flow from the WAS pumps installed in the MLSS recirculation channel. The aerobic digesters provide stabilization and storage of waste sludge prior to thickening, dewatering, and disposal. The key equipment components for each digester include fine bubble diffusers, sludge withdrawal pumps, rethickening pumps, and blowers. Rethickening pumps can circulate sludge from the digesters back through the gravity belt thickeners as needed.

During dewatering operations, the digested sludge is extracted from the aerated sludge storage basins and directed to the screw press via the screw press feed pumps. Polymer is added to enhance dewatering within the screw press. The sludge is released onto a conveyor system and deposited into a roll-off bin, serving as on-site storage for the sludge until it is transported away for disposal. **Table 4-11** summarizes the major equipment associated with solids handling system.

DRAFT

| Table 4-11: Solids Handling Equipment Major Equipment Summary | | | |
|---|---|---|---|
| **Equipment** | **Quantity** | **Manufacturer** | **Description** |
| WAS Pumps | 2 | Flygt | ❑ 480 GPM at 25 ft TDH<br>❑ 5 HP VFD, 460V/3P/60 Hz<br>❑ 4-inch diameter swept discharge<br>❑ Model NP3102 |
| Gravity Belt Thickeners | 2 | Filtech | ❑ Thickens waste sludge for improved digestion and to increase available sludge storage volume<br>❑ 220 GPM at 0.75% DS/825 lbs/hr<br>❑ 150 GPM @ 3.0% DS/2,200 lbs/hr<br>❑ Model FDW160 |
| Digester Blowers | 3* | K-Turbo | ❑ Provide aeration to the digester aeration diffusers<br>❑ 800-1,400 SCFM at 11.5 PSI, 75 HP VFD, 460V/3P/60 Hz<br>❑ Model TB75-0.8S |
| Rethickening Pumps | 2 | Vogelsang | ❑ 250 GPM at 15 PSI, 10 HP VFD, 460V/3P/60 Hz<br>❑ Model VX136-140Q |
| Screw Press Feed Pumps | 1 | Vogelsang | ❑ 100 GPM at 15 PSI, 7.5 HP VFD, 460V/3P/60 Hz<br>❑ Model VX136-70Q |
| Screw Press | 1 | Huber | ❑ 90 GPM at 1.5% Solids, 50 HP Drum Motor, 20 HP Screw Motor, 460V/3P/60 Hz<br>❑ Model ROS 3Q 800 |
| Polymer Units | 3 | Siemens | ❑ 240-2, 400 GPH Dilution/1-10 GPH Polymer<br>❑ 115VAC/60 Hz w/microcontroller<br>❑ Model M2400-P10-AB-V |
| Sludge Aeration Diffusers | 360 | EDI | ❑ Fine bubble diffusers producing 240 lbs/hr SOR per tank |
| Notes:<br>*WRF currently has two blowers operating as digester blowers. The third blower is being used as a temporary aeration blower due one aeration blower going out of service in 2022. | | | |

### 4.3.11 Odor Control System

The WRF incorporates both passive (covers) and active (mechanical) odor management systems. To mitigate odor emissions, odor-generating basins include concrete covers to capture off-gases. A mechanical odor capture and biological odor control system is used to collect and treat air from the lift station, equalization basins, aerobic digesters, anoxic tanks, headworks equipment, thickener unit, and headworks/dewatering room. The odor control system was installed in 2022. **Table 4-12** summarizes the major equipment associated with the odor control system.

DRAFT

| Table 4-12: Odor Control System Major Equipment Summary | | | |
|---|---|---|---|
| Equipment | Quantity | Manufacturer | Description |
| Foul Air Blower | 1 | BioAir | ❑ 20,000 SCFM capacity<br>❑ 60 HP motor<br>❑ Model FAB-17-301 |
| Biological Trickling Filter | 1 | BioAir | ❑ 20,000 SCFM design air flow @ an average 25 ppm input H2S<br>❑ Model BTF-17-301 |
| Nutrient Supply System | 1 | BioAir | ❑ 53 GPM supply panel flow rate and 70 PSI supply panel inlet pressure<br>❑ 2-inch diameter flanged supply panel inlet/outlet<br>❑ Model NSS-17-301 |

### 4.3.12 Onsite Reuse Water System

Following UV disinfection, a portion of the treated water is extracted from the pre-discharge storage channel for operational tasks and washdown. This reuse water system incorporates a packaged hydropneumatic tank and pump system to provide pressure and storage. **Table 4-13** summarizes the major equipment associated with the onsite water reuse system.

| Table 4-13: Onsite Water Reuse System Major Equipment Summary | | | |
|---|---|---|---|
| Equipment | Quantity | Manufacturer | Description |
| Plant Reuse Pumps | 2 | Marlow | ❑ Self-priming pump with 3-inch x 3-inch connections 7.31" Impeller, 340 GPM @ 80 PSI - 30 HP, 3450 RPM, 460V/3P/60 Hz<br>❑ Model #MP3L3EC |
| Hydropneumatic Tank | 1 | South Gate Engineering | ❑ 8,000 gal<br>❑ 6-inch inlet and outlet w/a 6-inch butterfly valve on outlet<br>❑ Air charging system (40-110 PSI Air Rite Compressor) |
| Pressure Relief, Sustaining, & Back Pressure Valve | 1 | Cla-Val | ❑ Maintains line pressure w/a pilot set-point for the system<br>❑ Set-point 70-90 PSI (manually adjusted)<br>❑ Model #750-01 |

### 4.3.13 Percolation Ponds

Treated and disinfected effluent is discharged to three percolation ponds within a 34-acre site southwest of the WRF. The treated effluent from the WRF is directed to the ponds utilizing a 30-inch diameter HDPE pipe. This pipe connects to a diversion structure positioned in between ponds 1, 2 and 3. Canal gates at the diversion structure redirect the treated effluent via three 24-inch pipes into a discharge box located within each pond.

DRAFT

| Table 4-14: Percolation Ponds Major Equipment Summary | | | |
|---|---|---|---|
| Equipment | Quantity | Manufacturer | Description |
| Canal Gates | 3 | Waterman | ❑ 24-inch gate controls flow to the percolation ponds discharge boxes<br>❑ Model C-10 |

### 4.3.14 Advanced Water Treatment Facility (AWTF)

In the future, a portion of the WRF-treated water will flow to the Advanced Water Treatment Facility (AWTF), currently in design. Design flows are being confirmed at the time of this report, but the objective of the project is to provide side-stream treatment of WRF flows to reduce chlorides to below 110 mg/L in the final combined WRF effluent. This project is required to meet the WRF effluent limit for chloride, outlined in the WDR and CDO.

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# 5.0 EVALUATION CRITERIA

This section provides an overview of the evaluation criteria used to analyze the City's existing collection system including gravity sewer pipes, lift stations, and force mains.

## 5.1 Gravity Collection System Criteria

The City has adopted design standards and specifications for sewer collection system improvements. These design standards, along with industry-accepted design criteria for gravity pipelines, lift stations and force mains, were utilized (when feasible) to evaluate the ability of the City's existing sewer infrastructure to meet existing and future flows. **Table 5-1** provides a summary of the City's design standards for sewer improvements.

**Table 5-1: Design Standards for Gravity Sewer Pipe**

| Diameter (in) | Slope (Feet/Foot) |
|---|---|
| | Minimum Acceptable |
| 6 | 0.0080 |
| 8 | 0.0044 |
| 10 | 0.0036 |
| 12 | 0.0024 |
| 15 | 0.0016 |
| 18 | 0.0014 |
| >=21 | 0.0010 |
| **Pipe Velocity (fps)** | |
| Minimum | 2.0 |
| Maximum | 10.0 |
| **Peaking Factor** | |
| PHDWF | 2.0 x ADF |
| PHWWF | 3.0 x ADF |
| **Depth over Diameter (d/D)** | |
| PHDWF <=12-inch | 0.50 |
| PHDWF >=15-inch | 0.67 |
| PHWWF | 0.75 |

Notes:
1. ADF = average day flow
2. PHDWF = Peak Dry Weather Flow
3. PHWWF =Peak Wet Weather Flow
4. Based on City of Santa Paula Wastewater System Master Plan June 2012

DRAFT

## 5.2 Lift Station Criteria

The following criteria were used to evaluate the capacity of the City's existing lift stations under existing and future flow conditions.

### 5.2.1 Pump Capacity

It is recommended that lift stations are designed with a minimum of two pumps, such that the pumping system can serve the full design flow with the largest pump offline, to provide full redundancy if one pump fails or requires service, to alternate pump cycles to minimize wear on the pump components, and to provide supplemental pumping capacity to convey instantaneous peak flows. Each pump should be sized to convey the peak hour flow entering the wet well.

### 5.2.2 Force Mains

Force mains were analyzed to determine if they are properly sized to convey the lift station pumped flow, while maintaining minimum pipeline velocities to re-suspend solids and provide pipeline cleaning. It is recommended that lift station force mains convey minimum velocities of 3.5 to 6 feet per second (fps) with maximum velocities less than 10 fps to minimize head loss and potential for surge events.

## 5.3 WRF Criteria

Design criteria used to evaluate the WRF treatment processes are included in **Section 9**.

DRAFT

# 6.0 HYDRAULIC COMPUTER MODEL

This section provides an overview of the collection system hydraulic model developed for this project to analyze the ability of the existing system to serve existing and future flows.

## 6.1 Model Development

MKN developed a hydraulic model using Bentley SewerCAD CONNECT Edition Version 10 (SewerCAD) hydraulic modeling software to simulate the operation of the gravity collection system. SewerCAD utilizes Manning's equation for open channel flow, and the Hazen-Williams formula for pressure pipes (lift station force mains). The hydraulic model was run under steady state conditions using a backwater analysis. This type of analysis starts at the collection system outlet locations (the WRF in this instance) with an assigned outlet condition (either free discharge, submerged, or tailwater control). From the outlet location SewerCAD proceeds in an upstream direction performing the hydraulic analysis. A representative model of the existing collection system was developed using the following information:

- City's existing sewer collection system AutoCAD file (pipelines, manholes, lift stations, and cleanouts) that provided the following information: Pipeline alignment, diameter, material, and length
- As-built plans

### 6.1.1 Sewer Flow Allocation

To distribute existing and future flows throughout the collection system model, baseline flow conditions were established as described in **Section 3**. Water demands within the Study Area were converted to sewer flows based on reduction factors and verified with flow monitoring data.

Each parcel within the Study Area was assigned an existing wastewater flow and future wastewater flow (when applicable). Each parcel was also associated with the closest manhole that it was assumed to flow to. Each manhole imported into the hydraulic model was "loaded" with the existing and future sewer flows from the upstream parcels entering the manhole (i.e. the manhole's sewershed).

**Figure 6-1: Sewer Flow Allocation**

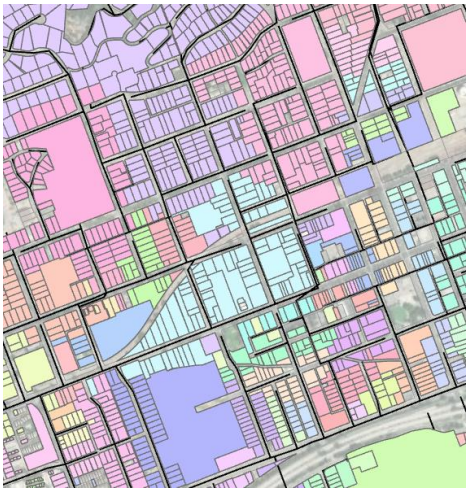
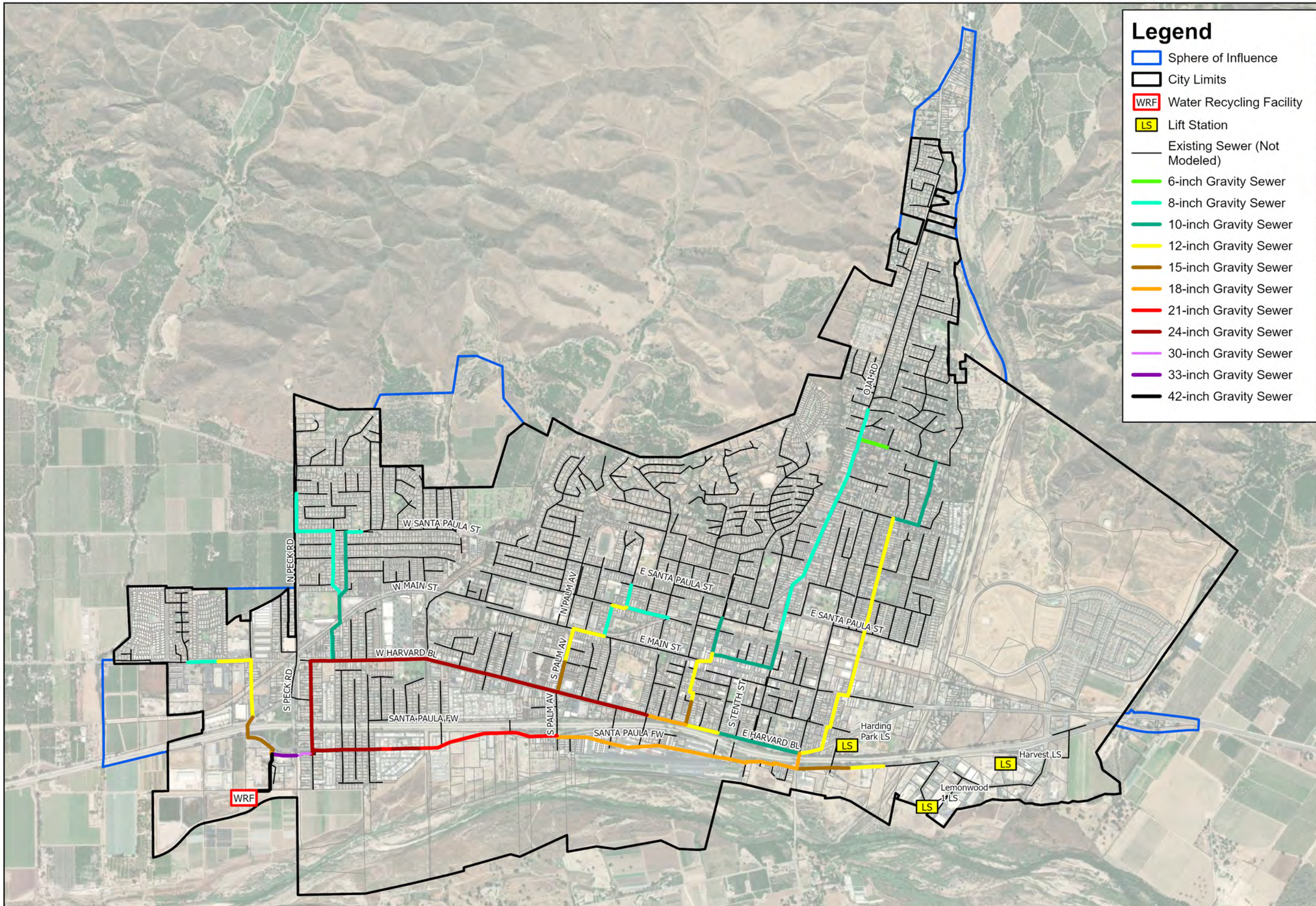


**Figure 6-1** shows a sample of the sewersheds that were developed for loading existing and future flows into the hydraulic model. Major trunk pipelines throughout the City and other critical areas were included in the hydraulic model and are shown on **Figure 6-2**.

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

**Wastewater Collection System and Water Recycling Facility Master Plan**

Figure 6-2:

Modeled Gravity Collection System

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

### 6.1.2 Model Scenarios

The following model simulations were completed to identify existing pipe capacity and pipe velocities during existing and future flow conditions:

- Existing Flow Conditions:
  - Average Day Flow (ADF)
  - Peak Hour Dry Weather Flows (PHDWF)
  - Peak Hour Wet Weather Flows (PHWWF)
  - Capital Improvement Plan Projects Identified to Correct System Deficiencies
- Near-Term Conditions:
  - ADF, PHDWF, PHWWF
  - Capital Improvement Plan Projects Identified to Correct System Deficiencies
- Ultimate Flow Conditions:
  - ADF, PHDWF, PHWWF
  - Capital Improvement Plan Projects Identified to Correct System Deficiencies

### 6.1.3 Model Settings

With the collection system network configured, existing and future flows were imported into SewerCAD and the following modeling parameters were configured:

- All hydraulic simulations were completed under the following:
  - Steady state time analysis – Single instantaneous analysis
  - Analysis calculation method – Gradually Varied Flow with Convex Routing (GVF-Convex Solver)
- The following Mannings n friction coefficients were used for gravity pipelines:
  - All existing pipes: 0.013
  - New pipes: 0.011

## 6.2 Hydraulic Model Flow Validation

As described in **Section 3.4**, MKN used City water usage data and WRF influent treatment flows from 2020 to 2022 to estimate existing flow conditions within the hydraulic model. These initial flow estimates were verified using the newly acquired flow monitoring data.

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# 7.0 HYDRAULIC ANALYSIS – EXISTING CONDITIONS

This section summarizes the hydraulic evaluation of the existing collection system to serve existing flows within the Study Area.

## 7.1 Gravity Collection System Hydraulic Analysis

### 7.1.1 Evaluation Overview

The collection system was evaluated using the design criteria defined in Section 5 under PHDWF and PHWWF flow conditions and recommendations were made for pipes found to be deficient.

The existing gravity collection system includes over 59 miles of gravity sewer pipe ranging from 4-inch to 42-inch in diameter. As described in Section 6, MKN developed a hydraulic model in Bentley's SewerCAD using information from the 2012 WWMP and the City's existing collection system AutoCAD file to evaluate the City's collection system. Only pipe segments along major trunk sewer mains were evaluated, amounting to approximately 11 miles or 18% of the system (**Figure 6-2**). The pipe segments selected for the evaluation were consistent with the pipe segments selected for analysis in the previous 2012 WWMP.

The hydraulic evaluation of the gravity collection system includes the pipeline sizes, slopes, and downstream restrictions. The ratio of the depth of wastewater (d) to the diameter of the pipe (D) is a typical measure of the hydraulic capacity in gravity pipelines. Pipes were considered deficient if the pipe's d/D exceeded the following PHWDF and PHWWF conditions:

- Peak Hour Dry Weather Flow (PHDWF)
  - For a pipe 12 inches or less, a d/D of 50 or greater
  - For a pipe greater than 12 inches, a d/D of 67 or greater
- Peak Hour Wet Weather Flow (PHWWF)
  - For all pipe diameters, a d/D of 75 or greater

### 7.1.2 Existing Flows Hydraulic Model Evaluation Results

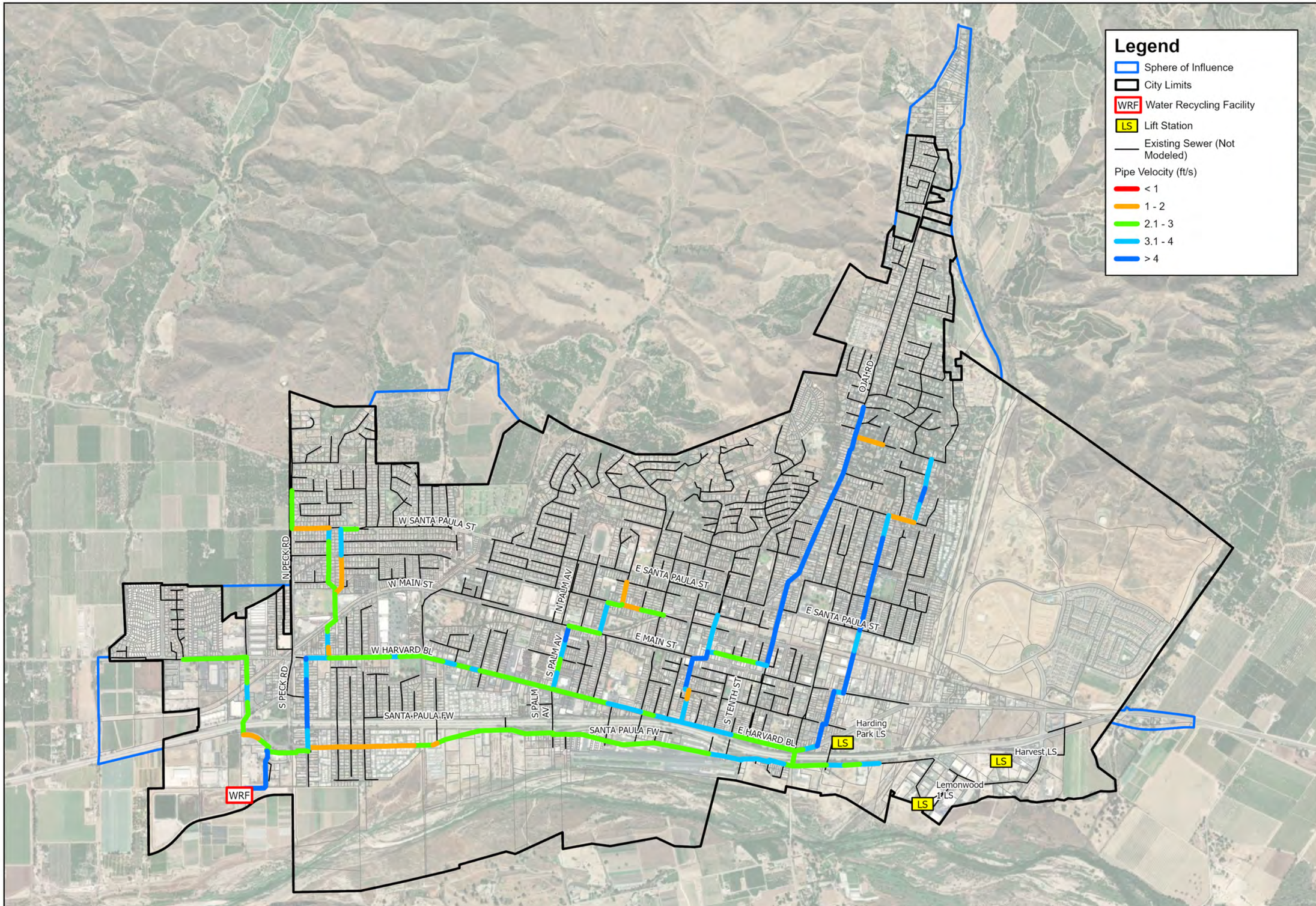
**Figure 7-1** and **Figure 7-2** provide an overview of model results showing pipeline velocities during existing PHDWF and PHWWF conditions, respectively. Based on model results, approximately 89% of the modeled gravity pipelines achieved self-cleaning velocities equal to or greater than 2 feet per second during PHDWF conditions. During PHWWF conditions, approximately 97% of the modeled gravity sewer pipelines achieved self-cleaning velocities equal to or greater than 2 feet per second. These self-cleaning velocities are considered satisfactory, and no gravity pipeline improvements were recommended based on insufficient velocities.

**Table 7-1** provides a summary of the existing gravity collection system pipeline deficiencies based on the evaluation criteria defined in Section 5. Existing system deficiencies were assigned a deficiency number, using "EX" to

DRAFT

designate existing flow conditions (i.e. EX-1). Based on the existing hydraulic model evaluation, there are approximately 50 pipelines that exceed the d/D capacity criteria under existing PHDWF and/or PHWWF conditions. Additionally, seven pipeline d/D deficiencies are resolved once downstream conditions are improved through recommended pipeline upgrades. Eight of the pipeline d/D deficiencies are within 5% of the design criteria, and improvements were not recommended for the marginal exceedance of the design criteria. **Figure 7-3** provides an overview of existing PHDWF pipeline d/D deficiencies and **Figure 7-4** provides an overview of existing PHWWF pipeline d/D deficiencies. **Table 7-2** provides a summary of the recommended improvements to address capacity deficiencies associated with existing PHDWF and PHWWF conditions as described in **Table 7-1**.

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 7-1:

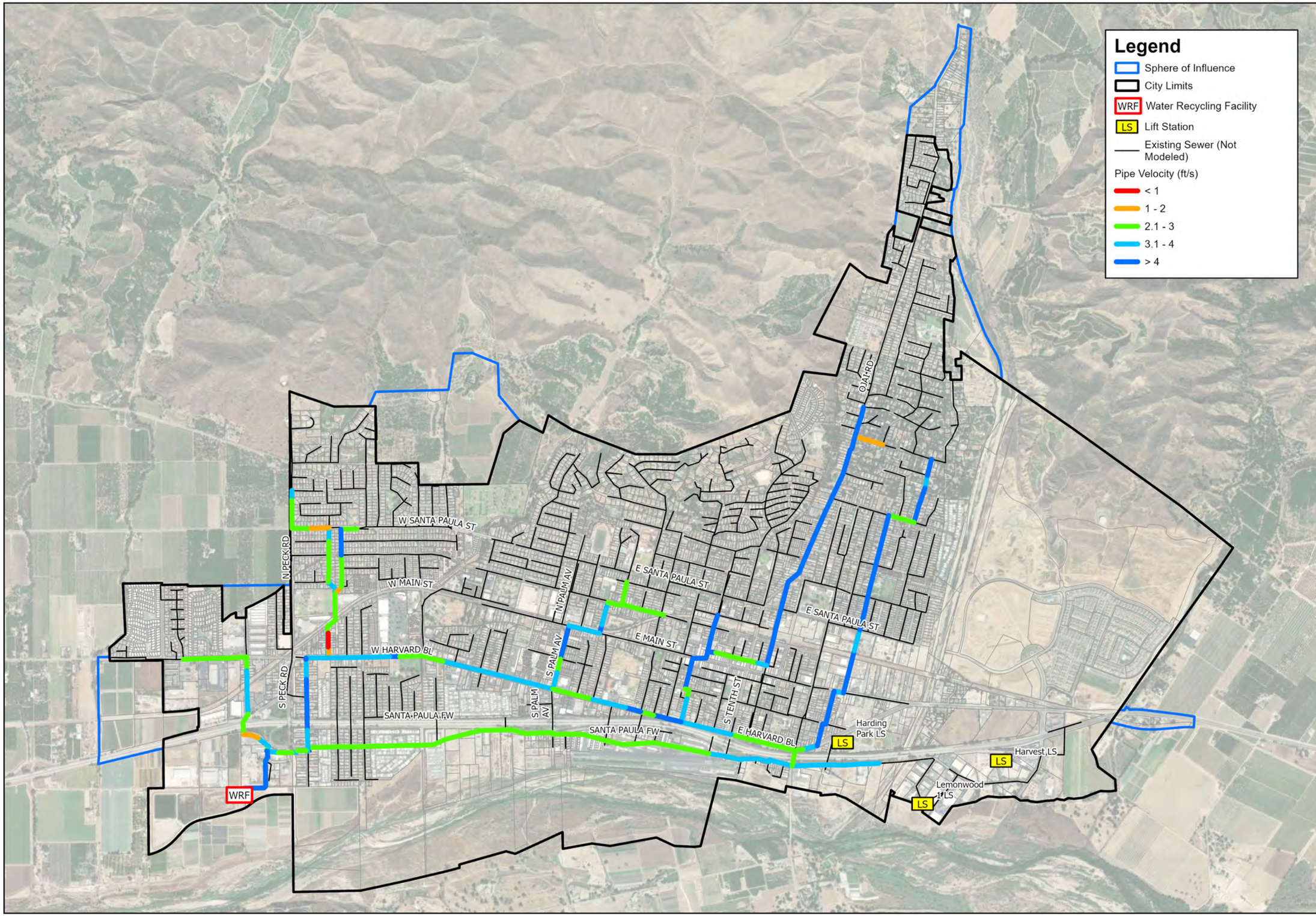
Gravity Pipeline Velocities During Existing PHDWF Conditions

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

**Wastewater Collection System and Water Recycling Facility Master Plan**

Figure 7-2:

Gravity Pipeline Velocities During Existing PHWWF Conditions

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

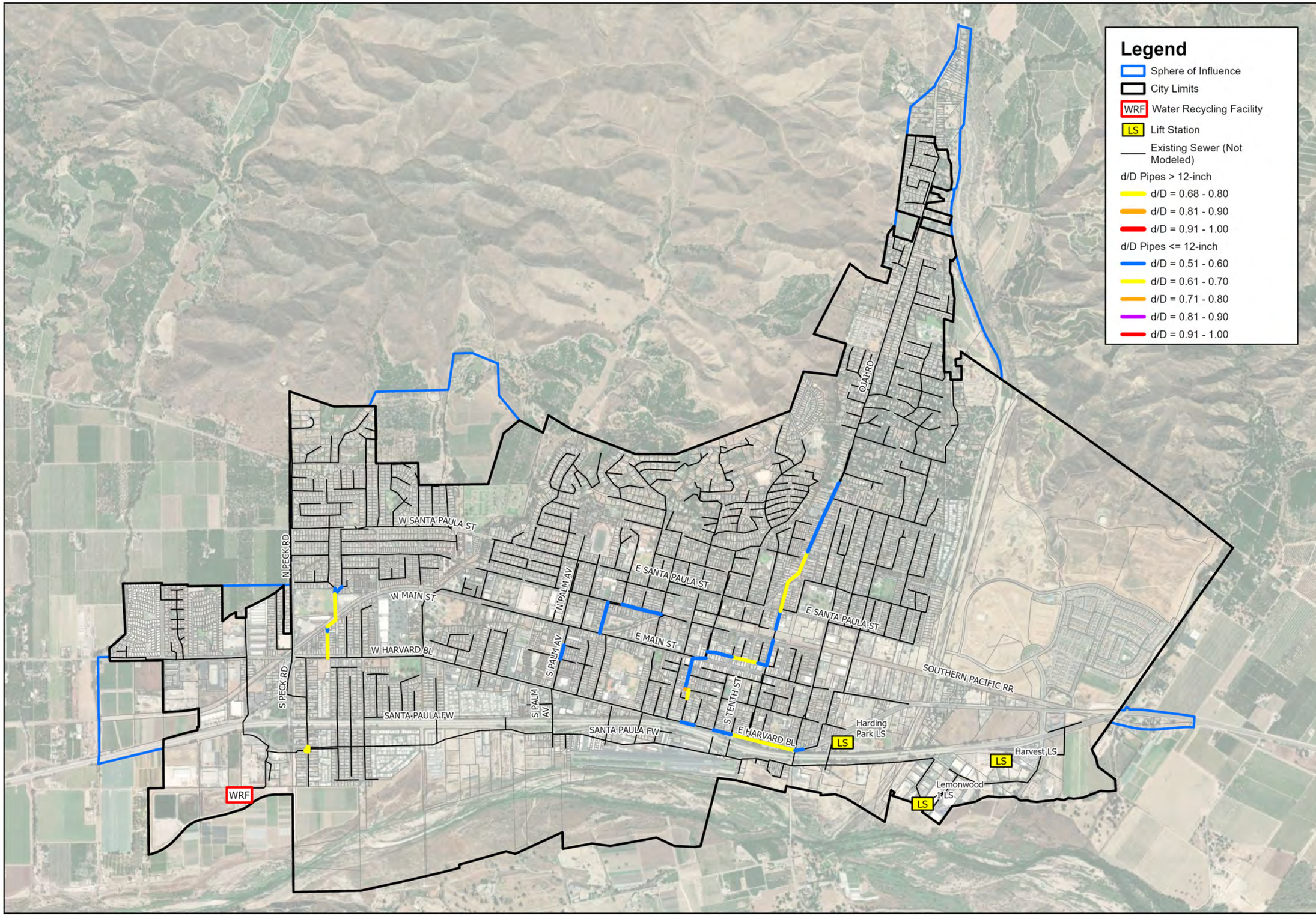
DRAFT

| Table 7-1: Gravity Collection System Pipe Deficiencies for Existing Flow Conditions | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Deficiency No. (EX-#) | Model ID | Location | Length (ft) | Diameter (in) | Existing PHDWF | | | Existing PHWWF | | | Deficiency Description |
| | | | | | Flow (gpm) | d/D Criteria | d/D Result | Flow (gpm) | d/D Criteria | d/D Result | |
| EX-1 | 2686 | Acacia Rd (536 Acacia Way) | 45 | 24 | 3375 | <= 67 | 68 | 5062 | <= 75 | 87 | Capacity deficiency for both PHDWF and PHWWF |
| EX-2 | 2685 | Acacia Rd (536 Acacia Way to Acacia Way) | 40 | 24 | 3369 | <= 67 | 69 | 5054 | <= 75 | 89 | Capacity deficiency for both PHDWF and PHWWF |
| EX-3 | 2428 | Acacia Rd (Acacia Way and Acacia Rd Intersection) | 35 | 24 | 3369 | <= 67 | 67 | 5054 | <= 75 | 89 | Capacity deficiency for both PHDWF and PHWWF |
| EX-4 | 2306 | Acacia Way (Acacia Rd to Santa Rosa Loop) | 250 | 24 | 694 | <= 67 | 60 | 1041 | <= 75 | 82 | Downstream pipe creates a surcharged condition for PHWWF |
| EX-5 | 2457 | Acacia Rd (Acacia Way to W Santa Maria St) | 340 | 24 | 2668 | <= 67 | 61 | 4002 | <= 75 | 83 | Capacity deficiency for PHWWF |
| EX-6 | 2259 | Elm St (W Harvard Blvd to 220 Elm St) | 525 | 8 | 374 | <= 50 | 63 | 561 | <= 75 | 84 | Capacity deficiency for both PHDWF and PHWWF |
| EX-7 | 2286 | Elm St (220 Elm St to W Main St) | 95 | 10 | 372 | <= 50 | 58 | 559 | <= 75 | 79 | Capacity deficiency for both PHDWF and PHWWF |
| EX-8 | 2295 | W Main St (Elm St to 700 W Main St) | 210 | 10 | 372 | <= 50 | 65 | 558 | <= 75 | 91 | Capacity deficiency for both PHDWF and PHWWF |
| EX-9 | 2289 | Blanchard Elementary School (W Main St to Blanchard Elementary School) | 130 | 10 | 371 | <= 50 | 65 | 556 | <= 75 | 98 | Capacity deficiency for both PHDWF and PHWWF |
| EX-10 | 2333 | Blanchard Elementary School | 390 | 10 | 371 | <= 50 | 65 | 556 | <= 75 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| EX-11 | 1690 | Blanchard Elementary School | 105 | 8 | 130 | <= 50 | 59 | 196 | <= 75 | 73 | Capacity deficiency for PHDWF |
| EX-12 | 2294 | Blanchard Elementary School (Blanchard Elementary School to Pamela Ct) | 200 | 10 | 240 | <= 50 | 57 | 359 | <= 75 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| EX-13 | 2328 | Pamela Ln (Pamela Ct to Venus Ave) | 370 | 10 | 214 | <= 50 | 48 | 321 | <= 75 | 80 | Downstream pipe creates a surcharged condition for PHWWF |
| EX-14 | 2364 | S Palm Ave (E Ventura St to Yale Ct) | 285 | 12 | 554 | <= 50 | 53 | 831 | <= 75 | 67 | Upgrade not recommended (within 5% of d/D criteria) |
| EX-15 | 1815 | N 4th St (E Main St to 122 N 4th St) | 175 | 8 | 291 | <= 50 | 54 | 436 | <= 75 | 68 | Upgrade not recommended (within 5% of d/D criteria) |
| EX-16 | 2248 | N 4th St (122 N 4th St to E Santa Barbara St) | 460 | 8 | 276 | <= 50 | 56 | 413 | <= 75 | 69 | Capacity deficiency for PHDWF |
| EX-17 | 2212 | E Santa Barbara St (N 5th St to N 6th St) | 400 | 8 | 198 | <= 50 | 58 | 297 | <= 75 | 77 | Capacity deficiency for both PHDWF and PHWWF |
| EX-18 | 2214 | E Santa Barbara St (N 6th St to N 7th St) | 400 | 8 | 183 | <= 50 | 56 | 274 | <= 75 | 75 | Capacity deficiency for both PHDWF and PHWWF |
| EX-19 | 2502 | California St (206 California St to E Ventura St) | 180 | 12 | 678 | <= 50 | 69 | 1017 | <= 75 | 83 | Capacity deficiency for both PHDWF and PHWWF |
| EX-20 | 2494 | E Ventura St (California St to Green St) | 80 | 12 | 664 | <= 50 | 72 | 996 | <= 75 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| EX-21 | 2368 | Green St (E Ventura St to Yale St) | 295 | 12 | 653 | <= 50 | 54 | 979 | <= 75 | 82 | Downstream pipe creates a surcharged condition for both PHDWF and PHWWF |
| EX-22 | 2350 | Green St (Yale St Halfway to E Main St) | 165 | 12 | 643 | <= 50 | 51 | 964 | <= 75 | 63 | Upgrade not recommended (within 5% of d/D criteria) |
| EX-23 | 2351 | Green St (Halfway from Yale St to E Main St) | 165 | 12 | 630 | <= 50 | 50 | 944 | <= 75 | 62 | Upgrade not recommended (within 5% of d/D criteria) |
| EX-24 | 2361 | E Main St (Green St to Davis St) | 265 | 12 | 626 | <= 50 | 50 | 939 | <= 75 | 62 | Upgrade not recommended (within 5% of d/D criteria) |
| EX-25 | 2287 | E Main St (Davis St to 925 E Main St) | 165 | 10 | 455 | <= 50 | 57 | 682 | <= 75 | 70 | Capacity deficiency for PHDWF |
| EX-26 | 2317 | E Main St (925 E Main St to N Mill St) | 335 | 10 | 451 | <= 50 | 60 | 677 | <= 75 | 83 | Capacity deficiency for both PHDWF and PHWWF |
| EX-27 | 2292 | E Main St (N Mill St to 969 E Main St) | 180 | 10 | 449 | <= 50 | 65 | 673 | <= 75 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| EX-28 | 2329 | E Main St (969 E Main St to 1033 E Main St) | 350 | 10 | 438 | <= 50 | 64 | 657 | <= 75 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| EX-29 | 2707 | E Main St (1033 E Main St to N Ojai St) | 180 | 10 | 432 | <= 50 | 57 | 648 | <= 75 | 92 | Capacity deficiency for both PHDWF and PHWWF |
| EX-30 | 2341 | N Ojai St (113 N Ojai St to E Santa Barbara St) | 515 | 10 | 391 | <= 50 | 51 | 586 | <= 75 | 73 | Downstream pipe creates a surcharged condition for PHDWF |
| EX-31 | 2330 | N Ojai St (Railroad Ave to E Santa Paula St) | 375 | 8 | 376 | <= 50 | 57 | 564 | <= 75 | 71 | Capacity deficiency for PHDWF |
| EX-32 | 2488 | N Ojai St (E Santa Paula St and N Ojai St Intersection) | 40 | 8 | 370 | <= 50 | 65 | 556 | <= 75 | 79 | Capacity deficiency for both PHDWF and PHWWF |
| EX-33 | 2708 | N Ojai St (E Santa Paula St to 325 N Ojai St) | 260 | 8 | 365 | <= 50 | 64 | 547 | <= 75 | 79 | Capacity deficiency for both PHDWF and PHWWF |
| EX-34 | 2709 | N Ojai St (325 N Ojai St to Ojai Rd) | 300 | 8 | 358 | <= 50 | 64 | 537 | <= 75 | 78 | Capacity deficiency for both PHDWF and PHWWF |
| EX-35 | 2020 | Ojai Rd (N Ojai St to Saticoy St) | 275 | 8 | 346 | <= 50 | 63 | 519 | <= 75 | 77 | Capacity deficiency for both PHDWF and PHWWF |
| EX-36 | 2245 | Ojai Rd (Saticoy St to E Orchard St) | 455 | 8 | 312 | <= 50 | 61 | 467 | <= 75 | 75 | Capacity deficiency for PHDWF |
| EX-37 | 2249 | Ojai Rd (E Orchard St to Park St) | 460 | 8 | 292 | <= 50 | 58 | 438 | <= 75 | 72 | Capacity deficiency for PHDWF |
| EX-38 | 2224 | Ojai Rd (Park St to 604 Ojai Rd) | 420 | 8 | 269 | <= 50 | 56 | 404 | <= 75 | 69 | Capacity deficiency for PHDWF |
| EX-39 | 2071 | Ojai Rd (604 Ojai Rd to Richmond Rd) | 300 | 8 | 260 | <= 50 | 54 | 390 | <= 75 | 67 | Downstream pipe creates a surcharged condition for PHDWF |
| EX-40 | 2118 | Ojai Rd (Richmond Rd to 725 Ojai Rd) | 325 | 8 | 230 | <= 50 | 52 | 345 | <= 75 | 64 | Upgrade not recommended (within 5% of d/D criteria) |
| EX-41 | 2367 | E Harvard Blvd (California St to Brett Way) | 265 | 12 | 488 | <= 50 | 54 | 732 | <= 75 | 67 | Upgrade not recommended (within 5% of d/D criteria) |
| EX-42 | 2327 | E Harvard Blvd (S Mill St to S 10th St) | 365 | 10 | 473 | <= 50 | 58 | 710 | <= 75 | 77 | Capacity deficiency for both PHDWF and PHWWF |
| EX-43 | 2313 | E Harvard Blvd (S 10th St to S Ojai St) | 320 | 10 | 464 | <= 50 | 62 | 697 | <= 75 | 93 | Capacity deficiency for both PHDWF and PHWWF |
| EX-44 | 2281 | E Harvard Blvd (E Harvard Blvd and Ojai St Intersection) | 25 | 10 | 458 | <= 50 | 64 | 687 | <= 75 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| EX-45 | 2304 | E Harvard Blvd (S Ojai St to S 11th St) | 245 | 10 | 450 | <= 50 | 63 | 675 | <= 75 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| EX-46 | 2310 | E Harvard Blvd (S 11th St to 1123 E Harvard Blvd) | 290 | 10 | 440 | <= 50 | 62 | 660 | <= 75 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| EX-47 | 2335 | E Harvard Blvd (1123 E Harvard Blvd to S 12th St) | 440 | 10 | 429 | <= 50 | 62 | 644 | <= 75 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| EX-48 | 2629 | E Harvard Blvd (E Harvard Blvd and S 12th St) | 35 | 12 | 495 | <= 50 | 52 | 742 | <= 75 | 100 | Downstream pipe creates a surcharged condition for PHDWF and PHWWF |
| EX-49 | 2628 | E Harvard Blvd (S 12th St to 1211 Harvard Blvd) | 125 | 12 | 494 | <= 50 | 52 | 741 | <= 75 | 100 | Downstream pipe creates a surcharged condition for PHDWF and PHWWF |
| EX-50 | 2366 | E Harvard Blvd (1211 Harvard Blvd to Garcia St) | 290 | 12 | 491 | <= 50 | 48 | 736 | <= 75 | 77 | Upgrade not recommended (within 5% of d/D criteria) |

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

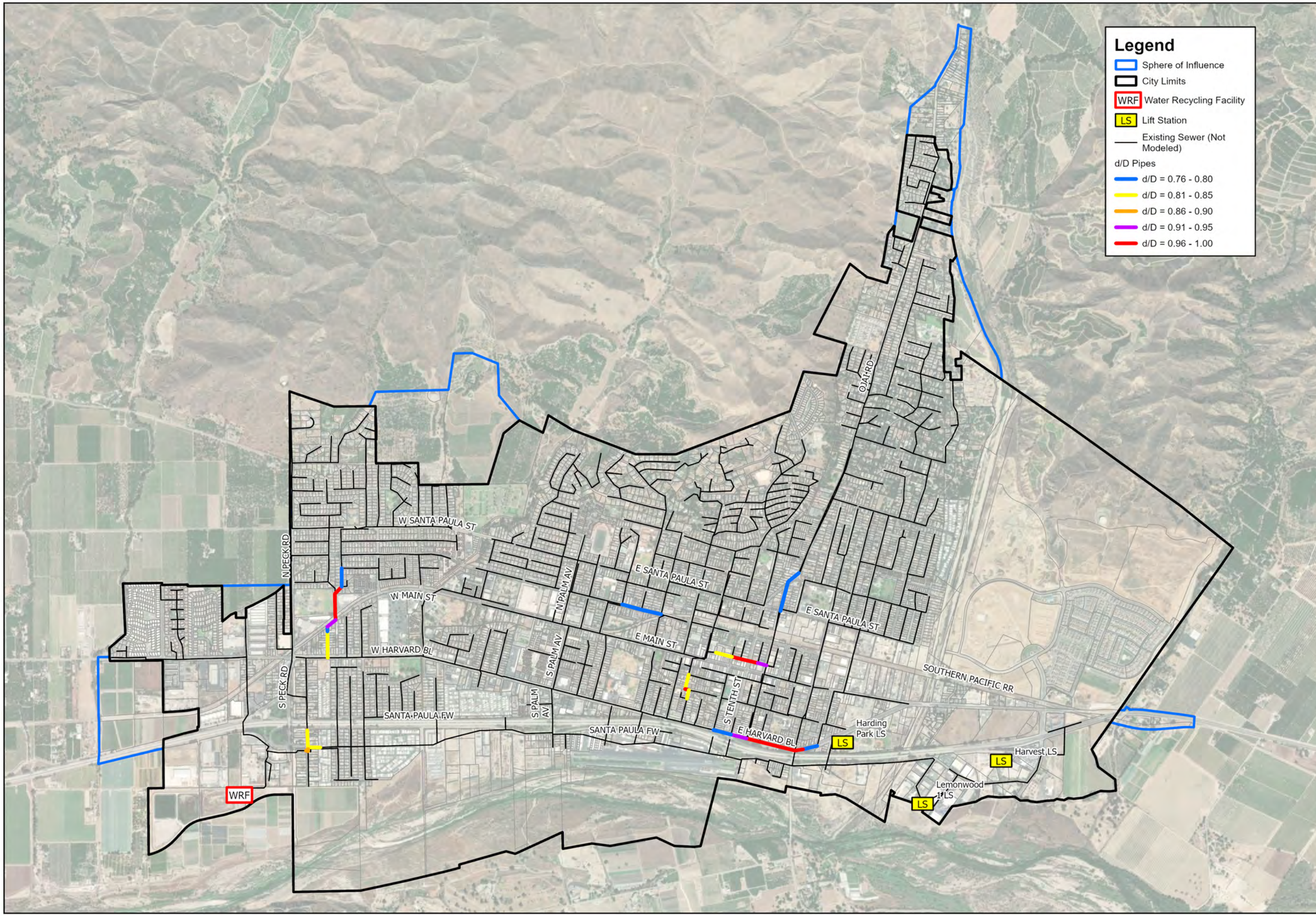
Wastewater Collection System and Water Recycling Facility Master Plan

Figure 7-3:

Existing PHDWF Pipeline d/D Deficiencies

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 7-4:

Existing PHWWF Pipeline d/D Deficiencies

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

| Table 7-2: Recommended Improvements to Address Existing Flow Conditions | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | PHDWF Conditions | | | PHWWF Conditions | | |
| Improvement (I-EX-#) | Model Deficiency Addressed | Location | Bounds | Length (ft) | Initial Diameter (in) | Proposed Diameter (in) | Average Flow (gpm) | Average Existing d/D | Average Improved d/D | Average Flow (gpm) | Average Existing d/D | Average Improved d/D |
| I-EX-1 | EX-19 | California St | 206 California St to E Ventura St | 180 | 12 | 15 | 678 | 69 | 50 | 1017 | 83 | 63 |
| I-EX-2 | EX-20 | E Ventura St | California St to Green St | 80 | 12 | 15 | 664 | 72 | 48 | 996 | 100 | 62 |
| I-EX-3 | EX-1 | Acacia Rd | 536 Acacia Way | 45 | 24 | 30 | 3375 | 68 | 54 | 5062 | 87 | 68 |
| I-EX-4 | EX-2 & EX-3 | Acacia Rd | 536 Acacia Way to Acacia Rd Intersection | 75 | 24 | 30 | 3369 | 68 | 52 | 5054 | 89 | 67 |
| I-EX-5 | EX-5 | Acacia Rd | Acacia Way to W Santa Maria St | 340 | 24 | 27 | 2668 | 61 | 50 | 4002 | 83 | 66 |
| I-EX-6 | EX-25, EX-26, EX-27, EX-28, EX-29 | E Main St | Davis St to N Ojai St | 1210 | 10 | 12 | 445 | 61 | 46 | 667 | 89 | 58 |
| I-EX-7 | EX-42, EX-43, EX-44, EX-45, EX-46, EX-47 | E Harvard Blvd | S Mill St to S 12th St | 1680 | 10 | 12 | 452 | 62 | 46 | 679 | 95 | 59 |
| I-EX-8 | EX-6 | Elm St | W Harvard Blvd to 220 Elm St | 525 | 8 | 10 | 374 | 63 | 46 | 561 | 84 | 57 |
| I-EX-9 | EX-7 | Elm St | 220 Elm St to W Main St | 100 | 10 | 12 | 372 | 58 | 44 | 559 | 79 | 56 |
| I-EX-10 | EX-8 | W Main St | Elm St to 700 W Main St | 210 | 10 | 12 | 372 | 65 | 48 | 558 | 91 | 61 |
| I-EX-11 | EX-9 & EX-10 | Blanchard Elementary School | W Main St to Blanchard Elementary School | 520 | 10 | 12 | 371 | 65 | 48 | 556 | 99 | 61 |
| I-EX-12 | EX-11 | Blanchard Elementary School | Blanchard Elementary School | 110 | 8 | 10 | 130 | 59 | 43 | 196 | 73 | 54 |
| I-EX-13 | EX-12 | Blanchard Elementary School | Blanchard Elementary School to Pamela Ct | 200 | 10 | 12 | 240 | 57 | 43 | 359 | 100 | 54 |
| I-EX-14 | EX-31, EX-32, EX-33, EX-34 | N Ojai St | Railroad Ave to Ojai Rd | 980 | 8 | 10 | 367 | 62 | 48 | 551 | 77 | 60 |
| I-EX-15 | EX-17 & EX-18 | E Santa Barbara St | N 5th St to N 7th St | 800 | 8 | 10 | 190 | 57 | 42 | 285 | 76 | 52 |
| I-EX-16 | EX-35, EX-36, EX-37, EX-38 | Ojai Rd | N Ojai St to 604 Ojai Rd | 1615 | 8 | 10 | 305 | 59 | 44 | 457 | 73 | 55 |
| I-EX-17 | EX-16 | N 4th St | 122 N 4th St to E Santa Barbara St | 460 | 8 | 10 | 276 | 56 | 43 | 413 | 69 | 54 |

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

### 7.1.3 Lift Station and Force Main Evaluation

**Table 7-3** provides a summary of the pumping capacity versus inflow for the City's three existing lift stations. Pumping capacity information for the Lemonwood 1 and Harding Park lift stations were not available. However, the Harvest lift station appears to have sufficient pumping capacity to serve existing flow conditions.

**Table 7-3: Lift Station Pump Capacity for Existing Flows**

| Flow Condition | | Lift Station | | |
|---|---|---|---|---|
| | | Lemonwood 1 | Harding Park | Harvest |
| ADF | gpd | 59,040 | 2,005 | 99,360 |
| | gpm | 41 | 1 | 69 |
| PHDWF | Peaking Factor | 2.0 x ADF | | |
| | gpm | 82 | 2 | 138 |
| PHWWF | Peaking Factor | 3.0 x ADF | | |
| | gpm | 123 | 3 | 207 |
| Pumping Capacity | gpm | NA | NA | 1,100 |

Notes:
1. ADF = Average Day Flow
2. PHDWF = Peak Hour Dry Weather Flow
3. PHWWF = Peak Hour Wet Weather Flow
4. gpd = gallons per day
5. gpm = gallons per minute
6. NA = Not available

For lift station force mains it is recommended that pipeline velocities be greater than 3.0 feet per second to provide self-cleaning velocities, but less than 5.0 – 10.0 feet per second to minimize head loss and surge events. **Table 7-4** provides an overview of the hydraulic analysis completed for the City's lift station force mains.

**Table 7-4: Force Main Evaluation for Existing Flows**

| Parameter | Units | Lift Station | | |
|---|---|---|---|---|
| | | Lemonwood 1 | Harding Park | Harvest |
| Force Main Diameter | inches | 6 | 4 & 6 | 8 |
| Force Main Material | -- | PVC | PVC | PVC |
| Hazen Williams C | -- | 140 | 140 | 140 |
| Force Main Length | feet | 1,900 | 207 & 208 | 1,780 |
| **Design Flows** | | | | |
| Pumping Capacity | gpm | NA | NA | 1,100 |
| Total Dynamic Head | feet | NA | NA | 70 |
| **Force Main Hydraulics** | | | | |
| Velocity | fps | NA | NA | 7.0 |
| Travel Time to Gravity system | minutes | NA | NA | 4 |

Notes:
1. gpm = gallons per minute
2. fps = feet per second
3. NA = Not available

Pumping capacity information for the Lemonwood 1 and Harding Park lift stations were not available. However, force main velocities for the Harvest Lift Station were observed to be within the recommended design range.

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# 8.0 LIFT STATION CONDITION ASSESSMENT

This section summarizes the condition assessment of the City's existing lift stations facilities.

## 8.1 Condition Assessment

To complete an assessment of the lift station facilities, MKN visited the sites with operations staff to observe existing conditions on September 12, 2023. During these visits, MKN observed the general configuration of the lift stations and reviewed the following items:

- Configuration / Pumps
- Lift Station Safety Features
- Flood Resilience
- Backup Power
- Wet Well Structure
- Dry Well Structure
- Coatings
- Instrumentation
- Access
- Bypassing Provisions
- Site Features

During these visits, specific operational deficiencies and suggested facility improvements were discussed with the operators. Observations and staff comments from the lift station assessments are provided below. Completed lift station checklists are provided in **Appendix E**.

### 8.1.1 Harding Park Lift Station

The Harding Park Lift Station is located in a parking lot planter 15 feet northeast of the Harding Park restroom. A summary of condition assessment is presented in **Table 8-1**.

DRAFT

| Table 8-1: Harding Park Lift Station Condition Assessment Summary | |
|---|---|
| **Assessment Item** | **Observations** |
| Configuration / Pumps | ❑ Lift station configuration is a round concrete wet well with two submersible pumps and two inlets<br>❑ Collects from one house located approximately 350 ft northwest of the lift station and one restroom directly west of the lift station<br>❑ Per the City operator, there was a recent seal failure |
| Lift Station Safety Features | ❑ Lighting provided by parking lot light fixtures |
| Flood Resilience | ❑ Historical flooding issues (none recently)<br>❑ Rainwater infiltrates ceiling conduit and has compromised some of the safety features |
| Backup Power | ❑ No backup power provisions<br>❑ Operators bring in a vactor truck and/or submersible pump as needed |
| Wet Well Structure | ❑ The wet well experiences odor and debris issues, as well as grease build up |
| Valve Vault Structure | ❑ Good |
| Coatings | ❑ Good |
| Instrumentation | ❑ Instrumentation includes a level sensor and an antenna that radio to the Lemonwood 1 lift station in the event of a high level power failure |
| Access | ❑ Accessible from park parking lot |
| Bypassing Provisions | ❑ None |
| Site Features | ❑ Located in park |

### 8.1.2 Harvest Lift Station

The Harvest Lift Station is located on Old Hallock Drive south of Highway 126 adjacent to an RV storage yard. A summary of condition assessment is presented in **Table 8-2**.

DRAFT

| Table 8-2: Harvest Lift Station Condition Assessment Summary | |
|---|---|
| **Assessment Item** | **Observations** |
| Configuration / Pumps | ❑ The lift station configuration is a round concrete wet well and includes 3 submersible pumps<br>❑ No issues reported with pumps |
| Lift Station Safety Features | ❑ Fall protection |
| Flood Resilience | ❑ Not applicable |
| Backup Power | ❑ Permanent generator |
| Wet Well Structure | ❑ There is H2S damage on metal piping, switches, electronics, etc.<br>❑ Structure in acceptable condition; coating and piping damage<br>❑ Has 10,000 gal overflow tank |
| Valve Vault Structure | ❑ Not applicable |
| Coatings | ❑ General corrosion in pipe and concrete coatings present<br>❑ Valve vault had previous leakage issues and H2S damage due to drain line (connected to wet well) |
| Instrumentation | ❑ Level sensing transmitter<br>❑ No flow metering |
| Access | ❑ Gated access<br>❑ Limited space available for equipment |
| Bypassing Provisions | ❑ Points of connection for bypassing |
| Site Features | ❑ Site is less than 3 years old |

### 8.1.3 Lemonwood 1 Lift Station

The Lemonwood 1 Lift Station is located south of Highway 126 in Lemonwood Industrial Park. A summary of condition assessment is presented in Table 8-3.

DRAFT

| Table 8-3: Lemonwood 1 Lift Station Condition Assessment Summary | |
|---|---|
| **Assessment Item** | **Observations** |
| Configuration / Pumps | ❑ Lift station configuration is two above ground suction lift pumps in an enclosure over a wet well<br>❑ The current pumps are old and do not have a large pumping capacity. However, flow conditions are acceptable following the installation of the Harvest LS |
| Lift Station Safety Features | ❑ Lighting recently upgraded |
| Flood Resilience | ❑ No flooding issues historically, however there are runoff issues |
| Backup Power | ❑ There is a manual transfer switch and a portable generator if needed |
| Wet Well Structure | ❑ Low inlets |
| Dry Well Structure | ❑ Not applicable |
| Coatings | ❑ In acceptable condition |
| Instrumentation | ❑ Radio condition is acceptable<br>❑ Other instrumentation includes a flow meter, level sensor (approximately 3 years old), and a bubbler control panel that cycles consistently |
| Access | ❑ Pavement has some condition issues<br>❑ Access by homeless; fence broken<br>❑ Hard to turn around in vehicle; small site |
| Bypassing Provisions | ❑ Points of connection<br>❑ Quick connects |
| Site Features | ❑ Graffiti on walls |

DRAFT

# 9.0 HYDRAULIC ANALYSIS – FUTURE CONDITIONS

This section summarizes the hydraulic evaluation of the existing collection system to serve Near-Term and Ultimate flows.

## 9.1 Gravity Collection System Hydraulic Analysis

### 9.1.1 Evaluation Overview

MKN evaluated the existing collection system against Near-term and Ultimate flows as defined in Section 3. The future flow scenarios included the following development within or adjacent to the City's SOI:

- Near-Term Flows
  - Approved / Pending Projects
  - East Area 1 Specific Plan
  - East Gateway Specific Plan
- Ultimate Flows
  - Vacant Residential Sites
  - Vacant Commercial Sites
  - Adams Canyon Expansion Area
  - Fagan Canyon Expansion Area
  - East Area 3 Expansion Area
  - West Area 2 Expansion Area

Gravity collection system deficiencies were determined based on a hydraulic evaluation of pipeline sizes, slope, and downstream restrictions. Pipes were considered deficient if the pipe's d/D was greater than the following for PHDWF and PHWWF conditions:

- Peak Hour Dry Weather Flow (PHDWF)
  - For a pipe 12 inches or less, a d/D of 50 or greater
  - For a pipe greater than 12 inches, a d/D of 67 or greater
- Peak Hour Wet Weather Flow (PHWWF)
  - For all pipe diameters, a d/D of 75 or greater

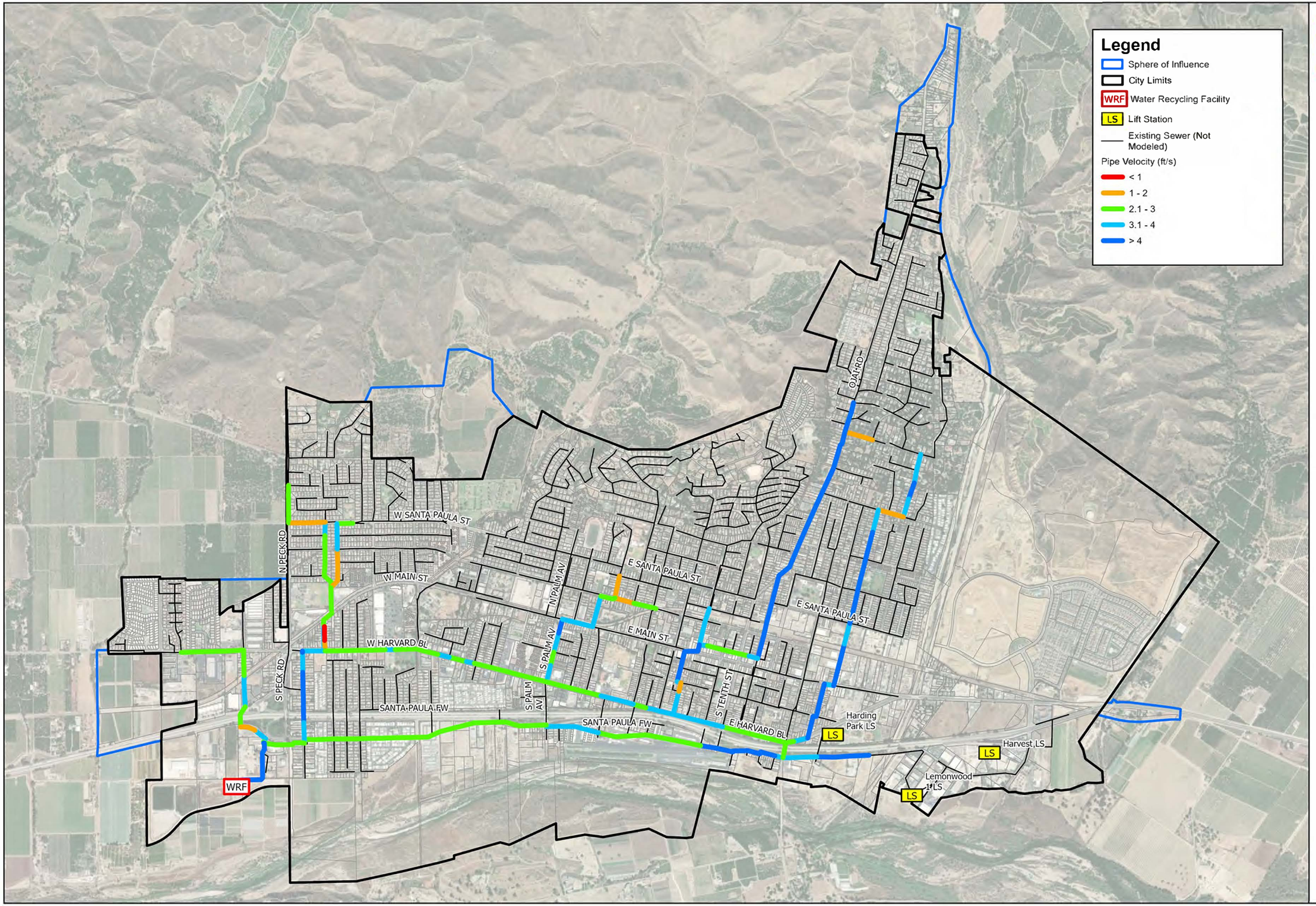
### 9.1.2 Near-Term Flows Hydraulic Model Evaluation Results

For near-term flows, MKN assumed that all the pipeline recommendations identified in **Table 7-2** were completed prior to conducting the hydraulic evaluation. **Figure 9-1** and **Figure 9-2** provide an overview of gravity pipeline velocities resulting from the model under near-term PHDWF and PHWWF conditions, respectively.

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 9-1:

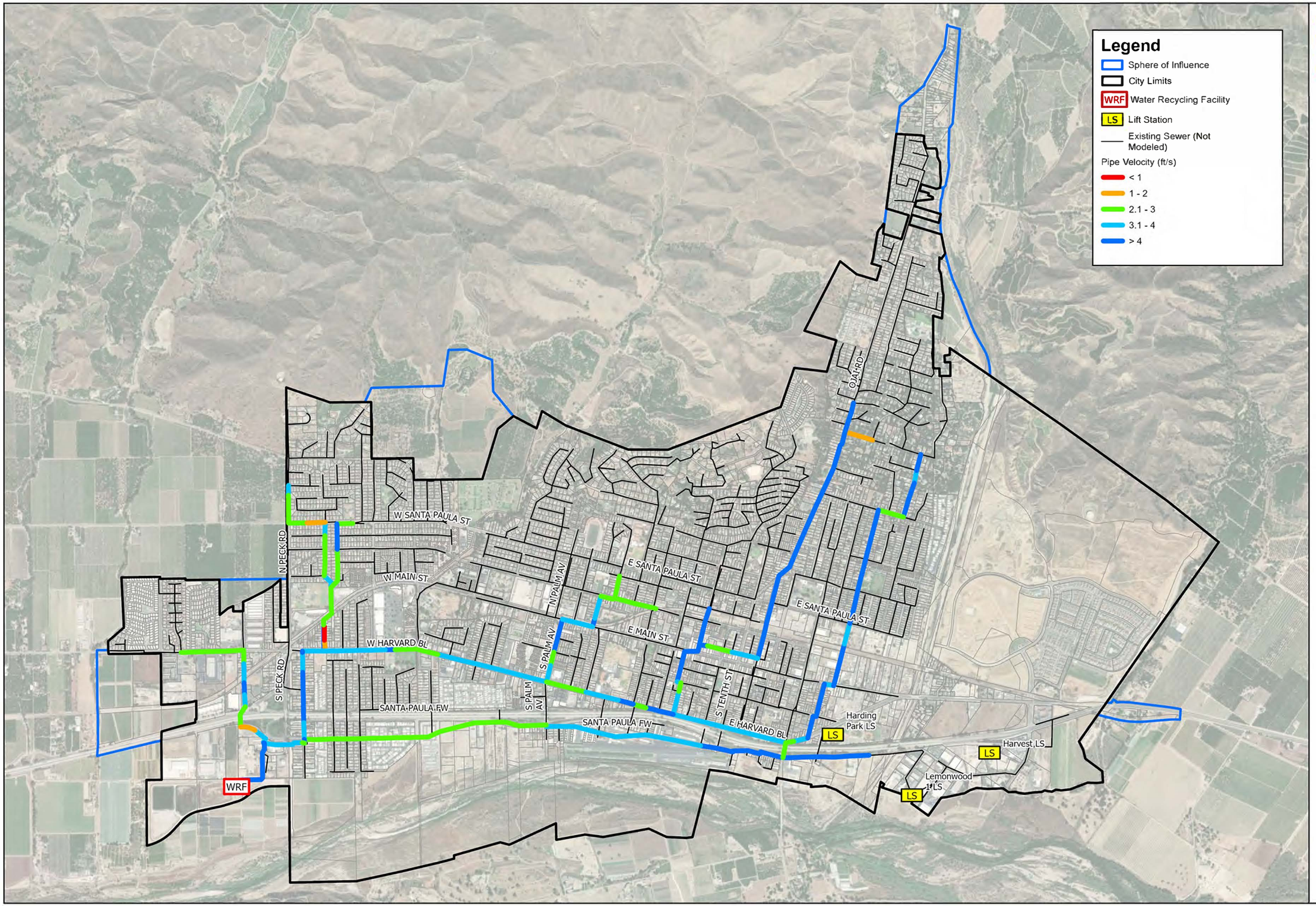
Gravity Pipeline Velocities During Near-Term PHDWF Conditions

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

**Wastewater Collection System and Water Recycling Facility Master Plan**

Figure 9-2:

Gravity Pipeline Velocities During Near-Term PHWWF Conditions

1 inch = 2,200 feet

0 1,100 2,200

mkn

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

Based on model results, approximately 93% of the modeled gravity sewer pipelines within the City's SOI will achieve self-cleaning velocities equal to or greater than 2 feet per second during PHDWF conditions. During PHWWF conditions, approximately 97% of the modeled gravity sewer pipelines within the City's SOI will achieve self-cleaning velocities equal to or greater than 2 feet per second. These self-cleaning velocities are considered satisfactory, and no gravity sewer improvements are recommended based on insufficient velocities.

**Table 9-1** provides a summary of the near-term gravity collection system pipe deficiencies based on the design criteria defined in Section 5. System deficiencies were assigned a deficiency number using "NT" to designate the near-term flow condition (i.e. NT-1).

Based on the near-term hydraulic model evaluation, there are 12 pipelines that exceed the d/D design criteria under near-term PHDWF and PHWWF conditions and are considered deficient. Ten pipeline d/D deficiencies that were within 3% of the design criteria were not recommended for capital improvement in the Near-Term scenario. **Figure 9-3** provides an overview of PHDWF pipeline d/D deficiencies and **Figure 9-4** provides an overview of PHWWF pipeline d/D deficiencies for the near-term scenario. These results assume the pipeline improvements identified to address deficiencies under existing flow conditions (**Table 7-2**) were completed.

**Table 9-2** provides a summary of the recommended improvements to address capacity deficiencies associated with near-term PHDWF and PHWWF conditions (as described in **Table 9-1**).

### 9.1.3 Ultimate Flows Hydraulic Model Evaluation Results

For ultimate flows, MKN assumed that all the pipeline recommendations identified in **Table 7-2** and **Table 9-2** were completed prior to conducting the hydraulic evaluation. **Figure 9-5** and **Figure 9-6** provide an overview of typical gravity pipeline velocities during ultimate PHDWF and PHWWF conditions, respectively. Based on model results, approximately 94% of the modeled gravity sewer pipelines within the City's SOI will achieve self-cleaning velocities equal to or greater than 2 feet per second during PHDWF conditions. During PHWWF conditions, approximately 97% of the modeled gravity sewer pipelines within the City's SOI will achieve self-cleaning velocities equal to or greater than 2 feet per second. These self-cleaning velocities are considered satisfactory, and no gravity sewer improvements are recommended based on insufficient velocities.

**Table 9-3** provides a summary of the ultimate gravity collection system pipe deficiencies based on the design criteria defined in Section 5. System deficiencies were assigned a deficiency number using "ULT" to designate ultimate flow condition (i.e. ULT-1).

Based on the ultimate hydraulic model evaluation, there are 50 pipelines that exceed the d/D design criteria under ultimate PHDWF and/or PHWWF conditions and are considered deficient. Fourteen pipeline d/D deficiencies that were within 5% of the design criteria were not recommended for capital improvement. Additionally, ten pipeline d/D deficiencies are addressed once downstream conditions are improved through larger diameter pipelines. **Figure 9-7** provides an overview of pipeline PHDWF d/D deficiencies and **Figure 9-8** provides an overview of pipeline PHWWF

DRAFT

d/D deficiencies for the ultimate scenario. These results assume the pipeline improvements identified in **Table 7-2** and **Table 9-2** were completed prior to conducting the hydraulic evaluation.

**Table 9-4** provides a summary of the recommended improvements to address capacity deficiencies associated with ultimate PHDWF and PHWWF conditions (as described in **Table 9-3**).

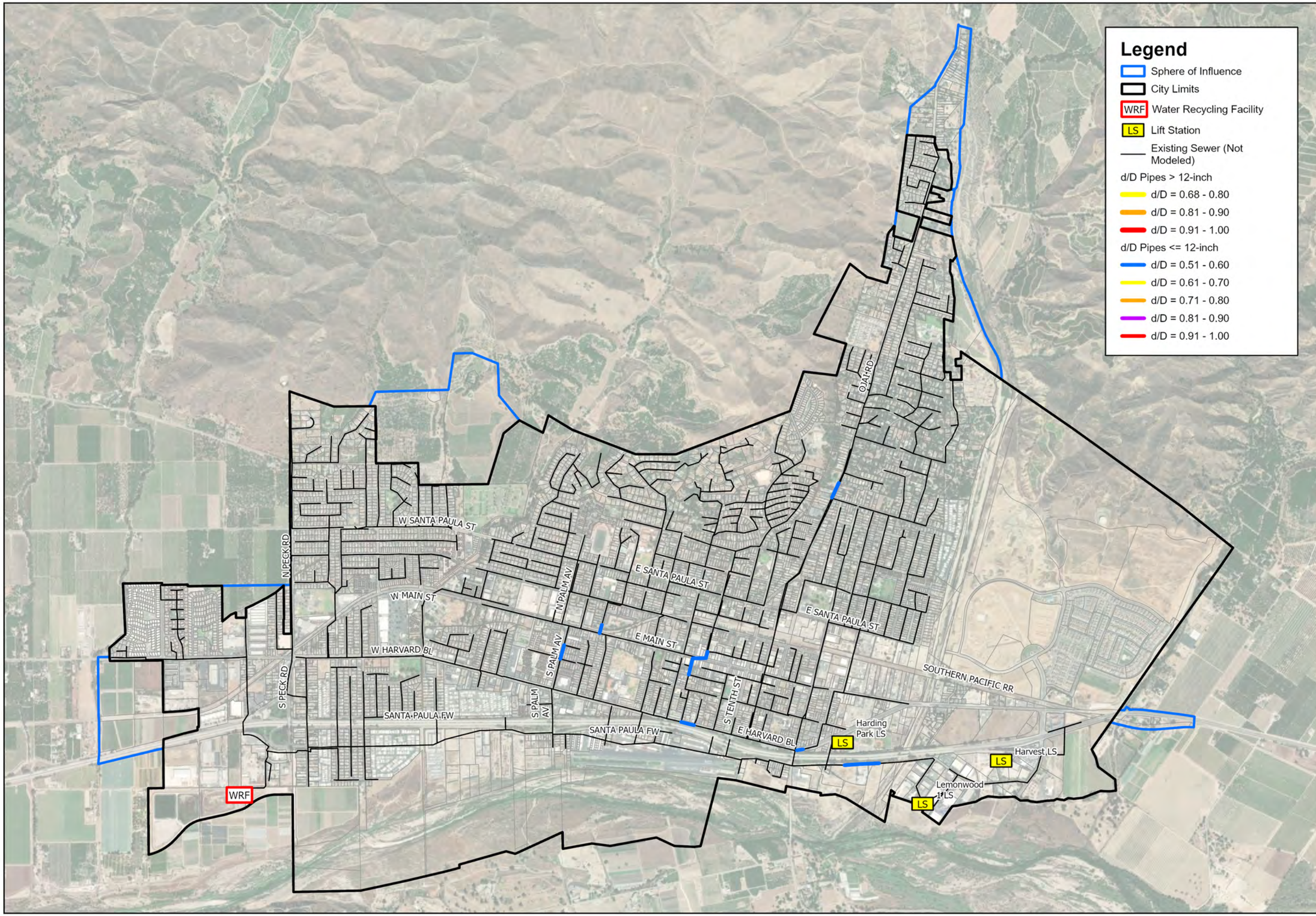
DRAFT

| Table 9-1: Near Term Scenario Gravity Collection System Pipe Deficiencies | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Deficiency No. (NT-#) | Model ID | Location | Length (ft) | Diameter (in) | Existing PHDWF | | | Existing PHWWF | | | Deficiency Description |
| | | | | | Flow (gpm) | d/D Criteria | d/D Result | Flow (gpm) | d/D Criteria | d/D Result | |
| NT-1 | 2306 | Acacia Way (Acacia Rd to Santa Rosa Loop) | 250 | 24 | 1183 | <= 67 | 62 | 1774 | <= 75 | 84 | Capacity deficiency for PHWWF |
| NT-2 | 2682 | Santa Clara St | 305 | 12 | 715 | <= 50 | 52 | 1072 | <= 75 | 65 | Upgrade not recommended (within 5% of d/D criteria) |
| NT-3 | 2681 | Santa Clara St | 390 | 12 | 715 | <= 50 | 51 | 1072 | <= 75 | 64 | Upgrade not recommended (within 5% of d/D criteria) |
| NT-4 | 2364 | S Palm Ave (E Ventura St to Yale Ct) | 285 | 12 | 568 | <= 50 | 54 | 851 | <= 75 | 68 | Upgrade not recommended (within 5% of d/D criteria) |
| NT-5 | 1815 | N 4th St (E Main St to 122 N 4th St) | 175 | 8 | 291 | <= 50 | 57 | 436 | <= 75 | 71 | Capacity deficiency for PHDWF |
| NT-6 | 2350 | Green St (Yale St Halfway to E Main St) | 165 | 12 | 650 | <= 50 | 51 | 975 | <= 75 | 63 | Upgrade not recommended (within 5% of d/D criteria) |
| NT-7 | 2351 | Green St (Halfway from Yale St to E Main St) | 165 | 12 | 636 | <= 50 | 51 | 955 | <= 75 | 63 | Upgrade not recommended (within 5% of d/D criteria) |
| NT-8 | 2361 | E Main St (Green St to Davis St) | 265 | 12 | 633 | <= 50 | 50 | 950 | <= 75 | 62 | Upgrade not recommended (within 5% of d/D criteria) |
| NT-9 | 2346 | Davis St (E Main St to 116 Davis St) | 130 | 12 | 631 | <= 50 | 50 | 947 | <= 75 | 62 | Upgrade not recommended (within 5% of d/D criteria) |
| NT-10 | 2118 | Ojai Rd (Richmond Rd to 725 Ojai Rd) | 325 | 8 | 230 | <= 50 | 52 | 345 | <= 75 | 64 | Upgrade not recommended (within 5% of d/D criteria) |
| NT-11 | 2367 | E Harvard Blvd (California St to Brett Way) | 265 | 12 | 489 | <= 50 | 54 | 734 | <= 75 | 68 | Upgrade not recommended (within 5% of d/D criteria) |
| NT-12 | 2628 | E Harvard Blvd (S 12th St to 1211 Harvard Blvd) | 125 | 12 | 496 | <= 50 | 52 | 744 | <= 75 | 68 | Upgrade not recommended (within 5% of d/D criteria) |

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 9-3:

Near Term PHDWF Pipeline d/D Deficiencies

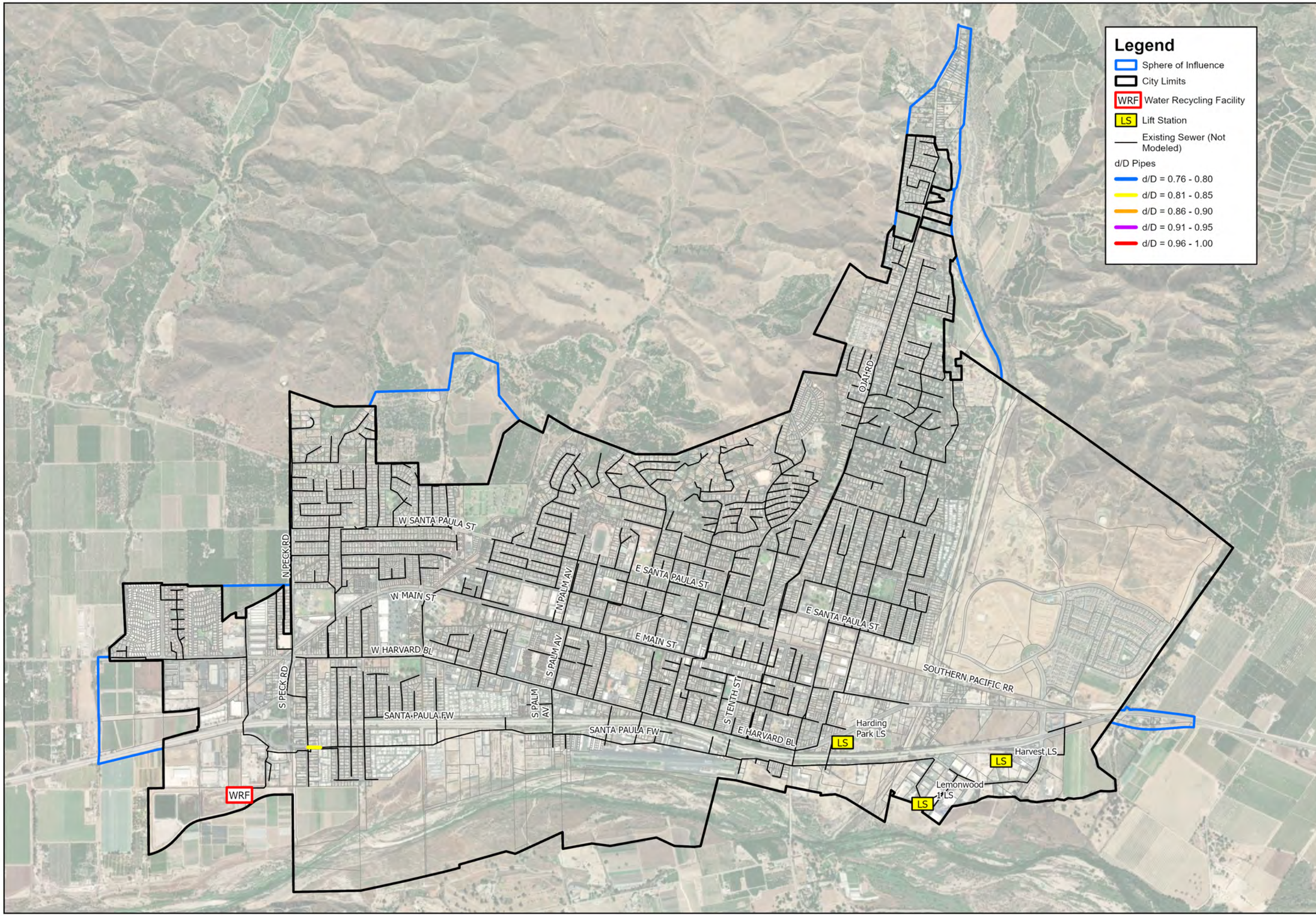
1 inch = 2,200 feet

0 1,100 2,200

mkn

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 9-4:

Near Term PHWWF Pipeline d/D Deficiencies

1 inch = 2,200 Feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

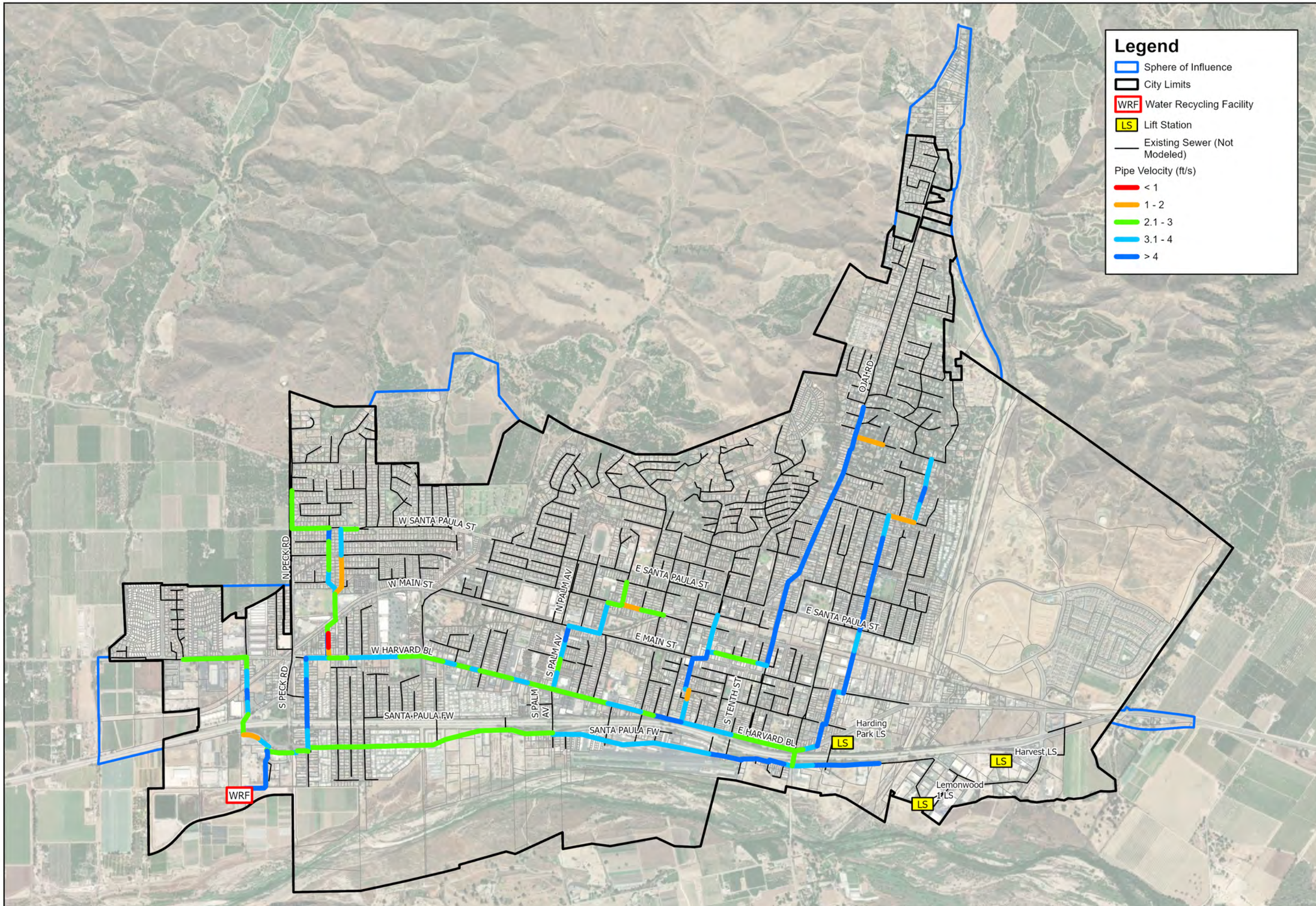
DRAFT

| Table 9-2: Recommended Improvements to Address Near Term Scenario Flows | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | PHDWF Conditions | | | PHWWF Conditions | | |
| Improvement (I-EX-#) | Model Deficiency Addressed | Location | Bounds | Length (ft) | Existing Diameter (in) | Proposed Diameter (in) | Average Flow (gpm) | Average Existing d/D | Average Improved d/D | Average Flow (gpm) | Average Existing d/D | Average Improved d/D |
| I-NT-1 | NT-1 | Acacia Way | Acacia Rd to Santa Rosa Loop | 250 | 24 | 27 | 1183 | 62 | 55 | 1774 | 84 | 74 |
| I-NT-2 | NT-5 | N 4th St | E Main St to 122 N 4th S | 175 | 8 | 10 | 291 | 57 | 44 | 436 | 71 | 55 |

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 9-5:

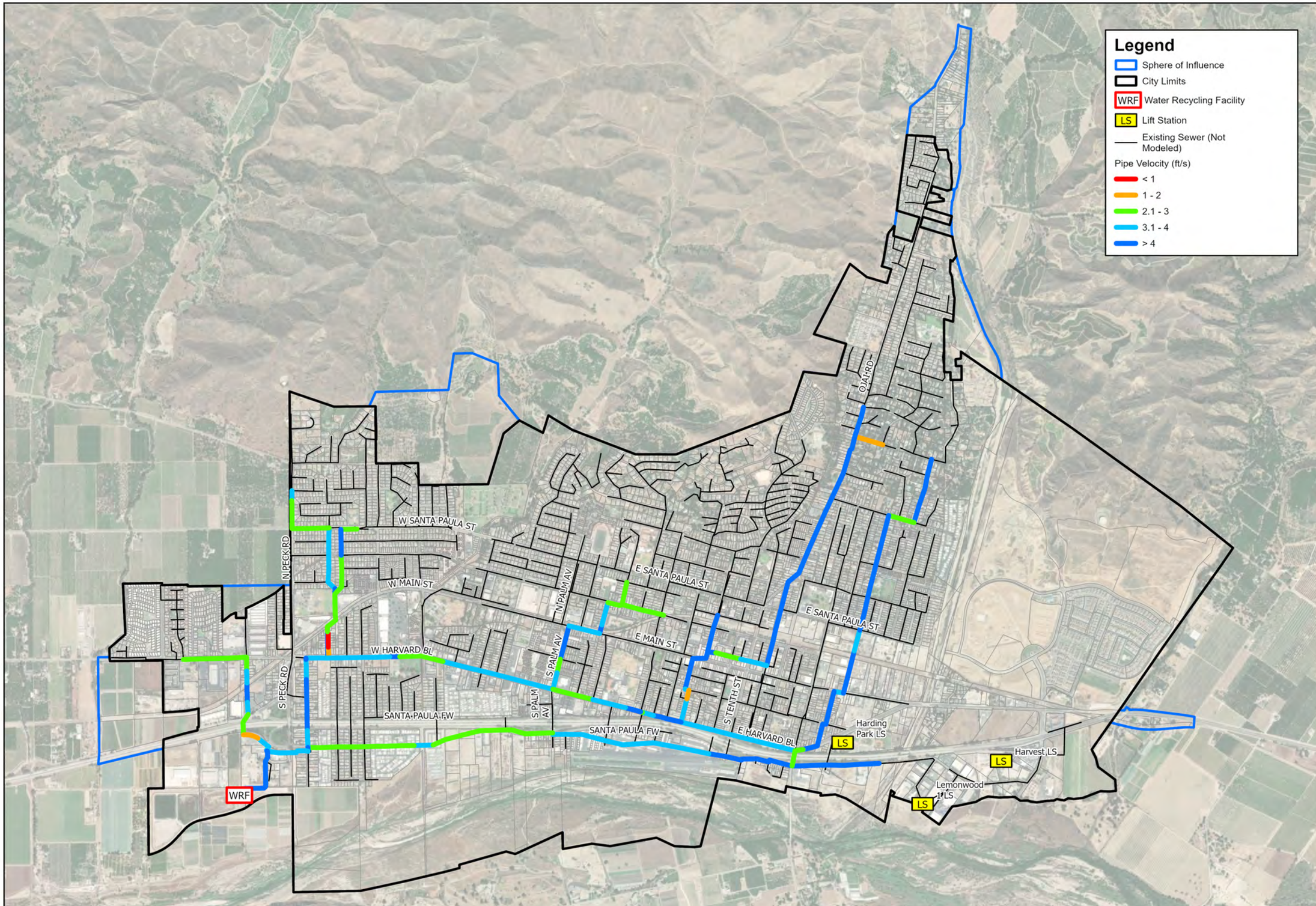
Gravity Pipeline Velocities During Ultimate PHDWF Conditions

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 9-6:

Gravity Pipeline Velocities During Ultimate PHWWF Conditions

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

| Table 9-3: Ultimate Scenario Gravity Collection System Pipe Deficiencies | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Deficiency No. (ULT-#) | Model ID | Location | Length (ft) | Diameter (in) | Existing PHDWF | | | Existing PHWWF | | | Deficiency Description |
| | | | | | Flow (gpm) | d/D Criteria | d/D Result | Flow (gpm) | d/D Criteria | d/D Result | |
| ULT-1 | 2466 | Acacia Way (Corporation St to Shell Rd) | 85 | 30 | 4602 | <= 67 | 61 | 6902 | <= 75 | 78 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-2 | 2465 | Acacia Way (At Shell Rd) | 45 | 30 | 4593 | <= 67 | 62 | 6890 | <= 76 | 79 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-3 | 2467 | Acacia Way (Shell Rd to 536 Acacia Way) | 170 | 30 | 4593 | <= 67 | 63 | 6890 | <= 77 | 82 | Capacity deficiency for PHWWF |
| ULT-4 | 2686 | Acacia Rd (536 Acacia Way) | 45 | 30[1] | 4593 | <= 67 | 64 | 6890 | <= 78 | 84 | Capacity deficiency for PHWWF |
| ULT-5 | 2685 | Acacia Rd (536 Acacia Rd to Acacia Way) | 40 | 30[1] | 4587 | <= 67 | 63 | 6881 | <= 79 | 83 | Downstream pipe creates a surcharged condition for PHWWF |
| ULT-6 | 2428 | Acacia Rd (Acacia Way and Acacia Rd Intersection) | 35 | 30[1] | 4587 | <= 67 | 62 | 6881 | <= 80 | 82 | Downstream pipe creates a surcharged condition for PHWWF |
| ULT-7 | 2306 | Acacia Way (Acacia Rd to Santa Rosa Loop) | 250 | 27[1] | 1332 | <= 67 | 62 | 1998 | <= 81 | 85 | Capacity deficiency for PHWWF |
| ULT-8 | 2325 | Santa Rosa Loop to Dartmouth Rd | 350 | 24 | 1323 | <= 67 | 56 | 1985 | <= 82 | 82 | Downstream pipe creates a surcharged condition for PHWWF |
| ULT-9 | 2682 | Santa Clara St | 305 | 12 | 849 | <= 67 | 57 | 1273 | <= 83 | 73 | Capacity deficiency for PHDWF |
| ULT-10 | 2681 | Santa Clara St | 390 | 12 | 849 | <= 67 | 56 | 1273 | <= 84 | 73 | Capacity deficiency for PHDWF |
| ULT-11 | 2457 | Acacia Rd (Acacia Way to W Santa Maria St) | 340 | 27[1] | 3249 | <= 67 | 60 | 4873 | <= 85 | 83 | Capacity deficiency for PHWWF |
| ULT-12 | 2785 | Acacia Rd (312 Acacia Rd to W Harvard Blvd) | 125 | 24 | 3180 | <= 67 | 62 | 4770 | <= 86 | 84 | Capacity deficiency for PHWWF |
| ULT-13 | 2786 | Acacia Rd (At W Harvard Blvd) | 25 | 24 | 3180 | <= 67 | 60 | 4770 | <= 87 | 83 | Capacity deficiency for PHWWF |
| ULT-14 | 2460 | W Harvard Blvd (Acacia Rd to 730 W Harvard Blvd) | 220 | 24 | 3136 | <= 67 | 61 | 4703 | <= 88 | 84 | Capacity deficiency for PHWWF |
| ULT-15 | 2432 | W Harvard Blvd (730 W Harvard Blvd to Elm St) | 215 | 24 | 3111 | <= 67 | 64 | 4667 | <= 89 | 88 | Capacity deficiency for PHWWF |
| ULT-16 | 2259 | Elm St (W Harvard Blvd to 220 Elm St) | 525 | 10[1] | 605 | <= 50 | 60 | 908 | <= 90 | 77 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-17 | 2286 | Elm St (220 Elm St to W Main St) | 95 | 12[1] | 604 | <= 67 | 58 | 905 | <= 91 | 75 | Capacity deficiency for PHDWF |
| ULT-18 | 2295 | W Main St (Elm St to 700 W Main St) | 210 | 12[1] | 603 | <= 67 | 64 | 904 | <= 92 | 89 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-19 | 2289 | Blanchard Elementary School (W Main St to Blanchard Elementary School) | 130 | 12[1] | 602 | <= 67 | 65 | 903 | <= 93 | 95 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-20 | 2333 | Blanchard Elementary School | 390 | 12[1] | 602 | <= 67 | 65 | 903 | <= 94 | 99 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-21 | 1690 | Blanchard Elementary School | 105 | 10[1] | 361 | <= 50 | 63 | 542 | <= 95 | 79 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-22 | 1843 | Blachard Elementary School to Fillmore St | 195 | 8 | 361 | <= 50 | 63 | 542 | <= 96 | 87 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-23 | 1945 | Walden St (Filmore St to 156 Walden St) | 240 | 8 | 340 | <= 50 | 65 | 510 | <= 97 | 97 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-24 | 2061 | Walden St (156 Walden St to W Santa Barbara St) | 295 | 8 | 339 | <= 50 | 67 | 508 | <= 98 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-25 | 2017 | Walden St (W Santa Barbara St to Center Ln) | 275 | 8 | 330 | <= 50 | 71 | 495 | <= 99 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-26 | 2008 | Walden St (Center Ln to W Santa Paula St) | 270 | 8 | 323 | <= 50 | 67 | 484 | <= 100 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-27 | 2158 | W Santa Paula St (Walden St to 757 W Santa Barbara St) | 365 | 8 | 297 | <= 50 | 66 | 446 | <= 101 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-28 | 2051 | W Santa Paula St (757 W Santa Barbara St to 783 W Santa Paula St) | 290 | 8 | 295 | <= 50 | 68 | 442 | <= 102 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-29 | 1642 | W Santa Paula St (783 W Santa Paula St to N Peck Rd) | 80 | 8 | 292 | <= 50 | 63 | 439 | <= 103 | 100 | Capacity deficiency for both PHDWF and PHWWF |
| ULT-30 | 2294 | Blanchard Elementary School (Blanchard Elementary School to Pamela Ct) | 200 | 12[1] | 240 | <= 50 | 51 | 360 | <= 104 | 92 | Downstream pipe creates a surcharged condition for PHWWF |
| ULT-31 | 2328 | Pamela Ln (Pamela Ct to Venus Ave) | 370 | 10 | 214 | <= 50 | 46 | 321 | <= 105 | 79 | Downstream pipe creates a surcharged condition for PHWWF |
| ULT-32 | 2427 | W Harvard Blvd (At Elm St) | 25 | 24 | 2496 | <= 67 | 61 | 3744 | <= 106 | 87 | Downstream pipe creates a surcharged condition for PHWWF |
| ULT-33 | 2459 | W Harvard Blvd (Elm St to Lucada St) | 355 | 24 | 2489 | <= 67 | 58 | 3734 | <= 107 | 83 | Downstream pipe creates a surcharged condition for PHWWF |
| ULT-34 | 2443 | W Harvard Blvd (Lucada St to Laurie Ln) | 300 | 24 | 2481 | <= 67 | 57 | 3721 | <= 108 | 78 | Downstream pipe creates a surcharged condition for PHWWF |
| ULT-35 | 2451 | W Harvard Blvd (Laurie Ln to Elizabeth Ct) | 265 | 24 | 2465 | <= 67 | 56 | 3698 | <= 109 | 76 | Downstream pipe creates a surcharged condition for PHWWF |
| ULT-36 | 2364 | S Palm Ave (E Ventura St to Yale Ct) | 285 | 12 | 576 | <= 50 | 54 | 864 | <= 110 | 68 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-37 | 2350 | Green St (Yale St Halfway to E Main St) | 165 | 12 | 685 | <= 50 | 53 | 1027 | <= 111 | 65 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-38 | 2351 | Green St (Halfway from Yale St to E Main St) | 165 | 12 | 671 | <= 50 | 52 | 1007 | <= 112 | 64 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-39 | 2361 | E Main St (Green St to Davis St) | 265 | 12 | 668 | <= 50 | 52 | 1002 | <= 113 | 64 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-40 | 2346 | Davis St (E Main St to 107 Davis St) | 130 | 12 | 666 | <= 50 | 52 | 999 | <= 114 | 64 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-41 | 2292 | E Main St (N Mill St to 969 E Main St) | 180 | 12[1] | 490 | <= 50 | 51 | 735 | <= 115 | 66 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-42 | 2301 | N Ojai St (E Santa Barbara St to 217 N 10th St) | 225 | 10 | 408 | <= 50 | 51 | 613 | <= 116 | 63 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-43 | 2330 | N Ojai St (113 N Ojai St to 215 Raiload Ave) | 375 | 10[1] | 389 | <= 50 | 50 | 584 | <= 117 | 62 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-44 | 2118 | Ojai Rd (Richmond Rd to 725 Ojai Rd) | 325 | 8 | 230 | <= 50 | 52 | 346 | <= 118 | 64 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-45 | 1904 | Ojai Rd (725 Ojai Rd to Bedford St) | 225 | 8 | 226 | <= 50 | 50 | 339 | <= 119 | 62 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-46 | 2367 | E Harvard Blvd (California St to Brett Way) | 265 | 12 | 548 | <= 67 | 57 | 822 | <= 120 | 72 | Capacity deficiency for PHDWF |
| ULT-47 | 2281 | E Harvard Blvd (E Harvard Blvd and Ojai St) | 25 | 12[1] | 517 | <= 50 | 51 | 775 | <= 121 | 66 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-48 | 2629 | E Harvard Blvd (E Harvard Blvd and S 12th St) | 35 | 12 | 566 | <= 50 | 52 | 849 | <= 122 | 67 | Upgrade not recommended (within 5% of d/D criteria) |
| ULT-49 | 2628 | E Harvard Blvd (S 12th St to 1211 Harvard Blvd) | 125 | 12 | 565 | <= 67 | 57 | 847 | <= 123 | 74 | Capacity deficiency for PHDWF |
| ULT-50 | 2366 | E Harvard Blvd (1211 Harvard Blvd to Garcia St) | 290 | 12 | 562 | <= 50 | 52 | 842 | <= 124 | 67 | Downstream pipe creates a surcharged condition for PHWWF |

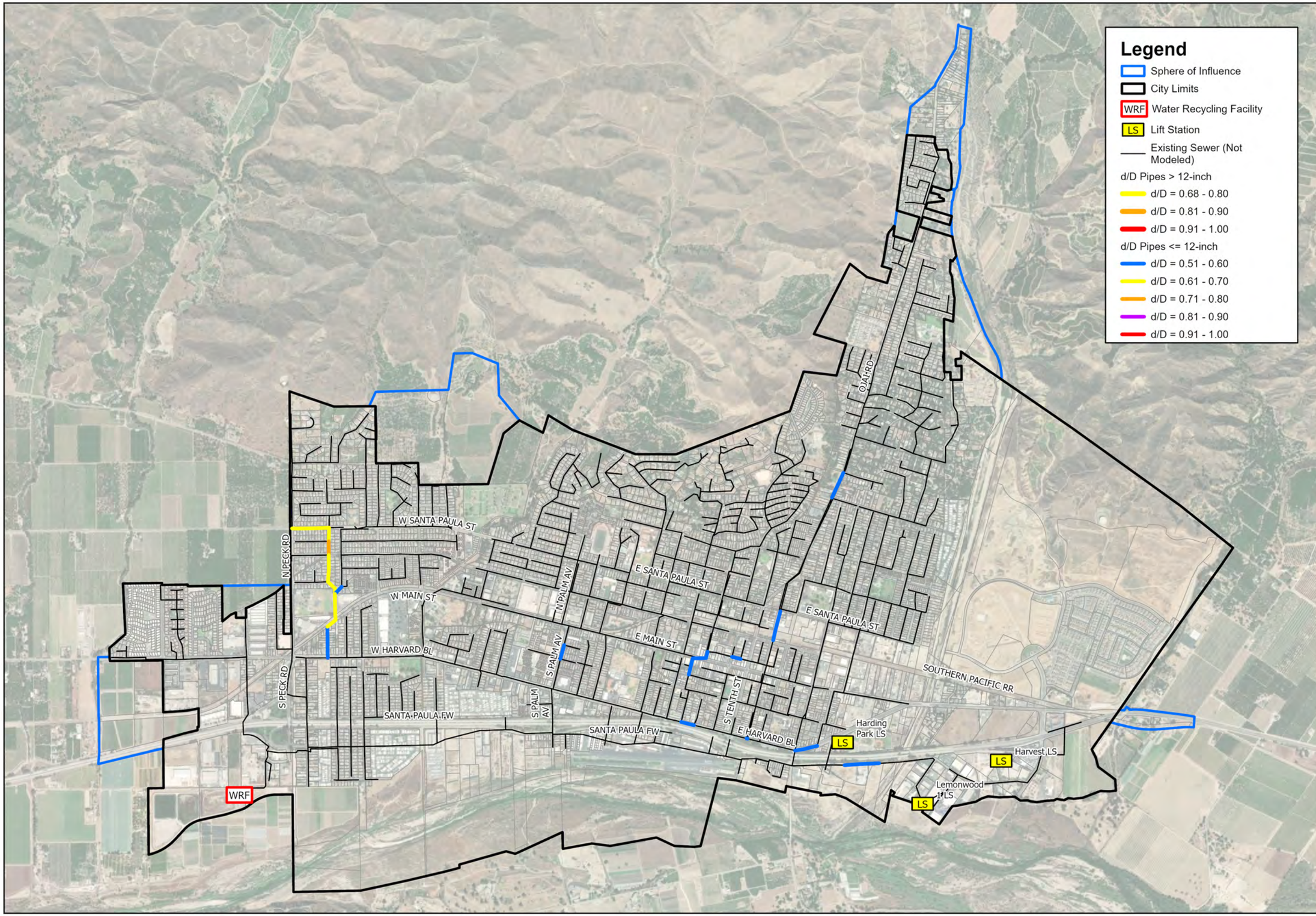
Notes:

1. MKN evaluated the ultimate scenario under the assumption that all Existing and Near Term Scenario recommended improvements were completed prior. The existing pipeline diameter listed is the recommended improvement for the pipeline segment from Table 7-2.

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




**City of Santa Paula**

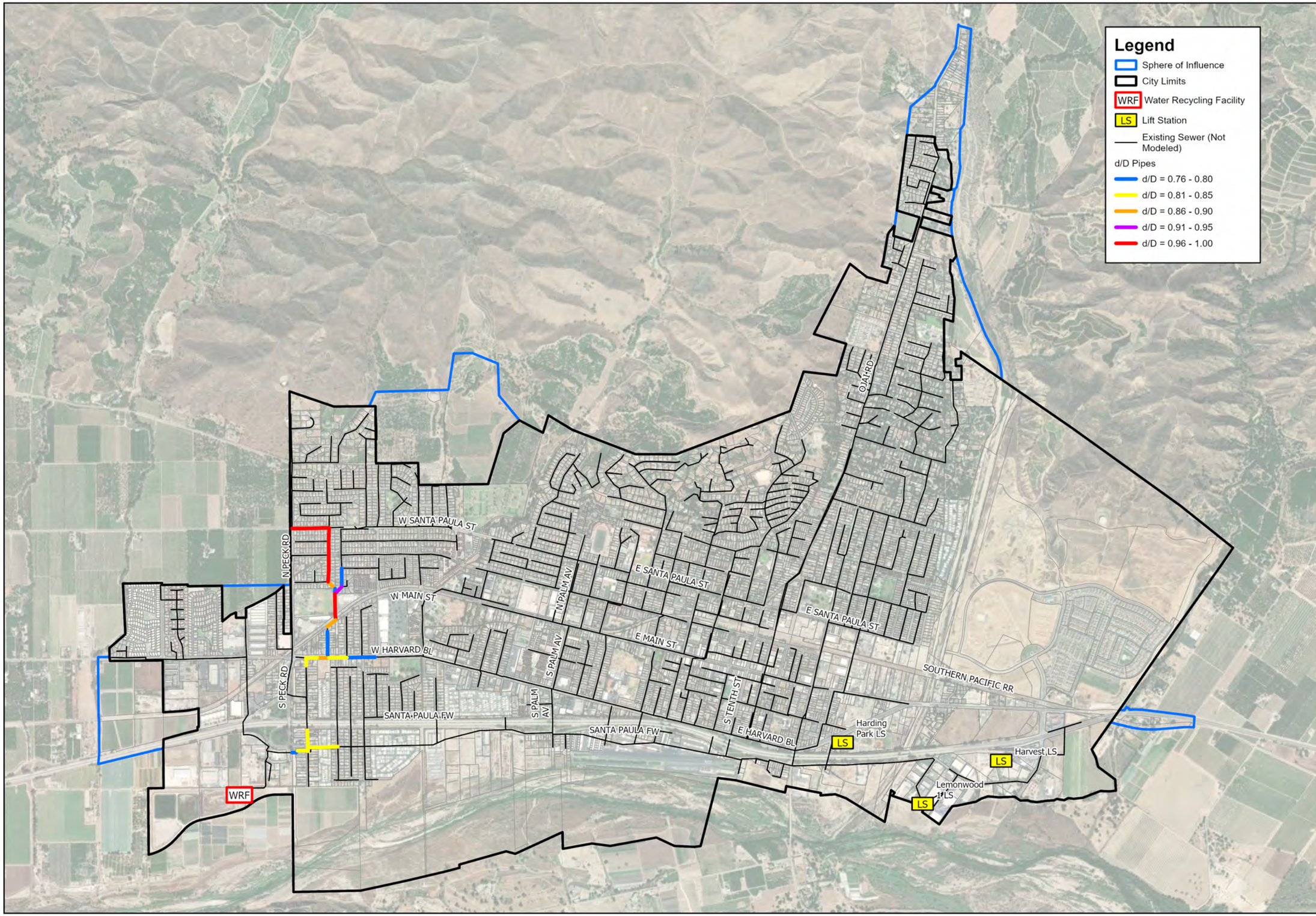
**Wastewater Collection System and Water Recycling Facility Master Plan**

Figure 9-7:

Ultimate PHDWF Pipeline d/D Deficiencies

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

Wastewater Collection System and Water Recycling Facility Master Plan

Figure 9-8:

Ultimate PHWWF Pipeline d/D Deficiencies

1 inch = 2,200 feet

0 1,100 2,200

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

| Table 9-4: Recommended Improvements to Address Ultimate Scenario Flows | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Improvement (I-ULT-#) | Model Deficiency Addressed | Location | Bounds | Length (ft) | Existing Diameter (in) | Proposed Diameter (in) | PHDWF Conditions | | | PHWWF Conditions | | |
| | | | | | | | Average Flow (gpm) | Average Existing d/D | Average Improved d/D | Average Flow (gpm) | Average Existing d/D | Average Improved d/D |
| I-ULT-1 | ULT-3 | Acacia Way | Shell Rd to 536 Acacia Way | 170 | 30 | 36 | 4593 | 63 | 51 | 6890 | 82 | 66 |
| I-ULT-2 | ULT-4 | Acacia Rd | 536 Acacia Wa | 45 | 30 | 36 | 4593 | 64 | 51 | 6890 | 84 | 66 |
| I-ULT-3 | ULT-7 | Acacia Way | Acacia Rd to Santa Rosa Loop | 250 | 27 | 30 | 1332 | 62 | 53 | 1998 | 85 | 71 |
| I-ULT-4 | ULT-9 & ULT-10 | Santa Clara St | Santa Clara St | 695 | 12 | 15 | 849 | 56 | 41 | 1273 | 73 | 51 |
| I-ULT-5 | ULT-11 | Acacia Rd | Acacia Way to W Santa Maria St | 340 | 27 | 30 | 3249 | 60 | 51 | 4873 | 83 | 69 |
| I-ULT-6 | ULT-12 & ULT-13 | Acacia Rd | 312 Acacia Rd to W Harvard Blvd | 150 | 24 | 27 | 3180 | 61 | 53 | 4770 | 83 | 71 |
| I-ULT-7 | ULT-14 & ULT-15 | W Harvard Blvd | Acacia Rd to Elm St | 435 | 24 | 27 | 3123 | 62 | 52 | 4685 | 86 | 69 |
| I-ULT-8 | ULT-16 | Elm St | W Harvard Blvd to 220 Elm St | 526 | 10 | 12 | 605 | 60 | 46 | 908 | 77 | 58 |
| I-ULT-9 | ULT-17 | Elm St | 220 Elm St to W Main St | 97 | 12 | 15 | 604 | 58 | 42 | 905 | 75 | 53 |
| I-ULT-10 | ULT-18 | W Main St | Elm St to 700 W Main St | 210 | 12 | 15 | 603 | 64 | 45 | 904 | 89 | 57 |
| I-ULT-11 | ULT-19 & ULT-20 | Blanchard Elementary School | W Main St to Blanchard Elementary School | 520 | 12 | 15 | 602 | 65 | 45 | 903 | 97 | 57 |
| I-ULT-12 | ULT-21 | Blanchard Elementary School | Blanchard Elementary School | 107 | 10 | 12 | 361 | 63 | 47 | 542 | 79 | 59 |
| I-ULT-13 | ULT-22 | Blanchard Elementary School | Blachard Elementary School to Fillmore St | 195 | 8 | 10 | 361 | 63 | 46 | 542 | 87 | 57 |
| I-ULT-14 | ULT-23, ULT-24, ULT-25, ULT-26 | Walden St | Filmore St to W Santa Paula St | 1080 | 8 | 10 | 333 | 67 | 47 | 500 | 99 | 60 |
| I-ULT-15 | ULT-27, ULT-28, ULT-29 | W Santa Paula St | Walden St to N Peck Rd | 735 | 8 | 10 | 295 | 65 | 46 | 442 | 100 | 58 |
| I-ULT-16 | ULT-46 | E Harvard Blvd | California St to Brent Way | 265 | 12 | 15 | 548 | 57 | 43 | 822 | 72 | 54 |
| I-ULT-17 | ULT-49 | E Harvard Blvd | S 12th St to 1211 Harvard Blvd | 125 | 12 | 15 | 565 | 57 | 43 | 847 | 74 | 54 |

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# 10.0 WATER RECYCLING FACILITY EVALUATION

This section summarizes the existing flows and loads to the WRF, condition assessment of existing facilities, and evaluation of capacity to serve existing and future flows and loads.

## 10.1 Historical Flows and Loadings

The following provides analysis of historical flows and influent loadings, influent concentrations, and existing effluent requirements and quality observed at the WRF.

### 10.1.1 Historical Influent Loading

At the WRF, influent organic and solids loading are calculated using monthly grab measurements of five-day biochemical oxygen demand ($BOD_5$) and Total Suspended Solids (TSS), mandated by Monitoring and Reporting Program (MRP) No. CI-9259. While the WRF has an effluent limit of 10 mg/L for Ammonia as nitrogen + nitrate as nitrogen + nitrite as nitrogen, it has not historically been required for measurement in plant influent.

The raw influent wastewater characteristics used in the original design for the WRF is summarized in **Table 10-1.** These values were obtained from the *Trussell Technologies, Inc., Evaluation of Biological Design and Process Sizing* Technical Memorandum (2008) which is attached as **Appendix F.**

Table 10-1: 2008 Raw Influent Design Criteria

| Parameters | Unit | Raw Influent |
|---|---|---|
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand (BOD) | mg/L | 320 |
| Total Suspended Solids (TSS) | mg/L | 210 |

A summary of the influent monitoring data from 2014 to 2023 is presented below in **Table 10-2** and **Table 10-3**. These records indicate the plant encountered its highest $BOD_5$ concentration in 2022 and its highest TSS concentration in 2019. The data also show that for every year except 2014 and 2022, the $BOD_5$ annual average concentrations were above the original design value of 320 mg/L. Similarly, all TSS annual average concentrations were above the original design value of 210 mg/L. The maximum month values for both constituents are substantially above the design criteria.

DRAFT

| Table 10-2: Historical Influent $BOD_5$ and Total Suspended Solids Concentrations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Month | 2014 | | 2015 | | 2016 | | 2017 | | 2018 | |
| | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) |
| January | 265 | 259 | 274 | 324 | 285 | 295 | 380 | 331 | 553 | 439 |
| February | 321 | 237 | 321 | 385 | 334 | 357 | 409 | 380 | 295 | 234 |
| March | 284 | 259 | 304 | 285 | 384 | 355 | 386 | 390 | 278 | 305 |
| April | 277 | 287 | 363 | 361 | 387 | 344 | 360 | 538 | 324 | 336 |
| May | 323 | 214 | 331 | 342 | 375 | 427 | 329 | 278 | 274 | 330 |
| June[1] | 350 | 340 | 361 | 413 | 320 | 325 | 407 | 320 | - | - |
| July | 306 | 329 | 380 | 357 | 300 | 258 | 307 | 288 | 333 | 303 |
| August | 266 | 286 | 315 | 381 | 320 | 356 | 332 | 304 | 325 | 274 |
| September | 310 | 301 | 314 | 351 | 344 | 344 | 327 | 311 | 328 | 272 |
| October | 271 | 324 | 349 | 427 | 322 | 365 | 372 | 275 | 326 | 264 |
| November | 306 | 364 | 327 | 305 | 269 | 276 | 381 | 300 | 398 | 346 |
| December | 314 | 336 | 351 | 360 | 294 | 305 | 404 | 286 | 185 | 303 |
| **Annual Avg.** | 299 | 295 | 333 | 358 | 328 | 334 | 366 | 333 | 329 | 310 |
| **Max. Month** | 350 | 364 | 380 | 427 | 387 | 427 | 409 | 538 | 553 | 439 |
| **Min. Month** | 265 | 214 | 274 | 285 | 269 | 258 | 307 | 275 | 185 | 234 |

Notes:
1. No data for June of 2018

| Table 10-3: Historical Influent $BOD_5$ and Total Suspended Solids Concentrations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Month | 2019 | | 2020 | | 2021 | | 2022 | | 2023 | |
| | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) |
| January | 388 | 359 | 268 | 349 | 443 | 366 | 231 | 252 | 220 | 270 |
| February | 325 | 273 | 318 | 274 | 430 | 300 | 257 | 303 | 221 | 259 |
| March | 205 | 243 | 320 | 303 | 436 | 305 | 318 | 214 | 228 | 257 |
| April | 495 | 291 | 469 | 314 | 324 | 289 | 630 | 433 | 345 | 315 |
| May | 406 | 343 | 369 | 356 | 277 | 306 | 400 | 304 | 628 | 636 |
| June | 233 | 188 | 313 | 366 | 216 | 214 | 321 | 364 | 159 | 277 |
| July | 419 | 319 | 335 | 276 | 155 | 334 | 294 | 299 | 241 | 577 |
| August | 575 | 904 | 266 | 564 | 319 | 349 | 278 | 321 | 277 | 243 |
| September | 439 | 444 | 396 | 314 | 329 | 384 | 320 | 254 | 302 | 308 |
| October | 343 | 296 | 336 | 241 | 391 | 326 | 272 | 400 | 279 | 260 |
| November | 178 | 360 | 191 | 245 | 334 | 258 | 207 | 243 | 339 | 360 |
| December | 217 | 350 | 411 | 251 | 316 | 224 | 252 | 271 | 321 | 175 |
| **Annual Avg.** | 352 | 364 | 333 | 321 | 331 | 305 | 315 | 305 | 297 | 328 |
| **Max. Month** | 575 | 904 | 469 | 564 | 443 | 384 | 630 | 433 | 628 | 636 |
| **Min. Month** | 178 | 188 | 191 | 241 | 155 | 214 | 207 | 214 | 159 | 175 |

DRAFT

WRF monitoring data from 2019 through 2023 was used to estimate the $BOD_5$ and TSS loadings as presented in **Table 10-4** below. Because wastewater in a community can change over time, with growth and other changes within a collection system, only the most recent full four years of data was used to estimate existing conditions. The loads are calculated by multiplying the relevant flow rate by the concentration and the constant of 8.34 lbs/gal. The calculated maximum month concentrations (mg/L) are acquired by dividing the maximum month load (ppd) by the maximum month flow (MGD) times 8.34 lbs/gal.

**Table 10-4: Existing Influent Flows and Loadings**

| Year | | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|
| Parameter | Unit | Existing | | | | |
| ADF | MGD | 2.38 | 2.50 | 3.01 | 2.23 | 2.14 |
| MMF | MGD | 2.91 | 2.77 | 3.69 | 2.63 | 2.67 |
| Average Annual $BOD_5$ Concentration | mg/L | 352 | 333 | 331 | 315 | 297 |
| Average Annual $BOD_5$ Load (Rounded) | ppd | 6990 | 6940 | 8310 | 5860 | 5300 |
| Maximum Month $BOD_5$ Concentration | mg/L | 575 | 469 | 443 | 630 | 628 |
| Maximum Month $BOD_5$ Load (Rounded) | ppd | 13035 | 9255 | 10837 | 11843 | 11333 |
| Maximum Month $BOD_5$ Concentration (Calculated) | mg/L | 537 | 401 | 352 | 540 | 509 |
| Average Annual TSS Concentration | mg/L | 364 | 321 | 305 | 305 | 328 |
| Average Annual TSS Load (Rounded) | ppd | 7230 | 6690 | 7650 | 5670 | 5850 |
| Maximum Month TSS Concentration | mg/L | 904 | 564 | 384 | 433 | 636 |
| Maximum Month TSS Load (Rounded) | ppd | 20492 | 12894 | 10733 | 8140 | 11478 |
| Maximum Month TSS Concentration (Calculated) | mg/L | 844 | 558 | 349 | 371 | 515 |

To develop wastewater loading projections, per capita loading values were calculated from the existing loading data in **Table 10-4** for 2019 through 2023. The projections are developed by dividing the loads by the population of each year mentioned. Population estimates were acquired from the State of California Department of Finance demographics estimate data. Loading per capita values are summarized in **Table 10-5**.

**Table 10-5: Historical Influent $BOD_5$ and TSS Loadings (2019-2023)**

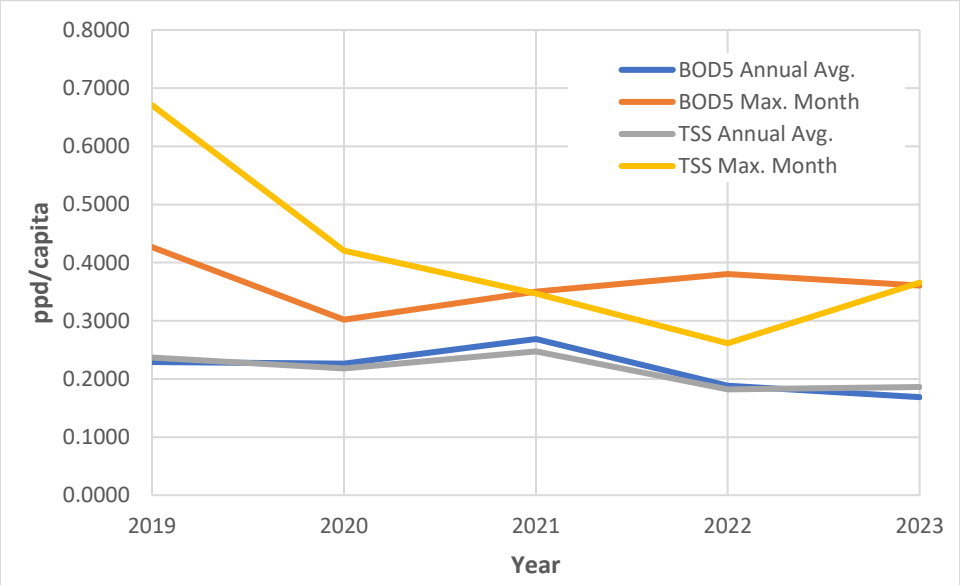
| Year | Population | ADF (MGD) | $BOD_5$ (ppd/capita) | | TSS (ppd/capita) | |
|---|---|---|---|---|---|---|
| | | | Annual Avg. | Max. Month | Annual Avg. | Max. Month |
| 2019 | 30,547 | 2.38 | 0.2288 | 0.4267 | 0.2367 | 0.6708 |
| 2020 | 30,658 | 2.50 | 0.2264 | 0.3019 | 0.2182 | 0.4206 |
| 2021 | 30,934 | 3.01 | 0.2686 | 0.3503 | 0.2473 | 0.3470 |
| 2022 | 31,145 | 2.23 | 0.1882 | 0.3803 | 0.1821 | 0.2614 |
| 2023 | 31,423 | 2.14 | 0.1687 | 0.3607 | 0.1862 | 0.3653 |
| 3-Year Average (2021 – 2023) | – | – | **0.209** | **0.364** | **0.205** | **0.325** |

The annual average and maximum month loadings per capita for $BOD_5$ and TSS for 2014 to 2023 are presented in **Figure 10-1**. Average $BOD_5$ and TSS loading per capita increased from 2014 through 2021 but declined in 2022

DRAFT

and 2023. Three-year averages from 2021 to 2023 were calculated in **Table 10-5** and were used in **Section 10.3.1** to predict future loading.

**Figure 10-1: Loadings per capita for $BOD_5$ and TSS**




### 10.1.2 Existing Effluent Requirements and Quality

The WRF is permitted to discharge a maximum effluent volume of 4.2 MGD and the quarterly average effluent volume of 2.6 MGD. The WDR provides discharge requirements, including effluent limits and Monitoring and Reporting Program (MRP) No. CI-9259. The monthly average and daily maximum effluent limits are summarized in **Table 10-6**.

DRAFT

| Table 10-6: Effluent Limits (Table 8 of WDR No. R4-2018-0022-A01) | | | |
|---|---|---|---|
| Constituents | Units | Monthly Average | Daily Maximum |
| Oil and Grease | mg/L | 10[1] | 15[1] |
| Total Suspended Solids | mg/L | 10[1] | 15[1] |
| | % Removal | ≥ 85[2] | --- |
| $BOD_5$ | mg/L | 10[1] | 15[1] |
| | % Removal | ≥ 85[2] | --- |
| Ammonia-N + Nitrate-N + Nitrite-N | mg/L | 10[3] | --- |
| Nitrite-N | mg/L | 1 | --- |
| Total Dissolved Solids | mg/L | 2000[4] | --- |
| Sulfate | mg/L | 800[4] | --- |
| Boron | mg/L | 1[4] | --- |
| Chloride | mg/L | 110[4] | --- |
| pH | pH units | Between 6.5 - 8.5 | --- |

Notes:
1. Limit is based on best professional judgement. Limits adopted by this Regional Board exist in the permits for tertiary-treated wastewater treatment plants
2. Limit is based on secondary treatment requirements, 40 C.F.R. section 133.102
3. Limit is based on the Load Allocations for nonpoint sources set forth in the Santa Clara River Nitrogen Compounds TMDL, Resolution No. 2003-011
4. Limit based on Basin Plan Groundwater Quality Objective

MKN reviewed the historical effluent quality based on annual reports from 2019 to 2023 provided by the City. During this time, the exceedances that occurred were for chloride, boron and ammonia-n + nitrate-n + nitrite-n, as shown in **Appendix F**. The WRF treatment equipment is unable to reduce chlorides. The City is planning improvements to address this and is operating the WRF in compliance with CDO No. R4-2018-0023-A01 which provides a ten-year timeline by which the City must come into compliance with the chloride effluent limit of 110 mg/L. The CDO outlines a schedule with interim milestones and effluent limits. To meet the chloride effluent limit, the AWTF will be constructed at the WRF as discussed in Section 4.3.14.

DRAFT

The table below summarizes the $BOD_5$ and total suspended solids (TSS) concentrations from 2019 to 2023 and confirms that the WRF has been meeting its monthly average and daily maximum effluent limits for both constituents. Grab samples for both constituents were taken once a month.

**Table 10-7: Treated Effluent $BOD_5$ and TSS Monthly Average and Daily Max Concentrations**

| Month | 2019 | | 2020 | | 2021 | | 2022 | | 2023 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) | $BOD_5$ (mg/L) | TSS (mg/L) |
| January | 1.00 | 1.00 | 1.20 | 0.78 | 1.20 | 1.36 | 1.40 | 0.98 | 1.00 | 1.28 |
| February | 1.70 | 1.00 | 2.10 | 1.10 | 2.43 | 1.37 | ND[1] | 0.78 | 1.10 | 1.03 |
| March | 2.00 | 1.00 | 0.94 | 2.56 | 2.30 | 0.77 | 1.60 | ND[1] | 2.10 | 0.92 |
| April | 1.30 | 1.00 | 1.80 | 1.28 | 2.90 | 2.72 | 2.50 | 0.98 | 1.00 | ND[1] |
| May | 0.70 | 1.00 | 2.00 | 1.54 | 1.20 | 0.50 | 6.60 | 0.96 | 0.50 | ND[1] |
| June | 0.50 | - | 2.90 | 1.00 | 1.10 | ND[1] | 9.10 | 1.60 | ND[1] | ND[1] |
| July | 1.00 | 1.11 | 1.40 | 1.36 | 1.00 | ND[1] | 20.90 | 1.79 | 1.00 | ND[1] |
| August | 1.50 | - | 0.50 | 1.09 | 0.74 | ND[1] | 13.50 | 1.74 | 1.20 | ND[1] |
| September | 0.40 | - | 4.70 | 0.65 | 0.80 | 0.65 | 4.00 | 1.60 | ND[1] | 0.70 |
| October | 0.60 | 1.08 | 1.70 | 1.02 | 0.69 | 1.54 | 0.90 | 0.68 | 1.10 | 0.60 |
| November | 2.50 | - | 0.40 | 1.20 | 0.39 | 0.54 | 1.50 | 0.86 | ND[1] | ND[1] |
| December | 0.80 | - | 2.00 | 7.50 | 0.50 | 1.21 | 2.60 | 1.30 | 1.40 | 1.00 |
| **Annual Avg.** | 1.17 | 1.03 | 1.80 | 1.76 | 1.27 | 1.18 | 5.87 | 1.21 | 1.16 | 0.92 |
| **Max. Month** | 2.50 | 1.11 | 4.70 | 7.50 | 2.90 | 2.72 | 20.90 | 1.79 | 2.10 | 1.28 |
| **Min. Month** | 0.40 | 1.00 | 0.40 | 0.65 | 0.39 | 0.50 | 0.90 | 0.68 | 0.50 | 0.60 |

Notes:
1. ND = Not detected

DRAFT

## 10.2 Condition Assessment

The following presents a summary of the visual condition assessment performed on the WRF by MKN on July 27, 2023. This assessment's purpose was to identify the facility's needs for rehabilitation and replacement (R&R, or renewal). The results obtained from this evaluation were integrated into the comprehensive capital improvement program (CIP) outlined in Section 11 of this report. The completed condition assessment checklist is provided in **Appendix G**. Photos of the condition assessment can be seen in **Appendix H.**

### 10.2.1 Influent Lift Station

The following observations were made at the influent lift station:

*Mechanical*

- ❑ Corrosion of lifting chain: replacement is recommended
- ❑ Check valves are not reliable
- ❑ Volutes are in good shape

- Lift station pumps are original pumps: evaluate pumps to repair or replace

*Instrumentation*

- No local control panel or HMI
- Seal failure has occurred within the low voltage conduits.

*Electrical*

- Worn cords: consider replacement

*Structural*

- Concrete/liners in bad shape
- Aluminum cover should be fiberglass: support brackets failing
- Spalling of concrete slab was observed
- Replace manhole cover and ring at influent metering station
- Influent flow weir concrete is worn, no metal protection
- Influent channel needs repairing and relining

*Safety*

- Confined space equipment is necessary for maintenance. VRSD currently charges for their own equipment. It is recommended to purchase harnesses, hoists, blowers, and gas detectors if City staff need to enter these areas in the future.
- Grating worn
- No fall arrest for ladders

DRAFT

### 10.2.2 Headworks

The following observations were made at the headworks structure:

*Mechanical*

- #2 grit classifier failing, stainless steel rotting out, and wear plates are missing and need to be replaced
- Total of 2 coarse and 2 fine screens, 2 classifiers
- Need manufacturer maintenance, bearing replacement, new screens, and augers

*Instrumentation*

- 2 water level transducers
- H2S gas causing problems with electrical cords and panels
- H2S will damage Huber stainless steel equipment

### 10.2.3 Primary and Secondary Equalization Basins

The following observations were made at the equalization basins:

**Primary Equalization Basin**

*Mechanical*

- No aeration is provided to keep stored flow mixed

*Instrumentation*

- Operators are unable to automate the peak shaving process. Transferring between equalization basins and ILS is a manual process.
- SCADA should be configured to automate the use of equalization storage to manage peak diurnal flows.

*Electrical*

- Intermittent conduit corrosion

*Structural*

- Concrete in equalization weirs does not have knife's edge and is worn
- Aluminum and safety grating need to be replaced

**Secondary Equalization Basin**

*Structural*

- Concrete in equalization weirs does not have knife's edge and is worn
- Aluminum and safety grating need to be replaced

*Operator Notes and Observations*

- Rarely used except when plant has high flow events

DRAFT

### 10.2.4 Anoxic Basins

The following observations were made at the anoxic basins:

*Mechanical*

- ❑ WRF exceeded nitrate limits due to failed RAS/WAS pump in April/May 2023
- ❑ Mud valve in #3 failed in April 2023
- ❑ Issues with mixers in anoxic basins include tangling, rails bending, skewed shafts, and cut cables

*Structural*

- ❑ Corrosion visible near top 3 feet of tanks

### 10.2.5 Aeration Basins

The following observations were made at the aeration basins:

*Mechanical*

- ❑ Operators need a spare RAS pump for redundancy

*Structural*

- ❑ In general, the upper 3 to 4 feet of the basins are corroded and may need coating
- ❑ Mixer has caused scarring of concrete walls in Aeration Basins

*Operator Notes and Observations*

- ❑ Aeration Basins are generally operating as intended.

### 10.2.6 Sludge Handling System

The following observations were made for equipment associated with the sludge handling system:

Digester Blowers

*Mechanical*

- ❑ Both blowers are operating as intended

*Instrumentation*

- ❑ Software not compatible with old blowers. Microsoft no longer covers HMIs resulting in needing new inverters

DRAFT

Thickeners & Screw Press

*Mechanical*

- Screw press self-clean capability is not operating. Press will not run in reverse for cleaning and its brushes are worn. Needs maintenance.
- Oil box is due for 10-year overhaul
- Feed pump does not prime well
- Rotary lobe pumps feed thickeners and screw press. Rotary lobe pumps have worn plates
- Replace bristles

*Operator Notes and Observations*

- Redundancy needed for screw press (second unit needed)
- The conveyor system which discharges to the roll-off needs maintenance

### 10.2.7 MBR Basins

The following observations were made at the MBR basins:

*Mechanical*

- One blower in MBR Basin #1 unexpectedly turns off

*Instrumentation*

- WAS #2 pump faults and turns off
- Operators recommend tying citric acid pump into MBR PLC
- MBR PLC #M needs redundant back up like PLC #A & B

*Structural*

- Coatings are chipped on basin concrete walls

*Operator Notes and Observations*

- Permeate pumps need to be evaluated and possibly rebuilt
- Operators prefer separate turbidity meters for each train on MBR

DRAFT

### 10.2.8 UV Disinfection

The following observations were made for the UV disinfection system:

*Mechanical*

- 3 out of 5 module banks are currently in service since flows are not at capacity
- Operators recently replaced bulbs from 2 out of the 5 module banks.
- Bulbs usage at + 30,000 hours; Per manufacturer recommendation, bulbs should be replaced at 12,000 hours

*Operators Notes and Observations*

- Only 3 modules in use at any time
- Shattered bulbs discovered after maintenance check-up
- Electronics need to be replaced

### 10.2.9 Decorative and Percolation Ponds

The WRF contains three percolation ponds located to the southwest of the facility and a decorative pond located at the entrance of the facility. The following observations were made:

Percolation Ponds

*Mechanical*

- Irrigation system around percolation ponds not operating as intended; Cracked pipelines were observed

*Operator Notes and Observations*

- Rocks and debris need to be cleared out of ponds
- Liners at percolation pond berms need to be replaced
- Recommend implementing regularly-scheduled weed removal and control

Decorative Pond

*Mechanical*

- Pond needs new sump pumps
- Replace exhaust fan; should be automatic when vault opens, and current fan is not
- Repair circulation pump and valves

DRAFT

*Safety*

- Major rusting on vault ladder
- Replace pond lighting
- Hatch in good condition

*Operator Notes and Observations*

- Accumulated sludge needs to be removed on a regular frequency
- Pond liner in good condition
- Water leaks into vault; vault should be repaired

### 10.2.10 Headworks/Dewatering and Controls Buildings

The following observations were made at the headworks/dewatering and the controls buildings at the WRF:

Headworks/Dewatering Building

*Structural*

- No insulation on the roof
- Windows do not have a proper seal
- Window screens damaged and should be replaced
- Trim and doors should be repainted
- Door locks failing and need to be repaired or replaced
- Poor lighting. City should replace ballasts and lighting with LED assemblies and bulbs

Controls Building

*Mechanical*

- Two HVAC units not operating as intended; Need replacement units

*Structural*

- No insulation on the roof
- Windows do not have a proper seal
- Window screens are damaged and should be replaced
- Trim and doors should be repainted

DRAFT

- Door locks failing and need to be repaired or replaced.
- Poor lighting. City should replace ballasts and lighting with LED assemblies and bulbs

*Safety*

- Replace panel on fire alarm system along with failing smoke detector

#### 10.2.11 Miscellaneous Observations

*General*

- Crane needs maintenance and load certification
- Spalled concrete pad for abandoned odor control system should be repaired to prevent trip hazards
- New tools needed for plant operators include tap and die set (SAE and Metric), multi-functional welder for stainless steel, and electric winches for gantry cranes.
- Portable ladders are old, worn, and sun damaged. Replacement ladders recommended
- Operators using unstable 12-foot step ladder to check sludge trailer; Add rolling stairway
- Effluent meter has no weir/flume causing inaccurate measurements
- Poor paint condition throughout the facility
- Rebuild or replace blowers
- Emergency stand-by generator needs to be serviced. Fuel polish, oil change, paint and replace filters, hoses, batteries, etc.
- Automatic transfer switch needs servicing
- Irrigation system timer runs numerous cycles a day. Replacement is recommended.

DRAFT

## 10.3 Capacity Evaluation

Capacity was evaluated for each WRF process, considering various factors such as flow rates, characteristics of influent wastewater, treatment goals, operational thresholds, and redundancy requirements. An evaluation of the original design capacity for the WRF, rated capacity of each unit process from the record drawings, historical loading patterns, and performance metrics was undertaken to establish the recommended capacity ratings for individual unit processes as part of the performance assessment. Estimated peak flow values for existing, near-term, and ultimate future flows were used in this evaluation.

### 10.3.1 Flow and Loading Conditions

Existing flows and loading conditions were developed as described in Sections 3.1 and 10.1. Future $BOD_5$ and TSS loadings were projected for near-term and ultimate conditions using two methods:

- Projecting future loads using existing peak concentrations and applying to future flows; and
- Applying three-year average loads (per capita) calculated in **Table 10-5** to future population projections

These two methods are identified in **Table 10-8** and **Table 10-9** for near-term and ultimate loads.

**Table 10-8: Estimated Future Influent Flows and BOD and TSS Loadings**

| Parameter | Unit | Flow Conditions | | |
|---|---|---|---|---|
| | | Existing | Near-Term | Ultimate |
| ADF | MGD | 2.58 | 3.02 | 3.55 |
| MMF | MGD | 3.00 | 3.51 | 4.12 |
| Average Annual $BOD_5$ Concentration | mg/L | 314 | 314 | 314 |
| Average Annual $BOD_5$ Load (Rounded) | ppd | 6,760 | 7,910 | 9,300 |
| Maximum Month $BOD_5$ Load (Rounded) | ppd | 11,338 | 13,261 | 15,565 |
| Maximum Month $BOD_5$ Concentration (Calculated) | mg/L | 453 | 453 | 453 |
| Average Annual TSS Concentration | mg/L | 312 | 312 | 312 |
| Average Annual TSS Load (Rounded) | ppd | 6,720 | 7,860 | 9,240 |
| Maximum Month TSS Load (Rounded) | ppd | 10,117 | 11,826 | 13,882 |
| Maximum Month TSS Concentration (Calculated) | mg/L | 404 | 404 | 404 |

**Table 10-9: Estimated Future Influent BOD and TSS Loadings**

| Parameter | Unit | Flow Conditions | | |
|---|---|---|---|---|
| | | Existing | Near-Term | Ultimate |
| Population[1] | capita | 31,423 | 38,703 | 45,217 |
| Average Annual $BOD_5$ Load per Capita | ppd/capita | 0.209 | | |
| Maximum Month $BOD_5$ Load per Capita | ppd/capita | 0.364 | | |
| Average Annual TSS Load per Capita | ppd/capita | 0.205 | | |
| Maximum Month TSS Load (Rounded) | ppd/capita | 0.325 | | |
| Average Annual $BOD_5$ Load | ppd | 6,567 | 8,089 | 9,450 |
| Maximum Month $BOD_5$ Load | ppd | 11,438 | 14,088 | 16,459 |
| Average Annual TSS Load | ppd | 6,442 | 7,934 | 9,269 |
| Maximum Month TSS Load | ppd | 10,212 | 12,578 | 14,696 |

Notes:
1. Near-Term and Ultimate populations estimated using the current population + (3.3 capita per housing unit x number of housing units from Tables 3-14 and 3-15).

DRAFT

The methodology shown in **Table 10-9** was used to prevent overestimating future loads. As shown above, applying the methodology for **Table 10-10** would result in overestimating future maximum month loads used to size process equipment.

### 10.3.2 Influent Lift Station

The influent lift station at the WRF was designed to accommodate a PHWWF capacity of 17.0 MGD with one pump out of service. Presently, the PHWWF is approximately 7.7 MGD. Projections suggest that in the near-term and under ultimate future conditions, the PHWWF may increase to 9.0 MGD and 10.6 MGD, respectively, factoring in expected growth. Given the design capacity of the influent lift station, the existing facility can handle existing, near-term, and ultimate future conditions.

**Table 10-10: Influent Lift Station Capacity (Three Pumps Operating)**

| Flow Condition | Units | Design Capacity | Existing Conditions | Near-Term Future Conditions | Ultimate Future Conditions |
|---|---|---|---|---|---|
| PHWWF | MGD | 17.0 | 7.7 | 9.0 | 10.6 |
| Available Capacity | MGD | - | 9.3 | 8.0 | 6.4 |

### 10.3.3 Headworks

The current headworks at the WRF features two duplicate trains to ensure operational redundancy. Each train includes a primary coarse screening unit, a grit removal unit, and a fine screen unit. The design capacities for each of these units are as follows:

- 8.5 MGD for the primary screen
- 8.5 MGD for grit removal
- 5.7 MGD for the fine screen

The tables below outline the design capacity of each unit when both trains are operational and when one train is out of service.

**Table 10-11: Headworks Primary Screen & Grit Removal Capacity (Two Screens)**

| Flow Condition | Units | Design Capacity | Existing Conditions | Near-term Future Conditions | Ultimate Future Conditions |
|---|---|---|---|---|---|
| Peak Day Flow | MGD | 17.0 | 5.7 | 6.6 | 7.8 |
| Available Capacity | MGD | - | 11.3 | 10.4 | 9.2 |

DRAFT

| Table 10-12: Headworks Primary Screen & Grit Removal Capacity (One Screen) | | | | | |
|---|---|---|---|---|---|
| Flow Condition | Units | Design Capacity | Existing Conditions | Near-term Future Conditions | Ultimate Future Conditions |
| Peak Day Flow | MGD | 8.5 | 5.7 | 6.6 | 7.8 |
| Available Capacity | MGD | - | 2.8 | 1.9 | 0.7 |

| Table 10-13: Headworks Fine Screening Capacity (Two Screens) | | | | | |
|---|---|---|---|---|---|
| Flow Condition | Units | Design Capacity | Existing Conditions | Near-term Future Conditions | Ultimate Future Conditions |
| Peak Day Flow | MGD | 11.4 | 5.7 | 6.6 | 7.8 |
| Available Capacity | MGD | - | 5.7 | 4.8 | 3.6 |

| Table 10-14: Headworks Fine Screening Capacity (One Screen) | | | | | |
|---|---|---|---|---|---|
| Flow Condition | Units | Design Capacity | Existing Conditions | Near-term Future Conditions | Ultimate Future Conditions |
| Peak Day Flow | MGD | 5.7 | 5.7 | 6.6 | 7.8 |
| Available Capacity | MGD | - | 0 | **-0.9** | **-2.1** |
| Notes: Capacity exceedances are bold and underlined | | | | | |

As seen above, the coarse screens, grit removal system and fine screens (both trains in service) have the ability to meet existing and future peak hour flow demands. Replacing the existing fine screens with higher capacity units is recommended to meet future demands with one unit out of service, providing redundancy. The fine screens are necessary to protect the membranes in the MBR Basins from damage.

### 10.3.4 Primary and Secondary Equalization Basins

The WRF's two EQ basins function in series, collectively providing a storage capacity of 1.05 million gallons. They are designed to provide two hours of equalization storage at a PDF of 10.4 MGD. Basin size is summarized below:

| Table 10-15: Equalization Basins | | |
|---|---|---|
| Equalization Basin | Size (L x W x H in ft) | Storage (gals) |
| Primary | 45 x 40 x 24 | 281,000 |
| Secondary | 118 38 x 24 | 771,400 |

Currently the EQ basins have sufficient storage to meet existing and future demands as shown in **Table 10-16**. However, City staff has noted that adding an additional EQ basin to the WRF would provide additional emergency storage.

DRAFT

| Table 10-16: Primary and Secondary Equalization Basins | | | | | |
|---|---|---|---|---|---|
| Flow Condition | Units | Design Capacity | Existing Conditions | Near-term Future Conditions | Ultimate Future Conditions |
| Peak Day Flow | MGD | 10.4 | 5.7 | 6.6 | 7.8 |
| Available Capacity | MGD | - | 4.7 | 3.8 | 2.6 |

### 10.3.5 Membrane Bioreactor System Process Evaluation

The WRF MBR system, including anoxic and aeration basins, was originally designed using parameters listed in the *Trussel Technologies, Inc., Evaluation of Biological Design and Process Sizing* Technical Memorandum (2008). The values used in the design are summarized in **Table 10-17**:

| Table 10-17: Trussell MBR Design Parameters | | | |
|---|---|---|---|
| Design Influent Flows | | | |
| Flow | Unit | Values | |
| Average Annual Influent Flow | MGD | 3.4 | |
| Peak Day Flow | MGD | 7.2 | |
| Screened Influent Characteristics | | | |
| Parameters | Unit | Values | |
| Minimum Temperature | °C | 19 | |
| Biochemical Oxygen Demand ($BOD_5$) | mg/L | 288 | |
| Chemical Oxygen Demand (COD) | mg/L | 662 | |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 51 | |
| Ammonium ($NH_4$-N) | mg/L | 32 | |
| Total Suspended Solids (TSS) | mg/L | 189 | |
| Alkalinity (as $CaCO_3$) | mg/L | 300 | |
| Average and Peak Day Influent Loads | | | |
| Parameters[1] | Unit | 3.4 MGD | 7.2 MGD |
| BOD | ppd | 5400 | 6400 |
| COD | ppd | 8200 | 9800 |
| TKN | ppd | 1400 | 1700 |
| TSS | ppd | 18,800 | 22,600 |
| Effluent | | | |
| Parameters | Unit | Values | |
| Biochemical Oxygen Demand ($BOD_5$) | mg/L | 10 | |
| Total Suspended Solids (TSS) | mg/L | 10 | |
| Ammonium ($NH_4$-N) | mg/L | 0.5 | |
| Notes:<br>1. Peak Day loadings are assumed to be 20% greater than Average Day loadings per Trussell TM. | | | |

DRAFT

MKN evaluated the capacity of the MBR system, including aeration and anoxic basins, using a spreadsheet model. Results and references are included in **Appendix I**. Existing, near-term, and ultimate future condition flow and loads were applied to the model using design parameters listed in the following tables below.

| Table 10-18: MBR Design Evaluation Parameters | | |
|---|---|---|
| **Design Influent Flows** | | |
| **Flow** | **Unit** | **Values** |
| Existing Flows MMF | MGD | 3.00 |
| Near-Term Development MMF | MGD | 3.51 |
| Ultimate-Term Development MMF | MGD | 4.12 |
| **Screened Influent Characteristics** | | |
| **Parameters** | **Unit** | **Values** |
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand ($BOD_5$) | mg/L | 420 |
| Chemical Oxygen Demand (COD) | mg/L | 857 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 70 |
| Ammonium (NH4-N) | mg/L | 42 |
| Total Suspended Solids (TSS) | mg/L | 329 |
| Alkalinity (as $CaCO_3$) | mg/L | 300 |
| **Effluent** | | |
| **Parameters** | **Unit** | **Values** |
| Biochemical Oxygen Demand ($BOD_5$) | mg/L | 10 |
| Total Suspended Solids (TSS) | mg/L | 10 |
| Ammonium (NH4-N) | mg/L | 1 |

MKN used data from **Table 10-5** to estimate the parameters used in **Table 10-18**. Specifically, averages from 2021-2023 for calculated maximum month concentrations for $BOD_5$ and TSS were used in the estimation. As recommended in the Trussel TM, MKN reduced the calculated average maximum month values for $BOD_5$ by 10% and TSS by 20% to account for impact of upstream screening processes. Comparing the values calculated for the existing and future flow conditions for $BOD_5$ and TSS in **Table 10-8** to the reduced values used in our MBR design evaluation above, the percent differences are approximately 7% and 19% respectively for $BOD_5$ and TSS. TKN was estimated assuming a ratio of $BOD_5$ to TKN of 6 to 1 since influent nitrogen concentrations were not available. Other rations and coefficients used in estimating other pertinent influent parameters used in the model are presented in **Table 10-19**.

| Table 10-19: Influent Fractions and Coefficients | | | |
|---|---|---|---|
| **Fractions/Coefficients** | **Value Used** | **Parameter Acquired** | **Units** |
| VSS/TSS Ratio | 0.79 | VSS = 260 | mg/L |
| COD/VSS Ratio | 3.3 | COD = 857 | mg/L |
| Ammonia/TKN Ratio | 0.6 | Ammonia = 42 | mg/L |

Using parameters discussed above, MKN determined that the full MBR process meets existing, near-term, and ultimate conditions with one treatment train out of service. For the anoxic basins, it was determined that for all conditions and with one full process train out of service, the existing system has the ability to handle the anticipated flows and loads.

DRAFT

| Table 10-20: Aeration and Anoxic Basin - Required Volumes (2 Trains in Service) | | | |
|---|---|---|---|
| | Units | Aeration Basins (2 Basins) and MBR Basins (4 Basins) | Anoxic Basin (2 Basins) |
| Actual Aeration Volume | $ft^3$ | 59,674 | 23,089 |
| **Existing MMF** | | | |
| Minimum Volume Required | $ft^3$ | 38,755 | 8,066 |
| **Near-Term MMF** | | | |
| Minimum Volume Required | $ft^3$ | 45,343 | 9,437 |
| **Ultimate-Term MMF** | | | |
| Minimum Volume Required | $ft^3$ | 53,223 | 11,078 |

There are a total of four aeration blowers for the aeration tanks (3 running and one in standby). Each blower output supplied is 1,750 SCFM. The total air flow supplied by the three active blowers is approximately 5,250 SCFM. The model indicates a required air flow of 5,920 SCFM for the ultimate-term development MMF. Therefore, it appears the current blowers do not meet the ultimate buildout conditions. An additional blower is recommended to be installed for redundancy.

There are three blowers dedicated for membrane scouring, (two running and one in standby) each supplying 4,700 SCFM of air. MKN found that the required scouring air flow rate under all flow conditions can be met by one blower (**Table 10-21**). This also confirms that the two running blowers can meet the requirements and there is no need to add additional membrane blowers.

| Table 10-21: Blower Air Flow Requirements | | |
|---|---|---|
| **Description** | **Type of Blower** | |
| | Membrane | Aeration |
| Air Flow (SCFM) per blower | 4,700 | 1,750 |
| Number of Blowers | 2 + 1 (Standby) | 3 + 1 (Standby) |
| Total Air Flow (SCFM) | 9400 | 5250 |
| **Flows Evaluated** | **Required Air Flow (Modeled - SCFM)** | |
| Existing MMF | 2,625 | 4,311 |
| Near-Term MMF | 3,071 | 5,044 |
| Ultimate-Term MMF | 3,605 | 5,920 |

MKN also evaluated maximum membrane flux capacity. The existing Koch Puron PSH-1800-36-BB membrane modules were installed in 2022 to replace the membrane cartridges installed when the plant was originally constructed in 2010. Four modules were installed in each basin and each module included 36 rows of membrane fibers, with the ability to add another eight rows to increase capacity in the future.

The goal is to stay with a peak flux rate of 15 gpd/SF at typical wastewater temperatures with all basins in service. This allows the system to operate temporarily at a maximum flux rate of 19 gpd/SF with one basin out of service, per the design specifications developed for the 2022 membrane replacement project completed by the City. The

DRAFT

table below summarizes the PDF under existing, near-term, and ultimate conditions and compares it to the flow calculated to maintain the maximum flux rate through the existing membranes (7.2 MGD).

| Table 10-22: Membrane Flow Capacity (15 gpd/SF All Membranes Operating) | | | | | |
|---|---|---|---|---|---|
| Flow Condition | Units | Design Capacity | Existing Conditions | Near-term Future Conditions | Ultimate Future Conditions |
| Peak Day Flow | MGD | 7.2 | 5.7 | 6.6 | 7.8 |
| Available Capacity | MGD | - | 1.5 | 0.6 | ***-0.6*** |
| Notes: Capacity exceedances are bold and underlined | | | | | |

As shown above, the maximum membrane flow rate (for a maximum flux rate of 15 gpd/SF) is not exceeded until ultimate PDF. Capacity could be increased by utilizing the available space within the current membrane basins. Work will include extending the MBR feed channels and placing additional equipment such as MBR feed pumps, blowers, permeate pumps, piping and ancillary equipment. Building out the empty membrane basins, would increase capacity above the ultimate PDF.

### 10.3.6 UV Disinfection System

The UV disinfection system has a total of two channels with five banks per channel. The capacity was assessed based on the design peak hour flow capacity of 10.4 MGD with 4 banks operating and one bank out of service in each channel. As shown in **Table 10-23**, the system does not have the capacity to handle the ultimate future loading conditions unless all five banks are in service. As presented in **Table 10-24** the system with all five banks operating can meet all existing and future flow conditions. Since peak hour is an extreme event, and the current effluent disposal permit does not require redundancy in disinfection, no expansion is necessary in the immediate future.

| Table 10-23: UV Disinfection Capacity (4 Banks Per Channel) | | | | | |
|---|---|---|---|---|---|
| Flow Condition | Units | Design Capacity | Existing Conditions | Near-term Future Conditions | Ultimate Future Conditions |
| Peak Hour Flow | MGD | 10.4 | 7.7 | 9.0 | 10.6 |
| Available Capacity | MGD | - | 2.7 | 1.4 | **-0.2** |
| Notes: Capacity exceedances are bold and underlined | | | | | |

| Table 10-24: UV Disinfection Capacity (5 Banks Per Channel) | | | | | |
|---|---|---|---|---|---|
| Flow Condition | Units | Design Capacity | Existing Conditions | Near-term Future Conditions | Ultimate Future Conditions |
| Peak Hour Flow | MGD | 11.4 | 7.7 | 9.0 | 10.6 |
| Available Capacity | MGD | - | 3.7 | 2.4 | 0.8 |

### 10.3.7 Sludge Thickener

The WRF currently conveys approximately 40,000 gallons of sludge per day to the existing gravity belt thickeners. each of the two thickeners is designed to process a WAS flow of 265 gpm and approximately 1,593 lbs per hour of

DRAFT

solids, assuming WAS flow is 1.2% solids. In 2023, the WRF disposed of approximately 6.3 million pounds of sludge, or an average of 720 lbs per hour assuming 24 hour per day operation (or 14 hours per day, five days per week at the solids handling capacity of 1,593 pounds per hour). These calculations were developed assuming only one thickener is in operation to provide redundancy. Future loads to the sludge thickener are expected to increase by 17% at near-term and 38% at ultimate conditions, respectively. This will require operating one thickener either an extra day each week at near-term conditions and increasing operating time to 20 hours per day, five days per week at ultimate conditions.

### 10.3.8 Aerobic Sludge Digesters

The three aerobic sludge digesters have a combined capacity of approximately 1.15 MG. They are designed to provide a solids retention time (SRT) of 18 days at 30° C (86° F), which would achieve over 50% VSS reduction per the *Trussell Technologies, Inc., Evaluation of Biological Design and Process Sizing* Technical Memorandum (2008). At ultimate conditions, since the WAS rate is anticipated to increase 38% in proportion to future loads, the future loading rate to the thickeners would increase from 50,000 gpd to approximately 62,000 gpd. Assuming the thickeners increase solids from 0.85% to 2.5%, this would reduce the thickened WAS rate to approximately 21,080 gpd and provide a SRT of 55 days with all three digesters in service or 36 days with two digesters in service. This is adequate through ultimate conditions.

### 10.3.9 Sludge Dewatering Screw Press

The existing screw press at the WRF is used for sludge dewatering, the final step in the sludge handling process. It is designed to have a hydraulic capacity of 92 GPM and a solids handling capacity of 918 pounds per hour. The screw press is designed to produce dewatered sludge with a solids concentration of approximately 22%. It was also designed to operate five days a week, 8 hours per day (40 hours per week). Per plant operators, the current screw press is operated 5 to 7 days a week for 20 to 24 hours per day (100 to 168 hours per week).

Operations staff have noted the original design underestimated the amount of solids being produced at the WRF. As noted in Section 10.3.7, in 2023, the WRF disposed of approximately 6.3 million pounds of sludge, or an average of 720 lbs per hour assuming 24 hour per day operation (or 19 hours per day at the solids handling capacity of 918 pounds per hour). It is recommended the WRF install a second screw press, to provide redundancy and reduce wear on the screw press, especially given the additional usage anticipated in the future.

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# 11.0 CAPITAL IMPROVEMENT PLAN

This section provides the recommended Capital Improvement Plan (CIP) for the City's wastewater collection system, treatment, and disposal systems based on the evaluations and findings of this Master Plan. Prior to the implementation of the recommended projects, the City should consider conducting a preliminary engineering evaluation for each project to refine the scope, assess feasibility and possible alternatives, and develop a more detailed cost estimate.

## 11.1 Capital Improvement Plan Development

The CIP serves as a fundamental pillar for strategic planning for collection system assets, optimization of system performance, and meeting the evolving needs of wastewater customers. Through planning and analysis, the CIP sets the stage for budgeting capital investments that will result in improved reliability and system efficiency.

### 11.1.1 Project Identification

Recommended projects were identified through the following evaluations included in the Master Plan:

- **Collection System Hydraulic Analysis:** The hydraulic analysis identified deficiencies in the existing wastewater collection system to serve existing and future flow (near-term and ultimate) conditions during ADF conditions. Recommended improvements include replacement of existing deficient pipelines with larger diameter pipes and/or directing future flows to locations within the collection system with available hydraulic capacity.
- **WRF Evaluation:** The WRF evaluation assessed the adequacy of the existing treatment processes, hydraulic capacity of plant equipment, and the disposal system to serve existing and future flow and load (near-term and ultimate) conditions.
- **Condition Assessment:** A condition assessment of the City's existing lift stations and WRF was performed to review previous recommendations and identify observed physical deficiencies. As part of this effort, MKN visited the existing lift stations and WRF site to document the condition of the existing system and interview the plant operators. Based on the condition assessment, MKN developed a comprehensive list of recommended improvements to address observed deficiencies.

### 11.1.2 Basis of Costs

To develop cost estimates for the proposed improvements, MKN utilized the Association for Advancement of Cost Estimating International (AACE) guidelines for cost estimating practices and classification. The Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries (AACE International Recommended Practice No. 18R-97) provides guidelines for applying the principles of estimate

DRAFT

classification to projects such as the Master Plan. A summary of the classification system is presented in **Table 11-1**.

| Table 11-1: Cost Estimate Classification Matrix | | | | | |
|---|---|---|---|---|---|
| **Estimate Class** | **Primary Characteristic** | **Secondary Characteristic** | | | |
| | Level of Project Definition | End Usage | Methodology | Expected Accuracy Range | Preparation Effort |
| | Expressed as % of complete definition | Typical purpose of estimate | Typical estimating method | Typical variation in low and high ranges[1] | Typical degree of effort relative to least cost index of 1[2] |
| **Class 5** | 0% to 2% | Concept Screening | Capacity Factored, Parametric Models, Judgment, or Analogy | L: -20% to -50%, H: +30% to +100% | 1 |
| **Class 4** | 1% to 15% | Study or Feasibility | Equipment Factored or Parametric Models | L: -15% to -30% H: +20% to +50% | 2 to 4 |
| **Class 3** | 10% to 40% | Budget, Authorization, or Control | Semi-Detailed Unit Costs with Assembly Level Line Items | L: -10% to -20% H: +10% to +30% | 3 to 10 |
| **Class 2** | 30% to 70% | Control or Bid/Tender | Detailed Unit Cost with Forced Detailed Take-Off | L: -5% to -15% H: +5% to +20% | 4 to 20 |
| **Class 1** | 50% to 100% | Check Estimate or Bid/Tender | Detailed Unit Cost with Detailed Take-Off | L: -3% to -10% H: +3% to +15% | 5 to 100 |

Notes:
1. The state of process technology and availability of applicable reference cost data affect the range markedly. The +/- value represents typical percentage variation of actual costs from the cost estimate after application of contingency (typically at a 50% level of confidence) for given scope.
2. If the range index value of "1" represents 0.005% of project costs, then an index value of 100 represents 0.5%. Estimate preparation effort is highly dependent upon the size of the project and the quality of estimating data and tools.

DRAFT

The cost estimates developed for this Master Plan are considered Class 4 Estimates, which is defined by AACE International as follows:

> *Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Typically, engineering is from 1% to 15% complete and would comprise at a minimum the following: plant capacity, block schematics, indicated layout, process flow diagrams (PFDs) for main process systems, and preliminary engineering process and utility equipment lists. Class 4 estimates are prepared for a number of purposes, such as but not limited to, detailed strategic planning, business development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, and preliminary budget approval to proceed*

*to next stage. Typical accuracy ranges for Class 4 estimates are -15% to -30% on the low side, and +20% to +50% on the high side, depending on the technological complexity of the project, appropriate reference information, and the inclusion of an appropriate contingency determination. American National Standards Institute (ANSI) Standard Reference Z94.2-1989 references this class as a "Budget Estimate", with an accuracy range between -15% to +30%.*

The cost estimates for this Master Plan are anticipated to be within an accuracy of -20% to +30%. The accuracy of the estimates reflects the level of confidence that an estimate will be near the actual project cost. The accuracy of the estimates should not be confused with the application of a project contingency (which is applied for unknown or unforeseen project conditions).

### 11.1.3 Cost Estimation

The opinions of probable cost prepared by MKN represent our judgment and are supplied for the general guidance for the City. Since MKN has no control over the cost of labor and material, or over competitive bidding or market conditions, MKN does not guarantee the accuracy of such opinions as compared to contractor bids or actual project costs. For each project identified, cost opinions were generated based on the following assumptions:

- Full capitalization inclusive of engineering, design, permitting, and construction administration / management
- Costs derived from similar infrastructure projects, with adjustments for inflation, size, complexity, and location
- Construction cost opinions were developed in March 2024. Use 20-Cities Engineering News-Record (ENR) Construction Cost Index (CCI) March 2024 = 13532.01 to escalate estimated cost to present value
- Cost opinions are "planning-level" and may not fully account for site-specific conditions or design decisions
- Construction contingency was estimated at 30 percent of total construction costs
- Engineering design services was estimated at 15 percent of total construction costs
- Project administration and construction management together was estimated at 15 percent of total construction costs
- All costs rounded to the nearest $1000

**Table 11-2** contains the unit construction costs for gravity collection system improvements and factors for estimating the non-construction costs associated with infrastructure improvement projects such as engineering design, project administration, and contingency to arrive at a total project cost.

DRAFT

| Table 11-2: Pipeline Unit Construction Costs | | |
|---|---|---|
| **Pipeline Installation** | **Budgetary Unit Cost** | **Unit** |
| 8-inch | $254 | LF |
| 10-inch | $317 | LF |
| 12-inch | $343 | LF |
| 15-inch | $454 | LF |
| 18-inch | $523 | LF |
| 21-inch | $565 | LF |
| 24-inch | $639 | LF |
| 27-inch | $729 | LF |
| 30-inch | $829 | LF |
| 36-inch | $956 | LF |
| **Non-Construction Costs** | | |
| Construction Contingency | 30% | |
| Engineering Design | 15% | |
| Administration and Construction Management | 15% | |

Notes:
1. The budgetary unit costs presented above represent the construction cost only and do not include contingency or other non-construction costs.
2. Pipeline costs are based on work in existing streets and include excavation, installation, backfill, pavement repair, upstream and downstream manholes, manholes spaced at 300 ft where needed, traffic control, and connection of existing laterals to new pipe. Cost does not include bypassing.
3. LF = linear foot

### 11.1.4 Project Prioritization and Scheduling

Each project was evaluated and ranked to determine the significance of the improvement and provide the City with a systematic method to assign priorities for each project. For each collection system pipeline, lift station, and WRF project, a priority point scale from 1 to 4 was assigned based on whether it resolved an existing capacity deficiency, near-term capacity deficiency, improved system efficiency/operations, or resolved an ultimate (build-out) capacity deficiency. The priority scale and scheduling projects is summarized in **Table 11-3**.

| Table 11-3: Project Ranking | |
|---|---|
| **Priority** | **Description** |
| 1 | Required to resolve existing **significant** capacity or condition-based deficiency and recommended for implementation within the next 1 - 3 years from the adoption of the Master Plan |
| 2 | Required to resolve **less significant** existing capacity or condition-based deficiency and recommended for implementation within the next 3 - 5 years from the adoption of the Master Plan |
| 3 | Required to resolve near-term capacity deficiency and recommended for implementation within the next 5 - 10 years from the adoption of the Master Plan |
| 4 | Required to meet ultimate capacity deficiency and recommended for implementation past 10 years from the adoption of the Master Plan and/or dependent on development status |

DRAFT

## 11.2 Capital Improvement Plan Projects

CIP projects are based on the hydraulic, treatment, and condition-based evaluations completed for the Master Plan and were organized into four project categories based on infrastructure type. These categories include the following:

- Gravity Collection System
- Lift Station Facilities
- Water Recycling Facility

CIP projects that involved equipment replacement considered energy efficiency in the selection process.

### 11.2.1 Gravity Collection System Projects – Capacity Based

The following improvements address capacity deficiencies throughout the existing gravity collection system to serve existing flow conditions:

- *Acacia Road and Acacia Way Gravity Sewer Improvement:* Upgrade a total of 460 linear feet of 24-inch diameter pipeline with 36-inch and 30-inch diameter pipeline.
- *California Street and East Ventura Street Gravity Sewer Improvement:* Upgrade a total of 260 linear feet of 12-inch diameter pipeline to 15-inch diameter pipeline.
- *East Harvard Gravity Sewer Improvement:* Upgrade a total of 1,680 linear feet of 10-inch diameter pipeline to 12-inch diameter pipeline.
- *Elm Street, West Main Street, and Blanchard Elementary School Gravity Sewer Improvement:* Upgrade a total of 1,665 linear feet of 8-inch and 10-inch diameter pipeline to 12-inch and 15-inch diameter pipeline.
- *East Main Street Gravity Sewer Improvement:* Upgrade a total of 1,210 linear feet of 10-inch diameter pipeline to 12-inch diameter pipeline.
- *North 4th Street Gravity Sewer Improvement:* Upgrade a total of 460 linear feet of 8-inch diameter pipeline to 10-inch diameter pipeline.
- *North Ojai Street Gravity Sewer Improvement:* Upgrade a total of 980 linear feet of 8-inch diameter pipeline to 10-inch diameter pipeline.
- *East Santa Barbara Street Gravity Sewer Improvement:* Upgrade a total of 800 linear feet of 8-inch diameter pipeline to 10-inch diameter pipeline.
- *Ojai Road Gravity Sewer Improvement:* Upgrade a total of 1,615 linear feet of 8-inch diameter pipeline to 10-inch diameter pipeline.

DRAFT

The following improvements address capacity deficiencies throughout the existing gravity collection system to serve near-term flow conditions:

- *Acacia Way Gravity Sewer Improvement:* Upgrade a total of 250 linear feet of 24-inch diameter pipeline to 30-inch diameter pipeline
- *North 4th Street Gravity Sewer Improvement:* Upgrade a total of 175 linear feet of 8-inch diameter pipeline to 10-inch diameter pipeline

The following improvements address capacity deficiencies throughout the existing gravity collection system to serve ultimate flow conditions:

- *Acacia Way Gravity Sewer Improvement:* Upgrade a total of 170 linear feet of 30-inch diameter pipeline to 36-inch diameter pipeline.
- *Acacia Road and West Harvard Boulevard Gravity Sewer Improvement:* Upgrade a total of 585 linear feet of 24-inch diameter pipeline to 27-inch diameter pipeline. This project is located along a section of the City's existing system that underwent recent improvements to rehabilitate the pipeline and improve sewer slopes. This project is designated as a lower priority project and is intended to address a deficiency that exists only during peak hour wet weather flow and ultimate buildout scenario.
- *East Harvard Boulevard Gravity Sewer Improvement:* Upgrade a total of 265 linear feet of 12-inch diameter pipeline to 15-inch diameter pipeline.
- *Walden Street and West Santa Paula Street Gravity Sewer Improvement:* Upgrade a total of 1,815 linear feet of 8-inch diameter pipeline to 10-inch diameter pipeline.
- *Blanchard Elementary School Gravity Sewer Improvement:* Upgrade a total of 195 linear feet of 8-inch diameter pipeline to 10-inch diameter pipeline.
- *East Harvard Boulevard Gravity Sewer Improvement:* Upgrade a total of 125 linear feet of 12-inch diameter pipeline to 15-inch diameter pipeline.
- *Santa Clara Street Gravity Sewer Improvement:* Upgrade a total of 695 linear feet of 12-inch diameter pipeline to 15-inch diameter pipeline.

### 11.2.2 Lift Station Facility Projects – Condition Based

Based on the condition assessment completed by MKN, several recommended improvements to address current physical deficiencies and improve facility operations were identified for the existing lift stations. The following provides a brief description of the recommended improvements for the City's lift stations:

DRAFT

- *Harvest Lift Station Rehabilitation:* Repair coatings within wet well to reduce the presence of hydrogen sulfide.
- *Lemonwood Lift Station Replacement:* Replace existing lift station pumps, piping, controls, and instrumentation. In addition, make improvements to site security and access.
- *Harding Park Lift Station Rehabilitation:* Repair leaking conduit penetration.

### 11.2.3 Water Recycling Facility Projects – Capacity and Condition Based

Based on the hydraulic and treatment evaluations completed by MKN, several recommended improvements to address these deficiencies were identified. The following provides a brief description of the recommended improvements at the WRF:

- *Headworks Screening:* Fine screening upgrade includes replacing the existing fine screening system with a larger system in order to meet near-term and ultimate flow conditions when one headworks train is not in use.
- *Flow Equalization:* Install additional flow equalization basin to meet anticipated permit requirements and/or increase in flow based on future developments within the City.
- *Membrane basins expansion:* Installation of additional membrane modules in MBR Basins 7 and 8 to increase capacity to handle ultimate flow and load conditions.

Based on the condition assessment completed by MKN, several recommended improvements to address existing physical deficiencies and improve facility operations were identified. The following provides a brief description of the recommended improvements at the WRF:

- *Preliminary Treatment:*
  - Influent pump station pump improvements including replacing and installing (4) new pumps; mounting components and guide rails; and installing controls and alarms.
  - Influent pump station structural improvements including performing concrete and coating rehabilitation.
  - Grit classifier replacement including replacing #2 grit classifier and appurtenances and reconnection to existing piping and its supports.
  - Screen discharge chute replacement.
- *Flow Equalization:* Flow equalization basin improvements including repairing concrete weir to give "knife's edge" and replacing aluminum and orange grating.
- *Site Improvement Projects:*

DRAFT

- Controls and headworks/dewatering building repairs and improvements including replacing all lighting, windows, window screens, and locks, and repair paint site-wide.
- Decorative pond rehabilitation including removing sludge; fixing leaks; and replacing exhaust fan, lights, transformer and sump pumps.
- Remove and replace security fencing around perimeter of WRF.
- Landscaping upgrades to improve WRF aesthetics.
- Repair concrete cracks and spalling around building exteriors.

❑ *Major Service and Replacement for Mechanical Equipment:* See **Appendix J** for the annual major service and replacement budget.

### 11.2.4 Operations and Maintenance Projects

The following **Table 11-4** identifies potential projects that the City could implement to efficiently operate and manage the existing sewer collection and WRF.

**Table 11-4: Operation and Maintenance Projects Allowance**

| Project | Improvement Name | Description | Frequency | Opinion of Cost ($) |
|---|---|---|---|---|
| OM-1 | Updating the City Geographic Information System (GIS) | Update model with field survey data | One Time | $35,000 |
| OM-2 | Hydraulic Model Maintenance | Complete updates of existing water GIS and hydraulic model | Annual | $10,000 |
| OM-3 | CIP Evaluation | Review, update, and prioritize CIP | Annual | $10,000 |
| OM-4 | Master Plan Update | Prepare master plan update | Every 5 Years | $150,000 |
| OM-5 | Wet Weather Flow Monitoring Study | Verify wet weather conditions for pipeline capacity deficiencies | One Time | $100,000 |
| OM-6 | Crane Load Certification | Annual allowance | Annual | $3,000 |
| OM-7 | Tool Purchases | Annual allowance | Annual | $1,500 |
| OM-8 | Generator and Transfer Switch Servicing | Annual allowance | Annual | $20,000 |
| OM-9 | Basin Cleaning | Performed every 5 years | Every 5 Years | $600,000 |
| OM-10 | Decorative Pond Maintenance | Includes weed abatement, sludge removal, etc. under an annual allowance | Annual | $20,000 |
| | | | **Total** | **$949,500** |

Notes:
1. OM = Operation and Maintenance Project
2. N/A = Not Applicable
3. Costs rounded to the nearest $1,000

Operation and maintenance projects were not included in the CIP cost summary table.

DRAFT

### 11.2.5 Capital Improvement Summary

**Table 11-5** provides an overall summary of the probable costs associated with existing and future gravity collection system, lift station facility, water recycling facility, and operations and maintenance CIPs. Active CIPs currently approved by the City for the WRF are also included in the table below.

| Table 11-5: CIP Cost Summary | |
|---|---|
| **Improvement** | **Estimated Project Cost** |
| **Gravity Collection System** | |
| Priority 1 | $2,722,000 |
| Priority 2 | $2,627,000 |
| Priority 3 | $424,000 |
| Priority 4 | $2,763,000 |
| **Subtotal** | **$8,536,000** |
| **Lift Station** | |
| Priority 1 | $0 |
| Priority 2 | $272,000 |
| Priority 3 | $0 |
| Priority 4 | $0 |
| **Subtotal** | **$272,000** |
| **Water Recycling Facility** | |
| Priority 1 | $10,225,000 |
| Priority 2 | $1,672,000 |
| Priority 3 | $3,590,000 |
| Priority 4 | $3,200,000 |
| **Subtotal** | **$18,687,000** |
| | |
| **Total** | **$27,495,000** |

DRAFT

Under the proposed CIP, the City will spend a total of approximately $27.5 million over the next 15-year planning period (City buildout) to fund existing and future gravity collection system projects (31%), lift station facility projects (1%), and water recycling facility projects (68%). **Table 11-6** through **Table 11-8** provide a summary of all recommended CIP projects with project categorization, project type, description, planning-level cost, and prioritization scoring. **Figure 11-1** identifies the locations of each gravity collection system and lift station facility project throughout the District's system. **Table 11-9** provides a schedule for the 15-year CIP.

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

| Table 11-6: Collection System Capital Improvements | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project | Improvement Name | Limits | Improvement No. | Existing Facility | Deficiency | | Capital Improvement Project (CIP) | | Priority Scale | Construction Cost ($) | Engineering, Project Administration, and Construction Management ($) | Construction Contingency Cost ($) | Opinion of Cost ($) |
| | | | | Diameter (inches) | PHDWF d/D | PHWWF d/D | Diameter (inches) | Length (feet) | | | | | |
| Prioriy 1 | | | | | | | | | | | | | |
| EX-GSCIP-1 | Acacia Road Gravity Sewer Improvement | 536 Acacia Way | I-EX-3 & I-ULT-2 | 24 | 68 | 87 | 36 | 45 | 1 | $44,000 | $14,000 | $14,000 | $72,000 |
| | | 536 Acacia Way to Acacia Rd Intersection | I-EX-4 | 24 | 68 | 89 | 30 | 75 | | $63,000 | $19,000 | $19,000 | $101,000 |
| | Acacia Way Gravity Sewer Improvement | Acacia Way to W Santa Maria St | I-EX-5 & I-ULT-5 | 24 | N/A | 83 | 30 | 340 | | $282,000 | $85,000 | $85,000 | $452,000 |
| EX-GSCIP-2 | California Street Gravity Sewer Improvement | 206 California St to E Ventura St | I-EX-1 | 12 | 69 | 83 | 15 | 180 | 1 | $82,000 | $25,000 | $25,000 | $132,000 |
| | East Ventura Street Gravity Sewer Improvement | California St to Green St | I-EX-2 | 12 | 72 | 100 | 15 | 80 | | $37,000 | $12,000 | $12,000 | $61,000 |
| EX-GSCIP-3 | East Harvard Boulevard Gravity Sewer Improvement | S Mill St to S 12th St | I-EX-7 | 10 | 62 | 95 | 12 | 1680 | 1 | $577,000 | $174,000 | $174,000 | $925,000 |
| EX-GSCIP-4 | Elm Street Gravity Sewer Improvement | W Harvard Blvd to 220 Elm St | I-EX-8 & I-ULT-8 | 8 | 63 | 84 | 12 | 525 | 1 | $181,000 | $55,000 | $55,000 | $291,000 |
| | | 220 Elm St to W Main St | I-EX-9 & I-ULT-9 | 10 | 58 | 79 | 15 | 100 | | $46,000 | $14,000 | $14,000 | $74,000 |
| | West Main Street Gravity Sewer Improvement | Elm St to 700 W Main St | I-EX-10 & I-ULT-10 | 10 | 65 | 91 | 15 | 210 | | $96,000 | $29,000 | $29,000 | $154,000 |
| | Blanchard Elementary School Gravity Sewer Improvement | W Main St to Blanchard Elementary School | I-EX-11 & I-ULT-11 | 10 | 65 | 99 | 12 | 520 | | $179,000 | $54,000 | $54,000 | $287,000 |
| | | Blanchard Elementary School | I-EX-12 & I-ULT-12 | 8 | 59 | N/A | 12 | 110 | | $38,000 | $12,000 | $12,000 | $62,000 |
| | | Blanchard Elementary School to Pamela Ct | I-EX-13 | 10 | 57 | 100 | 12 | 200 | | $69,000 | $21,000 | $21,000 | $111,000 |
| | | | | | | | | | | | | Subtotal | $2,722,000 |
| Prioriy 2 | | | | | | | | | | | | | |
| EX-GSCIP-5 | East Main Street Gravity Sewer Improvement | Davis St to N Ojai St | I-EX-6 | 10 | 61 | 89 | 12 | 1210 | 2 | $416,000 | $125,000 | $125,000 | $666,000 |
| EX-GSCIP-6 | North 4th Street Gravity Sewer Improvement | 122 N 4th St to E Santa Barbara St | I-EX-17 | 8 | 56 | N/A | 10 | 460 | 2 | $146,000 | $44,000 | $44,000 | $234,000 |
| EX-GSCIP-7 | North Ojai Street Gravity Sewer Improvement | Railroad Avenue to Ojai Road | I-EX-14 | 8 | 62 | 77 | 10 | 980 | 2 | $311,000 | $94,000 | $94,000 | $499,000 |
| EX-GSCIP-8 | East Santa Barbara Street Gravity Sewer Improvement | N 5th St to N 7th St | I-EX-15 | 8 | 57 | 76 | 10 | 800 | 2 | $254,000 | $77,000 | $77,000 | $408,000 |
| EX-GSCIP-9 | Ojai Road Gravity Sewer Improvement | N Ojai St to 604 Ojai Rd | I-EX-16 | 8 | 59 | N/A | 10 | 1615 | 2 | $512,000 | $154,000 | $154,000 | $820,000 |
| | | | | | | | | | | | | Subtotal | $2,627,000 |

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Prioriy 3** | | | | | | | | | | | | | |
| NT-GSCIP-1 | Acacia Way Gravity Sewer Improvement | Acacia Rd to Santa Rosa Loop | I-NT-1 & I-ULT-3 | 24 | N/A | 84 | 30 | 250 | 3 | $208,000 | $63,000 | $63,000 | $334,000 |
| NT-GSCIP-2 | North 4th Street Gravity Sewer Improvement | E Main St to 122 N 4th S | I-NT-2 | 8 | 57 | N/A | 10 | 175 | 3 | $56,000 | $17,000 | $17,000 | $90,000 |
| | | | | | | | | | | | | **Subtotal** | **$424,000** |
| **Prioriy 4** | | | | | | | | | | | | | |
| ULT-GSCIP-1 | Acacia Way Gravity Sewer Improvement | Shell Rd to 536 Acacia Way | I-ULT-1 | 30 | N/A | 82 | 36 | 170 | 4 | $163,000 | $49,000 | $49,000 | $261,000 |
| ULT-GSCIP-2 | Acacia Road Gravity Sewer Improvement | 312 Acacia Road to West | I-ULT-6 | 24 | N/A | 83 | 27 | 150 | 4 | $110,000 | $33,000 | $33,000 | $176,000 |
| | West Harvard Boulevard Gravity Sewer Improvement | Acacia Road to Elm Street | I-ULT-7 | 24 | N/A | 86 | 27 | 435 | | $318,000 | $96,000 | $96,000 | $510,000 |
| ULT-GSCIP-3 | East Harvard Boulevard Gravity Sewer Improvement | California St to Brent Way | I-ULT-16 | 12 | 57 | N/A | 15 | 265 | 4 | $121,000 | $37,000 | $37,000 | $195,000 |
| ULT-GSCIP-4 | Walden Street Gravity Sewer Improvement | Filmore St to W Santa Paula St | I-ULT-14 | 8 | 67 | 99 | 10 | 1080 | 4 | $343,000 | $103,000 | $103,000 | $549,000 |
| | West Santa Paula Street Gravity Sewer Improvement | Walden St to N Peck Rd | I-ULT-15 | 8 | 65 | 100 | 10 | 735 | | $233,000 | $70,000 | $70,000 | $373,000 |
| ULT-GSCIP-5 | Blanchard Elementary School Gravity Sewer Improvement | Blanchard Elementary School to Fillmore St | I-ULT-13 | 8 | 63 | 87 | 10 | 195 | 4 | $62,000 | $19,000 | $19,000 | $100,000 |
| ULT-GSCIP-6 | East Harvard Boulevard Gravity Sewer Improvement | S 12th St to 1211 Harvard Blvd | I-ULT-17 | 12 | 57 | N/A | 15 | 125 | 4 | $57,000 | $18,000 | $18,000 | $93,000 |
| ULT-GSCIP-7 | Santa Clara Street Gravity Sewer Improvement | Santa Clara Street | I-ULT-4 | 12 | 56 | N/A | 15 | 695 | 4 | $316,000 | $95,000 | $95,000 | $506,000 |
| | | | | | | | | | | | | **Subtotal** | **$2,763,000** |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | **Total** | **$8,536,000** |

Notes:
1. EX-GSCIP = Existing Gravity Sewer Capital Improvement Project
2. NT-GSCIP = Near-Term Gravity Sewer Capital Improvement Project
3. ULT-GSCIP = Ultimate Gravity Sewer Capital Improvement Project
4. PHDWF = Peak Hour Dry Weather Flow
5. PHWWF = Peak Hour Wet Weather Flow
6. "N/A" deficiency indicates no deficiency for the given flow condition
7. Costs rounded to the nearest $1,000
8. Engineering, project administration, and construction management costs estimated at 30%. Construction contingency estimated at 30%
9. Construction cost opinions were developed in March 2024. Use 20-Cities Engineering News-Record (ENR) Construction Cost Index (CCI) March 2024 = 13532.01 to escalate estimated cost to present value

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

| Table 11-7: Lift Station Capital Improvements | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Project | Improvement Name | Deficiency | Capital Improvement Project (CIP) | | Construction Cost ($) | Engineering, Project Administration, and Construction Management ($) | Contingency Cost ($) | Opinion of Cost ($) |
| Priority 1 | | | | | | | | |
| - | - | - | - | - | - | - | - | $0 |
| | | | | | | | Subtotal | $0 |
| Priority 2 | | | | | | | | |
| EX-LSCIP-1 | Harvest Lift Station Improvements | Metal piping and coatings in wet well are corroded due to H2S issue despite being a new site (~ 3 yrs old). | Repair coatings within wet well; mitigate H2S. | 2 | $50,000 | $15,000 | $15,000 | $80,000 |
| EX-LSCIP-2 | Lemonwood Lift Station Replacement | Aged equipment, minor wet well corrosion, pavement issues, trespassing issues. | Replace pumps and piping, controls and instrumentation, site security and access improvements. | 2 | $100,000 | $30,000 | $30,000 | $160,000 |
| EX-LSCIP-3 | Harding Park Lift Station Improvements | Control panel housing room has leak in roof penetration, causing water to | Repair leaking conduit penetration. | 2 | $20,000 | $6,000 | $6,000 | $32,000 |
| | | | | | | | Subtotal | $272,000 |
| Priority 3 | | | | | | | | |
| - | - | - | - | - | - | - | - | $0 |
| | | | | | | | Subtotal | $0 |
| Priority 4 | | | | | | | | |
| - | - | - | - | - | - | - | - | $0 |
| | | | | | | | Subtotal | $0 |
| | | | | | | | | |
| | | | | | | | Total | $272,000 |

Notes:
1. EX-LSCIP = Existing Lift Station Capital Improvement Plan
2. Costs rounded to the nearest $1,000
3. Engineering, project administration, and construction management costs estimated at 30%. Construction contingency estimated at 30%
4. Construction cost opinions were developed in March 2024. Use 20-Cities Engineering News-Record (ENR) Construction Cost Index (CCI) March 2024 = 13532.01 to escalate estimated cost to present value

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

**Table 11-8: Water Recycling Facility Capital Improvements**

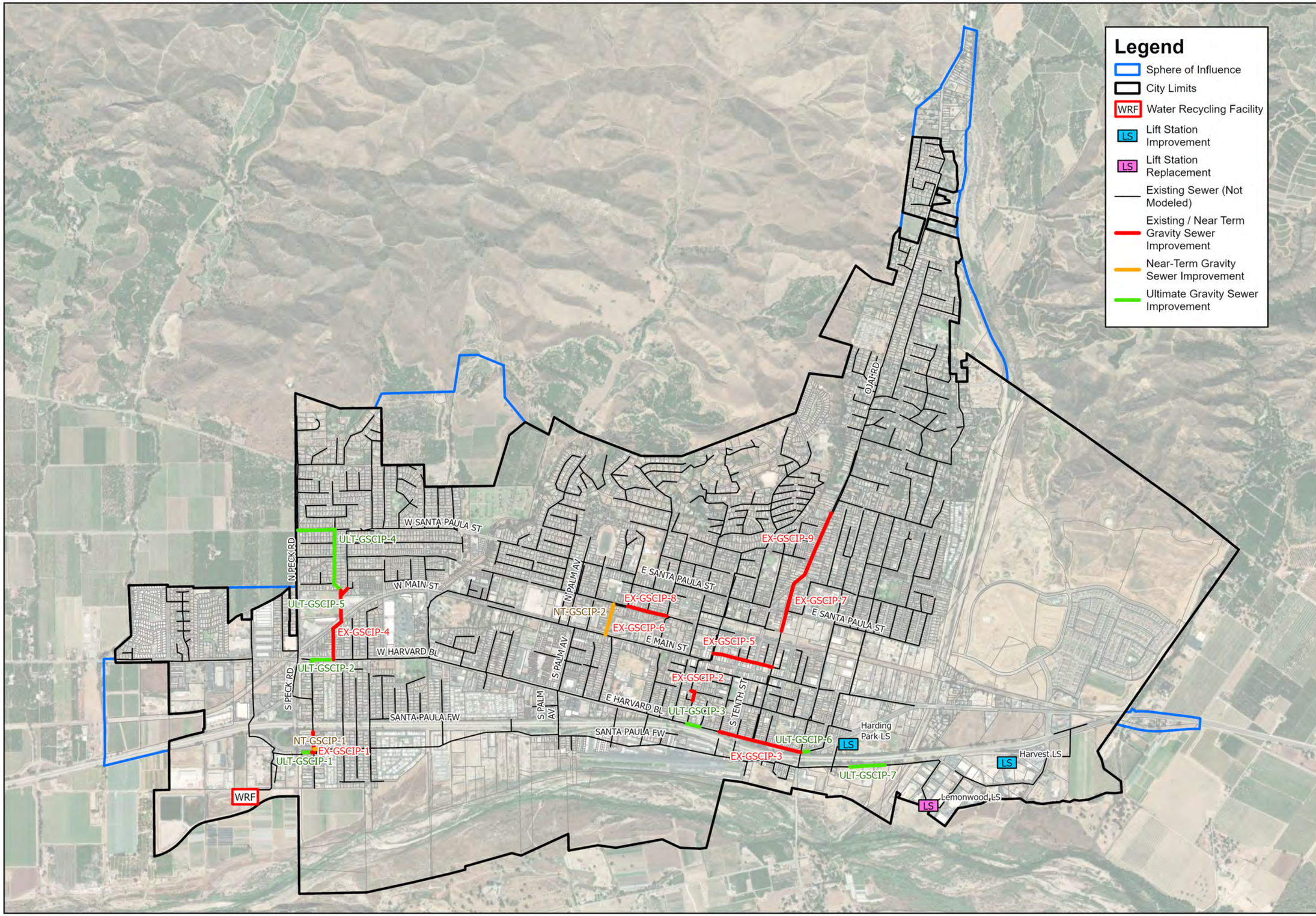
| Project | Improvement Name | Existing Facility | Deficiency | Capital Improvements Project (CIP) | Priority Scale | Construction Cost ($) | Engineering, Project Administration, and Construction Management ($) | Contingency Cost ($) | Opinion of Cost ($) |
|---|---|---|---|---|---|---|---|---|---|
| **Priority 1** | | | | | | | | | |
| EX-WRFCIP-1 (WRF-CIP-9383) | WRF Blower Replacement | (4) Aeration Blowers, (3) Membrane Blowers, (3) Digester Blowers | Existing blowers nearing end of design life and have required multiple major servicing or repairs. | Install new blowers via a 7-year blower replacement program. | 1 | - | - | - | $1,750,000 |
| EX-WRFCIP-2 | Grit Classifier Replacement | (2) 11" screw classifiers | #2 Grit Classifier failing, visible corrosion, wear plates missing. | Replace and install #2 Grit Classifier and appurtenances, reconnect to existing piping and its supports. | 1 | $250,000 | $75,000 | $75,000 | $400,000 |
| EX-WRFCIP-3 | UV Disinfection Rehabilitation | (2) UV Disinfection Trains | Lamps shattered and past design life. | Replace lamp modules at each train. | 1 | $40,000 | $12,000 | $12,000 | $64,000 |
| EX-WRFCIP-4 | Screw Press Redundancy Implementation | (1) Screw dewatering press | Lack of redundancy in the screw press. | Install additional screw press unit to provide redundancy and enhance operational reliability. | 1 | $800,000 | $240,000 | $240,000 | $1,280,000 |
| EX-WRFCIP-5 | Coating Repairs | Influent Channel, Aeration and MBR Tanks | Existing protective coatings are worn and deteriorated. | Remove and replace protective coatings across influent channel, aeration and MBR tanks. Coatings applied will be designed to resist corrosion, abrasion, and chemical exposure. | 1 | $1,000,000 | $300,000 | $300,000 | $1,600,000 |
| EX-WRFCIP-6 | Security Fencing and Landscaping Improvements | WRF Perimeter | Security fencing allows for easy unauthorized access. Landscaping's current appearance detracts from surrounding neighborhoods visual appeal. | Remove existing fencing and install new security barriers. Upgrade landscaping features to improve aesthetics of facility surroundings. | 1 | $150,000 | $45,000 | $45,000 | $240,000 |
| EX-WRFCIP-7 | Supervisory Control and Data Acquisition (SCADA) Computer Upgrades | WRF | Current SCADA computers have performance issues, including slow operation and insufficient memory capacity. | Replace outdated SCADA computers with modern hardware and software to address deficiencies. | 1 | $100,000 | $30,000 | $30,000 | $160,000 |
| EX-WRFCIP-8 (WRF-CIP-9379) | Enhanced Aeration Control - Ammonia Analyzer | (3) Aerobic Basins | Excess power consumption and ammonia emissions. | Upgrading and installing the analyzer equipment will reduce energy and chemical consumption. | 1 | - | - | - | $241,000 |
| | | | | | | | | **Subtotal** | **$5,735,000** |
| **Priority 2** | | | | | | | | | |
| EX-WRFCIP-9 | Influent Pump Station Pump Replacement | (4) 45-HP pumps with VFDs | Pumps are past design life. | Replace (4) pumps, mounting components and guide rails. Install controls and alarms. | 2 | $2,500,000 | $750,000 | $750,000 | $4,000,000 |
| EX-WRFCIP-10 | Coarse and Fine Screening Repairs | (2) Fine Screens, (2) Coarse Screens | Discharge chutes damaged and covered with duct tape. Stainless steel enclosures in poor shape. | Replace discharge chutes and screening enclosures. | 2 | $50,000 | $15,000 | $15,000 | $80,000 |
| EX-WRFCIP-11 | Permeate Pumps and SCADA Improvements | (6) Permeate Pumps | Pumps are nearing end of design life. | Evaluate and rebuild permeate pumps, implement controls/SCADA modifications. | 2 | $850,000 | $255,000 | $255,000 | $1,360,000 |
| EX-WRFCIP-12 | Hardscape Rehabilitation | WRF | Spalling and cracks to buildings exterior surface concrete. | Repair concrete cracks and spalling around building exteriors. | 2 | $100,000 | $30,000 | $30,000 | $160,000 |
| EX-WRFCIP-13 | Influent Channel Structural Improvements | Concrete Wet Well | Manhole cover and ring worn at influent metering station. Aluminum covers for influent channel to the anoxic basins in poor condition. | Replace and install new manhole cover and ring and aluminum covers. | 2 | $100,000 | $30,000 | $30,000 | $160,000 |
| EX-WRFCIP-14 | Flow Equalization Basin Improvements | (2) Surge Equalization Basins | Equalization storage and reintroduction to flow stream is a manual process. Equalization weirs worn, grating damaged, and intermittent corrosion to conduit was observed. | Implement automated SCADA system for basins to automate functionality, repair concrete weir to give "knife's edge". Replace aluminum and orange grating. | 2 | $300,000 | $90,000 | $90,000 | $480,000 |
| EX-WRFCIP-15 | Percolation Pond Rehabilitation | (3) Percolation ponds | Liner degradation, weed overgrowth, and irrigation system issues in the ponds. | Remove and replace existing liners. Implement effective weed control measures. Conduct assessment of irrigation system, repairing or replacing damaged components. | 2 | $450,000 | $135,000 | $135,000 | $720,000 |
| EX-WRFCIP-16 | Building Repairs and Improvements | Controls and Headworks/Dewatering Buildings | Buildings do not have sufficient insulation, lack of lighting, exterior doors and locks in poor shape, paint has worn, windows and screens are damaged, smoke detector system in need of upgrades. | Install roof insulation; replace all lighting, windows and window screens; repair paint plantwide; replace exterior doors and locks. | 2 | $175,000 | $52,500 | $52,500 | $280,000 |
| EX-WRFCIP-17 | Decorative Pond Rehabilitation | Decorative Pond | Water leaks into vault, faulty exhaust fan in vault, lack of lighting, sump pumps failing. | Fix vault leak, replace exhaust fan, install lights, replace/rebuild sump pumps. | 2 | $20,000 | $6,000 | $6,000 | $32,000 |
| | | | | | | | | **Subtotal** | **$7,272,000** |
| **Priority 3** | | | | | | | | | |
| **Project** | **Project Name** | **Existing Facility** | **Deficiency** | **Capital Improvements Project (CIP)** | **Priority Scale** | **Construction Cost ($)** | **Engineering, Project Administration, and Construction Management ($)** | **Contingency Cost ($)** | **Opinion of Cost ($)** |
| NT-WRFCIP-1 | Fine Screening Upgrades | (2) Fine Screens | Lack of redundancy at near-term and ultimate conditions with one headworks train out of service. | Upgrade current fine screening with a larger system in order to meet near-term and ultimate flow conditions with one headworks | 3 | $350,000.00 | $105,000.00 | $105,000.00 | $560,000 |
| NT-WRFCIP-2 | Equalization Basin Implementation | (2) Equalization Basins | Potential lack of influent storage in future buildout conditions. | Install additional equalization basin to act as an influent bypass to provide redundancy and ability to store extra flows. | 3 | $800,000 | $240,000 | $240,000 | $1,280,000 |
| | | | | | | | | **Subtotal** | **$1,840,000** |
| **Priority 4** | | | | | | | | | |
| ULT-WRFCIP-1 | Membrane System Expansion | (3) MBR Trains | Lack of redundancy at ultimate term conditions. | Install new membrane modules in MBR Basins 7 and 8. Extend the MBR feed channel into Basins 7 and 8 and install new permeate pumps, one MBR blower, and all supporting piping, electrical, and instrumentation system to provide redundancy at future buildout. | 4 | $2,000,000 | $600,000 | $600,000 | $3,200,000 |
| ULT-WRFCIP-2 (WRF-CIP-9379) | Gravity Belt Thickener Improvements | (2) Gravity Belt Thickener | Lack of redundancy in the gravity belt thickeners to handle anticipated increase at ultimate flows and loadings conditions. | Install additional gravity belt thickener to provide redundancy at ultimate flow conditions. | 4 | $400,000 | $120,000 | $120,000 | $640,000 |
| | | | | | | | | **Subtotal** | **$3,840,000** |
| | | | | | | | | **Total** | **$18,687,000** |

Notes:
1. EX-WRFCIP = Existing Water Recycling Facility Capital Improvement Project
1. NT-WRFCIP = Near-Term Water Recycling Facility Capital Improvement Project
1. ULT-WRFCIP = Ultimate Water Recycling Facility Capital Improvement Project
2. WRF-CIP = Water Recycling Facility Capital Improvement Project (Currently in City CIP)
3. Costs rounded to the nearest $1,000
4. Engineering, project administration, and construction management costs estimated at 30%. Construction contingency estimated at 30%
5. Construction cost opinions were developed in March 2024. Use 20-Cities Engineering News-Record (ENR) Construction Cost Index (CCI) March 2024 = 13532.01 to escalate estimated cost to present value

DRAFT

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT




City of Santa Paula

**City of Santa Paula**

**Wastewater Collection System and Water Recycling Facility Master Plan**

Figure 11-1:

Collection System CIP Project Locations

1 inch = 2,200 feet

0 1,100 2,200

mkn

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

| Table 11-9: 15-Year CIP Summary | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Project | Priority Scale | Opinion of Cost ($) | FY 25/26 | FY 26/27 | FY 27/28 | FY 28/29 | FY 29/30 | FY 30/31 | FY 31/32 | FY 32/33 | FY 33/34 | FY 34/35 | FY 35/36 | FY 36/37 | FY 37/38 | FY 38/39 | FY 39/40 |
| Collection System | | | | | | | | | | | | | | | | | |
| EX-GSCIP-1 | 1 | $625,000 | $125,000 | $500,000 | | | | | | | | | | | | | |
| EX-GSCIP-2 | 1 | $193,000 | $193,000 | | | | | | | | | | | | | | |
| EX-GSCIP-3 | 1 | $925,000 | | $185,000 | $740,000 | | | | | | | | | | | | |
| EX-GSCIP-4 | 1 | $979,000 | | $195,800 | $783,200 | | | | | | | | | | | | |
| EX-GSCIP-5 | 2 | $666,000 | | | | $133,200 | $532,800 | | | | | | | | | | |
| EX-GSCIP-6 | 2 | $234,000 | | | | $234,000 | | | | | | | | | | | |
| EX-GSCIP-7 | 2 | $499,000 | | | | | $499,000 | | | | | | | | | | |
| EX-GSCIP-8 | 2 | $408,000 | | | | | $408,000 | | | | | | | | | | |
| EX-GSCIP-9 | 2 | $820,000 | | | | | $164,000 | $656,000 | | | | | | | | | |
| NT-GSCIP-1 | 3 | $334,000 | | | | | | | | $334,000 | | | | | | | |
| NT-GSCIP-2 | 3 | $90,000 | | | | | | | | $90,000 | | | | | | | |
| ULT-GSCIP-1 | 4 | $261,000 | | | | | | | | | | | $261,000 | | | | |
| ULT-GSCIP-2 | 4 | $686,000 | | | | | | | | | | | $137,200 | $548,800 | | | |
| ULT-GSCIP-3 | 4 | $195,000 | | | | | | | | | | | $195,000 | | | | |
| ULT-GSCIP-4 | 4 | $922,000 | | | | | | | | | | | | $184,400 | $737,600 | | |
| ULT-GSCIP-5 | 4 | $100,000 | | | | | | | | | | | $100,000 | | | | |
| ULT-GSCIP-6 | 4 | $93,000 | | | | | | | | | | | $93,000 | | | | |
| ULT-GSCIP-7 | 4 | $506,000 | | | | | | | | | | | $101,200 | $404,800 | | | |
| | Subtotal | $8,536,000 | $318,000 | $880,800 | $1,523,200 | $367,200 | $1,603,800 | $656,000 | $0 | $424,000 | $0 | $0 | $887,400 | $1,138,000 | $737,600 | $0 | $0 |
| Lift Station | | | | | | | | | | | | | | | | | |
| EX-LSCIP-1 | 2 | $80,000 | | | | | $80,000 | | | | | | | | | | |
| EX-LSCIP-2 | 2 | $160,000 | | | | | $160,000 | | | | | | | | | | |
| EX-LSCIP-3 | 2 | $32,000 | | | | | $32,000 | | | | | | | | | | |
| | Subtotal | $272,000 | $0 | $0 | $0 | $0 | $272,000 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| Water Recycling Facility | | | | | | | | | | | | | | | | | |
| EX-WRFCIP-1 (WRF-CIP-9383) | 1 | $1,750,000 | $250,000 | $250,000 | $250,000 | $250,000 | $250,000 | $250,000 | $250,000 | | | | | | | | |
| EX-WRFCIP-2 | 1 | $400,000 | $400,000 | | | | | | | | | | | | | | |
| EX-WRFCIP-3 | 1 | $64,000 | $64,000 | | | | | | | | | | | | | | |
| EX-WRFCIP-4 | 1 | $1,280,000 | $256,000 | $1,024,000 | | | | | | | | | | | | | |
| EX-WRFCIP-5 | 1 | $1,600,000 | | | $320,000 | $1,280,000 | | | | | | | | | | | |
| EX-WRFCIP-6 | 1 | $240,000 | $240,000 | | | | | | | | | | | | | | |
| EX-WRFCIP-7 | 1 | $160,000 | | $160,000 | | | | | | | | | | | | | |
| EX-WRFCIP-8 (WRF-CIP-9379) | 1 | $241,000 | | | | $241,000 | | | | | | | | | | | |
| EX-WRFCIP-9 | 2 | $4,000,000 | | | | | | $800,000 | $1,600,000 | $1,600,000 | | | | | | | |
| EX-WRFCIP-10 | 2 | $80,000 | | | | $80,000 | | | | | | | | | | | |
| EX-WRFCIP-11 | 2 | $1,360,000 | | | | | $272,000 | $1,088,000 | | | | | | | | | |
| EX-WRFCIP-12 | 2 | $160,000 | | | | $160,000 | | | | | | | | | | | |
| EX-WRFCIP-13 | 2 | $160,000 | | | | $160,000 | | | | | | | | | | | |
| EX-WRFCIP-14 | 2 | $480,000 | | | | | $480,000 | | | | | | | | | | |
| EX-WRFCIP-15 | 2 | $720,000 | | | | | | | $144,000 | $576,000 | | | | | | | |
| EX-WRFCIP-16 | 2 | $280,000 | | | | | | | $280,000 | | | | | | | | |
| EX-WRFCIP-17 | 2 | $32,000 | | | | | | | $32,000 | | | | | | | | |
| NT-WRFCIP-1 | 3 | $560,000 | | | | | | | | | $560,000 | | | | | | |
| NT-WRFCIP-2 | 3 | $1,280,000 | | | | | | | | | $256,000 | $1,024,000 | | | | | |
| ULT-WRFCIP-1 | 4 | $3,200,000 | | | | | | | | | | | | | $1,066,667 | $1,066,667 | $1,066,667 |
| ULT-WRFCIP-2 (WRF-CIP-9379) | 4 | $640,000 | | | | | | | | | | | | | | $640,000 | |
| | Subtotal | $18,687,000 | $1,210,000 | $1,434,000 | $570,000 | $2,171,000 | $1,002,000 | $2,138,000 | $2,306,000 | $2,176,000 | $816,000 | $1,024,000 | $0 | $0 | $1,066,667 | $1,706,667 | $1,066,667 |
| | | | | | | | | | | | | | | | | | |
| | Total | $27,495,000 | $1,528,000 | $2,314,800 | $2,093,200 | $2,538,200 | $2,877,800 | $2,794,000 | $2,306,000 | $2,600,000 | $816,000 | $1,024,000 | $887,400 | $1,138,000 | $1,804,267 | $1,706,667 | $1,066,667 |

| Priority | Description |
|---|---|
| 1 | Required to resolve existing **significant** capacity or condition-based deficiency and recommended for implementation within the next 1 - 3 years from the adoption of the Master Plan |
| 2 | Required to resolve **less significant** existing capacity or condition-based deficiency and recommended for implementation within the next 3 - 5 years from the adoption of the Master Plan |
| 3 | Required to resolve near-term capacity deficiency and recommended for implementation within the next 5 - 10 years from the adoption of the Master Plan |
| 4 | Required to meet ultimate capacity deficiency and recommended for implementation past 10 years from the adoption of the Master Plan and/or dependent on development status |

THIS PAGE LEFT INTENTIONALLY BLANK

DRAFT

# Appendix A – Flow Monitoring Study

DRAFT

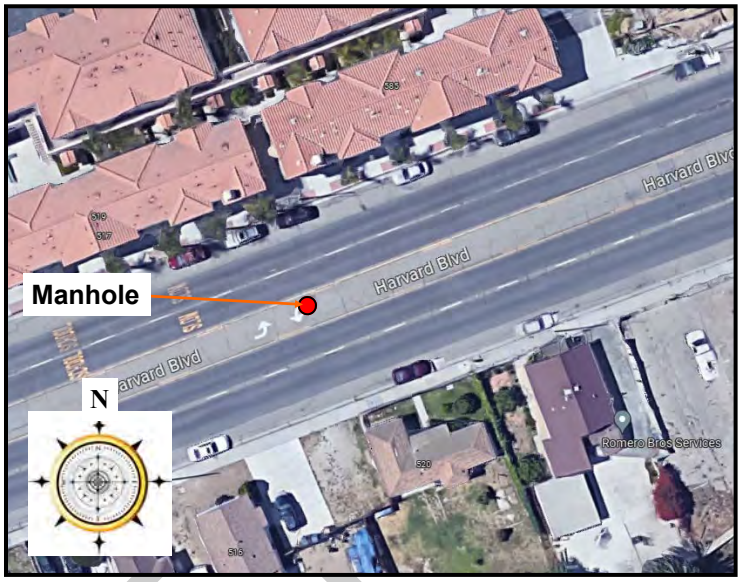
# CITY OF SANTA PAULA - SEWER FLOW STUDY

MH Location: **520 Harvard Blvd.**
**Santa Paula, CA 93060**

Pipe Size: **18" VCP**

Time Period: **7/11/2023 - 12:00 a.m. to**
**7/25/2023- 12:00 a.m.**

GPS: **34.348436, -119.065191**




## Manhole - Layout

- Manhole walls are made of stacked brick and mortar. Pipe transitions are in good condition inside of manhole
- Meter was placed inside downstream pipe in order to capture the flow from the tie in.

## Equipment

**Teledyne Isco 2150 Area Velocity Flow Meter with 10' measuring range:**
**Level Measurement:**

- Method - Submerged pressure transducer mounted in the flow stream
- Transducer Type - Differential linear integrated circuit pressure transducer
- Range (standard) 0.033 to 10 ft (0.010 to 3.05 m); Maximum Allowable Level 34 ft (10.5 m)
- Accuracy ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m,)
- Long-Term Stability ±0.023 ft/yr (±0.007 m/yr)
- Compensated Range 32° to 122°F (0° to 50°C)

**Velocity Measurement:**

- Method - Doppler ultrasonic, frequency 500 kHz
- Typical Minimum Depth 0.08 ft (25 mm)
- Range -5 to +20 ft/s (-1.5 to +6.1 m/s)
- Accuracy (in water with uniform velocity profile, speed of sound = 4850 ft/s, for indicated velocity range) ±0.1 ft/s from -5 to 5 ft/s (±0.03 m/s from— 1.5 to +1.5 m/s)
- ±2% of reading from 5 to 20 ft/s (1.5 to 6.1 m/s)

**Method Of Insertion:**

- 18 inch line requires Confined Space Entry.

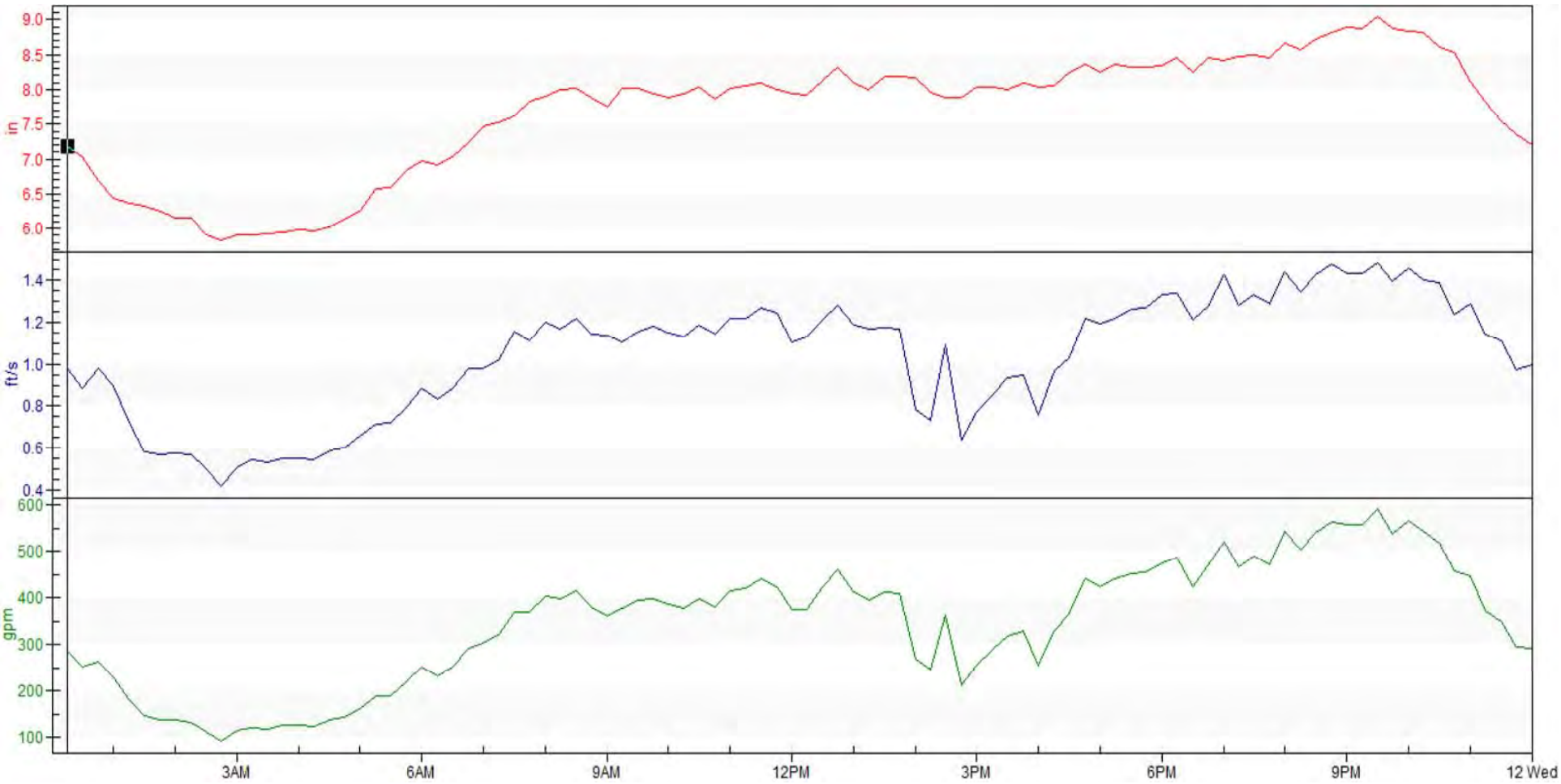
DRAFT

**Gold Coast Environmental**

**Specializing in process instrumentation and calibration.**

1868 Palma Drive, Suite I, Ventura, CA 93003 www.goldcoastenv.com 805.498.3811 ph.

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/11/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Tuesday- A.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| | | | |
| 12:15:00 AM | 7.176 | 0.982 | 285.171 |
| 12:30:00 AM | 7.02 | 0.883 | 252.86 |
| 12:45:00 AM | 6.684 | 0.978 | 262.146 |
| 1:00:00 AM | 6.442 | 0.897 | 228.816 |
| 1:15:00 AM | 6.364 | 0.721 | 180.816 |
| 1:30:00 AM | 6.333 | 0.582 | 145.09 |
| 1:45:00 AM | 6.252 | 0.57 | 137.604 |
| 2:00:00 AM | 6.156 | 0.574 | 137.649 |
| 2:15:00 AM | 6.145 | 0.57 | 133.583 |
| 2:30:00 AM | 5.903 | 0.501 | 113.486 |
| 2:45:00 AM | 5.828 | 0.418 | 92.864 |
| 3:00:00 AM | 5.899 | 0.505 | 114.22 |
| 3:15:00 AM | 5.904 | 0.541 | 121.559 |
| 3:30:00 AM | 5.927 | 0.529 | 117.895 |
| 3:45:00 AM | 5.938 | 0.549 | 125.205 |
| 4:00:00 AM | 5.978 | 0.551 | 126.914 |
| 4:15:00 AM | 5.971 | 0.544 | 124.278 |
| 4:30:00 AM | 6.015 | 0.589 | 136.878 |
| 4:45:00 AM | 6.139 | 0.599 | 143.092 |
| 5:00:00 AM | 6.24 | 0.659 | 160.937 |
| 5:15:00 AM | 6.574 | 0.717 | 187.884 |
| 5:30:00 AM | 6.599 | 0.718 | 188.9 |
| 5:45:00 AM | 6.831 | 0.799 | 220.672 |
| 6:00:00 AM | 6.97 | 0.886 | 251.299 |
| 6:15:00 AM | 6.91 | 0.833 | 233.275 |
| 6:30:00 AM | 7.03 | 0.882 | 252.726 |
| 6:45:00 AM | 7.245 | 0.979 | 292.397 |
| 7:00:00 AM | 7.463 | 0.979 | 303.501 |
| 7:15:00 AM | 7.529 | 1.017 | 319.625 |
| 7:30:00 AM | 7.628 | 1.159 | 369.612 |
| 7:45:00 AM | 7.822 | 1.114 | 368.409 |
| 8:00:00 AM | 7.914 | 1.203 | 403.953 |
| 8:15:00 AM | 8.008 | 1.167 | 397.994 |
| 8:30:00 AM | 8.021 | 1.221 | 415.67 |
| 8:45:00 AM | 7.885 | 1.143 | 380.289 |
| 9:00:00 AM | 7.749 | 1.137 | 361.494 |
| 9:15:00 AM | 8.022 | 1.108 | 378.761 |
| 9:30:00 AM | 8.014 | 1.157 | 395.114 |
| 9:45:00 AM | 7.949 | 1.179 | 397.148 |
| 10:00:00 AM | 7.895 | 1.153 | 385.795 |
| 10:15:00 AM | 7.935 | 1.134 | 377.751 |
| 10:30:00 AM | 8.033 | 1.19 | 398.148 |
| 10:45:00 AM | 7.873 | 1.145 | 381.772 |
| 11:00:00 AM | 8.015 | 1.218 | 415.983 |
| 11:15:00 AM | 8.059 | 1.223 | 420.433 |
| 11:30:00 AM | 8.097 | 1.271 | 439.855 |
| 11:45:00 AM | 7.991 | 1.242 | 422.478 |

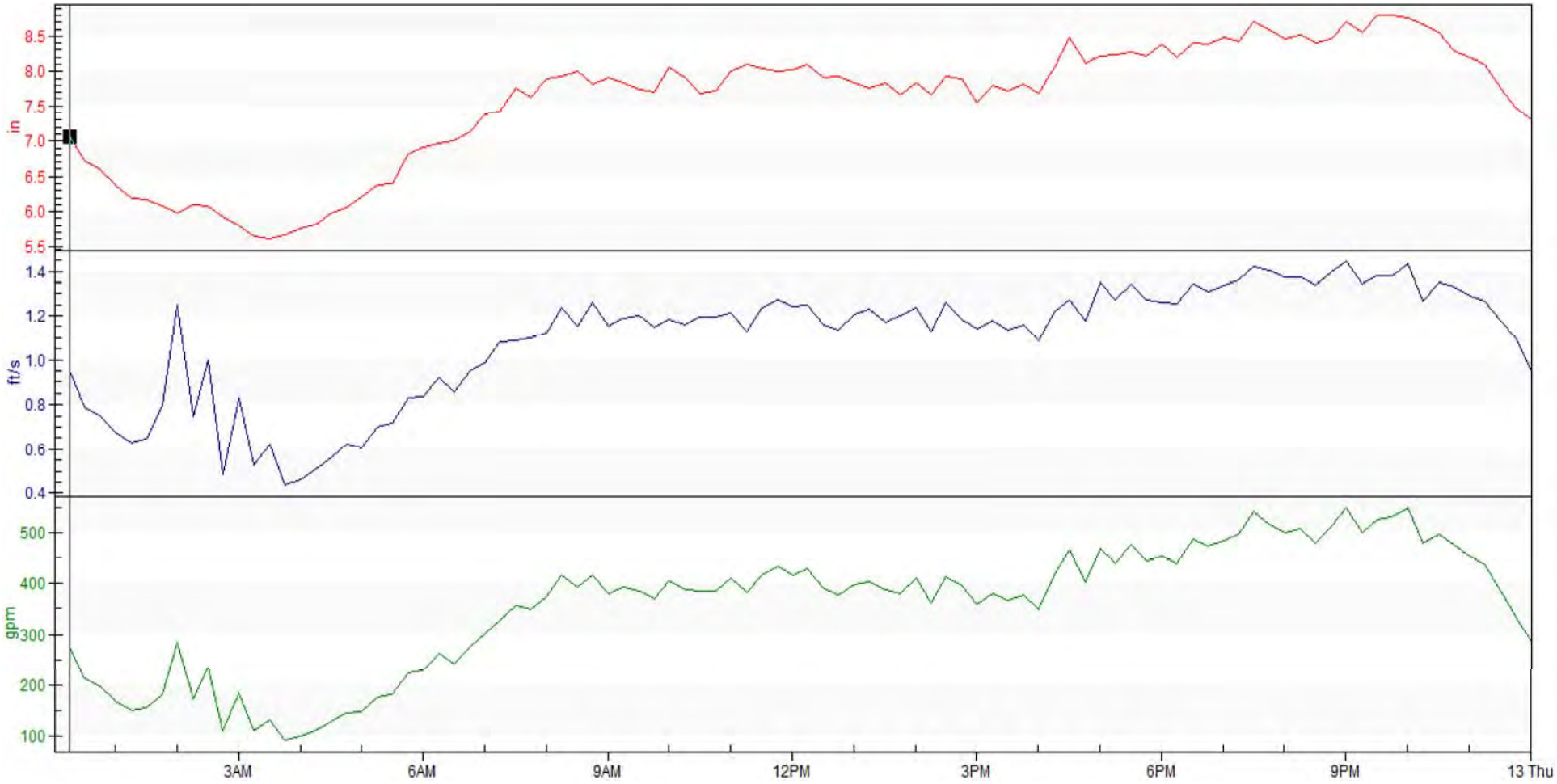
**Tuesday- P.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.943 | 1.109 | 374.206 |
| 12:15:00 PM | 7.915 | 1.133 | 373.468 |
| 12:30:00 PM | 8.132 | 1.215 | 422.74 |
| 12:45:00 PM | 8.33 | 1.283 | 460.71 |
| 1:00:00 PM | 8.103 | 1.188 | 411.419 |
| 1:15:00 PM | 8.003 | 1.172 | 394.073 |
| 1:30:00 PM | 8.196 | 1.172 | 412.057 |
| 1:45:00 PM | 8.196 | 1.166 | 408.752 |
| 2:00:00 PM | 8.177 | 0.784 | 268.728 |
| 2:15:00 PM | 7.968 | 0.731 | 246.496 |
| 2:30:00 PM | 7.877 | 1.093 | 364.433 |
| 2:45:00 PM | 7.878 | 0.639 | 213.252 |
| 3:00:00 PM | 8.047 | 0.773 | 256.147 |
| 3:15:00 PM | 8.04 | 0.852 | 288.172 |
| 3:30:00 PM | 8.001 | 0.934 | 318.272 |
| 3:45:00 PM | 8.104 | 0.948 | 328.399 |
| 4:00:00 PM | 8.033 | 0.759 | 256.072 |
| 4:15:00 PM | 8.048 | 0.966 | 330.345 |
| 4:30:00 PM | 8.244 | 1.033 | 365.917 |
| 4:45:00 PM | 8.369 | 1.221 | 440.122 |
| 5:00:00 PM | 8.246 | 1.192 | 422.317 |
| 5:15:00 PM | 8.367 | 1.22 | 440.383 |
| 5:30:00 PM | 8.328 | 1.261 | 452.693 |
| 5:45:00 PM | 8.317 | 1.267 | 453.401 |
| 6:00:00 PM | 8.346 | 1.333 | 474.869 |
| 6:15:00 PM | 8.453 | 1.339 | 487.1 |
| 6:30:00 PM | 8.239 | 1.211 | 422.99 |
| 6:45:00 PM | 8.459 | 1.279 | 468.46 |
| 7:00:00 PM | 8.427 | 1.427 | 520.169 |
| 7:15:00 PM | 8.476 | 1.281 | 465.367 |
| 7:30:00 PM | 8.5 | 1.333 | 487.504 |
| 7:45:00 PM | 8.46 | 1.286 | 471.059 |
| 8:00:00 PM | 8.67 | 1.438 | 543.462 |
| 8:15:00 PM | 8.578 | 1.347 | 502.431 |
| 8:30:00 PM | 8.722 | 1.428 | 539.631 |
| 8:45:00 PM | 8.82 | 1.478 | 562.773 |
| 9:00:00 PM | 8.901 | 1.432 | 557.871 |
| 9:15:00 PM | 8.874 | 1.434 | 558.465 |
| 9:30:00 PM | 9.048 | 1.485 | 590.916 |
| 9:45:00 PM | 8.874 | 1.396 | 538.714 |
| 10:00:00 PM | 8.844 | 1.46 | 566.303 |
| 10:15:00 PM | 8.819 | 1.406 | 543.13 |
| 10:30:00 PM | 8.605 | 1.393 | 516.29 |
| 10:45:00 PM | 8.528 | 1.237 | 457.915 |
| 11:00:00 PM | 8.123 | 1.286 | 446.952 |
| 11:15:00 PM | 7.837 | 1.143 | 372.211 |
| 11:30:00 PM | 7.539 | 1.114 | 348.878 |
| 11:45:00 PM | 7.351 | 0.975 | 295.419 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.671 | 1.040 | 346.773 |
| Daily Min: | 5.828 | 0.418 | 92.864 |
| Daily Max: | 9.048 | 1.485 | 590.916 |
| Peak to Avg: | | | 1.70 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/12/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Wednesday - A.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.207 | 0.998 | 290.826 |
| 12:15:00 AM | 7.066 | 0.952 | 275.095 |
| 12:30:00 AM | 6.725 | 0.791 | 213.704 |
| 12:45:00 AM | 6.595 | 0.747 | 196.791 |
| 1:00:00 AM | 6.377 | 0.674 | 168.364 |
| 1:15:00 AM | 6.194 | 0.626 | 149.838 |
| 1:30:00 AM | 6.174 | 0.646 | 155.433 |
| 1:45:00 AM | 6.082 | 0.796 | 182.799 |
| 2:00:00 AM | 5.987 | 1.248 | 283.493 |
| 2:15:00 AM | 6.092 | 0.75 | 173.27 |
| 2:30:00 AM | 6.074 | 0.998 | 234.815 |
| 2:45:00 AM | 5.937 | 0.488 | 111.237 |
| 3:00:00 AM | 5.792 | 0.833 | 183.746 |
| 3:15:00 AM | 5.648 | 0.53 | 111.521 |
| 3:30:00 AM | 5.606 | 0.623 | 131.267 |
| 3:45:00 AM | 5.667 | 0.438 | 93.759 |
| 4:00:00 AM | 5.757 | 0.461 | 100.775 |
| 4:15:00 AM | 5.812 | 0.507 | 112.332 |
| 4:30:00 AM | 5.979 | 0.566 | 130.267 |
| 4:45:00 AM | 6.056 | 0.623 | 146.046 |
| 5:00:00 AM | 6.217 | 0.608 | 147.291 |
| 5:15:00 AM | 6.373 | 0.703 | 176.655 |
| 5:30:00 AM | 6.395 | 0.72 | 181.892 |
| 5:45:00 AM | 6.819 | 0.829 | 222.609 |
| 6:00:00 AM | 6.917 | 0.84 | 228.794 |
| 6:15:00 AM | 6.965 | 0.923 | 261.568 |
| 6:30:00 AM | 7.002 | 0.858 | 241.386 |
| 6:45:00 AM | 7.137 | 0.95 | 274.548 |
| 7:00:00 AM | 7.375 | 0.988 | 301.162 |
| 7:15:00 AM | 7.416 | 1.083 | 328.748 |
| 7:30:00 AM | 7.767 | 1.089 | 356.689 |
| 7:45:00 AM | 7.623 | 1.098 | 349.259 |
| 8:00:00 AM | 7.895 | 1.123 | 375.996 |
| 8:15:00 AM | 7.938 | 1.235 | 415.255 |
| 8:30:00 AM | 8.014 | 1.154 | 394.057 |
| 8:45:00 AM | 7.826 | 1.262 | 417.075 |
| 9:00:00 AM | 7.918 | 1.151 | 379.325 |
| 9:15:00 AM | 7.834 | 1.192 | 392.61 |
| 9:30:00 AM | 7.748 | 1.198 | 384.007 |
| 9:45:00 AM | 7.711 | 1.144 | 369.064 |
| 10:00:00 AM | 8.056 | 1.183 | 406.625 |
| 10:15:00 AM | 7.911 | 1.158 | 388.522 |
| 10:30:00 AM | 7.679 | 1.194 | 385.454 |
| 10:45:00 AM | 7.731 | 1.197 | 385.96 |
| 11:00:00 AM | 7.998 | 1.213 | 410.473 |
| 11:15:00 AM | 8.101 | 1.127 | 381.492 |
| 11:30:00 AM | 8.037 | 1.238 | 416.561 |
| 11:45:00 AM | 8.009 | 1.274 | 434.642 |

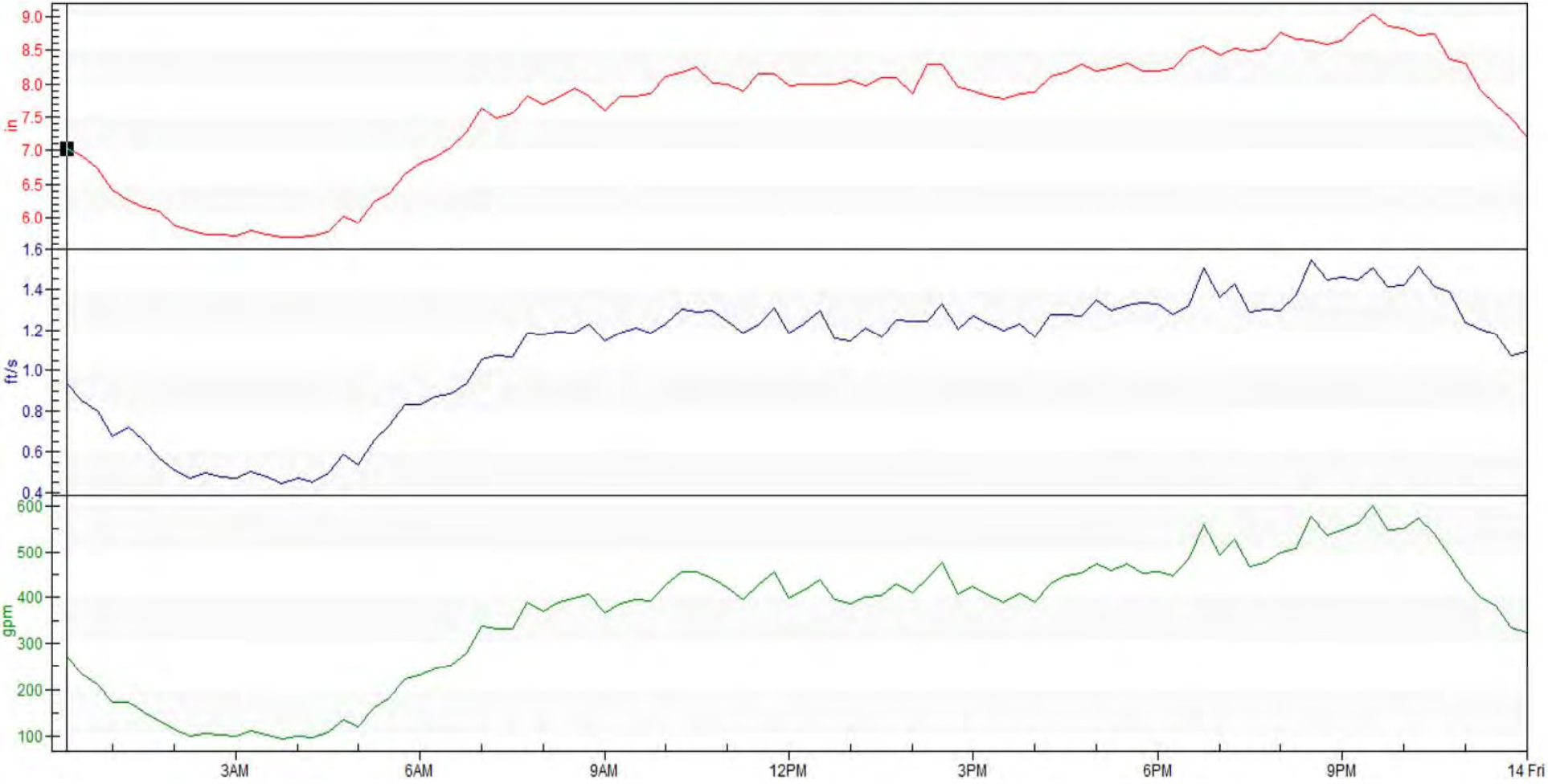
**Wednesday - P.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.028 | 1.245 | 417.246 |
| 12:15:00 PM | 8.091 | 1.248 | 428.656 |
| 12:30:00 PM | 7.913 | 1.159 | 389.177 |
| 12:45:00 PM | 7.935 | 1.136 | 376.022 |
| 1:00:00 PM | 7.836 | 1.205 | 399.478 |
| 1:15:00 PM | 7.762 | 1.228 | 402.134 |
| 1:30:00 PM | 7.829 | 1.169 | 386.879 |
| 1:45:00 PM | 7.666 | 1.201 | 379.839 |
| 2:00:00 PM | 7.83 | 1.238 | 410.071 |
| 2:15:00 PM | 7.658 | 1.129 | 362.477 |
| 2:30:00 PM | 7.929 | 1.258 | 412.561 |
| 2:45:00 PM | 7.886 | 1.185 | 396.14 |
| 3:00:00 PM | 7.558 | 1.138 | 357.937 |
| 3:15:00 PM | 7.802 | 1.178 | 379.068 |
| 3:30:00 PM | 7.716 | 1.135 | 366.023 |
| 3:45:00 PM | 7.813 | 1.161 | 376.82 |
| 4:00:00 PM | 7.681 | 1.089 | 348.894 |
| 4:15:00 PM | 8.069 | 1.219 | 419.225 |
| 4:30:00 PM | 8.484 | 1.269 | 466.699 |
| 4:45:00 PM | 8.125 | 1.178 | 403.482 |
| 5:00:00 PM | 8.217 | 1.351 | 469.265 |
| 5:15:00 PM | 8.238 | 1.27 | 440.792 |
| 5:30:00 PM | 8.275 | 1.346 | 476.884 |
| 5:45:00 PM | 8.216 | 1.273 | 446.338 |
| 6:00:00 PM | 8.375 | 1.259 | 452.824 |
| 6:15:00 PM | 8.188 | 1.253 | 439.891 |
| 6:30:00 PM | 8.398 | 1.341 | 486.445 |
| 6:45:00 PM | 8.393 | 1.31 | 474.787 |
| 7:00:00 PM | 8.48 | 1.337 | 485.301 |
| 7:15:00 PM | 8.416 | 1.363 | 495.969 |
| 7:30:00 PM | 8.708 | 1.423 | 540.967 |
| 7:45:00 PM | 8.595 | 1.404 | 514.296 |
| 8:00:00 PM | 8.45 | 1.374 | 500.771 |
| 8:15:00 PM | 8.512 | 1.374 | 507.315 |
| 8:30:00 PM | 8.409 | 1.339 | 479.567 |
| 8:45:00 PM | 8.465 | 1.4 | 513.041 |
| 9:00:00 PM | 8.696 | 1.445 | 548.426 |
| 9:15:00 PM | 8.561 | 1.346 | 500.543 |
| 9:30:00 PM | 8.8 | 1.38 | 525.912 |
| 9:45:00 PM | 8.797 | 1.381 | 532 |
| 10:00:00 PM | 8.766 | 1.431 | 548.79 |
| 10:15:00 PM | 8.674 | 1.263 | 477.884 |
| 10:30:00 PM | 8.546 | 1.351 | 497.584 |
| 10:45:00 PM | 8.289 | 1.332 | 475.118 |
| 11:00:00 PM | 8.195 | 1.289 | 452.92 |
| 11:15:00 PM | 8.092 | 1.264 | 437.024 |
| 11:30:00 PM | 7.76 | 1.178 | 385.406 |
| 11:45:00 PM | 7.472 | 1.099 | 336.141 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.564 | 1.094 | 356.666 |
| Daily Min: | 5.606 | 0.438 | 93.759 |
| Daily Max: | 8.8 | 1.445 | 548.79 |
| Peak to Avg: | | | 1.54 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/13/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Thursday - A.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.3 | 0.952 | 287.283 |
| 12:15:00 AM | 7.034 | 0.94 | 269.821 |
| 12:30:00 AM | 6.93 | 0.855 | 234.765 |
| 12:45:00 AM | 6.722 | 0.804 | 210.013 |
| 1:00:00 AM | 6.421 | 0.676 | 171.63 |
| 1:15:00 AM | 6.256 | 0.722 | 173.297 |
| 1:30:00 AM | 6.156 | 0.656 | 152.618 |
| 1:45:00 AM | 6.101 | 0.568 | 132.452 |
| 2:00:00 AM | 5.883 | 0.507 | 113.897 |
| 2:15:00 AM | 5.796 | 0.468 | 101.699 |
| 2:30:00 AM | 5.753 | 0.493 | 106.855 |
| 2:45:00 AM | 5.753 | 0.477 | 104.114 |
| 3:00:00 AM | 5.733 | 0.47 | 102.256 |
| 3:15:00 AM | 5.805 | 0.503 | 111.277 |
| 3:30:00 AM | 5.745 | 0.479 | 104.34 |
| 3:45:00 AM | 5.712 | 0.443 | 95.792 |
| 4:00:00 AM | 5.704 | 0.468 | 100.02 |
| 4:15:00 AM | 5.722 | 0.449 | 96.956 |
| 4:30:00 AM | 5.774 | 0.497 | 109.087 |
| 4:45:00 AM | 6.021 | 0.587 | 136.454 |
| 5:00:00 AM | 5.932 | 0.534 | 119.993 |
| 5:15:00 AM | 6.235 | 0.657 | 160.348 |
| 5:30:00 AM | 6.348 | 0.727 | 180.757 |
| 5:45:00 AM | 6.652 | 0.832 | 221.72 |
| 6:00:00 AM | 6.818 | 0.835 | 230.055 |
| 6:15:00 AM | 6.906 | 0.875 | 245.196 |
| 6:30:00 AM | 7.038 | 0.886 | 250.13 |
| 6:45:00 AM | 7.28 | 0.938 | 279.839 |
| 7:00:00 AM | 7.645 | 1.053 | 337.746 |
| 7:15:00 AM | 7.473 | 1.074 | 331.51 |
| 7:30:00 AM | 7.553 | 1.064 | 332.456 |
| 7:45:00 AM | 7.817 | 1.185 | 388.727 |
| 8:00:00 AM | 7.704 | 1.175 | 370.397 |
| 8:15:00 AM | 7.804 | 1.191 | 389.091 |
| 8:30:00 AM | 7.938 | 1.186 | 399.221 |
| 8:45:00 AM | 7.822 | 1.227 | 405.668 |
| 9:00:00 AM | 7.609 | 1.147 | 365.666 |
| 9:15:00 AM | 7.812 | 1.186 | 386.345 |
| 9:30:00 AM | 7.827 | 1.208 | 395.29 |
| 9:45:00 AM | 7.853 | 1.182 | 392.207 |
| 10:00:00 AM | 8.106 | 1.231 | 426.671 |
| 10:15:00 AM | 8.169 | 1.303 | 455.16 |
| 10:30:00 AM | 8.251 | 1.285 | 455.662 |
| 10:45:00 AM | 8.015 | 1.293 | 441.434 |
| 11:00:00 AM | 8 | 1.246 | 420.868 |
| 11:15:00 AM | 7.888 | 1.186 | 395.284 |
| 11:30:00 AM | 8.152 | 1.224 | 427.348 |
| 11:45:00 AM | 8.151 | 1.305 | 455.508 |

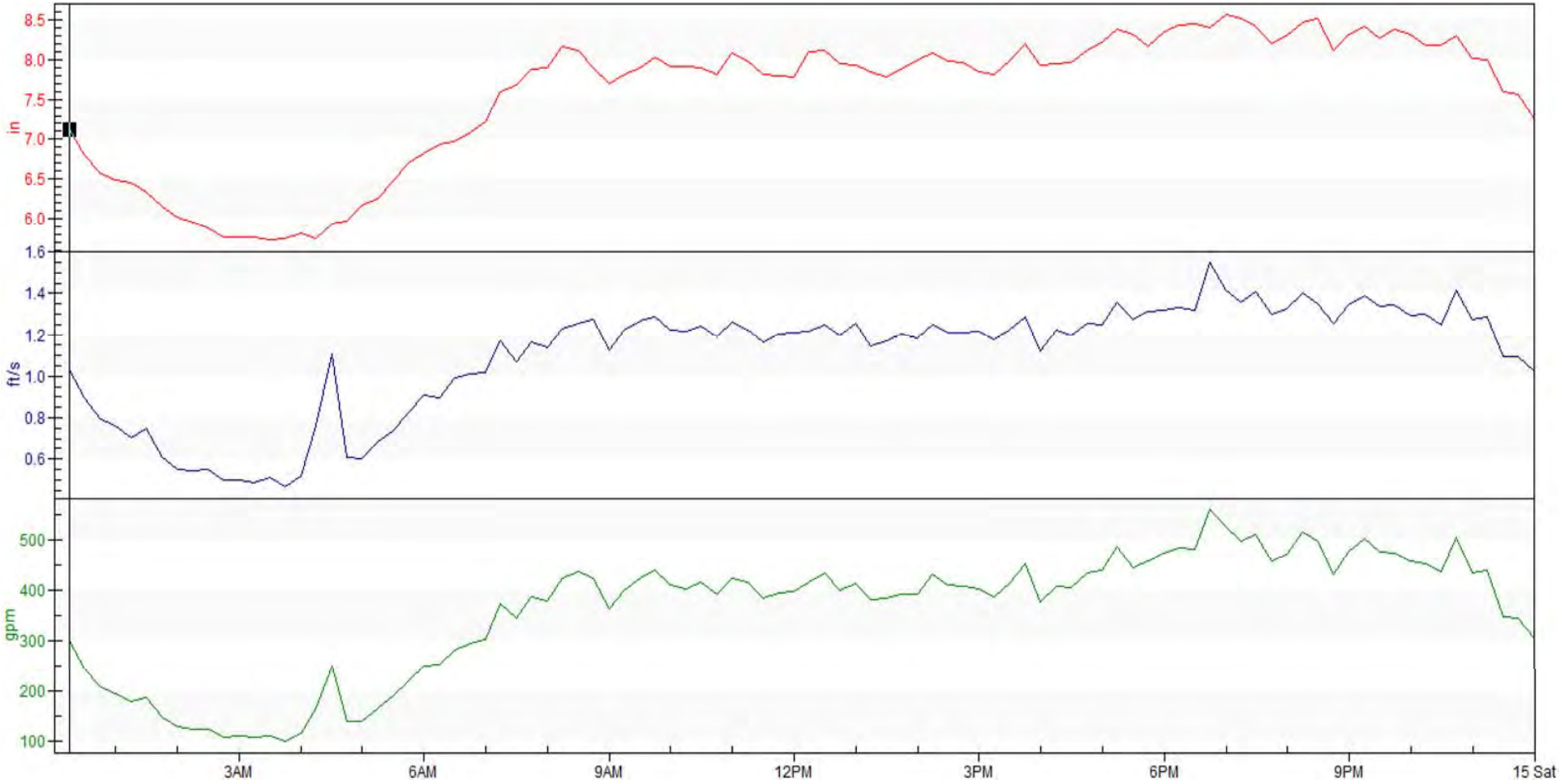
**Thursday - P.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.968 | 1.183 | 399.025 |
| 12:15:00 PM | 8.002 | 1.229 | 414.956 |
| 12:30:00 PM | 7.987 | 1.294 | 439.686 |
| 12:45:00 PM | 8.001 | 1.16 | 395.056 |
| 1:00:00 PM | 8.045 | 1.147 | 387.772 |
| 1:15:00 PM | 7.982 | 1.207 | 400.813 |
| 1:30:00 PM | 8.095 | 1.166 | 403.248 |
| 1:45:00 PM | 8.085 | 1.248 | 429.527 |
| 2:00:00 PM | 7.857 | 1.24 | 410.055 |
| 2:15:00 PM | 8.282 | 1.242 | 442.609 |
| 2:30:00 PM | 8.294 | 1.33 | 474.803 |
| 2:45:00 PM | 7.957 | 1.201 | 406.268 |
| 3:00:00 PM | 7.894 | 1.266 | 423.798 |
| 3:15:00 PM | 7.824 | 1.23 | 402.513 |
| 3:30:00 PM | 7.781 | 1.199 | 390.614 |
| 3:45:00 PM | 7.861 | 1.229 | 409.065 |
| 4:00:00 PM | 7.877 | 1.167 | 389.443 |
| 4:15:00 PM | 8.104 | 1.272 | 430.943 |
| 4:30:00 PM | 8.174 | 1.276 | 447.055 |
| 4:45:00 PM | 8.292 | 1.271 | 453.418 |
| 5:00:00 PM | 8.19 | 1.349 | 473.871 |
| 5:15:00 PM | 8.241 | 1.292 | 457.397 |
| 5:30:00 PM | 8.318 | 1.32 | 471.692 |
| 5:45:00 PM | 8.194 | 1.335 | 453.862 |
| 6:00:00 PM | 8.194 | 1.325 | 454.508 |
| 6:15:00 PM | 8.233 | 1.273 | 448.055 |
| 6:30:00 PM | 8.485 | 1.321 | 483.958 |
| 6:45:00 PM | 8.569 | 1.503 | 559.806 |
| 7:00:00 PM | 8.424 | 1.361 | 492.157 |
| 7:15:00 PM | 8.532 | 1.425 | 527.371 |
| 7:30:00 PM | 8.482 | 1.287 | 467.629 |
| 7:45:00 PM | 8.529 | 1.303 | 476.261 |
| 8:00:00 PM | 8.772 | 1.297 | 497.807 |
| 8:15:00 PM | 8.662 | 1.374 | 508.543 |
| 8:30:00 PM | 8.638 | 1.542 | 576.668 |
| 8:45:00 PM | 8.593 | 1.447 | 536.583 |
| 9:00:00 PM | 8.652 | 1.459 | 548.05 |
| 9:15:00 PM | 8.88 | 1.442 | 562.032 |
| 9:30:00 PM | 9.042 | 1.502 | 599.131 |
| 9:45:00 PM | 8.861 | 1.412 | 548.481 |
| 10:00:00 PM | 8.83 | 1.42 | 549.425 |
| 10:15:00 PM | 8.729 | 1.508 | 574.926 |
| 10:30:00 PM | 8.744 | 1.412 | 539.615 |
| 10:45:00 PM | 8.373 | 1.383 | 493.741 |
| 11:00:00 PM | 8.309 | 1.238 | 437.008 |
| 11:15:00 PM | 7.923 | 1.202 | 399.717 |
| 11:30:00 PM | 7.689 | 1.178 | 380.95 |
| 11:45:00 PM | 7.482 | 1.075 | 335.321 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.608 | 1.093 | 363.083 |
| Daily Min: | 5.704 | 0.443 | 95.792 |
| Daily Max: | 9.042 | 1.542 | 599.131 |
| Peak to Avg: | | | 1.65 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/14/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Friday - A.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.206 | 1.093 | 324.121 |
| 12:15:00 AM | 7.117 | 1.029 | 300.318 |
| 12:30:00 AM | 6.807 | 0.895 | 245.859 |
| 12:45:00 AM | 6.568 | 0.793 | 207.599 |
| 1:00:00 AM | 6.487 | 0.759 | 194.054 |
| 1:15:00 AM | 6.448 | 0.704 | 179.692 |
| 1:30:00 AM | 6.333 | 0.748 | 186.39 |
| 1:45:00 AM | 6.143 | 0.61 | 145.888 |
| 2:00:00 AM | 6.022 | 0.55 | 127.338 |
| 2:15:00 AM | 5.943 | 0.544 | 123.551 |
| 2:30:00 AM | 5.878 | 0.551 | 123.991 |
| 2:45:00 AM | 5.757 | 0.497 | 108.721 |
| 3:00:00 AM | 5.765 | 0.501 | 109.754 |
| 3:15:00 AM | 5.768 | 0.488 | 106.501 |
| 3:30:00 AM | 5.73 | 0.51 | 110.876 |
| 3:45:00 AM | 5.75 | 0.466 | 100.128 |
| 4:00:00 AM | 5.816 | 0.518 | 114.758 |
| 4:15:00 AM | 5.749 | 0.764 | 166.756 |
| 4:30:00 AM | 5.941 | 1.107 | 250.766 |
| 4:45:00 AM | 5.966 | 0.606 | 139.159 |
| 5:00:00 AM | 6.167 | 0.598 | 139.912 |
| 5:15:00 AM | 6.251 | 0.681 | 164.939 |
| 5:30:00 AM | 6.473 | 0.733 | 188.017 |
| 5:45:00 AM | 6.7 | 0.827 | 221.547 |
| 6:00:00 AM | 6.819 | 0.91 | 249.182 |
| 6:15:00 AM | 6.938 | 0.896 | 252.369 |
| 6:30:00 AM | 6.975 | 0.994 | 282.294 |
| 6:45:00 AM | 7.098 | 1.013 | 294.568 |
| 7:00:00 AM | 7.226 | 1.021 | 303.506 |
| 7:15:00 AM | 7.594 | 1.173 | 373.046 |
| 7:30:00 AM | 7.684 | 1.071 | 345.849 |
| 7:45:00 AM | 7.885 | 1.163 | 388.523 |
| 8:00:00 AM | 7.905 | 1.139 | 380.175 |
| 8:15:00 AM | 8.166 | 1.231 | 425.286 |
| 8:30:00 AM | 8.119 | 1.258 | 436.821 |
| 8:45:00 AM | 7.893 | 1.271 | 425.473 |
| 9:00:00 AM | 7.694 | 1.128 | 363.633 |
| 9:15:00 AM | 7.81 | 1.22 | 400.268 |
| 9:30:00 AM | 7.894 | 1.267 | 423.944 |
| 9:45:00 AM | 8.028 | 1.288 | 440.815 |
| 10:00:00 AM | 7.908 | 1.222 | 409.899 |
| 10:15:00 AM | 7.91 | 1.216 | 403.511 |
| 10:30:00 AM | 7.903 | 1.244 | 416.898 |
| 10:45:00 AM | 7.81 | 1.192 | 393.349 |
| 11:00:00 AM | 8.073 | 1.26 | 423.533 |
| 11:15:00 AM | 7.977 | 1.225 | 415.705 |
| 11:30:00 AM | 7.813 | 1.168 | 385.765 |
| 11:45:00 AM | 7.791 | 1.205 | 396.261 |

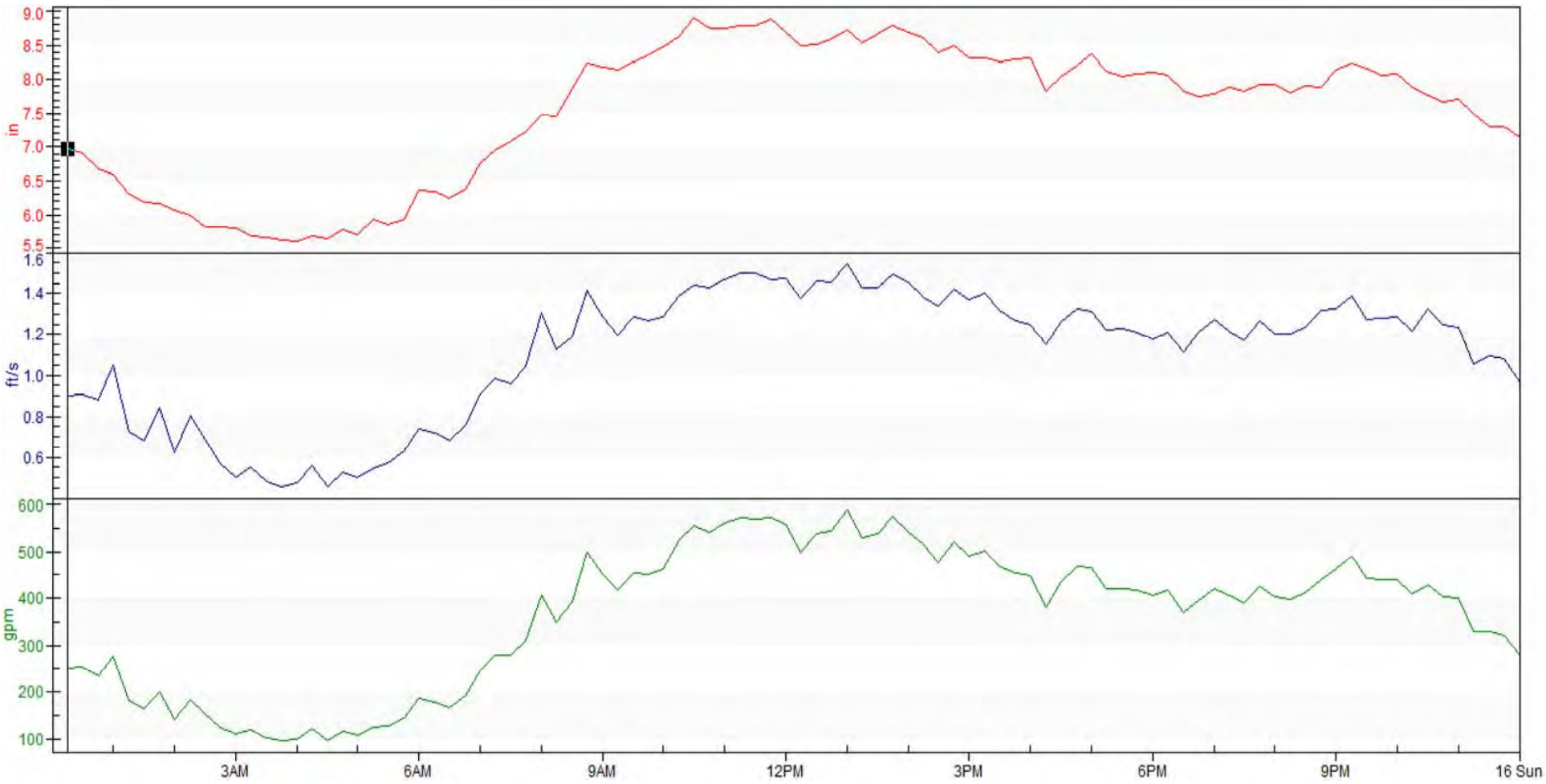
**Friday - P.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.782 | 1.21 | 397.29 |
| 12:15:00 PM | 8.103 | 1.219 | 416.249 |
| 12:30:00 PM | 8.113 | 1.25 | 433.558 |
| 12:45:00 PM | 7.948 | 1.195 | 401.343 |
| 1:00:00 PM | 7.936 | 1.255 | 414.397 |
| 1:15:00 PM | 7.838 | 1.149 | 380.998 |
| 1:30:00 PM | 7.775 | 1.175 | 385.402 |
| 1:45:00 PM | 7.881 | 1.204 | 392.222 |
| 2:00:00 PM | 8.001 | 1.183 | 393.781 |
| 2:15:00 PM | 8.076 | 1.251 | 431.479 |
| 2:30:00 PM | 7.972 | 1.211 | 410.471 |
| 2:45:00 PM | 7.956 | 1.21 | 409.255 |
| 3:00:00 PM | 7.846 | 1.217 | 403.99 |
| 3:15:00 PM | 7.813 | 1.175 | 386.447 |
| 3:30:00 PM | 7.982 | 1.221 | 414.55 |
| 3:45:00 PM | 8.199 | 1.29 | 453.557 |
| 4:00:00 PM | 7.926 | 1.123 | 377.972 |
| 4:15:00 PM | 7.952 | 1.222 | 408.422 |
| 4:30:00 PM | 7.961 | 1.197 | 404.782 |
| 4:45:00 PM | 8.108 | 1.258 | 436.108 |
| 5:00:00 PM | 8.213 | 1.25 | 440.778 |
| 5:15:00 PM | 8.388 | 1.355 | 486.655 |
| 5:30:00 PM | 8.315 | 1.272 | 446.69 |
| 5:45:00 PM | 8.162 | 1.315 | 459.943 |
| 6:00:00 PM | 8.352 | 1.317 | 474.619 |
| 6:15:00 PM | 8.429 | 1.333 | 484.286 |
| 6:30:00 PM | 8.453 | 1.318 | 482.121 |
| 6:45:00 PM | 8.393 | 1.551 | 561.023 |
| 7:00:00 PM | 8.568 | 1.418 | 527.982 |
| 7:15:00 PM | 8.511 | 1.356 | 499.358 |
| 7:30:00 PM | 8.418 | 1.411 | 511.206 |
| 7:45:00 PM | 8.204 | 1.303 | 458.724 |
| 8:00:00 PM | 8.303 | 1.328 | 471.86 |
| 8:15:00 PM | 8.475 | 1.405 | 515.915 |
| 8:30:00 PM | 8.514 | 1.349 | 498.18 |
| 8:45:00 PM | 8.107 | 1.252 | 431.86 |
| 9:00:00 PM | 8.32 | 1.348 | 477.032 |
| 9:15:00 PM | 8.42 | 1.389 | 503.712 |
| 9:30:00 PM | 8.266 | 1.339 | 475.941 |
| 9:45:00 PM | 8.385 | 1.343 | 473.621 |
| 10:00:00 PM | 8.319 | 1.293 | 459.08 |
| 10:15:00 PM | 8.179 | 1.3 | 454.275 |
| 10:30:00 PM | 8.18 | 1.248 | 437.308 |
| 10:45:00 PM | 8.304 | 1.414 | 505.701 |
| 11:00:00 PM | 8.019 | 1.272 | 434.634 |
| 11:15:00 PM | 8.004 | 1.29 | 439.545 |
| 11:30:00 PM | 7.588 | 1.095 | 347.079 |
| 11:45:00 PM | 7.562 | 1.095 | 346.215 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.547 | 1.099 | 358.366 |
| Daily Min: | 5.73 | 0.466 | 100.128 |
| Daily Max: | 8.568 | 1.551 | 561.023 |
| Peak to Avg: | | | 1.57 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/15/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Saturday - A.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.259 | 1.024 | 306.8 |
| 12:15:00 AM | 6.967 | 0.902 | 249.981 |
| 12:30:00 AM | 6.902 | 0.905 | 253.344 |
| 12:45:00 AM | 6.67 | 0.883 | 234.728 |
| 1:00:00 AM | 6.597 | 1.05 | 276.536 |
| 1:15:00 AM | 6.312 | 0.727 | 179.457 |
| 1:30:00 AM | 6.194 | 0.681 | 164.677 |
| 1:45:00 AM | 6.16 | 0.841 | 201.19 |
| 2:00:00 AM | 6.069 | 0.625 | 142.073 |
| 2:15:00 AM | 5.987 | 0.801 | 182.565 |
| 2:30:00 AM | 5.824 | 0.69 | 153.276 |
| 2:45:00 AM | 5.808 | 0.57 | 125.378 |
| 3:00:00 AM | 5.8 | 0.502 | 110.853 |
| 3:15:00 AM | 5.686 | 0.552 | 118.567 |
| 3:30:00 AM | 5.654 | 0.48 | 102.156 |
| 3:45:00 AM | 5.628 | 0.459 | 97.359 |
| 4:00:00 AM | 5.602 | 0.476 | 100.043 |
| 4:15:00 AM | 5.687 | 0.561 | 120.708 |
| 4:30:00 AM | 5.649 | 0.456 | 96.897 |
| 4:45:00 AM | 5.771 | 0.526 | 114.723 |
| 5:00:00 AM | 5.706 | 0.499 | 106.49 |
| 5:15:00 AM | 5.935 | 0.547 | 124.393 |
| 5:30:00 AM | 5.861 | 0.575 | 127.178 |
| 5:45:00 AM | 5.932 | 0.631 | 143.851 |
| 6:00:00 AM | 6.369 | 0.739 | 185.503 |
| 6:15:00 AM | 6.345 | 0.721 | 176.571 |
| 6:30:00 AM | 6.247 | 0.682 | 166.841 |
| 6:45:00 AM | 6.376 | 0.762 | 191.504 |
| 7:00:00 AM | 6.751 | 0.906 | 246.247 |
| 7:15:00 AM | 6.957 | 0.987 | 278.385 |
| 7:30:00 AM | 7.091 | 0.959 | 278.281 |
| 7:45:00 AM | 7.218 | 1.041 | 309.349 |
| 8:00:00 AM | 7.474 | 1.303 | 405.641 |
| 8:15:00 AM | 7.45 | 1.123 | 348.151 |
| 8:30:00 AM | 7.86 | 1.187 | 392.666 |
| 8:45:00 AM | 8.232 | 1.414 | 499.899 |
| 9:00:00 AM | 8.178 | 1.285 | 450.55 |
| 9:15:00 AM | 8.146 | 1.199 | 415.809 |
| 9:30:00 AM | 8.25 | 1.288 | 453.564 |
| 9:45:00 AM | 8.354 | 1.266 | 452.05 |
| 10:00:00 AM | 8.472 | 1.286 | 462.776 |
| 10:15:00 AM | 8.631 | 1.391 | 522.714 |
| 10:30:00 AM | 8.904 | 1.441 | 554.26 |
| 10:45:00 AM | 8.755 | 1.427 | 541.144 |
| 11:00:00 AM | 8.738 | 1.469 | 560.93 |
| 11:15:00 AM | 8.796 | 1.499 | 573.092 |
| 11:30:00 AM | 8.777 | 1.497 | 570.259 |
| 11:45:00 AM | 8.876 | 1.466 | 571.03 |

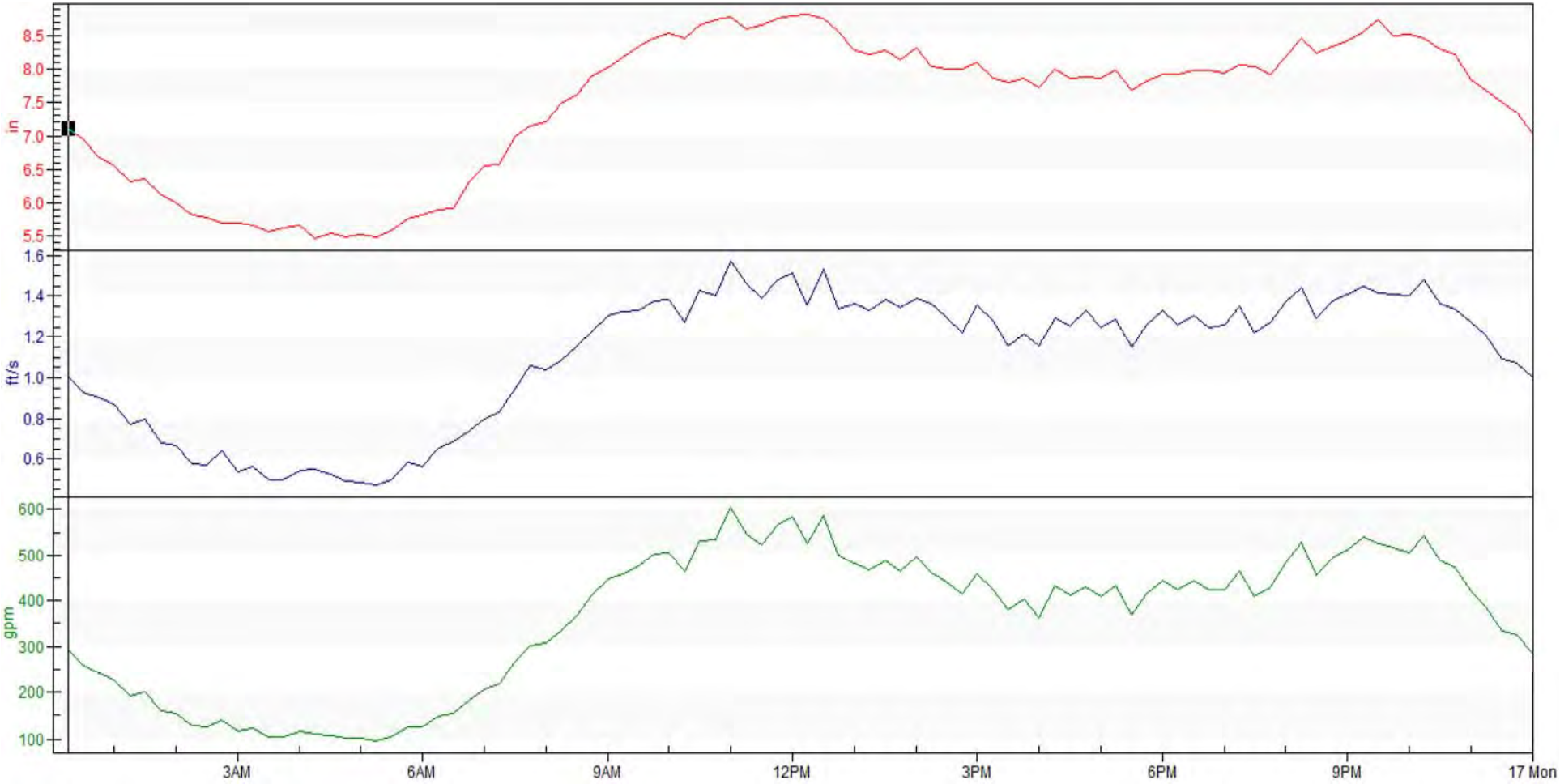
**Saturday - P.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.688 | 1.47 | 557.368 |
| 12:15:00 PM | 8.484 | 1.374 | 497.585 |
| 12:30:00 PM | 8.514 | 1.459 | 538.619 |
| 12:45:00 PM | 8.594 | 1.455 | 543.742 |
| 1:00:00 PM | 8.719 | 1.544 | 588.003 |
| 1:15:00 PM | 8.54 | 1.427 | 529.104 |
| 1:30:00 PM | 8.671 | 1.431 | 538.451 |
| 1:45:00 PM | 8.794 | 1.492 | 574.572 |
| 2:00:00 PM | 8.697 | 1.453 | 539.774 |
| 2:15:00 PM | 8.608 | 1.38 | 516.795 |
| 2:30:00 PM | 8.386 | 1.339 | 477.036 |
| 2:45:00 PM | 8.498 | 1.42 | 521.752 |
| 3:00:00 PM | 8.325 | 1.369 | 491.075 |
| 3:15:00 PM | 8.314 | 1.401 | 501.705 |
| 3:30:00 PM | 8.25 | 1.318 | 467.428 |
| 3:45:00 PM | 8.298 | 1.269 | 453.203 |
| 4:00:00 PM | 8.324 | 1.247 | 447.236 |
| 4:15:00 PM | 7.825 | 1.153 | 381.246 |
| 4:30:00 PM | 8.047 | 1.263 | 433.323 |
| 4:45:00 PM | 8.209 | 1.326 | 467.232 |
| 5:00:00 PM | 8.366 | 1.314 | 464.367 |
| 5:15:00 PM | 8.125 | 1.223 | 419.752 |
| 5:30:00 PM | 8.044 | 1.226 | 418.831 |
| 5:45:00 PM | 8.092 | 1.209 | 417.911 |
| 6:00:00 PM | 8.098 | 1.177 | 407.133 |
| 6:15:00 PM | 8.063 | 1.209 | 416.173 |
| 6:30:00 PM | 7.82 | 1.114 | 368.167 |
| 6:45:00 PM | 7.744 | 1.208 | 394.153 |
| 7:00:00 PM | 7.791 | 1.277 | 419.971 |
| 7:15:00 PM | 7.889 | 1.217 | 404.853 |
| 7:30:00 PM | 7.826 | 1.174 | 388.308 |
| 7:45:00 PM | 7.931 | 1.266 | 426.312 |
| 8:00:00 PM | 7.932 | 1.203 | 403.108 |
| 8:15:00 PM | 7.816 | 1.203 | 397.294 |
| 8:30:00 PM | 7.899 | 1.234 | 412.283 |
| 8:45:00 PM | 7.884 | 1.318 | 440.213 |
| 9:00:00 PM | 8.144 | 1.323 | 461.045 |
| 9:15:00 PM | 8.235 | 1.389 | 491.124 |
| 9:30:00 PM | 8.16 | 1.276 | 441.059 |
| 9:45:00 PM | 8.068 | 1.28 | 440.924 |
| 10:00:00 PM | 8.081 | 1.284 | 438.163 |
| 10:15:00 PM | 7.895 | 1.219 | 407.901 |
| 10:30:00 PM | 7.767 | 1.324 | 427.835 |
| 10:45:00 PM | 7.673 | 1.249 | 402.659 |
| 11:00:00 PM | 7.705 | 1.233 | 399.828 |
| 11:15:00 PM | 7.501 | 1.054 | 329.692 |
| 11:30:00 PM | 7.305 | 1.093 | 330.221 |
| 11:45:00 PM | 7.308 | 1.08 | 320.876 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.533 | 1.108 | 365.148 |
| Daily Min: | 5.602 | 0.456 | 96.897 |
| Daily Max: | 8.904 | 1.544 | 588.003 |
| Peak to Avg: | | | 1.61 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/16/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Sunday - A.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.137 | 0.966 | 278.839 |
| 12:15:00 AM | 7.104 | 1.008 | 293.251 |
| 12:30:00 AM | 6.962 | 0.93 | 257.546 |
| 12:45:00 AM | 6.665 | 0.903 | 240.646 |
| 1:00:00 AM | 6.548 | 0.87 | 226.703 |
| 1:15:00 AM | 6.322 | 0.774 | 192.295 |
| 1:30:00 AM | 6.357 | 0.799 | 200.073 |
| 1:45:00 AM | 6.118 | 0.678 | 159.765 |
| 2:00:00 AM | 5.996 | 0.67 | 154.971 |
| 2:15:00 AM | 5.83 | 0.578 | 128.511 |
| 2:30:00 AM | 5.789 | 0.569 | 125.288 |
| 2:45:00 AM | 5.712 | 0.642 | 138.256 |
| 3:00:00 AM | 5.713 | 0.537 | 116.257 |
| 3:15:00 AM | 5.666 | 0.566 | 120.867 |
| 3:30:00 AM | 5.56 | 0.497 | 103.583 |
| 3:45:00 AM | 5.62 | 0.498 | 104.628 |
| 4:00:00 AM | 5.658 | 0.546 | 116.569 |
| 4:15:00 AM | 5.467 | 0.548 | 110.622 |
| 4:30:00 AM | 5.544 | 0.523 | 108.632 |
| 4:45:00 AM | 5.491 | 0.492 | 100.553 |
| 5:00:00 AM | 5.529 | 0.485 | 100.257 |
| 5:15:00 AM | 5.479 | 0.472 | 96.351 |
| 5:30:00 AM | 5.581 | 0.5 | 104.445 |
| 5:45:00 AM | 5.755 | 0.58 | 124.601 |
| 6:00:00 AM | 5.832 | 0.562 | 125.048 |
| 6:15:00 AM | 5.897 | 0.652 | 147.299 |
| 6:30:00 AM | 5.932 | 0.684 | 154.806 |
| 6:45:00 AM | 6.311 | 0.738 | 183.018 |
| 7:00:00 AM | 6.559 | 0.798 | 205.997 |
| 7:15:00 AM | 6.574 | 0.83 | 216.951 |
| 7:30:00 AM | 6.996 | 0.949 | 266.703 |
| 7:45:00 AM | 7.153 | 1.056 | 301.071 |
| 8:00:00 AM | 7.2 | 1.041 | 308.455 |
| 8:15:00 AM | 7.496 | 1.086 | 333.228 |
| 8:30:00 AM | 7.628 | 1.158 | 369.277 |
| 8:45:00 AM | 7.897 | 1.227 | 410.84 |
| 9:00:00 AM | 8.013 | 1.308 | 446.521 |
| 9:15:00 AM | 8.184 | 1.322 | 458.327 |
| 9:30:00 AM | 8.333 | 1.329 | 475.344 |
| 9:45:00 AM | 8.457 | 1.375 | 503.507 |
| 10:00:00 AM | 8.526 | 1.385 | 505.707 |
| 10:15:00 AM | 8.455 | 1.275 | 464.355 |
| 10:30:00 AM | 8.651 | 1.428 | 530.652 |
| 10:45:00 AM | 8.741 | 1.405 | 532.909 |
| 11:00:00 AM | 8.767 | 1.573 | 603.097 |
| 11:15:00 AM | 8.599 | 1.46 | 546.01 |
| 11:30:00 AM | 8.656 | 1.389 | 521.303 |
| 11:45:00 AM | 8.746 | 1.48 | 565.724 |

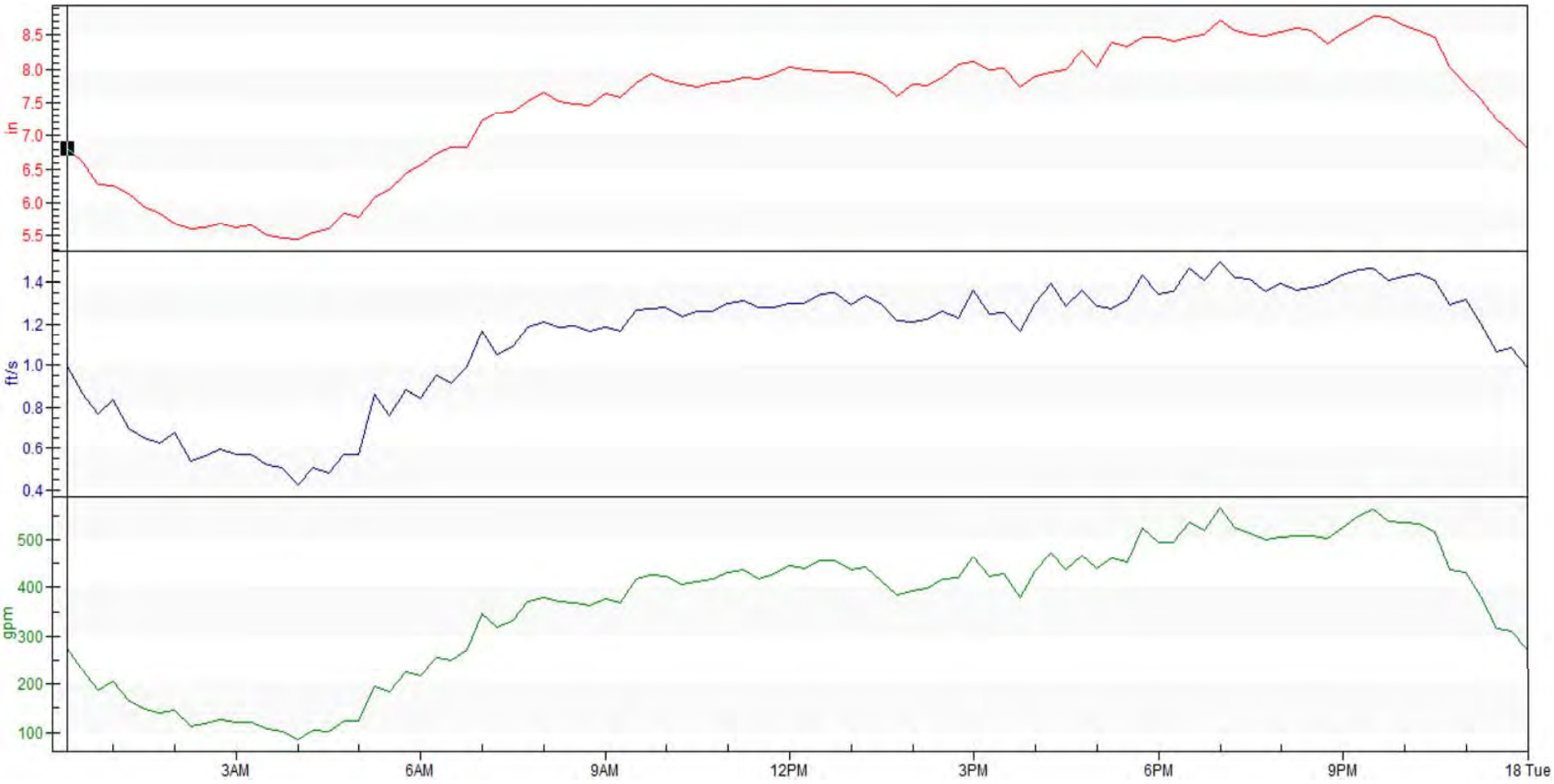
**Sunday - P.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.799 | 1.512 | 582.705 |
| 12:15:00 PM | 8.813 | 1.36 | 525.062 |
| 12:30:00 PM | 8.75 | 1.531 | 585.686 |
| 12:45:00 PM | 8.555 | 1.341 | 498.31 |
| 1:00:00 PM | 8.286 | 1.364 | 482.83 |
| 1:15:00 PM | 8.217 | 1.333 | 468.535 |
| 1:30:00 PM | 8.277 | 1.383 | 487.265 |
| 1:45:00 PM | 8.147 | 1.344 | 464.526 |
| 2:00:00 PM | 8.31 | 1.387 | 496.361 |
| 2:15:00 PM | 8.04 | 1.362 | 460.616 |
| 2:30:00 PM | 8 | 1.301 | 442.053 |
| 2:45:00 PM | 7.995 | 1.223 | 416.215 |
| 3:00:00 PM | 8.091 | 1.354 | 457.399 |
| 3:15:00 PM | 7.865 | 1.279 | 423.354 |
| 3:30:00 PM | 7.802 | 1.158 | 380.114 |
| 3:45:00 PM | 7.853 | 1.214 | 403.369 |
| 4:00:00 PM | 7.729 | 1.156 | 364.215 |
| 4:15:00 PM | 7.991 | 1.292 | 433.858 |
| 4:30:00 PM | 7.867 | 1.251 | 411.676 |
| 4:45:00 PM | 7.887 | 1.331 | 428.862 |
| 5:00:00 PM | 7.856 | 1.245 | 408.428 |
| 5:15:00 PM | 7.983 | 1.288 | 431.317 |
| 5:30:00 PM | 7.684 | 1.148 | 368.885 |
| 5:45:00 PM | 7.814 | 1.262 | 415.416 |
| 6:00:00 PM | 7.922 | 1.334 | 445.102 |
| 6:15:00 PM | 7.918 | 1.26 | 422.787 |
| 6:30:00 PM | 7.979 | 1.308 | 443.853 |
| 6:45:00 PM | 7.984 | 1.244 | 422.601 |
| 7:00:00 PM | 7.946 | 1.259 | 424.83 |
| 7:15:00 PM | 8.055 | 1.351 | 464.117 |
| 7:30:00 PM | 8.038 | 1.218 | 409.236 |
| 7:45:00 PM | 7.928 | 1.272 | 428.23 |
| 8:00:00 PM | 8.185 | 1.37 | 480.782 |
| 8:15:00 PM | 8.465 | 1.442 | 526.953 |
| 8:30:00 PM | 8.247 | 1.289 | 456.932 |
| 8:45:00 PM | 8.33 | 1.374 | 493.411 |
| 9:00:00 PM | 8.423 | 1.406 | 511.702 |
| 9:15:00 PM | 8.552 | 1.45 | 538.726 |
| 9:30:00 PM | 8.728 | 1.414 | 526.522 |
| 9:45:00 PM | 8.502 | 1.41 | 517.547 |
| 10:00:00 PM | 8.506 | 1.402 | 505.188 |
| 10:15:00 PM | 8.455 | 1.481 | 541.954 |
| 10:30:00 PM | 8.306 | 1.364 | 487.218 |
| 10:45:00 PM | 8.221 | 1.337 | 471.705 |
| 11:00:00 PM | 7.848 | 1.271 | 421.159 |
| 11:15:00 PM | 7.693 | 1.208 | 384.837 |
| 11:30:00 PM | 7.498 | 1.091 | 335.164 |
| 11:45:00 PM | 7.339 | 1.068 | 324.741 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.471 | 1.108 | 362.349 |
| Daily Min: | 5.467 | 0.472 | 96.351 |
| Daily Max: | 8.813 | 1.573 | 603.097 |
| Peak to Avg: | | | 1.66 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/17/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Monday - A.M. 7/17/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 7.024 | 0.997 | 285.655 |
| 12:15:00 AM | 6.819 | 0.994 | 273.663 |
| 12:30:00 AM | 6.606 | 0.87 | 229.548 |
| 12:45:00 AM | 6.272 | 0.765 | 186.796 |
| 1:00:00 AM | 6.264 | 0.835 | 205.052 |
| 1:15:00 AM | 6.143 | 0.695 | 166.154 |
| 1:30:00 AM | 5.949 | 0.652 | 148.35 |
| 1:45:00 AM | 5.843 | 0.625 | 139.38 |
| 2:00:00 AM | 5.695 | 0.674 | 145.235 |
| 2:15:00 AM | 5.6 | 0.536 | 112.381 |
| 2:30:00 AM | 5.624 | 0.561 | 118.238 |
| 2:45:00 AM | 5.682 | 0.592 | 126.837 |
| 3:00:00 AM | 5.626 | 0.568 | 120.329 |
| 3:15:00 AM | 5.668 | 0.568 | 121.033 |
| 3:30:00 AM | 5.502 | 0.521 | 106.622 |
| 3:45:00 AM | 5.477 | 0.504 | 102.46 |
| 4:00:00 AM | 5.449 | 0.423 | 85.754 |
| 4:15:00 AM | 5.545 | 0.507 | 104.02 |
| 4:30:00 AM | 5.603 | 0.478 | 100.776 |
| 4:45:00 AM | 5.845 | 0.569 | 124.226 |
| 5:00:00 AM | 5.783 | 0.571 | 124.119 |
| 5:15:00 AM | 6.081 | 0.862 | 194.159 |
| 5:30:00 AM | 6.201 | 0.76 | 183.93 |
| 5:45:00 AM | 6.444 | 0.88 | 224.48 |
| 6:00:00 AM | 6.558 | 0.842 | 218.032 |
| 6:15:00 AM | 6.725 | 0.947 | 256.044 |
| 6:30:00 AM | 6.839 | 0.914 | 250.19 |
| 6:45:00 AM | 6.825 | 0.995 | 272.989 |
| 7:00:00 AM | 7.221 | 1.169 | 346.77 |
| 7:15:00 AM | 7.334 | 1.051 | 319.23 |
| 7:30:00 AM | 7.366 | 1.093 | 333.661 |
| 7:45:00 AM | 7.52 | 1.182 | 370.05 |
| 8:00:00 AM | 7.65 | 1.209 | 378.115 |
| 8:15:00 AM | 7.523 | 1.182 | 370.968 |
| 8:30:00 AM | 7.475 | 1.191 | 369.546 |
| 8:45:00 AM | 7.46 | 1.168 | 362.68 |
| 9:00:00 AM | 7.634 | 1.187 | 376.626 |
| 9:15:00 AM | 7.581 | 1.169 | 367.347 |
| 9:30:00 AM | 7.79 | 1.268 | 417.026 |
| 9:45:00 AM | 7.929 | 1.273 | 425.727 |
| 10:00:00 AM | 7.832 | 1.279 | 422.819 |
| 10:15:00 AM | 7.772 | 1.237 | 405.488 |
| 10:30:00 AM | 7.747 | 1.261 | 411.685 |
| 10:45:00 AM | 7.805 | 1.264 | 416.881 |
| 11:00:00 AM | 7.822 | 1.302 | 430.376 |
| 11:15:00 AM | 7.883 | 1.31 | 437.471 |
| 11:30:00 AM | 7.858 | 1.281 | 417.625 |
| 11:45:00 AM | 7.933 | 1.283 | 429.77 |

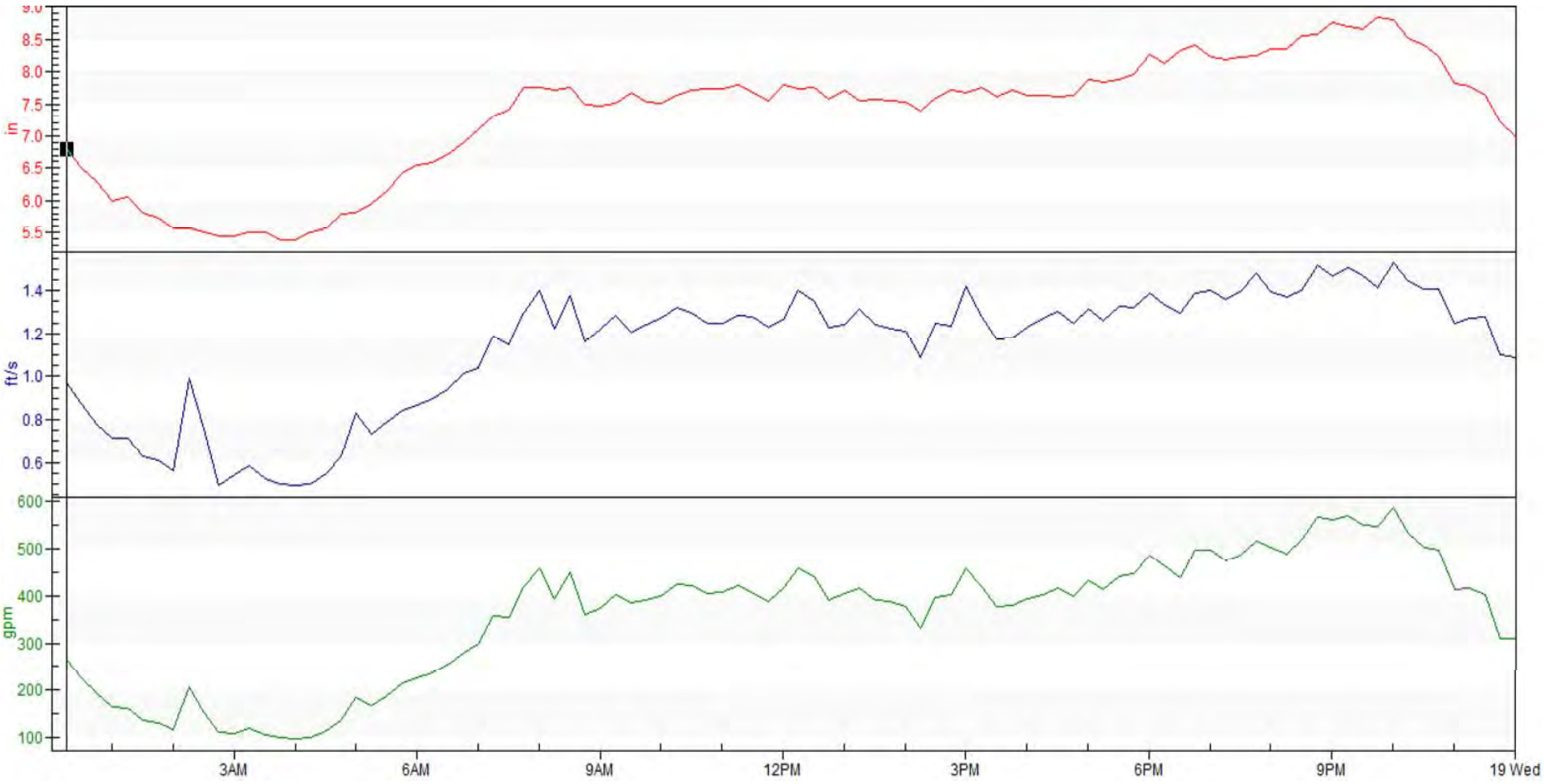
**Monday - P.M. 7/17/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.028 | 1.301 | 445.008 |
| 12:15:00 PM | 7.994 | 1.296 | 441.094 |
| 12:30:00 PM | 7.974 | 1.344 | 455.858 |
| 12:45:00 PM | 7.959 | 1.352 | 457.294 |
| 1:00:00 PM | 7.963 | 1.295 | 438.375 |
| 1:15:00 PM | 7.91 | 1.34 | 442.056 |
| 1:30:00 PM | 7.804 | 1.292 | 411.667 |
| 1:45:00 PM | 7.597 | 1.214 | 385.269 |
| 2:00:00 PM | 7.781 | 1.212 | 393.493 |
| 2:15:00 PM | 7.758 | 1.222 | 399.819 |
| 2:30:00 PM | 7.869 | 1.264 | 417.005 |
| 2:45:00 PM | 8.083 | 1.228 | 420.878 |
| 3:00:00 PM | 8.114 | 1.36 | 465.959 |
| 3:15:00 PM | 7.985 | 1.249 | 424.23 |
| 3:30:00 PM | 8.011 | 1.257 | 428.753 |
| 3:45:00 PM | 7.736 | 1.165 | 379.776 |
| 4:00:00 PM | 7.901 | 1.297 | 434.651 |
| 4:15:00 PM | 7.948 | 1.397 | 471.697 |
| 4:30:00 PM | 7.992 | 1.287 | 435.74 |
| 4:45:00 PM | 8.265 | 1.362 | 467.545 |
| 5:00:00 PM | 8.035 | 1.288 | 438.527 |
| 5:15:00 PM | 8.382 | 1.275 | 461.361 |
| 5:30:00 PM | 8.322 | 1.316 | 454.244 |
| 5:45:00 PM | 8.466 | 1.434 | 525.883 |
| 6:00:00 PM | 8.468 | 1.346 | 493.78 |
| 6:15:00 PM | 8.414 | 1.357 | 493.528 |
| 6:30:00 PM | 8.459 | 1.464 | 536.009 |
| 6:45:00 PM | 8.513 | 1.407 | 519.432 |
| 7:00:00 PM | 8.723 | 1.496 | 565.725 |
| 7:15:00 PM | 8.558 | 1.419 | 525.835 |
| 7:30:00 PM | 8.516 | 1.414 | 514.526 |
| 7:45:00 PM | 8.496 | 1.357 | 499.595 |
| 8:00:00 PM | 8.539 | 1.395 | 505.396 |
| 8:15:00 PM | 8.607 | 1.361 | 509.799 |
| 8:30:00 PM | 8.572 | 1.378 | 509.452 |
| 8:45:00 PM | 8.373 | 1.392 | 503.166 |
| 9:00:00 PM | 8.523 | 1.435 | 523.794 |
| 9:15:00 PM | 8.644 | 1.461 | 550.08 |
| 9:30:00 PM | 8.785 | 1.465 | 563.201 |
| 9:45:00 PM | 8.77 | 1.406 | 537.479 |
| 10:00:00 PM | 8.648 | 1.429 | 535.75 |
| 10:15:00 PM | 8.566 | 1.441 | 532.106 |
| 10:30:00 PM | 8.472 | 1.409 | 517.219 |
| 10:45:00 PM | 8.035 | 1.292 | 436.813 |
| 11:00:00 PM | 7.784 | 1.317 | 430.799 |
| 11:15:00 PM | 7.568 | 1.204 | 381.009 |
| 11:30:00 PM | 7.241 | 1.062 | 317.047 |
| 11:45:00 PM | 7.046 | 1.082 | 311.452 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.453 | 1.125 | 363.788 |
| Daily Min: | 5.449 | 0.423 | 85.754 |
| Daily Max: | 8.785 | 1.496 | 565.725 |
| Peak to Avg: | | | 1.56 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/18/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Tuesday- A.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.82 | 0.987 | 271.734 |
| 12:15:00 AM | 6.784 | 0.973 | 266.128 |
| 12:30:00 AM | 6.509 | 0.87 | 225.112 |
| 12:45:00 AM | 6.286 | 0.778 | 191.783 |
| 1:00:00 AM | 6 | 0.714 | 165.247 |
| 1:15:00 AM | 6.049 | 0.713 | 163.326 |
| 1:30:00 AM | 5.81 | 0.625 | 137.192 |
| 1:45:00 AM | 5.738 | 0.607 | 130.003 |
| 2:00:00 AM | 5.565 | 0.563 | 116.214 |
| 2:15:00 AM | 5.562 | 0.991 | 206.689 |
| 2:30:00 AM | 5.511 | 0.759 | 154.624 |
| 2:45:00 AM | 5.434 | 0.493 | 111.483 |
| 3:00:00 AM | 5.432 | 0.542 | 109.406 |
| 3:15:00 AM | 5.494 | 0.584 | 118.726 |
| 3:30:00 AM | 5.495 | 0.522 | 105.669 |
| 3:45:00 AM | 5.382 | 0.502 | 99.977 |
| 4:00:00 AM | 5.38 | 0.494 | 98.41 |
| 4:15:00 AM | 5.503 | 0.501 | 101.623 |
| 4:30:00 AM | 5.564 | 0.549 | 114.504 |
| 4:45:00 AM | 5.785 | 0.627 | 136.621 |
| 5:00:00 AM | 5.808 | 0.833 | 184.318 |
| 5:15:00 AM | 5.961 | 0.733 | 168.048 |
| 5:30:00 AM | 6.131 | 0.788 | 187.786 |
| 5:45:00 AM | 6.421 | 0.845 | 214.285 |
| 6:00:00 AM | 6.554 | 0.869 | 226.877 |
| 6:15:00 AM | 6.582 | 0.901 | 236.545 |
| 6:30:00 AM | 6.704 | 0.942 | 253.475 |
| 6:45:00 AM | 6.896 | 1.017 | 279.998 |
| 7:00:00 AM | 7.101 | 1.036 | 299.751 |
| 7:15:00 AM | 7.304 | 1.187 | 358.33 |
| 7:30:00 AM | 7.417 | 1.147 | 353.404 |
| 7:45:00 AM | 7.765 | 1.295 | 420.126 |
| 8:00:00 AM | 7.749 | 1.401 | 457.69 |
| 8:15:00 AM | 7.723 | 1.225 | 393.989 |
| 8:30:00 AM | 7.751 | 1.377 | 450.056 |
| 8:45:00 AM | 7.49 | 1.161 | 360.382 |
| 9:00:00 AM | 7.472 | 1.222 | 374.634 |
| 9:15:00 AM | 7.513 | 1.286 | 403.168 |
| 9:30:00 AM | 7.68 | 1.204 | 384.211 |
| 9:45:00 AM | 7.526 | 1.243 | 390.33 |
| 10:00:00 AM | 7.514 | 1.272 | 398.473 |
| 10:15:00 AM | 7.642 | 1.322 | 423.281 |
| 10:30:00 AM | 7.721 | 1.296 | 421.276 |
| 10:45:00 AM | 7.739 | 1.248 | 405.545 |
| 11:00:00 AM | 7.741 | 1.246 | 406.565 |
| 11:15:00 AM | 7.789 | 1.283 | 421.803 |
| 11:30:00 AM | 7.678 | 1.281 | 406.349 |
| 11:45:00 AM | 7.556 | 1.227 | 386.879 |

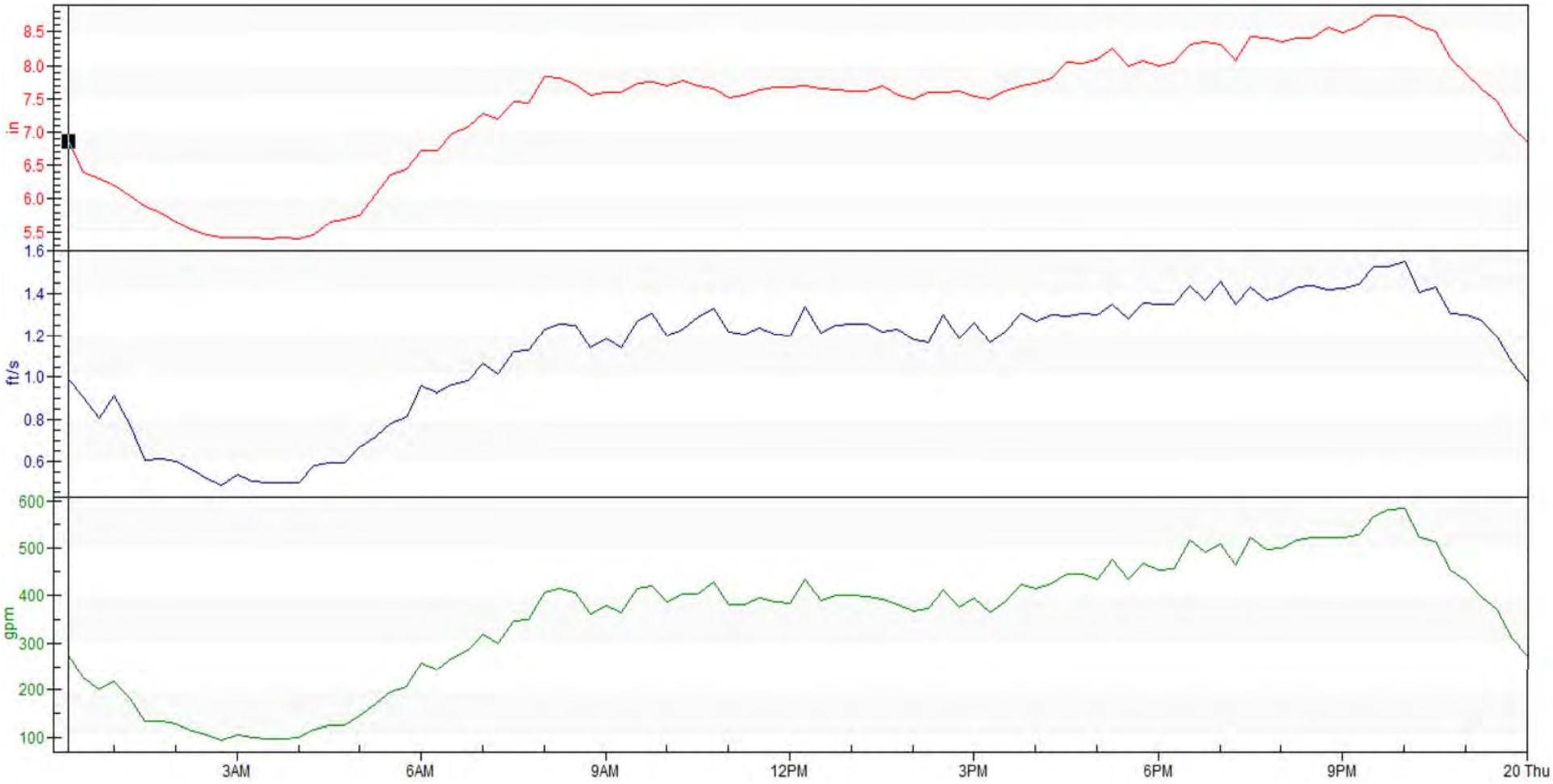
**Tuesday- P.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.799 | 1.268 | 415.493 |
| 12:15:00 PM | 7.746 | 1.404 | 458.257 |
| 12:30:00 PM | 7.762 | 1.354 | 441.195 |
| 12:45:00 PM | 7.581 | 1.228 | 389.692 |
| 1:00:00 PM | 7.723 | 1.241 | 403.669 |
| 1:15:00 PM | 7.56 | 1.314 | 415.236 |
| 1:30:00 PM | 7.564 | 1.244 | 391.654 |
| 1:45:00 PM | 7.559 | 1.226 | 387.447 |
| 2:00:00 PM | 7.525 | 1.21 | 377.918 |
| 2:15:00 PM | 7.381 | 1.088 | 333.233 |
| 2:30:00 PM | 7.585 | 1.248 | 396.241 |
| 2:45:00 PM | 7.726 | 1.232 | 400.944 |
| 3:00:00 PM | 7.682 | 1.42 | 458.552 |
| 3:15:00 PM | 7.755 | 1.279 | 418.112 |
| 3:30:00 PM | 7.622 | 1.176 | 375.77 |
| 3:45:00 PM | 7.709 | 1.181 | 380.328 |
| 4:00:00 PM | 7.638 | 1.229 | 393.861 |
| 4:15:00 PM | 7.637 | 1.27 | 401.26 |
| 4:30:00 PM | 7.611 | 1.303 | 415.12 |
| 4:45:00 PM | 7.63 | 1.247 | 398.905 |
| 5:00:00 PM | 7.874 | 1.316 | 433.231 |
| 5:15:00 PM | 7.834 | 1.261 | 413.97 |
| 5:30:00 PM | 7.871 | 1.325 | 441.788 |
| 5:45:00 PM | 7.958 | 1.322 | 447.083 |
| 6:00:00 PM | 8.266 | 1.387 | 485.483 |
| 6:15:00 PM | 8.122 | 1.335 | 463.724 |
| 6:30:00 PM | 8.338 | 1.295 | 438.429 |
| 6:45:00 PM | 8.403 | 1.386 | 498.423 |
| 7:00:00 PM | 8.234 | 1.404 | 496.541 |
| 7:15:00 PM | 8.196 | 1.36 | 474.471 |
| 7:30:00 PM | 8.224 | 1.392 | 485.319 |
| 7:45:00 PM | 8.258 | 1.48 | 515.797 |
| 8:00:00 PM | 8.357 | 1.398 | 503.879 |
| 8:15:00 PM | 8.341 | 1.373 | 489.457 |
| 8:30:00 PM | 8.552 | 1.401 | 520.584 |
| 8:45:00 PM | 8.573 | 1.519 | 566.214 |
| 9:00:00 PM | 8.759 | 1.466 | 561.687 |
| 9:15:00 PM | 8.692 | 1.504 | 570.521 |
| 9:30:00 PM | 8.659 | 1.466 | 550.981 |
| 9:45:00 PM | 8.843 | 1.411 | 547.322 |
| 10:00:00 PM | 8.796 | 1.53 | 585.837 |
| 10:15:00 PM | 8.515 | 1.445 | 533.59 |
| 10:30:00 PM | 8.411 | 1.404 | 501.716 |
| 10:45:00 PM | 8.222 | 1.408 | 497.103 |
| 11:00:00 PM | 7.826 | 1.251 | 413.846 |
| 11:15:00 PM | 7.787 | 1.269 | 417.257 |
| 11:30:00 PM | 7.627 | 1.276 | 402.962 |
| 11:45:00 PM | 7.221 | 1.1 | 310.997 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.324 | 1.136 | 358.331 |
| Daily Min: | 5.38 | 0.493 | 98.41 |
| Daily Max: | 8.843 | 1.53 | 585.837 |
| Peak to Avg: | | | 1.63 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/19/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Wednesday - A.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.987 | 1.085 | 308.873 |
| 12:15:00 AM | 6.867 | 0.988 | 274.581 |
| 12:30:00 AM | 6.402 | 0.908 | 226.835 |
| 12:45:00 AM | 6.312 | 0.808 | 200.299 |
| 1:00:00 AM | 6.205 | 0.917 | 218.738 |
| 1:15:00 AM | 6.041 | 0.775 | 181.153 |
| 1:30:00 AM | 5.886 | 0.601 | 133.939 |
| 1:45:00 AM | 5.786 | 0.608 | 133.859 |
| 2:00:00 AM | 5.646 | 0.6 | 127.667 |
| 2:15:00 AM | 5.535 | 0.559 | 115.67 |
| 2:30:00 AM | 5.45 | 0.517 | 104.839 |
| 2:45:00 AM | 5.41 | 0.484 | 95.341 |
| 3:00:00 AM | 5.411 | 0.534 | 105.705 |
| 3:15:00 AM | 5.424 | 0.502 | 100.982 |
| 3:30:00 AM | 5.404 | 0.496 | 98.002 |
| 3:45:00 AM | 5.414 | 0.5 | 98.335 |
| 4:00:00 AM | 5.393 | 0.499 | 99.752 |
| 4:15:00 AM | 5.448 | 0.581 | 117.733 |
| 4:30:00 AM | 5.66 | 0.592 | 126.38 |
| 4:45:00 AM | 5.697 | 0.59 | 126.624 |
| 5:00:00 AM | 5.748 | 0.666 | 145.311 |
| 5:15:00 AM | 6.073 | 0.721 | 169.563 |
| 5:30:00 AM | 6.372 | 0.779 | 195.618 |
| 5:45:00 AM | 6.439 | 0.812 | 206.972 |
| 6:00:00 AM | 6.725 | 0.955 | 258.267 |
| 6:15:00 AM | 6.715 | 0.926 | 243.224 |
| 6:30:00 AM | 6.983 | 0.965 | 268.349 |
| 6:45:00 AM | 7.073 | 0.984 | 284.795 |
| 7:00:00 AM | 7.269 | 1.064 | 319.387 |
| 7:15:00 AM | 7.199 | 1.015 | 300.61 |
| 7:30:00 AM | 7.457 | 1.122 | 348.231 |
| 7:45:00 AM | 7.444 | 1.127 | 349.114 |
| 8:00:00 AM | 7.836 | 1.228 | 406.963 |
| 8:15:00 AM | 7.807 | 1.256 | 414.213 |
| 8:30:00 AM | 7.723 | 1.25 | 406.429 |
| 8:45:00 AM | 7.55 | 1.144 | 361.029 |
| 9:00:00 AM | 7.596 | 1.185 | 377.102 |
| 9:15:00 AM | 7.598 | 1.145 | 364.433 |
| 9:30:00 AM | 7.735 | 1.268 | 413.048 |
| 9:45:00 AM | 7.749 | 1.303 | 420.332 |
| 10:00:00 AM | 7.703 | 1.199 | 385.71 |
| 10:15:00 AM | 7.781 | 1.234 | 404.131 |
| 10:30:00 AM | 7.69 | 1.284 | 403.701 |
| 10:45:00 AM | 7.654 | 1.33 | 427.447 |
| 11:00:00 AM | 7.514 | 1.217 | 381.192 |
| 11:15:00 AM | 7.547 | 1.203 | 379.573 |
| 11:30:00 AM | 7.63 | 1.235 | 395.173 |
| 11:45:00 AM | 7.673 | 1.208 | 386.974 |

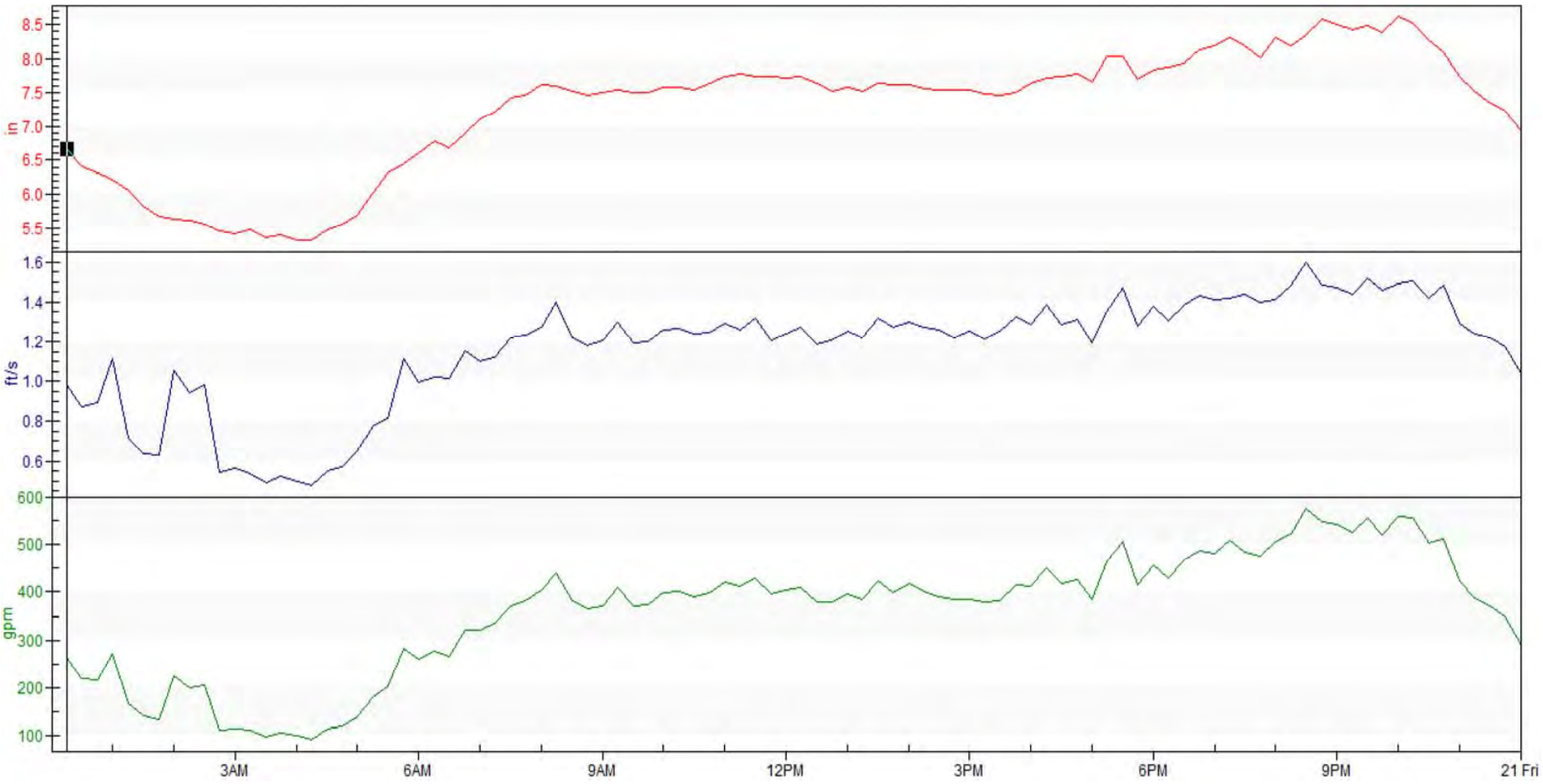
**Wednesday - P.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.664 | 1.2 | 382.739 |
| 12:15:00 PM | 7.693 | 1.338 | 432.953 |
| 12:30:00 PM | 7.649 | 1.21 | 388.509 |
| 12:45:00 PM | 7.626 | 1.249 | 399.281 |
| 1:00:00 PM | 7.619 | 1.256 | 401.012 |
| 1:15:00 PM | 7.618 | 1.256 | 396.991 |
| 1:30:00 PM | 7.685 | 1.216 | 392.801 |
| 1:45:00 PM | 7.553 | 1.228 | 379.865 |
| 2:00:00 PM | 7.488 | 1.178 | 366.858 |
| 2:15:00 PM | 7.589 | 1.167 | 370.842 |
| 2:30:00 PM | 7.601 | 1.301 | 412.486 |
| 2:45:00 PM | 7.623 | 1.186 | 375.992 |
| 3:00:00 PM | 7.542 | 1.265 | 395.706 |
| 3:15:00 PM | 7.502 | 1.166 | 364.761 |
| 3:30:00 PM | 7.615 | 1.216 | 386.72 |
| 3:45:00 PM | 7.702 | 1.306 | 423.027 |
| 4:00:00 PM | 7.743 | 1.27 | 414.221 |
| 4:15:00 PM | 7.806 | 1.299 | 424.08 |
| 4:30:00 PM | 8.052 | 1.296 | 445.233 |
| 4:45:00 PM | 8.031 | 1.304 | 446.21 |
| 5:00:00 PM | 8.093 | 1.3 | 432.626 |
| 5:15:00 PM | 8.248 | 1.348 | 476.625 |
| 5:30:00 PM | 7.985 | 1.278 | 434.285 |
| 5:45:00 PM | 8.063 | 1.356 | 466.709 |
| 6:00:00 PM | 7.998 | 1.352 | 453.045 |
| 6:15:00 PM | 8.046 | 1.352 | 456.437 |
| 6:30:00 PM | 8.317 | 1.441 | 516.414 |
| 6:45:00 PM | 8.341 | 1.367 | 491.771 |
| 7:00:00 PM | 8.303 | 1.459 | 509.952 |
| 7:15:00 PM | 8.069 | 1.35 | 465.064 |
| 7:30:00 PM | 8.431 | 1.435 | 523.245 |
| 7:45:00 PM | 8.399 | 1.372 | 497.857 |
| 8:00:00 PM | 8.341 | 1.389 | 499.58 |
| 8:15:00 PM | 8.399 | 1.432 | 517.187 |
| 8:30:00 PM | 8.398 | 1.441 | 522.944 |
| 8:45:00 PM | 8.57 | 1.42 | 523.299 |
| 9:00:00 PM | 8.479 | 1.427 | 524.065 |
| 9:15:00 PM | 8.587 | 1.445 | 528.637 |
| 9:30:00 PM | 8.745 | 1.527 | 567.964 |
| 9:45:00 PM | 8.737 | 1.528 | 583.285 |
| 10:00:00 PM | 8.733 | 1.553 | 584.352 |
| 10:15:00 PM | 8.581 | 1.407 | 522.113 |
| 10:30:00 PM | 8.511 | 1.431 | 515.943 |
| 10:45:00 PM | 8.119 | 1.309 | 453.97 |
| 11:00:00 PM | 7.867 | 1.297 | 432.186 |
| 11:15:00 PM | 7.654 | 1.272 | 398.159 |
| 11:30:00 PM | 7.463 | 1.19 | 369.897 |
| 11:45:00 PM | 7.073 | 1.072 | 310.275 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.343 | 1.119 | 354.542 |
| Daily Min: | 5.393 | 0.484 | 95.341 |
| Daily Max: | 8.745 | 1.553 | 584.352 |
| Peak to Avg: | | | 1.65 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/20/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Thursday - A.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.832 | 0.979 | 270.443 |
| 12:15:00 AM | 6.674 | 0.981 | 262.38 |
| 12:30:00 AM | 6.404 | 0.874 | 219.85 |
| 12:45:00 AM | 6.317 | 0.898 | 215.257 |
| 1:00:00 AM | 6.216 | 1.115 | 270.756 |
| 1:15:00 AM | 6.059 | 0.717 | 166.003 |
| 1:30:00 AM | 5.814 | 0.636 | 140.861 |
| 1:45:00 AM | 5.663 | 0.629 | 134.068 |
| 2:00:00 AM | 5.625 | 1.054 | 223.157 |
| 2:15:00 AM | 5.615 | 0.941 | 198.705 |
| 2:30:00 AM | 5.541 | 0.985 | 203.909 |
| 2:45:00 AM | 5.45 | 0.546 | 110.742 |
| 3:00:00 AM | 5.412 | 0.566 | 113.628 |
| 3:15:00 AM | 5.476 | 0.539 | 109.59 |
| 3:30:00 AM | 5.35 | 0.494 | 97.631 |
| 3:45:00 AM | 5.391 | 0.527 | 105.317 |
| 4:00:00 AM | 5.322 | 0.501 | 98.197 |
| 4:15:00 AM | 5.313 | 0.478 | 91.846 |
| 4:30:00 AM | 5.479 | 0.551 | 112.419 |
| 4:45:00 AM | 5.556 | 0.573 | 119.225 |
| 5:00:00 AM | 5.677 | 0.649 | 139.14 |
| 5:15:00 AM | 6.023 | 0.778 | 180.913 |
| 5:30:00 AM | 6.308 | 0.813 | 201.493 |
| 5:45:00 AM | 6.451 | 1.111 | 283.411 |
| 6:00:00 AM | 6.607 | 0.993 | 259.116 |
| 6:15:00 AM | 6.776 | 1.018 | 278.022 |
| 6:30:00 AM | 6.691 | 1.016 | 266.814 |
| 6:45:00 AM | 6.91 | 1.153 | 322.137 |
| 7:00:00 AM | 7.114 | 1.101 | 321.055 |
| 7:15:00 AM | 7.223 | 1.122 | 333.765 |
| 7:30:00 AM | 7.431 | 1.22 | 371.447 |
| 7:45:00 AM | 7.476 | 1.232 | 380.991 |
| 8:00:00 AM | 7.619 | 1.271 | 403.242 |
| 8:15:00 AM | 7.613 | 1.4 | 440.218 |
| 8:30:00 AM | 7.537 | 1.221 | 381.527 |
| 8:45:00 AM | 7.463 | 1.179 | 365.203 |
| 9:00:00 AM | 7.517 | 1.206 | 370.946 |
| 9:15:00 AM | 7.549 | 1.3 | 410.096 |
| 9:30:00 AM | 7.509 | 1.193 | 370.555 |
| 9:45:00 AM | 7.508 | 1.201 | 374.905 |
| 10:00:00 AM | 7.596 | 1.258 | 398.223 |
| 10:15:00 AM | 7.587 | 1.268 | 400.913 |
| 10:30:00 AM | 7.538 | 1.237 | 389.521 |
| 10:45:00 AM | 7.637 | 1.244 | 398.657 |
| 11:00:00 AM | 7.75 | 1.292 | 419.586 |
| 11:15:00 AM | 7.789 | 1.257 | 413.307 |
| 11:30:00 AM | 7.736 | 1.32 | 430.022 |
| 11:45:00 AM | 7.74 | 1.209 | 394.405 |

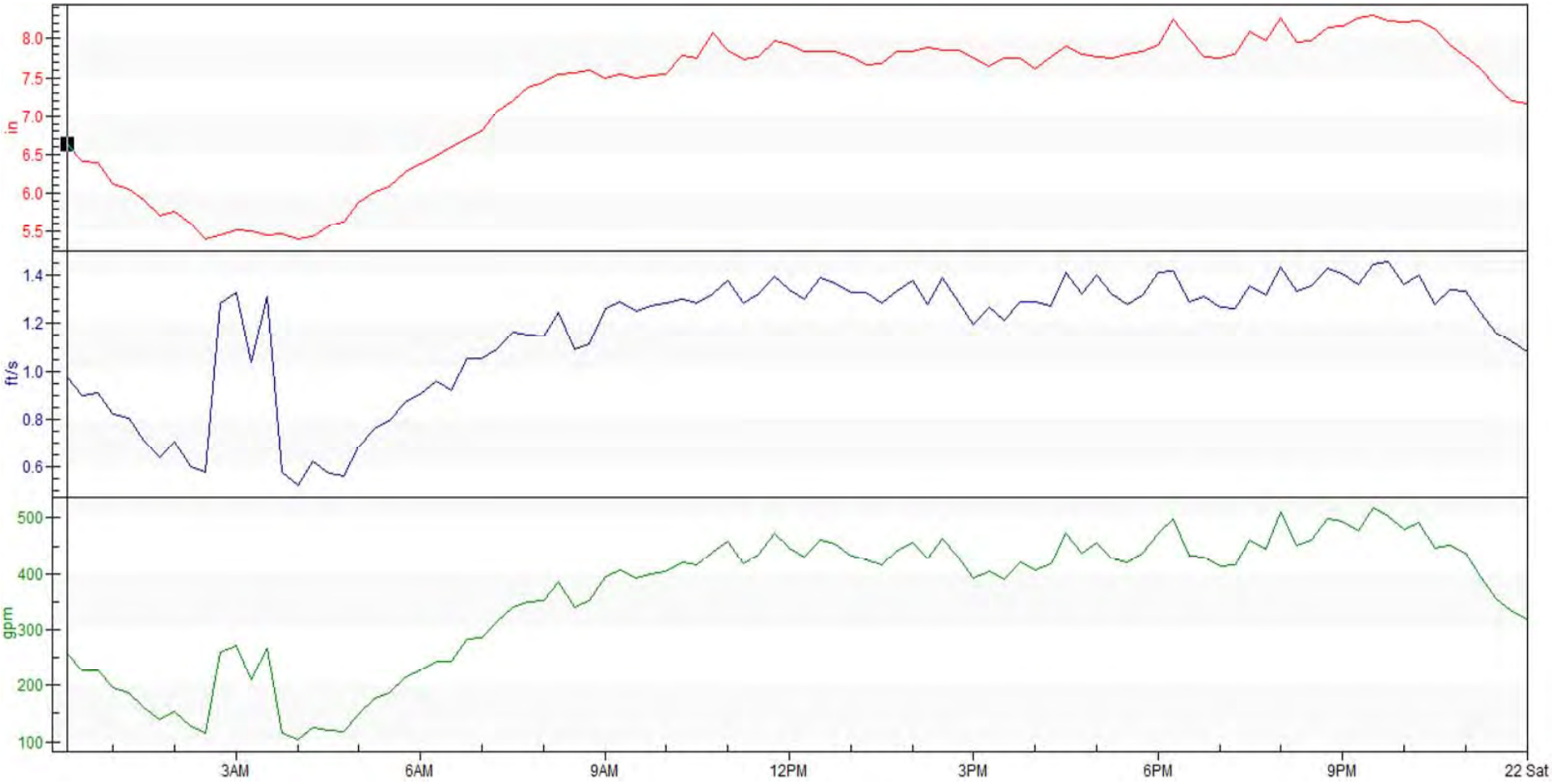
**Thursday - P.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.716 | 1.242 | 403.422 |
| 12:15:00 PM | 7.752 | 1.27 | 408.908 |
| 12:30:00 PM | 7.651 | 1.187 | 379.232 |
| 12:45:00 PM | 7.535 | 1.208 | 378.911 |
| 1:00:00 PM | 7.58 | 1.251 | 396.884 |
| 1:15:00 PM | 7.532 | 1.22 | 383.703 |
| 1:30:00 PM | 7.651 | 1.32 | 423.82 |
| 1:45:00 PM | 7.629 | 1.275 | 399.634 |
| 2:00:00 PM | 7.633 | 1.302 | 416.738 |
| 2:15:00 PM | 7.565 | 1.272 | 401.503 |
| 2:30:00 PM | 7.541 | 1.262 | 391.419 |
| 2:45:00 PM | 7.54 | 1.22 | 384.309 |
| 3:00:00 PM | 7.547 | 1.253 | 384.046 |
| 3:15:00 PM | 7.498 | 1.216 | 380.264 |
| 3:30:00 PM | 7.461 | 1.251 | 380.727 |
| 3:45:00 PM | 7.51 | 1.327 | 415.144 |
| 4:00:00 PM | 7.648 | 1.283 | 411.99 |
| 4:15:00 PM | 7.725 | 1.383 | 449.926 |
| 4:30:00 PM | 7.734 | 1.286 | 418.994 |
| 4:45:00 PM | 7.778 | 1.316 | 427.261 |
| 5:00:00 PM | 7.672 | 1.192 | 384.253 |
| 5:15:00 PM | 8.038 | 1.353 | 463.595 |
| 5:30:00 PM | 8.044 | 1.474 | 505.66 |
| 5:45:00 PM | 7.697 | 1.281 | 414.588 |
| 6:00:00 PM | 7.839 | 1.378 | 456.974 |
| 6:15:00 PM | 7.883 | 1.305 | 428.844 |
| 6:30:00 PM | 7.933 | 1.388 | 467.41 |
| 6:45:00 PM | 8.133 | 1.433 | 486.407 |
| 7:00:00 PM | 8.19 | 1.409 | 480.958 |
| 7:15:00 PM | 8.312 | 1.419 | 508.026 |
| 7:30:00 PM | 8.192 | 1.441 | 483.561 |
| 7:45:00 PM | 8.022 | 1.396 | 477.167 |
| 8:00:00 PM | 8.32 | 1.416 | 507.407 |
| 8:15:00 PM | 8.193 | 1.485 | 521.941 |
| 8:30:00 PM | 8.343 | 1.598 | 575.023 |
| 8:45:00 PM | 8.58 | 1.487 | 548.321 |
| 9:00:00 PM | 8.499 | 1.473 | 542.687 |
| 9:15:00 PM | 8.434 | 1.439 | 524.876 |
| 9:30:00 PM | 8.484 | 1.516 | 556.647 |
| 9:45:00 PM | 8.384 | 1.46 | 521.472 |
| 10:00:00 PM | 8.626 | 1.49 | 559.774 |
| 10:15:00 PM | 8.518 | 1.502 | 555.158 |
| 10:30:00 PM | 8.277 | 1.421 | 503.461 |
| 10:45:00 PM | 8.104 | 1.482 | 513.196 |
| 11:00:00 PM | 7.752 | 1.293 | 422.516 |
| 11:15:00 PM | 7.529 | 1.242 | 386.038 |
| 11:30:00 PM | 7.352 | 1.221 | 371.927 |
| 11:45:00 PM | 7.238 | 1.172 | 349.748 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.268 | 1.164 | 361.545 |
| Daily Min: | 5.313 | 0.478 | 91.846 |
| Daily Max: | 8.626 | 1.598 | 575.023 |
| Peak to Avg: | | | 1.59 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/21/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Friday - A.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.942 | 1.042 | 291.292 |
| 12:15:00 AM | 6.64 | 0.979 | 257.115 |
| 12:30:00 AM | 6.407 | 0.897 | 227.199 |
| 12:45:00 AM | 6.397 | 0.909 | 227.714 |
| 1:00:00 AM | 6.123 | 0.823 | 195.762 |
| 1:15:00 AM | 6.06 | 0.803 | 187.181 |
| 1:30:00 AM | 5.921 | 0.71 | 161.303 |
| 1:45:00 AM | 5.718 | 0.638 | 138.016 |
| 2:00:00 AM | 5.754 | 0.704 | 153.805 |
| 2:15:00 AM | 5.6 | 0.603 | 126.9 |
| 2:30:00 AM | 5.409 | 0.578 | 116.005 |
| 2:45:00 AM | 5.446 | 1.283 | 259.821 |
| 3:00:00 AM | 5.515 | 1.328 | 271.205 |
| 3:15:00 AM | 5.502 | 1.036 | 209.526 |
| 3:30:00 AM | 5.451 | 1.314 | 266.442 |
| 3:45:00 AM | 5.478 | 0.577 | 115.998 |
| 4:00:00 AM | 5.4 | 0.523 | 104.2 |
| 4:15:00 AM | 5.434 | 0.624 | 124.518 |
| 4:30:00 AM | 5.575 | 0.571 | 119.425 |
| 4:45:00 AM | 5.629 | 0.563 | 118.643 |
| 5:00:00 AM | 5.876 | 0.686 | 147.62 |
| 5:15:00 AM | 6.021 | 0.759 | 175.854 |
| 5:30:00 AM | 6.081 | 0.795 | 185.277 |
| 5:45:00 AM | 6.274 | 0.874 | 214.892 |
| 6:00:00 AM | 6.376 | 0.906 | 227.734 |
| 6:15:00 AM | 6.479 | 0.961 | 243.988 |
| 6:30:00 AM | 6.595 | 0.922 | 242.621 |
| 6:45:00 AM | 6.711 | 1.055 | 283.695 |
| 7:00:00 AM | 6.808 | 1.053 | 285.284 |
| 7:15:00 AM | 7.059 | 1.089 | 314.301 |
| 7:30:00 AM | 7.201 | 1.162 | 339.177 |
| 7:45:00 AM | 7.382 | 1.154 | 349.412 |
| 8:00:00 AM | 7.436 | 1.149 | 351.183 |
| 8:15:00 AM | 7.537 | 1.245 | 386.067 |
| 8:30:00 AM | 7.566 | 1.09 | 341.171 |
| 8:45:00 AM | 7.596 | 1.116 | 350.833 |
| 9:00:00 AM | 7.498 | 1.261 | 394.151 |
| 9:15:00 AM | 7.548 | 1.289 | 406.736 |
| 9:30:00 AM | 7.489 | 1.254 | 391.409 |
| 9:45:00 AM | 7.53 | 1.274 | 399.558 |
| 10:00:00 AM | 7.542 | 1.283 | 404.296 |
| 10:15:00 AM | 7.787 | 1.299 | 421.581 |
| 10:30:00 AM | 7.757 | 1.286 | 416.814 |
| 10:45:00 AM | 8.069 | 1.325 | 440.046 |
| 11:00:00 AM | 7.86 | 1.378 | 458.63 |
| 11:15:00 AM | 7.737 | 1.286 | 419.205 |
| 11:30:00 AM | 7.777 | 1.323 | 434.19 |
| 11:45:00 AM | 7.966 | 1.397 | 473.066 |

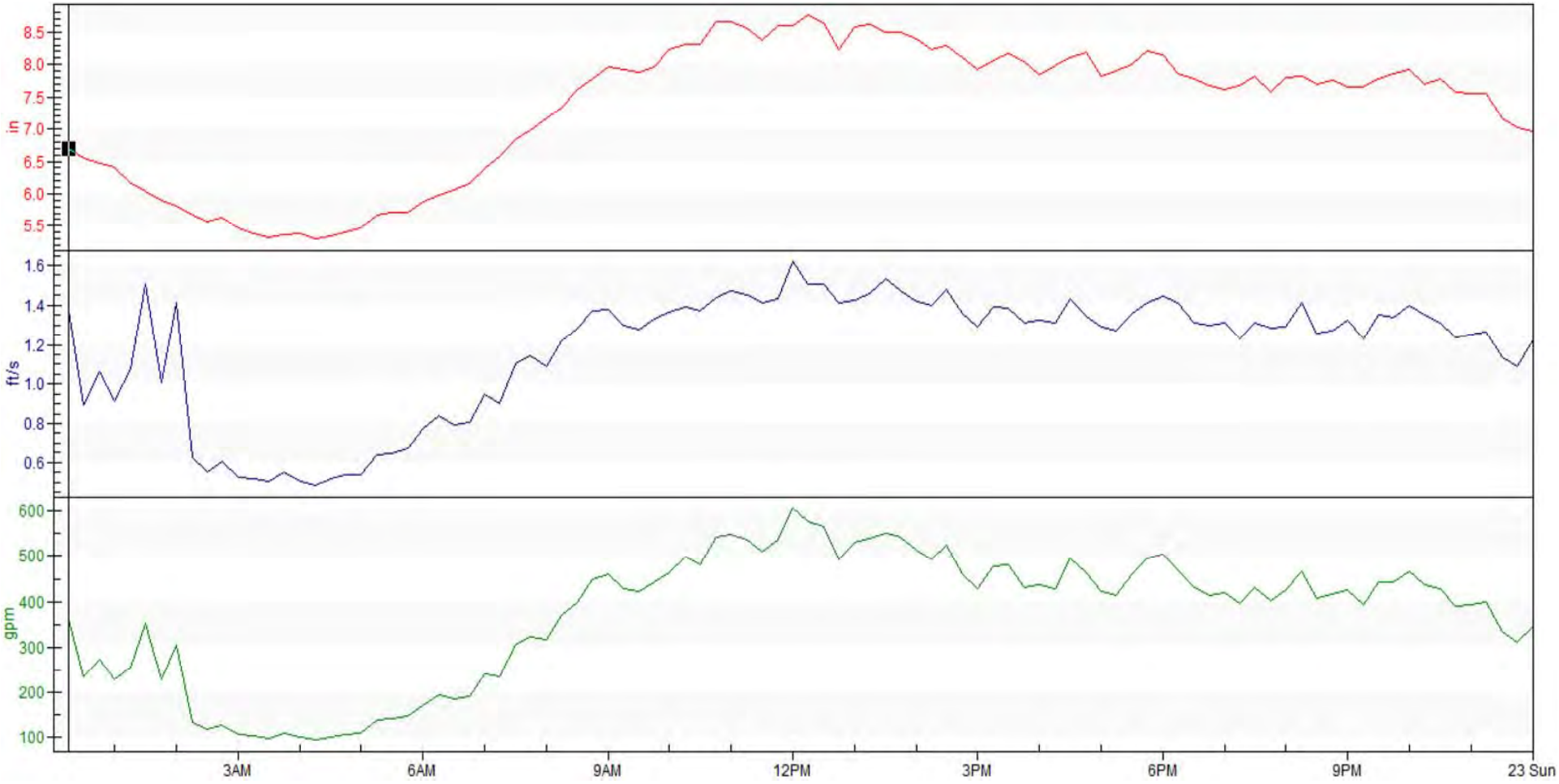
**Friday - P.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.915 | 1.343 | 446.623 |
| 12:15:00 PM | 7.829 | 1.3 | 430.324 |
| 12:30:00 PM | 7.842 | 1.388 | 460.611 |
| 12:45:00 PM | 7.834 | 1.369 | 453.689 |
| 1:00:00 PM | 7.762 | 1.331 | 433.098 |
| 1:15:00 PM | 7.672 | 1.327 | 426.248 |
| 1:30:00 PM | 7.677 | 1.286 | 414.951 |
| 1:45:00 PM | 7.83 | 1.333 | 441.25 |
| 2:00:00 PM | 7.834 | 1.378 | 456.513 |
| 2:15:00 PM | 7.882 | 1.282 | 428.212 |
| 2:30:00 PM | 7.85 | 1.392 | 462.603 |
| 2:45:00 PM | 7.849 | 1.293 | 429.426 |
| 3:00:00 PM | 7.754 | 1.199 | 392.039 |
| 3:15:00 PM | 7.653 | 1.266 | 402.838 |
| 3:30:00 PM | 7.757 | 1.214 | 388.745 |
| 3:45:00 PM | 7.747 | 1.289 | 420.699 |
| 4:00:00 PM | 7.616 | 1.291 | 407.259 |
| 4:15:00 PM | 7.764 | 1.277 | 418.076 |
| 4:30:00 PM | 7.914 | 1.409 | 471.541 |
| 4:45:00 PM | 7.796 | 1.326 | 436.654 |
| 5:00:00 PM | 7.76 | 1.398 | 454.883 |
| 5:15:00 PM | 7.751 | 1.321 | 428.273 |
| 5:30:00 PM | 7.801 | 1.282 | 420.413 |
| 5:45:00 PM | 7.84 | 1.32 | 436.126 |
| 6:00:00 PM | 7.916 | 1.409 | 473.378 |
| 6:15:00 PM | 8.242 | 1.419 | 499.157 |
| 6:30:00 PM | 7.998 | 1.29 | 431.677 |
| 6:45:00 PM | 7.774 | 1.313 | 430.751 |
| 7:00:00 PM | 7.747 | 1.268 | 413.436 |
| 7:15:00 PM | 7.804 | 1.261 | 415.708 |
| 7:30:00 PM | 8.094 | 1.358 | 460.289 |
| 7:45:00 PM | 7.977 | 1.317 | 444.303 |
| 8:00:00 PM | 8.263 | 1.434 | 509.579 |
| 8:15:00 PM | 7.959 | 1.334 | 451.116 |
| 8:30:00 PM | 7.97 | 1.356 | 459.686 |
| 8:45:00 PM | 8.146 | 1.429 | 498.24 |
| 9:00:00 PM | 8.167 | 1.408 | 492.656 |
| 9:15:00 PM | 8.258 | 1.362 | 476.4 |
| 9:30:00 PM | 8.301 | 1.446 | 516.849 |
| 9:45:00 PM | 8.234 | 1.456 | 503.255 |
| 10:00:00 PM | 8.208 | 1.363 | 480.232 |
| 10:15:00 PM | 8.237 | 1.398 | 490.589 |
| 10:30:00 PM | 8.131 | 1.28 | 445.39 |
| 10:45:00 PM | 7.929 | 1.342 | 451.866 |
| 11:00:00 PM | 7.761 | 1.336 | 437.098 |
| 11:15:00 PM | 7.62 | 1.247 | 394.649 |
| 11:30:00 PM | 7.375 | 1.16 | 354.878 |
| 11:45:00 PM | 7.208 | 1.124 | 333.383 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.255 | 1.167 | 359.002 |
| Daily Min: | 5.4 | 0.523 | 104.2 |
| Daily Max: | 8.301 | 1.456 | 516.849 |
| Peak to Avg: | | | 1.44 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/22/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Saturday - A.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.175 | 1.082 | 319.028 |
| 12:15:00 AM | 6.696 | 1.371 | 360.572 |
| 12:30:00 AM | 6.561 | 0.896 | 233.561 |
| 12:45:00 AM | 6.459 | 1.065 | 272.528 |
| 1:00:00 AM | 6.408 | 0.917 | 228.843 |
| 1:15:00 AM | 6.154 | 1.077 | 253.454 |
| 1:30:00 AM | 6.042 | 1.509 | 352.5 |
| 1:45:00 AM | 5.903 | 1.007 | 227.954 |
| 2:00:00 AM | 5.819 | 1.411 | 305.224 |
| 2:15:00 AM | 5.664 | 0.622 | 132.916 |
| 2:30:00 AM | 5.577 | 0.554 | 115.84 |
| 2:45:00 AM | 5.624 | 0.605 | 126.724 |
| 3:00:00 AM | 5.463 | 0.523 | 104.41 |
| 3:15:00 AM | 5.382 | 0.519 | 102.091 |
| 3:30:00 AM | 5.316 | 0.501 | 97.83 |
| 3:45:00 AM | 5.358 | 0.549 | 108.659 |
| 4:00:00 AM | 5.382 | 0.505 | 100.645 |
| 4:15:00 AM | 5.302 | 0.483 | 94.153 |
| 4:30:00 AM | 5.351 | 0.514 | 100.452 |
| 4:45:00 AM | 5.4 | 0.534 | 105.531 |
| 5:00:00 AM | 5.46 | 0.538 | 109.298 |
| 5:15:00 AM | 5.675 | 0.635 | 136.147 |
| 5:30:00 AM | 5.706 | 0.647 | 139.755 |
| 5:45:00 AM | 5.704 | 0.673 | 145.278 |
| 6:00:00 AM | 5.871 | 0.77 | 169.89 |
| 6:15:00 AM | 5.987 | 0.841 | 194.037 |
| 6:30:00 AM | 6.058 | 0.79 | 185.307 |
| 6:45:00 AM | 6.168 | 0.809 | 189.166 |
| 7:00:00 AM | 6.388 | 0.949 | 239.34 |
| 7:15:00 AM | 6.571 | 0.902 | 235.423 |
| 7:30:00 AM | 6.831 | 1.101 | 303.992 |
| 7:45:00 AM | 6.99 | 1.14 | 323.425 |
| 8:00:00 AM | 7.165 | 1.087 | 316.402 |
| 8:15:00 AM | 7.334 | 1.219 | 370.14 |
| 8:30:00 AM | 7.607 | 1.285 | 398.727 |
| 8:45:00 AM | 7.774 | 1.371 | 449.743 |
| 9:00:00 AM | 7.966 | 1.378 | 459.07 |
| 9:15:00 AM | 7.914 | 1.297 | 427.77 |
| 9:30:00 AM | 7.879 | 1.279 | 422.896 |
| 9:45:00 AM | 7.971 | 1.328 | 441.667 |
| 10:00:00 AM | 8.228 | 1.368 | 463.504 |
| 10:15:00 AM | 8.309 | 1.394 | 498.701 |
| 10:30:00 AM | 8.307 | 1.372 | 482.259 |
| 10:45:00 AM | 8.663 | 1.438 | 543.222 |
| 11:00:00 AM | 8.655 | 1.472 | 548.582 |
| 11:15:00 AM | 8.563 | 1.452 | 536.933 |
| 11:30:00 AM | 8.368 | 1.41 | 509.106 |
| 11:45:00 AM | 8.594 | 1.433 | 535.839 |

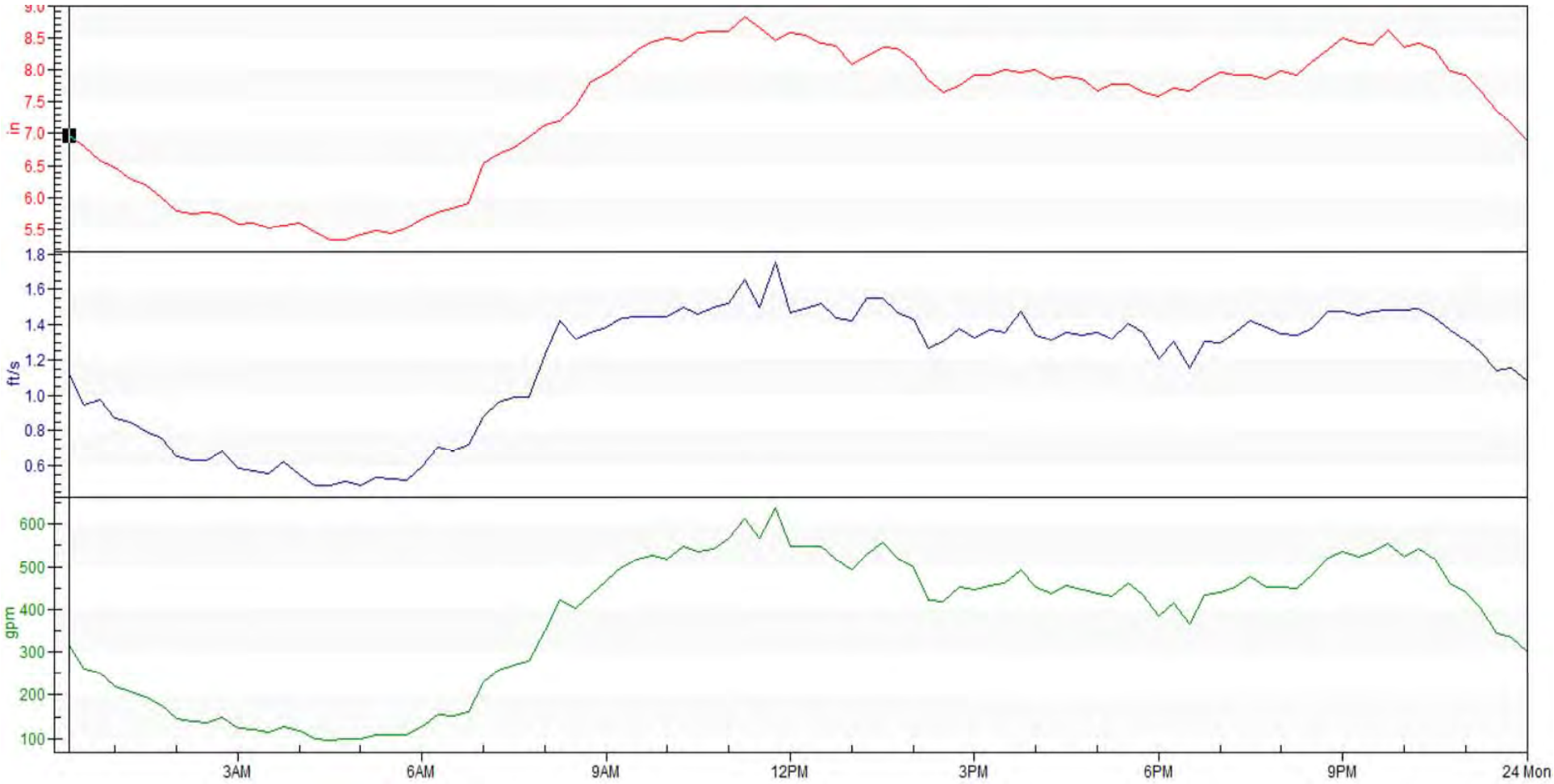
**Saturday - P.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.599 | 1.621 | 606.353 |
| 12:15:00 PM | 8.762 | 1.505 | 576.68 |
| 12:30:00 PM | 8.644 | 1.504 | 566.402 |
| 12:45:00 PM | 8.237 | 1.415 | 493.556 |
| 1:00:00 PM | 8.571 | 1.424 | 530.484 |
| 1:15:00 PM | 8.613 | 1.461 | 539.243 |
| 1:30:00 PM | 8.494 | 1.533 | 552.582 |
| 1:45:00 PM | 8.505 | 1.47 | 541.835 |
| 2:00:00 PM | 8.39 | 1.419 | 513.513 |
| 2:15:00 PM | 8.219 | 1.397 | 492.745 |
| 2:30:00 PM | 8.297 | 1.481 | 524.506 |
| 2:45:00 PM | 8.097 | 1.359 | 460.427 |
| 3:00:00 PM | 7.918 | 1.29 | 429.256 |
| 3:15:00 PM | 8.059 | 1.391 | 478.303 |
| 3:30:00 PM | 8.167 | 1.387 | 480.083 |
| 3:45:00 PM | 8.036 | 1.313 | 431.169 |
| 4:00:00 PM | 7.836 | 1.321 | 436.992 |
| 4:15:00 PM | 7.979 | 1.309 | 428.689 |
| 4:30:00 PM | 8.103 | 1.43 | 495.164 |
| 4:45:00 PM | 8.181 | 1.342 | 462.565 |
| 5:00:00 PM | 7.827 | 1.291 | 422.694 |
| 5:15:00 PM | 7.895 | 1.273 | 412.203 |
| 5:30:00 PM | 7.995 | 1.356 | 461.466 |
| 5:45:00 PM | 8.212 | 1.41 | 496.81 |
| 6:00:00 PM | 8.145 | 1.443 | 503.015 |
| 6:15:00 PM | 7.869 | 1.412 | 467.949 |
| 6:30:00 PM | 7.787 | 1.311 | 430.978 |
| 6:45:00 PM | 7.67 | 1.295 | 414.792 |
| 7:00:00 PM | 7.623 | 1.308 | 418.139 |
| 7:15:00 PM | 7.679 | 1.233 | 394.38 |
| 7:30:00 PM | 7.812 | 1.31 | 432.343 |
| 7:45:00 PM | 7.577 | 1.283 | 402.378 |
| 8:00:00 PM | 7.793 | 1.291 | 424.888 |
| 8:15:00 PM | 7.815 | 1.41 | 465.373 |
| 8:30:00 PM | 7.689 | 1.26 | 407.412 |
| 8:45:00 PM | 7.756 | 1.272 | 415.801 |
| 9:00:00 PM | 7.653 | 1.322 | 423.732 |
| 9:15:00 PM | 7.664 | 1.233 | 392.236 |
| 9:30:00 PM | 7.784 | 1.348 | 443.05 |
| 9:45:00 PM | 7.853 | 1.336 | 444.136 |
| 10:00:00 PM | 7.923 | 1.401 | 466.884 |
| 10:15:00 PM | 7.704 | 1.349 | 437.29 |
| 10:30:00 PM | 7.784 | 1.31 | 428.136 |
| 10:45:00 PM | 7.574 | 1.24 | 390.827 |
| 11:00:00 PM | 7.551 | 1.251 | 391.556 |
| 11:15:00 PM | 7.55 | 1.263 | 398.413 |
| 11:30:00 PM | 7.157 | 1.139 | 334.867 |
| 11:45:00 PM | 7.028 | 1.09 | 311.007 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.312 | 1.172 | 369.187 |
| Daily Min: | 5.302 | 0.483 | 94.153 |
| Daily Max: | 8.762 | 1.621 | 606.353 |
| Peak to Avg: | | | 1.64 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/23/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Sunday - A.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.961 | 1.22 | 345.596 |
| 12:15:00 AM | 6.974 | 1.116 | 316.689 |
| 12:30:00 AM | 6.8 | 0.947 | 259.878 |
| 12:45:00 AM | 6.572 | 0.972 | 252.351 |
| 1:00:00 AM | 6.47 | 0.869 | 220.113 |
| 1:15:00 AM | 6.28 | 0.851 | 208.485 |
| 1:30:00 AM | 6.204 | 0.8 | 193.803 |
| 1:45:00 AM | 6.009 | 0.756 | 175.304 |
| 2:00:00 AM | 5.788 | 0.658 | 144.891 |
| 2:15:00 AM | 5.757 | 0.635 | 138.264 |
| 2:30:00 AM | 5.775 | 0.628 | 137.533 |
| 2:45:00 AM | 5.732 | 0.687 | 149.353 |
| 3:00:00 AM | 5.588 | 0.587 | 122.306 |
| 3:15:00 AM | 5.614 | 0.575 | 121.356 |
| 3:30:00 AM | 5.534 | 0.558 | 115.475 |
| 3:45:00 AM | 5.567 | 0.621 | 127.818 |
| 4:00:00 AM | 5.609 | 0.552 | 116.389 |
| 4:15:00 AM | 5.465 | 0.493 | 98.772 |
| 4:30:00 AM | 5.346 | 0.49 | 96.635 |
| 4:45:00 AM | 5.34 | 0.51 | 100.421 |
| 5:00:00 AM | 5.416 | 0.489 | 97.858 |
| 5:15:00 AM | 5.476 | 0.537 | 108.454 |
| 5:30:00 AM | 5.438 | 0.53 | 107.029 |
| 5:45:00 AM | 5.516 | 0.521 | 107.346 |
| 6:00:00 AM | 5.678 | 0.592 | 127.101 |
| 6:15:00 AM | 5.777 | 0.705 | 153.487 |
| 6:30:00 AM | 5.844 | 0.681 | 151.443 |
| 6:45:00 AM | 5.92 | 0.719 | 162.067 |
| 7:00:00 AM | 6.546 | 0.882 | 229.879 |
| 7:15:00 AM | 6.683 | 0.958 | 256.846 |
| 7:30:00 AM | 6.778 | 0.99 | 270.319 |
| 7:45:00 AM | 6.944 | 0.987 | 278.598 |
| 8:00:00 AM | 7.127 | 1.227 | 348.507 |
| 8:15:00 AM | 7.2 | 1.421 | 421.012 |
| 8:30:00 AM | 7.438 | 1.323 | 402.495 |
| 8:45:00 AM | 7.813 | 1.356 | 432.628 |
| 9:00:00 AM | 7.944 | 1.388 | 468.276 |
| 9:15:00 AM | 8.105 | 1.442 | 499.017 |
| 9:30:00 AM | 8.302 | 1.447 | 517.358 |
| 9:45:00 AM | 8.423 | 1.444 | 526.026 |
| 10:00:00 AM | 8.499 | 1.445 | 518.494 |
| 10:15:00 AM | 8.447 | 1.502 | 546.912 |
| 10:30:00 AM | 8.572 | 1.461 | 535.785 |
| 10:45:00 AM | 8.6 | 1.502 | 542.28 |
| 11:00:00 AM | 8.587 | 1.52 | 567.674 |
| 11:15:00 AM | 8.825 | 1.653 | 614.296 |
| 11:30:00 AM | 8.669 | 1.496 | 565.471 |
| 11:45:00 AM | 8.455 | 1.754 | 637.3 |

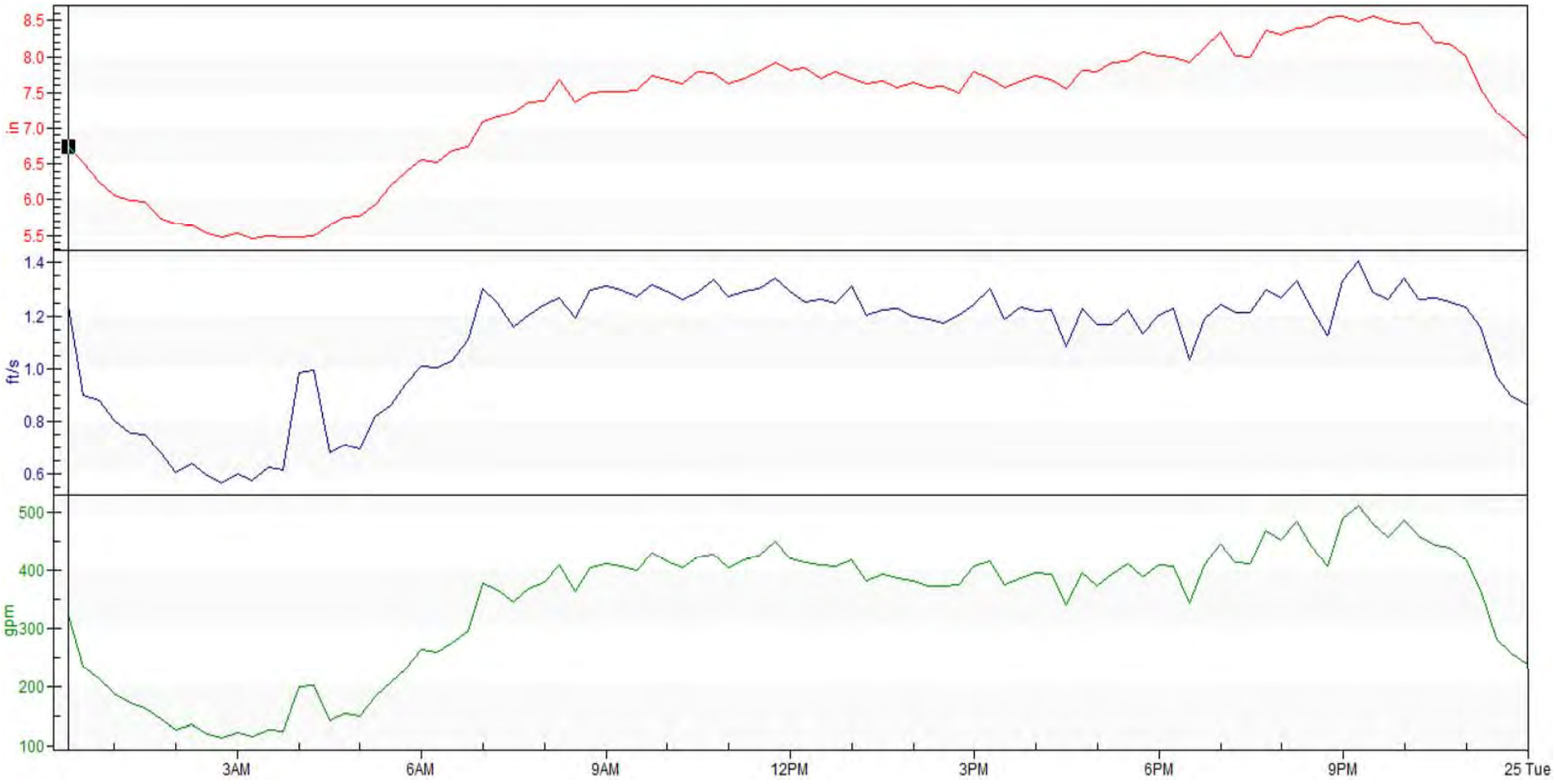
**Sunday - P.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.568 | 1.472 | 548.167 |
| 12:15:00 PM | 8.545 | 1.49 | 549.244 |
| 12:30:00 PM | 8.406 | 1.521 | 549.154 |
| 12:45:00 PM | 8.371 | 1.435 | 518.632 |
| 1:00:00 PM | 8.081 | 1.428 | 492.781 |
| 1:15:00 PM | 8.197 | 1.554 | 530.939 |
| 1:30:00 PM | 8.341 | 1.551 | 557.584 |
| 1:45:00 PM | 8.336 | 1.466 | 520.042 |
| 2:00:00 PM | 8.152 | 1.429 | 498.836 |
| 2:15:00 PM | 7.844 | 1.267 | 420.445 |
| 2:30:00 PM | 7.641 | 1.308 | 419.261 |
| 2:45:00 PM | 7.753 | 1.383 | 451.945 |
| 3:00:00 PM | 7.919 | 1.33 | 445.547 |
| 3:15:00 PM | 7.921 | 1.37 | 455.462 |
| 3:30:00 PM | 7.99 | 1.36 | 462.388 |
| 3:45:00 PM | 7.964 | 1.475 | 491.9 |
| 4:00:00 PM | 7.994 | 1.344 | 450.768 |
| 4:15:00 PM | 7.865 | 1.311 | 435.99 |
| 4:30:00 PM | 7.892 | 1.356 | 453.828 |
| 4:45:00 PM | 7.845 | 1.343 | 445.753 |
| 5:00:00 PM | 7.661 | 1.36 | 437.602 |
| 5:15:00 PM | 7.779 | 1.317 | 430.822 |
| 5:30:00 PM | 7.781 | 1.406 | 461.729 |
| 5:45:00 PM | 7.649 | 1.353 | 434.525 |
| 6:00:00 PM | 7.593 | 1.21 | 384.875 |
| 6:15:00 PM | 7.714 | 1.306 | 416.009 |
| 6:30:00 PM | 7.676 | 1.153 | 366.781 |
| 6:45:00 PM | 7.825 | 1.307 | 432.394 |
| 7:00:00 PM | 7.953 | 1.297 | 438.447 |
| 7:15:00 PM | 7.921 | 1.361 | 453.43 |
| 7:30:00 PM | 7.924 | 1.422 | 477.934 |
| 7:45:00 PM | 7.858 | 1.385 | 452.202 |
| 8:00:00 PM | 7.979 | 1.346 | 452.871 |
| 8:15:00 PM | 7.916 | 1.342 | 449.732 |
| 8:30:00 PM | 8.132 | 1.378 | 479.402 |
| 8:45:00 PM | 8.301 | 1.479 | 520.61 |
| 9:00:00 PM | 8.501 | 1.48 | 534.322 |
| 9:15:00 PM | 8.407 | 1.451 | 522.993 |
| 9:30:00 PM | 8.392 | 1.479 | 535.958 |
| 9:45:00 PM | 8.609 | 1.484 | 555.896 |
| 10:00:00 PM | 8.357 | 1.485 | 524.356 |
| 10:15:00 PM | 8.42 | 1.491 | 543.016 |
| 10:30:00 PM | 8.317 | 1.44 | 515.823 |
| 10:45:00 PM | 7.978 | 1.375 | 462.017 |
| 11:00:00 PM | 7.91 | 1.313 | 440.493 |
| 11:15:00 PM | 7.674 | 1.245 | 401.357 |
| 11:30:00 PM | 7.366 | 1.141 | 344.553 |
| 11:45:00 PM | 7.153 | 1.156 | 335.013 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.366 | 1.173 | 376.775 |
| Daily Min: | 5.34 | 0.489 | 96.635 |
| Daily Max: | 8.825 | 1.754 | 637.3 |
| Peak to Avg: | | | 1.69 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/24/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Monday - A.M. 7/24/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 6.895 | 1.082 | 298.847 |
| 12:15:00 AM | 6.735 | 1.237 | 324.137 |
| 12:30:00 AM | 6.531 | 0.9 | 233.844 |
| 12:45:00 AM | 6.251 | 0.88 | 215.535 |
| 1:00:00 AM | 6.06 | 0.805 | 188.626 |
| 1:15:00 AM | 5.992 | 0.757 | 173.082 |
| 1:30:00 AM | 5.979 | 0.749 | 165.337 |
| 1:45:00 AM | 5.739 | 0.681 | 147.13 |
| 2:00:00 AM | 5.653 | 0.604 | 128.757 |
| 2:15:00 AM | 5.636 | 0.643 | 136.608 |
| 2:30:00 AM | 5.532 | 0.597 | 122.481 |
| 2:45:00 AM | 5.481 | 0.566 | 115.223 |
| 3:00:00 AM | 5.536 | 0.6 | 124.389 |
| 3:15:00 AM | 5.455 | 0.578 | 117.278 |
| 3:30:00 AM | 5.501 | 0.624 | 128.177 |
| 3:45:00 AM | 5.475 | 0.618 | 126.093 |
| 4:00:00 AM | 5.481 | 0.985 | 200.228 |
| 4:15:00 AM | 5.486 | 0.995 | 202.827 |
| 4:30:00 AM | 5.634 | 0.682 | 144.795 |
| 4:45:00 AM | 5.742 | 0.713 | 155.246 |
| 5:00:00 AM | 5.759 | 0.696 | 151.645 |
| 5:15:00 AM | 5.93 | 0.82 | 185.426 |
| 5:30:00 AM | 6.192 | 0.858 | 207.395 |
| 5:45:00 AM | 6.402 | 0.943 | 233.123 |
| 6:00:00 AM | 6.55 | 1.01 | 263.506 |
| 6:15:00 AM | 6.515 | 1.003 | 259.616 |
| 6:30:00 AM | 6.693 | 1.029 | 276.465 |
| 6:45:00 AM | 6.738 | 1.111 | 296.512 |
| 7:00:00 AM | 7.085 | 1.301 | 377.293 |
| 7:15:00 AM | 7.162 | 1.246 | 366.678 |
| 7:30:00 AM | 7.229 | 1.16 | 345.587 |
| 7:45:00 AM | 7.374 | 1.202 | 367.69 |
| 8:00:00 AM | 7.392 | 1.242 | 380.661 |
| 8:15:00 AM | 7.687 | 1.267 | 409.454 |
| 8:30:00 AM | 7.362 | 1.192 | 363.687 |
| 8:45:00 AM | 7.501 | 1.296 | 405.483 |
| 9:00:00 AM | 7.519 | 1.312 | 411.835 |
| 9:15:00 AM | 7.517 | 1.299 | 407.655 |
| 9:30:00 AM | 7.527 | 1.275 | 400.627 |
| 9:45:00 AM | 7.728 | 1.318 | 428.986 |
| 10:00:00 AM | 7.688 | 1.29 | 416.957 |
| 10:15:00 AM | 7.628 | 1.265 | 404.572 |
| 10:30:00 AM | 7.795 | 1.287 | 423.504 |
| 10:45:00 AM | 7.776 | 1.336 | 428.527 |
| 11:00:00 AM | 7.616 | 1.272 | 405.954 |
| 11:15:00 AM | 7.695 | 1.293 | 418.562 |
| 11:30:00 AM | 7.794 | 1.304 | 424.494 |
| 11:45:00 AM | 7.911 | 1.343 | 450.58 |

**Monday - P.M. 7/24/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.807 | 1.293 | 421.347 |
| 12:15:00 PM | 7.839 | 1.25 | 414.605 |
| 12:30:00 PM | 7.704 | 1.261 | 408.583 |
| 12:45:00 PM | 7.795 | 1.249 | 406.465 |
| 1:00:00 PM | 7.695 | 1.313 | 419.381 |
| 1:15:00 PM | 7.618 | 1.201 | 383.493 |
| 1:30:00 PM | 7.66 | 1.221 | 392.784 |
| 1:45:00 PM | 7.562 | 1.225 | 386.087 |
| 2:00:00 PM | 7.641 | 1.198 | 383.517 |
| 2:15:00 PM | 7.57 | 1.187 | 373.335 |
| 2:30:00 PM | 7.582 | 1.174 | 372.26 |
| 2:45:00 PM | 7.503 | 1.202 | 376.256 |
| 3:00:00 PM | 7.795 | 1.241 | 408.343 |
| 3:15:00 PM | 7.692 | 1.301 | 415.384 |
| 3:30:00 PM | 7.578 | 1.188 | 374.569 |
| 3:45:00 PM | 7.658 | 1.233 | 387.186 |
| 4:00:00 PM | 7.742 | 1.217 | 397.111 |
| 4:15:00 PM | 7.678 | 1.221 | 392.934 |
| 4:30:00 PM | 7.55 | 1.086 | 342.081 |
| 4:45:00 PM | 7.804 | 1.227 | 395.667 |
| 5:00:00 PM | 7.795 | 1.17 | 374.289 |
| 5:15:00 PM | 7.922 | 1.171 | 393.604 |
| 5:30:00 PM | 7.928 | 1.223 | 411.562 |
| 5:45:00 PM | 8.063 | 1.132 | 389.555 |
| 6:00:00 PM | 8.014 | 1.201 | 409.879 |
| 6:15:00 PM | 7.998 | 1.228 | 406.386 |
| 6:30:00 PM | 7.91 | 1.032 | 344.381 |
| 6:45:00 PM | 8.127 | 1.19 | 408.586 |
| 7:00:00 PM | 8.342 | 1.242 | 446.87 |
| 7:15:00 PM | 8.017 | 1.215 | 415.063 |
| 7:30:00 PM | 7.983 | 1.212 | 411.646 |
| 7:45:00 PM | 8.365 | 1.297 | 468.171 |
| 8:00:00 PM | 8.303 | 1.268 | 453.53 |
| 8:15:00 PM | 8.395 | 1.333 | 483.372 |
| 8:30:00 PM | 8.406 | 1.227 | 440.868 |
| 8:45:00 PM | 8.538 | 1.121 | 407.898 |
| 9:00:00 PM | 8.561 | 1.332 | 488.331 |
| 9:15:00 PM | 8.485 | 1.407 | 511.168 |
| 9:30:00 PM | 8.563 | 1.29 | 479.825 |
| 9:45:00 PM | 8.497 | 1.262 | 456.536 |
| 10:00:00 PM | 8.457 | 1.341 | 486.644 |
| 10:15:00 PM | 8.473 | 1.263 | 459.768 |
| 10:30:00 PM | 8.191 | 1.269 | 442.903 |
| 10:45:00 PM | 8.168 | 1.252 | 438.086 |
| 11:00:00 PM | 8.007 | 1.23 | 419.485 |
| 11:15:00 PM | 7.549 | 1.16 | 365.875 |
| 11:30:00 PM | 7.216 | 0.967 | 282.855 |
| 11:45:00 PM | 7.049 | 0.896 | 257.542 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.289 | 1.112 | 343.877 |
| Daily Min: | 5.455 | 0.566 | 115.223 |
| Daily Max: | 8.563 | 1.407 | 511.168 |
| Peak to Avg: | | | 1.49 |

DRAFT

# Sewer Line Flow Study Summary

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd, Santa Paula, CA**
Pipe Size: **18" VCP**
Time Period: **7/11/2023, 12:00 a.m. - 7/25/2023, 12:00 a.m.**

## Level - Inches

| | |
|---|---|
| Average: | 7.362 |
| Maximum: | 9.048 |
| Minimum: | 5.248 |
| Max d/D: | 50.3% |

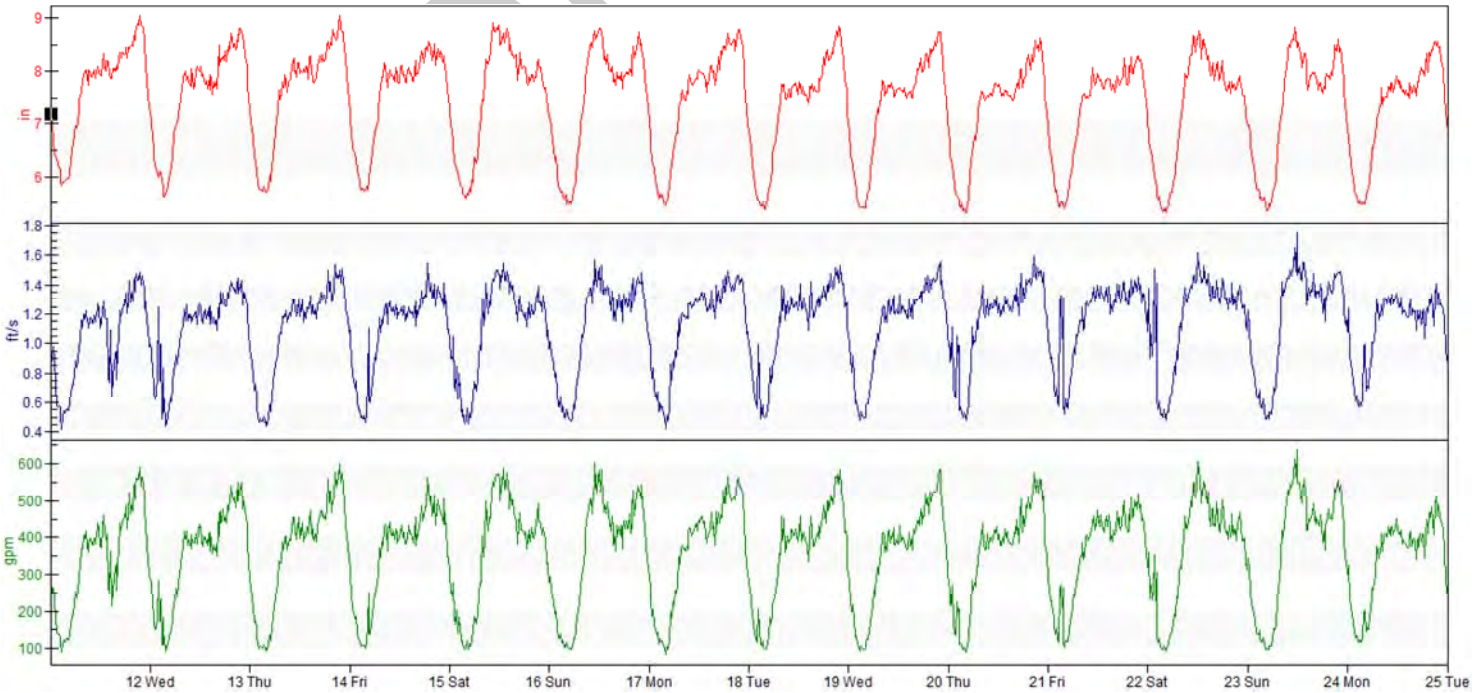
## Velocity - Feet per Second

| | |
|---|---|
| Average: | 1.066 |
| Maximum: | 1.754 |
| Minimum: | 0.408 |

## Flow Rate - Gallons Per Minute

| | |
|---|---|
| Average: | 340.898 |
| Maximum:: | 637.300 |
| Minimum: | 73.445 |
| Peak to Average | 1.70 |

DRAFT




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

# CITY OF SANTA PAULA - SEWER FLOW STUDY

MH Location: **500 Acacia**
**Santa Paula, CA 93060**

Pipe Size: **24" VCP**

Time Period: **7/11/2023 - 12:00 a.m. to**
**7/25/2023- 12:00 a.m.**

GPS: **34.337539, -119.081607**

## Manhole - Layout

## Equipment

**Teledyne Isco 2150 Area Velocity Flow Meter with 10' measuring range:**
**Level Measurement:**

- Method - Submerged pressure transducer mounted in the flow stream
- Transducer Type - Differential linear integrated circuit pressure transducer
- Range (standard) 0.033 to 10 ft (0.010 to 3.05 m); Maximum Allowable Level 34 ft (10.5 m)
- Accuracy ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m,)
- Long-Term Stability ±0.023 ft/yr (±0.007 m/yr)
- Compensated Range 32° to 122°F (0° to 50°C)

**Velocity Measurement:**

- Method - Doppler ultrasonic, frequency 500 kHz
- Typical Minimum Depth 0.08 ft (25 mm)
- Range -5 to +20 ft/s (-1.5 to +6.1 m/s)
- Accuracy (in water with uniform velocity profile, speed of sound = 4850 ft/s, for indicated velocity range) ±0.1 ft/s from -5 to 5 ft/s (±0.03 m/s from— 1.5 to +1.5 m/s)
- ±2% of reading from 5 to 20 ft/s (1.5 to 6.1 m/s)

**Method Of Insertion:**

- 24 inch line requires Confined Space Entry.

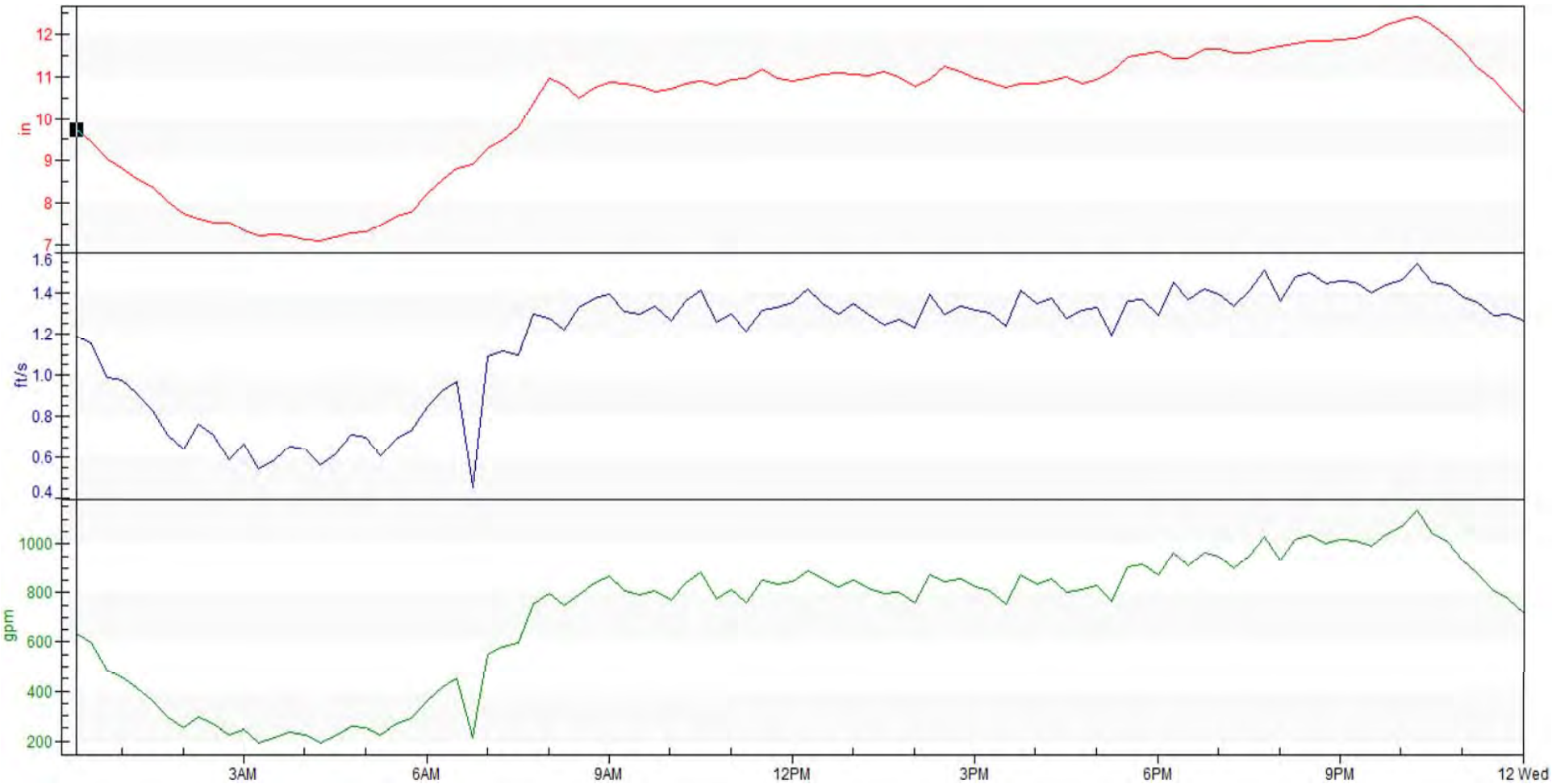
DRAFT

**Gold Coast Environmental**

**Specializing in process instrumentation and calibration.**

1868 Palma Drive, Suite I, Ventura, CA 93003 www.goldcoastenv.com 805.498.3811 ph.

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate** —

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/11/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Tuesday- A.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| | | | |
| 12:15:00 AM | 9.734 | 1.184 | 635.376 |
| 12:30:00 AM | 9.453 | 1.155 | 595.643 |
| 12:45:00 AM | 9.056 | 0.989 | 481.778 |
| 1:00:00 AM | 8.825 | 0.972 | 457.009 |
| 1:15:00 AM | 8.572 | 0.91 | 411.633 |
| 1:30:00 AM | 8.379 | 0.826 | 362.212 |
| 1:45:00 AM | 8.025 | 0.711 | 293.95 |
| 2:00:00 AM | 7.751 | 0.64 | 252.256 |
| 2:15:00 AM | 7.623 | 0.764 | 293.942 |
| 2:30:00 AM | 7.539 | 0.709 | 268.773 |
| 2:45:00 AM | 7.536 | 0.592 | 224.171 |
| 3:00:00 AM | 7.345 | 0.669 | 244.713 |
| 3:15:00 AM | 7.215 | 0.545 | 194.373 |
| 3:30:00 AM | 7.254 | 0.59 | 212.218 |
| 3:45:00 AM | 7.215 | 0.655 | 233.581 |
| 4:00:00 AM | 7.119 | 0.641 | 224.525 |
| 4:15:00 AM | 7.082 | 0.562 | 195.359 |
| 4:30:00 AM | 7.169 | 0.616 | 217.835 |
| 4:45:00 AM | 7.274 | 0.709 | 255.729 |
| 5:00:00 AM | 7.318 | 0.696 | 253.264 |
| 5:15:00 AM | 7.454 | 0.609 | 227.363 |
| 5:30:00 AM | 7.695 | 0.69 | 269.216 |
| 5:45:00 AM | 7.781 | 0.732 | 289.765 |
| 6:00:00 AM | 8.222 | 0.846 | 361.288 |
| 6:15:00 AM | 8.546 | 0.925 | 416.648 |
| 6:30:00 AM | 8.815 | 0.968 | 454.356 |
| 6:45:00 AM | 8.918 | 0.454 | 216.404 |
| 7:00:00 AM | 9.295 | 1.091 | 550.083 |
| 7:15:00 AM | 9.495 | 1.116 | 579.244 |
| 7:30:00 AM | 9.809 | 1.099 | 595.975 |
| 7:45:00 AM | 10.359 | 1.297 | 755.473 |
| 8:00:00 AM | 10.952 | 1.274 | 798.281 |
| 8:15:00 AM | 10.795 | 1.217 | 748.355 |
| 8:30:00 AM | 10.5 | 1.331 | 789.119 |
| 8:45:00 AM | 10.757 | 1.371 | 839.113 |
| 9:00:00 AM | 10.886 | 1.391 | 864.907 |
| 9:15:00 AM | 10.844 | 1.307 | 808.319 |
| 9:30:00 AM | 10.779 | 1.293 | 793.823 |
| 9:45:00 AM | 10.639 | 1.336 | 806.189 |
| 10:00:00 AM | 10.708 | 1.265 | 769.545 |
| 10:15:00 AM | 10.843 | 1.358 | 840.213 |
| 10:30:00 AM | 10.918 | 1.412 | 881.265 |
| 10:45:00 AM | 10.811 | 1.26 | 776.691 |
| 11:00:00 AM | 10.951 | 1.297 | 812.61 |
| 11:15:00 AM | 10.956 | 1.211 | 759.125 |
| 11:30:00 AM | 11.194 | 1.317 | 849.139 |
| 11:45:00 AM | 10.977 | 1.329 | 835.116 |

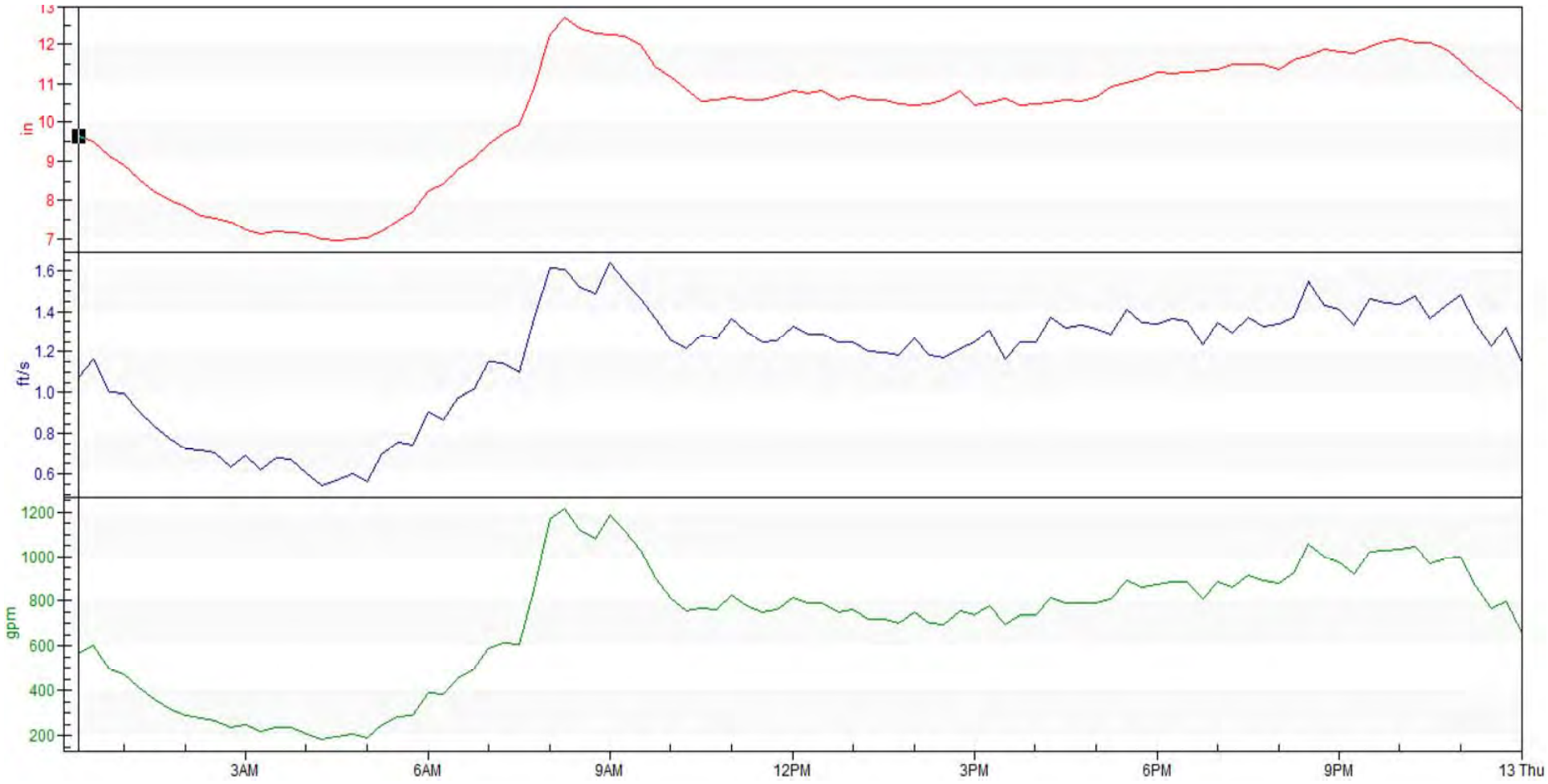
**Tuesday- P.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.904 | 1.356 | 845.223 |
| 12:15:00 PM | 10.968 | 1.418 | 890.063 |
| 12:30:00 PM | 11.073 | 1.347 | 856.621 |
| 12:45:00 PM | 11.097 | 1.296 | 826.204 |
| 1:00:00 PM | 11.046 | 1.345 | 852.329 |
| 1:15:00 PM | 11.019 | 1.298 | 819.984 |
| 1:30:00 PM | 11.127 | 1.243 | 795.54 |
| 1:45:00 PM | 10.989 | 1.272 | 800.844 |
| 2:00:00 PM | 10.767 | 1.234 | 756.263 |
| 2:15:00 PM | 10.927 | 1.394 | 871.18 |
| 2:30:00 PM | 11.25 | 1.299 | 842.646 |
| 2:45:00 PM | 11.132 | 1.338 | 856.459 |
| 3:00:00 PM | 10.979 | 1.314 | 826.037 |
| 3:15:00 PM | 10.868 | 1.306 | 810.057 |
| 3:30:00 PM | 10.752 | 1.236 | 755.972 |
| 3:45:00 PM | 10.831 | 1.415 | 873.822 |
| 4:00:00 PM | 10.842 | 1.349 | 834.198 |
| 4:15:00 PM | 10.906 | 1.372 | 855.379 |
| 4:30:00 PM | 10.986 | 1.274 | 801.615 |
| 4:45:00 PM | 10.851 | 1.315 | 814.484 |
| 5:00:00 PM | 10.947 | 1.327 | 831.396 |
| 5:15:00 PM | 11.123 | 1.196 | 764.582 |
| 5:30:00 PM | 11.457 | 1.363 | 905.363 |
| 5:45:00 PM | 11.53 | 1.368 | 916.654 |
| 6:00:00 PM | 11.585 | 1.291 | 870.367 |
| 6:15:00 PM | 11.455 | 1.448 | 961.964 |
| 6:30:00 PM | 11.444 | 1.369 | 908.49 |
| 6:45:00 PM | 11.655 | 1.417 | 962.4 |
| 7:00:00 PM | 11.647 | 1.395 | 946.414 |
| 7:15:00 PM | 11.558 | 1.334 | 896.604 |
| 7:30:00 PM | 11.574 | 1.415 | 952.36 |
| 7:45:00 PM | 11.673 | 1.511 | 1028.52 |
| 8:00:00 PM | 11.74 | 1.358 | 931.272 |
| 8:15:00 PM | 11.803 | 1.474 | 1017.37 |
| 8:30:00 PM | 11.84 | 1.495 | 1036.24 |
| 8:45:00 PM | 11.864 | 1.444 | 1003.08 |
| 9:00:00 PM | 11.885 | 1.458 | 1015.67 |
| 9:15:00 PM | 11.912 | 1.452 | 1014.34 |
| 9:30:00 PM | 12.039 | 1.398 | 989.995 |
| 9:45:00 PM | 12.227 | 1.439 | 1039.15 |
| 10:00:00 PM | 12.355 | 1.461 | 1068.97 |
| 10:15:00 PM | 12.421 | 1.541 | 1134.83 |
| 10:30:00 PM | 12.226 | 1.449 | 1045.95 |
| 10:45:00 PM | 11.934 | 1.44 | 1007.95 |
| 11:00:00 PM | 11.634 | 1.377 | 933.162 |
| 11:15:00 PM | 11.229 | 1.352 | 875.305 |
| 11:30:00 PM | 10.944 | 1.288 | 806.527 |
| 11:45:00 PM | 10.545 | 1.299 | 774.781 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.242 | 1.174 | 707.585 |
| Daily Min: | 7.082 | 0.454 | 194.373 |
| Daily Max: | 12.421 | 1.541 | 1134.83 |
| Peak to Avg: | | | 1.60 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate** —

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/12/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Wednesday - A.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.138 | 1.266 | 717.048 |
| 12:15:00 AM | 9.658 | 1.072 | 569.21 |
| 12:30:00 AM | 9.49 | 1.166 | 604.568 |
| 12:45:00 AM | 9.141 | 1.003 | 494.757 |
| 1:00:00 AM | 8.902 | 0.994 | 473.136 |
| 1:15:00 AM | 8.568 | 0.911 | 411.57 |
| 1:30:00 AM | 8.236 | 0.837 | 358.402 |
| 1:45:00 AM | 7.999 | 0.777 | 319.484 |
| 2:00:00 AM | 7.839 | 0.722 | 288.878 |
| 2:15:00 AM | 7.604 | 0.719 | 275.871 |
| 2:30:00 AM | 7.55 | 0.704 | 267.582 |
| 2:45:00 AM | 7.436 | 0.632 | 235.252 |
| 3:00:00 AM | 7.248 | 0.689 | 247.379 |
| 3:15:00 AM | 7.148 | 0.62 | 218.476 |
| 3:30:00 AM | 7.198 | 0.676 | 240.466 |
| 3:45:00 AM | 7.16 | 0.672 | 237.111 |
| 4:00:00 AM | 7.147 | 0.598 | 210.595 |
| 4:15:00 AM | 7.007 | 0.543 | 185.876 |
| 4:30:00 AM | 6.964 | 0.57 | 193.729 |
| 4:45:00 AM | 6.999 | 0.602 | 205.837 |
| 5:00:00 AM | 7.02 | 0.561 | 192.808 |
| 5:15:00 AM | 7.207 | 0.699 | 248.934 |
| 5:30:00 AM | 7.485 | 0.754 | 283.195 |
| 5:45:00 AM | 7.714 | 0.744 | 291.29 |
| 6:00:00 AM | 8.251 | 0.904 | 387.822 |
| 6:15:00 AM | 8.43 | 0.866 | 382.619 |
| 6:30:00 AM | 8.801 | 0.977 | 457.915 |
| 6:45:00 AM | 9.058 | 1.016 | 494.772 |
| 7:00:00 AM | 9.423 | 1.154 | 592.776 |
| 7:15:00 AM | 9.701 | 1.147 | 612.587 |
| 7:30:00 AM | 9.955 | 1.097 | 606.34 |
| 7:45:00 AM | 10.91 | 1.363 | 850.104 |
| 8:00:00 AM | 12.26 | 1.611 | 1166.9 |
| 8:15:00 AM | 12.693 | 1.604 | 1213.71 |
| 8:30:00 AM | 12.411 | 1.522 | 1120.13 |
| 8:45:00 AM | 12.287 | 1.485 | 1078.54 |
| 9:00:00 AM | 12.259 | 1.637 | 1185.81 |
| 9:15:00 AM | 12.227 | 1.547 | 1117.08 |
| 9:30:00 AM | 11.992 | 1.46 | 1028.56 |
| 9:45:00 AM | 11.446 | 1.365 | 905.573 |
| 10:00:00 AM | 11.151 | 1.258 | 807.06 |
| 10:15:00 AM | 10.875 | 1.218 | 756.585 |
| 10:30:00 AM | 10.568 | 1.28 | 765.366 |
| 10:45:00 AM | 10.581 | 1.267 | 759.049 |
| 11:00:00 AM | 10.669 | 1.365 | 826.589 |
| 11:15:00 AM | 10.595 | 1.3 | 780.139 |
| 11:30:00 AM | 10.592 | 1.246 | 747.411 |
| 11:45:00 AM | 10.676 | 1.254 | 760.153 |

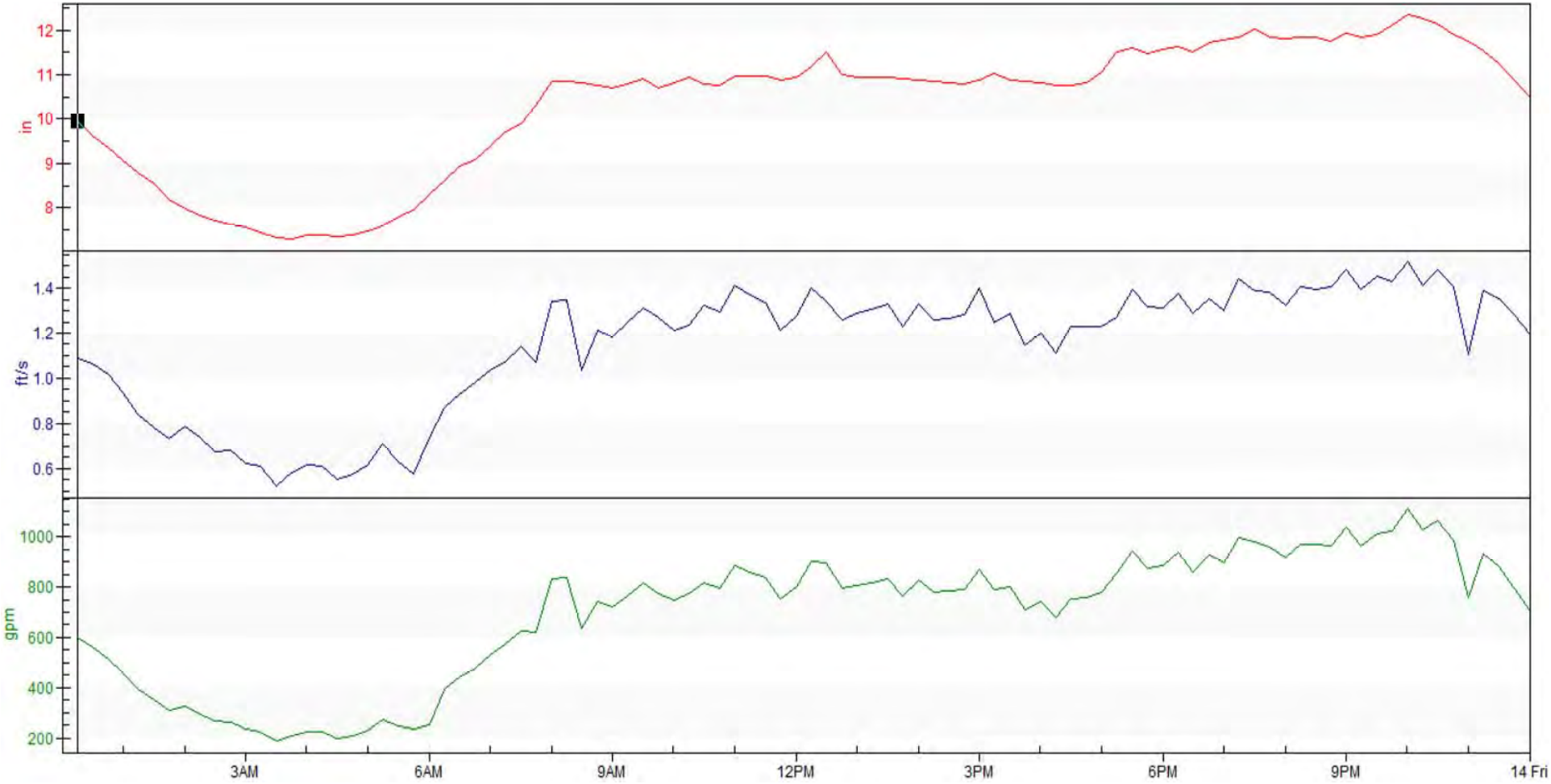
**Wednesday - P.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.818 | 1.325 | 817.152 |
| 12:15:00 PM | 10.757 | 1.287 | 788.197 |
| 12:30:00 PM | 10.815 | 1.287 | 793.376 |
| 12:45:00 PM | 10.605 | 1.248 | 749.987 |
| 1:00:00 PM | 10.699 | 1.248 | 758.803 |
| 1:15:00 PM | 10.595 | 1.201 | 720.996 |
| 1:30:00 PM | 10.596 | 1.196 | 718.024 |
| 1:45:00 PM | 10.502 | 1.186 | 703.459 |
| 2:00:00 PM | 10.458 | 1.269 | 748.507 |
| 2:15:00 PM | 10.485 | 1.186 | 701.979 |
| 2:30:00 PM | 10.574 | 1.169 | 699.727 |
| 2:45:00 PM | 10.842 | 1.217 | 752.919 |
| 3:00:00 PM | 10.451 | 1.249 | 736.119 |
| 3:15:00 PM | 10.526 | 1.308 | 778.166 |
| 3:30:00 PM | 10.609 | 1.164 | 699.776 |
| 3:45:00 PM | 10.456 | 1.25 | 737.319 |
| 4:00:00 PM | 10.495 | 1.246 | 738.563 |
| 4:15:00 PM | 10.511 | 1.369 | 812.994 |
| 4:30:00 PM | 10.574 | 1.322 | 791.127 |
| 4:45:00 PM | 10.549 | 1.33 | 793.442 |
| 5:00:00 PM | 10.655 | 1.312 | 793.132 |
| 5:15:00 PM | 10.936 | 1.289 | 806.584 |
| 5:30:00 PM | 11.021 | 1.407 | 889.121 |
| 5:45:00 PM | 11.124 | 1.347 | 861.335 |
| 6:00:00 PM | 11.305 | 1.341 | 875.603 |
| 6:15:00 PM | 11.274 | 1.362 | 886.429 |
| 6:30:00 PM | 11.299 | 1.354 | 883.86 |
| 6:45:00 PM | 11.353 | 1.232 | 809.292 |
| 7:00:00 PM | 11.376 | 1.344 | 885.003 |
| 7:15:00 PM | 11.491 | 1.293 | 862.622 |
| 7:30:00 PM | 11.499 | 1.374 | 917.055 |
| 7:45:00 PM | 11.519 | 1.328 | 888.786 |
| 8:00:00 PM | 11.367 | 1.339 | 880.828 |
| 8:15:00 PM | 11.62 | 1.372 | 928.18 |
| 8:30:00 PM | 11.707 | 1.549 | 1057.82 |
| 8:45:00 PM | 11.882 | 1.429 | 994.896 |
| 9:00:00 PM | 11.796 | 1.409 | 971.915 |
| 9:15:00 PM | 11.787 | 1.335 | 919.929 |
| 9:30:00 PM | 11.937 | 1.461 | 1023.17 |
| 9:45:00 PM | 12.076 | 1.441 | 1024.08 |
| 10:00:00 PM | 12.152 | 1.438 | 1029.92 |
| 10:15:00 PM | 12.055 | 1.473 | 1044.54 |
| 10:30:00 PM | 12.049 | 1.367 | 969.03 |
| 10:45:00 PM | 11.866 | 1.428 | 992.415 |
| 11:00:00 PM | 11.573 | 1.48 | 996.403 |
| 11:15:00 PM | 11.245 | 1.34 | 868.958 |
| 11:30:00 PM | 10.914 | 1.227 | 765.463 |
| 11:45:00 PM | 10.67 | 1.318 | 798.408 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.210 | 1.175 | 706.562 |
| Daily Min: | 6.964 | 0.543 | 185.876 |
| Daily Max: | 12.693 | 1.637 | 1213.71 |
| Peak to Avg: | | | 1.72 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/13/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Thursday - A.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.274 | 1.144 | 659.515 |
| 12:15:00 AM | 9.952 | 1.089 | 601.785 |
| 12:30:00 AM | 9.611 | 1.065 | 561.961 |
| 12:45:00 AM | 9.362 | 1.016 | 517.5 |
| 1:00:00 AM | 9.067 | 0.936 | 456.66 |
| 1:15:00 AM | 8.789 | 0.842 | 394.036 |
| 1:30:00 AM | 8.54 | 0.78 | 350.713 |
| 1:45:00 AM | 8.195 | 0.733 | 311.57 |
| 2:00:00 AM | 7.993 | 0.789 | 324.11 |
| 2:15:00 AM | 7.834 | 0.741 | 296.297 |
| 2:30:00 AM | 7.725 | 0.676 | 264.911 |
| 2:45:00 AM | 7.634 | 0.682 | 263.191 |
| 3:00:00 AM | 7.556 | 0.623 | 236.794 |
| 3:15:00 AM | 7.437 | 0.609 | 226.606 |
| 3:30:00 AM | 7.308 | 0.522 | 189.496 |
| 3:45:00 AM | 7.291 | 0.578 | 209.272 |
| 4:00:00 AM | 7.368 | 0.614 | 225.665 |
| 4:15:00 AM | 7.376 | 0.609 | 224.127 |
| 4:30:00 AM | 7.354 | 0.55 | 201.392 |
| 4:45:00 AM | 7.373 | 0.575 | 211.247 |
| 5:00:00 AM | 7.461 | 0.617 | 230.769 |
| 5:15:00 AM | 7.594 | 0.709 | 271.553 |
| 5:30:00 AM | 7.802 | 0.626 | 248.785 |
| 5:45:00 AM | 7.941 | 0.576 | 234.57 |
| 6:00:00 AM | 8.312 | 0.74 | 249.72 |
| 6:15:00 AM | 8.612 | 0.871 | 396.406 |
| 6:30:00 AM | 8.925 | 0.928 | 442.976 |
| 6:45:00 AM | 9.097 | 0.979 | 479.904 |
| 7:00:00 AM | 9.38 | 1.037 | 529.358 |
| 7:15:00 AM | 9.708 | 1.07 | 572.089 |
| 7:30:00 AM | 9.883 | 1.142 | 625.403 |
| 7:45:00 AM | 10.317 | 1.07 | 620.009 |
| 8:00:00 AM | 10.857 | 1.344 | 832.706 |
| 8:15:00 AM | 10.86 | 1.349 | 836.295 |
| 8:30:00 AM | 10.836 | 1.034 | 639.165 |
| 8:45:00 AM | 10.759 | 1.211 | 741.754 |
| 9:00:00 AM | 10.716 | 1.184 | 721.206 |
| 9:15:00 AM | 10.782 | 1.245 | 764.567 |
| 9:30:00 AM | 10.904 | 1.309 | 815.958 |
| 9:45:00 AM | 10.699 | 1.272 | 773.173 |
| 10:00:00 AM | 10.829 | 1.214 | 749.701 |
| 10:15:00 AM | 10.933 | 1.234 | 771.638 |
| 10:30:00 AM | 10.806 | 1.322 | 814.119 |
| 10:45:00 AM | 10.765 | 1.294 | 792.987 |
| 11:00:00 AM | 10.958 | 1.413 | 886.297 |
| 11:15:00 AM | 10.975 | 1.37 | 860.807 |
| 11:30:00 AM | 10.957 | 1.337 | 838.701 |
| 11:45:00 AM | 10.892 | 1.213 | 754.526 |

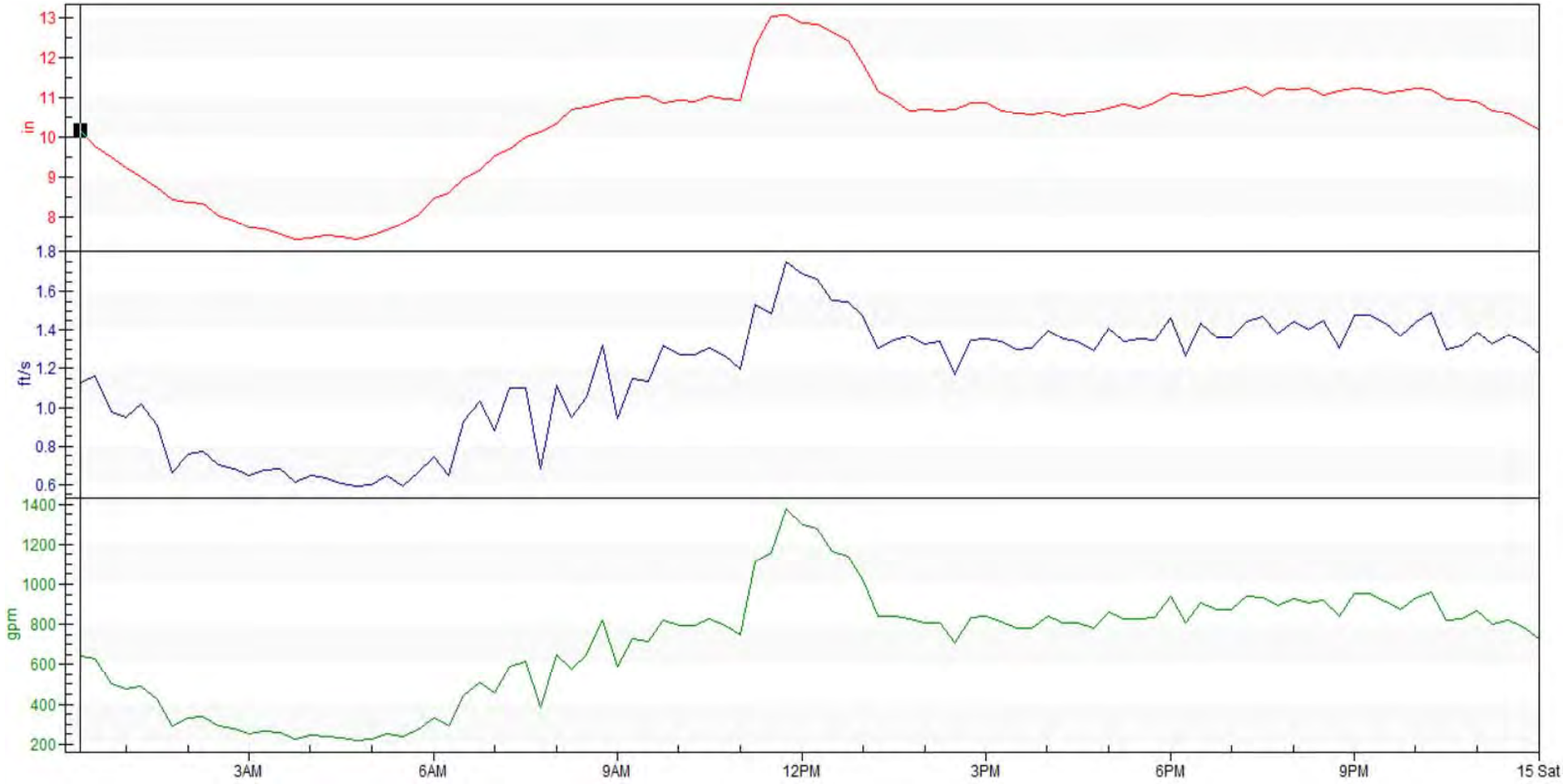
**Thursday - P.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.94 | 1.275 | 798.287 |
| 12:15:00 PM | 11.194 | 1.398 | 901.548 |
| 12:30:00 PM | 11.514 | 1.343 | 897.803 |
| 12:45:00 PM | 11.011 | 1.256 | 792.957 |
| 1:00:00 PM | 10.938 | 1.287 | 804.983 |
| 1:15:00 PM | 10.939 | 1.308 | 818.432 |
| 1:30:00 PM | 10.954 | 1.33 | 833.505 |
| 1:45:00 PM | 10.903 | 1.228 | 765.167 |
| 2:00:00 PM | 10.874 | 1.329 | 825.37 |
| 2:15:00 PM | 10.865 | 1.26 | 781.307 |
| 2:30:00 PM | 10.828 | 1.267 | 782.295 |
| 2:45:00 PM | 10.788 | 1.282 | 787.964 |
| 3:00:00 PM | 10.881 | 1.399 | 869.647 |
| 3:15:00 PM | 11.036 | 1.248 | 790.049 |
| 3:30:00 PM | 10.881 | 1.286 | 799.009 |
| 3:45:00 PM | 10.843 | 1.146 | 708.684 |
| 4:00:00 PM | 10.824 | 1.2 | 740.608 |
| 4:15:00 PM | 10.755 | 1.11 | 679.31 |
| 4:30:00 PM | 10.747 | 1.232 | 753.236 |
| 4:45:00 PM | 10.827 | 1.232 | 760.497 |
| 5:00:00 PM | 11.07 | 1.227 | 779.898 |
| 5:15:00 PM | 11.52 | 1.273 | 851.739 |
| 5:30:00 PM | 11.592 | 1.395 | 940.621 |
| 5:45:00 PM | 11.466 | 1.315 | 874.843 |
| 6:00:00 PM | 11.557 | 1.315 | 883.306 |
| 6:15:00 PM | 11.642 | 1.379 | 935.485 |
| 6:30:00 PM | 11.498 | 1.29 | 860.753 |
| 6:45:00 PM | 11.715 | 1.354 | 925.575 |
| 7:00:00 PM | 11.791 | 1.301 | 896.526 |
| 7:15:00 PM | 11.834 | 1.439 | 996.649 |
| 7:30:00 PM | 12.014 | 1.386 | 978.614 |
| 7:45:00 PM | 11.838 | 1.383 | 958.095 |
| 8:00:00 PM | 11.798 | 1.325 | 913.942 |
| 8:15:00 PM | 11.825 | 1.404 | 971.641 |
| 8:30:00 PM | 11.826 | 1.397 | 966.867 |
| 8:45:00 PM | 11.757 | 1.406 | 965.967 |
| 9:00:00 PM | 11.936 | 1.48 | 1036.67 |
| 9:15:00 PM | 11.83 | 1.392 | 963.645 |
| 9:30:00 PM | 11.902 | 1.452 | 1013.33 |
| 9:45:00 PM | 12.097 | 1.433 | 1020.33 |
| 10:00:00 PM | 12.348 | 1.519 | 1110.27 |
| 10:15:00 PM | 12.269 | 1.414 | 1025.76 |
| 10:30:00 PM | 12.142 | 1.486 | 1063.08 |
| 10:45:00 PM | 11.902 | 1.408 | 982.671 |
| 11:00:00 PM | 11.746 | 1.107 | 759.24 |
| 11:15:00 PM | 11.528 | 1.391 | 931.342 |
| 11:30:00 PM | 11.238 | 1.354 | 877.152 |
| 11:45:00 PM | 10.891 | 1.28 | 796.166 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.310 | 1.142 | 691.930 |
| Daily Min: | 7.291 | 0.522 | 189.496 |
| Daily Max: | 12.348 | 1.519 | 1110.27 |
| Peak to Avg: | | | 1.60 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/14/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Friday - A.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.49 | 1.193 | 706.655 |
| 12:15:00 AM | 10.158 | 1.13 | 641.421 |
| 12:30:00 AM | 9.787 | 1.165 | 629.34 |
| 12:45:00 AM | 9.489 | 0.975 | 505.678 |
| 1:00:00 AM | 9.24 | 0.949 | 474.687 |
| 1:15:00 AM | 9 | 1.017 | 491.252 |
| 1:30:00 AM | 8.747 | 0.909 | 422.482 |
| 1:45:00 AM | 8.445 | 0.66 | 292.387 |
| 2:00:00 AM | 8.385 | 0.757 | 332.154 |
| 2:15:00 AM | 8.328 | 0.773 | 335.997 |
| 2:30:00 AM | 8.06 | 0.698 | 290.151 |
| 2:45:00 AM | 7.901 | 0.683 | 276.13 |
| 3:00:00 AM | 7.751 | 0.647 | 254.685 |
| 3:15:00 AM | 7.713 | 0.677 | 264.944 |
| 3:30:00 AM | 7.584 | 0.68 | 259.851 |
| 3:45:00 AM | 7.452 | 0.612 | 228.202 |
| 4:00:00 AM | 7.49 | 0.648 | 243.44 |
| 4:15:00 AM | 7.56 | 0.63 | 239.962 |
| 4:30:00 AM | 7.498 | 0.608 | 228.816 |
| 4:45:00 AM | 7.443 | 0.591 | 220.148 |
| 5:00:00 AM | 7.541 | 0.598 | 227.017 |
| 5:15:00 AM | 7.669 | 0.646 | 250.854 |
| 5:30:00 AM | 7.856 | 0.591 | 237.334 |
| 5:45:00 AM | 8.043 | 0.66 | 273.376 |
| 6:00:00 AM | 8.465 | 0.743 | 330.148 |
| 6:15:00 AM | 8.606 | 0.647 | 294.058 |
| 6:30:00 AM | 8.959 | 0.925 | 443.865 |
| 6:45:00 AM | 9.166 | 1.029 | 509.615 |
| 7:00:00 AM | 9.534 | 0.88 | 459.096 |
| 7:15:00 AM | 9.717 | 1.101 | 589.198 |
| 7:30:00 AM | 10.017 | 1.103 | 614.953 |
| 7:45:00 AM | 10.135 | 0.682 | 385.924 |
| 8:00:00 AM | 10.351 | 1.113 | 647.765 |
| 8:15:00 AM | 10.709 | 0.947 | 576.56 |
| 8:30:00 AM | 10.782 | 1.053 | 646.654 |
| 8:45:00 AM | 10.853 | 1.322 | 818.935 |
| 9:00:00 AM | 10.983 | 0.94 | 591.552 |
| 9:15:00 AM | 11.016 | 1.151 | 726.812 |
| 9:30:00 AM | 11.027 | 1.136 | 718.387 |
| 9:45:00 AM | 10.873 | 1.318 | 818.485 |
| 10:00:00 AM | 10.938 | 1.273 | 796.789 |
| 10:15:00 AM | 10.908 | 1.27 | 791.985 |
| 10:30:00 AM | 11.032 | 1.309 | 828.265 |
| 10:45:00 AM | 10.984 | 1.262 | 794.081 |
| 11:00:00 AM | 10.942 | 1.198 | 749.722 |
| 11:15:00 AM | 12.302 | 1.531 | 1113.58 |
| 11:30:00 AM | 13.013 | 1.483 | 1157.54 |
| 11:45:00 AM | 13.064 | 1.753 | 1375.59 |

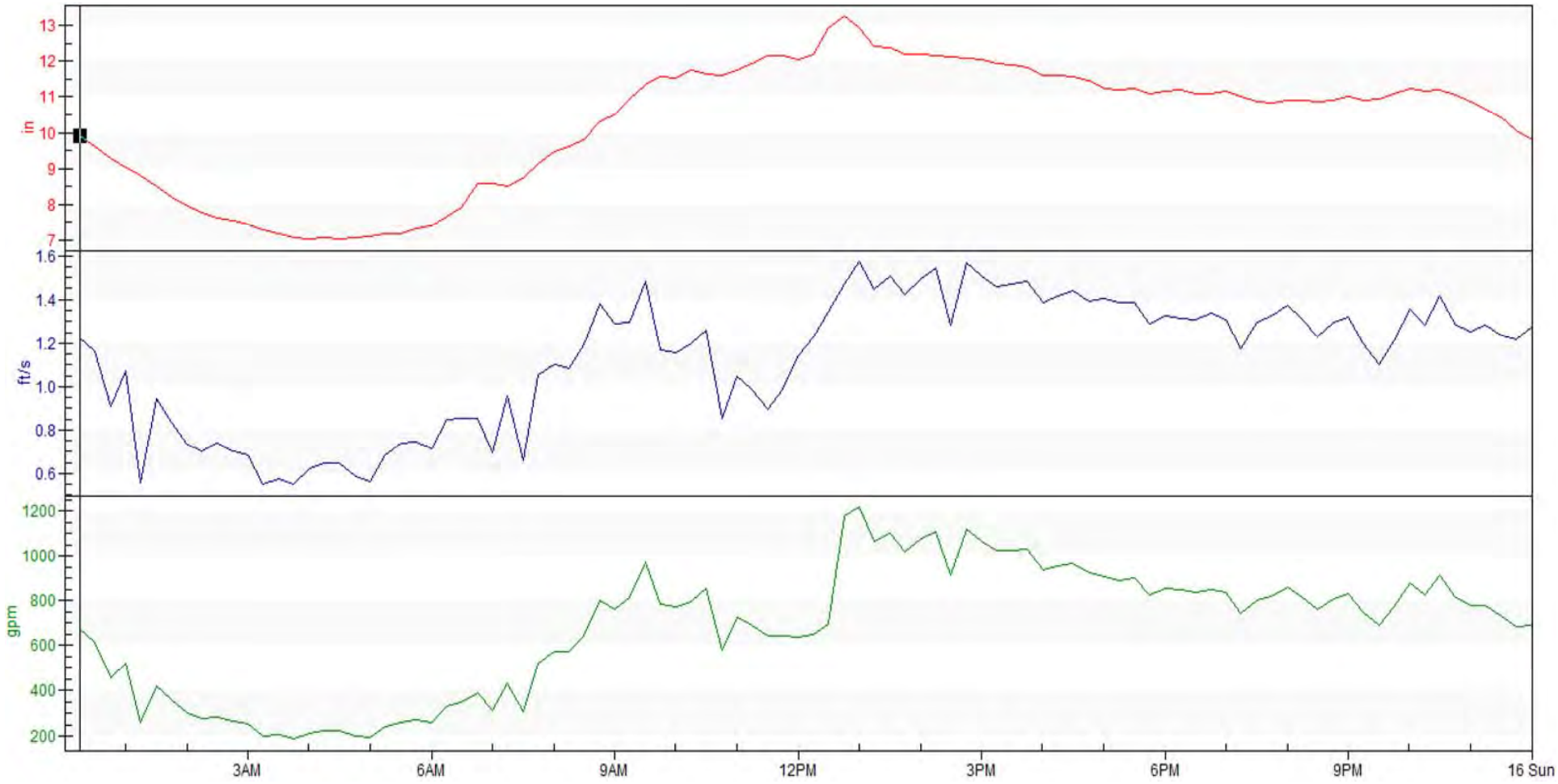
**Friday - P.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.849 | 1.689 | 1298.19 |
| 12:15:00 PM | 12.826 | 1.665 | 1276.64 |
| 12:30:00 PM | 12.619 | 1.555 | 1168.37 |
| 12:45:00 PM | 12.437 | 1.547 | 1141.05 |
| 1:00:00 PM | 11.824 | 1.471 | 1018 |
| 1:15:00 PM | 11.158 | 1.307 | 839.424 |
| 1:30:00 PM | 10.92 | 1.347 | 840.807 |
| 1:45:00 PM | 10.673 | 1.365 | 827.133 |
| 2:00:00 PM | 10.715 | 1.326 | 807.518 |
| 2:15:00 PM | 10.664 | 1.339 | 810.644 |
| 2:30:00 PM | 10.713 | 1.166 | 710.061 |
| 2:45:00 PM | 10.868 | 1.344 | 834.026 |
| 3:00:00 PM | 10.864 | 1.357 | 841.887 |
| 3:15:00 PM | 10.682 | 1.343 | 814.807 |
| 3:30:00 PM | 10.619 | 1.302 | 783.692 |
| 3:45:00 PM | 10.564 | 1.308 | 781.979 |
| 4:00:00 PM | 10.626 | 1.399 | 842.585 |
| 4:15:00 PM | 10.534 | 1.352 | 805.126 |
| 4:30:00 PM | 10.604 | 1.343 | 807.053 |
| 4:45:00 PM | 10.646 | 1.29 | 779.109 |
| 5:00:00 PM | 10.727 | 1.409 | 859.417 |
| 5:15:00 PM | 10.846 | 1.34 | 829.362 |
| 5:30:00 PM | 10.729 | 1.357 | 828.189 |
| 5:45:00 PM | 10.855 | 1.351 | 836.692 |
| 6:00:00 PM | 11.109 | 1.468 | 937.07 |
| 6:15:00 PM | 11.068 | 1.268 | 805.842 |
| 6:30:00 PM | 11.027 | 1.435 | 907.545 |
| 6:45:00 PM | 11.114 | 1.364 | 871.131 |
| 7:00:00 PM | 11.182 | 1.36 | 876.021 |
| 7:15:00 PM | 11.254 | 1.444 | 937.668 |
| 7:30:00 PM | 11.049 | 1.472 | 933.31 |
| 7:45:00 PM | 11.238 | 1.38 | 894.064 |
| 8:00:00 PM | 11.187 | 1.44 | 928.015 |
| 8:15:00 PM | 11.23 | 1.401 | 907.208 |
| 8:30:00 PM | 11.082 | 1.45 | 922.995 |
| 8:45:00 PM | 11.159 | 1.306 | 838.769 |
| 9:00:00 PM | 11.239 | 1.476 | 956.68 |
| 9:15:00 PM | 11.199 | 1.475 | 951.764 |
| 9:30:00 PM | 11.095 | 1.435 | 914.709 |
| 9:45:00 PM | 11.154 | 1.365 | 876.156 |
| 10:00:00 PM | 11.237 | 1.441 | 933.655 |
| 10:15:00 PM | 11.197 | 1.492 | 962.044 |
| 10:30:00 PM | 10.985 | 1.301 | 818.49 |
| 10:45:00 PM | 10.92 | 1.321 | 824.882 |
| 11:00:00 PM | 10.896 | 1.391 | 865.739 |
| 11:15:00 PM | 10.658 | 1.329 | 803.526 |
| 11:30:00 PM | 10.59 | 1.372 | 822.944 |
| 11:45:00 PM | 10.419 | 1.338 | 785.6 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.267 | 1.171 | 705.868 |
| Daily Min: | 7.443 | 0.591 | 220.148 |
| Daily Max: | 13.064 | 1.753 | 1375.59 |
| Peak to Avg: | | | 1.95 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/15/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Saturday - A.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.188 | 1.282 | 730.785 |
| 12:15:00 AM | 9.892 | 1.222 | 669.576 |
| 12:30:00 AM | 9.605 | 1.163 | 612.757 |
| 12:45:00 AM | 9.278 | 0.908 | 457.064 |
| 1:00:00 AM | 9.039 | 1.071 | 520.21 |
| 1:15:00 AM | 8.798 | 0.556 | 260.408 |
| 1:30:00 AM | 8.493 | 0.942 | 420.363 |
| 1:45:00 AM | 8.229 | 0.837 | 357.831 |
| 2:00:00 AM | 7.955 | 0.733 | 299.264 |
| 2:15:00 AM | 7.793 | 0.705 | 279.869 |
| 2:30:00 AM | 7.634 | 0.74 | 285.49 |
| 2:45:00 AM | 7.568 | 0.703 | 268.075 |
| 3:00:00 AM | 7.429 | 0.687 | 255.302 |
| 3:15:00 AM | 7.288 | 0.554 | 200.442 |
| 3:30:00 AM | 7.181 | 0.578 | 204.865 |
| 3:45:00 AM | 7.076 | 0.551 | 191.3 |
| 4:00:00 AM | 7.052 | 0.624 | 215.54 |
| 4:15:00 AM | 7.093 | 0.65 | 226.642 |
| 4:30:00 AM | 7.037 | 0.648 | 223.207 |
| 4:45:00 AM | 7.062 | 0.59 | 204.307 |
| 5:00:00 AM | 7.126 | 0.563 | 197.5 |
| 5:15:00 AM | 7.171 | 0.683 | 241.582 |
| 5:30:00 AM | 7.188 | 0.737 | 261.54 |
| 5:45:00 AM | 7.32 | 0.748 | 272.189 |
| 6:00:00 AM | 7.39 | 0.714 | 263.311 |
| 6:15:00 AM | 7.671 | 0.845 | 328.2 |
| 6:30:00 AM | 7.917 | 0.854 | 346.183 |
| 6:45:00 AM | 8.601 | 0.854 | 388.003 |
| 7:00:00 AM | 8.578 | 0.697 | 315.314 |
| 7:15:00 AM | 8.522 | 0.958 | 429.584 |
| 7:30:00 AM | 8.749 | 0.661 | 307.509 |
| 7:45:00 AM | 9.125 | 1.056 | 519.716 |
| 8:00:00 AM | 9.457 | 1.103 | 569.527 |
| 8:15:00 AM | 9.602 | 1.083 | 570.682 |
| 8:30:00 AM | 9.799 | 1.19 | 644.312 |
| 8:45:00 AM | 10.322 | 1.382 | 801.436 |
| 9:00:00 AM | 10.485 | 1.288 | 762.692 |
| 9:15:00 AM | 10.952 | 1.294 | 810.893 |
| 9:30:00 AM | 11.358 | 1.483 | 974.546 |
| 9:45:00 AM | 11.566 | 1.166 | 783.995 |
| 10:00:00 AM | 11.535 | 1.156 | 774.81 |
| 10:15:00 AM | 11.745 | 1.198 | 793.001 |
| 10:30:00 AM | 11.628 | 1.258 | 852.01 |
| 10:45:00 AM | 11.609 | 0.855 | 577.89 |
| 11:00:00 AM | 11.767 | 1.05 | 722.057 |
| 11:15:00 AM | 11.924 | 0.988 | 690.706 |
| 11:30:00 AM | 12.138 | 0.896 | 641.264 |
| 11:45:00 AM | 12.145 | 0.984 | 641.71 |

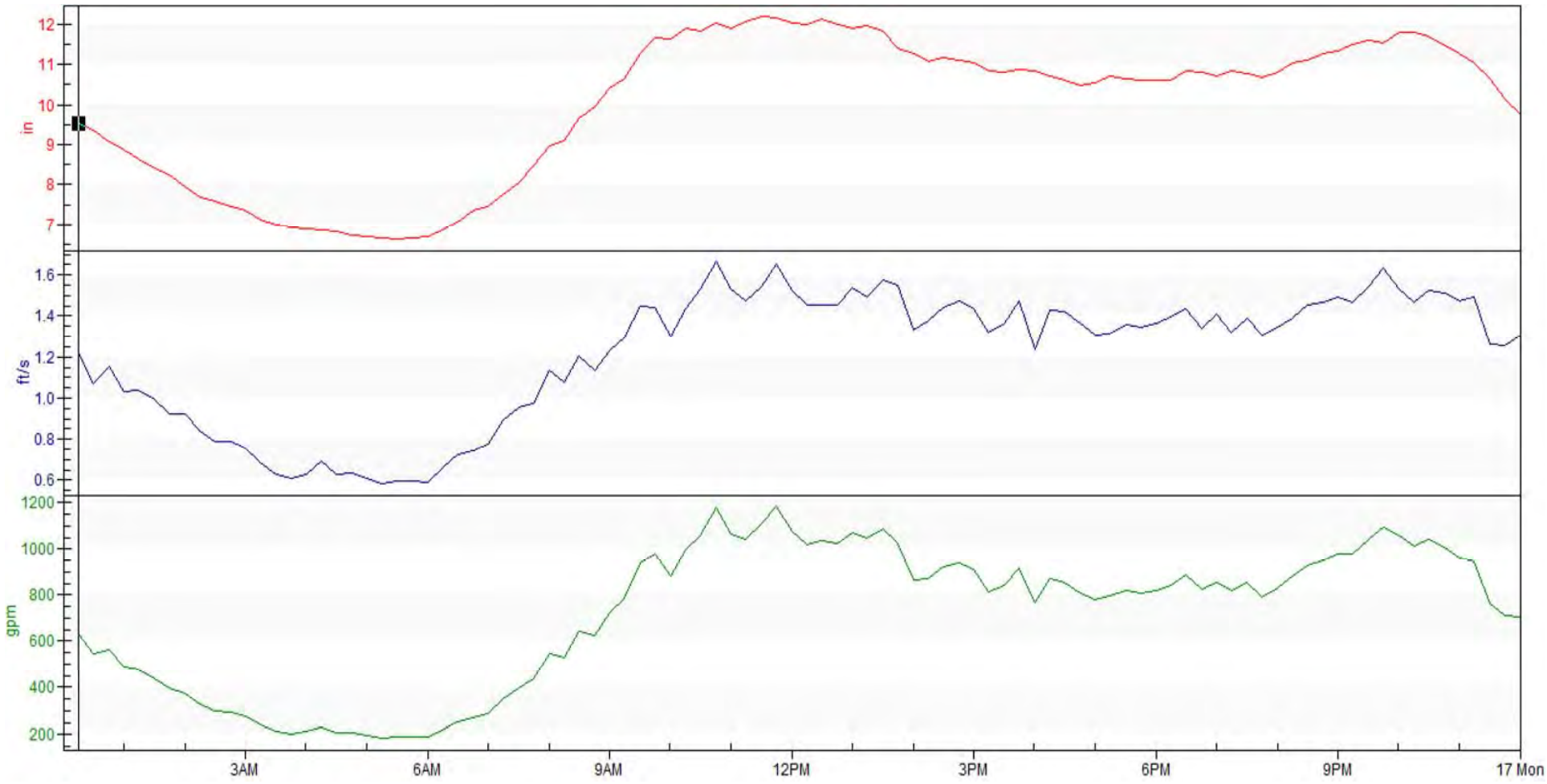
**Saturday - P.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.045 | 1.145 | 635.013 |
| 12:15:00 PM | 12.202 | 1.227 | 645.543 |
| 12:30:00 PM | 12.929 | 1.342 | 694.25 |
| 12:45:00 PM | 13.26 | 1.474 | 1177.58 |
| 1:00:00 PM | 12.915 | 1.574 | 1217.35 |
| 1:15:00 PM | 12.423 | 1.445 | 1064.15 |
| 1:30:00 PM | 12.357 | 1.509 | 1103.85 |
| 1:45:00 PM | 12.191 | 1.42 | 1021.61 |
| 2:00:00 PM | 12.201 | 1.498 | 1078.34 |
| 2:15:00 PM | 12.155 | 1.542 | 1104.72 |
| 2:30:00 PM | 12.124 | 1.282 | 915.492 |
| 2:45:00 PM | 12.091 | 1.57 | 1117.74 |
| 3:00:00 PM | 12.044 | 1.508 | 1068.21 |
| 3:15:00 PM | 11.951 | 1.461 | 1024.8 |
| 3:30:00 PM | 11.88 | 1.469 | 1022.37 |
| 3:45:00 PM | 11.841 | 1.484 | 1028.77 |
| 4:00:00 PM | 11.611 | 1.384 | 935.217 |
| 4:15:00 PM | 11.591 | 1.416 | 954.982 |
| 4:30:00 PM | 11.553 | 1.441 | 968.019 |
| 4:45:00 PM | 11.451 | 1.393 | 924.635 |
| 5:00:00 PM | 11.231 | 1.405 | 909.924 |
| 5:15:00 PM | 11.189 | 1.383 | 891.331 |
| 5:30:00 PM | 11.228 | 1.388 | 898.595 |
| 5:45:00 PM | 11.094 | 1.291 | 822.991 |
| 6:00:00 PM | 11.179 | 1.327 | 854.058 |
| 6:15:00 PM | 11.209 | 1.317 | 850.315 |
| 6:30:00 PM | 11.097 | 1.308 | 834.074 |
| 6:45:00 PM | 11.074 | 1.337 | 849.982 |
| 7:00:00 PM | 11.143 | 1.309 | 839.292 |
| 7:15:00 PM | 11.014 | 1.176 | 742.583 |
| 7:30:00 PM | 10.867 | 1.296 | 803.858 |
| 7:45:00 PM | 10.828 | 1.327 | 819.393 |
| 8:00:00 PM | 10.903 | 1.376 | 857.185 |
| 8:15:00 PM | 10.898 | 1.31 | 815.537 |
| 8:30:00 PM | 10.868 | 1.229 | 762.407 |
| 8:45:00 PM | 10.89 | 1.295 | 805.766 |
| 9:00:00 PM | 11.008 | 1.319 | 832.226 |
| 9:15:00 PM | 10.91 | 1.197 | 746.291 |
| 9:30:00 PM | 10.947 | 1.099 | 688.348 |
| 9:45:00 PM | 11.104 | 1.208 | 770.852 |
| 10:00:00 PM | 11.224 | 1.356 | 877.642 |
| 10:15:00 PM | 11.178 | 1.282 | 825.1 |
| 10:30:00 PM | 11.183 | 1.415 | 911.202 |
| 10:45:00 PM | 11.051 | 1.285 | 814.675 |
| 11:00:00 PM | 10.873 | 1.253 | 777.897 |
| 11:15:00 PM | 10.658 | 1.282 | 775.442 |
| 11:30:00 PM | 10.435 | 1.237 | 727.885 |
| 11:45:00 PM | 10.072 | 1.218 | 683.857 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.264 | 1.126 | 675.011 |
| Daily Min: | 7.037 | 0.551 | 191.3 |
| Daily Max: | 13.26 | 1.574 | 1217.35 |
| Peak to Avg: | | | 1.80 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/16/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Sunday - A.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.81 | 1.276 | 691.965 |
| 12:15:00 AM | 9.515 | 1.217 | 633.262 |
| 12:30:00 AM | 9.363 | 1.07 | 544.875 |
| 12:45:00 AM | 9.07 | 1.156 | 563.942 |
| 1:00:00 AM | 8.862 | 1.03 | 487 |
| 1:15:00 AM | 8.634 | 1.039 | 474.455 |
| 1:30:00 AM | 8.424 | 0.994 | 438.731 |
| 1:45:00 AM | 8.229 | 0.922 | 394.253 |
| 2:00:00 AM | 7.964 | 0.921 | 376.634 |
| 2:15:00 AM | 7.701 | 0.842 | 328.923 |
| 2:30:00 AM | 7.576 | 0.789 | 301.25 |
| 2:45:00 AM | 7.463 | 0.79 | 295.325 |
| 3:00:00 AM | 7.359 | 0.757 | 277.625 |
| 3:15:00 AM | 7.126 | 0.687 | 240.841 |
| 3:30:00 AM | 6.997 | 0.626 | 214.11 |
| 3:45:00 AM | 6.922 | 0.61 | 205.374 |
| 4:00:00 AM | 6.901 | 0.63 | 211.406 |
| 4:15:00 AM | 6.849 | 0.691 | 229.383 |
| 4:30:00 AM | 6.818 | 0.629 | 207.535 |
| 4:45:00 AM | 6.734 | 0.637 | 206.42 |
| 5:00:00 AM | 6.709 | 0.61 | 196.573 |
| 5:15:00 AM | 6.676 | 0.584 | 186.873 |
| 5:30:00 AM | 6.633 | 0.595 | 188.976 |
| 5:45:00 AM | 6.67 | 0.6 | 191.782 |
| 6:00:00 AM | 6.714 | 0.591 | 190.608 |
| 6:15:00 AM | 6.861 | 0.66 | 219.683 |
| 6:30:00 AM | 7.071 | 0.727 | 252.144 |
| 6:45:00 AM | 7.348 | 0.744 | 272.144 |
| 7:00:00 AM | 7.47 | 0.777 | 290.805 |
| 7:15:00 AM | 7.739 | 0.892 | 350.454 |
| 7:30:00 AM | 8.042 | 0.956 | 396.271 |
| 7:45:00 AM | 8.485 | 0.977 | 435.573 |
| 8:00:00 AM | 8.973 | 1.136 | 546.545 |
| 8:15:00 AM | 9.113 | 1.077 | 529.101 |
| 8:30:00 AM | 9.654 | 1.207 | 640.408 |
| 8:45:00 AM | 9.962 | 1.132 | 626.209 |
| 9:00:00 AM | 10.424 | 1.23 | 722.475 |
| 9:15:00 AM | 10.652 | 1.294 | 782.042 |
| 9:30:00 AM | 11.268 | 1.448 | 941.771 |
| 9:45:00 AM | 11.672 | 1.441 | 980.554 |
| 10:00:00 AM | 11.627 | 1.299 | 879.749 |
| 10:15:00 AM | 11.884 | 1.433 | 997.991 |
| 10:30:00 AM | 11.82 | 1.531 | 1058.55 |
| 10:45:00 AM | 12.022 | 1.665 | 1176.75 |
| 11:00:00 AM | 11.893 | 1.531 | 1067.23 |
| 11:15:00 AM | 12.04 | 1.474 | 1043.51 |
| 11:30:00 AM | 12.187 | 1.544 | 1110.31 |
| 11:45:00 AM | 12.16 | 1.65 | 1183.12 |

**Sunday - P.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.008 | 1.523 | 1074.47 |
| 12:15:00 PM | 11.974 | 1.451 | 1020.29 |
| 12:30:00 PM | 12.104 | 1.451 | 1034.12 |
| 12:45:00 PM | 11.99 | 1.454 | 1023.71 |
| 1:00:00 PM | 11.887 | 1.54 | 1072.75 |
| 1:15:00 PM | 11.963 | 1.493 | 1048.35 |
| 1:30:00 PM | 11.813 | 1.577 | 1090.01 |
| 1:45:00 PM | 11.388 | 1.551 | 1022.35 |
| 2:00:00 PM | 11.253 | 1.331 | 863.758 |
| 2:15:00 PM | 11.07 | 1.374 | 873.175 |
| 2:30:00 PM | 11.154 | 1.438 | 923.174 |
| 2:45:00 PM | 11.098 | 1.474 | 939.749 |
| 3:00:00 PM | 11.05 | 1.433 | 908.601 |
| 3:15:00 PM | 10.835 | 1.319 | 815.096 |
| 3:30:00 PM | 10.805 | 1.363 | 839.17 |
| 3:45:00 PM | 10.862 | 1.475 | 914.533 |
| 4:00:00 PM | 10.833 | 1.239 | 765.348 |
| 4:15:00 PM | 10.723 | 1.429 | 871.442 |
| 4:30:00 PM | 10.596 | 1.42 | 852.042 |
| 4:45:00 PM | 10.479 | 1.366 | 807.736 |
| 5:00:00 PM | 10.53 | 1.308 | 778.74 |
| 5:15:00 PM | 10.714 | 1.311 | 798.491 |
| 5:30:00 PM | 10.649 | 1.36 | 821.377 |
| 5:45:00 PM | 10.6 | 1.346 | 808.064 |
| 6:00:00 PM | 10.61 | 1.365 | 820.686 |
| 6:15:00 PM | 10.614 | 1.399 | 841.504 |
| 6:30:00 PM | 10.841 | 1.433 | 886.282 |
| 6:45:00 PM | 10.817 | 1.339 | 826.008 |
| 7:00:00 PM | 10.7 | 1.406 | 855.022 |
| 7:15:00 PM | 10.845 | 1.321 | 817.283 |
| 7:30:00 PM | 10.768 | 1.389 | 851.708 |
| 7:45:00 PM | 10.685 | 1.304 | 791.287 |
| 8:00:00 PM | 10.814 | 1.347 | 830.575 |
| 8:15:00 PM | 11.046 | 1.387 | 879.167 |
| 8:30:00 PM | 11.089 | 1.454 | 926.159 |
| 8:45:00 PM | 11.25 | 1.468 | 952.857 |
| 9:00:00 PM | 11.336 | 1.491 | 976.998 |
| 9:15:00 PM | 11.48 | 1.469 | 978.173 |
| 9:30:00 PM | 11.586 | 1.544 | 1040.69 |
| 9:45:00 PM | 11.541 | 1.631 | 1093.99 |
| 10:00:00 PM | 11.804 | 1.531 | 1057.21 |
| 10:15:00 PM | 11.805 | 1.466 | 1012.25 |
| 10:30:00 PM | 11.685 | 1.527 | 1040.69 |
| 10:45:00 PM | 11.47 | 1.513 | 1006.87 |
| 11:00:00 PM | 11.27 | 1.475 | 959.474 |
| 11:15:00 PM | 11.052 | 1.491 | 945.817 |
| 11:30:00 PM | 10.637 | 1.261 | 760.639 |
| 11:45:00 PM | 10.148 | 1.254 | 710.845 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.964 | 1.212 | 714.929 |
| Daily Min: | 6.633 | 0.584 | 186.873 |
| Daily Max: | 12.187 | 1.665 | 1183.12 |
| Peak to Avg: | | | 1.65 |

DRAFT

# MAXIMUM DAILY FLOW DATA

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/17/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Monday - A.M. 7/17/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 9.771 | 1.308 | 705.196 |
| 12:15:00 AM | 9.452 | 1.231 | 635.24 |
| 12:30:00 AM | 9.1 | 1.255 | 615.211 |
| 12:45:00 AM | 8.763 | 1.146 | 533.939 |
| 1:00:00 AM | 8.485 | 1.005 | 448.205 |
| 1:15:00 AM | 8.185 | 0.872 | 370.232 |
| 1:30:00 AM | 7.849 | 0.828 | 332.022 |
| 1:45:00 AM | 7.654 | 0.804 | 311.181 |
| 2:00:00 AM | 7.411 | 0.728 | 269.439 |
| 2:15:00 AM | 7.268 | 0.738 | 265.822 |
| 2:30:00 AM | 7.186 | 0.754 | 267.496 |
| 2:45:00 AM | 7.109 | 0.637 | 222.554 |
| 3:00:00 AM | 6.952 | 0.663 | 224.51 |
| 3:15:00 AM | 6.867 | 0.665 | 221.508 |
| 3:30:00 AM | 6.774 | 0.59 | 192.874 |
| 3:45:00 AM | 6.819 | 0.61 | 201.16 |
| 4:00:00 AM | 6.863 | 0.544 | 181.182 |
| 4:15:00 AM | 6.796 | 0.642 | 210.752 |
| 4:30:00 AM | 6.75 | 0.645 | 209.737 |
| 4:45:00 AM | 6.763 | 0.635 | 207.075 |
| 5:00:00 AM | 6.943 | 0.668 | 225.778 |
| 5:15:00 AM | 7.053 | 0.686 | 237.071 |
| 5:30:00 AM | 7.18 | 0.682 | 241.826 |
| 5:45:00 AM | 7.407 | 0.731 | 270.309 |
| 6:00:00 AM | 7.623 | 0.843 | 324.486 |
| 6:15:00 AM | 7.956 | 0.846 | 345.437 |
| 6:30:00 AM | 8.599 | 1.086 | 492.968 |
| 6:45:00 AM | 8.695 | 0.957 | 441.147 |
| 7:00:00 AM | 8.863 | 1.003 | 474.487 |
| 7:15:00 AM | 9.281 | 1.061 | 534.09 |
| 7:30:00 AM | 9.513 | 1.177 | 612.489 |
| 7:45:00 AM | 9.709 | 1.097 | 586.739 |
| 8:00:00 AM | 9.951 | 1.263 | 697.799 |
| 8:15:00 AM | 10.078 | 1.344 | 755.241 |
| 8:30:00 AM | 11.244 | 1.442 | 935.265 |
| 8:45:00 AM | 12.389 | 1.497 | 1098.9 |
| 9:00:00 AM | 12.645 | 1.613 | 1215.03 |
| 9:15:00 AM | 12.557 | 1.548 | 1156.03 |
| 9:30:00 AM | 12.597 | 1.535 | 1151.03 |
| 9:45:00 AM | 12.491 | 1.589 | 1178.71 |
| 10:00:00 AM | 12.305 | 1.599 | 1163.97 |
| 10:15:00 AM | 11.818 | 1.535 | 1061.39 |
| 10:30:00 AM | 11.309 | 1.433 | 936.502 |
| 10:45:00 AM | 11.215 | 1.356 | 876.246 |
| 11:00:00 AM | 11.081 | 1.403 | 892.879 |
| 11:15:00 AM | 10.925 | 1.385 | 865.378 |
| 11:30:00 AM | 10.726 | 1.445 | 881.459 |
| 11:45:00 AM | 10.777 | 1.366 | 837.986 |

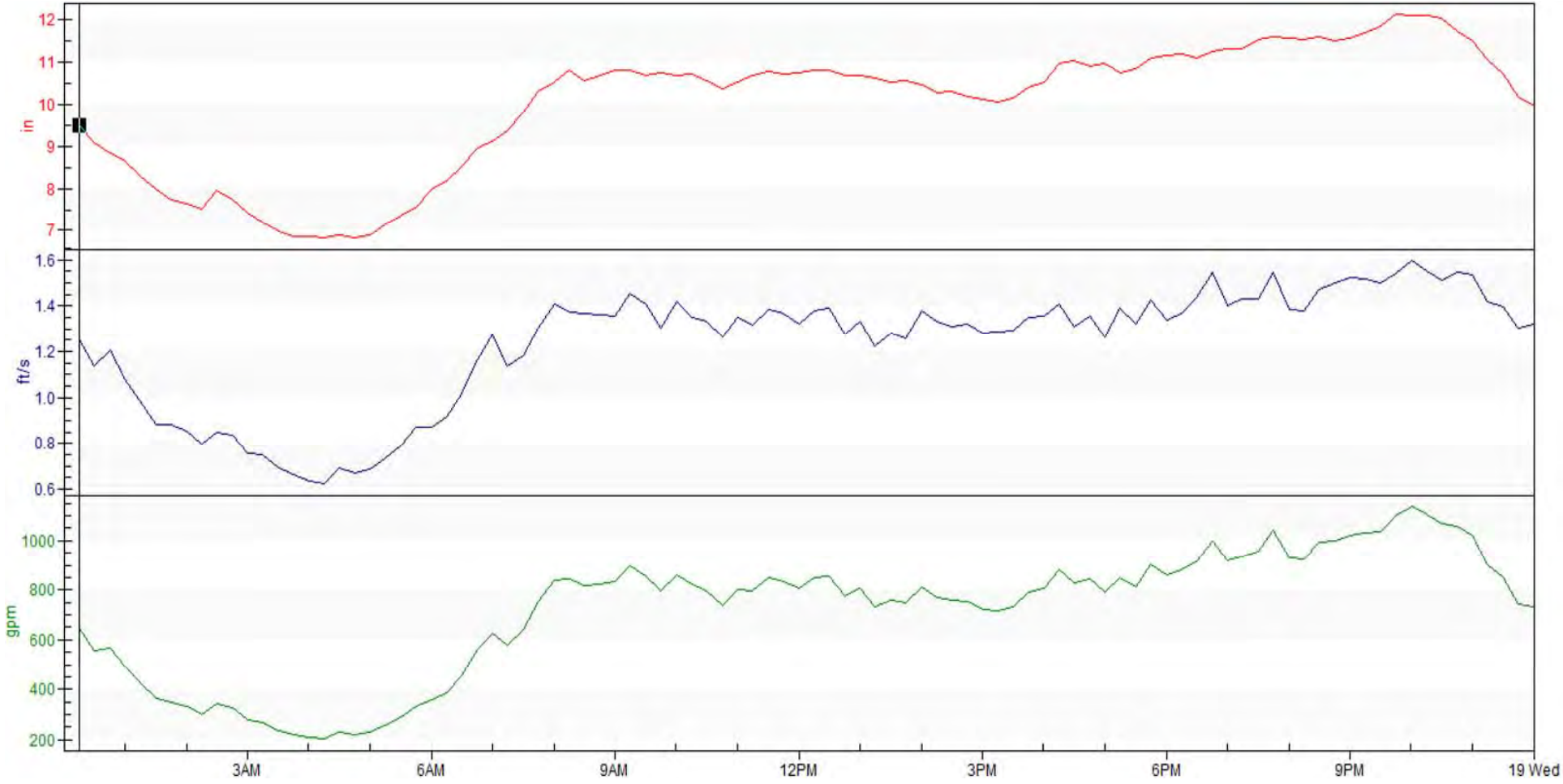
**Monday - P.M. 7/17/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.006 | 1.44 | 908.036 |
| 12:15:00 PM | 10.976 | 1.456 | 915.291 |
| 12:30:00 PM | 10.968 | 1.431 | 898.637 |
| 12:45:00 PM | 11.036 | 1.352 | 855.874 |
| 1:00:00 PM | 11.04 | 1.414 | 895.615 |
| 1:15:00 PM | 10.893 | 1.44 | 896.463 |
| 1:30:00 PM | 10.881 | 1.4 | 895.101 |
| 1:45:00 PM | 10.756 | 1.397 | 855.138 |
| 2:00:00 PM | 10.829 | 1.384 | 854.542 |
| 2:15:00 PM | 10.749 | 1.389 | 849.642 |
| 2:30:00 PM | 10.717 | 1.429 | 870.34 |
| 2:45:00 PM | 10.617 | 1.344 | 808.721 |
| 3:00:00 PM | 10.817 | 1.484 | 915.391 |
| 3:15:00 PM | 10.92 | 1.476 | 921.319 |
| 3:30:00 PM | 10.835 | 1.411 | 871.685 |
| 3:45:00 PM | 10.634 | 1.27 | 765.925 |
| 4:00:00 PM | 10.658 | 1.375 | 831.92 |
| 4:15:00 PM | 10.734 | 1.394 | 851.254 |
| 4:30:00 PM | 10.733 | 1.294 | 789.608 |
| 4:45:00 PM | 10.7 | 1.377 | 837.047 |
| 5:00:00 PM | 10.69 | 1.396 | 847.68 |
| 5:15:00 PM | 10.886 | 1.334 | 829.641 |
| 5:30:00 PM | 11.034 | 1.313 | 830.859 |
| 5:45:00 PM | 11.143 | 1.32 | 845.926 |
| 6:00:00 PM | 11.168 | 1.395 | 896.626 |
| 6:15:00 PM | 11.248 | 1.546 | 1002.92 |
| 6:30:00 PM | 11.422 | 1.461 | 966.545 |
| 6:45:00 PM | 11.532 | 1.456 | 975.425 |
| 7:00:00 PM | 11.639 | 1.517 | 1028.27 |
| 7:15:00 PM | 11.765 | 1.556 | 1069.52 |
| 7:30:00 PM | 11.848 | 1.604 | 1112.88 |
| 7:45:00 PM | 12.026 | 1.524 | 1077.56 |
| 8:00:00 PM | 12.007 | 1.522 | 1074.02 |
| 8:15:00 PM | 12.045 | 1.517 | 1074.93 |
| 8:30:00 PM | 11.959 | 1.483 | 1041.17 |
| 8:45:00 PM | 11.851 | 1.474 | 1023.09 |
| 9:00:00 PM | 11.936 | 1.49 | 1043.1 |
| 9:15:00 PM | 11.947 | 1.634 | 1145.44 |
| 9:30:00 PM | 12.189 | 1.605 | 1154.36 |
| 9:45:00 PM | 12.198 | 1.548 | 1114.48 |
| 10:00:00 PM | 12.143 | 1.454 | 1041 |
| 10:15:00 PM | 12.221 | 1.557 | 1123.67 |
| 10:30:00 PM | 12.147 | 1.564 | 1119.54 |
| 10:45:00 PM | 12.043 | 1.584 | 1121.99 |
| 11:00:00 PM | 11.774 | 1.598 | 1099.71 |
| 11:15:00 PM | 11.391 | 1.498 | 987.839 |
| 11:30:00 PM | 10.814 | 1.368 | 843.039 |
| 11:45:00 PM | 10.419 | 1.301 | 763.901 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.189 | 1.250 | 757.405 |
| Daily Min: | 6.75 | 0.544 | 181.182 |
| Daily Max: | 12.645 | 1.634 | 1215.03 |
| Peak to Avg: | | | 1.60 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate** —

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/18/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Tuesday- A.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.037 | 1.273 | 711.46 |
| 12:15:00 AM | 9.495 | 1.25 | 648.805 |
| 12:30:00 AM | 9.077 | 1.136 | 555.196 |
| 12:45:00 AM | 8.838 | 1.204 | 567.463 |
| 1:00:00 AM | 8.63 | 1.079 | 492.161 |
| 1:15:00 AM | 8.313 | 0.985 | 427.098 |
| 1:30:00 AM | 7.976 | 0.884 | 362.257 |
| 1:45:00 AM | 7.736 | 0.883 | 346.817 |
| 2:00:00 AM | 7.635 | 0.856 | 330.101 |
| 2:15:00 AM | 7.529 | 0.793 | 300.091 |
| 2:30:00 AM | 7.944 | 0.847 | 345.111 |
| 2:45:00 AM | 7.746 | 0.836 | 329.231 |
| 3:00:00 AM | 7.43 | 0.753 | 279.898 |
| 3:15:00 AM | 7.201 | 0.752 | 267.566 |
| 3:30:00 AM | 6.97 | 0.694 | 235.977 |
| 3:45:00 AM | 6.869 | 0.665 | 221.453 |
| 4:00:00 AM | 6.846 | 0.635 | 210.646 |
| 4:15:00 AM | 6.827 | 0.622 | 205.615 |
| 4:30:00 AM | 6.879 | 0.69 | 230.277 |
| 4:45:00 AM | 6.826 | 0.669 | 221.084 |
| 5:00:00 AM | 6.905 | 0.688 | 231.042 |
| 5:15:00 AM | 7.146 | 0.732 | 257.857 |
| 5:30:00 AM | 7.352 | 0.793 | 290.353 |
| 5:45:00 AM | 7.532 | 0.871 | 329.851 |
| 6:00:00 AM | 7.984 | 0.873 | 358.141 |
| 6:15:00 AM | 8.165 | 0.917 | 387.857 |
| 6:30:00 AM | 8.528 | 1.017 | 456.743 |
| 6:45:00 AM | 8.97 | 1.167 | 561.12 |
| 7:00:00 AM | 9.124 | 1.276 | 627.523 |
| 7:15:00 AM | 9.366 | 1.134 | 577.919 |
| 7:30:00 AM | 9.811 | 1.181 | 640.057 |
| 7:45:00 AM | 10.303 | 1.302 | 753.259 |
| 8:00:00 AM | 10.531 | 1.407 | 837.827 |
| 8:15:00 AM | 10.789 | 1.374 | 844.462 |
| 8:30:00 AM | 10.563 | 1.368 | 818.008 |
| 8:45:00 AM | 10.663 | 1.358 | 822.022 |
| 9:00:00 AM | 10.792 | 1.357 | 834.17 |
| 9:15:00 AM | 10.8 | 1.456 | 896.2 |
| 9:30:00 AM | 10.679 | 1.409 | 854.685 |
| 9:45:00 AM | 10.732 | 1.303 | 795.104 |
| 10:00:00 AM | 10.673 | 1.417 | 858.357 |
| 10:15:00 AM | 10.714 | 1.35 | 822.203 |
| 10:30:00 AM | 10.561 | 1.331 | 795.27 |
| 10:45:00 AM | 10.356 | 1.263 | 735.384 |
| 11:00:00 AM | 10.518 | 1.349 | 801.797 |
| 11:15:00 AM | 10.677 | 1.314 | 796.336 |
| 11:30:00 AM | 10.767 | 1.386 | 849.816 |
| 11:45:00 AM | 10.71 | 1.367 | 831.931 |

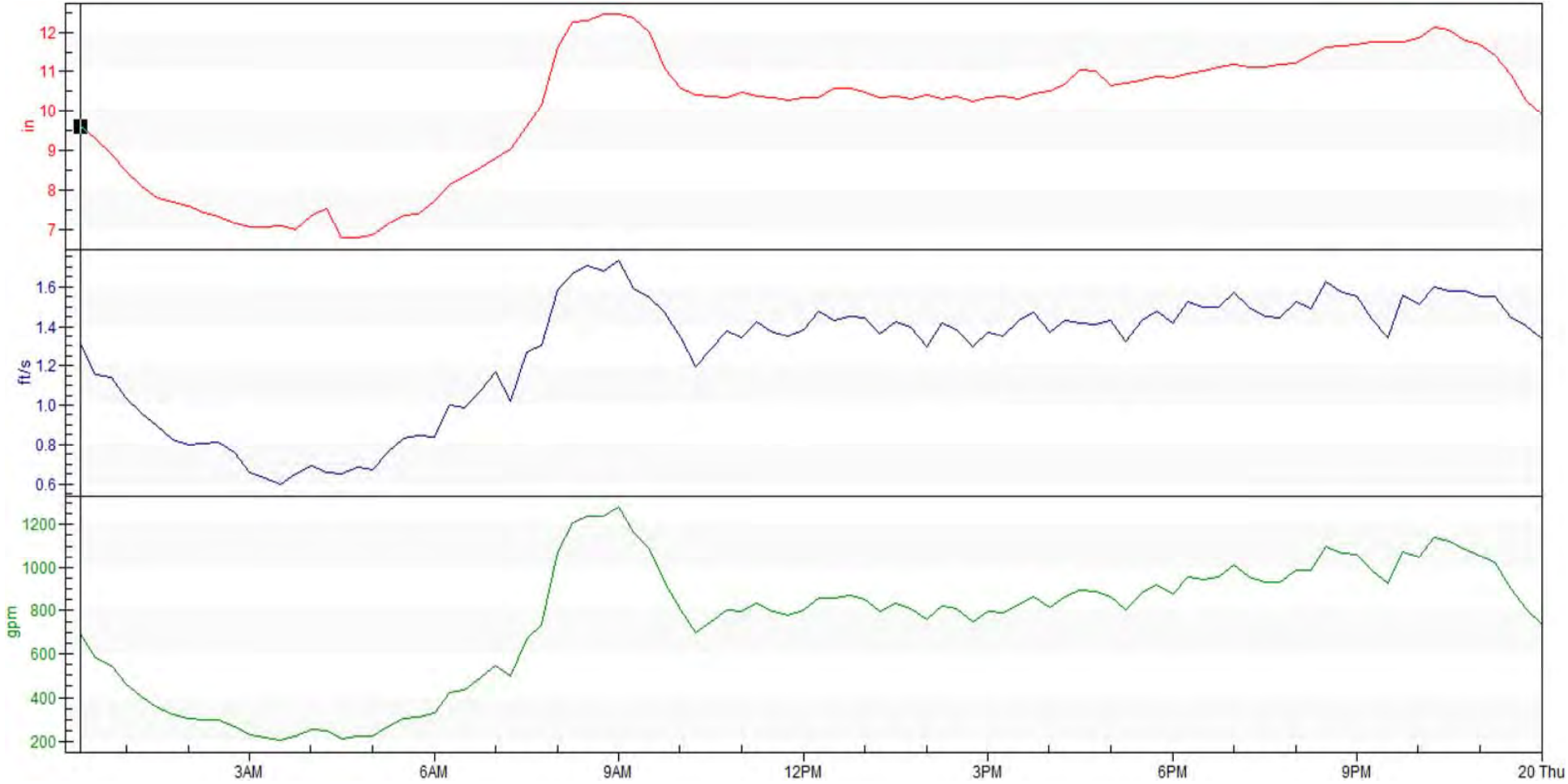
**Tuesday- P.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.741 | 1.32 | 806.237 |
| 12:15:00 PM | 10.812 | 1.377 | 848.811 |
| 12:30:00 PM | 10.792 | 1.388 | 853.498 |
| 12:45:00 PM | 10.687 | 1.274 | 773.569 |
| 1:00:00 PM | 10.674 | 1.335 | 808.747 |
| 1:15:00 PM | 10.615 | 1.221 | 734.753 |
| 1:30:00 PM | 10.517 | 1.28 | 760.523 |
| 1:45:00 PM | 10.555 | 1.255 | 749.558 |
| 2:00:00 PM | 10.464 | 1.378 | 813.555 |
| 2:15:00 PM | 10.272 | 1.335 | 769.268 |
| 2:30:00 PM | 10.301 | 1.309 | 756.996 |
| 2:45:00 PM | 10.185 | 1.319 | 751.376 |
| 3:00:00 PM | 10.115 | 1.282 | 724.001 |
| 3:15:00 PM | 10.045 | 1.285 | 718.67 |
| 3:30:00 PM | 10.143 | 1.291 | 731.394 |
| 3:45:00 PM | 10.397 | 1.35 | 790.23 |
| 4:00:00 PM | 10.513 | 1.358 | 806.605 |
| 4:15:00 PM | 10.957 | 1.409 | 883.513 |
| 4:30:00 PM | 11.027 | 1.309 | 827.461 |
| 4:45:00 PM | 10.88 | 1.358 | 843.678 |
| 5:00:00 PM | 10.959 | 1.264 | 792.541 |
| 5:15:00 PM | 10.724 | 1.39 | 847.52 |
| 5:30:00 PM | 10.836 | 1.318 | 814.844 |
| 5:45:00 PM | 11.071 | 1.423 | 904.539 |
| 6:00:00 PM | 11.153 | 1.337 | 858.115 |
| 6:15:00 PM | 11.182 | 1.365 | 879.131 |
| 6:30:00 PM | 11.074 | 1.437 | 913.819 |
| 6:45:00 PM | 11.229 | 1.546 | 1001.1 |
| 7:00:00 PM | 11.311 | 1.402 | 916.463 |
| 7:15:00 PM | 11.29 | 1.43 | 932.471 |
| 7:30:00 PM | 11.507 | 1.428 | 953.963 |
| 7:45:00 PM | 11.586 | 1.545 | 1041.17 |
| 8:00:00 PM | 11.547 | 1.385 | 929.471 |
| 8:15:00 PM | 11.532 | 1.377 | 922.243 |
| 8:30:00 PM | 11.594 | 1.471 | 992.177 |
| 8:45:00 PM | 11.499 | 1.5 | 1001.37 |
| 9:00:00 PM | 11.541 | 1.522 | 1020.75 |
| 9:15:00 PM | 11.685 | 1.517 | 1033.55 |
| 9:30:00 PM | 11.83 | 1.499 | 1037.6 |
| 9:45:00 PM | 12.117 | 1.539 | 1098.19 |
| 10:00:00 PM | 12.083 | 1.598 | 1136.41 |
| 10:15:00 PM | 12.09 | 1.55 | 1103.22 |
| 10:30:00 PM | 12.03 | 1.51 | 1067.98 |
| 10:45:00 PM | 11.713 | 1.546 | 1056.88 |
| 11:00:00 PM | 11.493 | 1.532 | 1022.35 |
| 11:15:00 PM | 11.062 | 1.418 | 900.547 |
| 11:30:00 PM | 10.708 | 1.395 | 848.687 |
| 11:45:00 PM | 10.178 | 1.306 | 743.522 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.977 | 1.231 | 713.318 |
| Daily Min: | 6.826 | 0.622 | 205.615 |
| Daily Max: | 12.117 | 1.598 | 1136.41 |
| Peak to Avg: | | | 1.59 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/19/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Wednesday - A.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.944 | 1.322 | 729.971 |
| 12:15:00 AM | 9.614 | 1.31 | 691.362 |
| 12:30:00 AM | 9.313 | 1.155 | 584.016 |
| 12:45:00 AM | 8.897 | 1.141 | 542.538 |
| 1:00:00 AM | 8.465 | 1.035 | 460.082 |
| 1:15:00 AM | 8.088 | 0.959 | 400.412 |
| 1:30:00 AM | 7.813 | 0.894 | 356.295 |
| 1:45:00 AM | 7.692 | 0.828 | 322.7 |
| 2:00:00 AM | 7.594 | 0.796 | 305.069 |
| 2:15:00 AM | 7.435 | 0.807 | 300 |
| 2:30:00 AM | 7.326 | 0.815 | 297.072 |
| 2:45:00 AM | 7.164 | 0.756 | 267.184 |
| 3:00:00 AM | 7.079 | 0.661 | 229.584 |
| 3:15:00 AM | 7.053 | 0.632 | 218.567 |
| 3:30:00 AM | 7.093 | 0.597 | 207.994 |
| 3:45:00 AM | 7.014 | 0.65 | 223.136 |
| 4:00:00 AM | 7.382 | 0.691 | 254.432 |
| 4:15:00 AM | 7.525 | 0.66 | 249.517 |
| 4:30:00 AM | 6.806 | 0.649 | 213.508 |
| 4:45:00 AM | 6.797 | 0.685 | 224.995 |
| 5:00:00 AM | 6.869 | 0.674 | 224.708 |
| 5:15:00 AM | 7.12 | 0.76 | 266.213 |
| 5:30:00 AM | 7.364 | 0.829 | 304.462 |
| 5:45:00 AM | 7.412 | 0.845 | 313.137 |
| 6:00:00 AM | 7.738 | 0.837 | 329.117 |
| 6:15:00 AM | 8.126 | 0.998 | 419.711 |
| 6:30:00 AM | 8.343 | 0.99 | 431.436 |
| 6:45:00 AM | 8.582 | 1.077 | 487.643 |
| 7:00:00 AM | 8.812 | 1.165 | 546.99 |
| 7:15:00 AM | 9.054 | 1.021 | 496.862 |
| 7:30:00 AM | 9.594 | 1.269 | 667.707 |
| 7:45:00 AM | 10.149 | 1.3 | 737.075 |
| 8:00:00 AM | 11.615 | 1.586 | 1072.86 |
| 8:15:00 AM | 12.241 | 1.667 | 1205.52 |
| 8:30:00 AM | 12.294 | 1.706 | 1239.99 |
| 8:45:00 AM | 12.455 | 1.68 | 1241.96 |
| 9:00:00 AM | 12.453 | 1.733 | 1280.62 |
| 9:15:00 AM | 12.364 | 1.593 | 1166.37 |
| 9:30:00 AM | 11.985 | 1.545 | 1087.8 |
| 9:45:00 AM | 11.067 | 1.471 | 934.395 |
| 10:00:00 AM | 10.567 | 1.346 | 805.178 |
| 10:15:00 AM | 10.421 | 1.193 | 700.725 |
| 10:30:00 AM | 10.367 | 1.282 | 747.757 |
| 10:45:00 AM | 10.358 | 1.374 | 800.559 |
| 11:00:00 AM | 10.487 | 1.343 | 795.161 |
| 11:15:00 AM | 10.39 | 1.426 | 834.036 |
| 11:30:00 AM | 10.353 | 1.369 | 797.143 |
| 11:45:00 AM | 10.289 | 1.348 | 778.242 |

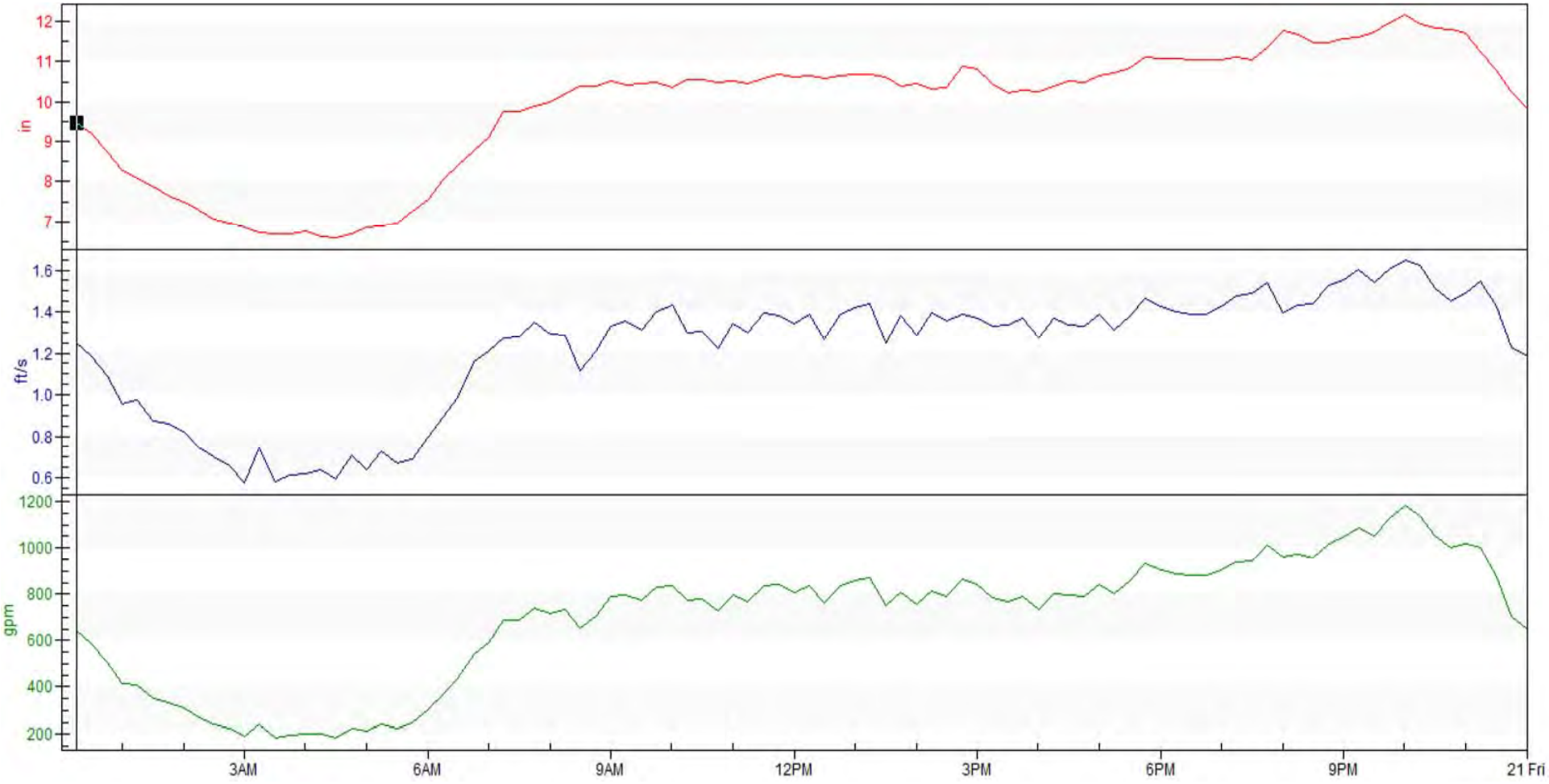
**Wednesday - P.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.346 | 1.381 | 803.319 |
| 12:15:00 PM | 10.349 | 1.477 | 859.462 |
| 12:30:00 PM | 10.579 | 1.433 | 858.273 |
| 12:45:00 PM | 10.569 | 1.452 | 868.304 |
| 1:00:00 PM | 10.488 | 1.441 | 853.609 |
| 1:15:00 PM | 10.355 | 1.364 | 794.528 |
| 1:30:00 PM | 10.37 | 1.424 | 831.041 |
| 1:45:00 PM | 10.321 | 1.394 | 808.086 |
| 2:00:00 PM | 10.423 | 1.297 | 761.861 |
| 2:15:00 PM | 10.323 | 1.416 | 821.307 |
| 2:30:00 PM | 10.371 | 1.383 | 806.834 |
| 2:45:00 PM | 10.245 | 1.297 | 745.015 |
| 3:00:00 PM | 10.355 | 1.367 | 796.271 |
| 3:15:00 PM | 10.374 | 1.353 | 789.586 |
| 3:30:00 PM | 10.327 | 1.428 | 828.535 |
| 3:45:00 PM | 10.449 | 1.471 | 867.165 |
| 4:00:00 PM | 10.506 | 1.372 | 814.146 |
| 4:15:00 PM | 10.668 | 1.43 | 866.015 |
| 4:30:00 PM | 11.044 | 1.416 | 896.941 |
| 4:45:00 PM | 11.025 | 1.408 | 889.796 |
| 5:00:00 PM | 10.642 | 1.433 | 865.266 |
| 5:15:00 PM | 10.709 | 1.324 | 805.726 |
| 5:30:00 PM | 10.794 | 1.433 | 881.053 |
| 5:45:00 PM | 10.895 | 1.48 | 921.34 |
| 6:00:00 PM | 10.848 | 1.419 | 878.622 |
| 6:15:00 PM | 10.961 | 1.527 | 958.169 |
| 6:30:00 PM | 11.015 | 1.499 | 946.294 |
| 6:45:00 PM | 11.103 | 1.495 | 953.694 |
| 7:00:00 PM | 11.19 | 1.573 | 1014.12 |
| 7:15:00 PM | 11.125 | 1.498 | 958.122 |
| 7:30:00 PM | 11.13 | 1.452 | 928.931 |
| 7:45:00 PM | 11.194 | 1.444 | 930.903 |
| 8:00:00 PM | 11.231 | 1.522 | 985.587 |
| 8:15:00 PM | 11.406 | 1.494 | 986.764 |
| 8:30:00 PM | 11.622 | 1.624 | 1098.97 |
| 8:45:00 PM | 11.666 | 1.57 | 1067.49 |
| 9:00:00 PM | 11.692 | 1.552 | 1058.17 |
| 9:15:00 PM | 11.765 | 1.434 | 986.048 |
| 9:30:00 PM | 11.761 | 1.345 | 924.296 |
| 9:45:00 PM | 11.745 | 1.561 | 1070.47 |
| 10:00:00 PM | 11.855 | 1.513 | 1050.62 |
| 10:15:00 PM | 12.12 | 1.597 | 1140.02 |
| 10:30:00 PM | 12.056 | 1.578 | 1119.2 |
| 10:45:00 PM | 11.783 | 1.579 | 1087.85 |
| 11:00:00 PM | 11.697 | 1.548 | 1056.44 |
| 11:15:00 PM | 11.423 | 1.55 | 1026.15 |
| 11:30:00 PM | 10.907 | 1.447 | 901.772 |
| 11:45:00 PM | 10.293 | 1.404 | 811.044 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.012 | 1.274 | 747.738 |
| Daily Min: | 6.797 | 0.597 | 207.994 |
| Daily Max: | 12.455 | 1.733 | 1280.62 |
| Peak to Avg: | | | 1.71 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate** —

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/20/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Thursday - A.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.919 | 1.337 | 735.392 |
| 12:15:00 AM | 9.475 | 1.245 | 644.558 |
| 12:30:00 AM | 9.196 | 1.181 | 587.263 |
| 12:45:00 AM | 8.753 | 1.086 | 505.275 |
| 1:00:00 AM | 8.276 | 0.956 | 412.061 |
| 1:15:00 AM | 8.067 | 0.976 | 406.289 |
| 1:30:00 AM | 7.889 | 0.875 | 353.279 |
| 1:45:00 AM | 7.642 | 0.858 | 331.628 |
| 2:00:00 AM | 7.485 | 0.825 | 309.719 |
| 2:15:00 AM | 7.28 | 0.748 | 270.304 |
| 2:30:00 AM | 7.071 | 0.704 | 244.115 |
| 2:45:00 AM | 6.952 | 0.658 | 223.069 |
| 3:00:00 AM | 6.869 | 0.574 | 191.425 |
| 3:15:00 AM | 6.725 | 0.748 | 241.846 |
| 3:30:00 AM | 6.688 | 0.581 | 186.522 |
| 3:45:00 AM | 6.701 | 0.61 | 196.363 |
| 4:00:00 AM | 6.755 | 0.616 | 200.594 |
| 4:15:00 AM | 6.631 | 0.636 | 201.742 |
| 4:30:00 AM | 6.595 | 0.596 | 187.633 |
| 4:45:00 AM | 6.707 | 0.705 | 227.39 |
| 5:00:00 AM | 6.845 | 0.638 | 211.604 |
| 5:15:00 AM | 6.909 | 0.728 | 244.727 |
| 5:30:00 AM | 6.975 | 0.67 | 227.912 |
| 5:45:00 AM | 7.265 | 0.691 | 248.891 |
| 6:00:00 AM | 7.548 | 0.798 | 302.989 |
| 6:15:00 AM | 8.05 | 0.89 | 369.47 |
| 6:30:00 AM | 8.408 | 0.986 | 434.151 |
| 6:45:00 AM | 8.757 | 1.159 | 539.248 |
| 7:00:00 AM | 9.098 | 1.207 | 591.362 |
| 7:15:00 AM | 9.771 | 1.276 | 688.16 |
| 7:30:00 AM | 9.768 | 1.279 | 689.266 |
| 7:45:00 AM | 9.908 | 1.348 | 740.731 |
| 8:00:00 AM | 10.001 | 1.29 | 717.576 |
| 8:15:00 AM | 10.185 | 1.288 | 733.74 |
| 8:30:00 AM | 10.398 | 1.115 | 653.046 |
| 8:45:00 AM | 10.391 | 1.207 | 706.354 |
| 9:00:00 AM | 10.515 | 1.332 | 791.453 |
| 9:15:00 AM | 10.411 | 1.356 | 795.135 |
| 9:30:00 AM | 10.445 | 1.313 | 773.184 |
| 9:45:00 AM | 10.5 | 1.402 | 831.653 |
| 10:00:00 AM | 10.362 | 1.433 | 835.239 |
| 10:15:00 AM | 10.548 | 1.297 | 774.139 |
| 10:30:00 AM | 10.542 | 1.306 | 778.369 |
| 10:45:00 AM | 10.491 | 1.224 | 725.341 |
| 11:00:00 AM | 10.516 | 1.343 | 798.065 |
| 11:15:00 AM | 10.443 | 1.299 | 765.199 |
| 11:30:00 AM | 10.591 | 1.396 | 837.127 |
| 11:45:00 AM | 10.686 | 1.384 | 839.821 |

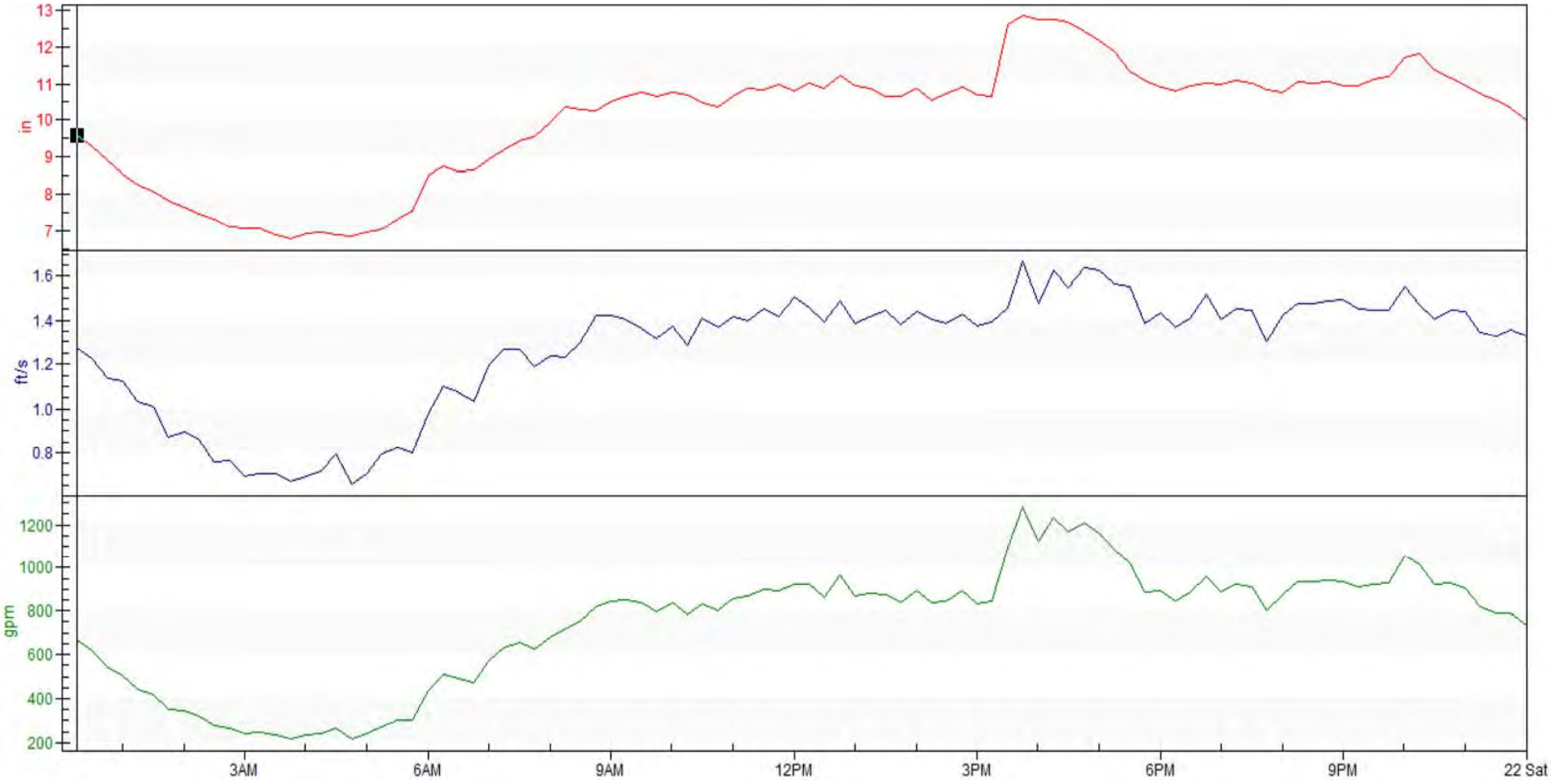
**Thursday - P.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.603 | 1.346 | 808.712 |
| 12:15:00 PM | 10.637 | 1.385 | 835.68 |
| 12:30:00 PM | 10.575 | 1.269 | 759.872 |
| 12:45:00 PM | 10.645 | 1.386 | 836.873 |
| 1:00:00 PM | 10.675 | 1.418 | 859.539 |
| 1:15:00 PM | 10.669 | 1.438 | 870.816 |
| 1:30:00 PM | 10.61 | 1.247 | 749.947 |
| 1:45:00 PM | 10.386 | 1.378 | 805.594 |
| 2:00:00 PM | 10.451 | 1.285 | 757.354 |
| 2:15:00 PM | 10.33 | 1.396 | 810.291 |
| 2:30:00 PM | 10.351 | 1.358 | 790.745 |
| 2:45:00 PM | 10.89 | 1.388 | 863.379 |
| 3:00:00 PM | 10.804 | 1.369 | 842.973 |
| 3:15:00 PM | 10.464 | 1.332 | 786.31 |
| 3:30:00 PM | 10.212 | 1.337 | 764.513 |
| 3:45:00 PM | 10.272 | 1.368 | 788.451 |
| 4:00:00 PM | 10.253 | 1.276 | 733.323 |
| 4:15:00 PM | 10.402 | 1.369 | 802.076 |
| 4:30:00 PM | 10.527 | 1.337 | 795.731 |
| 4:45:00 PM | 10.479 | 1.333 | 788.818 |
| 5:00:00 PM | 10.653 | 1.391 | 840.573 |
| 5:15:00 PM | 10.728 | 1.31 | 799.241 |
| 5:30:00 PM | 10.862 | 1.384 | 858.289 |
| 5:45:00 PM | 11.103 | 1.467 | 935.606 |
| 6:00:00 PM | 11.067 | 1.426 | 905.913 |
| 6:15:00 PM | 11.062 | 1.398 | 887.669 |
| 6:30:00 PM | 11.06 | 1.387 | 880.541 |
| 6:45:00 PM | 11.061 | 1.388 | 880.973 |
| 7:00:00 PM | 11.06 | 1.423 | 903.555 |
| 7:15:00 PM | 11.096 | 1.474 | 939.497 |
| 7:30:00 PM | 11.051 | 1.489 | 944.137 |
| 7:45:00 PM | 11.337 | 1.541 | 1010.32 |
| 8:00:00 PM | 11.76 | 1.395 | 958.839 |
| 8:15:00 PM | 11.673 | 1.431 | 973.913 |
| 8:30:00 PM | 11.488 | 1.437 | 958.209 |
| 8:45:00 PM | 11.47 | 1.527 | 1015.92 |
| 9:00:00 PM | 11.566 | 1.555 | 1045.92 |
| 9:15:00 PM | 11.617 | 1.603 | 1084.04 |
| 9:30:00 PM | 11.739 | 1.538 | 1054.47 |
| 9:45:00 PM | 11.955 | 1.605 | 1126.2 |
| 10:00:00 PM | 12.167 | 1.648 | 1182.56 |
| 10:15:00 PM | 11.928 | 1.624 | 1136.42 |
| 10:30:00 PM | 11.833 | 1.516 | 1049.77 |
| 10:45:00 PM | 11.81 | 1.451 | 1002.58 |
| 11:00:00 PM | 11.713 | 1.486 | 1015.95 |
| 11:15:00 PM | 11.23 | 1.546 | 1001.01 |
| 11:30:00 PM | 10.787 | 1.423 | 874.228 |
| 11:45:00 PM | 10.253 | 1.229 | 706.22 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.851 | 1.220 | 701.532 |
| Daily Min: | 6.595 | 0.574 | 186.522 |
| Daily Max: | 12.167 | 1.648 | 1182.56 |
| Peak to Avg: | | | 1.69 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/21/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Friday - A.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.832 | 1.187 | 645.357 |
| 12:15:00 AM | 9.603 | 1.272 | 670.266 |
| 12:30:00 AM | 9.317 | 1.224 | 619.334 |
| 12:45:00 AM | 8.906 | 1.134 | 539.809 |
| 1:00:00 AM | 8.537 | 1.123 | 504.798 |
| 1:15:00 AM | 8.246 | 1.036 | 444.099 |
| 1:30:00 AM | 8.081 | 1.01 | 421.145 |
| 1:45:00 AM | 7.835 | 0.872 | 348.5 |
| 2:00:00 AM | 7.663 | 0.893 | 346.382 |
| 2:15:00 AM | 7.471 | 0.858 | 321.473 |
| 2:30:00 AM | 7.332 | 0.757 | 276.181 |
| 2:45:00 AM | 7.107 | 0.764 | 266.816 |
| 3:00:00 AM | 7.094 | 0.694 | 241.82 |
| 3:15:00 AM | 7.077 | 0.707 | 245.701 |
| 3:30:00 AM | 6.885 | 0.703 | 234.889 |
| 3:45:00 AM | 6.792 | 0.67 | 219.855 |
| 4:00:00 AM | 6.923 | 0.69 | 232.527 |
| 4:15:00 AM | 6.988 | 0.714 | 243.652 |
| 4:30:00 AM | 6.905 | 0.795 | 266.891 |
| 4:45:00 AM | 6.866 | 0.656 | 218.606 |
| 5:00:00 AM | 6.967 | 0.706 | 240.045 |
| 5:15:00 AM | 7.042 | 0.796 | 274.654 |
| 5:30:00 AM | 7.329 | 0.822 | 299.859 |
| 5:45:00 AM | 7.548 | 0.799 | 303.541 |
| 6:00:00 AM | 8.51 | 0.977 | 437.347 |
| 6:15:00 AM | 8.753 | 1.097 | 510.035 |
| 6:30:00 AM | 8.626 | 1.076 | 490.73 |
| 6:45:00 AM | 8.642 | 1.033 | 472.083 |
| 7:00:00 AM | 8.947 | 1.194 | 572.06 |
| 7:15:00 AM | 9.188 | 1.269 | 630.338 |
| 7:30:00 AM | 9.446 | 1.267 | 652.878 |
| 7:45:00 AM | 9.545 | 1.19 | 622.149 |
| 8:00:00 AM | 9.958 | 1.234 | 682.476 |
| 8:15:00 AM | 10.367 | 1.232 | 718.756 |
| 8:30:00 AM | 10.299 | 1.298 | 750.568 |
| 8:45:00 AM | 10.283 | 1.422 | 820.46 |
| 9:00:00 AM | 10.535 | 1.422 | 847.282 |
| 9:15:00 AM | 10.661 | 1.406 | 850.631 |
| 9:30:00 AM | 10.785 | 1.364 | 837.578 |
| 9:45:00 AM | 10.67 | 1.317 | 797.991 |
| 10:00:00 AM | 10.755 | 1.374 | 840.685 |
| 10:15:00 AM | 10.696 | 1.286 | 781.631 |
| 10:30:00 AM | 10.481 | 1.411 | 834.799 |
| 10:45:00 AM | 10.389 | 1.368 | 800.132 |
| 11:00:00 AM | 10.645 | 1.414 | 853.929 |
| 11:15:00 AM | 10.876 | 1.399 | 868.751 |
| 11:30:00 AM | 10.834 | 1.454 | 898.454 |
| 11:45:00 AM | 10.985 | 1.415 | 890.368 |

**Friday - P.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.796 | 1.504 | 924.843 |
| 12:15:00 PM | 11.029 | 1.458 | 922.44 |
| 12:30:00 PM | 10.862 | 1.392 | 862.825 |
| 12:45:00 PM | 11.25 | 1.487 | 964.733 |
| 1:00:00 PM | 10.932 | 1.386 | 866.52 |
| 1:15:00 PM | 10.875 | 1.415 | 878.709 |
| 1:30:00 PM | 10.657 | 1.444 | 873.208 |
| 1:45:00 PM | 10.653 | 1.382 | 835.259 |
| 2:00:00 PM | 10.888 | 1.441 | 895.912 |
| 2:15:00 PM | 10.547 | 1.402 | 836.408 |
| 2:30:00 PM | 10.718 | 1.386 | 844.8 |
| 2:45:00 PM | 10.906 | 1.43 | 891.107 |
| 3:00:00 PM | 10.682 | 1.373 | 833.11 |
| 3:15:00 PM | 10.657 | 1.392 | 841.913 |
| 3:30:00 PM | 12.607 | 1.459 | 1094.69 |
| 3:45:00 PM | 12.847 | 1.668 | 1281.36 |
| 4:00:00 PM | 12.747 | 1.479 | 1124.92 |
| 4:15:00 PM | 12.729 | 1.628 | 1236.81 |
| 4:30:00 PM | 12.652 | 1.547 | 1166.33 |
| 4:45:00 PM | 12.418 | 1.64 | 1207.29 |
| 5:00:00 PM | 12.151 | 1.623 | 1162.7 |
| 5:15:00 PM | 11.861 | 1.564 | 1086.63 |
| 5:30:00 PM | 11.351 | 1.553 | 1019.78 |
| 5:45:00 PM | 11.099 | 1.387 | 884.428 |
| 6:00:00 PM | 10.909 | 1.432 | 892.682 |
| 6:15:00 PM | 10.804 | 1.368 | 842.296 |
| 6:30:00 PM | 10.962 | 1.412 | 885.802 |
| 6:45:00 PM | 11.025 | 1.521 | 961.485 |
| 7:00:00 PM | 10.992 | 1.405 | 884.691 |
| 7:15:00 PM | 11.098 | 1.452 | 925.947 |
| 7:30:00 PM | 11.017 | 1.445 | 912.894 |
| 7:45:00 PM | 10.839 | 1.301 | 804.514 |
| 8:00:00 PM | 10.757 | 1.425 | 872.24 |
| 8:15:00 PM | 11.039 | 1.479 | 936.333 |
| 8:30:00 PM | 11.029 | 1.477 | 934.126 |
| 8:45:00 PM | 11.047 | 1.486 | 941.674 |
| 9:00:00 PM | 10.958 | 1.493 | 936.438 |
| 9:15:00 PM | 10.93 | 1.453 | 908.427 |
| 9:30:00 PM | 11.119 | 1.448 | 925.418 |
| 9:45:00 PM | 11.193 | 1.444 | 930.694 |
| 10:00:00 PM | 11.698 | 1.554 | 1060.31 |
| 10:15:00 PM | 11.789 | 1.471 | 1013.78 |
| 10:30:00 PM | 11.391 | 1.404 | 925.616 |
| 10:45:00 PM | 11.158 | 1.448 | 929.657 |
| 11:00:00 PM | 10.949 | 1.442 | 903.379 |
| 11:15:00 PM | 10.744 | 1.343 | 820.917 |
| 11:30:00 PM | 10.567 | 1.325 | 792.151 |
| 11:45:00 PM | 10.342 | 1.357 | 789.027 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.039 | 1.268 | 742.212 |
| Daily Min: | 6.792 | 0.656 | 218.606 |
| Daily Max: | 12.847 | 1.668 | 1281.36 |
| Peak to Avg: | | | 1.73 |

DRAFT

# MAXIMUM DAILY FLOW DATA

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/22/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Saturday - A.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.965 | 1.325 | 733.672 |
| 12:15:00 AM | 9.684 | 1.187 | 632.678 |
| 12:30:00 AM | 9.247 | 1.155 | 578.363 |
| 12:45:00 AM | 9.023 | 1.086 | 526.421 |
| 1:00:00 AM | 8.691 | 1.077 | 496.191 |
| 1:15:00 AM | 8.388 | 0.988 | 433.887 |
| 1:30:00 AM | 8.209 | 0.9 | 383.796 |
| 1:45:00 AM | 7.981 | 0.89 | 365.088 |
| 2:00:00 AM | 7.839 | 0.816 | 326.353 |
| 2:15:00 AM | 7.557 | 0.875 | 333.014 |
| 2:30:00 AM | 7.453 | 0.754 | 281.504 |
| 2:45:00 AM | 7.324 | 0.78 | 284.21 |
| 3:00:00 AM | 7.16 | 0.729 | 257.371 |
| 3:15:00 AM | 7.017 | 0.672 | 230.855 |
| 3:30:00 AM | 7.073 | 0.669 | 232.107 |
| 3:45:00 AM | 7.15 | 0.762 | 268.445 |
| 4:00:00 AM | 7.118 | 0.709 | 248.195 |
| 4:15:00 AM | 6.94 | 0.644 | 217.807 |
| 4:30:00 AM | 6.907 | 0.747 | 250.899 |
| 4:45:00 AM | 6.852 | 0.662 | 219.961 |
| 5:00:00 AM | 6.971 | 0.6 | 204.143 |
| 5:15:00 AM | 6.997 | 0.729 | 249.099 |
| 5:30:00 AM | 7.157 | 0.746 | 263.237 |
| 5:45:00 AM | 7.264 | 0.676 | 243.525 |
| 6:00:00 AM | 7.281 | 0.73 | 263.902 |
| 6:15:00 AM | 7.686 | 0.903 | 351.477 |
| 6:30:00 AM | 7.923 | 0.948 | 384.916 |
| 6:45:00 AM | 7.872 | 0.93 | 374.236 |
| 7:00:00 AM | 8.081 | 0.973 | 405.993 |
| 7:15:00 AM | 8.402 | 0.896 | 394.358 |
| 7:30:00 AM | 8.756 | 1.05 | 488.732 |
| 7:45:00 AM | 8.896 | 1.072 | 509.644 |
| 8:00:00 AM | 9.401 | 1.145 | 586.427 |
| 8:15:00 AM | 9.649 | 1.178 | 624.579 |
| 8:30:00 AM | 9.849 | 1.3 | 708.533 |
| 8:45:00 AM | 10.338 | 1.453 | 844.429 |
| 9:00:00 AM | 10.702 | 1.277 | 776.303 |
| 9:15:00 AM | 10.867 | 1.379 | 855.533 |
| 9:30:00 AM | 11.077 | 1.37 | 871.666 |
| 9:45:00 AM | 11.217 | 1.432 | 926.059 |
| 10:00:00 AM | 11.597 | 1.461 | 985.627 |
| 10:15:00 AM | 12.098 | 1.504 | 1071.32 |
| 10:30:00 AM | 12.124 | 1.534 | 1095.99 |
| 10:45:00 AM | 11.848 | 1.441 | 999.727 |
| 11:00:00 AM | 11.831 | 1.526 | 1056.61 |
| 11:15:00 AM | 11.737 | 1.534 | 1051.6 |
| 11:30:00 AM | 11.901 | 1.55 | 1081.3 |
| 11:45:00 AM | 11.986 | 1.544 | 1086.76 |

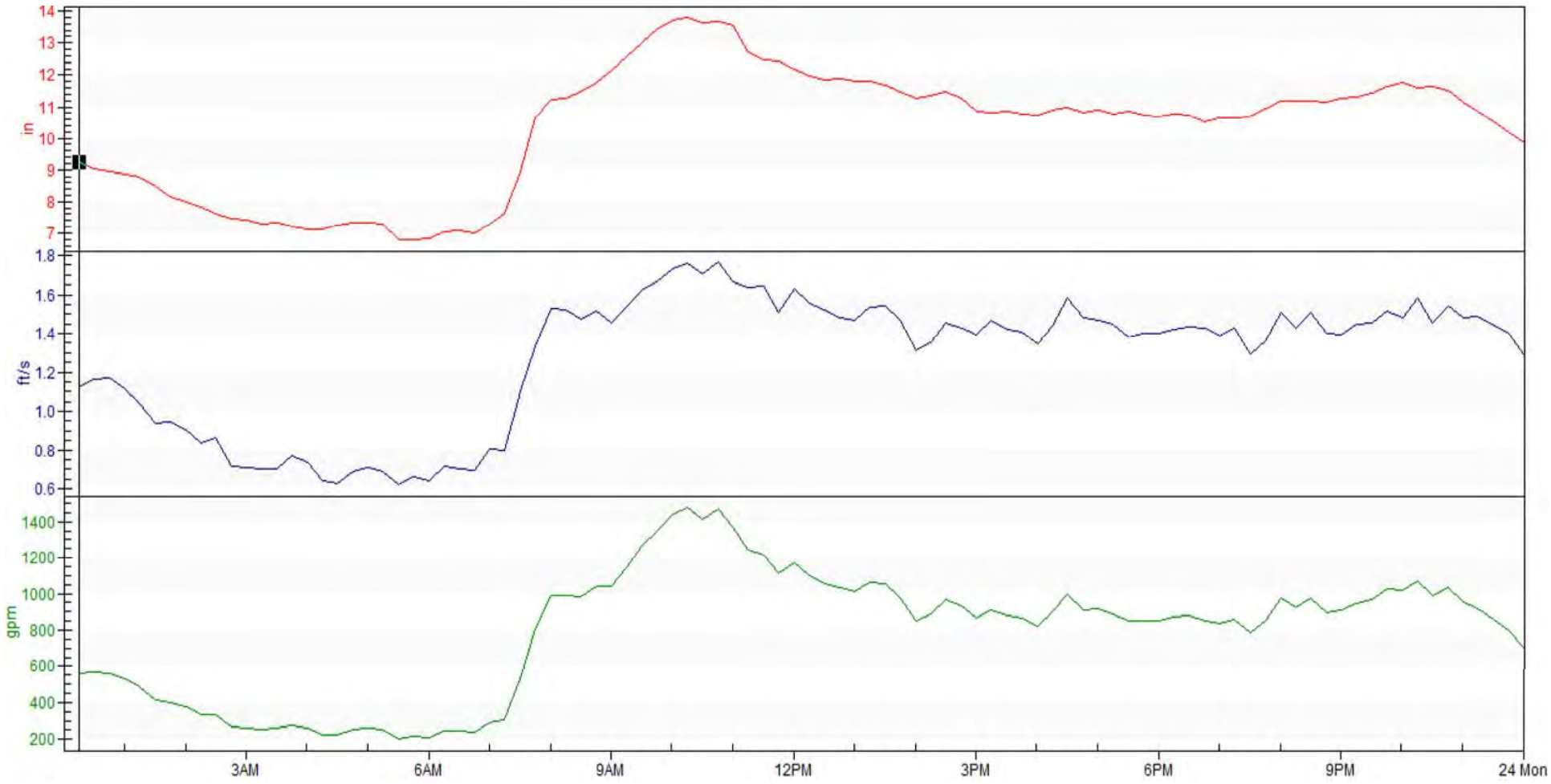
**Saturday - P.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.058 | 1.462 | 1037.15 |
| 12:15:00 PM | 12.033 | 1.524 | 1077.92 |
| 12:30:00 PM | 12.15 | 1.603 | 1148.01 |
| 12:45:00 PM | 12.367 | 1.552 | 1137.04 |
| 1:00:00 PM | 12.427 | 1.668 | 1229.58 |
| 1:15:00 PM | 12.27 | 1.555 | 1127.63 |
| 1:30:00 PM | 11.633 | 1.499 | 1015.67 |
| 1:45:00 PM | 11.779 | 1.52 | 1046.68 |
| 2:00:00 PM | 11.587 | 1.574 | 1061.08 |
| 2:15:00 PM | 11.521 | 1.581 | 1058.11 |
| 2:30:00 PM | 11.406 | 1.584 | 1046.22 |
| 2:45:00 PM | 11.256 | 1.521 | 987.487 |
| 3:00:00 PM | 11.204 | 1.381 | 891.218 |
| 3:15:00 PM | 11.178 | 1.48 | 952.465 |
| 3:30:00 PM | 10.978 | 1.422 | 893.762 |
| 3:45:00 PM | 10.774 | 1.527 | 936.955 |
| 4:00:00 PM | 11.078 | 1.482 | 942.935 |
| 4:15:00 PM | 11.168 | 1.573 | 1010.89 |
| 4:30:00 PM | 10.879 | 1.439 | 894.286 |
| 4:45:00 PM | 10.576 | 1.362 | 815.383 |
| 5:00:00 PM | 10.63 | 1.29 | 777.283 |
| 5:15:00 PM | 10.801 | 1.389 | 855.063 |
| 5:30:00 PM | 10.794 | 1.433 | 881.023 |
| 5:45:00 PM | 10.705 | 1.406 | 855.533 |
| 6:00:00 PM | 10.438 | 1.147 | 675.26 |
| 6:15:00 PM | 10.628 | 1.459 | 879.218 |
| 6:30:00 PM | 10.573 | 1.372 | 821.185 |
| 6:45:00 PM | 10.644 | 1.381 | 833.994 |
| 7:00:00 PM | 10.733 | 1.554 | 948.547 |
| 7:15:00 PM | 10.926 | 1.468 | 917.207 |
| 7:30:00 PM | 11.041 | 1.41 | 892.703 |
| 7:45:00 PM | 10.802 | 1.352 | 832.318 |
| 8:00:00 PM | 10.675 | 1.324 | 802.652 |
| 8:15:00 PM | 10.608 | 1.393 | 837.617 |
| 8:30:00 PM | 10.521 | 1.246 | 740.784 |
| 8:45:00 PM | 10.326 | 1.442 | 836.345 |
| 9:00:00 PM | 10.282 | 1.425 | 822.41 |
| 9:15:00 PM | 10.259 | 1.393 | 801.182 |
| 9:30:00 PM | 10.547 | 1.392 | 830.429 |
| 9:45:00 PM | 10.391 | 1.323 | 773.915 |
| 10:00:00 PM | 10.314 | 1.332 | 771.791 |
| 10:15:00 PM | 10.336 | 1.377 | 799.976 |
| 10:30:00 PM | 10.512 | 1.382 | 820.919 |
| 10:45:00 PM | 10.647 | 1.428 | 862.32 |
| 11:00:00 PM | 10.334 | 1.378 | 800.212 |
| 11:15:00 PM | 10.273 | 1.354 | 780.097 |
| 11:30:00 PM | 10.141 | 1.33 | 753.297 |
| 11:45:00 PM | 9.854 | 1.332 | 726.579 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.939 | 1.240 | 721.718 |
| Daily Min: | 6.852 | 0.6 | 204.143 |
| Daily Max: | 12.427 | 1.668 | 1229.58 |
| Peak to Avg: | | | 1.70 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/23/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Sunday - A.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.596 | 1.242 | 653.717 |
| 12:15:00 AM | 9.226 | 1.12 | 559.117 |
| 12:30:00 AM | 9.042 | 1.164 | 565.584 |
| 12:45:00 AM | 8.957 | 1.168 | 560.554 |
| 1:00:00 AM | 8.858 | 1.118 | 528.309 |
| 1:15:00 AM | 8.778 | 1.04 | 485.82 |
| 1:30:00 AM | 8.47 | 0.937 | 416.857 |
| 1:45:00 AM | 8.169 | 0.947 | 401.033 |
| 2:00:00 AM | 7.993 | 0.909 | 373.357 |
| 2:15:00 AM | 7.822 | 0.841 | 335.317 |
| 2:30:00 AM | 7.616 | 0.866 | 333.127 |
| 2:45:00 AM | 7.464 | 0.717 | 267.953 |
| 3:00:00 AM | 7.407 | 0.71 | 262.718 |
| 3:15:00 AM | 7.305 | 0.706 | 256.158 |
| 3:30:00 AM | 7.32 | 0.706 | 256.919 |
| 3:45:00 AM | 7.212 | 0.767 | 273.498 |
| 4:00:00 AM | 7.116 | 0.734 | 256.751 |
| 4:15:00 AM | 7.139 | 0.638 | 224.325 |
| 4:30:00 AM | 7.251 | 0.626 | 224.942 |
| 4:45:00 AM | 7.322 | 0.686 | 249.807 |
| 5:00:00 AM | 7.325 | 0.707 | 257.57 |
| 5:15:00 AM | 7.305 | 0.69 | 250.272 |
| 5:30:00 AM | 6.788 | 0.621 | 203.463 |
| 5:45:00 AM | 6.796 | 0.66 | 216.861 |
| 6:00:00 AM | 6.813 | 0.638 | 210.347 |
| 6:15:00 AM | 7.04 | 0.714 | 246.075 |
| 6:30:00 AM | 7.063 | 0.701 | 242.77 |
| 6:45:00 AM | 6.994 | 0.696 | 237.689 |
| 7:00:00 AM | 7.305 | 0.801 | 290.737 |
| 7:15:00 AM | 7.635 | 0.794 | 306.45 |
| 7:30:00 AM | 8.951 | 1.102 | 528.417 |
| 7:45:00 AM | 10.655 | 1.331 | 804.697 |
| 8:00:00 AM | 11.236 | 1.526 | 989.067 |
| 8:15:00 AM | 11.279 | 1.525 | 993.044 |
| 8:30:00 AM | 11.489 | 1.476 | 984.501 |
| 8:45:00 AM | 11.759 | 1.513 | 1039.5 |
| 9:00:00 AM | 12.125 | 1.458 | 1041.25 |
| 9:15:00 AM | 12.549 | 1.536 | 1145.71 |
| 9:30:00 AM | 13.017 | 1.622 | 1266.9 |
| 9:45:00 AM | 13.419 | 1.665 | 1350.58 |
| 10:00:00 AM | 13.729 | 1.733 | 1445.22 |
| 10:15:00 AM | 13.802 | 1.759 | 1476.69 |
| 10:30:00 AM | 13.636 | 1.706 | 1411.27 |
| 10:45:00 AM | 13.691 | 1.767 | 1468.73 |
| 11:00:00 AM | 13.532 | 1.666 | 1365.34 |
| 11:15:00 AM | 12.736 | 1.64 | 1246.45 |
| 11:30:00 AM | 12.484 | 1.642 | 1217.47 |
| 11:45:00 AM | 12.445 | 1.507 | 1112.75 |

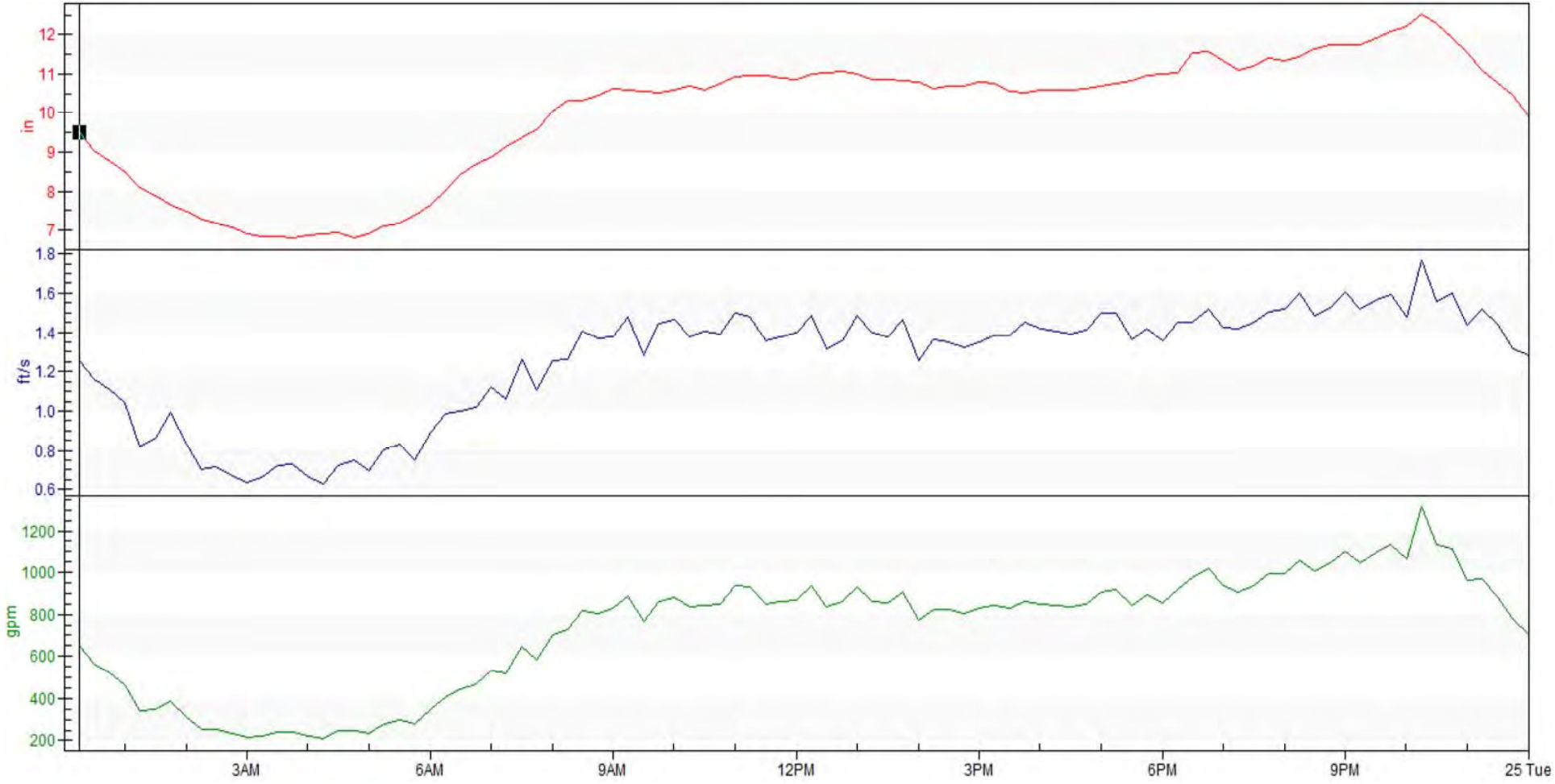
**Sunday - P.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.187 | 1.633 | 1174.42 |
| 12:15:00 PM | 11.979 | 1.56 | 1097.19 |
| 12:30:00 PM | 11.841 | 1.524 | 1056.47 |
| 12:45:00 PM | 11.911 | 1.484 | 1036.06 |
| 1:00:00 PM | 11.811 | 1.467 | 1013.68 |
| 1:15:00 PM | 11.795 | 1.538 | 1060.61 |
| 1:30:00 PM | 11.693 | 1.545 | 1053.98 |
| 1:45:00 PM | 11.483 | 1.468 | 978.09 |
| 2:00:00 PM | 11.267 | 1.314 | 854.257 |
| 2:15:00 PM | 11.344 | 1.353 | 887.703 |
| 2:30:00 PM | 11.491 | 1.456 | 971.018 |
| 2:45:00 PM | 11.283 | 1.429 | 931.17 |
| 3:00:00 PM | 10.859 | 1.393 | 863.285 |
| 3:15:00 PM | 10.813 | 1.471 | 906.404 |
| 3:30:00 PM | 10.861 | 1.423 | 882.245 |
| 3:45:00 PM | 10.768 | 1.409 | 863.703 |
| 4:00:00 PM | 10.721 | 1.346 | 820.341 |
| 4:15:00 PM | 10.907 | 1.443 | 899.417 |
| 4:30:00 PM | 10.972 | 1.581 | 993.315 |
| 4:45:00 PM | 10.822 | 1.479 | 912.873 |
| 5:00:00 PM | 10.887 | 1.469 | 913.382 |
| 5:15:00 PM | 10.778 | 1.45 | 889.797 |
| 5:30:00 PM | 10.847 | 1.379 | 853.589 |
| 5:45:00 PM | 10.719 | 1.398 | 851.636 |
| 6:00:00 PM | 10.683 | 1.399 | 848.708 |
| 6:15:00 PM | 10.778 | 1.424 | 874.141 |
| 6:30:00 PM | 10.737 | 1.436 | 877.107 |
| 6:45:00 PM | 10.526 | 1.425 | 847.696 |
| 7:00:00 PM | 10.635 | 1.388 | 836.997 |
| 7:15:00 PM | 10.633 | 1.427 | 860.427 |
| 7:30:00 PM | 10.675 | 1.292 | 783.213 |
| 7:45:00 PM | 10.919 | 1.357 | 847.435 |
| 8:00:00 PM | 11.203 | 1.506 | 972.315 |
| 8:15:00 PM | 11.177 | 1.431 | 920.791 |
| 8:30:00 PM | 11.184 | 1.511 | 973.332 |
| 8:45:00 PM | 11.158 | 1.399 | 898.088 |
| 9:00:00 PM | 11.264 | 1.395 | 906.547 |
| 9:15:00 PM | 11.316 | 1.446 | 945.336 |
| 9:30:00 PM | 11.422 | 1.457 | 964.475 |
| 9:45:00 PM | 11.66 | 1.514 | 1028.7 |
| 10:00:00 PM | 11.762 | 1.48 | 1016.85 |
| 10:15:00 PM | 11.607 | 1.582 | 1068.58 |
| 10:30:00 PM | 11.663 | 1.454 | 988.41 |
| 10:45:00 PM | 11.506 | 1.542 | 1029.91 |
| 11:00:00 PM | 11.164 | 1.481 | 951.882 |
| 11:15:00 PM | 10.835 | 1.487 | 919.076 |
| 11:30:00 PM | 10.542 | 1.443 | 860.29 |
| 11:45:00 PM | 10.2 | 1.404 | 801.557 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.309 | 1.277 | 789.142 |
| Daily Min: | 6.788 | 0.621 | 203.463 |
| Daily Max: | 13.802 | 1.767 | 1476.69 |
| Peak to Avg: | | | 1.87 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/24/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Monday - A.M. 7/24/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 9.859 | 1.283 | 700.097 |
| 12:15:00 AM | 9.503 | 1.254 | 651.536 |
| 12:30:00 AM | 9.049 | 1.16 | 564.577 |
| 12:45:00 AM | 8.776 | 1.11 | 518.026 |
| 1:00:00 AM | 8.477 | 1.042 | 464.145 |
| 1:15:00 AM | 8.102 | 0.818 | 342.601 |
| 1:30:00 AM | 7.886 | 0.864 | 348.541 |
| 1:45:00 AM | 7.658 | 0.99 | 383.465 |
| 2:00:00 AM | 7.474 | 0.831 | 311.278 |
| 2:15:00 AM | 7.286 | 0.704 | 254.769 |
| 2:30:00 AM | 7.18 | 0.719 | 254.996 |
| 2:45:00 AM | 7.078 | 0.673 | 233.731 |
| 3:00:00 AM | 6.908 | 0.637 | 214.082 |
| 3:15:00 AM | 6.844 | 0.661 | 219.194 |
| 3:30:00 AM | 6.831 | 0.724 | 239.375 |
| 3:45:00 AM | 6.796 | 0.731 | 240.017 |
| 4:00:00 AM | 6.855 | 0.661 | 219.765 |
| 4:15:00 AM | 6.887 | 0.629 | 210.293 |
| 4:30:00 AM | 6.917 | 0.725 | 243.967 |
| 4:45:00 AM | 6.811 | 0.75 | 246.928 |
| 5:00:00 AM | 6.909 | 0.698 | 234.589 |
| 5:15:00 AM | 7.094 | 0.807 | 281.142 |
| 5:30:00 AM | 7.178 | 0.834 | 295.439 |
| 5:45:00 AM | 7.389 | 0.75 | 276.598 |
| 6:00:00 AM | 7.648 | 0.893 | 345.481 |
| 6:15:00 AM | 8.011 | 0.987 | 406.988 |
| 6:30:00 AM | 8.439 | 1.002 | 443.333 |
| 6:45:00 AM | 8.694 | 1.021 | 470.657 |
| 7:00:00 AM | 8.876 | 1.123 | 532.34 |
| 7:15:00 AM | 9.132 | 1.06 | 521.917 |
| 7:30:00 AM | 9.373 | 1.262 | 643.942 |
| 7:45:00 AM | 9.588 | 1.109 | 582.908 |
| 8:00:00 AM | 10.063 | 1.253 | 702.524 |
| 8:15:00 AM | 10.308 | 1.262 | 730.3 |
| 8:30:00 AM | 10.32 | 1.406 | 814.941 |
| 8:45:00 AM | 10.45 | 1.367 | 806.004 |
| 9:00:00 AM | 10.617 | 1.378 | 829.037 |
| 9:15:00 AM | 10.593 | 1.48 | 888.299 |
| 9:30:00 AM | 10.574 | 1.28 | 766.164 |
| 9:45:00 AM | 10.535 | 1.443 | 859.593 |
| 10:00:00 AM | 10.609 | 1.462 | 879.026 |
| 10:15:00 AM | 10.694 | 1.374 | 834.504 |
| 10:30:00 AM | 10.576 | 1.407 | 842.51 |
| 10:45:00 AM | 10.751 | 1.392 | 851.57 |
| 11:00:00 AM | 10.918 | 1.5 | 936.492 |
| 11:15:00 AM | 10.97 | 1.479 | 928.597 |
| 11:30:00 AM | 10.957 | 1.356 | 850.217 |
| 11:45:00 AM | 10.903 | 1.38 | 859.509 |

**Monday - P.M. 7/24/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.854 | 1.399 | 866.842 |
| 12:15:00 PM | 10.985 | 1.487 | 935.426 |
| 12:30:00 PM | 11.022 | 1.318 | 832.951 |
| 12:45:00 PM | 11.063 | 1.354 | 859.649 |
| 1:00:00 PM | 10.985 | 1.484 | 933.881 |
| 1:15:00 PM | 10.854 | 1.394 | 863.601 |
| 1:30:00 PM | 10.857 | 1.378 | 853.885 |
| 1:45:00 PM | 10.825 | 1.462 | 902.505 |
| 2:00:00 PM | 10.811 | 1.258 | 775.143 |
| 2:15:00 PM | 10.636 | 1.364 | 822.542 |
| 2:30:00 PM | 10.695 | 1.351 | 820.683 |
| 2:45:00 PM | 10.696 | 1.322 | 803.417 |
| 3:00:00 PM | 10.783 | 1.349 | 828.78 |
| 3:15:00 PM | 10.75 | 1.381 | 844.945 |
| 3:30:00 PM | 10.548 | 1.385 | 826.564 |
| 3:45:00 PM | 10.523 | 1.452 | 863.456 |
| 4:00:00 PM | 10.606 | 1.415 | 850.651 |
| 4:15:00 PM | 10.586 | 1.405 | 842.338 |
| 4:30:00 PM | 10.576 | 1.391 | 832.879 |
| 4:45:00 PM | 10.633 | 1.412 | 851.539 |
| 5:00:00 PM | 10.679 | 1.498 | 908.46 |
| 5:15:00 PM | 10.774 | 1.496 | 917.924 |
| 5:30:00 PM | 10.843 | 1.365 | 844.376 |
| 5:45:00 PM | 10.975 | 1.419 | 891.802 |
| 6:00:00 PM | 10.995 | 1.358 | 855.188 |
| 6:15:00 PM | 11.047 | 1.45 | 918.725 |
| 6:30:00 PM | 11.557 | 1.451 | 975.031 |
| 6:45:00 PM | 11.57 | 1.52 | 1022.66 |
| 7:00:00 PM | 11.331 | 1.427 | 934.677 |
| 7:15:00 PM | 11.092 | 1.421 | 905.102 |
| 7:30:00 PM | 11.194 | 1.454 | 937.705 |
| 7:45:00 PM | 11.42 | 1.502 | 993.576 |
| 8:00:00 PM | 11.324 | 1.516 | 992.213 |
| 8:15:00 PM | 11.426 | 1.597 | 1057.47 |
| 8:30:00 PM | 11.642 | 1.482 | 1005.19 |
| 8:45:00 PM | 11.76 | 1.523 | 1046.05 |
| 9:00:00 PM | 11.735 | 1.607 | 1100.82 |
| 9:15:00 PM | 11.754 | 1.521 | 1044.13 |
| 9:30:00 PM | 11.897 | 1.568 | 1093.49 |
| 9:45:00 PM | 12.075 | 1.593 | 1132.29 |
| 10:00:00 PM | 12.212 | 1.475 | 1063.54 |
| 10:15:00 PM | 12.525 | 1.768 | 1315.86 |
| 10:30:00 PM | 12.297 | 1.559 | 1133.94 |
| 10:45:00 PM | 11.904 | 1.6 | 1116.89 |
| 11:00:00 PM | 11.552 | 1.435 | 963.66 |
| 11:15:00 PM | 11.113 | 1.516 | 968.06 |
| 11:30:00 PM | 10.776 | 1.438 | 882.442 |
| 11:45:00 PM | 10.473 | 1.318 | 779.079 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.965 | 1.254 | 730.399 |
| Daily Min: | 6.796 | 0.629 | 210.293 |
| Daily Max: | 12.525 | 1.768 | 1315.86 |
| Peak to Avg: | | | 1.80 |

DRAFT

# Sewer Line Flow Study Summary

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Pipe Size: **24" VCP**
Time Period: **7/11/2023, 12:00 a.m. - 7/25/2023, 12:00 a.m.**

## Level - Inches

| | |
|---|---|
| Average: | 10.108 |
| Maximum: | 13.802 |
| Minimum: | 6.595 |
| Max d/D: | 57.5% |

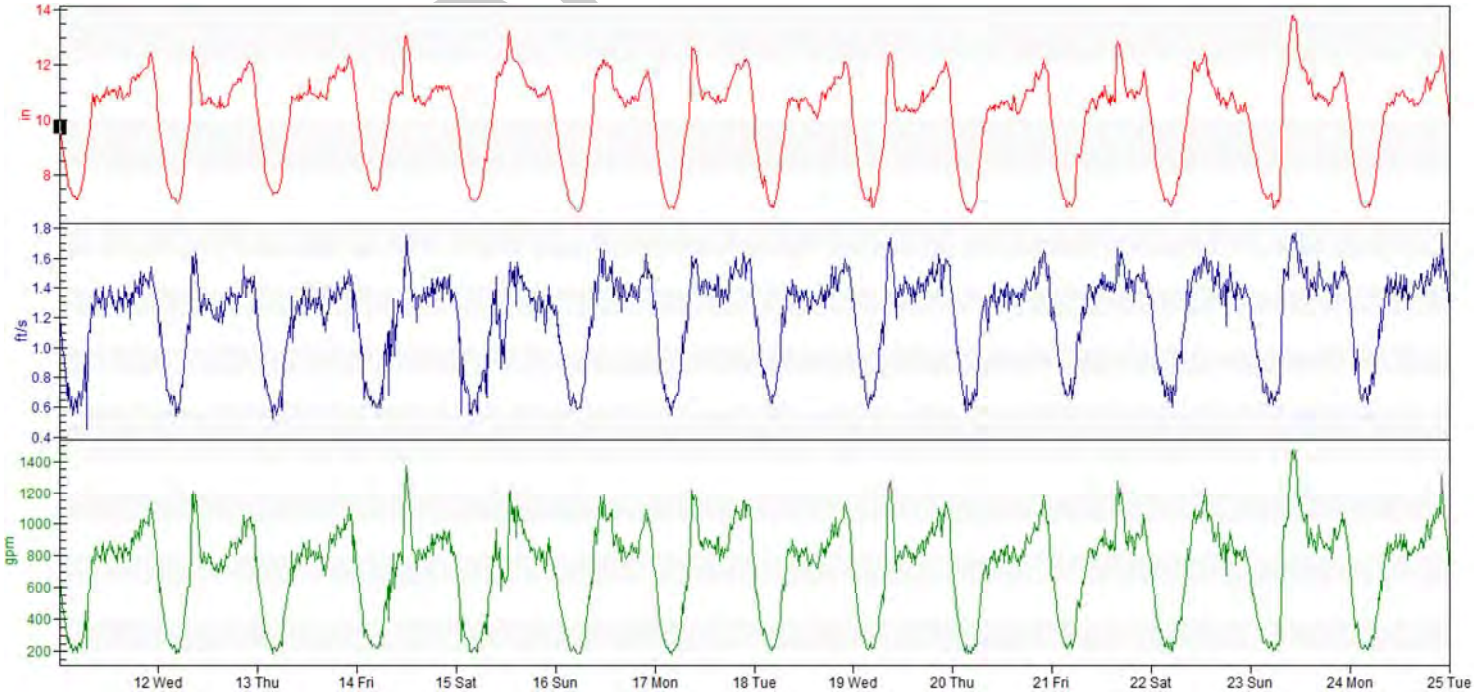
## Velocity - Feet per Second

| | |
|---|---|
| Average: | 1.216 |
| Maximum: | 1.768 |
| Minimum: | 0.454 |

## Flow Rate - Gallons Per Minute

| | |
|---|---|
| Average: | 721.560 |
| Maximum:: | 1476.69 |
| Minimum: | 181.182 |
| Peak to Average | 1.70 |

DRAFT




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

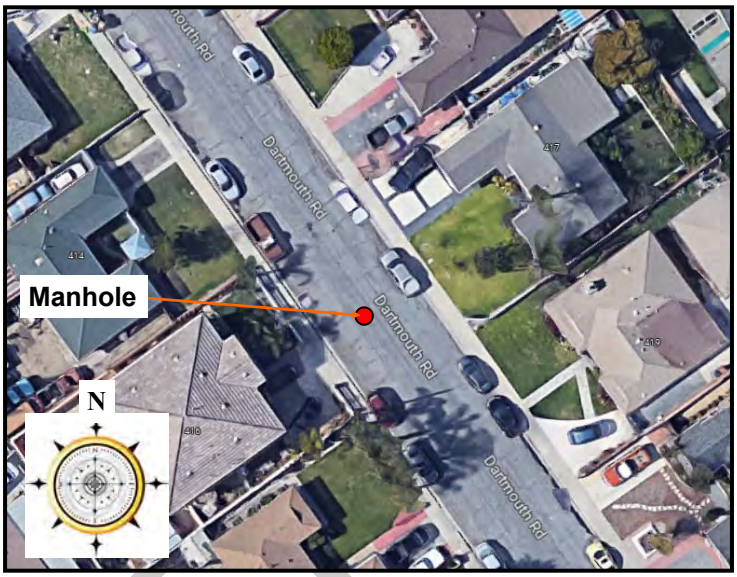
# CITY OF SANTA PAULA - SEWER FLOW STUDY

MH Location: **416 Dartmouth**
**Santa Paula, CA 93060**

Pipe Size: **24" VCP**

Time Period: **7/11/2023 - 12:00 a.m. to**
**7/25/2023- 12:00 a.m.**

GPS: **34.348436, -119.065191**




## Manhole - Layout

- This line has very low velocity possibly from a silt damn downstream.
- The line was cleaned prior to installation of the meter, but after 2.5 weeks of being installed silt was back inside of the channel and on our meter.

## Equipment

**Teledyne Isco 2150 Area Velocity Flow Meter with 10' measuring range:**
**Level Measurement:**

- Method - Submerged pressure transducer mounted in the flow stream
- Transducer Type - Differential linear integrated circuit pressure transducer
- Range (standard) 0.033 to 10 ft (0.010 to 3.05 m); Maximum Allowable Level 34 ft (10.5 m)
- Accuracy ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m,)
- Long-Term Stability ±0.023 ft/yr (±0.007 m/yr)
- Compensated Range 32° to 122°F (0° to 50°C)

**Velocity Measurement:**

- Method - Doppler ultrasonic, frequency 500 kHz
- Typical Minimum Depth 0.08 ft (25 mm)
- Range -5 to +20 ft/s (-1.5 to +6.1 m/s)
- Accuracy (in water with uniform velocity profile, speed of sound = 4850 ft/s, for indicated velocity range) ±0.1 ft/s from -5 to 5 ft/s (±0.03 m/s from— 1.5 to +1.5 m/s)
- ±2% of reading from 5 to 20 ft/s (1.5 to 6.1 m/s)

**Method Of Insertion:**

- 24 inch line requires Confined Space Entry.

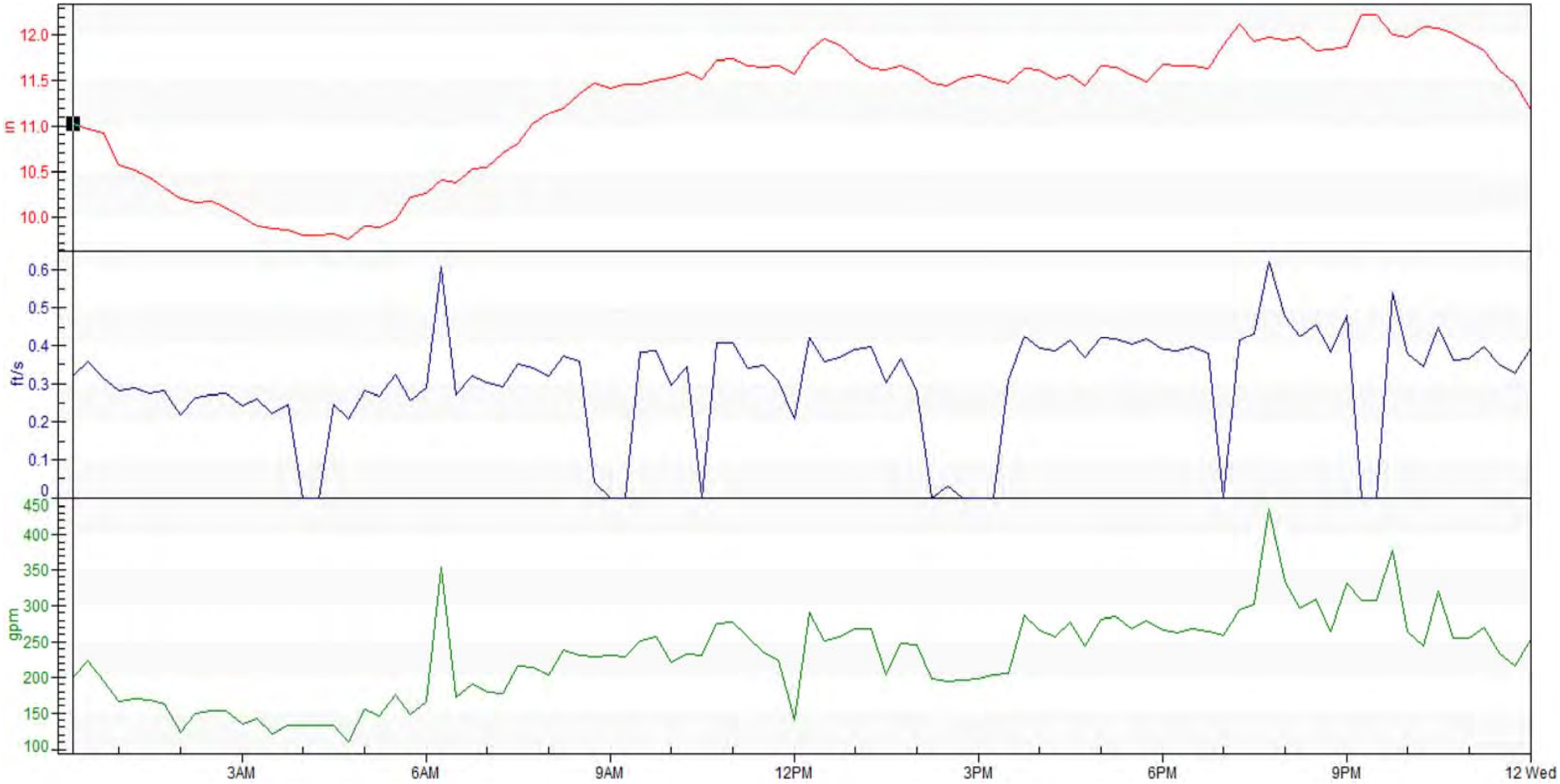
DRAFT

**Gold Coast Environmental**

**Specializing in process instrumentation and calibration.**

1868 Palma Drive, Suite I, Ventura, CA 93003 www.goldcoastenv.com 805.498.3811 ph.

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/11/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Tuesday- A.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| | | | |
| 12:15:00 AM | 11.017 | 0.318 | 200.433 |
| 12:30:00 AM | 10.958 | 0.357 | 223.716 |
| 12:45:00 AM | 10.927 | 0.314 | 193.478 |
| 1:00:00 AM | 10.571 | 0.28 | 166.451 |
| 1:15:00 AM | 10.512 | 0.287 | 170.195 |
| 1:30:00 AM | 10.432 | 0.274 | 168.604 |
| 1:45:00 AM | 10.322 | 0.281 | 163.223 |
| 2:00:00 AM | 10.195 | 0.218 | 124.25 |
| 2:15:00 AM | 10.161 | 0.263 | 149.269 |
| 2:30:00 AM | 10.167 | 0.271 | 153.624 |
| 2:45:00 AM | 10.098 | 0.274 | 153.895 |
| 3:00:00 AM | 10.001 | 0.243 | 135.105 |
| 3:15:00 AM | 9.898 | 0.261 | 142.867 |
| 3:30:00 AM | 9.861 | 0.223 | 121.497 |
| 3:45:00 AM | 9.842 | 0.245 | 133.382 |
| 4:00:00 AM | 9.789 | 0 | 132.427 |
| 4:15:00 AM | 9.793 | 0 | 132.507 |
| 4:30:00 AM | 9.799 | 0.246 | 132.607 |
| 4:45:00 AM | 9.746 | 0.206 | 110.827 |
| 5:00:00 AM | 9.899 | 0.282 | 154.428 |
| 5:15:00 AM | 9.878 | 0.268 | 146.42 |
| 5:30:00 AM | 9.971 | 0.323 | 175.278 |
| 5:45:00 AM | 10.223 | 0.257 | 147.169 |
| 6:00:00 AM | 10.26 | 0.289 | 166.153 |
| 6:15:00 AM | 10.404 | 0.606 | 353.445 |
| 6:30:00 AM | 10.382 | 0.272 | 170.809 |
| 6:45:00 AM | 10.521 | 0.32 | 190.087 |
| 7:00:00 AM | 10.543 | 0.302 | 179.909 |
| 7:15:00 AM | 10.703 | 0.29 | 176.613 |
| 7:30:00 AM | 10.804 | 0.352 | 216.636 |
| 7:45:00 AM | 11.028 | 0.34 | 214.783 |
| 8:00:00 AM | 11.138 | 0.319 | 203.534 |
| 8:15:00 AM | 11.202 | 0.373 | 239.186 |
| 8:30:00 AM | 11.362 | 0.356 | 231.142 |
| 8:45:00 AM | 11.48 | 0.039 | 229.594 |
| 9:00:00 AM | 11.415 | 0 | 231.554 |
| 9:15:00 AM | 11.456 | 0 | 229.802 |
| 9:30:00 AM | 11.461 | 0.381 | 252.104 |
| 9:45:00 AM | 11.503 | 0.385 | 257.038 |
| 10:00:00 AM | 11.54 | 0.294 | 221.091 |
| 10:15:00 AM | 11.59 | 0.345 | 232.273 |
| 10:30:00 AM | 11.524 | 0 | 230.99 |
| 10:45:00 AM | 11.726 | 0.405 | 275.272 |
| 11:00:00 AM | 11.736 | 0.407 | 276.721 |
| 11:15:00 AM | 11.664 | 0.341 | 256.905 |
| 11:30:00 AM | 11.655 | 0.347 | 235.827 |
| 11:45:00 AM | 11.671 | 0.306 | 223.674 |

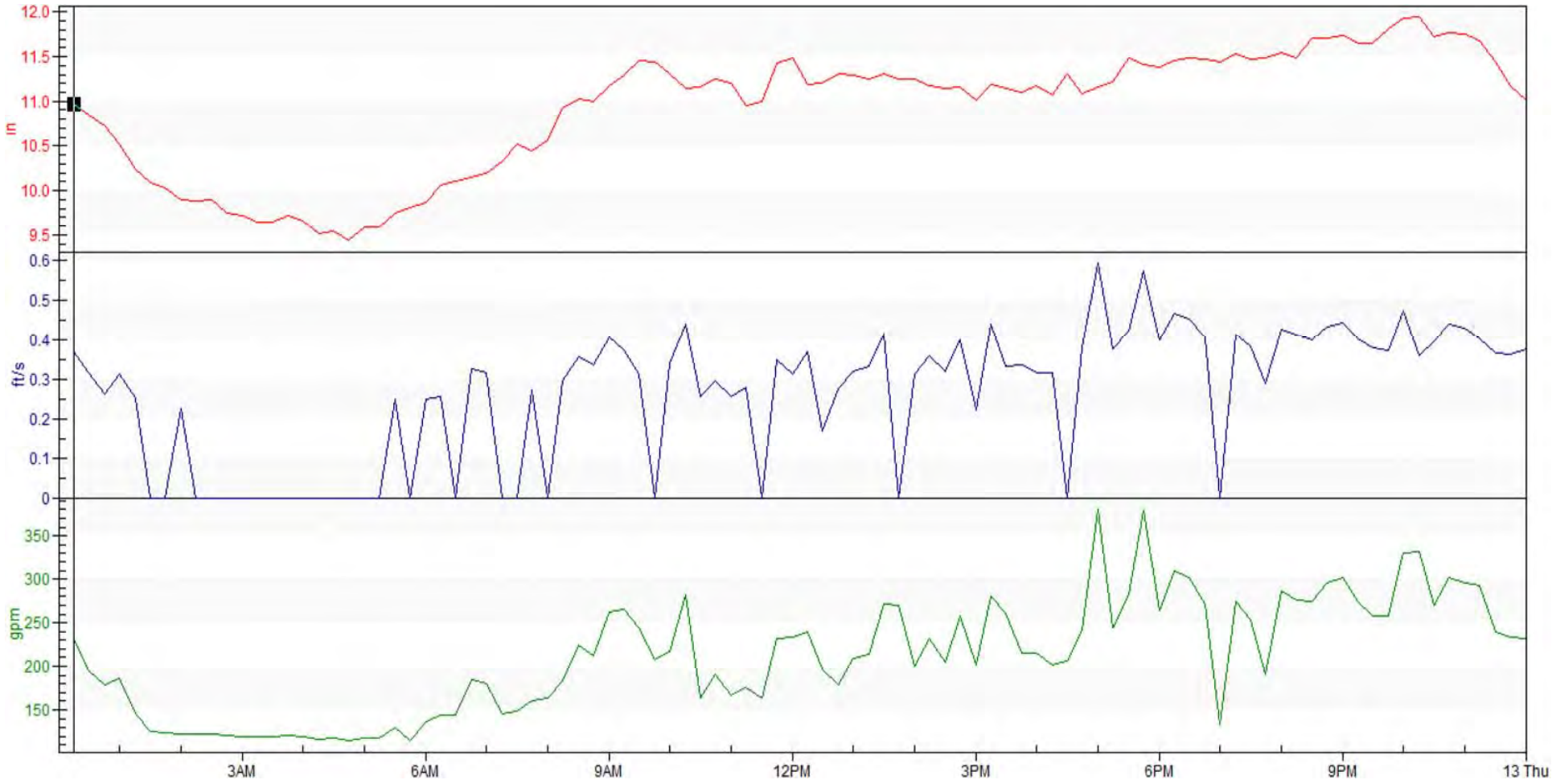
**Tuesday- P.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.576 | 0.209 | 140.784 |
| 12:15:00 PM | 11.83 | 0.42 | 290.607 |
| 12:30:00 PM | 11.963 | 0.359 | 252.193 |
| 12:45:00 PM | 11.89 | 0.37 | 256.607 |
| 1:00:00 PM | 11.741 | 0.391 | 268.031 |
| 1:15:00 PM | 11.634 | 0.397 | 268.81 |
| 1:30:00 PM | 11.622 | 0.302 | 202.689 |
| 1:45:00 PM | 11.672 | 0.365 | 248.212 |
| 2:00:00 PM | 11.595 | 0.282 | 246.125 |
| 2:15:00 PM | 11.482 | 0 | 198.274 |
| 2:30:00 PM | 11.441 | 0.031 | 194.771 |
| 2:45:00 PM | 11.529 | 0 | 196.523 |
| 3:00:00 PM | 11.569 | 0 | 198.274 |
| 3:15:00 PM | 11.521 | 0 | 203.529 |
| 3:30:00 PM | 11.475 | 0.308 | 205.253 |
| 3:45:00 PM | 11.635 | 0.424 | 287.071 |
| 4:00:00 PM | 11.627 | 0.393 | 265.893 |
| 4:15:00 PM | 11.514 | 0.385 | 257.25 |
| 4:30:00 PM | 11.56 | 0.414 | 278.09 |
| 4:45:00 PM | 11.451 | 0.369 | 243.924 |
| 5:00:00 PM | 11.666 | 0.42 | 281.918 |
| 5:15:00 PM | 11.655 | 0.419 | 284.556 |
| 5:30:00 PM | 11.57 | 0.402 | 268.527 |
| 5:45:00 PM | 11.493 | 0.418 | 278.826 |
| 6:00:00 PM | 11.686 | 0.391 | 266.344 |
| 6:15:00 PM | 11.674 | 0.385 | 261.936 |
| 6:30:00 PM | 11.661 | 0.398 | 268.095 |
| 6:45:00 PM | 11.635 | 0.378 | 264.961 |
| 7:00:00 PM | 11.893 | 0 | 258.402 |
| 7:15:00 PM | 12.12 | 0.413 | 295.038 |
| 7:30:00 PM | 11.928 | 0.431 | 301.196 |
| 7:45:00 PM | 11.981 | 0.618 | 435.178 |
| 8:00:00 PM | 11.949 | 0.477 | 334.175 |
| 8:15:00 PM | 11.982 | 0.423 | 296.382 |
| 8:30:00 PM | 11.834 | 0.454 | 308.777 |
| 8:45:00 PM | 11.851 | 0.384 | 263.941 |
| 9:00:00 PM | 11.871 | 0.48 | 332.156 |
| 9:15:00 PM | 12.226 | 0 | 308.051 |
| 9:30:00 PM | 12.223 | 0 | 307.959 |
| 9:45:00 PM | 12.004 | 0.539 | 377.824 |
| 10:00:00 PM | 11.977 | 0.377 | 265.152 |
| 10:15:00 PM | 12.089 | 0.342 | 243.573 |
| 10:30:00 PM | 12.08 | 0.45 | 319.624 |
| 10:45:00 PM | 12.019 | 0.361 | 255.188 |
| 11:00:00 PM | 11.917 | 0.366 | 255.055 |
| 11:15:00 PM | 11.83 | 0.397 | 269.469 |
| 11:30:00 PM | 11.604 | 0.347 | 233.89 |
| 11:45:00 PM | 11.47 | 0.325 | 216.221 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 11.232 | 0.301 | 229.285 |
| Daily Min: | 9.746 | 0 | 110.827 |
| Daily Max: | 12.226 | 0.618 | 435.178 |
| Peak to Avg: | | | 1.90 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/12/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Wednesday - A.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 11.188 | 0.392 | 252.733 |
| 12:15:00 AM | 10.973 | 0.368 | 230.157 |
| 12:30:00 AM | 10.842 | 0.317 | 196.047 |
| 12:45:00 AM | 10.727 | 0.262 | 179.447 |
| 1:00:00 AM | 10.523 | 0.313 | 185.961 |
| 1:15:00 AM | 10.242 | 0.252 | 144.715 |
| 1:30:00 AM | 10.097 | 0 | 125.786 |
| 1:45:00 AM | 10.034 | 0 | 124.761 |
| 2:00:00 AM | 9.9 | 0.225 | 123.371 |
| 2:15:00 AM | 9.877 | 0 | 123.056 |
| 2:30:00 AM | 9.896 | 0 | 123.371 |
| 2:45:00 AM | 9.755 | 0 | 121.037 |
| 3:00:00 AM | 9.713 | 0 | 120.344 |
| 3:15:00 AM | 9.648 | 0 | 119.271 |
| 3:30:00 AM | 9.638 | 0 | 119.116 |
| 3:45:00 AM | 9.725 | 0 | 120.553 |
| 4:00:00 AM | 9.661 | 0 | 119.486 |
| 4:15:00 AM | 9.513 | 0 | 117.052 |
| 4:30:00 AM | 9.547 | 0 | 117.604 |
| 4:45:00 AM | 9.437 | 0 | 115.793 |
| 5:00:00 AM | 9.58 | 0 | 118.155 |
| 5:15:00 AM | 9.593 | 0 | 118.367 |
| 5:30:00 AM | 9.744 | 0.248 | 130.973 |
| 5:45:00 AM | 9.808 | 0 | 115.449 |
| 6:00:00 AM | 9.865 | 0.249 | 136.239 |
| 6:15:00 AM | 10.063 | 0.257 | 143.859 |
| 6:30:00 AM | 10.105 | 0 | 144.653 |
| 6:45:00 AM | 10.151 | 0.326 | 184.798 |
| 7:00:00 AM | 10.193 | 0.316 | 180.124 |
| 7:15:00 AM | 10.321 | 0 | 145.168 |
| 7:30:00 AM | 10.524 | 0 | 148.934 |
| 7:45:00 AM | 10.45 | 0.273 | 160.933 |
| 8:00:00 AM | 10.567 | 0 | 163.305 |
| 8:15:00 AM | 10.92 | 0.295 | 184.067 |
| 8:30:00 AM | 11.027 | 0.356 | 224.6 |
| 8:45:00 AM | 10.991 | 0.337 | 212.08 |
| 9:00:00 AM | 11.174 | 0.408 | 262.164 |
| 9:15:00 AM | 11.292 | 0.372 | 264.691 |
| 9:30:00 AM | 11.456 | 0.313 | 244.415 |
| 9:45:00 AM | 11.437 | 0 | 207.608 |
| 10:00:00 AM | 11.303 | 0.339 | 217.189 |
| 10:15:00 AM | 11.151 | 0.44 | 282.117 |
| 10:30:00 AM | 11.156 | 0.257 | 164.233 |
| 10:45:00 AM | 11.242 | 0.295 | 191.309 |
| 11:00:00 AM | 11.209 | 0.257 | 166.162 |
| 11:15:00 AM | 10.954 | 0.281 | 175.586 |
| 11:30:00 AM | 10.992 | 0 | 163.391 |
| 11:45:00 AM | 11.422 | 0.35 | 231.737 |

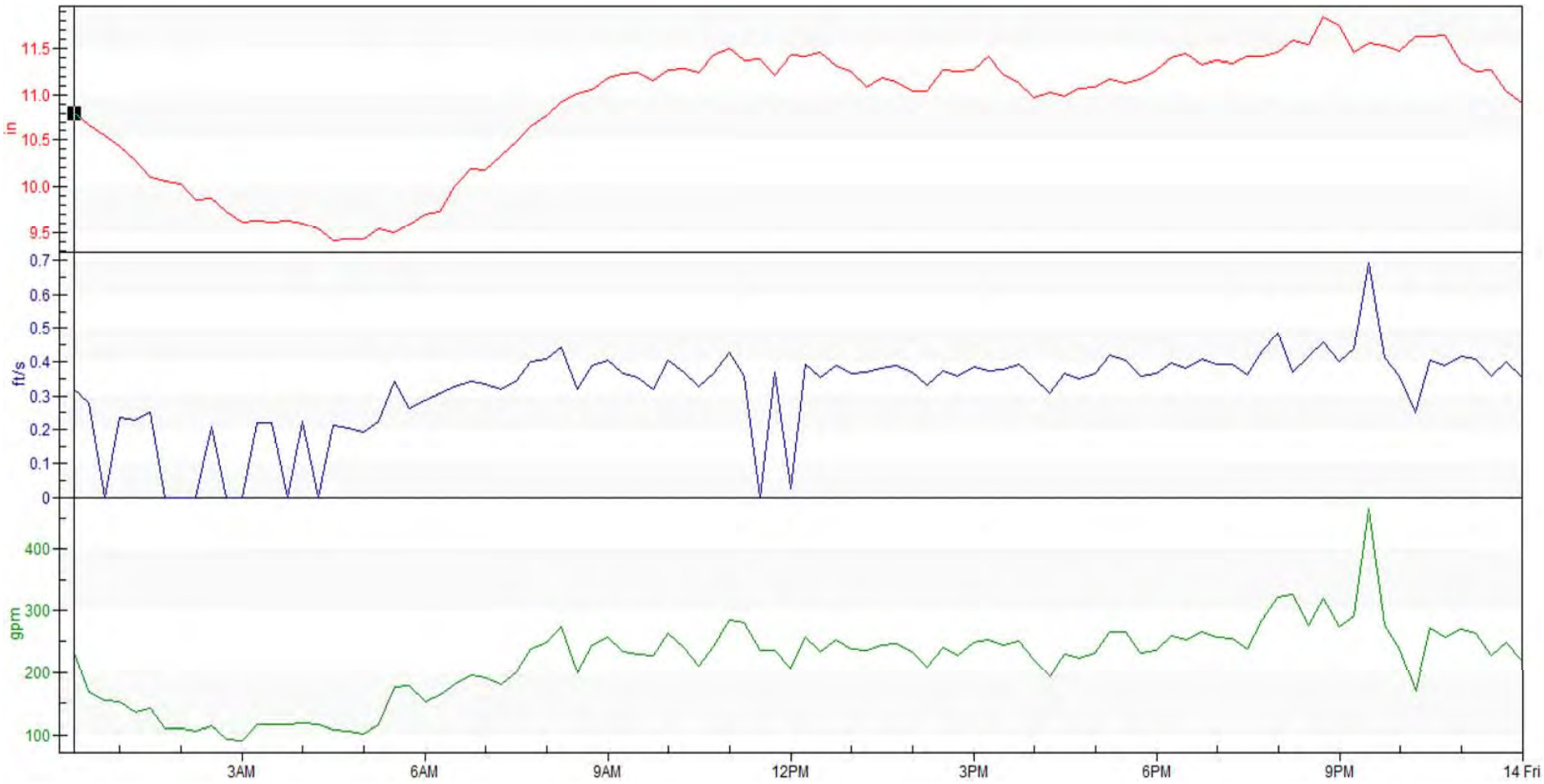
**Wednesday - P.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.49 | 0.312 | 233.534 |
| 12:15:00 PM | 11.184 | 0.371 | 238.961 |
| 12:30:00 PM | 11.198 | 0.169 | 196.427 |
| 12:45:00 PM | 11.301 | 0.275 | 179.298 |
| 1:00:00 PM | 11.294 | 0.321 | 209.227 |
| 1:15:00 PM | 11.242 | 0.333 | 214.065 |
| 1:30:00 PM | 11.313 | 0.416 | 271.759 |
| 1:45:00 PM | 11.245 | 0 | 269.633 |
| 2:00:00 PM | 11.255 | 0.312 | 199.498 |
| 2:15:00 PM | 11.181 | 0.36 | 231.294 |
| 2:30:00 PM | 11.15 | 0.319 | 204.611 |
| 2:45:00 PM | 11.165 | 0.4 | 257.082 |
| 3:00:00 PM | 11.014 | 0.222 | 202.164 |
| 3:15:00 PM | 11.184 | 0.439 | 280.807 |
| 3:30:00 PM | 11.148 | 0.334 | 260.801 |
| 3:45:00 PM | 11.098 | 0.336 | 214.541 |
| 4:00:00 PM | 11.179 | 0.316 | 215.588 |
| 4:15:00 PM | 11.073 | 0.317 | 201.374 |
| 4:30:00 PM | 11.305 | 0 | 206.857 |
| 4:45:00 PM | 11.086 | 0.38 | 240.759 |
| 5:00:00 PM | 11.158 | 0.592 | 380.4 |
| 5:15:00 PM | 11.215 | 0.377 | 243.637 |
| 5:30:00 PM | 11.492 | 0.423 | 282.252 |
| 5:45:00 PM | 11.412 | 0.573 | 378.913 |
| 6:00:00 PM | 11.376 | 0.4 | 263.379 |
| 6:15:00 PM | 11.462 | 0.467 | 309.845 |
| 6:30:00 PM | 11.486 | 0.452 | 301.584 |
| 6:45:00 PM | 11.475 | 0.407 | 270.867 |
| 7:00:00 PM | 11.434 | 0 | 132.976 |
| 7:15:00 PM | 11.533 | 0.412 | 274.591 |
| 7:30:00 PM | 11.471 | 0.383 | 253.446 |
| 7:45:00 PM | 11.485 | 0.288 | 190.789 |
| 8:00:00 PM | 11.55 | 0.427 | 286.463 |
| 8:15:00 PM | 11.484 | 0.414 | 276.182 |
| 8:30:00 PM | 11.708 | 0.401 | 274.096 |
| 8:45:00 PM | 11.714 | 0.432 | 295.645 |
| 9:00:00 PM | 11.732 | 0.442 | 302.45 |
| 9:15:00 PM | 11.654 | 0.403 | 274.665 |
| 9:30:00 PM | 11.655 | 0.379 | 257.752 |
| 9:45:00 PM | 11.819 | 0.372 | 257.121 |
| 10:00:00 PM | 11.93 | 0.473 | 330.985 |
| 10:15:00 PM | 11.947 | 0.361 | 331.575 |
| 10:30:00 PM | 11.722 | 0.398 | 269.839 |
| 10:45:00 PM | 11.764 | 0.44 | 301.983 |
| 11:00:00 PM | 11.754 | 0.43 | 295.507 |
| 11:15:00 PM | 11.68 | 0.402 | 293.118 |
| 11:30:00 PM | 11.44 | 0.367 | 239.205 |
| 11:45:00 PM | 11.181 | 0.364 | 232.871 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.908 | 0.262 | 210.944 |
| Daily Min: | 9.437 | 0 | 115.449 |
| Daily Max: | 11.947 | 0.592 | 380.4 |
| Peak to Avg: | | | 1.80 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/13/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Thursday - A.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 11.004 | 0.375 | 231.892 |
| 12:15:00 AM | 10.79 | 0.317 | 230.763 |
| 12:30:00 AM | 10.662 | 0.28 | 168.132 |
| 12:45:00 AM | 10.545 | 0 | 154.368 |
| 1:00:00 AM | 10.433 | 0.235 | 152.232 |
| 1:15:00 AM | 10.27 | 0.227 | 135.633 |
| 1:30:00 AM | 10.107 | 0.25 | 141.168 |
| 1:45:00 AM | 10.057 | 0 | 109.17 |
| 2:00:00 AM | 10.036 | 0 | 108.862 |
| 2:15:00 AM | 9.854 | 0 | 106.244 |
| 2:30:00 AM | 9.866 | 0.208 | 113.1 |
| 2:45:00 AM | 9.724 | 0 | 92.29 |
| 3:00:00 AM | 9.622 | 0 | 90.993 |
| 3:15:00 AM | 9.634 | 0.219 | 116.096 |
| 3:30:00 AM | 9.608 | 0.221 | 116.37 |
| 3:45:00 AM | 9.629 | 0 | 116.712 |
| 4:00:00 AM | 9.606 | 0.224 | 118.066 |
| 4:15:00 AM | 9.538 | 0 | 117.137 |
| 4:30:00 AM | 9.413 | 0.212 | 108.545 |
| 4:45:00 AM | 9.429 | 0.205 | 105.182 |
| 5:00:00 AM | 9.428 | 0.195 | 100.158 |
| 5:15:00 AM | 9.547 | 0.224 | 117.206 |
| 5:30:00 AM | 9.5 | 0.342 | 175.437 |
| 5:45:00 AM | 9.587 | 0.262 | 177.247 |
| 6:00:00 AM | 9.697 | 0.287 | 153.18 |
| 6:15:00 AM | 9.73 | 0.305 | 163.489 |
| 6:30:00 AM | 10.007 | 0.325 | 181.083 |
| 6:45:00 AM | 10.186 | 0.342 | 195.029 |
| 7:00:00 AM | 10.174 | 0.335 | 190.667 |
| 7:15:00 AM | 10.334 | 0.316 | 180.33 |
| 7:30:00 AM | 10.48 | 0.34 | 199.02 |
| 7:45:00 AM | 10.655 | 0.4 | 237.571 |
| 8:00:00 AM | 10.768 | 0.408 | 249.749 |
| 8:15:00 AM | 10.92 | 0.443 | 273.673 |
| 8:30:00 AM | 11.005 | 0.316 | 199.333 |
| 8:45:00 AM | 11.048 | 0.388 | 244.894 |
| 9:00:00 AM | 11.175 | 0.403 | 257.604 |
| 9:15:00 AM | 11.221 | 0.365 | 234.811 |
| 9:30:00 AM | 11.241 | 0.355 | 230.146 |
| 9:45:00 AM | 11.155 | 0.317 | 226.931 |
| 10:00:00 AM | 11.263 | 0.405 | 263.116 |
| 10:15:00 AM | 11.276 | 0.37 | 240.019 |
| 10:30:00 AM | 11.24 | 0.324 | 210.27 |
| 10:45:00 AM | 11.429 | 0.366 | 242.636 |
| 11:00:00 AM | 11.505 | 0.427 | 284.437 |
| 11:15:00 AM | 11.371 | 0.357 | 280.73 |
| 11:30:00 AM | 11.38 | 0 | 235.091 |
| 11:45:00 AM | 11.206 | 0.367 | 236.4 |

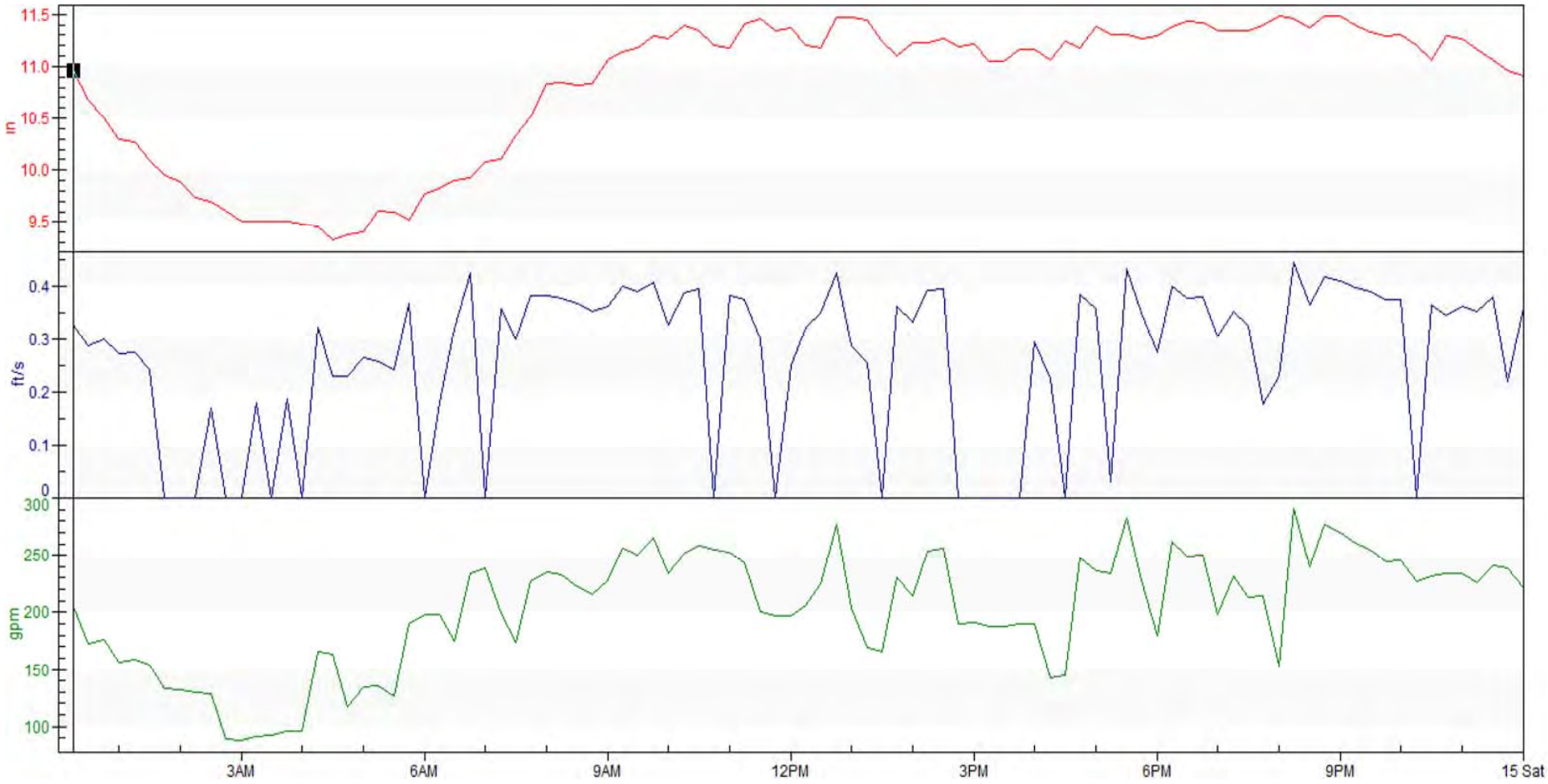
**Thursday - P.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.431 | 0.024 | 207.032 |
| 12:15:00 PM | 11.406 | 0.391 | 258.197 |
| 12:30:00 PM | 11.457 | 0.354 | 233.366 |
| 12:45:00 PM | 11.308 | 0.389 | 253.81 |
| 1:00:00 PM | 11.253 | 0.366 | 237.877 |
| 1:15:00 PM | 11.086 | 0.371 | 235.471 |
| 1:30:00 PM | 11.177 | 0.379 | 243.547 |
| 1:45:00 PM | 11.141 | 0.389 | 246.087 |
| 2:00:00 PM | 11.038 | 0.368 | 233.091 |
| 2:15:00 PM | 11.041 | 0.331 | 208.937 |
| 2:30:00 PM | 11.262 | 0.372 | 239.524 |
| 2:45:00 PM | 11.255 | 0.357 | 227.637 |
| 3:00:00 PM | 11.272 | 0.383 | 249.163 |
| 3:15:00 PM | 11.411 | 0.371 | 252.273 |
| 3:30:00 PM | 11.231 | 0.376 | 243.474 |
| 3:45:00 PM | 11.122 | 0.394 | 251.389 |
| 4:00:00 PM | 10.964 | 0.351 | 220.414 |
| 4:15:00 PM | 11.028 | 0.306 | 193.674 |
| 4:30:00 PM | 10.981 | 0.367 | 229.526 |
| 4:45:00 PM | 11.068 | 0.35 | 222.374 |
| 5:00:00 PM | 11.081 | 0.366 | 232.55 |
| 5:15:00 PM | 11.163 | 0.42 | 266.519 |
| 5:30:00 PM | 11.122 | 0.405 | 266.466 |
| 5:45:00 PM | 11.17 | 0.359 | 230.728 |
| 6:00:00 PM | 11.263 | 0.363 | 235.99 |
| 6:15:00 PM | 11.4 | 0.395 | 259.635 |
| 6:30:00 PM | 11.446 | 0.381 | 252.697 |
| 6:45:00 PM | 11.33 | 0.408 | 266.642 |
| 7:00:00 PM | 11.373 | 0.39 | 256.942 |
| 7:15:00 PM | 11.341 | 0.391 | 255.751 |
| 7:30:00 PM | 11.408 | 0.361 | 238.402 |
| 7:45:00 PM | 11.419 | 0.43 | 284.332 |
| 8:00:00 PM | 11.457 | 0.485 | 322.034 |
| 8:15:00 PM | 11.577 | 0.368 | 326.377 |
| 8:30:00 PM | 11.544 | 0.414 | 277.574 |
| 8:45:00 PM | 11.844 | 0.46 | 319.215 |
| 9:00:00 PM | 11.737 | 0.4 | 274.204 |
| 9:15:00 PM | 11.449 | 0.44 | 290.531 |
| 9:30:00 PM | 11.555 | 0.691 | 464.318 |
| 9:45:00 PM | 11.525 | 0.412 | 276.014 |
| 10:00:00 PM | 11.466 | 0.357 | 237.169 |
| 10:15:00 PM | 11.625 | 0.25 | 169.474 |
| 10:30:00 PM | 11.625 | 0.404 | 273.193 |
| 10:45:00 PM | 11.637 | 0.388 | 258.103 |
| 11:00:00 PM | 11.357 | 0.415 | 270.749 |
| 11:15:00 PM | 11.26 | 0.408 | 263.435 |
| 11:30:00 PM | 11.266 | 0.358 | 227.71 |
| 11:45:00 PM | 11.037 | 0.4 | 248.255 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.850 | 0.318 | 216.981 |
| Daily Min: | 9.413 | 0 | 90.993 |
| Daily Max: | 11.844 | 0.691 | 464.318 |
| Peak to Avg: | | | 2.14 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/14/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Friday - A.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.911 | 0.353 | 219.617 |
| 12:15:00 AM | 10.955 | 0.327 | 205.045 |
| 12:30:00 AM | 10.674 | 0.287 | 172.345 |
| 12:45:00 AM | 10.499 | 0.298 | 176.094 |
| 1:00:00 AM | 10.302 | 0.271 | 156.836 |
| 1:15:00 AM | 10.271 | 0.275 | 158.221 |
| 1:30:00 AM | 10.093 | 0.241 | 154.617 |
| 1:45:00 AM | 9.951 | 0 | 133.364 |
| 2:00:00 AM | 9.892 | 0 | 132.315 |
| 2:15:00 AM | 9.733 | 0 | 129.495 |
| 2:30:00 AM | 9.691 | 0.17 | 128.747 |
| 2:45:00 AM | 9.61 | 0 | 89.704 |
| 3:00:00 AM | 9.507 | 0 | 88.423 |
| 3:15:00 AM | 9.507 | 0.178 | 91.441 |
| 3:30:00 AM | 9.504 | 0 | 92.532 |
| 3:45:00 AM | 9.502 | 0.186 | 96.352 |
| 4:00:00 AM | 9.476 | 0 | 96.252 |
| 4:15:00 AM | 9.456 | 0.322 | 166.079 |
| 4:30:00 AM | 9.325 | 0.23 | 163.335 |
| 4:45:00 AM | 9.377 | 0.23 | 117.221 |
| 5:00:00 AM | 9.4 | 0.263 | 134.789 |
| 5:15:00 AM | 9.606 | 0.256 | 135.216 |
| 5:30:00 AM | 9.591 | 0.242 | 126.765 |
| 5:45:00 AM | 9.514 | 0.366 | 190.345 |
| 6:00:00 AM | 9.777 | 0 | 197.569 |
| 6:15:00 AM | 9.818 | 0.179 | 198.653 |
| 6:30:00 AM | 9.896 | 0.319 | 174.685 |
| 6:45:00 AM | 9.928 | 0.425 | 234.168 |
| 7:00:00 AM | 10.076 | 0 | 238.817 |
| 7:15:00 AM | 10.11 | 0.356 | 199.067 |
| 7:30:00 AM | 10.336 | 0.299 | 173.976 |
| 7:45:00 AM | 10.518 | 0.381 | 226.579 |
| 8:00:00 AM | 10.836 | 0.381 | 235.709 |
| 8:15:00 AM | 10.844 | 0.375 | 232.311 |
| 8:30:00 AM | 10.822 | 0.366 | 222.853 |
| 8:45:00 AM | 10.829 | 0.352 | 215.825 |
| 9:00:00 AM | 11.066 | 0.363 | 228.107 |
| 9:15:00 AM | 11.141 | 0.4 | 256.162 |
| 9:30:00 AM | 11.176 | 0.389 | 250.119 |
| 9:45:00 AM | 11.299 | 0.406 | 264.686 |
| 10:00:00 AM | 11.27 | 0.326 | 233.406 |
| 10:15:00 AM | 11.394 | 0.385 | 250.904 |
| 10:30:00 AM | 11.343 | 0.395 | 258.831 |
| 10:45:00 AM | 11.202 | 0 | 254.678 |
| 11:00:00 AM | 11.178 | 0.382 | 252.774 |
| 11:15:00 AM | 11.407 | 0.375 | 242.969 |
| 11:30:00 AM | 11.457 | 0.299 | 200.357 |
| 11:45:00 AM | 11.345 | 0 | 196.422 |

**Friday - P.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.365 | 0.25 | 196.874 |
| 12:15:00 PM | 11.198 | 0.321 | 205.912 |
| 12:30:00 PM | 11.178 | 0.349 | 224.517 |
| 12:45:00 PM | 11.474 | 0.424 | 276.868 |
| 1:00:00 PM | 11.475 | 0.285 | 203.707 |
| 1:15:00 PM | 11.441 | 0.255 | 168.948 |
| 1:30:00 PM | 11.241 | 0 | 165.158 |
| 1:45:00 PM | 11.099 | 0.361 | 230.423 |
| 2:00:00 PM | 11.223 | 0.332 | 214.571 |
| 2:15:00 PM | 11.223 | 0.392 | 253.332 |
| 2:30:00 PM | 11.269 | 0.394 | 256.416 |
| 2:45:00 PM | 11.192 | 0 | 190.363 |
| 3:00:00 PM | 11.215 | 0 | 190.867 |
| 3:15:00 PM | 11.056 | 0 | 187.353 |
| 3:30:00 PM | 11.055 | 0 | 187.344 |
| 3:45:00 PM | 11.169 | 0 | 189.847 |
| 4:00:00 PM | 11.159 | 0.294 | 189.629 |
| 4:15:00 PM | 11.062 | 0.224 | 142.021 |
| 4:30:00 PM | 11.243 | 0 | 145.044 |
| 4:45:00 PM | 11.176 | 0.385 | 247.823 |
| 5:00:00 PM | 11.388 | 0.358 | 235.745 |
| 5:15:00 PM | 11.301 | 0.03 | 233.405 |
| 5:30:00 PM | 11.302 | 0.433 | 282.43 |
| 5:45:00 PM | 11.27 | 0.35 | 227.676 |
| 6:00:00 PM | 11.29 | 0.275 | 179.28 |
| 6:15:00 PM | 11.38 | 0.398 | 262.238 |
| 6:30:00 PM | 11.431 | 0.377 | 248.621 |
| 6:45:00 PM | 11.42 | 0.378 | 250.203 |
| 7:00:00 PM | 11.338 | 0.304 | 198.606 |
| 7:15:00 PM | 11.346 | 0.352 | 231.281 |
| 7:30:00 PM | 11.341 | 0.324 | 212.6 |
| 7:45:00 PM | 11.397 | 0.177 | 213.961 |
| 8:00:00 PM | 11.48 | 0.229 | 152.845 |
| 8:15:00 PM | 11.453 | 0.443 | 290.424 |
| 8:30:00 PM | 11.374 | 0.364 | 239.628 |
| 8:45:00 PM | 11.485 | 0.416 | 277.054 |
| 9:00:00 PM | 11.479 | 0.408 | 269.844 |
| 9:15:00 PM | 11.396 | 0.397 | 261.167 |
| 9:30:00 PM | 11.336 | 0.389 | 254.707 |
| 9:45:00 PM | 11.298 | 0.375 | 244.153 |
| 10:00:00 PM | 11.311 | 0.375 | 244.975 |
| 10:15:00 PM | 11.209 | 0 | 226.502 |
| 10:30:00 PM | 11.067 | 0.365 | 231.996 |
| 10:45:00 PM | 11.294 | 0.344 | 233.684 |
| 11:00:00 PM | 11.27 | 0.36 | 234.288 |
| 11:15:00 PM | 11.169 | 0.351 | 225.766 |
| 11:30:00 PM | 11.065 | 0.38 | 240.441 |
| 11:45:00 PM | 10.963 | 0.219 | 238.413 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.799 | 0.260 | 202.991 |
| Daily Min: | 9.325 | 0 | 88.423 |
| Daily Max: | 11.485 | 0.443 | 290.424 |
| Peak to Avg: | | | 1.43 |

DRAFT

# MAXIMUM DAILY FLOW DATA

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/15/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Saturday - A.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.909 | 0.358 | 221.001 |
| 12:15:00 AM | 10.762 | 0.376 | 228.583 |
| 12:30:00 AM | 10.734 | 0 | 188.613 |
| 12:45:00 AM | 10.585 | 0 | 185.192 |
| 1:00:00 AM | 10.42 | 0.149 | 181.416 |
| 1:15:00 AM | 10.242 | 0.193 | 111.014 |
| 1:30:00 AM | 10.212 | 0 | 110.583 |
| 1:45:00 AM | 10.085 | 0.234 | 131.068 |
| 2:00:00 AM | 10.035 | 0.354 | 197.614 |
| 2:15:00 AM | 9.942 | 0 | 148.686 |
| 2:30:00 AM | 9.908 | 0.284 | 154.346 |
| 2:45:00 AM | 9.818 | 0.228 | 153.884 |
| 3:00:00 AM | 9.648 | 0 | 120.986 |
| 3:15:00 AM | 9.589 | 0 | 119.994 |
| 3:30:00 AM | 9.599 | 0.248 | 130.86 |
| 3:45:00 AM | 9.614 | 0 | 131.13 |
| 4:00:00 AM | 9.618 | 0.264 | 139.255 |
| 4:15:00 AM | 9.538 | 0 | 137.716 |
| 4:30:00 AM | 9.438 | 0 | 135.777 |
| 4:45:00 AM | 9.402 | 0.192 | 98.33 |
| 5:00:00 AM | 9.427 | 0 | 98.687 |
| 5:15:00 AM | 9.433 | 0 | 98.775 |
| 5:30:00 AM | 9.552 | 0.225 | 117.722 |
| 5:45:00 AM | 9.524 | 0 | 117.252 |
| 6:00:00 AM | 9.416 | 0.255 | 130.804 |
| 6:15:00 AM | 9.537 | 0.263 | 137.301 |
| 6:30:00 AM | 9.513 | 0.269 | 140.085 |
| 6:45:00 AM | 9.522 | 0.211 | 138.957 |
| 7:00:00 AM | 9.638 | 0 | 111.949 |
| 7:15:00 AM | 9.796 | 0 | 114.402 |
| 7:30:00 AM | 10.052 | 0 | 118.386 |
| 7:45:00 AM | 10.042 | 0.329 | 183.611 |
| 8:00:00 AM | 10.175 | 0.524 | 295.258 |
| 8:15:00 AM | 10.313 | 0.396 | 229.571 |
| 8:30:00 AM | 10.324 | 0.336 | 193.748 |
| 8:45:00 AM | 10.591 | 0.393 | 230.544 |
| 9:00:00 AM | 10.847 | 0.411 | 246.74 |
| 9:15:00 AM | 10.975 | 0.592 | 370.711 |
| 9:30:00 AM | 11.201 | 0.455 | 293.602 |
| 9:45:00 AM | 11.566 | 0.374 | 245.995 |
| 10:00:00 AM | 11.542 | 0.5 | 332.878 |
| 10:15:00 AM | 11.562 | 0.477 | 317.844 |
| 10:30:00 AM | 11.578 | 0.451 | 301.394 |
| 10:45:00 AM | 11.741 | 0.482 | 328.436 |
| 11:00:00 AM | 11.763 | 0 | 331.241 |
| 11:15:00 AM | 11.709 | 0.425 | 289.87 |
| 11:30:00 AM | 11.792 | 0.466 | 321.561 |
| 11:45:00 AM | 11.695 | 0.573 | 389.483 |

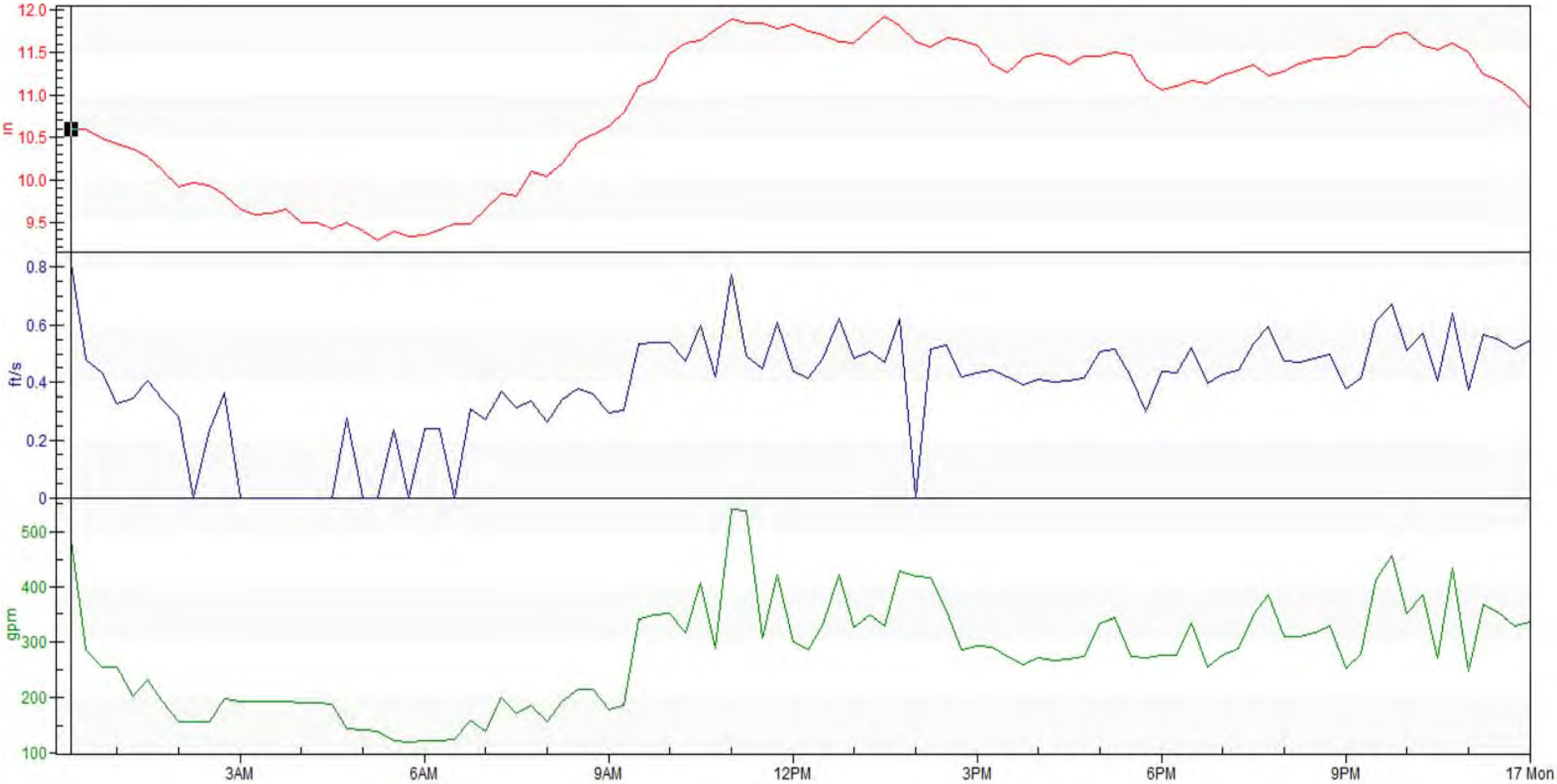
**Saturday - P.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.696 | 0.661 | 449.317 |
| 12:15:00 PM | 11.77 | 0.508 | 349.285 |
| 12:30:00 PM | 11.84 | 0.374 | 259.048 |
| 12:45:00 PM | 11.95 | 0.516 | 360.984 |
| 1:00:00 PM | 11.962 | 0.477 | 361.42 |
| 1:15:00 PM | 11.879 | 0.505 | 349.506 |
| 1:30:00 PM | 11.824 | 0.461 | 318.379 |
| 1:45:00 PM | 11.809 | 0.552 | 381.308 |
| 2:00:00 PM | 11.785 | 0.545 | 374.48 |
| 2:15:00 PM | 11.697 | 0.501 | 340.986 |
| 2:30:00 PM | 11.775 | 0.565 | 389.126 |
| 2:45:00 PM | 11.804 | 0.634 | 437.674 |
| 3:00:00 PM | 11.732 | 0.446 | 373.705 |
| 3:15:00 PM | 11.699 | 0.475 | 324.094 |
| 3:30:00 PM | 11.662 | 0.538 | 365.53 |
| 3:45:00 PM | 11.668 | 0.5 | 340.145 |
| 4:00:00 PM | 11.723 | 0.504 | 343.528 |
| 4:15:00 PM | 11.652 | 0.567 | 382.931 |
| 4:30:00 PM | 11.519 | 0.529 | 354.238 |
| 4:45:00 PM | 11.331 | 0.596 | 390.6 |
| 5:00:00 PM | 11.326 | 0.43 | 390.364 |
| 5:15:00 PM | 11.393 | 0.401 | 264.382 |
| 5:30:00 PM | 11.387 | 0.448 | 295.09 |
| 5:45:00 PM | 11.383 | 0.521 | 343.515 |
| 6:00:00 PM | 11.327 | 0.469 | 305.904 |
| 6:15:00 PM | 11.385 | 0.457 | 301.388 |
| 6:30:00 PM | 11.393 | 0.468 | 308.403 |
| 6:45:00 PM | 11.297 | 0.46 | 299.64 |
| 7:00:00 PM | 11.236 | 0.374 | 242.174 |
| 7:15:00 PM | 11.323 | 0.506 | 331.406 |
| 7:30:00 PM | 11.203 | 0.617 | 388.405 |
| 7:45:00 PM | 11.2 | 0.439 | 282.406 |
| 8:00:00 PM | 11.143 | 0.453 | 290.548 |
| 8:15:00 PM | 11.148 | 0.458 | 293.947 |
| 8:30:00 PM | 11.201 | 0.503 | 323.646 |
| 8:45:00 PM | 11.271 | 0.664 | 430.739 |
| 9:00:00 PM | 11.323 | 0.6 | 388.396 |
| 9:15:00 PM | 11.122 | 0.556 | 383.898 |
| 9:30:00 PM | 11.025 | 0.376 | 237.508 |
| 9:45:00 PM | 10.974 | 0.398 | 249.184 |
| 10:00:00 PM | 11.264 | 0.424 | 268.423 |
| 10:15:00 PM | 11.378 | 0.327 | 215.247 |
| 10:30:00 PM | 11.362 | 0.581 | 380.552 |
| 10:45:00 PM | 11.306 | 0 | 379.592 |
| 11:00:00 PM | 11.193 | 0.454 | 292.946 |
| 11:15:00 PM | 10.992 | 0.412 | 271.602 |
| 11:30:00 PM | 11.033 | 0.538 | 339.645 |
| 11:45:00 PM | 11.024 | 0.505 | 315.834 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.878 | 0.360 | 264.136 |
| Daily Min: | 9.402 | 0 | 98.33 |
| Daily Max: | 11.962 | 0.664 | 449.317 |
| Peak to Avg: | | | 1.70 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/16/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Sunday - A.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.754 | 0.382 | 232.604 |
| 12:15:00 AM | 10.589 | 0.813 | 485.304 |
| 12:30:00 AM | 10.59 | 0.481 | 287.362 |
| 12:45:00 AM | 10.481 | 0.436 | 255.478 |
| 1:00:00 AM | 10.422 | 0.329 | 254.888 |
| 1:15:00 AM | 10.364 | 0.347 | 202.253 |
| 1:30:00 AM | 10.27 | 0.406 | 230.526 |
| 1:45:00 AM | 10.105 | 0.341 | 192.183 |
| 2:00:00 AM | 9.913 | 0.283 | 155.47 |
| 2:15:00 AM | 9.965 | 0 | 156.552 |
| 2:30:00 AM | 9.931 | 0.238 | 155.844 |
| 2:45:00 AM | 9.831 | 0.364 | 196.851 |
| 3:00:00 AM | 9.653 | 0 | 193.151 |
| 3:15:00 AM | 9.597 | 0 | 191.648 |
| 3:30:00 AM | 9.607 | 0 | 191.929 |
| 3:45:00 AM | 9.648 | 0 | 192.998 |
| 4:00:00 AM | 9.498 | 0 | 189.021 |
| 4:15:00 AM | 9.498 | 0 | 189.019 |
| 4:30:00 AM | 9.413 | 0 | 186.749 |
| 4:45:00 AM | 9.493 | 0.278 | 144.316 |
| 5:00:00 AM | 9.384 | 0 | 142.097 |
| 5:15:00 AM | 9.279 | 0 | 139.964 |
| 5:30:00 AM | 9.392 | 0.239 | 122.098 |
| 5:45:00 AM | 9.326 | 0 | 120.955 |
| 6:00:00 AM | 9.345 | 0.24 | 122.161 |
| 6:15:00 AM | 9.406 | 0.24 | 122.884 |
| 6:30:00 AM | 9.478 | 0 | 124.15 |
| 6:45:00 AM | 9.481 | 0.308 | 159.448 |
| 7:00:00 AM | 9.66 | 0.272 | 140.085 |
| 7:15:00 AM | 9.84 | 0.371 | 200.858 |
| 7:30:00 AM | 9.806 | 0.314 | 169.718 |
| 7:45:00 AM | 10.093 | 0.335 | 184.956 |
| 8:00:00 AM | 10.049 | 0.264 | 156.782 |
| 8:15:00 AM | 10.181 | 0.341 | 192.309 |
| 8:30:00 AM | 10.443 | 0.377 | 215.082 |
| 8:45:00 AM | 10.531 | 0.358 | 213.272 |
| 9:00:00 AM | 10.626 | 0.297 | 178.62 |
| 9:15:00 AM | 10.789 | 0.303 | 186.288 |
| 9:30:00 AM | 11.102 | 0.536 | 342.072 |
| 9:45:00 AM | 11.185 | 0.542 | 348.148 |
| 10:00:00 AM | 11.486 | 0.54 | 351.047 |
| 10:15:00 AM | 11.603 | 0.474 | 317.759 |
| 10:30:00 AM | 11.636 | 0.6 | 405.313 |
| 10:45:00 AM | 11.762 | 0.421 | 289.313 |
| 11:00:00 AM | 11.895 | 0.775 | 540.432 |
| 11:15:00 AM | 11.844 | 0.492 | 537.409 |
| 11:30:00 AM | 11.839 | 0.447 | 308.873 |
| 11:45:00 AM | 11.784 | 0.61 | 419.903 |

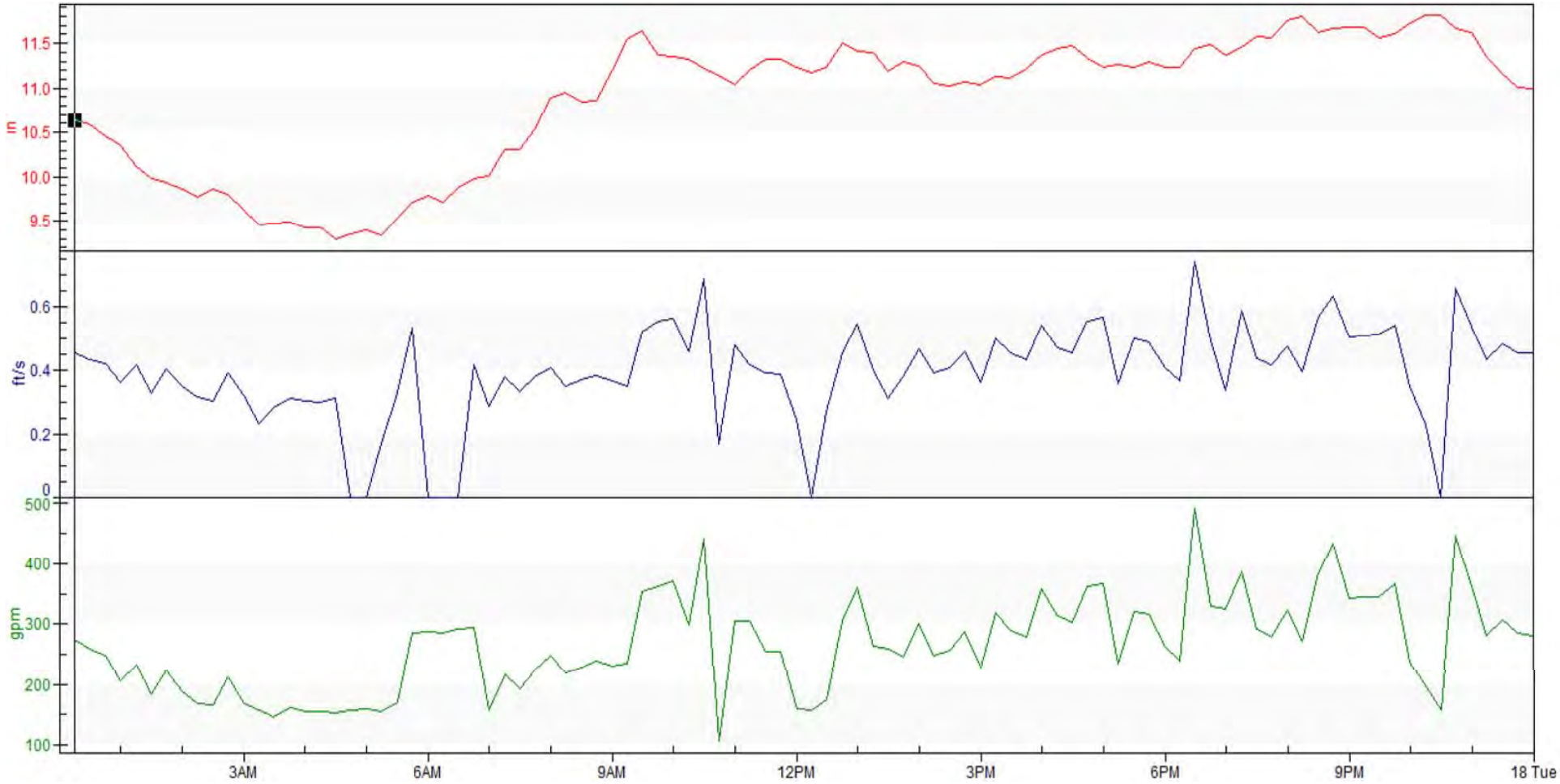
**Sunday - P.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.828 | 0.437 | 300.74 |
| 12:15:00 PM | 11.748 | 0.417 | 286.412 |
| 12:30:00 PM | 11.709 | 0.484 | 330.754 |
| 12:45:00 PM | 11.628 | 0.623 | 421.863 |
| 1:00:00 PM | 11.615 | 0.483 | 326.692 |
| 1:15:00 PM | 11.775 | 0.508 | 349.645 |
| 1:30:00 PM | 11.922 | 0.47 | 328.972 |
| 1:45:00 PM | 11.807 | 0.62 | 428.128 |
| 2:00:00 PM | 11.618 | 0 | 419.361 |
| 2:15:00 PM | 11.565 | 0.515 | 416.895 |
| 2:30:00 PM | 11.668 | 0.532 | 356.269 |
| 2:45:00 PM | 11.635 | 0.421 | 285.592 |
| 3:00:00 PM | 11.575 | 0.436 | 293.349 |
| 3:15:00 PM | 11.359 | 0.443 | 290.98 |
| 3:30:00 PM | 11.267 | 0.422 | 274.59 |
| 3:45:00 PM | 11.436 | 0.391 | 259.005 |
| 4:00:00 PM | 11.486 | 0.409 | 270.991 |
| 4:15:00 PM | 11.446 | 0.402 | 266.551 |
| 4:30:00 PM | 11.357 | 0.409 | 268.423 |
| 4:45:00 PM | 11.455 | 0.416 | 275.099 |
| 5:00:00 PM | 11.445 | 0.509 | 335.351 |
| 5:15:00 PM | 11.496 | 0.518 | 344.367 |
| 5:30:00 PM | 11.471 | 0.42 | 274.721 |
| 5:45:00 PM | 11.193 | 0.303 | 270.924 |
| 6:00:00 PM | 11.063 | 0.437 | 277.544 |
| 6:15:00 PM | 11.102 | 0.434 | 275.906 |
| 6:30:00 PM | 11.166 | 0.521 | 333.311 |
| 6:45:00 PM | 11.139 | 0.397 | 254.147 |
| 7:00:00 PM | 11.233 | 0.428 | 277.125 |
| 7:15:00 PM | 11.302 | 0.445 | 289.522 |
| 7:30:00 PM | 11.359 | 0.536 | 348.083 |
| 7:45:00 PM | 11.241 | 0.595 | 385.264 |
| 8:00:00 PM | 11.276 | 0.476 | 309.904 |
| 8:15:00 PM | 11.373 | 0.472 | 309.394 |
| 8:30:00 PM | 11.419 | 0.482 | 318.044 |
| 8:45:00 PM | 11.429 | 0.497 | 329.146 |
| 9:00:00 PM | 11.46 | 0.381 | 253.081 |
| 9:15:00 PM | 11.558 | 0.414 | 278.232 |
| 9:30:00 PM | 11.559 | 0.611 | 410.025 |
| 9:45:00 PM | 11.699 | 0.671 | 457.882 |
| 10:00:00 PM | 11.738 | 0.512 | 350.798 |
| 10:15:00 PM | 11.572 | 0.571 | 384.499 |
| 10:30:00 PM | 11.534 | 0.408 | 272.462 |
| 10:45:00 PM | 11.61 | 0.642 | 433.712 |
| 11:00:00 PM | 11.5 | 0.372 | 248.602 |
| 11:15:00 PM | 11.243 | 0.568 | 367.196 |
| 11:30:00 PM | 11.178 | 0.548 | 351.052 |
| 11:45:00 PM | 11.039 | 0.518 | 328.301 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.867 | 0.385 | 277.078 |
| Daily Min: | 9.279 | 0 | 120.955 |
| Daily Max: | 11.922 | 0.813 | 540.432 |
| Peak to Avg: | | | 1.95 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/17/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Monday - A.M. 7/17/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 10.846 | 0.548 | 337.004 |
| 12:15:00 AM | 10.632 | 0.456 | 273.097 |
| 12:30:00 AM | 10.594 | 0.435 | 257.864 |
| 12:45:00 AM | 10.463 | 0.42 | 247.71 |
| 1:00:00 AM | 10.353 | 0.362 | 206.835 |
| 1:15:00 AM | 10.113 | 0.415 | 232.693 |
| 1:30:00 AM | 9.985 | 0.331 | 183.51 |
| 1:45:00 AM | 9.939 | 0.404 | 222.608 |
| 2:00:00 AM | 9.858 | 0.348 | 188.961 |
| 2:15:00 AM | 9.772 | 0.316 | 169.336 |
| 2:30:00 AM | 9.862 | 0.305 | 166.245 |
| 2:45:00 AM | 9.808 | 0.392 | 212.19 |
| 3:00:00 AM | 9.62 | 0.32 | 168.873 |
| 3:15:00 AM | 9.465 | 0.234 | 157.584 |
| 3:30:00 AM | 9.478 | 0.281 | 145.669 |
| 3:45:00 AM | 9.485 | 0.312 | 160.908 |
| 4:00:00 AM | 9.426 | 0.303 | 154.921 |
| 4:15:00 AM | 9.433 | 0.3 | 154.335 |
| 4:30:00 AM | 9.294 | 0.31 | 153.911 |
| 4:45:00 AM | 9.357 | 0 | 157.972 |
| 5:00:00 AM | 9.396 | 0 | 158.854 |
| 5:15:00 AM | 9.341 | 0.168 | 156.091 |
| 5:30:00 AM | 9.535 | 0.327 | 170.127 |
| 5:45:00 AM | 9.718 | 0.532 | 284.624 |
| 6:00:00 AM | 9.787 | 0 | 287.309 |
| 6:15:00 AM | 9.706 | 0 | 284.149 |
| 6:30:00 AM | 9.881 | 0 | 290.98 |
| 6:45:00 AM | 9.984 | 0.417 | 295.011 |
| 7:00:00 AM | 10.006 | 0.287 | 158.106 |
| 7:15:00 AM | 10.307 | 0.379 | 217.79 |
| 7:30:00 AM | 10.313 | 0.335 | 193.515 |
| 7:45:00 AM | 10.539 | 0.379 | 222.888 |
| 8:00:00 AM | 10.884 | 0.407 | 246.901 |
| 8:15:00 AM | 10.946 | 0.351 | 219.828 |
| 8:30:00 AM | 10.848 | 0.369 | 228.281 |
| 8:45:00 AM | 10.864 | 0.384 | 238.092 |
| 9:00:00 AM | 11.207 | 0.367 | 229.374 |
| 9:15:00 AM | 11.551 | 0.35 | 234.123 |
| 9:30:00 AM | 11.64 | 0.521 | 353.137 |
| 9:45:00 AM | 11.369 | 0.554 | 361.557 |
| 10:00:00 AM | 11.357 | 0.564 | 370.4 |
| 10:15:00 AM | 11.318 | 0.46 | 299.268 |
| 10:30:00 AM | 11.217 | 0.687 | 442.366 |
| 10:45:00 AM | 11.142 | 0.168 | 107.476 |
| 11:00:00 AM | 11.039 | 0.481 | 304.716 |
| 11:15:00 AM | 11.198 | 0.416 | 305.903 |
| 11:30:00 AM | 11.323 | 0.391 | 255.41 |
| 11:45:00 AM | 11.329 | 0.388 | 253.431 |

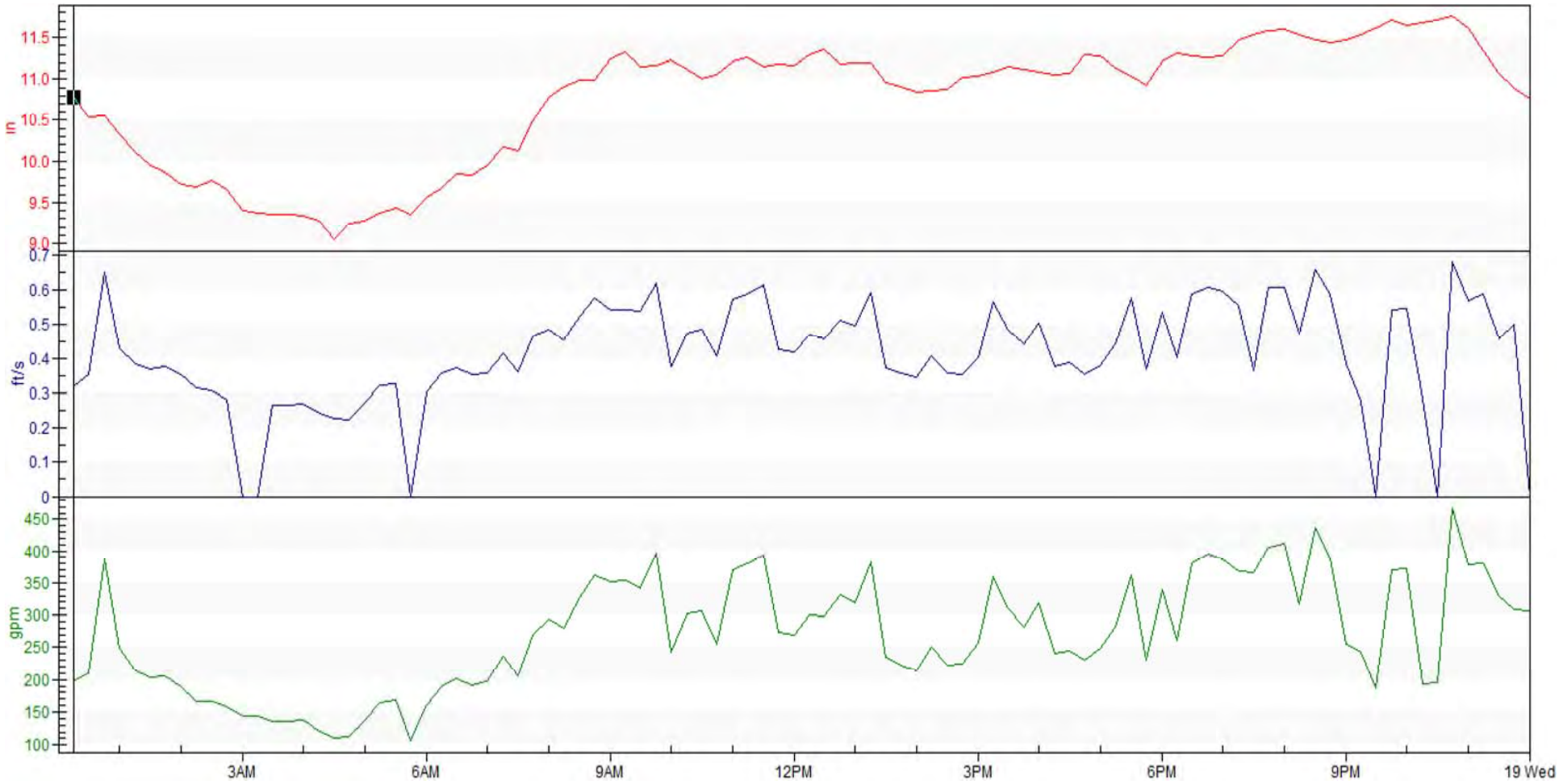
**Monday - P.M. 7/17/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.229 | 0.246 | 159.491 |
| 12:15:00 PM | 11.177 | 0 | 158.529 |
| 12:30:00 PM | 11.237 | 0.27 | 174.67 |
| 12:45:00 PM | 11.504 | 0.456 | 304.61 |
| 1:00:00 PM | 11.413 | 0.544 | 359.838 |
| 1:15:00 PM | 11.391 | 0.4 | 264.007 |
| 1:30:00 PM | 11.184 | 0.313 | 257.8 |
| 1:45:00 PM | 11.293 | 0.378 | 246.539 |
| 2:00:00 PM | 11.242 | 0.468 | 300.946 |
| 2:15:00 PM | 11.054 | 0.392 | 248.19 |
| 2:30:00 PM | 11.017 | 0.408 | 257.244 |
| 2:45:00 PM | 11.067 | 0.456 | 287.992 |
| 3:00:00 PM | 11.033 | 0.363 | 228.449 |
| 3:15:00 PM | 11.131 | 0.5 | 318.26 |
| 3:30:00 PM | 11.108 | 0.456 | 289.898 |
| 3:45:00 PM | 11.218 | 0.432 | 279.17 |
| 4:00:00 PM | 11.374 | 0.544 | 357.895 |
| 4:15:00 PM | 11.444 | 0.472 | 312.833 |
| 4:30:00 PM | 11.469 | 0.455 | 302.743 |
| 4:45:00 PM | 11.339 | 0.553 | 362.275 |
| 5:00:00 PM | 11.238 | 0.568 | 365.901 |
| 5:15:00 PM | 11.264 | 0.358 | 234.408 |
| 5:30:00 PM | 11.228 | 0.501 | 319.32 |
| 5:45:00 PM | 11.296 | 0.488 | 315.491 |
| 6:00:00 PM | 11.235 | 0.408 | 264.217 |
| 6:15:00 PM | 11.24 | 0.367 | 238.034 |
| 6:30:00 PM | 11.436 | 0.741 | 491.486 |
| 6:45:00 PM | 11.486 | 0.493 | 328.508 |
| 7:00:00 PM | 11.374 | 0.339 | 324.4 |
| 7:15:00 PM | 11.462 | 0.589 | 387.427 |
| 7:30:00 PM | 11.578 | 0.437 | 292.056 |
| 7:45:00 PM | 11.559 | 0.415 | 277.966 |
| 8:00:00 PM | 11.753 | 0.475 | 321.525 |
| 8:15:00 PM | 11.801 | 0.396 | 273.019 |
| 8:30:00 PM | 11.625 | 0.568 | 384.644 |
| 8:45:00 PM | 11.669 | 0.634 | 431.532 |
| 9:00:00 PM | 11.684 | 0.503 | 342.512 |
| 9:15:00 PM | 11.68 | 0.508 | 345.361 |
| 9:30:00 PM | 11.56 | 0.513 | 343.965 |
| 9:45:00 PM | 11.609 | 0.543 | 366.727 |
| 10:00:00 PM | 11.721 | 0.349 | 237.861 |
| 10:15:00 PM | 11.808 | 0.228 | 195.229 |
| 10:30:00 PM | 11.815 | 0 | 157.805 |
| 10:45:00 PM | 11.671 | 0.657 | 445.772 |
| 11:00:00 PM | 11.625 | 0.536 | 361.149 |
| 11:15:00 PM | 11.353 | 0.432 | 280.524 |
| 11:30:00 PM | 11.162 | 0.485 | 307.19 |
| 11:45:00 PM | 11.008 | 0.452 | 285.299 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.858 | 0.390 | 265.007 |
| Daily Min: | 9.294 | 0 | 107.476 |
| Daily Max: | 11.815 | 0.741 | 491.486 |
| Peak to Avg: | | | 1.85 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/18/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Tuesday- A.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.99 | 0.453 | 280.813 |
| 12:15:00 AM | 10.785 | 0.321 | 197.034 |
| 12:30:00 AM | 10.535 | 0.355 | 210.128 |
| 12:45:00 AM | 10.549 | 0.649 | 386.837 |
| 1:00:00 AM | 10.324 | 0.433 | 248.033 |
| 1:15:00 AM | 10.1 | 0.385 | 214.809 |
| 1:30:00 AM | 9.953 | 0.371 | 204.324 |
| 1:45:00 AM | 9.87 | 0.379 | 206.125 |
| 2:00:00 AM | 9.725 | 0.355 | 188.953 |
| 2:15:00 AM | 9.687 | 0.315 | 166.437 |
| 2:30:00 AM | 9.769 | 0.311 | 167.477 |
| 2:45:00 AM | 9.665 | 0.281 | 158.979 |
| 3:00:00 AM | 9.399 | 0 | 143.777 |
| 3:15:00 AM | 9.366 | 0 | 143.094 |
| 3:30:00 AM | 9.349 | 0.267 | 134.579 |
| 3:45:00 AM | 9.348 | 0.265 | 134.94 |
| 4:00:00 AM | 9.341 | 0.271 | 137.226 |
| 4:15:00 AM | 9.279 | 0.242 | 120.285 |
| 4:30:00 AM | 9.049 | 0.228 | 110.009 |
| 4:45:00 AM | 9.249 | 0.224 | 112.448 |
| 5:00:00 AM | 9.28 | 0.274 | 137.923 |
| 5:15:00 AM | 9.372 | 0.322 | 164.401 |
| 5:30:00 AM | 9.432 | 0.329 | 169.172 |
| 5:45:00 AM | 9.36 | 0 | 107.19 |
| 6:00:00 AM | 9.562 | 0.307 | 160.606 |
| 6:15:00 AM | 9.668 | 0.357 | 189.736 |
| 6:30:00 AM | 9.845 | 0.373 | 202.51 |
| 6:45:00 AM | 9.827 | 0.354 | 191.488 |
| 7:00:00 AM | 9.954 | 0.357 | 197.319 |
| 7:15:00 AM | 10.17 | 0.415 | 235.975 |
| 7:30:00 AM | 10.127 | 0.363 | 205.355 |
| 7:45:00 AM | 10.486 | 0.466 | 270.201 |
| 8:00:00 AM | 10.781 | 0.485 | 294.62 |
| 8:15:00 AM | 10.9 | 0.455 | 279.899 |
| 8:30:00 AM | 10.993 | 0.523 | 328.082 |
| 8:45:00 AM | 10.991 | 0.578 | 362.155 |
| 9:00:00 AM | 11.24 | 0.542 | 351.642 |
| 9:15:00 AM | 11.325 | 0.543 | 354.112 |
| 9:30:00 AM | 11.144 | 0.538 | 340.908 |
| 9:45:00 AM | 11.156 | 0.618 | 396.683 |
| 10:00:00 AM | 11.227 | 0.377 | 243.209 |
| 10:15:00 AM | 11.113 | 0.475 | 303.18 |
| 10:30:00 AM | 10.998 | 0.486 | 305.994 |
| 10:45:00 AM | 11.056 | 0.408 | 255.166 |
| 11:00:00 AM | 11.218 | 0.573 | 370.675 |
| 11:15:00 AM | 11.258 | 0.588 | 381.567 |
| 11:30:00 AM | 11.151 | 0.615 | 393.827 |
| 11:45:00 AM | 11.173 | 0.429 | 274.189 |

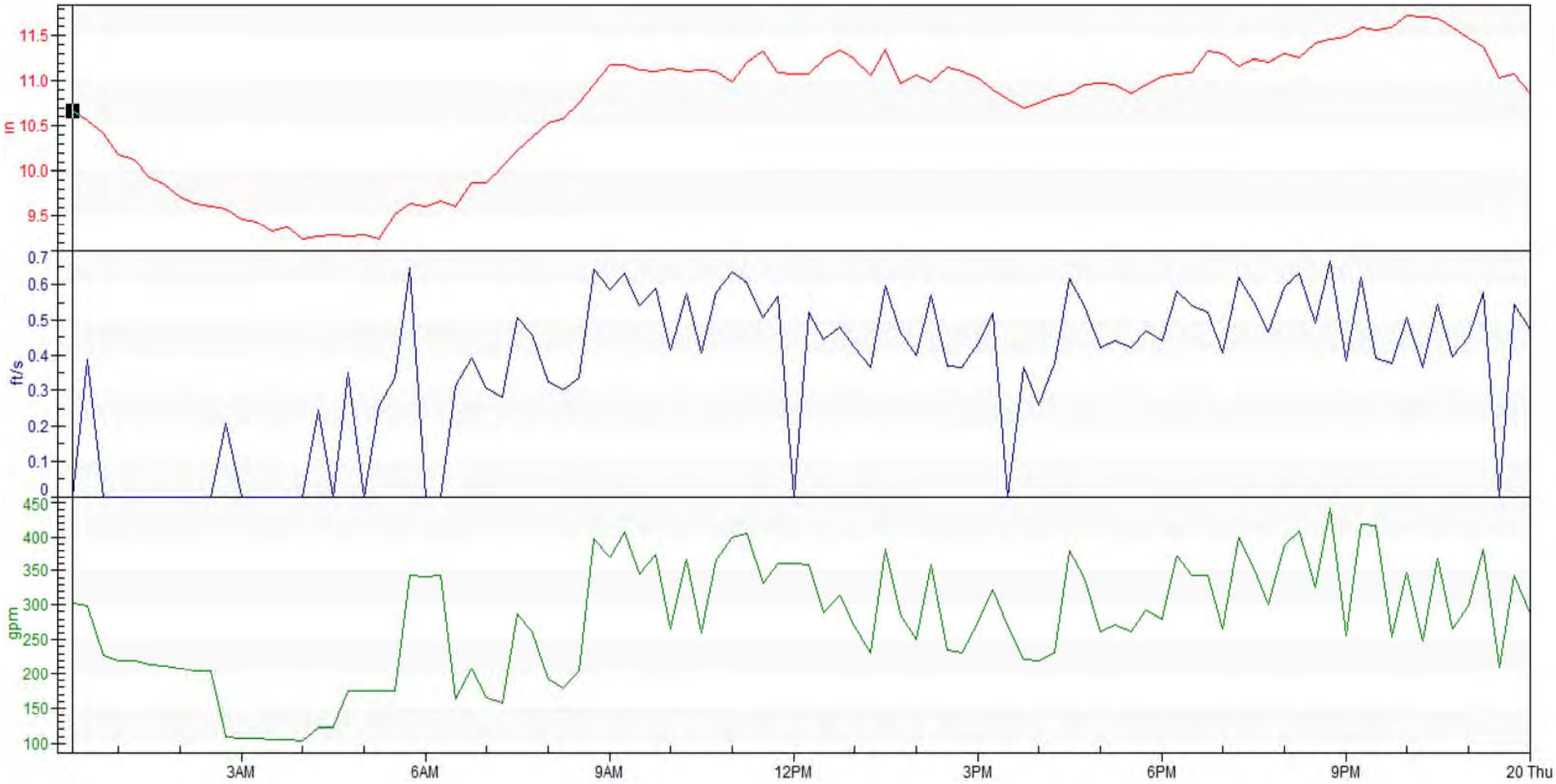
**Tuesday- P.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.157 | 0.422 | 270.205 |
| 12:15:00 PM | 11.297 | 0.468 | 300.893 |
| 12:30:00 PM | 11.354 | 0.459 | 298.275 |
| 12:45:00 PM | 11.183 | 0.513 | 330.518 |
| 1:00:00 PM | 11.198 | 0.498 | 319.734 |
| 1:15:00 PM | 11.202 | 0.592 | 382.042 |
| 1:30:00 PM | 10.95 | 0.375 | 234.073 |
| 1:45:00 PM | 10.904 | 0.359 | 222.787 |
| 2:00:00 PM | 10.851 | 0.348 | 214.669 |
| 2:15:00 PM | 10.857 | 0.407 | 251.653 |
| 2:30:00 PM | 10.878 | 0.358 | 221.373 |
| 2:45:00 PM | 11.023 | 0.354 | 223.721 |
| 3:00:00 PM | 11.033 | 0.406 | 256.725 |
| 3:15:00 PM | 11.09 | 0.564 | 359.226 |
| 3:30:00 PM | 11.145 | 0.484 | 310.109 |
| 3:45:00 PM | 11.11 | 0.442 | 282.454 |
| 4:00:00 PM | 11.089 | 0.503 | 319.585 |
| 4:15:00 PM | 11.059 | 0.378 | 239.727 |
| 4:30:00 PM | 11.064 | 0.388 | 245.379 |
| 4:45:00 PM | 11.298 | 0.353 | 230.441 |
| 5:00:00 PM | 11.277 | 0.382 | 248.954 |
| 5:15:00 PM | 11.137 | 0.441 | 282.619 |
| 5:30:00 PM | 11.039 | 0.576 | 361.669 |
| 5:45:00 PM | 10.927 | 0.369 | 230.838 |
| 6:00:00 PM | 11.205 | 0.534 | 340.388 |
| 6:15:00 PM | 11.31 | 0.406 | 261.582 |
| 6:30:00 PM | 11.27 | 0.588 | 380.885 |
| 6:45:00 PM | 11.259 | 0.607 | 394.434 |
| 7:00:00 PM | 11.283 | 0.595 | 387.801 |
| 7:15:00 PM | 11.466 | 0.554 | 368.35 |
| 7:30:00 PM | 11.525 | 0.368 | 367.073 |
| 7:45:00 PM | 11.588 | 0.606 | 406.431 |
| 8:00:00 PM | 11.598 | 0.61 | 411.487 |
| 8:15:00 PM | 11.537 | 0.475 | 315.868 |
| 8:30:00 PM | 11.466 | 0.659 | 435.441 |
| 8:45:00 PM | 11.435 | 0.588 | 389.848 |
| 9:00:00 PM | 11.462 | 0.384 | 254.585 |
| 9:15:00 PM | 11.54 | 0.277 | 241.919 |
| 9:30:00 PM | 11.61 | 0 | 187.493 |
| 9:45:00 PM | 11.715 | 0.544 | 370.482 |
| 10:00:00 PM | 11.649 | 0.548 | 372.31 |
| 10:15:00 PM | 11.677 | 0.285 | 193.967 |
| 10:30:00 PM | 11.715 | 0 | 194.769 |
| 10:45:00 PM | 11.758 | 0.68 | 466.787 |
| 11:00:00 PM | 11.615 | 0.571 | 378.281 |
| 11:15:00 PM | 11.346 | 0.589 | 381.163 |
| 11:30:00 PM | 11.071 | 0.459 | 329.887 |
| 11:45:00 PM | 10.889 | 0.5 | 308.35 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.750 | 0.418 | 269.795 |
| Daily Min: | 9.049 | 0 | 107.19 |
| Daily Max: | 11.758 | 0.68 | 466.787 |
| Peak to Avg: | | | 1.73 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/19/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Wednesday - A.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.756 | 0 | 305.887 |
| 12:15:00 AM | 10.661 | 0 | 302.345 |
| 12:30:00 AM | 10.563 | 0.387 | 298.71 |
| 12:45:00 AM | 10.423 | 0 | 227.243 |
| 1:00:00 AM | 10.183 | 0 | 220.363 |
| 1:15:00 AM | 10.12 | 0 | 218.568 |
| 1:30:00 AM | 9.936 | 0 | 213.334 |
| 1:45:00 AM | 9.852 | 0 | 210.924 |
| 2:00:00 AM | 9.71 | 0 | 206.878 |
| 2:15:00 AM | 9.631 | 0 | 204.643 |
| 2:30:00 AM | 9.613 | 0 | 204.144 |
| 2:45:00 AM | 9.574 | 0.207 | 108.872 |
| 3:00:00 AM | 9.465 | 0 | 107.212 |
| 3:15:00 AM | 9.43 | 0 | 106.682 |
| 3:30:00 AM | 9.324 | 0 | 105.076 |
| 3:45:00 AM | 9.371 | 0 | 105.785 |
| 4:00:00 AM | 9.246 | 0 | 103.901 |
| 4:15:00 AM | 9.277 | 0.246 | 123.616 |
| 4:30:00 AM | 9.281 | 0 | 123.69 |
| 4:45:00 AM | 9.274 | 0.349 | 175.473 |
| 5:00:00 AM | 9.289 | 0 | 175.876 |
| 5:15:00 AM | 9.24 | 0.258 | 174.388 |
| 5:30:00 AM | 9.525 | 0.335 | 174.623 |
| 5:45:00 AM | 9.633 | 0.647 | 342.136 |
| 6:00:00 AM | 9.608 | 0 | 340.919 |
| 6:15:00 AM | 9.668 | 0 | 343.769 |
| 6:30:00 AM | 9.609 | 0.312 | 163.53 |
| 6:45:00 AM | 9.868 | 0.391 | 208.158 |
| 7:00:00 AM | 9.876 | 0.306 | 165.967 |
| 7:15:00 AM | 10.043 | 0.282 | 157.629 |
| 7:30:00 AM | 10.222 | 0.507 | 287.309 |
| 7:45:00 AM | 10.379 | 0.459 | 262.828 |
| 8:00:00 AM | 10.538 | 0.325 | 192.937 |
| 8:15:00 AM | 10.574 | 0.303 | 179.536 |
| 8:30:00 AM | 10.751 | 0.334 | 204.415 |
| 8:45:00 AM | 10.956 | 0.644 | 397.46 |
| 9:00:00 AM | 11.176 | 0.585 | 369.264 |
| 9:15:00 AM | 11.179 | 0.631 | 406.442 |
| 9:30:00 AM | 11.124 | 0.54 | 345.179 |
| 9:45:00 AM | 11.112 | 0.59 | 374.907 |
| 10:00:00 AM | 11.139 | 0.414 | 265.138 |
| 10:15:00 AM | 11.114 | 0.574 | 365.584 |
| 10:30:00 AM | 11.12 | 0.407 | 260.33 |
| 10:45:00 AM | 11.106 | 0.577 | 366.267 |
| 11:00:00 AM | 10.995 | 0.635 | 399.776 |
| 11:15:00 AM | 11.212 | 0.603 | 403.986 |
| 11:30:00 AM | 11.323 | 0.506 | 330.993 |
| 11:45:00 AM | 11.091 | 0.567 | 361.227 |

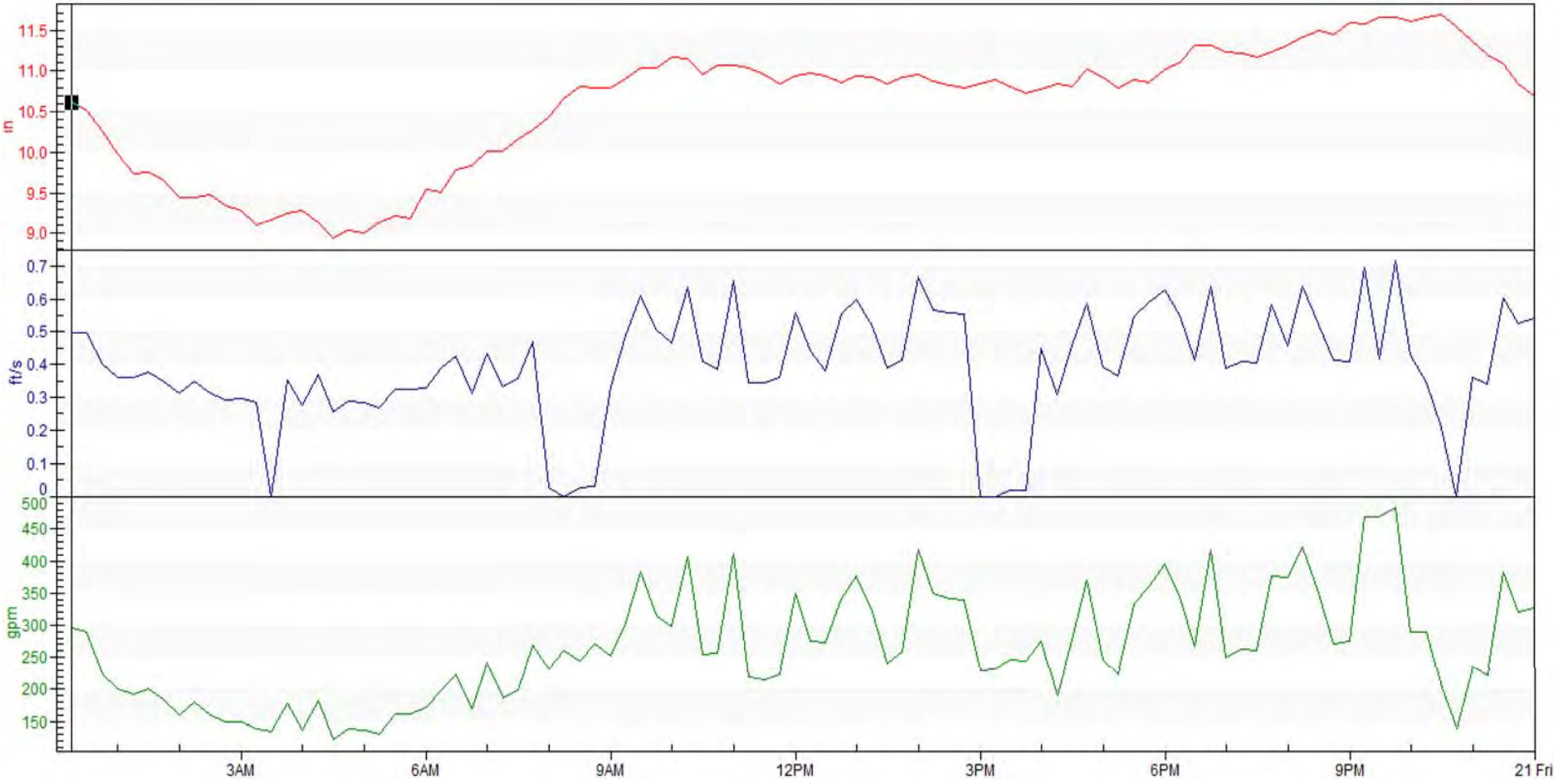
**Wednesday - P.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.085 | 0 | 360.97 |
| 12:15:00 PM | 11.074 | 0.523 | 357.786 |
| 12:30:00 PM | 11.238 | 0.445 | 288.451 |
| 12:45:00 PM | 11.341 | 0.481 | 314.287 |
| 1:00:00 PM | 11.24 | 0.42 | 269.658 |
| 1:15:00 PM | 11.062 | 0.366 | 230.542 |
| 1:30:00 PM | 11.347 | 0.596 | 381.458 |
| 1:45:00 PM | 10.977 | 0.465 | 287.857 |
| 2:00:00 PM | 11.058 | 0.399 | 250.781 |
| 2:15:00 PM | 10.989 | 0.572 | 358.271 |
| 2:30:00 PM | 11.144 | 0.368 | 234.948 |
| 2:45:00 PM | 11.108 | 0.363 | 230.237 |
| 3:00:00 PM | 11.03 | 0.434 | 274.548 |
| 3:15:00 PM | 10.897 | 0.518 | 321.125 |
| 3:30:00 PM | 10.804 | 0 | 269.989 |
| 3:45:00 PM | 10.702 | 0.366 | 222.018 |
| 4:00:00 PM | 10.751 | 0.259 | 220.123 |
| 4:15:00 PM | 10.825 | 0.375 | 231.577 |
| 4:30:00 PM | 10.859 | 0.615 | 379.376 |
| 4:45:00 PM | 10.959 | 0.543 | 338.399 |
| 5:00:00 PM | 10.979 | 0.42 | 262.528 |
| 5:15:00 PM | 10.963 | 0.44 | 272.346 |
| 5:30:00 PM | 10.858 | 0.423 | 261.988 |
| 5:45:00 PM | 10.953 | 0.469 | 293.116 |
| 6:00:00 PM | 11.043 | 0.441 | 279.088 |
| 6:15:00 PM | 11.077 | 0.584 | 371.639 |
| 6:30:00 PM | 11.095 | 0.54 | 343.782 |
| 6:45:00 PM | 11.326 | 0.524 | 342.954 |
| 7:00:00 PM | 11.303 | 0.406 | 265.18 |
| 7:15:00 PM | 11.161 | 0.621 | 398.424 |
| 7:30:00 PM | 11.24 | 0.552 | 354.569 |
| 7:45:00 PM | 11.208 | 0.467 | 301.274 |
| 8:00:00 PM | 11.296 | 0.594 | 387.361 |
| 8:15:00 PM | 11.252 | 0.63 | 408.775 |
| 8:30:00 PM | 11.413 | 0.492 | 325.173 |
| 8:45:00 PM | 11.463 | 0.664 | 441.173 |
| 9:00:00 PM | 11.493 | 0.385 | 256.221 |
| 9:15:00 PM | 11.593 | 0.62 | 418.512 |
| 9:30:00 PM | 11.556 | 0.393 | 416.791 |
| 9:45:00 PM | 11.593 | 0.377 | 254.223 |
| 10:00:00 PM | 11.725 | 0.508 | 347.572 |
| 10:15:00 PM | 11.706 | 0.365 | 248.438 |
| 10:30:00 PM | 11.699 | 0.543 | 367.343 |
| 10:45:00 PM | 11.596 | 0.393 | 265.469 |
| 11:00:00 PM | 11.477 | 0.451 | 298.832 |
| 11:15:00 PM | 11.379 | 0.578 | 380.807 |
| 11:30:00 PM | 11.029 | 0 | 208.912 |
| 11:45:00 PM | 11.072 | 0.546 | 342.511 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.689 | 0.363 | 277.110 |
| Daily Min: | 9.24 | 0 | 103.901 |
| Daily Max: | 11.725 | 0.664 | 441.173 |
| Peak to Avg: | | | 1.59 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/20/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Thursday - A.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.856 | 0.473 | 287.896 |
| 12:15:00 AM | 10.62 | 0.496 | 295.316 |
| 12:30:00 AM | 10.516 | 0.497 | 289.271 |
| 12:45:00 AM | 10.251 | 0.4 | 224.497 |
| 1:00:00 AM | 9.981 | 0.362 | 200.568 |
| 1:15:00 AM | 9.744 | 0.362 | 193.264 |
| 1:30:00 AM | 9.76 | 0.376 | 201.633 |
| 1:45:00 AM | 9.663 | 0.348 | 183.489 |
| 2:00:00 AM | 9.45 | 0.312 | 160.598 |
| 2:15:00 AM | 9.443 | 0.35 | 180.187 |
| 2:30:00 AM | 9.48 | 0.311 | 160.194 |
| 2:45:00 AM | 9.352 | 0.292 | 148.666 |
| 3:00:00 AM | 9.277 | 0.296 | 148.819 |
| 3:15:00 AM | 9.104 | 0.284 | 137.99 |
| 3:30:00 AM | 9.161 | 0 | 135.427 |
| 3:45:00 AM | 9.242 | 0.354 | 177.173 |
| 4:00:00 AM | 9.278 | 0.275 | 137.761 |
| 4:15:00 AM | 9.133 | 0.368 | 181.371 |
| 4:30:00 AM | 8.94 | 0.257 | 122.912 |
| 4:45:00 AM | 9.038 | 0.287 | 139.345 |
| 5:00:00 AM | 9.01 | 0.282 | 136.458 |
| 5:15:00 AM | 9.132 | 0.267 | 129.831 |
| 5:30:00 AM | 9.215 | 0.323 | 160.694 |
| 5:45:00 AM | 9.191 | 0.324 | 160.881 |
| 6:00:00 AM | 9.539 | 0.328 | 171.242 |
| 6:15:00 AM | 9.514 | 0.388 | 198.976 |
| 6:30:00 AM | 9.791 | 0.426 | 222.915 |
| 6:45:00 AM | 9.841 | 0.311 | 169.321 |
| 7:00:00 AM | 10.01 | 0.434 | 241.456 |
| 7:15:00 AM | 10.016 | 0.333 | 185.648 |
| 7:30:00 AM | 10.167 | 0.355 | 199.346 |
| 7:45:00 AM | 10.276 | 0.468 | 269.887 |
| 8:00:00 AM | 10.441 | 0.025 | 231.21 |
| 8:15:00 AM | 10.669 | 0 | 260.871 |
| 8:30:00 AM | 10.815 | 0.027 | 245.169 |
| 8:45:00 AM | 10.787 | 0.032 | 271.34 |
| 9:00:00 AM | 10.801 | 0.332 | 252.148 |
| 9:15:00 AM | 10.903 | 0.488 | 303.935 |
| 9:30:00 AM | 11.031 | 0.61 | 381.691 |
| 9:45:00 AM | 11.031 | 0.504 | 314.903 |
| 10:00:00 AM | 11.173 | 0.467 | 297.622 |
| 10:15:00 AM | 11.15 | 0.634 | 406.486 |
| 10:30:00 AM | 10.961 | 0.41 | 254.681 |
| 10:45:00 AM | 11.071 | 0.386 | 256.302 |
| 11:00:00 AM | 11.068 | 0.655 | 411.585 |
| 11:15:00 AM | 11.038 | 0.346 | 219.064 |
| 11:30:00 AM | 10.951 | 0.343 | 214.488 |
| 11:45:00 AM | 10.849 | 0.362 | 223.781 |

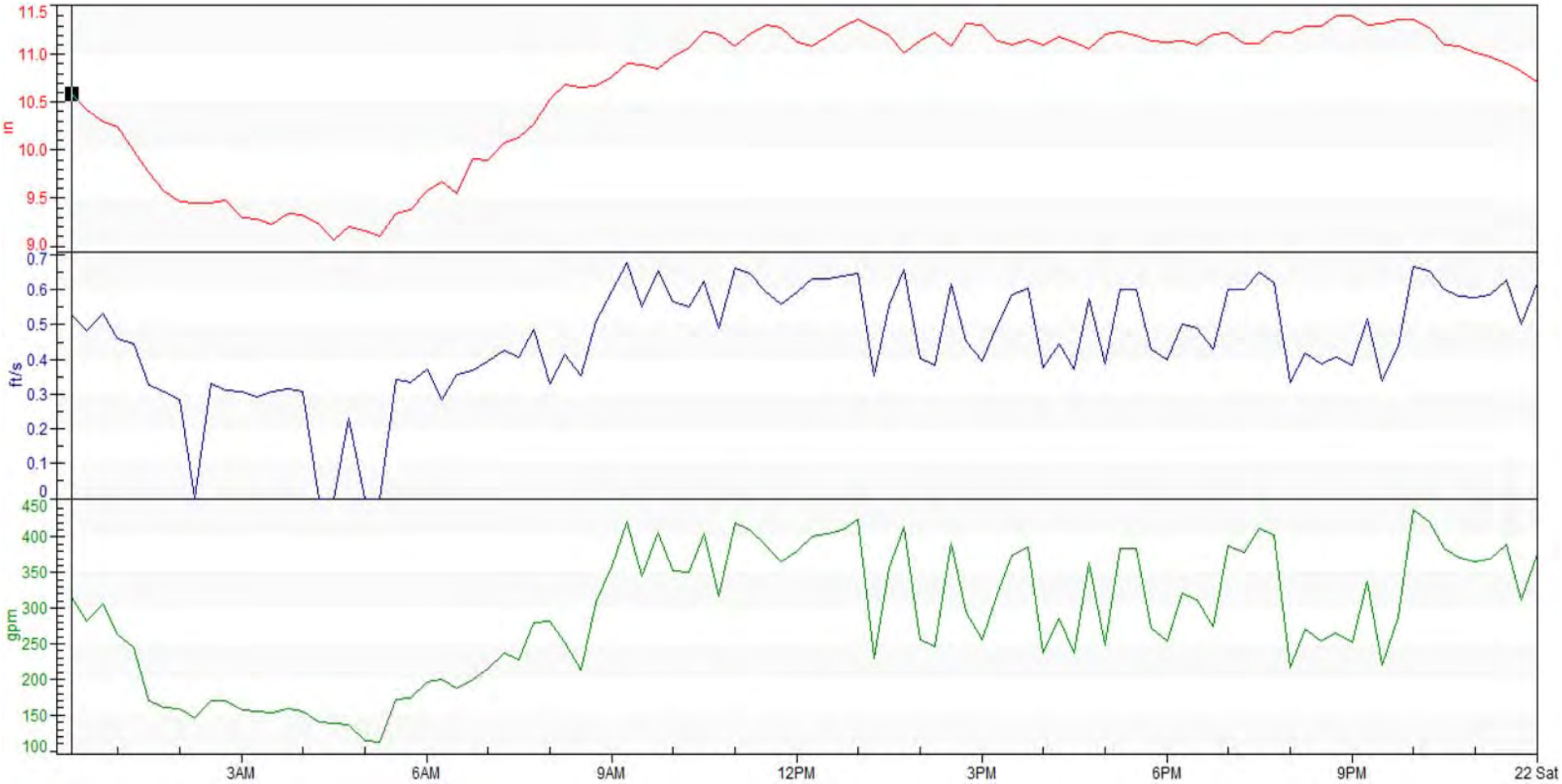
**Thursday - P.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.933 | 0.56 | 350.273 |
| 12:15:00 PM | 10.973 | 0.44 | 274.849 |
| 12:30:00 PM | 10.946 | 0.379 | 273.723 |
| 12:45:00 PM | 10.853 | 0.555 | 341.842 |
| 1:00:00 PM | 10.946 | 0.6 | 375.27 |
| 1:15:00 PM | 10.92 | 0.518 | 321.107 |
| 1:30:00 PM | 10.846 | 0.389 | 239.621 |
| 1:45:00 PM | 10.922 | 0.414 | 258.591 |
| 2:00:00 PM | 10.949 | 0.668 | 418.247 |
| 2:15:00 PM | 10.869 | 0.564 | 350.257 |
| 2:30:00 PM | 10.819 | 0.56 | 340.639 |
| 2:45:00 PM | 10.802 | 0.553 | 340.146 |
| 3:00:00 PM | 10.846 | 0 | 229.848 |
| 3:15:00 PM | 10.892 | 0 | 231.13 |
| 3:30:00 PM | 10.806 | 0.018 | 246.913 |
| 3:45:00 PM | 10.734 | 0.018 | 245.169 |
| 4:00:00 PM | 10.784 | 0.448 | 275.024 |
| 4:15:00 PM | 10.844 | 0.309 | 190.596 |
| 4:30:00 PM | 10.817 | 0.457 | 276.67 |
| 4:45:00 PM | 11.029 | 0.585 | 369.692 |
| 5:00:00 PM | 10.923 | 0.394 | 246.348 |
| 5:15:00 PM | 10.79 | 0.363 | 223.34 |
| 5:30:00 PM | 10.888 | 0.547 | 332.938 |
| 5:45:00 PM | 10.867 | 0.59 | 360.007 |
| 6:00:00 PM | 11.017 | 0.625 | 394.801 |
| 6:15:00 PM | 11.106 | 0.551 | 344.014 |
| 6:30:00 PM | 11.314 | 0.413 | 267.678 |
| 6:45:00 PM | 11.313 | 0.639 | 417.678 |
| 7:00:00 PM | 11.233 | 0.388 | 251.18 |
| 7:15:00 PM | 11.212 | 0.408 | 263.525 |
| 7:30:00 PM | 11.163 | 0.404 | 259.759 |
| 7:45:00 PM | 11.237 | 0.584 | 376.314 |
| 8:00:00 PM | 11.316 | 0.456 | 374.922 |
| 8:15:00 PM | 11.404 | 0.639 | 421.043 |
| 8:30:00 PM | 11.497 | 0.523 | 349.129 |
| 8:45:00 PM | 11.447 | 0.411 | 271.01 |
| 9:00:00 PM | 11.584 | 0.408 | 274.629 |
| 9:15:00 PM | 11.573 | 0.697 | 468.567 |
| 9:30:00 PM | 11.65 | 0.418 | 468.708 |
| 9:45:00 PM | 11.651 | 0.714 | 483.119 |
| 10:00:00 PM | 11.609 | 0.429 | 289.946 |
| 10:15:00 PM | 11.649 | 0.346 | 289.348 |
| 10:30:00 PM | 11.689 | 0.206 | 203.294 |
| 10:45:00 PM | 11.543 | 0 | 138.329 |
| 11:00:00 PM | 11.359 | 0.359 | 235.894 |
| 11:15:00 PM | 11.195 | 0.342 | 220.701 |
| 11:30:00 PM | 11.079 | 0.602 | 382.778 |
| 11:45:00 PM | 10.835 | 0.525 | 319.984 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.584 | 0.389 | 263.763 |
| Daily Min: | 8.94 | 0 | 122.912 |
| Daily Max: | 11.689 | 0.714 | 483.119 |
| Peak to Avg: | | | 1.83 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/21/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Friday - A.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.699 | 0.541 | 327.061 |
| 12:15:00 AM | 10.583 | 0.527 | 315.311 |
| 12:30:00 AM | 10.424 | 0.485 | 280.77 |
| 12:45:00 AM | 10.298 | 0.531 | 305.641 |
| 1:00:00 AM | 10.234 | 0.46 | 263.673 |
| 1:15:00 AM | 9.997 | 0.446 | 245.362 |
| 1:30:00 AM | 9.77 | 0.325 | 169.977 |
| 1:45:00 AM | 9.578 | 0.307 | 161.329 |
| 2:00:00 AM | 9.465 | 0.283 | 158.791 |
| 2:15:00 AM | 9.449 | 0 | 145.944 |
| 2:30:00 AM | 9.455 | 0.329 | 169.916 |
| 2:45:00 AM | 9.48 | 0.313 | 170.524 |
| 3:00:00 AM | 9.298 | 0.307 | 157.73 |
| 3:15:00 AM | 9.281 | 0.291 | 154.332 |
| 3:30:00 AM | 9.222 | 0.306 | 152.586 |
| 3:45:00 AM | 9.34 | 0.314 | 159.191 |
| 4:00:00 AM | 9.33 | 0.307 | 155.415 |
| 4:15:00 AM | 9.233 | 0 | 141.077 |
| 4:30:00 AM | 9.062 | 0 | 137.57 |
| 4:45:00 AM | 9.2 | 0.23 | 136.589 |
| 5:00:00 AM | 9.163 | 0 | 113.758 |
| 5:15:00 AM | 9.11 | 0 | 112.867 |
| 5:30:00 AM | 9.342 | 0.34 | 172.815 |
| 5:45:00 AM | 9.375 | 0.335 | 173.345 |
| 6:00:00 AM | 9.571 | 0.374 | 196.045 |
| 6:15:00 AM | 9.676 | 0.283 | 198.927 |
| 6:30:00 AM | 9.55 | 0.356 | 186.087 |
| 6:45:00 AM | 9.901 | 0.369 | 200.38 |
| 7:00:00 AM | 9.896 | 0.395 | 214.721 |
| 7:15:00 AM | 10.081 | 0.427 | 236.167 |
| 7:30:00 AM | 10.124 | 0.407 | 228.469 |
| 7:45:00 AM | 10.262 | 0.486 | 279.914 |
| 8:00:00 AM | 10.533 | 0.329 | 282.143 |
| 8:15:00 AM | 10.681 | 0.416 | 252.313 |
| 8:30:00 AM | 10.651 | 0.351 | 212.286 |
| 8:45:00 AM | 10.668 | 0.51 | 307.206 |
| 9:00:00 AM | 10.766 | 0.596 | 359.034 |
| 9:15:00 AM | 10.902 | 0.676 | 421.087 |
| 9:30:00 AM | 10.887 | 0.553 | 344.006 |
| 9:45:00 AM | 10.854 | 0.655 | 405.828 |
| 10:00:00 AM | 10.976 | 0.566 | 352.687 |
| 10:15:00 AM | 11.075 | 0.55 | 349.694 |
| 10:30:00 AM | 11.24 | 0.624 | 404.619 |
| 10:45:00 AM | 11.216 | 0.489 | 316.336 |
| 11:00:00 AM | 11.08 | 0.661 | 418.948 |
| 11:15:00 AM | 11.213 | 0.646 | 410.548 |
| 11:30:00 AM | 11.304 | 0.593 | 387.498 |
| 11:45:00 AM | 11.281 | 0.56 | 364.485 |

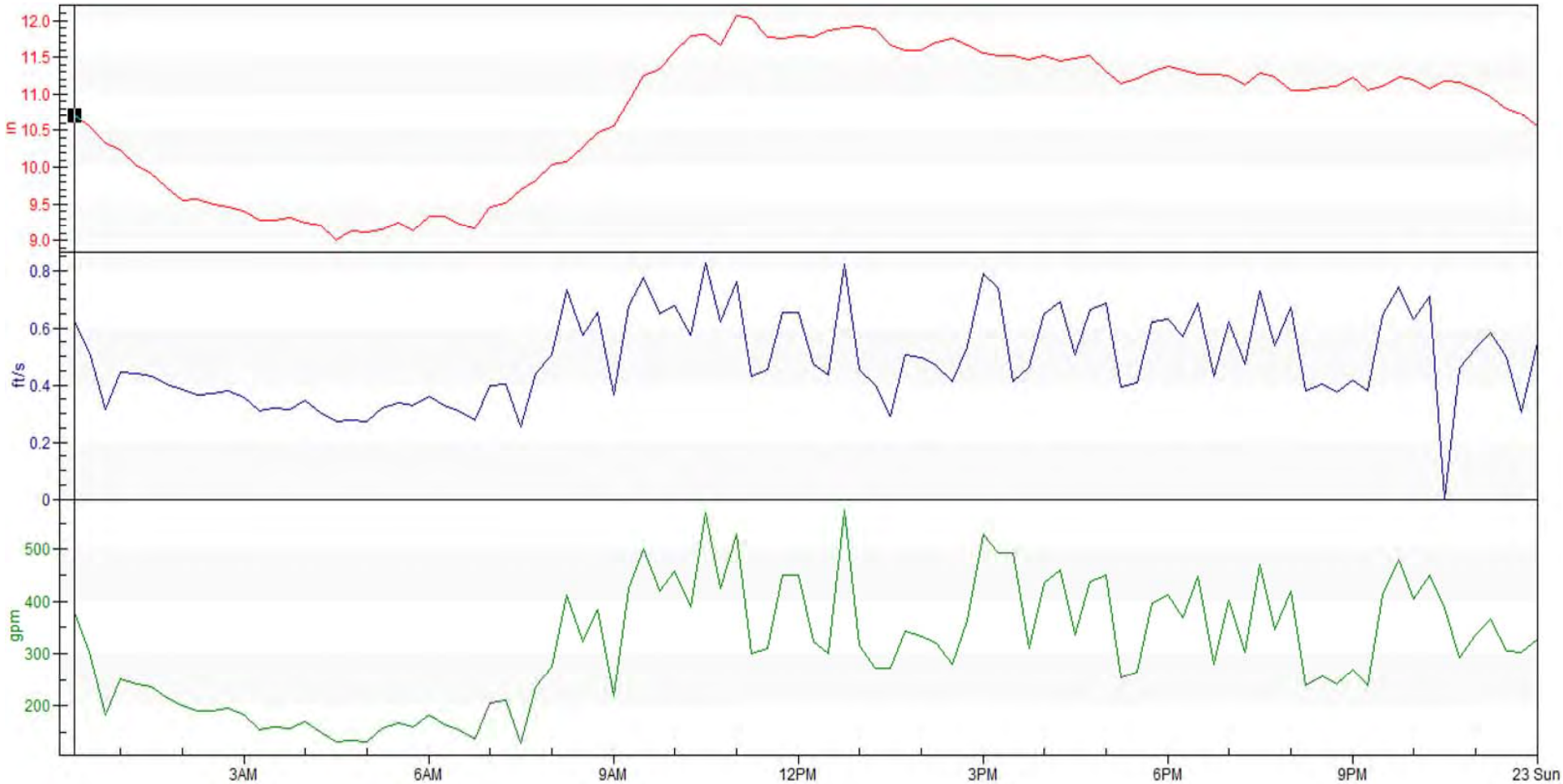
**Friday - P.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.132 | 0.595 | 380.133 |
| 12:15:00 PM | 11.081 | 0.631 | 401.615 |
| 12:30:00 PM | 11.176 | 0.63 | 405.196 |
| 12:45:00 PM | 11.298 | 0.64 | 410.405 |
| 1:00:00 PM | 11.359 | 0.648 | 425.767 |
| 1:15:00 PM | 11.28 | 0.352 | 228.943 |
| 1:30:00 PM | 11.194 | 0.557 | 356.481 |
| 1:45:00 PM | 11.012 | 0.657 | 414.625 |
| 2:00:00 PM | 11.14 | 0.404 | 255.6 |
| 2:15:00 PM | 11.219 | 0.384 | 246.761 |
| 2:30:00 PM | 11.085 | 0.616 | 391.937 |
| 2:45:00 PM | 11.316 | 0.45 | 294.498 |
| 3:00:00 PM | 11.31 | 0.396 | 255.303 |
| 3:15:00 PM | 11.138 | 0.5 | 319.592 |
| 3:30:00 PM | 11.106 | 0.586 | 373.917 |
| 3:45:00 PM | 11.155 | 0.603 | 385.179 |
| 4:00:00 PM | 11.105 | 0.377 | 237.77 |
| 4:15:00 PM | 11.181 | 0.443 | 285.1 |
| 4:30:00 PM | 11.127 | 0.372 | 237.744 |
| 4:45:00 PM | 11.055 | 0.575 | 363.832 |
| 5:00:00 PM | 11.207 | 0.388 | 248.522 |
| 5:15:00 PM | 11.239 | 0.6 | 383.396 |
| 5:30:00 PM | 11.202 | 0.603 | 384.432 |
| 5:45:00 PM | 11.146 | 0.43 | 272.544 |
| 6:00:00 PM | 11.135 | 0.398 | 253.524 |
| 6:15:00 PM | 11.135 | 0.503 | 321.08 |
| 6:30:00 PM | 11.104 | 0.49 | 312.272 |
| 6:45:00 PM | 11.208 | 0.429 | 274.683 |
| 7:00:00 PM | 11.22 | 0.601 | 388.549 |
| 7:15:00 PM | 11.117 | 0.602 | 379.057 |
| 7:30:00 PM | 11.114 | 0.649 | 412.62 |
| 7:45:00 PM | 11.237 | 0.622 | 403.017 |
| 8:00:00 PM | 11.223 | 0.334 | 215.986 |
| 8:15:00 PM | 11.288 | 0.418 | 271.247 |
| 8:30:00 PM | 11.296 | 0.388 | 253.007 |
| 8:45:00 PM | 11.405 | 0.405 | 265.341 |
| 9:00:00 PM | 11.403 | 0.382 | 252.021 |
| 9:15:00 PM | 11.307 | 0.517 | 337.073 |
| 9:30:00 PM | 11.315 | 0.339 | 220.776 |
| 9:45:00 PM | 11.369 | 0.437 | 286.429 |
| 10:00:00 PM | 11.361 | 0.666 | 437.486 |
| 10:15:00 PM | 11.28 | 0.653 | 420.775 |
| 10:30:00 PM | 11.105 | 0.601 | 383.328 |
| 10:45:00 PM | 11.088 | 0.583 | 371.225 |
| 11:00:00 PM | 11.02 | 0.578 | 365.427 |
| 11:15:00 PM | 10.975 | 0.586 | 368.29 |
| 11:30:00 PM | 10.903 | 0.626 | 390.232 |
| 11:45:00 PM | 10.827 | 0.503 | 310.744 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.640 | 0.453 | 287.762 |
| Daily Min: | 9.062 | 0 | 112.867 |
| Daily Max: | 11.405 | 0.676 | 437.486 |
| Peak to Avg: | | | 1.52 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/22/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Saturday - A.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.707 | 0.619 | 376.859 |
| 12:15:00 AM | 10.705 | 0.623 | 378.83 |
| 12:30:00 AM | 10.566 | 0.514 | 303.691 |
| 12:45:00 AM | 10.329 | 0.316 | 183.664 |
| 1:00:00 AM | 10.234 | 0.446 | 251.172 |
| 1:15:00 AM | 10.02 | 0.438 | 240.771 |
| 1:30:00 AM | 9.908 | 0.433 | 236.06 |
| 1:45:00 AM | 9.73 | 0.404 | 215.303 |
| 2:00:00 AM | 9.554 | 0.384 | 201.139 |
| 2:15:00 AM | 9.561 | 0.364 | 190.079 |
| 2:30:00 AM | 9.488 | 0.37 | 191.707 |
| 2:45:00 AM | 9.453 | 0.379 | 195.387 |
| 3:00:00 AM | 9.409 | 0.358 | 183.47 |
| 3:15:00 AM | 9.283 | 0.309 | 155.375 |
| 3:30:00 AM | 9.278 | 0.319 | 160.759 |
| 3:45:00 AM | 9.306 | 0.315 | 158.774 |
| 4:00:00 AM | 9.236 | 0.345 | 171.614 |
| 4:15:00 AM | 9.203 | 0.301 | 149.804 |
| 4:30:00 AM | 9.005 | 0.275 | 132.818 |
| 4:45:00 AM | 9.13 | 0.276 | 135.675 |
| 5:00:00 AM | 9.114 | 0.271 | 132.473 |
| 5:15:00 AM | 9.151 | 0.318 | 157.229 |
| 5:30:00 AM | 9.237 | 0.338 | 167.771 |
| 5:45:00 AM | 9.133 | 0.328 | 161.44 |
| 6:00:00 AM | 9.336 | 0.363 | 183.965 |
| 6:15:00 AM | 9.339 | 0.326 | 164.474 |
| 6:30:00 AM | 9.218 | 0.31 | 154.604 |
| 6:45:00 AM | 9.172 | 0.277 | 136.705 |
| 7:00:00 AM | 9.449 | 0.398 | 205.185 |
| 7:15:00 AM | 9.518 | 0.404 | 210.198 |
| 7:30:00 AM | 9.694 | 0.252 | 130.419 |
| 7:45:00 AM | 9.826 | 0.438 | 236.443 |
| 8:00:00 AM | 10.033 | 0.505 | 275.265 |
| 8:15:00 AM | 10.072 | 0.735 | 412.745 |
| 8:30:00 AM | 10.278 | 0.576 | 323.318 |
| 8:45:00 AM | 10.47 | 0.655 | 384.073 |
| 9:00:00 AM | 10.569 | 0.367 | 219.581 |
| 9:15:00 AM | 10.915 | 0.68 | 424.251 |
| 9:30:00 AM | 11.242 | 0.775 | 501.167 |
| 9:45:00 AM | 11.347 | 0.65 | 420.454 |
| 10:00:00 AM | 11.569 | 0.68 | 457.353 |
| 10:15:00 AM | 11.796 | 0.574 | 388.426 |
| 10:30:00 AM | 11.815 | 0.825 | 570.345 |
| 10:45:00 AM | 11.676 | 0.623 | 424.427 |
| 11:00:00 AM | 12.066 | 0.762 | 527.772 |
| 11:15:00 AM | 12.033 | 0.431 | 299.252 |
| 11:30:00 AM | 11.775 | 0.456 | 311.266 |
| 11:45:00 AM | 11.756 | 0.655 | 448.876 |

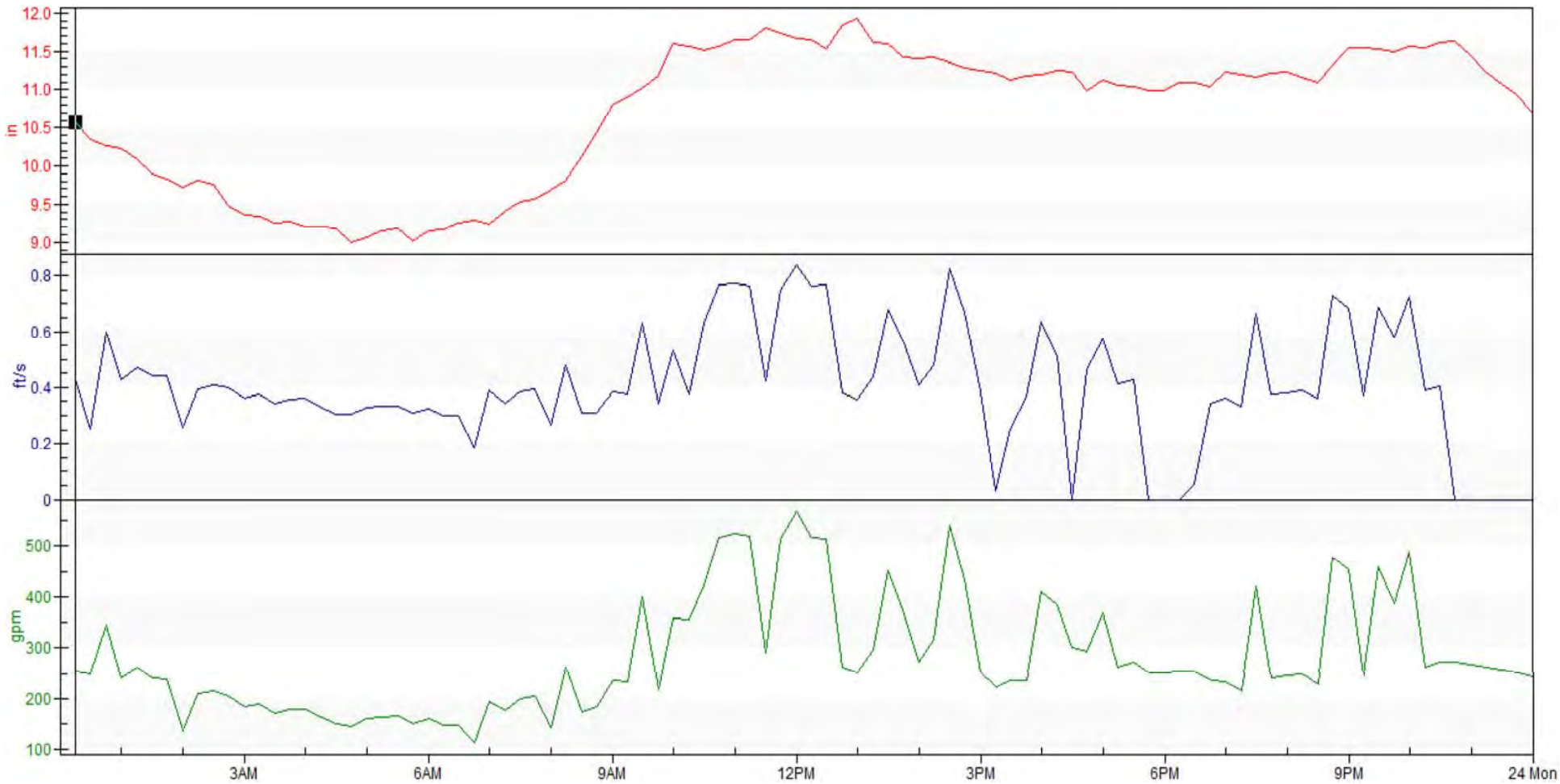
**Saturday - P.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.802 | 0.653 | 450.64 |
| 12:15:00 PM | 11.771 | 0.472 | 323.713 |
| 12:30:00 PM | 11.867 | 0.434 | 300.368 |
| 12:45:00 PM | 11.91 | 0.823 | 573.74 |
| 1:00:00 PM | 11.922 | 0.452 | 316.114 |
| 1:15:00 PM | 11.89 | 0.398 | 272.455 |
| 1:30:00 PM | 11.666 | 0.293 | 270.936 |
| 1:45:00 PM | 11.593 | 0.507 | 341.943 |
| 2:00:00 PM | 11.59 | 0.494 | 332.884 |
| 2:15:00 PM | 11.708 | 0.467 | 319.397 |
| 2:30:00 PM | 11.759 | 0.411 | 280.231 |
| 2:45:00 PM | 11.669 | 0.535 | 363.836 |
| 3:00:00 PM | 11.56 | 0.789 | 529.511 |
| 3:15:00 PM | 11.517 | 0.738 | 493.945 |
| 3:30:00 PM | 11.517 | 0.411 | 493.962 |
| 3:45:00 PM | 11.476 | 0.465 | 309.374 |
| 4:00:00 PM | 11.515 | 0.65 | 433.944 |
| 4:15:00 PM | 11.456 | 0.693 | 460.045 |
| 4:30:00 PM | 11.49 | 0.507 | 335.216 |
| 4:45:00 PM | 11.522 | 0.662 | 436.134 |
| 5:00:00 PM | 11.305 | 0.688 | 449.219 |
| 5:15:00 PM | 11.136 | 0.395 | 253.252 |
| 5:30:00 PM | 11.214 | 0.408 | 263.545 |
| 5:45:00 PM | 11.299 | 0.621 | 397.572 |
| 6:00:00 PM | 11.386 | 0.631 | 411.829 |
| 6:15:00 PM | 11.32 | 0.57 | 367.614 |
| 6:30:00 PM | 11.267 | 0.689 | 446.799 |
| 6:45:00 PM | 11.277 | 0.431 | 280.261 |
| 7:00:00 PM | 11.249 | 0.62 | 402.337 |
| 7:15:00 PM | 11.123 | 0.474 | 303.062 |
| 7:30:00 PM | 11.285 | 0.73 | 470.032 |
| 7:45:00 PM | 11.229 | 0.539 | 345.056 |
| 8:00:00 PM | 11.043 | 0.672 | 419.319 |
| 8:15:00 PM | 11.058 | 0.379 | 240.006 |
| 8:30:00 PM | 11.084 | 0.402 | 255.71 |
| 8:45:00 PM | 11.112 | 0.377 | 240.425 |
| 9:00:00 PM | 11.24 | 0.417 | 269.479 |
| 9:15:00 PM | 11.044 | 0.382 | 239.314 |
| 9:30:00 PM | 11.108 | 0.644 | 411.42 |
| 9:45:00 PM | 11.228 | 0.741 | 479.334 |
| 10:00:00 PM | 11.195 | 0.631 | 404.698 |
| 10:15:00 PM | 11.068 | 0.709 | 450.5 |
| 10:30:00 PM | 11.175 | 0 | 385.39 |
| 10:45:00 PM | 11.156 | 0.457 | 293.27 |
| 11:00:00 PM | 11.077 | 0.527 | 334.896 |
| 11:15:00 PM | 10.952 | 0.584 | 366.107 |
| 11:30:00 PM | 10.791 | 0.496 | 304.227 |
| 11:45:00 PM | 10.72 | 0.303 | 302.156 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.740 | 0.490 | 312.535 |
| Daily Min: | 9.005 | 0 | 130.419 |
| Daily Max: | 12.066 | 0.825 | 573.74 |
| Peak to Avg: | | | 1.84 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/23/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Sunday - A.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.568 | 0.548 | 327.576 |
| 12:15:00 AM | 10.568 | 0.429 | 254.559 |
| 12:30:00 AM | 10.347 | 0.253 | 249.379 |
| 12:45:00 AM | 10.269 | 0.6 | 345.507 |
| 1:00:00 AM | 10.231 | 0.426 | 242.282 |
| 1:15:00 AM | 10.089 | 0.472 | 261.903 |
| 1:30:00 AM | 9.903 | 0.441 | 241.982 |
| 1:45:00 AM | 9.821 | 0.442 | 239.386 |
| 2:00:00 AM | 9.724 | 0.255 | 136.573 |
| 2:15:00 AM | 9.811 | 0.395 | 211.2 |
| 2:30:00 AM | 9.759 | 0.408 | 216.179 |
| 2:45:00 AM | 9.473 | 0.398 | 204.938 |
| 3:00:00 AM | 9.352 | 0.361 | 183.269 |
| 3:15:00 AM | 9.351 | 0.374 | 188.754 |
| 3:30:00 AM | 9.264 | 0.342 | 171.931 |
| 3:45:00 AM | 9.281 | 0.359 | 178.871 |
| 4:00:00 AM | 9.204 | 0.361 | 179.605 |
| 4:15:00 AM | 9.209 | 0.329 | 164.087 |
| 4:30:00 AM | 9.189 | 0.304 | 149.748 |
| 4:45:00 AM | 8.995 | 0.305 | 146.332 |
| 5:00:00 AM | 9.069 | 0.329 | 160.134 |
| 5:15:00 AM | 9.149 | 0.333 | 164.512 |
| 5:30:00 AM | 9.18 | 0.334 | 165.268 |
| 5:45:00 AM | 9.01 | 0.311 | 149.944 |
| 6:00:00 AM | 9.15 | 0.324 | 159.956 |
| 6:15:00 AM | 9.169 | 0.302 | 148.074 |
| 6:30:00 AM | 9.253 | 0.301 | 146.699 |
| 6:45:00 AM | 9.286 | 0.188 | 114.499 |
| 7:00:00 AM | 9.239 | 0.389 | 194.562 |
| 7:15:00 AM | 9.405 | 0.344 | 176.144 |
| 7:30:00 AM | 9.53 | 0.388 | 200.596 |
| 7:45:00 AM | 9.56 | 0.393 | 206.066 |
| 8:00:00 AM | 9.693 | 0.265 | 141.394 |
| 8:15:00 AM | 9.814 | 0.482 | 261.589 |
| 8:30:00 AM | 10.123 | 0.31 | 173.398 |
| 8:45:00 AM | 10.442 | 0.31 | 182.766 |
| 9:00:00 AM | 10.793 | 0.385 | 236.705 |
| 9:15:00 AM | 10.908 | 0.374 | 232.847 |
| 9:30:00 AM | 11.023 | 0.631 | 398.58 |
| 9:45:00 AM | 11.176 | 0.342 | 217.976 |
| 10:00:00 AM | 11.591 | 0.53 | 357.397 |
| 10:15:00 AM | 11.563 | 0.378 | 356.288 |
| 10:30:00 AM | 11.507 | 0.633 | 423.179 |
| 10:45:00 AM | 11.569 | 0.769 | 517.298 |
| 11:00:00 AM | 11.655 | 0.772 | 524.537 |
| 11:15:00 AM | 11.657 | 0.765 | 519.318 |
| 11:30:00 AM | 11.811 | 0.424 | 290.629 |
| 11:45:00 AM | 11.745 | 0.747 | 512.572 |

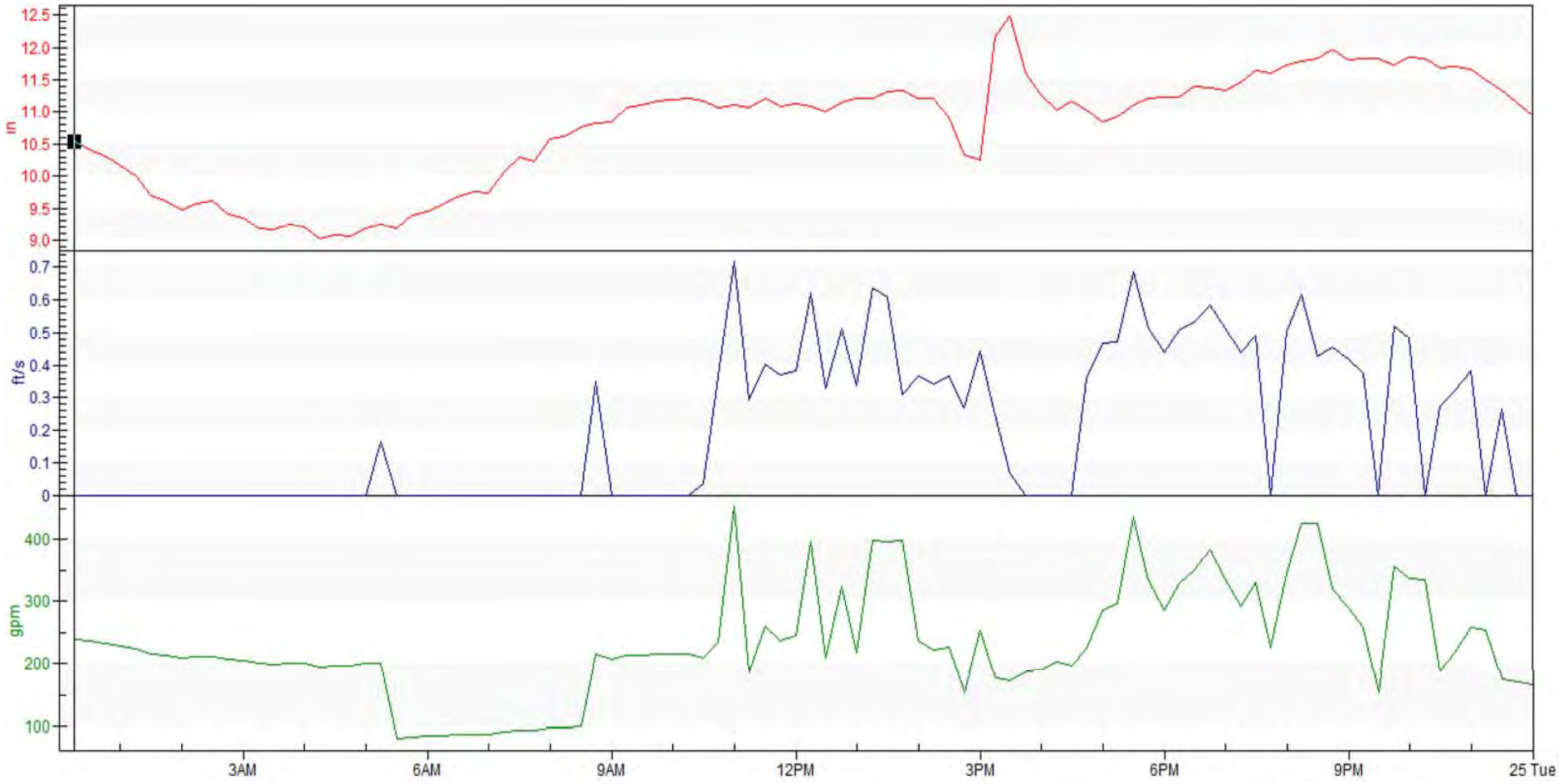
**Sunday - P.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.67 | 0.838 | 567.821 |
| 12:15:00 PM | 11.656 | 0.765 | 517.351 |
| 12:30:00 PM | 11.535 | 0.768 | 514.977 |
| 12:45:00 PM | 11.848 | 0.378 | 261.641 |
| 1:00:00 PM | 11.929 | 0.359 | 251.328 |
| 1:15:00 PM | 11.617 | 0.435 | 294.497 |
| 1:30:00 PM | 11.604 | 0.677 | 451.163 |
| 1:45:00 PM | 11.416 | 0.568 | 374.245 |
| 2:00:00 PM | 11.415 | 0.411 | 271.9 |
| 2:15:00 PM | 11.429 | 0.48 | 317.636 |
| 2:30:00 PM | 11.361 | 0.827 | 539.333 |
| 2:45:00 PM | 11.293 | 0.668 | 433.4 |
| 3:00:00 PM | 11.26 | 0.387 | 251.659 |
| 3:15:00 PM | 11.214 | 0.029 | 223.869 |
| 3:30:00 PM | 11.126 | 0.251 | 235.422 |
| 3:45:00 PM | 11.175 | 0.366 | 235.209 |
| 4:00:00 PM | 11.199 | 0.636 | 410.646 |
| 4:15:00 PM | 11.249 | 0.512 | 383.144 |
| 4:30:00 PM | 11.234 | 0 | 301.893 |
| 4:45:00 PM | 10.994 | 0.466 | 293.252 |
| 5:00:00 PM | 11.128 | 0.576 | 368.769 |
| 5:15:00 PM | 11.056 | 0.413 | 262.258 |
| 5:30:00 PM | 11.04 | 0.429 | 271.22 |
| 5:45:00 PM | 10.993 | 0 | 251.43 |
| 6:00:00 PM | 10.987 | 0 | 251.245 |
| 6:15:00 PM | 11.095 | 0 | 254.465 |
| 6:30:00 PM | 11.095 | 0.053 | 254.303 |
| 6:45:00 PM | 11.036 | 0.343 | 235.422 |
| 7:00:00 PM | 11.233 | 0.362 | 233.149 |
| 7:15:00 PM | 11.201 | 0.335 | 214.802 |
| 7:30:00 PM | 11.17 | 0.663 | 421.186 |
| 7:45:00 PM | 11.221 | 0.376 | 242.365 |
| 8:00:00 PM | 11.231 | 0.382 | 247.355 |
| 8:15:00 PM | 11.165 | 0.389 | 247.731 |
| 8:30:00 PM | 11.088 | 0.36 | 229.157 |
| 8:45:00 PM | 11.323 | 0.731 | 478.106 |
| 9:00:00 PM | 11.545 | 0.681 | 453.628 |
| 9:15:00 PM | 11.547 | 0.37 | 247.154 |
| 9:30:00 PM | 11.527 | 0.688 | 458.041 |
| 9:45:00 PM | 11.492 | 0.58 | 386.023 |
| 10:00:00 PM | 11.566 | 0.728 | 488.191 |
| 10:15:00 PM | 11.542 | 0.392 | 263.202 |
| 10:30:00 PM | 11.608 | 0.403 | 272.048 |
| 10:45:00 PM | 11.627 | 0 | 272.617 |
| 11:00:00 PM | 11.448 | 0 | 267.231 |
| 11:15:00 PM | 11.235 | 0 | 260.836 |
| 11:30:00 PM | 11.083 | 0 | 256.266 |
| 11:45:00 PM | 10.938 | 0 | 251.908 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.688 | 0.404 | 281.788 |
| Daily Min: | 8.995 | 0 | 114.499 |
| Daily Max: | 11.929 | 0.838 | 567.821 |
| Peak to Avg: | | | 2.02 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/24/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Monday - A.M. 7/24/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 10.697 | 0 | 244.707 |
| 12:15:00 AM | 10.53 | 0 | 239.71 |
| 12:30:00 AM | 10.424 | 0 | 236.543 |
| 12:45:00 AM | 10.304 | 0 | 232.94 |
| 1:00:00 AM | 10.174 | 0 | 229.066 |
| 1:15:00 AM | 10.003 | 0 | 223.99 |
| 1:30:00 AM | 9.689 | 0 | 214.691 |
| 1:45:00 AM | 9.619 | 0 | 212.617 |
| 2:00:00 AM | 9.465 | 0 | 208.078 |
| 2:15:00 AM | 9.566 | 0 | 211.072 |
| 2:30:00 AM | 9.604 | 0 | 212.176 |
| 2:45:00 AM | 9.413 | 0 | 206.544 |
| 3:00:00 AM | 9.344 | 0 | 204.519 |
| 3:15:00 AM | 9.183 | 0 | 199.803 |
| 3:30:00 AM | 9.166 | 0 | 199.307 |
| 3:45:00 AM | 9.237 | 0 | 201.387 |
| 4:00:00 AM | 9.197 | 0 | 200.219 |
| 4:15:00 AM | 9.018 | 0 | 194.98 |
| 4:30:00 AM | 9.077 | 0 | 196.702 |
| 4:45:00 AM | 9.06 | 0 | 196.22 |
| 5:00:00 AM | 9.173 | 0 | 199.517 |
| 5:15:00 AM | 9.237 | 0.164 | 201.399 |
| 5:30:00 AM | 9.187 | 0 | 81.59 |
| 5:45:00 AM | 9.387 | 0 | 83.981 |
| 6:00:00 AM | 9.459 | 0 | 84.853 |
| 6:15:00 AM | 9.544 | 0 | 85.869 |
| 6:30:00 AM | 9.674 | 0 | 87.437 |
| 6:45:00 AM | 9.761 | 0 | 88.482 |
| 7:00:00 AM | 9.74 | 0 | 88.226 |
| 7:15:00 AM | 10.066 | 0 | 92.173 |
| 7:30:00 AM | 10.288 | 0 | 94.877 |
| 7:45:00 AM | 10.234 | 0 | 94.216 |
| 8:00:00 AM | 10.572 | 0 | 98.338 |
| 8:15:00 AM | 10.612 | 0 | 98.827 |
| 8:30:00 AM | 10.765 | 0 | 100.696 |
| 8:45:00 AM | 10.817 | 0.35 | 215.917 |
| 9:00:00 AM | 10.848 | 0 | 207.029 |
| 9:15:00 AM | 11.079 | 0 | 212.804 |
| 9:30:00 AM | 11.115 | 0 | 213.694 |
| 9:45:00 AM | 11.176 | 0 | 215.225 |
| 10:00:00 AM | 11.185 | 0 | 215.437 |
| 10:15:00 AM | 11.207 | 0 | 215.982 |
| 10:30:00 AM | 11.169 | 0.034 | 208.474 |
| 10:45:00 AM | 11.069 | 0.368 | 233.876 |
| 11:00:00 AM | 11.106 | 0.717 | 453.845 |
| 11:15:00 AM | 11.073 | 0.294 | 185.051 |
| 11:30:00 AM | 11.22 | 0.402 | 260.141 |
| 11:45:00 AM | 11.089 | 0.372 | 236.901 |

**Monday - P.M. 7/24/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.138 | 0.384 | 245.678 |
| 12:15:00 PM | 11.09 | 0.622 | 396.127 |
| 12:30:00 PM | 11.01 | 0.331 | 208.776 |
| 12:45:00 PM | 11.159 | 0.51 | 324.131 |
| 1:00:00 PM | 11.216 | 0.337 | 216.732 |
| 1:15:00 PM | 11.21 | 0.639 | 399.944 |
| 1:30:00 PM | 11.313 | 0.607 | 396.873 |
| 1:45:00 PM | 11.342 | 0.309 | 398.159 |
| 2:00:00 PM | 11.217 | 0.366 | 236.354 |
| 2:15:00 PM | 11.209 | 0.344 | 221.441 |
| 2:30:00 PM | 10.907 | 0.364 | 227.046 |
| 2:45:00 PM | 10.33 | 0.27 | 154.547 |
| 3:00:00 PM | 10.241 | 0.443 | 253.854 |
| 3:15:00 PM | 12.156 | 0.248 | 177.557 |
| 3:30:00 PM | 12.487 | 0.066 | 172.544 |
| 3:45:00 PM | 11.611 | 0 | 188.712 |
| 4:00:00 PM | 11.276 | 0 | 190.509 |
| 4:15:00 PM | 11.024 | 0 | 203.084 |
| 4:30:00 PM | 11.172 | 0 | 195.898 |
| 4:45:00 PM | 11.038 | 0.357 | 223.727 |
| 5:00:00 PM | 10.845 | 0.466 | 286.089 |
| 5:15:00 PM | 10.933 | 0.473 | 295.572 |
| 5:30:00 PM | 11.118 | 0.685 | 437.05 |
| 5:45:00 PM | 11.217 | 0.517 | 334.524 |
| 6:00:00 PM | 11.229 | 0.44 | 284.976 |
| 6:15:00 PM | 11.226 | 0.508 | 328.332 |
| 6:30:00 PM | 11.397 | 0.532 | 350.753 |
| 6:45:00 PM | 11.381 | 0.586 | 384.797 |
| 7:00:00 PM | 11.335 | 0.518 | 336.344 |
| 7:15:00 PM | 11.47 | 0.438 | 291.576 |
| 7:30:00 PM | 11.654 | 0.491 | 331.287 |
| 7:45:00 PM | 11.602 | 0 | 226.122 |
| 8:00:00 PM | 11.725 | 0.505 | 345.375 |
| 8:15:00 PM | 11.786 | 0.618 | 425.848 |
| 8:30:00 PM | 11.824 | 0.427 | 427.564 |
| 8:45:00 PM | 11.966 | 0.455 | 319.237 |
| 9:00:00 PM | 11.808 | 0.42 | 289.76 |
| 9:15:00 PM | 11.827 | 0.375 | 257.88 |
| 9:30:00 PM | 11.824 | 0 | 154.073 |
| 9:45:00 PM | 11.723 | 0.522 | 357.073 |
| 10:00:00 PM | 11.859 | 0.484 | 335.972 |
| 10:15:00 PM | 11.833 | 0 | 335.034 |
| 10:30:00 PM | 11.689 | 0.274 | 186.743 |
| 10:45:00 PM | 11.704 | 0.321 | 218.296 |
| 11:00:00 PM | 11.667 | 0.381 | 257.696 |
| 11:15:00 PM | 11.512 | 0 | 253.027 |
| 11:30:00 PM | 11.343 | 0.265 | 173.904 |
| 11:45:00 PM | 11.146 | 0 | 170.02 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.744 | 0.206 | 232.653 |
| Daily Min: | 9.018 | 0 | 81.59 |
| Daily Max: | 12.487 | 0.717 | 453.845 |
| Peak to Avg: | | | 1.95 |

DRAFT

# Sewer Line Flow Study Summary

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Pipe Size: **24" VCP**
Time Period: **7/11/2023, 12:00 a.m. - 7/25/2023, 12:00 a.m.**

## Level - Inches

| | |
|---|---|
| Average: | 10.757 |
| Maximum: | 12.487 |
| Minimum: | 8.904 |
| Max d/D: | 52.0% |

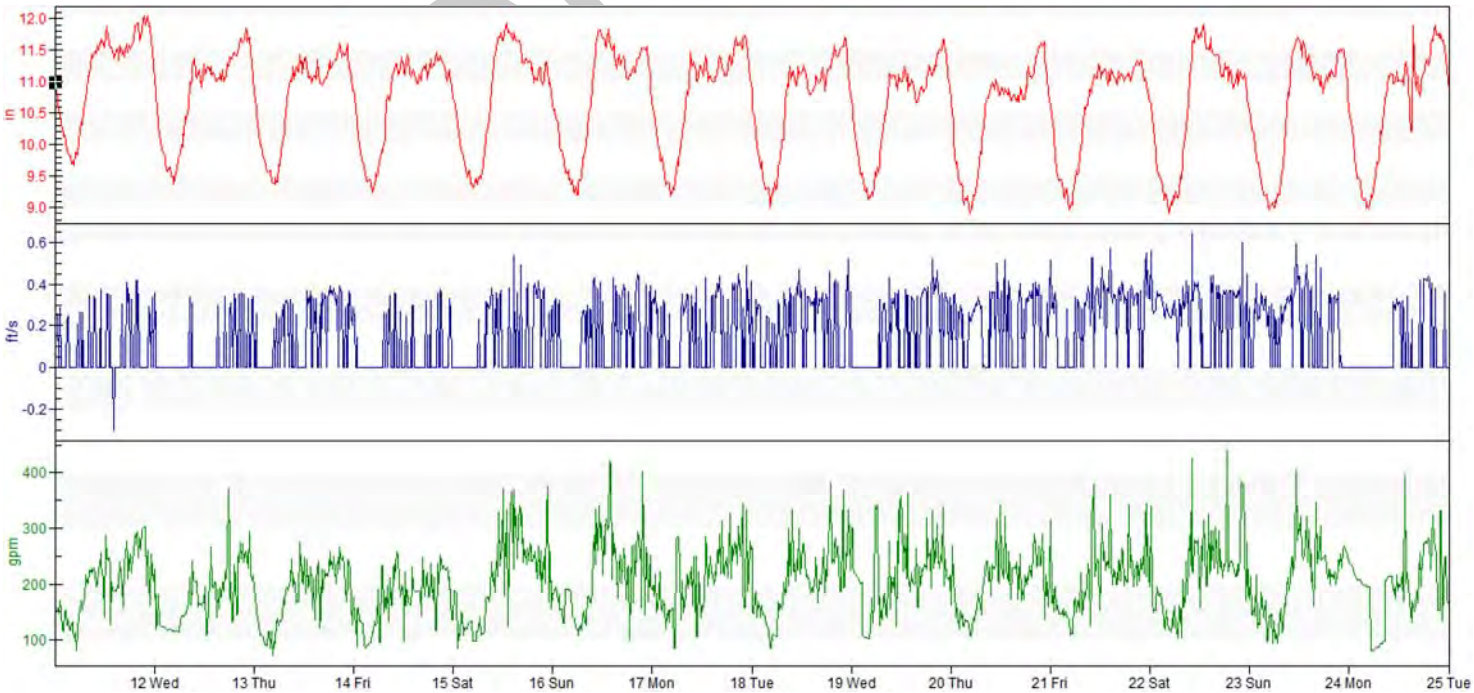
## Velocity - Feet per Second

| | |
|---|---|
| Average: | 0.258 |
| Maximum: | 0.838 |
| Minimum: | 0.194 |

## Flow Rate - Gallons Per Minute

| | |
|---|---|
| Average: | 228.388 |
| Maximum:: | 573.740 |
| Minimum: | 73.413 |
| Peak to Average | 1.70 |

DRAFT




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

# CITY OF SANTA PAULA - SEWER FLOW STUDY

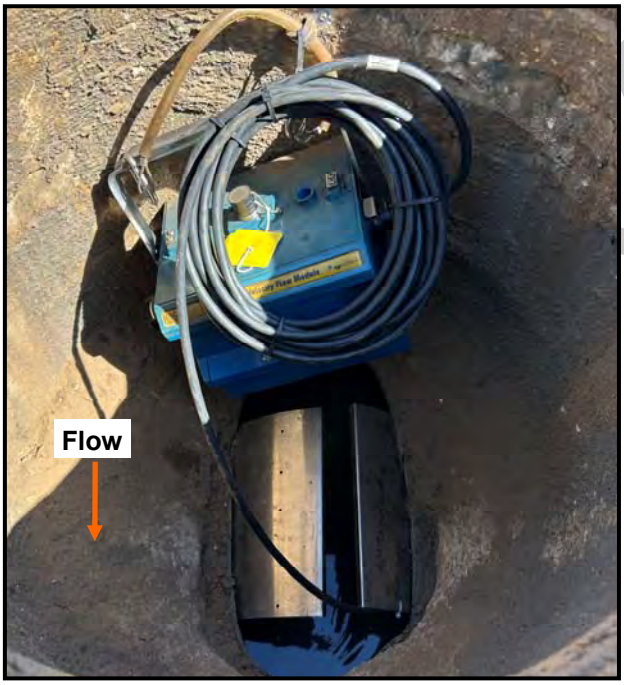
MH Location: **224 S. Palm Ave.**
**Santa Paula, CA 93060**

Pipe Size: **15" VCP**

Time Period: **7/11/2023 - 12:00 a.m. to**
**7/25/2023- 12:00 a.m.**

GPS: **34.347765, -119.070200**

## Manhole - Layout




- This is a very shallow manhole, top of the VCP line is not fully opened, a special spring ring was required to install the meter inside of this line.

## Equipment

**Teledyne Isco 2150 Area Velocity Flow Meter with 10' measuring range:**
**Level Measurement:**

- Method - Submerged pressure transducer mounted in the flow stream
- Transducer Type - Differential linear integrated circuit pressure transducer
- Range (standard) 0.033 to 10 ft (0.010 to 3.05 m); Maximum Allowable Level 34 ft (10.5 m)
- Accuracy ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m,)
- Long-Term Stability ±0.023 ft/yr (±0.007 m/yr)
- Compensated Range 32° to 122°F (0° to 50°C)

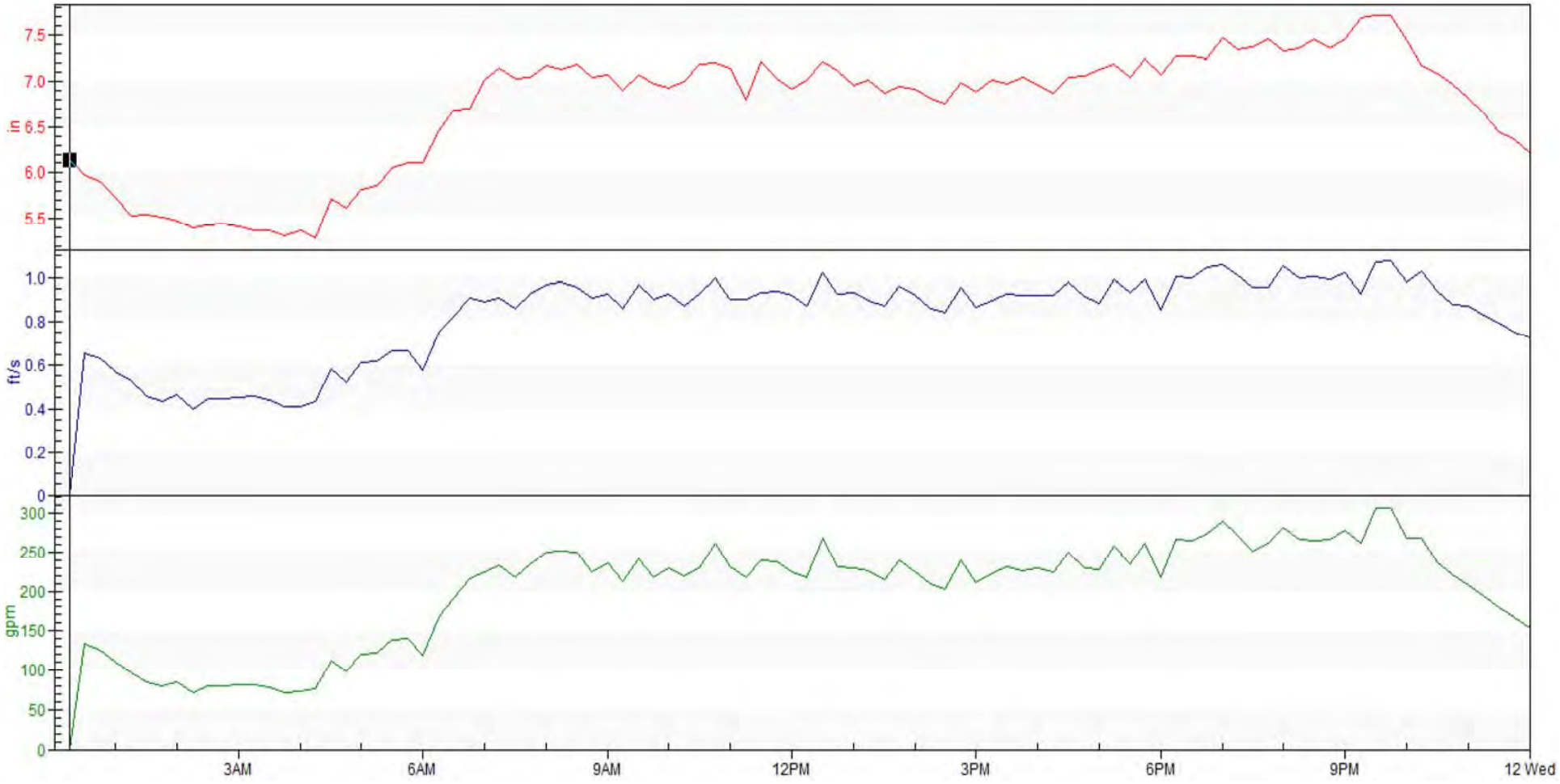
**Velocity Measurement:**

- Method - Doppler ultrasonic, frequency 500 kHz
- Typical Minimum Depth 0.08 ft (25 mm)
- Range -5 to +20 ft/s (-1.5 to +6.1 m/s)
- Accuracy (in water with uniform velocity profile, speed of sound = 4850 ft/s, for indicated velocity range) ±0.1 ft/s from -5 to 5 ft/s (±0.03 m/s from— 1.5 to +1.5 m/s)
- ±2% of reading from 5 to 20 ft/s (1.5 to 6.1 m/s)

**Method Of Insertion:**

- 15 inch line did not require Confined Space Entry.

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/11/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Tuesday- A.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| | | | |
| 12:15:00 AM | 6.129 | 0 | 0 |
| 12:30:00 AM | 5.972 | 0.654 | 133.776 |
| 12:45:00 AM | 5.902 | 0.627 | 126.011 |
| 1:00:00 AM | 5.736 | 0.569 | 110.265 |
| 1:15:00 AM | 5.533 | 0.525 | 96.839 |
| 1:30:00 AM | 5.551 | 0.46 | 85.299 |
| 1:45:00 AM | 5.518 | 0.433 | 79.378 |
| 2:00:00 AM | 5.473 | 0.464 | 84.43 |
| 2:15:00 AM | 5.398 | 0.4 | 71.144 |
| 2:30:00 AM | 5.426 | 0.449 | 80.336 |
| 2:45:00 AM | 5.448 | 0.448 | 80.332 |
| 3:00:00 AM | 5.412 | 0.455 | 81.402 |
| 3:15:00 AM | 5.376 | 0.458 | 81.242 |
| 3:30:00 AM | 5.374 | 0.438 | 77.732 |
| 3:45:00 AM | 5.308 | 0.412 | 71.675 |
| 4:00:00 AM | 5.374 | 0.41 | 72.758 |
| 4:15:00 AM | 5.285 | 0.437 | 75.718 |
| 4:30:00 AM | 5.725 | 0.579 | 111.905 |
| 4:45:00 AM | 5.624 | 0.517 | 97.557 |
| 5:00:00 AM | 5.821 | 0.609 | 120.274 |
| 5:15:00 AM | 5.857 | 0.615 | 122.047 |
| 5:30:00 AM | 6.054 | 0.664 | 138.335 |
| 5:45:00 AM | 6.114 | 0.666 | 140.414 |
| 6:00:00 AM | 6.105 | 0.572 | 119.231 |
| 6:15:00 AM | 6.46 | 0.749 | 166.732 |
| 6:30:00 AM | 6.685 | 0.826 | 190.249 |
| 6:45:00 AM | 6.702 | 0.906 | 215.71 |
| 7:00:00 AM | 7.008 | 0.888 | 224.237 |
| 7:15:00 AM | 7.147 | 0.906 | 232.467 |
| 7:30:00 AM | 7.028 | 0.861 | 218.19 |
| 7:45:00 AM | 7.045 | 0.927 | 234.658 |
| 8:00:00 AM | 7.172 | 0.97 | 249.226 |
| 8:15:00 AM | 7.127 | 0.981 | 251.751 |
| 8:30:00 AM | 7.188 | 0.954 | 248.92 |
| 8:45:00 AM | 7.039 | 0.905 | 224.595 |
| 9:00:00 AM | 7.067 | 0.925 | 236.087 |
| 9:15:00 AM | 6.898 | 0.861 | 213.012 |
| 9:30:00 AM | 7.071 | 0.969 | 241.544 |
| 9:45:00 AM | 6.975 | 0.9 | 217.589 |
| 10:00:00 AM | 6.933 | 0.925 | 230.365 |
| 10:15:00 AM | 7.007 | 0.871 | 219.704 |
| 10:30:00 AM | 7.192 | 0.925 | 229.825 |
| 10:45:00 AM | 7.203 | 1 | 261.612 |
| 11:00:00 AM | 7.141 | 0.903 | 231.434 |
| 11:15:00 AM | 6.801 | 0.903 | 218.507 |
| 11:30:00 AM | 7.223 | 0.935 | 239.633 |
| 11:45:00 AM | 7.03 | 0.941 | 238.623 |

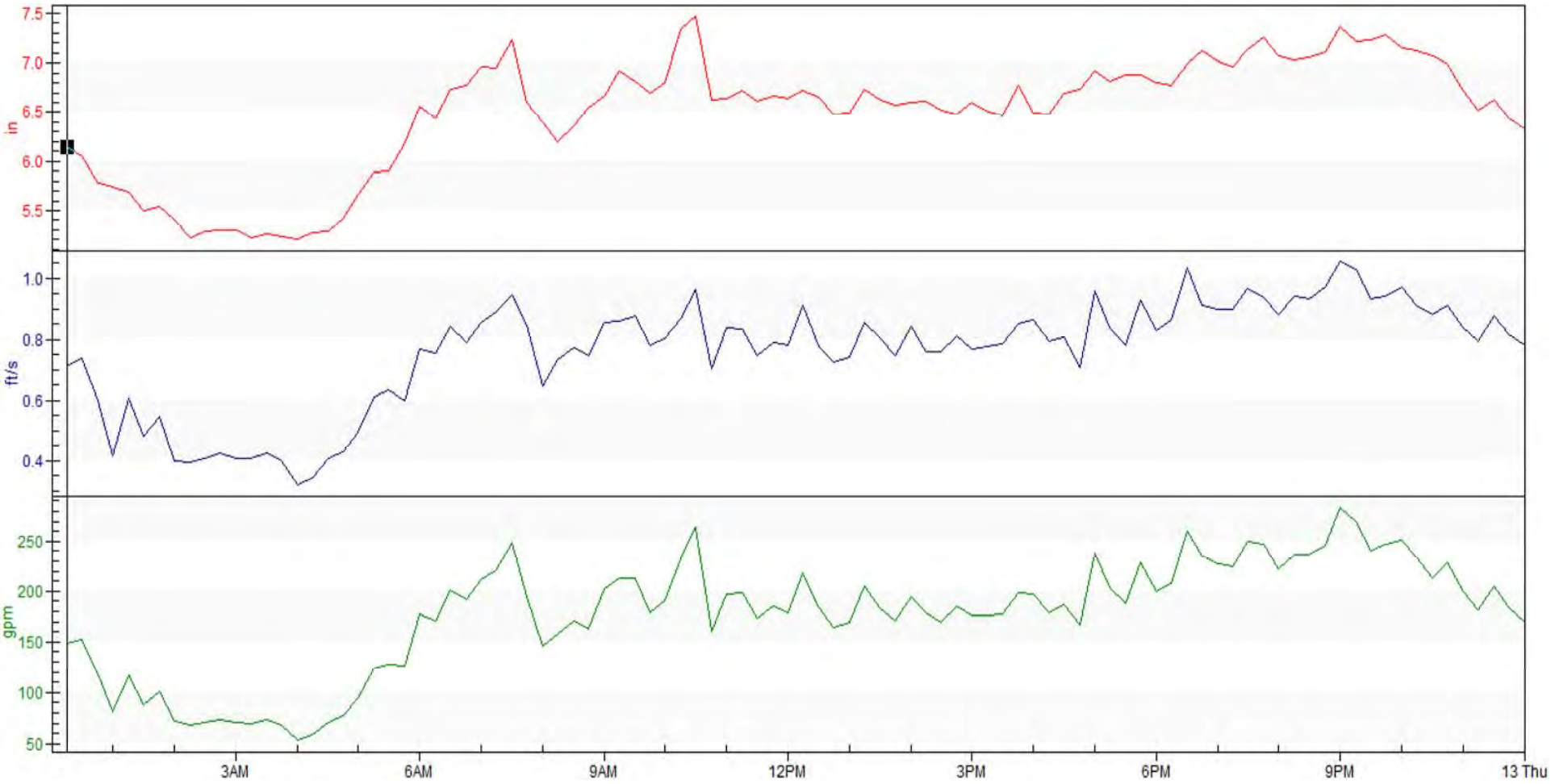
**Tuesday- P.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.912 | 0.918 | 223.882 |
| 12:15:00 PM | 7.016 | 0.87 | 217.385 |
| 12:30:00 PM | 7.217 | 1.024 | 268.509 |
| 12:45:00 PM | 7.111 | 0.925 | 230.476 |
| 1:00:00 PM | 6.964 | 0.936 | 228.964 |
| 1:15:00 PM | 7.013 | 0.893 | 225.676 |
| 1:30:00 PM | 6.87 | 0.873 | 214.799 |
| 1:45:00 PM | 6.94 | 0.961 | 239.509 |
| 2:00:00 PM | 6.919 | 0.923 | 225.227 |
| 2:15:00 PM | 6.806 | 0.859 | 208.814 |
| 2:30:00 PM | 6.757 | 0.843 | 202.249 |
| 2:45:00 PM | 6.982 | 0.954 | 239.733 |
| 3:00:00 PM | 6.881 | 0.866 | 210.973 |
| 3:15:00 PM | 7.013 | 0.899 | 222.758 |
| 3:30:00 PM | 6.978 | 0.928 | 230.863 |
| 3:45:00 PM | 7.04 | 0.922 | 226.783 |
| 4:00:00 PM | 6.955 | 0.919 | 229.609 |
| 4:15:00 PM | 6.877 | 0.918 | 225.108 |
| 4:30:00 PM | 7.049 | 0.981 | 249.531 |
| 4:45:00 PM | 7.057 | 0.917 | 229.938 |
| 5:00:00 PM | 7.129 | 0.884 | 228.185 |
| 5:15:00 PM | 7.194 | 0.991 | 258.857 |
| 5:30:00 PM | 7.037 | 0.932 | 234.978 |
| 5:45:00 PM | 7.25 | 0.994 | 261.801 |
| 6:00:00 PM | 7.07 | 0.855 | 218.135 |
| 6:15:00 PM | 7.271 | 1.007 | 266.313 |
| 6:30:00 PM | 7.281 | 1 | 265.151 |
| 6:45:00 PM | 7.245 | 1.05 | 272.794 |
| 7:00:00 PM | 7.475 | 1.06 | 290.696 |
| 7:15:00 PM | 7.348 | 1.014 | 272.067 |
| 7:30:00 PM | 7.37 | 0.955 | 252.058 |
| 7:45:00 PM | 7.46 | 0.956 | 261.477 |
| 8:00:00 PM | 7.329 | 1.056 | 281.756 |
| 8:15:00 PM | 7.363 | 0.997 | 265.869 |
| 8:30:00 PM | 7.461 | 1.005 | 265.666 |
| 8:45:00 PM | 7.363 | 0.995 | 266.421 |
| 9:00:00 PM | 7.464 | 1.025 | 278.616 |
| 9:15:00 PM | 7.685 | 0.926 | 260.758 |
| 9:30:00 PM | 7.72 | 1.074 | 306.682 |
| 9:45:00 PM | 7.721 | 1.076 | 307.546 |
| 10:00:00 PM | 7.453 | 0.984 | 267.989 |
| 10:15:00 PM | 7.168 | 1.03 | 267.694 |
| 10:30:00 PM | 7.086 | 0.936 | 236.752 |
| 10:45:00 PM | 6.975 | 0.878 | 220.356 |
| 11:00:00 PM | 6.813 | 0.873 | 207.581 |
| 11:15:00 PM | 6.653 | 0.827 | 194.995 |
| 11:30:00 PM | 6.441 | 0.795 | 179.633 |
| 11:45:00 PM | 6.368 | 0.751 | 167.312 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.718 | 0.822 | 201.070 |
| Daily Min: | 5.285 | 0 | 0 |
| Daily Max: | 7.721 | 1.076 | 307.546 |
| Peak to Avg: | | | 1.53 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/12/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Wednesday - A.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.201 | 0.724 | 153.448 |
| 12:15:00 AM | 6.14 | 0.712 | 149.048 |
| 12:30:00 AM | 6.043 | 0.736 | 152.973 |
| 12:45:00 AM | 5.787 | 0.6 | 117.546 |
| 1:00:00 AM | 5.738 | 0.417 | 80.737 |
| 1:15:00 AM | 5.687 | 0.607 | 116.151 |
| 1:30:00 AM | 5.504 | 0.482 | 87.292 |
| 1:45:00 AM | 5.535 | 0.547 | 101.051 |
| 2:00:00 AM | 5.412 | 0.4 | 71.655 |
| 2:15:00 AM | 5.219 | 0.397 | 67.656 |
| 2:30:00 AM | 5.28 | 0.41 | 70.956 |
| 2:45:00 AM | 5.302 | 0.426 | 73.419 |
| 3:00:00 AM | 5.298 | 0.408 | 70.965 |
| 3:15:00 AM | 5.222 | 0.407 | 69.449 |
| 3:30:00 AM | 5.263 | 0.425 | 72.922 |
| 3:45:00 AM | 5.237 | 0.401 | 68.06 |
| 4:00:00 AM | 5.204 | 0.321 | 53.885 |
| 4:15:00 AM | 5.275 | 0.344 | 59.362 |
| 4:30:00 AM | 5.291 | 0.407 | 70.691 |
| 4:45:00 AM | 5.424 | 0.43 | 77.227 |
| 5:00:00 AM | 5.663 | 0.494 | 94.141 |
| 5:15:00 AM | 5.887 | 0.614 | 123.092 |
| 5:30:00 AM | 5.898 | 0.634 | 127.401 |
| 5:45:00 AM | 6.182 | 0.6 | 125.935 |
| 6:00:00 AM | 6.563 | 0.769 | 177.434 |
| 6:15:00 AM | 6.438 | 0.755 | 170.475 |
| 6:30:00 AM | 6.731 | 0.843 | 201.108 |
| 6:45:00 AM | 6.78 | 0.792 | 191.426 |
| 7:00:00 AM | 6.959 | 0.855 | 211.363 |
| 7:15:00 AM | 6.95 | 0.888 | 220.603 |
| 7:30:00 AM | 7.236 | 0.945 | 248.607 |
| 7:45:00 AM | 6.596 | 0.848 | 194.717 |
| 8:00:00 AM | 6.401 | 0.649 | 145.454 |
| 8:15:00 AM | 6.198 | 0.733 | 157.427 |
| 8:30:00 AM | 6.356 | 0.771 | 171.267 |
| 8:45:00 AM | 6.546 | 0.745 | 162.888 |
| 9:00:00 AM | 6.666 | 0.855 | 202.083 |
| 9:15:00 AM | 6.92 | 0.859 | 213.373 |
| 9:30:00 AM | 6.812 | 0.877 | 213.362 |
| 9:45:00 AM | 6.694 | 0.783 | 178.437 |
| 10:00:00 AM | 6.805 | 0.802 | 191.08 |
| 10:15:00 AM | 7.342 | 0.868 | 232.563 |
| 10:30:00 AM | 7.473 | 0.963 | 264.026 |
| 10:45:00 AM | 6.624 | 0.703 | 160.723 |
| 11:00:00 AM | 6.642 | 0.838 | 197.256 |
| 11:15:00 AM | 6.723 | 0.835 | 198.306 |
| 11:30:00 AM | 6.619 | 0.747 | 173.973 |
| 11:45:00 AM | 6.661 | 0.788 | 185.673 |

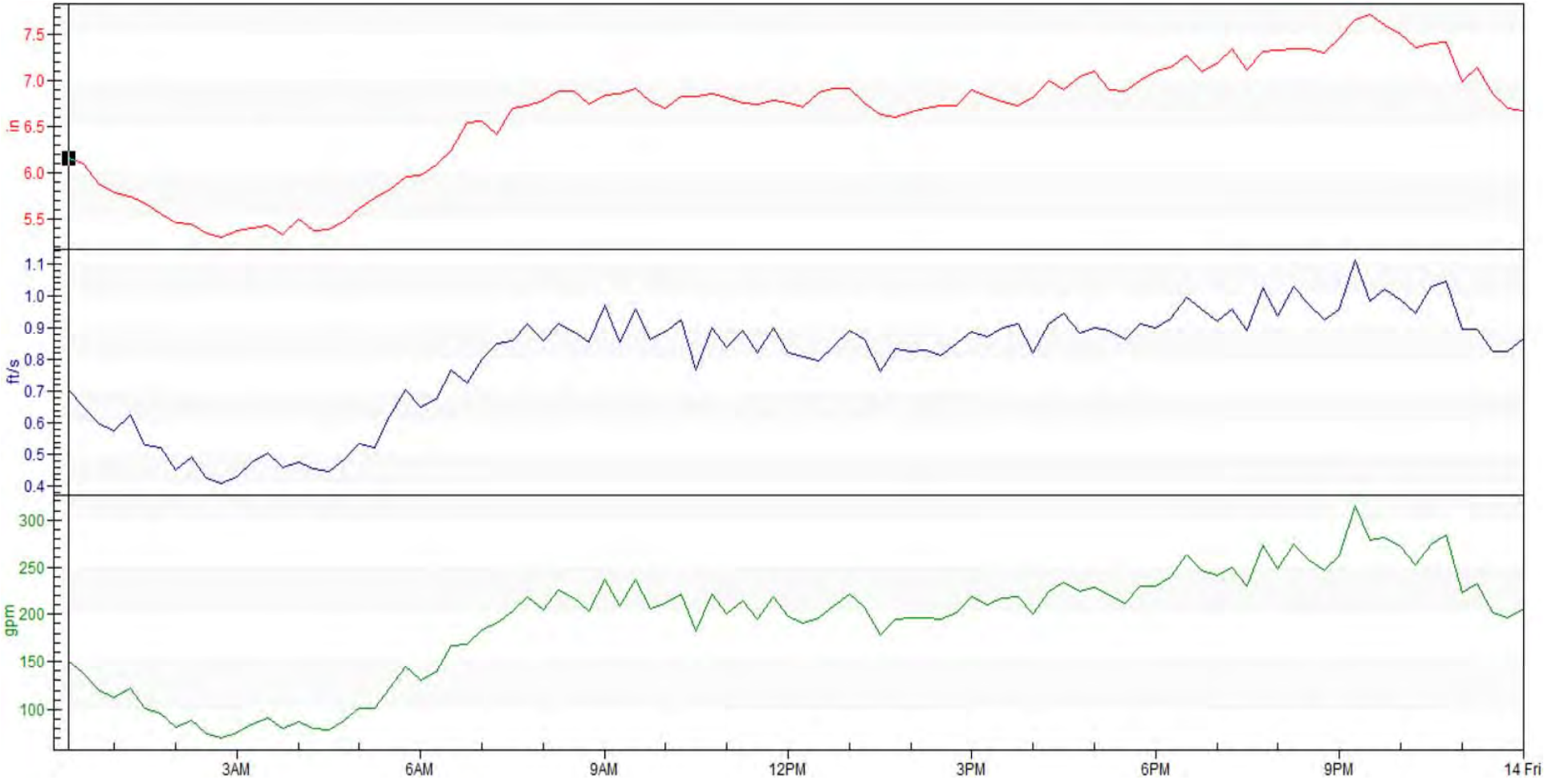
**Wednesday - P.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.638 | 0.783 | 178.56 |
| 12:15:00 PM | 6.717 | 0.913 | 217.571 |
| 12:30:00 PM | 6.653 | 0.778 | 183.382 |
| 12:45:00 PM | 6.475 | 0.725 | 164.208 |
| 1:00:00 PM | 6.488 | 0.741 | 169.077 |
| 1:15:00 PM | 6.73 | 0.854 | 204.556 |
| 1:30:00 PM | 6.631 | 0.801 | 182.976 |
| 1:45:00 PM | 6.568 | 0.747 | 171.13 |
| 2:00:00 PM | 6.596 | 0.843 | 194.916 |
| 2:15:00 PM | 6.619 | 0.761 | 178.354 |
| 2:30:00 PM | 6.521 | 0.758 | 169.743 |
| 2:45:00 PM | 6.485 | 0.814 | 185.599 |
| 3:00:00 PM | 6.596 | 0.769 | 175.444 |
| 3:15:00 PM | 6.51 | 0.775 | 176.371 |
| 3:30:00 PM | 6.468 | 0.787 | 176.716 |
| 3:45:00 PM | 6.771 | 0.852 | 198.218 |
| 4:00:00 PM | 6.492 | 0.863 | 197.038 |
| 4:15:00 PM | 6.475 | 0.796 | 178.353 |
| 4:30:00 PM | 6.689 | 0.808 | 187.203 |
| 4:45:00 PM | 6.734 | 0.709 | 166.941 |
| 5:00:00 PM | 6.921 | 0.961 | 238.564 |
| 5:15:00 PM | 6.817 | 0.837 | 203.779 |
| 5:30:00 PM | 6.881 | 0.783 | 188.012 |
| 5:45:00 PM | 6.88 | 0.93 | 229.106 |
| 6:00:00 PM | 6.799 | 0.83 | 200.057 |
| 6:15:00 PM | 6.781 | 0.865 | 207.122 |
| 6:30:00 PM | 6.99 | 1.032 | 259.715 |
| 6:45:00 PM | 7.126 | 0.913 | 235.415 |
| 7:00:00 PM | 7.019 | 0.898 | 227.075 |
| 7:15:00 PM | 6.961 | 0.9 | 225.138 |
| 7:30:00 PM | 7.135 | 0.969 | 250.334 |
| 7:45:00 PM | 7.251 | 0.939 | 247.769 |
| 8:00:00 PM | 7.076 | 0.882 | 221.891 |
| 8:15:00 PM | 7.033 | 0.942 | 236.848 |
| 8:30:00 PM | 7.056 | 0.931 | 237.104 |
| 8:45:00 PM | 7.116 | 0.971 | 246.043 |
| 9:00:00 PM | 7.363 | 1.055 | 283.725 |
| 9:15:00 PM | 7.224 | 1.029 | 269.394 |
| 9:30:00 PM | 7.236 | 0.933 | 241.017 |
| 9:45:00 PM | 7.285 | 0.94 | 247.551 |
| 10:00:00 PM | 7.147 | 0.971 | 251.295 |
| 10:15:00 PM | 7.122 | 0.91 | 234.498 |
| 10:30:00 PM | 7.069 | 0.879 | 213.072 |
| 10:45:00 PM | 6.983 | 0.91 | 228.531 |
| 11:00:00 PM | 6.726 | 0.838 | 200.401 |
| 11:15:00 PM | 6.515 | 0.793 | 181.852 |
| 11:30:00 PM | 6.63 | 0.875 | 205.425 |
| 11:45:00 PM | 6.438 | 0.818 | 183.61 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.491 | 0.759 | 177.010 |
| Daily Min: | 5.204 | 0.321 | 53.885 |
| Daily Max: | 7.473 | 1.055 | 283.725 |
| Peak to Avg: | | | 1.60 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/13/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Thursday - A.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.326 | 0.781 | 169.149 |
| 12:15:00 AM | 6.161 | 0.703 | 149.807 |
| 12:30:00 AM | 6.099 | 0.652 | 137.209 |
| 12:45:00 AM | 5.873 | 0.596 | 118.661 |
| 1:00:00 AM | 5.786 | 0.576 | 112.03 |
| 1:15:00 AM | 5.745 | 0.626 | 121.472 |
| 1:30:00 AM | 5.666 | 0.53 | 101.012 |
| 1:45:00 AM | 5.549 | 0.522 | 96.251 |
| 2:00:00 AM | 5.45 | 0.45 | 81.254 |
| 2:15:00 AM | 5.44 | 0.493 | 88.675 |
| 2:30:00 AM | 5.333 | 0.425 | 74.604 |
| 2:45:00 AM | 5.295 | 0.409 | 70.732 |
| 3:00:00 AM | 5.365 | 0.432 | 76.39 |
| 3:15:00 AM | 5.396 | 0.477 | 84.396 |
| 3:30:00 AM | 5.429 | 0.505 | 90.882 |
| 3:45:00 AM | 5.32 | 0.46 | 80.445 |
| 4:00:00 AM | 5.498 | 0.478 | 87.373 |
| 4:15:00 AM | 5.367 | 0.453 | 80.286 |
| 4:30:00 AM | 5.38 | 0.446 | 79.167 |
| 4:45:00 AM | 5.464 | 0.486 | 88.119 |
| 5:00:00 AM | 5.61 | 0.535 | 100.505 |
| 5:15:00 AM | 5.724 | 0.52 | 100.511 |
| 5:30:00 AM | 5.807 | 0.621 | 122.334 |
| 5:45:00 AM | 5.954 | 0.707 | 143.948 |
| 6:00:00 AM | 5.97 | 0.652 | 130.53 |
| 6:15:00 AM | 6.092 | 0.676 | 138.483 |
| 6:30:00 AM | 6.238 | 0.768 | 166.507 |
| 6:45:00 AM | 6.551 | 0.728 | 168.205 |
| 7:00:00 AM | 6.565 | 0.801 | 183.53 |
| 7:15:00 AM | 6.414 | 0.849 | 190.782 |
| 7:30:00 AM | 6.699 | 0.858 | 203.396 |
| 7:45:00 AM | 6.73 | 0.913 | 218.672 |
| 8:00:00 AM | 6.788 | 0.861 | 204.739 |
| 8:15:00 AM | 6.89 | 0.912 | 225.285 |
| 8:30:00 AM | 6.891 | 0.889 | 217.24 |
| 8:45:00 AM | 6.75 | 0.855 | 202.595 |
| 9:00:00 AM | 6.844 | 0.97 | 237.442 |
| 9:15:00 AM | 6.858 | 0.856 | 208.565 |
| 9:30:00 AM | 6.913 | 0.957 | 236.532 |
| 9:45:00 AM | 6.779 | 0.862 | 205.611 |
| 10:00:00 AM | 6.704 | 0.886 | 211.006 |
| 10:15:00 AM | 6.832 | 0.927 | 220.859 |
| 10:30:00 AM | 6.831 | 0.768 | 182.661 |
| 10:45:00 AM | 6.856 | 0.9 | 220.705 |
| 11:00:00 AM | 6.816 | 0.837 | 199.856 |
| 11:15:00 AM | 6.759 | 0.892 | 214.755 |
| 11:30:00 AM | 6.75 | 0.822 | 195.234 |
| 11:45:00 AM | 6.79 | 0.901 | 218.193 |

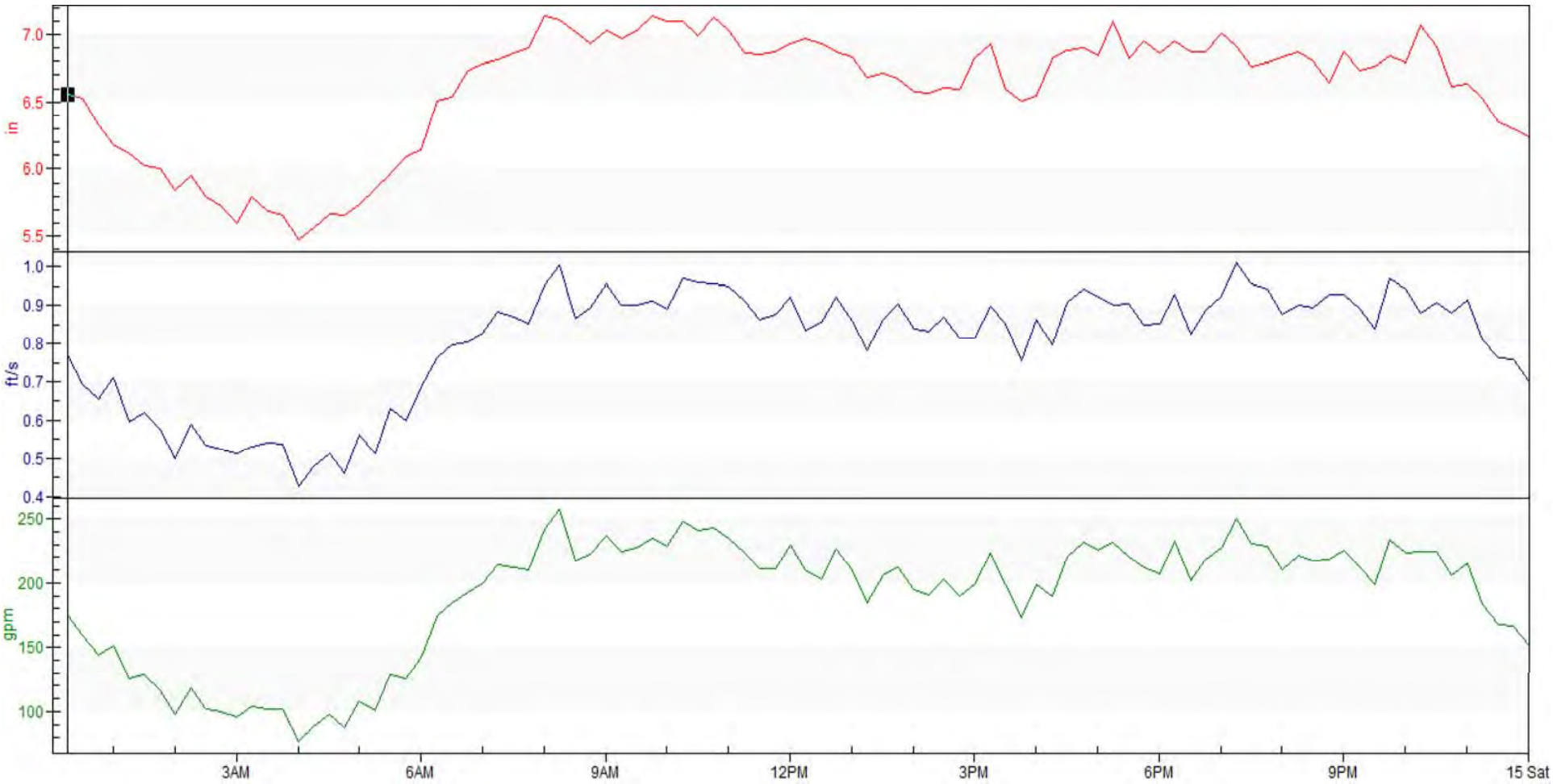
**Thursday - P.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.759 | 0.823 | 198.174 |
| 12:15:00 PM | 6.719 | 0.811 | 191.121 |
| 12:30:00 PM | 6.873 | 0.797 | 195.522 |
| 12:45:00 PM | 6.911 | 0.844 | 209.271 |
| 1:00:00 PM | 6.918 | 0.893 | 221.7 |
| 1:15:00 PM | 6.753 | 0.861 | 207.211 |
| 1:30:00 PM | 6.626 | 0.761 | 177.354 |
| 1:45:00 PM | 6.605 | 0.832 | 194.501 |
| 2:00:00 PM | 6.662 | 0.828 | 195.544 |
| 2:15:00 PM | 6.699 | 0.831 | 196.077 |
| 2:30:00 PM | 6.729 | 0.815 | 195.033 |
| 2:45:00 PM | 6.729 | 0.852 | 202.232 |
| 3:00:00 PM | 6.909 | 0.89 | 218.277 |
| 3:15:00 PM | 6.833 | 0.872 | 210.337 |
| 3:30:00 PM | 6.767 | 0.902 | 216.979 |
| 3:45:00 PM | 6.737 | 0.914 | 219.121 |
| 4:00:00 PM | 6.821 | 0.823 | 200.51 |
| 4:15:00 PM | 6.999 | 0.914 | 224.589 |
| 4:30:00 PM | 6.908 | 0.945 | 234.103 |
| 4:45:00 PM | 7.049 | 0.884 | 224.473 |
| 5:00:00 PM | 7.101 | 0.9 | 228.312 |
| 5:15:00 PM | 6.91 | 0.89 | 219.798 |
| 5:30:00 PM | 6.889 | 0.861 | 211.838 |
| 5:45:00 PM | 7.001 | 0.914 | 230.278 |
| 6:00:00 PM | 7.099 | 0.9 | 229.797 |
| 6:15:00 PM | 7.152 | 0.93 | 239.162 |
| 6:30:00 PM | 7.277 | 0.996 | 263.91 |
| 6:45:00 PM | 7.108 | 0.961 | 246.36 |
| 7:00:00 PM | 7.197 | 0.92 | 240.362 |
| 7:15:00 PM | 7.351 | 0.96 | 250.014 |
| 7:30:00 PM | 7.119 | 0.893 | 229.897 |
| 7:45:00 PM | 7.326 | 1.024 | 273.501 |
| 8:00:00 PM | 7.334 | 0.937 | 248.154 |
| 8:15:00 PM | 7.353 | 1.03 | 274.889 |
| 8:30:00 PM | 7.351 | 0.976 | 257.081 |
| 8:45:00 PM | 7.311 | 0.926 | 246.93 |
| 9:00:00 PM | 7.462 | 0.958 | 262.19 |
| 9:15:00 PM | 7.659 | 1.113 | 314.718 |
| 9:30:00 PM | 7.722 | 0.984 | 278.427 |
| 9:45:00 PM | 7.604 | 1.021 | 281.535 |
| 10:00:00 PM | 7.502 | 0.988 | 272.291 |
| 10:15:00 PM | 7.356 | 0.945 | 251.856 |
| 10:30:00 PM | 7.402 | 1.028 | 274.952 |
| 10:45:00 PM | 7.419 | 1.048 | 284.643 |
| 11:00:00 PM | 6.986 | 0.898 | 222.373 |
| 11:15:00 PM | 7.146 | 0.898 | 232.483 |
| 11:30:00 PM | 6.862 | 0.826 | 201.946 |
| 11:45:00 PM | 6.707 | 0.826 | 195.659 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.608 | 0.801 | 191.399 |
| Daily Min: | 5.295 | 0.409 | 70.732 |
| Daily Max: | 7.722 | 1.113 | 314.718 |
| Peak to Avg: | | | 1.64 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/14/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Friday - A.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.677 | 0.867 | 205.407 |
| 12:15:00 AM | 6.554 | 0.77 | 175.321 |
| 12:30:00 AM | 6.522 | 0.694 | 159.566 |
| 12:45:00 AM | 6.329 | 0.654 | 144.536 |
| 1:00:00 AM | 6.18 | 0.71 | 151.542 |
| 1:15:00 AM | 6.11 | 0.597 | 125.846 |
| 1:30:00 AM | 6.024 | 0.62 | 128.289 |
| 1:45:00 AM | 6.003 | 0.577 | 116.151 |
| 2:00:00 AM | 5.851 | 0.499 | 97.556 |
| 2:15:00 AM | 5.952 | 0.589 | 118.907 |
| 2:30:00 AM | 5.799 | 0.534 | 102.426 |
| 2:45:00 AM | 5.73 | 0.524 | 100.234 |
| 3:00:00 AM | 5.6 | 0.513 | 95.42 |
| 3:15:00 AM | 5.798 | 0.531 | 104.284 |
| 3:30:00 AM | 5.689 | 0.539 | 101.484 |
| 3:45:00 AM | 5.656 | 0.536 | 101.607 |
| 4:00:00 AM | 5.472 | 0.426 | 77.462 |
| 4:15:00 AM | 5.562 | 0.479 | 89.026 |
| 4:30:00 AM | 5.671 | 0.515 | 97.559 |
| 4:45:00 AM | 5.662 | 0.46 | 87.47 |
| 5:00:00 AM | 5.737 | 0.56 | 108.547 |
| 5:15:00 AM | 5.853 | 0.514 | 100.607 |
| 5:30:00 AM | 5.97 | 0.629 | 128.622 |
| 5:45:00 AM | 6.097 | 0.6 | 126.141 |
| 6:00:00 AM | 6.141 | 0.686 | 142.428 |
| 6:15:00 AM | 6.507 | 0.763 | 174.05 |
| 6:30:00 AM | 6.534 | 0.798 | 183.904 |
| 6:45:00 AM | 6.734 | 0.803 | 192.52 |
| 7:00:00 AM | 6.783 | 0.827 | 200.125 |
| 7:15:00 AM | 6.81 | 0.883 | 214.715 |
| 7:30:00 AM | 6.859 | 0.869 | 212.374 |
| 7:45:00 AM | 6.896 | 0.852 | 210.509 |
| 8:00:00 AM | 7.138 | 0.953 | 242.397 |
| 8:15:00 AM | 7.106 | 1.004 | 257.351 |
| 8:30:00 AM | 7.02 | 0.866 | 217.014 |
| 8:45:00 AM | 6.929 | 0.894 | 222.239 |
| 9:00:00 AM | 7.031 | 0.955 | 237.094 |
| 9:15:00 AM | 6.967 | 0.901 | 224.249 |
| 9:30:00 AM | 7.027 | 0.9 | 227.909 |
| 9:45:00 AM | 7.137 | 0.91 | 235.186 |
| 10:00:00 AM | 7.101 | 0.89 | 228.545 |
| 10:15:00 AM | 7.096 | 0.97 | 248.774 |
| 10:30:00 AM | 6.991 | 0.96 | 241.492 |
| 10:45:00 AM | 7.131 | 0.956 | 243.087 |
| 11:00:00 AM | 7.027 | 0.948 | 234.473 |
| 11:15:00 AM | 6.866 | 0.911 | 223.955 |
| 11:30:00 AM | 6.847 | 0.864 | 211.608 |
| 11:45:00 AM | 6.868 | 0.877 | 211.089 |

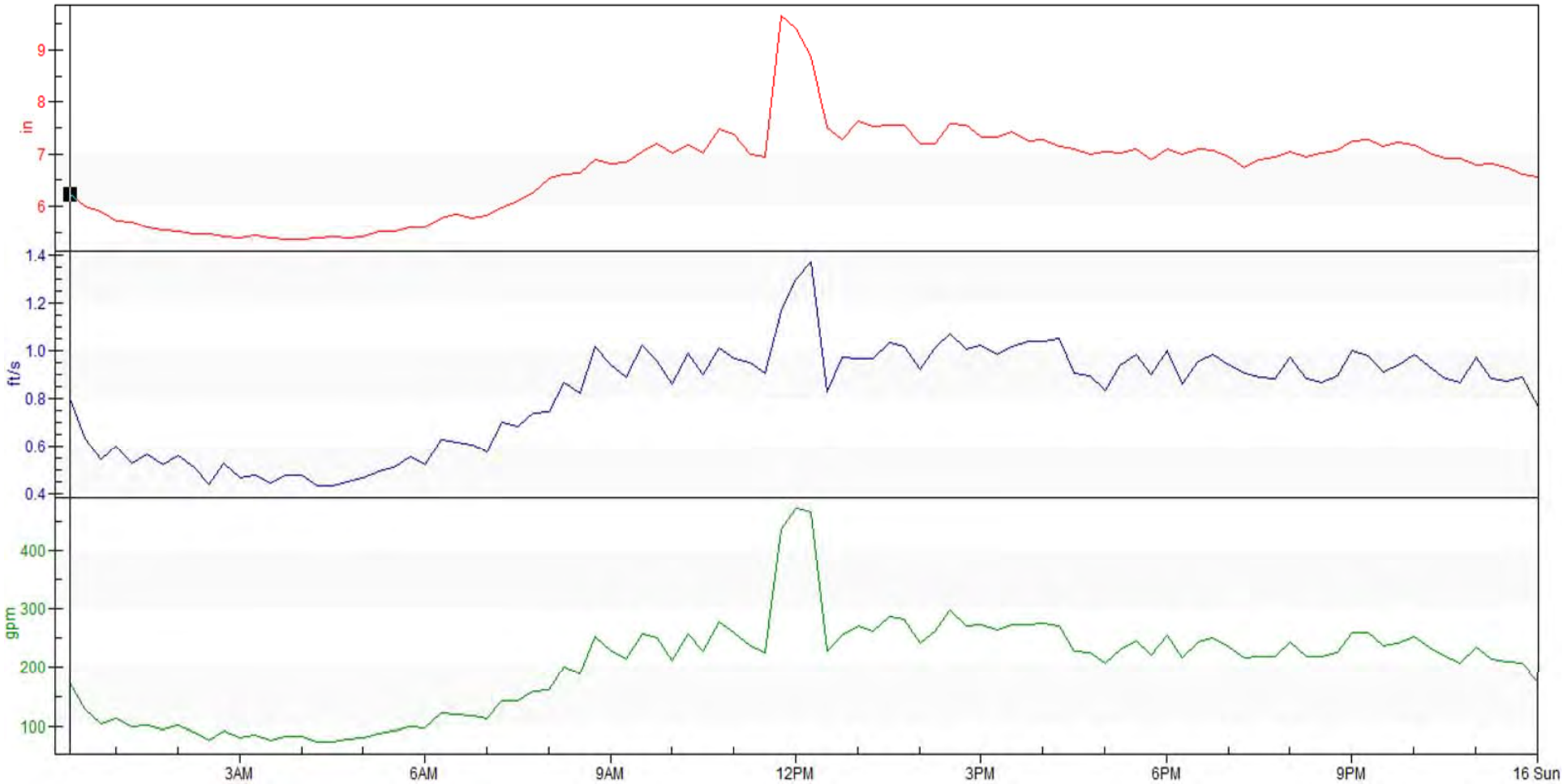
**Friday - P.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.932 | 0.923 | 229.721 |
| 12:15:00 PM | 6.973 | 0.837 | 209.84 |
| 12:30:00 PM | 6.931 | 0.855 | 203.255 |
| 12:45:00 PM | 6.87 | 0.921 | 226.292 |
| 1:00:00 PM | 6.837 | 0.86 | 210.227 |
| 1:15:00 PM | 6.685 | 0.782 | 184.138 |
| 1:30:00 PM | 6.714 | 0.862 | 205.79 |
| 1:45:00 PM | 6.674 | 0.905 | 211.778 |
| 2:00:00 PM | 6.578 | 0.84 | 195.224 |
| 2:15:00 PM | 6.566 | 0.832 | 190.418 |
| 2:30:00 PM | 6.601 | 0.869 | 202.545 |
| 2:45:00 PM | 6.597 | 0.815 | 190.058 |
| 3:00:00 PM | 6.827 | 0.813 | 198.465 |
| 3:15:00 PM | 6.933 | 0.898 | 223.585 |
| 3:30:00 PM | 6.6 | 0.851 | 198.733 |
| 3:45:00 PM | 6.508 | 0.756 | 173.156 |
| 4:00:00 PM | 6.546 | 0.862 | 198.95 |
| 4:15:00 PM | 6.818 | 0.797 | 190.026 |
| 4:30:00 PM | 6.883 | 0.907 | 220.509 |
| 4:45:00 PM | 6.899 | 0.942 | 231.677 |
| 5:00:00 PM | 6.841 | 0.921 | 225.219 |
| 5:15:00 PM | 7.098 | 0.903 | 231.361 |
| 5:30:00 PM | 6.824 | 0.905 | 220.56 |
| 5:45:00 PM | 6.952 | 0.849 | 212.034 |
| 6:00:00 PM | 6.862 | 0.851 | 206.956 |
| 6:15:00 PM | 6.955 | 0.93 | 232.39 |
| 6:30:00 PM | 6.87 | 0.825 | 202.355 |
| 6:45:00 PM | 6.875 | 0.887 | 218.316 |
| 7:00:00 PM | 7.014 | 0.926 | 227.203 |
| 7:15:00 PM | 6.91 | 1.012 | 250.817 |
| 7:30:00 PM | 6.765 | 0.957 | 230.641 |
| 7:45:00 PM | 6.789 | 0.944 | 228.656 |
| 8:00:00 PM | 6.831 | 0.876 | 210.065 |
| 8:15:00 PM | 6.876 | 0.899 | 221.43 |
| 8:30:00 PM | 6.805 | 0.895 | 217.444 |
| 8:45:00 PM | 6.645 | 0.928 | 218.533 |
| 9:00:00 PM | 6.873 | 0.928 | 225.3 |
| 9:15:00 PM | 6.733 | 0.889 | 212.134 |
| 9:30:00 PM | 6.767 | 0.839 | 198.975 |
| 9:45:00 PM | 6.842 | 0.97 | 234.164 |
| 10:00:00 PM | 6.794 | 0.942 | 223.4 |
| 10:15:00 PM | 7.072 | 0.88 | 224.83 |
| 10:30:00 PM | 6.909 | 0.908 | 225.092 |
| 10:45:00 PM | 6.615 | 0.88 | 205.945 |
| 11:00:00 PM | 6.635 | 0.916 | 215.228 |
| 11:15:00 PM | 6.53 | 0.81 | 183.121 |
| 11:30:00 PM | 6.353 | 0.761 | 167.792 |
| 11:45:00 PM | 6.299 | 0.758 | 166.425 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.597 | 0.804 | 189.542 |
| Daily Min: | 5.472 | 0.426 | 77.462 |
| Daily Max: | 7.138 | 1.012 | 257.351 |
| Peak to Avg: | | | 1.36 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/15/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Saturday - A.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.24 | 0.699 | 151.565 |
| 12:15:00 AM | 6.233 | 0.797 | 172.425 |
| 12:30:00 AM | 6.006 | 0.632 | 130.182 |
| 12:45:00 AM | 5.895 | 0.544 | 105.238 |
| 1:00:00 AM | 5.72 | 0.598 | 114.874 |
| 1:15:00 AM | 5.691 | 0.527 | 100.92 |
| 1:30:00 AM | 5.587 | 0.562 | 104.02 |
| 1:45:00 AM | 5.546 | 0.52 | 96.262 |
| 2:00:00 AM | 5.532 | 0.557 | 102.78 |
| 2:15:00 AM | 5.464 | 0.509 | 92.352 |
| 2:30:00 AM | 5.479 | 0.437 | 78.061 |
| 2:45:00 AM | 5.41 | 0.524 | 93.224 |
| 3:00:00 AM | 5.394 | 0.466 | 82.816 |
| 3:15:00 AM | 5.447 | 0.477 | 86.177 |
| 3:30:00 AM | 5.391 | 0.441 | 78.558 |
| 3:45:00 AM | 5.368 | 0.477 | 84.545 |
| 4:00:00 AM | 5.377 | 0.474 | 84.061 |
| 4:15:00 AM | 5.399 | 0.431 | 76.401 |
| 4:30:00 AM | 5.409 | 0.431 | 76.606 |
| 4:45:00 AM | 5.385 | 0.447 | 79.437 |
| 5:00:00 AM | 5.431 | 0.465 | 82.652 |
| 5:15:00 AM | 5.51 | 0.49 | 89.851 |
| 5:30:00 AM | 5.534 | 0.506 | 93.37 |
| 5:45:00 AM | 5.592 | 0.553 | 101.901 |
| 6:00:00 AM | 5.596 | 0.521 | 97.615 |
| 6:15:00 AM | 5.778 | 0.627 | 122.585 |
| 6:30:00 AM | 5.852 | 0.616 | 120.943 |
| 6:45:00 AM | 5.778 | 0.603 | 117.949 |
| 7:00:00 AM | 5.822 | 0.578 | 114.177 |
| 7:15:00 AM | 5.967 | 0.7 | 142.9 |
| 7:30:00 AM | 6.111 | 0.679 | 143.209 |
| 7:45:00 AM | 6.265 | 0.738 | 160.46 |
| 8:00:00 AM | 6.542 | 0.744 | 160.989 |
| 8:15:00 AM | 6.612 | 0.867 | 199.783 |
| 8:30:00 AM | 6.64 | 0.819 | 189.04 |
| 8:45:00 AM | 6.9 | 1.016 | 251.452 |
| 9:00:00 AM | 6.808 | 0.938 | 228.132 |
| 9:15:00 AM | 6.837 | 0.885 | 213.187 |
| 9:30:00 AM | 7.033 | 1.019 | 257.702 |
| 9:45:00 AM | 7.197 | 0.956 | 249.626 |
| 10:00:00 AM | 7.016 | 0.862 | 212.781 |
| 10:15:00 AM | 7.182 | 0.985 | 256.738 |
| 10:30:00 AM | 7.018 | 0.895 | 226.424 |
| 10:45:00 AM | 7.467 | 1.01 | 276.361 |
| 11:00:00 AM | 7.364 | 0.966 | 259.897 |
| 11:15:00 AM | 6.991 | 0.947 | 236.838 |
| 11:30:00 AM | 6.941 | 0.903 | 224.334 |
| 11:45:00 AM | 9.657 | 1.165 | 436.863 |

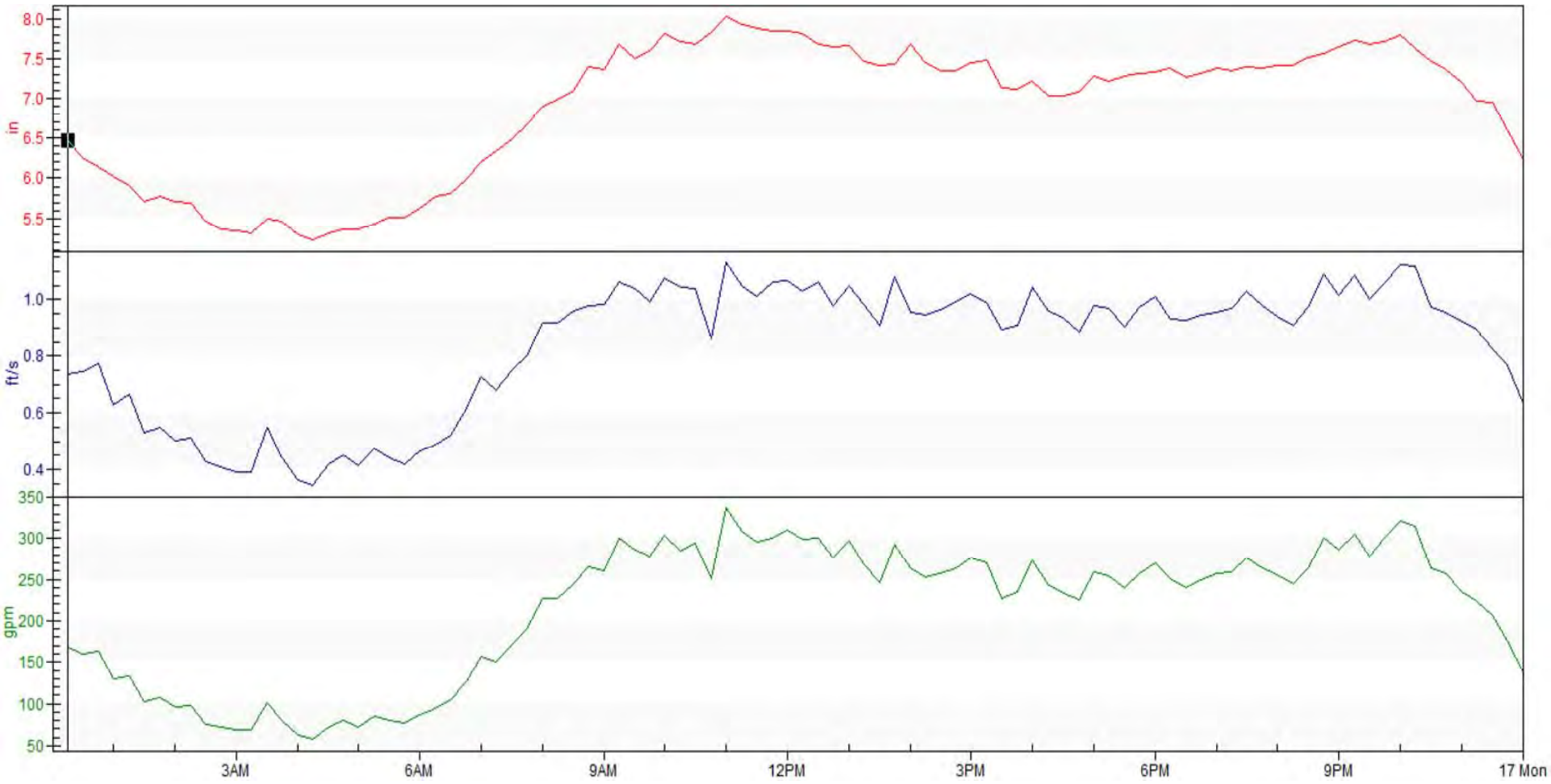
**Saturday - P.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 9.396 | 1.298 | 471.466 |
| 12:15:00 PM | 8.863 | 1.371 | 464.305 |
| 12:30:00 PM | 7.509 | 0.825 | 227.643 |
| 12:45:00 PM | 7.272 | 0.968 | 254.357 |
| 1:00:00 PM | 7.637 | 0.964 | 270.347 |
| 1:15:00 PM | 7.516 | 0.965 | 262.594 |
| 1:30:00 PM | 7.55 | 1.032 | 286.73 |
| 1:45:00 PM | 7.548 | 1.017 | 282.403 |
| 2:00:00 PM | 7.201 | 0.919 | 240.193 |
| 2:15:00 PM | 7.186 | 1.006 | 261.913 |
| 2:30:00 PM | 7.564 | 1.071 | 298.135 |
| 2:45:00 PM | 7.557 | 1.005 | 270.325 |
| 3:00:00 PM | 7.329 | 1.018 | 272.017 |
| 3:15:00 PM | 7.335 | 0.983 | 263.177 |
| 3:30:00 PM | 7.418 | 1.015 | 272.95 |
| 3:45:00 PM | 7.245 | 1.038 | 273.57 |
| 4:00:00 PM | 7.277 | 1.037 | 274.649 |
| 4:15:00 PM | 7.146 | 1.047 | 269.573 |
| 4:30:00 PM | 7.086 | 0.903 | 227.525 |
| 4:45:00 PM | 6.991 | 0.893 | 224.828 |
| 5:00:00 PM | 7.041 | 0.828 | 207.763 |
| 5:15:00 PM | 7.006 | 0.936 | 230.272 |
| 5:30:00 PM | 7.092 | 0.979 | 245.917 |
| 5:45:00 PM | 6.881 | 0.896 | 220.897 |
| 6:00:00 PM | 7.093 | 1 | 255.107 |
| 6:15:00 PM | 6.982 | 0.86 | 215.731 |
| 6:30:00 PM | 7.093 | 0.956 | 243.559 |
| 6:45:00 PM | 7.071 | 0.982 | 250.657 |
| 7:00:00 PM | 6.938 | 0.937 | 233.457 |
| 7:15:00 PM | 6.732 | 0.905 | 216.736 |
| 7:30:00 PM | 6.89 | 0.888 | 219.007 |
| 7:45:00 PM | 6.943 | 0.879 | 219.136 |
| 8:00:00 PM | 7.041 | 0.971 | 242.972 |
| 8:15:00 PM | 6.955 | 0.879 | 218.373 |
| 8:30:00 PM | 7.024 | 0.865 | 218.95 |
| 8:45:00 PM | 7.064 | 0.89 | 225.492 |
| 9:00:00 PM | 7.236 | 0.998 | 260.2 |
| 9:15:00 PM | 7.27 | 0.977 | 258.496 |
| 9:30:00 PM | 7.156 | 0.911 | 236.245 |
| 9:45:00 PM | 7.216 | 0.937 | 242.225 |
| 10:00:00 PM | 7.158 | 0.983 | 253.022 |
| 10:15:00 PM | 7.011 | 0.934 | 234.554 |
| 10:30:00 PM | 6.915 | 0.879 | 217.351 |
| 10:45:00 PM | 6.909 | 0.862 | 206.58 |
| 11:00:00 PM | 6.792 | 0.969 | 234.706 |
| 11:15:00 PM | 6.803 | 0.881 | 213.842 |
| 11:30:00 PM | 6.743 | 0.872 | 209.382 |
| 11:45:00 PM | 6.615 | 0.886 | 207.333 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.689 | 0.821 | 202.246 |
| Daily Min: | 5.368 | 0.431 | 76.401 |
| Daily Max: | 9.657 | 1.371 | 471.466 |
| Peak to Avg: | | | 2.33 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/16/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Sunday - A.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.558 | 0.763 | 176.515 |
| 12:15:00 AM | 6.467 | 0.736 | 167.343 |
| 12:30:00 AM | 6.258 | 0.744 | 160.279 |
| 12:45:00 AM | 6.143 | 0.772 | 163.834 |
| 1:00:00 AM | 6.027 | 0.63 | 128.944 |
| 1:15:00 AM | 5.909 | 0.665 | 133.615 |
| 1:30:00 AM | 5.708 | 0.531 | 102.198 |
| 1:45:00 AM | 5.773 | 0.548 | 107.058 |
| 2:00:00 AM | 5.702 | 0.502 | 96.535 |
| 2:15:00 AM | 5.695 | 0.514 | 97.81 |
| 2:30:00 AM | 5.466 | 0.428 | 75.17 |
| 2:45:00 AM | 5.367 | 0.41 | 72.57 |
| 3:00:00 AM | 5.353 | 0.392 | 69.191 |
| 3:15:00 AM | 5.311 | 0.393 | 68.548 |
| 3:30:00 AM | 5.488 | 0.549 | 100.108 |
| 3:45:00 AM | 5.462 | 0.44 | 79.811 |
| 4:00:00 AM | 5.294 | 0.363 | 63.16 |
| 4:15:00 AM | 5.23 | 0.344 | 58.126 |
| 4:30:00 AM | 5.306 | 0.419 | 72.693 |
| 4:45:00 AM | 5.371 | 0.453 | 79.693 |
| 5:00:00 AM | 5.361 | 0.416 | 72.834 |
| 5:15:00 AM | 5.428 | 0.473 | 85.072 |
| 5:30:00 AM | 5.518 | 0.44 | 79.495 |
| 5:45:00 AM | 5.518 | 0.42 | 76.936 |
| 6:00:00 AM | 5.629 | 0.465 | 86.356 |
| 6:15:00 AM | 5.774 | 0.489 | 94.523 |
| 6:30:00 AM | 5.814 | 0.524 | 103.314 |
| 6:45:00 AM | 5.986 | 0.613 | 125.746 |
| 7:00:00 AM | 6.206 | 0.725 | 156.05 |
| 7:15:00 AM | 6.335 | 0.679 | 149.639 |
| 7:30:00 AM | 6.488 | 0.75 | 171.254 |
| 7:45:00 AM | 6.674 | 0.804 | 190.349 |
| 8:00:00 AM | 6.907 | 0.918 | 227.303 |
| 8:15:00 AM | 6.987 | 0.917 | 227.374 |
| 8:30:00 AM | 7.099 | 0.959 | 245.127 |
| 8:45:00 AM | 7.398 | 0.978 | 264.741 |
| 9:00:00 AM | 7.37 | 0.983 | 261.401 |
| 9:15:00 AM | 7.682 | 1.061 | 301.284 |
| 9:30:00 AM | 7.498 | 1.041 | 286.545 |
| 9:45:00 AM | 7.601 | 0.991 | 277.532 |
| 10:00:00 AM | 7.805 | 1.075 | 304.46 |
| 10:15:00 AM | 7.704 | 1.046 | 284.47 |
| 10:30:00 AM | 7.679 | 1.039 | 294.807 |
| 10:45:00 AM | 7.832 | 0.863 | 251.112 |
| 11:00:00 AM | 8.026 | 1.133 | 336.989 |
| 11:15:00 AM | 7.925 | 1.046 | 308.056 |
| 11:30:00 AM | 7.871 | 1.013 | 296.525 |
| 11:45:00 AM | 7.839 | 1.061 | 300.76 |

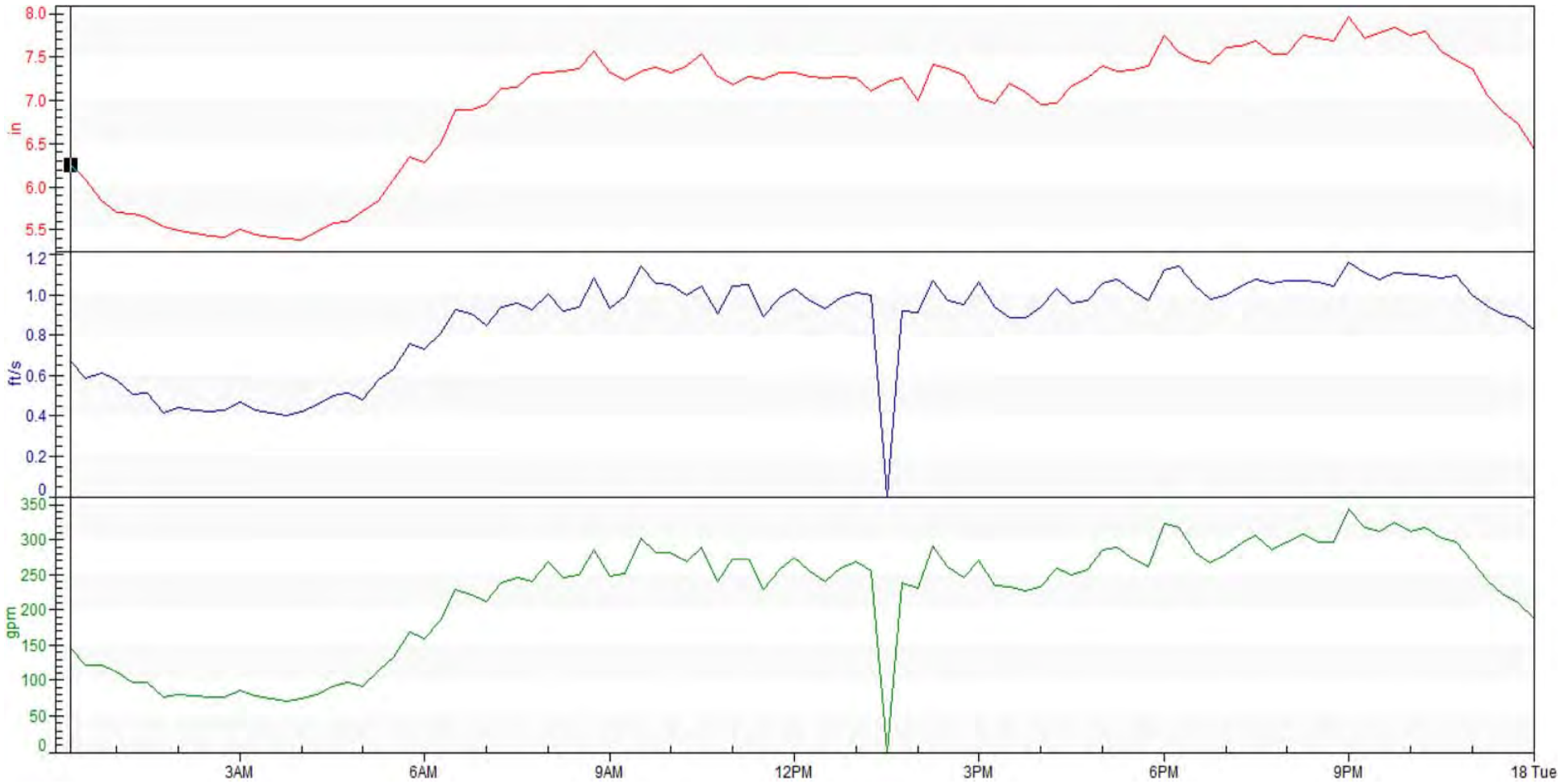
**Sunday - P.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.838 | 1.069 | 309.653 |
| 12:15:00 PM | 7.811 | 1.031 | 298.86 |
| 12:30:00 PM | 7.678 | 1.061 | 300.683 |
| 12:45:00 PM | 7.648 | 0.981 | 276.906 |
| 1:00:00 PM | 7.667 | 1.049 | 296.987 |
| 1:15:00 PM | 7.465 | 0.981 | 268.699 |
| 1:30:00 PM | 7.406 | 0.91 | 246.546 |
| 1:45:00 PM | 7.423 | 1.082 | 292.385 |
| 2:00:00 PM | 7.679 | 0.958 | 263.137 |
| 2:15:00 PM | 7.441 | 0.945 | 253.105 |
| 2:30:00 PM | 7.343 | 0.966 | 257.921 |
| 2:45:00 PM | 7.353 | 0.991 | 264.097 |
| 3:00:00 PM | 7.447 | 1.02 | 276.846 |
| 3:15:00 PM | 7.48 | 0.986 | 270.632 |
| 3:30:00 PM | 7.129 | 0.895 | 226.501 |
| 3:45:00 PM | 7.119 | 0.911 | 234.669 |
| 4:00:00 PM | 7.213 | 1.043 | 273.31 |
| 4:15:00 PM | 7.039 | 0.961 | 243.689 |
| 4:30:00 PM | 7.028 | 0.936 | 233.964 |
| 4:45:00 PM | 7.08 | 0.885 | 225.991 |
| 5:00:00 PM | 7.275 | 0.98 | 259.645 |
| 5:15:00 PM | 7.223 | 0.97 | 254.618 |
| 5:30:00 PM | 7.282 | 0.905 | 240.118 |
| 5:45:00 PM | 7.307 | 0.975 | 257.054 |
| 6:00:00 PM | 7.326 | 1.013 | 270.077 |
| 6:15:00 PM | 7.383 | 0.932 | 251.569 |
| 6:30:00 PM | 7.26 | 0.926 | 240.304 |
| 6:45:00 PM | 7.307 | 0.944 | 249.913 |
| 7:00:00 PM | 7.382 | 0.954 | 257.45 |
| 7:15:00 PM | 7.348 | 0.969 | 259.246 |
| 7:30:00 PM | 7.4 | 1.03 | 277.345 |
| 7:45:00 PM | 7.383 | 0.978 | 264.083 |
| 8:00:00 PM | 7.422 | 0.944 | 256.389 |
| 8:15:00 PM | 7.409 | 0.911 | 245.07 |
| 8:30:00 PM | 7.511 | 0.973 | 263.667 |
| 8:45:00 PM | 7.568 | 1.093 | 299.849 |
| 9:00:00 PM | 7.652 | 1.015 | 286.816 |
| 9:15:00 PM | 7.727 | 1.084 | 305.143 |
| 9:30:00 PM | 7.686 | 1.003 | 278.082 |
| 9:45:00 PM | 7.706 | 1.06 | 299.954 |
| 10:00:00 PM | 7.786 | 1.125 | 321.224 |
| 10:15:00 PM | 7.636 | 1.118 | 314.966 |
| 10:30:00 PM | 7.469 | 0.973 | 263.674 |
| 10:45:00 PM | 7.371 | 0.954 | 257.063 |
| 11:00:00 PM | 7.201 | 0.921 | 235.595 |
| 11:15:00 PM | 6.96 | 0.897 | 223.863 |
| 11:30:00 PM | 6.946 | 0.826 | 205.97 |
| 11:45:00 PM | 6.6 | 0.771 | 176.301 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.885 | 0.839 | 214.593 |
| Daily Min: | 5.23 | 0.344 | 58.126 |
| Daily Max: | 8.026 | 1.133 | 336.989 |
| Peak to Avg: | | | 1.57 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/17/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Monday - A.M. 7/17/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 6.233 | 0.632 | 136.879 |
| 12:15:00 AM | 6.256 | 0.67 | 145.813 |
| 12:30:00 AM | 6.091 | 0.587 | 120.64 |
| 12:45:00 AM | 5.846 | 0.614 | 122.051 |
| 1:00:00 AM | 5.71 | 0.58 | 111.725 |
| 1:15:00 AM | 5.695 | 0.51 | 97.809 |
| 1:30:00 AM | 5.647 | 0.515 | 97.737 |
| 1:45:00 AM | 5.533 | 0.417 | 75.695 |
| 2:00:00 AM | 5.486 | 0.44 | 80.272 |
| 2:15:00 AM | 5.462 | 0.429 | 77.702 |
| 2:30:00 AM | 5.435 | 0.424 | 75.813 |
| 2:45:00 AM | 5.419 | 0.429 | 76.874 |
| 3:00:00 AM | 5.513 | 0.47 | 86.371 |
| 3:15:00 AM | 5.448 | 0.43 | 77.742 |
| 3:30:00 AM | 5.408 | 0.417 | 74.563 |
| 3:45:00 AM | 5.393 | 0.4 | 71.198 |
| 4:00:00 AM | 5.384 | 0.424 | 75.306 |
| 4:15:00 AM | 5.475 | 0.453 | 80.878 |
| 4:30:00 AM | 5.582 | 0.502 | 90.978 |
| 4:45:00 AM | 5.592 | 0.515 | 96.365 |
| 5:00:00 AM | 5.728 | 0.482 | 91.228 |
| 5:15:00 AM | 5.849 | 0.577 | 114.711 |
| 5:30:00 AM | 6.092 | 0.632 | 132.761 |
| 5:45:00 AM | 6.352 | 0.758 | 168.15 |
| 6:00:00 AM | 6.288 | 0.731 | 159.608 |
| 6:15:00 AM | 6.506 | 0.808 | 184.979 |
| 6:30:00 AM | 6.903 | 0.928 | 229.737 |
| 6:45:00 AM | 6.9 | 0.907 | 221.691 |
| 7:00:00 AM | 6.954 | 0.848 | 211.88 |
| 7:15:00 AM | 7.137 | 0.937 | 237.758 |
| 7:30:00 AM | 7.162 | 0.957 | 245.021 |
| 7:45:00 AM | 7.314 | 0.923 | 240.757 |
| 8:00:00 AM | 7.327 | 1.004 | 268.39 |
| 8:15:00 AM | 7.332 | 0.917 | 245.37 |
| 8:30:00 AM | 7.371 | 0.941 | 250.122 |
| 8:45:00 AM | 7.561 | 1.08 | 284.907 |
| 9:00:00 AM | 7.328 | 0.931 | 247.823 |
| 9:15:00 AM | 7.239 | 0.989 | 251.054 |
| 9:30:00 AM | 7.338 | 1.14 | 302.011 |
| 9:45:00 AM | 7.39 | 1.058 | 282.188 |
| 10:00:00 AM | 7.327 | 1.053 | 281.485 |
| 10:15:00 AM | 7.397 | 0.999 | 268.293 |
| 10:30:00 AM | 7.536 | 1.045 | 289.64 |
| 10:45:00 AM | 7.283 | 0.904 | 239.927 |
| 11:00:00 AM | 7.185 | 1.042 | 271.658 |
| 11:15:00 AM | 7.282 | 1.053 | 273.197 |
| 11:30:00 AM | 7.246 | 0.896 | 229.801 |
| 11:45:00 AM | 7.329 | 0.984 | 258.002 |

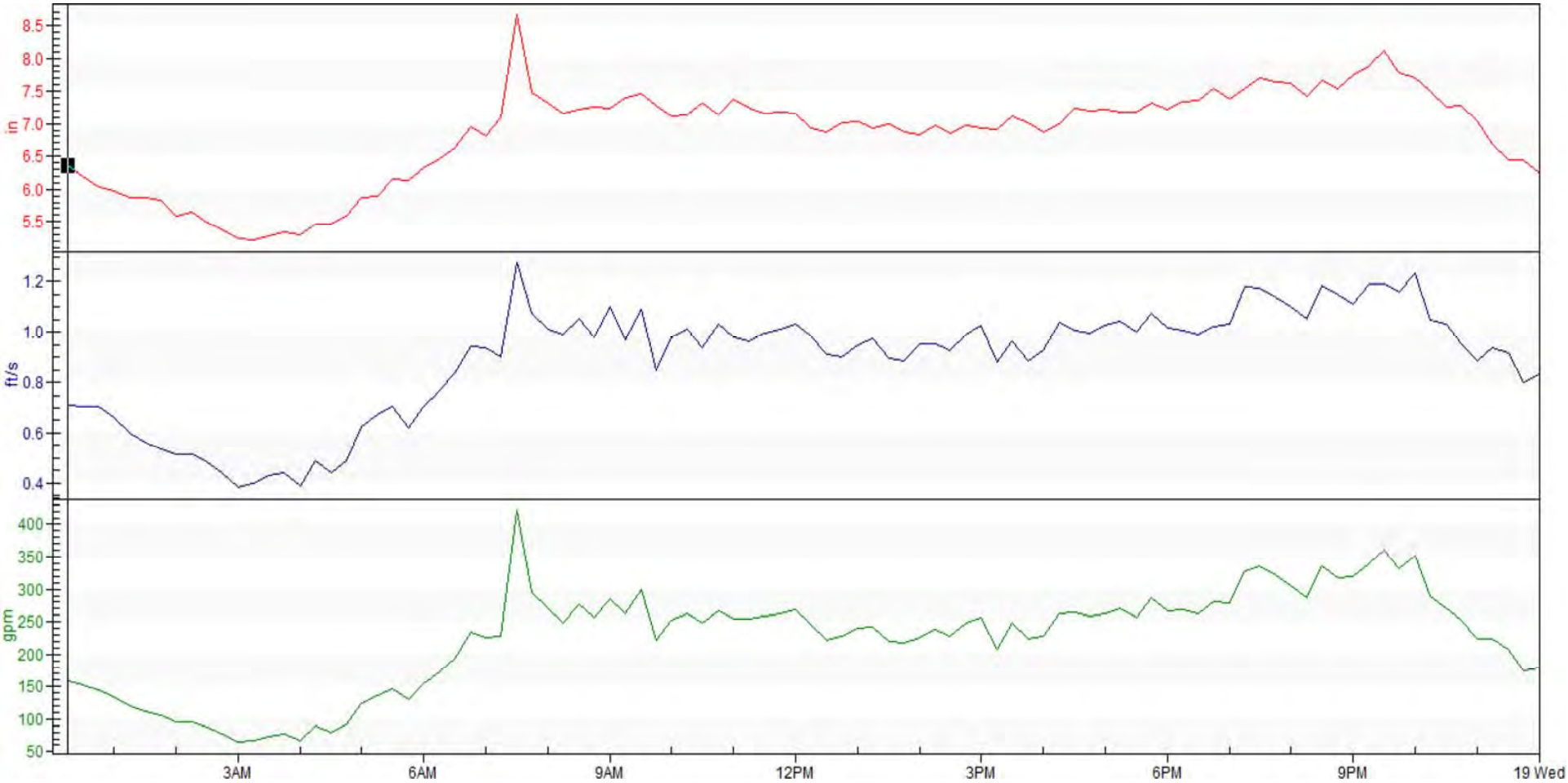
**Monday - P.M. 7/17/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.319 | 1.029 | 274.561 |
| 12:15:00 PM | 7.273 | 0.972 | 254.845 |
| 12:30:00 PM | 7.264 | 0.933 | 241.134 |
| 12:45:00 PM | 7.272 | 0.982 | 259.965 |
| 1:00:00 PM | 7.268 | 1.013 | 267.694 |
| 1:15:00 PM | 7.103 | 0.998 | 255.691 |
| 1:30:00 PM | 7.224 | 0 | 0 |
| 1:45:00 PM | 7.266 | 0.917 | 238.318 |
| 2:00:00 PM | 6.995 | 0.916 | 230.161 |
| 2:15:00 PM | 7.413 | 1.07 | 290.223 |
| 2:30:00 PM | 7.364 | 0.969 | 260.781 |
| 2:45:00 PM | 7.289 | 0.953 | 246.109 |
| 3:00:00 PM | 7.039 | 1.064 | 270.216 |
| 3:15:00 PM | 6.976 | 0.941 | 235.401 |
| 3:30:00 PM | 7.201 | 0.89 | 232.584 |
| 3:45:00 PM | 7.094 | 0.888 | 227.652 |
| 4:00:00 PM | 6.952 | 0.942 | 231.839 |
| 4:15:00 PM | 6.976 | 1.03 | 258.355 |
| 4:30:00 PM | 7.174 | 0.96 | 249.795 |
| 4:45:00 PM | 7.27 | 0.975 | 257.877 |
| 5:00:00 PM | 7.393 | 1.055 | 285.173 |
| 5:15:00 PM | 7.346 | 1.079 | 289.306 |
| 5:30:00 PM | 7.354 | 1.015 | 271.483 |
| 5:45:00 PM | 7.406 | 0.97 | 261.037 |
| 6:00:00 PM | 7.75 | 1.123 | 322.295 |
| 6:15:00 PM | 7.548 | 1.14 | 316.584 |
| 6:30:00 PM | 7.463 | 1.043 | 280.813 |
| 6:45:00 PM | 7.424 | 0.98 | 266.29 |
| 7:00:00 PM | 7.607 | 0.995 | 279.04 |
| 7:15:00 PM | 7.635 | 1.044 | 294.034 |
| 7:30:00 PM | 7.686 | 1.076 | 305.79 |
| 7:45:00 PM | 7.537 | 1.056 | 285.157 |
| 8:00:00 PM | 7.541 | 1.069 | 296.523 |
| 8:15:00 PM | 7.747 | 1.071 | 307.21 |
| 8:30:00 PM | 7.717 | 1.061 | 296.746 |
| 8:45:00 PM | 7.691 | 1.044 | 296.77 |
| 9:00:00 PM | 7.965 | 1.16 | 344.566 |
| 9:15:00 PM | 7.721 | 1.112 | 316.75 |
| 9:30:00 PM | 7.783 | 1.079 | 311.493 |
| 9:45:00 PM | 7.841 | 1.113 | 324.197 |
| 10:00:00 PM | 7.749 | 1.1 | 312.755 |
| 10:15:00 PM | 7.801 | 1.096 | 317.157 |
| 10:30:00 PM | 7.567 | 1.083 | 301.601 |
| 10:45:00 PM | 7.468 | 1.095 | 297.152 |
| 11:00:00 PM | 7.362 | 0.996 | 267.77 |
| 11:15:00 PM | 7.06 | 0.949 | 241.59 |
| 11:30:00 PM | 6.864 | 0.899 | 221.006 |
| 11:45:00 PM | 6.729 | 0.889 | 210.242 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.921 | 0.869 | 222.331 |
| Daily Min: | 5.384 | 0 | 0 |
| Daily Max: | 7.965 | 1.16 | 344.566 |
| Peak to Avg: | | | 1.55 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/18/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Tuesday- A.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.436 | 0.831 | 187.73 |
| 12:15:00 AM | 6.355 | 0.712 | 158.124 |
| 12:30:00 AM | 6.203 | 0.708 | 152.168 |
| 12:45:00 AM | 6.024 | 0.704 | 144.569 |
| 1:00:00 AM | 5.972 | 0.663 | 133.712 |
| 1:15:00 AM | 5.878 | 0.599 | 119.983 |
| 1:30:00 AM | 5.879 | 0.561 | 111.425 |
| 1:45:00 AM | 5.822 | 0.533 | 105.393 |
| 2:00:00 AM | 5.58 | 0.516 | 94.727 |
| 2:15:00 AM | 5.644 | 0.514 | 96.338 |
| 2:30:00 AM | 5.48 | 0.481 | 87.616 |
| 2:45:00 AM | 5.383 | 0.438 | 77.893 |
| 3:00:00 AM | 5.242 | 0.382 | 65.539 |
| 3:15:00 AM | 5.218 | 0.398 | 67.329 |
| 3:30:00 AM | 5.281 | 0.432 | 73.272 |
| 3:45:00 AM | 5.34 | 0.441 | 77.461 |
| 4:00:00 AM | 5.301 | 0.389 | 67.799 |
| 4:15:00 AM | 5.463 | 0.488 | 88.585 |
| 4:30:00 AM | 5.454 | 0.443 | 79.844 |
| 4:45:00 AM | 5.593 | 0.49 | 91.642 |
| 5:00:00 AM | 5.869 | 0.623 | 124.525 |
| 5:15:00 AM | 5.896 | 0.675 | 135.687 |
| 5:30:00 AM | 6.153 | 0.703 | 146.568 |
| 5:45:00 AM | 6.138 | 0.622 | 130.211 |
| 6:00:00 AM | 6.319 | 0.704 | 155.204 |
| 6:15:00 AM | 6.462 | 0.769 | 172.269 |
| 6:30:00 AM | 6.625 | 0.835 | 194.211 |
| 6:45:00 AM | 6.943 | 0.942 | 234.734 |
| 7:00:00 AM | 6.808 | 0.939 | 226.131 |
| 7:15:00 AM | 7.1 | 0.902 | 228.495 |
| 7:30:00 AM | 8.666 | 1.277 | 420.868 |
| 7:45:00 AM | 7.484 | 1.074 | 295.008 |
| 8:00:00 AM | 7.314 | 1.013 | 270.263 |
| 8:15:00 AM | 7.163 | 0.99 | 248.241 |
| 8:30:00 AM | 7.226 | 1.052 | 276.346 |
| 8:45:00 AM | 7.255 | 0.981 | 255.96 |
| 9:00:00 AM | 7.242 | 1.099 | 284.995 |
| 9:15:00 AM | 7.402 | 0.971 | 262.42 |
| 9:30:00 AM | 7.472 | 1.093 | 299.62 |
| 9:45:00 AM | 7.287 | 0.848 | 222.609 |
| 10:00:00 AM | 7.114 | 0.981 | 252.364 |
| 10:15:00 AM | 7.138 | 1.013 | 261.831 |
| 10:30:00 AM | 7.329 | 0.938 | 248.492 |
| 10:45:00 AM | 7.138 | 1.035 | 267.561 |
| 11:00:00 AM | 7.37 | 0.981 | 253.551 |
| 11:15:00 AM | 7.24 | 0.965 | 254.1 |
| 11:30:00 AM | 7.162 | 0.995 | 257.543 |
| 11:45:00 AM | 7.176 | 1.011 | 262.876 |

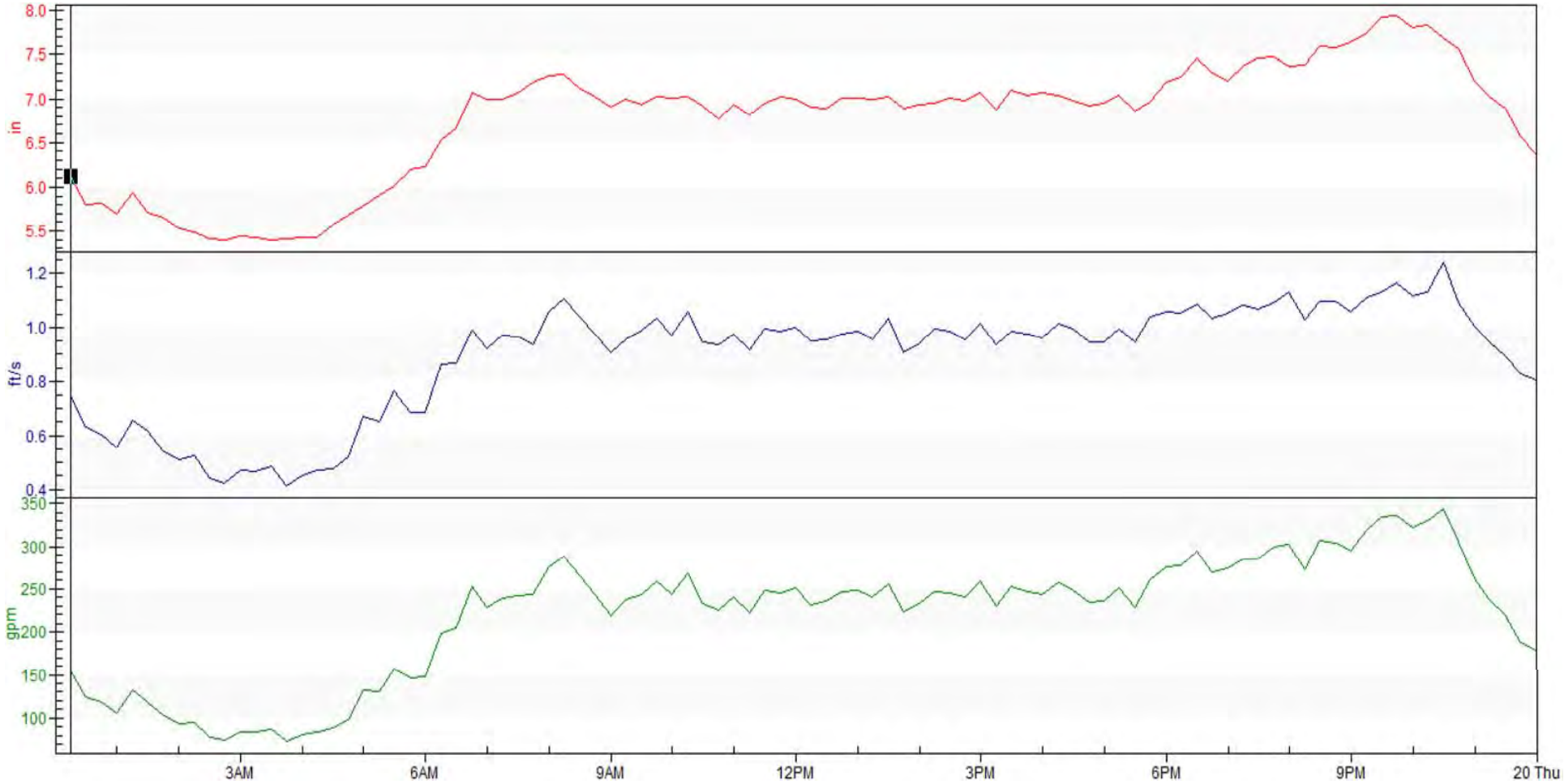
**Tuesday- P.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.166 | 1.034 | 268.514 |
| 12:15:00 PM | 6.929 | 0.988 | 245.661 |
| 12:30:00 PM | 6.87 | 0.911 | 222.197 |
| 12:45:00 PM | 7.018 | 0.902 | 228.109 |
| 1:00:00 PM | 7.043 | 0.947 | 240.62 |
| 1:15:00 PM | 6.941 | 0.976 | 242.962 |
| 1:30:00 PM | 6.99 | 0.896 | 219.847 |
| 1:45:00 PM | 6.865 | 0.886 | 217.727 |
| 2:00:00 PM | 6.838 | 0.951 | 226.511 |
| 2:15:00 PM | 6.976 | 0.955 | 237.793 |
| 2:30:00 PM | 6.846 | 0.929 | 227.583 |
| 2:45:00 PM | 6.971 | 0.991 | 248.373 |
| 3:00:00 PM | 6.939 | 1.03 | 256.748 |
| 3:15:00 PM | 6.917 | 0.878 | 207.813 |
| 3:30:00 PM | 7.113 | 0.962 | 247.492 |
| 3:45:00 PM | 7.004 | 0.885 | 223.139 |
| 4:00:00 PM | 6.864 | 0.929 | 228.368 |
| 4:15:00 PM | 6.992 | 1.04 | 261.753 |
| 4:30:00 PM | 7.239 | 1.008 | 265.383 |
| 4:45:00 PM | 7.192 | 0.997 | 257.967 |
| 5:00:00 PM | 7.223 | 1.025 | 263.278 |
| 5:15:00 PM | 7.168 | 1.041 | 270.525 |
| 5:30:00 PM | 7.171 | 1 | 256.151 |
| 5:45:00 PM | 7.328 | 1.073 | 286.893 |
| 6:00:00 PM | 7.213 | 1.017 | 266.512 |
| 6:15:00 PM | 7.331 | 1.007 | 268.028 |
| 6:30:00 PM | 7.364 | 0.99 | 262.392 |
| 6:45:00 PM | 7.549 | 1.021 | 281.155 |
| 7:00:00 PM | 7.38 | 1.036 | 279.022 |
| 7:15:00 PM | 7.552 | 1.18 | 327.805 |
| 7:30:00 PM | 7.711 | 1.176 | 335.405 |
| 7:45:00 PM | 7.649 | 1.139 | 321.522 |
| 8:00:00 PM | 7.616 | 1.104 | 305.369 |
| 8:15:00 PM | 7.429 | 1.055 | 287.131 |
| 8:30:00 PM | 7.664 | 1.188 | 334.984 |
| 8:45:00 PM | 7.534 | 1.148 | 317.959 |
| 9:00:00 PM | 7.743 | 1.113 | 319.172 |
| 9:15:00 PM | 7.883 | 1.191 | 339.052 |
| 9:30:00 PM | 8.115 | 1.192 | 361.064 |
| 9:45:00 PM | 7.78 | 1.159 | 332.731 |
| 10:00:00 PM | 7.703 | 1.236 | 352.053 |
| 10:15:00 PM | 7.508 | 1.05 | 289.596 |
| 10:30:00 PM | 7.267 | 1.036 | 270.027 |
| 10:45:00 PM | 7.277 | 0.956 | 253.341 |
| 11:00:00 PM | 7.039 | 0.882 | 224.02 |
| 11:15:00 PM | 6.694 | 0.939 | 223.18 |
| 11:30:00 PM | 6.434 | 0.918 | 207.152 |
| 11:45:00 PM | 6.442 | 0.801 | 174.59 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.843 | 0.891 | 224.429 |
| Daily Min: | 5.218 | 0.382 | 65.539 |
| Daily Max: | 8.666 | 1.277 | 420.868 |
| Peak to Avg: | | | 1.88 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/19/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Wednesday - A.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.237 | 0.831 | 180.038 |
| 12:15:00 AM | 6.121 | 0.746 | 153.35 |
| 12:30:00 AM | 5.804 | 0.631 | 124.168 |
| 12:45:00 AM | 5.812 | 0.602 | 118.697 |
| 1:00:00 AM | 5.697 | 0.556 | 106.623 |
| 1:15:00 AM | 5.94 | 0.655 | 132.951 |
| 1:30:00 AM | 5.706 | 0.618 | 118.953 |
| 1:45:00 AM | 5.651 | 0.539 | 102.284 |
| 2:00:00 AM | 5.532 | 0.51 | 93.335 |
| 2:15:00 AM | 5.491 | 0.525 | 95.948 |
| 2:30:00 AM | 5.413 | 0.443 | 77.572 |
| 2:45:00 AM | 5.397 | 0.425 | 74.992 |
| 3:00:00 AM | 5.443 | 0.469 | 83.85 |
| 3:15:00 AM | 5.432 | 0.466 | 83.859 |
| 3:30:00 AM | 5.394 | 0.488 | 86.998 |
| 3:45:00 AM | 5.414 | 0.413 | 73.923 |
| 4:00:00 AM | 5.43 | 0.45 | 80.892 |
| 4:15:00 AM | 5.431 | 0.47 | 84.649 |
| 4:30:00 AM | 5.574 | 0.479 | 89.196 |
| 4:45:00 AM | 5.688 | 0.522 | 98.129 |
| 5:00:00 AM | 5.783 | 0.673 | 131.839 |
| 5:15:00 AM | 5.903 | 0.654 | 130.775 |
| 5:30:00 AM | 6.016 | 0.764 | 157.711 |
| 5:45:00 AM | 6.192 | 0.684 | 146.855 |
| 6:00:00 AM | 6.229 | 0.688 | 148.261 |
| 6:15:00 AM | 6.527 | 0.864 | 198.646 |
| 6:30:00 AM | 6.668 | 0.869 | 205.605 |
| 6:45:00 AM | 7.067 | 0.99 | 252.551 |
| 7:00:00 AM | 6.992 | 0.919 | 228.477 |
| 7:15:00 AM | 6.996 | 0.968 | 238.277 |
| 7:30:00 AM | 7.074 | 0.964 | 241.347 |
| 7:45:00 AM | 7.189 | 0.934 | 243.655 |
| 8:00:00 AM | 7.269 | 1.059 | 276.431 |
| 8:15:00 AM | 7.277 | 1.108 | 288.957 |
| 8:30:00 AM | 7.113 | 1.039 | 264.811 |
| 8:45:00 AM | 7.023 | 0.974 | 243.826 |
| 9:00:00 AM | 6.908 | 0.908 | 218.987 |
| 9:15:00 AM | 6.988 | 0.957 | 236.991 |
| 9:30:00 AM | 6.937 | 0.989 | 243.414 |
| 9:45:00 AM | 7.026 | 1.035 | 259.231 |
| 10:00:00 AM | 7.003 | 0.969 | 244.305 |
| 10:15:00 AM | 7.019 | 1.06 | 267.858 |
| 10:30:00 AM | 6.926 | 0.945 | 233.404 |
| 10:45:00 AM | 6.769 | 0.935 | 224.424 |
| 11:00:00 AM | 6.931 | 0.977 | 240.408 |
| 11:15:00 AM | 6.807 | 0.914 | 222.136 |
| 11:30:00 AM | 6.942 | 0.996 | 248.339 |
| 11:45:00 AM | 7.021 | 0.985 | 245.514 |

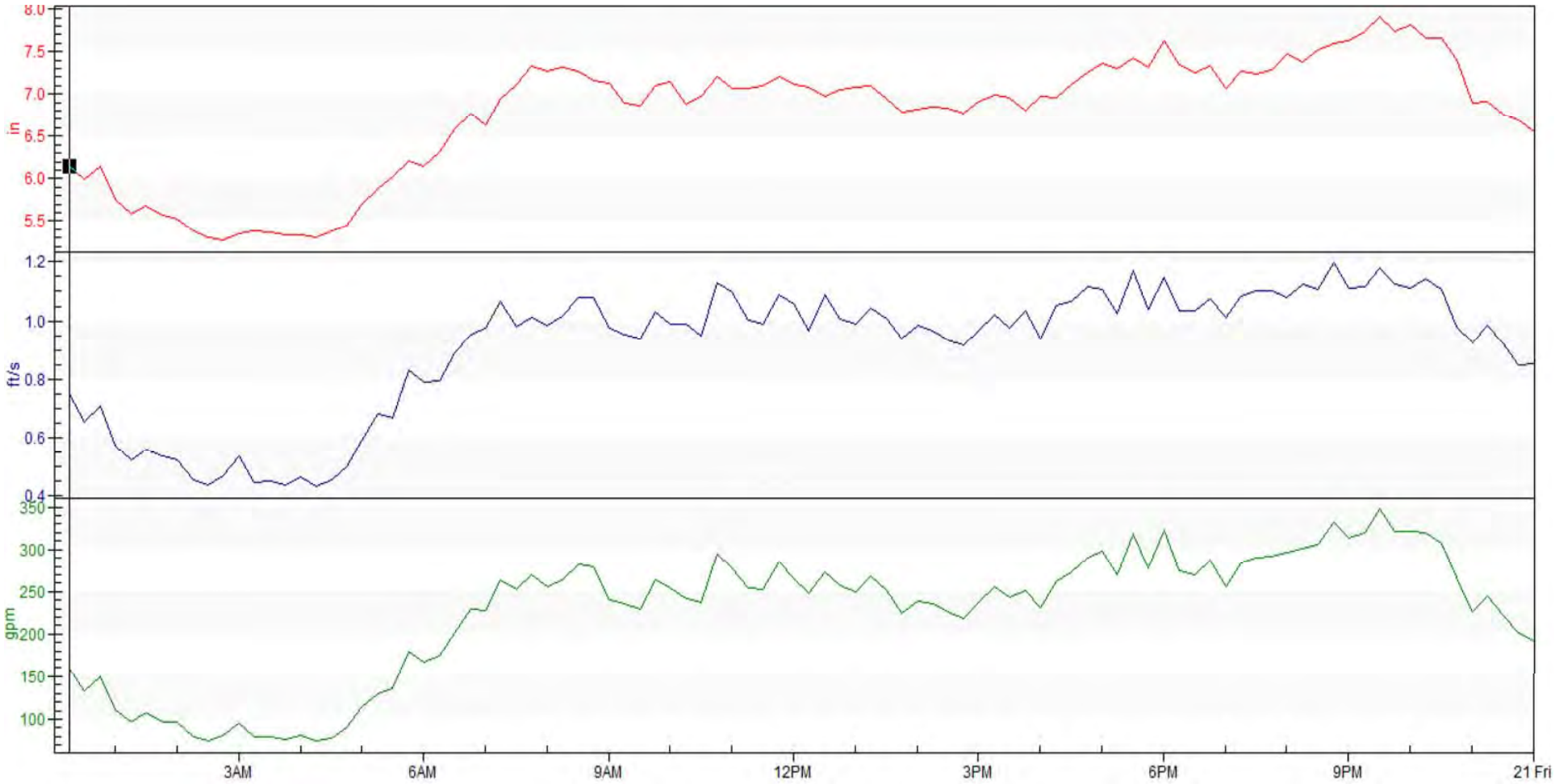
**Wednesday - P.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.997 | 0.999 | 251.739 |
| 12:15:00 PM | 6.904 | 0.951 | 231.554 |
| 12:30:00 PM | 6.881 | 0.956 | 235.629 |
| 12:45:00 PM | 7.006 | 0.977 | 246.594 |
| 1:00:00 PM | 7.003 | 0.985 | 248.381 |
| 1:15:00 PM | 6.989 | 0.956 | 240.359 |
| 1:30:00 PM | 7.019 | 1.034 | 255.474 |
| 1:45:00 PM | 6.884 | 0.907 | 223.77 |
| 2:00:00 PM | 6.94 | 0.942 | 232.874 |
| 2:15:00 PM | 6.944 | 0.993 | 246.52 |
| 2:30:00 PM | 7.003 | 0.985 | 244.554 |
| 2:45:00 PM | 6.98 | 0.956 | 240.036 |
| 3:00:00 PM | 7.069 | 1.015 | 259.03 |
| 3:15:00 PM | 6.874 | 0.934 | 230.016 |
| 3:30:00 PM | 7.102 | 0.983 | 252.43 |
| 3:45:00 PM | 7.045 | 0.974 | 247.418 |
| 4:00:00 PM | 7.076 | 0.96 | 244.211 |
| 4:15:00 PM | 7.038 | 1.012 | 256.787 |
| 4:30:00 PM | 6.982 | 0.993 | 248.991 |
| 4:45:00 PM | 6.925 | 0.946 | 234.854 |
| 5:00:00 PM | 6.954 | 0.946 | 236.331 |
| 5:15:00 PM | 7.046 | 0.993 | 251.524 |
| 5:30:00 PM | 6.851 | 0.945 | 228.756 |
| 5:45:00 PM | 6.96 | 1.04 | 260.162 |
| 6:00:00 PM | 7.183 | 1.059 | 276.024 |
| 6:15:00 PM | 7.255 | 1.054 | 278.208 |
| 6:30:00 PM | 7.455 | 1.087 | 293.875 |
| 6:45:00 PM | 7.293 | 1.033 | 269.574 |
| 7:00:00 PM | 7.202 | 1.055 | 275.078 |
| 7:15:00 PM | 7.37 | 1.081 | 284.797 |
| 7:30:00 PM | 7.461 | 1.067 | 284.716 |
| 7:45:00 PM | 7.472 | 1.09 | 298.861 |
| 8:00:00 PM | 7.368 | 1.129 | 303.105 |
| 8:15:00 PM | 7.379 | 1.028 | 272.874 |
| 8:30:00 PM | 7.591 | 1.099 | 307.293 |
| 8:45:00 PM | 7.581 | 1.097 | 303.897 |
| 9:00:00 PM | 7.637 | 1.059 | 294.715 |
| 9:15:00 PM | 7.749 | 1.113 | 319.342 |
| 9:30:00 PM | 7.935 | 1.132 | 334.137 |
| 9:45:00 PM | 7.945 | 1.166 | 336.256 |
| 10:00:00 PM | 7.806 | 1.115 | 323.036 |
| 10:15:00 PM | 7.841 | 1.131 | 329.522 |
| 10:30:00 PM | 7.684 | 1.239 | 343.754 |
| 10:45:00 PM | 7.57 | 1.093 | 304.701 |
| 11:00:00 PM | 7.212 | 1.003 | 262.816 |
| 11:15:00 PM | 7.03 | 0.947 | 237.472 |
| 11:30:00 PM | 6.89 | 0.89 | 219.648 |
| 11:45:00 PM | 6.575 | 0.828 | 187.262 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.768 | 0.893 | 220.551 |
| Daily Min: | 5.394 | 0.413 | 73.923 |
| Daily Max: | 7.945 | 1.239 | 343.754 |
| Peak to Avg: | | | 1.56 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/20/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Thursday - A.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.361 | 0.804 | 178.766 |
| 12:15:00 AM | 6.14 | 0.751 | 159.216 |
| 12:30:00 AM | 5.989 | 0.654 | 132.689 |
| 12:45:00 AM | 6.14 | 0.708 | 150.257 |
| 1:00:00 AM | 5.748 | 0.575 | 111.304 |
| 1:15:00 AM | 5.584 | 0.523 | 97.336 |
| 1:30:00 AM | 5.675 | 0.56 | 106.975 |
| 1:45:00 AM | 5.572 | 0.537 | 96.664 |
| 2:00:00 AM | 5.52 | 0.526 | 96.205 |
| 2:15:00 AM | 5.377 | 0.455 | 80.251 |
| 2:30:00 AM | 5.298 | 0.438 | 75.525 |
| 2:45:00 AM | 5.271 | 0.471 | 81.009 |
| 3:00:00 AM | 5.352 | 0.538 | 94.862 |
| 3:15:00 AM | 5.38 | 0.445 | 79.043 |
| 3:30:00 AM | 5.368 | 0.453 | 80.248 |
| 3:45:00 AM | 5.334 | 0.436 | 76.337 |
| 4:00:00 AM | 5.334 | 0.467 | 81.646 |
| 4:15:00 AM | 5.296 | 0.433 | 75.333 |
| 4:30:00 AM | 5.381 | 0.454 | 78.69 |
| 4:45:00 AM | 5.438 | 0.501 | 90.382 |
| 5:00:00 AM | 5.694 | 0.593 | 113.811 |
| 5:15:00 AM | 5.884 | 0.681 | 129.839 |
| 5:30:00 AM | 6.016 | 0.667 | 135.908 |
| 5:45:00 AM | 6.206 | 0.831 | 178.907 |
| 6:00:00 AM | 6.153 | 0.789 | 166.525 |
| 6:15:00 AM | 6.317 | 0.794 | 174.811 |
| 6:30:00 AM | 6.587 | 0.888 | 201.03 |
| 6:45:00 AM | 6.763 | 0.952 | 229.384 |
| 7:00:00 AM | 6.623 | 0.976 | 227.859 |
| 7:15:00 AM | 6.948 | 1.067 | 262.936 |
| 7:30:00 AM | 7.111 | 0.982 | 252.49 |
| 7:45:00 AM | 7.325 | 1.011 | 269.277 |
| 8:00:00 AM | 7.267 | 0.987 | 255.735 |
| 8:15:00 AM | 7.313 | 1.019 | 264.162 |
| 8:30:00 AM | 7.268 | 1.078 | 282.516 |
| 8:45:00 AM | 7.162 | 1.078 | 279.84 |
| 9:00:00 AM | 7.132 | 0.976 | 239.853 |
| 9:15:00 AM | 6.899 | 0.953 | 235.707 |
| 9:30:00 AM | 6.87 | 0.938 | 229.923 |
| 9:45:00 AM | 7.091 | 1.028 | 263.388 |
| 10:00:00 AM | 7.15 | 0.987 | 253.952 |
| 10:15:00 AM | 6.88 | 0.991 | 242.308 |
| 10:30:00 AM | 6.966 | 0.948 | 237.325 |
| 10:45:00 AM | 7.205 | 1.128 | 295.081 |
| 11:00:00 AM | 7.07 | 1.096 | 278.083 |
| 11:15:00 AM | 7.06 | 1.003 | 254.047 |
| 11:30:00 AM | 7.101 | 0.991 | 252.803 |
| 11:45:00 AM | 7.211 | 1.09 | 285.406 |

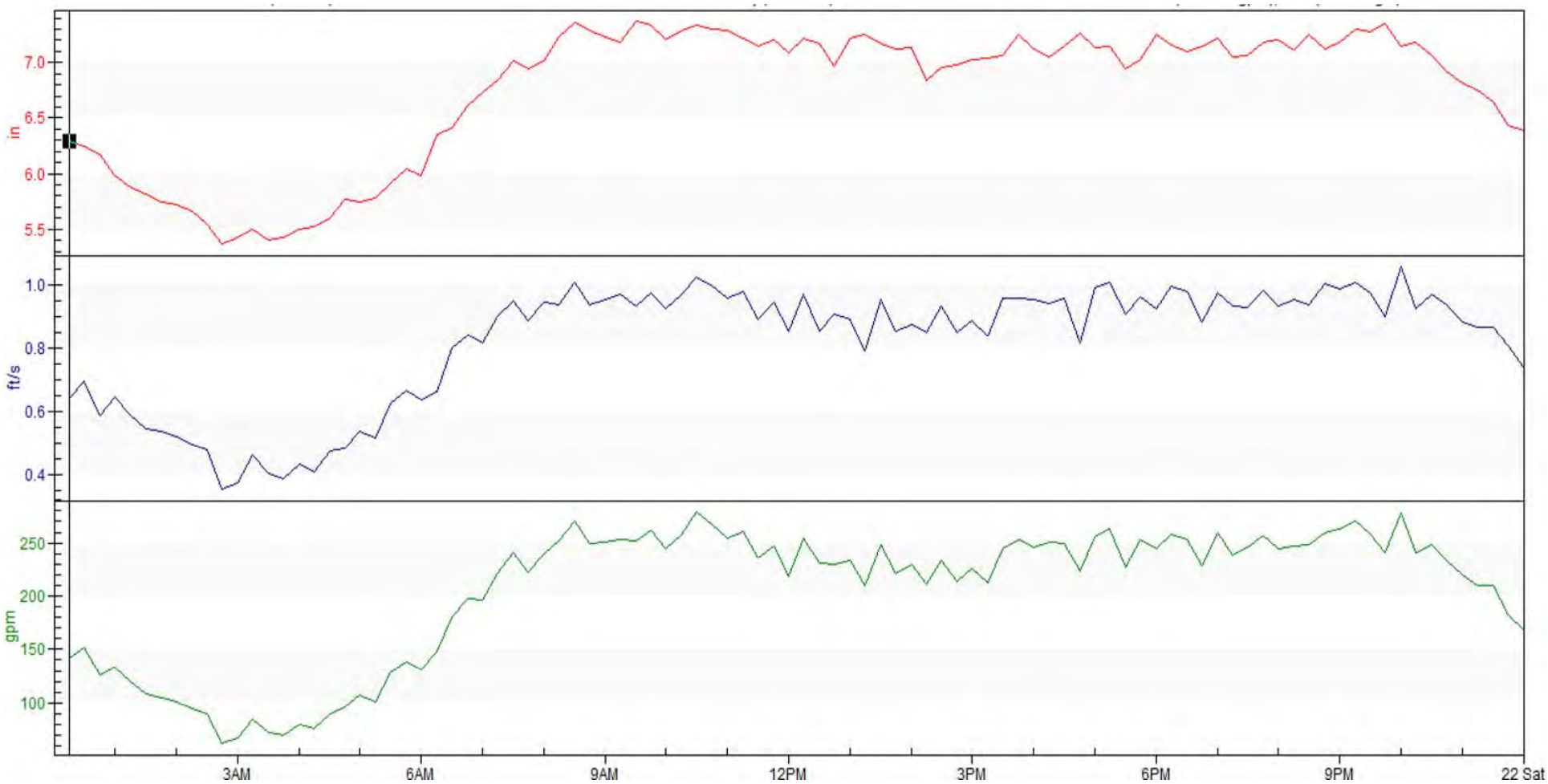
**Thursday - P.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.115 | 1.056 | 265.161 |
| 12:15:00 PM | 7.086 | 0.967 | 247.568 |
| 12:30:00 PM | 6.976 | 1.09 | 273.454 |
| 12:45:00 PM | 7.058 | 1.009 | 257.122 |
| 1:00:00 PM | 7.08 | 0.989 | 250.068 |
| 1:15:00 PM | 7.104 | 1.044 | 268.081 |
| 1:30:00 PM | 6.946 | 1.008 | 251.513 |
| 1:45:00 PM | 6.78 | 0.939 | 224.211 |
| 2:00:00 PM | 6.811 | 0.984 | 239.392 |
| 2:15:00 PM | 6.842 | 0.968 | 235.827 |
| 2:30:00 PM | 6.834 | 0.937 | 226.976 |
| 2:45:00 PM | 6.77 | 0.918 | 218.521 |
| 3:00:00 PM | 6.913 | 0.967 | 237.385 |
| 3:15:00 PM | 6.981 | 1.021 | 255.721 |
| 3:30:00 PM | 6.951 | 0.974 | 242.974 |
| 3:45:00 PM | 6.806 | 1.036 | 251.821 |
| 4:00:00 PM | 6.977 | 0.938 | 231.072 |
| 4:15:00 PM | 6.958 | 1.051 | 262.849 |
| 4:30:00 PM | 7.114 | 1.068 | 273.365 |
| 4:45:00 PM | 7.248 | 1.117 | 289.59 |
| 5:00:00 PM | 7.369 | 1.107 | 298.195 |
| 5:15:00 PM | 7.297 | 1.024 | 269.329 |
| 5:30:00 PM | 7.43 | 1.171 | 318.791 |
| 5:45:00 PM | 7.319 | 1.04 | 277.683 |
| 6:00:00 PM | 7.626 | 1.147 | 322.596 |
| 6:15:00 PM | 7.342 | 1.036 | 274.293 |
| 6:30:00 PM | 7.259 | 1.037 | 270.628 |
| 6:45:00 PM | 7.327 | 1.075 | 287.289 |
| 7:00:00 PM | 7.068 | 1.013 | 255.22 |
| 7:15:00 PM | 7.271 | 1.085 | 283.675 |
| 7:30:00 PM | 7.233 | 1.104 | 290.181 |
| 7:45:00 PM | 7.278 | 1.103 | 291.728 |
| 8:00:00 PM | 7.475 | 1.079 | 295.896 |
| 8:15:00 PM | 7.386 | 1.126 | 301.621 |
| 8:30:00 PM | 7.523 | 1.109 | 306.529 |
| 8:45:00 PM | 7.59 | 1.197 | 331.801 |
| 9:00:00 PM | 7.635 | 1.112 | 313.392 |
| 9:15:00 PM | 7.737 | 1.116 | 319.766 |
| 9:30:00 PM | 7.909 | 1.18 | 347.513 |
| 9:45:00 PM | 7.735 | 1.123 | 321.537 |
| 10:00:00 PM | 7.81 | 1.111 | 322.024 |
| 10:15:00 PM | 7.66 | 1.143 | 319.435 |
| 10:30:00 PM | 7.652 | 1.106 | 306.915 |
| 10:45:00 PM | 7.41 | 0.982 | 266.225 |
| 11:00:00 PM | 6.9 | 0.925 | 226.501 |
| 11:15:00 PM | 6.917 | 0.985 | 244.336 |
| 11:30:00 PM | 6.751 | 0.923 | 221.993 |
| 11:45:00 PM | 6.692 | 0.848 | 200.6 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.769 | 0.913 | 226.234 |
| Daily Min: | 5.271 | 0.433 | 75.333 |
| Daily Max: | 7.909 | 1.197 | 347.513 |
| Peak to Avg: | | | 1.54 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/21/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Friday - A.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.549 | 0.854 | 191.468 |
| 12:15:00 AM | 6.428 | 0.805 | 179.563 |
| 12:30:00 AM | 6.29 | 0.741 | 162.414 |
| 12:45:00 AM | 6.177 | 0.696 | 148.635 |
| 1:00:00 AM | 6.122 | 0.72 | 147.641 |
| 1:15:00 AM | 6.017 | 0.618 | 126.154 |
| 1:30:00 AM | 5.946 | 0.717 | 145.836 |
| 1:45:00 AM | 5.828 | 0.595 | 117.722 |
| 2:00:00 AM | 5.738 | 0.58 | 112.406 |
| 2:15:00 AM | 5.697 | 0.544 | 104.407 |
| 2:30:00 AM | 5.652 | 0.51 | 96.92 |
| 2:45:00 AM | 5.49 | 0.459 | 83.872 |
| 3:00:00 AM | 5.453 | 0.52 | 94.044 |
| 3:15:00 AM | 5.564 | 0.5 | 91.422 |
| 3:30:00 AM | 5.436 | 0.457 | 82.399 |
| 3:45:00 AM | 5.481 | 0.427 | 76.682 |
| 4:00:00 AM | 5.514 | 0.493 | 90.11 |
| 4:15:00 AM | 5.565 | 0.508 | 94.364 |
| 4:30:00 AM | 5.814 | 0.583 | 113.216 |
| 4:45:00 AM | 5.802 | 0.565 | 111.046 |
| 5:00:00 AM | 5.82 | 0.594 | 115.415 |
| 5:15:00 AM | 5.886 | 0.595 | 119.307 |
| 5:30:00 AM | 6.076 | 0.688 | 144.039 |
| 5:45:00 AM | 6.234 | 0.702 | 152.085 |
| 6:00:00 AM | 6.201 | 0.714 | 153.459 |
| 6:15:00 AM | 6.38 | 0.825 | 183.177 |
| 6:30:00 AM | 6.61 | 0.901 | 204.147 |
| 6:45:00 AM | 6.664 | 0.869 | 204.932 |
| 7:00:00 AM | 6.905 | 1.067 | 264.192 |
| 7:15:00 AM | 6.954 | 0.977 | 244.212 |
| 7:30:00 AM | 7.078 | 0.987 | 251.561 |
| 7:45:00 AM | 7.14 | 1.005 | 250.762 |
| 8:00:00 AM | 7.058 | 0.968 | 245.047 |
| 8:15:00 AM | 7.346 | 1.084 | 290.263 |
| 8:30:00 AM | 7.476 | 1.124 | 308.259 |
| 8:45:00 AM | 7.461 | 1.098 | 300.468 |
| 9:00:00 AM | 7.27 | 1.022 | 269.412 |
| 9:15:00 AM | 7.485 | 1.079 | 296.287 |
| 9:30:00 AM | 7.552 | 1.019 | 276.971 |
| 9:45:00 AM | 7.543 | 1.108 | 307.224 |
| 10:00:00 AM | 7.321 | 1.03 | 274.936 |
| 10:15:00 AM | 7.374 | 1.05 | 279.702 |
| 10:30:00 AM | 7.423 | 1.044 | 281.587 |
| 10:45:00 AM | 7.325 | 1.053 | 280.122 |
| 11:00:00 AM | 7.367 | 1.013 | 272.597 |
| 11:15:00 AM | 7.429 | 1.007 | 272.816 |
| 11:30:00 AM | 7.251 | 1.014 | 262.361 |
| 11:45:00 AM | 7.296 | 0.975 | 259.321 |

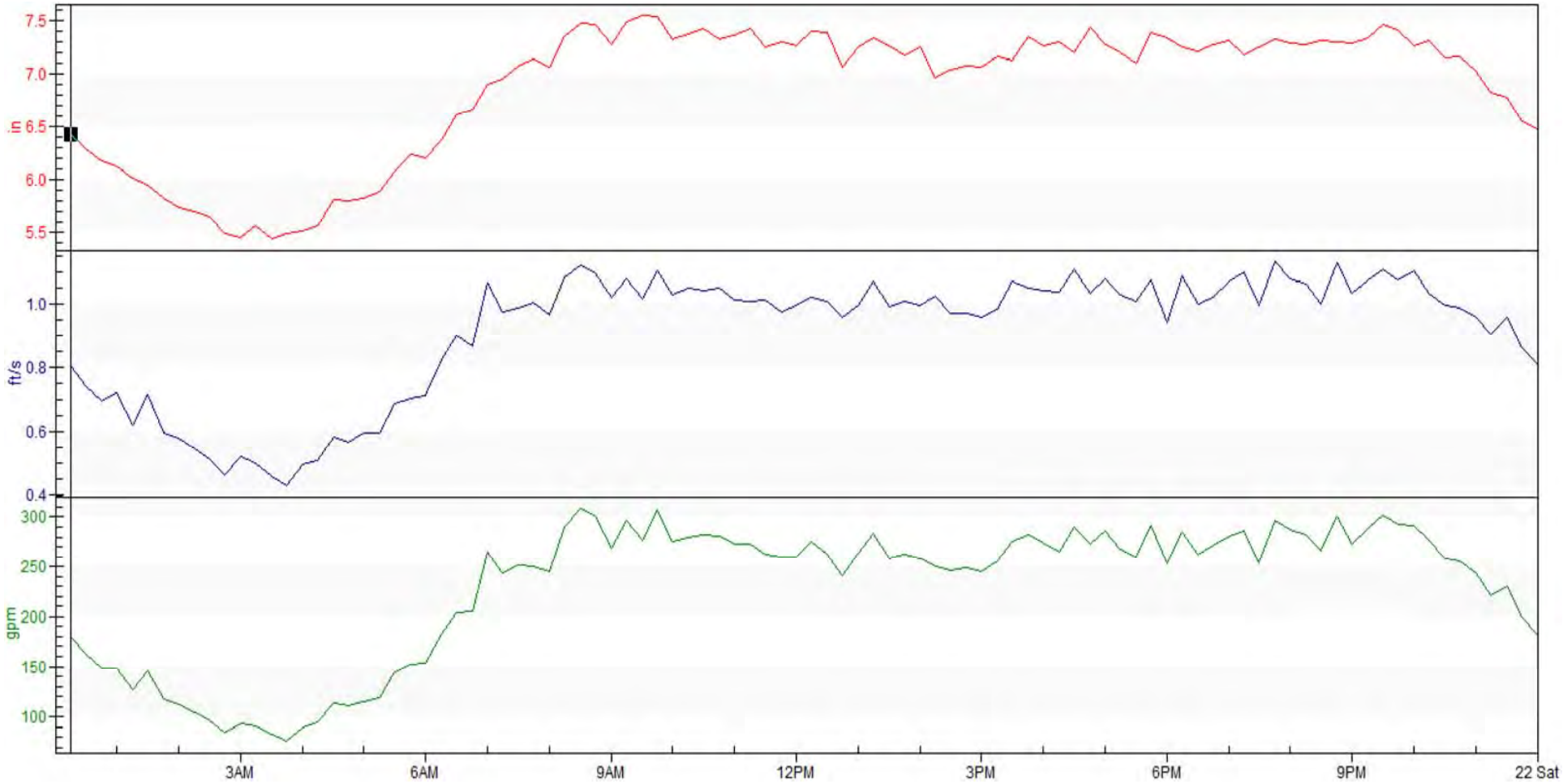
**Friday - P.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.264 | 0.998 | 259.31 |
| 12:15:00 PM | 7.395 | 1.02 | 275.832 |
| 12:30:00 PM | 7.388 | 1.01 | 262.681 |
| 12:45:00 PM | 7.066 | 0.96 | 240.322 |
| 1:00:00 PM | 7.257 | 0.997 | 263.313 |
| 1:15:00 PM | 7.336 | 1.073 | 283.344 |
| 1:30:00 PM | 7.264 | 0.991 | 258.121 |
| 1:45:00 PM | 7.17 | 1.009 | 262.294 |
| 2:00:00 PM | 7.248 | 0.998 | 257.996 |
| 2:15:00 PM | 6.968 | 1.024 | 250.504 |
| 2:30:00 PM | 7.038 | 0.972 | 246.665 |
| 2:45:00 PM | 7.073 | 0.973 | 248.644 |
| 3:00:00 PM | 7.068 | 0.96 | 244.491 |
| 3:15:00 PM | 7.16 | 0.985 | 255.512 |
| 3:30:00 PM | 7.13 | 1.071 | 275.282 |
| 3:45:00 PM | 7.355 | 1.049 | 281.873 |
| 4:00:00 PM | 7.269 | 1.044 | 273.884 |
| 4:15:00 PM | 7.295 | 1.04 | 264.803 |
| 4:30:00 PM | 7.202 | 1.111 | 290.359 |
| 4:45:00 PM | 7.443 | 1.033 | 273.103 |
| 5:00:00 PM | 7.276 | 1.081 | 286.421 |
| 5:15:00 PM | 7.202 | 1.032 | 266.963 |
| 5:30:00 PM | 7.097 | 1.009 | 258.995 |
| 5:45:00 PM | 7.393 | 1.076 | 290.966 |
| 6:00:00 PM | 7.338 | 0.942 | 252.353 |
| 6:15:00 PM | 7.253 | 1.088 | 284.309 |
| 6:30:00 PM | 7.215 | 0.999 | 261.752 |
| 6:45:00 PM | 7.28 | 1.022 | 270.96 |
| 7:00:00 PM | 7.308 | 1.07 | 280.391 |
| 7:15:00 PM | 7.179 | 1.101 | 286.659 |
| 7:30:00 PM | 7.251 | 0.995 | 253.911 |
| 7:45:00 PM | 7.328 | 1.135 | 296.482 |
| 8:00:00 PM | 7.293 | 1.079 | 286.748 |
| 8:15:00 PM | 7.278 | 1.063 | 281.627 |
| 8:30:00 PM | 7.315 | 1 | 266.68 |
| 8:45:00 PM | 7.301 | 1.131 | 300.903 |
| 9:00:00 PM | 7.285 | 1.035 | 272.735 |
| 9:15:00 PM | 7.34 | 1.077 | 288.477 |
| 9:30:00 PM | 7.47 | 1.109 | 301.71 |
| 9:45:00 PM | 7.418 | 1.077 | 292.482 |
| 10:00:00 PM | 7.268 | 1.107 | 291.104 |
| 10:15:00 PM | 7.319 | 1.034 | 276.064 |
| 10:30:00 PM | 7.153 | 0.999 | 258.785 |
| 10:45:00 PM | 7.164 | 0.988 | 255.834 |
| 11:00:00 PM | 7.02 | 0.961 | 243.042 |
| 11:15:00 PM | 6.825 | 0.906 | 221.045 |
| 11:30:00 PM | 6.781 | 0.957 | 230.79 |
| 11:45:00 PM | 6.549 | 0.862 | 199.15 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.866 | 0.915 | 229.149 |
| Daily Min: | 5.436 | 0.427 | 76.682 |
| Daily Max: | 7.552 | 1.135 | 308.259 |
| Peak to Avg: | | | 1.35 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/22/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Saturday - A.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.47 | 0.808 | 180.59 |
| 12:15:00 AM | 6.38 | 0.829 | 184.992 |
| 12:30:00 AM | 6.293 | 0.806 | 174.207 |
| 12:45:00 AM | 6.15 | 0.727 | 153.528 |
| 1:00:00 AM | 6.039 | 0.684 | 141.909 |
| 1:15:00 AM | 6.049 | 0.672 | 138.716 |
| 1:30:00 AM | 5.99 | 0.671 | 136.001 |
| 1:45:00 AM | 5.984 | 0.526 | 107.919 |
| 2:00:00 AM | 5.883 | 0.457 | 88.252 |
| 2:15:00 AM | 5.698 | 0.415 | 79.161 |
| 2:30:00 AM | 5.685 | 0.441 | 84.417 |
| 2:45:00 AM | 5.75 | 0.44 | 85.569 |
| 3:00:00 AM | 5.699 | 0.537 | 102.887 |
| 3:15:00 AM | 5.677 | 0.441 | 83.619 |
| 3:30:00 AM | 5.608 | 0.408 | 76.614 |
| 3:45:00 AM | 5.541 | 0.373 | 68.997 |
| 4:00:00 AM | 5.499 | 0.402 | 73.439 |
| 4:15:00 AM | 5.541 | 0.444 | 81.838 |
| 4:30:00 AM | 5.668 | 0.42 | 80.038 |
| 4:45:00 AM | 5.763 | 0.46 | 87.602 |
| 5:00:00 AM | 5.648 | 0.558 | 105.772 |
| 5:15:00 AM | 5.659 | 0.497 | 94.548 |
| 5:30:00 AM | 5.779 | 0.574 | 110.786 |
| 5:45:00 AM | 5.784 | 0.619 | 120.143 |
| 6:00:00 AM | 5.974 | 0.595 | 121.688 |
| 6:15:00 AM | 5.908 | 0.577 | 116.247 |
| 6:30:00 AM | 5.931 | 0.573 | 116.193 |
| 6:45:00 AM | 6.102 | 0.654 | 133.611 |
| 7:00:00 AM | 6.131 | 0.634 | 134.148 |
| 7:15:00 AM | 6.562 | 0.825 | 189.492 |
| 7:30:00 AM | 6.683 | 0.939 | 219.023 |
| 7:45:00 AM | 6.796 | 0.892 | 214.865 |
| 8:00:00 AM | 7.162 | 1.019 | 264.626 |
| 8:15:00 AM | 7.096 | 1.026 | 256.999 |
| 8:30:00 AM | 7.198 | 1.049 | 274.06 |
| 8:45:00 AM | 7.474 | 1.11 | 304.34 |
| 9:00:00 AM | 7.747 | 1.116 | 320.112 |
| 9:15:00 AM | 7.6 | 1.138 | 318.734 |
| 9:30:00 AM | 7.804 | 1.19 | 344.49 |
| 9:45:00 AM | 7.809 | 1.155 | 334.864 |
| 10:00:00 AM | 7.894 | 1.17 | 338.352 |
| 10:15:00 AM | 7.768 | 1.185 | 341.035 |
| 10:30:00 AM | 7.491 | 1.007 | 276.776 |
| 10:45:00 AM | 7.46 | 1.108 | 293.65 |
| 11:00:00 AM | 7.523 | 1.186 | 327.976 |
| 11:15:00 AM | 7.693 | 1.107 | 306.054 |
| 11:30:00 AM | 7.742 | 1.081 | 310.04 |
| 11:45:00 AM | 7.6 | 1.123 | 311.582 |

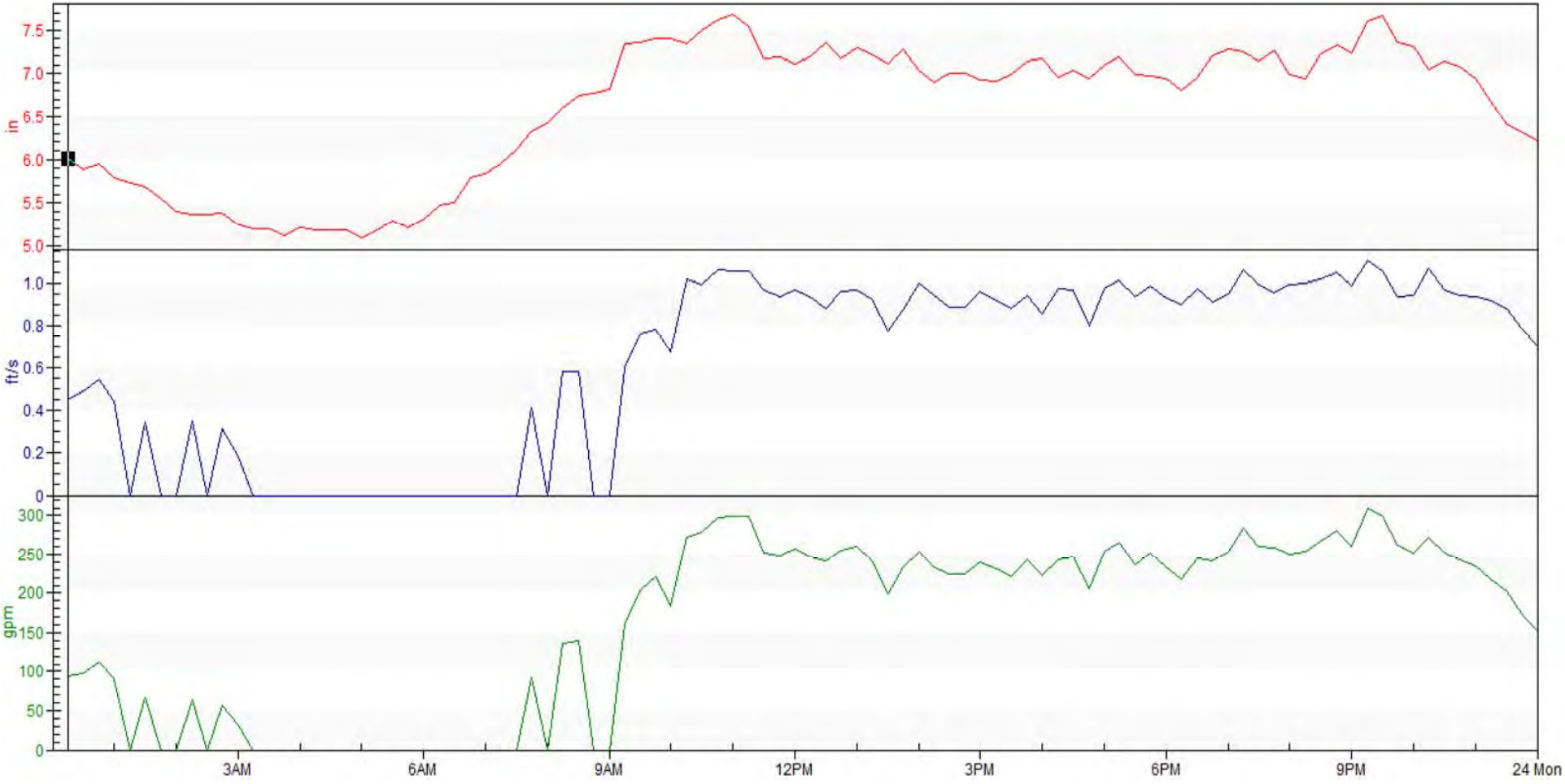
**Saturday - P.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.427 | 1.149 | 312.411 |
| 12:15:00 PM | 7.581 | 1.101 | 307.458 |
| 12:30:00 PM | 7.69 | 1.137 | 323.331 |
| 12:45:00 PM | 7.542 | 1.09 | 302.445 |
| 1:00:00 PM | 7.267 | 1.117 | 290.88 |
| 1:15:00 PM | 7.391 | 1.115 | 301.292 |
| 1:30:00 PM | 7.517 | 1.093 | 301.918 |
| 1:45:00 PM | 7.635 | 1.068 | 294.068 |
| 2:00:00 PM | 7.357 | 1.048 | 276.028 |
| 2:15:00 PM | 7.308 | 1.092 | 290.974 |
| 2:30:00 PM | 7.391 | 1.047 | 280.814 |
| 2:45:00 PM | 7.331 | 1.069 | 285.924 |
| 3:00:00 PM | 7.212 | 1.093 | 286.268 |
| 3:15:00 PM | 7.295 | 1.037 | 271.8 |
| 3:30:00 PM | 7.067 | 1.106 | 282.144 |
| 3:45:00 PM | 7.137 | 0.997 | 253.24 |
| 4:00:00 PM | 7.12 | 1.084 | 279.231 |
| 4:15:00 PM | 7.269 | 1.046 | 276.552 |
| 4:30:00 PM | 7.143 | 1.068 | 276.351 |
| 4:45:00 PM | 7.105 | 1.119 | 287.541 |
| 5:00:00 PM | 6.983 | 1.001 | 251.415 |
| 5:15:00 PM | 7.103 | 0.967 | 248.169 |
| 5:30:00 PM | 7.122 | 1.013 | 260.988 |
| 5:45:00 PM | 7 | 1.091 | 275.043 |
| 6:00:00 PM | 7.08 | 1.03 | 258.429 |
| 6:15:00 PM | 6.921 | 0.925 | 225.362 |
| 6:30:00 PM | 6.948 | 0.96 | 237.76 |
| 6:45:00 PM | 6.924 | 0.941 | 233.78 |
| 7:00:00 PM | 6.714 | 0.934 | 219.433 |
| 7:15:00 PM | 7.008 | 1.053 | 265.762 |
| 7:30:00 PM | 6.916 | 1.025 | 251.189 |
| 7:45:00 PM | 6.877 | 0.913 | 222.926 |
| 8:00:00 PM | 7.063 | 0.972 | 247.782 |
| 8:15:00 PM | 6.933 | 1.02 | 253.889 |
| 8:30:00 PM | 6.974 | 0.991 | 246.793 |
| 8:45:00 PM | 7.074 | 1.003 | 246.355 |
| 9:00:00 PM | 7.161 | 1.031 | 262.78 |
| 9:15:00 PM | 7.058 | 0.982 | 250.049 |
| 9:30:00 PM | 7.067 | 0.994 | 251.045 |
| 9:45:00 PM | 7.154 | 1.032 | 267.528 |
| 10:00:00 PM | 7.079 | 0.998 | 253.586 |
| 10:15:00 PM | 7.035 | 0.986 | 250.013 |
| 10:30:00 PM | 6.928 | 1.013 | 251.627 |
| 10:45:00 PM | 6.751 | 0.94 | 222.614 |
| 11:00:00 PM | 6.703 | 0.895 | 208.999 |
| 11:15:00 PM | 6.597 | 0.919 | 214.422 |
| 11:30:00 PM | 6.662 | 0.865 | 202.14 |
| 11:45:00 PM | 6.304 | 0.777 | 169.756 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.798 | 0.893 | 222.739 |
| Daily Min: | 5.499 | 0.373 | 68.997 |
| Daily Max: | 7.894 | 1.19 | 344.49 |
| Peak to Avg: | | | 1.55 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/23/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Sunday - A.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.291 | 0.791 | 169.053 |
| 12:15:00 AM | 6.084 | 0.697 | 146.175 |
| 12:30:00 AM | 6.003 | 0.845 | 173.993 |
| 12:45:00 AM | 6.023 | 0.669 | 135.863 |
| 1:00:00 AM | 5.899 | 0.579 | 115.319 |
| 1:15:00 AM | 5.79 | 0.66 | 127.835 |
| 1:30:00 AM | 5.769 | 0.544 | 106.058 |
| 1:45:00 AM | 5.648 | 0 | 0 |
| 2:00:00 AM | 5.505 | 0 | 0 |
| 2:15:00 AM | 5.468 | 0.483 | 86.966 |
| 2:30:00 AM | 5.403 | 0.391 | 69.67 |
| 2:45:00 AM | 5.469 | 0.462 | 83.959 |
| 3:00:00 AM | 5.338 | 0.387 | 66.391 |
| 3:15:00 AM | 5.253 | 0.457 | 78.128 |
| 3:30:00 AM | 5.286 | 0.388 | 65.914 |
| 3:45:00 AM | 5.216 | 0 | 0 |
| 4:00:00 AM | 5.286 | 0 | 0 |
| 4:15:00 AM | 5.288 | 0 | 0 |
| 4:30:00 AM | 5.252 | 0 | 0 |
| 4:45:00 AM | 5.238 | 0 | 0 |
| 5:00:00 AM | 5.161 | 0 | 0 |
| 5:15:00 AM | 5.182 | 0 | 0 |
| 5:30:00 AM | 5.344 | 0 | 0 |
| 5:45:00 AM | 5.358 | 0 | 0 |
| 6:00:00 AM | 5.488 | 0 | 0 |
| 6:15:00 AM | 5.54 | 0 | 0 |
| 6:30:00 AM | 5.603 | 0.498 | 92.456 |
| 6:45:00 AM | 5.797 | 0.33 | 64.788 |
| 7:00:00 AM | 5.932 | 0.371 | 74.533 |
| 7:15:00 AM | 6.046 | 0.467 | 97.015 |
| 7:30:00 AM | 6.377 | 0.541 | 114.088 |
| 7:45:00 AM | 6.491 | 0.597 | 136.293 |
| 8:00:00 AM | 6.632 | 0.52 | 117.725 |
| 8:15:00 AM | 6.787 | 0.71 | 171.962 |
| 8:30:00 AM | 6.781 | 0.663 | 160.238 |
| 8:45:00 AM | 6.934 | 0.766 | 190.704 |
| 9:00:00 AM | 7.338 | 0.948 | 253.79 |
| 9:15:00 AM | 7.493 | 0.981 | 269.82 |
| 9:30:00 AM | 7.661 | 0.867 | 236.112 |
| 9:45:00 AM | 7.643 | 0.864 | 234.083 |
| 10:00:00 AM | 7.423 | 1.099 | 298.605 |
| 10:15:00 AM | 7.464 | 1.22 | 331.823 |
| 10:30:00 AM | 7.817 | 1.234 | 358.139 |
| 10:45:00 AM | 7.784 | 1.182 | 341.238 |
| 11:00:00 AM | 7.809 | 1.194 | 343.669 |
| 11:15:00 AM | 7.669 | 1.153 | 319.97 |
| 11:30:00 AM | 7.495 | 0.998 | 267.649 |
| 11:45:00 AM | 7.275 | 1.013 | 263.945 |

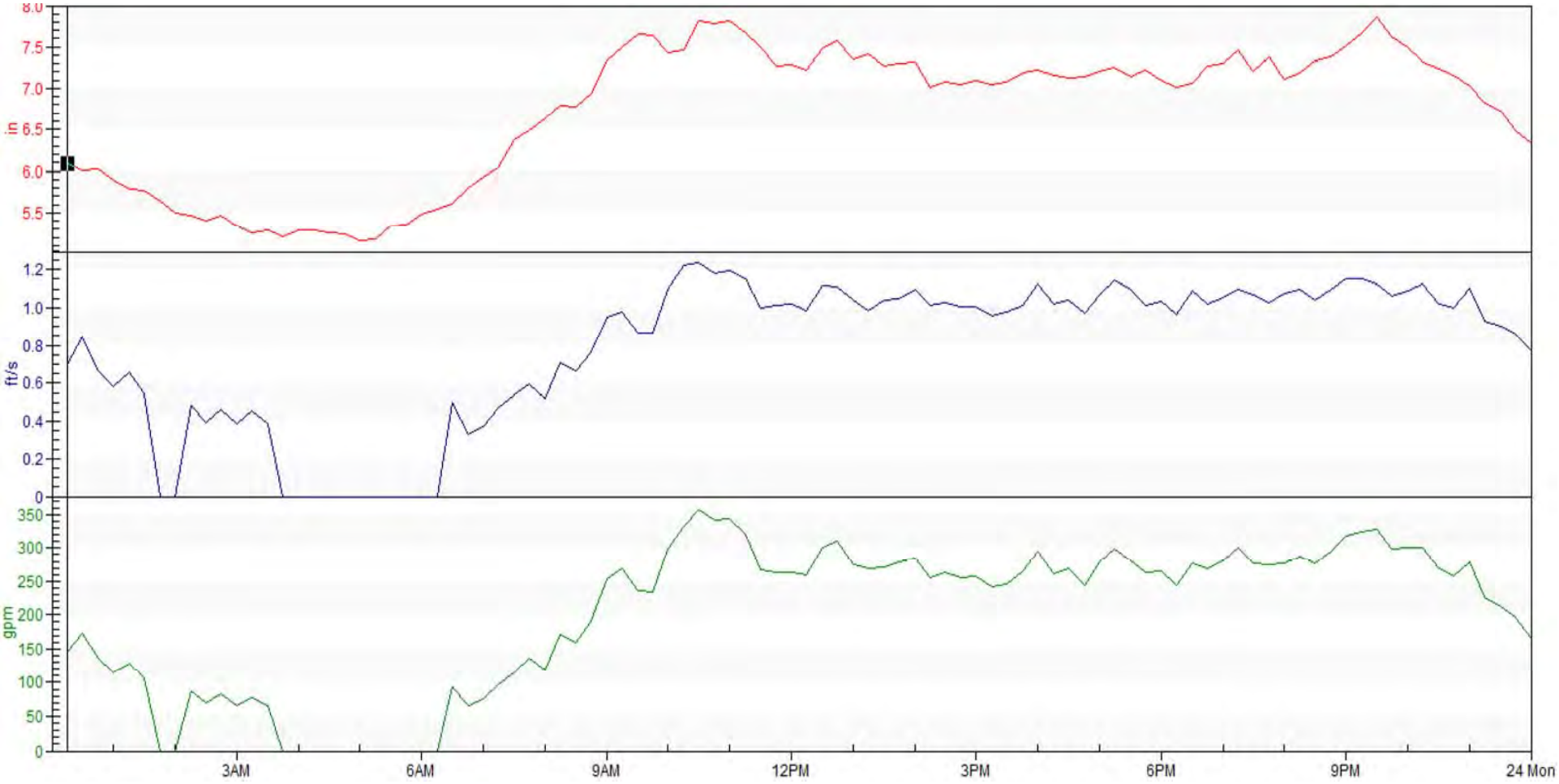
**Sunday - P.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.283 | 1.018 | 263.539 |
| 12:15:00 PM | 7.224 | 0.986 | 258.621 |
| 12:30:00 PM | 7.473 | 1.115 | 300.549 |
| 12:45:00 PM | 7.58 | 1.109 | 309.633 |
| 1:00:00 PM | 7.353 | 1.039 | 275.98 |
| 1:15:00 PM | 7.418 | 0.989 | 268.508 |
| 1:30:00 PM | 7.267 | 1.042 | 270.911 |
| 1:45:00 PM | 7.304 | 1.051 | 278.984 |
| 2:00:00 PM | 7.322 | 1.1 | 284.405 |
| 2:15:00 PM | 7.019 | 1.014 | 254.833 |
| 2:30:00 PM | 7.075 | 1.028 | 262.611 |
| 2:45:00 PM | 7.05 | 1.007 | 256.227 |
| 3:00:00 PM | 7.087 | 1.009 | 258.525 |
| 3:15:00 PM | 7.048 | 0.96 | 241.953 |
| 3:30:00 PM | 7.081 | 0.98 | 246.16 |
| 3:45:00 PM | 7.191 | 1.017 | 265.406 |
| 4:00:00 PM | 7.216 | 1.122 | 294.073 |
| 4:15:00 PM | 7.159 | 1.02 | 262.355 |
| 4:30:00 PM | 7.134 | 1.041 | 268.998 |
| 4:45:00 PM | 7.142 | 0.971 | 244.344 |
| 5:00:00 PM | 7.204 | 1.068 | 279.295 |
| 5:15:00 PM | 7.259 | 1.148 | 299.36 |
| 5:30:00 PM | 7.142 | 1.099 | 281.367 |
| 5:45:00 PM | 7.218 | 1.016 | 262.616 |
| 6:00:00 PM | 7.097 | 1.035 | 265.42 |
| 6:15:00 PM | 7.013 | 0.967 | 244.218 |
| 6:30:00 PM | 7.069 | 1.087 | 277.58 |
| 6:45:00 PM | 7.265 | 1.024 | 268.898 |
| 7:00:00 PM | 7.301 | 1.057 | 280.16 |
| 7:15:00 PM | 7.458 | 1.098 | 300.193 |
| 7:30:00 PM | 7.211 | 1.069 | 276.367 |
| 7:45:00 PM | 7.376 | 1.029 | 275.611 |
| 8:00:00 PM | 7.111 | 1.08 | 277.726 |
| 8:15:00 PM | 7.188 | 1.099 | 286.568 |
| 8:30:00 PM | 7.337 | 1.042 | 276.931 |
| 8:45:00 PM | 7.377 | 1.1 | 294.449 |
| 9:00:00 PM | 7.506 | 1.154 | 318.18 |
| 9:15:00 PM | 7.671 | 1.154 | 324.99 |
| 9:30:00 PM | 7.862 | 1.124 | 328.558 |
| 9:45:00 PM | 7.614 | 1.064 | 298.582 |
| 10:00:00 PM | 7.489 | 1.093 | 300.583 |
| 10:15:00 PM | 7.323 | 1.124 | 300.193 |
| 10:30:00 PM | 7.237 | 1.023 | 269.25 |
| 10:45:00 PM | 7.156 | 0.999 | 258.493 |
| 11:00:00 PM | 7.033 | 1.101 | 279.228 |
| 11:15:00 PM | 6.824 | 0.932 | 227.156 |
| 11:30:00 PM | 6.721 | 0.904 | 212.342 |
| 11:45:00 PM | 6.494 | 0.864 | 197.352 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.721 | 0.789 | 201.297 |
| Daily Min: | 5.161 | 0 | 0 |
| Daily Max: | 7.862 | 1.234 | 358.139 |
| Peak to Avg: | | | 1.78 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/24/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Monday - A.M. 7/24/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 6.327 | 0.769 | 165.914 |
| 12:15:00 AM | 6.265 | 0.82 | 178.626 |
| 12:30:00 AM | 5.956 | 0.651 | 125.797 |
| 12:45:00 AM | 6 | 0.749 | 154.044 |
| 1:00:00 AM | 5.924 | 0.619 | 125.203 |
| 1:15:00 AM | 5.738 | 0.593 | 113.569 |
| 1:30:00 AM | 5.628 | 0.571 | 107.896 |
| 1:45:00 AM | 5.632 | 0.475 | 87.068 |
| 2:00:00 AM | 5.65 | 0.581 | 110.239 |
| 2:15:00 AM | 5.632 | 0.538 | 101.631 |
| 2:30:00 AM | 5.433 | 0.43 | 76.119 |
| 2:45:00 AM | 5.325 | 0.437 | 76.252 |
| 3:00:00 AM | 5.378 | 0.479 | 84.995 |
| 3:15:00 AM | 5.357 | 0.518 | 89.023 |
| 3:30:00 AM | 5.384 | 0.523 | 91.596 |
| 3:45:00 AM | 5.273 | 0.529 | 91.492 |
| 4:00:00 AM | 5.294 | 0.434 | 74.443 |
| 4:15:00 AM | 5.293 | 0.47 | 81.326 |
| 4:30:00 AM | 5.414 | 0.473 | 84.676 |
| 4:45:00 AM | 5.516 | 0.568 | 104.365 |
| 5:00:00 AM | 5.65 | 0.63 | 118.33 |
| 5:15:00 AM | 5.789 | 0.66 | 129.423 |
| 5:30:00 AM | 5.963 | 0.666 | 134.334 |
| 5:45:00 AM | 6.033 | 0.819 | 169.785 |
| 6:00:00 AM | 6.12 | 0.86 | 181.49 |
| 6:15:00 AM | 6.284 | 0.802 | 174.909 |
| 6:30:00 AM | 6.515 | 0.913 | 208.795 |
| 6:45:00 AM | 6.71 | 0.956 | 227.962 |
| 7:00:00 AM | 6.738 | 0.941 | 224.86 |
| 7:15:00 AM | 6.892 | 0.956 | 228.679 |
| 7:30:00 AM | 6.932 | 0.985 | 243.035 |
| 7:45:00 AM | 7.03 | 1.091 | 272.32 |
| 8:00:00 AM | 7.011 | 1.065 | 266.739 |
| 8:15:00 AM | 6.968 | 1.06 | 264.585 |
| 8:30:00 AM | 7.002 | 1.108 | 279.348 |
| 8:45:00 AM | 7.161 | 1.057 | 269.283 |
| 9:00:00 AM | 7.041 | 0.992 | 251.893 |
| 9:15:00 AM | 7.006 | 1.076 | 271.33 |
| 9:30:00 AM | 7.104 | 1.043 | 264.416 |
| 9:45:00 AM | 7.139 | 1.061 | 268.97 |
| 10:00:00 AM | 7.504 | 1.119 | 303.799 |
| 10:15:00 AM | 7.378 | 0.968 | 259.272 |
| 10:30:00 AM | 7.574 | 1.103 | 302.61 |
| 10:45:00 AM | 7.358 | 1.078 | 289.722 |
| 11:00:00 AM | 7.406 | 1 | 269.628 |
| 11:15:00 AM | 7.368 | 1.066 | 279.352 |
| 11:30:00 AM | 7.098 | 0.96 | 245.048 |
| 11:45:00 AM | 7.24 | 1.109 | 290.235 |

**Monday - P.M. 7/24/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.031 | 0.998 | 251.241 |
| 12:15:00 PM | 7.143 | 1.007 | 258.079 |
| 12:30:00 PM | 7.111 | 0.986 | 253.766 |
| 12:45:00 PM | 7.267 | 1.05 | 272.694 |
| 1:00:00 PM | 7.168 | 1.054 | 272.796 |
| 1:15:00 PM | 7.155 | 0.995 | 258.086 |
| 1:30:00 PM | 7.067 | 0.982 | 244.061 |
| 1:45:00 PM | 6.988 | 0.975 | 245.187 |
| 2:00:00 PM | 6.989 | 0.984 | 247.219 |
| 2:15:00 PM | 7.057 | 0.933 | 237.295 |
| 2:30:00 PM | 7.146 | 0.969 | 250.935 |
| 2:45:00 PM | 7.093 | 1.025 | 262.786 |
| 3:00:00 PM | 6.925 | 1.043 | 259.211 |
| 3:15:00 PM | 6.956 | 1.031 | 254.407 |
| 3:30:00 PM | 7.037 | 0.914 | 231.561 |
| 3:45:00 PM | 7.078 | 1.082 | 271.098 |
| 4:00:00 PM | 7.189 | 1.023 | 261.89 |
| 4:15:00 PM | 7.234 | 1.071 | 281.663 |
| 4:30:00 PM | 7.235 | 1.013 | 266.498 |
| 4:45:00 PM | 7.121 | 1.108 | 285.417 |
| 5:00:00 PM | 7.179 | 1.059 | 273.171 |
| 5:15:00 PM | 7.237 | 1.053 | 277.066 |
| 5:30:00 PM | 7.294 | 1.185 | 314.897 |
| 5:45:00 PM | 7.303 | 1.032 | 268.419 |
| 6:00:00 PM | 7.439 | 1.189 | 319.855 |
| 6:15:00 PM | 7.275 | 1.102 | 291.953 |
| 6:30:00 PM | 7.005 | 0.953 | 237.253 |
| 6:45:00 PM | 7.069 | 1.023 | 261.018 |
| 7:00:00 PM | 7.124 | 1.036 | 259.749 |
| 7:15:00 PM | 7.137 | 0.996 | 256.392 |
| 7:30:00 PM | 7.209 | 0.971 | 237.576 |
| 7:45:00 PM | 7.577 | 1.066 | 290.174 |
| 8:00:00 PM | 7.554 | 1.113 | 307.942 |
| 8:15:00 PM | 7.435 | 1.136 | 306.764 |
| 8:30:00 PM | 7.442 | 1.041 | 281.421 |
| 8:45:00 PM | 7.869 | 1.156 | 338.458 |
| 9:00:00 PM | 7.628 | 1.132 | 318.581 |
| 9:15:00 PM | 7.78 | 1.182 | 334.407 |
| 9:30:00 PM | 7.546 | 0.989 | 269.859 |
| 9:45:00 PM | 7.668 | 1.137 | 322.209 |
| 10:00:00 PM | 7.695 | 1.145 | 325.631 |
| 10:15:00 PM | 7.435 | 1.159 | 312.493 |
| 10:30:00 PM | 7.398 | 1.045 | 281.942 |
| 10:45:00 PM | 7.323 | 1.057 | 277.852 |
| 11:00:00 PM | 7.066 | 0.995 | 253.753 |
| 11:15:00 PM | 6.767 | 0.959 | 223.243 |
| 11:30:00 PM | 6.489 | 0.909 | 207.253 |
| 11:45:00 PM | 6.292 | 0.791 | 171.735 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.782 | 0.921 | 227.742 |
| Daily Min: | 5.273 | 0.43 | 74.443 |
| Daily Max: | 7.869 | 1.189 | 338.458 |
| Peak to Avg: | | | 1.49 |

DRAFT

# Sewer Line Flow Study Summary

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 Palm, Santa Paula, CA**
Pipe Size: **15" VCP**
Time Period: **7/11/2023, 12:00 a.m. - 7/25/2023, 12:00 a.m.**

## Level - Inches

| | |
|---|---|
| Average: | 6.675 |
| Maximum: | 9.657 |
| Minimum: | 5.088 |
| Max d/D: | 64.4% |

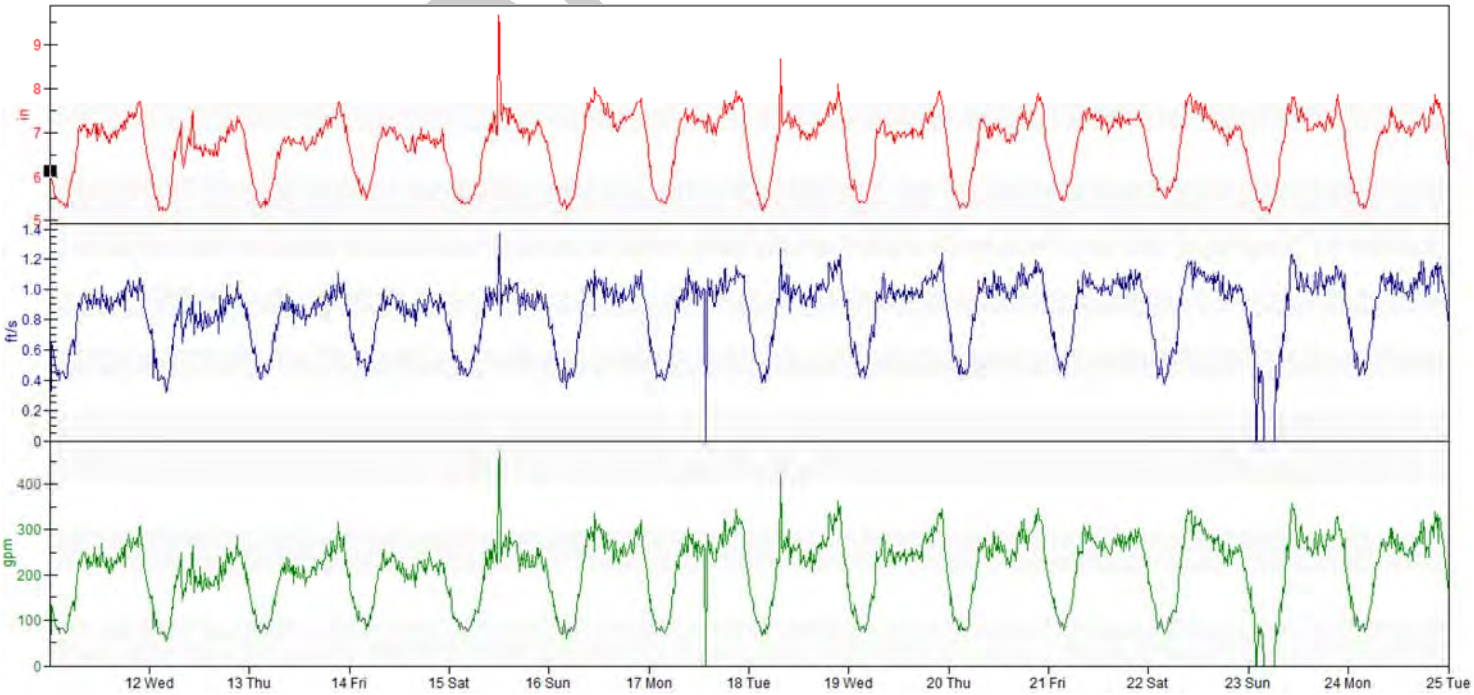
## Velocity - Feet per Second

| | |
|---|---|
| Average: | 0.800 |
| Maximum: | 0.363 |
| Minimum: | 0.408 |

## Flow Rate - Gallons Per Minute

| | |
|---|---|
| Average: | 196.456 |
| Maximum:: | 471.466 |
| Minimum: | 55.449 |
| Peak to Average | 2.33 |

DRAFT




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

# Appendix B – Detailed Flow Verification

DRAFT

## Appendix C - Flow Verification

During the flow monitoring study, the average day water demand was 2.72 MGD and the average day flow to the WRF was 2.02 MGD, resulting in an average return factor of 74%, which is slightly lower than the average return factor of 86% from 2020 to 2022. For validating the preliminary return factors, MKN reduced the return factors for all land uses proportionally by 12%. **Table 1** provides the preliminary wastewater return factors adjusted proportionally for validation with the flow monitoring study.

**Table 1: Flow Monitoring Wastewater Return Factors**

| Land Use | Number of Parcels | Acreage | Average Day Demand (MGD)[1] | Average Day Demand (GPM)[1] | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
|---|---|---|---|---|---|---|---|
| Single-Family Residential | 3,405 | 829 | 1.19 | 827 | 68% | 0.74 | 512 |
| Multi-Family Residential | 1,890 | 278 | 0.81 | 562 | 78% | 0.57 | 398 |
| Mobile Homes | 6 | 57 | 0.14 | 99 | 73% | 0.09 | 66 |
| General Commercial | 499 | 266 | 0.43 | 300 | 83% | 0.33 | 226 |
| Commercial Office | 178 | 40 | 0.07 | 52 | 83% | 0.06 | 39 |
| General Industrial | 99 | 130 | 0.11 | 80 | 83% | 0.09 | 60 |
| Public Facilities | 23 | 114 | 0.12 | 81 | 68% | 0.07 | 50 |
| Airport | 9 | 47 | 0.01 | 5 | 73% | 0.00 | 3 |
| Specific Plan | 12 | 124 | 0.11 | 74 | 73% | 0.07 | 49 |
| **Total** | **6,121** | **1,885** | **2.99** | **2,078** | **74%** | **2.02** | **1,403** |
| | | | | | **WRF ADF[2]** | **2.02** | **1,403** |

Notes:
1. Potable water usage was calculated using a three-year average from 2020 to 2022 water billing data. Water usage that did not result in return wastewater flows was not included in this average (ex: hydrant testing, landscaping-specific meters, water losses, etc.)
2. Actual existing average daily flow calculated from influent WRF data from 2020 to 2022

**Table 2** through **Table 5** provide a summary of the estimated average day water demand and average day flow within the FM01, FM02, FM03, and FM04 sewersheds during the flow monitoring study.

DRAFT

| Table 2: Estimated FM01 Results with Adjusted Preliminary Wastewater Return Factors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land Use | Number of Sewered Parcels | Sewered Acres | Average Day Demand (MGD) | Average Day Demand (GPM) | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
| Single-Family Residential | 282 | 45 | 0.07 | 48 | 68% | 0.05 | 32 |
| Multi-Family Residential | 58 | 13 | 0.04 | 27 | 78% | 0.03 | 21 |
| Mobile Homes | 3 | 36 | 0.08 | 54 | 73% | 0.06 | 39 |
| General Commercial | 89 | 52 | 0.09 | 64 | 83% | 0.08 | 53 |
| Commercial Office | 1 | 1 | 0.00 | 0 | 83% | 0.00 | 0 |
| General Industrial | 82 | 77 | 0.05 | 37 | 83% | 0.04 | 31 |
| Public Facilities | 1 | 0 | 0.00 | 0 | 68% | 0.00 | 0 |
| Airport | 9 | 47 | 0.01 | 4 | 73% | 0.00 | 3 |
| Specific Plan | 10 | 92 | 0.09 | 64 | 73% | 0.07 | 47 |
| **Total** | **535** | **363** | **0.43** | **299** | **76%** | **0.33** | **228** |
| | | | | | | | |
| | | | | | **Estimated ADF** | **0.33** | **228** |
| | | | | | **Flow Monitoring ADF** | **0.37** | **256** |
| | | | | | **Percent Difference** | **11%** | |

| Table 3: Estimated FM02 Results with Adjusted Preliminary Wastewater Return Factors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land Use | Number of Sewered Parcels | Sewered Acres | Average Day Demand (MGD) | Average Day Demand (GPM) | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
| Single-Family Residential | 3084 | 852 | 1.00 | 696 | 68% | 0.68 | 474 |
| Multi-Family Residential | 1593 | 234 | 0.63 | 438 | 78% | 0.49 | 341 |
| Mobile Homes | 1 | 13 | 0.01 | 6 | 73% | 0.01 | 5 |
| General Commercial | 378 | 178 | 0.27 | 189 | 83% | 0.23 | 157 |
| Commercial Office | 177 | 40 | 0.07 | 46 | 83% | 0.06 | 39 |
| General Industrial | 9 | 16 | 0.03 | 23 | 83% | 0.03 | 19 |
| Public Facilities | 21 | 103 | 0.10 | 72 | 68% | 0.07 | 49 |
| Airport | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| Specific Plan | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| **Total** | **5,263** | **1,435** | **2** | **1,471** | **74%** | **1.56** | **1,083** |
| | | | | | | | |
| | | | | | **Estimated ADF** | **1.56** | **1,083** |
| | | | | | **Flow Monitoring ADF** | **1.04** | **722** |
| | | | | | **Percent Difference** | **50%** | |

DRAFT

| Table 4: Estimated FM03 Results with Adjusted Preliminary Wastewater Return Factors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land Use | Number of Sewered Parcels | Sewered Acres | Average Day Demand (MGD) | Average Day Demand (GPM) | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
| Single-Family Residential | 1498 | 437 | 0.49 | 339 | 68% | 0.33 | 230 |
| Multi-Family Residential | 667 | 106 | 0.28 | 197 | 78% | 0.22 | 154 |
| Mobile Homes | 1 | 13 | 0.01 | 6 | 73% | 0.01 | 5 |
| General Commercial | 230 | 99 | 0.14 | 100 | 83% | 0.12 | 83 |
| Commercial Office | 128 | 21 | 0.04 | 25 | 83% | 0.03 | 21 |
| General Industrial | 4 | 4 | 0.00 | 1 | 83% | 0.00 | 1 |
| Public Facilities | 15 | 41 | 0.06 | 42 | 68% | 0.04 | 29 |
| Airport | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| Specific Plan | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| **Total** | **6,121** | **1,885** | **2.72** | **1887** | **73%** | **0.75** | **522** |
| | | | | | | | |
| | | | | | **Estimated ADF** | **0.75** | **522** |
| | | | | | **Flow Monitoring ADF** | **0.52** | **361** |
| | | | | | **Percent Difference** | **45%** | |

| Table 5: Estimated FM04 Results with Adjusted Preliminary Wastewater Return Factors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land Use | Number of Sewered Parcels | Sewered Acres | Average Day Demand (MGD) | Average Day Demand (GPM) | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
| Single-Family Residential | 649 | 170 | 0.24 | 168 | 68% | 0.16 | 114 |
| Multi-Family Residential | 346 | 64 | 0.16 | 110 | 78% | 0.12 | 86 |
| Mobile Homes | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| General Commercial | 67 | 22 | 0.03 | 22 | 83% | 0.03 | 18 |
| Commercial Office | 24 | 10 | 0.01 | 10 | 83% | 0.01 | 8 |
| General Industrial | 3 | 10 | 0.01 | 4 | 83% | 0.00 | 3 |
| Public Facilities | 1 | 11 | 0.01 | 7 | 68% | 0.01 | 5 |
| Airport | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| Specific Plan | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| **Total** | **6,121** | **1,885** | **2.72** | **1887** | **73%** | **0.34** | **235** |
| | | | | | | | |
| | | | | | **Estimated ADF** | **0.34** | **235** |
| | | | | | **Flow Monitoring ADF** | **0.31** | **213** |
| | | | | | **Percent Difference** | **10%** | |

DRAFT

Estimated ADF for flow meter basins FM01 and FM04 were within approximately 11% of the measured flows, which are within an acceptable range for validation purposes. However, FM02 and FM03 had large discrepancies at approximately 50% and 45%, respectively. Possible explanations could include discrepancies with the flow meter at the WRF or pipeline connections throughout the collection system that may be directing flow to other portions of the collection system not measured by the flow meters.

DRAFT

# Appendix C – Waste Discharge Requirement and Cease-and-Desist Order

DRAFT

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD**
**LOS ANGELES REGION**

320 West 4th Street, Suite 200, Los Angeles, California 90013
(213) 576-6600 • Fax (213) 576-6640
https://www.waterboards.ca.gov/losangeles/

# ORDER NO. R4-2018-0022, AS AMENDED BY ORDER NO. R4-2018-0022-A01
# FILE NO. 06-189
# CI-9259

# WASTE DISCHARGE REQUIREMENTS ISSUED TO CITY OF SANTA PAULA (SANTA PAULA WATER RECYCLING FACILITY)

The California Regional Water Quality Control Board, Los Angeles Region (Regional Water Board) finds:

## PURPOSE OF ORDER

1. The City of Santa Paula (City or Discharger) is the owner of the Santa Paula Water Recycling Facility (SPWRF), a Publicly-Owned Treatment Works (POTW), located at 920 Corporation Street in Santa Paula, California (Figure 1). The SPWRF, currently operated by Ventura Regional Sanitation District, discharges tertiary-treated wastewater to groundwater via three percolation ponds adjacent to the facility.

2. The City was previously regulated under Waste Discharge Requirements (WDRs) contained in Order No. R4-2007-0028, adopted by this Regional Board on May 3, 2007. The Regional Board amended Order No. R4-2007-0028 three times as follows:

   A. Order No. R4-2010-0074, adopted by this Regional Board on May 6, 2010, required that effluent discharged to percolations ponds shall not exceed 2.6 million gallons per day (MGD).

   B. Order No. R4-2007-0028-R02, adopted by this Regional Board on February 2, 2012, incorporated pretreatment program requirements and corresponding monitoring requirements.

   C. Order No. R4-2007-0028-R03, adopted by this Regional Board on April 6, 2017, extended the expiration date of Order No. R4-2007-0028 from May 3, 2010 to December 15, 2017 or upon future issuance of new or revised WDRs.

   D. Order No. R4-2007-0028-R04, adopted by this Regional Board on December 21, 2017, extended the expiration date of Order No. R4-2007-0028 from December 15, 2017 to March 31, 2018 or upon future issuance of new or revised WDRs.

DRAFT

Adopted: February 8, 2018
Amended: May 12, 2022

3. On October 1, 2015, the Regional Board directed the City to submit a Report of Waste Discharge (ROWD) for application of renewal of the City's WDRs to discharge treated wastewater from the SPWRF to the percolation pond. On December 5, 2015, the City filed its ROWD for the SPWRF.

4. To verify the information provided in the ROWD, Regional Board staff conducted inspections of the SPWRF on December 8, 2015 and December 28, 2016, including the wastewater treatment processes, percolation ponds, and groundwater monitoring wells.

5. The purpose of this Order is to renew WDRs for the City's SPWRF. This Order includes updates to effluent limitations, groundwater limitations, and Monitoring and Reporting Program (MRP) CI No. 9259 to ensure that the City's discharge of waste complies with water quality objectives set forth in the *Water Quality Control Plan for the Los Angeles Region: Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* (Basin Plan) and is protective of beneficial uses.

**BACKGROUND**

6. Before 2010, the City's wastewater was treated at the Santa Paula Wastewater Reclamation Plant (Plant), which discharged the treated wastewater to the Santa Clara River. That discharge was regulated by a National Pollutant Discharge Elimination System (NPDES) permit. Due to the age of the Plant, which was built in 1939, the City was unable to comply with the effluent limitations for biological oxygen demand (BOD), total suspended solids (TSS), turbidity, bacteria, residual chlorine, nitrate-nitrite, sulfate, and toxicity, as set forth in its NPDES permit. More than 3,000 violations at the Plant lead the Regional Board to engage in settlement discussions with the City, resulting in a Stipulated Consent Judgment and Final Order in 2007. The City chose to build a new treatment plant, the SPWRF, to discharge to groundwater through percolation ponds. The City was required to complete construction of the new SPWRF by September 15, 2010 and be in full compliance with WDRs set forth in Order No. R4-2007-0028 by December 15, 2010.

7. Construction of the SPWRF began in July 2008 and was completed in December 2009. The SPWRF began accepting partial flow in April 2010 and then accepted all flow from the City in May 2010. The Plant built in 1939 was thereafter decommissioned.

8. According to the United States Census Bureau, approximately 19% of the population in the City have income levels below the poverty line, and approximately 25% of area in the City is categorized as a disadvantage community (less than 80% of the State's median household income) or a severely disadvantaged community (less than 60% of the State's median household income). The average sewer fee assessed for a single family was about $88, based on the City's *2014 Water and Sewer Rate Study Results*.

DRAFT

9. Drinking water supplied to the City is produced from deep wells including Well 1-B, Well 11, Well 12, Well 13, and Well 14, which are owned and operated by the Water Division of the City and produce up to 10.6 MGD. Water produced at all five wells between 2010 and 2020 complied with all primary state and federal drinking water standards. Table 1 summarizes drinking water test results for total dissolved solids (TDS), sulfate, chloride, and boron from the City's 2010-2020Annual Water Quality Reports, as compared to the groundwater quality objectives (GQOs) set forth in the Basin Plan.

**Table 1. Drinking Water Quality (milligrams per liter, mg/L)**

| Period | TDS | Sulfate | Chloride | Boron |
|---|---|---|---|---|
| 2010 | 941 | 440 | 43 | 0.53 |
| 2011 | 918 | 428 | 41 | 0.54 |
| 2012 | 964 | 442 | 42 | 0.52 |
| 2013 | 693 | 208 | 47 | 0.52 |
| 2014 | 975 | 420 | 42 | 0.54 |
| 2015 | 941 | 405 | 44 | 0.47 |
| 2016 | 981 | 440 | 48 | 0.55 |
| 2017 | 924.2 | 393.6 | 47.8 | 0.4482 |
| 2018 | 924.2[1] | 450.5 | 48 | 0.525 |
| 2019 | 1.036.7 | 477.7 | 48 | 0.4833 |
| 2020 | 1,060 | 446 | 49 | 0.6 |
| GQOs | 2,000 | 800 | 110 | 1.0 |

Table note: [1] Result sampled in 2017.

DRAFT

## CURRENT FACILITY AND TREATMENT PROCESS DESCRIPTION

10. SPWRF and Vicinity

    A. The SPWRF (34º 19' 56.3" N, 119º 04' 57.2" W) is sited on a 50-acre parcel along Calpipe Road and Todd Lane in Santa Paula, California (Figure 1). The SPWRF is approximately 1,200 feet southeast of Highway 126, approximately 1,000 southwest of Shell Road, and approximately 1,300 feet northwest of the Santa Clara River.

    B. The SPWRF is located over the Santa Clara-Santa Paula Groundwater Basin (DWR Basin No. 4-4) (Figure 2).

11. SPWRF Treatment

A. The SPWRF treats wastewater generated within the City and is designed for a flow of 4.2 MGD. Based on the discharge records between July 2010 and June 2017, the monthly average effluent discharged from the SPWRF ranged between 1.36 and 2.44 MGD, with an average of 1.86 MGD. The monthly average effluent discharge flow rates between February 2018 and December 2021 ranged from 1.03 to 3.4 MGD, with an average of 1.86 MGD.

B. The wastewater treatment process at the SPWRF (See Figure 3 for process flow schematic) consists of preliminary treatment (coarse and fine mechanical screening and grit removal at the Influent Lift Station), flow equalization (two flow equalization tanks), secondary treatment (three aeration tanks with nitrification and denitrification activated sludge), tertiary treatment (six membrane bioreactors, providing further carbonaceous oxidation, nitrification/denitrification and solids removal to meet the limits of the WDRs), and disinfection (UV). Treated and disinfected effluent is discharged to three percolation ponds (Figure 5). The returned activated sludge is treated at two of three aerobic digesters (one aerobic digester is for backup) after being thickened at two thickeners. The solids generated at the aerobic digesters receive final dewatering at the screw dewatering press. Final solids are hauled by Synargro to their South Kern Compost Manufacturing Facility where they are composted to the United States Environmental Protection Agency (USEPA) Class A reuse standards for agricultural reuse.

C. To address levels of chloride in the effluent, an advanced treatment system, consisting of reverse osmosis (RO), will be constructed at the SPWRF, which will be designed to reduce the chloride concentration in the effluent to 110 milligrams per liter (mg/L) or less. The RO system will consist of nanofiltration and RO units to reduce effluent chloride concentrations followed by a RO brine concentrator (Figure 4).

D. The City owns and operates the sewer collection system, which conveys domestic, commercial, and industrial wastewater to the SPWRF. Two industrial users within the City are Aurora Casting (metal foundry) and Saticoy Lemon (lemon packing house). The City is required to implement a Pretreatment Program and to comply with requirements for operation and maintenance of the sewer collection system. The City has been implementing an industrial wastewater Pretreatment Program for the SPWRF, which has been approved by the USEPA and the Regional Board.

E. Percolation Ponds

i. The three percolation ponds were built on approximately 34 acres of agriculture land (Figure 5) and are located along Todd Lane in the Santa Clara-Santa Paula Groundwater Basin area.

ii. The Regional Board classified the discharge to the percolation pond as a discharge of treated wastewater to land that is subject to WDRs.

DRAFT

iii. A hydrologic model completed by the City in 2008 indicated that the percolation pond have a maximum discharge capacity of 2.6 MGD during wet years. Therefore, the allowable discharge of the SPWRF was reduced from 8 MGD to 2.6 MGD in Order No. R4-2010-0074 (amending Order No. R4-2007-0028).

12. Depth to groundwater within the shallow aquifer at the site ranges from approximately 15 to 49 feet below ground surface. Groundwater gradients generally appear to parallel the ground surface, gently sloping downward to the southwest. During wet years, groundwater may rise to within 10 to 11 feet below ground surface in the area along the Santa Clara River.

13. On August 23, 2018, the Regional Water Board approved the City's modified groundwater monitoring network dated May 1, 2018 to expand the groundwater monitoring network by including agricultural water supply wells. Subsequently, on April 22, 2019, the Regional Water Board approved the Groundwater Chloride Investigation and Well Production Workplan dated December 2018, which proposed installing one additional off-site groundwater monitoring well, MW-9.

    The City owns and currently samples nine (9) groundwater monitoring wells, including MW-1, MW-2a, MW-3, MW-4, MW-5, MW-6, MW-7a, MW-8, and MW-9 (shown on Figure 5).

**COMPLIANCE HISTORY**

14. Based on data collected from July 2010 to June 2017, the City had the following number of exceedances recorded in the effluent and groundwater at the SPWRF, which are identified in Table 2.

**Table 2. Number of Exceedances Recorded in Effluent and Groundwater**

| Pollutants | Effluent | Groundwater |
|---|---|---|
| Chloride | 84 | 174 |
| Di(2-ethyl)phthalate | 1 | |
| Dioxin | 1 | |
| Total nitrogen | 1 | |
| Nitrate plus nitrite | | 1 |
| Sulfate | | 1 |
| Chromium | | 5 |
| Aluminum | | 10 |
| Nickel | | 1 |

DRAFT

| Pollutants | Effluent | Groundwater |
|---|---|---|
| Boron | | 1 |

Multiple effluent and groundwater limitations were exceeded during the period between the 2nd quarter of 2010 and the 3rd quarter of 2011. Beginning with the 4th quarter of 2011, the City had met all effluent limitations except for chloride. As previously noted, the SPWRF was not designed to remove chloride. The monthly effluent chloride concentration ranged from 125 to 166 mg/L and continuously exceeded the effluent chloride monthly average of 110 mg/L. Table 3 summarizes the annual average chloride concentrations in the SPWRF effluent.

**Table 3. Annual Average Chloride Concentrations[1] (mg/L) in SPWRF Effluent**

| Period | Concentration |
|---|---|
| 2010 | 156 |
| 2011 | 153 |
| 2012 | 149 |
| 2013 | 155 |
| 2014 | 145 |
| 2015 | 134 |
| 2016 | 137 |
| 2017 | 131 |
| 2018 | 121 |
| 2019 | 120 |
| 2020 | 118.88 |
| 2021 | 112 |
| Range[2] | 135.99 ± 15.61 |

Table Notes:
[1] All data collected from grab samples.
[2] Data range is based on one standard deviation.

15. Table 4 summarizes the groundwater annual average chloride concentration before and after the SPWRF began discharging via the percolation pond. The annual average chloride groundwater concentration was 108 mg/L at the downgradient water supply Well AW03 prior to initiation of discharge at the percolation pond in 2010. After the SPWRF began discharging to the percolation pond, the annual average chloride groundwater concentration increased to 135 mg/L at Well AW03.

DRAFT

Monitoring data from the upgradient groundwater monitoring Well MW-3 indicates an annual average chloride groundwater concentration of 100 mg/L. This information suggests that the background groundwater chloride concentration was around 100 mg/L. Groundwater chloride concentrations at the downgradient groundwater monitoring Well MW-5 have been recorded between 135 and 155 mg/L, with an average of 142 mg/L. This data closely aligns with the SPWRF's effluent chloride concentration of approximately 136 mg/L (Table 3). The groundwater and effluent data indicate that the chloride discharges from the SPWRF have impacted, and continue to impact, the receiving groundwater quality in the vicinity of the SPWRF.

**Table 4. Annual Average Chloride Concentration[1] in Groundwater (mg/L)**

| Prior to Discharge from SPWRF | | | |
|---|---|---|---|
| **Period** | **Downgradient MW-5[2]** | **Downgradient 03N21W21G03S[3]** | **Upgradient MW-3[4]** |
| 2003 | | 113 | |
| 2004 | | 111 | |
| 2005 | 115 | 117 | 92 |
| 2006 | 114 | 112 | 88 |
| 2007 | 108 | 110 | 85 |
| 2008 | 87 | 100 | 78 |
| 2009 | 74 | 92 | 96 |
| Range[5] | 99.6 ± 16.3 | 107.9 ± 8.6 | 87.8 ± 6.1 |
| **After Discharge from SPWRF** | | | |
| 2010 (Jul – Dec) | 145 | 138 | 93 |
| 2011 | 145 | 146 | 112 |
| 2012 | 153 | 135 | 87 |
| 2013 | 155 | 136 | 103 |
| 2014 | 135 | 129 | 115 |
| 2015 | 136 | 129 | 108 |
| 2016 | 135 | 134 | 103 |
| 2017 | 121 | 131 | 105 |
| 2018 | 128.2 | 126.6 | 123.6 |
| 2019 | 128.8 | 129.4 | 163.1 |

DRAFT

| | | | |
|---|---|---|---|
| 2020 | 129.5 | 127.4 | 126.3 |
| 2021 | 130.2 | 129.8 | 114.3 |
| Range[5] | 136.8 ± 10.5 | 132.6 ± 5.5 | 112.8 ± 19.5 |

Table Notes:

[1] All data collected from grab samples.

[2] Data were averaged from samples collected at the City-owned groundwater monitoring Well MW-5 with screen intervals of 42 to 62 feet, located approximately 50 feet downgradient from Percolation Pond 3.

[3] Water supply Well AW03 is owned and operated by a private entity. This well is located approximately 300 feet southwest of Well MW-5. The screen intervals of Well AW03 are from 80 to 120 below surface grade. Water produced at this well is used for agricultural irrigation only.

[4] Data were averaged from samples collected at the City-owned groundwater monitoring Well MW-3 with screen intervals of 25 to 45 feet, located approximately 1,800 feet upgradient from Percolation Pond 1.

[5] Data range is based on one standard deviation.

16. The Regional Board issued three Notices of Violation (NOVs) to the City, dated November 3, 2011, December 30, 2014, and March 20, 2017, for exceedances of the chloride effluent and groundwater limitations in Order No. R4-2007-0028. These NOVs required the City to implement corrective and preventative actions to bring the City's discharge to full compliance with the chloride effluent limitation and receiving water requirements specified in Order No. R4-2007-0028.

**PLAN FOR CHLORIDE COMPLIANCE**

17. The City's efforts to reduce the chloride concentration in the influent to the SPWRF are summarized below:

    A. The City identified that the influent to the SPWRF contains brine with elevated chloride concentration from Self-Regenerating Water Softeners (SRWS). There are approximately 1,250 residential SRWS used in the City.

    B. On September 5, 2006, the City established Ordinance No. 1160 prohibiting the installation or replacement of residential SRWS.

    C. On June 22, 2015, the City adopted Resolution No. 6918 approving a SRWS Buyback and Incentive Program. This program offers a financial incentive to residents to voluntarily remove SRWS. A Kick-Off SRWS Buyback event was held on September 19, 2015. The removal of SRWS under this program began in October 2015. Three hundred (300) of the approximately 1,250 SRWS have been removed from October 2015 through February 2022. Decreasing chloride concentrations in the effluent have been observed, but they still cannot meet the chloride discharge limitation set forth in the WDRs.

DRAFT

18. To address the City's chloride exceedances in the effluent and groundwater, the Regional Board required the City to submit a Chloride Reduction Workplan. Board staff also met with the City on several occasions to discuss the City's chloride exceedances. A summary of these events are as follows:

    A. On December 19, 2013 and May 11, 2015, the Regional Board met with the City to discuss its Chloride Reduction Workplan. The City's Chloride Reduction Workplan includes the following tasks:

        i. Prohibit SRWS installations or replacements;

        ii. Implement a SRWS Buyback Program;

        iii. Implement a Recycled Water Program to reduce effluent discharged to the three percolation ponds; and

        iv. Implement Supplemental Strategies, if needed, including advanced treatment (e.g. reverse osmosis) and disposal of brine.

    B. On January 28, 2016, Regional Board staff discussed with the City the necessary actions to reduce the chloride concentration in the effluent, which included the SRWS Buyback Program. The City also proposed to explore application of recycled water at locations other than identified groundwater hot spots and to conduct groundwater impact investigation and remediation activities. The City was notified that detailed schedules and milestones were required for all actions.

    C. On March 8, 2016 and September 14, 2016, the City met with Regional Board staff to provide an update of its SRWS Buyback Program efforts. The City noted that five City employees were deployed to conduct door-to-door visits to encourage participation in the SRWS Buyback Program among 7,500 dwellings within the City.

    D. On October 31, 2016, the City met with Regional Board staff to provide an update on the following topics:

        i. Status of implementing the chloride compliance strategy and potential for reduction of effluent discharged to the three percolation ponds via the City's Recycled Water Program;

        ii. Assimilative capacities for chloride at different groundwater locations beneath the City based on the Salt and Nutrient Management Plan for the Lower Santa Clara River Basin; and

        iii. Groundwater hot spots (i.e., chloride-impaired areas with no assimilative capacity for recycled water applications) in the City.

DRAFT

19. On July 9, 2015, the Regional Board adopted Resolution No. R15-007, an amendment to the Basin Plan that incorporated stakeholder-developed groundwater quality management plan for salts and nutrients in the Lower Santa Clara River groundwater basins. Groundwater quality management measures were developed by stakeholders as part of the Salt and Nutrient Management Plan (SNMP) for the Lower Santa Clara River Basins in Ventura County. Such plans are a requirement of the State Water Resources Control Board's (State Water Board) Recycled Water Policy and are intended to maintain high quality waters and to protect the beneficial uses of groundwater while promoting recycled water use throughout the state. The SNMP utilized a groundwater quality model that characterized the water quality in the Santa Paula Basin and examined the degree of impairment to water quality in the Basin. The model shows there is available assimilative capacity for salts and nutrients, including chloride, in most areas of the Santa Paula Basin to allow for recycled water projects consistent with the Recycled Water Policy. As described below, the City is planning to recycle effluent that is currently discharged to the percolation pond.

20. The City developed and utilized a simple spreadsheet mixing model, the Groundwater Chloride Transportation Model (Chloride Model), to analyze the effect of future effluent discharges on groundwater over time at various distances from the percolation pond. The City's modelling assumed some degradation of groundwater with respect to chloride within a limited range of mixing zone radius below and adjacent to the SPWRF, measured from the boundaries of the percolation pond. This distance is the maximum allowable distance where SPWRF effluent disposed to the percolation pond can mix with groundwater and result in receiving water chloride concentrations of 110 mg/L or less in order to provide protection to groundwater beneficial uses at the first encountered water supply wells which are at 150 feet away from the percolation ponds. Groundwater within the mixing zone will exceed the chloride GQO of 110 mg/L. Mass-volume balance calculations along with Darcy's Law are used to account for travel in porous media. The Chloride Model simulates instantaneous and complete mixing of ambient groundwater with effluent seepage reaching the water table from the percolation pond using SPWRF data for flow and chloride effluent concentrations. It was conservatively assumed that any effluent discharge to the percolation pond would infiltrate into the underlying aquifer and not be diverted for other uses. Groundwater parameters within the spreadsheet model were selected based on recent monitoring reports in order to be representative of average conditions within the vicinity of the SPWRF. The Chloride Model assumes an initial volume of groundwater underlying the ponds possessing background chloride concentrations of 136 mg/L. The volume of the existing groundwater body is calculated as the product of the radius of interest (150-1200 feet), an assumed saturated thickness of potentially impacted groundwater (50 feet), and the porosity of the underlying sediments (assumed to be 0.2) based on the low end of published literature values for a sand and gravel mixture. Based on the regional groundwater quality data documented in the SNMP, regional groundwater inflow is assumed to have a chloride concentration of 91 mg/L.

DRAFT

On December 14, 2016, Regional Board staff met with the City to discuss the results of the Chloride Model, which evaluated compliance with the groundwater quality objectives beneath and adjacent to the three percolation ponds, for various discharge scenarios. Based on Regional Board staff's comments, the City implemented additional discharge scenarios in the Chloride Model, which was discussed in meetings held on February 8, 2017, February 17, 2017, July 24, 2017, and August 7, 2017.

21. The Chloride Model simulated chloride concentrations in the receiving groundwater resulting from chloride mass loading reduction in the three percolation ponds. The Model predicted GQOs being achieved at 150 feet away from the percolation pond when the total mass of chloride in the effluent is significantly reduced. The initial mass of chloride is calculated based on the average chloride effluent concentration of 135 mg/L and the discharge rate of 2.2 MGD [95 percentile of monthly average effluent flows, resulting from data recorded between October 2015 (beginning of the SRWS Buyback Program) and June 2017], which results in 2,479 pounds total mass of chloride discharged per day. The reduction of chloride mass discharged to the percolation pond can be achieved by improving the effluent chloride concentration (e.g., source control or treatment), or diverting a significant amount of flow for recycled water uses, or a combination of both in order to protect water supply Wells AW01, AW02, and, AW03, approximately 150, 150, and 300 feet, respectively, away from percolation ponds. Water produced from these wells is primarily for agricultural irrigation use.

    To achieve the chloride GQO of 110 mg/L in groundwater at least 150 feet away from the percolation pond, the City provided various effluent chloride concentration and allowable flow combinations (Table 5). Based on the hydrology and hydrogeologic condition at the SPWRF percolation ponds area, the higher the concentration of chloride in the effluent, the less volume and mass can be discharged to percolation ponds to comply with the chloride GQO in the Basin Plan. For example, if the chloride concentration in the effluent is 135 mg/L, only 0.07 MGD, which is equivalent to 79 pounds of chloride per day, could be discharged to the percolation pond to achieve the chloride GQO of 110 mg/L at 150 feet away from the percolation pond. If the chloride concentration in the effluent is reduced to 120 mg/L, then more flow (0.2 MGD) can be discharged to the percolation pond and achieve the chloride GQO 150 feet away from the percolation pond.

**Table 5. Groundwater Chloride Transportation Model – Continuous Discharge**

| Chloride Effluent Concentration (mg/L) | Flow to Percolation Ponds (MGD) (% of 2.2 MGD) | Daily Allowable Effluent Mass Load to Groundwater (lbs) | Chloride Groundwater Concentration at 150 feet (mg/L) |
|---|---|---|---|
| 135 | 0.07 (3.2%) | 79 | 110 |
| 130 | 0.1 (4.5%) | 108 | 110 |

DRAFT

| Chloride Effluent Concentration (mg/L) | Flow to Percolation Ponds (MGD) (% of 2.2 MGD) | Daily Allowable Effluent Mass Load to Groundwater (lbs) | Chloride Groundwater Concentration at 150 feet (mg/L) |
|---|---|---|---|
| 125 | 0.13 (5.9%) | 135 | 110 |
| 120 | 0.2 (9.1%) | 200 | 110 |
| 115 | 0.4 (18.2%) | 384 | 110 |

22. To achieve compliance with the chloride GQO in this Order and to conserve potable water, the City plans to reduce the volume of effluent, and thus a reduction of the chloride mass discharged to the percolation pond by providing recycled water for various local uses. The Regional Board has evaluated the planned recycle projects and has determined that they will be consistent with the State Water Board's Recycled Water Policy and will still preserve available assimilative capacity within the Santa Paula Basin consistent with the SNMP. The mass-based effluent limitation for chloride in this Order reflects the City's chosen compliance option. The groundwater limitations are based on the GQOs in the Basin Plan.

23. On December 22, 2015, the City submitted the Recycled Water Program Technical Report and Notice of Intent with the Title 22 Engineering Report to the State Water Board's Division of Drinking Water (DDW) for approval. DDW conditionally approved the Title 22 Engineering Report on August 19, 2016. On June 14, 2017, the Regional Board enrolled the City's recycled water program under separate Water Reclamation Requirements for Recycled Water Use, Order WQ 2016-0068-DDW, issued by the State Water Board on June 7, 2016.

24. In the City's report, Chloride Load Reduction Milestones, submitted to the Regional Board on March 14, 2017, the City included the construction of RO treatment at the SPWRF as an option (under Supplemental Strategies), if needed, in order to comply with the chloride groundwater quality objective (GQO) of 110 mg/L. The City will continue its source control efforts to remove SRWSs and will first focus on recycling most of its effluent in order to bring the groundwater back into compliance with GQOs. Progress with these efforts was assessed at Year 2020 and determination was made to pursue advanced treatment to meet the chloride GQO at Year 2027.

    On April 15, 2020, the City notified the Regional Water Board of its modified approach to install an advanced wastewater treatment system with RO at SPWRF in lieu of the originally proposed recycled water project to meet the effluent limitations in this Order.

25. Due to the following reasons, the City cannot immediately comply with the chloride effluent and groundwater limitations prescribed in this Order: (1) elevated chloride concentrations in the influent, (2) the wastewater treatment process not currently designed to remove chloride out of the waste stream, and (3) time needed to

DRAFT

construct the advanced wastewater treatment system with RO. In addition, the current progress of the City's SRWS Buyback Program does not reliably ensure that the SPWRF will comply with the chloride effluent and groundwater limitations. Therefore, the Regional Board has determined that issuance of an accompanying CDO is appropriate and necessary to put the City on the path towards compliance with the effluent and groundwater limitations for chloride set forth in this Order. The CDO requires the City to comply with interim chloride effluent and groundwater limitations and implement actions pursuant to a prescribed time schedule.

During the pendency of the CDO schedule, there will be permitted degradation of groundwater with respect to chloride within a limited mixing zone radius downgradient and adjacent to the SPWRF percolation ponds, measured from the boundaries of the percolation pond to 150 feet. This distance is the shortest distance where SPWRF effluent disposed to the percolation pond can mix with groundwater and result in receiving water chloride concentrations of 110 mg/L or less. Groundwater within the 150-foot mixing zone will exceed the chloride GQO of 110 mg/L for the duration of the CDO schedule. Based on the available data, there are no water supply wells within the 150-foot mixing zone. The City can arrange for alternative water supplies for any well owners in the mixing zone, if any are discovered. At the end of the CDO schedule, the mixing zone is no longer allowed, and compliance with chloride limitations of 110 mg/L at monitoring wells adjacent and downgradient to the boundaries of the percolation ponds is required. global warming and climate change

26. The observed century-scale rise in the average temperature of the Earth's surface, oceans, and atmosphere, commonly recognized as the Global Warming, has resulted in extreme climate change, such as the extreme drought and extremely heavy rainfall. In Southern California, the predicted impacts of climate change are numerous. Annual average temperatures are expected to increase, coupled with a higher frequency of extreme heat days. A likely consequence of this warmer climate will be more severe drought periods, leading to an increase in the amount and intensity of fires and a longer fire season. In addition, precipitation patterns are likely to be modified. A decrease in snowfall, combined with warmer temperatures, will induce a decrease in the amount and duration of snowpack, an essential source of freshwater to the region. The increasing occurrence of extreme precipitation events will amplify the risk of flooding, which recently happened in Southern California.

    These impacts will affect water quality in multiple ways, including changes in stream flow, aquatic habitats, surface water temperature, pollutant levels, sedimentation, algal growth, and salinity levels and acidification in coastal areas. For permitted facilities such as Publically Owned Treatment Works (POTWs), specific impacts could include, but are not limited to, an increase in the concentration of pollutants entering the facility, an increase in the temperature of effluents and receiving waters, an increase in storm water inflow and infiltration, increase in flooding/inundation of facilities, sewer overflows, power outages, pump maintenance issues, and onsite or nearby hillside destabilization.

DRAFT

Executive Order B-30-15, issued on April 29, 2015, recognizing the challenges posed by climate change, directed state agencies to take climate change into account in their planning decisions, guided by the following principles: Priority should be given to actions that both build climate preparedness and reduce greenhouse gas emissions; where possible, flexible and adaptive approaches should be taken to prepare for uncertain climate impacts; actions should protect the state's most vulnerable populations; and natural infrastructure solutions should be prioritized.

On February 7, 2019, the City submitted a Climate Change Plan. The Climate Change Plan indicated the SPWRF is outside of the 100-year floodplain of the Santa Clara River. This Order requires the City to periodically review and submit a revised Climate Change Plan when conditions at the facility change that may impact water quality. In addition, this Order contains provisions to require planning and actions to address climate-related impacts that can cause or contribute to violations of this Order and/or degradation of waters of the state.

27. The SPWRF was designed to include protection from a 100-year storm event in the Santa Clara River. The SPWRF buildings and percolation ponds are located behind a dike that has an elevation above the elevation anticipated as the result of a 100-year storm event. The design documents and potential flood flow assessment is contained in files in the City's Building & Safety Department. The elevation of the dike at the SPWRF is 23 feet higher than the Santa Clara River located at approximately 1,300 feet southeast. This elevation separation provides additional protection from a possible flood overflow from the Santa Clara River caused by the climate change. It should also be noted that the SPWRF is located outside of the Santa Clara River floodway defined by the Federal Emergency Management Agency and the Ventura County Watershed Protection District. Lastly, the SPWRF is equipped with a backup generator that is capable of operating the SPWRF through power outages and other emergencies.

    Climate change may also increase drought and related impacts such as reduced potable water supply and/or changing water supplies, which may be of less quality.

## APPLICABLE LAWS, PLANS, POLICIES, AND REGULATIONS

28. This Order serves as WDRs pursuant to Division 7, Chapter 4, Article 4 of the California Water Code (commencing with section 13260). WDRs have been established because discharges from the SPWRF have the potential to affect the quality of the waters of the State, to impact the beneficial uses of those waters, and/or to cause a nuisance. The Regional Board developed the requirements of this Order based on information submitted as part of the application, through monitoring and reporting programs, and other available information.

29. Water Quality Control Plan for the Los Angeles Region: Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Basin Plan) - On June 13, 1994, the Regional Board adopted a comprehensive revision to the Basin Plan. The Basin

DRAFT

Plan: (i) designates beneficial uses for surface and groundwater, (ii) establishes narrative and numeric water quality objectives that must be attained or maintained to protect the designated beneficial uses, and (iii) sets forth implementation programs to achieve those objectives for all waters addressed through the Basin Plan. The Basin Plan also incorporates State Water Board Resolution No. 68-16 (see finding below for detail). In addition, the Basin Plan incorporates applicable State and Regional Board plans and policies and other pertinent water quality policies and regulations. The Basin Plan has been amended occasionally since 1994, including recent administrative updates. The requirements in this Order implement the Basin Plan.

30. Beneficial Uses - The SPWRF overlies the Santa Clara-Santa Paula Groundwater Basin (DWR Basin No. 4-4). The Basin Plan identifies beneficial uses for regional waters, including those based on State Water Board Resolution No. 88-63 ("Sources of Drinking Water Policy"), which established state policy that all surface and ground waters of the State, with certain exceptions, are considered suitable or potentially suitable for municipal or domestic water supply. Beneficial uses applicable to the receiving groundwater are as follows:

**Table 6. Basin Plan Beneficial Uses of Groundwater**

| Receiving Water | Beneficial Use(s) |
|---|---|
| Santa Clara-Santa Paula Groundwater (DWR Basin No. 4-4) | Existing:<br>Municipal and domestic supply (MUN), industrial service supply (IND), industrial process supply (PROC), and agricultural supply (AGR) |

31. Title 22, California Code of Regulations (CCR) - To protect sources of drinking water, the Basin Plan (Chapter 3) incorporates the primary and secondary maximum contaminant levels (MCLs) for inorganic, organic, and radioactive contaminants in drinking water as water quality objectives. These MCLs are codified in CCR, Title 22, Division 4. This incorporation by reference is prospective including future changes to the incorporated provisions as the changes take effect. The primary MCLs (see Attachments A-1 to A-6) are applicable water quality objectives for a receiving water to protect beneficial uses when that receiving water is designated as municipal and domestic supply. The Basin Plan also specifies that "Ground waters shall not contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses." Therefore, the secondary MCLs, which are limits based on aesthetic, organoleptic standards, are applicable water quality objectives for a receiving water to protect beneficial uses when that receiving water is designated as municipal and domestic supply. These water quality objectives are implemented in this Order to protect the designated beneficial uses.

32. Domestic Water Quality – In compliance with California Water Code section 106.3, it is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking,



DRAFT

and sanitary purposes. This Order promotes that policy by requiring discharges to meet MCLs implemented by the Basin Plan that are designed to protect human health and ensure that water is safe for domestic use.

33. Impaired Water Bodies on Clean Water Act Section 303(d) List/Total Maximum Daily Loads (TMDLs) – The Santa Clara River is listed on the Clean Water Act Section 303(d) List as impaired by ammonia in Reach 3 and by nitrate plus nitrite in Reach 7. To address this impairment, the Regional Board established the Santa Clara River Nitrogen Compounds TMDL on August 7, 2003 by Regional Board Resolution No. 2003-011. The State Water Board approved the TMDL on November 19, 2003 (Resolution No. 2003-0073) and OAL approved it on February 27, 2004. The TMDL became effective upon approval of the U.S. Environmental Protection Agency on March 18, 2004. Concentration-based loads for nitrogen compounds are allocated for nonpoint sources. The Discharger is subject to the following assigned load allocation for nonpoint sources:

**Table 7. Nonpoint Source Load Allocation for Santa Clara River Nitrogen Compounds TMDL**

| Nitrogen Compounds TMDL | Monthly Average (mg/L) |
|---|---|
| Combined ammonia ($NH_3$-N), nitrite ($NO_2$-N), nitrate ($NO_3$-N) loads as nitrogen | 10 |

34. California Water Code section 13263 requires that the Regional Board, when prescribing waste discharge requirements, take into consideration the factors in section 13241. The Regional Board has considered those factors in establishing the WDRs in this Order.

35. State Water Board Resolution No. 68-16, Antidegradation Policy – State Water Board Resolution No. 68-16 “Statement of Policy with Respect to Maintaining High Quality of Waters in California” (also called the “Antidegradation Policy”) requires the Regional Board, in regulating the discharges of waste, to maintain high quality waters of the state unless it is demonstrated that any change in quality is consistent with maximum benefit to the people of the State, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in the State Water Board’s policies (e.g., quality that exceeds water quality objectives). Further, any activity that produces waste must meet waste discharge requirements that will result in the best practicable treatment or control (BPTC) of the discharge necessary to assure that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

Excepting chloride (discussed below), the SPWRF's discharge is high quality, tertiary-treated effluent meeting groundwater quality objectives in the Basin Plan and MCLs for drinking water. The Regional Board finds that the discharge, as allowed in

DRAFT

this Order, is consistent with Resolution No. 68-16 since this Order: (1) requires compliance with the requirements set forth in this Order, including the use of best practicable treatment and control of the discharges, (2) requires implementation of a Monitoring and Reporting Program (MRP); and (3) requires that the discharges comply with effluent limits to meet water quality objectives. This Order establishes limitations and requirements that will not unreasonably threaten present and anticipated beneficial uses or result in receiving ground water quality that exceeds water quality objectives set forth in the Basin Plan. Limitations for each waste constituent are based on the most stringent applicable water quality objectives to protect the most sensitive beneficial use of the receiving waterbody; thus, all beneficial uses are protected. To ensure such protection, a vigorous monitoring plan is also adopted with this Order. This Order contains requirements for implementing Best Practicable Technology and Control (BPTC). Accordingly, the discharge is consistent with the antidegradation provisions of Resolution 68-16. Based on the results of wastewater treatment and monitoring of effluent and groundwater quality, the Regional Water Board may open this Order to reconsider groundwater limitations and other requirements to comply with Resolution 68-16, if necessary.

Untreated discharges of chloride over the last 10 years have resulted in elevated concentrations of chloride in the effluent and groundwater. The groundwater quality objective for chloride is 110 mg/L and the average effluent chloride concentration in 2016 was 137 mg/L. To comply with the chloride groundwater limitations in this Order, which are based on the chloride groundwater quality objective, the City intends to upgrade the SPWRF with reverse osmosis (RO) in lieu of the recycled water projects to reduce the chloride concentration in the effluent prior to discharge into the percolation pond. This will, in time, restore the impaired groundwater zone adjacent and downgradient to the percolation pond. However, implementation of the RO system will take time to fully implement, which will result in continued localized degradation in the immediate vicinity of the SPWRF percolation ponds. Construction and optimization of the RO system is due to be completed by March 30, 2025, at which time, a chloride concentration in the effluent from the SPWRF of 110 mg/L is required. However, a lag in groundwater quality improvement is expected following the improved quality of the discharge. While groundwater within the 150-foot mixing zone adjacent to the percolation ponds will temporarily exceed the chloride groundwater quality objective, this Order imposes limits on flow and chloride mass loading in the effluent to ensure receiving groundwater beneficial uses will be maintained and supported. Beneficial uses will be maintained as all wells utilized for crop irrigation are located outside the mixing zone. By the final CDO compliance date of February 8, 2028, the mixing zone is no longer allowed and compliance with chloride limitations of 110 mg/L at monitoring wells adjacent and downgradient to the boundaries of the percolation ponds is required.

The Regional Board recognizes that reducing chloride concentrations in the effluent or in the groundwater by using RO can be costly. The current estimated cost for the City to install a RO system is $26.6 million with annual operating and maintenance costs of $1.6 million, including brine waste disposal. These costs would be passed on to the ratepayers, who already pay one of the highest sewer rates in the State.

DRAFT

The City is also a small low-income community. The costs of RO treatment depend on the volume of effluent or groundwater to be treated in order to meet the groundwater quality objectives specified in the Basin Plan. To defray the costs of the upgrade, the City has submitted a State Water Board Clean Water State Revolving Fund application with the State Water Board Division of Financial Assistance. The City plans to complete construction of the RO system within two years of receiving the Final Funding Agreement but no later than December 2024.

Incorporating an RO system to reduce chloride and other salts from the SPWRF effluent prior to discharge into the percolation pond will benefit water quality locally and effectively reduce the contribution of chloride and other salts to the Santa Clara-Santa Paula groundwater basin. This Order establishes limitations and requirements protective of the present and anticipated beneficial uses or result in receiving ground water quality that meets or exceeds water quality objectives set forth in the Basin Plan and is therefore, consistent with State Water Board Resolution No. 68-16.

36. California Water Code section 13267 authorizes the Regional Water Board to require the City to submit monitoring and technical reports as necessary to investigate the impact of a waste discharge on waters of the state. The monitoring and reporting requirements established in this Order are necessary to characterize the discharge, evaluate compliance with this Order, and evaluate groundwater quality and the extent of degradation, if any, caused by the discharge.

37. Publicly Owned Treatment Works (POTW) – The term POTW means a treatment works as defined by section 212 of the federal Clean Water Act, which is owned by a State or municipality (as defined by section 502(4) of the Act). This definition includes any devices and systems used in the storage, treatment, recycling and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes and other conveyances only if they convey wastewater to a POTW treatment facility. The term also means the municipality as defined in section 502(4) of the Clean Water Act, which has jurisdiction over the indirect discharges to and the discharges from such treatment works. (40 C.F.R. section 403.3(q)). The SPWRF meets all of the above criteria and therefore is considered a POTW.

38. Pretreatment – The City is required to implement a Pretreatment Program and to comply with requirements for operation and maintenance of its sewer collection system. Pursuant to CCR, Title 23, section 2233 and Title 40, Code of Federal Regulations (C.F.R.), Part 403, the City has been implementing an approved industrial wastewater Pretreatment Program for the SPWRF since February 2012. The Regional Board finds it appropriate to require the City to continue to implement its approved Pretreatment Program.

39. Endangered Species Act Requirements - This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code, §§ 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C. §§ 1531 to 1544). This Order requires

DRAFT

compliance with effluent limits, groundwater quality objectives, and other requirements to protect the beneficial uses of waters of the state. The Discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

40. California Environmental Quality Act - This Order involves the renewal of WDRs for an existing facility. Therefore, this action to prescribe WDRs is exempt from the provisions of CEQA (Public Resources Code section 21000 et seq.) in accordance with California Code of Regulations, Title 14, section 15301.

41. Pursuant to CWC section 13263, the requirements of this Order take into consideration the provisions of CWC section 13241, including the following factors.

    A. Past, present, and probable future beneficial uses of water;

    The receiving water for discharges from the SPWRF is the Santa Clara Valley River Groundwater Basin-Santa Paula subbasin-West of Peck Road. The receiving water limitations in this Order are specified to maintain the beneficial uses of this basin: municipal and domestic water supply (MUN), industrial service supply (IND), industrial process supply (PROC), and agricultural supply (AGR). This Order also specifies effluent limitations protective of the beneficial uses and includes effluent and receiving water monitoring and reporting requirements to verify that discharges will not adversely affect the beneficial uses of groundwater.

    B. Environmental characteristics of the hydrographic unit under consideration, including the quality of the water available thereto;

    This Order incorporates the site-specific water quality objectives for groundwater in the Basin Plan considering geology, hydrogeology, and hydrology. Based on recent and historical data, the regional groundwater basin currently has high quality water, but is experiencing increases in salt and nitrogen loading from natural and anthropogenic sources. The SPWRF will produce effluent quality that is better than or equivalent to the groundwater quality objectives and will comply with the state's Antidegradation Policy (Resolution No. 68-16). The project will therefore limit further groundwater degradation.

    C. Water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area;

    The water quality conditions that can be reasonably achieved are those consistent with the site-specific water quality objectives necessary to protect the beneficial uses of the groundwater basin identified in A, above. through the coordinated control of all factors that affect water quality in the area. The City's plans to upgrade the SPWRF with an advanced treatment system, including RO, is part of the coordinated control of all factors that affect water quality in the areas.

DRAFT

D. Economic considerations;

The City of Santa Paula is identified as a disadvantaged community as defined in CWC section 79505.5. A "disadvantaged community means a community with an annual median household income that is less than 80 percent of the statewide annual median household income." According to the United States Census Bureau, the 2019 California median household income is $80,440 and the City of Santa Paula median household income is $60,468.

Based on the City's *Water and Sewer Rate Study* dated September 2019, the monthly wastewater user rate at monthly water use of 8.1 hundred cubic feet is $98.55 per single family residence in the fiscal year 2021-2022.

Therefore, the implementation of the RO system may cause significant economic impact to the community. The City continuously investigates solutions to minimize economic impact, including submittal of an application to the State Revolving Fund to defray costs to the community.

E. The need for developing housing within the region;

According to the United States Census Bureau, the total population in the City of Santa Paula is 30,657 in 2019. The SPWRF is designed to treat 4.2 MGD of wastewater and currently discharges approximately 2 MGD. The SPWRF has sufficient capacity to treat additional wastewater generated from newly developed residential, commercial, and industrial districts.

F. The need to develop and use recycled water;

The State Water Board adopted the *Water Quality Control Policy for Recycled Water* (Recycled Water Policy) in 2018 and encourages the increased use of recycled water in California: 714,000 acre-feet per year (AFY) in 2015 to 1.5 million AFY by 2020 and to 2.5 million AFY by 2030. The Recycled Water Policy categorizes recycled water use as agricultural irrigation, landscape irrigation, golf course irrigation, commercial application, industrial application, geothermal energy production, non-potable uses, groundwater recharge, seawater intrusion barrier, reservoir water augmentation, raw water augmentation, and potable uses.

On June 14, 2017, the City enrolled under State Water Board Water Reclamation Requirements for Recycled Water Use Order No. WQ 2016-0068-DDW. The City may distribute the disinfected tertiary-treated wastewater for recycled water applications, as appropriate, consistent with the Recycled Water Policy when the RO system is implemented at the SPWRF. This will help offset the need for potable water.

DRAFT

**NOTIFICATION**

42. The Regional Board has notified the Discharger and interested agencies and persons of its intent to prescribe WDRs for the discharge and has provided them with an opportunity to submit their written comments and recommendations.

43. The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.

44. Any person aggrieved by this action of the Regional Board may petition the State Water Board to review the action in accordance with California Water Code section 13320 and California Code of Regulations, title 23, section 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the Regional Board's action, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions will be provided upon request or may be found on the Internet at: http://www.waterboards.ca.gov/public_notices/petitions/water_quality

**IT IS HEREBY ORDERED** that, in order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, the City of Santa Paula shall comply with the following requirements, including all attachments, in all operations and activities at the SPWRF:

## I. INFLUENT LIMITATIONS AND REQUIREMENTS

Influent wastewater shall be limited to wastewater generated within the jurisdiction of the City.

## II. EFFLUENT LIMITATIONS

A. Discharges from the SPWRF shall not exceed the maximum effluent volume of 4.2 MGD and the quarterly average effluent volume of 2.6 MGD.

B. Tertiary-treated effluent shall not exceed the effluent limitations in Table 8 below.

**Table 8. Effluent Limits**

| Constituents | Units | Monthly Average | Daily Maximum |
|---|---|---|---|
| Oil and grease | mg/L | 10[1] | 15[1] |
| Total suspended solids | mg/L | 10[1] | 15[1] |
| | %removal | ≥85[2] | None |

DRAFT

| Constituents | Units | Monthly Average | Daily Maximum |
|---|---|---|---|
| $BOD_{5@20°C}$ | mg/L | 10[1] | 15[1] |
| | %removal | ≥85[2] | None |
| Ammonia as nitrogen + nitrate as nitrogen + nitrite as nitrogen | mg/L | 10[3] | None |
| Nitrite as nitrogen | mg/L | 1 | None |
| Total dissolved solids | mg/L | 2,000[4] | None |
| Sulfate | mg/L | 800[4] | None |
| Boron | mg/L | 1.0[4] | None |
| Chloride | mg/L | 110[4] | None |

Table Notes:

[1] Limit is based on best professional judgment. Limits adopted by this Regional Board exist in the permits for tertiary-treated wastewater treatment plants.

[2] Limit is based on secondary treatment requirements, 40 C.F.R. section 133.102.

[3] Limit is based on the Load Allocations for nonpoint sources set forth in the Santa Clara River Nitrogen Compounds TMDL, Resolution No. 2003-011.

[4] Limit based on Basin Plan Groundwater Quality Objective.

C. The pH of effluent discharged shall at all times be within the range of 6.5 to 8.5. Excursion from this range shall not be considered a violation provided the duration is not more than 10 minutes in a 24-hour period, and pH shall at all times be within 6 to 9.

D. Effluent shall, at all times, be adequately disinfected and oxidized and shall meet the following effluent limitations:

1. the median concentration of total coliform bacteria shall not exceed a most probable number (MPN) of 23 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed; and

2. the number of total coliform bacteria shall not exceed an MPN of 240 per 100 milliliters in more than one sample in any 30 day period.

Samples shall be collected at a time when wastewater flow and characteristics are most demanding (e.g., during peak flows) on treatment facilities and disinfection processes.

DRAFT

E. A filtered wastewater shall be an oxidized wastewater that has been passed through a membrane so that the turbidity of the filtered wastewater does not exceed any of the following:

1. An average of 2 Nephelometric Turbidity Units (NTU) within a 24-hour period;

2. 5 NTU more than 5 percent of the time within a 24-hour period; and

3. 10 NTU at any time.

F. Maximum Contaminant Levels: The effluent shall not contain trace, toxic and other constituents in concentrations that exceed the applicable maximum contaminant levels for drinking water established by the State Water Board's Division of Drinking Water (DDW) in sections 64431, 64442, 64443, 64444, 64449, and 64533 of CCR, Title 22, Division 4, or subsequent revisions, or at levels that adversely affect the beneficial uses of receiving groundwater. The effluent shall, at all times, not exceed the following MCLs (Attachment A). In the event of a violation of any primary or secondary MCL, the City shall notify and submit a report in accordance with Provision VI.F. of this Order.

1. Primary MCLs specified in CCR, Title 22, Division 4, Chapter 15 (Domestic Water Quality and Monitoring Regulations):

i. Inorganic chemicals in CCR, Title 22, Division 4, Chapter 15, Section 64431, Table 64431-A, except for nitrogen compounds (Attachment A-1 of this Order);

ii.. Radionuclides in CCR, Title 22, Division 4, Chapter 15, Section 64442, Table 64442 (Attachment A-2 of this Order) and Section 64443, Table 64443 (Attachment A-3 of this Order); and

iii. Organic chemicals in CCR, Title 22, Division 4, Chapter 15, Section 64444, Table 64444-A (Attachment A-4 of this Order).

2. Secondary MCLs specified in CCR, Title 22, Division 4, Chapter 15 (Domestic Water Quality and Monitoring Regulations), Section 64449, Table 64449-A (Attachment A-5 of this Order).

3. Primary MCLs for disinfection byproducts specified in CCR, Title 22, Division 4, Chapter 15.5 (Disinfectant Residuals, Disinfection Byproducts, and Disinfection Byproduct Precursors) Article 2, Section 64533, Table 64533-A (Attachment A-6 of this Order).

## III. GROUNDWATER LIMITATIONS

A. The City is prohibited from negatively altering the quality or elevation of the underlying groundwater.

DRAFT

B. The discharge of treated wastewater from the SPWRF shall not cause an exceedance of the following groundwater limitations in Table 9 below. Except for chloride, compliance with the groundwater limitations will be determined by the groundwater samples collected from monitoring wells located within or on the boundary of the percolation pond. Compliance with the chloride groundwater limitation will be determined by the groundwater samples collected from monitoring wells located 150 feet away from the percolation pond. The specific monitoring well locations will be determined through the Monitoring and Reporting Program (MRP) (Attachment E). Per Section IV.C.3 of the MRP, the City is required to submit a work plan proposing a modified groundwater monitoring network by May 1, 2018.

**Table 9. Groundwater Limitations**

| Constituents | Units | Monthly Average |
|---|---|---|
| Nitrate as nitrogen + nitrite as nitrogen | mg/L | 10[1] |
| Nitrite as nitrogen | mg/L | 1[1] |
| Total dissolved solids | mg/L | 2,000[1] |
| Sulfate | mg/L | 800[1] |
| Chloride | mg/L | 110[1] |
| Boron | mg/L | 1.0[1] |
| Total coliform | MPN/100mL | 1.1[1] |
| Fecal coliform | MPN/100mL | 1.1[1] |

Table Note:
[1] Limit based on Basin Plan Groundwater Quality Objective.

C. Groundwater shall not exceed the MCLs specified in Attachments A-1 to A-6.

E. The minimum vertical separation between the bottom of the percolation pond and groundwater table shall be five feet.

## IV. GENERAL REQUIREMENTS

A. The SPWRF and areas where any potential pollutants are stored shall be adequately protected from inundation and damage by storm flows and runoff.

B. Adequate facilities shall be provided to protect the SPWRF, treatment system devices, sewer collection system and recycling/disposal facilities from damage by storm flows and run-off or run-on generated by a 100-year return storm/24 hour duration.

DRAFT

C. The SPWRF and the collection system that is a part of the treatment and disposal system shall be maintained in such a manner that prevents sewage from surfacing or overflowing at any location.

D. A minimum of two feet of freeboard shall be maintained in the percolation/evaporation ponds at all time to ensure that direct rainfall will not cause overtopping.

E. No disposal areas with treated wastewater shall be located within 600 feet of any domestic water supply well unless all of the following conditions have been met:

1. A geological investigation demonstrates that an aquitard exists at the well between the uppermost aquifer being drawn from and the ground surface;

2. The well contains an annular seal that extends from the surface into the aquitard;

3. The well is housed to prevent any treated wastewater spray from coming into contact with the wellhead facilities;

4. The ground surface immediately around the wellhead is contoured to allow surface water to drain away from the well; and

5. The owner of the well approves of the elimination of the buffer zone requirement.

F. There shall be no storage or impoundment of treated wastewater within 600 feet of any domestic water supply well.

G. No disposal of sludge, waste, and treated wastewater shall take place within 600 feet of any reservoir or stream used as a source of domestic water.

H. Any wastes that do not meet the foregoing requirements shall be held in impervious containers and discharged at a legal point of disposal.

I. Percolation ponds shall be maintained to ensure that percolation rate at the pond bottom shall not decrease over time.

J. The Discharger shall notify well owners within 500 feet radius from the boundary of percolation ponds when there is any exceedance on the effluent limitations and/or groundwater limitations.

K. The City shall, at all times, properly operate and maintain all treatment facilities and control systems (and related appurtenances), which are installed or used by the City to achieve compliance with the conditions of this Order. Proper operation and maintenance include effective performance, adequate funding,

DRAFT

adequate operator staffing and training, and adequate laboratory and process controls (including appropriate quality assurance procedures).

## V. PROHIBITIONS

A. Any discharge of wastewater from the SPWRF (including the wastewater collection system) at any point other than specifically described in this Order is prohibited.

B. There shall be no waste overflows or discharge of untreated or partially-treated waste from the SPWRF's treatment, storage or disposal facilities to adjacent drainage or water ways, adjacent properties, or to waters of the State at any time. The discharge of any wastewater to surface waters or surface water drainage courses is prohibited without a NPDES permit.

C. Industrial wastewater subject to the Prohibited Discharge Standards in 40 C.F.R. section 403.5 shall not be accepted by the SPWRF.

D. Wastes discharged shall not contain tastes, odors, color, foaming, any materials, or other objectionable characteristics in concentrations that would:

1. Affect human, animal, or plant life;

2. Cause nuisance or adversely affect any beneficial uses and quality of the receiving groundwater; and

3. Impact the Santa Clara River that may be in hydraulic connection with groundwater.

E. Odors originating at the SPWRF, including of sewage origin, shall not be perceivable any time outside the boundary of the SPWRF property owned by the City.

F. The percolation pond shall not contain floating materials, including solids, foams, or scum in concentrations that cause nuisance, adversely affect beneficial uses, or serve as a substrate for undesirable bacterial or algae growth or insect vectors. The wastewater treatment shall not result in nuisance conditions caused by breeding of mosquitoes, gnats, midges, or other pests.

G. Discharge of waste classified as "hazardous waste," as defined in CCR, Title 23, section 2521(a), is prohibited. Discharge of waste classified as "designated waste," as defined in California Water Code section 13173, in a manner that causes violation of receiving water limits is prohibited.

H. The percolation/evaporation ponds, drying beds, and the berms surrounding the ponds shall not contain plants, shrubs, or bushes that may damage the berms and the ponds.

DRAFT

I. The percolation pond shall not be altered without the approval by the Regional Board.

J. There shall be no onsite disposal of sludge. Sludge-drying activities are allowed, but only as an intermediate treatment prior to offsite disposal. Any offsite disposal of wastewater or sludge shall be made only to a legal point of disposal. For purposes of this Order, a legal disposal site is one for which requirements have been established by USEPA, and which is in full compliance therewith. Any wastewater or sludge handling shall be in such a manner as to prevent its reaching surface waters or watercourses.

K. Bypass (the intentional diversion of waste streams from any portion of the SPWRF) is prohibited. The Regional Board may take enforcement action against the City for bypass, unless:

1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the SPWRF that cause it to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass.

2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance.

3. Notice

i. Anticipated bypass: If the City knows in advance of the need for a bypass, it shall submit written notice to the Regional Board, if possible at least 10 days before the date of the bypass.

ii. Unanticipated bypass: The City shall provide verbal notice to the Regional Board Executive Officer of an unanticipated bypass within 24 hours from the time the City becomes aware of the circumstances. A written submission shall also be provided within five (5) days of the time the City becomes aware of the circumstances.

L. The wastewater treatment and percolation ponds shall not result in nuisance conditions caused by breeding of mosquitoes, gnats, midges, or other pests.

## VI. PROVISIONS

A. This Order includes "Attachment B - Standard Provisions Applicable to Waste Discharge Requirements" (Standard Provisions). If there is any conflict

DRAFT

between provisions stated herein and the Standard Provisions, the provisions stated herein prevail.

B. The City shall operate and maintain facilities, treatment operations, associated collection systems and outfalls in ways that preclude adverse impacts to surface or groundwater from impacts predicted to occur due to climate change.

C. The City shall evaluate the need to revise its Climate Change Effects Vulnerability Assessment and Management Plan (Climate Change Plan) when conditions change that may impact water quality. The City shall periodically submit a report of its evaluation or a revised Climate Change Plan based on its evaluation. Submittal of the Climate Change Plan is required pursuant to California Water Code section 13267. As required by this provision, a regional board may require a person to submit technical or monitoring program reports that the regional board requires. The Climate Change Plan is needed in order to assess and manage climate change related-effects associated with City operations that may affect water quality.

The Climate Change Plan shall include an assessment of short and long term vulnerabilities of the facility(ies) and operations as well as plans to address vulnerabilities of collection systems, facilities, treatment systems, and outfalls for predicted impacts in order to ensure that facility operations are not disrupted, compliance with permit conditions is achieved, and receiving waters are not adversely impacted by discharges. Control measures shall include, but are not limited to, emergency procedures, contingency plans, alarm/notification systems, training, backup power and equipment, and the need for planned mitigations to ameliorate climate-induced impacts including, but not limited to, changing influent and receiving water quality and conditions, as well as the impact of rising sea level (where applicable) storm surges and back-to-back severe storms that are expected to become more frequent.

D. The City shall comply with MRP No. CI-9259 (Attachment E), which is part of this Order, and any revisions thereto as ordered by the Executive Officer. The submittal dates of Discharger self-monitoring reports shall be no later than the submittal date specified in the MRP. If there is any conflict between the provisions stated herein and the MRP, the provisions stated herein prevail.

E. The City shall file with the Regional Board, under penalty of perjury, annual and quarterly reports on self-monitoring work performed according to the detailed specifications contained in the MRP attached hereto and incorporated herein by reference, as directed by the Executive Officer. The results of any monitoring done in addition to what is required or done more frequently than required at the location and/or times specified in the MRP shall be reported to the Regional Board. The City shall comply with all of the provisions and requirements of the MRP.

DRAFT

F. The City shall notify this Regional Board by telephone or electronic means within 24 hours of knowledge of any discharge exceeding the effluent limits prescribed in this Order from the SPWRF; written confirmation shall follow within 5 working days from date of notification, unless otherwise specified in this Order. The report shall include, but is not limited to, the following information, as appropriate:

1. Nature and extent of the violation;

2. Date and time: when the violation started, when compliance was achieved, and when injection was suspended and restored, as applicable;

3. Duration of violation;

4. Cause(s) of violation;

5. Corrective and/or remedial actions taken and/or will be taken with a time schedule for implementation to prevent future violations; and

6. Impact of the violation.

G. This Order does not exempt the City from compliance with any other laws, regulations, or ordinances that may be applicable; they do not legalize the recycling and use facilities; and they leave unaffected any further constraint on the use of recycled water at certain site(s) that may be contained in other statutes or required by other agencies.

H. This Order does not alleviate the responsibility of the City to obtain other necessary local, state, and federal permits to construct facilities necessary for compliance with this Order; nor does this Order prevent imposition of additional standards, requirements, or conditions by any other regulatory agency. Expansion of the recycled water distribution facility shall be contingent upon issuance of all necessary requirements and permits, including a conditional use permit.

I. After notice and opportunity for a hearing, this Order may be modified, revoked and reissued, or terminated for cause, that includes, but is not limited to: failure to comply with any condition in this Order, endangerment of human health, adverse impacts on water quality and/or beneficial uses of the receiving water resulting from the permitted activities in this Order, obtaining this Order by misrepresentation or failure to disclose all relevant facts, and acquisition of new information that could have justified the application of different conditions if known at the time of Order adoption.

The filing of a request by the City for modification, revocation and reissuance, or termination of this Order; or a notification of planned changes or anticipated noncompliance does not stay any condition of this Order.

DRAFT

J. The City shall furnish, within a reasonable time, any information that the Regional Board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order. The City shall also provide the Regional Board, upon request, with copies of records required to be kept under this Order for at least three (3) years.

K. Spill Clean-Up Contingency Plan (SCCP) Requirements – The City is required to periodically submit an updated and revised SCCP, which describes the activities and protocols to address clean-up of spills, overflows, and bypasses of untreated or partially treated wastewater from the City's collection system or treatment facilities. At a minimum, this SCCP shall include sections on spill clean-up and containment measures, public notification, and monitoring. The City shall review and amend this SCCP as appropriate after each spill from the SPWRF or in the service area of the SPWRF. The City shall include a discussion in the annual summary report of any modifications to the SCCP and the application of the SCCP to all spills during the year.

L. Construction, Operation, and Maintenance Requirements

1. The City shall, at all times, properly operate and maintain the SPWRF, including its wastewater collection, treatment, and disposal facilities (and related appurtenances) to ensure compliance with this Order, as well as provide adequate and reliable transport, treatment, and disposal of all wastewater from planned future wastewater sources under the City's responsibilities. Proper operation and maintenance includes, but is not limited to: effective performance, repairs and upgrades when needed, adequate funding, adequate operator staffing and training, adequate operator supervision, and adequate laboratory and process controls (including appropriate quality assurance/quality control procedures).

2. The SPWRF shall be supervised and operated by persons possessing certificates of appropriate grade in accordance with CCR, Title 23, Division 3, Chapter 26 and California Water Code sections 13625 - 13633.

3. The SPWRF shall be operated and maintained in accordance with the operation and maintenance manual prepared by the municipality through the Clean Water Grant Program. The City's Operation, Maintenance, and Monitoring Plan (OMM Plan) shall be available for reference and use by all applicable personnel. The City shall maintain, regularly review, and revise or update as necessary the OMM Plan in order for the document(s) to remain useful and relevant to current equipment and operation practices. Reviews shall be conducted annually, and revisions or updates shall be completed as necessary and submitted to the Regional Board on an annual basis.

4. The City shall maintain in good working order a sufficient alternate power source for operating the wastewater treatment and disposal facilities. All

DRAFT

equipment shall be located to minimize failure due to moisture, liquid spray, flooding, and other physical phenomena. The alternate power source shall be designed to permit inspection and maintenance and shall provide for periodic testing. If such alternate power source is not in existence, the City shall halt, reduce, or otherwise control all discharges upon the reduction, loss, or failure of the primary source of power.

5. The City shall provide standby or emergency power facilities and/or sufficient storage capacity or other means so that in the event of plant upset, outage due to power failure or other cause, or heavy rainfall, discharge of raw or inadequately treated sewage does not occur and infiltration ponds do not exceed their hydraulic capacity.

M. Sludge Disposal Requirements

1. All sludge generated at the wastewater treatment plant shall be disposed of, treated, or applied to land in accordance with federal regulations contained in 40 C.F.R. Part 503. These requirements are enforceable by USEPA.

2. The City shall comply with requirements in State Water Board Order No. 2004-10-DWQ, *"General Waste Discharge Requirements for the Discharge of Biosolids to Land for Use as a Soil Amendment in Agricultural, Silvicultural, Horticultural and Land Reclamation Activities"* for those sites receiving the City's biosolids that a regional water board has placed under this general order, and with the requirements in individual waste discharge requirements issued by a regional water board for sites receiving the City's biosolids.

3. The City shall comply, if applicable, with WDRs issued by other regional water boards to which jurisdiction the biosolids are transported and applied.

4. The City shall provide this Regional Board with a copy of any report(s) submitted to USEPA, the State Water Board, or other regional water boards, with respect to municipal sludge or biosolids.

N. Collection System Requirements

The City must properly enroll under the applicable General WDRs for Sanitary Sewer Systems and comply with the requirements specified in the General WDRs. The State Water Board adopted General WDRs for Sanitary Sewer Systems (Order No. 2006-0003-DWQ) on May 2, 2006 and amended the WDRs by Order No. WQ 2008-0002-EXEC and Order No. WQ 2013-0058-EXEC, to provide a consistent and statewide approach to regulating sanitary sewer systems to prevent and/or reduce sanitary sewer overflows (SSOs). Order No. 2006-0003-DWQ requires public agencies that own or operate sanitary sewer systems to develop and implement sewer system management

DRAFT

plans and report all SSOs to the State Water Board's online SSO database. The City's collection system is part of the system that is subject to Order No. 2006-0003-DWQ. The City enrolled in Order No. 2006-0003-DWQ on July 27, 2006. As such, the City must properly operate and maintain its collection system. The City must also report any non-compliance and mitigate any discharge from the collection system in violation of this Order.

O. Spill Reporting Requirements

1. Initial Notification – Although State and Regional Board staff do not have duties as first responders, this requirement is an appropriate mechanism to ensure that the agencies that do have first responder duties are notified in a timely manner in order to protect public health and beneficial uses. For certain spills, overflows and bypasses, the City shall make notifications as required below:

   i. In accordance with the requirements of Health and Safety Code section 5411.5, the City shall provide notification to the local health officer or the director of environmental health with jurisdiction over the affected water body of any unauthorized release of sewage or other waste that causes, or probably will cause, a discharge to any waters of the state as soon as possible, but no later than two (2) hours after becoming aware of the release.

   ii. In accordance with the requirements of California Water Code section 13271, the City shall provide notification to the California Emergency Management Agency (Cal EMA) of the release of reportable quantities of hazardous substances or sewage that causes, or probably will cause, a discharge to any waters of the state as soon as possible, but not later than two (2) hours after becoming aware of the release. CCR, Title 23, section 2250 establishes 1,000 gallons or more as a reportable quantity of sewage. The phone number for reporting these releases to the Cal EMA is (800) 852-7550.

   iii. The City shall notify the Regional Board of any unauthorized release of sewage from the SPWRF that causes, or probably will cause, a discharge to a water of the state as soon as possible, but not later than two (2) hours after becoming aware of the release. This initial notification does not need to be made if the City has notified Cal EMA and the local health officer or the director of environmental health with jurisdiction over the affected waterbody. The phone number for reporting these releases of sewage to the Regional Board is (213) 576-6683. The phone numbers for after hours and weekend reporting of releases of sewage to the Regional Board are (213) 305-2284 and (213) 305-2253.

DRAFT

At a minimum, the following information shall be provided to the Regional Board:

a. The location, date, and time of the release;

b. The water body that may be impacted by the discharge;

c. An estimate of the amount of sewage or other waste released and the amount that reached the receiving water at the time of notification;

d. If ongoing, the estimated flow rate of the release at the time of the notification;

e. The name, organization, phone number, and email address of the reporting representative; and

f. A certification that the State Office of Emergency Services and the local health officer or directors of environmental health with jurisdiction over the possibly affected water bodies have been notified of the discharge.

2. Monitoring – For spills, overflows and bypasses reported under Section VI.O.1., the City shall monitor as required below:

To define the geographical extent of the spill's impact, the City shall obtain grab samples (if feasible, accessible, and safe) for all spills, overflows or bypasses of any volume that reach any waters of the State (including surface and ground waters). The City shall analyze the samples for total and fecal coliforms, E. coli (if fecal coliform test shows positive), enterococcus, and relevant pollutants of concern, upstream and downstream of the point of entry of the spill (if feasible, accessible and safe). This monitoring shall be done on a daily basis from the time the spill is known until the results of two (2) consecutive sets of bacteriological monitoring indicate the return to the background level or the County Department of Public Health authorizes cessation of monitoring.

3. Reporting – The initial notification required under Section VI.O.1. shall be followed by:

i. As soon as possible, but not later than twenty-four (24) hours after becoming aware of an unauthorized discharge of sewage or other waste from its wastewater treatment plant to a water of the state, the City shall submit a statement to the Regional Board via email. If the discharge is 1,000 gallons or more, this statement shall certify that Cal EMA has been notified of the discharge in accordance with California Water Code section 13271. The statement shall also certify that the local health officer or director of environmental health

DRAFT

with jurisdiction over the affected water bodies has been notified of the discharge in accordance with Health and Safety Code section 5411.5. The statement shall also include at a minimum the following information:

a. Agency, Order No., and MRP CI No.;

b. The location, date, and time of the discharge;

c. The water body that received the discharge;

d. A description of the level of treatment of the sewage or other waste discharged;

e. An initial estimate of the amount of sewage or other waste released and the amount that reached the impacted water body;

f. The Cal EMA control number and the date and time that notification of the incident was provided to Cal EMA; and

g. The name of the local health officer or director of environmental health representative notified (if contacted directly); the date and time of notification; and the method of notification (e.g., phone, fax, email).

ii. A written preliminary report shall be submitted to the Regional Board within five (5) working days after disclosure of the incident via the State Water Board GeoTracker database under Global ID WDR100000359. The final written report shall be included in the next quarterly monitoring report submitted to the GeoTracker database above. The written report shall document the information required in Section VI.O.4. below, monitoring results and any other information required in provisions of the Standard Provisions (Attachment B) including corrective measures implemented or proposed to be implemented to prevent/minimize future occurrences.

iii. The City shall include a certification in the annual summary report (due according to the schedule in the MRP) that states that the sewer system emergency equipment, including alarm systems, backup pumps, standby power generators, and other critical emergency pump station components were maintained and tested in accordance with the City's preventive maintenance plan. Any deviations from or modifications to the preventive maintenance plan shall be approved by the Executive Officer.

4. Records – The City shall prepare and maintain a record of all spills, overflows or bypasses of raw or partially treated sewage from its collection system or the SPWRF. This record shall be made available to the

DRAFT

Regional Board upon request and a spill summary shall be included in the annual report, as required in the MRP. The record shall contain:

i. The date and time of each spill, overflow, or bypass;

ii. The location of each spill, overflow, or bypass;

iii. The estimated volume of each spill, overflow, or bypass including gross volume, amount recovered and amount not recovered, monitoring results as required by Section VI.O.2.;

iv. The cause of each spill, overflow, or bypass;

v. Whether each spill, overflow, or bypass entered a receiving water and, if so, the name of the water body and whether it entered via storm drains or other man-made conveyances;

vi. Any corrective measures implemented or proposed to be implemented to prevent/minimize future occurrences; and

vii. The mandatory information included in Sanitary Sewer Overflows (SSO) online reporting for finalizing and certifying the SSO report for each spill, overflow, or bypass under State Water Board Order No. 2006-0003-DWQ.

5. Activities Coordination – The Regional Board expects that the City will coordinate their compliance activities for consistency and efficiency with other entitles that have responsibilities to implement: (i) this Order, and (ii) State Water Board Order No. 2006-0003-DWQ.

6. Consistency with State Water Board Order No. 2006-0003-DWQ – The requirements contained in this Order in Sections VI.K. (SCCP Requirements), VI.L. (Construction, Operation, and Maintenance Requirements), and VI.O. (Spill Reporting Requirements) are intended to be consistent with the requirements of Order No. 2006-0003-DWQ. The Regional Board recognizes that there may be some overlap between this Order and Order No. 2006-0003-DWQ. The requirements of Order No. 2006-0003-DWQ are considered the minimum thresholds (see Finding 11 of Order No. 2006-0003-DWQ). To encourage efficiency, the Regional Board will accept the documentation prepared by the City under Order No. 2006-0003-DWQ for compliance purposes, as satisfying the requirements in Sections VI.K., VI.L., and VI.O. provided the more stringent provisions enumerated in this Order have also been addressed.

P. Pretreatment Requirements

1. This Order includes the City's Pretreatment Program, as previously submitted to this Regional Board and specified in Order No. R4-2007-

DRAFT

0028-R2, adopted by this Regional board on February 2, 2012. Any change to the Program shall be reported to the Regional Board in writing and shall not become effective until approved by the Executive Officer in accordance with procedures established in 40 C.F.R. section 403.18.

2. The City shall enforce the requirements under Sections 307(b), 307(c), 307(d), and 402(b) of the Federal Clean Water Act with timely, appropriate, and effective enforcement actions. The City shall require industrial users to comply with Federal Categorical Standards and shall initiate enforcement actions against those users who do not comply with the standards. The City shall require industrial users subject to the Federal Categorical Standards to achieve compliance no later than the date specified in those requirements or, in the case of a new industrial user, upon commencement of the discharge.

3. The City shall perform the pretreatment functions as required in 40 C.F.R. Part 403 including, but not limited to:

   i. Implement the necessary legal authorities as provided in 40 C.F.R. section 403.8(f)(1);

   ii. Enforce the pretreatment requirements under 40 C.F.R. sections 403.5 and 403.6;

   iii. Implement the programmatic functions as provided in 40 C.F.R. section 403.8(f)(2); and

   iv. Provide the requisite funding of personnel to implement the Pretreatment Program as provided in 40 C.F.R. section 403.8(f)(3).

4. The City shall submit an annual report of effectiveness of the City's Pretreatment Program. This annual report shall be submitted to the Regional Board, with copies to the State Water Board and USEPA Region 9, describing the City's pretreatment activities over the period and whether such activities have been effective. If the City is not in compliance with any conditions or requirements of this Order, the City shall include the reasons for noncompliance and shall state how and when the City will comply with such conditions and requirements.

5. The City shall be responsible and liable for the performance of all control authority pretreatment requirements contained in 40 C.F.R. Part 403, including subsequent regulatory revisions thereof. Where Part 403 or subsequent revision places mandatory actions upon the City as Control Authority, but does not specify a timetable for completion of the actions, the City shall complete the required actions within six months from the effective date of this Order or the effective date of Part 403 revisions, whichever comes later. For violations of pretreatment requirements, the City shall be subject to enforcement actions, penalties, fines, and other

DRAFT

remedies by the Regional Board, USEPA, or other appropriate parties, as provided in the Federal Clean Water Act. The Regional Board or USEPA may initiate enforcement action against an industrial user for noncompliance with acceptable standards and requirements as provided in the Federal Clean Water Act and/or the California Water Code.

## VII. REOPENER

The Regional Water Board will review this Order periodically and will revise requirements when necessary. The waste discharge requirements and monitoring and reporting requirements in this Order were developed based on currently available technical information and applicable water quality laws, regulations, policies, and plans, and are intended to assure compliance with them. If applicable laws and regulations change, including but not limited to, establishment of total maximum daily loads, or once new information is obtained that will change the overall discharge and its potential to impact waters of the state, it may be appropriate to reopen this Order. This Order may also specifically be reopened to make revisions consistent with an approved salt and nutrient management plan.

## VIII. TERMINATION

Except for enforcement purposes, Order No. R4-2007-0028, adopted by the Regional Board on May 3, 2007, and amended on May 6, 2010, February 2, 2012, April 6, 2017 and December 21, 2017, is hereby terminated.

The Regional Board's termination of prior waste discharge requirements and/or monitoring and reporting requirements do not extinguish any violations that may have occurred during the time those requirements were in effect. The Regional Board reserves the right to take enforcement actions to address violations of prior prohibitions, limitations, specifications, requirements, or provisions of rescinded requirements as allowed by law.

## IX. EFFECTIVE DATE

This Order becomes effective immediately upon its adoption.

I, Renee Purdy, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order originally adopted on February 8, 2018 and amended and adopted by the California Regional Water Quality Control Board, Los Angeles Region on May 12, 2022.

Renee Purdy
Executive Officer

DRAFT

Figure 1 – The Vicinity of Santa Paula Water Recycling Facility (SPWRF)

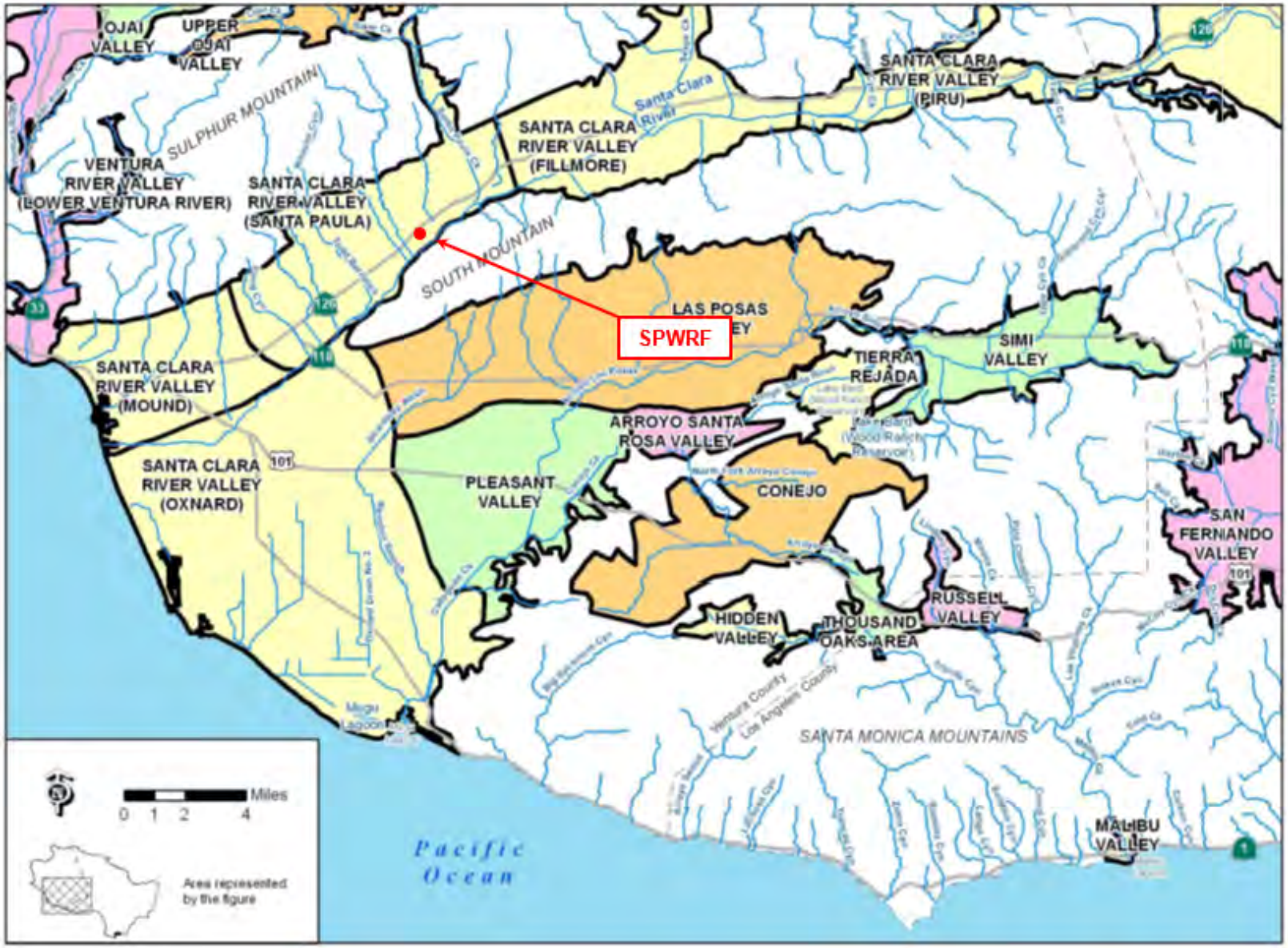



Figure 2 – Santa Paula Groundwater Basin

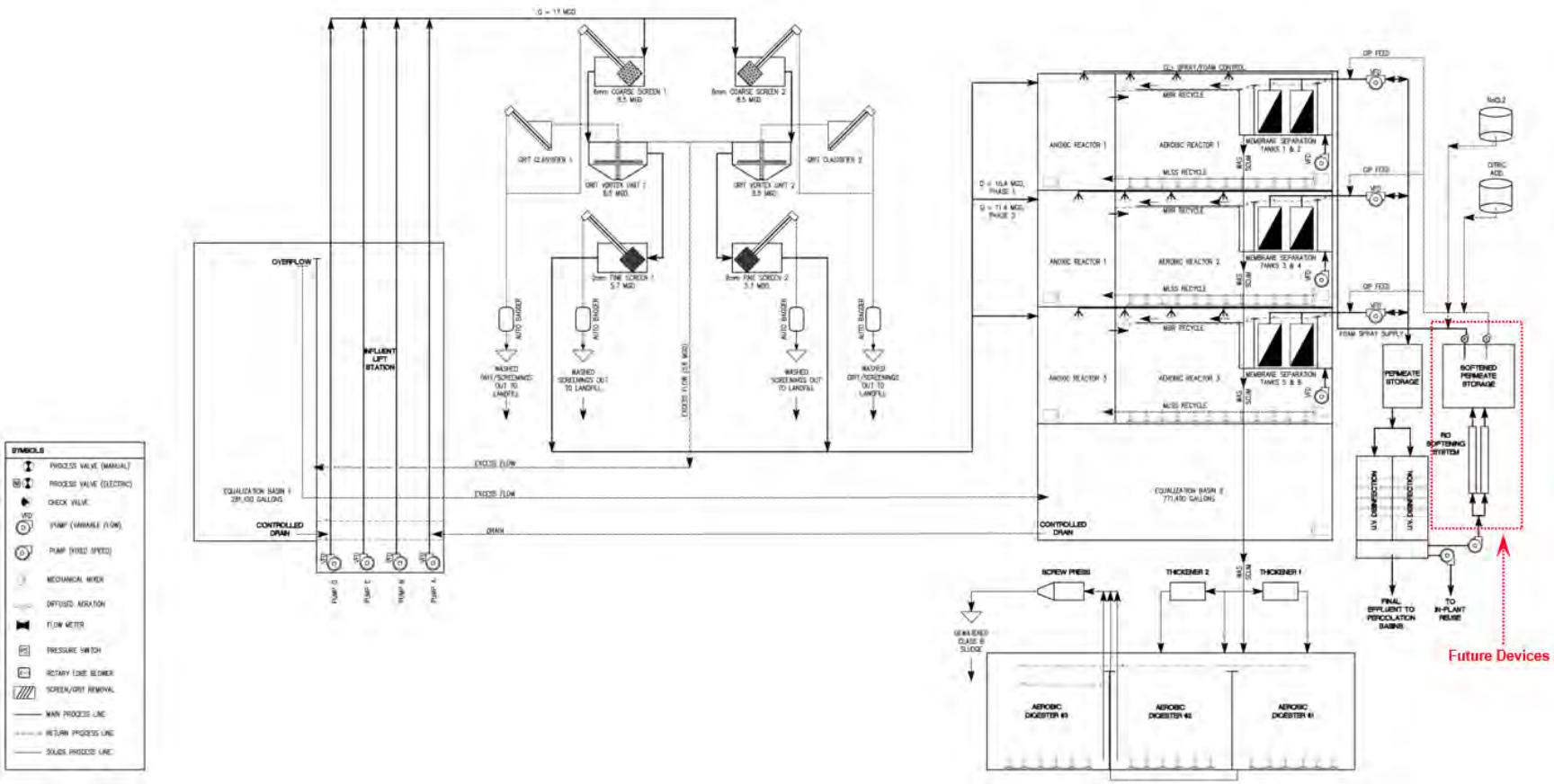
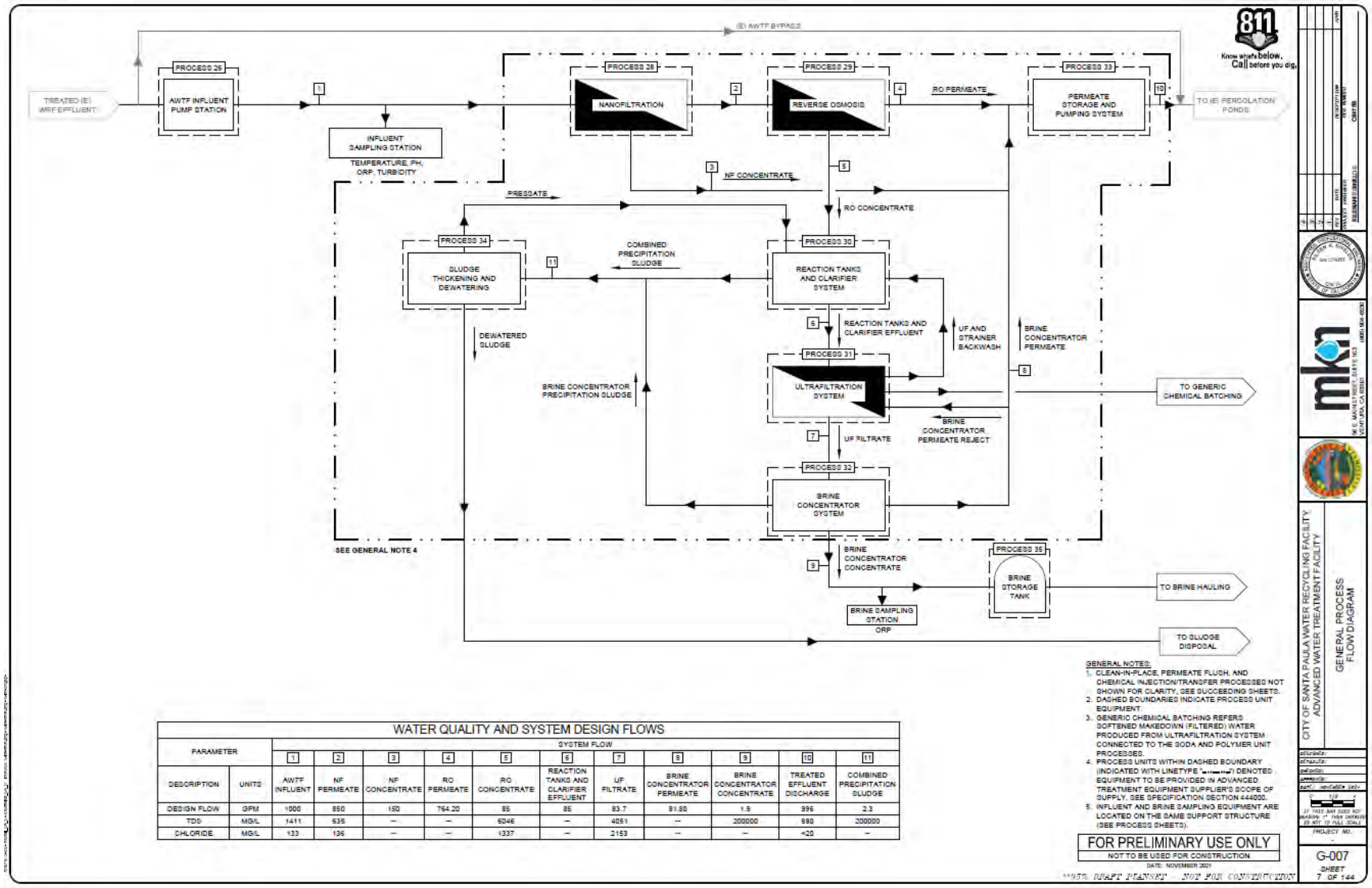



Figure 3 – Process Flow Schematic of Santa Paula Wastewater Recycling Facility




| WATER QUALITY AND SYSTEM DESIGN FLOWS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PARAMETER | | SYSTEM FLOW | | | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| DESCRIPTION | UNITS | AWTF INFLUENT | NF PERMEATE | NF CONCENTRATE | RO PERMEATE | RO CONCENTRATE | REACTION TANKS AND CLARIFIER EFFLUENT | UF FILTRATE | BRINE CONCENTRATOR PERMEATE | BRINE CONCENTRATOR CONCENTRATE | TREATED EFFLUENT DISCHARGE | COMBINED PRECIPITATION SLUDGE |
| DESIGN FLOW | GPM | 1000 | 850 | 150 | 764.20 | 85 | 85 | 83.7 | 81.80 | 1.9 | 996 | 2.3 |
| TDS | MG/L | 1411 | 535 | -- | -- | 6046 | -- | 4051 | -- | 200000 | 680 | 200000 |
| CHLORIDE | MG/L | 133 | 136 | -- | -- | 1337 | -- | 2153 | -- | -- | <20 | -- |

Figure 4 – Process Flow Schematic of Reverse Osmosis Advanced Wastewater Treatment System at Santa Paula Water Recycling Facility

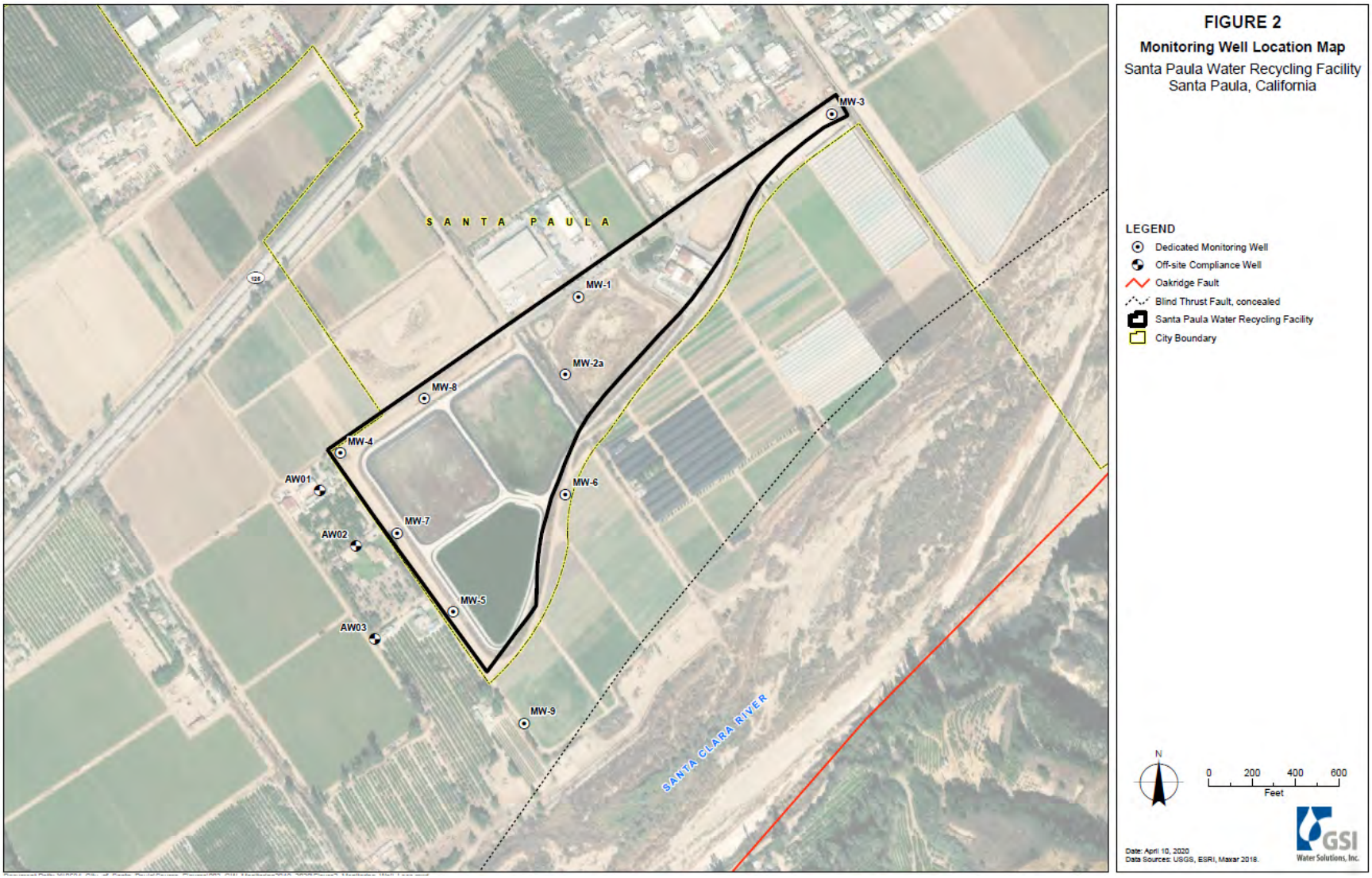



Figure 5 – Locations of Groundwater Monitoring Wells

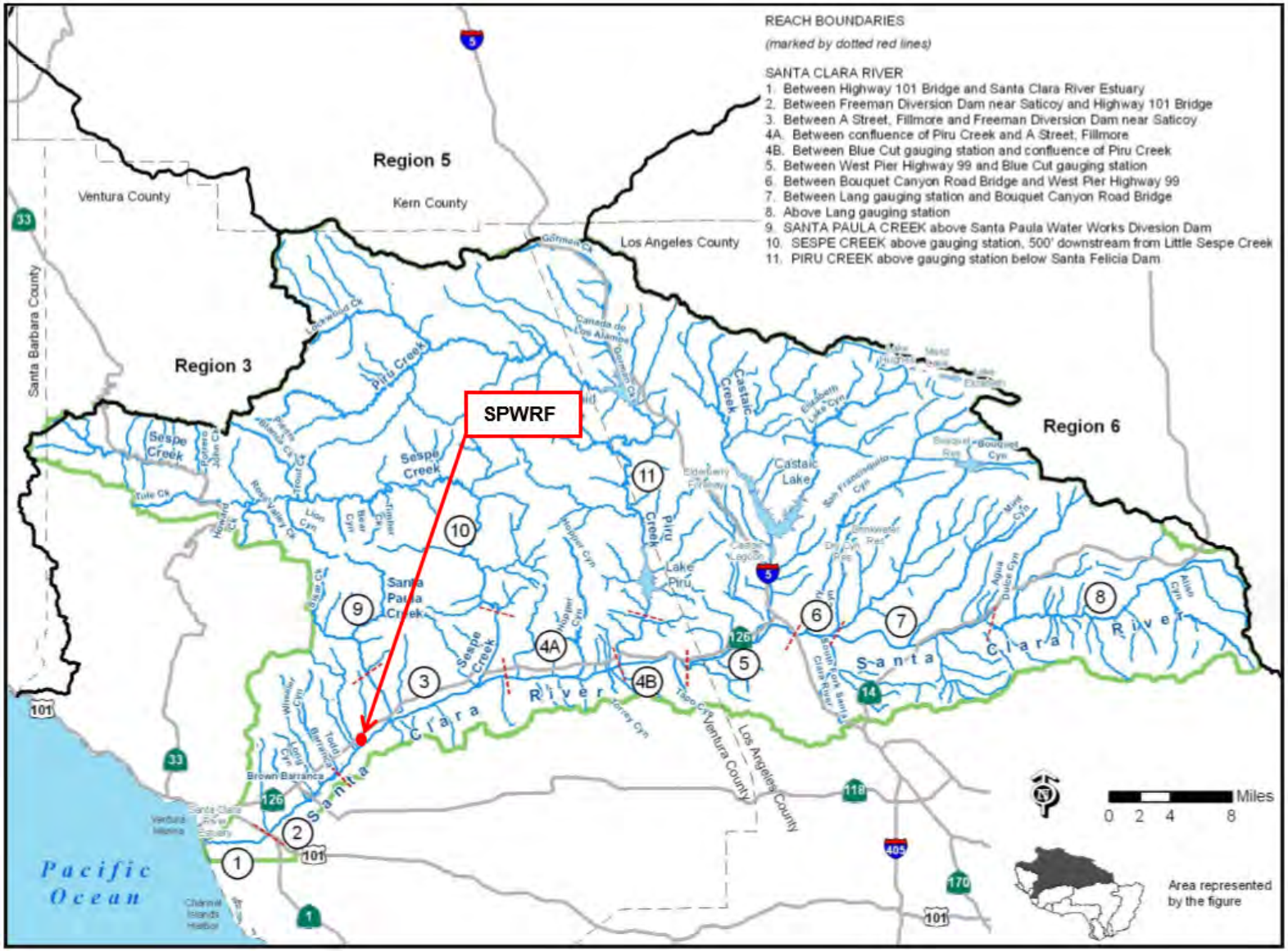



Figure 6 – Santa Clara River Watershed Surface Reaches

## Attachment A – Maximum Contaminant Levels

### Attachment A-1 Inorganic Chemicals

**Table 64431-A**

| Chemical | Maximum Contaminant Levels (mg/L) | Reporting Detection Limit (mg/L) |
|---|---|---|
| Aluminum | 1 | 0.05 |
| Antimony | 0.006 | 0.006 |
| Arsenic | 0.010 | 0.002 |
| Asbestos | 7 MFL [1] | 0.2 MFL [2] |
| Barium | 1 | 0.1 |
| Beryllium | 0.004 | 0.001 |
| Cadmium | 0.005 | 0.001 |
| Chromium | 0.05 | 0.01 |
| Cyanide | 0.15 | 0.1 |
| Fluoride | 2.0 | 0.1 |
| Mercury | 0.002 | 0.001 |
| Nickel | 0.1 | 0.01 |
| Nitrate (as nitrogen) | 10 | 0.4 |
| Nitrate+Nitrite (sum as nitrogen) | 10 | |
| Nitrite (as nitrogen) | 1 | 0.4 |
| Perchlorate | 0.006 | 0.002<br>0.001 [3] |
| Selenium | 0.05 | 0.005 |
| Thallium | 0.002 | 0.001 |

Note: [1] MFL = million fibers per liter; MCL for fibers exceeding 10 µm in length.
[2] Reporting detection limit for fibers exceeding 10 µm in length.
[3] Effective January 1, 2024.

DRAFT

## Attachment A-2 Radioactivity

Gross alpha and gross beta analysis must be performed. If gross alpha is greater than 1 picocurie per liter (pCi/L), uranium analysis must be performed. Compliance with this Order shall then be based on comparing gross alpha minus total uranium to the gross alpha limit of 15 pCi/L.

Radium-226 and radium-228 analysis must be performed, and combined Radium-226 and radium-228 activity must be less than or equal to 5 pCi/L. If gross alpha is less than 50 pCi/L, one can assume radium-226 activity is equal to gross alpha activity for purposes of meeting the 5 pCi/L limit.

**Table 64442**

| Radionuclide | Maximum Contaminant Level (pCi/L) | Reporting Detection Limit (pCi/L) |
|---|---|---|
| Radium-226 | | 1 |
| Radium-228 | | 1 |
| Combined radium-226 and radium-228 | 5 | |
| Gross Alpha particle activity (excluding radon and uranium) | 15 | 3 |
| Uranium | 20 | 1 |

Note: pCi/L = picocuries per liter

**Table 64443**

| Radionuclide | Maximum Contaminant Level (pCi/L) | Reporting Detection Limit (pCi/L) |
|---|---|---|
| Beta/photon emitters | 4 millirem per year annual dose equivalent to the total body or any internal organ | Gross Beta particle activity: 4 |
| Strontium-90 | 8 (= 4 millirem per year dose to bone marrow) | 2 |
| Tritium | 20,000 (=4 millirem per year dose to total body) | 1,000 |

DRAFT

## Attachment A-3 Organic Chemicals

**Table 64444-A**

**(a) Volatile Organic Chemicals (VOCs)**

| Chemical | Maximum Contaminant Levels (mg/L) | Reporting Detection Limit (mg/L) |
|---|---|---|
| Benzene | 0.001 | 0.0005 |
| Carbon Tetrachloride | 0.0005 | 0.0005 |
| 1,2-Dichlorobenzene | 0.6 | 0.0005 |
| 1,4-Dichlorobenzene | 0.005 | 0.0005 |
| 1,1-Dichloroethane | 0.005 | 0.0005 |
| 1,2-Dichloroethane | 0.0005 | 0.0005 |
| 1,1-Dichloroethylene | 0.006 | 0.0005 |
| cis-1,2-Dichloroethylene | 0.006 | 0.0005 |
| trans-1,2-Dichloroethylene | 0.01 | 0.0005 |
| Dichloromethane | 0.005 | 0.0005 |
| 1,2-Dichloropropane | 0.005 | 0.0005 |
| 1,3-Dichloropropene | 0.0005 | 0.0005 |
| Ethylbenzene | 0.3 | 0.0005 |
| Methyl-*tert*-butyl ether | 0.013 | 0.003 |
| Monochlorobenzene | 0.07 | 0.0005 |
| Styrene | 0.1 | 0.0005 |
| 1,1,2,2-Tetrachloroethane | 0.001 | 0.0005 |
| Tetrachloroethylene | 0.005 | 0.0005 |
| Toluene | 0.15 | 0.0005 |
| 1,2,4-Trichlorobenzene | 0.005 | 0.0005 |
| 1,1,1-Trichloroethane | 0.200 | 0.0005 |
| 1,1,2-Trichloroethane | 0.005 | 0.0005 |
| Trichloroethylene | 0.005 | 0.0005 |
| Trichlorofluoromethane | 0.15 | 0.005 |

DRAFT

| | | |
|---|---|---|
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | 1.2 | 0.01 |
| Vinyl Chloride | 0.0005 | 0.0005 |
| Xylenes | 1.750 [1] | 0.0005 |

**(b) Synthetic Organic Chemicals (SOCs)**

| **Chemical** | **Maximum Contaminant Levels (mg/L)** | **Reporting Detection Limit (mg/L)** |
|---|---|---|
| Alachlor | 0.002 | 0.001 |
| Atrazine | 0.001 | 0.0005 |
| Bentazon | 0.018 | 0.002 |
| Benzo(a)pyrene | 0.0002 | 0.0001 |
| Carbofuran | 0.018 | 0.005 |
| Chlordane | 0.0001 | 0.0001 |
| 2,4-D | 0.07 | 0.01 |
| Dalapon | 0.2 | 0.01 |
| Dibromochloropropane | 0.0002 | 0.00001 |
| Di(2-ethylhexyl)adipate | 0.4 | 0.005 |
| Di(2-ethylhexyl)phthalate | 0.004 | 0.003 |
| Dinoseb | 0.007 | 0.002 |
| Diquat | 0.02 | 0.004 |
| Endothall | 0.1 | 0.045 |
| Endrin | 0.002 | 0.0001 |
| Ethylene Dibromide | 0.00005 | 0.00002 |
| Glyphosate | 0.7 | 0.025 |
| Heptachlor | 0.00001 | 0.00001 |
| Heptachlor Epoxide | 0.00001 | 0.00001 |
| Hexachlorobenzene | 0.001 | 0.0005 |
| Hexachlorocyclopentadiene | 0.05 | 0.001 |
| Lindane | 0.0002 | 0.0002 |

DRAFT

| Chemical | Maximum Contaminant Levels (mg/L) | Reporting Detection Limit (mg/L) |
|---|---|---|
| Methoxychlor | 0.03 | 0.01 |
| Molinate | 0.02 | 0.002 |
| Oxamyl | 0.05 | 0.02 |
| Pentachlorophenol | 0.001 | 0.0002 |
| Picloram | 0.5 | 0.001 |
| Polychlorinated Biphenyls | 0.0005 | 0.0005 |
| Simazine | 0.004 | 0.001 |
| Thiobencarb | 0.07 | 0.001 |
| Toxaphene | 0.003 | 0.001 |
| 1,2,3-Trichloropropane | 0.000005 | 0.000005 |
| 2,3,7,8-TCDD (Dioxin) | $3\times10^{-8}$ | $5\times10^{-9}$ |
| 2,4,5-TP (Silvex) | 0.05 | 0.001 |

Note: [1] MCL is for either a single isomer or the sum of the isomers.

DRAFT

## Attachment A-4 Secondary Maximum Contaminant Levels

**Table 64449-A**

| Chemical | Levels/Units |
|---|---|
| Aluminum | 0.2 mg/L |
| Color | 15 Units |
| Copper | 1.0 mg/L |
| Foaming Agents (MBAS) | 0.5 mg/L |
| Iron | 0.3 mg/L |
| Manganese | 0.05 mg/L |
| Methyl-tert-butyl ether (MTBE) | 0.005 mg/L |
| Odor -Threshold | 3 Units |
| Silver | 0.1 mg/L |
| Thiobencarb | 0.001 mg/L |
| Turbidity | 5 Units |
| Zinc | 5.0 mg/L |

DRAFT

## Attachment A-5 Disinfection Byproducts

**Table 64533-A**

| Chemical | Maximum Contaminant Levels (mg/L) | Reporting Detection Limit (mg/L) |
|---|---|---|
| Total trihalomethanes (TTHM) | 0.080 | |
| Bromodichloromethane | | 0.0010 |
| Bromoform | | 0.0010 |
| Chloroform | | 0.0010 |
| Dibromochloromethane | | 0.0010 |
| Haloacetic acids (five) (HAA5) | 0.060 | |
| Monochloroacetic Acid | | 0.0020 |
| Dichloroacetic Acid | | 0.0010 |
| Trichloroacetic Acid | | 0.0010 |
| Monobromoacetic Acid | | 0.0010 |
| Dibromoacetic Acid | | 0.0010 |
| Bromate [1] | 0.010 | 0.0050<br>0.0010 [2] |
| Chlorite [3] | 1.0 | 0.020 |

Notes: [1] Bromate is listed for plant using ozone disinfection only.
[2] For analysis performed using EPA Method 317.0 Revision 2.0, 321.8, or 326.0.
[3] Chlorite is listed for plant using chlorine dioxide only.

DRAFT

## Attachment B – Standard Provisions
## Applicable to Waste Discharge Requirements

1. **Duty to Comply**

The discharger must comply with all conditions of these waste discharge requirements. A responsible party has been designated in the Order for this project, and is legally bound to maintain the monitoring program and permit. Violations may result in enforcement actions, including Regional Board orders or court orders requiring corrective action or imposing civil monetary liability, or in modification or revocation of these waste discharge requirements by the Regional Board. (California Water Code, Sections 13261, 13263, 13265, 13268, 13300, 13301, 13304, 13340, and 13350). Failure to comply with any waste discharge requirement, monitoring and reporting requirement, or other order or prohibition issued, reissued or amended by the Los Angeles Water Board or State Water Resources Control Board is a violation of these waste discharge requirements and the Water Code, which can result in the imposition of civil liability. (California Water Code, Section 13350, subdivision (a).)

2. **General Prohibition**

Neither the treatment nor the discharge of waste shall create a pollution, contamination or nuisance, as defined by California Water Code section 13050. In addition, the discharge of waste classified as hazardous, as defined in California Code of Regulations, Title 23, Section 2521, subdivision (a) is also prohibited.

3. **Availability**

A copy of these waste discharge requirements shall be maintained at the discharge facility and be available at all times to operating personnel. (California Water Code, Section 13263)

4. **Change in Ownership**

The discharger must notify the Executive Officer, in writing at least 30 days in advance of any proposed transfer of this Order's responsibility and coverage to a new discharger containing a specific date for the transfer of this Order's responsibility and coverage between the current discharger and the new discharger. This agreement shall include an acknowledgement that the existing discharger is liable for violations up to the transfer date and that the new discharger is liable from the transfer date forward. (California Water Code, Sections 13267 and 13263)

5. **Change in Discharge**

In the event of a material change in the character, location, or volume of a discharge, the discharger shall file with this Regional Board a new Report of Waste Discharge.

DRAFT

(California Water Code, Section 13260, subdivision (c)). A material change includes, but is not limited to, the following:

(a) Addition of a major industrial waste discharge to a discharge of essentially domestic sewage, or the addition of a new process or product by an industrial facility resulting in a change in the character of the waste.

(b) Significant change in disposal method, e.g., change from a land disposal to a direct discharge to water, or change in the method of treatment which would significantly alter the characteristics of the waste.

(c) Significant change in the disposal area, e.g., moving the discharge to another drainage area, to a different water body, or to a disposal area significantly removed from the original area potentially causing different water quality or nuisance problems.

(d) Increase in flow beyond that specified in the waste discharge requirements.

(e) Increase in the area or depth to be used for solid waste disposal beyond that specified in the waste discharge requirements. (California Code of Regulations, Title 23, Section 2210)

6. **Revision**

These waste discharge requirements are subject to review and revision by the Regional Board. (California Water Code, Sections 13263)

7. **Notification**

Where the discharger becomes aware that it failed to submit any relevant facts in a Report of Waste Discharge or submitted incorrect information in a Report of Waste Discharge or in any report to the Regional Board, it shall promptly submit such facts or information. (California Water Code, Sections 13260 and 13267)

8. **Vested Rights**

This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, do not protect the discharger from his liability under Federal, State or local laws, nor do they create a vested right for the discharger to continue the waste discharge. (California Water Code, Section 13263, subdivision (g).)

9. **Severability**

Provisions of these waste discharge requirements are severable. If any provisions of these requirements are found invalid, the remainder of the requirements shall not be affected.

DRAFT

10. **Operation and Maintenance**

The discharger shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with conditions of this Order. Proper operation and maintenance include effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Order. (California Water Code, Section 13263, subdivision (f).)

11. **Notification Requirement**

Except for a discharge which is in compliance with these waste discharge requirements, any person who, without regard to intent or negligence, causes or permits any hazardous substance or sewage to be discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, shall, as soon as (a) that person has knowledge of the discharge, (b) notification is possible, and (c) notification can be provided without substantially impeding cleanup or other emergency measures, immediately notify the Office of Emergency Services of the discharge in accordance with the spill reporting provision of the State toxic disaster contingency plan adopted pursuant to Article 3.7 (commencing with Section 8574.7) of Chapter 7 of Division 1 of Title 2 of the Government Code, and immediately notify the State Board or the appropriate Regional Board of the discharge. This provision does not require reporting of any discharge of less than a reportable quantity as provided for under subdivisions (f) and (g) of Section 13271 of the Water Code unless the discharger is in violation of a prohibition in the applicable Water Quality Control plan. (California Water Code, Section 13271, subdivision (a).)

12. **Oil or Petroleum Releases**

Except for a discharge which is in compliance with these waste discharge requirements, any person who without regard to intent or negligence, causes or permits any oil or petroleum product to be discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, shall, as soon as (a) such person has knowledge of the discharge, (b) notification is possible, and (c) notification can be provided without substantially impeding cleanup or other emergency measures, immediately notify the Office of Emergency Services of the discharge in accordance with the spill reporting provision of the State oil spill contingency plan adopted pursuant to Article 3.5 (commencing with Section 8574.1) of Chapter 7 of Division 1 of Title 2 of the Government Code. This provision does not require reporting of any discharge of less than 42 gallons unless the discharge is also required to be reported pursuant to Section 311 of the Clean Water Act or the discharge is in violation of a prohibition in the applicable Water Quality Control Plan. (California Water Code, Section 13272)

DRAFT

13. **Investigations and Inspections**

The discharger shall allow the Regional Board, or an authorized representative upon the presentation of credentials and other documents as may be required by law, to:

(a) Enter upon the discharger's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Order;

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order;

(c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order; and

(d) Sample or monitor at reasonable times, for the purposes of assuring compliance with this Order, or as otherwise authorized by the California Water Code, any substances or parameters at any location. (California Water Code, Section 13267)

(e) Except for material determined to be confidential in accordance with applicable law, all reports prepared in accordance with the terms of this Order shall be available for public inspection at the office of the Los Angeles Water Board. Data on waste discharges, water quality, geology, and hydrogeology shall not be considered confidential.

14. **Monitoring Program and Devices**

The discharger shall furnish, under penalty of perjury, technical monitoring program reports; such reports shall be submitted in accordance with specifications prepared by the Executive Officer, which specifications are subject to periodic revisions as may be warranted. (California Water Code, Section 13267)

All monitoring instruments and devices used by the discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy. All flow measurement devices shall be calibrated at least once per year, or more frequently, to ensure continued accuracy of the devices. Annually, the discharger shall submit to the Executive Office a written statement, signed by a registered professional engineer, certifying that all flow measurement devices have been calibrated and will reliably achieve the accuracy required.

The analysis of any material required pursuant to Division 7 of the Water Code shall be performed by a laboratory that has accreditation or certification pursuant to Article 3 (commencing with Section 100825) of Chapter 4 of Part 1 of Division 101 of the Health and Safety Code. However, this requirement does not apply to field tests, such as test for color, odor, turbidity, pH, temperature, dissolved oxygen,

DRAFT

conductivity, and disinfectant residual chlorine. (California Water Code, Section 13176). Unless otherwise permitted by the Regional Board Executive officer, all analyses shall be conducted at a laboratory certified for such analyses by the State Water Resources Control Board's Division of Drinking Water. All analyses shall be required to be conducted in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants" (40 CFR Part 136) promulgated by the United States, Environmental Protection Agency (USEPA). (California Code of Regulation, Title 23, Section 2230)

The Quality Assurance-Quality Control Program must conform to the USEPA Guidelines "Laboratory Documentation Requirements for Data Validation", January 1990, USEPA Region 9) or procedures approved by the Los Angeles Regional Water Quality Control Board.

All quality assurance and quality control (QA/QC) analyses must be run on the same dates when samples were actually analyzed. All QA/QC data shall be reported, along with the sample results to which they apply, including the method, equipment, analytical detection and quantitation limits, the percent recovery, and explanation for any recovery that falls outside the QC limits, the results of equipment and method blanks, the results of spiked and surrogate samples, the frequency of quality control analysis, and the name and qualifications of the person(s) performing the analyses. Sample results shall be reported unadjusted for lank results or spike recoveries. In cases where contaminants are detected in QA/QC samples (e.g., field, trip, or lab blanks); the accompanying sample results shall be appropriately flagged.

The Discharger shall make all QA/QC data available for inspection by Regional Board staff and submit the QA/QC documentation with its respective quarterly report. Proper chain of custody procedures must be followed and a copy of that documentation shall be submitted with the quarterly report.

15. **Treatment Failure**

In an enforcement action, it shall not be a defense for the discharger that it would have been necessary to halt or to reduce the permitted activity in order to maintain compliance with this Order. Upon reduction, loss, or failure of the treatment facility, the discharger shall, to the extent necessary to maintain compliance with this Order, control production or all discharges, or both, until the facility is restored or an alternative method of treatment is provided. This provision applies, for example, when the primary source of power of the treatment facility fails, is reduced, or is lost. (California Water Code, Section 13263, subdivision (f).)

16. **Discharge to Navigable Waters**

A person who discharges pollutants or proposes to discharge pollutants or proposes to discharge pollutants to the navigable waters of the United States within the jurisdiction of this state or a person who discharges dredged or fill material or proposes to discharge dredged or fill material into the navigable waters of the United

DRAFT

States within the jurisdiction of this state shall file a report of waste discharge in compliance with the procedures set forth in Water Code section 13260. (California Water Code, Section 13376)

17. **Endangerment to Health and Environment**

The discharger shall report any noncompliance which may endanger health or the environment. Any such information shall be provided verbally to the Executive Officer within 24 hours from the time the discharger becomes aware of the circumstances. A written submission shall also be provided within five days of the time the discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected; the anticipated time it is expected to continue and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Executive officer, or an authorized representative, may waive the written report on a case-by-case basis if the oral report has been received within 24 hours. The following occurrence(s) must be reported to the Executive Office within 24 hours:

(a) Any bypass from any portion of the treatment facility.

(b) Any discharge of treated or untreated wastewater resulting from sewer line breaks, obstruction, surcharge or any other circumstances.

(c) Any treatment plan upset which causes the effluent limitation of this Order to be exceeded. (California Water Code, Sections 13263 and 13267)

18. **Maintenance of Records**

The discharger shall retain records of all monitoring information including all calibration and maintenance records, all original strip chart recordings for continuous monitoring instrumentation, copies off all reports required by this Order, and record of all data used to complete the application for this Order. Records shall be maintained for a minimum of three years from the date of the sample, measurement, report, or application. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Regional Board Executive Officer.

Records of monitoring information shall include:

(a) The date, exact place, and time of sampling or measurement;

(b) The individual(s) who performed the sampling or measurement;

(c) The date(s) analyses were performed;

(d) The individual(s) who performed the analyses;

DRAFT

(e) The analytical techniques or method used; and

(f) The results of such analyses.

19. (a) All application reports or information to be submitted to the Executive Office shall be signed and certified as follows:

(1) For a corporation – by a principal executive officer or at least the level of vice president.

(2) For a partnership or sole proprietorship – by a general partner or the proprietor, respectively.

(3) For a municipality, state, federal, or other public agency – by either a principal executive officer or ranking elected official.

(b) A duly authorized representative of a person designated in paragraph (a) of this provision may sign documents if:

(1) The authorization is made in writing by a person described in paragraph (a) of this provision.

(2) The authorization specifies either an individual or position having responsibility for the overall operation of the regulated facility or activity; and

(3) The written authorization is submitted to the Executive Officer.

Any person signing a document under this Section shall make the following certification:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. [California Water Code Sections 13263, 13267, and 13268]"

20. **Operator Certification**

Supervisors and operators of municipal wastewater treatment plants and privately owned facilities regulated by the Public Utilities Commission, used in the treatment or reclamation of sewage and industrial waste shall possess a certificate of appropriate grade in accordance with California Code of Regulations, Title 23, section 3680. State Boards may accept experience in lieu of qualification training. (California Code of Regulations, Title, 23, Sections 3680 and 3680.2.) In lieu of a properly certified wastewater treatment plant operator, the State Board may approve



DRAFT

use of a water treatment plant operator of appropriate grade certified by the State Department of Public Health where reclamation is involved. (California Code of Regulations, Title, 23, Section 3670.1, subdivision (b).)

## ADDITIONAL PROVISIONS APPLICABLE TO PUBLICLY OWNED TREATEMENT WORKS' ADEQUATE CAPACITY

21. Whenever a regional board finds that a publicly owned wastewater treatment plant will reach capacity within four years, the board shall notify the discharger. Such notification shall inform the discharger that the regional board will consider adopting a time schedule order pursuant to Section 13300 of the Water Code or other enforcement order unless the discharger can demonstrate that adequate steps are being taken to address the capacity problem. The notification shall require the discharger to submit a technical report to the regional board within 120 days showing how flow volumes will be prevented from exceeding existing capacity or how capacity will be increased. A copy of such notification shall be sent to appropriate local elected officials, local permitting agencies and the press. The time for filing the required technical report may be extended by the regional board. An extension of 30 days may be granted by the executive officer. Longer extensions may be granted by the regional board itself. (California Code of Regulations, Title, 23, Section 2232.)

DRAFT

## Attachment C – Monitoring for Constituents of Emerging Concern (CECs)

**Table C-1. Health-based and Performance Indicator CECs and Required Reporting Limits [1]**

| Constituent | Constituent Group | Reporting Limit (µg/L) |
|---|---|---|
| 1,4-Dioxane | Industrial chemical | 0.1 |
| N-Nitrosodimethylamine (NDMA) | Disinfection byproduct | 0.002 |
| N-Nitrosomorpholine (NMOR) | Industrial chemical | 0.002 |
| Perfluorooctane sulfonate (PFOS) | Consumer/industrial chemical | 0.0065 |
| Perfluorooctanoic acid (PFOA) | Consumer/industrial chemical | 0.007 |
| Sucralose | Food additive | 0.1 |
| Sulfamethoxazole | Antibiotic | 0.01 |

Note: [1] *Water Quality Control Policy for Recycled Water* (Recycled Water Policy), effective April 8, 2019.

DRAFT

## Attachment D – Monitoring for Priority Pollutants

Acenaphthene
Acrolein
Acrylonitrile
Benzene
Benzidine
Carbon tetrachloride
Chlorobenzene
1,2,4-trichlorobenzene
Hexachlorobenzene
1,2-dichloroethane
1,1,1-trichloreothane
Hexachloroethane
1,1-dichloroethane
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
Chloroethane
Bis(2-chloroethyl) ether
2-chloroethyl vinyl ethers
2-chloronaphthalene
2,4,6-trichlorophenol
Parachlorometa cresol
Chloroform
2-chlorophenol
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
3,3-dichlorobenzidine
1,1-dichloroethylene
1,2-trans-dichloroethylene
2,4-dichlorophenol
1,2-dichloropropane
1,3-dichloropropylene
2,4-dimethylphenol
2,4-dinitrotoluene
2,6-dinitrotoluene
1,2-diphenylhydrazine
Ethylbenzene
Fluoranthene
4-chlorophenyl phenyl ether
4-bromophenyl phenyl ether
Bis(2-chloroisopropyl) ether
Bis(2-chloroethoxy) methane
Methylene chloride
Methyl chloride
Methyl bromide
Bromoform
Dichlorobromomethane
Chlorodibromomethane
Hexachlorobutadiene
Hexachlorocyclopentadiene
Isophorone
Naphthalene
Nitrobenzene
2-nitrophenol
4-nitrophenol
2,4-dinitrophenol
4,6-dinitro-o-cresol
N-nitrosodimethylamine
N-nitrosodiphenylamine
N-nitrosodi-n-propylamine
Pentachlorophenol
Phenol
Bis(2-ethylhexyl) phthalate
Butyl benzyl phthalate
Di-N-Butyl Phthalate 2
Di-n-octyl phthalate
Diethyl Phthalate
Dimethyl phthalate
Benzo(a) anthracene
Benzo(a) pyrene
Benzo(b) fluoranthene
Benzo(k) fluoranthene
Chrysene
Acenaphthylene
Anthracene
Benzo(ghi) perylene
Fluorene
Phenanthrene
Dibenzo(,h) anthracene
Indeno (1,2,3-cd) pyrene
Pyrene
Tetrachloroethylene
Toluene
Trichloroethylene
Vinyl chloride
Aldrin
Dieldrin
Chlordane

DRAFT

4,4-DDT
4,4-DDE
4,4-DDD
Alpha-endosulfan
Beta-endosulfan
Endosulfan sulfate
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Alpha-BHC
Beta-BHC
Gamma-BHC
Delta-BHC
PCB-1242 (Arochlor 1242)
PCB-1254 (Arochlor 1254)
PCB-1221 (Arochlor 1221)
PCB-1232 (Arochlor 1232)
PCB-1248 (Arochlor 1248)
PCB-1260 (Arochlor 1260)
PCB-1016 (Arochlor 1016)
Toxaphene
Antimony
Arsenic
Asbestos
Beryllium
Cadmium
Chromium
Copper
Cyanide, Total
Lead
Mercury
Nickel
Selenium
Silver
Thallium
Zinc
2,3,7,8-TCDD

DRAFT

**Attachment E**

# MONITORING AND REPORTING PROGRAM NO. CI-9259
# FOR
# CITY OF SANTA PAULA
# (SANTA PAULA WATER RECYCLING FACILITY)
# (File No. 06-189)

This Monitoring and Reporting Program (MRP) No. CI-9259 is issued pursuant to California Water Code section 13267, which authorizes the Regional Water Quality Control Board, Los Angeles Region (Regional Board) to require the City of Santa Paula (City), who discharges tertiary-treated wastewater generated from the Santa Paula Water Recycling Facility (SPWRF) to groundwater via three percolation ponds, to furnish technical or monitoring reports.

The reports required herein are necessary to:

- Determine compliance with Waste Discharge Requirements (WDRs) Order No. R4-2018-0022 and assure protection of the waters of the state and their beneficial uses.
- Assess treatment plant performance, identify operational problems, and improve plant performance.
- Assess effectiveness of the City's Pretreatment Program.
- Provide information on wastewater characteristics and flows for use in interpreting water quality and biological data.
- Determine total maximum daily load (TMDL) effectiveness.

The evidence that supports the need for the reports is set forth in the WDRs and the Regional Board record.

## I. SUBMITTAL OF REPORTS

A. The City shall comply with the Electronic Submittal of Information (ESI) requirements by submitting all reports required under this MRP, including electronic data format (EDF) groundwater and surface water monitoring data, injection location data, and monitoring reports. These reports shall be received by the Regional Board via the State Water Resources Control Board's (State Water Board) GeoTracker database under Global ID WDR100000849 on the dates indicated as follows:

1. **Quarterly Monitoring Reports** shall be received by the Regional Board by the 30th day of the month following the end of each quarterly monitoring period according to Table 1 below. The first Quarterly Monitoring Report

DRAFT

under this program must be received by the Regional Board by April 30, 2018.

**Table 1. Reporting Period and Due**

| Reporting Period | Report Due |
|---|---|
| January – March | April 30 |
| April – June | July 30 |
| July – September | October 30 |
| October - December | January 30 |

2. **Annual Summary Report** shall be received by the Regional Board by March 1 of each year. The first Annual Summary Report under this program must be received by the Regional Board no later than March 1, 2018.

B. If there is no discharge during any reporting period, the report shall still be submitted and so state.

C. Data collected from monitoring wells shall be included in the quarterly monitoring reports and annual summary report. The data shall include the well specifications, ordinances, well heads elevation to mean sea level (MSL) and the method to develop the well. The California Department of Water Resources sets standards for the construction of groundwater wells, as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 74-81* (December 1981). These well standards, and any more stringent standards adopted by the state or county pursuant to Water Code section 13801, apply to all monitoring wells used to monitor the impacts of wastewater storage or disposal governed by waste discharge or monitoring and reporting requirements.

D. In accordance with California Business and Profession Code sections 6735, 7835, and 7835.1, engineering and geologic evaluations and judgments shall be performed by or under the direction of registered professionals competent and proficient in the fields pertinent to the required activities. All reports submitted to the Regional Board pursuant to waste discharge or monitoring and reporting requirements that contain work plans for investigations and studies, that describe the conduct of investigations and studies, or that contain technical conclusions and recommendations concerning engineering and geology shall be prepared by or under the direction of appropriately qualified professional(s), such a licensed engineer or a certified hydrogeologist in the State of California, even if not explicitly stated. Each report must submitted by the Discharger shall bear the professional's signature and stamp.

E. All monitoring reports must include, at minimum, the following:

DRAFT

1. Well or location identification, date and time of sampling;

2. Sampler identification, laboratory identification, and chain of custody;

3. Quarterly observation of groundwater levels, recorded to 0.01 feet mean sea level (MSL), and flow direction; and

4. Calculation of vertical separation of the water table from the bottom of the disposal system.

## II. MONITORING REQUIREMENTS

A. Monitoring shall be used to determine compliance with waste discharge requirements and shall include, but is not limited to, implementation and documentation of the following:

1. Locations of each groundwater well where representative samples can be obtained and the rationale for the selection. The City must include a map, at a scale of 1 inch equals 1,200 feet or less, that clearly identifies the locations of the SPWRF, and all groundwater monitoring wells.

2. Sampling protocols (specified in 40 C.F.R. Part 136 or American Water Works Association standards where appropriate) and chain of custody procedures.

3. For groundwater monitoring, outline the methods and procedures to be used for measuring water levels; purging wells; collecting samples; decontaminating equipment; containing, preserving, and shipping samples; and maintaining appropriate documentation. Also include the procedures for handling, storing, testing, and disposing of purge and decontamination waters generated from the sampling events.

4. Laboratory or laboratories, which conducted the analyses. Include copy or copies of laboratory certifications by the Environmental Laboratory Accreditation Program (ELAP) of the State Water Board's Division of Drinking Water (DDW) every year or when the City changes their contract laboratory.

5. Analytical test methods used and the corresponding Detection Limits for Purposes of Reporting (DLR) for unregulated and regulated chemicals. Please see the DDW's website at http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/EDT.shtml for unregulated and regulated chemicals.

6. Quality assurance and control measures.

B. The samples shall be analyzed using analytical methods described in 40 C.F.R. Part 136; or where no methods are specified for a given pollutant, by

DRAFT

commercially available methods approved by the United State Environmental Protection Agency (USEPA) or DDW, Regional Board and/or State Board. The City shall select the analytical methods that provide reporting detection limits (RDLs) lower than the limits prescribed in waste discharge requirements.

C. The City shall instruct its laboratories to establish calibration standards so that the RDLs (or its equivalent if there is a different treatment of samples relative to calibration standards) are the lowest calibration standard. At no time shall the City use analytical data derived from extrapolation beyond the lowest point of the calibration curve.

D. Upon request by the City, the Regional Board, in consultation with the USEPA or DDW and the State Board Quality Assurance Program, may establish RDLs in any of the following situations:

1. When the pollutant has no established method under 40 C.F.R. Part 136 (revised May 14, 1999, or subsequent revision);

2. When the method under 40 C.F.R. Part 136 for the pollutant has a RDL higher than the limit specified in this Order; or

3. When the City agrees to use a test method that is more sensitive than those specified in 40 C.F.R. Part 136 and is commercially available.

E. Samples of influent and disinfected effluent must be analyzed within allowable holding time limits as specified in 40 C.F.R. section 136.3. All quality assurance/quality control (QA/QC) analyses must be run on the same dates when samples were actually analyzed. The City shall make available for inspection and/or submit the QA/QC documentation upon request by the Regional Board. Proper chain of custody procedures must be followed and a copy of that documentation shall be submitted with the quarterly monitoring report.

F. Constituents of emerging concern (CECs): In recent years, the Regional Board has required monitoring of a select group of anthropogenic chemicals, particularly pesticides, pharmaceuticals and personal care products, known collectively as CECs, into monitoring and program requirements to better understand the propensity, persistence and effects of CECs in our environment. Recently adopted permits in this region contain requirements for CEC effluent monitoring, including identification of the CECs to be monitored in the effluent, sample type, sampling frequency, and sampling methodology.

1. The City shall monitor a selective list of CECs identified in Attachment C in the SPWRF's effluent discharge and in the groundwater. The reporting limits in Attachment C shall be used for these constituents.

2. The City shall select methods according to the following approach:

DRAFT

i. Use USEPA drinking water methods, if available;

ii. Use DDW-recommended methods for CECs, if available;

iii. If there is no DDW-recommended drinking water method for a chemical, and more than a single USEPA-approved method is available, use the most sensitive USEPA-approved method;

iv. If there is no USEPA-approved method for a chemical, and more than one method is available from the scientific literature and commercial laboratory, after consultation with DDW, use the most sensitive method; or

v. If no approved method is available for a specific chemical, the City's laboratory may develop or use its own methods and should provide the analytical methods to DDW or the Regional Board for review and approval. Those methods may be used until DDW-recommended or USEPA-approved methods are available.

vi. In the event that subsections II.F.2.i. or II.F.2.v. are applicable, the City shall inform the Regional Board.

3. CECs identified in Attachment C shall be monitored once within six months from the effective date of this Order (by May 2, 2018) and once every five years thereafter. The Regional Board Executive Officer may add or delete chemicals from Attachment C as new analytical methods become available and may also make revisions to approved analytical methods as needed. A revised CECs list will be made available to the City when changes occur. The City shall request (and submit a justification for) any deviation from the attached list for Executive Officer approval, if a change is required, before collecting samples.

4. Monitoring results shall be reported as part of the annual report. Analysis under this section is for monitoring purposes only as there are currently no standards for these constituents.

## III. REPORTING REQUIREMENTS

The City shall submit all reports to the Regional Board by the dates indicated in Section I. All quarterly and annual reports shall clearly list all non-compliance with WDRs, as well as all excursions of effluent limits. All quarterly and annual monitoring reports shall contain a separate section titled "Summary of Non-Compliance", which discusses the compliance records and corrective actions taken or planned that may be needed to bring the discharge into full compliance with WDRs.

DRAFT

## A. Quarterly Monitoring Reports

1. These reports shall include, at a minimum, the following information:

   i. The volume of the effluent used for land disposal via percolation.

   ii. The date and time of sampling and analyses on the influent, effluent, and groundwater.

   iii. All analytical results of samples collected during the monitoring period of the influent, effluent, and groundwater.

   iv. Documentation of all QA/QC procedures that were followed during sampling and laboratory analyses.

   v. Records of any operational problems, plant upset and equipment breakdowns or malfunctions, and any discharge(s) used for land disposal via percolation.

   vi. Discussion of compliance, non-compliance, or violation of waste discharge requirements.

   vii. All corrective and/or preventive action(s) taken or planned with schedule of implementation, if any violation occurs.

2. For the purpose of reporting compliance with numerical limitations, analytical data shall be reported using the following reporting protocols:

   i. Sample results greater than or equal to the RDL must be reported "as measured" by the laboratory (i.e., the measured chemical concentration in the sample);

   ii. Sample results less than the RDL, but greater than or equal to the laboratory's method detection limit (MDL), must be reported as "Detected, but Not Quantified" (DNQ). The laboratory must write the estimated chemical concentration of the sample next to DNQ as well as the words "Estimated Concentration" (may be shortened to Est. Conc.); or

   iii. Sample results less than the laboratory's MDL must be reported as "None-Detected" (ND).

3. If the City samples and performs analyses (other than for process/operational control, startup, research, or equipment testing) on any sample more frequently than required in this MRP using approved analytical methods, the results of those analyses shall be included in the report. These results shall be included in the calculation of the average

DRAFT

used in demonstrating compliance with average effluent limits, receiving groundwater limits, etc.

4. The Regional Board may request supporting documentation, such as daily logs of operations.

**B. Annual Summary Reports**

These reports shall include, at a minimum, the following information:

1. Tabular and graphical summaries of the monitoring data (quality of influent, effluent, and groundwater; quantity of influent and effluent to percolation ponds,) obtained during the previous calendar year. A comparison of laboratory results against effluent limits contained in these WDRs and notations of any exceedances of limits or other requirements shall be summarized and submitted at the beginning of the report.

2. Discussion of the compliance record and corrective and/or preventive action(s) taken or planned that may be needed to bring the treated effluent, including the treated effluent used for recycled water, into full compliance with the requirements in the WDRs.

3. An in-depth discussion of the results of the final effluent monitoring and groundwater monitoring conducted during the previous year includes:

   i. Any change of receiving groundwater resulting from effluent discharges at percolation ponds; and

   ii. Any change of groundwater flow pattern resulting from discharge via percolation ponds.

   Temporal and spatial trends in the data shall be analyzed, with particular reference to comparisons between stations with respect to distances from the monitoring wells and comparisons to data collected during previous years. Appropriate statistical tests and indices, subject to approval by the Regional Board Executive Officer, shall be calculated and included in the annual report.

4. The description of any changes and anticipated changes including any impacts in operation of any unit processes or facilities shall be provided.

5. A list of the analytical methods employed for each test and associated laboratory QA/QC procedures shall be included. The report shall restate the laboratories used by the City to monitor compliance with the accompanying Order, their status of certification, and provide a summary of analyses.

DRAFT

6. The report shall confirm operator certification and provide a list of current operating personnel, their responsibilities, and their corresponding grade of certification.

7. The report shall also summarize any change of the Operation, Maintenance, and Monitoring Plan (OMM Plan) due to the optimization of the existing SPWRF operation. The summary shall discuss conformance with the SPWRF's OMM Plan for operations, maintenance, and monitoring of the SPWRF, and whether the OMM Plan requires revision for the current facilities.

## IV. WATER QUALITY MONITORING REQUIREMENTS

### A. Influent Monitoring

1. The City shall monitor influent to the SPWRF at Influent Pump Station located in the main stream of the influent channel prior to the headworks as specified in Table 2 below.

**Table 2. Influent Monitoring**

| Constituents | Units[1] | Type of Sample | Minimum Frequency of Analysis |
|---|---|---|---|
| Total waste flow | gpd | Recorder | Continuous[2] |
| $BOD_{5@20^oC}$ | mg/L | Grab | Monthly |
| Total suspended solids | mg/L | Grab | Monthly |
| Chloride | mg/L | 24-hour composite | Monthly |
| Sulfate | mg/L | Grab | Monthly |
| Boron | mg/L | Grab | Monthly |
| Total dissolved solids | mg/L | Grab | Monthly |
| Metals[3] | µg/L | Grab | Quarterly |

Table nots: [1] gpd: gallons per day; mg/L: milligrams per liter; µg/L: micrograms per liter
[2] The City shall report the daily minimum, maximum, and average values.
[3] Metals include antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

### B. Effluent Monitoring

1. The City shall monitor its discharge of tertiary-treated effluent at downstream of all treated effluent passing through the effluent sampling station, including the final disinfection process.

DRAFT

2. The following shall constitute the effluent monitoring program, specified in Table 3 below:

**Table 3. Effluent Monitoring**

| Constituent | Unit[1] | Type of Sample[2] | Minimum Frequency of Analysis |
|---|---|---|---|
| Total flow | gpd | Recorder | Continuous[3] |
| UV | mW-s/cm$^2$ | Recorder | Continuous[3] |
| Turbidity | NTU | Recorder | Continuous[3][4] |
| pH | pH units | Grab | Daily |
| Fecal coliform | MPN/100mL | Grab | Daily |
| Total coliform | MPN/100mL | Grab | Daily |
| Enterococcus | MPN/100mL | Grab | Weekly |
| Total suspended solids | mg/L | 24-hour composite | Monthly |
| $BOD_{5@20^oC}$ | mg/L | 24-hour composite | Monthly |
| Oil and grease | mg/L | Grab | Monthly |
| Ammonia as nitrogen | mg/L | Grab | Monthly |
| Nitrate as nitrogen | mg/L | Grab | Monthly |
| Nitrite as nitrogen | mg/L | Grab | Monthly |
| Organic nitrogen | mg/L | Grab | Monthly |
| Residual chlorine | mg/L | Grab | Monthly |
| Total dissolved solids | mg/L | Grab | Monthly |
| Sulfate | mg/L | Grab | Monthly |
| Chloride | mg/L | Grab | Weekly |
| Boron | mg/L | Grab | Monthly |
| MBAS[5] | mg/L | Grab | Quarterly |
| CTAS[6] | mg/L | Grab | Quarterly |
| Total hardness | mg/L | 24-hour composite | Quarterly |
| Total phosphorus | mg/L | 24-hour composite | Quarterly |
| Constituents listed in Attachment A-1 to A-6 | various | Grab/24-hour composite | Quarterly |

DRAFT

| Constituent | Unit[1] | Type of Sample[2] | Minimum Frequency of Analysis |
|---|---|---|---|
| CECs in Attachment C | various | Grab | Once within 6 months and every 5 years thereafter[7] |
| Remaining priority pollutants in Attachment D | µg/L | Grab/24-hour composite | Annually |

Table notes: [1] NTU: Nephelometric turbidity unit; mW-s/cm$^2$:milli-watts seconds per square centimeter; MPN/100mL: most probable number per 100 milliliter; µg/L: micrograms per liter

[2] Grab sample is an individual sample collected in a short period of time not exceeding 15 minutes. Grab samples shall be collected during normal peak loading conditions for the parameter of interest, which may or may not be during hydraulic peaks. When an automatic composite sampler is not used, composite sampling shall be done as follows. If the duration of the discharge is equal to or less than 24 hours but greater than eight (8) hours, at least eight (8) flow-weighted samples shall be obtained during the discharge period and composited. For discharge duration of less than eight (8) hours, individual "grab" sample may be substituted. 24-hour composite is for semi-volatile and volatile chemicals.

[3] The City shall report the daily minimum, maximum, and average values.

[4] In the event the continuous turbidity meter and recorder fail, grab sampling may be substituted for a period of up to 24 hours. The turbidity samples must be taken at intervals of no more than 1.2 hours over a 24-hour period to determine compliance for turbidity.

[5] MBAS: Methylene Blue Active Substances

[6] CTAS: Cobalt Thiocyanate Active Substances

[7] CECs shall be monitored once within six months from the effective date of this Order (by May 2, 2018) and once every five years thereafter.

DRAFT

### C. Groundwater Monitoring

1. The City shall monitor the groundwater at and surrounding the SPWRF to assess the water quality impact of the SPWRF's discharges to groundwater.

2. The City shall continue to conduct groundwater monitoring from all existing wells, including MW-1, MW-2a, MW-3, MW-4, MW-5, MW-6, MW-7a, MW-8, and MW-9 until such time as the City's work plan proposing a modified groundwater monitoring network, described in Section IV.C.3 below, is approved by the Executive Officer and is implemented by the City.

3. By May 1, 2018, the City shall submit to the Regional Board a work plan proposing a modified groundwater monitoring network for compliance determination with the groundwater limitations. The proposed

groundwater monitoring network shall include groundwater monitoring wells upgradient, cross gradient, and downgradient to the percolation pond. In addition to installation of new wells, the City may propose continuing to use some or all of the existing groundwater monitoring wells (MW-1, MW-2a, MW-3, MW-4, MW-5, MW-6, MW-7a, MW-8, and MW-9). For compliance determination with the groundwater limitation for chloride, the City's proposed modified groundwater monitoring network shall include wells at approximately 150 feet downgradient from the percolation pond. The work plan shall be submitted to the Regional Board for the Executive Officer's review and approval. If the City proposes to use existing wells (such as water supply or irrigation wells) not owned by the City, or proposes to install new wells on property not owned by the City, the City shall include as part of its work plan any access agreements between the City and property owner(s) to use and/or install groundwater wells on non-City-owned property. The City shall implement the work plan, by completing installation of any new wells and commencing monitoring from them, within 60 days after the Executive Officer's approval.

4. The required groundwater monitoring of constituents/parameter with sample type and frequencies is specified in Table 4 below.

**Table 4. Groundwater Monitoring**

| Constituents | Units | Type of Sample | Minimum Frequency of Analysis[2] |
|---|---|---|---|
| Water level elevation[1] | feet | Recorder | Monthly |
| pH | pH units | Grab | Monthly |
| Total coliform | MPN/100mL | Grab | Monthly |
| Fecal coliform | MPN/100mL | Grab | Monthly |
| Enterococcus | MPN/100mL | Grab | Monthly |
| Ammonia as nitrogen | mg/L | Grab | Monthly |
| Nitrate as nitrogen | mg/L | Grab | Monthly |
| Nitrite as nitrogen | mg/L | Grab | Monthly |
| Organic nitrogen | mg/L | Grab | Monthly |
| Total dissolved solids | mg/L | Grab | Monthly |
| Sulfate | mg/L | Grab | Monthly |
| Chloride | mg/L | Grab | Monthly |
| Boron | mg/L | Grab | Monthly |

DRAFT

| Constituents | Units | Type of Sample | Minimum Frequency of Analysis[2] |
|---|---|---|---|
| Constituents listed in Attachments A-1 to A-5 | various | Grab | Annually |
| CECs in Attachment C | µg/L | Grab | Once within 6 months and every 5 years thereafter |
| Remaining priority pollutants in Attachment D | µg/L | Grab | Annually |

Table notes: [1] Annual samples shall be collected during the dry season each year.
[2] Water level elevations must be measured to the nearest 0.01 feet, and referenced to mean sea level.

**D. Monitoring of Effluent Flow to Percolation Ponds**

The City shall record the volume in gallons per day (GPD) of treated wastewater discharged to the three percolation ponds. This information shall be submitted as part of the quarterly monitoring reports.

## V. GENERAL MONITORING AND REPORTING REQUIREMENTS

A. The City shall comply with all Standard Provisions (Attachment B) related to monitoring, reporting, and recordkeeping.

B. For every requirement not met, the City shall submit a statement of the actions undertaken or proposed that will bring the treated effluent into full compliance with requirements at the earliest possible time, and submit a timetable for implementation of the corrective measures.

C. Monitoring reports shall be signed by either the principal Executive Officer or ranking elected official. A duly authorized representative of the aforementioned signatories may sign documents if:

1. The authorization is made in writing by the signatory;

2. The authorization specifies the representative as either an individual or position having responsibility for the overall operation of the regulated facility or activity; and

3. The written authorization is submitted to the Regional Board Executive Officer.

D. The monitoring report shall contain the following completed declaration:

"I certify under penalty of law that this document, including all attachments and supplemental information, was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly

DRAFT

gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment."

Executed on the ___ day of _____ at _____

_____ Signature

_____ Title

E. The City shall retain records of all monitoring information, including all calibration and maintenance, monitoring instrumentation, and copies of all reports required by this Order, for a period of at least three (3) years from the date of sampling measurement, or report. This period may be extended by request of the Regional Board at any time and shall be extended during the course of any unresolved administrative proceeding or judicial litigation regarding the regulated activity.

F. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The individual(s) who performed the analysis;
5. The analytical techniques or methods used; and
6. The results of such analyses.

G. The City shall submit to the Regional Board, together with the first monitoring report required by this Order, a list of all chemicals and proprietary additives that could affect the quality of the treated effluent. Any subsequent changes in types and/or quantities shall be reported promptly. An annual summary of the quantities of all chemicals, listed by both trade and chemical names that are used in the treatment process shall be included in the annual report.

## VI. WASTE HAULING REPORTING

In the event that waste sludge, septage, or other wastes are hauled offsite, the name and address of the hauler shall be reported, along with types and quantities hauled during the reporting period and the location of final point of disposal. In the event that

DRAFT

no wastes are hauled during the reporting period, a statement to that effect shall be submitted in the quarterly monitoring report.

## VII. PRETREATMENT REPORTING

The City shall submit annual reports to the Regional Board, with copies to the State Board, and USEPA Region 9, describing the City's pretreatment activities over the period.

A. The annual reports shall identify:

1. All significant industrial users (SIUs) that violated any standards or reporting requirements during that year;

2. The violations committed;

3. The enforcement actions undertaken; and

4. The status of active enforcement actions from previous periods, including closeouts (facilities under previous enforcement actions that attained compliance during the quarter).

B. By March 1 of each year, beginning January 1, 2018, the City shall submit an annual summary report to the Regional Board describing the pretreatment activities within the service area during the previous year. In the event that any control authority within the service area is not in compliance with any conditions or requirements of this Order or their approved pretreatment program (such as due to industrial user discharges, interjurisdictional agency agreement implementation issues, or other causes,) then the City shall also include the reasons for noncompliance and state how and when the City and the control authority shall comply with such conditions and requirements. The report shall contain, but not be limited to, the following information:

1. A summary of analytical results from representative, flow-proportioned, 24-hour composite sampling of the SPWRF's influent and effluent wastewaters for those pollutants that are known or suspected to be discharged by industrial users (IUs) as identified by the pretreatment program.

2. The summary shall include the result of annual full priority pollutant scan, with quarterly samples analyzed only for those pollutants detected in the full scan.

3. The City shall also provide any influent or effluent monitoring data for non-priority pollutants that the City believes may be causing or contributing to Interference, Pass Through or adversely impacting sludge quality.

DRAFT

4. Sampling and analysis shall be performed in accordance with the techniques prescribed in pretreatment program and amendments thereto.

5. A discussion of any upset, interference, or pass-through incidents at the treatment plant (if any), which the City knows or suspects were caused by IUs of the SPWRF system. The discussion shall include the following:

   i. The reasons why the incidents occurred, the corrective actions taken, and, if known, the name and address of the IU(s) responsible.

   ii. A review of the applicable pollutant limitations to determine whether any additional limitations, or changes to existing requirements, may be necessary to prevent pass through, interference or noncompliance with sludge disposal requirements, if any.

6. A complete and updated list of the City's significant industrial users (SIUs), including names, Standard Industrial Classification code(s) and addresses, and a list of any SIU deletions and/or additions.

7. The City shall provide a brief explanation for each deletion. The SIU list shall identify the SIUs equivalent to Federal Categorical Standards by specifying which standards are applicable to each SIU. The list shall also indicate which SIUs are subject to local limitations and those that are not subject to local limits.

8. A list or table characterizing the industrial compliance status of each SIU, including:

   i. SIU name and address;

   ii. Industrial category;

   iii. The type (processes) of wastewater treatment in place;

   iv. Number of samples taken by the SPWRF during the year;

   v. Number of samples taken by the SIU during the year;

   vi. Whether all needed certifications (if allowed) were provided by SIUs that have limits for total toxic organics;

   vii. Regional Standards violated during the year, reported separately;

   viii. whether the SIU at any time in the year was in Significant Noncompliance (SNC), equivalent to that defined in 40 C.F.R. section 403.12(f)(2)(vii);

DRAFT

ix A summary of enforcement actions against the SIU taken during the year, including the type of action, final compliance date, and amount of fines assessed/collected (if any). Proposed actions, if known, should be included; and

x. Number of inspections conducted at each SIU during the year.

9. A compliance summary table that includes:

   i. SIU's which were in SNC at any time during the year;

   ii. The total number of SIUs that are in SNC with pretreatment, compliance schedules during the year; and

   iii. The total number of notices of violation and administrative orders issued against SIUs during the year:

      a. The total number of civil and criminal judicial actions filed against SIUs during the year;

      b. The number of SIUs that were published as being in SNC during the year; and

      c. The number of IUs from which penalties were collected during the year.

10. A short description of any significant changes in operating the pretreatment program that differ from the previous year including, but not limited to changes concerning:

   i. The program's administrative structure;

   ii. Local industrial discharge limitations;

   iii. Monitoring program or monitoring frequencies;

   iv. Legal authority or enforcement policy;

   v. Funding mechanisms; and

   vi. Resource requirements and/or staffing levels.

11. A summary of the annual pretreatment budget, including the cost of pretreatment program functions and equipment purchases.

12. A summary of public participation activities to involve and inform the public.

DRAFT

13. A description of any changes in sludge disposal methods and a discussion of any concerns not described elsewhere in the report.

14. The cumulative number of industrial users that the City has notified regarding Baseline Monitoring Reports and the cumulative number of industrial user responses.

15. The City shall submit the quarterly compliance status reports and the annual pretreatment report to the Regional Board.

## VIII. MONITORING FREQUENCIES

The Regional Board Executive Officer is delegated authority to revise this Monitoring and Reporting Program, including monitoring frequencies and parameters. The City may make a request (with justification) to reduce the monitoring frequency or to modify the list of monitoring constituents. The City shall not make any adjustment until the Executive Officer provides written approval after determining that the request is adequately justified.

DRAFT

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD**
**LOS ANGELES REGION**

320 West 4th Street, Suite 200, Los Angeles, California 90013
(213) 576-6600 • Fax (213) 576-6640
https://www.waterboards.ca.gov/losangeles/

# CEASE AND DESIST ORDER FOR CITY OF SANTA PAULA ORDER NO. R4-2018-0023, AS AMENDED BY ORDER NO. R4-2018-0023-A01 (SANTA PAULA WATER RECYCLING FACILITY) (FILE NO. 16-189)

REQUIRING CITY OF SANTA PAULA
TO UNDERTAKE ACTIONS TOWARD COMPLIANCE WITH
CHLORIDE REQUIREMENTS IN WASTE DISCHARGE REQUIREMENTS FOR
DISCHARGES FROM SANTA PAULA WATER RECYCLING FACILITY

DRAFT

TENTATIVE

The California Regional Water Quality Control Board, Los Angeles Region (Regional Water Board) finds:

1. The City of Santa Paula (City or Discharger) is the owner of the Santa Paula Water Recycling Facility (SPWRF), a Publicly-Owned Treatment Works (POTW), located at 920 Corporation Street in Santa Paula, California. The SPWRF is operated by Ventura Regional Sanitation District and discharges tertiary-treated wastewater to groundwater via three percolation ponds adjacent to the facility.

2. The SPWRF treats wastewater generated within the City and is designed for a flow of 4.2 million gallons per day (MGD). Based on the discharge records between July 2010 and June 2017, the monthly average effluent discharged from the SPWRF ranged between 1.36 and 2.44 MGD, with an average of 1.86 MGD.

3. The wastewater treatment process at the SPWRF consists of preliminary treatment (coarse and fine mechanical screening and grit removal at the Influent Lift Station), flow equalization (two flow equalization tanks), secondary treatment (three aeration tanks with nitrification and denitrification activated sludge), tertiary treatment (six biomembrane reactors, providing further carbonaceous oxidation, nitrification/denitrification and solids removal to meet the limits of the WDRs), and disinfection (UV). Treated and disinfected effluent is discharged to three percolation ponds. The returned activated sludge is treated at two of three aerobic digesters (one aerobic digester is for backup) after being thickened at two thickeners. The solids generated at the aerobic digesters receive final dewatering at the screw dewatering press. Final solids meeting the United States Environmental Protection Agency (USEPA) Class B reuse standards are sent to the Ventura County Regional Bio-Solids facility.

4. The SPWRF is able to meet all final effluent limitations in the City's waste discharge requirements (WDRs) except for chloride. This is due to the SPWRF not being

Adopted: February 8, 2018
Amended: May 12, 2022

designed to remove chloride. Since the SPWRF has no ability to remove chloride, chloride is passed through to the effluent and then groundwater via discharges to the percolation pond. Noncompliance with chloride effluent and groundwater limitations is the most problematic issue with the SPWRF. Table 1 summarizes the chloride concentrations of effluent discharged from the SPWRF.

**Table 1. Annual Average Chloride Concentrations[1] (milligrams per liter, mg/L) in SPWRF Effluent**

| Period | Effluent of SPWRF |
|---|---|
| 2010 | 156 |
| 2011 | 153 |
| 2012 | 149 |
| 2013 | 155 |
| 2014 | 145 |
| 2015 | 134 |
| 2016 | 137 |
| 2017 | 131 |
| 2018 | 121 |
| 2019 | 120 |
| 2020 | 118.88 |
| 2021 | 112 |
| Range[2] | 135.99 ± 15.61 |

Table 1 notes:

[1] All data were collected from grab samples.

[2] Data range is based on one standard deviation.

A. The monthly effluent chloride concentration ranged from 125 to 166 mg/L between July 2010 and June 2017, which continuously exceeded the chloride effluent limitation of 110 mg/L. This has led to an escalation of the chloride concentrations in groundwater below and surrounding the three percolation ponds with a range of 121 to 168 mg/L and an average of 140 mg/L since July 2010. The groundwater and effluent data indicate that the chloride discharges from the SPWRF have impacted the receiving groundwater quality in the vicinity of the SPWRF.

B. The elevated chloride concentrations in the effluent were believed to be associated with the approximately 1,250 Self-Regenerating Water Softeners (SRWS) installed in the households of the City. These SRWS generate brine

DRAFT

TENTATIVE

containing elevated chloride concentrations, which are discharged to sewers and delivered to the SPWRF as influent.

C. According to the effluent data collected between October 2015 and June 2017, a total of 2,479 pounds/day (lbs/day) of chloride, based on the effluent flow rate of 2.2 MGD [95 percentile of monthly average effluent flows, resulting from data recorded between October 2015 (beginning of the SRWS Buyback Program) and June 2017] and a chloride effluent concentration of 135 mg/L, were discharged to the groundwater underlying the percolation pond.

D. The chloride interim effluent limit of 1,983 lbs/day was exceeded twice between 2018 and 2021: 2,040 lbs/day in February 2021, calculated from February 8, 2021 through March 7, 2021, and 2,030 lbs/day in March 2021, calculated from March 8, 2021 through April 7, 2021.

E. The chloride interim groundwater limitation was exceeded at downgradient wells AW01 in July 2018 and at AW03 in August 2020.

5. The Regional Water Board issued three Notices of Violation (NOVs), described below, to the City for exceedances of the chloride effluent and groundwater limitations in Order No. R4-2007-0028. These NOVs required the City to implement corrective and preventative actions to bring the City's discharge into full compliance with chloride effluent limitations and receiving water requirements specified in Order No. R4-2007-0028, previously adopted by this Regional Water Board on May 3, 2007.

A. The November 3, 2011 NOV summarized chloride limit exceedances between the second quarter of 2010 and the third quarter of 2011. These violations included 15 exceedances of chloride and one exceedance of total nitrogen, di(2-ethyl)phthalate, and dioxin in effluent; and 1 exceedance of sulfate, 5 exceedances of chromium, 10 exceedances of aluminum, 1 exceedance of nickel and boron and nitrate plus nitrite, and 26 chloride exceedances of groundwater limitations.

B. The December 30, 2014 NOV summarized 36 and 88 chloride exceedances in effluent and groundwater, respectively, between the fourth quarter of 2011 and the third quarter of 2014.

C. The March 20, 2017 NOV summarized 27 and 50 chloride exceedances in effluent and groundwater, respectively, between the fourth quarter of 2011 and the fourth quarter of 2016.

6. The City's efforts to reduce the chloride concentration in the influent to the SPWRF are summarized below:

DRAFT

TENTATIVE

A. The City identified that the influent to the SPWRF contains brine with elevated chloride concentration from Self-Regenerating Water Softeners (SRWS). There are approximately 1,250 residential SRWS used in the City.

B. On September 5, 2006, the City established Ordinance No. 1160 prohibiting the installation or replacement of residential SRWS.

C. On June 22, 2015, the City adopted Resolution No. 6918 approving a SRWS Buyback and Incentive Program. This program offers a financial incentive to residents to voluntarily remove SRWS. A Kick-Off SRWS Buyback event was held on September 19, 2015. The removal of SRWS under this program began in October 2015. Three hundred (300) of the approximately 1,250 SRWS have been removed from October 2015 through February 2022. A reliable decreasing trend for chloride has not been observed in the effluent.

7. To address the City's chloride exceedances in the effluent and groundwater, the Regional Water Board required the City to submit a Chloride Reduction Workplan. Board staff also met with the City on several occasions to discuss the City's chloride exceedances. A summary of these events are as follows:

A. On December 19, 2013 and May 11, 2015, the Regional Water Board met with the City to discuss its Chloride Reduction Workplan. The City's Chloride Reduction Workplan includes the following tasks:

i. Prohibit SRWS installations or replacements;

ii. Implement a SRWS Buyback Program;

iii. Implement a Recycled Water Program to reduce effluent discharged to the three percolation ponds; and

iv. Implement Supplemental Strategies, if needed, including advanced treatment (e.g., reverse osmosis) and disposal of brine.

B. On January 28, 2016, Regional Water Board staff discussed with the City the necessary actions to reduce the chloride concentration in the effluent, which included the SRWS Buyback Program. The City also proposed to explore application of recycled water at locations other than identified groundwater hot spots and to conduct groundwater impact investigation and remediation activities. The City was notified that detailed schedules and milestones were required for all actions.

C. On March 8, 2016 and September 14, 2016, the City met with Regional Water Board staff to provide an update of its SRWS Buyback Program efforts. The City noted that five City employees were deployed to conduct door-to-door visits to encourage participation in the SRWS Buyback Program among 7,500 dwellings within the City.

DRAFT

TENTATIVE

D. On October 31, 2016, the City met with Regional Water Board staff to provide an update on the following topics:

   i. Status of implementing the chloride compliance strategy and potential for reduction of effluent discharged to the three percolation ponds via the City's Recycled Water Program;

   ii. Assimilative capacities for chloride at different groundwater locations beneath the City based on the Salt and Nutrient Management Plan for the Lower Santa Clara River Basin; and

   iii. Groundwater hot spots (i.e., chloride impaired areas with no assimilative capacity for recycled water applications) in the City.

E. On May 1, 2018, the City submitted the Self-Regenerating Water Softener Buyback Program Evaluation Report to comply with CDO requirements. The report concluded that the Buyback Program is partially effective in reducing chloride loadings to the SPWRF, but the estimated reduction in the chloride concentration in the effluent has not been met.

F. On January 30, 2019, the City submitted the Recycled Water Project Layout Report to identify potential recycled water opportunities, conduct outreach to potential recycled water users, and draft conceptual recycled water projects and evaluate them. During the process, the City met with potential project partners and interested parties to discuss opportunities, project components, design criteria, and project feasibility. However, the City was unable to accomplish the recycled water project due to an incompatibility in schedules between the City and potential recycled water partners.

G. On September 20, 2019, the City submitted the Alternative Effluent Chloride Mitigation Workplan to request a Basin Plan amendment to adopt a site-specific groundwater quality objective for chloride after discussions on January 30, 2019 and June 27, 2019.

H. On February 28, 2020, the Regional Water Board provided comments on the Alternative Effluent Chloride Mitigation Workplan. The comments required the City to provide supporting information regarding a site-specific chloride groundwater quality objective that would be protective of beneficial uses for agricultural water supply for salt sensitive crops.

I. On April 15, 2020, the City notified the Regional Water Board of its modified approach to upgrade the SPWRF with reverse osmosis (RO), in lieu of the proposed recycled water project, to reduce chloride concentrations in the treated effluent to meet the permit requirements.

DRAFT

TENTATIVE

J. On July 13, 2020, the City requested development of a site-specific groundwater quality objective for chloride of 117 mg/L as a Basin Plan amendment to reduce the cost of the RO implementation.

K. On December 1, 2021, the City and Regional Water Board staff discussed the progress of the RO plant development and the requested Basin Plan amendment. The City decided to implement the advanced wastewater treatment system with RO based on the existing groundwater quality objective for chloride of 110 mg/L.

8. On July 9, 2015, the Regional Water Board adopted Resolution No. R15-007, an amendment to the Basin Plan that incorporated stakeholder-developed groundwater quality management plan for salts and nutrients in the Lower Santa Clara River groundwater basins. Groundwater quality management measures were developed by stakeholders as part of the Salt and Nutrient Management Plan (SNMP) for the Lower Santa Clara River Basins in Ventura County. Such plans are a requirement of the State Water Resources Control Board's (State Water Board) Recycled Water Policy and are intended to maintain high quality waters and to protect the beneficial uses of groundwater while promoting recycled water use throughout the state. The SNMP utilized a groundwater quality model that characterized the water quality in the Santa Paula Basin and examined the degree of impairment to water quality in the Basin. The model shows there is available assimilative capacity for salts and nutrients, including chloride, in most areas of the Santa Paula Basin to allow for recycled water projects consistent with the Recycled Water Policy. As described below, the City is planning to recycle effluent that is currently discharged to the percolation pond.

9. The City developed and utilized a simple spreadsheet mixing model, the *Groundwater Chloride Transportation Model* (Chloride Model), to analyze the effect of future effluent discharges on groundwater overtime at various distances from the percolation pond. The City's modeling assumed some degradation of groundwater with respect to chloride within a limited range of mixing zone radius below and adjacent to the SPWRF, measured from the boundaries of the percolation pond. This distance is the maximum allowable distance where SPWRF effluent disposed to the percolation pond can mix with groundwater and result in receiving water chloride concentrations of 110 mg/L or less in order to provide protection to groundwater beneficial uses at the first encountered water supply wells which are at 150 feet away from the percolation ponds. Groundwater within the mixing zone will exceed the chloride groundwater quality objective (GQO) of 110 mg/L. Mass-volume balance calculations along with Darcy's Law are used to account for travel in porous media. The Chloride Model simulates instantaneous and complete mixing of ambient groundwater with effluent seepage reaching the water table from the percolation pond using SPWRF data for flow and chloride effluent concentrations. It was conservatively assumed that any effluent discharge to the percolation pond would infiltrate into the underlying aquifer and not be diverted for other uses. Groundwater parameters within the spreadsheet model were selected based on recent monitoring reports in order to be representative of average conditions within the vicinity of the

TENTATIVE

DRAFT

SPWRF. The Chloride Model assumes an initial volume of groundwater underlying the ponds possessing background chloride concentrations of 136 mg/L. The volume of the existing groundwater body is calculated as the product of the radius of interest (150-1200 feet), an assumed saturated thickness of potentially impacted groundwater (50 feet), and the porosity of the underlying sediments (assumed to be 0.2) based on the low end of published literature values for a sand and gravel mixture. Based on the regional groundwater quality data documented in the SNMP, regional groundwater inflow is assumed to have a chloride concentration of 91 mg/L.

On December 14, 2016, Regional Water Board staff met with the City to discuss the results of the Chloride Model, which evaluated compliance with the groundwater quality objectives beneath and adjacent to the three percolation ponds, for various discharge scenarios. Based on Regional Water Board staff's comments, the City implemented additional discharge scenarios in the Chloride Model, which was discussed in meetings held on February 8, 2017, February 17, 2017, July 24, 2017, and August 7, 2017.

10. The Chloride Model simulated chloride concentrations in the receiving groundwater resulting from chloride mass loading reduction in the three percolation ponds. The Model predicted GQOs being achieved at 150 feet away from the percolation pond when the total mass of chloride in the effluent is significantly reduced. The initial mass of chloride is calculated based on the average chloride effluent concentration of 135 mg/L and the discharge rate of 2.2 MGD, which results in 2,479 pounds total mass of chloride discharged per day. The reduction of chloride mass discharged to the percolation pond can be achieved by improving the effluent chloride concentration (e.g., source control or treatment), or diverting a significant amount of flow for recycled water uses, or a combination of both in order to protect water supply wells AW01, AW02, and AW03, approximately 150, 150, and 300 feet, respectively, away from percolation pond. Water produced from these wells is primarily for agricultural irrigation use.

    To achieve the chloride GQO of 110 mg/L in groundwater at least 150 feet away from the percolation pond, the City provided various effluent chloride concentrations and allowable flow combinations (Table 2). Based on the hydrology and hydrogeologic condition at the SPWRF percolation ponds area, the higher the concentration of chloride in the effluent, the less volume and mass can be discharged to percolation ponds to comply with the chloride GQO in the Basin Plan. For example, if the chloride concentration in the effluent is 135 mg/L, only 0.07 MGD, which is equivalent to 79 pounds of chloride per day, could be discharged to the percolation pond to achieve the chloride GQO of 110 mg/L at 150 feet away from the percolation pond. If the chloride concentration in the effluent is reduced to 120 mg/L, then more flow (0.2 MGD) can be discharged to the percolation pond and achieve the chloride GQO 150 feet away from the percolation pond.

**Table 2. Groundwater Chloride Transportation Model – Continuous Discharge**

DRAFT

TENTATIVE

| Chloride Effluent Concentration | Flow to Percolation Ponds (% of 2.2 MGD) | Allowable Effluent Mass Load to Groundwater (Daily) | Chloride Groundwater Concentration at 150 feet |
|---|---|---|---|
| 135 mg/L | 0.07 MGD (3.2%) | 79 pounds (lbs) | 110 mg/L |
| 130 mg/L | 0.1 MGD (4.5%) | 108 lbs | 110 mg/L |
| 125 mg/L | 0.13 MGD (5.9%) | 135 lbs | 110 mg/L |
| 120 mg/L | 0.2 MGD (9.1%) | 200 lbs | 110 mg/L |
| 115 mg/L | 0.4 MGD (18.2%) | 384 lbs | 110 mg/L |

11. To achieve compliance with the chloride GQO and to conserve potable water, the City will construct the advanced wastewater treatment system with RO as proposed in the April 15, 2020 letter. The Regional Board has evaluated the proposed RO system and determined that it will be consistent with the State Water Board's Recycled Water Policy and will preserve available assimilative capacity within the Santa Paula Basin consistent with the SNMP. The mass-based effluent limitation for chloride previously established in the WDRs will no longer be applicable, but the concentration-based effluent limitation for chloride is appropriate after implementing the RO system. The groundwater limitations are based on the GQOs in the Basin Plan.

12. On December 22, 2015, the City submitted the Recycled Water Program Technical Report and Notice of Intent with the Title 22 Engineering Report to the State Water Board's Division of Drinking Water (DOW) for approval. DOW conditionally approved the Title 22 Engineering Report on August 19, 2016. On June 14, 2017, the Regional Water Board enrolled the City's recycled water program under separate Water Reclamation Requirements for Recycled Water Use Order WQ 2016-0068-DDW, issued by the State Water Board on June 7, 2016.

    In March 2020, the City decided to upgrade the SPWRF with the RO process to reduce the chloride concentrations in the effluent to meet the permit requirements. In December 2021, the City stated that the RO system would be able to produce 110 mg/L of chloride in the effluent to meet the groundwater quality objective in the Basin Plan. Currently, the City has completed the State Water Board Clean Water State Revolving Fund application with the State Water Board Division of Financial Assistance. The City plans to complete construction of the RO system within two years of receiving the Final Funding Agreement but no later than December 2024.

13. In the City's report, *Chloride Load Reduction Milestones,* submitted to the Regional Water Board on March 14, 2017, the City included the construction of reverse osmosis treatment at the SPWRF as an option (under Supplemental Strategies), if needed, in order to comply with the chloride groundwater quality objective of 110 mg/L. The City will continue its source control efforts to remove SRWSs and will first focus on recycling most of its effluent in order to bring the groundwater back into

DRAFT

TENTATIVE

compliance with GQOs. Progress with these efforts will be assessed at Year 2022 and determination will be made as to whether advanced treatment will be required to meet the chloride GQO at Year 2027. If advanced treatment is required, effluent limits will be applied in a way to ensure protection of all beneficial uses, including salt-sensitive crops.

In March 2020, the City decided to upgrade the SPWRF with an advanced treatment system, including RO, to reduce the chloride concentrations in the effluent to meet the permit requirements. In December 2021, the City stated that the RO system would be able to produce effluent with a chloride concentration of 110 mg/L to meet the groundwater quality objective in the Basin Plan. The City has submitted a State Water Board Clean Water State Revolving Fund application with the State Water Board Division of Financial Assistance. The City plans to complete construction of the RO system within two years of receiving the Final Funding Agreement but no later than December 2024.

14. Due to the following reasons, the City cannot immediately comply with the chloride effluent and groundwater limitations prescribed in this Order: (1) elevated chloride concentrations in the influent, (2) the wastewater treatment process not currently designed to remove chloride out of the waste stream, and (3) time needed to construct the advanced wastewater treatment system with RO. In addition, the current progress of the City's SRWS Buyback Program does not reliably ensure that the SPWRF will comply with the chloride effluent and groundwater limitations. Therefore, the Regional Board has determined that issuance of an accompanying CDO is appropriate and necessary to put the City on the path towards compliance with the effluent and groundwater limitations for chloride set forth in this Order. The CDO requires the City to comply with interim chloride effluent and groundwater limitations and implement actions pursuant to a prescribed time schedule.

    During the pendency of the CDO schedule, there will be permitted degradation of groundwater with respect to chloride within a limited mixing zone radius downgradient and adjacent to the SPWRF percolation ponds, measured from the boundaries of the percolation ponds to 150 feet. This distance is the shortest distance where SPWRF effluent disposed to the percolation pond can mix with groundwater and result in receiving water chloride concentrations of 110 mg/L or less. Groundwater within the 150-foot mixing zone will exceed the chloride GQO of 110 mg/L for the duration of the CDO schedule. Based on the available data, there are no water supply wells within the 150-foot mixing zone. The City can arrange for alternative water supplies for any well owners in the mixing zone, if any are discovered. At the end of the CDO schedule, the mixing zone is no longer allowed, and compliance with the chloride limitation of 110 mg/L at monitoring wells adjacent to and downgradient from the boundaries of the percolation ponds is required.

15. California Water Code (CWC) section 13301 provides in pertinent part "When a regional board finds that a discharge of waste is taking place, or threatening to take place, in violation of requirements or discharge prohibitions prescribed by the regional board or the state board, the board may issue an order to cease and desist

TENTATIVE
DRAFT

and direct that those persons not complying with the requirements or discharge prohibitions (a) comply forthwith, (b) comply in accordance with a time schedule set by the board, or (c) in the event of a threatened violation, take appropriate remedial or preventive action ... Cease and desist orders may be issued directly by a board, after notice and hearing."

16. As a result of the historical monitoring data and other activities described in this CDO, the Regional Water Board finds that a discharge of waste is taking place or threatening to take place in violation of requirements or discharge prohibitions prescribed by the Regional Water Board in the City's WDRs, Order No. R4-2018-0022. This CDO requires the City to take appropriate remedial action and to comply in accordance with the time schedule set forth below. The compliance schedules provide the City sufficient time to achieve compliance with the chloride requirements in its WDRs.

17. This Order includes interim effluent and groundwater limitations, identified below, and actions and milestones proposed by the City leading to compliance with the effluent and groundwater limitations for chloride. The interim effluent and groundwater limitations are based on gradual reductions in chloride mass loading. The established compliance schedule is as short as possible, taking into account the technological, operation, and economic factors that affect the design, development, and implementation of the remedial actions that are necessary to comply with the effluent and groundwater limitations.

18. A CDO is appropriate in these circumstances to allow time for the City to implement the advanced wastewater treatment system to bring the SPWRF into compliance with the effluent and groundwater limitations. The temporary exceedances allowed by this CDO are in the public interest given the significant environmental benefits associated with reducing chloride loading to groundwater to promptly achieve compliance with the effluent and groundwater limitations, and to allow for potential recycled water use throughout the City of Santa Paula, especially in light of California's historic drought and predictions for future climatological effects from climate change.

19. CWC section 13267 provides in pertinent part:

    (a) A regional board, in establishing or reviewing any water quality control plan or waste discharge requirements, or in connection with any action relating to any plan or requirement or authorized by this division, may investigate the quality of any waters of the state within its region.

    (b)(1) In conducting an investigation specified in subdivision (a). the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region ... shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the

DRAFT

TENTATIVE

report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.

20. The technical and/or monitoring reports required by this CDO are necessary to assure compliance with the WDRs Order No. R4-2018-0022 and this CDO. The City operates the SPWRF that produces and discharges the waste subject to WDRs. The actions and reports required by this CDO are directly related to the City's compliance with these requirements and do not require expense that is not already required pursuant to the WDRs. This CDO provides time for the City to comply and to spread costs over several years. The burden of these actions and reports bears a reasonable relationship to the need for the actions and reports.

21. This CDO concerns an existing facility and does not significantly alter the status with respect to the SPWRF. The issuance of this Order is an enforcement action by a regulatory agency and is being taken for the protection of the environment. Therefore, issuance of this Order is exempt from the provisions of the California Environmental Quality Act (Public Resources Code, Section 21100, et seq.) in accordance with sections 15061(b)(3), 15301, 15306, 15307, 15308, and 15321 (a)(2) of Title 14 of the California Code of Regulations.

22. The Regional Water Board has notified the City and interested agencies and persons of its intent to issue this CDO concerning compliance with the WDRs. The Regional Water Board accepted written comments, and heard and considered all comments and evidence pertaining to this matter in a public hearing.

23. Any person aggrieved by this action of the Regional Water Board may petition the State Water Board to review the action in accordance with California Water Code section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must *receive* the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at Water Quality Petitions | California State Water Resources Control Board (http://www.waterboards.ca.gov/public_notices/petitions/water_quality) or will be provided upon request.

**THEREFORE, IT IS HEREBY ORDERED** that, pursuant to California Water Code sections 13301 and 13267, the City of Santa Paula, as owner of the SPWRF, shall comply with the following measures to ensure compliance with Order No. R4-2018-0022:

1. Cease and desist discharging chloride in violation or threatened violation of Order No. R4-2018-0022. No term or condition of Order No. R4-2018-0022 is superseded or stayed by this CDO.

DRAFT

TENTATIVE

2. The discharge of treated wastewater from the SPWRF shall not cause the exceedance of the following groundwater limitations in Table 3 below. Comply immediately with the interim effluent and groundwater limitations for chloride prescribed in Table 3 below, and in accordance with the following schedule.

**Table 3. Interim Chloride Limitations**

| Effluent Limitation (Monthly Average)[0] | Mass Reduction | Groundwater Limitation (Monthly Average) | Deadline |
|---|---|---|---|
| 2,479 lbs/day[1] | 0% | 136 mg/L[2] | February 8, 2018 |
| 2,231 lbs/day[1] | 10% | 136 mg/L[2] | February 8, 2020 |
| 1,983 lbs/day[1] | 20% | 136 mg/L[2] | February 8, 2021 |
| 1,983 lbs/day[5][6] | 20% | 136 mg/L[2] | July 1, 2022 |
| 110 mg/L[3] | Not applicable | 129 mg/L[4] | March 30, 2025 |
| 110 mg/L[3] | Not applicable | 114 mg/L[4] | February 8, 2027 |

Table 3 notes:

[0] Monthly Average except as noted.

[1] Based on the City's *Chloride Load Reduction Milestones* dated August 8, 2017.

[2] Based on the 95th percentile of chloride effluent concentrations during the implementation of the SRWS Buyback Program from October 2015 to September 2017.

[3] The concentration-based effluent limitation is based on the groundwater quality objective in the Santa Paula Groundwater Basin-West of Peck Road Subbasin. The deadline considers the date of December 30, 2024 for completion of construction of the reverse osmosis unit and a 90-day optimization period.

[4] The change in the groundwater concentration is not expected to be immediate.

[5] Based on paragraph No. 4.D, the City cannot consistently comply with the effluent limitation on a monthly basis due to a lack of flow control measures that would have been in place with the recycled water project.

[6] Compliance with the effluent limitation is based on an annual monthly running average. For example, to meet the July 1, 2022 compliance date, the monthly average from July 2021 to June 2022 must be no greater than 1,983 lbs/day.

3. Comply with the following remedial actions and milestones according to the time schedule below:

A. By **May 1, 2018,** the City shall submit a technical report evaluating the long-term effectiveness of the SRWS Buyback Program for the reduction of chloride concentration in the SPWRF's effluent and the groundwater.

B. By **August 1, 2018,** the City shall submit a *Groundwater Chloride Investigation and Well Protection Workplan* (with schedules and milestones) for the Executive Officer's review and approval. The City shall implement this

DRAFT

TENTATIVE

Workplan within 120 days from the Executive Officer's approval. The Workplan shall:

i. Identify the names/numbers and locations of the groundwater monitoring wells to determine site-specific groundwater flow direction and gradient for the purposes of adequately assessing any impacts of chloride discharges to the quality of the receiving groundwater;

ii. Identify all water supply wells that may be influenced by the discharge of chloride from the SPWRF, the well structures, ownership and associated groundwater quality; and

iii. Include an approach to ensure that groundwater quality influenced by the discharge of chloride from the SPWRF and delivered from agricultural water supply wells to irrigate salt-sensitive crops be no higher than 117 mg/L. Alternatively, the City may voluntarily provide alternative water supplies to private well owners to irrigate salt-sensitive crops, upon request by the well owners.

C. By **March 15, 2022,** the City shall submit the final design report for the advanced treatment system at the SPWRF, including brine concentration facility and brine management plan.

D. By **October 15, 2022,** the City shall complete all necessary regulatory requirements, including compliance with the California Environmental Quality Act (CEQA), and obtain all necessary permits for construction and/or installation of the advanced treatment system.

E. **Within three months** of receiving the Final Funding Agreement from the Department of Financial Assistance, but no later than **March 30, 2023**, the City shall complete and release a Bid Package for the advanced wastewater treatment system with a reverse osmosis process.

F. No later than **June 30, 2023**, the City shall complete contractor selection and award the contract for construction of the advanced wastewater treatment system with a reverse osmosis process.

G. **Within twenty-four months** of receiving the Final Funding Agreement from the Department of Financial Assistance, but no later than **December 30, 2024**, the City shall complete construction and start-up of the advanced wastewater treatment system with a reverse osmosis process.

H. As soon as possible, but no later than **February 8, 2028,** the City shall achieve full compliance with the effluent and groundwater limitations for chloride prescribed in Order No. R4-2018-0022.

DRAFT

TENTATIVE

I. After each date listed in subsection A through G above, the City shall provide a verbal report at the next regularly scheduled Board meeting pertaining to the compliance, or lack thereof, with the requirement.

J. Subsections F and G, above, do not limit the City's ability to propose a Basin Plan amendment for Regional Water Board consideration prior to November 14, 2024. At any time during the term of this CDO, the City may propose a Basin Plan amendment that the Regional Water Board will consider, including an averaging period and/or a site-specific chloride GQO that protects beneficial uses. As with subsection G, the City shall include supporting scientific and technical information and analysis demonstrating that beneficial uses would be protected, as well as documentation that such a proposal was discussed in detail by a stakeholder working group.

4. Submit quarterly progress reports on the status of the City's compliance with the effluent and groundwater limitations for chloride in Order No. R4-2018-0022 and this CDO.

A. Each quarterly progress report shall include, but is not limited to:

i. Continuous SRWS Buyback Program Assessment - The City shall report its progress on the SRWS Buyback Program and evaluate whether the Program is resulting in chloride reductions in the effluent and groundwater.

ii. Groundwater and Well Protection Program - The City shall report its progress on implementing the Groundwater Chloride Investigation and Well Protection Workplan, including the actions taken to protect water supply wells influenced by the discharge of chloride from the SPWRF.

iii. Alternative Effluent Chloride Mitigation Implementation - The City shall provide the progress of implementing the alternative effluent chloride mitigation workplan and evaluate the compliance with the schedule and milestones set forth in the CDO and WDRs.

B. Quarterly progress reports shall be *received* by the Regional Water Board by the 30th day of the month following the end of each quarterly monitoring period according to Table 4 below. The first report is due by April 30, 2018.

**Table 4. Reporting Period and Due**

| Quarterly Report | Reporting Period | Report Due |
|---|---|---|
| First Quarter | January – March | April 30 |
| Second Quarter | April – June | July 30 |
| Third Quarter | July – September | October 30 |

DRAFT

TENTATIVE

| Quarterly Report | Reporting Period | Report Due |
|---|---|---|
| Fourth Quarter | October – December | January 30 |
| Annual | January – December | April 30 |

Table 4 notes if a deadline falls on a Saturday, Sunday, or State holiday, the report must be received by the next business day.

5. Any person signing a document submitted under this CDO shall make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

6. In accordance with California Business and Professions Code sections 6735, 7835, and 7835.1, engineering and geologic evaluations and judgments shall be performed by or under the direction of registered professionals competent and proficient in the fields pertinent to the required activities. All technical reports specified herein that contain work plans for, that describe the conduct of investigations and studies, or that contain technical conclusions and recommendations concerning engineering and geology shall be prepared by or under the direction of appropriately qualified professional(s), even if not explicitly stated. Each technical report submitted by the City shall contain the professional's signature and/or stamp of the seal.

7. The City shall submit all reports required under this CDO, including groundwater monitoring data in Electronic Data Format, well and discharge location data, and searchable Portable Document Format (PDF) of reports and correspondence, to the State Water Board's GeoTracker database under Global ID WDR100000849.

8. If the City fails to comply with any provision of this CDO, the Regional Water Board may take any further action authorized by law. The Executive Officer, or his/her delegee, may take appropriate administrative enforcement action pursuant, but not limited to, California Water Code sections 13268 and/or 13350. The Regional Water Board may also refer any violations to the Attorney General for judicial enforcement, including injunction and civil monetary remedies.

9. This CDO may be reopened at the Regional Water Board's discretion to consider limits or other requirements for the SPWRF and may specifically be reopened to make revisions consistent with the City's efforts to reduce chloride discharge from the SPWRF.

DRAFT

TENTATIVE

10. This Order becomes effective immediately upon issuance.

I, Renee Purdy, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Los Angeles Region, on May 12, 2022.

Renee Purdy
Executive Officer

DRAFT

TENTATIVE

# Appendix D – Trussel Technologies, Inc., Evaluation of Biological Design and Process Sizing Technical Memorandum

DRAFT

# Technical Memorandum

City of Santa Paula Water Recycling Facility
Design, Build, Operate, Finance

**Date:** 6 January 2008
**Revised:** 25 January 2008

**Authors:** R. Shane Trussell, Ph.D., P.E.
Joanne Chiu

**Subject:** Evaluation of Biological Design and Process Sizing

---

## OBJECTIVE OF THIS MEMORANDUM

The purpose of this document is to evaluate the biological design and determine process equipment sizing using process simulation software. The process will be evaluated at the design capacity, at the current wastewater flows, and solids stabilization and handling will also be assessed. In addition, process aeration demands will be determined and recommendations for maintaining a healthy biology through careful process design will also be discussed.

## DESCRIPTION OF EVALUATION PROCEDURE

The City of Santa Paula has selected the membrane bioreactor (MBR) technology to serve as the principle wastewater treatment process for this Water Reclamation Facility (WRF). An MBR is a biological process that combines secondary and tertiary treatment using low-pressure membrane filtration. Because membranes are used to provide the necessary solids-liquid separation, MBR effluent is consistently high quality with low turbidity, low chemical oxygen demand (COD), and non-detect total suspended solids (TSS), making it suitable for feeding directly into an RO process (if required in the future). However, using membranes for solids-liquid separation also means that the biological design requires careful consideration. MBRs are a perfect trap for filamentous bacteria that float and cause biological foaming events. MBRs are also operated at 2 to 4 times the mixed liquor suspended solids (MLSS) concentration compared to conventional activated sludge processes, which means that special attention must be paid to the aeration design. Finally, MBRs have especially high dissolved oxygen (DO) concentrations in the membrane tanks and this fact,

accompanied with required high rates of mixed liquor circulation, means that caution must be exercised to ensure that intended anoxic zones remain anoxic.

Biological modeling simulations were performed using GPS-X process simulator. GPS-X is a modular, multi-purpose modeling environment for the simulation of municipal and industrial wastewater treatment plants (GPS-X Technical Reference, Chapter 3). GPS-X from Hydromantis is similar to BIOWIN or other wastewater models.

## INFLUENT DESIGN CRITERIA

The flow information and annual average influent wastewater characteristics presented in Table 1 and Table 2 were obtained from the Request For Proposal (RFP), Appendix B – Performance Specification, from the City of Santa Paula for a new Water Recycling Facility (WRF).

**Table 1. Design influent wastewater flows**

| *Flow* | *Unit* | *2005* | *2015* |
|---|---|---|---|
| Average Annual Influent Flow | MGD | 2.5 | 3.4 |
| Peak Day Flow | MGD | 6.3 | 7.2 |
| Peak Hour (8 hours) Flow | MGD | - | 10.4 |

**Table 2. Raw influent wastewater characteristics**

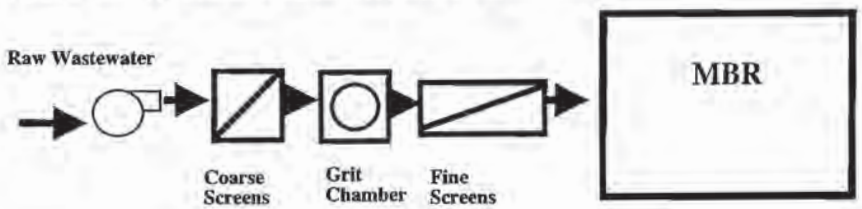
| *Parameters* | *Unit* | *Raw Influent* |
|---|---|---|
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand (BOD) | mg/L | 320 |
| Chemical Oxygen Demand (COD) | mg/L | 736 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 53 |
| Ammonia ($NH_3$) | mg/L | 32 |
| Total Suspended Solid (TSS) | mg/L | 210 |
| Alkalinity (as $CaCO_3$) | mg/L | 300 |

However, screened influent wastewater characteristics presented in Table 3 were used for the described modeling efforts. This is because the changes in wastewater properties through the screening process generally reduce the ratio of BOD/TKN, which will have an important impact on a biological design for nitrogen removal. Additionally, all MBR manufacturers require fine screening of influent wastewater to protect the membranes from physical damage. For this design, the headworks consists of three steps (see Figure 1):

1) coarse bar screens (6 mm),
2) circular grit chambers,
3) Huber Rotomat fine drum screens (2 mm)

The headworks are one of the most common "headaches" associated with operating an MBR facility. With this in mind, this facility is designed with 2 gross solids removal processes ahead of the fine screens to reduce the loading to the fine screens. Additionally, all of these headwork process units are oversized to reduce the frequency of required maintenance and ensure consistent performance. The coarse bar screens and grit chamber have a rated capacity of 17 MGD and the fine screens have a rated capacity of 10.4 MGD when treating raw wastewater. A decision was made not to use 1 mm fine screens because of their increased susceptibility to blinding and the additional unwanted screenings produced by these units. Even though 1 mm fine screens may provide additional protection for the membranes, both membrane manufacturers considered in this design (Koch Puron and GE/Zenon) allow 2 mm fine screens.

**Figure 1. Physical treatment flow schematic**




Based on the specifications provided by Huber Technologies, a 5% to 10% COD reduction and 20% to 40% suspended solid reduction can be achieved in a single step, 1 mm fine screening process of raw wastewater. As a result, it is reasonable to assume a 10% loading reduction of COD, BOD, TKN-organic nitrogen, and TSS could be achieved through the 3-step physical removal process described above. Screened influent wastewater characteristics are summarized in Table 3.

**Table 3. Design screened influent wastewater characteristics**

| *Influent Parameters* | *Unit* | *Screened Influent* |
|---|---|---|
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand (BOD) | mg/L | 288 |
| Chemical Oxygen Demand (COD) | mg/L | 662 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 51 |
| Ammonia ($NH_3$) | mg/L | 32 |
| Total Suspended Solid (TSS) | mg/L | 189 |
| Alkalinity (as $CaCO_3$) | mg/L | 300 |

The peak day flow was used to evaluate the adequacy of the biological sizing of this facility. The peak day flow was estimated in the RFP based on the additional 3.8 MG of inflow volume from a 100-year storm to the annual average flow. It is appropriate to assume that the additional 3.8 MG of wet weather flow contains low organics and solids concentrations and will thus have a limited impact on the

influent loadings of organics and solids as lbs per day. However, to ensure a robust biological process design, the loadings of TSS, BOD, COD, and TKN were all increased by 20% to represent the peak day influent wastewater loads, as detailed in Table 4.

**Table 4. Average and peak day influent loads**

| *Influent Parameters* | *Unit* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|---|
| TSS | 1000 lb/day | 5.4 | 6.4 |
| BOD | 1000 lb/day | 8.2 | 9.8 |
| TKN | 1000 lb/day | 1.4 | 1.7 |
| COD | 1000 lb/day | 18.8 | 22.6 |

As a result of the 20% safety factor that was applied to the peak day loads, the peak day influent wastewater concentrations need to be estimated and are presented in Table 5.

**Table 5. Design peak day influent organic wastewater characteristics**

| *Influent Parameters* | *Unit* | *Values* |
|---|---|---|
| Flow | MGD | 7.2 |
| TSS | mg/L | 107 |
| BOD | mg/L | 163 |
| TKN | mg/L | 28.8 |
| COD | mg/L | 375 |
| Min Design Temperature | °C | 19 |

The influent fractions and coefficients presented in Table 6 were adjusted from the GPS-X default values to accommodate the wastewater characteristics presented in Tables 3 and 5. These adjustments were made using an "Influent Advisor" which was developed by Hydromantis to help users better understand the influent water quality characteristics and to avoid assumption errors.

**Table 6. Influent wastewater fractions and coefficients**

| *Fractions/Coefficients* | *Default Value* | *Value Used* |
|---|---|---|
| xCOD/VSS Ratio | 2.20 | 3.0 - 3.4 |
| VSS/TSS Ratio | 0.60 | 0.785 |
| Ammonia/TKN Ratio | 0.65 | 0.63 |

## EFFLUENT DESIGN CRITERIA

Since the MBR process produces non-detect TSS and low COD water for a wide-range of operating conditions (Merlo et al., 2007), the MBR sizing was controlled by the effluent nitrogen limits that the City is required to meet in its *Waste Discharge Requirements ORDER NO. R4-2007- 0028*. The monthly, or 30-day,

average nitrate + nitrite as nitrogen concentration of 5 mg/L must be achieved through the WRF. For this design, a safety factor of 20% was applied that produced a performance target of nitrate+nitrite as nitrogen of 4 mg/L (Table 7).

**Table 7. WRF Required Effluent Limits and Performance Targets**

| *Constituent* | *Unit* | *Effluent Limit* | *Performance Target* |
|---|---|---|---|
| Nitrate + Nitrite as nitrogen | mg/L | 5 | < 4 |

## PROCESS DESIGN CRITERIA

The following table presents the proposed process tank sizes provided by the PERC team for this MBR design. Approximately one quarter of the biological reactor volume will be used as a dedicated anoxic zone for denitrification. Different from the Kennedy/Jenks design, the second anoxic zone was eliminated as biological modeling (results presented in upcoming sections) demonstrated that this was not needed. Additionally, there were significant concerns expressed by the project team about having an anoxic zone just prior to the membrane separation tank in an MBR. This is because increased rates of membrane fouling have been attributed to anoxic sludge conditions (Jang et al., 2006).

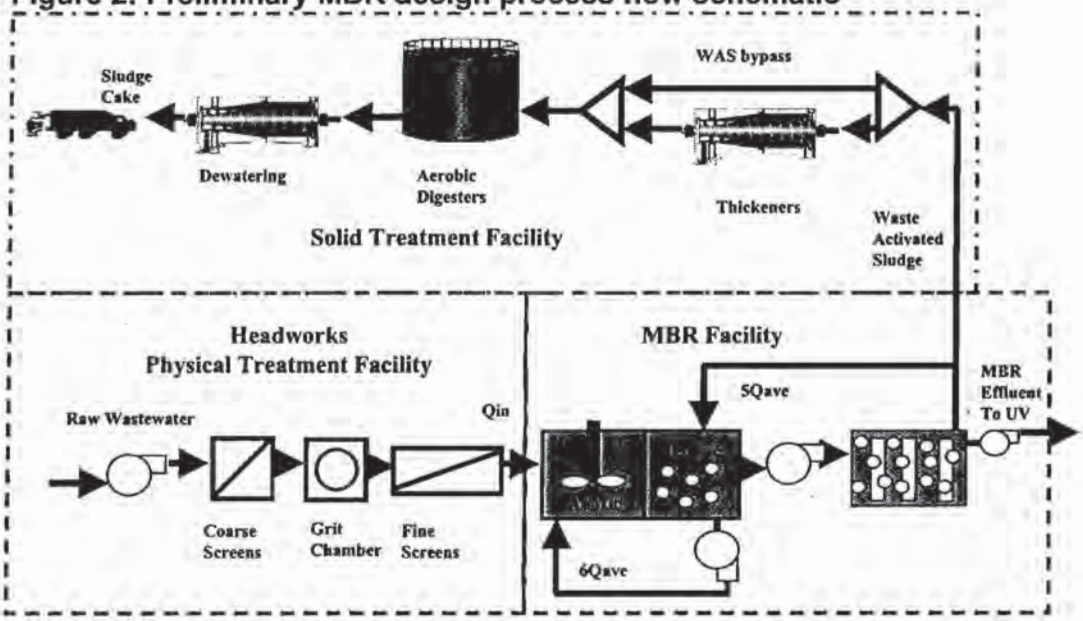
**Table 8. Preliminary tank design operating volumes**

| *MBR VOLUME DISTRIBUTION* | *Size, cu.ft* | *%* | *Size, gal* |
|---|---|---|---|
| Anoxic Volume | 71,205 | 26.7 | 532,650 |
| Aerobic Volume | 180,428 | 67.7 | 1,349,700 |
| Membrane Tank Volume | 15,039 | 5.6 | 112,500 |
| *Total Operating Reactor Volume* | *266,672* | *100* | *1,994,850* |

### Process Flow Schematic

A process flow diagram for the MBR process is presented in Figure 2. The screened raw wastewater first flows into the anoxic zone, then to the aerobic zone, and continues to the membrane tank. Nitrified mixed liquor is recirculated (internal recycle) at a rate of 20.4 MGD (6 $Q_{ave}$) from the end of the aerobic zone to the head of the anoxic zone to provide nitrate and biomass for denitrification. Additionally, 17 MGD (5 $Q_{ave}$) of return activated sludge (RAS) is returned from the membrane tank to the head of the aerobic zone to prevent excessive solids concentrations from occurring in the membrane tank. For the peak day flow, the RAS rate will be increased to 30 MGD.

**Figure 2: Preliminary MBR design process flow schematic**




## BIOLOGICAL MODELING RESULTS FOR THE DESIGN FLOWS

Based on the design criteria presented in previous sections, modeling simulations were performed. A solids residence time (SRT) of 14.7 d was determined for the predicted average flow of 3.4 MGD and 14.0 d for the peak day flow of 7.2 MGD. An SRT of more than 14 d ensures that nitrification will be stable and helps to minimize membrane fouling (Trussell et al., 2006). The MLSS concentrations and operational parameters are summarized in Table 9.

**Table 9. Biological process control and MLSS concentration**

| *Process Control Parameters* | *Units* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|---|
| F/M | gCOD/gMLSS.d | 0.07 | 0.08 |
| Wasting Rate | MGD | 0.11 | 0.11 |
| SRT | d | 14.7 | 13.8 |
| Internal Recycle Rate | MGD | 20.4 | 20.4 |
| RAS Rate | MGD | 17 | 30 |
| **MLSS Concentrations** | | | |
| Anoxic Zone | g/L | 5.7 | 5.3 |
| Aerobic Zone | g/L | 6.6 | 7.1 |
| Membrane Tank | g/L | 7.9 | 8.8 |

With a total reactor volume of 1,994,850 gal, the hydraulic retention time (HRT) is 14.1 h for the average annual flow and 6.6 h for the peak day flow. The filtrate water quality for the annual average and peak day flows is listed in Table 10. Effluent TSS and BOD are essentially non-detect. Also, the total nitrate + nitrite as nitrogen concentration meets the effluent design target value in Table 7.

**Table 10. Filtrate water quality**

| *Filtrate Qualities* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|
| TSS, mg/L | 0.8 | 0.9 |
| COD, mg/L | 33.0 | 33.0 |
| BOD, mg/L | 1.2 | 1.3 |
| Total Nitrogen, mg/L | 6.2 | 6.1 |
| TKN, mg/L | 3.1 | 3.0 |
| $NH_3$-N, mg/L | 0.10 | 0.11 |
| $NO3^-$+$NO2^-$, mg/L | 3.1 | 3.0 |

## BIOLOGICAL MODELING RESULTS FOR THE CURRENT FLOW

Based on the design volumes presented in Table 8, biological modeling was performed with one aeration train offline (of the total 3 trains) and two membrane tanks offline (of the total 6 tanks) for the historical flow of 2.5 MGD. A solids residence time (SRT) of 14.2 d was determined. The mixed liquor suspended solids (MLSS) concentrations and process control parameters are summarized in Table 11 and the simulated filtrate water quality is listed in Table 12.

**Table 11. Biological process control and MLSS concentration**

| *Process Control Parameters* | *Units* | *2.5 MGD* |
|---|---|---|
| F/M | gCOD/gMLSS.d | 0.08 |
| Wasting Rate | MGD | 0.075 |
| SRT | d | 14.2 |
| Internal Recycle Rate | MGD | 20.4 |
| RAS Rate | MGD | 17 |
| **MLSS Concentrations** | | |
| Anoxic Zone | g/L | 6.7 |
| Aerobic Zone | g/L | 7.5 |
| Membrane Tank | g/L | 8.6 |

**Table 12. Filtrate water quality**

| *Filtrate Qualities* | *2.5 MGD* |
|---|---|
| TSS, mg/L | 0.9 |
| COD, mg/L | 33.0 |
| BOD, mg/L | 1.3 |
| Total Nitrogen, mg/L | 5.6 |
| TKN, mg/L | 3.0 |
| $NH_3$-N, mg/L | 0.14 |
| $NO3^-$+$NO2^-$, mg/L | 2.5 |

With a total in-service reactor volume of 1,329,900 gal, the hydraulic retention time (HRT) is 12.8 h. Effluent TSS and BOD are essentially non-detect. Total nitrate+nitrite as nitrogen concentration also meets the effluent design target value in Table 7. As a result, it is concluded that one aeration train and two membrane tanks can be used as standby under the current flow conditions.

## BIOLOGICAL AERATION DESIGN

The adequacy of an aeration system to provide necessary oxygen to the biology is a common concern of process design engineers with any biological process, but is of special concern with the MBR process. In the early days of MBR design, aeration systems were often inadequate for maintaining appropriate dissolved oxygen levels. For this MBR design, the required airflow rates to maintain the aerobic zones at dissolved oxygen (DO) concentrations of 2 mg/L were determined using an alpha-factor of 0.45 ( justification for this selected alpha factor is discussed further in the next section) and a standard oxygen transfer efficiency (SOTE) of 30 percent for the membrane aeration panels. The SOTE of 30 percent is conservative for the membrane aeration panels used in this design and is representative of fouled aeration panels. The aeration panel manufacturer claims SOTEs as high as 40 percent for new panels. Using these established design criteria, the required airflow rates were determined for the aerobic zone and are presented in Table 13 for the annual average and peak day flows.

**Table 13. Design criteria and resulting airflows for fine bubble diffusers**

| *Parameter* | *2.5 MGD* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|---|
| α, -- | 0.45 | 0.45 | 0.45 |
| SOTE, % | 30 | 30 | 30 |
| Air Flow Rate, scfm | 2969 | 3703 | 4385 |

## α-FACTOR AND IMPORTANCE OF MLSS IN MBR AERATION DESIGNS

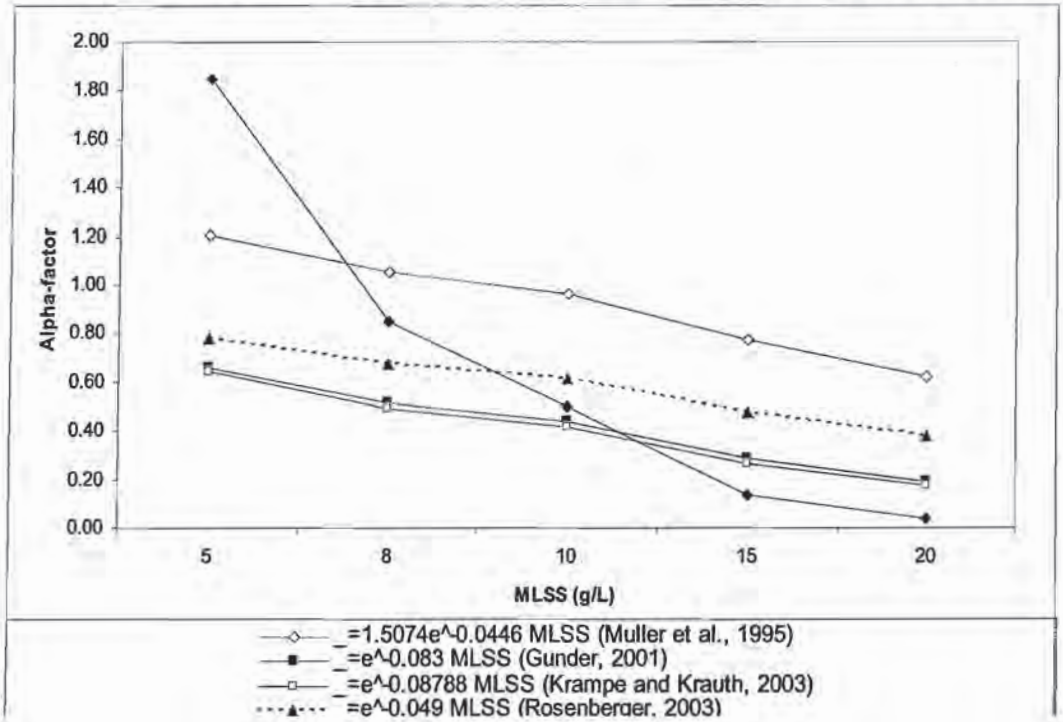
The α-factor is an oxygen transfer correction factor used to estimate the $K_La$ value (i.e. mass transfer coefficient) in the actual process system (Metcalf & Eddy, 2003) and the *oxygen transfer rate* is directly proportional to the $K_La$ value (ASCE & WEF, 2001):

$$\alpha\text{ - factor} = \frac{K_La\text{ (process water)}}{K_La\text{ (clean water)}}$$

Values of α-factor vary with the type of aeration devices, the basin geometry, the degree of mixing, and the wastewater characteristics (Metcalf & Eddy, 2003). A study of a ceramic disc grid system operating in a conventional activated-sludge basin found variations in α-factor from 0.2 when the flow first entered into the aeration tank to 0.55 after the flow had traveled a tank length of 280 ft (ASCE & WEF, 2001). Another study of flexible membrane diffusers installed in a plug-flow aeration system that was not nitrifying, found that the apparent α-factor increase from 0.27 at the aeration tank inlet to 0.42 in the effluent outlet (ASCE &

WEF, 2001). In the membrane bioreactor (MBR) process, additional attention needs to be given to the design of the aeration system due to the increased MLSS concentrations at which MBRs operate compared to conventional processes. This is a classic problem with pioneer MBR facilities (e.g. inadequate dissolved oxygen concentrations) and is still something that requires careful consideration by MBR design engineers today. In fact, the *oxygen transfer rate* is lower at a given airflow rate for the same aeration device in an MBR plant than in a conventional-activated sludge process due to the increased levels of MLSS (Muller et al., 1995; Krampe and Krauth, 2003). The α-factor and MLSS concentration correlation for MBR type sludge was first introduced in by Muller et al. (1995) and the results are shown in Figure 3. Several other studies have also reported an exponential correlation between α-factor and the MLSS concentration. These additional studies are also presented in Figure 3. The results show that an increase in the MLSS concentration leads to an exponential decrease in α-factor.

**Figure 3 – Comparison of the correlations obtained between α-factor and MLSS concentration for several studies (adapted from Germain et al., 2007)**




Although the length of the biological reactor is not known for the data presented in Figure 3, it is known that the α-factor increases as the flow proceeds along the biological reactor and this is an important consideration that provides additional support, other than the more obvious increased oxygen demand, to the concept of tapered aeration (e.g. higher air demand at the head of the reactor than at the end). For this MBR design, the project team has incorporated an aeration system

that will use multiple, redundant DO sensors, to determine aeration demands at various points along the aerobic zone with a target DO of 2 mg/L. To determine the required air flows for this MBR design, the PERC team has modeled the aeration device using an α-factor of 0.45, which provides more than a 10% safety factor from the observed α-factors presented in Figure 3 at the design MLSS concentration of 8 g/L.

## MAJOR PROCESS EQUIPMENT SIZING

Based on the airflow rates presented in Table 13, the required minimum horse power for the aeration blowers have been calculated and are presented in Table 14. These blowers were sized based on the maximum horse power requirement, which occurred at the 7.2 MGD flow as presented in Table 15. The internal recycle rate and membrane RAS rate were used to size the internal recycle pumps and membrane RAS pumps. A 70% operational efficiency was applied in these equipment sizings.

**Table 14. Operation process control rates**

| | *Unit* | *2.5 MGD* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|---|---|
| Actual Required Air Flowrate | scfm | 2969 | 3702 | 4385 |
| Aeration Blowers, Required Min hp | hp/blower | 45 | 55 | 65 |
| Internal Recycle Rate | MGD | 20.4 | 20.4 | 20.4 |
| Membrane RAS Rate | MGD | 17 | 17 | 30 |

**Table 15. Operation energy loads and required equipment sizes**

| *Equipments* | *Duty* | *Standby* | *Total Quantity* | *hp/Ea* | *Total hp* | *Specs.* |
|---|---|---|---|---|---|---|
| Aeration Blowers | 3 | 1 | 4 | 100 | 400 | 1470 SCFM @ 12 psi |
| Internal Recycle Pumps | 3 | 1 | 4 | 4 | 16 | 4730 GPM @ 1.2 psi |
| Membrane RAS Pumps | 3 | 1 | 4 | 27 | 108 | 6950 GPM @ 5.4 psi |

## CONTROL OF BIOLOGICAL FOAMING

MBRs provide a perfect trapping environment for filamentous bacteria that float and cause biological foaming (Trussell et al., 2006). This means that biological foaming is ubiquitous in MBR facilities. Biological foaming at an MBR facility is more than nuisance and can often result in undesired loss of biomass and increased membrane fouling rates. Since the entire process basin will be completely covered in this MBR design, the project team has included a sprayer system that will spray chlorinated MBR effluent over the biological reactor three to four times per day. This has proven to be a very effective means of controlling biological foaming in an MBR (Adham and Trussell, 2001) and essentially oxidizes bacteria that live on the surface, preventing them from establishing a large enough population to cause a biological foaming event.

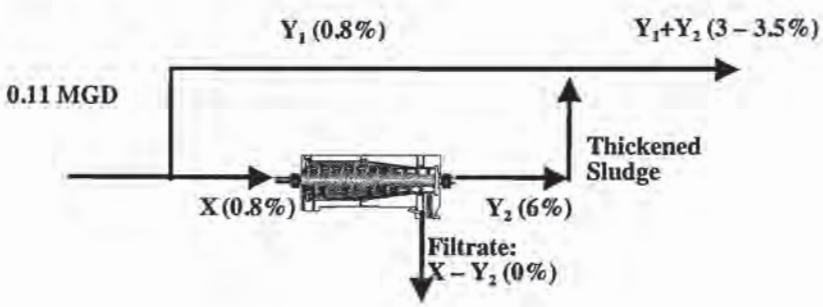
## SOLIDS HANDLING

The solids stabilization process selected for this design is an aerobic digester (Figure 2). The target feed WAS solids concentration into the aerobic digesters is about 3 to 3.5%. Drum thickeners will be used to thicken the MBR WAS prior to feeding the solids into the aerobic digester and since the drum thickener will increase the solids concentration to 6 - 8%, about 89% of the WAS flow will be thickened and then combined with a WAS bypass flow stream to produce the target concentrations (details described in upcoming section on the Sludge Thickening Design). This aerobic digester has been designed to produce Class B biosolids. According to EPA Class B biosolids regulations, values for the mean cell residence time (MCRT) and temperature shall be greater than 40 days at 20°C or greater than 60 days at 15°C.

### *Sludge Thickening Design*

Based on the GPS-X process simulation results, the waste activated sludge (WAS) production rate is about 0.11 MGD and the WAS solids concentration is approximately 0.8% for the design average flowrate of 3.4 MGD. The target solids concentration of sludge feed to the digesters is about 3 to 3.5%. Since the drum thickener will increase the solids concentration of the sludge feed to 6 - 8%, a portion of WAS will be fed to the drum thickener and the rest of the WAS will be bypassed; these streams will be combined to produce the target solids concentration of 3 to 3.5%. It is critical to determine the amount of WAS flow being fed to the drum thickener to determining the appropriate sizing and number of required sludge thickeners. Calculations are detailed below and Figure 4 is the sludge thickening flow diagram.

**Figure 4: Sludge thickening flow schematics**




Performing a flow balance on the WAS split flow point, we attain:

$Y_1$=0.11 MGD - X (1)

Performing a solids mass balance around the thickener gives:

X (0.8%) = $Y_2$ (6%) + (X-$Y_2$) (?%) (2)

Where X is the WAS flow to the Drum Thickener, MGD
$Y_1$ is the bypass WAS, MGD
$Y_2$ is the thickened flowrate, MGD

Assuming a solids recovery of 100%, then the filtrate stream (e.g. $X-Y_2$) solids concentration is 0 % and equation 2 simplifies to:

$$X\,(0.8\%) = Y_2\,(6\%) \qquad (3)$$

The solids concentration of sludge feed can be calculated by equation 4.

$$(Y_1)\,(0.8\%) + Y_2\,(6\%) = (Y_1 + Y_2)\,(3 \text{ to } 3.5\%) \qquad (4)$$

For a 3% sludge feed, we can substitute equation 1 into equation 4 and we get:

$$(0.11 - X)\,(0.8\%) + Y_2\,(6\%) = (0.11 - X + Y_2)\,(3\%)$$

$$3Y_2 + 2.2\,X = 0.242$$

Substitute in equation 3, and we get:

$$3Y_2 + 2.2\,(7.5Y_2) = 0.242$$

$$Y_2 = 0.0124$$

and

$$X = 0.0931$$

Thus, X = 0.093 MGD or about 85% of the total WAS flow (e.g. 0.11 MGD) required to be thickened to produce a combined sludge feedflow with 3% solids content.

Following the same procedure for a 3.5% sludge feed concentration, we attain:

$$Y_2 = 0.0131$$

and

$$X = 0.0983$$

As a result, 0.098 MGD or about 89% of the total WAS flow required to be thickened to produce a combined sludge feedflow with 3.5% solids content.

For reference purposes, solids concentration of 2% and 4% are also being calculated as summarized in Table 16.

**Table 16. Percentage of the total WAS flow required to be thickened to attain various feed sludge solids concentrations**

| | 2% | 3% | 3.5% | 4% |
|---|---|---|---|---|
| % of the total WAS flow | 69% | 85% | 89% | 92% |

The thickening capacity of the drum thickener is sized based on the design upper limit solids concentration of 3.5%. Assume the wasting system operates 5 days a week for maximum of 8 hours per day, the required WAS pumping rate is 321 gpm. With the WAS solids concentration of 0.8%, the required solids pumping rate is 1610 lbs/hr. With 89% of the WAS flow feeding to the drum thickener, the required thickening capacity is 1433 lbs/hr. For a thickener operating at 860 lbs/hr, 2 units will be required.

***Current Regulations on Aerobic Digestion Processes***

In aerobic digestion, sewage sludge is biochemically oxidized by bacteria in an aerobic environment that can operate in either a batch or continuous mode (EPA, 2003). According to the Environmental Regulations and Technology – Control of Pathogens and Vector Attraction in Sewage Sludge (EPA/625/R-92/013), there are three alternatives of the Class B pathogen requirements for sewage sludge (biosolids). The three alternative requirements exist as follows (EPA, 2003):

1. Sewage Sludge Alternative 1: Monitoring of Fecal Coliforms [503.32(b)(2)]
   *Seven samples of treated sewage sludge (biosolids) be collected and that the geometric mean fecal coliform density of these samples be less than 2 million CFU or MPN per gram of bioslids (dry weight basis).*

2. Sewage Sludge Alternative 2: Use of a Process to Significantly Reduce Pathogens (PSRPs) [503.32(b)(3)]
   *For aerobic digestion, sewage sludge is agitated with air or oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 40 days at 20˚C (68°F) and 60 days at 15˚C (59°F).*

3. Sewage Sludge Alternative 3: Use of Processes Equivalent to PSRP [503.32(b)(4)]
   1. *Alkaline Addition to achieve Lime Stabilization*
   2. *OxyOzonation*

Class B biosolids and domestic septage also must meet one of the vector attraction reduction requirements. The requirements for aerobic digesters are as follows (EPA, 2003):

1. At least 38% reduction in volatile solids during sewage sludge treatment.

2. The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a temperature between 10 to 20˚C.

3. Less than 15% additional volatile solids reduction can occur during bench-scale aerobic batch digestion for 30 additional days at 20˚C.

**DESIGN OF AEROBIC DIGESTOR**

Based on the Sewage Sludge Alternative 2 of the Class B Pathogen Requirements for Biosolids, GPS-X modeling simulations were performed to estimate the digester volumes. The total digester volume provided in this design is 1.14 MG, which is broken up into two stages. Thickened sludge will be fed to

two of three digesters in parallel and then the digested sludge will be transferred to the third digester which also acts as a sludge storage tank. Based on the GPS-X modeling simulation results ($Q_i$, $X_i$, and X), minimum digester volumes for the various wastewater influent flows modeled for this WRF design were calculated using equation 6(Metcalf&Eddy, 2003):

$$V = \frac{Q_i X_i}{X(k_d P_v + 1/SRT)} \qquad (6)$$

Where V = volume of aerobic digester, MG
$Q_i$ = influent flowrate to digester, mgd
$X_i$ = influent suspended solid, mg/L
X = digester suspended solid, mg/L
$k_d$ = reaction rate constant, $d^{-1}$
$P_v$ = volatile fraction of digester suspended solids
SRT = solids residence time, d

$P_v$ is approximately 0.8 and $k_d$ is typically equal to 0.1 and 0.06 $d^{-1}$ at 20 and 15°C, respectively. The results of the modeling and calculations for a digester operating with a 40 d SRT at 20°C and with a 60 d SRT at 15°C are summarized in Tables 17 and 18, respectively. The maximum required digester volumes were 0.5 and 0.82 MG when the digester was operated at 20 and 15°C, respectively.

**Table 17. Digester sludge volumes at 20°C**

| *Wastewater Influent Flow* | *2.5MGD* | *3.4MGD* | *7.2MGD* | *10.4MGD* |
|---|---|---|---|---|
| $Q_i$ | 0.0203 | 0.0253 | 0.0322 | 0.03121 |
| $X_i$ | 31670 | 34190 | 29850 | 29600 |
| X | 17600 | 20110 | 19640 | 18340 |
| $k_d$ | 0.1 | 0.1 | 0.1 | 0.1 |
| $P_v$ | 0.8 | 0.8 | 0.8 | 0.8 |
| SRT | 40 | 40 | 40 | 40 |
| V | 0.35 | 0.41 | 0.47 | 0.48 |

**Table 18. Digester sludge volumes at 15°C**

| *Wastewater Influent Flow* | *2.5MGD* | *3.4MGD* | *7.2MGD* | *10.4MGD* |
|---|---|---|---|---|
| $Q_i$ | 0.0203 | 0.0253 | 0.0322 | 0.03121 |
| $X_i$ | 31660 | 34190 | 29800 | 29550 |
| X | 17600 | 20110 | 18600 | 18300 |
| $k_d$ | 0.06 | 0.06 | 0.06 | 0.06 |
| $P_v$ | 0.8 | 0.8 | 0.8 | 0.8 |
| SRT | 60 | 60 | 60 | 60 |
| V | 0.56 | 0.67 | 0.80 | 0.78 |

It can be observed from Tables 17 and 18 that the design digester volume of 1.14 MG is more than adequate to meet the 40 day MCRT at 20˚C or 60 day MCRT at 15˚C.

However, the PERC design digesters will be operated at a temperature closer to 30˚C; therefore, the required SRT to produce Class B biosolids needs to be evaluated. With temperature correction, the required SRT at 30˚C can be estimated with equation 7.

$$SRT_T = SRT_{20^oC}(\theta_d)^{T-20^oC} \qquad (7)$$

Where $\theta_d$ is a temperature variation constant for SRT.

First of all, $\theta_d$ is calculated by using the given detention times and temperatures provided in the definition of Class B biosolids.

$$60 = 40(\theta_d)^{15^oC-20^oC}$$
$$\theta_d = 0.922$$

Then, for digester operating at 30˚C, we can calculate the minimum SRT:

$$SRT_{30^oC} = 40\,(0.922)^{30^oC-20^oC}$$
$$SRT_{30^oC} = 18\ days$$

Therefore, the required SRT for aerobic digesters to produce Class B biosolids is approximately 18 days at a digester temperature of 30˚C.

In the option #1 of the vector attraction reduction requirements, it states that a least 38% reduction in volatile solids needs to be achieved during sewage sludge treatment. As shown in Figure 5, with sludge age of 18 days at 30˚C, more than 40% of the volatile solids reduction can be achieved.

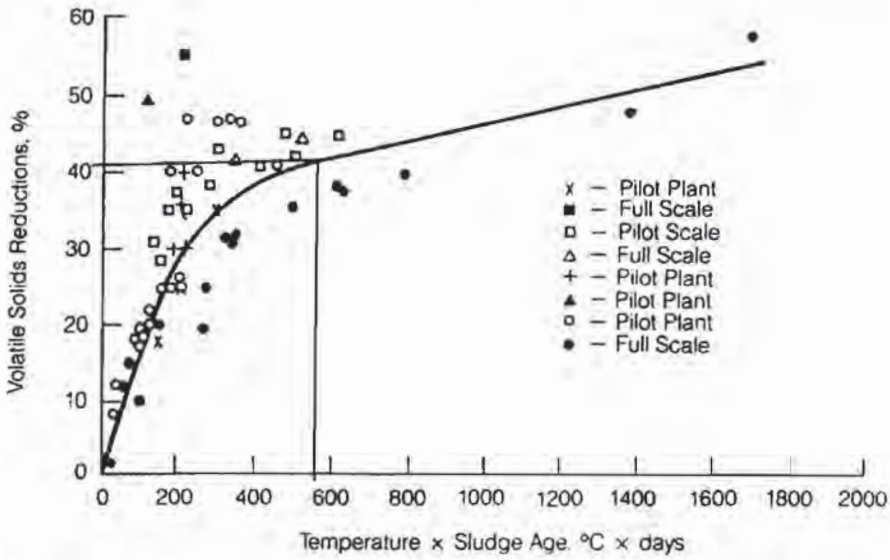



**Figure 18.31** **Typical volatile solids reductions as a function of digester liquid temperature and digester sludge age.[37] VS reduction depends on many variables, including prior processing, sludge characteristics, and digester operating conditions.[37]**

**Figure 5. Typical volatile solids reduction as a function of digester liquid temperature and digester sludge age (adapted from WEF, 1992)**

**GPS-X Modeling Simulation**

Operating the digesters in a CSTR (continuous stirred-tank reactor) mode (e.g. no settling mode), the hydraulic detention time (HRT) is equivalent to the SRT, which can be calculated by equation 8.

$$HRT = SRT = \frac{V}{Q} \qquad (8)$$

Where V = total volume of the digesters, MG
Q = influent sludge feed to the digesters, MGD

To evaluate the digesters performance at 30°C, a GPS-X modeling simulation was performed with the design criteria listed in Table 19 and the modeling results are detailed in Table 20.

**Table 19. Digester design criteria.**

| Parameters | |
|---|---|
| SOTE, % | 25 |
| α, – | 0.85 |
| Temperature, °C | 30 |

**Table 20. Digester simulation results.**

| | *Unit* | *3.4 MGD* | *7.2 MGD* | *2.5 MGD* |
|---|---|---|---|---|
| Digester #1 | scfm | 552 | 615 | 458 |
| Digester #2 | scfm | 552 | 615 | 458 |
| Digester #3 | scfm | 258 | 282 | 186 |
| %VS reduction | % | 53 | 51 | 59 |
| SRT (full capacity) | days | 39.9 | 35.7 | 56 |

Observing the data in Table 20, the SRTs vary from 35.7 days for the peak day flow of 7.2 MGD to 56 days for the current annual average influent flow of 2.5 MGD. The percentages of VS reduction are all above 50% which meets the vector attraction reduction requirement of 38%. Thus, it is concluded that the PERC project team's design digester volume is adequate to produce Class B biosolids at an operating temperature of 30˚C.

## REFERENCES


HYDROMANTIS, INC. (2006), "GPS-X TECHNICAL REFERENCE," CHAPTER 3

Adham, S. and Trussell, R. S. (2001) *Membrane Bioreactors: Feasibility and Use in Water Reclamation*.98-CTS-5 WERF, Alexandria, VA.

Jang, N., Ren, X., Choi, K. and Kim, I. S. (2006) Comparison of membrane biofouling in nitrification and denitrification for the membrane bioreactor (MBR). *Water Science and Technology*, **53**, 43.

Merlo, R. P., Trussell, R. S., Hermanowicz, S. W. and Jenkins, D. (2007) A comparison of the physical, chemical, and biological properties of sludges from a complete-mix activated sludge reactor and a submerged membrane bioreactor. *Water Environment Research*, **79**, 320.

Trussell, R. S., Merlo, R. P., Hermanowicz, S. W. and Jenkins, D. (2006) The effect of organic loading on process performance and membrane fouling in a submerged membrane bioreactor treating municipal wastewater. *Water Research*, **40**, 2675.

Germain, E., Nelles, F., Drews, A., Pearce, P., Kraume, M., Reid, E., Judd, S. J., Stephenson, T., 2007. Biomass effects on oxygen transfer in membrane bioreactors. Water Research. 41, 1038-1044.

Metcalf & Eddy (2003). Wastewater Engineering Treatment and Reuse – Forth Edition. McGraw-Hill, New York, NY.

Krampe, J., Krauth, K., 2003. Oxygen transfer into activated sludge with high MLSS concentrations. Water Sci. Technol. 47, 297-303

Muller, E. B., Stouthamer, A. H., Vanverseveld, H.W., Eikelboom, D.H., 1995. Aerobic domestic waste water treatment in a pilot plant with complete sludge retention by cross-flow filtration. Water Res. 29, 1179-1189.

EPA/625/R-92/013 (2003), Environmental Regulations and Technology – Control of Pathogens and Vector Attraction in sewage Sludge, Chapter 5. 8, and 11.

WEF Manual of Practice No. 8, 1992. Design of Municipal Wastewater Treatment Plants Volume II. Pg. 1327.

# Technical Memorandum

City of Santa Paula Water Recycling Facility
Design, Build, Operate, Finance

**Date:** 24 January 2008

**Authors:** R. Shane Trussell, Ph.D., P.E.
Joanne Chiu

**Subject:** Phase II Evaluation of Biological Design and Process Sizing

---

## OBJECTIVE OF THIS MEMORANDUM

The purpose of this document is to evaluate the ability of the Phase I (year 2015) biological and process equipment design to handle the predicted flow from the Phase II design (year 2025) using process simulation software, GPS-X from Hydromantis, Inc. The process will be evaluated at the Phase II flow capacity and solids handling will also be assessed. Recommendations for maintaining a healthy biology at a higher influent flow rate will also be discussed.

## INFLUENT DESIGN CRITERIA

The flow information and annual average influent wastewater characteristics for the Phase II design presented in Tables 1 and 2 were obtained from the Request For Proposal (RFP), Appendix B – Performance Specification, from the City of Santa Paula for a new Water Recycling Facility (WRF).

**Table 1. Design influent wastewater flows**

| *Flow* | *Unit* | *2025* |
|---|---|---|
| Average Annual Influent Flow | MGD | 4.2 |
| Peak Day Flow | MGD | 8.0 |

**Table 2. Raw influent wastewater characteristics**

| *Parameters* | *Unit* | *Raw Influent* |
|---|---|---|
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand (BOD) | mg/L | 320 |
| Chemical Oxygen Demand (COD) | mg/L | 736 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 53 |
| Ammonia ($NH_3$) | mg/L | 32 |
| Total Suspended Solid (TSS) | mg/L | 210 |
| Alkalinity (as $CaCO_3$) | mg/L | 300 |

A10% loading reduction of COD, BOD, TKN-organic nitrogen, and TSS through the 3-step physical removal process was applied. Screened influent wastewater characteristics are summarized in Table 3.

**Table 3. Design screened influent wastewater characteristics**

| *Influent Parameters* | *Unit* | *Screened Influent* |
|---|---|---|
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand (BOD) | mg/L | 288 |
| Chemical Oxygen Demand (COD) | mg/L | 662 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 51 |
| Ammonia ($NH_3$) | mg/L | 32 |
| Total Suspended Solid (TSS) | mg/L | 189 |
| Alkalinity (as $CaCO_3$) | mg/L | 300 |

The peak day flow was used to evaluate the adequacy of the biological sizing of this facility. The peak day flow was estimated in the RFP based on the additional 3.8 MG of inflow volume from a 100-year storm to the annual average flow. It is appropriate to assume that the additional 3.8 MG of wet weather flow contains low organics and solids concentrations and will thus have a limited impact on the influent loadings of organics and solids as lbs per day. However, to ensure a robust biological process design, the loadings of TSS, BOD, COD, and TKN were all increased by 20% to represent the peak day influent wastewater loads, as detailed in Table 4.

**Table 4. Average and peak day influent loads**

| *Influent Parameters* | *Unit* | *4.2 MGD* | *8.0 MGD* |
|---|---|---|---|
| TSS | 1000 lb/day | 6.6 | 7.9 |
| BOD | 1000 lb/day | 10.1 | 12.1 |
| TKN | 1000 lb/day | 1.8 | 2.1 |
| COD | 1000 lb/day | 23.2 | 27.8 |

As a result of the 20% safety factor that was applied to the peak day loads, the peak day influent wastewater concentrations need to be estimated and are presented in Table 5.

**Table 5. Design peak day influent organic wastewater characteristics**

| *Influent Parameters* | *Unit* | *Values* |
|---|---|---|
| Flow | MGD | 8.0 |
| TSS | mg/L | 119 |
| BOD | mg/L | 181 |
| TKN | mg/L | 32 |
| COD | mg/L | 417 |
| Min Design Temperature | °C | 19 |

The influent fractions and coefficients presented in Table 6 were adjusted from the GPS-X default values to accommodate the wastewater characteristics presented in Table 3 and 5. These adjustments were made using an "Influent Advisor" which was developed by Hydromantis to help users better understand the influent water quality characteristics and to avoid assumption errors.

**Table 6. Influent wastewater fractions and coefficients**

| *Fractions/Coefficients* | *Default Value* | *Value Used* |
|---|---|---|
| xCOD/VSS Ratio | 2.20 | 3.3 - 3.4 |
| VSS/TSS Ratio | 0.60 | 0.79 |
| Ammonia/TKN Ratio | 0.65 | 0.63 |

## EFFLUENT DESIGN CRITERIA

Since the MBR process produces non-detect TSS and low COD water for a wide-range of operating conditions (Merlo et al., 2007), the MBR sizing was controlled by the effluent nitrogen limits that the City is required to meet in its *Waste Discharge Requirements ORDER NO. R4-2007- 0028*. The monthly, or 30-day, average nitrate + nitrite as nitrogen concentration of 5 mg/L must be achieved through the WRF. For this design, a safety factor of 20% was applied that produced a performance target of nitrate+nitrite as nitrogen of 4 mg/L (Table 7).

**Table 7. WRF Required Effluent Limits and Performance Targets**

| *Constituent* | *Unit* | *Effluent Limit* | *Performance Target* |
|---|---|---|---|
| Nitrate + Nitrite as nitrogen | mg/L | 5 | < 4 |

## PROCESS DESIGN CRITERIA

The following table presents the proposed process tank sizes provided by the PERC team for the Phase I MBR design.

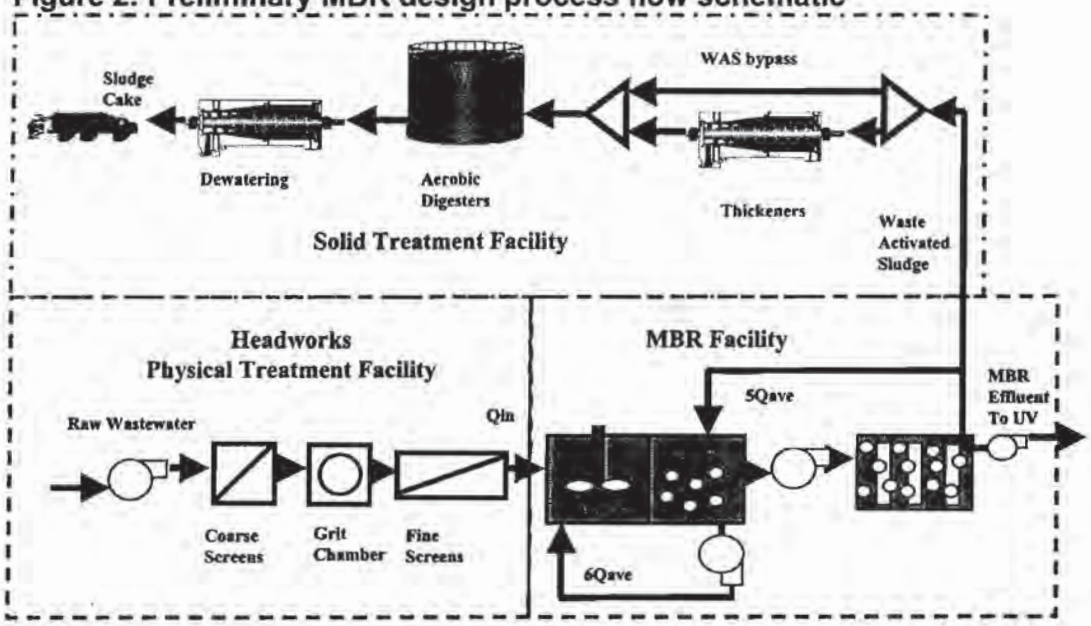
**Table 8. Preliminary tank design operating volumes**

| *MBR VOLUME DISTRIBUTION* | *Size, cu.ft* | *%* | *Size, gal* |
|---|---|---|---|
| Anoxic Volume | 71,205 | 26.7 | 532,650 |
| Aerobic Volume | 180,428 | 67.7 | 1,349,700 |
| Membrane Tank Volume | 15,039 | 5.6 | 112,500 |
| *Total Operating Reactor Volume* | *266,672* | *100* | *1,994,850* |

### Process Flow Schematic

A process flow diagram for the Phase II MBR process is presented in Figure 2. The screened raw wastewater first flows into the anoxic zone, then to the aerobic zone, and continues to the membrane tank. Nitrified mixed liquor is recirculated (internal recycle) at a rate of 25.2 MGD (6 $Q_{ave}$) from the end of the aerobic zone to the head of the anoxic zone to provide nitrate and biomass for denitrification. Additionally, 21 MGD (5 $Q_{ave}$) of return activated sludge (RAS) is returned from the membrane tank to the head of the aerobic zone to prevent excessive solids concentrations from occurring in the membrane tank. A 30 MGD of RAS rates will be operated during peak day.

**Figure 2: Preliminary MBR design process flow schematic**




## BIOLOGICAL MODELING RESULTS FOR THE DESIGN FLOWS

Based on the design criteria presented in previous sections, modeling simulations were performed for the Phase I design reactor volumes for the Phase II influent flow rate and wastewater characteristics. A solids residence time

(SRT) of 14.7 d was determined for the predicted average flow of 4.2 MGD and 12.4 d for the peak day flow of 8.0 MGD. An SRT of more than 14 d ensures that nitrification will be stable and helps to minimize membrane fouling (Trussell et al., 2006). The MLSS concentrations and operational parameters for both Phase I and Phase II designs are presented in Table 9 for comparison purposes.

**Table 9. Biological process control and MLSS concentration**

| *Process Control Parameters* | *Units* | *Phase I* | | *Phase II* | |
|---|---|---|---|---|---|
| | | *3.4 MGD* | *7.2 MGD* | *4.2 MGD* | *8.0 MGD* |
| F/M | gCOD/gMLSS.d | 0.07 | 0.08 | 0.07 | 0.09 |
| Wasting Rate | MGD | 0.11 | 0.11 | 0.11 | 0.12 |
| SRT | d | 14.7 | 13.8 | 14.7 | 12.4 |
| Internal Recycle Rate | MGD | 20.4 | 20.4 | 25.2 | 25.2 |
| RAS Rate | MGD | 17 | 30 | 21 | 30 |
| **MLSS Concentrations** | | | | | |
| Anoxic Zone | g/L | 5.7 | 5.3 | 7.0 | 6.1 |
| Aerobic Zone | g/L | 6.6 | 7.1 | 8.1 | 8.0 |
| Membrane Tank | g/L | 7.9 | 8.8 | 9.7 | 10.1 |

As shown in Table 9, with the Phase I design reactor volume of 1,994,850 gal, the MLSS concentration has increased, but it is still well below the target upper limit of 12 g/L in the membrane tank. The hydraulic retention time (HRT) for Phase II design is 11.4 h for the average annual flow and 6.0 h for the peak day flow. The filtrate water quality for the annual average and peak day flows is provided in Table 10. Effluent TSS and BOD are essentially non-detect. Also, the total nitrate + nitrite as nitrogen concentration meets the effluent design target value in Table 7.

**Table 10. Filtrate water quality**

| *Filtrate Qualities* | *4.2 MGD* | *8.0 MGD* |
|---|---|---|
| TSS, mg/L | 1.0 | 1.0 |
| COD, mg/L | 33.0 | 33.0 |
| BOD, mg/L | 1.3 | 1.3 |
| Total Nitrogen, mg/L | 6.2 | 6.3 |
| TKN, mg/L | 3.1 | 3.1 |
| $NH_3$-N, mg/L | 0.10 | 0.12 |
| $NO3^-$+$NO2^-$, mg/L | 3.1 | 3.2 |

## BIOLOGICAL AERATION DESIGN

For this MBR design, the required airflow rates to maintain the aerobic zones at dissolved oxygen (DO) concentrations of 2 mg/L were determined using an alpha-factor of 0.45 and a standard oxygen transfer efficiency (SOTE) of 30 percent for the membrane aeration panels. Using these established design

criteria, the required airflow rates were determined for the aerobic zone and are presented in Table 11 for the annual average and peak day flows.

**Table 11. Design criteria and resulting airflows for fine bubble diffusers**

| *Parameter* | *4.2 MGD* | *8.0 MGD* |
|---|---|---|
| α, -- | 0.45 | 0.45 |
| SOTE, % | 30 | 30 |
| Air Flow Rate, scfm | 4609 | 5431 |

**MAJOR PROCESS EQUIPMENT SIZING**

Based on the airflow rates presented in Table 11, the required minimum horse power for the aeration blowers have been calculated and are presented in Table 12. A 70% operational efficiency was applied in these equipment sizings.

**Table 12. Operation process control rates**

| | *Unit* | *4.2 MGD* | *8.0 MGD* |
|---|---|---|---|
| Actual Required Air Flowrate | scfm | 4609 | 5431 |
| Aeration Blowers, Required Min hp | hp/blower | 65 | 76 |
| Internal Recycle Rate | MGD | 25.2 | 25.2 |
| Membrane RAS Rate | MGD | 21 | 30 |

Table 13 has detailed the operation energy loads and required equipment sizes for the Phase I design. The aeration blowers from Phase I design are sufficient to handle the flows from the Phase II design based on the required minimum hp listed in Table 12. With the internal recycle rate of 25.2 MGD, 3 hp per pump is required; therefore, the recycle pumps from the Phase I design are also sufficient to handle the higher recycle rate. Since the RAS pumps will be operated at the same rate as the Phase I design for the peak flow, no changes on the RAS pumps is needed. Thus, no additional equipment appears to be required for the biological reactor to achieve the Phase II design.

**Table 13. Operation energy loads and required equipment sizes**

| *Equipments* | *Duty* | *Standby* | *Total Quantity* | *hp/Ea* | *Total hp* |
|---|---|---|---|---|---|
| Aeration Blowers | 3 | 1 | 4 | 100 | 400 |
| Internal Recycle Pumps | 3 | 1 | 4 | 4 | 16 |
| Membrane RAS Pumps | 3 | 1 | 4 | 27 | 108 |

**SOLIDS HANDLING**

With the temperature correction, the estimated SRT for the digesters to produce Class B biosolids was calculated to be 18 days at the digester temperature of 30°C.

To evaluate the digesters performance, a GPS-X modeling simulation was performed with the design criteria listed in Table 16 and the modeling results are detailed in Table 17.

**Table 16. Digester design criteria**

| Parameters | |
|---|---|
| SOTE, % | 25 |
| α, – | 0.85 |
| Temperature, °C | 30 |

**Table 17. Digester simulation results**

| | *Unit* | *4.2 MGD* | *8 MGD* |
|---|---|---|---|
| Digester #1 | scfm | 633 | 748 |
| Digester #2 | scfm | 633 | 748 |
| Digester #3 | scfm | 317 | 357 |
| %VS reduction | % | 49 | 49 |
| SRT (full capacity) | days | 32 | 29.7 |

With an SRT of 29.7 days and 49 % volatile reduction (min vector attraction reduction requirement is 38%) for the peak day flow, it is concluded that the PERC design digester volume is adequate to produce Class B biosolids for the Phase II design.

## REFERENCES


Merlo, R. P., Trussell, R. S., Hermanowicz, S. W. and Jenkins, D. (2007) A comparison of the physical, chemical, and biological properties of sludges from a complete-mix activated sludge reactor and a submerged membrane bioreactor. *Water Environment Research*, **79**, 320.

Trussell, R. S., Merlo, R. P., Hermanowicz, S. W. and Jenkins, D. (2006) The effect of organic loading on process performance and membrane fouling in a submerged membrane bioreactor treating municipal wastewater. *Water Research*, **40**, 2675.

# Appendix E – Lift Station Condition Assessment

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

Location (Add Sketch Pg. 5):_____ Weather:___Sunny_____

Personnel:____Morgan and Tanner_____

Surroundings (i.e., enclosure, lawn, street):_____

Year Built/Improved:_____

As-Builts Available: _____

Design Capacity:_____

Pump Maintenance:_____

Model #:_____

Serial #:_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Configuration / Pumps: | | | |
| Wet well w/ submers. Or suction Lift | | | - round wet well |
| Wet well / dry well | | | - submersibles in wet well |
| Number of Pumps | 2 | | - collects from 1 house located 350+ ft NW of LS and 1 restroom directly W of LS |
| VFDs | N | | - recent seal failure (per operator) |
| Wet well shape and size | | | |
| # of inlets | 2 | | |
| Size? | | | |
| Depth relative to Pumps/Floor | | | |
| Known Pump Issues | | | |
| Overheating/ Noise/ Ragging | | | |
| Lift Station Safety Features: | | | |
| Fall protection | N | | - lighting comes from parking lot |
| Bollards | N | | |
| Lifting equipment | N | | |
| Explosion-proof fixtures | | | |
| Ventilation of wet well/ dry well | | | |
| Lighting | | | |
| Locks of hatches/ covers/ etc. | Y | | |
| Stair Railing | | | |
| Eye wash (if chemical treatment) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Flood Resilience: | | | |
| Backup power | | | - some flooding issues historically but not recently |
| Redundant controls | | | |
| Flood doors | | | |
| Elevated station (or barriers) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Backup Power: | | | |
| Perm. Generator | N | | - use submersible pump |
| Generator Plug Panel | | | - vactor truck |
| Type of fuel | | | |
| Automatic Transfer Switch | N | | |
| Manual Transfer Switch | N | | |
| Space for Temporary Gen. | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Wet Well Structure: | | | |
| Material type / condition | Y | | - coating ok |
| Liner (presence / type) | | | - odor issues |
| Offsets | | | - debris issues |
| Protrusions | | | - grease buildup |
| Exposed reinforcing | | | |
| Access hatch-type/condition | | | |
| Scratch test | | | |
| Odor Control | | | |
| Overflow Level | | | |
| FOG Issues | | | |
| High Water Level Stains | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Dry Well Structure: | | | |
| Shape | | | - good |
| Dimensions | | | |
| Structural Condition | | | |
| Lighting | | | |
| Ventilation | | | |
| Access to Equipment | | | |
| Perm. Lifting Equipment | | | |
| Sump Pump | | | |
| Pipe Supports | | | |
| Equipment Anchors | | | |
| | | | |
| | | | |
| Coatings: | | | |
| Pipe coatings-exposed | | | - good |
| Valve coatings-exposed | | | |
| Pipe coatings-wet well | | | |
| Valve coatings-wet well | | | |
| Pipe coatings-vault | | | |
| Valve coatings-vault | | | |
| Structure Coatings (other than wet well) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Instrumentation: | | | |
| Level controls | | | - level sensor |
| Flow meter | | | - antenna radios to lemonwood 1 (power failure, high level) |
| Gauges | | | |
| Pressure switches | | | |
| SCADA/Telemtry | | | |
| Antennae | | | |
| Alarms (List) | | | |
| MCC Enclosure-style/condition | | | |
| Shade structure (Elec.) | | | |
| Shade structure (Instr.) | | | |
| Intrusion Alarms | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Access: | | | |
| Vehicular | | | - parking lot leads to LS |
| Maint. Equip. (ie vactor truck / crane | | | |
| Surfacing (paved, gravel) | | | |
| Height/orientation of panels | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Bypassing Provisions: | | | |
| Points of connection | | | - none |
| Quick connects | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Site Features: | | | |
| Potable water | Y | | - located in park |
| Spill containment | | | |
| On-site Eqpt. Storage | | | |
| Gates, Site Fencing | | | |
| Lighting | | | |
| Overflow Tank / Containment | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

- rain water comes down through ceiling conduit into panel; fried some of the safeties

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

Location (Add Sketch Pg. 5):_____ Weather:_____

Personnel:_____Morgan and Tanner_____

Surroundings (i.e., enclosure, lawn, street):_____

Year Built/Improved:_____

As-Builts Available: _____

Design Capacity:_____

Pump Maintenance:_____

Model #:_____

Serial #:_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Configuration / Pumps: | | | |
| Wet well w/ submers. Or suction Lift | | | - 2 aboveground pumps over wetwell suction lift |
| Wet well / dry well | | | - flow conditions are ok following installation of new lift station |
| Number of Pumps | 2 | Y | - pumps are old, not super strong |
| VFDs | N | | - operators stated they prefer submersible pumps |
| Wet well shape and size | | | |
| # of inlets | | | |
| Size? | | | |
| Depth relative to Pumps/Floor | | | |
| Known Pump Issues | | | |
| Overheating/ Noise/ Ragging | | | |
| Lift Station Safety Features: | | | |
| Fall protection | N | | - lighting upgrades are recent |
| Bollards | N | | |
| Lifting equipment | | | |
| Explosion-proof fixtures | | | |
| Ventilation of wet well/ dry well | N | | |
| Lighting | Y | | |
| Locks of hatches/ covers/ etc. | Y | | |
| Stair Railing | N/A | | |
| Eye wash (if chemical treatment) | N | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Flood Resilience: | | | |
| Backup power | | | - runoff problems |
| Redundant controls | | | - no flooding issues historically |
| Flood doors | | | |
| Elevated station (or barriers) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Backup Power: | | | |
| Perm. Generator | | | - manual transfer switch |
| Generator Plug Panel | | | - portable generator if needed |
| Type of fuel | | | |
| Automatic Transfer Switch | | | |
| Manual Transfer Switch | | | |
| Space for Temporary Gen. | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Wet Well Structure: | | | |
| Material type / condition | | | - coating is ok |
| Liner (presence / type) | | | - low inlets |
| Offsets | | | |
| Protrusions | | | |
| Exposed reinforcing | | | |
| Access hatch-type/condition | | | |
| Scratch test | | | |
| Odor Control | | | |
| Overflow Level | | | |
| FOG Issues | | | |
| High Water Level Stains | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Dry Well Structure: | | | |
| Shape | | | - N/A |
| Dimensions | | | |
| Structural Condition | | | |
| Lighting | | | |
| Ventilation | | | |
| Access to Equipment | | | |
| Perm. Lifting Equipment | | | |
| Sump Pump | | | |
| Pipe Supports | | | |
| Equipment Anchors | | | |
| | | | |
| | | | |
| Coatings: | | | |
| Pipe coatings-exposed | | | - OK |
| Valve coatings-exposed | | | |
| Pipe coatings-wet well | | | |
| Valve coatings-wet well | | | |
| Pipe coatings-vault | | | |
| Valve coatings-vault | | | |
| Structure Coatings (other than wet well) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Instrumentation: | | | |
| Level controls | | | - radio; works fine; operator called it "sensophone" |
| Flow meter | | | - flow meter |
| Gauges | | | - level sensor (~ 3 yrs) |
| Pressure switches | | | - bubbler control panel; bubbler is cycling consistently |
| SCADA/Telemtry | | | |
| Antennae | Y | | |
| Alarms (List) | | | |
| MCC Enclosure-style/condition | | | |
| Shade structure (Elec.) | Y | | |
| Shade structure (Instr.) | | | |
| Intrusion Alarms | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Access: | | | |
| Vehicular | Y | | - Pavement has some condition issues |
| Maint. Equip. (ie vactor truck / crane | | | - Access by homeless; fence broken |
| Surfacing (paved, gravel) | Y | | - Hard to turn around in vehicle; small site |
| Height/orientation of panels | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Bypassing Provisions: | | | |
| Points of connection | Y | | |
| Quick connects | Y | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Site Features: | | | |
| Potable water | Y | | - graffiti on walls |
| Spill containment | N | | |
| On-site Eqpt. Storage | | | |
| Gates, Site Fencing | | | |
| Lighting | Y | | |
| Overflow Tank / Containment | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

Location (Add Sketch Pg. 5):_____ Weather:____Sunny_____

Personnel:_____Morgan and Tanner_____

Surroundings (i.e., enclosure, lawn, street):_____

Year Built/Improved:_____

As-Builts Available: _____

Design Capacity:_____

Pump Maintenance:_____

Model #:_____

Serial #:_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Configuration / Pumps: | | | |
| Wet well w/ submers. Or suction Lift | | | - round wet well shape |
| Wet well / dry well | | | - submersibles |
| Number of Pumps | 3 | | - no issues w/ pumps |
| VFDs | N | | |
| Wet well shape and size | | | |
| # of inlets | | | |
| Size? | | | |
| Depth relative to Pumps/Floor | | | |
| Known Pump Issues | | | |
| Overheating/ Noise/ Ragging | | | |
| Lift Station Safety Features: | | | |
| Fall protection | Y | | |
| Bollards | N | | |
| Lifting equipment | | | |
| Explosion-proof fixtures | | | |
| Ventilation of wet well/ dry well | | | |
| Lighting | Y | | |
| Locks of hatches/ covers/ etc. | Y | | |
| Stair Railing | | | |
| Eye wash (if chemical treatment) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Flood Resilience: | | | |
| Backup power | | | - N/A |
| Redundant controls | | | |
| Flood doors | | | |
| Elevated station (or barriers) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Backup Power: | | | |
| Perm. Generator | Y | | |
| Generator Plug Panel | | | |
| Type of fuel | | | |
| Automatic Transfer Switch | | | |
| Manual Transfer Switch | | | |
| Space for Temporary Gen. | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Wet Well Structure: | | | |
| Material type / condition | | | - H2S damage on metal piping, switches, electronics, etc. |
| Liner (presence / type) | | | - structure doing well; just coating and piping damage |
| Offsets | | | - ongoing H2S issues |
| Protrusions | | | - has capsule-shaped 10,000 gal overflow tank |
| Exposed reinforcing | | | |
| Access hatch-type/condition | | | |
| Scratch test | | | |
| Odor Control | | | |
| Overflow Level | | | |
| FOG Issues | | | |
| High Water Level Stains | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Dry Well Structure: | | | |
| Shape | | | |
| Dimensions | | | |
| Structural Condition | | | |
| Lighting | | | |
| Ventilation | | | |
| Access to Equipment | | | |
| Perm. Lifting Equipment | | | |
| Sump Pump | | | |
| Pipe Supports | | | |
| Equipment Anchors | | | |
| | | | |
| | | | |
| Coatings: | | | |
| Pipe coatings-exposed | | | - general corrosion |
| Valve coatings-exposed | | | - vault had previous leakage |
| Pipe coatings-wet well | | | - vault has some H2S due to drain to wet well |
| Valve coatings-wet well | | | |
| Pipe coatings-vault | | | |
| Valve coatings-vault | | | |
| Structure Coatings (other than wet well) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Instrumentation: | | | |
| Level controls | | | - level sensing transmitter |
| Flow meter | | | - no flow metering |
| Gauges | | | |
| Pressure switches | | | |
| SCADA/Telemtry | | | |
| Antennae | | | |
| Alarms (List) | | | |
| MCC Enclosure-style/condition | | | |
| Shade structure (Elec.) | | | |
| Shade structure (Instr.) | | | |
| Intrusion Alarms | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Access: | | | |
| Vehicular | | | - gated |
| Maint. Equip. (ie vactor truck / crane | | | - no issues |
| Surfacing (paved, gravel) | | | - access a bit tight |
| Height/orientation of panels | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Bypassing Provisions: | | | |
| Points of connection | Y | | |
| Quick connects | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Site Features: | | | |
| Potable water | Y | | - site ~ 3 yrs old |
| Spill containment | N | | |
| On-site Eqpt. Storage | | | |
| Gates, Site Fencing | Y | | |
| Lighting | Y | | |
| Overflow Tank / Containment | Y | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

DRAFT

# Appendix F – Treated Effluent Monthly Average Monitoring Results 2019-2023

DRAFT

| Treated Effluent Monthly Average Monitoring Results (2019-2023) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Total Dissolved Solids (mg/L) | Chloride[1] (mg/L) | Sulfate (mg/L) | Boron (mg/L) | Nitrite-N (mg/L) | Ammonia-N + Nitrate-N + Nitrite-N (mg/L) |
| WDR Limit | | 2,000 | 110 | 800 | 1 | 1 | 10 |
| 2019 | January | 1190 | *118* | 427 | 0.752 | 0 | 7.07 |
| | February | 1370 | *125* | 569 | 0.889 | 0 | 7.95 |
| | March | 1250 | *129* | 511 | 0.74 | 0.02 | 3.74 |
| | April | 1270 | *126* | 500 | 0.766 | 0.01 | 7.48 |
| | May | 1280 | *119* | 474 | 0.842 | 0.02 | 4.62 |
| | June | 1250 | *124* | 521 | 0.694 | 0.04 | 5.24 |
| | July | 1180 | *122* | 482 | 0.685 | 0.2 | 0.54 |
| | August | 1200 | *116* | 457 | 0.846 | 0.04 | 1.58 |
| | September | 1150 | *112* | 437 | 0.787 | ND | 0.7 |
| | October | 1200 | *114* | 446 | 0.673 | ND | 1.5 |
| | November | 1270 | *117* | 435 | 0.736 | 0.03 | 9.07 |
| | December | 1160 | *116* | 413 | 0.684 | 0.02 | 7.36 |
| | | | | | | | |
| 2020 | January | 1270 | *120* | 458 | 0.77 | 0.03 | 5.31 |
| | February | 1230 | *121* | 458 | 0.689 | 0.04 | 4.38 |
| | March | 1220 | *122* | 458 | 0.72 | 0.03 | 1.62 |
| | April | 1300 | *126* | 481 | 0.798 | 0.03 | 6.22 |
| | May | 1250 | *120* | 469 | 0.77 | ND | 2.51 |
| | June | 1250 | *118* | 444 | 0.631 | 0.05 | 4.42 |
| | July | 1260 | *116* | 421 | 0.759 | 0.03 | 4.13 |
| | August | 1220 | *116* | 418 | 0.723 | 0.03 | 3.44 |
| | September | 1210 | *117* | 432 | 0.659 | 0.05 | 4.8 |
| | October | 1240 | *116* | 451 | 0.781 | 0.07 | 5.4 |
| | November | 1190 | *118* | 381 | 0.848 | 0.04 | 7.8 |
| | December | 1200 | *118* | 421 | 0.775 | ND | 8.86 |
| | | | | | | | |
| 2021 | January | 1210 | *113* | 444 | 0.766 | ND | 5.31 |
| | February | 1250 | *122* | 449 | 0.984 | ND | *17.9* |
| | March | 1260 | *128* | 400 | 0.772 | ND | 8.32 |
| | April | 1250 | *112* | 467 | 0.737 | 0.05 | 9.4 |
| | May | 1250 | *117* | 414 | 0.835 | 0.04 | 8.6 |
| | June | 1310 | *115* | 414 | 0.729 | <0.1 | 6.7 |
| | July | 1260 | 106 | 447 | 0.77 | 0.02 | 9.9 |
| | August | 1220 | 107 | 422 | 0.874 | 0.03 | 6.1 |
| | September | 1210 | 110 | 427 | 0.711 | 0.03 | 9.6 |
| | October | 1240 | 104 | 453 | 0.874 | 0.03 | 7.71 |
| | November | 1240 | 97 | 457 | 0.849 | 0.03 | *11.7* |
| | December | 1210 | 109 | 383 | 0.849 | 0.03 | *10.2* |
| | | | | | | | |

DRAFT

| | | Total Dissolved Solids (mg/L) | Chloride[1] (mg/L) | Sulfate (mg/L) | Boron (mg/L) | Nitrite-N (mg/L) | Ammonia-N + Nitrate-N + Nitrite-N (mg/L) |
|---|---|---|---|---|---|---|---|
| WDR Limit | | 2,000 | 110 | 800 | 1 | 1 | 10 |
| 2022 | January | 1240 | 105 | 493 | 0.914 | 0.2 | 3.57 |
| | February | 1220 | 107 | 409 | 0.776 | 0.03 | 9.4 |
| | March | 1200 | 109 | 442 | 0.866 | 0.04 | 6.4 |
| | April | 1200 | 110 | 387 | 0.833 | 0.07 | 7.06 |
| | May | 1260 | 101 | 407 | 0.612 | ND | 6.8 |
| | June | 1220 | 106 | 394 | 0.763 | 0.02 | 8.7 |
| | July | 1240 | 108 | 420 | 0.794 | 0.04 | *16.85* |
| | August | 1250 | 101 | 418 | 0.91 | 0.05 | *22.3* |
| | September | 1230 | 109 | 435 | 0.962 | 0.3 | 8.5 |
| | October | 1200 | *118* | 400 | *1.15* | 0.04 | 5.54 |
| | November | 1230 | *120* | 469 | 0.832 | 0.04 | 8 |
| | December | 1170 | *116* | 445 | 0.836 | ND | *11.2* |
| | | | | | | | |
| 2023 | January | 1380 | *116* | 556 | 0.994 | 0.03 | 7.18 |
| | February | 1290 | *124* | 457 | 0.881 | 0.04 | 4.4 |
| | March | 1420 | *116* | 584 | *1.12* | 0.03 | 8.9 |
| | April | 1390 | *121* | 543 | 0.921 | 0.02 | *13.62* |
| | May | 1310 | *124* | 418 | 0.852 | ND | *11.3* |
| | June | 1250 | *122* | 458 | 0.089 | ND | 9.3 |
| | July | 1390 | *116* | 543 | 0.921 | 0.02 | *13.62* |
| | August | 1290 | *113* | 446 | 0.909 | <0.1 | 6.3 |
| | September | 1230 | *114* | 472 | 0.9 | 0.03 | 6.5 |
| | October | 1260 | *115* | 456 | 0.755 | ND | 7.5 |
| | November | 1250 | *122* | 476 | 0.972 | 0.03 | 8.03 |
| | December | 1240 | *120* | 462 | 0.854 | 0.03 | 7.7 |

Notes:
1. Exceedances are underlined and italicized.
2. ND = Not detected

DRAFT

# Appendix G – WRF Condition Assessment Checklist

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

Name of Observer: Mike Nunley, PE

WWTP Name: Santa Paula Water Recycling Facility

Date: 7/27/23

Personnel: Pete, Ethan

Weather: Clear

Year Built/Improved: 2010

As-Builts Available: Yes

Design Capacity: 4.1 MGD

**Item**

## Influent Pump Station

**Mechanical**

- Lifting chain corroded - needs to be replaced
- Check valves on lift station have issues
- Volutes are in good shape (VRSO, CPO)
- Lift station pumps are the original pumps - evaluate pumps to repair or replace

**Instrumentation**

- Seal failure
- No local HMI

**Electrical**

- Consider changing cords out

**Structural**

- Concrete/liners in bad shape - haven't been in ILS
- Aluminum cover - should be fiberglass, support brackets are failing
- Spalling of slab near influent meter
- Replace manhole cover and ring
- Influent flow weir is worn concrete, no metal protection
- Influent channel needs to be repaired and relined

## Influent Pump Station (Continued)

**Safety**

- Need harnesses, hoists, blowers, gas detectors (confined space equipment; VRSD is currently charging for their own equipment)
- Grating worn
- No fall arrest on any ladder

**Operator Notes and Observations**

- N/A

## Grit Removal/Coarse & Fine Screens

**Mechanical**

- #2 Grit classifier failing - stainless steel rotting out, wear plates missing and need to be replaced
- Total of 2 coarse screen, 2 fine screens, 2 classifiers
- Need manufacturer's maintenance, bearing replacement, screens and augers

**Instrumentation**

- Total of 2 space level transducer, 6 endress hauser panels
- H2S gas causing problem w/ electrical cords + panels
- H2S will damage Huber stainless equipment

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## Grit Removal/Coarse & Fine Screens (Cont.)

**Electrical**
- N/A

**Structural**
- N/A

**Safety**
- N/A

**Operator Notes and Observations**
- Replaced bagging system, which has been working well - less dumpster corrosion

## Flow Equalization Tank 1

**Mechanical**
- No aeration

**Instrumentation**
- Pacing used to be automatic; now operator has to log in every night for shaving
- SCADA needs to be set to work automatically with flow rates, auto shaving

**Electrical**
- Conduit getting corroded (intermittent)

**Structural**
- EQ weirs - concrete doesn't have knife's edge, worn
- Aluminum & orange grating needs to be replaced

**Safety**
- N/A

**Operator Notes and Observations**
- N/A

## Flow Equalization Tank 2

**Mechanical**
- N/A

**Instrumentation**
- N/A

**Electrical**
- N/A

**Structural**
- EQ weirs - concrete doesn't have knife's edge, worn
- Aluminum & orange grating needs to be replaced

**Safety**
- N/A

**Operator Notes and Observations**
- Rarely used; except when plant has high flow events

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## Anoxic Tanks

**Mechanical**

- April/May - exceeded NO3 due to failed RAS/WAS pump
- EQ valve in #3 failed - can now be isolated with first 2 valves

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- Top 3 ft starting to corrode

**Safety**

- N/A

**Operator Notes and Observations**

- N/A

## Aeration Tanks

**Mechanical**

- Need RAS spare pump
- Issues with mixers in RAS + WAS tangling, rails bending, skewed, cut up cables etc.

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- Upper 3-4 ft in general are worn - potential need for coating
- Tank 1 has scars from mixer

**Safety**

- N/A

**Operator Notes and Observations**

- Working well

## Thickeners/Screw Press

**Mechanical**

- Self clean not working - won't run in reverse for cleaning, brushes worn out - needs maintenance
- Oil box needs 10 year overhaul
- Feed pump doesn't prime well
- Rotary lobe pumps feed thickener + press, rotary lobe pumps have worn plates
- Replace bristles

**Instrumentation**

- N/A

**Electrical**

- N/A

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## Thickeners/Screw Press (Cont.)

**Structural**
- N/A

**Safety**
- N/A

**Operator Notes and Observations**
- Needs redundancy
- Need second unit
- Auger to trailer needs maintenance

## Aerobic Digesters

**Mechanical**
- Both blowers working
- Software not compatible with old blower - microsoft doesn't cover HMIs anymore - results in needing new inverter

**Instrumentation**
- N/A

**Electrical**
- N/A

**Structural**
- N/A

**Safety**
- N/A

**Operator Notes and Observations**
- N/A

## Membrane Separation Tanks

**Mechanical**
- One blower (MBR #1) shuts off randomly at times
- Return channel - blower not sized adequately

**Instrumentation**
- #2 WAS pump fault - turns off
- Tie citric acid pump into MBR PLC
- MBR PLC #M needs redundant back up just like PLC A&B (not in back up PLC list order #1)

**Electrical**
- N/A

**Structural**
- Coatings starting to chip off

**Safety**
- N/A

**Operator Notes and Observations**
- Tie citric acid pump into MBR PLC
- Permeate pumps need to be evaluated and rebuilt
- Operators prefer separate turbidity meters for each train on MBR

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## UV Disinfection

**Mechanical**

- Only 3 out of 5 modules are seeing flow
- Replaced 2/3 of bulbs
- Lot of shattered bulbs
- Bulbs at 30,000 hrs - should be replaced at 12,000 hrs per manufacturer recommendation

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- N/A

**Safety**

- N/A

**Operator Notes and Observations**

- 3 modules in use at any time
- Recently maintenance had shattered valves
- Electronics need to be replaced - many back panels not working

## Percolation Pond Diversion Structure

**Mechanical**

- N/A

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- N/A

**Safety**

- N/A

**Operator Notes and Observations**

- N/A

## Percolation Pond

**Mechanical**

- Irrigation system not working - cracked pipeline

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- N/A

**Safety**

- N/A

**Operator Notes and Observations**

- Water is beginning to pool in one pond
- Rocks, etc. need to be cleared out
- Replace liners (rips in ponds), perform weed control

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## Biofilter

**Mechanical**
- N/A

**Instrumentation**
- N/A

**Electrical**
- N/A

**Structural**
- N/A

**Safety**
- N/A

**Operator Notes and Observations**
- N/A

## Controls Building

- No insulation on roof
- Windows - leak in control room
- Screens damaged - replace
- Doors - repaint; door locks damaged
- Paint trim
- Fire alarm system - replace panel; smoke detector in building failed
- Two HVAC units need to be replaced
- Lighting poor - replace with LEDs; ballasts need to be replaced

## Headworks Building

- No insulation on roof
- Windows - leak in control room
- Screens damaged - replace
- Doors - repaint; door locks damaged
- Paint trim
- Lighting poor - replace with LEDs; ballasts need to be replaced

## Decorative Pond

- Remove sludge
- Replace transformer
- Need new sump pumps
- New exhaust fan - should be automatic when vault opens and current one is not
- Repair circ. pump and valves
- Fix water leaks into vault
- New pond lights
- Liner is in ok condition
- Ladder rusting
- Hatch is in good condition

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## General Observations

- Dump Station - not used and they do not plan on using it in the future
- Crane - needs maintenance and load certification
- Concrete spalled on pad for old odor control system - repair
- Reuse line - a lot of movement on startup
- Operators requested new tools - tap and die set (SAE and Metric), multi-function welder for SS, electric winches for gantry, blower, battery rachet
- Portable ladders - old, worn out, sun damaged; all fixed ladders are good
- Add rolling stair for sludge truck - 12 foot step ladder unsafe
- Effluent meter - no weir/flume, does not measure accurately
- Paint condition is poor throughout plant
- Blowers need to be replaced or rebuilt in general
- Wasting pumps have problems with SCADA on start
- Generator needs service, filters, hoses, fuel polish, batteries, oil change, and paint
- Transfer switch needs service
- Irrigation system timer runs numerous cycles a day, should only be running once (needs replacement)

DRAFT

# Appendix H – WRF Condition Assessment Photos

DRAFT

# Headworks

Fine Screen Unit

Coarse Screen Unit

Grit Classifier

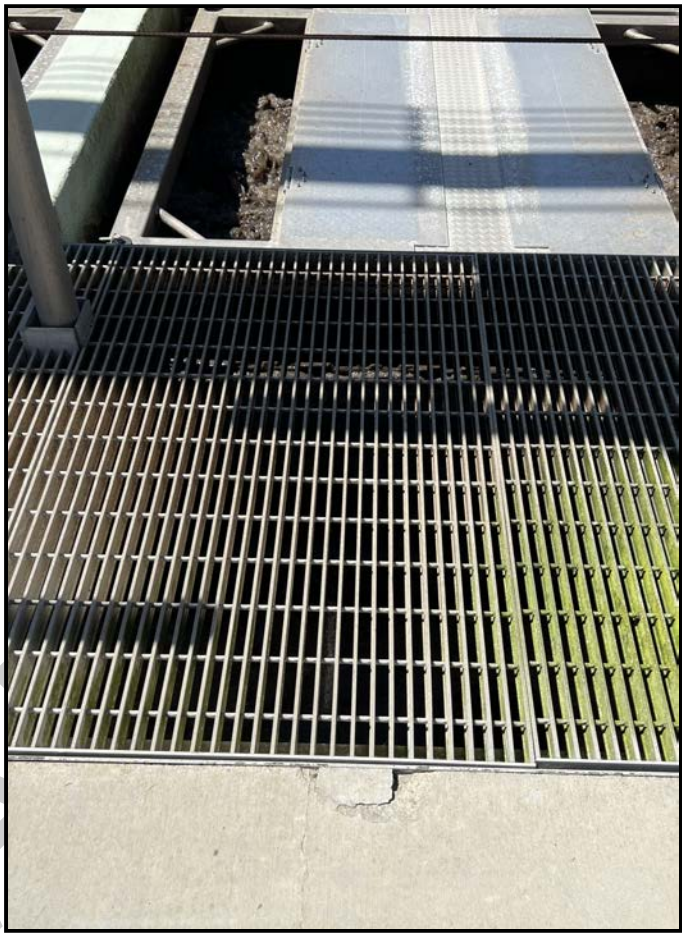
# Dewatering

Screw Press

Thickener Feed Pump

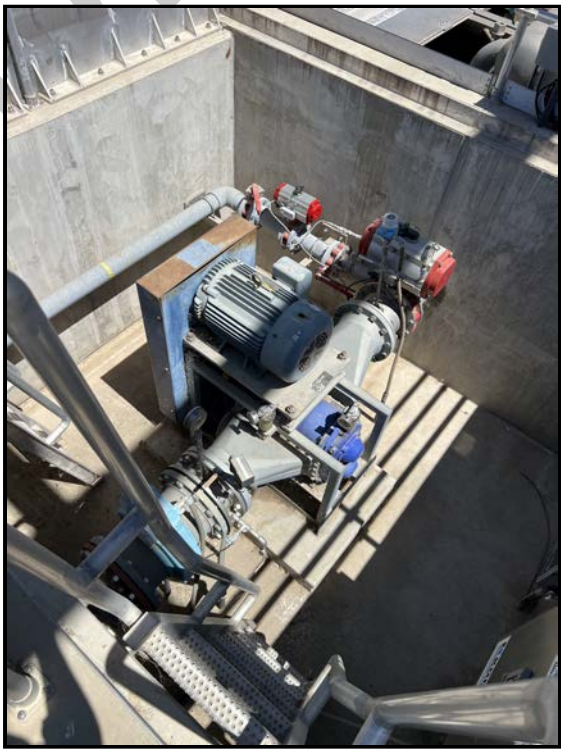
Gravity Belt Thickener

# MBR Basins



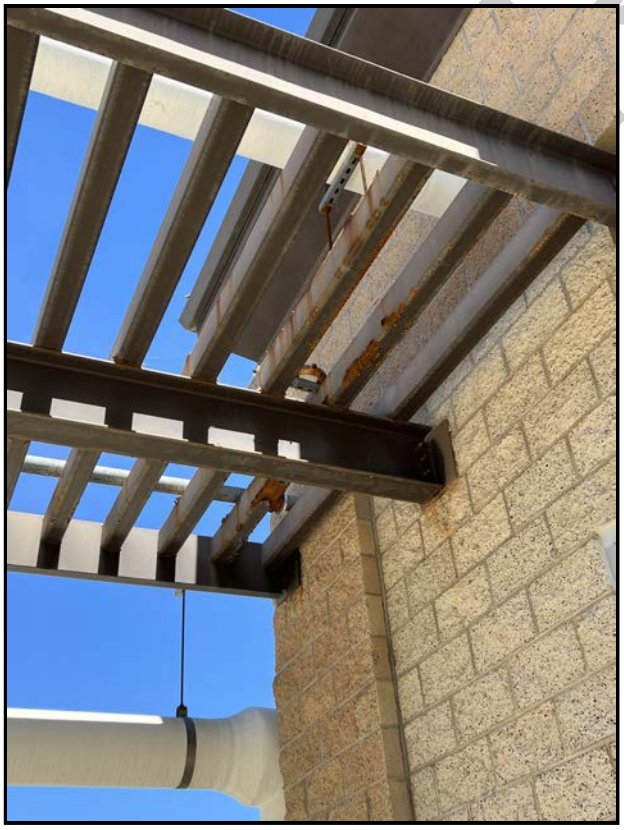
MBR Basins

Permeate Pump



DRAFT

# Headworks/Dewatering and Controls Building



DRAFT

# UV Disinfection

CIP Pump

UV Channels

RO Low Pressure Pump

UV Module Instrumentation

# Appendix I – MBR Process Design Calculations

DRAFT

# Existing Conditions

MBR WW Treatment Process Design Calculations - U.S. Units
User Inputs and Constants

WW INFORMATION

## I. Wastewater Parameters/Characteristics

Enter values in yellow cells only.

| | | | | | |
|---|---|---|---|---|---|
| Design ww Flow Rate, $Q_o$ = | 3.00 | MGD | Influent TSS, $TSS_o$ = | 329 | mg/L |
| Influent BOD, $BOD_o$ = | 420 | mg/L | Influent VSS, $VSS_o$ = | 260 | mg/L |
| Influent sBOD, $sBOD_o$ = | 168 | mg/L | | | |
| | | | Influent TKN, $TKN_o$ = | 70 | mg/L |
| Influent COD, $COD_o$ = | 857 | mg/L | TKN peak/ave factor, **FS** = | 1.0 | |
| Influent sCOD, $sCOD_o$ = | 129 | mg/L | Influent $NH_4$-N, $NH_4$-$N_o$ = | 42 | mg/L |
| Influent rbCOD, $rbCOD_o$ = | 86 | mg/L | Influent Alkalinity, $Alk_o$ = (mg/L as $CaCO_3$) | 300 | |
| ratio, **bCOD/BOD** = | 1.6 | | Aeration WW Temp, $T_{ww}$ = | 66.2 | °F |

BIOL. KINETIC COEFFICIENTS

## II. Biological Kinetic Coefficients - For BOD Removal

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., **Y** = | 0.40 | lb VSS/lb bCOD | Half Veloc. Coeff., $K_s$ = | 20 | mg/L |
| Temp coeff., q, for mm = | 1.07 | | Temp coeff., q, for kd = | 1.04 | |
| | | | Resid. biomass fract., $f_d$ = | 0.15 | |
| Max spec. gwth rate at 20°C, $\mu_{m20}$ = | 6 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{d20}$ = | 0.12 | lb VSS/d/lb VSS | | | |

## III. Biological Kinetic Coefficients - For Nitrification

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., $Y_n$ = | 0.12 | lb VSS/lb NOx | | | |
| Temp coeff., q, for mmn = | 1.070 | | Half Veloc. Coeff. at 20°C, $K_n$ = | 0.7 | mg/L |
| Temp coeff., q, for kdn = | 1.040 | | Half Veloc. Coeff. at 20°C, $K_o$ = | 0.5 | mg/L |
| Temp coeff., q, for Kn = | 1.053 | | Temp coeff., q, for Ko = | 1 | |
| Max spec. gwth rate at 20°C, $\mu_{mn20}$ = | 0.8 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{dn20}$ = | 0.08 | lb VSS/d/lb VSS | | | |

CONSTANTS

## IV. Constants Used in the Calculations

| | | | | | |
|---|---|---|---|---|---|
| Ratio of $BOD_5$ to $BOD_u$, **f** = | 0.68 | | Saturation D.O. in water at 20°C & 1 atm, $C_{ss}$ = | 9.17 | mg/L |
| $BOD_u$ equiv. of VSS = | 1.42 | lb $BOD_u$/lb VSS | Standard Pressure = | 14.7 | psi |
| Spec Wt of water, $\gamma_{H2O}$ = | 62.4 | lb/ft$^3$ | Standard Temperature = | 68.0 | °F |
| Mol. Wt. of Air = | 28.97 | | Mol. Wt. of Oxygen = | 32.0 | |
| Temp Coeff. for $O_2$ rate, $\theta$ = | 1.024 | | $O_2$ mole fraction in Air = | 0.209 | |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

DRAFT

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

**Activated Sludge Kinetic Coefficients for heterotrophic bacteria at 20°C (for BOD removal)**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_m$ | kg VSS/day/kg VSS | 3.0 - 13.2 | 6.0 |
| $K_s$ | mg/L bCOD | 5.0 - 40.0 | 20.0 |
| Y | kg VSS/day/kg bCOD | 0.30 - 0.50 | 0.40 |
| $k_d$ | kg VSS/day/kg VSS | 0.06 - 0.20 | 0.12 |
| $f_d$ | dimensionless | 0.08 - 0.20 | 0.15 |
| θ values for temperature corrections | | | |
| for $\mu_m$ | dimensionless | 1.03 - 1.08 | 1.07 |
| for $k_d$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_s$ | dimensionless | 1.00 | 1.00 |

The source for the values in the table above is:
Introduction to Water Resource Recovery Facility Design, 2nd Ed., Table 6.1

**Activated Sludge Nitrification Kinetic Coefficients at 20°C**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_{mn}$ | kg VSS/day/kg VSS | 0.2 - 0.90 | 0.75 |
| $K_n$ | mg/L $NH_4$-N | 0.50 - 1.0 | 0.74 |
| $Y_n$ | kg VSS/kg $NH_4$-N | 0.10 - 0.15 | 0.12 |
| $k_{dn}$ | kg VSS/day/kg VSS | 0.05 - 0.15 | 0.08 |
| $K_o$ | mg/L | 0.40 - 0.60 | 0.50 |
| θ values for temperature corrections | | | |
| for $\mu_{mn}$ | dimensionless | 1.06 - 1.123 | 1.07 |
| for $k_{dn}$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_n$ | dimensionless | 1.03 - 1.123 | 1.053 |

The source for the values in the table above is:
Introduction to Water Rsource Recovery Facility Design, 2nd Ed., Table 6.2

MBR WW Treatment Process Design Calculations - U.S. Units
Membrane Module Sizing Calculations

INPUTS

## I. Membrane/Membrane Module Parameters

(Values typically available from membrane manufacturer or vendor - Enter values in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Module packing density, $\phi$ = | 182 | $m^2/m^3$ | equals | 55.5 | $ft^2/ft^3$ |
| Specific Aer. Demand, $SAD_M$ = | 0.2 | $m^3$ air/hr/$m^2$ membrane | | | |
| | | equals | 0.656 | $ft^3$ air/hr/$ft^2$ membrane | |

CALCULATIONS

## II. Process Design Calculations (done by worksheet)

| | | | | | |
|---|---|---|---|---|---|
| Membrane Flux, **J** = | 21.1 | L/hr/$m^2$ | equals | 0.518 | gal/hr/$ft^2$ |
| Membrane Area, $A_M$ = | 241,123 | $ft^2$ | | | |
| Membrane Module Vol., $V_M$ = | 4,347 | $ft^3$ | | | |
| Scouring Air Flow Required = | 2,637 | $ft^3$/min (ACFM) = | | 2,625 | SCFM |

**(This is the scouring air flow rate needed for the membrane module, typically provided by a coarse bubble diffuser system.)**

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

Values given for MBR specific area (module packing density) range from 150 -334 $m^2/m^3$ in Table 8-35 of Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery, 5th Ed.,* McGraw-Hill, 2014

**Equations Used in the Calculations:**

Module packing density, $\phi$, in $ft^2/ft^3$ = ($\phi$ in $m^2/m^3$)/3.28084

Specific Aeration Demand, $SAD_M$, in $ft^3$ air/hr/$ft^2$ membrane =
= $SAD_M$ in $m^3$ air/hr/$m^2$ membrane/3.28084

Membrane Flux, **J**, in L/hr/$m^2$ = $0.4056T_{ww} - 5.7278$ (with $T_{ww}$ in $^oF$)
(See Worksheet 6 for derivation of this eqution)

Membrane Flux, **J**, in gal/hr/$ft^2$ = [(Membrane Flux (**J**) in L/hr/$m^2$)/3.7854]/($3.28084^2$)

Membrane Area, $A_M = (Q_o*10^6/24)/J$

Membrane Module Volume, $V_M = A_M/\phi$

Scouring Air Flow Required, **ACFM** = $(SAD_M)(A_M)/60$ ACFM

Scouring Air Flow Req'd, **SCFM** = (**ACFM**)[($T_{std}$ + 459.67)/($T_{ww}$ + 459.67)]($P_{atm}/P_{std}$) SCFM

DRAFT

# MBR WW Treatment Process Design Calculations - U.S. Units

BOD Removal and Nitrification

INPUTS

## I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| | | | Target Effluent Concentrations: | | |
| MLSS in Aer Tank, **MLSS** = | 8,500 | mg/L | **$BOD_e$** = | 10 | mg/L |
| MLSS in Waste Sludge, **$X_w$** = | 8,500 | mg/L | **$TSS_e$** = | 10 | mg/L |
| DO in Aer. Tank, **$DO_o$** = | 2 | mg/L | **$NH_4$-$N_e$** = | 1.0 | mg/L |
| Number of Aeration Tanks = | 2 | | Tank Freeboard = | 2.0 | ft |
| Liquid Depth in Tank = | 22 | ft | Tank L:W ratio = | 2.3 | |
| Initial Estimate of **$NO_x$** = | 44.93 | mg/L | **(Tank L:W ratio is only used for rectangular tanks)** | | |
| **Note that an initial estimate is needed for $NO_x$ in cell D14 to start an iterative calculation of $NO_x$ below. 80% of the influent TKN is suggested for this initial estimate.** | | | Influent TKN, **$TKN_o$** = | 70 | mg/L |
| | | | (value transferred from Worksheet 2) | | |
| **80% of $TKN_o$ =** | 56.0 | mg/L | | | |

PROCESS DESIGN CALCULATIONS

## II. Calculate Design SRT

| | | | | | |
|---|---|---|---|---|---|
| $\mu_{mn}$ at $T_{ww}$ = | 0.70 | lb VSS/d/lb VSS | $K_n$ at $T_{ww}$ = | 0.70 | mg/L |
| $k_{dn}$ at $T_{ww}$ = | 0.08 | lb VSS/d/lb VSS | Theor. SRT = | 3.96 | days |
| $\mu_n$ = | 0.25 | lb VSS/d/lb VSS | Design **SRT** = | 3.96 | days |

## III. Calculate the Biomass Production Rate

| | | | | | |
|---|---|---|---|---|---|
| $\mu_m$ at $T_{ww}$ = | 5.61 | lb VSS/d/lb VSS | **bCODo** = | 672 | mg/L |
| $k_d$ at $T_{ww}$ = | 0.1154 | lb VSS/d/lb VSS | **S** = | 1.404 | mg bCOD/L |
| Biomass Production Rate, $P_{x,bio}$ = | 5029 | lb VSS/day | | | |

## IV. Determine the Amount of Nitrogen Oxidized to Nitrate

| | | |
|---|---|---|
| Calculated amount of nitrogen oxidized to nitrate, $NO_x$ = | 44.932 | mg/L |
| Difference between estimated and calculated values $NO_x$ = | 0.00000 | mg/L |
| **Goal Seek Result:** | | |
| Amount of nitrogen oxidized to nitrate, $NO_x$ = | **44.93** | mg/L |

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $NO_x$ value as follows: Place the cursor on the green cell G42 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell:" G42, "To value:" 0, "By changing cell:" D14, and click on "OK". The calculated value of $NO_x$ will appear in cell F44 and G42 should be zero if the process worked properly. Note that cell D14 needs an initial estimate for $NO_x$ in order for the iterative solution to work properly.**

## IV. Calc. the Prod. Rate and Mass of VSS and TSS in Aeration Basin

| | | | | | |
|---|---|---|---|---|---|
| **bpCOD/pCOD** = | 0.554 | | **nbVSS** = | 115.9 | mg/L |
| Aeration Tank VSS Production Rate, $P_{X,VSS}$ = | 7928 | lb VSS/day | | | |
| Aeration Tank TSS Production Rate, $P_{X,TSS}$ = | 9656 | lb TSS/day | | | |
| Mass of **MLVSS** = | 31,413 | lb VSS | Mass of **MLSS** = | 38,258 | lb TSS |

AER. TANK CALC'NS

## V. Aeration Tank Calculations (User input needed in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Req. Aeration Vol., $V_{aer,min}$ = | 72,149 | $ft^3$ | **Click on green box & then on the arrow to select tank shape** | **rectangular** | |
| Aer. + Membr. Vol., $V_{tot}$ = | 76,496 | $ft^3$ | | | |
| Req. Vol. per tank, $V_{tank}$ = | 38,248 | $ft^3$ | **Actual Tank Width =** | 38.3 | ft |
| Calculated Tank Width = | 27.6 | ft | **Actual Tank Length =** | 71.8 | ft |
| Calculated Tank Length = | 63.9 | ft | Act. Aer. Vol., $V_{aer,act}$ = | 57,500 | $ft^3$ |
| Tank Wall Height = | 23.7 | ft | Memb. Mod. Vol/Tank: | 2,173 | $ft^3$ |
| Aer. Detention Time, $\tau_{aer}$ = | 6.9 | hr | **MLVSS** = | 6,979 | mg/L |
| Vol. BOD Loading = | 91.4 | lb BOD/d/1000 $ft^3$ | | | |
| **F:M** ratio = | 0.210 | lb BOD/d/lb MLVSS | | | |
| Sludge Wasting Rate, $Q_w$ = | 217,112 | gal/day | | | |

OXYGEN/AIR/BLOWER REQUIREMENTS

## VI. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| Standard $O_2$ transf. Effic., **SOTE** = (from diffuser mfr or vendor) | 30.0% | | Design Elevation above Sea Level, **Elev** = | 225 | ft |
| | | | ambient air Temp., $T_{amb}$ = | 70 | °F |
| Ratio of oxygen transfer rate in wastewater to that in clean water, $\alpha$ = | 0.5 | | Diffuser Fouling Factor, **F** = | 0.8 | |
| Ratio of D.O. saturation in ww to that in clean water at same T & P, **B** = | 1.0 | | Depth of Diffuser, $d_{diff}$ = | 21.7 | ft |
| D.O sat'n conc. for clean water at ww temp. & 1 atm, $C_s$ = | 9.3 | mg/L | Pressure drop across diffuser, $\Delta P_{diff}$ = (from diffuser mfr or vendor) | 10.8 | in $H_2O$ |

**NOTE:** Derivation of the equation for $C_s$ as a function of $T_{ww}$ is shown in wksht 7.

## VII. Air Requirement/Blower Design Calculations

| | | | | | |
|---|---|---|---|---|---|
| Barom. Pressure, $P_{atm}$ = | 14.6 | psia | Des. Air Flow Rate, **SCFM:** | **4,311** | **scfm** |
| Pressure at Mid Depth, $P_D$ = | 19.3 | psia | | | |
| Standard Air Density, $\rho_{air}$ = (from Ideal Gas Law) | 0.07521 | $lb/ft^3$ | Des. Air Flow Rate, **ACFM:** (at delivery point) | **2591** | **acfm** |
| $O_2$ Utilization Rate, $m_{O2}$ = | 8,976 | lb/day | Blower Outlet Press., $P_{B2}$ = | **24.38** | **psia** |
| Actual $O_2$ transf. Efficiency, **AOTE** = | 8.33% | | | | |

**(This is the air flow rate needed for the aeration tank, typically provided by a fine bubble diffuser system.)**

ALKALINITY REQUIREMENT

## VIII. User Inputs and Constants - Enter value in yellow cell only

| | | |
|---|---|---|
| Target Effluent Alkalinity = | 20 | mg/L as $CaCO_3$ |
| Equiv. Weight of $CaCO_3$ = | 50 | g/equiv. |
| Equiv. Weight of $NaHCO_3$ = | 84 | g/equiv. |
| Alkalinity used for Nitrification = | 7.14 | g $CaCO_2$/g $NH_3$-N |

## IX. Calculation of Alkalinity Requirement

| | | |
|---|---|---|
| Alkalinity used for Nitrification = | 320.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 40.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 1,021 | lb/day as $CaCO_3$ |
| Sodium Bicarbonate needed per day to maintain alkalinity = | 1,716 | lb/day $NaHCO_3$ |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

rectangular
cylindrical

### Discussion and References

**For background information about Membrane Bioreactors (MBRs) see:**

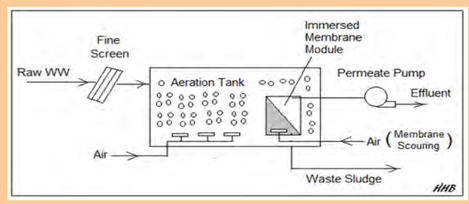
Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

As noted in all four of the above references, MLSS and $X_w$ for MBR processes are typically in the range from 8,000 to 12,000 mg/L.




**Flow Diagram - Membrane Bioreactor for BOD Removal & Nitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process

Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

**Equations Used in the Calculations:**

$\mu_{mn}$ at $T_{ww}$ = $(\mu_{mn_20})*\theta_{\mu mn}^{[(Tww-32)/1.8)-20]}$
$k_{dn}$ at $T_{ww}$ = $(k_{mn_20})*\theta_{Kdn}^{[(Tww-32)/1.8)-20]}$
$K_n$ at $T_{ww}$ = $(K_{n_20})*\theta_{Kn}^{[(Tww-32)/1.8)-20]}$

$\mu_n = [\mu_{mn}*NH_4\text{-}N_e/(K_n + NH_4\text{-}N_e)]*[DO_o/(0.5 + DO_o)] - k_{dn}$

Theor. **SRT = $1/\mu_n$**
Design **SRT = (**Theor. **SRT)FS** ( **FS** = TKN Peak/Ave Factor )

$\mu_m$ at $T_{ww}$ = $(\mu_{m_20})*\theta_{\mu m}^{[(Tww-32)/1.8)-20]}$
$k_d$ at $T_{ww}$ = $(k_{m_20})*\theta_{kd}^{[(Tww-32)/1.8)-20]}$ **bCODo = 1.6*BODo**

$S = K_s*[1 + (k_d*SRT)]/[SRT*(\mu_m - k_d) - 1]$

$P_{x,bio} = (Q_o*Y*(\mu_m - k_d)*8.34/(1 + (k_d*SRT)))$
$+ (f_d*k_d*Q_o*Y*(\mu_m - k_d)SRT*8.34/(1 + (k_d*SRT)))$
$+ (Q_o*Y_n*NO_x*8.34/(1 + (k_{dn}*SRT)))$

$NO_x = TKN_o - NH_4\text{-}N_e - [(0.12\ P_{x,bio}/8.34)/Q_o]$

$bpCOD/pCOD = (bCOD/BOD)*(BOD_o - sBOD_o)/(COD_o - sCOD_o)$

$nbVSS = [1 - (bpCOD/pCOD)]VSS_o$

$P_{x,VSS} = P_{x,bio} + (Q_o*nbVSS*8.34)$ $P_{x,TSS} = P_{x,VSS} + [Q_o(TSS_o - VSS_o)8.34]$

Mass of **MLVSS** = $P_{X,VSS}$*SRT Mass of **MLSS** = $P_{X,TSS}$*SRT

Required Aeration Volume = $V_{aer,min}$ = (Mass of MLSS/(MLSS*8.34))*($10^6$/7.48)

Aeration Detntion Time, $\tau = (V_{aer,act}*7.48/10^6)*N*24/Q_o$

Vol. BOD Loading = $Q_o*BOD_o*8.34/((V_{aer,act}/1000)*N)$

MLVSS = MLSS(Mass of MLVSS/Mass of MLSS)

F:M ratio = $Q_o*8.34*BOD_o/((MLVSS*8.34*(V_{aer,act}*7.48/10^6)*N))$

$Q_w = ((N*V_{aer,act}*7.48/10^6)*MLSS/(SRT*X_w))*10^6$

**Air Requirement/Blower Design Calculations**

$P_{atm} = 14.696*EXP[-32.17*MW_{air}*Elev/(g_c*R*T_{amb})]$

This equation for $P_{atm}$ as a function of elev. above sea level and ambient temperature comes from:
Water Reuse: Issues, Technologies, and Applications, Sec. 2.2

$P_D = P_{atm} + (62.4*d_{diff}/2)/144$ $\rho_{air} = MW_{air}*P_{std}/(10.73*(T_{std} + 459.67))$

lb/day $O_2$: $m_{O2} = Q_o*8.34*(BOD_o - BODe)/f - (1.42*P_{x,VSS}) + (4.57*Q_o*8.34*NO_x)$

This equation for oxygen utilization rate comes from:
Nalco Water Handbook, 4th Ed., Ch. 23 Eqns 23.6 and 23.7

The equation below for the actual oxygen transfer efficiency, AOTE, is found as
Design of Water Resource Recovery Facilities, 6th Ed., Equation 12.32

$$AOTE = SOTE\ \alpha\ F\ \frac{\left(B\left(\frac{P_D}{P_{std.}}\right)C_s - C_L\right)}{C_{ss}}\ \theta^{(Tww-20)}$$

**Note that for use in this equation Tww must be converted to °C**

Design Air Flow Rate, **SCFM = $(m_{O2}/AOTE)*MW_{air}/(O_2_mole\ fraction*MW_O_2*\rho_{air}_std*60*24$**

Design Air Flow Rate, **ACFM = SCFM*$(P_{std}/P_{blower})*((T_{ww} + 459.67)/(T_{std} + 459.67))$**

Blower Outlet Press., $P_{B2} = P_{atm} + \Delta P_{diff}*0.036126 + 62.4*d_{diff}/144$

Alkalinity used for Nitrification, **$Alk_{Nitrif}$ = 7.14*NOx mg/L as $CaCO_3$**

Alkalinity needed = **$Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$ mg/L as $CaCO_3$**

Alkalinity needed **Alk_perday = ($Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$)Qo*8.34 lb/day as $CaCO_3$**

Sodium Bicarbonate needed to maintain alkalinity = **Alk_perday*84/50 lb/day $NaHCO_3$**

MBR WW Treatment Process Design Calculations - U.S. Units
PreAnoxic Denitrification

**This worksheet makes the design calculations for preanoxic denitrification basin(s) to go with the Aeration Tank(s) designed for BOD removal and Nitrification in Worksheet 4. (Wastewater parameters/characteristics and biological kinetic coefficients entered on Worksheet 2 will also be used in this worksheet)**

INPUTS

## I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| Effluent Nitrate conc., $N_e$ = | 5.0 | mg/L | Mixing Energy | | |
| Nitrate conc. in RAS, $N_{RAS}$ = | 5.0 | mg/L | for Anoxic Reactor = | 0.38 | $hp/10^3\ ft^3$ |
| Temp. Coeff. For **SDNR** = | 1.026 | . | Design % Excess | | |
| Tank Freeboard = | 2.3 | ft | Nitrif. Capacity = | 2% | |
| No. of Anoxic Tanks, $N_{an}$ = | 2 | . | Liquid Depth in Tank = | 22 | ft |
| Est. of detention time, $t_{an}$ = | 0.9654 | hr | Tank L:W ratio = | 1 | |

**Note that an initial estimate is needed for anoxic detention time in cell D19 to start an iterative calculation of minimum required anoxoc detention time below.**

**(Tank L:W ratio is only used for rectangular tanks)**

PROCESS DESIGN CALCULATIONS

## II. Calculate RAS Ratio and Anoxic Tank Active Biomass Conc.

| | | | | |
|---|---|---|---|---|
| RAS ratio, **RAS** = | 7.99 | Aer. Tank Act. Biomass, $P_{xb}$ = | 4609 | lb/d |
| An. Tank MLSS, $MLSS_{AN}$ = | 7554 | mg/L | | |
| Aeration Tank Active Biomass Fraction, $X_{aer,b}$ = | | 0.4773 | | |
| Anoxic Tank Active Biomass Conc., $X_{an,b}$ = | | 3606 | mg/L | |

## III. Calc Feed Rate of $NO_x$ to Anoxic Tank and Anoxic Tank Volume

| | | | | |
|---|---|---|---|---|
| Flow rate to Anoxic Tank = | 24.0 | MGD | | |
| (RAS flow containing nitrate) | | Anoxic Tank Volume, $V_{an}$ = | 16,132 | $ft^3$ |
| $NO_x$ rate to Anoxic Tank = | 999 | lb/day | (based on detention time value in cell D19) | |

## IV. Calculate the SDNR (Specific Denitrification Rate)

| | | | |
|---|---|---|---|
| Anoxic Tank **F/M** ratio = | 2.8979 | lb BOD/day/lb MLVSS | |
| **rbCODo/bCODo** ratio = | 0.1275 | | |
| | | Next lower rbCOD/bCOD value from table = | 0.1 |
| | | Next higher rbCOD/bCOD value from table = | 0.2 |
| **SDNR** for rbCOD/bCOD = | 0.1 | is equal to | 0.26899 |
| **SDNR** for rbCOD/bCOD = | 0.2 | is equal to | 0.33855 |
| **SDNR** for rbCOD/bCOD = | 0.1275 | is equal to | 0.2881 ( at 20°C) |
| **SDNR** at $T_{ww}$ = | 0.2808 | lb $NO_3$-N/day/lb biomass (at $T_{ww}$) | |

TANK VOLUME AND DIMENSIONS

## V. Calculate Anoxic Tank Volume, Dimensions, and Detention Time

| | | | | |
|---|---|---|---|---|
| $NO_3$-N reduction capacity = | 1019 | lb/day | % Excess Nitrif Capacity = | 2.0% |
| Difference between Design and Calculated % Excess Nitrif. Capacity = | | | 0.000 | |
| Anoxic Tank min. Vol, $V_{an}$ = | 16,132 | $ft^3$ | | |
| Min. Anoxic Det'n Time, $t_{an}$ = | 0.97 | hr | | |

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $V_{an}$ and $t_{an}$ values as follows: Place the cursor on the green cell G64 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell" G64 "To value:" 0, "By changing cell:" D19, and click on "OK". The calculated values of $V_{an}$ and $t_{an}$ will be in cells D66 and D68. Cell G64 should be zero if the process worked right. A preliminary estimate for $t_{an}$ is needed in cell D19 in order for the iterative solution to work.**

| | | | | | |
|---|---|---|---|---|---|
| Min. Vol. per tank, $V_{tank}$ = | 8,066 | $ft^3$ | **Click on green box & then on the arrow** | | |
| Calculated Tank Width = | 19.3 | ft | **to select tank shape** | **rectangular** | |
| Calculated Tank Length = | 19.3 | ft | **Actual Tank Width =** | 28.0 | ft |
| Tank Wall Height = | 24.0 | ft | **Actual Tank Length =** | 38.0 | ft |
| | | | Act. Tank Liq. Vol. = | 23,089 | $ft^3$ |
| Anoxic Detention Time, $\tau_{an}$ = | 2.763 | hr | (Preanoxic Tank Liquid Volume) | | |

FINAL CALCULATIONS

## VI. Calc. Revised Air Requirement & Alkalinity Requirement, Mixing Power & Sludge Wasting Rate

| | | | | |
|---|---|---|---|---|
| Oxygen Credit = | 2857 | lb/day | equals: 119.1 | lb/hr |
| $O_2$ Utilization Rate = | 255 | lb/hr | | |
| Required Air Flow Rate (in Aeration Tank), SCFM = | | | 2938.6 | SCFM |
| Required Air Flow Rate (in Aeration Tank), ACFM = | | | 1766.0 | ACFM |

| | | |
|---|---|---|
| Alkalinity Produced = | 142.6 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -101.7 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -2546 | lb/day as $CaCO_3$ |
| Sodum Bicarbonate Needed per Day to Maintain Alkalinity (lb/day $NaHCO_3$) = | | -4277 |

| | | |
|---|---|---|
| Required Anoxic Tank Mixing Power = | 17.5 | hp |
| Sludge Wasting Rate = | 254,094 | gal/day |

**Discussion and References**

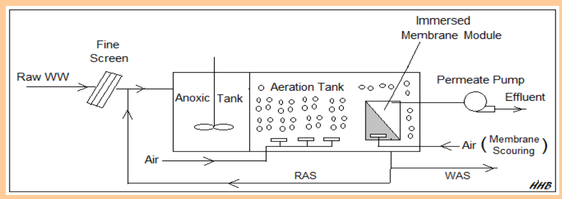
**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes




**Membrane Bioreactor for Preanoxic Denitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process
Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

RAS ratio, $RAS = (NO_x/N_{RAS}) - 1$
Aer Tank Act. Biomass, $P_{xb} = [Q_o*Y*(bCOD_o - S)*8.34]/[1 + (k_d*SRT)]$
Anaer. Tank MLSS, $MLSS_{AN} = [RAS/(RAS + 1)]\ MLSS_w$
Aeration Tank Active Biomass Fraction, $X_{aer,b} = P_{xb}/P_{x,vss}$
Anoxic Tank Active Biomass Conc., $X_{an,b} = X_{aer,b}*MLSS_{AN}$

Flow Rate to Anoxic Tank, $Q_{AN} = RAS*Q_o$
$NO_x$ Rate to Anoxic Tank $= Q_{AN}*N_{RAS}*8.34$
Anoxic Tank Volume, $V_{an} = (Q_o*10^6/7.48)*t_{AN}/24$

Anoxic Tank F:M ratio, $F:M = Q_o*BOD_o*8.34/((V_{an}*7.48/10^6)*X_{an,b}/8.34)$

**Coefficients for: $SDNR = b_o + b_1\ [\ln(F:M)]$**

| rbCOD/bCOD | $b_o$ | $b_1$ |
|---|---|---|
| 0.1 | 0.186 | 0.078 |
| 0.2 | 0.213 | 0.118 |
| 0.3 | 0.235 | 0.141 |
| 0.4 | 0.242 | 0.152 |
| 0.5 | 0.27 | 0.162 |
| 0.10 | 0.1860 | 0.0780 |
| 0.20 | 0.2130 | 0.1180 |

The SDNR equation, coefficient values, and temperature correction equations are from: Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery*, 5th Ed., McGraw-Hill, 2014

Note that for F:M < 0.5, SDNR at 20°C is calculated as: **SDNR = 0.24*F:M**

SDNR at $T_{ww}$ = (SDNR at 20°C)*$\theta_{SDNR}^{[((Tww-32)/1.8)-20]}$

$NO_3$-N reduction capacity $= (V_{an}*7.48/10^6)*SDNR*X_{an,b}*8.34$

% Excess Nitrif. Capac. = ($NO_3$-N Reduction Capacity - $NO_x$ Rate to Anoxic Tank) / $NO_x$ Rate to Anoxic Tank

Min. Anoxic Det'n Time, $t_{an} = V_{an}*24/(Q_o*10^6/7.48)$

Min. Vol. per Tank, $V_{tank} = V_{an}/N_{an}$

Oxygen credit for nitrate reduction $= 2.86\ Q_o(NO_x - N_e)$

Alkalinity produced by nitrate reduction $= 3.57(NO_x - N_e)$

Sludge Wasting Rate:
$Q_w = [((V_{aer}*MLSS + V_{anox}*X_b)/SRT)]/(TSS_w)$

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

rectangular
cylindrical

# Near-Term Conditions

MBR WW Treatment Process Design Calculations - U.S. Units
User Inputs and Constants

WW INFORMATION

## I. Wastewater Parameters/Characteristics

Enter values in yellow cells only.

| | | | | | |
|---|---|---|---|---|---|
| Design ww Flow Rate, $Q_o$ = | 3.51 | MGD | Influent TSS, $TSS_o$ = | 329 | mg/L |
| Influent BOD, $BOD_o$ = | 420 | mg/L | Influent VSS, $VSS_o$ = | 260 | mg/L |
| Influent sBOD, $sBOD_o$ = | 168 | mg/L | | | |
| | | | Influent TKN, $TKN_o$ = | 70 | mg/L |
| Influent COD, $COD_o$ = | 857 | mg/L | TKN peak/ave factor, FS = | 1.0 | |
| Influent sCOD, $sCOD_o$ = | 129 | mg/L | Influent $NH_4$-N, $NH_4$-$N_o$ = | 42 | mg/L |
| Influent rbCOD, $rbCOD_o$ = | 86 | mg/L | Influent Alkalinity, $Alk_o$ = (mg/L as $CaCO_3$) | 300 | |
| ratio, bCOD/BOD = | 1.6 | | Aeration WW Temp, $T_{ww}$ = | 66.2 | °F |

BIOL. KINETIC COEFFICIENTS

## II. Biological Kinetic Coefficients - For BOD Removal

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., Y = | 0.40 | lb VSS/lb bCOD | Half Veloc. Coeff., $K_s$ = | 20 | mg/L |
| Temp coeff., q, for mm = | 1.07 | | Temp coeff., q, for kd = | 1.04 | |
| | | | Resid. biomass fract., $f_d$ = | 0.15 | |
| Max spec. gwth rate at 20°C, $\mu_{m20}$ = | 6 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{d20}$ = | 0.12 | lb VSS/d/lb VSS | | | |

## III. Biological Kinetic Coefficients - For Nitrification

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., $Y_n$ = | 0.12 | lb VSS/lb NOx | | | |
| Temp coeff., q, for mmn = | 1.070 | | Half Veloc. Coeff. at 20°C, $K_n$ = | 0.7 | mg/L |
| Temp coeff., q, for kdn = | 1.040 | | Half Veloc. Coeff. at 20°C, $K_o$ = | 0.5 | mg/L |
| Temp coeff., q, for Kn = | 1.053 | | Temp coeff., q, for Ko = | 1 | |
| Max spec. gwth rate at 20°C, $\mu_{mn20}$ = | 0.8 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{dn20}$ = | 0.08 | lb VSS/d/lb VSS | | | |

CONSTANTS

## IV. Constants Used in the Calculations

| | | | | | |
|---|---|---|---|---|---|
| Ratio of $BOD_5$ to $BOD_u$, f = | 0.68 | | Saturation D.O. in water at 20°C & 1 atm, $C_{ss}$ = | 9.17 | mg/L |
| $BOD_u$ equiv. of VSS = | 1.42 | lb $BOD_u$/lb VSS | Standard Pressure = | 14.7 | psi |
| Spec Wt of water, $\gamma_{H2O}$ = | 62.4 | lb/ft$^3$ | Standard Temperature = | 68.0 | °F |
| Mol. Wt. of Air = | 28.97 | | Mol. Wt. of Oxygen = | 32.0 | |
| Temp Coeff. for $O_2$ rate, $\theta$ = | 1.024 | | $O_2$ mole fraction in Air = | 0.209 | |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

DRAFT

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

**Activated Sludge Kinetic Coefficients for heterotrophic bacteria at 20°C (for BOD removal)**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_m$ | kg VSS/day/kg VSS | 3.0 - 13.2 | 6.0 |
| $K_s$ | mg/L bCOD | 5.0 - 40.0 | 20.0 |
| Y | kg VSS/day/kg bCOD | 0.30 - 0.50 | 0.40 |
| $k_d$ | kg VSS/day/kg VSS | 0.06 - 0.20 | 0.12 |
| $f_d$ | dimensionless | 0.08 - 0.20 | 0.15 |
| θ values for temperature corrections | | | |
| for $\mu_m$ | dimensionless | 1.03 - 1.08 | 1.07 |
| for $k_d$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_s$ | dimensionless | 1.00 | 1.00 |

The source for the values in the table above is:
Introduction to Water Resource Recovery Facility Design, 2nd Ed., Table 6.1

**Activated Sludge Nitrification Kinetic Coefficients at 20°C**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_{mn}$ | kg VSS/day/kg VSS | 0.2 - 0.90 | 0.75 |
| $K_n$ | mg/L $NH_4$-N | 0.50 - 1.0 | 0.74 |
| $Y_n$ | kg VSS/kg $NH_4$-N | 0.10 - 0.15 | 0.12 |
| $k_{dn}$ | kg VSS/day/kg VSS | 0.05 - 0.15 | 0.08 |
| $K_o$ | mg/L | 0.40 - 0.60 | 0.50 |
| θ values for temperature corrections | | | |
| for $\mu_{mn}$ | dimensionless | 1.06 - 1.123 | 1.07 |
| for $k_{dn}$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_n$ | dimensionless | 1.03 - 1.123 | 1.053 |

The source for the values in the table above is:
Introduction to Water Rsource Recovery Facility Design, 2nd Ed., Table 6.2

MBR WW Treatment Process Design Calculations - U.S. Units
Membrane Module Sizing Calculations

INPUTS

## I. Membrane/Membrane Module Parameters

(Values typically available from membrane manufacturer or vendor - Enter values in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Module packing density, $\phi$ = | 148 | $m^2/m^3$ | equals | 45.0 | $ft^2/ft^3$ |
| Specific Aer. Demand, $SAD_M$ = | 0.2 | $m^3$ air/hr/$m^2$ membrane | | | |
| | | equals | 0.656 | $ft^3$ air/hr/$ft^2$ membrane | |

CALCULATIONS

## II. Process Design Calculations (done by worksheet)

| | | | | | |
|---|---|---|---|---|---|
| Membrane Flux, **J** = | 21.1 | L/hr/$m^2$ | equals | 0.518 | gal/hr/$ft^2$ |
| Membrane Area, $A_M$ = | 282,113 | $ft^2$ | | | |
| Membrane Module Vol., $V_M$ = | 6,271 | $ft^3$ | | | |
| Scouring Air Flow Required = | 3,085 | $ft^3$/min (ACFM) | = | 3,071 | SCFM |

**(This is the scouring air flow rate needed for the membrane module, typically provided by a coarse bubble diffuser system.)**

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

Values given for MBR specific area (module packing density) range from 150 -334 $m^2/m^3$ in Table 8-35 of Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery, 5th Ed.,* McGraw-Hill, 2014

**Equations Used in the Calculations:**

Module packing density, $\phi$, in $ft^2/ft^3$ = ($\phi$ in $m^2/m^3$)/3.28084

Specific Aeration Demand, $SAD_M$, in $ft^3$ air/hr/$ft^2$ membrane =
= $SAD_M$ in $m^3$ air/hr/$m^2$ membrane/3.28084

Membrane Flux, **J**, in L/hr/$m^2$ = $0.4056T_{ww} - 5.7278$ (with $T_{ww}$ in $^oF$)
(See Worksheet 6 for derivation of this eqution)

Membrane Flux, **J**, in gal/hr/$ft^2$ = [(Membrane Flux (**J**) in L/hr/$m^2$)/3.7854]/($3.28084^2$)

Membrane Area, $A_M = (Q_o*10^6/24)/J$

Membrane Module Volume, $V_M = A_M/\phi$

Scouring Air Flow Required, **ACFM** = $(SAD_M)(A_M)/60$ ACFM

Scouring Air Flow Req'd, **SCFM** = (**ACFM**)[($T_{std}$ + 459.67)/($T_{ww}$ + 459.67)]($P_{atm}/P_{std}$) SCFM

DRAFT

# MBR WW Treatment Process Design Calculations - U.S. Units

BOD Removal and Nitrification

INPUTS

## I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| | | | Target Effluent Concentrations: | | |
| MLSS in Aer Tank, **MLSS** = | 8,500 | mg/L | **$BOD_e$** = | 10 | mg/L |
| MLSS in Waste Sludge, **$X_w$** = | 8,500 | mg/L | **$TSS_e$** = | 10 | mg/L |
| DO in Aer. Tank, **$DO_o$** = | 2 | mg/L | **$NH_4$-$N_e$** = | 1.0 | mg/L |
| Number of Aeration Tanks = | 2 | | Tank Freeboard = | 2.0 | ft |
| Liquid Depth in Tank = | 22 | ft | Tank L:W ratio = | 2.3 | |
| Initial Estimate of **$NO_x$** = | 44.93 | mg/L | **(Tank L:W ratio is only used for rectangular tanks)** | | |

**Note that an initial estimate is needed for $NO_x$ in cell D14 to start an iterative calculation of $NO_x$ below. 80% of the influent TKN is suggested for this initial estimate. 80% of $TKN_o$ =** 56.0 mg/L

Influent TKN, **$TKN_o$** = 70 mg/L
(value transferred from Worksheet 2)

PROCESS DESIGN CALCULATIONS

## II. Calculate Design SRT

| | | | | | |
|---|---|---|---|---|---|
| $\mu_{mn}$ at $T_{ww}$ = | 0.70 | lb VSS/d/lb VSS | **$K_n$** at $T_{ww}$ = | 0.70 | mg/L |
| $k_{dn}$ at $T_{ww}$ = | 0.08 | lb VSS/d/lb VSS | Theor. SRT = | 3.96 | days |
| $\mu_n$ = | 0.25 | lb VSS/d/lb VSS | Design **SRT** = | 3.96 | days |

## III. Calculate the Biomass Production Rate

| | | | | | |
|---|---|---|---|---|---|
| $\mu_m$ at $T_{ww}$ = | 5.61 | lb VSS/d/lb VSS | **bCODo** = | 672 | mg/L |
| $k_d$ at $T_{ww}$ = | 0.1154 | lb VSS/d/lb VSS | **S** = | 1.404 | mg bCOD/L |

Biomass Production Rate, **$P_{x,bio}$** = 5883 lb VSS/day

## IV. Determine the Amount of Nitrogen Oxidized to Nitrate

| | | |
|---|---|---|
| Calculated amount of nitrogen oxidized to nitrate, **$NO_x$** = | 44.932 | mg/L |
| Difference between estimated and calculated values **$NO_x$** = | 0.00000 | mg/L |

**Goal Seek Result:**
Amount of nitrogen oxidized to nitrate, **$NO_x$** = **44.93** mg/L

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $NO_x$ value as follows: Place the cursor on the green cell G42 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell:" G42, "To value:" 0, "By changing cell:" D14, and click on "OK". The calculated value of $NO_x$ will appear in cell F44 and G42 should be zero if the process worked properly. Note that cell D14 needs an initial estimate for $NO_x$ in order for the iterative solution to work properly.**

## IV. Calc. the Prod. Rate and Mass of VSS and TSS in Aeration Basin

| | | | | | |
|---|---|---|---|---|---|
| **bpCOD/pCOD** = | 0.554 | | **nbVSS** = | 115.9 | mg/L |
| Aeration Tank VSS Production Rate, **$P_{X,VSS}$** = | 9276 | lb VSS/day | | | |
| Aeration Tank TSS Production Rate, **$P_{X,TSS}$** = | 11298 | lb TSS/day | | | |
| Mass of **MLVSS** = | 36,753 | lb VSS | Mass of **MLSS** = | 44,762 | lb TSS |

AER. TANK CALC'NS

## V. Aeration Tank Calculations (User input needed in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Req. Aeration Vol., **$V_{aer,min}$** = | 84,415 | $ft^3$ | **Click on green box & then on the arrow to select tank shape** | **rectangular** | |
| Aer. + Membr. Vol., **$V_{tot}$** = | 90,686 | $ft^3$ | | | |
| Req. Vol. per tank, **$V_{tank}$** = | 45,343 | $ft^3$ | **Actual Tank Width =** | 38.3 | ft |
| Calculated Tank Width = | 30.0 | ft | **Actual Tank Length =** | 71.8 | ft |
| Calculated Tank Length = | 69.6 | ft | Act. Aer. Vol., **$V_{aer,act}$** = | 56,538 | $ft^3$ |
| Tank Wall Height = | 23.7 | ft | Memb. Mod. Vol/Tank: | 3,135 | $ft^3$ |
| Aer. Detention Time, $\tau_{aer}$ = | 5.8 | hr | **MLVSS** = | 6,979 | mg/L |
| Vol. BOD Loading = | 108.8 | lb BOD/d/1000 $ft^3$ | | | |
| **F:M** ratio = | 0.250 | lb BOD/d/lb MLVSS | | | |
| Sludge Wasting Rate, **$Q_w$** = | 213,479 | gal/day | | | |

## VI. User Inputs - Enter values in yellow cells only

### Discussion and References

**For background information about Membrane Bioreactors (MBRs) see:**

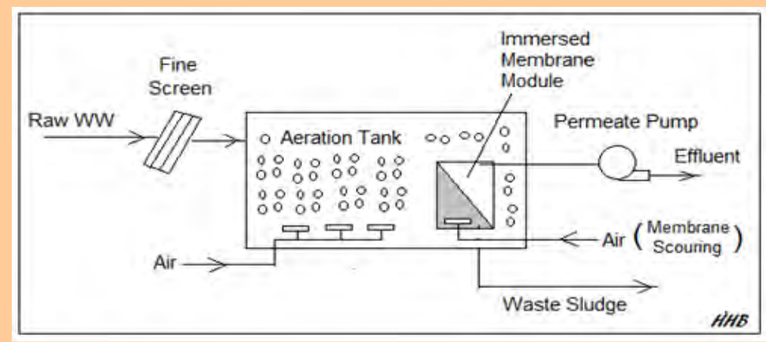
Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

As noted in all four of the above references, MLSS and $X_w$ for MBR processes are typically in the range from 8,000 to 12,000 mg/L.




**Flow Diagram - Membrane Bioreactor for BOD Removal & Nitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process

Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

**Equations Used in the Calculations:**

$\mu_{mn}$ at $T_{ww}$ = $(\mu_{mn_20})*\theta_{\mu mn}^{[((Tww-32)/1.8)-20]}$
$k_{dn}$ at $T_{ww}$ = $(k_{mn_20})*\theta_{kdn}^{[((Tww-32)/1.8)-20]}$
$K_n$ at $T_{ww}$ = $(K_{n_20})*\theta_{Kn}^{[((Tww-32)/1.8)-20]}$

$\mu_n = [\mu_{mn}*NH_4\text{-}N_e/(K_n + NH_4\text{-}N_e)]*[DO_o/(0.5 + DO_o)] - k_{dn}$

Theor. **SRT** = $1/\mu_n$
Design **SRT** = (Theor. **SRT**)**FS** ( **FS** = TKN Peak/Ave Factor )

$\mu_m$ at $T_{ww}$ = $(\mu_{m_20})*\theta_{\mu m}^{[((Tww-32)/1.8)-20]}$
$k_d$ at $T_{ww}$ = $(k_{m_20})*\theta_{kd}^{[((Tww-32)/1.8)-20]}$ **bCODo = 1.6*BODo**

$S = K_s*[1 + (k_d*SRT)]/[SRT*(\mu_m - k_d) - 1]$

$P_{x,bio} = (Q_o*Y*(\mu_m - k_d)*8.34/(1 + (k_d*SRT)))$
$+ (f_d*k_d*Q_o*Y*(\mu_m - k_d)SRT*8.34/(1 + (k_d*SRT)))$
$+ (Q_o*Y_n*NO_x*8.34/(1 + (k_{dn}*SRT)))$

$NO_x = TKN_o - NH_4\text{-}N_e - [(0.12\ P_{x,bio}/8.34)/Q_o]$

$bpCOD/pCOD = (bCOD/BOD)*(BOD_o - sBOD_o)/(COD_o - sCOD_o)$

$nbVSS = [1 - (bpCOD/pCOD)]VSS_o$

$P_{x,VSS} = P_{x,bio} + (Q_o*nbVSS*8.34)$ $P_{x,TSS} = P_{x,VSS} + [Q_o(TSS_o - VSS_o)8.34]$

Mass of **MLVSS** = $P_{X,VSS}$*SRT Mass of **MLSS** = $P_{X,TSS}$*SRT

Required Aeration Volume = $V_{aer,min} = (\text{Mass of MLSS}/(MLSS*8.34))*(10^6/7.48)$

Aeration Detntion Time, $\tau = (V_{aer,act}*7.48/10^6)*N*24/Q_o$

Vol. BOD Loading = $Q_o*BOD_o*8.34/((V_{aer,act}/1000)*N)$

**MLVSS = MLSS(Mass of MLVSS/Mass of MLSS)**

**F:M ratio** = $Q_o*8.34*BOD_o/((MLVSS*8.34*(V_{aer,act}*7.48/10^6)*N))$

$Q_w = ((N*V_{aer,act}*7.48/10^6)*MLSS/(SRT*X_w))*10^6$

**Air Requirement/Blower Design Calculations**

$P_{atm} = 14.696*EXP[-32.17*MW_{air}*Elev/(g_c*R*T_{amb})$

DRAFT

OXYGEN/AIR/BLOWER REQUIREMENTS

| | | | | | |
|---|---|---|---|---|---|
| Standard $O_2$ transf. Effic., **SOTE** = (from diffuser mfr or vendor) | 30.0% | | Design Elevation above Sea Level, **Elev** = | 225 | ft |
| | | | ambient air Temp., $T_{amb}$ = | 70 | °F |
| Ratio of oxygen transfer rate in wastewater to that in clean water, $\alpha$ = | 0.5 | | Diffuser Fouling Factor, **F** = | 0.8 | |
| Ratio of D.O. saturation in ww to that in clean water at same T & P, **B** = | 1.0 | | Depth of Diffuser, $d_{diff}$ = | 21.7 | ft |
| D.O sat'n conc. for clean water at ww temp. & 1 atm, $C_s$ = | 9.3 | mg/L | Pressure drop across diffuser, $\Delta P_{diff}$ = (from diffuser mfr or vendor) | 10.8 | in $H_2O$ |

**NOTE:** Derivation of the equation for $C_s$ as a function of $T_{ww}$ is shown in wksht 7.

## VII. Air Requirement/Blower Design Calculations

| | | | | | |
|---|---|---|---|---|---|
| Barom. Pressure, $P_{atm}$ = | 14.6 | psia | Des. Air Flow Rate, **SCFM:** | 5,044 | scfm |
| Pressure at Mid Depth, $P_D$ = | 19.3 | psia | | | |
| Standard Air Density, $\rho_{air}$ = (from Ideal Gas Law) | 0.07521 | lb/ft$^3$ | Des. Air Flow Rate, **ACFM:** (at delivery point) | 3031 | acfm |
| $O_2$ Utilization Rate, $m_{O2}$ = | 10,502 | lb/day | Blower Outlet Press., $P_{B2}$ = | 24.38 | psia |
| Actual $O_2$ transf. Efficiency, **AOTE** = | 8.33% | | | | |

**(This is the air flow rate needed for the aeration tank, typically provided by a fine bubble diffuser system.)**

This equation for $P_{atm}$ as a function of elev. above sea level and ambient temperature comes from:
Water Reuse: Issues, Technologies, and Applications, Sec. 2.2

$$P_D = P_{atm} + (62.4*d_{diff}/2)/144 \qquad \rho_{air} = MW_{air}*P_{std}/(10.73*(T_{std} + 459.67))$$

lb/day $O_2$: $m_{O2} = Q_o*8.34*(BOD_o - BODe)/f - (1.42*P_{x,VSS}) + (4.57*Q_o*8.34*NO_x)$

This equation for oxygen utilization rate comes from:
Nalco Water Handbook, 4th Ed., Ch. 23 Eqns 23.6 and 23.7

The equation below for the actual oxygen transfer efficiency, AOTE, is found as
Design of Water Resource Recovery Facilities, 6th Ed., Equation 12.32

$$AOTE = SOTE\ \alpha\ F\ \frac{\left(B\left(\frac{P_D}{P_{std}}\right)C_s - C_L\right)}{C_{ss}}\ \theta^{(Tww-20)}$$

**Note that for use in this equation Tww must be converted to °C**

Design Air Flow Rate, **SCFM = ($m_{O2}$/AOTE)*$MW_{air}$/($O_2$_mole fraction*MW_$O_2$*$\rho_{air}$_std*60*24**

Design Air Flow Rate, **ACFM = SCFM*($P_{std}$/$P_{blower}$)*(($T_{ww}$ + 459.67)/($T_{std}$ + 459.67))**

Blower Outlet Press., $P_{B2} = P_{atm} + \Delta P_{diff}*0.036126 + 62.4*d_{diff}/144$

Alkalinity used for Nitrification, **$Alk_{Nitrif}$ = 7.14*NOx mg/L as $CaCO_3$**

Alkalinity needed = **$Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$ mg/L as $CaCO_3$**

Alkalinity needed **Alk_perday = ($Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$)Qo*8.34 lb/day as $CaCO_3$**

Sodium Bicarbonate needed to maintain alkalinity = **Alk_perday*84/50 lb/day $NaHCO_3$**

ALKALINITY REQUIREMENT

## VIII. User Inputs and Constants- Enter value in yellow cell only

| | | |
|---|---|---|
| Target Effluent Alkalinity = | 20 | mg/L as $CaCO_3$ |
| Equiv. Weight of $CaCO_3$ = | 50 | g/equiv. |
| Equiv. Weight of $NaHCO_3$ = | 84 | g/equiv. |
| Alkalinity used for Nitrification = | 7.14 | g $CaCO_2$/g $NH_3$-N |

## IX. Calculation of Alkalinity Requirement

| | | |
|---|---|---|
| Alkalinity used for Nitrification = | 320.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 40.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 1,195 | lb/day as $CaCO_3$ |
| Sodium Bicarbonate needed per day to maintain alkalinity = | 2,007 | lb/day $NaHCO_3$ |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

DRAFT

rectangular
cylindrical

# MBR WW Treatment Process Design Calculations - U.S. Units
## PreAnoxic Denitrification

**This worksheet makes the design calculations for preanoxic denitrification basin(s) to go with the Aeration Tank(s) designed for BOD removal and Nitrification in Worksheet 4. (Wastewater parameters/characteristics and biological kinetic coefficients entered on Worksheet 2 will also be used in this worksheet)**

INPUTS

### I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| Effluent Nitrate conc., $N_e$ = | 5.0 | mg/L | Mixing Energy | | |
| Nitrate conc. in RAS, $N_{RAS}$ = | 5.0 | mg/L | for Anoxic Reactor = | 0.38 | hp/10$^3$ ft$^3$ |
| Temp. Coeff. For **SDNR** = | 1.026 | . | Design % Excess | | |
| Tank Freeboard = | 2.3 | ft | Nitrif. Capacity = | 2% | |
| No. of Anoxic Tanks, $N_{an}$ = | 2 | . | Liquid Depth in Tank = | 22 | ft |
| Est. of detention time, $t_{an}$ = | 0.9654 | hr | Tank L:W ratio = | 1 | |

**Note that an initial estimate is needed for anoxic detention time in cell D19 to start an iterative calculation of minimum required anoxoc detention time below.**

**(Tank L:W ratio is only used for rectangular tanks)**

PROCESS DESIGN CALCULATIONS

### II. Calculate RAS Ratio and Anoxic Tank Active Biomass Conc.

| | | | | |
|---|---|---|---|---|
| RAS ratio, **RAS** = | 7.99 | Aer. Tank Act. Biomass, $P_{xb}$ = | 5393 | lb/d |
| An. Tank MLSS, $MLSS_{AN}$ = | 7554 | mg/L | | |
| Aeration Tank Active Biomass Fraction, $X_{aer,b}$ = | | 0.4773 | | |
| Anoxic Tank Active Biomass Conc., $X_{an,b}$ = | | 3606 | mg/L | |

### III. Calc Feed Rate of $NO_x$ to Anoxic Tank and Anoxic Tank Volume

| | | | | |
|---|---|---|---|---|
| Flow rate to Anoxic Tank = | 28.0 | MGD | | |
| (RAS flow containing nitrate) | | Anoxic Tank Volume, $V_{an}$ = | 18,875 | ft$^3$ |
| $NO_x$ rate to Anoxic Tank = | 1169 | lb/day | (based on detention time value in cell D19) | |

### IV. Calculate the SDNR (Specific Denitrification Rate)

| | | | | |
|---|---|---|---|---|
| Anoxic Tank **F/M** ratio = | 2.8979 | lb BOD/day/lb MLVSS | | |
| **rbCODo/bCODo** ratio = | 0.1275 | | | |
| | | Next lower rbCOD/bCOD value from table = | 0.1 | |
| | | Next higher rbCOD/bCOD value from table = | 0.2 | |
| **SDNR** for rbCOD/bCOD = | 0.1 | is equal to | 0.26899 | |
| **SDNR** for rbCOD/bCOD = | 0.2 | is equal to | 0.33855 | |
| **SDNR** for rbCOD/bCOD = | 0.1275 | is equal to | 0.2881 ( at 20°C) | |
| **SDNR** at $T_{ww}$ = | 0.2808 | lb $NO_3$-N/day/lb biomass (at $T_{ww}$) | | |

TANK VOLUME AND DIMENSIONS

### V. Calculate Anoxic Tank Volume, Dimensions, and Detention Time

| | | | | |
|---|---|---|---|---|
| $NO_3$-N reduction capacity = | 1192 | lb/day | % Excess Nitrif Capacity = | 2.0% |
| Difference between Design and Calculated % Excess Nitrif. Capacity = | | | 0.000 | |
| Anoxic Tank min. Vol, $V_{an}$ = | 18,875 | ft$^3$ | | |
| Min. Anoxic Det'n Time, $t_{an}$ = | 0.97 | hr | | |

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $V_{an}$ and $t_{an}$ values as follows: Place the cursor on the green cell G64 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell" G64 "To value:" 0, "By changing cell:" D19, and click on "OK". The calculated values of $V_{an}$ and $t_{an}$ will be in cells D66 and D68. Cell G64 should be zero if the process worked right. A preliminary estimate for $t_{an}$ is needed in cell D19 in order for the iterative solution to work.**

| | | | | | |
|---|---|---|---|---|---|
| Min. Vol. per tank, $V_{tank}$ = | 9,437 | ft$^3$ | Click on green box & then on the arrow | | |
| Calculated Tank Width = | 20.9 | ft | to select tank shape | rectangular | |
| Calculated Tank Length = | 20.9 | ft | Actual Tank Width = | 28.0 | ft |
| Tank Wall Height = | 24.0 | ft | Actual Tank Length = | 38.0 | ft |
| | | | Act. Tank Liq. Vol. = | 23,089 | ft$^3$ |
| Anoxic Detention Time, $\tau_{an}$ = | 2.362 | hr | (Preanoxic Tank Liquid Volume) | | |

ITIONS

### VI. Calc. Revised Air Requirement & Alkalinity Requirement, Mixing Power & Sludge Wasting Rate

| | | | | |
|---|---|---|---|---|
| Oxygen Credit = | 3343 | lb/day | equals: 139.3 | lb/hr |
| $O_2$ Utilization Rate = | 298 | lb/hr | | |

**Discussion and References**

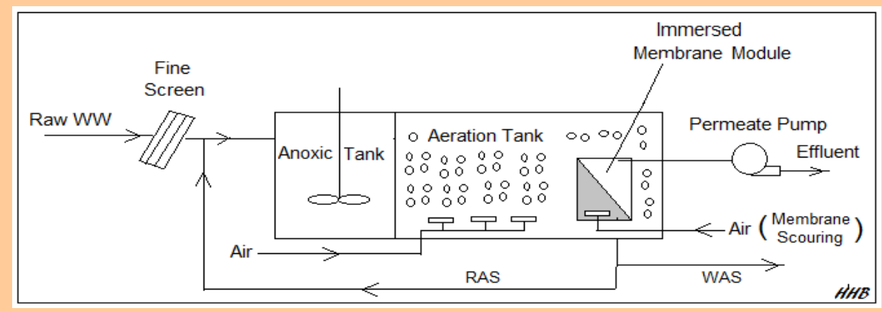
**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes




**Membrane Bioreactor for Preanoxic Denitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process
Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

RAS ratio, **RAS** = $(NO_x/N_{RAS}) - 1$

Aer Tank Act. Biomass, $P_{xb} = [Q_o*Y*(bCOD_o - S)*8.34]/[1 + (k_d*SRT)]$

Anaer. Tank MLSS, $MLSS_{AN} = [RAS/(RAS + 1)]\ MLSS_w$

Aeration Tank Active Biomass Fraction, $X_{aer,b} = P_{xb}/P_{x,vss}$

Anoxic Tank Active Biomass Conc., $X_{an,b} = X_{aer,b}*MLSS_{AN}$

Flow Rate to Anoxic Tank, $Q_{AN} = RAS*Q_o$

$NO_x$ Rate to Anoxic Tank $= Q_{AN}*N_{RAS}*8.34$

Anoxic Tank Volume, $V_{an} = (Q_o*10^6/7.48)*t_{AN}/24$

Anoxic Tank F:M ratio, **F:M** $= Q_o*BOD_o*8.34/((V_{an}*7.48/10^6)*X_{an,b}/8.34)$

**Coefficients for: SDNR = $b_o + b_1$ [ln(F:M)]**

| rbCOD/bCOD | $b_o$ | $b_1$ |
|---|---|---|
| 0.1 | 0.186 | 0.078 |
| 0.2 | 0.213 | 0.118 |
| 0.3 | 0.235 | 0.141 |
| 0.4 | 0.242 | 0.152 |
| 0.5 | 0.27 | 0.162 |
| 0.10 | 0.1860 | 0.0780 |
| 0.20 | 0.2130 | 0.1180 |

The SDNR equation, coefficient values, and temperature correction equations are from: Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery*, 5th Ed., McGraw-Hill, 2014

Note that for F:M < 0.5, SDNR at 20°C is calculated as: **SDNR = 0.24*F:M**

**SDNR** at $T_{ww}$ = (**SDNR** at 20°C)*$\theta_{SDNR}^{[((Tww-32)/1.8)-20]}$

$NO_3$-N reduction capacity $= (V_{an}*7.48/10^6)*SDNR*X_{an,b}*8.34$

% Excess Nitrif. Capac. = (($NO_3$-N Reduction Capacity - $NO_x$ Rate to Anoxic Tank) / $NO_x$ Rate to Anoxic Tank)

Min. Anoxic Det'n Time, $t_{an} = V_{an}*24/(Q_o*10^6/7.48)$

Min. Vol. per Tank, $V_{tank} = V_{an}/N_{an}$

Oxygen credit for nitrate reduction $= 2.86\ Q_o(NO_x - N_e)$

Alkalinity produced by nitrate reduction $= 3.57(NO_x - N_e)$

Sludge Wasting Rate:

$Q_w = [((V_{aer}*MLSS + V_{anox}*X_b)/SRT)]/(TSS_w)$

DRAFT

FINAL CALCULAT

| | | |
|---|---|---|
| Required Air Flow Rate (in Aeration Tank), SCFM = | 3438.1 | SCFM |
| Required Air Flow Rate (in Aeration Tank), ACFM = | 2066.2 | ACFM |

| | | |
|---|---|---|
| Alkalinity Produced = | 142.6 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -101.7 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -2978 | lb/day as $CaCO_3$ |

Sodum Bicarbonate Needed per Day to Maintain Alkalinity (lb/day $NaHCO_3$) = -5004

| | | |
|---|---|---|
| Required Anoxic Tank Mixing Power = | 17.5 | hp |
| Sludge Wasting Rate = | 250,461 | gal/day |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

rectangular
cylindrical

DRAFT

# Ultimate Conditions

MBR WW Treatment Process Design Calculations - U.S. Units
User Inputs and Constants

WW INFORMATION

## I. Wastewater Parameters/Characteristics

Enter values in yellow cells only.

| | | | | | |
|---|---|---|---|---|---|
| Design ww Flow Rate, $Q_o$ = | 4.12 | MGD | Influent TSS, $TSS_o$ = | 329 | mg/L |
| Influent BOD, $BOD_o$ = | 420 | mg/L | Influent VSS, $VSS_o$ = | 260 | mg/L |
| Influent sBOD, $sBOD_o$ = | 168 | mg/L | | | |
| | | | Influent TKN, $TKN_o$ = | 70 | mg/L |
| Influent COD, $COD_o$ = | 857 | mg/L | TKN peak/ave factor, FS = | 1.0 | |
| Influent sCOD, $sCOD_o$ = | 129 | mg/L | Influent $NH_4$-N, $NH_4$-$N_o$ = | 42 | mg/L |
| Influent rbCOD, $rbCOD_o$ = | 86 | mg/L | Influent Alkalinity, $Alk_o$ = (mg/L as $CaCO_3$) | 300 | |
| ratio, bCOD/BOD = | 1.6 | | Aeration WW Temp, $T_{ww}$ = | 66.2 | °F |

BIOL. KINETIC COEFFICIENTS

## II. Biological Kinetic Coefficients - For BOD Removal

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., Y = | 0.40 | lb VSS/lb bCOD | Half Veloc. Coeff., $K_s$ = | 20 | mg/L |
| Temp coeff., q, for mm = | 1.07 | | Temp coeff., q, for kd = | 1.04 | |
| | | | Resid. biomass fract., $f_d$ = | 0.15 | |
| Max spec. gwth rate at 20°C, $\mu_{m20}$ = | 6 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{d20}$ = | 0.12 | lb VSS/d/lb VSS | | | |

## III. Biological Kinetic Coefficients - For Nitrification

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., $Y_n$ = | 0.12 | lb VSS/lb NOx | | | |
| Temp coeff., q, for mmn = | 1.070 | | Half Veloc. Coeff. at 20°C, $K_n$ = | 0.7 | mg/L |
| Temp coeff., q, for kdn = | 1.040 | | Half Veloc. Coeff. at 20°C, $K_o$ = | 0.5 | mg/L |
| Temp coeff., q, for Kn = | 1.053 | | Temp coeff., q, for Ko = | 1 | |
| Max spec. gwth rate at 20°C, $\mu_{mn20}$ = | 0.8 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{dn20}$ = | 0.08 | lb VSS/d/lb VSS | | | |

CONSTANTS

## IV. Constants Used in the Calculations

| | | | | | |
|---|---|---|---|---|---|
| Ratio of $BOD_5$ to $BOD_u$, f = | 0.68 | | Saturation D.O. in water at 20°C & 1 atm, $C_{ss}$ = | 9.17 | mg/L |
| $BOD_u$ equiv. of VSS = | 1.42 | lb $BOD_u$/lb VSS | Standard Pressure = | 14.7 | psi |
| Spec Wt of water, $\gamma_{H2O}$ = | 62.4 | lb/ft$^3$ | Standard Temperature = | 68.0 | °F |
| Mol. Wt. of Air = | 28.97 | | Mol. Wt. of Oxygen = | 32.0 | |
| Temp Coeff. for $O_2$ rate, θ = | 1.024 | | $O_2$ mole fraction in Air = | 0.209 | |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

DRAFT

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

**Activated Sludge Kinetic Coefficients for heterotrophic bacteria at 20°C (for BOD removal)**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_m$ | kg VSS/day/kg VSS | 3.0 - 13.2 | 6.0 |
| $K_s$ | mg/L bCOD | 5.0 - 40.0 | 20.0 |
| Y | kg VSS/day/kg bCOD | 0.30 - 0.50 | 0.40 |
| $k_d$ | kg VSS/day/kg VSS | 0.06 - 0.20 | 0.12 |
| $f_d$ | dimensionless | 0.08 - 0.20 | 0.15 |
| θ values for temperature corrections | | | |
| for $\mu_m$ | dimensionless | 1.03 - 1.08 | 1.07 |
| for $k_d$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_s$ | dimensionless | 1.00 | 1.00 |

The source for the values in the table above is:
Introduction to Water Resource Recovery Facility Design, 2nd Ed., Table 6.1

**Activated Sludge Nitrification Kinetic Coefficients at 20°C**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_{mn}$ | kg VSS/day/kg VSS | 0.2 - 0.90 | 0.75 |
| $K_n$ | mg/L $NH_4$-N | 0.50 - 1.0 | 0.74 |
| $Y_n$ | kg VSS/kg $NH_4$-N | 0.10 - 0.15 | 0.12 |
| $k_{dn}$ | kg VSS/day/kg VSS | 0.05 - 0.15 | 0.08 |
| $K_o$ | mg/L | 0.40 - 0.60 | 0.50 |
| θ values for temperature corrections | | | |
| for $\mu_{mn}$ | dimensionless | 1.06 - 1.123 | 1.07 |
| for $k_{dn}$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_n$ | dimensionless | 1.03 - 1.123 | 1.053 |

The source for the values in the table above is:
Introduction to Water Rsource Recovery Facility Design, 2nd Ed., Table 6.2

MBR WW Treatment Process Design Calculations - U.S. Units
Membrane Module Sizing Calculations

INPUTS

## I. Membrane/Membrane Module Parameters

(Values typically available from membrane manufacturer or vendor - Enter values in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Module packing density, $\phi$ = | 148 | $m^2/m^3$ | equals | 45.0 | $ft^2/ft^3$ |
| Specific Aer. Demand, $SAD_M$ = | 0.2 | $m^3$ air/hr/$m^2$ membrane | | | |
| | | equals | 0.656 | $ft^3$ air/hr/$ft^2$ membrane | |

CALCULATIONS

## II. Process Design Calculations (done by worksheet)

| | | | | | |
|---|---|---|---|---|---|
| Membrane Flux, **J** = | 21.1 | L/hr/$m^2$ | equals | 0.518 | gal/hr/$ft^2$ |
| Membrane Area, $A_M$ = | 331,142 | $ft^2$ | | | |
| Membrane Module Vol., $V_M$ = | 7,361 | $ft^3$ | | | |
| Scouring Air Flow Required = | 3,621 | $ft^3$/min (ACFM) = | | 3,605 | SCFM |

**(This is the scouring air flow rate needed for the membrane module, typically provided by a coarse bubble diffuser system.)**

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

Values given for MBR specific area (module packing density) range from 150 -334 $m^2/m^3$ in Table 8-35 of Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery, 5th Ed.,* McGraw-Hill, 2014

**Equations Used in the Calculations:**

Module packing density, $\phi$, in $ft^2/ft^3$ = ($\phi$ in $m^2/m^3$)/3.28084

Specific Aeration Demand, $SAD_M$, in $ft^3$ air/hr/$ft^2$ membrane =
= $SAD_M$ in $m^3$ air/hr/$m^2$ membrane/3.28084

Membrane Flux, **J**, in L/hr/$m^2$ = $0.4056T_{ww} - 5.7278$ (with $T_{ww}$ in $^oF$)
(See Worksheet 6 for derivation of this eqution)

Membrane Flux, **J**, in gal/hr/$ft^2$ = [(Membrane Flux (**J**) in L/hr/$m^2$)/3.7854]/($3.28084^2$)

Membrane Area, $A_M = (Q_o*10^6/24)/J$

Membrane Module Volume, $V_M = A_M/\phi$

Scouring Air Flow Required, **ACFM** = $(SAD_M)(A_M)/60$ ACFM

Scouring Air Flow Req'd, **SCFM** = (**ACFM**)[($T_{std}$ + 459.67)/($T_{ww}$ + 459.67)]($P_{atm}/P_{std}$) SCFM

DRAFT

# MBR WW Treatment Process Design Calculations - U.S. Units

BOD Removal and Nitrification

INPUTS

## I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| | | | Target Effluent Concentrations: | | |
| MLSS in Aer Tank, **MLSS** = | 8,500 | mg/L | **$BOD_e$** = | 10 | mg/L |
| MLSS in Waste Sludge, **$X_w$** = | 8,500 | mg/L | **$TSS_e$** = | 10 | mg/L |
| DO in Aer. Tank, **$DO_o$** = | 2 | mg/L | **$NH_4$-$N_e$** = | 1.0 | mg/L |
| Number of Aeration Tanks = | 2 | | Tank Freeboard = | 2.0 | ft |
| Liquid Depth in Tank = | 22 | ft | Tank L:W ratio = | 2.3 | |
| Initial Estimate of **$NO_x$** = | 44.93 | mg/L | **(Tank L:W ratio is only used for rectangular tanks)** | | |
| **Note that an initial estimate is needed for $NO_x$ in cell D14 to start an iterative calculation of $NO_x$ below. 80% of the influent TKN is suggested for this initial estimate. 80% of $TKN_o$ =** | 56.0 | mg/L | Influent TKN, **$TKN_o$** = (value transferred from Worksheet 2) | 70 | mg/L |

PROCESS DESIGN CALCULATIONS

## II. Calculate Design SRT

| | | | | | |
|---|---|---|---|---|---|
| $\mu_{mn}$ at $T_{ww}$ = | 0.70 | lb VSS/d/lb VSS | $K_n$ at $T_{ww}$ = | 0.70 | mg/L |
| $k_{dn}$ at $T_{ww}$ = | 0.08 | lb VSS/d/lb VSS | Theor. SRT = | 3.96 | days |
| $\mu_n$ = | 0.25 | lb VSS/d/lb VSS | Design **SRT** = | 3.96 | days |

## III. Calculate the Biomass Production Rate

| | | | | | |
|---|---|---|---|---|---|
| $\mu_m$ at $T_{ww}$ = | 5.61 | lb VSS/d/lb VSS | **bCODo** = | 672 | mg/L |
| $k_d$ at $T_{ww}$ = | 0.1154 | lb VSS/d/lb VSS | **S** = | 1.404 | mg bCOD/L |

Biomass Production Rate, **$P_{x,bio}$** = 6906 lb VSS/day

## IV. Determine the Amount of Nitrogen Oxidized to Nitrate

| | | |
|---|---|---|
| Calculated amount of nitrogen oxidized to nitrate, **$NO_x$** = | 44.932 | mg/L |
| Difference between estimated and calculated values **$NO_x$** = | 0.00000 | mg/L |

**Goal Seek Result:**

Amount of nitrogen oxidized to nitrate, **$NO_x$** = **44.93** mg/L

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $NO_x$ value as follows: Place the cursor on the green cell G42 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell:" G42, "To value:" 0, "By changing cell:" D14, and click on "OK". The calculated value of $NO_x$ will appear in cell F44 and G42 should be zero if the process worked properly. Note that cell D14 needs an initial estimate for $NO_x$ in order for the iterative solution to work properly.**

## IV. Calc. the Prod. Rate and Mass of VSS and TSS in Aeration Basin

| | | | | | |
|---|---|---|---|---|---|
| **bpCOD/pCOD** = | 0.554 | | **nbVSS** = | 115.9 | mg/L |
| Aeration Tank VSS Production Rate, **$P_{X,VSS}$** = | 10888 | lb VSS/day | | | |
| Aeration Tank TSS Production Rate, **$P_{X,TSS}$** = | 13261 | lb TSS/day | | | |
| Mass of **MLVSS** = | 43,141 | lb VSS | Mass of **MLSS** = | 52,541 | lb TSS |

AER. TANK CALC'NS

## V. Aeration Tank Calculations (User input needed in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Req. Aeration Vol., **$V_{aer,min}$** = | 99,085 | $ft^3$ | **Click on green box & then on the arrow to select tank shape** | **rectangular** | |
| Aer. + Membr. Vol., **$V_{tot}$** = | 106,446 | $ft^3$ | | | |
| Req. Vol. per tank, **$V_{tank}$** = | 53,223 | $ft^3$ | **Actual Tank Width =** | 38.3 | ft |
| Calculated Tank Width = | 32.5 | ft | **Actual Tank Length =** | 71.8 | ft |
| Calculated Tank Length = | 75.4 | ft | Act. Aer. Vol., **$V_{aer,act}$** = | 55,993 | $ft^3$ |
| Tank Wall Height = | 23.7 | ft | Memb. Mod. Vol/Tank: | 3,680 | $ft^3$ |
| Aer. Detention Time, $\tau_{aer}$ = | 4.9 | hr | **MLVSS** = | 6,979 | mg/L |
| Vol. BOD Loading = | 129.0 | lb BOD/d/1000 $ft^3$ | | | |
| **F:M** ratio = | 0.296 | lb BOD/d/lb MLVSS | | | |
| Sludge Wasting Rate, **$Q_w$** = | 211,422 | gal/day | | | |

## VI. User Inputs - Enter values in yellow cells only

### Discussion and References

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice

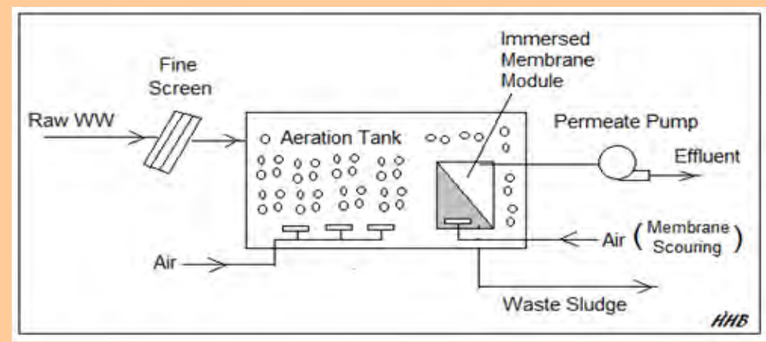
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications

Section 7.8, Analysis and Design of Membrane Bioreactor Processes

As noted in all four of the above references, MLSS and $X_w$ for MBR processes are typically in the range from 8,000 to 12,000 mg/L.




**Flow Diagram - Membrane Bioreactor for BOD Removal & Nitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process

Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

**Equations Used in the Calculations:**

$\mu_{mn}$ at $T_{ww}$ = $(\mu_{mn_20})*\theta_{\mu mn}^{[((Tww-32)/1.8)-20]}$

$k_{dn}$ at $T_{ww}$ = $(k_{mn_20})*\theta_{kdn}^{[((Tww-32)/1.8)-20]}$

$K_n$ at $T_{ww}$ = $(K_{n_20})*\theta_{Kn}^{[((Tww-32)/1.8)-20]}$

$\mu_n = [\mu_{mn}*NH_4\text{-}N_e/(K_n + NH_4\text{-}N_e)]*[DO_o/(0.5 + DO_o)] - k_{dn}$

Theor. **SRT** = $1/\mu_n$

Design **SRT** = (Theor. **SRT**)**FS** ( **FS** = TKN Peak/Ave Factor )

$\mu_m$ at $T_{ww}$ = $(\mu_{m_20})*\theta_{\mu m}^{[((Tww-32)/1.8)-20]}$

$k_d$ at $T_{ww}$ = $(k_{m_20})*\theta_{kd}^{[((Tww-32)/1.8)-20]}$ **bCODo = 1.6*BODo**

$S = K_s*[1 + (k_d*SRT)]/[SRT*(\mu_m - k_d) - 1]$

$P_{x,bio} = (Q_o*Y*(\mu_m - k_d)*8.34/(1 + (k_d*SRT)))$
$+ (f_d*k_d*Q_o*Y*(\mu_m - k_d)SRT*8.34/(1 + (k_d*SRT)))$
$+ (Q_o*Y_n*NO_x*8.34/(1 + (k_{dn}*SRT)))$

$NO_x = TKN_o - NH_4\text{-}N_e - [(0.12\ P_{x,bio}/8.34)/Q_o]$

$bpCOD/pCOD = (bCOD/BOD)*(BOD_o - sBOD_o)/(COD_o - sCOD_o)$

$nbVSS = [1 - (bpCOD/pCOD)]VSS_o$

$P_{x,VSS} = P_{x,bio} + (Q_o*nbVSS*8.34)$ $P_{x,TSS} = P_{x,VSS} + [Q_o(TSS_o - VSS_o)8.34]$

Mass of **MLVSS** = $P_{X,VSS}$*SRT Mass of **MLSS** = $P_{X,TSS}$*SRT

Required Aeration Volume = $V_{aer,min} = (\text{Mass of MLSS}/(MLSS*8.34))*(10^6/7.48)$

Aeration Detntion Time, $\tau = (V_{aer,act}*7.48/10^6)*N*24/Q_o$

Vol. BOD Loading = $Q_o*BOD_o*8.34/((V_{aer,act}/1000)*N)$

**MLVSS = MLSS(Mass of MLVSS/Mass of MLSS)**

**F:M ratio** = $Q_o*8.34*BOD_o/((MLVSS*8.34*(V_{aer,act}*7.48/10^6)*N))$

$Q_w = ((N*V_{aer,act}*7.48/10^6)*MLSS/(SRT*X_w))*10^6$

**Air Requirement/Blower Design Calculations**

$P_{atm} = 14.696*EXP[-32.17*MW_{air}*Elev/(g_c*R*T_{amb})$

DRAFT

OXYGEN/AIR/BLOWER REQUIREMENTS

| | | | | | |
|---|---|---|---|---|---|
| Standard $O_2$ transf. Effic., **SOTE** = (from diffuser mfr or vendor) | 30.0% | | Design Elevation above Sea Level, **Elev** = | 225 | ft |
| | | | ambient air Temp., $T_{amb}$ = | 70 | °F |
| Ratio of oxygen transfer rate in wastewater to that in clean water, $\alpha$ = | 0.5 | | Diffuser Fouling Factor, **F** = | 0.8 | |
| Ratio of D.O. saturation in ww to that in clean water at same T & P, **B** = | 1.0 | | Depth of Diffuser, $d_{diff}$ = | 21.7 | ft |
| D.O sat'n conc. for clean water at ww temp. & 1 atm, $C_s$ = | 9.3 | mg/L | Pressure drop across diffuser, $\Delta P_{diff}$ = (from diffuser mfr or vendor) | 10.8 | in $H_2O$ |

**NOTE:** Derivation of the equation for $C_s$ as a function of $T_{ww}$ is shown in wksht 7.

## VII. Air Requirement/Blower Design Calculations

| | | | | | |
|---|---|---|---|---|---|
| Barom. Pressure, $P_{atm}$ = | 14.6 | psia | Des. Air Flow Rate, **SCFM:** | 5,920 | scfm |
| Pressure at Mid Depth, $P_D$ = | 19.3 | psia | | | |
| Standard Air Density, $\rho_{air}$ = (from Ideal Gas Law) | 0.07521 | lb/ft$^3$ | Des. Air Flow Rate, **ACFM:** (at delivery point) | 3558 | acfm |
| $O_2$ Utilization Rate, $m_{O2}$ = | 12,327 | lb/day | Blower Outlet Press., $P_{B2}$ = | 24.38 | psia |
| Actual $O_2$ transf. Efficiency, **AOTE** = | 8.33% | | | | |

**(This is the air flow rate needed for the aeration tank, typically provided by a fine bubble diffuser system.)**

This equation for $P_{atm}$ as a function of elev. above sea level and ambient temperature comes from:
Water Reuse: Issues, Technologies, and Applications, Sec. 2.2

$$P_D = P_{atm} + (62.4*d_{diff}/2)/144 \qquad \rho_{air} = MW_{air}*P_{std}/(10.73*(T_{std} + 459.67))$$

lb/day $O_2$: $m_{O2} = Q_o*8.34*(BOD_o - BODe)/f - (1.42*P_{x,VSS}) + (4.57*Q_o*8.34*NO_x)$

This equation for oxygen utilization rate comes from:
Nalco Water Handbook, 4th Ed., Ch. 23 Eqns 23.6 and 23.7

The equation below for the actual oxygen transfer efficiency, AOTE, is found as
Design of Water Resource Recovery Facilities, 6th Ed., Equation 12.32

$$AOTE = SOTE\ \alpha\ F\ \frac{\left(B\left(\frac{P_D}{P_{std}}\right)C_s - C_L\right)}{C_{ss}}\ \theta^{(Tww-20)}$$

**Note that for use in this equation Tww must be converted to °C**

Design Air Flow Rate, **SCFM = ($m_{O2}$/AOTE)*$MW_{air}$/($O_2$_mole fraction*MW_$O_2$*$\rho_{air}$_std*60*24**

Design Air Flow Rate, **ACFM = SCFM*($P_{std}$/$P_{blower}$)*(($T_{ww}$ + 459.67)/($T_{std}$ + 459.67))**

Blower Outlet Press., $P_{B2} = P_{atm} + \Delta P_{diff}*0.036126 + 62.4*d_{diff}/144$

ALKALINITY REQUIREMENT

## VIII. User Inputs and Constants- Enter value in yellow cell only

| | | |
|---|---|---|
| Target Effluent Alkalinity = | 20 | mg/L as $CaCO_3$ |
| Equiv. Weight of $CaCO_3$ = | 50 | g/equiv. |
| Equiv. Weight of $NaHCO_3$ = | 84 | g/equiv. |
| Alkalinity used for Nitrification = | 7.14 | g $CaCO_2$/g $NH_3$-N |

Alkalinity used for Nitrification, **$Alk_{Nitrif}$ = 7.14*NOx mg/L as $CaCO_3$**

Alkalinity needed = **$Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$ mg/L as $CaCO_3$**

Alkalinity needed **Alk_perday = ($Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$)Qo*8.34 lb/day as $CaCO_3$**

Sodium Bicarbonate needed to maintain alkalinity = **Alk_perday*84/50 lb/day $NaHCO_3$**

## IX. Calculation of Alkalinity Requirement

| | | |
|---|---|---|
| Alkalinity used for Nitrification = | 320.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 40.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 1,403 | lb/day as $CaCO_3$ |
| Sodium Bicarbonate needed per day to maintain alkalinity = | 2,356 | lb/day $NaHCO_3$ |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

DRAFT

rectangular
cylindrical

# MBR WW Treatment Process Design Calculations - U.S. Units
## PreAnoxic Denitrification

**This worksheet makes the design calculations for preanoxic denitrification basin(s) to go with the Aeration Tank(s) designed for BOD removal and Nitrification in Worksheet 4. (Wastewater parameters/characteristics and biological kinetic coefficients entered on Worksheet 2 will also be used in this worksheet)**

INPUTS

### I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| Effluent Nitrate conc., $N_e$ = | 5.0 | mg/L | Mixing Energy | | |
| Nitrate conc. in RAS, $N_{RAS}$ = | 5.0 | mg/L | for Anoxic Reactor = | 0.38 | hp/10$^3$ ft$^3$ |
| Temp. Coeff. For **SDNR** = | 1.026 | . | Design % Excess | | |
| Tank Freeboard = | 2.3 | ft | Nitrif. Capacity = | 2% | |
| No. of Anoxic Tanks, $N_{an}$ = | 2 | . | Liquid Depth in Tank = | 22 | ft |
| Est. of detention time, $t_{an}$ = | 0.9654 | hr | Tank L:W ratio = | 1 | |

**Note that an initial estimate is needed for anoxic detention time in cell D19 to start an iterative calculation of minimum required anoxoc detention time below.**

**(Tank L:W ratio is only used for rectangular tanks)**

PROCESS DESIGN CALCULATIONS

### II. Calculate RAS Ratio and Anoxic Tank Active Biomass Conc.

| | | | | |
|---|---|---|---|---|
| RAS ratio, **RAS** = | 7.99 | Aer. Tank Act. Biomass, $P_{xb}$ = | 6330 | lb/d |
| An. Tank MLSS, $MLSS_{AN}$ = | 7554 | mg/L | | |
| Aeration Tank Active Biomass Fraction, $X_{aer,b}$ = | | 0.4773 | | |
| Anoxic Tank Active Biomass Conc., $X_{an,b}$ = | | 3606 | mg/L | |

### III. Calc Feed Rate of $NO_x$ to Anoxic Tank and Anoxic Tank Volume

| | | | | |
|---|---|---|---|---|
| Flow rate to Anoxic Tank = | 32.9 | MGD | | |
| (RAS flow containing nitrate) | | Anoxic Tank Volume, $V_{an}$ = | 22,155 | ft$^3$ |
| $NO_x$ rate to Anoxic Tank = | 1372 | lb/day | (based on detention time value in cell D19) | |

### IV. Calculate the SDNR (Specific Denitrification Rate)

| | | | |
|---|---|---|---|
| Anoxic Tank **F/M** ratio = | 2.8979 | lb BOD/day/lb MLVSS | |
| **rbCODo/bCODo** ratio = | 0.1275 | | |
| | Next lower rbCOD/bCOD value from table = | | 0.1 |
| | Next higher rbCOD/bCOD value from table = | | 0.2 |
| **SDNR** for rbCOD/bCOD = | 0.1 | is equal to | 0.26899 |
| **SDNR** for rbCOD/bCOD = | 0.2 | is equal to | 0.33855 |
| **SDNR** for rbCOD/bCOD = | 0.1275 | is equal to | 0.2881 ( at 20°C) |
| **SDNR** at $T_{ww}$ = | 0.2808 | lb $NO_3$-N/day/lb biomass (at $T_{ww}$) | |

TANK VOLUME AND DIMENSIONS

### V. Calculate Anoxic Tank Volume, Dimensions, and Detention Time

| | | | | |
|---|---|---|---|---|
| $NO_3$-N reduction capacity = | 1399 | lb/day | % Excess Nitrif Capacity = | 2.0% |
| Difference between Design and Calculated % Excess Nitrif. Capacity = | | | 0.000 | |
| Anoxic Tank min. Vol, $V_{an}$ = | 22,155 | ft$^3$ | | |
| Min. Anoxic Det'n Time, $t_{an}$ = | 0.97 | hr | | |

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $V_{an}$ and $t_{an}$ values as follows: Place the cursor on the green cell G64 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell" G64 "To value:" 0, "By changing cell:" D19, and click on "OK". The calculated values of $V_{an}$ and $t_{an}$ will be in cells D66 and D68. Cell G64 should be zero if the process worked right. A preliminary estimate for $t_{an}$ is needed in cell D19 in order for the iterative solution to work.**

| | | | | | |
|---|---|---|---|---|---|
| Min. Vol. per tank, $V_{tank}$ = | 11,078 | ft$^3$ | **Click on green box & then on the arrow** | | |
| Calculated Tank Width = | 22.6 | ft | **to select tank shape** | rectangular | |
| Calculated Tank Length = | 22.6 | ft | **Actual Tank Width =** | 28.0 | ft |
| Tank Wall Height = | 24.0 | ft | **Actual Tank Length =** | 38.0 | ft |
| | | | Act. Tank Liq. Vol. = | 23,089 | ft$^3$ |
| Anoxic Detention Time, $\tau_{an}$ = | 2.012 | hr | (Preanoxic Tank Liquid Volume) | | |

ONS

### VI. Calc. Revised Air Requirement & Alkalinity Requirement, Mixing Power & Sludge Wasting Rate

| | | | | |
|---|---|---|---|---|
| Oxygen Credit = | 3924 | lb/day | equals: 163.5 | lb/hr |
| $O_2$ Utilization Rate = | 350 | lb/hr | | |

**Discussion and References**

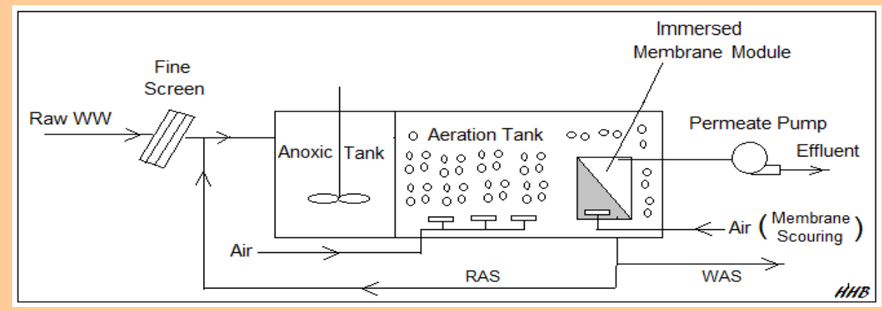
**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes




**Membrane Bioreactor for Preanoxic Denitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process
Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

RAS ratio, **RAS = ($NO_x/N_{RAS}$) - 1**

Aer Tank Act. Biomass, $P_{xb} = [Q_o*Y*(bCOD_o - S)*8.34]/[1 + (k_d*SRT)]$

Anaer. Tank MLSS, $MLSS_{AN} = [RAS/(RAS + 1)]\ MLSS_w$

Aeration Tank Active Biomass Fraction, $X_{aer,b} = P_{xb}/P_{x,vss}$

Anoxic Tank Active Biomass Conc., $X_{an,b} = X_{aer,b}*MLSS_{AN}$

Flow Rate to Anoxic Tank, $Q_{AN} = RAS*Q_o$

$NO_x$ Rate to Anoxic Tank $= Q_{AN}*N_{RAS}*8.34$

Anoxic Tank Volume, $V_{an} = (Q_o*10^6/7.48)*t_{AN}/24$

Anoxic Tank F:M ratio, $F:M = Q_o*BOD_o*8.34/((V_{an}*7.48/10^6)*X_{an,b}/8.34)$

**Coefficients for: $SDNR = b_o + b_1\ [\ln(F:M)]$**

| rbCOD/bCOD | $b_o$ | $b_1$ |
|---|---|---|
| 0.1 | 0.186 | 0.078 |
| 0.2 | 0.213 | 0.118 |
| 0.3 | 0.235 | 0.141 |
| 0.4 | 0.242 | 0.152 |
| 0.5 | 0.27 | 0.162 |
| 0.10 | 0.1860 | 0.0780 |
| 0.20 | 0.2130 | 0.1180 |

The SDNR equation, coefficient values, and temperature correction equations are from: Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery*, 5th Ed., McGraw-Hill, 2014

Note that for F:M < 0.5, SDNR at 20°C is calculated as: **SDNR = 0.24*F:M**

**SDNR** at $T_{ww}$ = (**SDNR** at 20°C)*$\theta_{SDNR}^{[((Tww-32)/1.8)-20]}$

$NO_3$-N reduction capacity $= (V_{an}*7.48/10^6)*SDNR*X_{an,b}*8.34$

% Excess Nitrif. Capac. = ($NO_3$-N Reduction Capacity - $NO_x$ Rate to Anoxic Tank) / $NO_x$ Rate to Anoxic Tank

Min. Anoxic Det'n Time, $t_{an} = V_{an}*24/(Q_o*10^6/7.48)$

Min. Vol. per Tank, $V_{tank} = V_{an}/N_{an}$

Oxygen credit for nitrate reduction $= 2.86\ Q_o(NO_x - N_e)$

Alkalinity produced by nitrate reduction $= 3.57(NO_x - N_e)$

Sludge Wasting Rate:

$Q_w = [((V_{aer}*MLSS + V_{anox}*X_b)/SRT)]/(TSS_w)$

DRAFT

FINAL CALCULAT

| | | |
|---|---|---|
| Required Air Flow Rate (in Aeration Tank), SCFM = | 4035.6 | SCFM |
| Required Air Flow Rate (in Aeration Tank), ACFM = | 2425.3 | ACFM |

| | | |
|---|---|---|
| Alkalinity Produced = | 142.6 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -101.7 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -3496 | lb/day as $CaCO_3$ |

Sodum Bicarbonate Needed per Day to Maintain Alkalinity (lb/day $NaHCO_3$) = -5873

| | | |
|---|---|---|
| Required Anoxic Tank Mixing Power = | 17.5 | hp |
| Sludge Wasting Rate = | 248,404 | gal/day |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

rectangular
cylindrical

DRAFT

# Appendix J – Annual Major Service and Replacement Budget

DRAFT

# TECHNICAL MEMORANDUM

**To:** Clete Saunier, Public Works Director
City of Santa Paula

**From:** Becca Bugielski – PE | MKN & Associates, Inc.
Mike Nunley– PE | MKN & Associates, Inc.

**Date:** 3/4/2024

**Re:** Annual Major Service and Replacement Budget

DRAFT

## 1.0 Objectives

As part of the Santa Paula Wastewater Master Plan Update, MKN identified major mechanical equipment and developed recommendations for budgeting to repair and/or replace that equipment. The City of Santa Paula completed the WRF in 2010, and many of the mechanical systems have required replacement or major service since the ten-year milestone is a critical event for evaluating membranes, blowers, pumps, and other major pieces of equipment.

### 1.1 Purpose

The purpose of this evaluation is to allow the City to develop a budget for major service and/or replacement of critical mechanical equipment. These recommendations are based on observation of existing plant systems, cost for ongoing service, and cost for services at similar facilities or for similar pieces of equipment.

## 2.0 Annual Major Service and Replacement Budget

The table on the following page is based on the equipment schedules in Section 4.4 of the Draft Wastewater Master Plan Update. Five year and ten-year intervals are identified, since these are typically the major milestones or design lives for blowers, pumps, and other mechanical equipment.

| Major Service and Replacement Recommendations | | | | | |
|---|---|---|---|---|---|
| | | 5 Year | | 10 Year | |
| Processes | Quantity | Cost Opinion | Comment | Cost Opinion | Comment |
| **Influent Lift Station** | | | | | |
| Pumps | 4 | $ 40,000 | New seals and Impellers | $ 100,000 | Replacement |
| Plug Valves | 4 | $ 20,000 | New internals and operator service | $ 20,000 | New internals and operator service |
| Swing-Flex Check Valves | 4 | $ 20,000 | New internals and operator service | $ 20,000 | New internals and operator service |
| Slide Gates | 2 | $ 10,000 | New internals and operator service | $ 10,000 | New internals and operator service |
| Flap Gates | 2 | $ 10,000 | Inspection and repairs | $ 10,000 | Inspection and repairs |
| **Headworks** | | | | | |
| Primary Screens | 2 | $ 30,000 | New bearings and inspection/ repairs | $ 200,000 | Screen replacement |
| Grit Vortex | 2 | $ 10,000 | New bearings and inspection/ repairs | $ 100,000 | Replacement |
| Grit Classifier | 2 | $ 15,000 | New bearings and inspection/ repairs | $ 30,000 | Replacement |
| Primary Screens Conveyor | 2 | $ 10,000 | New bearings and inspection/ repairs | $ 100,000 | Replacement |
| Fine Screens | 2 | $ 30,000 | New bearings and inspection/ repairs | $ 200,000 | Screen replacement |
| Fine Screens Conveyor | 2 | $ 10,000 | New bearings and inspection/ repairs | $ 100,000 | Replacement |
| Slide Gates | 6 | $ 30,000 | New internals and operator service | $ 30,000 | New internals and operator service |
| **EQ Basins** | | | | | |
| Slide Gates | 2 | $ 20,000 | Inspection and repairs | $ 20,000 | Inspection and repairs |
| **Anoxic Basins** | | | | | |
| Anoxic Mixer | 3 | $ 15,000 | Replacement | $ 15,000 | Replacement |
| Diversion Channel Slide Gates | 3 | $ 20,000 | New internals and operator service | $ 20,000 | New internals and operator service |
| **Aeration Basins** | | | | | |
| MBR Feed Pumps | 3 | $ 30,000 | New seals and Impellers | $ 210,000 | Replacement |
| RAS Pumps | 3 | $ 30,000 | New seals and Impellers | $ 210,000 | Replacement |
| Aeration Panels | 207 | $ 100,000 | Replace panels | $ 100,000 | Replace panels |
| Biological Aeration Blowers | 4 | $ 200,000 | Inspection and repairs | $ 400,000 | Replacement |
| **ML Collection and MLSS Recirculation Channels** | | | | | |
| WAS Pumps | 2 | $ 20,000 | New seals and Impellers | $ 140,000 | Replacement |

DRAFT

| | | | | | |
|---|---|---|---|---|---|
| Mud Valves | 6 | $ 30,000 | New internals and operator service | $ 30,000 | New internals and operator service |
| Slide Gates | 3 | $ 30,000 | Inspection and repairs | $ 30,000 | Inspection and repairs |
| Channel Aeration Blowers | 2 | $ 100,000 | Inspection and repairs | $ 200,000 | Replacement |
| **MBR Filtration Modules** | | | | | |
| Mud Valves | 6 | $ 30,000 | New internals and operator service | $ 30,000 | New internals and operator service |
| Membrane Filtration Modules | 24 | $ 50,000 | Inspection and repairs | $ 250,000 | Replacement |
| Permeate Pumps | 6 | $ 60,000 | New seals and impellers | $ 420,000 | Replacement |
| Membrane Module Aeration | 3 | $ 150,000 | | | |
| **UV Disinfection** | | | | | |
| UV Modules | 10 | $ 50,000 | Inspect modules and replace lamps | $ 100,000 | Replace modules and lamps |
| UV Air Flush-out Compressor | 1 | $ 15,000 | Replacement | $ 15,000 | Replacement |
| Automatic Level Gate | 2 | $ 20,000 | Inspection and repairs | $ 20,000 | Inspection and repairs |
| Channel Weir Gates | 2 | $ 20,000 | Inspection and repairs | $ 20,000 | Inspection and repairs |
| **CIP Storage Tanks and Foam Spray System** | | | | | |
| CIP Pumps | 2 | $ 60,000 | Replacement | $ 60,000 | Replacement |
| Chemical Metering/Injection Pumps | 2 | $ 20,000 | Replacement | $ 20,000 | Replacement |
| Foam Spray Pumps | 2 | $ 20,000 | Replacement | $ 20,000 | Replacement |
| Foam Spray Nozzles | 270 | $ 50,000 | Inspection and repairs | $ 100,000 | Inspection and repairs |
| Storage Tank Drain - Mud Valves | 2 | $ 10,000 | New internals and operator service | $ 10,000 | New internals and operator service |
| **Solids Processing System** | | | | | |
| Gravity Belt Thickeners | 2 | $ 50,000 | Inspection and repairs | $ 300,000 | Replacement |
| Digester Blowers | 3 | $ 150,000 | Inspection and repairs | $ 300,000 | Replacement |
| Rethickening Pumps | 2 | $ 20,000 | New seals and impellers | $ 140,000 | Replacement |
| Screw Press Feed Pumps | 1 | $ 10,000 | New seals and impellers | $ 70,000 | Replacement |
| Screw Press | 1 | $ 30,000 | Inspection and repairs | $ 150,000 | New internals and motor |
| Polymer Units | 3 | $ 15,000 | Inspection and repairs | $ 60,000 | Replacement |
| **Odor Control System** | | | | | |

DRAFT

| | | | | | |
|---|---|---|---|---|---|
| Foul Air Blower | 1 | $ 10,000 | Inspection and repairs | $ 50,000 | Replacement |
| Biological Trickling Filter | 1 | $ 100,000 | | $ 100,000 | |
| **Total (Rounded)** | | **$ 1,800,000** | | **$ 4,600,000** | |

Notes

1) ENR LA CCI (Jan 2024) = 15299.7
2) Future Costs have not been escalated. It is assumed costs will be escalated during development of the rate study.

As shown in the attached table, 5-year major expenditures of $1.8M and 10-year expenditures of $4.6M should be anticipated by the City. These costs are not escalated, but it is recommended the City budget annually to build reserves for payment of these expenses. An annual allocation of $640,000, with annual escalation as recommended by the City's financial consultant, would allow the City to prepare to cover these anticipated costs at these 5- and 10-year milestones.

DRAFT

# ATTACHMENT 2

## 2024 Wastewater Collection System and Water Recycling Facility Master Plan Appendices

# Appendix A – Flow Monitoring Study

DRAFT

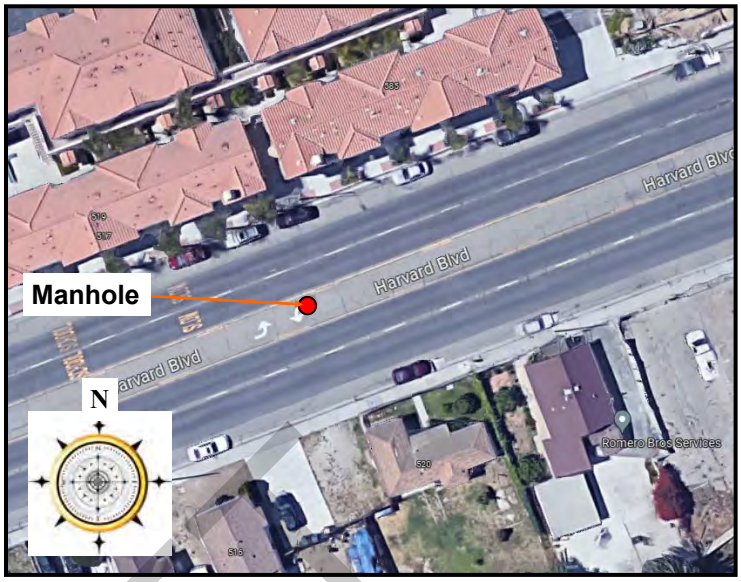
# CITY OF SANTA PAULA - SEWER FLOW STUDY

MH Location: **520 Harvard Blvd.**
**Santa Paula, CA 93060**

Pipe Size: **18" VCP**

Time Period: **7/11/2023 - 12:00 a.m. to**
**7/25/2023- 12:00 a.m.**

GPS: **34.348436, -119.065191**




## Manhole - Layout

- Manhole walls are made of stacked brick and mortar. Pipe transitions are in good condition inside of manhole
- Meter was placed inside downstream pipe in order to capture the flow from the tie in.

## Equipment

**Teledyne Isco 2150 Area Velocity Flow Meter with 10' measuring range:**
**Level Measurement:**

- Method - Submerged pressure transducer mounted in the flow stream
- Transducer Type - Differential linear integrated circuit pressure transducer
- Range (standard) 0.033 to 10 ft (0.010 to 3.05 m); Maximum Allowable Level 34 ft (10.5 m)
- Accuracy ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m,)
- Long-Term Stability ±0.023 ft/yr (±0.007 m/yr)
- Compensated Range 32° to 122°F (0° to 50°C)

**Velocity Measurement:**

- Method - Doppler ultrasonic, frequency 500 kHz
- Typical Minimum Depth 0.08 ft (25 mm)
- Range -5 to +20 ft/s (-1.5 to +6.1 m/s)
- Accuracy (in water with uniform velocity profile, speed of sound = 4850 ft/s, for indicated velocity range) ±0.1 ft/s from -5 to 5 ft/s (±0.03 m/s from— 1.5 to +1.5 m/s)
- ±2% of reading from 5 to 20 ft/s (1.5 to 6.1 m/s)

**Method Of Insertion:**

- 18 inch line requires Confined Space Entry.

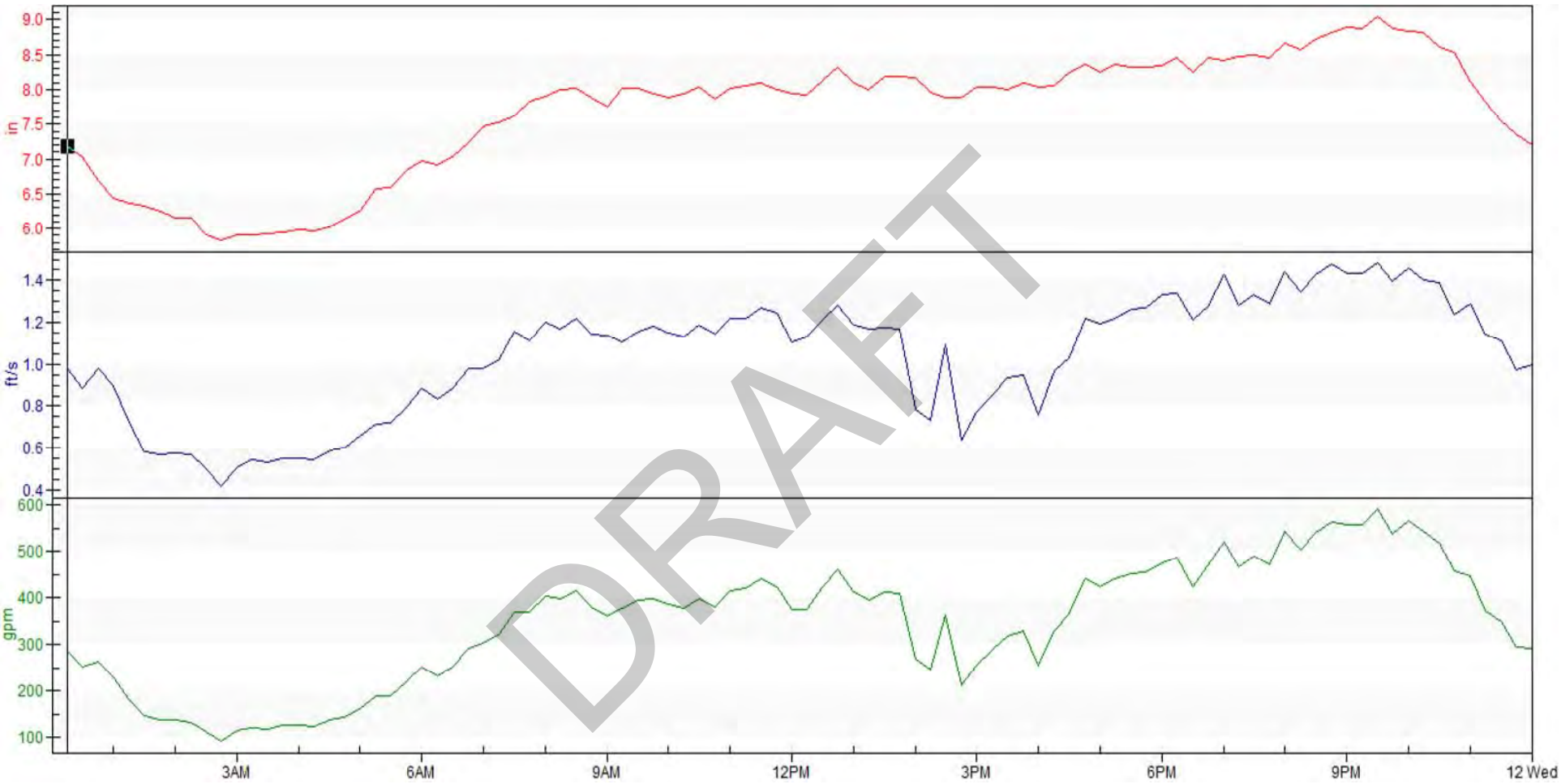
DRAFT

**Gold Coast Environmental**

**Specializing in process instrumentation and calibration.**

1868 Palma Drive, Suite I, Ventura, CA 93003 www.goldcoastenv.com 805.498.3811 ph.

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/11/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Tuesday- A.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| | | | |
| 12:15:00 AM | 7.176 | 0.982 | 285.171 |
| 12:30:00 AM | 7.02 | 0.883 | 252.86 |
| 12:45:00 AM | 6.684 | 0.978 | 262.146 |
| 1:00:00 AM | 6.442 | 0.897 | 228.816 |
| 1:15:00 AM | 6.364 | 0.721 | 180.816 |
| 1:30:00 AM | 6.333 | 0.582 | 145.09 |
| 1:45:00 AM | 6.252 | 0.57 | 137.604 |
| 2:00:00 AM | 6.156 | 0.574 | 137.649 |
| 2:15:00 AM | 6.145 | 0.57 | 133.583 |
| 2:30:00 AM | 5.903 | 0.501 | 113.486 |
| 2:45:00 AM | 5.828 | 0.418 | 92.864 |
| 3:00:00 AM | 5.899 | 0.505 | 114.22 |
| 3:15:00 AM | 5.904 | 0.541 | 121.559 |
| 3:30:00 AM | 5.927 | 0.529 | 117.895 |
| 3:45:00 AM | 5.938 | 0.549 | 125.205 |
| 4:00:00 AM | 5.978 | 0.551 | 126.914 |
| 4:15:00 AM | 5.971 | 0.544 | 124.278 |
| 4:30:00 AM | 6.015 | 0.589 | 136.878 |
| 4:45:00 AM | 6.139 | 0.599 | 143.092 |
| 5:00:00 AM | 6.24 | 0.659 | 160.937 |
| 5:15:00 AM | 6.574 | 0.717 | 187.884 |
| 5:30:00 AM | 6.599 | 0.718 | 188.9 |
| 5:45:00 AM | 6.831 | 0.799 | 220.672 |
| 6:00:00 AM | 6.97 | 0.886 | 251.299 |
| 6:15:00 AM | 6.91 | 0.833 | 233.275 |
| 6:30:00 AM | 7.03 | 0.882 | 252.726 |
| 6:45:00 AM | 7.245 | 0.979 | 292.397 |
| 7:00:00 AM | 7.463 | 0.979 | 303.501 |
| 7:15:00 AM | 7.529 | 1.017 | 319.625 |
| 7:30:00 AM | 7.628 | 1.159 | 369.612 |
| 7:45:00 AM | 7.822 | 1.114 | 368.409 |
| 8:00:00 AM | 7.914 | 1.203 | 403.953 |
| 8:15:00 AM | 8.008 | 1.167 | 397.994 |
| 8:30:00 AM | 8.021 | 1.221 | 415.67 |
| 8:45:00 AM | 7.885 | 1.143 | 380.289 |
| 9:00:00 AM | 7.749 | 1.137 | 361.494 |
| 9:15:00 AM | 8.022 | 1.108 | 378.761 |
| 9:30:00 AM | 8.014 | 1.157 | 395.114 |
| 9:45:00 AM | 7.949 | 1.179 | 397.148 |
| 10:00:00 AM | 7.895 | 1.153 | 385.795 |
| 10:15:00 AM | 7.935 | 1.134 | 377.751 |
| 10:30:00 AM | 8.033 | 1.19 | 398.148 |
| 10:45:00 AM | 7.873 | 1.145 | 381.772 |
| 11:00:00 AM | 8.015 | 1.218 | 415.983 |
| 11:15:00 AM | 8.059 | 1.223 | 420.433 |
| 11:30:00 AM | 8.097 | 1.271 | 439.855 |
| 11:45:00 AM | 7.991 | 1.242 | 422.478 |

**Tuesday- P.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.943 | 1.109 | 374.206 |
| 12:15:00 PM | 7.915 | 1.133 | 373.468 |
| 12:30:00 PM | 8.132 | 1.215 | 422.74 |
| 12:45:00 PM | 8.33 | 1.283 | 460.71 |
| 1:00:00 PM | 8.103 | 1.188 | 411.419 |
| 1:15:00 PM | 8.003 | 1.172 | 394.073 |
| 1:30:00 PM | 8.196 | 1.172 | 412.057 |
| 1:45:00 PM | 8.196 | 1.166 | 408.752 |
| 2:00:00 PM | 8.177 | 0.784 | 268.728 |
| 2:15:00 PM | 7.968 | 0.731 | 246.496 |
| 2:30:00 PM | 7.877 | 1.093 | 364.433 |
| 2:45:00 PM | 7.878 | 0.639 | 213.252 |
| 3:00:00 PM | 8.047 | 0.773 | 256.147 |
| 3:15:00 PM | 8.04 | 0.852 | 288.172 |
| 3:30:00 PM | 8.001 | 0.934 | 318.272 |
| 3:45:00 PM | 8.104 | 0.948 | 328.399 |
| 4:00:00 PM | 8.033 | 0.759 | 256.072 |
| 4:15:00 PM | 8.048 | 0.966 | 330.345 |
| 4:30:00 PM | 8.244 | 1.033 | 365.917 |
| 4:45:00 PM | 8.369 | 1.221 | 440.122 |
| 5:00:00 PM | 8.246 | 1.192 | 422.317 |
| 5:15:00 PM | 8.367 | 1.22 | 440.383 |
| 5:30:00 PM | 8.328 | 1.261 | 452.693 |
| 5:45:00 PM | 8.317 | 1.267 | 453.401 |
| 6:00:00 PM | 8.346 | 1.333 | 474.869 |
| 6:15:00 PM | 8.453 | 1.339 | 487.1 |
| 6:30:00 PM | 8.239 | 1.211 | 422.99 |
| 6:45:00 PM | 8.459 | 1.279 | 468.46 |
| 7:00:00 PM | 8.427 | 1.427 | 520.169 |
| 7:15:00 PM | 8.476 | 1.281 | 465.367 |
| 7:30:00 PM | 8.5 | 1.333 | 487.504 |
| 7:45:00 PM | 8.46 | 1.286 | 471.059 |
| 8:00:00 PM | 8.67 | 1.438 | 543.462 |
| 8:15:00 PM | 8.578 | 1.347 | 502.431 |
| 8:30:00 PM | 8.722 | 1.428 | 539.631 |
| 8:45:00 PM | 8.82 | 1.478 | 562.773 |
| 9:00:00 PM | 8.901 | 1.432 | 557.871 |
| 9:15:00 PM | 8.874 | 1.434 | 558.465 |
| 9:30:00 PM | 9.048 | 1.485 | 590.916 |
| 9:45:00 PM | 8.874 | 1.396 | 538.714 |
| 10:00:00 PM | 8.844 | 1.46 | 566.303 |
| 10:15:00 PM | 8.819 | 1.406 | 543.13 |
| 10:30:00 PM | 8.605 | 1.393 | 516.29 |
| 10:45:00 PM | 8.528 | 1.237 | 457.915 |
| 11:00:00 PM | 8.123 | 1.286 | 446.952 |
| 11:15:00 PM | 7.837 | 1.143 | 372.211 |
| 11:30:00 PM | 7.539 | 1.114 | 348.878 |
| 11:45:00 PM | 7.351 | 0.975 | 295.419 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.671 | 1.040 | 346.773 |
| Daily Min: | 5.828 | 0.418 | 92.864 |
| Daily Max: | 9.048 | 1.485 | 590.916 |
| Peak to Avg: | | | 1.70 |

DRAFT

# MAXIMUM DAILY FLOW DATA

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/12/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Wednesday - A.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.207 | 0.998 | 290.826 |
| 12:15:00 AM | 7.066 | 0.952 | 275.095 |
| 12:30:00 AM | 6.725 | 0.791 | 213.704 |
| 12:45:00 AM | 6.595 | 0.747 | 196.791 |
| 1:00:00 AM | 6.377 | 0.674 | 168.364 |
| 1:15:00 AM | 6.194 | 0.626 | 149.838 |
| 1:30:00 AM | 6.174 | 0.646 | 155.433 |
| 1:45:00 AM | 6.082 | 0.796 | 182.799 |
| 2:00:00 AM | 5.987 | 1.248 | 283.493 |
| 2:15:00 AM | 6.092 | 0.75 | 173.27 |
| 2:30:00 AM | 6.074 | 0.998 | 234.815 |
| 2:45:00 AM | 5.937 | 0.488 | 111.237 |
| 3:00:00 AM | 5.792 | 0.833 | 183.746 |
| 3:15:00 AM | 5.648 | 0.53 | 111.521 |
| 3:30:00 AM | 5.606 | 0.623 | 131.267 |
| 3:45:00 AM | 5.667 | 0.438 | 93.759 |
| 4:00:00 AM | 5.757 | 0.461 | 100.775 |
| 4:15:00 AM | 5.812 | 0.507 | 112.332 |
| 4:30:00 AM | 5.979 | 0.566 | 130.267 |
| 4:45:00 AM | 6.056 | 0.623 | 146.046 |
| 5:00:00 AM | 6.217 | 0.608 | 147.291 |
| 5:15:00 AM | 6.373 | 0.703 | 176.655 |
| 5:30:00 AM | 6.395 | 0.72 | 181.892 |
| 5:45:00 AM | 6.819 | 0.829 | 222.609 |
| 6:00:00 AM | 6.917 | 0.84 | 228.794 |
| 6:15:00 AM | 6.965 | 0.923 | 261.568 |
| 6:30:00 AM | 7.002 | 0.858 | 241.386 |
| 6:45:00 AM | 7.137 | 0.95 | 274.548 |
| 7:00:00 AM | 7.375 | 0.988 | 301.162 |
| 7:15:00 AM | 7.416 | 1.083 | 328.748 |
| 7:30:00 AM | 7.767 | 1.089 | 356.689 |
| 7:45:00 AM | 7.623 | 1.098 | 349.259 |
| 8:00:00 AM | 7.895 | 1.123 | 375.996 |
| 8:15:00 AM | 7.938 | 1.235 | 415.255 |
| 8:30:00 AM | 8.014 | 1.154 | 394.057 |
| 8:45:00 AM | 7.826 | 1.262 | 417.075 |
| 9:00:00 AM | 7.918 | 1.151 | 379.325 |
| 9:15:00 AM | 7.834 | 1.192 | 392.61 |
| 9:30:00 AM | 7.748 | 1.198 | 384.007 |
| 9:45:00 AM | 7.711 | 1.144 | 369.064 |
| 10:00:00 AM | 8.056 | 1.183 | 406.625 |
| 10:15:00 AM | 7.911 | 1.158 | 388.522 |
| 10:30:00 AM | 7.679 | 1.194 | 385.454 |
| 10:45:00 AM | 7.731 | 1.197 | 385.96 |
| 11:00:00 AM | 7.998 | 1.213 | 410.473 |
| 11:15:00 AM | 8.101 | 1.127 | 381.492 |
| 11:30:00 AM | 8.037 | 1.238 | 416.561 |
| 11:45:00 AM | 8.009 | 1.274 | 434.642 |

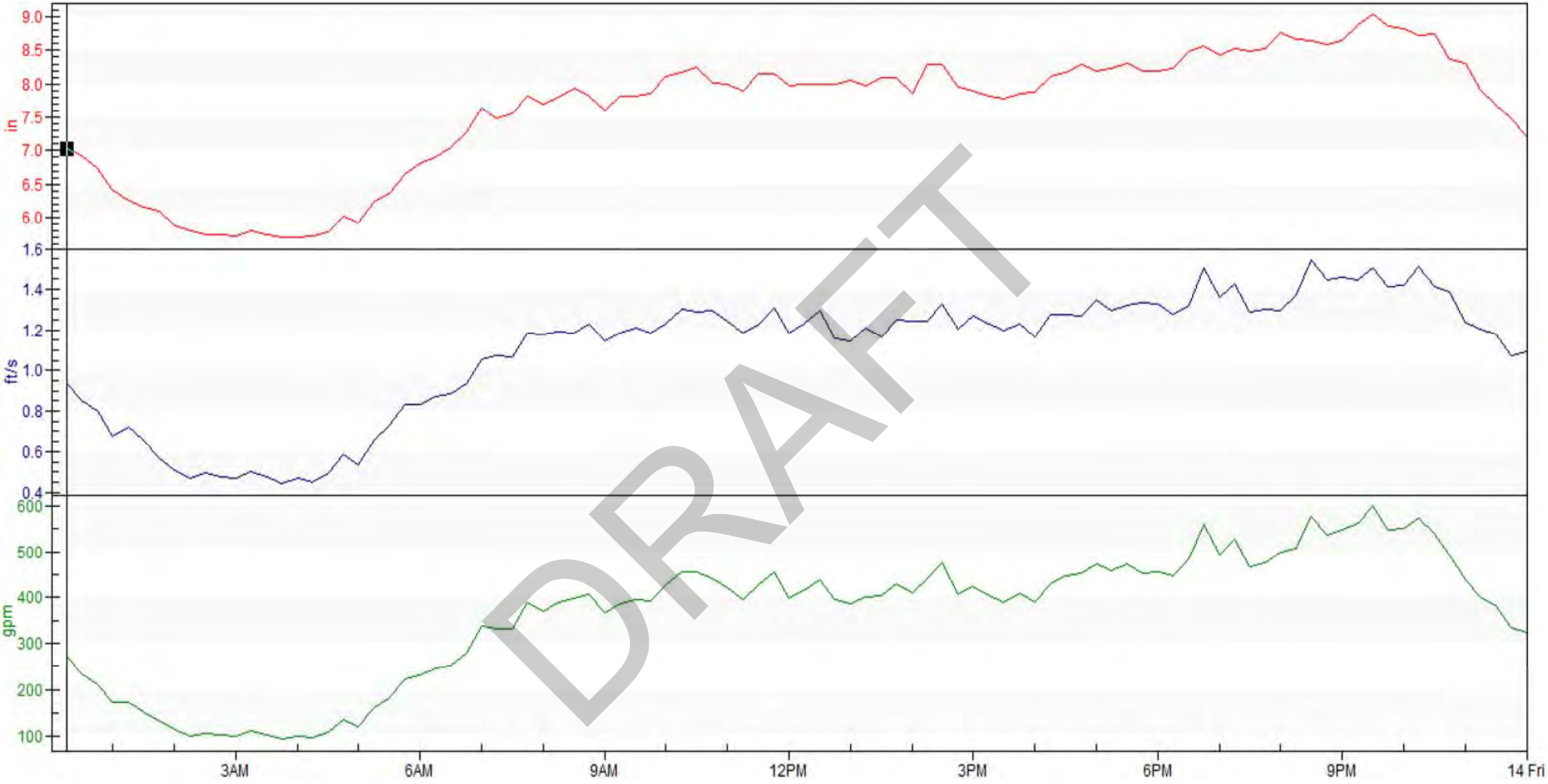
**Wednesday - P.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.028 | 1.245 | 417.246 |
| 12:15:00 PM | 8.091 | 1.248 | 428.656 |
| 12:30:00 PM | 7.913 | 1.159 | 389.177 |
| 12:45:00 PM | 7.935 | 1.136 | 376.022 |
| 1:00:00 PM | 7.836 | 1.205 | 399.478 |
| 1:15:00 PM | 7.762 | 1.228 | 402.134 |
| 1:30:00 PM | 7.829 | 1.169 | 386.879 |
| 1:45:00 PM | 7.666 | 1.201 | 379.839 |
| 2:00:00 PM | 7.83 | 1.238 | 410.071 |
| 2:15:00 PM | 7.658 | 1.129 | 362.477 |
| 2:30:00 PM | 7.929 | 1.258 | 412.561 |
| 2:45:00 PM | 7.886 | 1.185 | 396.14 |
| 3:00:00 PM | 7.558 | 1.138 | 357.937 |
| 3:15:00 PM | 7.802 | 1.178 | 379.068 |
| 3:30:00 PM | 7.716 | 1.135 | 366.023 |
| 3:45:00 PM | 7.813 | 1.161 | 376.82 |
| 4:00:00 PM | 7.681 | 1.089 | 348.894 |
| 4:15:00 PM | 8.069 | 1.219 | 419.225 |
| 4:30:00 PM | 8.484 | 1.269 | 466.699 |
| 4:45:00 PM | 8.125 | 1.178 | 403.482 |
| 5:00:00 PM | 8.217 | 1.351 | 469.265 |
| 5:15:00 PM | 8.238 | 1.27 | 440.792 |
| 5:30:00 PM | 8.275 | 1.346 | 476.884 |
| 5:45:00 PM | 8.216 | 1.273 | 446.338 |
| 6:00:00 PM | 8.375 | 1.259 | 452.824 |
| 6:15:00 PM | 8.188 | 1.253 | 439.891 |
| 6:30:00 PM | 8.398 | 1.341 | 486.445 |
| 6:45:00 PM | 8.393 | 1.31 | 474.787 |
| 7:00:00 PM | 8.48 | 1.337 | 485.301 |
| 7:15:00 PM | 8.416 | 1.363 | 495.969 |
| 7:30:00 PM | 8.708 | 1.423 | 540.967 |
| 7:45:00 PM | 8.595 | 1.404 | 514.296 |
| 8:00:00 PM | 8.45 | 1.374 | 500.771 |
| 8:15:00 PM | 8.512 | 1.374 | 507.315 |
| 8:30:00 PM | 8.409 | 1.339 | 479.567 |
| 8:45:00 PM | 8.465 | 1.4 | 513.041 |
| 9:00:00 PM | 8.696 | 1.445 | 548.426 |
| 9:15:00 PM | 8.561 | 1.346 | 500.543 |
| 9:30:00 PM | 8.8 | 1.38 | 525.912 |
| 9:45:00 PM | 8.797 | 1.381 | 532 |
| 10:00:00 PM | 8.766 | 1.431 | 548.79 |
| 10:15:00 PM | 8.674 | 1.263 | 477.884 |
| 10:30:00 PM | 8.546 | 1.351 | 497.584 |
| 10:45:00 PM | 8.289 | 1.332 | 475.118 |
| 11:00:00 PM | 8.195 | 1.289 | 452.92 |
| 11:15:00 PM | 8.092 | 1.264 | 437.024 |
| 11:30:00 PM | 7.76 | 1.178 | 385.406 |
| 11:45:00 PM | 7.472 | 1.099 | 336.141 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.564 | 1.094 | 356.666 |
| Daily Min: | 5.606 | 0.438 | 93.759 |
| Daily Max: | 8.8 | 1.445 | 548.79 |
| Peak to Avg: | | | 1.54 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/13/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Thursday - A.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.3 | 0.952 | 287.283 |
| 12:15:00 AM | 7.034 | 0.94 | 269.821 |
| 12:30:00 AM | 6.93 | 0.855 | 234.765 |
| 12:45:00 AM | 6.722 | 0.804 | 210.013 |
| 1:00:00 AM | 6.421 | 0.676 | 171.63 |
| 1:15:00 AM | 6.256 | 0.722 | 173.297 |
| 1:30:00 AM | 6.156 | 0.656 | 152.618 |
| 1:45:00 AM | 6.101 | 0.568 | 132.452 |
| 2:00:00 AM | 5.883 | 0.507 | 113.897 |
| 2:15:00 AM | 5.796 | 0.468 | 101.699 |
| 2:30:00 AM | 5.753 | 0.493 | 106.855 |
| 2:45:00 AM | 5.753 | 0.477 | 104.114 |
| 3:00:00 AM | 5.733 | 0.47 | 102.256 |
| 3:15:00 AM | 5.805 | 0.503 | 111.277 |
| 3:30:00 AM | 5.745 | 0.479 | 104.34 |
| 3:45:00 AM | 5.712 | 0.443 | 95.792 |
| 4:00:00 AM | 5.704 | 0.468 | 100.02 |
| 4:15:00 AM | 5.722 | 0.449 | 96.956 |
| 4:30:00 AM | 5.774 | 0.497 | 109.087 |
| 4:45:00 AM | 6.021 | 0.587 | 136.454 |
| 5:00:00 AM | 5.932 | 0.534 | 119.993 |
| 5:15:00 AM | 6.235 | 0.657 | 160.348 |
| 5:30:00 AM | 6.348 | 0.727 | 180.757 |
| 5:45:00 AM | 6.652 | 0.832 | 221.72 |
| 6:00:00 AM | 6.818 | 0.835 | 230.055 |
| 6:15:00 AM | 6.906 | 0.875 | 245.196 |
| 6:30:00 AM | 7.038 | 0.886 | 250.13 |
| 6:45:00 AM | 7.28 | 0.938 | 279.839 |
| 7:00:00 AM | 7.645 | 1.053 | 337.746 |
| 7:15:00 AM | 7.473 | 1.074 | 331.51 |
| 7:30:00 AM | 7.553 | 1.064 | 332.456 |
| 7:45:00 AM | 7.817 | 1.185 | 388.727 |
| 8:00:00 AM | 7.704 | 1.175 | 370.397 |
| 8:15:00 AM | 7.804 | 1.191 | 389.091 |
| 8:30:00 AM | 7.938 | 1.186 | 399.221 |
| 8:45:00 AM | 7.822 | 1.227 | 405.668 |
| 9:00:00 AM | 7.609 | 1.147 | 365.666 |
| 9:15:00 AM | 7.812 | 1.186 | 386.345 |
| 9:30:00 AM | 7.827 | 1.208 | 395.29 |
| 9:45:00 AM | 7.853 | 1.182 | 392.207 |
| 10:00:00 AM | 8.106 | 1.231 | 426.671 |
| 10:15:00 AM | 8.169 | 1.303 | 455.16 |
| 10:30:00 AM | 8.251 | 1.285 | 455.662 |
| 10:45:00 AM | 8.015 | 1.293 | 441.434 |
| 11:00:00 AM | 8 | 1.246 | 420.868 |
| 11:15:00 AM | 7.888 | 1.186 | 395.284 |
| 11:30:00 AM | 8.152 | 1.224 | 427.348 |
| 11:45:00 AM | 8.151 | 1.305 | 455.508 |

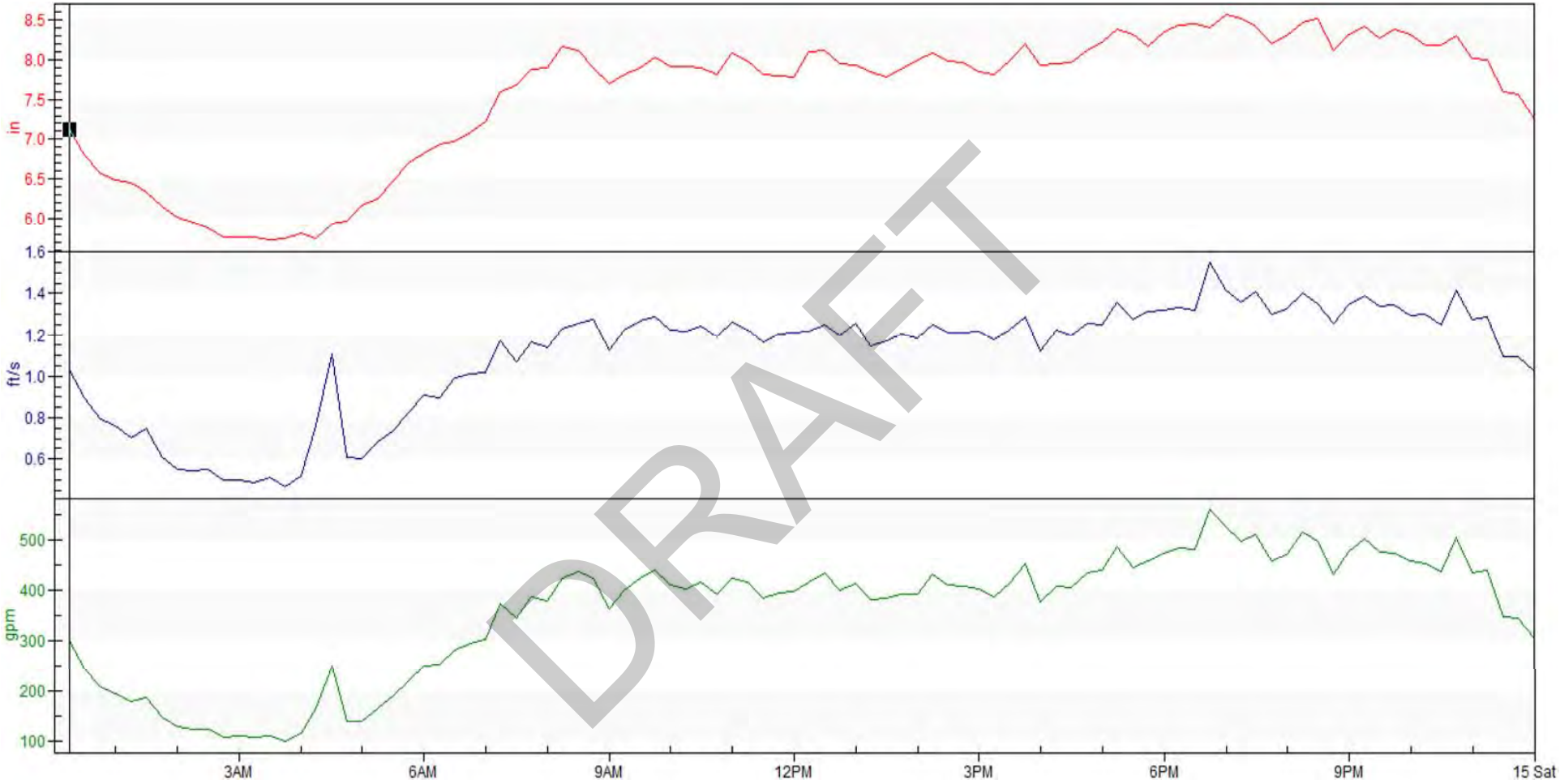
**Thursday - P.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.968 | 1.183 | 399.025 |
| 12:15:00 PM | 8.002 | 1.229 | 414.956 |
| 12:30:00 PM | 7.987 | 1.294 | 439.686 |
| 12:45:00 PM | 8.001 | 1.16 | 395.056 |
| 1:00:00 PM | 8.045 | 1.147 | 387.772 |
| 1:15:00 PM | 7.982 | 1.207 | 400.813 |
| 1:30:00 PM | 8.095 | 1.166 | 403.248 |
| 1:45:00 PM | 8.085 | 1.248 | 429.527 |
| 2:00:00 PM | 7.857 | 1.24 | 410.055 |
| 2:15:00 PM | 8.282 | 1.242 | 442.609 |
| 2:30:00 PM | 8.294 | 1.33 | 474.803 |
| 2:45:00 PM | 7.957 | 1.201 | 406.268 |
| 3:00:00 PM | 7.894 | 1.266 | 423.798 |
| 3:15:00 PM | 7.824 | 1.23 | 402.513 |
| 3:30:00 PM | 7.781 | 1.199 | 390.614 |
| 3:45:00 PM | 7.861 | 1.229 | 409.065 |
| 4:00:00 PM | 7.877 | 1.167 | 389.443 |
| 4:15:00 PM | 8.104 | 1.272 | 430.943 |
| 4:30:00 PM | 8.174 | 1.276 | 447.055 |
| 4:45:00 PM | 8.292 | 1.271 | 453.418 |
| 5:00:00 PM | 8.19 | 1.349 | 473.871 |
| 5:15:00 PM | 8.241 | 1.292 | 457.397 |
| 5:30:00 PM | 8.318 | 1.32 | 471.692 |
| 5:45:00 PM | 8.194 | 1.335 | 453.862 |
| 6:00:00 PM | 8.194 | 1.325 | 454.508 |
| 6:15:00 PM | 8.233 | 1.273 | 448.055 |
| 6:30:00 PM | 8.485 | 1.321 | 483.958 |
| 6:45:00 PM | 8.569 | 1.503 | 559.806 |
| 7:00:00 PM | 8.424 | 1.361 | 492.157 |
| 7:15:00 PM | 8.532 | 1.425 | 527.371 |
| 7:30:00 PM | 8.482 | 1.287 | 467.629 |
| 7:45:00 PM | 8.529 | 1.303 | 476.261 |
| 8:00:00 PM | 8.772 | 1.297 | 497.807 |
| 8:15:00 PM | 8.662 | 1.374 | 508.543 |
| 8:30:00 PM | 8.638 | 1.542 | 576.668 |
| 8:45:00 PM | 8.593 | 1.447 | 536.583 |
| 9:00:00 PM | 8.652 | 1.459 | 548.05 |
| 9:15:00 PM | 8.88 | 1.442 | 562.032 |
| 9:30:00 PM | 9.042 | 1.502 | 599.131 |
| 9:45:00 PM | 8.861 | 1.412 | 548.481 |
| 10:00:00 PM | 8.83 | 1.42 | 549.425 |
| 10:15:00 PM | 8.729 | 1.508 | 574.926 |
| 10:30:00 PM | 8.744 | 1.412 | 539.615 |
| 10:45:00 PM | 8.373 | 1.383 | 493.741 |
| 11:00:00 PM | 8.309 | 1.238 | 437.008 |
| 11:15:00 PM | 7.923 | 1.202 | 399.717 |
| 11:30:00 PM | 7.689 | 1.178 | 380.95 |
| 11:45:00 PM | 7.482 | 1.075 | 335.321 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.608 | 1.093 | 363.083 |
| Daily Min: | 5.704 | 0.443 | 95.792 |
| Daily Max: | 9.042 | 1.542 | 599.131 |
| Peak to Avg: | | | 1.65 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/14/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Friday - A.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.206 | 1.093 | 324.121 |
| 12:15:00 AM | 7.117 | 1.029 | 300.318 |
| 12:30:00 AM | 6.807 | 0.895 | 245.859 |
| 12:45:00 AM | 6.568 | 0.793 | 207.599 |
| 1:00:00 AM | 6.487 | 0.759 | 194.054 |
| 1:15:00 AM | 6.448 | 0.704 | 179.692 |
| 1:30:00 AM | 6.333 | 0.748 | 186.39 |
| 1:45:00 AM | 6.143 | 0.61 | 145.888 |
| 2:00:00 AM | 6.022 | 0.55 | 127.338 |
| 2:15:00 AM | 5.943 | 0.544 | 123.551 |
| 2:30:00 AM | 5.878 | 0.551 | 123.991 |
| 2:45:00 AM | 5.757 | 0.497 | 108.721 |
| 3:00:00 AM | 5.765 | 0.501 | 109.754 |
| 3:15:00 AM | 5.768 | 0.488 | 106.501 |
| 3:30:00 AM | 5.73 | 0.51 | 110.876 |
| 3:45:00 AM | 5.75 | 0.466 | 100.128 |
| 4:00:00 AM | 5.816 | 0.518 | 114.758 |
| 4:15:00 AM | 5.749 | 0.764 | 166.756 |
| 4:30:00 AM | 5.941 | 1.107 | 250.766 |
| 4:45:00 AM | 5.966 | 0.606 | 139.159 |
| 5:00:00 AM | 6.167 | 0.598 | 139.912 |
| 5:15:00 AM | 6.251 | 0.681 | 164.939 |
| 5:30:00 AM | 6.473 | 0.733 | 188.017 |
| 5:45:00 AM | 6.7 | 0.827 | 221.547 |
| 6:00:00 AM | 6.819 | 0.91 | 249.182 |
| 6:15:00 AM | 6.938 | 0.896 | 252.369 |
| 6:30:00 AM | 6.975 | 0.994 | 282.294 |
| 6:45:00 AM | 7.098 | 1.013 | 294.568 |
| 7:00:00 AM | 7.226 | 1.021 | 303.506 |
| 7:15:00 AM | 7.594 | 1.173 | 373.046 |
| 7:30:00 AM | 7.684 | 1.071 | 345.849 |
| 7:45:00 AM | 7.885 | 1.163 | 388.523 |
| 8:00:00 AM | 7.905 | 1.139 | 380.175 |
| 8:15:00 AM | 8.166 | 1.231 | 425.286 |
| 8:30:00 AM | 8.119 | 1.258 | 436.821 |
| 8:45:00 AM | 7.893 | 1.271 | 425.473 |
| 9:00:00 AM | 7.694 | 1.128 | 363.633 |
| 9:15:00 AM | 7.81 | 1.22 | 400.268 |
| 9:30:00 AM | 7.894 | 1.267 | 423.944 |
| 9:45:00 AM | 8.028 | 1.288 | 440.815 |
| 10:00:00 AM | 7.908 | 1.222 | 409.899 |
| 10:15:00 AM | 7.91 | 1.216 | 403.511 |
| 10:30:00 AM | 7.903 | 1.244 | 416.898 |
| 10:45:00 AM | 7.81 | 1.192 | 393.349 |
| 11:00:00 AM | 8.073 | 1.26 | 423.533 |
| 11:15:00 AM | 7.977 | 1.225 | 415.705 |
| 11:30:00 AM | 7.813 | 1.168 | 385.765 |
| 11:45:00 AM | 7.791 | 1.205 | 396.261 |

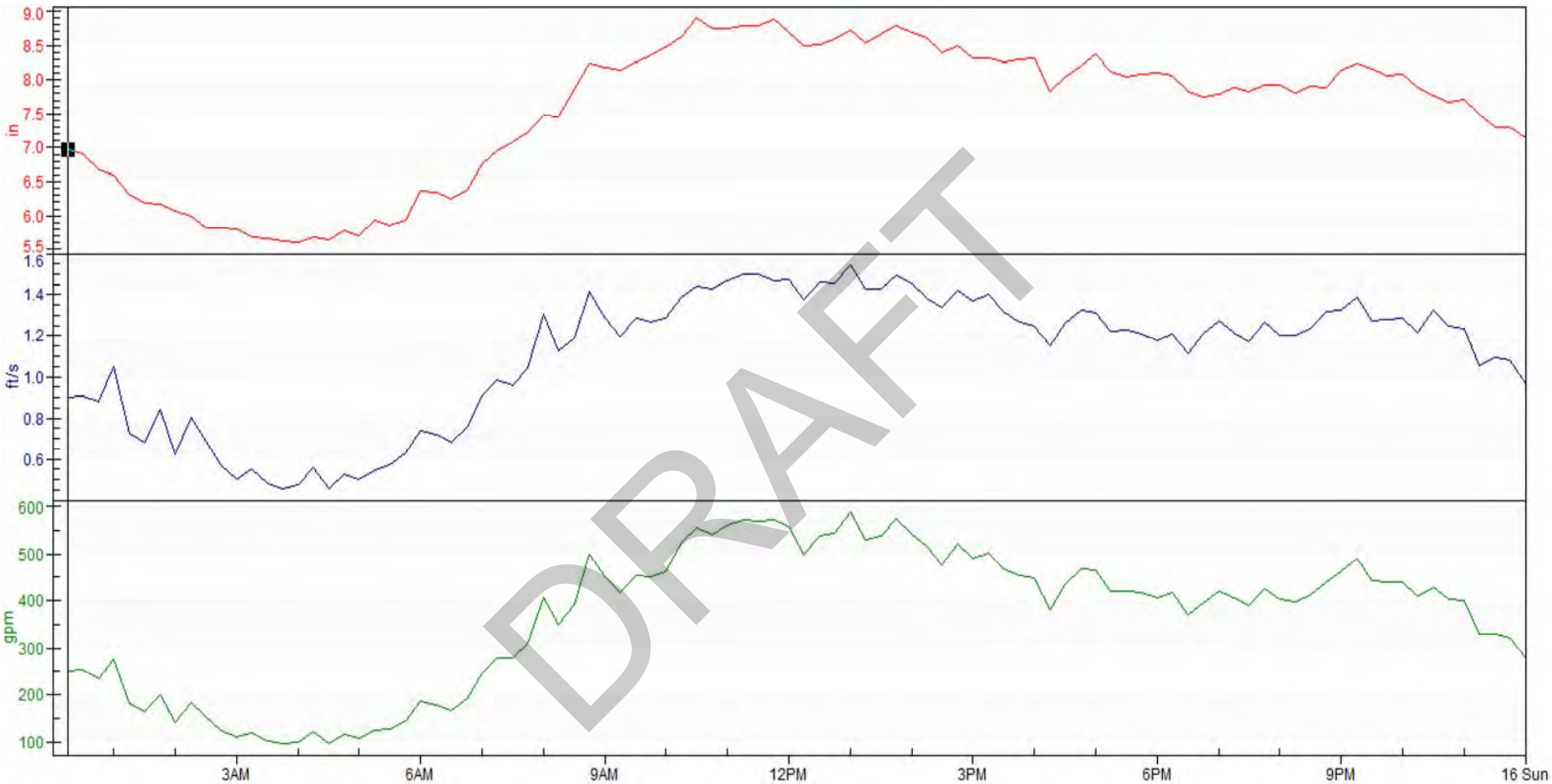
**Friday - P.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.782 | 1.21 | 397.29 |
| 12:15:00 PM | 8.103 | 1.219 | 416.249 |
| 12:30:00 PM | 8.113 | 1.25 | 433.558 |
| 12:45:00 PM | 7.948 | 1.195 | 401.343 |
| 1:00:00 PM | 7.936 | 1.255 | 414.397 |
| 1:15:00 PM | 7.838 | 1.149 | 380.998 |
| 1:30:00 PM | 7.775 | 1.175 | 385.402 |
| 1:45:00 PM | 7.881 | 1.204 | 392.222 |
| 2:00:00 PM | 8.001 | 1.183 | 393.781 |
| 2:15:00 PM | 8.076 | 1.251 | 431.479 |
| 2:30:00 PM | 7.972 | 1.211 | 410.471 |
| 2:45:00 PM | 7.956 | 1.21 | 409.255 |
| 3:00:00 PM | 7.846 | 1.217 | 403.99 |
| 3:15:00 PM | 7.813 | 1.175 | 386.447 |
| 3:30:00 PM | 7.982 | 1.221 | 414.55 |
| 3:45:00 PM | 8.199 | 1.29 | 453.557 |
| 4:00:00 PM | 7.926 | 1.123 | 377.972 |
| 4:15:00 PM | 7.952 | 1.222 | 408.422 |
| 4:30:00 PM | 7.961 | 1.197 | 404.782 |
| 4:45:00 PM | 8.108 | 1.258 | 436.108 |
| 5:00:00 PM | 8.213 | 1.25 | 440.778 |
| 5:15:00 PM | 8.388 | 1.355 | 486.655 |
| 5:30:00 PM | 8.315 | 1.272 | 446.69 |
| 5:45:00 PM | 8.162 | 1.315 | 459.943 |
| 6:00:00 PM | 8.352 | 1.317 | 474.619 |
| 6:15:00 PM | 8.429 | 1.333 | 484.286 |
| 6:30:00 PM | 8.453 | 1.318 | 482.121 |
| 6:45:00 PM | 8.393 | 1.551 | 561.023 |
| 7:00:00 PM | 8.568 | 1.418 | 527.982 |
| 7:15:00 PM | 8.511 | 1.356 | 499.358 |
| 7:30:00 PM | 8.418 | 1.411 | 511.206 |
| 7:45:00 PM | 8.204 | 1.303 | 458.724 |
| 8:00:00 PM | 8.303 | 1.328 | 471.86 |
| 8:15:00 PM | 8.475 | 1.405 | 515.915 |
| 8:30:00 PM | 8.514 | 1.349 | 498.18 |
| 8:45:00 PM | 8.107 | 1.252 | 431.86 |
| 9:00:00 PM | 8.32 | 1.348 | 477.032 |
| 9:15:00 PM | 8.42 | 1.389 | 503.712 |
| 9:30:00 PM | 8.266 | 1.339 | 475.941 |
| 9:45:00 PM | 8.385 | 1.343 | 473.621 |
| 10:00:00 PM | 8.319 | 1.293 | 459.08 |
| 10:15:00 PM | 8.179 | 1.3 | 454.275 |
| 10:30:00 PM | 8.18 | 1.248 | 437.308 |
| 10:45:00 PM | 8.304 | 1.414 | 505.701 |
| 11:00:00 PM | 8.019 | 1.272 | 434.634 |
| 11:15:00 PM | 8.004 | 1.29 | 439.545 |
| 11:30:00 PM | 7.588 | 1.095 | 347.079 |
| 11:45:00 PM | 7.562 | 1.095 | 346.215 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.547 | 1.099 | 358.366 |
| Daily Min: | 5.73 | 0.466 | 100.128 |
| Daily Max: | 8.568 | 1.551 | 561.023 |
| Peak to Avg: | | | 1.57 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/15/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Saturday - A.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.259 | 1.024 | 306.8 |
| 12:15:00 AM | 6.967 | 0.902 | 249.981 |
| 12:30:00 AM | 6.902 | 0.905 | 253.344 |
| 12:45:00 AM | 6.67 | 0.883 | 234.728 |
| 1:00:00 AM | 6.597 | 1.05 | 276.536 |
| 1:15:00 AM | 6.312 | 0.727 | 179.457 |
| 1:30:00 AM | 6.194 | 0.681 | 164.677 |
| 1:45:00 AM | 6.16 | 0.841 | 201.19 |
| 2:00:00 AM | 6.069 | 0.625 | 142.073 |
| 2:15:00 AM | 5.987 | 0.801 | 182.565 |
| 2:30:00 AM | 5.824 | 0.69 | 153.276 |
| 2:45:00 AM | 5.808 | 0.57 | 125.378 |
| 3:00:00 AM | 5.8 | 0.502 | 110.853 |
| 3:15:00 AM | 5.686 | 0.552 | 118.567 |
| 3:30:00 AM | 5.654 | 0.48 | 102.156 |
| 3:45:00 AM | 5.628 | 0.459 | 97.359 |
| 4:00:00 AM | 5.602 | 0.476 | 100.043 |
| 4:15:00 AM | 5.687 | 0.561 | 120.708 |
| 4:30:00 AM | 5.649 | 0.456 | 96.897 |
| 4:45:00 AM | 5.771 | 0.526 | 114.723 |
| 5:00:00 AM | 5.706 | 0.499 | 106.49 |
| 5:15:00 AM | 5.935 | 0.547 | 124.393 |
| 5:30:00 AM | 5.861 | 0.575 | 127.178 |
| 5:45:00 AM | 5.932 | 0.631 | 143.851 |
| 6:00:00 AM | 6.369 | 0.739 | 185.503 |
| 6:15:00 AM | 6.345 | 0.721 | 176.571 |
| 6:30:00 AM | 6.247 | 0.682 | 166.841 |
| 6:45:00 AM | 6.376 | 0.762 | 191.504 |
| 7:00:00 AM | 6.751 | 0.906 | 246.247 |
| 7:15:00 AM | 6.957 | 0.987 | 278.385 |
| 7:30:00 AM | 7.091 | 0.959 | 278.281 |
| 7:45:00 AM | 7.218 | 1.041 | 309.349 |
| 8:00:00 AM | 7.474 | 1.303 | 405.641 |
| 8:15:00 AM | 7.45 | 1.123 | 348.151 |
| 8:30:00 AM | 7.86 | 1.187 | 392.666 |
| 8:45:00 AM | 8.232 | 1.414 | 499.899 |
| 9:00:00 AM | 8.178 | 1.285 | 450.55 |
| 9:15:00 AM | 8.146 | 1.199 | 415.809 |
| 9:30:00 AM | 8.25 | 1.288 | 453.564 |
| 9:45:00 AM | 8.354 | 1.266 | 452.05 |
| 10:00:00 AM | 8.472 | 1.286 | 462.776 |
| 10:15:00 AM | 8.631 | 1.391 | 522.714 |
| 10:30:00 AM | 8.904 | 1.441 | 554.26 |
| 10:45:00 AM | 8.755 | 1.427 | 541.144 |
| 11:00:00 AM | 8.738 | 1.469 | 560.93 |
| 11:15:00 AM | 8.796 | 1.499 | 573.092 |
| 11:30:00 AM | 8.777 | 1.497 | 570.259 |
| 11:45:00 AM | 8.876 | 1.466 | 571.03 |

**Saturday - P.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.688 | 1.47 | 557.368 |
| 12:15:00 PM | 8.484 | 1.374 | 497.585 |
| 12:30:00 PM | 8.514 | 1.459 | 538.619 |
| 12:45:00 PM | 8.594 | 1.455 | 543.742 |
| 1:00:00 PM | 8.719 | 1.544 | 588.003 |
| 1:15:00 PM | 8.54 | 1.427 | 529.104 |
| 1:30:00 PM | 8.671 | 1.431 | 538.451 |
| 1:45:00 PM | 8.794 | 1.492 | 574.572 |
| 2:00:00 PM | 8.697 | 1.453 | 539.774 |
| 2:15:00 PM | 8.608 | 1.38 | 516.795 |
| 2:30:00 PM | 8.386 | 1.339 | 477.036 |
| 2:45:00 PM | 8.498 | 1.42 | 521.752 |
| 3:00:00 PM | 8.325 | 1.369 | 491.075 |
| 3:15:00 PM | 8.314 | 1.401 | 501.705 |
| 3:30:00 PM | 8.25 | 1.318 | 467.428 |
| 3:45:00 PM | 8.298 | 1.269 | 453.203 |
| 4:00:00 PM | 8.324 | 1.247 | 447.236 |
| 4:15:00 PM | 7.825 | 1.153 | 381.246 |
| 4:30:00 PM | 8.047 | 1.263 | 433.323 |
| 4:45:00 PM | 8.209 | 1.326 | 467.232 |
| 5:00:00 PM | 8.366 | 1.314 | 464.367 |
| 5:15:00 PM | 8.125 | 1.223 | 419.752 |
| 5:30:00 PM | 8.044 | 1.226 | 418.831 |
| 5:45:00 PM | 8.092 | 1.209 | 417.911 |
| 6:00:00 PM | 8.098 | 1.177 | 407.133 |
| 6:15:00 PM | 8.063 | 1.209 | 416.173 |
| 6:30:00 PM | 7.82 | 1.114 | 368.167 |
| 6:45:00 PM | 7.744 | 1.208 | 394.153 |
| 7:00:00 PM | 7.791 | 1.277 | 419.971 |
| 7:15:00 PM | 7.889 | 1.217 | 404.853 |
| 7:30:00 PM | 7.826 | 1.174 | 388.308 |
| 7:45:00 PM | 7.931 | 1.266 | 426.312 |
| 8:00:00 PM | 7.932 | 1.203 | 403.108 |
| 8:15:00 PM | 7.816 | 1.203 | 397.294 |
| 8:30:00 PM | 7.899 | 1.234 | 412.283 |
| 8:45:00 PM | 7.884 | 1.318 | 440.213 |
| 9:00:00 PM | 8.144 | 1.323 | 461.045 |
| 9:15:00 PM | 8.235 | 1.389 | 491.124 |
| 9:30:00 PM | 8.16 | 1.276 | 441.059 |
| 9:45:00 PM | 8.068 | 1.28 | 440.924 |
| 10:00:00 PM | 8.081 | 1.284 | 438.163 |
| 10:15:00 PM | 7.895 | 1.219 | 407.901 |
| 10:30:00 PM | 7.767 | 1.324 | 427.835 |
| 10:45:00 PM | 7.673 | 1.249 | 402.659 |
| 11:00:00 PM | 7.705 | 1.233 | 399.828 |
| 11:15:00 PM | 7.501 | 1.054 | 329.692 |
| 11:30:00 PM | 7.305 | 1.093 | 330.221 |
| 11:45:00 PM | 7.308 | 1.08 | 320.876 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.533 | 1.108 | 365.148 |
| Daily Min: | 5.602 | 0.456 | 96.897 |
| Daily Max: | 8.904 | 1.544 | 588.003 |
| Peak to Avg: | | | 1.61 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/16/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Sunday - A.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.137 | 0.966 | 278.839 |
| 12:15:00 AM | 7.104 | 1.008 | 293.251 |
| 12:30:00 AM | 6.962 | 0.93 | 257.546 |
| 12:45:00 AM | 6.665 | 0.903 | 240.646 |
| 1:00:00 AM | 6.548 | 0.87 | 226.703 |
| 1:15:00 AM | 6.322 | 0.774 | 192.295 |
| 1:30:00 AM | 6.357 | 0.799 | 200.073 |
| 1:45:00 AM | 6.118 | 0.678 | 159.765 |
| 2:00:00 AM | 5.996 | 0.67 | 154.971 |
| 2:15:00 AM | 5.83 | 0.578 | 128.511 |
| 2:30:00 AM | 5.789 | 0.569 | 125.288 |
| 2:45:00 AM | 5.712 | 0.642 | 138.256 |
| 3:00:00 AM | 5.713 | 0.537 | 116.257 |
| 3:15:00 AM | 5.666 | 0.566 | 120.867 |
| 3:30:00 AM | 5.56 | 0.497 | 103.583 |
| 3:45:00 AM | 5.62 | 0.498 | 104.628 |
| 4:00:00 AM | 5.658 | 0.546 | 116.569 |
| 4:15:00 AM | 5.467 | 0.548 | 110.622 |
| 4:30:00 AM | 5.544 | 0.523 | 108.632 |
| 4:45:00 AM | 5.491 | 0.492 | 100.553 |
| 5:00:00 AM | 5.529 | 0.485 | 100.257 |
| 5:15:00 AM | 5.479 | 0.472 | 96.351 |
| 5:30:00 AM | 5.581 | 0.5 | 104.445 |
| 5:45:00 AM | 5.755 | 0.58 | 124.601 |
| 6:00:00 AM | 5.832 | 0.562 | 125.048 |
| 6:15:00 AM | 5.897 | 0.652 | 147.299 |
| 6:30:00 AM | 5.932 | 0.684 | 154.806 |
| 6:45:00 AM | 6.311 | 0.738 | 183.018 |
| 7:00:00 AM | 6.559 | 0.798 | 205.997 |
| 7:15:00 AM | 6.574 | 0.83 | 216.951 |
| 7:30:00 AM | 6.996 | 0.949 | 266.703 |
| 7:45:00 AM | 7.153 | 1.056 | 301.071 |
| 8:00:00 AM | 7.2 | 1.041 | 308.455 |
| 8:15:00 AM | 7.496 | 1.086 | 333.228 |
| 8:30:00 AM | 7.628 | 1.158 | 369.277 |
| 8:45:00 AM | 7.897 | 1.227 | 410.84 |
| 9:00:00 AM | 8.013 | 1.308 | 446.521 |
| 9:15:00 AM | 8.184 | 1.322 | 458.327 |
| 9:30:00 AM | 8.333 | 1.329 | 475.344 |
| 9:45:00 AM | 8.457 | 1.375 | 503.507 |
| 10:00:00 AM | 8.526 | 1.385 | 505.707 |
| 10:15:00 AM | 8.455 | 1.275 | 464.355 |
| 10:30:00 AM | 8.651 | 1.428 | 530.652 |
| 10:45:00 AM | 8.741 | 1.405 | 532.909 |
| 11:00:00 AM | 8.767 | 1.573 | 603.097 |
| 11:15:00 AM | 8.599 | 1.46 | 546.01 |
| 11:30:00 AM | 8.656 | 1.389 | 521.303 |
| 11:45:00 AM | 8.746 | 1.48 | 565.724 |

**Sunday - P.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.799 | 1.512 | 582.705 |
| 12:15:00 PM | 8.813 | 1.36 | 525.062 |
| 12:30:00 PM | 8.75 | 1.531 | 585.686 |
| 12:45:00 PM | 8.555 | 1.341 | 498.31 |
| 1:00:00 PM | 8.286 | 1.364 | 482.83 |
| 1:15:00 PM | 8.217 | 1.333 | 468.535 |
| 1:30:00 PM | 8.277 | 1.383 | 487.265 |
| 1:45:00 PM | 8.147 | 1.344 | 464.526 |
| 2:00:00 PM | 8.31 | 1.387 | 496.361 |
| 2:15:00 PM | 8.04 | 1.362 | 460.616 |
| 2:30:00 PM | 8 | 1.301 | 442.053 |
| 2:45:00 PM | 7.995 | 1.223 | 416.215 |
| 3:00:00 PM | 8.091 | 1.354 | 457.399 |
| 3:15:00 PM | 7.865 | 1.279 | 423.354 |
| 3:30:00 PM | 7.802 | 1.158 | 380.114 |
| 3:45:00 PM | 7.853 | 1.214 | 403.369 |
| 4:00:00 PM | 7.729 | 1.156 | 364.215 |
| 4:15:00 PM | 7.991 | 1.292 | 433.858 |
| 4:30:00 PM | 7.867 | 1.251 | 411.676 |
| 4:45:00 PM | 7.887 | 1.331 | 428.862 |
| 5:00:00 PM | 7.856 | 1.245 | 408.428 |
| 5:15:00 PM | 7.983 | 1.288 | 431.317 |
| 5:30:00 PM | 7.684 | 1.148 | 368.885 |
| 5:45:00 PM | 7.814 | 1.262 | 415.416 |
| 6:00:00 PM | 7.922 | 1.334 | 445.102 |
| 6:15:00 PM | 7.918 | 1.26 | 422.787 |
| 6:30:00 PM | 7.979 | 1.308 | 443.853 |
| 6:45:00 PM | 7.984 | 1.244 | 422.601 |
| 7:00:00 PM | 7.946 | 1.259 | 424.83 |
| 7:15:00 PM | 8.055 | 1.351 | 464.117 |
| 7:30:00 PM | 8.038 | 1.218 | 409.236 |
| 7:45:00 PM | 7.928 | 1.272 | 428.23 |
| 8:00:00 PM | 8.185 | 1.37 | 480.782 |
| 8:15:00 PM | 8.465 | 1.442 | 526.953 |
| 8:30:00 PM | 8.247 | 1.289 | 456.932 |
| 8:45:00 PM | 8.33 | 1.374 | 493.411 |
| 9:00:00 PM | 8.423 | 1.406 | 511.702 |
| 9:15:00 PM | 8.552 | 1.45 | 538.726 |
| 9:30:00 PM | 8.728 | 1.414 | 526.522 |
| 9:45:00 PM | 8.502 | 1.41 | 517.547 |
| 10:00:00 PM | 8.506 | 1.402 | 505.188 |
| 10:15:00 PM | 8.455 | 1.481 | 541.954 |
| 10:30:00 PM | 8.306 | 1.364 | 487.218 |
| 10:45:00 PM | 8.221 | 1.337 | 471.705 |
| 11:00:00 PM | 7.848 | 1.271 | 421.159 |
| 11:15:00 PM | 7.693 | 1.208 | 384.837 |
| 11:30:00 PM | 7.498 | 1.091 | 335.164 |
| 11:45:00 PM | 7.339 | 1.068 | 324.741 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.471 | 1.108 | 362.349 |
| Daily Min: | 5.467 | 0.472 | 96.351 |
| Daily Max: | 8.813 | 1.573 | 603.097 |
| Peak to Avg: | | | 1.66 |

DRAFT

# MAXIMUM DAILY FLOW DATA

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/17/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Monday - A.M. 7/17/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 7.024 | 0.997 | 285.655 |
| 12:15:00 AM | 6.819 | 0.994 | 273.663 |
| 12:30:00 AM | 6.606 | 0.87 | 229.548 |
| 12:45:00 AM | 6.272 | 0.765 | 186.796 |
| 1:00:00 AM | 6.264 | 0.835 | 205.052 |
| 1:15:00 AM | 6.143 | 0.695 | 166.154 |
| 1:30:00 AM | 5.949 | 0.652 | 148.35 |
| 1:45:00 AM | 5.843 | 0.625 | 139.38 |
| 2:00:00 AM | 5.695 | 0.674 | 145.235 |
| 2:15:00 AM | 5.6 | 0.536 | 112.381 |
| 2:30:00 AM | 5.624 | 0.561 | 118.238 |
| 2:45:00 AM | 5.682 | 0.592 | 126.837 |
| 3:00:00 AM | 5.626 | 0.568 | 120.329 |
| 3:15:00 AM | 5.668 | 0.568 | 121.033 |
| 3:30:00 AM | 5.502 | 0.521 | 106.622 |
| 3:45:00 AM | 5.477 | 0.504 | 102.46 |
| 4:00:00 AM | 5.449 | 0.423 | 85.754 |
| 4:15:00 AM | 5.545 | 0.507 | 104.02 |
| 4:30:00 AM | 5.603 | 0.478 | 100.776 |
| 4:45:00 AM | 5.845 | 0.569 | 124.226 |
| 5:00:00 AM | 5.783 | 0.571 | 124.119 |
| 5:15:00 AM | 6.081 | 0.862 | 194.159 |
| 5:30:00 AM | 6.201 | 0.76 | 183.93 |
| 5:45:00 AM | 6.444 | 0.88 | 224.48 |
| 6:00:00 AM | 6.558 | 0.842 | 218.032 |
| 6:15:00 AM | 6.725 | 0.947 | 256.044 |
| 6:30:00 AM | 6.839 | 0.914 | 250.19 |
| 6:45:00 AM | 6.825 | 0.995 | 272.989 |
| 7:00:00 AM | 7.221 | 1.169 | 346.77 |
| 7:15:00 AM | 7.334 | 1.051 | 319.23 |
| 7:30:00 AM | 7.366 | 1.093 | 333.661 |
| 7:45:00 AM | 7.52 | 1.182 | 370.05 |
| 8:00:00 AM | 7.65 | 1.209 | 378.115 |
| 8:15:00 AM | 7.523 | 1.182 | 370.968 |
| 8:30:00 AM | 7.475 | 1.191 | 369.546 |
| 8:45:00 AM | 7.46 | 1.168 | 362.68 |
| 9:00:00 AM | 7.634 | 1.187 | 376.626 |
| 9:15:00 AM | 7.581 | 1.169 | 367.347 |
| 9:30:00 AM | 7.79 | 1.268 | 417.026 |
| 9:45:00 AM | 7.929 | 1.273 | 425.727 |
| 10:00:00 AM | 7.832 | 1.279 | 422.819 |
| 10:15:00 AM | 7.772 | 1.237 | 405.488 |
| 10:30:00 AM | 7.747 | 1.261 | 411.685 |
| 10:45:00 AM | 7.805 | 1.264 | 416.881 |
| 11:00:00 AM | 7.822 | 1.302 | 430.376 |
| 11:15:00 AM | 7.883 | 1.31 | 437.471 |
| 11:30:00 AM | 7.858 | 1.281 | 417.625 |
| 11:45:00 AM | 7.933 | 1.283 | 429.77 |

**Monday - P.M. 7/17/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.028 | 1.301 | 445.008 |
| 12:15:00 PM | 7.994 | 1.296 | 441.094 |
| 12:30:00 PM | 7.974 | 1.344 | 455.858 |
| 12:45:00 PM | 7.959 | 1.352 | 457.294 |
| 1:00:00 PM | 7.963 | 1.295 | 438.375 |
| 1:15:00 PM | 7.91 | 1.34 | 442.056 |
| 1:30:00 PM | 7.804 | 1.292 | 411.667 |
| 1:45:00 PM | 7.597 | 1.214 | 385.269 |
| 2:00:00 PM | 7.781 | 1.212 | 393.493 |
| 2:15:00 PM | 7.758 | 1.222 | 399.819 |
| 2:30:00 PM | 7.869 | 1.264 | 417.005 |
| 2:45:00 PM | 8.083 | 1.228 | 420.878 |
| 3:00:00 PM | 8.114 | 1.36 | 465.959 |
| 3:15:00 PM | 7.985 | 1.249 | 424.23 |
| 3:30:00 PM | 8.011 | 1.257 | 428.753 |
| 3:45:00 PM | 7.736 | 1.165 | 379.776 |
| 4:00:00 PM | 7.901 | 1.297 | 434.651 |
| 4:15:00 PM | 7.948 | 1.397 | 471.697 |
| 4:30:00 PM | 7.992 | 1.287 | 435.74 |
| 4:45:00 PM | 8.265 | 1.362 | 467.545 |
| 5:00:00 PM | 8.035 | 1.288 | 438.527 |
| 5:15:00 PM | 8.382 | 1.275 | 461.361 |
| 5:30:00 PM | 8.322 | 1.316 | 454.244 |
| 5:45:00 PM | 8.466 | 1.434 | 525.883 |
| 6:00:00 PM | 8.468 | 1.346 | 493.78 |
| 6:15:00 PM | 8.414 | 1.357 | 493.528 |
| 6:30:00 PM | 8.459 | 1.464 | 536.009 |
| 6:45:00 PM | 8.513 | 1.407 | 519.432 |
| 7:00:00 PM | 8.723 | 1.496 | 565.725 |
| 7:15:00 PM | 8.558 | 1.419 | 525.835 |
| 7:30:00 PM | 8.516 | 1.414 | 514.526 |
| 7:45:00 PM | 8.496 | 1.357 | 499.595 |
| 8:00:00 PM | 8.539 | 1.395 | 505.396 |
| 8:15:00 PM | 8.607 | 1.361 | 509.799 |
| 8:30:00 PM | 8.572 | 1.378 | 509.452 |
| 8:45:00 PM | 8.373 | 1.392 | 503.166 |
| 9:00:00 PM | 8.523 | 1.435 | 523.794 |
| 9:15:00 PM | 8.644 | 1.461 | 550.08 |
| 9:30:00 PM | 8.785 | 1.465 | 563.201 |
| 9:45:00 PM | 8.77 | 1.406 | 537.479 |
| 10:00:00 PM | 8.648 | 1.429 | 535.75 |
| 10:15:00 PM | 8.566 | 1.441 | 532.106 |
| 10:30:00 PM | 8.472 | 1.409 | 517.219 |
| 10:45:00 PM | 8.035 | 1.292 | 436.813 |
| 11:00:00 PM | 7.784 | 1.317 | 430.799 |
| 11:15:00 PM | 7.568 | 1.204 | 381.009 |
| 11:30:00 PM | 7.241 | 1.062 | 317.047 |
| 11:45:00 PM | 7.046 | 1.082 | 311.452 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.453 | 1.125 | 363.788 |
| Daily Min: | 5.449 | 0.423 | 85.754 |
| Daily Max: | 8.785 | 1.496 | 565.725 |
| Peak to Avg: | | | 1.56 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/18/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Tuesday- A.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.82 | 0.987 | 271.734 |
| 12:15:00 AM | 6.784 | 0.973 | 266.128 |
| 12:30:00 AM | 6.509 | 0.87 | 225.112 |
| 12:45:00 AM | 6.286 | 0.778 | 191.783 |
| 1:00:00 AM | 6 | 0.714 | 165.247 |
| 1:15:00 AM | 6.049 | 0.713 | 163.326 |
| 1:30:00 AM | 5.81 | 0.625 | 137.192 |
| 1:45:00 AM | 5.738 | 0.607 | 130.003 |
| 2:00:00 AM | 5.565 | 0.563 | 116.214 |
| 2:15:00 AM | 5.562 | 0.991 | 206.689 |
| 2:30:00 AM | 5.511 | 0.759 | 154.624 |
| 2:45:00 AM | 5.434 | 0.493 | 111.483 |
| 3:00:00 AM | 5.432 | 0.542 | 109.406 |
| 3:15:00 AM | 5.494 | 0.584 | 118.726 |
| 3:30:00 AM | 5.495 | 0.522 | 105.669 |
| 3:45:00 AM | 5.382 | 0.502 | 99.977 |
| 4:00:00 AM | 5.38 | 0.494 | 98.41 |
| 4:15:00 AM | 5.503 | 0.501 | 101.623 |
| 4:30:00 AM | 5.564 | 0.549 | 114.504 |
| 4:45:00 AM | 5.785 | 0.627 | 136.621 |
| 5:00:00 AM | 5.808 | 0.833 | 184.318 |
| 5:15:00 AM | 5.961 | 0.733 | 168.048 |
| 5:30:00 AM | 6.131 | 0.788 | 187.786 |
| 5:45:00 AM | 6.421 | 0.845 | 214.285 |
| 6:00:00 AM | 6.554 | 0.869 | 226.877 |
| 6:15:00 AM | 6.582 | 0.901 | 236.545 |
| 6:30:00 AM | 6.704 | 0.942 | 253.475 |
| 6:45:00 AM | 6.896 | 1.017 | 279.998 |
| 7:00:00 AM | 7.101 | 1.036 | 299.751 |
| 7:15:00 AM | 7.304 | 1.187 | 358.33 |
| 7:30:00 AM | 7.417 | 1.147 | 353.404 |
| 7:45:00 AM | 7.765 | 1.295 | 420.126 |
| 8:00:00 AM | 7.749 | 1.401 | 457.69 |
| 8:15:00 AM | 7.723 | 1.225 | 393.989 |
| 8:30:00 AM | 7.751 | 1.377 | 450.056 |
| 8:45:00 AM | 7.49 | 1.161 | 360.382 |
| 9:00:00 AM | 7.472 | 1.222 | 374.634 |
| 9:15:00 AM | 7.513 | 1.286 | 403.168 |
| 9:30:00 AM | 7.68 | 1.204 | 384.211 |
| 9:45:00 AM | 7.526 | 1.243 | 390.33 |
| 10:00:00 AM | 7.514 | 1.272 | 398.473 |
| 10:15:00 AM | 7.642 | 1.322 | 423.281 |
| 10:30:00 AM | 7.721 | 1.296 | 421.276 |
| 10:45:00 AM | 7.739 | 1.248 | 405.545 |
| 11:00:00 AM | 7.741 | 1.246 | 406.565 |
| 11:15:00 AM | 7.789 | 1.283 | 421.803 |
| 11:30:00 AM | 7.678 | 1.281 | 406.349 |
| 11:45:00 AM | 7.556 | 1.227 | 386.879 |

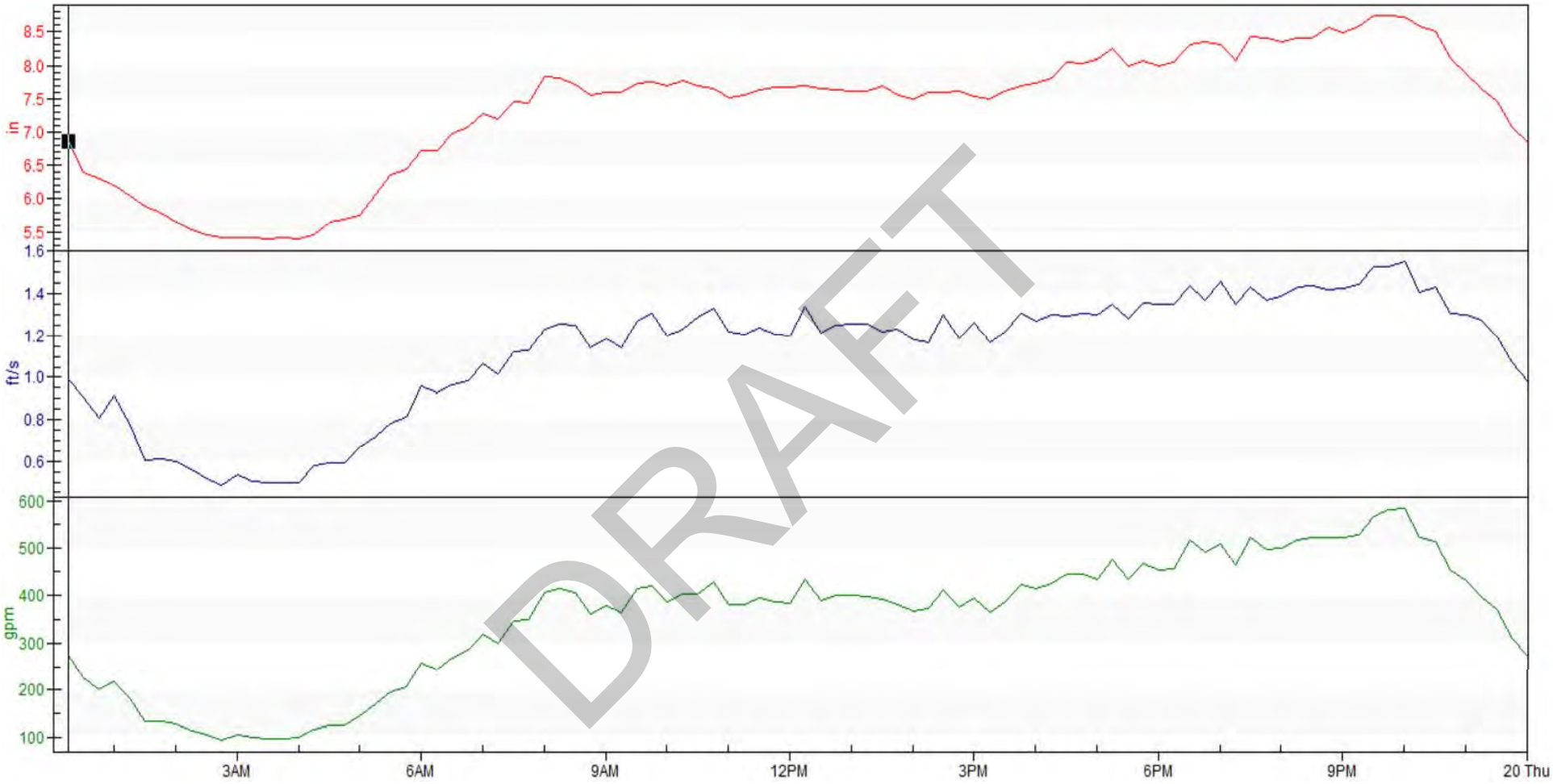
**Tuesday- P.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.799 | 1.268 | 415.493 |
| 12:15:00 PM | 7.746 | 1.404 | 458.257 |
| 12:30:00 PM | 7.762 | 1.354 | 441.195 |
| 12:45:00 PM | 7.581 | 1.228 | 389.692 |
| 1:00:00 PM | 7.723 | 1.241 | 403.669 |
| 1:15:00 PM | 7.56 | 1.314 | 415.236 |
| 1:30:00 PM | 7.564 | 1.244 | 391.654 |
| 1:45:00 PM | 7.559 | 1.226 | 387.447 |
| 2:00:00 PM | 7.525 | 1.21 | 377.918 |
| 2:15:00 PM | 7.381 | 1.088 | 333.233 |
| 2:30:00 PM | 7.585 | 1.248 | 396.241 |
| 2:45:00 PM | 7.726 | 1.232 | 400.944 |
| 3:00:00 PM | 7.682 | 1.42 | 458.552 |
| 3:15:00 PM | 7.755 | 1.279 | 418.112 |
| 3:30:00 PM | 7.622 | 1.176 | 375.77 |
| 3:45:00 PM | 7.709 | 1.181 | 380.328 |
| 4:00:00 PM | 7.638 | 1.229 | 393.861 |
| 4:15:00 PM | 7.637 | 1.27 | 401.26 |
| 4:30:00 PM | 7.611 | 1.303 | 415.12 |
| 4:45:00 PM | 7.63 | 1.247 | 398.905 |
| 5:00:00 PM | 7.874 | 1.316 | 433.231 |
| 5:15:00 PM | 7.834 | 1.261 | 413.97 |
| 5:30:00 PM | 7.871 | 1.325 | 441.788 |
| 5:45:00 PM | 7.958 | 1.322 | 447.083 |
| 6:00:00 PM | 8.266 | 1.387 | 485.483 |
| 6:15:00 PM | 8.122 | 1.335 | 463.724 |
| 6:30:00 PM | 8.338 | 1.295 | 438.429 |
| 6:45:00 PM | 8.403 | 1.386 | 498.423 |
| 7:00:00 PM | 8.234 | 1.404 | 496.541 |
| 7:15:00 PM | 8.196 | 1.36 | 474.471 |
| 7:30:00 PM | 8.224 | 1.392 | 485.319 |
| 7:45:00 PM | 8.258 | 1.48 | 515.797 |
| 8:00:00 PM | 8.357 | 1.398 | 503.879 |
| 8:15:00 PM | 8.341 | 1.373 | 489.457 |
| 8:30:00 PM | 8.552 | 1.401 | 520.584 |
| 8:45:00 PM | 8.573 | 1.519 | 566.214 |
| 9:00:00 PM | 8.759 | 1.466 | 561.687 |
| 9:15:00 PM | 8.692 | 1.504 | 570.521 |
| 9:30:00 PM | 8.659 | 1.466 | 550.981 |
| 9:45:00 PM | 8.843 | 1.411 | 547.322 |
| 10:00:00 PM | 8.796 | 1.53 | 585.837 |
| 10:15:00 PM | 8.515 | 1.445 | 533.59 |
| 10:30:00 PM | 8.411 | 1.404 | 501.716 |
| 10:45:00 PM | 8.222 | 1.408 | 497.103 |
| 11:00:00 PM | 7.826 | 1.251 | 413.846 |
| 11:15:00 PM | 7.787 | 1.269 | 417.257 |
| 11:30:00 PM | 7.627 | 1.276 | 402.962 |
| 11:45:00 PM | 7.221 | 1.1 | 310.997 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.324 | 1.136 | 358.331 |
| Daily Min: | 5.38 | 0.493 | 98.41 |
| Daily Max: | 8.843 | 1.53 | 585.837 |
| Peak to Avg: | | | 1.63 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/19/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Wednesday - A.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.987 | 1.085 | 308.873 |
| 12:15:00 AM | 6.867 | 0.988 | 274.581 |
| 12:30:00 AM | 6.402 | 0.908 | 226.835 |
| 12:45:00 AM | 6.312 | 0.808 | 200.299 |
| 1:00:00 AM | 6.205 | 0.917 | 218.738 |
| 1:15:00 AM | 6.041 | 0.775 | 181.153 |
| 1:30:00 AM | 5.886 | 0.601 | 133.939 |
| 1:45:00 AM | 5.786 | 0.608 | 133.859 |
| 2:00:00 AM | 5.646 | 0.6 | 127.667 |
| 2:15:00 AM | 5.535 | 0.559 | 115.67 |
| 2:30:00 AM | 5.45 | 0.517 | 104.839 |
| 2:45:00 AM | 5.41 | 0.484 | 95.341 |
| 3:00:00 AM | 5.411 | 0.534 | 105.705 |
| 3:15:00 AM | 5.424 | 0.502 | 100.982 |
| 3:30:00 AM | 5.404 | 0.496 | 98.002 |
| 3:45:00 AM | 5.414 | 0.5 | 98.335 |
| 4:00:00 AM | 5.393 | 0.499 | 99.752 |
| 4:15:00 AM | 5.448 | 0.581 | 117.733 |
| 4:30:00 AM | 5.66 | 0.592 | 126.38 |
| 4:45:00 AM | 5.697 | 0.59 | 126.624 |
| 5:00:00 AM | 5.748 | 0.666 | 145.311 |
| 5:15:00 AM | 6.073 | 0.721 | 169.563 |
| 5:30:00 AM | 6.372 | 0.779 | 195.618 |
| 5:45:00 AM | 6.439 | 0.812 | 206.972 |
| 6:00:00 AM | 6.725 | 0.955 | 258.267 |
| 6:15:00 AM | 6.715 | 0.926 | 243.224 |
| 6:30:00 AM | 6.983 | 0.965 | 268.349 |
| 6:45:00 AM | 7.073 | 0.984 | 284.795 |
| 7:00:00 AM | 7.269 | 1.064 | 319.387 |
| 7:15:00 AM | 7.199 | 1.015 | 300.61 |
| 7:30:00 AM | 7.457 | 1.122 | 348.231 |
| 7:45:00 AM | 7.444 | 1.127 | 349.114 |
| 8:00:00 AM | 7.836 | 1.228 | 406.963 |
| 8:15:00 AM | 7.807 | 1.256 | 414.213 |
| 8:30:00 AM | 7.723 | 1.25 | 406.429 |
| 8:45:00 AM | 7.55 | 1.144 | 361.029 |
| 9:00:00 AM | 7.596 | 1.185 | 377.102 |
| 9:15:00 AM | 7.598 | 1.145 | 364.433 |
| 9:30:00 AM | 7.735 | 1.268 | 413.048 |
| 9:45:00 AM | 7.749 | 1.303 | 420.332 |
| 10:00:00 AM | 7.703 | 1.199 | 385.71 |
| 10:15:00 AM | 7.781 | 1.234 | 404.131 |
| 10:30:00 AM | 7.69 | 1.284 | 403.701 |
| 10:45:00 AM | 7.654 | 1.33 | 427.447 |
| 11:00:00 AM | 7.514 | 1.217 | 381.192 |
| 11:15:00 AM | 7.547 | 1.203 | 379.573 |
| 11:30:00 AM | 7.63 | 1.235 | 395.173 |
| 11:45:00 AM | 7.673 | 1.208 | 386.974 |

**Wednesday - P.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.664 | 1.2 | 382.739 |
| 12:15:00 PM | 7.693 | 1.338 | 432.953 |
| 12:30:00 PM | 7.649 | 1.21 | 388.509 |
| 12:45:00 PM | 7.626 | 1.249 | 399.281 |
| 1:00:00 PM | 7.619 | 1.256 | 401.012 |
| 1:15:00 PM | 7.618 | 1.256 | 396.991 |
| 1:30:00 PM | 7.685 | 1.216 | 392.801 |
| 1:45:00 PM | 7.553 | 1.228 | 379.865 |
| 2:00:00 PM | 7.488 | 1.178 | 366.858 |
| 2:15:00 PM | 7.589 | 1.167 | 370.842 |
| 2:30:00 PM | 7.601 | 1.301 | 412.486 |
| 2:45:00 PM | 7.623 | 1.186 | 375.992 |
| 3:00:00 PM | 7.542 | 1.265 | 395.706 |
| 3:15:00 PM | 7.502 | 1.166 | 364.761 |
| 3:30:00 PM | 7.615 | 1.216 | 386.72 |
| 3:45:00 PM | 7.702 | 1.306 | 423.027 |
| 4:00:00 PM | 7.743 | 1.27 | 414.221 |
| 4:15:00 PM | 7.806 | 1.299 | 424.08 |
| 4:30:00 PM | 8.052 | 1.296 | 445.233 |
| 4:45:00 PM | 8.031 | 1.304 | 446.21 |
| 5:00:00 PM | 8.093 | 1.3 | 432.626 |
| 5:15:00 PM | 8.248 | 1.348 | 476.625 |
| 5:30:00 PM | 7.985 | 1.278 | 434.285 |
| 5:45:00 PM | 8.063 | 1.356 | 466.709 |
| 6:00:00 PM | 7.998 | 1.352 | 453.045 |
| 6:15:00 PM | 8.046 | 1.352 | 456.437 |
| 6:30:00 PM | 8.317 | 1.441 | 516.414 |
| 6:45:00 PM | 8.341 | 1.367 | 491.771 |
| 7:00:00 PM | 8.303 | 1.459 | 509.952 |
| 7:15:00 PM | 8.069 | 1.35 | 465.064 |
| 7:30:00 PM | 8.431 | 1.435 | 523.245 |
| 7:45:00 PM | 8.399 | 1.372 | 497.857 |
| 8:00:00 PM | 8.341 | 1.389 | 499.58 |
| 8:15:00 PM | 8.399 | 1.432 | 517.187 |
| 8:30:00 PM | 8.398 | 1.441 | 522.944 |
| 8:45:00 PM | 8.57 | 1.42 | 523.299 |
| 9:00:00 PM | 8.479 | 1.427 | 524.065 |
| 9:15:00 PM | 8.587 | 1.445 | 528.637 |
| 9:30:00 PM | 8.745 | 1.527 | 567.964 |
| 9:45:00 PM | 8.737 | 1.528 | 583.285 |
| 10:00:00 PM | 8.733 | 1.553 | 584.352 |
| 10:15:00 PM | 8.581 | 1.407 | 522.113 |
| 10:30:00 PM | 8.511 | 1.431 | 515.943 |
| 10:45:00 PM | 8.119 | 1.309 | 453.97 |
| 11:00:00 PM | 7.867 | 1.297 | 432.186 |
| 11:15:00 PM | 7.654 | 1.272 | 398.159 |
| 11:30:00 PM | 7.463 | 1.19 | 369.897 |
| 11:45:00 PM | 7.073 | 1.072 | 310.275 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.343 | 1.119 | 354.542 |
| Daily Min: | 5.393 | 0.484 | 95.341 |
| Daily Max: | 8.745 | 1.553 | 584.352 |
| Peak to Avg: | | | 1.65 |

DRAFT

# MAXIMUM DAILY FLOW DATA

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/20/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Thursday - A.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.832 | 0.979 | 270.443 |
| 12:15:00 AM | 6.674 | 0.981 | 262.38 |
| 12:30:00 AM | 6.404 | 0.874 | 219.85 |
| 12:45:00 AM | 6.317 | 0.898 | 215.257 |
| 1:00:00 AM | 6.216 | 1.115 | 270.756 |
| 1:15:00 AM | 6.059 | 0.717 | 166.003 |
| 1:30:00 AM | 5.814 | 0.636 | 140.861 |
| 1:45:00 AM | 5.663 | 0.629 | 134.068 |
| 2:00:00 AM | 5.625 | 1.054 | 223.157 |
| 2:15:00 AM | 5.615 | 0.941 | 198.705 |
| 2:30:00 AM | 5.541 | 0.985 | 203.909 |
| 2:45:00 AM | 5.45 | 0.546 | 110.742 |
| 3:00:00 AM | 5.412 | 0.566 | 113.628 |
| 3:15:00 AM | 5.476 | 0.539 | 109.59 |
| 3:30:00 AM | 5.35 | 0.494 | 97.631 |
| 3:45:00 AM | 5.391 | 0.527 | 105.317 |
| 4:00:00 AM | 5.322 | 0.501 | 98.197 |
| 4:15:00 AM | 5.313 | 0.478 | 91.846 |
| 4:30:00 AM | 5.479 | 0.551 | 112.419 |
| 4:45:00 AM | 5.556 | 0.573 | 119.225 |
| 5:00:00 AM | 5.677 | 0.649 | 139.14 |
| 5:15:00 AM | 6.023 | 0.778 | 180.913 |
| 5:30:00 AM | 6.308 | 0.813 | 201.493 |
| 5:45:00 AM | 6.451 | 1.111 | 283.411 |
| 6:00:00 AM | 6.607 | 0.993 | 259.116 |
| 6:15:00 AM | 6.776 | 1.018 | 278.022 |
| 6:30:00 AM | 6.691 | 1.016 | 266.814 |
| 6:45:00 AM | 6.91 | 1.153 | 322.137 |
| 7:00:00 AM | 7.114 | 1.101 | 321.055 |
| 7:15:00 AM | 7.223 | 1.122 | 333.765 |
| 7:30:00 AM | 7.431 | 1.22 | 371.447 |
| 7:45:00 AM | 7.476 | 1.232 | 380.991 |
| 8:00:00 AM | 7.619 | 1.271 | 403.242 |
| 8:15:00 AM | 7.613 | 1.4 | 440.218 |
| 8:30:00 AM | 7.537 | 1.221 | 381.527 |
| 8:45:00 AM | 7.463 | 1.179 | 365.203 |
| 9:00:00 AM | 7.517 | 1.206 | 370.946 |
| 9:15:00 AM | 7.549 | 1.3 | 410.096 |
| 9:30:00 AM | 7.509 | 1.193 | 370.555 |
| 9:45:00 AM | 7.508 | 1.201 | 374.905 |
| 10:00:00 AM | 7.596 | 1.258 | 398.223 |
| 10:15:00 AM | 7.587 | 1.268 | 400.913 |
| 10:30:00 AM | 7.538 | 1.237 | 389.521 |
| 10:45:00 AM | 7.637 | 1.244 | 398.657 |
| 11:00:00 AM | 7.75 | 1.292 | 419.586 |
| 11:15:00 AM | 7.789 | 1.257 | 413.307 |
| 11:30:00 AM | 7.736 | 1.32 | 430.022 |
| 11:45:00 AM | 7.74 | 1.209 | 394.405 |

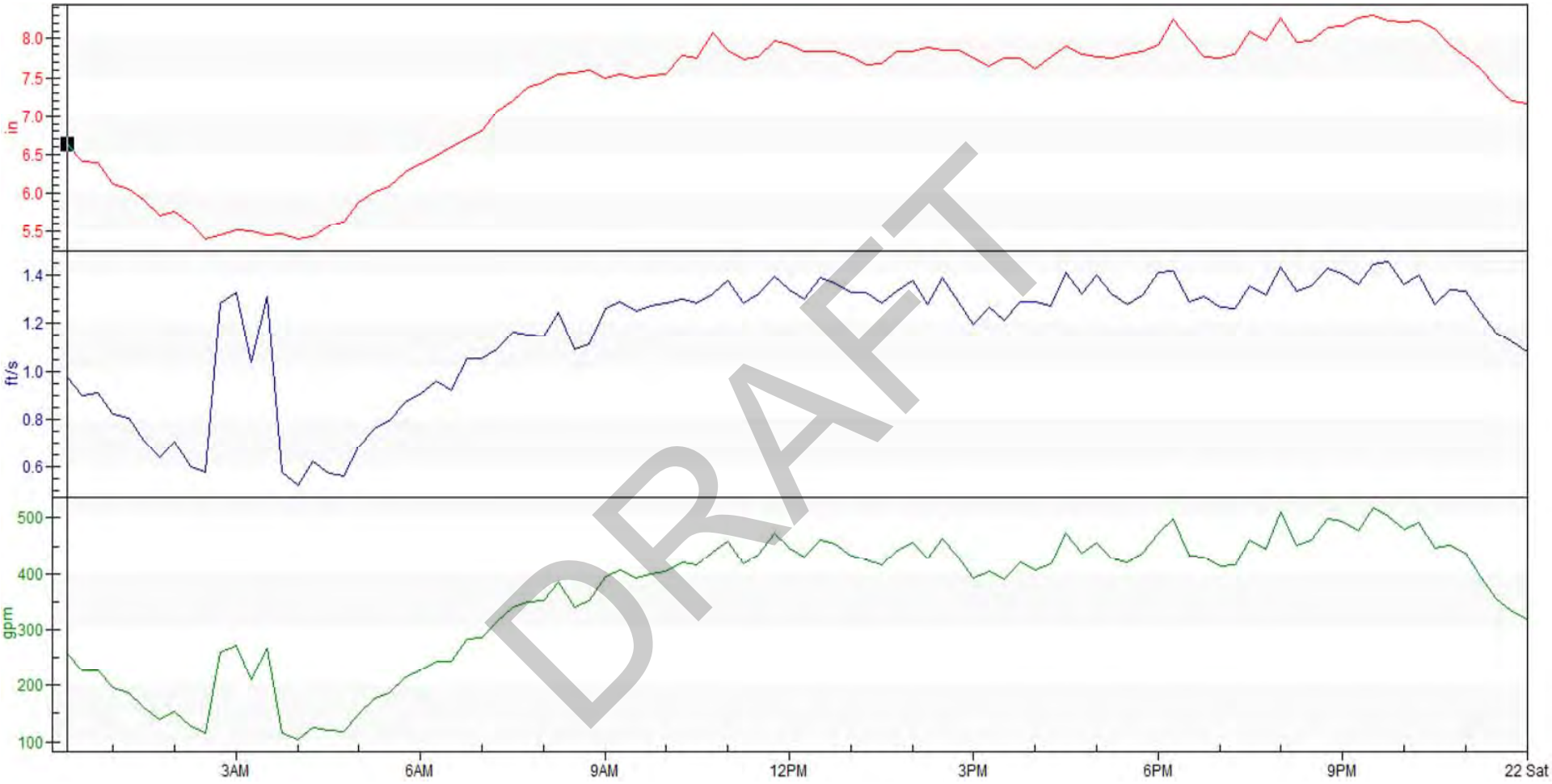
**Thursday - P.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.716 | 1.242 | 403.422 |
| 12:15:00 PM | 7.752 | 1.27 | 408.908 |
| 12:30:00 PM | 7.651 | 1.187 | 379.232 |
| 12:45:00 PM | 7.535 | 1.208 | 378.911 |
| 1:00:00 PM | 7.58 | 1.251 | 396.884 |
| 1:15:00 PM | 7.532 | 1.22 | 383.703 |
| 1:30:00 PM | 7.651 | 1.32 | 423.82 |
| 1:45:00 PM | 7.629 | 1.275 | 399.634 |
| 2:00:00 PM | 7.633 | 1.302 | 416.738 |
| 2:15:00 PM | 7.565 | 1.272 | 401.503 |
| 2:30:00 PM | 7.541 | 1.262 | 391.419 |
| 2:45:00 PM | 7.54 | 1.22 | 384.309 |
| 3:00:00 PM | 7.547 | 1.253 | 384.046 |
| 3:15:00 PM | 7.498 | 1.216 | 380.264 |
| 3:30:00 PM | 7.461 | 1.251 | 380.727 |
| 3:45:00 PM | 7.51 | 1.327 | 415.144 |
| 4:00:00 PM | 7.648 | 1.283 | 411.99 |
| 4:15:00 PM | 7.725 | 1.383 | 449.926 |
| 4:30:00 PM | 7.734 | 1.286 | 418.994 |
| 4:45:00 PM | 7.778 | 1.316 | 427.261 |
| 5:00:00 PM | 7.672 | 1.192 | 384.253 |
| 5:15:00 PM | 8.038 | 1.353 | 463.595 |
| 5:30:00 PM | 8.044 | 1.474 | 505.66 |
| 5:45:00 PM | 7.697 | 1.281 | 414.588 |
| 6:00:00 PM | 7.839 | 1.378 | 456.974 |
| 6:15:00 PM | 7.883 | 1.305 | 428.844 |
| 6:30:00 PM | 7.933 | 1.388 | 467.41 |
| 6:45:00 PM | 8.133 | 1.433 | 486.407 |
| 7:00:00 PM | 8.19 | 1.409 | 480.958 |
| 7:15:00 PM | 8.312 | 1.419 | 508.026 |
| 7:30:00 PM | 8.192 | 1.441 | 483.561 |
| 7:45:00 PM | 8.022 | 1.396 | 477.167 |
| 8:00:00 PM | 8.32 | 1.416 | 507.407 |
| 8:15:00 PM | 8.193 | 1.485 | 521.941 |
| 8:30:00 PM | 8.343 | 1.598 | 575.023 |
| 8:45:00 PM | 8.58 | 1.487 | 548.321 |
| 9:00:00 PM | 8.499 | 1.473 | 542.687 |
| 9:15:00 PM | 8.434 | 1.439 | 524.876 |
| 9:30:00 PM | 8.484 | 1.516 | 556.647 |
| 9:45:00 PM | 8.384 | 1.46 | 521.472 |
| 10:00:00 PM | 8.626 | 1.49 | 559.774 |
| 10:15:00 PM | 8.518 | 1.502 | 555.158 |
| 10:30:00 PM | 8.277 | 1.421 | 503.461 |
| 10:45:00 PM | 8.104 | 1.482 | 513.196 |
| 11:00:00 PM | 7.752 | 1.293 | 422.516 |
| 11:15:00 PM | 7.529 | 1.242 | 386.038 |
| 11:30:00 PM | 7.352 | 1.221 | 371.927 |
| 11:45:00 PM | 7.238 | 1.172 | 349.748 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.268 | 1.164 | 361.545 |
| Daily Min: | 5.313 | 0.478 | 91.846 |
| Daily Max: | 8.626 | 1.598 | 575.023 |
| Peak to Avg: | | | 1.59 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/21/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Friday - A.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.942 | 1.042 | 291.292 |
| 12:15:00 AM | 6.64 | 0.979 | 257.115 |
| 12:30:00 AM | 6.407 | 0.897 | 227.199 |
| 12:45:00 AM | 6.397 | 0.909 | 227.714 |
| 1:00:00 AM | 6.123 | 0.823 | 195.762 |
| 1:15:00 AM | 6.06 | 0.803 | 187.181 |
| 1:30:00 AM | 5.921 | 0.71 | 161.303 |
| 1:45:00 AM | 5.718 | 0.638 | 138.016 |
| 2:00:00 AM | 5.754 | 0.704 | 153.805 |
| 2:15:00 AM | 5.6 | 0.603 | 126.9 |
| 2:30:00 AM | 5.409 | 0.578 | 116.005 |
| 2:45:00 AM | 5.446 | 1.283 | 259.821 |
| 3:00:00 AM | 5.515 | 1.328 | 271.205 |
| 3:15:00 AM | 5.502 | 1.036 | 209.526 |
| 3:30:00 AM | 5.451 | 1.314 | 266.442 |
| 3:45:00 AM | 5.478 | 0.577 | 115.998 |
| 4:00:00 AM | 5.4 | 0.523 | 104.2 |
| 4:15:00 AM | 5.434 | 0.624 | 124.518 |
| 4:30:00 AM | 5.575 | 0.571 | 119.425 |
| 4:45:00 AM | 5.629 | 0.563 | 118.643 |
| 5:00:00 AM | 5.876 | 0.686 | 147.62 |
| 5:15:00 AM | 6.021 | 0.759 | 175.854 |
| 5:30:00 AM | 6.081 | 0.795 | 185.277 |
| 5:45:00 AM | 6.274 | 0.874 | 214.892 |
| 6:00:00 AM | 6.376 | 0.906 | 227.734 |
| 6:15:00 AM | 6.479 | 0.961 | 243.988 |
| 6:30:00 AM | 6.595 | 0.922 | 242.621 |
| 6:45:00 AM | 6.711 | 1.055 | 283.695 |
| 7:00:00 AM | 6.808 | 1.053 | 285.284 |
| 7:15:00 AM | 7.059 | 1.089 | 314.301 |
| 7:30:00 AM | 7.201 | 1.162 | 339.177 |
| 7:45:00 AM | 7.382 | 1.154 | 349.412 |
| 8:00:00 AM | 7.436 | 1.149 | 351.183 |
| 8:15:00 AM | 7.537 | 1.245 | 386.067 |
| 8:30:00 AM | 7.566 | 1.09 | 341.171 |
| 8:45:00 AM | 7.596 | 1.116 | 350.833 |
| 9:00:00 AM | 7.498 | 1.261 | 394.151 |
| 9:15:00 AM | 7.548 | 1.289 | 406.736 |
| 9:30:00 AM | 7.489 | 1.254 | 391.409 |
| 9:45:00 AM | 7.53 | 1.274 | 399.558 |
| 10:00:00 AM | 7.542 | 1.283 | 404.296 |
| 10:15:00 AM | 7.787 | 1.299 | 421.581 |
| 10:30:00 AM | 7.757 | 1.286 | 416.814 |
| 10:45:00 AM | 8.069 | 1.325 | 440.046 |
| 11:00:00 AM | 7.86 | 1.378 | 458.63 |
| 11:15:00 AM | 7.737 | 1.286 | 419.205 |
| 11:30:00 AM | 7.777 | 1.323 | 434.19 |
| 11:45:00 AM | 7.966 | 1.397 | 473.066 |

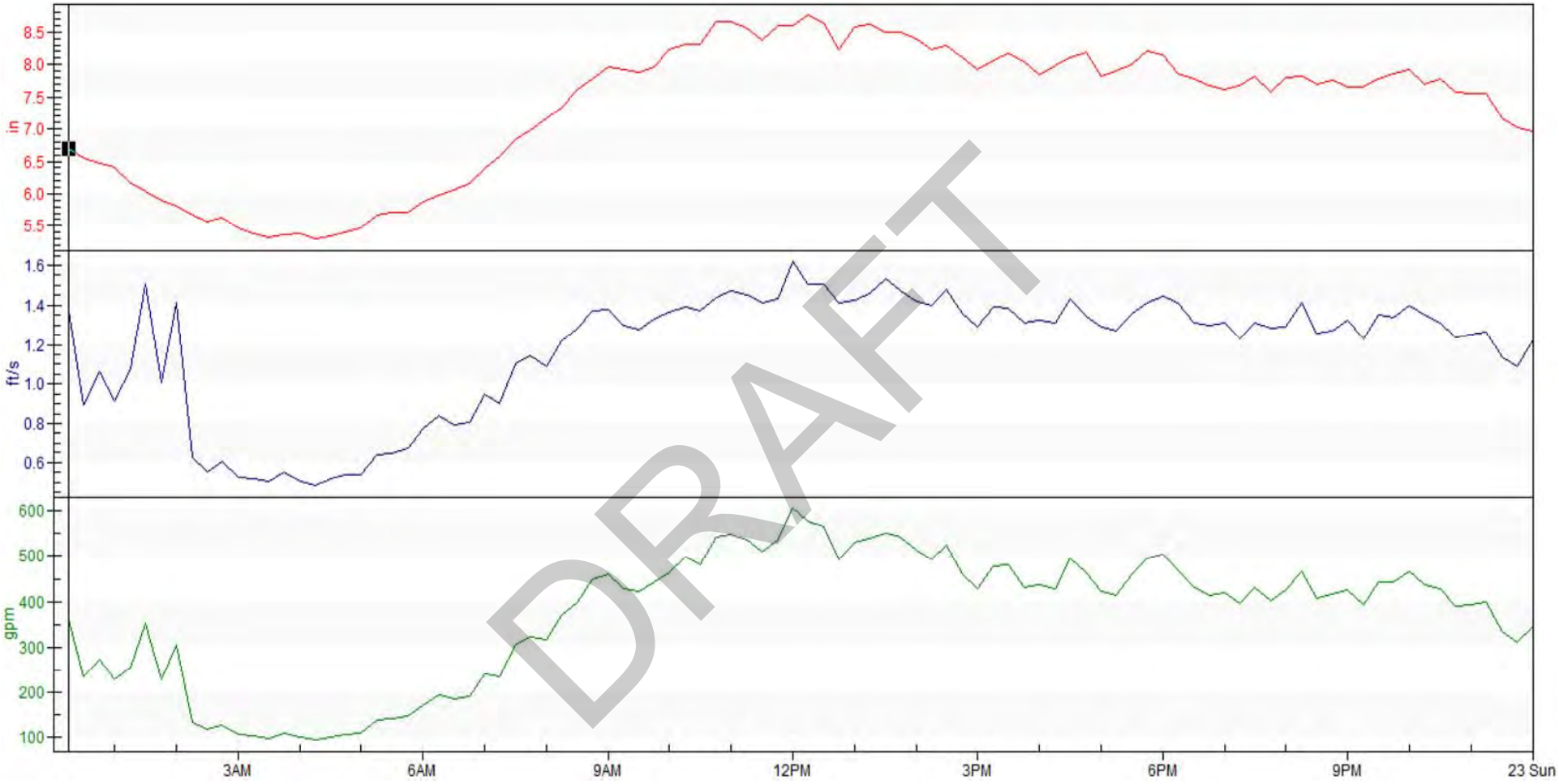
**Friday - P.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.915 | 1.343 | 446.623 |
| 12:15:00 PM | 7.829 | 1.3 | 430.324 |
| 12:30:00 PM | 7.842 | 1.388 | 460.611 |
| 12:45:00 PM | 7.834 | 1.369 | 453.689 |
| 1:00:00 PM | 7.762 | 1.331 | 433.098 |
| 1:15:00 PM | 7.672 | 1.327 | 426.248 |
| 1:30:00 PM | 7.677 | 1.286 | 414.951 |
| 1:45:00 PM | 7.83 | 1.333 | 441.25 |
| 2:00:00 PM | 7.834 | 1.378 | 456.513 |
| 2:15:00 PM | 7.882 | 1.282 | 428.212 |
| 2:30:00 PM | 7.85 | 1.392 | 462.603 |
| 2:45:00 PM | 7.849 | 1.293 | 429.426 |
| 3:00:00 PM | 7.754 | 1.199 | 392.039 |
| 3:15:00 PM | 7.653 | 1.266 | 402.838 |
| 3:30:00 PM | 7.757 | 1.214 | 388.745 |
| 3:45:00 PM | 7.747 | 1.289 | 420.699 |
| 4:00:00 PM | 7.616 | 1.291 | 407.259 |
| 4:15:00 PM | 7.764 | 1.277 | 418.076 |
| 4:30:00 PM | 7.914 | 1.409 | 471.541 |
| 4:45:00 PM | 7.796 | 1.326 | 436.654 |
| 5:00:00 PM | 7.76 | 1.398 | 454.883 |
| 5:15:00 PM | 7.751 | 1.321 | 428.273 |
| 5:30:00 PM | 7.801 | 1.282 | 420.413 |
| 5:45:00 PM | 7.84 | 1.32 | 436.126 |
| 6:00:00 PM | 7.916 | 1.409 | 473.378 |
| 6:15:00 PM | 8.242 | 1.419 | 499.157 |
| 6:30:00 PM | 7.998 | 1.29 | 431.677 |
| 6:45:00 PM | 7.774 | 1.313 | 430.751 |
| 7:00:00 PM | 7.747 | 1.268 | 413.436 |
| 7:15:00 PM | 7.804 | 1.261 | 415.708 |
| 7:30:00 PM | 8.094 | 1.358 | 460.289 |
| 7:45:00 PM | 7.977 | 1.317 | 444.303 |
| 8:00:00 PM | 8.263 | 1.434 | 509.579 |
| 8:15:00 PM | 7.959 | 1.334 | 451.116 |
| 8:30:00 PM | 7.97 | 1.356 | 459.686 |
| 8:45:00 PM | 8.146 | 1.429 | 498.24 |
| 9:00:00 PM | 8.167 | 1.408 | 492.656 |
| 9:15:00 PM | 8.258 | 1.362 | 476.4 |
| 9:30:00 PM | 8.301 | 1.446 | 516.849 |
| 9:45:00 PM | 8.234 | 1.456 | 503.255 |
| 10:00:00 PM | 8.208 | 1.363 | 480.232 |
| 10:15:00 PM | 8.237 | 1.398 | 490.589 |
| 10:30:00 PM | 8.131 | 1.28 | 445.39 |
| 10:45:00 PM | 7.929 | 1.342 | 451.866 |
| 11:00:00 PM | 7.761 | 1.336 | 437.098 |
| 11:15:00 PM | 7.62 | 1.247 | 394.649 |
| 11:30:00 PM | 7.375 | 1.16 | 354.878 |
| 11:45:00 PM | 7.208 | 1.124 | 333.383 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.255 | 1.167 | 359.002 |
| Daily Min: | 5.4 | 0.523 | 104.2 |
| Daily Max: | 8.301 | 1.456 | 516.849 |
| Peak to Avg: | | | 1.44 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/22/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Saturday - A.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 7.175 | 1.082 | 319.028 |
| 12:15:00 AM | 6.696 | 1.371 | 360.572 |
| 12:30:00 AM | 6.561 | 0.896 | 233.561 |
| 12:45:00 AM | 6.459 | 1.065 | 272.528 |
| 1:00:00 AM | 6.408 | 0.917 | 228.843 |
| 1:15:00 AM | 6.154 | 1.077 | 253.454 |
| 1:30:00 AM | 6.042 | 1.509 | 352.5 |
| 1:45:00 AM | 5.903 | 1.007 | 227.954 |
| 2:00:00 AM | 5.819 | 1.411 | 305.224 |
| 2:15:00 AM | 5.664 | 0.622 | 132.916 |
| 2:30:00 AM | 5.577 | 0.554 | 115.84 |
| 2:45:00 AM | 5.624 | 0.605 | 126.724 |
| 3:00:00 AM | 5.463 | 0.523 | 104.41 |
| 3:15:00 AM | 5.382 | 0.519 | 102.091 |
| 3:30:00 AM | 5.316 | 0.501 | 97.83 |
| 3:45:00 AM | 5.358 | 0.549 | 108.659 |
| 4:00:00 AM | 5.382 | 0.505 | 100.645 |
| 4:15:00 AM | 5.302 | 0.483 | 94.153 |
| 4:30:00 AM | 5.351 | 0.514 | 100.452 |
| 4:45:00 AM | 5.4 | 0.534 | 105.531 |
| 5:00:00 AM | 5.46 | 0.538 | 109.298 |
| 5:15:00 AM | 5.675 | 0.635 | 136.147 |
| 5:30:00 AM | 5.706 | 0.647 | 139.755 |
| 5:45:00 AM | 5.704 | 0.673 | 145.278 |
| 6:00:00 AM | 5.871 | 0.77 | 169.89 |
| 6:15:00 AM | 5.987 | 0.841 | 194.037 |
| 6:30:00 AM | 6.058 | 0.79 | 185.307 |
| 6:45:00 AM | 6.168 | 0.809 | 189.166 |
| 7:00:00 AM | 6.388 | 0.949 | 239.34 |
| 7:15:00 AM | 6.571 | 0.902 | 235.423 |
| 7:30:00 AM | 6.831 | 1.101 | 303.992 |
| 7:45:00 AM | 6.99 | 1.14 | 323.425 |
| 8:00:00 AM | 7.165 | 1.087 | 316.402 |
| 8:15:00 AM | 7.334 | 1.219 | 370.14 |
| 8:30:00 AM | 7.607 | 1.285 | 398.727 |
| 8:45:00 AM | 7.774 | 1.371 | 449.743 |
| 9:00:00 AM | 7.966 | 1.378 | 459.07 |
| 9:15:00 AM | 7.914 | 1.297 | 427.77 |
| 9:30:00 AM | 7.879 | 1.279 | 422.896 |
| 9:45:00 AM | 7.971 | 1.328 | 441.667 |
| 10:00:00 AM | 8.228 | 1.368 | 463.504 |
| 10:15:00 AM | 8.309 | 1.394 | 498.701 |
| 10:30:00 AM | 8.307 | 1.372 | 482.259 |
| 10:45:00 AM | 8.663 | 1.438 | 543.222 |
| 11:00:00 AM | 8.655 | 1.472 | 548.582 |
| 11:15:00 AM | 8.563 | 1.452 | 536.933 |
| 11:30:00 AM | 8.368 | 1.41 | 509.106 |
| 11:45:00 AM | 8.594 | 1.433 | 535.839 |

**Saturday - P.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.599 | 1.621 | 606.353 |
| 12:15:00 PM | 8.762 | 1.505 | 576.68 |
| 12:30:00 PM | 8.644 | 1.504 | 566.402 |
| 12:45:00 PM | 8.237 | 1.415 | 493.556 |
| 1:00:00 PM | 8.571 | 1.424 | 530.484 |
| 1:15:00 PM | 8.613 | 1.461 | 539.243 |
| 1:30:00 PM | 8.494 | 1.533 | 552.582 |
| 1:45:00 PM | 8.505 | 1.47 | 541.835 |
| 2:00:00 PM | 8.39 | 1.419 | 513.513 |
| 2:15:00 PM | 8.219 | 1.397 | 492.745 |
| 2:30:00 PM | 8.297 | 1.481 | 524.506 |
| 2:45:00 PM | 8.097 | 1.359 | 460.427 |
| 3:00:00 PM | 7.918 | 1.29 | 429.256 |
| 3:15:00 PM | 8.059 | 1.391 | 478.303 |
| 3:30:00 PM | 8.167 | 1.387 | 480.083 |
| 3:45:00 PM | 8.036 | 1.313 | 431.169 |
| 4:00:00 PM | 7.836 | 1.321 | 436.992 |
| 4:15:00 PM | 7.979 | 1.309 | 428.689 |
| 4:30:00 PM | 8.103 | 1.43 | 495.164 |
| 4:45:00 PM | 8.181 | 1.342 | 462.565 |
| 5:00:00 PM | 7.827 | 1.291 | 422.694 |
| 5:15:00 PM | 7.895 | 1.273 | 412.203 |
| 5:30:00 PM | 7.995 | 1.356 | 461.466 |
| 5:45:00 PM | 8.212 | 1.41 | 496.81 |
| 6:00:00 PM | 8.145 | 1.443 | 503.015 |
| 6:15:00 PM | 7.869 | 1.412 | 467.949 |
| 6:30:00 PM | 7.787 | 1.311 | 430.978 |
| 6:45:00 PM | 7.67 | 1.295 | 414.792 |
| 7:00:00 PM | 7.623 | 1.308 | 418.139 |
| 7:15:00 PM | 7.679 | 1.233 | 394.38 |
| 7:30:00 PM | 7.812 | 1.31 | 432.343 |
| 7:45:00 PM | 7.577 | 1.283 | 402.378 |
| 8:00:00 PM | 7.793 | 1.291 | 424.888 |
| 8:15:00 PM | 7.815 | 1.41 | 465.373 |
| 8:30:00 PM | 7.689 | 1.26 | 407.412 |
| 8:45:00 PM | 7.756 | 1.272 | 415.801 |
| 9:00:00 PM | 7.653 | 1.322 | 423.732 |
| 9:15:00 PM | 7.664 | 1.233 | 392.236 |
| 9:30:00 PM | 7.784 | 1.348 | 443.05 |
| 9:45:00 PM | 7.853 | 1.336 | 444.136 |
| 10:00:00 PM | 7.923 | 1.401 | 466.884 |
| 10:15:00 PM | 7.704 | 1.349 | 437.29 |
| 10:30:00 PM | 7.784 | 1.31 | 428.136 |
| 10:45:00 PM | 7.574 | 1.24 | 390.827 |
| 11:00:00 PM | 7.551 | 1.251 | 391.556 |
| 11:15:00 PM | 7.55 | 1.263 | 398.413 |
| 11:30:00 PM | 7.157 | 1.139 | 334.867 |
| 11:45:00 PM | 7.028 | 1.09 | 311.007 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.312 | 1.172 | 369.187 |
| Daily Min: | 5.302 | 0.483 | 94.153 |
| Daily Max: | 8.762 | 1.621 | 606.353 |
| Peak to Avg: | | | 1.64 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/23/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Sunday - A.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.961 | 1.22 | 345.596 |
| 12:15:00 AM | 6.974 | 1.116 | 316.689 |
| 12:30:00 AM | 6.8 | 0.947 | 259.878 |
| 12:45:00 AM | 6.572 | 0.972 | 252.351 |
| 1:00:00 AM | 6.47 | 0.869 | 220.113 |
| 1:15:00 AM | 6.28 | 0.851 | 208.485 |
| 1:30:00 AM | 6.204 | 0.8 | 193.803 |
| 1:45:00 AM | 6.009 | 0.756 | 175.304 |
| 2:00:00 AM | 5.788 | 0.658 | 144.891 |
| 2:15:00 AM | 5.757 | 0.635 | 138.264 |
| 2:30:00 AM | 5.775 | 0.628 | 137.533 |
| 2:45:00 AM | 5.732 | 0.687 | 149.353 |
| 3:00:00 AM | 5.588 | 0.587 | 122.306 |
| 3:15:00 AM | 5.614 | 0.575 | 121.356 |
| 3:30:00 AM | 5.534 | 0.558 | 115.475 |
| 3:45:00 AM | 5.567 | 0.621 | 127.818 |
| 4:00:00 AM | 5.609 | 0.552 | 116.389 |
| 4:15:00 AM | 5.465 | 0.493 | 98.772 |
| 4:30:00 AM | 5.346 | 0.49 | 96.635 |
| 4:45:00 AM | 5.34 | 0.51 | 100.421 |
| 5:00:00 AM | 5.416 | 0.489 | 97.858 |
| 5:15:00 AM | 5.476 | 0.537 | 108.454 |
| 5:30:00 AM | 5.438 | 0.53 | 107.029 |
| 5:45:00 AM | 5.516 | 0.521 | 107.346 |
| 6:00:00 AM | 5.678 | 0.592 | 127.101 |
| 6:15:00 AM | 5.777 | 0.705 | 153.487 |
| 6:30:00 AM | 5.844 | 0.681 | 151.443 |
| 6:45:00 AM | 5.92 | 0.719 | 162.067 |
| 7:00:00 AM | 6.546 | 0.882 | 229.879 |
| 7:15:00 AM | 6.683 | 0.958 | 256.846 |
| 7:30:00 AM | 6.778 | 0.99 | 270.319 |
| 7:45:00 AM | 6.944 | 0.987 | 278.598 |
| 8:00:00 AM | 7.127 | 1.227 | 348.507 |
| 8:15:00 AM | 7.2 | 1.421 | 421.012 |
| 8:30:00 AM | 7.438 | 1.323 | 402.495 |
| 8:45:00 AM | 7.813 | 1.356 | 432.628 |
| 9:00:00 AM | 7.944 | 1.388 | 468.276 |
| 9:15:00 AM | 8.105 | 1.442 | 499.017 |
| 9:30:00 AM | 8.302 | 1.447 | 517.358 |
| 9:45:00 AM | 8.423 | 1.444 | 526.026 |
| 10:00:00 AM | 8.499 | 1.445 | 518.494 |
| 10:15:00 AM | 8.447 | 1.502 | 546.912 |
| 10:30:00 AM | 8.572 | 1.461 | 535.785 |
| 10:45:00 AM | 8.6 | 1.502 | 542.28 |
| 11:00:00 AM | 8.587 | 1.52 | 567.674 |
| 11:15:00 AM | 8.825 | 1.653 | 614.296 |
| 11:30:00 AM | 8.669 | 1.496 | 565.471 |
| 11:45:00 AM | 8.455 | 1.754 | 637.3 |

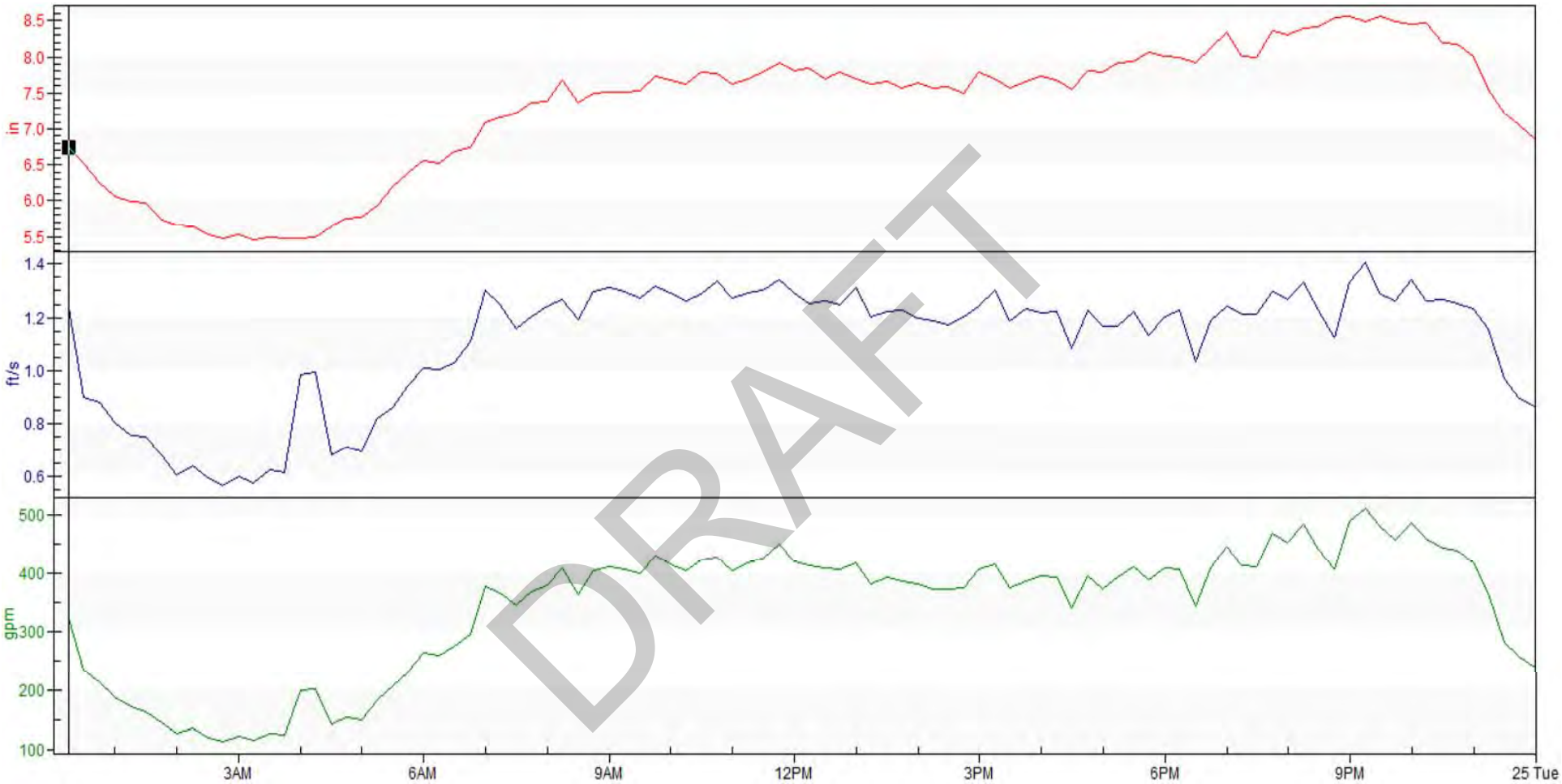
**Sunday - P.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 8.568 | 1.472 | 548.167 |
| 12:15:00 PM | 8.545 | 1.49 | 549.244 |
| 12:30:00 PM | 8.406 | 1.521 | 549.154 |
| 12:45:00 PM | 8.371 | 1.435 | 518.632 |
| 1:00:00 PM | 8.081 | 1.428 | 492.781 |
| 1:15:00 PM | 8.197 | 1.554 | 530.939 |
| 1:30:00 PM | 8.341 | 1.551 | 557.584 |
| 1:45:00 PM | 8.336 | 1.466 | 520.042 |
| 2:00:00 PM | 8.152 | 1.429 | 498.836 |
| 2:15:00 PM | 7.844 | 1.267 | 420.445 |
| 2:30:00 PM | 7.641 | 1.308 | 419.261 |
| 2:45:00 PM | 7.753 | 1.383 | 451.945 |
| 3:00:00 PM | 7.919 | 1.33 | 445.547 |
| 3:15:00 PM | 7.921 | 1.37 | 455.462 |
| 3:30:00 PM | 7.99 | 1.36 | 462.388 |
| 3:45:00 PM | 7.964 | 1.475 | 491.9 |
| 4:00:00 PM | 7.994 | 1.344 | 450.768 |
| 4:15:00 PM | 7.865 | 1.311 | 435.99 |
| 4:30:00 PM | 7.892 | 1.356 | 453.828 |
| 4:45:00 PM | 7.845 | 1.343 | 445.753 |
| 5:00:00 PM | 7.661 | 1.36 | 437.602 |
| 5:15:00 PM | 7.779 | 1.317 | 430.822 |
| 5:30:00 PM | 7.781 | 1.406 | 461.729 |
| 5:45:00 PM | 7.649 | 1.353 | 434.525 |
| 6:00:00 PM | 7.593 | 1.21 | 384.875 |
| 6:15:00 PM | 7.714 | 1.306 | 416.009 |
| 6:30:00 PM | 7.676 | 1.153 | 366.781 |
| 6:45:00 PM | 7.825 | 1.307 | 432.394 |
| 7:00:00 PM | 7.953 | 1.297 | 438.447 |
| 7:15:00 PM | 7.921 | 1.361 | 453.43 |
| 7:30:00 PM | 7.924 | 1.422 | 477.934 |
| 7:45:00 PM | 7.858 | 1.385 | 452.202 |
| 8:00:00 PM | 7.979 | 1.346 | 452.871 |
| 8:15:00 PM | 7.916 | 1.342 | 449.732 |
| 8:30:00 PM | 8.132 | 1.378 | 479.402 |
| 8:45:00 PM | 8.301 | 1.479 | 520.61 |
| 9:00:00 PM | 8.501 | 1.48 | 534.322 |
| 9:15:00 PM | 8.407 | 1.451 | 522.993 |
| 9:30:00 PM | 8.392 | 1.479 | 535.958 |
| 9:45:00 PM | 8.609 | 1.484 | 555.896 |
| 10:00:00 PM | 8.357 | 1.485 | 524.356 |
| 10:15:00 PM | 8.42 | 1.491 | 543.016 |
| 10:30:00 PM | 8.317 | 1.44 | 515.823 |
| 10:45:00 PM | 7.978 | 1.375 | 462.017 |
| 11:00:00 PM | 7.91 | 1.313 | 440.493 |
| 11:15:00 PM | 7.674 | 1.245 | 401.357 |
| 11:30:00 PM | 7.366 | 1.141 | 344.553 |
| 11:45:00 PM | 7.153 | 1.156 | 335.013 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.366 | 1.173 | 376.775 |
| Daily Min: | 5.34 | 0.489 | 96.635 |
| Daily Max: | 8.825 | 1.754 | 637.3 |
| Peak to Avg: | | | 1.69 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd., Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/24/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 520 Harvard Blvd.

**Monday - A.M. 7/24/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 6.895 | 1.082 | 298.847 |
| 12:15:00 AM | 6.735 | 1.237 | 324.137 |
| 12:30:00 AM | 6.531 | 0.9 | 233.844 |
| 12:45:00 AM | 6.251 | 0.88 | 215.535 |
| 1:00:00 AM | 6.06 | 0.805 | 188.626 |
| 1:15:00 AM | 5.992 | 0.757 | 173.082 |
| 1:30:00 AM | 5.979 | 0.749 | 165.337 |
| 1:45:00 AM | 5.739 | 0.681 | 147.13 |
| 2:00:00 AM | 5.653 | 0.604 | 128.757 |
| 2:15:00 AM | 5.636 | 0.643 | 136.608 |
| 2:30:00 AM | 5.532 | 0.597 | 122.481 |
| 2:45:00 AM | 5.481 | 0.566 | 115.223 |
| 3:00:00 AM | 5.536 | 0.6 | 124.389 |
| 3:15:00 AM | 5.455 | 0.578 | 117.278 |
| 3:30:00 AM | 5.501 | 0.624 | 128.177 |
| 3:45:00 AM | 5.475 | 0.618 | 126.093 |
| 4:00:00 AM | 5.481 | 0.985 | 200.228 |
| 4:15:00 AM | 5.486 | 0.995 | 202.827 |
| 4:30:00 AM | 5.634 | 0.682 | 144.795 |
| 4:45:00 AM | 5.742 | 0.713 | 155.246 |
| 5:00:00 AM | 5.759 | 0.696 | 151.645 |
| 5:15:00 AM | 5.93 | 0.82 | 185.426 |
| 5:30:00 AM | 6.192 | 0.858 | 207.395 |
| 5:45:00 AM | 6.402 | 0.943 | 233.123 |
| 6:00:00 AM | 6.55 | 1.01 | 263.506 |
| 6:15:00 AM | 6.515 | 1.003 | 259.616 |
| 6:30:00 AM | 6.693 | 1.029 | 276.465 |
| 6:45:00 AM | 6.738 | 1.111 | 296.512 |
| 7:00:00 AM | 7.085 | 1.301 | 377.293 |
| 7:15:00 AM | 7.162 | 1.246 | 366.678 |
| 7:30:00 AM | 7.229 | 1.16 | 345.587 |
| 7:45:00 AM | 7.374 | 1.202 | 367.69 |
| 8:00:00 AM | 7.392 | 1.242 | 380.661 |
| 8:15:00 AM | 7.687 | 1.267 | 409.454 |
| 8:30:00 AM | 7.362 | 1.192 | 363.687 |
| 8:45:00 AM | 7.501 | 1.296 | 405.483 |
| 9:00:00 AM | 7.519 | 1.312 | 411.835 |
| 9:15:00 AM | 7.517 | 1.299 | 407.655 |
| 9:30:00 AM | 7.527 | 1.275 | 400.627 |
| 9:45:00 AM | 7.728 | 1.318 | 428.986 |
| 10:00:00 AM | 7.688 | 1.29 | 416.957 |
| 10:15:00 AM | 7.628 | 1.265 | 404.572 |
| 10:30:00 AM | 7.795 | 1.287 | 423.504 |
| 10:45:00 AM | 7.776 | 1.336 | 428.527 |
| 11:00:00 AM | 7.616 | 1.272 | 405.954 |
| 11:15:00 AM | 7.695 | 1.293 | 418.562 |
| 11:30:00 AM | 7.794 | 1.304 | 424.494 |
| 11:45:00 AM | 7.911 | 1.343 | 450.58 |

**Monday - P.M. 7/24/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.807 | 1.293 | 421.347 |
| 12:15:00 PM | 7.839 | 1.25 | 414.605 |
| 12:30:00 PM | 7.704 | 1.261 | 408.583 |
| 12:45:00 PM | 7.795 | 1.249 | 406.465 |
| 1:00:00 PM | 7.695 | 1.313 | 419.381 |
| 1:15:00 PM | 7.618 | 1.201 | 383.493 |
| 1:30:00 PM | 7.66 | 1.221 | 392.784 |
| 1:45:00 PM | 7.562 | 1.225 | 386.087 |
| 2:00:00 PM | 7.641 | 1.198 | 383.517 |
| 2:15:00 PM | 7.57 | 1.187 | 373.335 |
| 2:30:00 PM | 7.582 | 1.174 | 372.26 |
| 2:45:00 PM | 7.503 | 1.202 | 376.256 |
| 3:00:00 PM | 7.795 | 1.241 | 408.343 |
| 3:15:00 PM | 7.692 | 1.301 | 415.384 |
| 3:30:00 PM | 7.578 | 1.188 | 374.569 |
| 3:45:00 PM | 7.658 | 1.233 | 387.186 |
| 4:00:00 PM | 7.742 | 1.217 | 397.111 |
| 4:15:00 PM | 7.678 | 1.221 | 392.934 |
| 4:30:00 PM | 7.55 | 1.086 | 342.081 |
| 4:45:00 PM | 7.804 | 1.227 | 395.667 |
| 5:00:00 PM | 7.795 | 1.17 | 374.289 |
| 5:15:00 PM | 7.922 | 1.171 | 393.604 |
| 5:30:00 PM | 7.928 | 1.223 | 411.562 |
| 5:45:00 PM | 8.063 | 1.132 | 389.555 |
| 6:00:00 PM | 8.014 | 1.201 | 409.879 |
| 6:15:00 PM | 7.998 | 1.228 | 406.386 |
| 6:30:00 PM | 7.91 | 1.032 | 344.381 |
| 6:45:00 PM | 8.127 | 1.19 | 408.586 |
| 7:00:00 PM | 8.342 | 1.242 | 446.87 |
| 7:15:00 PM | 8.017 | 1.215 | 415.063 |
| 7:30:00 PM | 7.983 | 1.212 | 411.646 |
| 7:45:00 PM | 8.365 | 1.297 | 468.171 |
| 8:00:00 PM | 8.303 | 1.268 | 453.53 |
| 8:15:00 PM | 8.395 | 1.333 | 483.372 |
| 8:30:00 PM | 8.406 | 1.227 | 440.868 |
| 8:45:00 PM | 8.538 | 1.121 | 407.898 |
| 9:00:00 PM | 8.561 | 1.332 | 488.331 |
| 9:15:00 PM | 8.485 | 1.407 | 511.168 |
| 9:30:00 PM | 8.563 | 1.29 | 479.825 |
| 9:45:00 PM | 8.497 | 1.262 | 456.536 |
| 10:00:00 PM | 8.457 | 1.341 | 486.644 |
| 10:15:00 PM | 8.473 | 1.263 | 459.768 |
| 10:30:00 PM | 8.191 | 1.269 | 442.903 |
| 10:45:00 PM | 8.168 | 1.252 | 438.086 |
| 11:00:00 PM | 8.007 | 1.23 | 419.485 |
| 11:15:00 PM | 7.549 | 1.16 | 365.875 |
| 11:30:00 PM | 7.216 | 0.967 | 282.855 |
| 11:45:00 PM | 7.049 | 0.896 | 257.542 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 7.289 | 1.112 | 343.877 |
| Daily Min: | 5.455 | 0.566 | 115.223 |
| Daily Max: | 8.563 | 1.407 | 511.168 |
| Peak to Avg: | | | 1.49 |

DRAFT

# Sewer Line Flow Study Summary

Project: **City of Santa Paula - Sewer Flow Study**
Location: **520 Harvard Blvd, Santa Paula, CA**
Pipe Size: **18" VCP**
Time Period: **7/11/2023, 12:00 a.m. - 7/25/2023, 12:00 a.m.**

## Level - Inches

| | |
|---|---|
| Average: | 7.362 |
| Maximum: | 9.048 |
| Minimum: | 5.248 |
| Max d/D: | 50.3% |

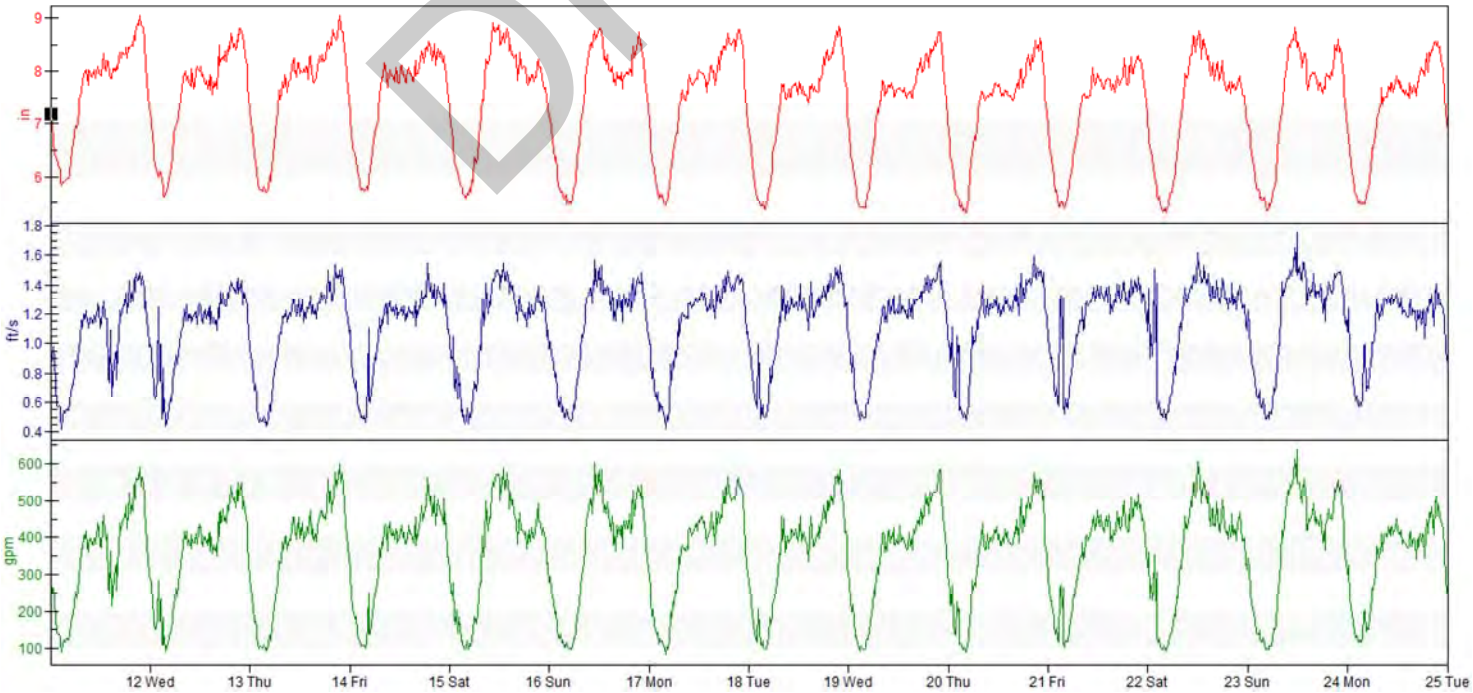
## Velocity - Feet per Second

| | |
|---|---|
| Average: | 1.066 |
| Maximum: | 1.754 |
| Minimum: | 0.408 |

## Flow Rate - Gallons Per Minute

| | |
|---|---|
| Average: | 340.898 |
| Maximum:: | 637.300 |
| Minimum: | 73.445 |
| Peak to Average | 1.70 |

DRAFT




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

# CITY OF SANTA PAULA - SEWER FLOW STUDY

MH Location: **500 Acacia**
**Santa Paula, CA 93060**

Pipe Size: **24" VCP**

Time Period: **7/11/2023 - 12:00 a.m. to**
**7/25/2023- 12:00 a.m.**

GPS: **34.337539, -119.081607**

## Manhole - Layout

## Equipment

**Teledyne Isco 2150 Area Velocity Flow Meter with 10' measuring range:**
**Level Measurement:**

- Method - Submerged pressure transducer mounted in the flow stream
- Transducer Type - Differential linear integrated circuit pressure transducer
- Range (standard) 0.033 to 10 ft (0.010 to 3.05 m); Maximum Allowable Level 34 ft (10.5 m)
- Accuracy ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m,)
- Long-Term Stability ±0.023 ft/yr (±0.007 m/yr)
- Compensated Range 32° to 122°F (0° to 50°C)

**Velocity Measurement:**

- Method - Doppler ultrasonic, frequency 500 kHz
- Typical Minimum Depth 0.08 ft (25 mm)
- Range -5 to +20 ft/s (-1.5 to +6.1 m/s)
- Accuracy (in water with uniform velocity profile, speed of sound = 4850 ft/s, for indicated velocity range) ±0.1 ft/s from -5 to 5 ft/s (±0.03 m/s from— 1.5 to +1.5 m/s)
- ±2% of reading from 5 to 20 ft/s (1.5 to 6.1 m/s)

**Method Of Insertion:**

- 24 inch line requires Confined Space Entry.

DRAFT

**Gold Coast Environmental**

**Specializing in process instrumentation and calibration.**

1868 Palma Drive, Suite I, Ventura, CA 93003 www.goldcoastenv.com 805.498.3811 ph.

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/11/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Tuesday- A.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| | | | |
| 12:15:00 AM | 9.734 | 1.184 | 635.376 |
| 12:30:00 AM | 9.453 | 1.155 | 595.643 |
| 12:45:00 AM | 9.056 | 0.989 | 481.778 |
| 1:00:00 AM | 8.825 | 0.972 | 457.009 |
| 1:15:00 AM | 8.572 | 0.91 | 411.633 |
| 1:30:00 AM | 8.379 | 0.826 | 362.212 |
| 1:45:00 AM | 8.025 | 0.711 | 293.95 |
| 2:00:00 AM | 7.751 | 0.64 | 252.256 |
| 2:15:00 AM | 7.623 | 0.764 | 293.942 |
| 2:30:00 AM | 7.539 | 0.709 | 268.773 |
| 2:45:00 AM | 7.536 | 0.592 | 224.171 |
| 3:00:00 AM | 7.345 | 0.669 | 244.713 |
| 3:15:00 AM | 7.215 | 0.545 | 194.373 |
| 3:30:00 AM | 7.254 | 0.59 | 212.218 |
| 3:45:00 AM | 7.215 | 0.655 | 233.581 |
| 4:00:00 AM | 7.119 | 0.641 | 224.525 |
| 4:15:00 AM | 7.082 | 0.562 | 195.359 |
| 4:30:00 AM | 7.169 | 0.616 | 217.835 |
| 4:45:00 AM | 7.274 | 0.709 | 255.729 |
| 5:00:00 AM | 7.318 | 0.696 | 253.264 |
| 5:15:00 AM | 7.454 | 0.609 | 227.363 |
| 5:30:00 AM | 7.695 | 0.69 | 269.216 |
| 5:45:00 AM | 7.781 | 0.732 | 289.765 |
| 6:00:00 AM | 8.222 | 0.846 | 361.288 |
| 6:15:00 AM | 8.546 | 0.925 | 416.648 |
| 6:30:00 AM | 8.815 | 0.968 | 454.356 |
| 6:45:00 AM | 8.918 | 0.454 | 216.404 |
| 7:00:00 AM | 9.295 | 1.091 | 550.083 |
| 7:15:00 AM | 9.495 | 1.116 | 579.244 |
| 7:30:00 AM | 9.809 | 1.099 | 595.975 |
| 7:45:00 AM | 10.359 | 1.297 | 755.473 |
| 8:00:00 AM | 10.952 | 1.274 | 798.281 |
| 8:15:00 AM | 10.795 | 1.217 | 748.355 |
| 8:30:00 AM | 10.5 | 1.331 | 789.119 |
| 8:45:00 AM | 10.757 | 1.371 | 839.113 |
| 9:00:00 AM | 10.886 | 1.391 | 864.907 |
| 9:15:00 AM | 10.844 | 1.307 | 808.319 |
| 9:30:00 AM | 10.779 | 1.293 | 793.823 |
| 9:45:00 AM | 10.639 | 1.336 | 806.189 |
| 10:00:00 AM | 10.708 | 1.265 | 769.545 |
| 10:15:00 AM | 10.843 | 1.358 | 840.213 |
| 10:30:00 AM | 10.918 | 1.412 | 881.265 |
| 10:45:00 AM | 10.811 | 1.26 | 776.691 |
| 11:00:00 AM | 10.951 | 1.297 | 812.61 |
| 11:15:00 AM | 10.956 | 1.211 | 759.125 |
| 11:30:00 AM | 11.194 | 1.317 | 849.139 |
| 11:45:00 AM | 10.977 | 1.329 | 835.116 |

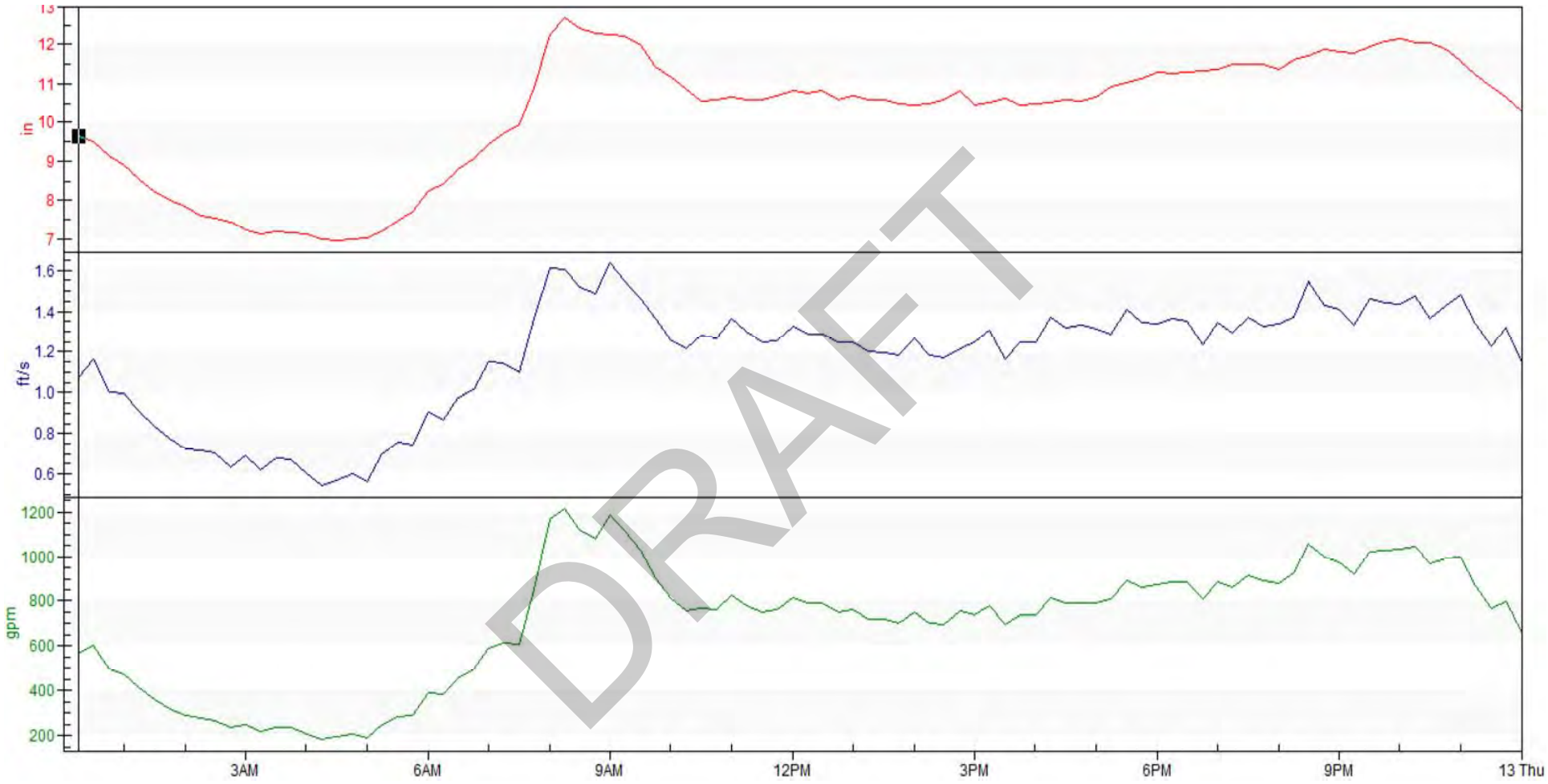
**Tuesday- P.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.904 | 1.356 | 845.223 |
| 12:15:00 PM | 10.968 | 1.418 | 890.063 |
| 12:30:00 PM | 11.073 | 1.347 | 856.621 |
| 12:45:00 PM | 11.097 | 1.296 | 826.204 |
| 1:00:00 PM | 11.046 | 1.345 | 852.329 |
| 1:15:00 PM | 11.019 | 1.298 | 819.984 |
| 1:30:00 PM | 11.127 | 1.243 | 795.54 |
| 1:45:00 PM | 10.989 | 1.272 | 800.844 |
| 2:00:00 PM | 10.767 | 1.234 | 756.263 |
| 2:15:00 PM | 10.927 | 1.394 | 871.18 |
| 2:30:00 PM | 11.25 | 1.299 | 842.646 |
| 2:45:00 PM | 11.132 | 1.338 | 856.459 |
| 3:00:00 PM | 10.979 | 1.314 | 826.037 |
| 3:15:00 PM | 10.868 | 1.306 | 810.057 |
| 3:30:00 PM | 10.752 | 1.236 | 755.972 |
| 3:45:00 PM | 10.831 | 1.415 | 873.822 |
| 4:00:00 PM | 10.842 | 1.349 | 834.198 |
| 4:15:00 PM | 10.906 | 1.372 | 855.379 |
| 4:30:00 PM | 10.986 | 1.274 | 801.615 |
| 4:45:00 PM | 10.851 | 1.315 | 814.484 |
| 5:00:00 PM | 10.947 | 1.327 | 831.396 |
| 5:15:00 PM | 11.123 | 1.196 | 764.582 |
| 5:30:00 PM | 11.457 | 1.363 | 905.363 |
| 5:45:00 PM | 11.53 | 1.368 | 916.654 |
| 6:00:00 PM | 11.585 | 1.291 | 870.367 |
| 6:15:00 PM | 11.455 | 1.448 | 961.964 |
| 6:30:00 PM | 11.444 | 1.369 | 908.49 |
| 6:45:00 PM | 11.655 | 1.417 | 962.4 |
| 7:00:00 PM | 11.647 | 1.395 | 946.414 |
| 7:15:00 PM | 11.558 | 1.334 | 896.604 |
| 7:30:00 PM | 11.574 | 1.415 | 952.36 |
| 7:45:00 PM | 11.673 | 1.511 | 1028.52 |
| 8:00:00 PM | 11.74 | 1.358 | 931.272 |
| 8:15:00 PM | 11.803 | 1.474 | 1017.37 |
| 8:30:00 PM | 11.84 | 1.495 | 1036.24 |
| 8:45:00 PM | 11.864 | 1.444 | 1003.08 |
| 9:00:00 PM | 11.885 | 1.458 | 1015.67 |
| 9:15:00 PM | 11.912 | 1.452 | 1014.34 |
| 9:30:00 PM | 12.039 | 1.398 | 989.995 |
| 9:45:00 PM | 12.227 | 1.439 | 1039.15 |
| 10:00:00 PM | 12.355 | 1.461 | 1068.97 |
| 10:15:00 PM | 12.421 | 1.541 | 1134.83 |
| 10:30:00 PM | 12.226 | 1.449 | 1045.95 |
| 10:45:00 PM | 11.934 | 1.44 | 1007.95 |
| 11:00:00 PM | 11.634 | 1.377 | 933.162 |
| 11:15:00 PM | 11.229 | 1.352 | 875.305 |
| 11:30:00 PM | 10.944 | 1.288 | 806.527 |
| 11:45:00 PM | 10.545 | 1.299 | 774.781 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.242 | 1.174 | 707.585 |
| Daily Min: | 7.082 | 0.454 | 194.373 |
| Daily Max: | 12.421 | 1.541 | 1134.83 |
| Peak to Avg: | | | 1.60 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/12/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Wednesday - A.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.138 | 1.266 | 717.048 |
| 12:15:00 AM | 9.658 | 1.072 | 569.21 |
| 12:30:00 AM | 9.49 | 1.166 | 604.568 |
| 12:45:00 AM | 9.141 | 1.003 | 494.757 |
| 1:00:00 AM | 8.902 | 0.994 | 473.136 |
| 1:15:00 AM | 8.568 | 0.911 | 411.57 |
| 1:30:00 AM | 8.236 | 0.837 | 358.402 |
| 1:45:00 AM | 7.999 | 0.777 | 319.484 |
| 2:00:00 AM | 7.839 | 0.722 | 288.878 |
| 2:15:00 AM | 7.604 | 0.719 | 275.871 |
| 2:30:00 AM | 7.55 | 0.704 | 267.582 |
| 2:45:00 AM | 7.436 | 0.632 | 235.252 |
| 3:00:00 AM | 7.248 | 0.689 | 247.379 |
| 3:15:00 AM | 7.148 | 0.62 | 218.476 |
| 3:30:00 AM | 7.198 | 0.676 | 240.466 |
| 3:45:00 AM | 7.16 | 0.672 | 237.111 |
| 4:00:00 AM | 7.147 | 0.598 | 210.595 |
| 4:15:00 AM | 7.007 | 0.543 | 185.876 |
| 4:30:00 AM | 6.964 | 0.57 | 193.729 |
| 4:45:00 AM | 6.999 | 0.602 | 205.837 |
| 5:00:00 AM | 7.02 | 0.561 | 192.808 |
| 5:15:00 AM | 7.207 | 0.699 | 248.934 |
| 5:30:00 AM | 7.485 | 0.754 | 283.195 |
| 5:45:00 AM | 7.714 | 0.744 | 291.29 |
| 6:00:00 AM | 8.251 | 0.904 | 387.822 |
| 6:15:00 AM | 8.43 | 0.866 | 382.619 |
| 6:30:00 AM | 8.801 | 0.977 | 457.915 |
| 6:45:00 AM | 9.058 | 1.016 | 494.772 |
| 7:00:00 AM | 9.423 | 1.154 | 592.776 |
| 7:15:00 AM | 9.701 | 1.147 | 612.587 |
| 7:30:00 AM | 9.955 | 1.097 | 606.34 |
| 7:45:00 AM | 10.91 | 1.363 | 850.104 |
| 8:00:00 AM | 12.26 | 1.611 | 1166.9 |
| 8:15:00 AM | 12.693 | 1.604 | 1213.71 |
| 8:30:00 AM | 12.411 | 1.522 | 1120.13 |
| 8:45:00 AM | 12.287 | 1.485 | 1078.54 |
| 9:00:00 AM | 12.259 | 1.637 | 1185.81 |
| 9:15:00 AM | 12.227 | 1.547 | 1117.08 |
| 9:30:00 AM | 11.992 | 1.46 | 1028.56 |
| 9:45:00 AM | 11.446 | 1.365 | 905.573 |
| 10:00:00 AM | 11.151 | 1.258 | 807.06 |
| 10:15:00 AM | 10.875 | 1.218 | 756.585 |
| 10:30:00 AM | 10.568 | 1.28 | 765.366 |
| 10:45:00 AM | 10.581 | 1.267 | 759.049 |
| 11:00:00 AM | 10.669 | 1.365 | 826.589 |
| 11:15:00 AM | 10.595 | 1.3 | 780.139 |
| 11:30:00 AM | 10.592 | 1.246 | 747.411 |
| 11:45:00 AM | 10.676 | 1.254 | 760.153 |

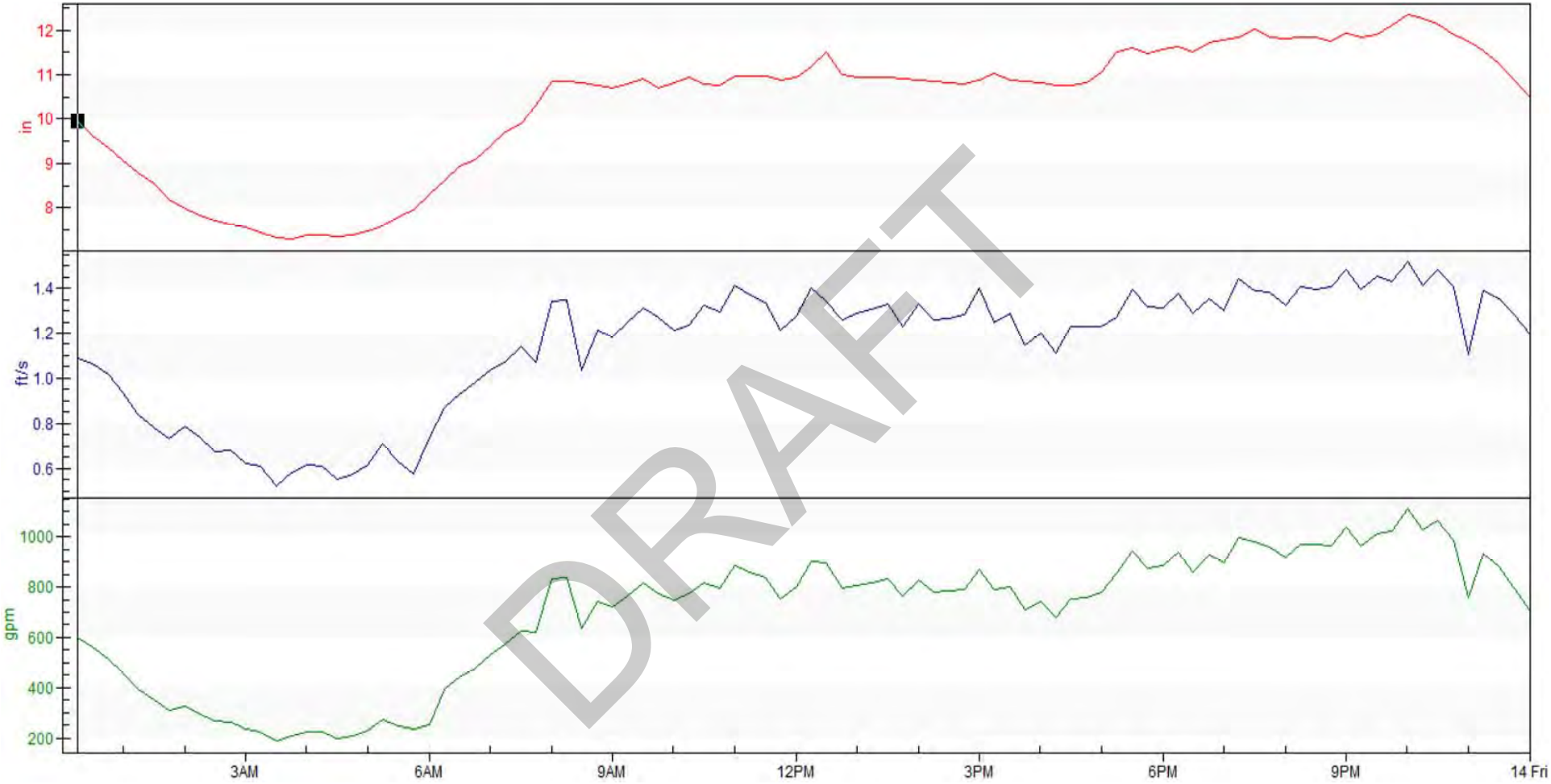
**Wednesday - P.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.818 | 1.325 | 817.152 |
| 12:15:00 PM | 10.757 | 1.287 | 788.197 |
| 12:30:00 PM | 10.815 | 1.287 | 793.376 |
| 12:45:00 PM | 10.605 | 1.248 | 749.987 |
| 1:00:00 PM | 10.699 | 1.248 | 758.803 |
| 1:15:00 PM | 10.595 | 1.201 | 720.996 |
| 1:30:00 PM | 10.596 | 1.196 | 718.024 |
| 1:45:00 PM | 10.502 | 1.186 | 703.459 |
| 2:00:00 PM | 10.458 | 1.269 | 748.507 |
| 2:15:00 PM | 10.485 | 1.186 | 701.979 |
| 2:30:00 PM | 10.574 | 1.169 | 699.727 |
| 2:45:00 PM | 10.842 | 1.217 | 752.919 |
| 3:00:00 PM | 10.451 | 1.249 | 736.119 |
| 3:15:00 PM | 10.526 | 1.308 | 778.166 |
| 3:30:00 PM | 10.609 | 1.164 | 699.776 |
| 3:45:00 PM | 10.456 | 1.25 | 737.319 |
| 4:00:00 PM | 10.495 | 1.246 | 738.563 |
| 4:15:00 PM | 10.511 | 1.369 | 812.994 |
| 4:30:00 PM | 10.574 | 1.322 | 791.127 |
| 4:45:00 PM | 10.549 | 1.33 | 793.442 |
| 5:00:00 PM | 10.655 | 1.312 | 793.132 |
| 5:15:00 PM | 10.936 | 1.289 | 806.584 |
| 5:30:00 PM | 11.021 | 1.407 | 889.121 |
| 5:45:00 PM | 11.124 | 1.347 | 861.335 |
| 6:00:00 PM | 11.305 | 1.341 | 875.603 |
| 6:15:00 PM | 11.274 | 1.362 | 886.429 |
| 6:30:00 PM | 11.299 | 1.354 | 883.86 |
| 6:45:00 PM | 11.353 | 1.232 | 809.292 |
| 7:00:00 PM | 11.376 | 1.344 | 885.003 |
| 7:15:00 PM | 11.491 | 1.293 | 862.622 |
| 7:30:00 PM | 11.499 | 1.374 | 917.055 |
| 7:45:00 PM | 11.519 | 1.328 | 888.786 |
| 8:00:00 PM | 11.367 | 1.339 | 880.828 |
| 8:15:00 PM | 11.62 | 1.372 | 928.18 |
| 8:30:00 PM | 11.707 | 1.549 | 1057.82 |
| 8:45:00 PM | 11.882 | 1.429 | 994.896 |
| 9:00:00 PM | 11.796 | 1.409 | 971.915 |
| 9:15:00 PM | 11.787 | 1.335 | 919.929 |
| 9:30:00 PM | 11.937 | 1.461 | 1023.17 |
| 9:45:00 PM | 12.076 | 1.441 | 1024.08 |
| 10:00:00 PM | 12.152 | 1.438 | 1029.92 |
| 10:15:00 PM | 12.055 | 1.473 | 1044.54 |
| 10:30:00 PM | 12.049 | 1.367 | 969.03 |
| 10:45:00 PM | 11.866 | 1.428 | 992.415 |
| 11:00:00 PM | 11.573 | 1.48 | 996.403 |
| 11:15:00 PM | 11.245 | 1.34 | 868.958 |
| 11:30:00 PM | 10.914 | 1.227 | 765.463 |
| 11:45:00 PM | 10.67 | 1.318 | 798.408 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.210 | 1.175 | 706.562 |
| Daily Min: | 6.964 | 0.543 | 185.876 |
| Daily Max: | 12.693 | 1.637 | 1213.71 |
| Peak to Avg: | | | 1.72 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/13/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Thursday - A.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.274 | 1.144 | 659.515 |
| 12:15:00 AM | 9.952 | 1.089 | 601.785 |
| 12:30:00 AM | 9.611 | 1.065 | 561.961 |
| 12:45:00 AM | 9.362 | 1.016 | 517.5 |
| 1:00:00 AM | 9.067 | 0.936 | 456.66 |
| 1:15:00 AM | 8.789 | 0.842 | 394.036 |
| 1:30:00 AM | 8.54 | 0.78 | 350.713 |
| 1:45:00 AM | 8.195 | 0.733 | 311.57 |
| 2:00:00 AM | 7.993 | 0.789 | 324.11 |
| 2:15:00 AM | 7.834 | 0.741 | 296.297 |
| 2:30:00 AM | 7.725 | 0.676 | 264.911 |
| 2:45:00 AM | 7.634 | 0.682 | 263.191 |
| 3:00:00 AM | 7.556 | 0.623 | 236.794 |
| 3:15:00 AM | 7.437 | 0.609 | 226.606 |
| 3:30:00 AM | 7.308 | 0.522 | 189.496 |
| 3:45:00 AM | 7.291 | 0.578 | 209.272 |
| 4:00:00 AM | 7.368 | 0.614 | 225.665 |
| 4:15:00 AM | 7.376 | 0.609 | 224.127 |
| 4:30:00 AM | 7.354 | 0.55 | 201.392 |
| 4:45:00 AM | 7.373 | 0.575 | 211.247 |
| 5:00:00 AM | 7.461 | 0.617 | 230.769 |
| 5:15:00 AM | 7.594 | 0.709 | 271.553 |
| 5:30:00 AM | 7.802 | 0.626 | 248.785 |
| 5:45:00 AM | 7.941 | 0.576 | 234.57 |
| 6:00:00 AM | 8.312 | 0.74 | 249.72 |
| 6:15:00 AM | 8.612 | 0.871 | 396.406 |
| 6:30:00 AM | 8.925 | 0.928 | 442.976 |
| 6:45:00 AM | 9.097 | 0.979 | 479.904 |
| 7:00:00 AM | 9.38 | 1.037 | 529.358 |
| 7:15:00 AM | 9.708 | 1.07 | 572.089 |
| 7:30:00 AM | 9.883 | 1.142 | 625.403 |
| 7:45:00 AM | 10.317 | 1.07 | 620.009 |
| 8:00:00 AM | 10.857 | 1.344 | 832.706 |
| 8:15:00 AM | 10.86 | 1.349 | 836.295 |
| 8:30:00 AM | 10.836 | 1.034 | 639.165 |
| 8:45:00 AM | 10.759 | 1.211 | 741.754 |
| 9:00:00 AM | 10.716 | 1.184 | 721.206 |
| 9:15:00 AM | 10.782 | 1.245 | 764.567 |
| 9:30:00 AM | 10.904 | 1.309 | 815.958 |
| 9:45:00 AM | 10.699 | 1.272 | 773.173 |
| 10:00:00 AM | 10.829 | 1.214 | 749.701 |
| 10:15:00 AM | 10.933 | 1.234 | 771.638 |
| 10:30:00 AM | 10.806 | 1.322 | 814.119 |
| 10:45:00 AM | 10.765 | 1.294 | 792.987 |
| 11:00:00 AM | 10.958 | 1.413 | 886.297 |
| 11:15:00 AM | 10.975 | 1.37 | 860.807 |
| 11:30:00 AM | 10.957 | 1.337 | 838.701 |
| 11:45:00 AM | 10.892 | 1.213 | 754.526 |

**Thursday - P.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.94 | 1.275 | 798.287 |
| 12:15:00 PM | 11.194 | 1.398 | 901.548 |
| 12:30:00 PM | 11.514 | 1.343 | 897.803 |
| 12:45:00 PM | 11.011 | 1.256 | 792.957 |
| 1:00:00 PM | 10.938 | 1.287 | 804.983 |
| 1:15:00 PM | 10.939 | 1.308 | 818.432 |
| 1:30:00 PM | 10.954 | 1.33 | 833.505 |
| 1:45:00 PM | 10.903 | 1.228 | 765.167 |
| 2:00:00 PM | 10.874 | 1.329 | 825.37 |
| 2:15:00 PM | 10.865 | 1.26 | 781.307 |
| 2:30:00 PM | 10.828 | 1.267 | 782.295 |
| 2:45:00 PM | 10.788 | 1.282 | 787.964 |
| 3:00:00 PM | 10.881 | 1.399 | 869.647 |
| 3:15:00 PM | 11.036 | 1.248 | 790.049 |
| 3:30:00 PM | 10.881 | 1.286 | 799.009 |
| 3:45:00 PM | 10.843 | 1.146 | 708.684 |
| 4:00:00 PM | 10.824 | 1.2 | 740.608 |
| 4:15:00 PM | 10.755 | 1.11 | 679.31 |
| 4:30:00 PM | 10.747 | 1.232 | 753.236 |
| 4:45:00 PM | 10.827 | 1.232 | 760.497 |
| 5:00:00 PM | 11.07 | 1.227 | 779.898 |
| 5:15:00 PM | 11.52 | 1.273 | 851.739 |
| 5:30:00 PM | 11.592 | 1.395 | 940.621 |
| 5:45:00 PM | 11.466 | 1.315 | 874.843 |
| 6:00:00 PM | 11.557 | 1.315 | 883.306 |
| 6:15:00 PM | 11.642 | 1.379 | 935.485 |
| 6:30:00 PM | 11.498 | 1.29 | 860.753 |
| 6:45:00 PM | 11.715 | 1.354 | 925.575 |
| 7:00:00 PM | 11.791 | 1.301 | 896.526 |
| 7:15:00 PM | 11.834 | 1.439 | 996.649 |
| 7:30:00 PM | 12.014 | 1.386 | 978.614 |
| 7:45:00 PM | 11.838 | 1.383 | 958.095 |
| 8:00:00 PM | 11.798 | 1.325 | 913.942 |
| 8:15:00 PM | 11.825 | 1.404 | 971.641 |
| 8:30:00 PM | 11.826 | 1.397 | 966.867 |
| 8:45:00 PM | 11.757 | 1.406 | 965.967 |
| 9:00:00 PM | 11.936 | 1.48 | 1036.67 |
| 9:15:00 PM | 11.83 | 1.392 | 963.645 |
| 9:30:00 PM | 11.902 | 1.452 | 1013.33 |
| 9:45:00 PM | 12.097 | 1.433 | 1020.33 |
| 10:00:00 PM | 12.348 | 1.519 | 1110.27 |
| 10:15:00 PM | 12.269 | 1.414 | 1025.76 |
| 10:30:00 PM | 12.142 | 1.486 | 1063.08 |
| 10:45:00 PM | 11.902 | 1.408 | 982.671 |
| 11:00:00 PM | 11.746 | 1.107 | 759.24 |
| 11:15:00 PM | 11.528 | 1.391 | 931.342 |
| 11:30:00 PM | 11.238 | 1.354 | 877.152 |
| 11:45:00 PM | 10.891 | 1.28 | 796.166 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.310 | 1.142 | 691.930 |
| Daily Min: | 7.291 | 0.522 | 189.496 |
| Daily Max: | 12.348 | 1.519 | 1110.27 |
| Peak to Avg: | | | 1.60 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/14/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Friday - A.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.49 | 1.193 | 706.655 |
| 12:15:00 AM | 10.158 | 1.13 | 641.421 |
| 12:30:00 AM | 9.787 | 1.165 | 629.34 |
| 12:45:00 AM | 9.489 | 0.975 | 505.678 |
| 1:00:00 AM | 9.24 | 0.949 | 474.687 |
| 1:15:00 AM | 9 | 1.017 | 491.252 |
| 1:30:00 AM | 8.747 | 0.909 | 422.482 |
| 1:45:00 AM | 8.445 | 0.66 | 292.387 |
| 2:00:00 AM | 8.385 | 0.757 | 332.154 |
| 2:15:00 AM | 8.328 | 0.773 | 335.997 |
| 2:30:00 AM | 8.06 | 0.698 | 290.151 |
| 2:45:00 AM | 7.901 | 0.683 | 276.13 |
| 3:00:00 AM | 7.751 | 0.647 | 254.685 |
| 3:15:00 AM | 7.713 | 0.677 | 264.944 |
| 3:30:00 AM | 7.584 | 0.68 | 259.851 |
| 3:45:00 AM | 7.452 | 0.612 | 228.202 |
| 4:00:00 AM | 7.49 | 0.648 | 243.44 |
| 4:15:00 AM | 7.56 | 0.63 | 239.962 |
| 4:30:00 AM | 7.498 | 0.608 | 228.816 |
| 4:45:00 AM | 7.443 | 0.591 | 220.148 |
| 5:00:00 AM | 7.541 | 0.598 | 227.017 |
| 5:15:00 AM | 7.669 | 0.646 | 250.854 |
| 5:30:00 AM | 7.856 | 0.591 | 237.334 |
| 5:45:00 AM | 8.043 | 0.66 | 273.376 |
| 6:00:00 AM | 8.465 | 0.743 | 330.148 |
| 6:15:00 AM | 8.606 | 0.647 | 294.058 |
| 6:30:00 AM | 8.959 | 0.925 | 443.865 |
| 6:45:00 AM | 9.166 | 1.029 | 509.615 |
| 7:00:00 AM | 9.534 | 0.88 | 459.096 |
| 7:15:00 AM | 9.717 | 1.101 | 589.198 |
| 7:30:00 AM | 10.017 | 1.103 | 614.953 |
| 7:45:00 AM | 10.135 | 0.682 | 385.924 |
| 8:00:00 AM | 10.351 | 1.113 | 647.765 |
| 8:15:00 AM | 10.709 | 0.947 | 576.56 |
| 8:30:00 AM | 10.782 | 1.053 | 646.654 |
| 8:45:00 AM | 10.853 | 1.322 | 818.935 |
| 9:00:00 AM | 10.983 | 0.94 | 591.552 |
| 9:15:00 AM | 11.016 | 1.151 | 726.812 |
| 9:30:00 AM | 11.027 | 1.136 | 718.387 |
| 9:45:00 AM | 10.873 | 1.318 | 818.485 |
| 10:00:00 AM | 10.938 | 1.273 | 796.789 |
| 10:15:00 AM | 10.908 | 1.27 | 791.985 |
| 10:30:00 AM | 11.032 | 1.309 | 828.265 |
| 10:45:00 AM | 10.984 | 1.262 | 794.081 |
| 11:00:00 AM | 10.942 | 1.198 | 749.722 |
| 11:15:00 AM | 12.302 | 1.531 | 1113.58 |
| 11:30:00 AM | 13.013 | 1.483 | 1157.54 |
| 11:45:00 AM | 13.064 | 1.753 | 1375.59 |

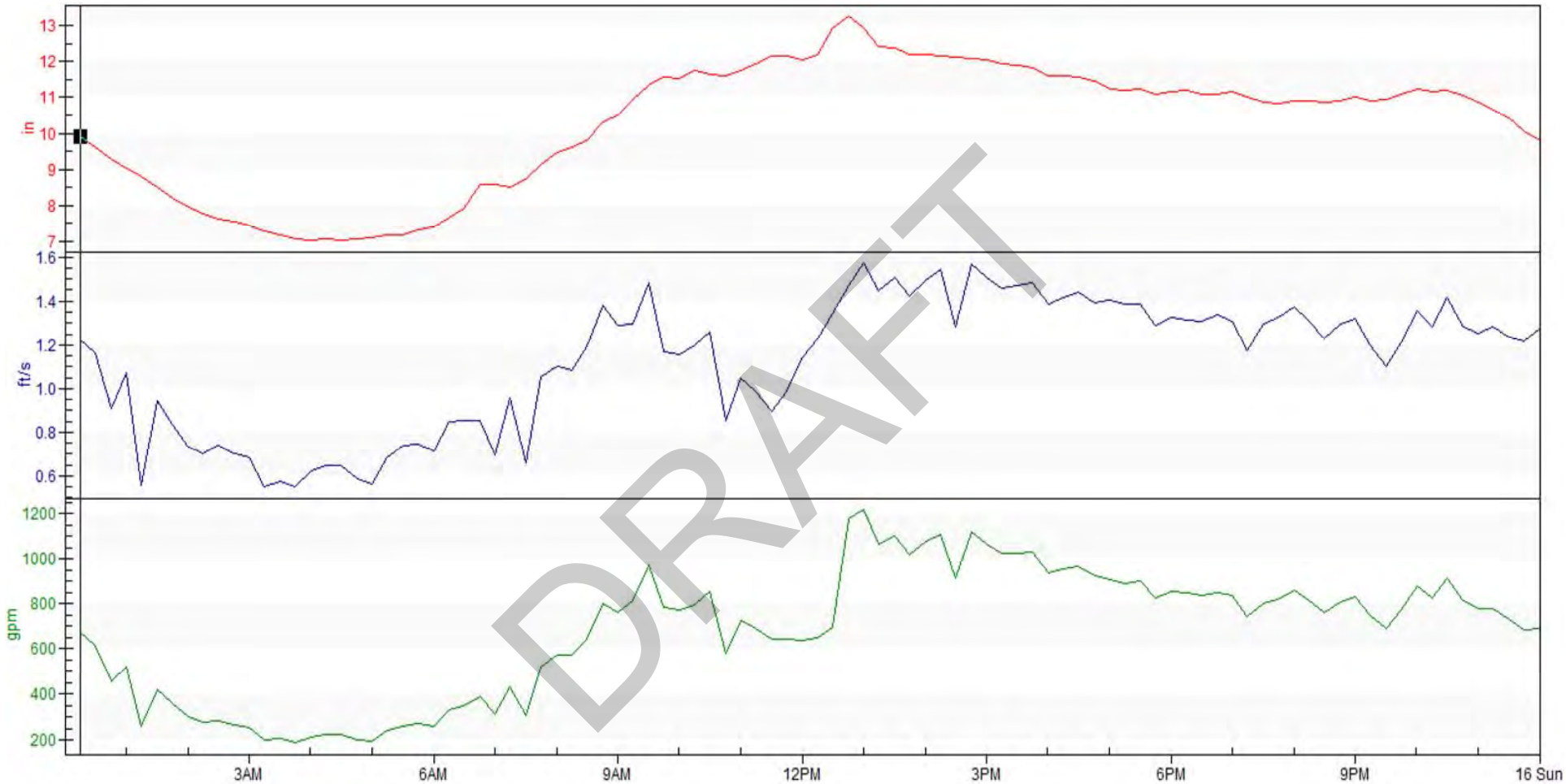
**Friday - P.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.849 | 1.689 | 1298.19 |
| 12:15:00 PM | 12.826 | 1.665 | 1276.64 |
| 12:30:00 PM | 12.619 | 1.555 | 1168.37 |
| 12:45:00 PM | 12.437 | 1.547 | 1141.05 |
| 1:00:00 PM | 11.824 | 1.471 | 1018 |
| 1:15:00 PM | 11.158 | 1.307 | 839.424 |
| 1:30:00 PM | 10.92 | 1.347 | 840.807 |
| 1:45:00 PM | 10.673 | 1.365 | 827.133 |
| 2:00:00 PM | 10.715 | 1.326 | 807.518 |
| 2:15:00 PM | 10.664 | 1.339 | 810.644 |
| 2:30:00 PM | 10.713 | 1.166 | 710.061 |
| 2:45:00 PM | 10.868 | 1.344 | 834.026 |
| 3:00:00 PM | 10.864 | 1.357 | 841.887 |
| 3:15:00 PM | 10.682 | 1.343 | 814.807 |
| 3:30:00 PM | 10.619 | 1.302 | 783.692 |
| 3:45:00 PM | 10.564 | 1.308 | 781.979 |
| 4:00:00 PM | 10.626 | 1.399 | 842.585 |
| 4:15:00 PM | 10.534 | 1.352 | 805.126 |
| 4:30:00 PM | 10.604 | 1.343 | 807.053 |
| 4:45:00 PM | 10.646 | 1.29 | 779.109 |
| 5:00:00 PM | 10.727 | 1.409 | 859.417 |
| 5:15:00 PM | 10.846 | 1.34 | 829.362 |
| 5:30:00 PM | 10.729 | 1.357 | 828.189 |
| 5:45:00 PM | 10.855 | 1.351 | 836.692 |
| 6:00:00 PM | 11.109 | 1.468 | 937.07 |
| 6:15:00 PM | 11.068 | 1.268 | 805.842 |
| 6:30:00 PM | 11.027 | 1.435 | 907.545 |
| 6:45:00 PM | 11.114 | 1.364 | 871.131 |
| 7:00:00 PM | 11.182 | 1.36 | 876.021 |
| 7:15:00 PM | 11.254 | 1.444 | 937.668 |
| 7:30:00 PM | 11.049 | 1.472 | 933.31 |
| 7:45:00 PM | 11.238 | 1.38 | 894.064 |
| 8:00:00 PM | 11.187 | 1.44 | 928.015 |
| 8:15:00 PM | 11.23 | 1.401 | 907.208 |
| 8:30:00 PM | 11.082 | 1.45 | 922.995 |
| 8:45:00 PM | 11.159 | 1.306 | 838.769 |
| 9:00:00 PM | 11.239 | 1.476 | 956.68 |
| 9:15:00 PM | 11.199 | 1.475 | 951.764 |
| 9:30:00 PM | 11.095 | 1.435 | 914.709 |
| 9:45:00 PM | 11.154 | 1.365 | 876.156 |
| 10:00:00 PM | 11.237 | 1.441 | 933.655 |
| 10:15:00 PM | 11.197 | 1.492 | 962.044 |
| 10:30:00 PM | 10.985 | 1.301 | 818.49 |
| 10:45:00 PM | 10.92 | 1.321 | 824.882 |
| 11:00:00 PM | 10.896 | 1.391 | 865.739 |
| 11:15:00 PM | 10.658 | 1.329 | 803.526 |
| 11:30:00 PM | 10.59 | 1.372 | 822.944 |
| 11:45:00 PM | 10.419 | 1.338 | 785.6 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.267 | 1.171 | 705.868 |
| Daily Min: | 7.443 | 0.591 | 220.148 |
| Daily Max: | 13.064 | 1.753 | 1375.59 |
| Peak to Avg: | | | 1.95 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/15/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Saturday - A.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.188 | 1.282 | 730.785 |
| 12:15:00 AM | 9.892 | 1.222 | 669.576 |
| 12:30:00 AM | 9.605 | 1.163 | 612.757 |
| 12:45:00 AM | 9.278 | 0.908 | 457.064 |
| 1:00:00 AM | 9.039 | 1.071 | 520.21 |
| 1:15:00 AM | 8.798 | 0.556 | 260.408 |
| 1:30:00 AM | 8.493 | 0.942 | 420.363 |
| 1:45:00 AM | 8.229 | 0.837 | 357.831 |
| 2:00:00 AM | 7.955 | 0.733 | 299.264 |
| 2:15:00 AM | 7.793 | 0.705 | 279.869 |
| 2:30:00 AM | 7.634 | 0.74 | 285.49 |
| 2:45:00 AM | 7.568 | 0.703 | 268.075 |
| 3:00:00 AM | 7.429 | 0.687 | 255.302 |
| 3:15:00 AM | 7.288 | 0.554 | 200.442 |
| 3:30:00 AM | 7.181 | 0.578 | 204.865 |
| 3:45:00 AM | 7.076 | 0.551 | 191.3 |
| 4:00:00 AM | 7.052 | 0.624 | 215.54 |
| 4:15:00 AM | 7.093 | 0.65 | 226.642 |
| 4:30:00 AM | 7.037 | 0.648 | 223.207 |
| 4:45:00 AM | 7.062 | 0.59 | 204.307 |
| 5:00:00 AM | 7.126 | 0.563 | 197.5 |
| 5:15:00 AM | 7.171 | 0.683 | 241.582 |
| 5:30:00 AM | 7.188 | 0.737 | 261.54 |
| 5:45:00 AM | 7.32 | 0.748 | 272.189 |
| 6:00:00 AM | 7.39 | 0.714 | 263.311 |
| 6:15:00 AM | 7.671 | 0.845 | 328.2 |
| 6:30:00 AM | 7.917 | 0.854 | 346.183 |
| 6:45:00 AM | 8.601 | 0.854 | 388.003 |
| 7:00:00 AM | 8.578 | 0.697 | 315.314 |
| 7:15:00 AM | 8.522 | 0.958 | 429.584 |
| 7:30:00 AM | 8.749 | 0.661 | 307.509 |
| 7:45:00 AM | 9.125 | 1.056 | 519.716 |
| 8:00:00 AM | 9.457 | 1.103 | 569.527 |
| 8:15:00 AM | 9.602 | 1.083 | 570.682 |
| 8:30:00 AM | 9.799 | 1.19 | 644.312 |
| 8:45:00 AM | 10.322 | 1.382 | 801.436 |
| 9:00:00 AM | 10.485 | 1.288 | 762.692 |
| 9:15:00 AM | 10.952 | 1.294 | 810.893 |
| 9:30:00 AM | 11.358 | 1.483 | 974.546 |
| 9:45:00 AM | 11.566 | 1.166 | 783.995 |
| 10:00:00 AM | 11.535 | 1.156 | 774.81 |
| 10:15:00 AM | 11.745 | 1.198 | 793.001 |
| 10:30:00 AM | 11.628 | 1.258 | 852.01 |
| 10:45:00 AM | 11.609 | 0.855 | 577.89 |
| 11:00:00 AM | 11.767 | 1.05 | 722.057 |
| 11:15:00 AM | 11.924 | 0.988 | 690.706 |
| 11:30:00 AM | 12.138 | 0.896 | 641.264 |
| 11:45:00 AM | 12.145 | 0.984 | 641.71 |

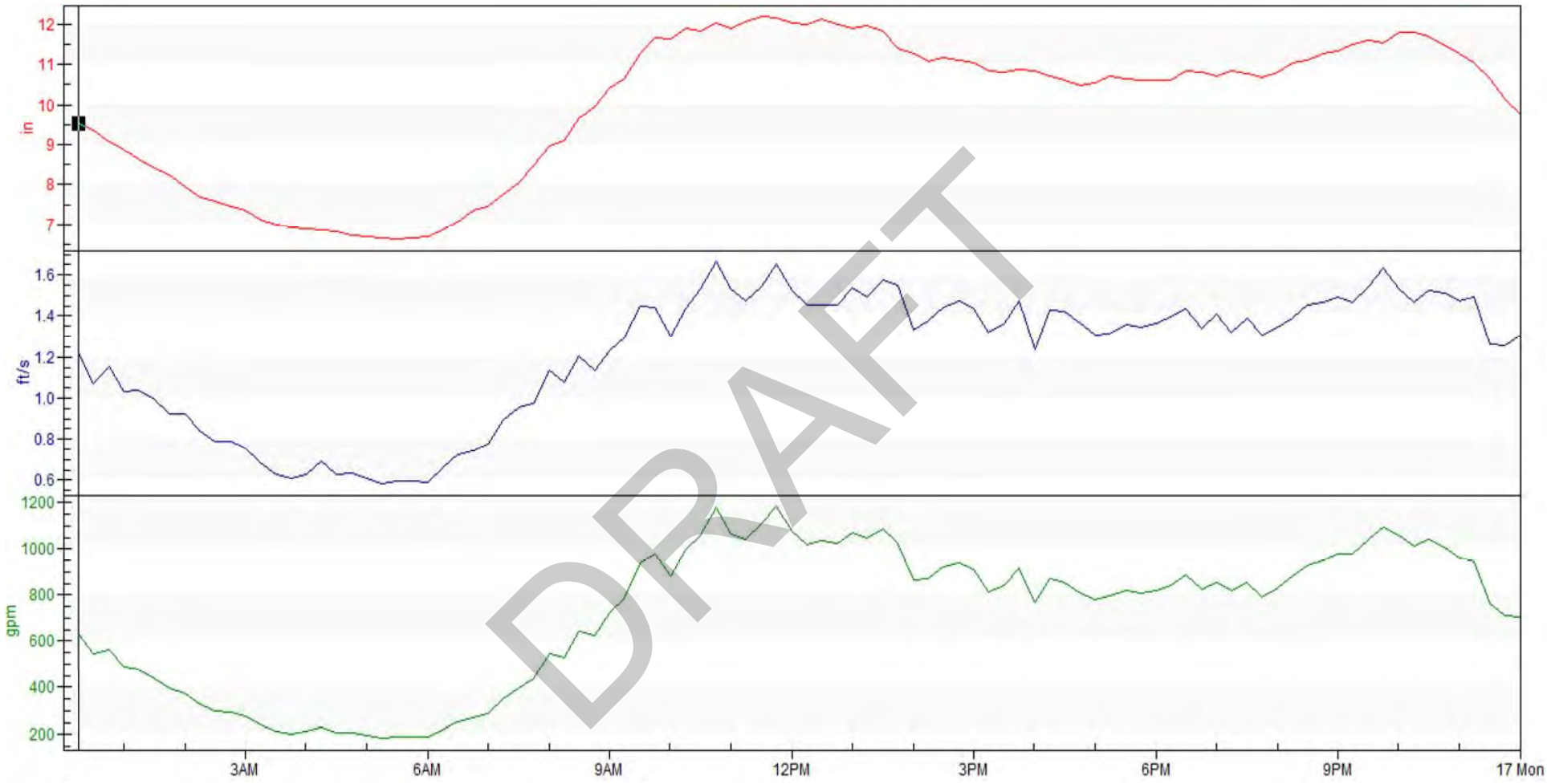
**Saturday - P.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.045 | 1.145 | 635.013 |
| 12:15:00 PM | 12.202 | 1.227 | 645.543 |
| 12:30:00 PM | 12.929 | 1.342 | 694.25 |
| 12:45:00 PM | 13.26 | 1.474 | 1177.58 |
| 1:00:00 PM | 12.915 | 1.574 | 1217.35 |
| 1:15:00 PM | 12.423 | 1.445 | 1064.15 |
| 1:30:00 PM | 12.357 | 1.509 | 1103.85 |
| 1:45:00 PM | 12.191 | 1.42 | 1021.61 |
| 2:00:00 PM | 12.201 | 1.498 | 1078.34 |
| 2:15:00 PM | 12.155 | 1.542 | 1104.72 |
| 2:30:00 PM | 12.124 | 1.282 | 915.492 |
| 2:45:00 PM | 12.091 | 1.57 | 1117.74 |
| 3:00:00 PM | 12.044 | 1.508 | 1068.21 |
| 3:15:00 PM | 11.951 | 1.461 | 1024.8 |
| 3:30:00 PM | 11.88 | 1.469 | 1022.37 |
| 3:45:00 PM | 11.841 | 1.484 | 1028.77 |
| 4:00:00 PM | 11.611 | 1.384 | 935.217 |
| 4:15:00 PM | 11.591 | 1.416 | 954.982 |
| 4:30:00 PM | 11.553 | 1.441 | 968.019 |
| 4:45:00 PM | 11.451 | 1.393 | 924.635 |
| 5:00:00 PM | 11.231 | 1.405 | 909.924 |
| 5:15:00 PM | 11.189 | 1.383 | 891.331 |
| 5:30:00 PM | 11.228 | 1.388 | 898.595 |
| 5:45:00 PM | 11.094 | 1.291 | 822.991 |
| 6:00:00 PM | 11.179 | 1.327 | 854.058 |
| 6:15:00 PM | 11.209 | 1.317 | 850.315 |
| 6:30:00 PM | 11.097 | 1.308 | 834.074 |
| 6:45:00 PM | 11.074 | 1.337 | 849.982 |
| 7:00:00 PM | 11.143 | 1.309 | 839.292 |
| 7:15:00 PM | 11.014 | 1.176 | 742.583 |
| 7:30:00 PM | 10.867 | 1.296 | 803.858 |
| 7:45:00 PM | 10.828 | 1.327 | 819.393 |
| 8:00:00 PM | 10.903 | 1.376 | 857.185 |
| 8:15:00 PM | 10.898 | 1.31 | 815.537 |
| 8:30:00 PM | 10.868 | 1.229 | 762.407 |
| 8:45:00 PM | 10.89 | 1.295 | 805.766 |
| 9:00:00 PM | 11.008 | 1.319 | 832.226 |
| 9:15:00 PM | 10.91 | 1.197 | 746.291 |
| 9:30:00 PM | 10.947 | 1.099 | 688.348 |
| 9:45:00 PM | 11.104 | 1.208 | 770.852 |
| 10:00:00 PM | 11.224 | 1.356 | 877.642 |
| 10:15:00 PM | 11.178 | 1.282 | 825.1 |
| 10:30:00 PM | 11.183 | 1.415 | 911.202 |
| 10:45:00 PM | 11.051 | 1.285 | 814.675 |
| 11:00:00 PM | 10.873 | 1.253 | 777.897 |
| 11:15:00 PM | 10.658 | 1.282 | 775.442 |
| 11:30:00 PM | 10.435 | 1.237 | 727.885 |
| 11:45:00 PM | 10.072 | 1.218 | 683.857 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.264 | 1.126 | 675.011 |
| Daily Min: | 7.037 | 0.551 | 191.3 |
| Daily Max: | 13.26 | 1.574 | 1217.35 |
| Peak to Avg: | | | 1.80 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/16/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Sunday - A.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.81 | 1.276 | 691.965 |
| 12:15:00 AM | 9.515 | 1.217 | 633.262 |
| 12:30:00 AM | 9.363 | 1.07 | 544.875 |
| 12:45:00 AM | 9.07 | 1.156 | 563.942 |
| 1:00:00 AM | 8.862 | 1.03 | 487 |
| 1:15:00 AM | 8.634 | 1.039 | 474.455 |
| 1:30:00 AM | 8.424 | 0.994 | 438.731 |
| 1:45:00 AM | 8.229 | 0.922 | 394.253 |
| 2:00:00 AM | 7.964 | 0.921 | 376.634 |
| 2:15:00 AM | 7.701 | 0.842 | 328.923 |
| 2:30:00 AM | 7.576 | 0.789 | 301.25 |
| 2:45:00 AM | 7.463 | 0.79 | 295.325 |
| 3:00:00 AM | 7.359 | 0.757 | 277.625 |
| 3:15:00 AM | 7.126 | 0.687 | 240.841 |
| 3:30:00 AM | 6.997 | 0.626 | 214.11 |
| 3:45:00 AM | 6.922 | 0.61 | 205.374 |
| 4:00:00 AM | 6.901 | 0.63 | 211.406 |
| 4:15:00 AM | 6.849 | 0.691 | 229.383 |
| 4:30:00 AM | 6.818 | 0.629 | 207.535 |
| 4:45:00 AM | 6.734 | 0.637 | 206.42 |
| 5:00:00 AM | 6.709 | 0.61 | 196.573 |
| 5:15:00 AM | 6.676 | 0.584 | 186.873 |
| 5:30:00 AM | 6.633 | 0.595 | 188.976 |
| 5:45:00 AM | 6.67 | 0.6 | 191.782 |
| 6:00:00 AM | 6.714 | 0.591 | 190.608 |
| 6:15:00 AM | 6.861 | 0.66 | 219.683 |
| 6:30:00 AM | 7.071 | 0.727 | 252.144 |
| 6:45:00 AM | 7.348 | 0.744 | 272.144 |
| 7:00:00 AM | 7.47 | 0.777 | 290.805 |
| 7:15:00 AM | 7.739 | 0.892 | 350.454 |
| 7:30:00 AM | 8.042 | 0.956 | 396.271 |
| 7:45:00 AM | 8.485 | 0.977 | 435.573 |
| 8:00:00 AM | 8.973 | 1.136 | 546.545 |
| 8:15:00 AM | 9.113 | 1.077 | 529.101 |
| 8:30:00 AM | 9.654 | 1.207 | 640.408 |
| 8:45:00 AM | 9.962 | 1.132 | 626.209 |
| 9:00:00 AM | 10.424 | 1.23 | 722.475 |
| 9:15:00 AM | 10.652 | 1.294 | 782.042 |
| 9:30:00 AM | 11.268 | 1.448 | 941.771 |
| 9:45:00 AM | 11.672 | 1.441 | 980.554 |
| 10:00:00 AM | 11.627 | 1.299 | 879.749 |
| 10:15:00 AM | 11.884 | 1.433 | 997.991 |
| 10:30:00 AM | 11.82 | 1.531 | 1058.55 |
| 10:45:00 AM | 12.022 | 1.665 | 1176.75 |
| 11:00:00 AM | 11.893 | 1.531 | 1067.23 |
| 11:15:00 AM | 12.04 | 1.474 | 1043.51 |
| 11:30:00 AM | 12.187 | 1.544 | 1110.31 |
| 11:45:00 AM | 12.16 | 1.65 | 1183.12 |

**Sunday - P.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.008 | 1.523 | 1074.47 |
| 12:15:00 PM | 11.974 | 1.451 | 1020.29 |
| 12:30:00 PM | 12.104 | 1.451 | 1034.12 |
| 12:45:00 PM | 11.99 | 1.454 | 1023.71 |
| 1:00:00 PM | 11.887 | 1.54 | 1072.75 |
| 1:15:00 PM | 11.963 | 1.493 | 1048.35 |
| 1:30:00 PM | 11.813 | 1.577 | 1090.01 |
| 1:45:00 PM | 11.388 | 1.551 | 1022.35 |
| 2:00:00 PM | 11.253 | 1.331 | 863.758 |
| 2:15:00 PM | 11.07 | 1.374 | 873.175 |
| 2:30:00 PM | 11.154 | 1.438 | 923.174 |
| 2:45:00 PM | 11.098 | 1.474 | 939.749 |
| 3:00:00 PM | 11.05 | 1.433 | 908.601 |
| 3:15:00 PM | 10.835 | 1.319 | 815.096 |
| 3:30:00 PM | 10.805 | 1.363 | 839.17 |
| 3:45:00 PM | 10.862 | 1.475 | 914.533 |
| 4:00:00 PM | 10.833 | 1.239 | 765.348 |
| 4:15:00 PM | 10.723 | 1.429 | 871.442 |
| 4:30:00 PM | 10.596 | 1.42 | 852.042 |
| 4:45:00 PM | 10.479 | 1.366 | 807.736 |
| 5:00:00 PM | 10.53 | 1.308 | 778.74 |
| 5:15:00 PM | 10.714 | 1.311 | 798.491 |
| 5:30:00 PM | 10.649 | 1.36 | 821.377 |
| 5:45:00 PM | 10.6 | 1.346 | 808.064 |
| 6:00:00 PM | 10.61 | 1.365 | 820.686 |
| 6:15:00 PM | 10.614 | 1.399 | 841.504 |
| 6:30:00 PM | 10.841 | 1.433 | 886.282 |
| 6:45:00 PM | 10.817 | 1.339 | 826.008 |
| 7:00:00 PM | 10.7 | 1.406 | 855.022 |
| 7:15:00 PM | 10.845 | 1.321 | 817.283 |
| 7:30:00 PM | 10.768 | 1.389 | 851.708 |
| 7:45:00 PM | 10.685 | 1.304 | 791.287 |
| 8:00:00 PM | 10.814 | 1.347 | 830.575 |
| 8:15:00 PM | 11.046 | 1.387 | 879.167 |
| 8:30:00 PM | 11.089 | 1.454 | 926.159 |
| 8:45:00 PM | 11.25 | 1.468 | 952.857 |
| 9:00:00 PM | 11.336 | 1.491 | 976.998 |
| 9:15:00 PM | 11.48 | 1.469 | 978.173 |
| 9:30:00 PM | 11.586 | 1.544 | 1040.69 |
| 9:45:00 PM | 11.541 | 1.631 | 1093.99 |
| 10:00:00 PM | 11.804 | 1.531 | 1057.21 |
| 10:15:00 PM | 11.805 | 1.466 | 1012.25 |
| 10:30:00 PM | 11.685 | 1.527 | 1040.69 |
| 10:45:00 PM | 11.47 | 1.513 | 1006.87 |
| 11:00:00 PM | 11.27 | 1.475 | 959.474 |
| 11:15:00 PM | 11.052 | 1.491 | 945.817 |
| 11:30:00 PM | 10.637 | 1.261 | 760.639 |
| 11:45:00 PM | 10.148 | 1.254 | 710.845 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.964 | 1.212 | 714.929 |
| Daily Min: | 6.633 | 0.584 | 186.873 |
| Daily Max: | 12.187 | 1.665 | 1183.12 |
| Peak to Avg: | | | 1.65 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/17/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Monday - A.M. 7/17/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 9.771 | 1.308 | 705.196 |
| 12:15:00 AM | 9.452 | 1.231 | 635.24 |
| 12:30:00 AM | 9.1 | 1.255 | 615.211 |
| 12:45:00 AM | 8.763 | 1.146 | 533.939 |
| 1:00:00 AM | 8.485 | 1.005 | 448.205 |
| 1:15:00 AM | 8.185 | 0.872 | 370.232 |
| 1:30:00 AM | 7.849 | 0.828 | 332.022 |
| 1:45:00 AM | 7.654 | 0.804 | 311.181 |
| 2:00:00 AM | 7.411 | 0.728 | 269.439 |
| 2:15:00 AM | 7.268 | 0.738 | 265.822 |
| 2:30:00 AM | 7.186 | 0.754 | 267.496 |
| 2:45:00 AM | 7.109 | 0.637 | 222.554 |
| 3:00:00 AM | 6.952 | 0.663 | 224.51 |
| 3:15:00 AM | 6.867 | 0.665 | 221.508 |
| 3:30:00 AM | 6.774 | 0.59 | 192.874 |
| 3:45:00 AM | 6.819 | 0.61 | 201.16 |
| 4:00:00 AM | 6.863 | 0.544 | 181.182 |
| 4:15:00 AM | 6.796 | 0.642 | 210.752 |
| 4:30:00 AM | 6.75 | 0.645 | 209.737 |
| 4:45:00 AM | 6.763 | 0.635 | 207.075 |
| 5:00:00 AM | 6.943 | 0.668 | 225.778 |
| 5:15:00 AM | 7.053 | 0.686 | 237.071 |
| 5:30:00 AM | 7.18 | 0.682 | 241.826 |
| 5:45:00 AM | 7.407 | 0.731 | 270.309 |
| 6:00:00 AM | 7.623 | 0.843 | 324.486 |
| 6:15:00 AM | 7.956 | 0.846 | 345.437 |
| 6:30:00 AM | 8.599 | 1.086 | 492.968 |
| 6:45:00 AM | 8.695 | 0.957 | 441.147 |
| 7:00:00 AM | 8.863 | 1.003 | 474.487 |
| 7:15:00 AM | 9.281 | 1.061 | 534.09 |
| 7:30:00 AM | 9.513 | 1.177 | 612.489 |
| 7:45:00 AM | 9.709 | 1.097 | 586.739 |
| 8:00:00 AM | 9.951 | 1.263 | 697.799 |
| 8:15:00 AM | 10.078 | 1.344 | 755.241 |
| 8:30:00 AM | 11.244 | 1.442 | 935.265 |
| 8:45:00 AM | 12.389 | 1.497 | 1098.9 |
| 9:00:00 AM | 12.645 | 1.613 | 1215.03 |
| 9:15:00 AM | 12.557 | 1.548 | 1156.03 |
| 9:30:00 AM | 12.597 | 1.535 | 1151.03 |
| 9:45:00 AM | 12.491 | 1.589 | 1178.71 |
| 10:00:00 AM | 12.305 | 1.599 | 1163.97 |
| 10:15:00 AM | 11.818 | 1.535 | 1061.39 |
| 10:30:00 AM | 11.309 | 1.433 | 936.502 |
| 10:45:00 AM | 11.215 | 1.356 | 876.246 |
| 11:00:00 AM | 11.081 | 1.403 | 892.879 |
| 11:15:00 AM | 10.925 | 1.385 | 865.378 |
| 11:30:00 AM | 10.726 | 1.445 | 881.459 |
| 11:45:00 AM | 10.777 | 1.366 | 837.986 |

**Monday - P.M. 7/17/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.006 | 1.44 | 908.036 |
| 12:15:00 PM | 10.976 | 1.456 | 915.291 |
| 12:30:00 PM | 10.968 | 1.431 | 898.637 |
| 12:45:00 PM | 11.036 | 1.352 | 855.874 |
| 1:00:00 PM | 11.04 | 1.414 | 895.615 |
| 1:15:00 PM | 10.893 | 1.44 | 896.463 |
| 1:30:00 PM | 10.881 | 1.4 | 895.101 |
| 1:45:00 PM | 10.756 | 1.397 | 855.138 |
| 2:00:00 PM | 10.829 | 1.384 | 854.542 |
| 2:15:00 PM | 10.749 | 1.389 | 849.642 |
| 2:30:00 PM | 10.717 | 1.429 | 870.34 |
| 2:45:00 PM | 10.617 | 1.344 | 808.721 |
| 3:00:00 PM | 10.817 | 1.484 | 915.391 |
| 3:15:00 PM | 10.92 | 1.476 | 921.319 |
| 3:30:00 PM | 10.835 | 1.411 | 871.685 |
| 3:45:00 PM | 10.634 | 1.27 | 765.925 |
| 4:00:00 PM | 10.658 | 1.375 | 831.92 |
| 4:15:00 PM | 10.734 | 1.394 | 851.254 |
| 4:30:00 PM | 10.733 | 1.294 | 789.608 |
| 4:45:00 PM | 10.7 | 1.377 | 837.047 |
| 5:00:00 PM | 10.69 | 1.396 | 847.68 |
| 5:15:00 PM | 10.886 | 1.334 | 829.641 |
| 5:30:00 PM | 11.034 | 1.313 | 830.859 |
| 5:45:00 PM | 11.143 | 1.32 | 845.926 |
| 6:00:00 PM | 11.168 | 1.395 | 896.626 |
| 6:15:00 PM | 11.248 | 1.546 | 1002.92 |
| 6:30:00 PM | 11.422 | 1.461 | 966.545 |
| 6:45:00 PM | 11.532 | 1.456 | 975.425 |
| 7:00:00 PM | 11.639 | 1.517 | 1028.27 |
| 7:15:00 PM | 11.765 | 1.556 | 1069.52 |
| 7:30:00 PM | 11.848 | 1.604 | 1112.88 |
| 7:45:00 PM | 12.026 | 1.524 | 1077.56 |
| 8:00:00 PM | 12.007 | 1.522 | 1074.02 |
| 8:15:00 PM | 12.045 | 1.517 | 1074.93 |
| 8:30:00 PM | 11.959 | 1.483 | 1041.17 |
| 8:45:00 PM | 11.851 | 1.474 | 1023.09 |
| 9:00:00 PM | 11.936 | 1.49 | 1043.1 |
| 9:15:00 PM | 11.947 | 1.634 | 1145.44 |
| 9:30:00 PM | 12.189 | 1.605 | 1154.36 |
| 9:45:00 PM | 12.198 | 1.548 | 1114.48 |
| 10:00:00 PM | 12.143 | 1.454 | 1041 |
| 10:15:00 PM | 12.221 | 1.557 | 1123.67 |
| 10:30:00 PM | 12.147 | 1.564 | 1119.54 |
| 10:45:00 PM | 12.043 | 1.584 | 1121.99 |
| 11:00:00 PM | 11.774 | 1.598 | 1099.71 |
| 11:15:00 PM | 11.391 | 1.498 | 987.839 |
| 11:30:00 PM | 10.814 | 1.368 | 843.039 |
| 11:45:00 PM | 10.419 | 1.301 | 763.901 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.189 | 1.250 | 757.405 |
| Daily Min: | 6.75 | 0.544 | 181.182 |
| Daily Max: | 12.645 | 1.634 | 1215.03 |
| Peak to Avg: | | | 1.60 |

DRAFT

# MAXIMUM DAILY FLOW DATA

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/18/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Tuesday- A.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.037 | 1.273 | 711.46 |
| 12:15:00 AM | 9.495 | 1.25 | 648.805 |
| 12:30:00 AM | 9.077 | 1.136 | 555.196 |
| 12:45:00 AM | 8.838 | 1.204 | 567.463 |
| 1:00:00 AM | 8.63 | 1.079 | 492.161 |
| 1:15:00 AM | 8.313 | 0.985 | 427.098 |
| 1:30:00 AM | 7.976 | 0.884 | 362.257 |
| 1:45:00 AM | 7.736 | 0.883 | 346.817 |
| 2:00:00 AM | 7.635 | 0.856 | 330.101 |
| 2:15:00 AM | 7.529 | 0.793 | 300.091 |
| 2:30:00 AM | 7.944 | 0.847 | 345.111 |
| 2:45:00 AM | 7.746 | 0.836 | 329.231 |
| 3:00:00 AM | 7.43 | 0.753 | 279.898 |
| 3:15:00 AM | 7.201 | 0.752 | 267.566 |
| 3:30:00 AM | 6.97 | 0.694 | 235.977 |
| 3:45:00 AM | 6.869 | 0.665 | 221.453 |
| 4:00:00 AM | 6.846 | 0.635 | 210.646 |
| 4:15:00 AM | 6.827 | 0.622 | 205.615 |
| 4:30:00 AM | 6.879 | 0.69 | 230.277 |
| 4:45:00 AM | 6.826 | 0.669 | 221.084 |
| 5:00:00 AM | 6.905 | 0.688 | 231.042 |
| 5:15:00 AM | 7.146 | 0.732 | 257.857 |
| 5:30:00 AM | 7.352 | 0.793 | 290.353 |
| 5:45:00 AM | 7.532 | 0.871 | 329.851 |
| 6:00:00 AM | 7.984 | 0.873 | 358.141 |
| 6:15:00 AM | 8.165 | 0.917 | 387.857 |
| 6:30:00 AM | 8.528 | 1.017 | 456.743 |
| 6:45:00 AM | 8.97 | 1.167 | 561.12 |
| 7:00:00 AM | 9.124 | 1.276 | 627.523 |
| 7:15:00 AM | 9.366 | 1.134 | 577.919 |
| 7:30:00 AM | 9.811 | 1.181 | 640.057 |
| 7:45:00 AM | 10.303 | 1.302 | 753.259 |
| 8:00:00 AM | 10.531 | 1.407 | 837.827 |
| 8:15:00 AM | 10.789 | 1.374 | 844.462 |
| 8:30:00 AM | 10.563 | 1.368 | 818.008 |
| 8:45:00 AM | 10.663 | 1.358 | 822.022 |
| 9:00:00 AM | 10.792 | 1.357 | 834.17 |
| 9:15:00 AM | 10.8 | 1.456 | 896.2 |
| 9:30:00 AM | 10.679 | 1.409 | 854.685 |
| 9:45:00 AM | 10.732 | 1.303 | 795.104 |
| 10:00:00 AM | 10.673 | 1.417 | 858.357 |
| 10:15:00 AM | 10.714 | 1.35 | 822.203 |
| 10:30:00 AM | 10.561 | 1.331 | 795.27 |
| 10:45:00 AM | 10.356 | 1.263 | 735.384 |
| 11:00:00 AM | 10.518 | 1.349 | 801.797 |
| 11:15:00 AM | 10.677 | 1.314 | 796.336 |
| 11:30:00 AM | 10.767 | 1.386 | 849.816 |
| 11:45:00 AM | 10.71 | 1.367 | 831.931 |

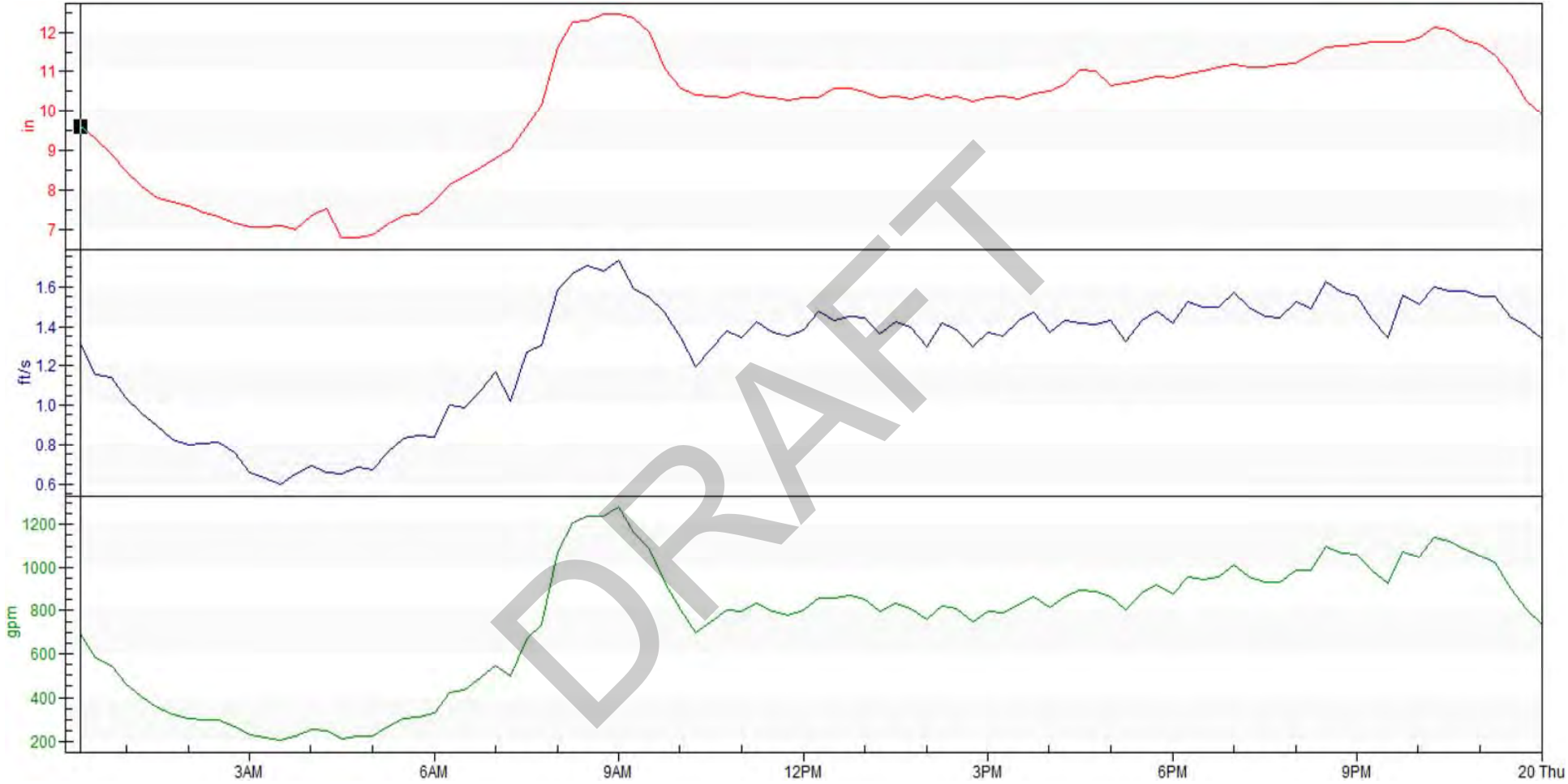
**Tuesday- P.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.741 | 1.32 | 806.237 |
| 12:15:00 PM | 10.812 | 1.377 | 848.811 |
| 12:30:00 PM | 10.792 | 1.388 | 853.498 |
| 12:45:00 PM | 10.687 | 1.274 | 773.569 |
| 1:00:00 PM | 10.674 | 1.335 | 808.747 |
| 1:15:00 PM | 10.615 | 1.221 | 734.753 |
| 1:30:00 PM | 10.517 | 1.28 | 760.523 |
| 1:45:00 PM | 10.555 | 1.255 | 749.558 |
| 2:00:00 PM | 10.464 | 1.378 | 813.555 |
| 2:15:00 PM | 10.272 | 1.335 | 769.268 |
| 2:30:00 PM | 10.301 | 1.309 | 756.996 |
| 2:45:00 PM | 10.185 | 1.319 | 751.376 |
| 3:00:00 PM | 10.115 | 1.282 | 724.001 |
| 3:15:00 PM | 10.045 | 1.285 | 718.67 |
| 3:30:00 PM | 10.143 | 1.291 | 731.394 |
| 3:45:00 PM | 10.397 | 1.35 | 790.23 |
| 4:00:00 PM | 10.513 | 1.358 | 806.605 |
| 4:15:00 PM | 10.957 | 1.409 | 883.513 |
| 4:30:00 PM | 11.027 | 1.309 | 827.461 |
| 4:45:00 PM | 10.88 | 1.358 | 843.678 |
| 5:00:00 PM | 10.959 | 1.264 | 792.541 |
| 5:15:00 PM | 10.724 | 1.39 | 847.52 |
| 5:30:00 PM | 10.836 | 1.318 | 814.844 |
| 5:45:00 PM | 11.071 | 1.423 | 904.539 |
| 6:00:00 PM | 11.153 | 1.337 | 858.115 |
| 6:15:00 PM | 11.182 | 1.365 | 879.131 |
| 6:30:00 PM | 11.074 | 1.437 | 913.819 |
| 6:45:00 PM | 11.229 | 1.546 | 1001.1 |
| 7:00:00 PM | 11.311 | 1.402 | 916.463 |
| 7:15:00 PM | 11.29 | 1.43 | 932.471 |
| 7:30:00 PM | 11.507 | 1.428 | 953.963 |
| 7:45:00 PM | 11.586 | 1.545 | 1041.17 |
| 8:00:00 PM | 11.547 | 1.385 | 929.471 |
| 8:15:00 PM | 11.532 | 1.377 | 922.243 |
| 8:30:00 PM | 11.594 | 1.471 | 992.177 |
| 8:45:00 PM | 11.499 | 1.5 | 1001.37 |
| 9:00:00 PM | 11.541 | 1.522 | 1020.75 |
| 9:15:00 PM | 11.685 | 1.517 | 1033.55 |
| 9:30:00 PM | 11.83 | 1.499 | 1037.6 |
| 9:45:00 PM | 12.117 | 1.539 | 1098.19 |
| 10:00:00 PM | 12.083 | 1.598 | 1136.41 |
| 10:15:00 PM | 12.09 | 1.55 | 1103.22 |
| 10:30:00 PM | 12.03 | 1.51 | 1067.98 |
| 10:45:00 PM | 11.713 | 1.546 | 1056.88 |
| 11:00:00 PM | 11.493 | 1.532 | 1022.35 |
| 11:15:00 PM | 11.062 | 1.418 | 900.547 |
| 11:30:00 PM | 10.708 | 1.395 | 848.687 |
| 11:45:00 PM | 10.178 | 1.306 | 743.522 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.977 | 1.231 | 713.318 |
| Daily Min: | 6.826 | 0.622 | 205.615 |
| Daily Max: | 12.117 | 1.598 | 1136.41 |
| Peak to Avg: | | | 1.59 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/19/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Wednesday - A.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.944 | 1.322 | 729.971 |
| 12:15:00 AM | 9.614 | 1.31 | 691.362 |
| 12:30:00 AM | 9.313 | 1.155 | 584.016 |
| 12:45:00 AM | 8.897 | 1.141 | 542.538 |
| 1:00:00 AM | 8.465 | 1.035 | 460.082 |
| 1:15:00 AM | 8.088 | 0.959 | 400.412 |
| 1:30:00 AM | 7.813 | 0.894 | 356.295 |
| 1:45:00 AM | 7.692 | 0.828 | 322.7 |
| 2:00:00 AM | 7.594 | 0.796 | 305.069 |
| 2:15:00 AM | 7.435 | 0.807 | 300 |
| 2:30:00 AM | 7.326 | 0.815 | 297.072 |
| 2:45:00 AM | 7.164 | 0.756 | 267.184 |
| 3:00:00 AM | 7.079 | 0.661 | 229.584 |
| 3:15:00 AM | 7.053 | 0.632 | 218.567 |
| 3:30:00 AM | 7.093 | 0.597 | 207.994 |
| 3:45:00 AM | 7.014 | 0.65 | 223.136 |
| 4:00:00 AM | 7.382 | 0.691 | 254.432 |
| 4:15:00 AM | 7.525 | 0.66 | 249.517 |
| 4:30:00 AM | 6.806 | 0.649 | 213.508 |
| 4:45:00 AM | 6.797 | 0.685 | 224.995 |
| 5:00:00 AM | 6.869 | 0.674 | 224.708 |
| 5:15:00 AM | 7.12 | 0.76 | 266.213 |
| 5:30:00 AM | 7.364 | 0.829 | 304.462 |
| 5:45:00 AM | 7.412 | 0.845 | 313.137 |
| 6:00:00 AM | 7.738 | 0.837 | 329.117 |
| 6:15:00 AM | 8.126 | 0.998 | 419.711 |
| 6:30:00 AM | 8.343 | 0.99 | 431.436 |
| 6:45:00 AM | 8.582 | 1.077 | 487.643 |
| 7:00:00 AM | 8.812 | 1.165 | 546.99 |
| 7:15:00 AM | 9.054 | 1.021 | 496.862 |
| 7:30:00 AM | 9.594 | 1.269 | 667.707 |
| 7:45:00 AM | 10.149 | 1.3 | 737.075 |
| 8:00:00 AM | 11.615 | 1.586 | 1072.86 |
| 8:15:00 AM | 12.241 | 1.667 | 1205.52 |
| 8:30:00 AM | 12.294 | 1.706 | 1239.99 |
| 8:45:00 AM | 12.455 | 1.68 | 1241.96 |
| 9:00:00 AM | 12.453 | 1.733 | 1280.62 |
| 9:15:00 AM | 12.364 | 1.593 | 1166.37 |
| 9:30:00 AM | 11.985 | 1.545 | 1087.8 |
| 9:45:00 AM | 11.067 | 1.471 | 934.395 |
| 10:00:00 AM | 10.567 | 1.346 | 805.178 |
| 10:15:00 AM | 10.421 | 1.193 | 700.725 |
| 10:30:00 AM | 10.367 | 1.282 | 747.757 |
| 10:45:00 AM | 10.358 | 1.374 | 800.559 |
| 11:00:00 AM | 10.487 | 1.343 | 795.161 |
| 11:15:00 AM | 10.39 | 1.426 | 834.036 |
| 11:30:00 AM | 10.353 | 1.369 | 797.143 |
| 11:45:00 AM | 10.289 | 1.348 | 778.242 |

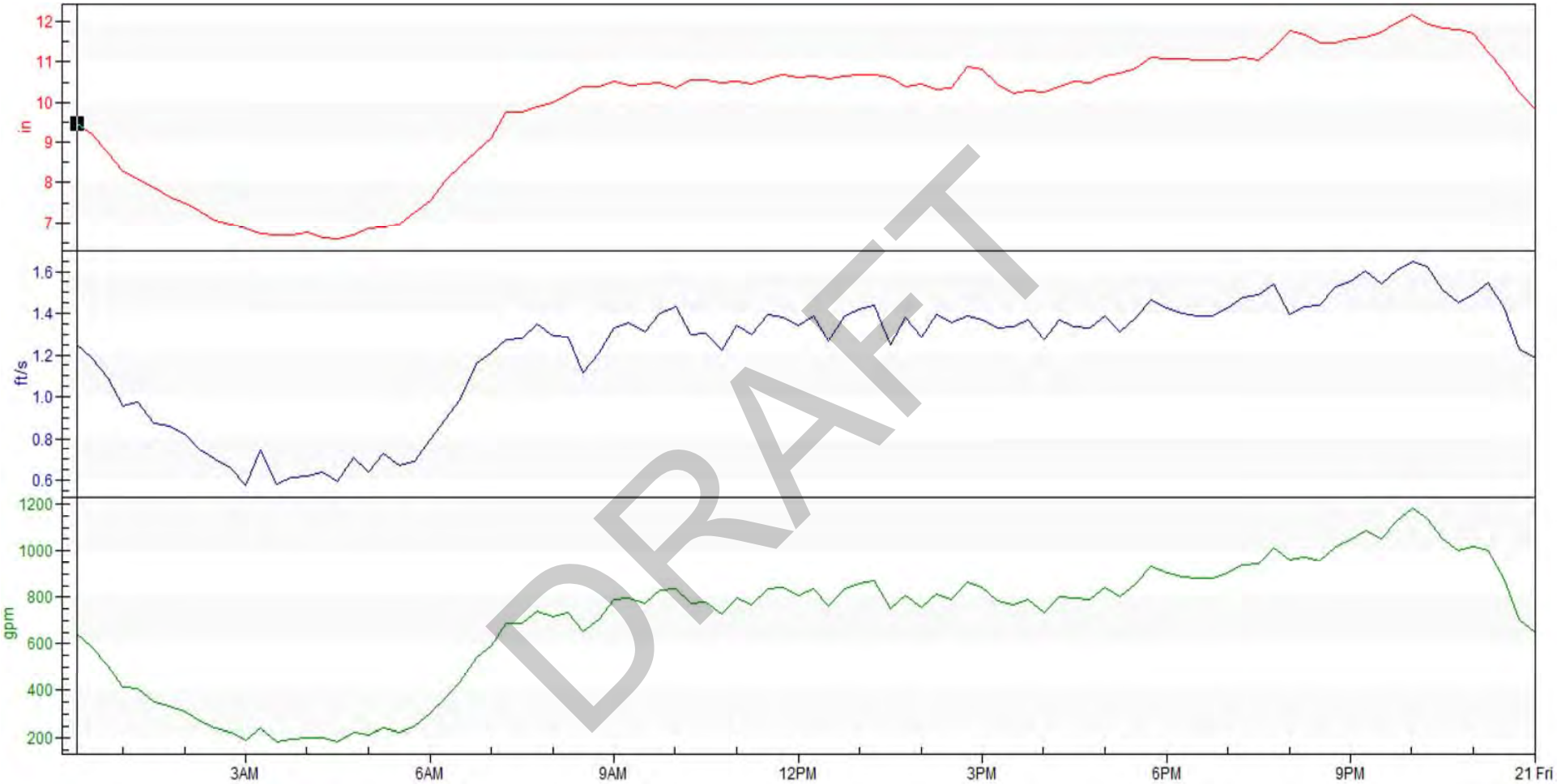
**Wednesday - P.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.346 | 1.381 | 803.319 |
| 12:15:00 PM | 10.349 | 1.477 | 859.462 |
| 12:30:00 PM | 10.579 | 1.433 | 858.273 |
| 12:45:00 PM | 10.569 | 1.452 | 868.304 |
| 1:00:00 PM | 10.488 | 1.441 | 853.609 |
| 1:15:00 PM | 10.355 | 1.364 | 794.528 |
| 1:30:00 PM | 10.37 | 1.424 | 831.041 |
| 1:45:00 PM | 10.321 | 1.394 | 808.086 |
| 2:00:00 PM | 10.423 | 1.297 | 761.861 |
| 2:15:00 PM | 10.323 | 1.416 | 821.307 |
| 2:30:00 PM | 10.371 | 1.383 | 806.834 |
| 2:45:00 PM | 10.245 | 1.297 | 745.015 |
| 3:00:00 PM | 10.355 | 1.367 | 796.271 |
| 3:15:00 PM | 10.374 | 1.353 | 789.586 |
| 3:30:00 PM | 10.327 | 1.428 | 828.535 |
| 3:45:00 PM | 10.449 | 1.471 | 867.165 |
| 4:00:00 PM | 10.506 | 1.372 | 814.146 |
| 4:15:00 PM | 10.668 | 1.43 | 866.015 |
| 4:30:00 PM | 11.044 | 1.416 | 896.941 |
| 4:45:00 PM | 11.025 | 1.408 | 889.796 |
| 5:00:00 PM | 10.642 | 1.433 | 865.266 |
| 5:15:00 PM | 10.709 | 1.324 | 805.726 |
| 5:30:00 PM | 10.794 | 1.433 | 881.053 |
| 5:45:00 PM | 10.895 | 1.48 | 921.34 |
| 6:00:00 PM | 10.848 | 1.419 | 878.622 |
| 6:15:00 PM | 10.961 | 1.527 | 958.169 |
| 6:30:00 PM | 11.015 | 1.499 | 946.294 |
| 6:45:00 PM | 11.103 | 1.495 | 953.694 |
| 7:00:00 PM | 11.19 | 1.573 | 1014.12 |
| 7:15:00 PM | 11.125 | 1.498 | 958.122 |
| 7:30:00 PM | 11.13 | 1.452 | 928.931 |
| 7:45:00 PM | 11.194 | 1.444 | 930.903 |
| 8:00:00 PM | 11.231 | 1.522 | 985.587 |
| 8:15:00 PM | 11.406 | 1.494 | 986.764 |
| 8:30:00 PM | 11.622 | 1.624 | 1098.97 |
| 8:45:00 PM | 11.666 | 1.57 | 1067.49 |
| 9:00:00 PM | 11.692 | 1.552 | 1058.17 |
| 9:15:00 PM | 11.765 | 1.434 | 986.048 |
| 9:30:00 PM | 11.761 | 1.345 | 924.296 |
| 9:45:00 PM | 11.745 | 1.561 | 1070.47 |
| 10:00:00 PM | 11.855 | 1.513 | 1050.62 |
| 10:15:00 PM | 12.12 | 1.597 | 1140.02 |
| 10:30:00 PM | 12.056 | 1.578 | 1119.2 |
| 10:45:00 PM | 11.783 | 1.579 | 1087.85 |
| 11:00:00 PM | 11.697 | 1.548 | 1056.44 |
| 11:15:00 PM | 11.423 | 1.55 | 1026.15 |
| 11:30:00 PM | 10.907 | 1.447 | 901.772 |
| 11:45:00 PM | 10.293 | 1.404 | 811.044 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.012 | 1.274 | 747.738 |
| Daily Min: | 6.797 | 0.597 | 207.994 |
| Daily Max: | 12.455 | 1.733 | 1280.62 |
| Peak to Avg: | | | 1.71 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/20/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Thursday - A.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.919 | 1.337 | 735.392 |
| 12:15:00 AM | 9.475 | 1.245 | 644.558 |
| 12:30:00 AM | 9.196 | 1.181 | 587.263 |
| 12:45:00 AM | 8.753 | 1.086 | 505.275 |
| 1:00:00 AM | 8.276 | 0.956 | 412.061 |
| 1:15:00 AM | 8.067 | 0.976 | 406.289 |
| 1:30:00 AM | 7.889 | 0.875 | 353.279 |
| 1:45:00 AM | 7.642 | 0.858 | 331.628 |
| 2:00:00 AM | 7.485 | 0.825 | 309.719 |
| 2:15:00 AM | 7.28 | 0.748 | 270.304 |
| 2:30:00 AM | 7.071 | 0.704 | 244.115 |
| 2:45:00 AM | 6.952 | 0.658 | 223.069 |
| 3:00:00 AM | 6.869 | 0.574 | 191.425 |
| 3:15:00 AM | 6.725 | 0.748 | 241.846 |
| 3:30:00 AM | 6.688 | 0.581 | 186.522 |
| 3:45:00 AM | 6.701 | 0.61 | 196.363 |
| 4:00:00 AM | 6.755 | 0.616 | 200.594 |
| 4:15:00 AM | 6.631 | 0.636 | 201.742 |
| 4:30:00 AM | 6.595 | 0.596 | 187.633 |
| 4:45:00 AM | 6.707 | 0.705 | 227.39 |
| 5:00:00 AM | 6.845 | 0.638 | 211.604 |
| 5:15:00 AM | 6.909 | 0.728 | 244.727 |
| 5:30:00 AM | 6.975 | 0.67 | 227.912 |
| 5:45:00 AM | 7.265 | 0.691 | 248.891 |
| 6:00:00 AM | 7.548 | 0.798 | 302.989 |
| 6:15:00 AM | 8.05 | 0.89 | 369.47 |
| 6:30:00 AM | 8.408 | 0.986 | 434.151 |
| 6:45:00 AM | 8.757 | 1.159 | 539.248 |
| 7:00:00 AM | 9.098 | 1.207 | 591.362 |
| 7:15:00 AM | 9.771 | 1.276 | 688.16 |
| 7:30:00 AM | 9.768 | 1.279 | 689.266 |
| 7:45:00 AM | 9.908 | 1.348 | 740.731 |
| 8:00:00 AM | 10.001 | 1.29 | 717.576 |
| 8:15:00 AM | 10.185 | 1.288 | 733.74 |
| 8:30:00 AM | 10.398 | 1.115 | 653.046 |
| 8:45:00 AM | 10.391 | 1.207 | 706.354 |
| 9:00:00 AM | 10.515 | 1.332 | 791.453 |
| 9:15:00 AM | 10.411 | 1.356 | 795.135 |
| 9:30:00 AM | 10.445 | 1.313 | 773.184 |
| 9:45:00 AM | 10.5 | 1.402 | 831.653 |
| 10:00:00 AM | 10.362 | 1.433 | 835.239 |
| 10:15:00 AM | 10.548 | 1.297 | 774.139 |
| 10:30:00 AM | 10.542 | 1.306 | 778.369 |
| 10:45:00 AM | 10.491 | 1.224 | 725.341 |
| 11:00:00 AM | 10.516 | 1.343 | 798.065 |
| 11:15:00 AM | 10.443 | 1.299 | 765.199 |
| 11:30:00 AM | 10.591 | 1.396 | 837.127 |
| 11:45:00 AM | 10.686 | 1.384 | 839.821 |

**Thursday - P.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.603 | 1.346 | 808.712 |
| 12:15:00 PM | 10.637 | 1.385 | 835.68 |
| 12:30:00 PM | 10.575 | 1.269 | 759.872 |
| 12:45:00 PM | 10.645 | 1.386 | 836.873 |
| 1:00:00 PM | 10.675 | 1.418 | 859.539 |
| 1:15:00 PM | 10.669 | 1.438 | 870.816 |
| 1:30:00 PM | 10.61 | 1.247 | 749.947 |
| 1:45:00 PM | 10.386 | 1.378 | 805.594 |
| 2:00:00 PM | 10.451 | 1.285 | 757.354 |
| 2:15:00 PM | 10.33 | 1.396 | 810.291 |
| 2:30:00 PM | 10.351 | 1.358 | 790.745 |
| 2:45:00 PM | 10.89 | 1.388 | 863.379 |
| 3:00:00 PM | 10.804 | 1.369 | 842.973 |
| 3:15:00 PM | 10.464 | 1.332 | 786.31 |
| 3:30:00 PM | 10.212 | 1.337 | 764.513 |
| 3:45:00 PM | 10.272 | 1.368 | 788.451 |
| 4:00:00 PM | 10.253 | 1.276 | 733.323 |
| 4:15:00 PM | 10.402 | 1.369 | 802.076 |
| 4:30:00 PM | 10.527 | 1.337 | 795.731 |
| 4:45:00 PM | 10.479 | 1.333 | 788.818 |
| 5:00:00 PM | 10.653 | 1.391 | 840.573 |
| 5:15:00 PM | 10.728 | 1.31 | 799.241 |
| 5:30:00 PM | 10.862 | 1.384 | 858.289 |
| 5:45:00 PM | 11.103 | 1.467 | 935.606 |
| 6:00:00 PM | 11.067 | 1.426 | 905.913 |
| 6:15:00 PM | 11.062 | 1.398 | 887.669 |
| 6:30:00 PM | 11.06 | 1.387 | 880.541 |
| 6:45:00 PM | 11.061 | 1.388 | 880.973 |
| 7:00:00 PM | 11.06 | 1.423 | 903.555 |
| 7:15:00 PM | 11.096 | 1.474 | 939.497 |
| 7:30:00 PM | 11.051 | 1.489 | 944.137 |
| 7:45:00 PM | 11.337 | 1.541 | 1010.32 |
| 8:00:00 PM | 11.76 | 1.395 | 958.839 |
| 8:15:00 PM | 11.673 | 1.431 | 973.913 |
| 8:30:00 PM | 11.488 | 1.437 | 958.209 |
| 8:45:00 PM | 11.47 | 1.527 | 1015.92 |
| 9:00:00 PM | 11.566 | 1.555 | 1045.92 |
| 9:15:00 PM | 11.617 | 1.603 | 1084.04 |
| 9:30:00 PM | 11.739 | 1.538 | 1054.47 |
| 9:45:00 PM | 11.955 | 1.605 | 1126.2 |
| 10:00:00 PM | 12.167 | 1.648 | 1182.56 |
| 10:15:00 PM | 11.928 | 1.624 | 1136.42 |
| 10:30:00 PM | 11.833 | 1.516 | 1049.77 |
| 10:45:00 PM | 11.81 | 1.451 | 1002.58 |
| 11:00:00 PM | 11.713 | 1.486 | 1015.95 |
| 11:15:00 PM | 11.23 | 1.546 | 1001.01 |
| 11:30:00 PM | 10.787 | 1.423 | 874.228 |
| 11:45:00 PM | 10.253 | 1.229 | 706.22 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.851 | 1.220 | 701.532 |
| Daily Min: | 6.595 | 0.574 | 186.522 |
| Daily Max: | 12.167 | 1.648 | 1182.56 |
| Peak to Avg: | | | 1.69 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/21/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Friday - A.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.832 | 1.187 | 645.357 |
| 12:15:00 AM | 9.603 | 1.272 | 670.266 |
| 12:30:00 AM | 9.317 | 1.224 | 619.334 |
| 12:45:00 AM | 8.906 | 1.134 | 539.809 |
| 1:00:00 AM | 8.537 | 1.123 | 504.798 |
| 1:15:00 AM | 8.246 | 1.036 | 444.099 |
| 1:30:00 AM | 8.081 | 1.01 | 421.145 |
| 1:45:00 AM | 7.835 | 0.872 | 348.5 |
| 2:00:00 AM | 7.663 | 0.893 | 346.382 |
| 2:15:00 AM | 7.471 | 0.858 | 321.473 |
| 2:30:00 AM | 7.332 | 0.757 | 276.181 |
| 2:45:00 AM | 7.107 | 0.764 | 266.816 |
| 3:00:00 AM | 7.094 | 0.694 | 241.82 |
| 3:15:00 AM | 7.077 | 0.707 | 245.701 |
| 3:30:00 AM | 6.885 | 0.703 | 234.889 |
| 3:45:00 AM | 6.792 | 0.67 | 219.855 |
| 4:00:00 AM | 6.923 | 0.69 | 232.527 |
| 4:15:00 AM | 6.988 | 0.714 | 243.652 |
| 4:30:00 AM | 6.905 | 0.795 | 266.891 |
| 4:45:00 AM | 6.866 | 0.656 | 218.606 |
| 5:00:00 AM | 6.967 | 0.706 | 240.045 |
| 5:15:00 AM | 7.042 | 0.796 | 274.654 |
| 5:30:00 AM | 7.329 | 0.822 | 299.859 |
| 5:45:00 AM | 7.548 | 0.799 | 303.541 |
| 6:00:00 AM | 8.51 | 0.977 | 437.347 |
| 6:15:00 AM | 8.753 | 1.097 | 510.035 |
| 6:30:00 AM | 8.626 | 1.076 | 490.73 |
| 6:45:00 AM | 8.642 | 1.033 | 472.083 |
| 7:00:00 AM | 8.947 | 1.194 | 572.06 |
| 7:15:00 AM | 9.188 | 1.269 | 630.338 |
| 7:30:00 AM | 9.446 | 1.267 | 652.878 |
| 7:45:00 AM | 9.545 | 1.19 | 622.149 |
| 8:00:00 AM | 9.958 | 1.234 | 682.476 |
| 8:15:00 AM | 10.367 | 1.232 | 718.756 |
| 8:30:00 AM | 10.299 | 1.298 | 750.568 |
| 8:45:00 AM | 10.283 | 1.422 | 820.46 |
| 9:00:00 AM | 10.535 | 1.422 | 847.282 |
| 9:15:00 AM | 10.661 | 1.406 | 850.631 |
| 9:30:00 AM | 10.785 | 1.364 | 837.578 |
| 9:45:00 AM | 10.67 | 1.317 | 797.991 |
| 10:00:00 AM | 10.755 | 1.374 | 840.685 |
| 10:15:00 AM | 10.696 | 1.286 | 781.631 |
| 10:30:00 AM | 10.481 | 1.411 | 834.799 |
| 10:45:00 AM | 10.389 | 1.368 | 800.132 |
| 11:00:00 AM | 10.645 | 1.414 | 853.929 |
| 11:15:00 AM | 10.876 | 1.399 | 868.751 |
| 11:30:00 AM | 10.834 | 1.454 | 898.454 |
| 11:45:00 AM | 10.985 | 1.415 | 890.368 |

**Friday - P.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.796 | 1.504 | 924.843 |
| 12:15:00 PM | 11.029 | 1.458 | 922.44 |
| 12:30:00 PM | 10.862 | 1.392 | 862.825 |
| 12:45:00 PM | 11.25 | 1.487 | 964.733 |
| 1:00:00 PM | 10.932 | 1.386 | 866.52 |
| 1:15:00 PM | 10.875 | 1.415 | 878.709 |
| 1:30:00 PM | 10.657 | 1.444 | 873.208 |
| 1:45:00 PM | 10.653 | 1.382 | 835.259 |
| 2:00:00 PM | 10.888 | 1.441 | 895.912 |
| 2:15:00 PM | 10.547 | 1.402 | 836.408 |
| 2:30:00 PM | 10.718 | 1.386 | 844.8 |
| 2:45:00 PM | 10.906 | 1.43 | 891.107 |
| 3:00:00 PM | 10.682 | 1.373 | 833.11 |
| 3:15:00 PM | 10.657 | 1.392 | 841.913 |
| 3:30:00 PM | 12.607 | 1.459 | 1094.69 |
| 3:45:00 PM | 12.847 | 1.668 | 1281.36 |
| 4:00:00 PM | 12.747 | 1.479 | 1124.92 |
| 4:15:00 PM | 12.729 | 1.628 | 1236.81 |
| 4:30:00 PM | 12.652 | 1.547 | 1166.33 |
| 4:45:00 PM | 12.418 | 1.64 | 1207.29 |
| 5:00:00 PM | 12.151 | 1.623 | 1162.7 |
| 5:15:00 PM | 11.861 | 1.564 | 1086.63 |
| 5:30:00 PM | 11.351 | 1.553 | 1019.78 |
| 5:45:00 PM | 11.099 | 1.387 | 884.428 |
| 6:00:00 PM | 10.909 | 1.432 | 892.682 |
| 6:15:00 PM | 10.804 | 1.368 | 842.296 |
| 6:30:00 PM | 10.962 | 1.412 | 885.802 |
| 6:45:00 PM | 11.025 | 1.521 | 961.485 |
| 7:00:00 PM | 10.992 | 1.405 | 884.691 |
| 7:15:00 PM | 11.098 | 1.452 | 925.947 |
| 7:30:00 PM | 11.017 | 1.445 | 912.894 |
| 7:45:00 PM | 10.839 | 1.301 | 804.514 |
| 8:00:00 PM | 10.757 | 1.425 | 872.24 |
| 8:15:00 PM | 11.039 | 1.479 | 936.333 |
| 8:30:00 PM | 11.029 | 1.477 | 934.126 |
| 8:45:00 PM | 11.047 | 1.486 | 941.674 |
| 9:00:00 PM | 10.958 | 1.493 | 936.438 |
| 9:15:00 PM | 10.93 | 1.453 | 908.427 |
| 9:30:00 PM | 11.119 | 1.448 | 925.418 |
| 9:45:00 PM | 11.193 | 1.444 | 930.694 |
| 10:00:00 PM | 11.698 | 1.554 | 1060.31 |
| 10:15:00 PM | 11.789 | 1.471 | 1013.78 |
| 10:30:00 PM | 11.391 | 1.404 | 925.616 |
| 10:45:00 PM | 11.158 | 1.448 | 929.657 |
| 11:00:00 PM | 10.949 | 1.442 | 903.379 |
| 11:15:00 PM | 10.744 | 1.343 | 820.917 |
| 11:30:00 PM | 10.567 | 1.325 | 792.151 |
| 11:45:00 PM | 10.342 | 1.357 | 789.027 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.039 | 1.268 | 742.212 |
| Daily Min: | 6.792 | 0.656 | 218.606 |
| Daily Max: | 12.847 | 1.668 | 1281.36 |
| Peak to Avg: | | | 1.73 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/22/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Saturday - A.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.965 | 1.325 | 733.672 |
| 12:15:00 AM | 9.684 | 1.187 | 632.678 |
| 12:30:00 AM | 9.247 | 1.155 | 578.363 |
| 12:45:00 AM | 9.023 | 1.086 | 526.421 |
| 1:00:00 AM | 8.691 | 1.077 | 496.191 |
| 1:15:00 AM | 8.388 | 0.988 | 433.887 |
| 1:30:00 AM | 8.209 | 0.9 | 383.796 |
| 1:45:00 AM | 7.981 | 0.89 | 365.088 |
| 2:00:00 AM | 7.839 | 0.816 | 326.353 |
| 2:15:00 AM | 7.557 | 0.875 | 333.014 |
| 2:30:00 AM | 7.453 | 0.754 | 281.504 |
| 2:45:00 AM | 7.324 | 0.78 | 284.21 |
| 3:00:00 AM | 7.16 | 0.729 | 257.371 |
| 3:15:00 AM | 7.017 | 0.672 | 230.855 |
| 3:30:00 AM | 7.073 | 0.669 | 232.107 |
| 3:45:00 AM | 7.15 | 0.762 | 268.445 |
| 4:00:00 AM | 7.118 | 0.709 | 248.195 |
| 4:15:00 AM | 6.94 | 0.644 | 217.807 |
| 4:30:00 AM | 6.907 | 0.747 | 250.899 |
| 4:45:00 AM | 6.852 | 0.662 | 219.961 |
| 5:00:00 AM | 6.971 | 0.6 | 204.143 |
| 5:15:00 AM | 6.997 | 0.729 | 249.099 |
| 5:30:00 AM | 7.157 | 0.746 | 263.237 |
| 5:45:00 AM | 7.264 | 0.676 | 243.525 |
| 6:00:00 AM | 7.281 | 0.73 | 263.902 |
| 6:15:00 AM | 7.686 | 0.903 | 351.477 |
| 6:30:00 AM | 7.923 | 0.948 | 384.916 |
| 6:45:00 AM | 7.872 | 0.93 | 374.236 |
| 7:00:00 AM | 8.081 | 0.973 | 405.993 |
| 7:15:00 AM | 8.402 | 0.896 | 394.358 |
| 7:30:00 AM | 8.756 | 1.05 | 488.732 |
| 7:45:00 AM | 8.896 | 1.072 | 509.644 |
| 8:00:00 AM | 9.401 | 1.145 | 586.427 |
| 8:15:00 AM | 9.649 | 1.178 | 624.579 |
| 8:30:00 AM | 9.849 | 1.3 | 708.533 |
| 8:45:00 AM | 10.338 | 1.453 | 844.429 |
| 9:00:00 AM | 10.702 | 1.277 | 776.303 |
| 9:15:00 AM | 10.867 | 1.379 | 855.533 |
| 9:30:00 AM | 11.077 | 1.37 | 871.666 |
| 9:45:00 AM | 11.217 | 1.432 | 926.059 |
| 10:00:00 AM | 11.597 | 1.461 | 985.627 |
| 10:15:00 AM | 12.098 | 1.504 | 1071.32 |
| 10:30:00 AM | 12.124 | 1.534 | 1095.99 |
| 10:45:00 AM | 11.848 | 1.441 | 999.727 |
| 11:00:00 AM | 11.831 | 1.526 | 1056.61 |
| 11:15:00 AM | 11.737 | 1.534 | 1051.6 |
| 11:30:00 AM | 11.901 | 1.55 | 1081.3 |
| 11:45:00 AM | 11.986 | 1.544 | 1086.76 |

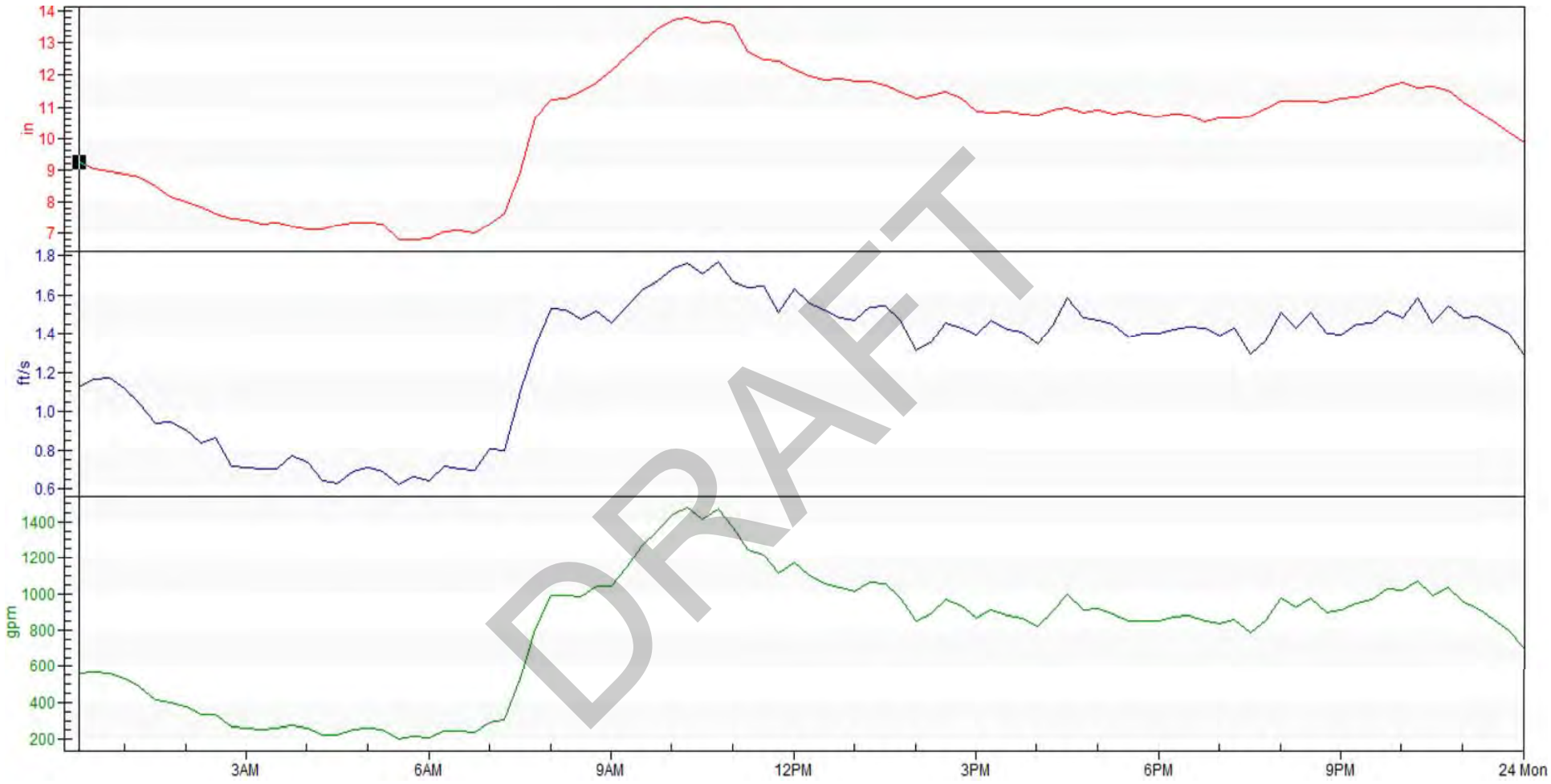
**Saturday - P.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.058 | 1.462 | 1037.15 |
| 12:15:00 PM | 12.033 | 1.524 | 1077.92 |
| 12:30:00 PM | 12.15 | 1.603 | 1148.01 |
| 12:45:00 PM | 12.367 | 1.552 | 1137.04 |
| 1:00:00 PM | 12.427 | 1.668 | 1229.58 |
| 1:15:00 PM | 12.27 | 1.555 | 1127.63 |
| 1:30:00 PM | 11.633 | 1.499 | 1015.67 |
| 1:45:00 PM | 11.779 | 1.52 | 1046.68 |
| 2:00:00 PM | 11.587 | 1.574 | 1061.08 |
| 2:15:00 PM | 11.521 | 1.581 | 1058.11 |
| 2:30:00 PM | 11.406 | 1.584 | 1046.22 |
| 2:45:00 PM | 11.256 | 1.521 | 987.487 |
| 3:00:00 PM | 11.204 | 1.381 | 891.218 |
| 3:15:00 PM | 11.178 | 1.48 | 952.465 |
| 3:30:00 PM | 10.978 | 1.422 | 893.762 |
| 3:45:00 PM | 10.774 | 1.527 | 936.955 |
| 4:00:00 PM | 11.078 | 1.482 | 942.935 |
| 4:15:00 PM | 11.168 | 1.573 | 1010.89 |
| 4:30:00 PM | 10.879 | 1.439 | 894.286 |
| 4:45:00 PM | 10.576 | 1.362 | 815.383 |
| 5:00:00 PM | 10.63 | 1.29 | 777.283 |
| 5:15:00 PM | 10.801 | 1.389 | 855.063 |
| 5:30:00 PM | 10.794 | 1.433 | 881.023 |
| 5:45:00 PM | 10.705 | 1.406 | 855.533 |
| 6:00:00 PM | 10.438 | 1.147 | 675.26 |
| 6:15:00 PM | 10.628 | 1.459 | 879.218 |
| 6:30:00 PM | 10.573 | 1.372 | 821.185 |
| 6:45:00 PM | 10.644 | 1.381 | 833.994 |
| 7:00:00 PM | 10.733 | 1.554 | 948.547 |
| 7:15:00 PM | 10.926 | 1.468 | 917.207 |
| 7:30:00 PM | 11.041 | 1.41 | 892.703 |
| 7:45:00 PM | 10.802 | 1.352 | 832.318 |
| 8:00:00 PM | 10.675 | 1.324 | 802.652 |
| 8:15:00 PM | 10.608 | 1.393 | 837.617 |
| 8:30:00 PM | 10.521 | 1.246 | 740.784 |
| 8:45:00 PM | 10.326 | 1.442 | 836.345 |
| 9:00:00 PM | 10.282 | 1.425 | 822.41 |
| 9:15:00 PM | 10.259 | 1.393 | 801.182 |
| 9:30:00 PM | 10.547 | 1.392 | 830.429 |
| 9:45:00 PM | 10.391 | 1.323 | 773.915 |
| 10:00:00 PM | 10.314 | 1.332 | 771.791 |
| 10:15:00 PM | 10.336 | 1.377 | 799.976 |
| 10:30:00 PM | 10.512 | 1.382 | 820.919 |
| 10:45:00 PM | 10.647 | 1.428 | 862.32 |
| 11:00:00 PM | 10.334 | 1.378 | 800.212 |
| 11:15:00 PM | 10.273 | 1.354 | 780.097 |
| 11:30:00 PM | 10.141 | 1.33 | 753.297 |
| 11:45:00 PM | 9.854 | 1.332 | 726.579 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.939 | 1.240 | 721.718 |
| Daily Min: | 6.852 | 0.6 | 204.143 |
| Daily Max: | 12.427 | 1.668 | 1229.58 |
| Peak to Avg: | | | 1.70 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/23/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Sunday - A.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 9.596 | 1.242 | 653.717 |
| 12:15:00 AM | 9.226 | 1.12 | 559.117 |
| 12:30:00 AM | 9.042 | 1.164 | 565.584 |
| 12:45:00 AM | 8.957 | 1.168 | 560.554 |
| 1:00:00 AM | 8.858 | 1.118 | 528.309 |
| 1:15:00 AM | 8.778 | 1.04 | 485.82 |
| 1:30:00 AM | 8.47 | 0.937 | 416.857 |
| 1:45:00 AM | 8.169 | 0.947 | 401.033 |
| 2:00:00 AM | 7.993 | 0.909 | 373.357 |
| 2:15:00 AM | 7.822 | 0.841 | 335.317 |
| 2:30:00 AM | 7.616 | 0.866 | 333.127 |
| 2:45:00 AM | 7.464 | 0.717 | 267.953 |
| 3:00:00 AM | 7.407 | 0.71 | 262.718 |
| 3:15:00 AM | 7.305 | 0.706 | 256.158 |
| 3:30:00 AM | 7.32 | 0.706 | 256.919 |
| 3:45:00 AM | 7.212 | 0.767 | 273.498 |
| 4:00:00 AM | 7.116 | 0.734 | 256.751 |
| 4:15:00 AM | 7.139 | 0.638 | 224.325 |
| 4:30:00 AM | 7.251 | 0.626 | 224.942 |
| 4:45:00 AM | 7.322 | 0.686 | 249.807 |
| 5:00:00 AM | 7.325 | 0.707 | 257.57 |
| 5:15:00 AM | 7.305 | 0.69 | 250.272 |
| 5:30:00 AM | 6.788 | 0.621 | 203.463 |
| 5:45:00 AM | 6.796 | 0.66 | 216.861 |
| 6:00:00 AM | 6.813 | 0.638 | 210.347 |
| 6:15:00 AM | 7.04 | 0.714 | 246.075 |
| 6:30:00 AM | 7.063 | 0.701 | 242.77 |
| 6:45:00 AM | 6.994 | 0.696 | 237.689 |
| 7:00:00 AM | 7.305 | 0.801 | 290.737 |
| 7:15:00 AM | 7.635 | 0.794 | 306.45 |
| 7:30:00 AM | 8.951 | 1.102 | 528.417 |
| 7:45:00 AM | 10.655 | 1.331 | 804.697 |
| 8:00:00 AM | 11.236 | 1.526 | 989.067 |
| 8:15:00 AM | 11.279 | 1.525 | 993.044 |
| 8:30:00 AM | 11.489 | 1.476 | 984.501 |
| 8:45:00 AM | 11.759 | 1.513 | 1039.5 |
| 9:00:00 AM | 12.125 | 1.458 | 1041.25 |
| 9:15:00 AM | 12.549 | 1.536 | 1145.71 |
| 9:30:00 AM | 13.017 | 1.622 | 1266.9 |
| 9:45:00 AM | 13.419 | 1.665 | 1350.58 |
| 10:00:00 AM | 13.729 | 1.733 | 1445.22 |
| 10:15:00 AM | 13.802 | 1.759 | 1476.69 |
| 10:30:00 AM | 13.636 | 1.706 | 1411.27 |
| 10:45:00 AM | 13.691 | 1.767 | 1468.73 |
| 11:00:00 AM | 13.532 | 1.666 | 1365.34 |
| 11:15:00 AM | 12.736 | 1.64 | 1246.45 |
| 11:30:00 AM | 12.484 | 1.642 | 1217.47 |
| 11:45:00 AM | 12.445 | 1.507 | 1112.75 |

**Sunday - P.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 12.187 | 1.633 | 1174.42 |
| 12:15:00 PM | 11.979 | 1.56 | 1097.19 |
| 12:30:00 PM | 11.841 | 1.524 | 1056.47 |
| 12:45:00 PM | 11.911 | 1.484 | 1036.06 |
| 1:00:00 PM | 11.811 | 1.467 | 1013.68 |
| 1:15:00 PM | 11.795 | 1.538 | 1060.61 |
| 1:30:00 PM | 11.693 | 1.545 | 1053.98 |
| 1:45:00 PM | 11.483 | 1.468 | 978.09 |
| 2:00:00 PM | 11.267 | 1.314 | 854.257 |
| 2:15:00 PM | 11.344 | 1.353 | 887.703 |
| 2:30:00 PM | 11.491 | 1.456 | 971.018 |
| 2:45:00 PM | 11.283 | 1.429 | 931.17 |
| 3:00:00 PM | 10.859 | 1.393 | 863.285 |
| 3:15:00 PM | 10.813 | 1.471 | 906.404 |
| 3:30:00 PM | 10.861 | 1.423 | 882.245 |
| 3:45:00 PM | 10.768 | 1.409 | 863.703 |
| 4:00:00 PM | 10.721 | 1.346 | 820.341 |
| 4:15:00 PM | 10.907 | 1.443 | 899.417 |
| 4:30:00 PM | 10.972 | 1.581 | 993.315 |
| 4:45:00 PM | 10.822 | 1.479 | 912.873 |
| 5:00:00 PM | 10.887 | 1.469 | 913.382 |
| 5:15:00 PM | 10.778 | 1.45 | 889.797 |
| 5:30:00 PM | 10.847 | 1.379 | 853.589 |
| 5:45:00 PM | 10.719 | 1.398 | 851.636 |
| 6:00:00 PM | 10.683 | 1.399 | 848.708 |
| 6:15:00 PM | 10.778 | 1.424 | 874.141 |
| 6:30:00 PM | 10.737 | 1.436 | 877.107 |
| 6:45:00 PM | 10.526 | 1.425 | 847.696 |
| 7:00:00 PM | 10.635 | 1.388 | 836.997 |
| 7:15:00 PM | 10.633 | 1.427 | 860.427 |
| 7:30:00 PM | 10.675 | 1.292 | 783.213 |
| 7:45:00 PM | 10.919 | 1.357 | 847.435 |
| 8:00:00 PM | 11.203 | 1.506 | 972.315 |
| 8:15:00 PM | 11.177 | 1.431 | 920.791 |
| 8:30:00 PM | 11.184 | 1.511 | 973.332 |
| 8:45:00 PM | 11.158 | 1.399 | 898.088 |
| 9:00:00 PM | 11.264 | 1.395 | 906.547 |
| 9:15:00 PM | 11.316 | 1.446 | 945.336 |
| 9:30:00 PM | 11.422 | 1.457 | 964.475 |
| 9:45:00 PM | 11.66 | 1.514 | 1028.7 |
| 10:00:00 PM | 11.762 | 1.48 | 1016.85 |
| 10:15:00 PM | 11.607 | 1.582 | 1068.58 |
| 10:30:00 PM | 11.663 | 1.454 | 988.41 |
| 10:45:00 PM | 11.506 | 1.542 | 1029.91 |
| 11:00:00 PM | 11.164 | 1.481 | 951.882 |
| 11:15:00 PM | 10.835 | 1.487 | 919.076 |
| 11:30:00 PM | 10.542 | 1.443 | 860.29 |
| 11:45:00 PM | 10.2 | 1.404 | 801.557 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.309 | 1.277 | 789.142 |
| Daily Min: | 6.788 | 0.621 | 203.463 |
| Daily Max: | 13.802 | 1.767 | 1476.69 |
| Peak to Avg: | | | 1.87 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/24/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 500 Acacia

**Monday - A.M. 7/24/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 9.859 | 1.283 | 700.097 |
| 12:15:00 AM | 9.503 | 1.254 | 651.536 |
| 12:30:00 AM | 9.049 | 1.16 | 564.577 |
| 12:45:00 AM | 8.776 | 1.11 | 518.026 |
| 1:00:00 AM | 8.477 | 1.042 | 464.145 |
| 1:15:00 AM | 8.102 | 0.818 | 342.601 |
| 1:30:00 AM | 7.886 | 0.864 | 348.541 |
| 1:45:00 AM | 7.658 | 0.99 | 383.465 |
| 2:00:00 AM | 7.474 | 0.831 | 311.278 |
| 2:15:00 AM | 7.286 | 0.704 | 254.769 |
| 2:30:00 AM | 7.18 | 0.719 | 254.996 |
| 2:45:00 AM | 7.078 | 0.673 | 233.731 |
| 3:00:00 AM | 6.908 | 0.637 | 214.082 |
| 3:15:00 AM | 6.844 | 0.661 | 219.194 |
| 3:30:00 AM | 6.831 | 0.724 | 239.375 |
| 3:45:00 AM | 6.796 | 0.731 | 240.017 |
| 4:00:00 AM | 6.855 | 0.661 | 219.765 |
| 4:15:00 AM | 6.887 | 0.629 | 210.293 |
| 4:30:00 AM | 6.917 | 0.725 | 243.967 |
| 4:45:00 AM | 6.811 | 0.75 | 246.928 |
| 5:00:00 AM | 6.909 | 0.698 | 234.589 |
| 5:15:00 AM | 7.094 | 0.807 | 281.142 |
| 5:30:00 AM | 7.178 | 0.834 | 295.439 |
| 5:45:00 AM | 7.389 | 0.75 | 276.598 |
| 6:00:00 AM | 7.648 | 0.893 | 345.481 |
| 6:15:00 AM | 8.011 | 0.987 | 406.988 |
| 6:30:00 AM | 8.439 | 1.002 | 443.333 |
| 6:45:00 AM | 8.694 | 1.021 | 470.657 |
| 7:00:00 AM | 8.876 | 1.123 | 532.34 |
| 7:15:00 AM | 9.132 | 1.06 | 521.917 |
| 7:30:00 AM | 9.373 | 1.262 | 643.942 |
| 7:45:00 AM | 9.588 | 1.109 | 582.908 |
| 8:00:00 AM | 10.063 | 1.253 | 702.524 |
| 8:15:00 AM | 10.308 | 1.262 | 730.3 |
| 8:30:00 AM | 10.32 | 1.406 | 814.941 |
| 8:45:00 AM | 10.45 | 1.367 | 806.004 |
| 9:00:00 AM | 10.617 | 1.378 | 829.037 |
| 9:15:00 AM | 10.593 | 1.48 | 888.299 |
| 9:30:00 AM | 10.574 | 1.28 | 766.164 |
| 9:45:00 AM | 10.535 | 1.443 | 859.593 |
| 10:00:00 AM | 10.609 | 1.462 | 879.026 |
| 10:15:00 AM | 10.694 | 1.374 | 834.504 |
| 10:30:00 AM | 10.576 | 1.407 | 842.51 |
| 10:45:00 AM | 10.751 | 1.392 | 851.57 |
| 11:00:00 AM | 10.918 | 1.5 | 936.492 |
| 11:15:00 AM | 10.97 | 1.479 | 928.597 |
| 11:30:00 AM | 10.957 | 1.356 | 850.217 |
| 11:45:00 AM | 10.903 | 1.38 | 859.509 |

**Monday - P.M. 7/24/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.854 | 1.399 | 866.842 |
| 12:15:00 PM | 10.985 | 1.487 | 935.426 |
| 12:30:00 PM | 11.022 | 1.318 | 832.951 |
| 12:45:00 PM | 11.063 | 1.354 | 859.649 |
| 1:00:00 PM | 10.985 | 1.484 | 933.881 |
| 1:15:00 PM | 10.854 | 1.394 | 863.601 |
| 1:30:00 PM | 10.857 | 1.378 | 853.885 |
| 1:45:00 PM | 10.825 | 1.462 | 902.505 |
| 2:00:00 PM | 10.811 | 1.258 | 775.143 |
| 2:15:00 PM | 10.636 | 1.364 | 822.542 |
| 2:30:00 PM | 10.695 | 1.351 | 820.683 |
| 2:45:00 PM | 10.696 | 1.322 | 803.417 |
| 3:00:00 PM | 10.783 | 1.349 | 828.78 |
| 3:15:00 PM | 10.75 | 1.381 | 844.945 |
| 3:30:00 PM | 10.548 | 1.385 | 826.564 |
| 3:45:00 PM | 10.523 | 1.452 | 863.456 |
| 4:00:00 PM | 10.606 | 1.415 | 850.651 |
| 4:15:00 PM | 10.586 | 1.405 | 842.338 |
| 4:30:00 PM | 10.576 | 1.391 | 832.879 |
| 4:45:00 PM | 10.633 | 1.412 | 851.539 |
| 5:00:00 PM | 10.679 | 1.498 | 908.46 |
| 5:15:00 PM | 10.774 | 1.496 | 917.924 |
| 5:30:00 PM | 10.843 | 1.365 | 844.376 |
| 5:45:00 PM | 10.975 | 1.419 | 891.802 |
| 6:00:00 PM | 10.995 | 1.358 | 855.188 |
| 6:15:00 PM | 11.047 | 1.45 | 918.725 |
| 6:30:00 PM | 11.557 | 1.451 | 975.031 |
| 6:45:00 PM | 11.57 | 1.52 | 1022.66 |
| 7:00:00 PM | 11.331 | 1.427 | 934.677 |
| 7:15:00 PM | 11.092 | 1.421 | 905.102 |
| 7:30:00 PM | 11.194 | 1.454 | 937.705 |
| 7:45:00 PM | 11.42 | 1.502 | 993.576 |
| 8:00:00 PM | 11.324 | 1.516 | 992.213 |
| 8:15:00 PM | 11.426 | 1.597 | 1057.47 |
| 8:30:00 PM | 11.642 | 1.482 | 1005.19 |
| 8:45:00 PM | 11.76 | 1.523 | 1046.05 |
| 9:00:00 PM | 11.735 | 1.607 | 1100.82 |
| 9:15:00 PM | 11.754 | 1.521 | 1044.13 |
| 9:30:00 PM | 11.897 | 1.568 | 1093.49 |
| 9:45:00 PM | 12.075 | 1.593 | 1132.29 |
| 10:00:00 PM | 12.212 | 1.475 | 1063.54 |
| 10:15:00 PM | 12.525 | 1.768 | 1315.86 |
| 10:30:00 PM | 12.297 | 1.559 | 1133.94 |
| 10:45:00 PM | 11.904 | 1.6 | 1116.89 |
| 11:00:00 PM | 11.552 | 1.435 | 963.66 |
| 11:15:00 PM | 11.113 | 1.516 | 968.06 |
| 11:30:00 PM | 10.776 | 1.438 | 882.442 |
| 11:45:00 PM | 10.473 | 1.318 | 779.079 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 9.965 | 1.254 | 730.399 |
| Daily Min: | 6.796 | 0.629 | 210.293 |
| Daily Max: | 12.525 | 1.768 | 1315.86 |
| Peak to Avg: | | | 1.80 |

DRAFT

# Sewer Line Flow Study Summary

Project: **City of Santa Paula - Sewer Flow Study**
Location: **500 Acacia, Santa Paula, CA**
Pipe Size: **24" VCP**
Time Period: **7/11/2023, 12:00 a.m. - 7/25/2023, 12:00 a.m.**

## Level - Inches

| | |
|---|---|
| Average: | 10.108 |
| Maximum: | 13.802 |
| Minimum: | 6.595 |
| Max d/D: | 57.5% |

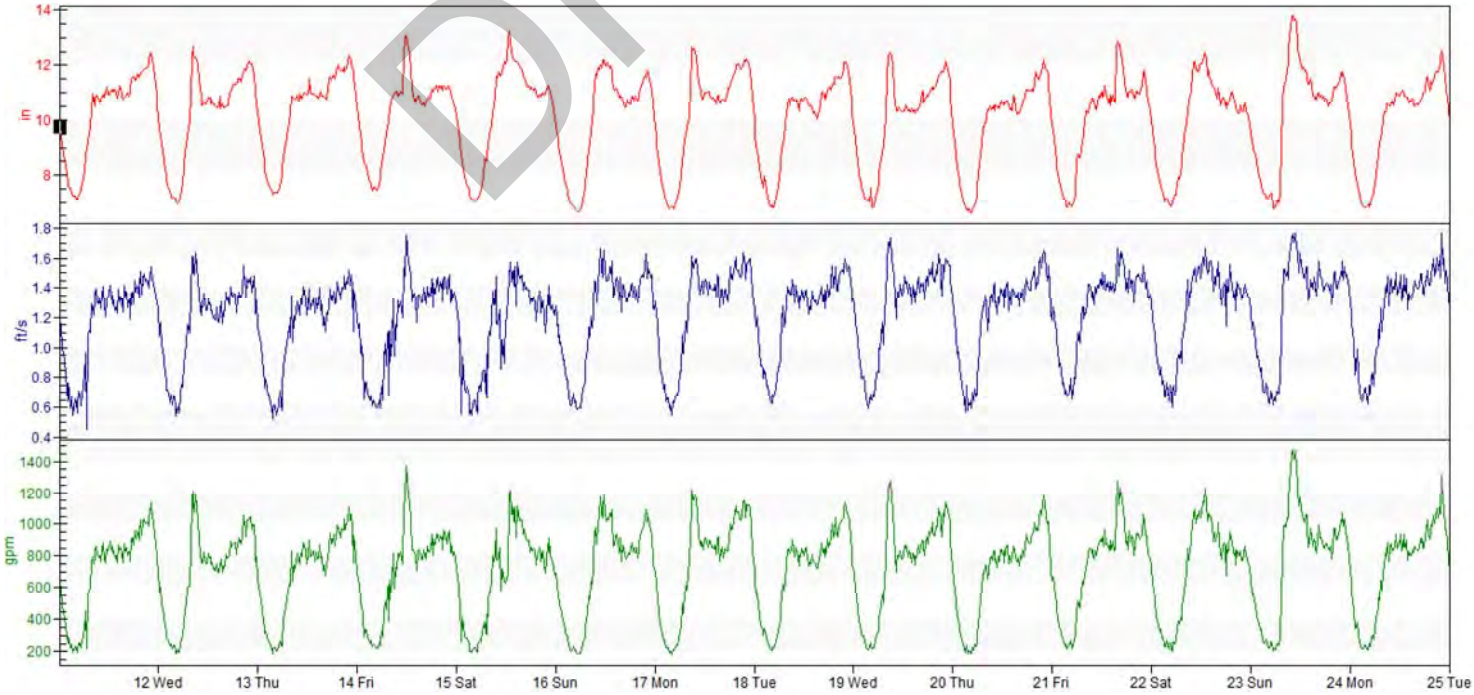
## Velocity - Feet per Second

| | |
|---|---|
| Average: | 1.216 |
| Maximum: | 1.768 |
| Minimum: | 0.454 |

## Flow Rate - Gallons Per Minute

| | |
|---|---|
| Average: | 721.560 |
| Maximum:: | 1476.69 |
| Minimum: | 181.182 |
| Peak to Average | 1.70 |

DRAFT




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

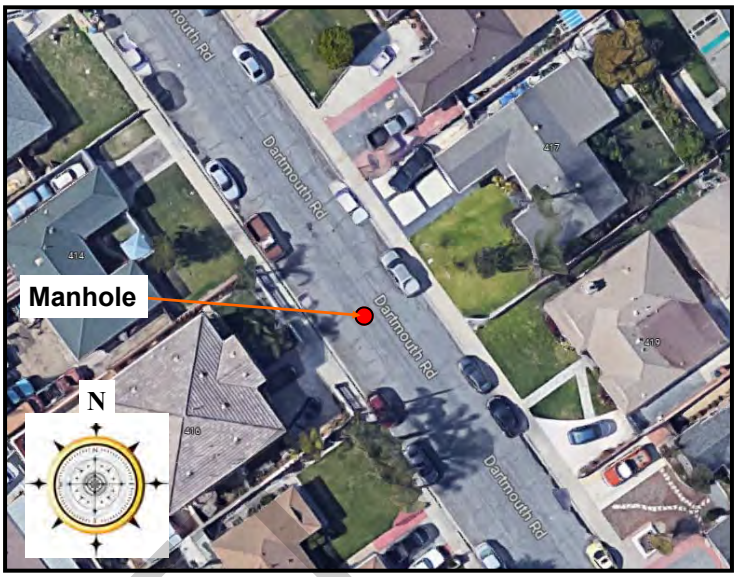
# CITY OF SANTA PAULA - SEWER FLOW STUDY

MH Location: **416 Dartmouth**
**Santa Paula, CA 93060**

Pipe Size: **24" VCP**

Time Period: **7/11/2023 - 12:00 a.m. to**
**7/25/2023- 12:00 a.m.**

GPS: **34.348436, -119.065191**




## Manhole - Layout

- This line has very low velocity possibly from a silt damn downstream.
- The line was cleaned prior to installation of the meter, but after 2.5 weeks of being installed silt was back inside of the channel and on our meter.

## Equipment

**Teledyne Isco 2150 Area Velocity Flow Meter with 10' measuring range:**
**Level Measurement:**

- Method - Submerged pressure transducer mounted in the flow stream
- Transducer Type - Differential linear integrated circuit pressure transducer
- Range (standard) 0.033 to 10 ft (0.010 to 3.05 m); Maximum Allowable Level 34 ft (10.5 m)
- Accuracy ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m,)
- Long-Term Stability ±0.023 ft/yr (±0.007 m/yr)
- Compensated Range 32° to 122°F (0° to 50°C)

**Velocity Measurement:**

- Method - Doppler ultrasonic, frequency 500 kHz
- Typical Minimum Depth 0.08 ft (25 mm)
- Range -5 to +20 ft/s (-1.5 to +6.1 m/s)
- Accuracy (in water with uniform velocity profile, speed of sound = 4850 ft/s, for indicated velocity range) ±0.1 ft/s from -5 to 5 ft/s (±0.03 m/s from— 1.5 to +1.5 m/s)
- ±2% of reading from 5 to 20 ft/s (1.5 to 6.1 m/s)

**Method Of Insertion:**

- 24 inch line requires Confined Space Entry.

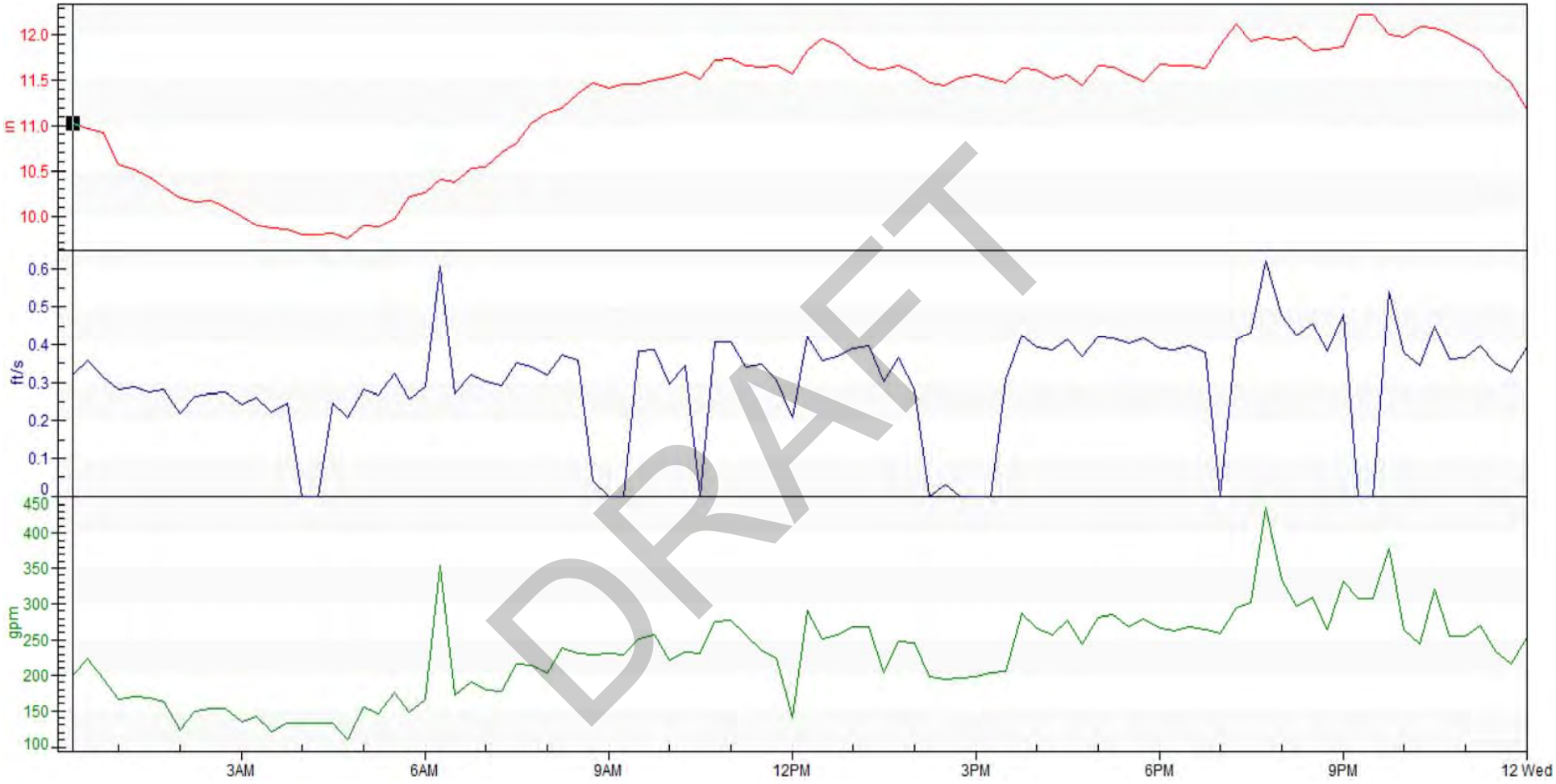
DRAFT

**Gold Coast Environmental**

**Specializing in process instrumentation and calibration.**

1868 Palma Drive, Suite I, Ventura, CA 93003 www.goldcoastenv.com 805.498.3811 ph.

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/11/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Tuesday- A.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| | | | |
| 12:15:00 AM | 11.017 | 0.318 | 200.433 |
| 12:30:00 AM | 10.958 | 0.357 | 223.716 |
| 12:45:00 AM | 10.927 | 0.314 | 193.478 |
| 1:00:00 AM | 10.571 | 0.28 | 166.451 |
| 1:15:00 AM | 10.512 | 0.287 | 170.195 |
| 1:30:00 AM | 10.432 | 0.274 | 168.604 |
| 1:45:00 AM | 10.322 | 0.281 | 163.223 |
| 2:00:00 AM | 10.195 | 0.218 | 124.25 |
| 2:15:00 AM | 10.161 | 0.263 | 149.269 |
| 2:30:00 AM | 10.167 | 0.271 | 153.624 |
| 2:45:00 AM | 10.098 | 0.274 | 153.895 |
| 3:00:00 AM | 10.001 | 0.243 | 135.105 |
| 3:15:00 AM | 9.898 | 0.261 | 142.867 |
| 3:30:00 AM | 9.861 | 0.223 | 121.497 |
| 3:45:00 AM | 9.842 | 0.245 | 133.382 |
| 4:00:00 AM | 9.789 | 0 | 132.427 |
| 4:15:00 AM | 9.793 | 0 | 132.507 |
| 4:30:00 AM | 9.799 | 0.246 | 132.607 |
| 4:45:00 AM | 9.746 | 0.206 | 110.827 |
| 5:00:00 AM | 9.899 | 0.282 | 154.428 |
| 5:15:00 AM | 9.878 | 0.268 | 146.42 |
| 5:30:00 AM | 9.971 | 0.323 | 175.278 |
| 5:45:00 AM | 10.223 | 0.257 | 147.169 |
| 6:00:00 AM | 10.26 | 0.289 | 166.153 |
| 6:15:00 AM | 10.404 | 0.606 | 353.445 |
| 6:30:00 AM | 10.382 | 0.272 | 170.809 |
| 6:45:00 AM | 10.521 | 0.32 | 190.087 |
| 7:00:00 AM | 10.543 | 0.302 | 179.909 |
| 7:15:00 AM | 10.703 | 0.29 | 176.613 |
| 7:30:00 AM | 10.804 | 0.352 | 216.636 |
| 7:45:00 AM | 11.028 | 0.34 | 214.783 |
| 8:00:00 AM | 11.138 | 0.319 | 203.534 |
| 8:15:00 AM | 11.202 | 0.373 | 239.186 |
| 8:30:00 AM | 11.362 | 0.356 | 231.142 |
| 8:45:00 AM | 11.48 | 0.039 | 229.594 |
| 9:00:00 AM | 11.415 | 0 | 231.554 |
| 9:15:00 AM | 11.456 | 0 | 229.802 |
| 9:30:00 AM | 11.461 | 0.381 | 252.104 |
| 9:45:00 AM | 11.503 | 0.385 | 257.038 |
| 10:00:00 AM | 11.54 | 0.294 | 221.091 |
| 10:15:00 AM | 11.59 | 0.345 | 232.273 |
| 10:30:00 AM | 11.524 | 0 | 230.99 |
| 10:45:00 AM | 11.726 | 0.405 | 275.272 |
| 11:00:00 AM | 11.736 | 0.407 | 276.721 |
| 11:15:00 AM | 11.664 | 0.341 | 256.905 |
| 11:30:00 AM | 11.655 | 0.347 | 235.827 |
| 11:45:00 AM | 11.671 | 0.306 | 223.674 |

**Tuesday- P.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.576 | 0.209 | 140.784 |
| 12:15:00 PM | 11.83 | 0.42 | 290.607 |
| 12:30:00 PM | 11.963 | 0.359 | 252.193 |
| 12:45:00 PM | 11.89 | 0.37 | 256.607 |
| 1:00:00 PM | 11.741 | 0.391 | 268.031 |
| 1:15:00 PM | 11.634 | 0.397 | 268.81 |
| 1:30:00 PM | 11.622 | 0.302 | 202.689 |
| 1:45:00 PM | 11.672 | 0.365 | 248.212 |
| 2:00:00 PM | 11.595 | 0.282 | 246.125 |
| 2:15:00 PM | 11.482 | 0 | 198.274 |
| 2:30:00 PM | 11.441 | 0.031 | 194.771 |
| 2:45:00 PM | 11.529 | 0 | 196.523 |
| 3:00:00 PM | 11.569 | 0 | 198.274 |
| 3:15:00 PM | 11.521 | 0 | 203.529 |
| 3:30:00 PM | 11.475 | 0.308 | 205.253 |
| 3:45:00 PM | 11.635 | 0.424 | 287.071 |
| 4:00:00 PM | 11.627 | 0.393 | 265.893 |
| 4:15:00 PM | 11.514 | 0.385 | 257.25 |
| 4:30:00 PM | 11.56 | 0.414 | 278.09 |
| 4:45:00 PM | 11.451 | 0.369 | 243.924 |
| 5:00:00 PM | 11.666 | 0.42 | 281.918 |
| 5:15:00 PM | 11.655 | 0.419 | 284.556 |
| 5:30:00 PM | 11.57 | 0.402 | 268.527 |
| 5:45:00 PM | 11.493 | 0.418 | 278.826 |
| 6:00:00 PM | 11.686 | 0.391 | 266.344 |
| 6:15:00 PM | 11.674 | 0.385 | 261.936 |
| 6:30:00 PM | 11.661 | 0.398 | 268.095 |
| 6:45:00 PM | 11.635 | 0.378 | 264.961 |
| 7:00:00 PM | 11.893 | 0 | 258.402 |
| 7:15:00 PM | 12.12 | 0.413 | 295.038 |
| 7:30:00 PM | 11.928 | 0.431 | 301.196 |
| 7:45:00 PM | 11.981 | 0.618 | 435.178 |
| 8:00:00 PM | 11.949 | 0.477 | 334.175 |
| 8:15:00 PM | 11.982 | 0.423 | 296.382 |
| 8:30:00 PM | 11.834 | 0.454 | 308.777 |
| 8:45:00 PM | 11.851 | 0.384 | 263.941 |
| 9:00:00 PM | 11.871 | 0.48 | 332.156 |
| 9:15:00 PM | 12.226 | 0 | 308.051 |
| 9:30:00 PM | 12.223 | 0 | 307.959 |
| 9:45:00 PM | 12.004 | 0.539 | 377.824 |
| 10:00:00 PM | 11.977 | 0.377 | 265.152 |
| 10:15:00 PM | 12.089 | 0.342 | 243.573 |
| 10:30:00 PM | 12.08 | 0.45 | 319.624 |
| 10:45:00 PM | 12.019 | 0.361 | 255.188 |
| 11:00:00 PM | 11.917 | 0.366 | 255.055 |
| 11:15:00 PM | 11.83 | 0.397 | 269.469 |
| 11:30:00 PM | 11.604 | 0.347 | 233.89 |
| 11:45:00 PM | 11.47 | 0.325 | 216.221 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 11.232 | 0.301 | 229.285 |
| Daily Min: | 9.746 | 0 | 110.827 |
| Daily Max: | 12.226 | 0.618 | 435.178 |
| Peak to Avg: | | | 1.90 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/12/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Wednesday - A.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 11.188 | 0.392 | 252.733 |
| 12:15:00 AM | 10.973 | 0.368 | 230.157 |
| 12:30:00 AM | 10.842 | 0.317 | 196.047 |
| 12:45:00 AM | 10.727 | 0.262 | 179.447 |
| 1:00:00 AM | 10.523 | 0.313 | 185.961 |
| 1:15:00 AM | 10.242 | 0.252 | 144.715 |
| 1:30:00 AM | 10.097 | 0 | 125.786 |
| 1:45:00 AM | 10.034 | 0 | 124.761 |
| 2:00:00 AM | 9.9 | 0.225 | 123.371 |
| 2:15:00 AM | 9.877 | 0 | 123.056 |
| 2:30:00 AM | 9.896 | 0 | 123.371 |
| 2:45:00 AM | 9.755 | 0 | 121.037 |
| 3:00:00 AM | 9.713 | 0 | 120.344 |
| 3:15:00 AM | 9.648 | 0 | 119.271 |
| 3:30:00 AM | 9.638 | 0 | 119.116 |
| 3:45:00 AM | 9.725 | 0 | 120.553 |
| 4:00:00 AM | 9.661 | 0 | 119.486 |
| 4:15:00 AM | 9.513 | 0 | 117.052 |
| 4:30:00 AM | 9.547 | 0 | 117.604 |
| 4:45:00 AM | 9.437 | 0 | 115.793 |
| 5:00:00 AM | 9.58 | 0 | 118.155 |
| 5:15:00 AM | 9.593 | 0 | 118.367 |
| 5:30:00 AM | 9.744 | 0.248 | 130.973 |
| 5:45:00 AM | 9.808 | 0 | 115.449 |
| 6:00:00 AM | 9.865 | 0.249 | 136.239 |
| 6:15:00 AM | 10.063 | 0.257 | 143.859 |
| 6:30:00 AM | 10.105 | 0 | 144.653 |
| 6:45:00 AM | 10.151 | 0.326 | 184.798 |
| 7:00:00 AM | 10.193 | 0.316 | 180.124 |
| 7:15:00 AM | 10.321 | 0 | 145.168 |
| 7:30:00 AM | 10.524 | 0 | 148.934 |
| 7:45:00 AM | 10.45 | 0.273 | 160.933 |
| 8:00:00 AM | 10.567 | 0 | 163.305 |
| 8:15:00 AM | 10.92 | 0.295 | 184.067 |
| 8:30:00 AM | 11.027 | 0.356 | 224.6 |
| 8:45:00 AM | 10.991 | 0.337 | 212.08 |
| 9:00:00 AM | 11.174 | 0.408 | 262.164 |
| 9:15:00 AM | 11.292 | 0.372 | 264.691 |
| 9:30:00 AM | 11.456 | 0.313 | 244.415 |
| 9:45:00 AM | 11.437 | 0 | 207.608 |
| 10:00:00 AM | 11.303 | 0.339 | 217.189 |
| 10:15:00 AM | 11.151 | 0.44 | 282.117 |
| 10:30:00 AM | 11.156 | 0.257 | 164.233 |
| 10:45:00 AM | 11.242 | 0.295 | 191.309 |
| 11:00:00 AM | 11.209 | 0.257 | 166.162 |
| 11:15:00 AM | 10.954 | 0.281 | 175.586 |
| 11:30:00 AM | 10.992 | 0 | 163.391 |
| 11:45:00 AM | 11.422 | 0.35 | 231.737 |

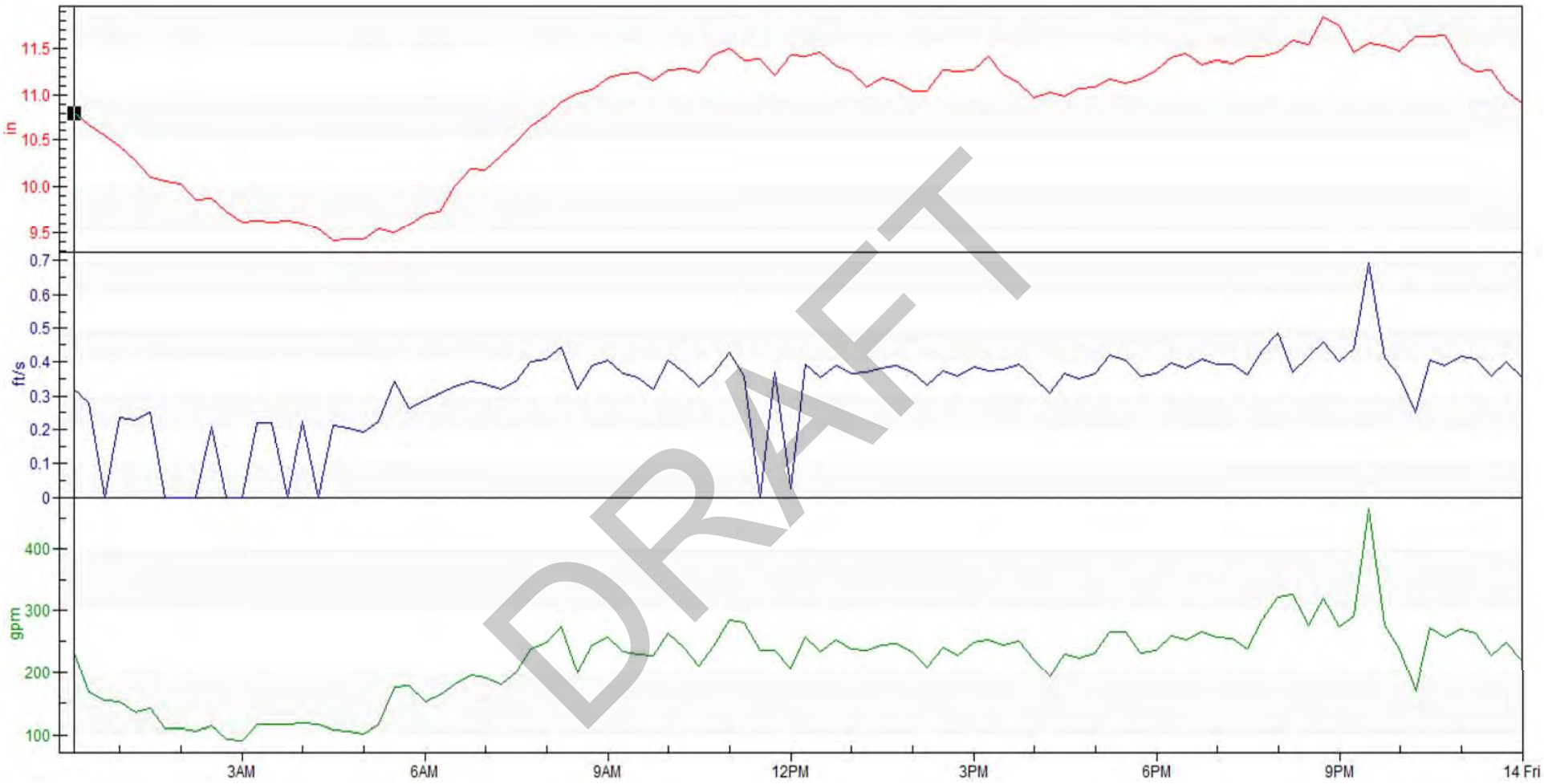
**Wednesday - P.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.49 | 0.312 | 233.534 |
| 12:15:00 PM | 11.184 | 0.371 | 238.961 |
| 12:30:00 PM | 11.198 | 0.169 | 196.427 |
| 12:45:00 PM | 11.301 | 0.275 | 179.298 |
| 1:00:00 PM | 11.294 | 0.321 | 209.227 |
| 1:15:00 PM | 11.242 | 0.333 | 214.065 |
| 1:30:00 PM | 11.313 | 0.416 | 271.759 |
| 1:45:00 PM | 11.245 | 0 | 269.633 |
| 2:00:00 PM | 11.255 | 0.312 | 199.498 |
| 2:15:00 PM | 11.181 | 0.36 | 231.294 |
| 2:30:00 PM | 11.15 | 0.319 | 204.611 |
| 2:45:00 PM | 11.165 | 0.4 | 257.082 |
| 3:00:00 PM | 11.014 | 0.222 | 202.164 |
| 3:15:00 PM | 11.184 | 0.439 | 280.807 |
| 3:30:00 PM | 11.148 | 0.334 | 260.801 |
| 3:45:00 PM | 11.098 | 0.336 | 214.541 |
| 4:00:00 PM | 11.179 | 0.316 | 215.588 |
| 4:15:00 PM | 11.073 | 0.317 | 201.374 |
| 4:30:00 PM | 11.305 | 0 | 206.857 |
| 4:45:00 PM | 11.086 | 0.38 | 240.759 |
| 5:00:00 PM | 11.158 | 0.592 | 380.4 |
| 5:15:00 PM | 11.215 | 0.377 | 243.637 |
| 5:30:00 PM | 11.492 | 0.423 | 282.252 |
| 5:45:00 PM | 11.412 | 0.573 | 378.913 |
| 6:00:00 PM | 11.376 | 0.4 | 263.379 |
| 6:15:00 PM | 11.462 | 0.467 | 309.845 |
| 6:30:00 PM | 11.486 | 0.452 | 301.584 |
| 6:45:00 PM | 11.475 | 0.407 | 270.867 |
| 7:00:00 PM | 11.434 | 0 | 132.976 |
| 7:15:00 PM | 11.533 | 0.412 | 274.591 |
| 7:30:00 PM | 11.471 | 0.383 | 253.446 |
| 7:45:00 PM | 11.485 | 0.288 | 190.789 |
| 8:00:00 PM | 11.55 | 0.427 | 286.463 |
| 8:15:00 PM | 11.484 | 0.414 | 276.182 |
| 8:30:00 PM | 11.708 | 0.401 | 274.096 |
| 8:45:00 PM | 11.714 | 0.432 | 295.645 |
| 9:00:00 PM | 11.732 | 0.442 | 302.45 |
| 9:15:00 PM | 11.654 | 0.403 | 274.665 |
| 9:30:00 PM | 11.655 | 0.379 | 257.752 |
| 9:45:00 PM | 11.819 | 0.372 | 257.121 |
| 10:00:00 PM | 11.93 | 0.473 | 330.985 |
| 10:15:00 PM | 11.947 | 0.361 | 331.575 |
| 10:30:00 PM | 11.722 | 0.398 | 269.839 |
| 10:45:00 PM | 11.764 | 0.44 | 301.983 |
| 11:00:00 PM | 11.754 | 0.43 | 295.507 |
| 11:15:00 PM | 11.68 | 0.402 | 293.118 |
| 11:30:00 PM | 11.44 | 0.367 | 239.205 |
| 11:45:00 PM | 11.181 | 0.364 | 232.871 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.908 | 0.262 | 210.944 |
| Daily Min: | 9.437 | 0 | 115.449 |
| Daily Max: | 11.947 | 0.592 | 380.4 |
| Peak to Avg: | | | 1.80 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/13/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Thursday - A.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 11.004 | 0.375 | 231.892 |
| 12:15:00 AM | 10.79 | 0.317 | 230.763 |
| 12:30:00 AM | 10.662 | 0.28 | 168.132 |
| 12:45:00 AM | 10.545 | 0 | 154.368 |
| 1:00:00 AM | 10.433 | 0.235 | 152.232 |
| 1:15:00 AM | 10.27 | 0.227 | 135.633 |
| 1:30:00 AM | 10.107 | 0.25 | 141.168 |
| 1:45:00 AM | 10.057 | 0 | 109.17 |
| 2:00:00 AM | 10.036 | 0 | 108.862 |
| 2:15:00 AM | 9.854 | 0 | 106.244 |
| 2:30:00 AM | 9.866 | 0.208 | 113.1 |
| 2:45:00 AM | 9.724 | 0 | 92.29 |
| 3:00:00 AM | 9.622 | 0 | 90.993 |
| 3:15:00 AM | 9.634 | 0.219 | 116.096 |
| 3:30:00 AM | 9.608 | 0.221 | 116.37 |
| 3:45:00 AM | 9.629 | 0 | 116.712 |
| 4:00:00 AM | 9.606 | 0.224 | 118.066 |
| 4:15:00 AM | 9.538 | 0 | 117.137 |
| 4:30:00 AM | 9.413 | 0.212 | 108.545 |
| 4:45:00 AM | 9.429 | 0.205 | 105.182 |
| 5:00:00 AM | 9.428 | 0.195 | 100.158 |
| 5:15:00 AM | 9.547 | 0.224 | 117.206 |
| 5:30:00 AM | 9.5 | 0.342 | 175.437 |
| 5:45:00 AM | 9.587 | 0.262 | 177.247 |
| 6:00:00 AM | 9.697 | 0.287 | 153.18 |
| 6:15:00 AM | 9.73 | 0.305 | 163.489 |
| 6:30:00 AM | 10.007 | 0.325 | 181.083 |
| 6:45:00 AM | 10.186 | 0.342 | 195.029 |
| 7:00:00 AM | 10.174 | 0.335 | 190.667 |
| 7:15:00 AM | 10.334 | 0.316 | 180.33 |
| 7:30:00 AM | 10.48 | 0.34 | 199.02 |
| 7:45:00 AM | 10.655 | 0.4 | 237.571 |
| 8:00:00 AM | 10.768 | 0.408 | 249.749 |
| 8:15:00 AM | 10.92 | 0.443 | 273.673 |
| 8:30:00 AM | 11.005 | 0.316 | 199.333 |
| 8:45:00 AM | 11.048 | 0.388 | 244.894 |
| 9:00:00 AM | 11.175 | 0.403 | 257.604 |
| 9:15:00 AM | 11.221 | 0.365 | 234.811 |
| 9:30:00 AM | 11.241 | 0.355 | 230.146 |
| 9:45:00 AM | 11.155 | 0.317 | 226.931 |
| 10:00:00 AM | 11.263 | 0.405 | 263.116 |
| 10:15:00 AM | 11.276 | 0.37 | 240.019 |
| 10:30:00 AM | 11.24 | 0.324 | 210.27 |
| 10:45:00 AM | 11.429 | 0.366 | 242.636 |
| 11:00:00 AM | 11.505 | 0.427 | 284.437 |
| 11:15:00 AM | 11.371 | 0.357 | 280.73 |
| 11:30:00 AM | 11.38 | 0 | 235.091 |
| 11:45:00 AM | 11.206 | 0.367 | 236.4 |

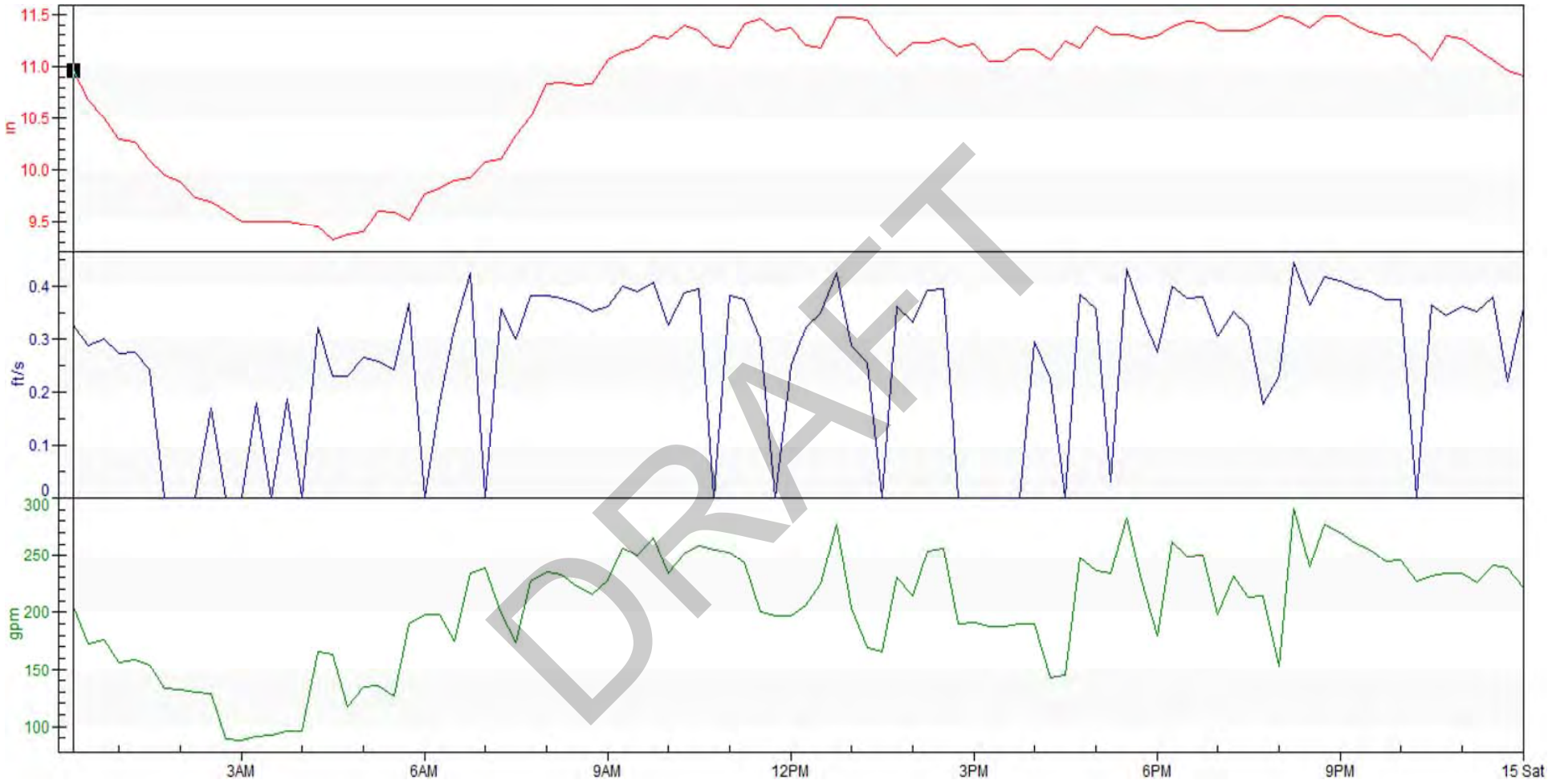
**Thursday - P.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.431 | 0.024 | 207.032 |
| 12:15:00 PM | 11.406 | 0.391 | 258.197 |
| 12:30:00 PM | 11.457 | 0.354 | 233.366 |
| 12:45:00 PM | 11.308 | 0.389 | 253.81 |
| 1:00:00 PM | 11.253 | 0.366 | 237.877 |
| 1:15:00 PM | 11.086 | 0.371 | 235.471 |
| 1:30:00 PM | 11.177 | 0.379 | 243.547 |
| 1:45:00 PM | 11.141 | 0.389 | 246.087 |
| 2:00:00 PM | 11.038 | 0.368 | 233.091 |
| 2:15:00 PM | 11.041 | 0.331 | 208.937 |
| 2:30:00 PM | 11.262 | 0.372 | 239.524 |
| 2:45:00 PM | 11.255 | 0.357 | 227.637 |
| 3:00:00 PM | 11.272 | 0.383 | 249.163 |
| 3:15:00 PM | 11.411 | 0.371 | 252.273 |
| 3:30:00 PM | 11.231 | 0.376 | 243.474 |
| 3:45:00 PM | 11.122 | 0.394 | 251.389 |
| 4:00:00 PM | 10.964 | 0.351 | 220.414 |
| 4:15:00 PM | 11.028 | 0.306 | 193.674 |
| 4:30:00 PM | 10.981 | 0.367 | 229.526 |
| 4:45:00 PM | 11.068 | 0.35 | 222.374 |
| 5:00:00 PM | 11.081 | 0.366 | 232.55 |
| 5:15:00 PM | 11.163 | 0.42 | 266.519 |
| 5:30:00 PM | 11.122 | 0.405 | 266.466 |
| 5:45:00 PM | 11.17 | 0.359 | 230.728 |
| 6:00:00 PM | 11.263 | 0.363 | 235.99 |
| 6:15:00 PM | 11.4 | 0.395 | 259.635 |
| 6:30:00 PM | 11.446 | 0.381 | 252.697 |
| 6:45:00 PM | 11.33 | 0.408 | 266.642 |
| 7:00:00 PM | 11.373 | 0.39 | 256.942 |
| 7:15:00 PM | 11.341 | 0.391 | 255.751 |
| 7:30:00 PM | 11.408 | 0.361 | 238.402 |
| 7:45:00 PM | 11.419 | 0.43 | 284.332 |
| 8:00:00 PM | 11.457 | 0.485 | 322.034 |
| 8:15:00 PM | 11.577 | 0.368 | 326.377 |
| 8:30:00 PM | 11.544 | 0.414 | 277.574 |
| 8:45:00 PM | 11.844 | 0.46 | 319.215 |
| 9:00:00 PM | 11.737 | 0.4 | 274.204 |
| 9:15:00 PM | 11.449 | 0.44 | 290.531 |
| 9:30:00 PM | 11.555 | 0.691 | 464.318 |
| 9:45:00 PM | 11.525 | 0.412 | 276.014 |
| 10:00:00 PM | 11.466 | 0.357 | 237.169 |
| 10:15:00 PM | 11.625 | 0.25 | 169.474 |
| 10:30:00 PM | 11.625 | 0.404 | 273.193 |
| 10:45:00 PM | 11.637 | 0.388 | 258.103 |
| 11:00:00 PM | 11.357 | 0.415 | 270.749 |
| 11:15:00 PM | 11.26 | 0.408 | 263.435 |
| 11:30:00 PM | 11.266 | 0.358 | 227.71 |
| 11:45:00 PM | 11.037 | 0.4 | 248.255 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.850 | 0.318 | 216.981 |
| Daily Min: | 9.413 | 0 | 90.993 |
| Daily Max: | 11.844 | 0.691 | 464.318 |
| Peak to Avg: | | | 2.14 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/14/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Friday - A.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.911 | 0.353 | 219.617 |
| 12:15:00 AM | 10.955 | 0.327 | 205.045 |
| 12:30:00 AM | 10.674 | 0.287 | 172.345 |
| 12:45:00 AM | 10.499 | 0.298 | 176.094 |
| 1:00:00 AM | 10.302 | 0.271 | 156.836 |
| 1:15:00 AM | 10.271 | 0.275 | 158.221 |
| 1:30:00 AM | 10.093 | 0.241 | 154.617 |
| 1:45:00 AM | 9.951 | 0 | 133.364 |
| 2:00:00 AM | 9.892 | 0 | 132.315 |
| 2:15:00 AM | 9.733 | 0 | 129.495 |
| 2:30:00 AM | 9.691 | 0.17 | 128.747 |
| 2:45:00 AM | 9.61 | 0 | 89.704 |
| 3:00:00 AM | 9.507 | 0 | 88.423 |
| 3:15:00 AM | 9.507 | 0.178 | 91.441 |
| 3:30:00 AM | 9.504 | 0 | 92.532 |
| 3:45:00 AM | 9.502 | 0.186 | 96.352 |
| 4:00:00 AM | 9.476 | 0 | 96.252 |
| 4:15:00 AM | 9.456 | 0.322 | 166.079 |
| 4:30:00 AM | 9.325 | 0.23 | 163.335 |
| 4:45:00 AM | 9.377 | 0.23 | 117.221 |
| 5:00:00 AM | 9.4 | 0.263 | 134.789 |
| 5:15:00 AM | 9.606 | 0.256 | 135.216 |
| 5:30:00 AM | 9.591 | 0.242 | 126.765 |
| 5:45:00 AM | 9.514 | 0.366 | 190.345 |
| 6:00:00 AM | 9.777 | 0 | 197.569 |
| 6:15:00 AM | 9.818 | 0.179 | 198.653 |
| 6:30:00 AM | 9.896 | 0.319 | 174.685 |
| 6:45:00 AM | 9.928 | 0.425 | 234.168 |
| 7:00:00 AM | 10.076 | 0 | 238.817 |
| 7:15:00 AM | 10.11 | 0.356 | 199.067 |
| 7:30:00 AM | 10.336 | 0.299 | 173.976 |
| 7:45:00 AM | 10.518 | 0.381 | 226.579 |
| 8:00:00 AM | 10.836 | 0.381 | 235.709 |
| 8:15:00 AM | 10.844 | 0.375 | 232.311 |
| 8:30:00 AM | 10.822 | 0.366 | 222.853 |
| 8:45:00 AM | 10.829 | 0.352 | 215.825 |
| 9:00:00 AM | 11.066 | 0.363 | 228.107 |
| 9:15:00 AM | 11.141 | 0.4 | 256.162 |
| 9:30:00 AM | 11.176 | 0.389 | 250.119 |
| 9:45:00 AM | 11.299 | 0.406 | 264.686 |
| 10:00:00 AM | 11.27 | 0.326 | 233.406 |
| 10:15:00 AM | 11.394 | 0.385 | 250.904 |
| 10:30:00 AM | 11.343 | 0.395 | 258.831 |
| 10:45:00 AM | 11.202 | 0 | 254.678 |
| 11:00:00 AM | 11.178 | 0.382 | 252.774 |
| 11:15:00 AM | 11.407 | 0.375 | 242.969 |
| 11:30:00 AM | 11.457 | 0.299 | 200.357 |
| 11:45:00 AM | 11.345 | 0 | 196.422 |

**Friday - P.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.365 | 0.25 | 196.874 |
| 12:15:00 PM | 11.198 | 0.321 | 205.912 |
| 12:30:00 PM | 11.178 | 0.349 | 224.517 |
| 12:45:00 PM | 11.474 | 0.424 | 276.868 |
| 1:00:00 PM | 11.475 | 0.285 | 203.707 |
| 1:15:00 PM | 11.441 | 0.255 | 168.948 |
| 1:30:00 PM | 11.241 | 0 | 165.158 |
| 1:45:00 PM | 11.099 | 0.361 | 230.423 |
| 2:00:00 PM | 11.223 | 0.332 | 214.571 |
| 2:15:00 PM | 11.223 | 0.392 | 253.332 |
| 2:30:00 PM | 11.269 | 0.394 | 256.416 |
| 2:45:00 PM | 11.192 | 0 | 190.363 |
| 3:00:00 PM | 11.215 | 0 | 190.867 |
| 3:15:00 PM | 11.056 | 0 | 187.353 |
| 3:30:00 PM | 11.055 | 0 | 187.344 |
| 3:45:00 PM | 11.169 | 0 | 189.847 |
| 4:00:00 PM | 11.159 | 0.294 | 189.629 |
| 4:15:00 PM | 11.062 | 0.224 | 142.021 |
| 4:30:00 PM | 11.243 | 0 | 145.044 |
| 4:45:00 PM | 11.176 | 0.385 | 247.823 |
| 5:00:00 PM | 11.388 | 0.358 | 235.745 |
| 5:15:00 PM | 11.301 | 0.03 | 233.405 |
| 5:30:00 PM | 11.302 | 0.433 | 282.43 |
| 5:45:00 PM | 11.27 | 0.35 | 227.676 |
| 6:00:00 PM | 11.29 | 0.275 | 179.28 |
| 6:15:00 PM | 11.38 | 0.398 | 262.238 |
| 6:30:00 PM | 11.431 | 0.377 | 248.621 |
| 6:45:00 PM | 11.42 | 0.378 | 250.203 |
| 7:00:00 PM | 11.338 | 0.304 | 198.606 |
| 7:15:00 PM | 11.346 | 0.352 | 231.281 |
| 7:30:00 PM | 11.341 | 0.324 | 212.6 |
| 7:45:00 PM | 11.397 | 0.177 | 213.961 |
| 8:00:00 PM | 11.48 | 0.229 | 152.845 |
| 8:15:00 PM | 11.453 | 0.443 | 290.424 |
| 8:30:00 PM | 11.374 | 0.364 | 239.628 |
| 8:45:00 PM | 11.485 | 0.416 | 277.054 |
| 9:00:00 PM | 11.479 | 0.408 | 269.844 |
| 9:15:00 PM | 11.396 | 0.397 | 261.167 |
| 9:30:00 PM | 11.336 | 0.389 | 254.707 |
| 9:45:00 PM | 11.298 | 0.375 | 244.153 |
| 10:00:00 PM | 11.311 | 0.375 | 244.975 |
| 10:15:00 PM | 11.209 | 0 | 226.502 |
| 10:30:00 PM | 11.067 | 0.365 | 231.996 |
| 10:45:00 PM | 11.294 | 0.344 | 233.684 |
| 11:00:00 PM | 11.27 | 0.36 | 234.288 |
| 11:15:00 PM | 11.169 | 0.351 | 225.766 |
| 11:30:00 PM | 11.065 | 0.38 | 240.441 |
| 11:45:00 PM | 10.963 | 0.219 | 238.413 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.799 | 0.260 | 202.991 |
| Daily Min: | 9.325 | 0 | 88.423 |
| Daily Max: | 11.485 | 0.443 | 290.424 |
| Peak to Avg: | | | 1.43 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/15/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Saturday - A.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.909 | 0.358 | 221.001 |
| 12:15:00 AM | 10.762 | 0.376 | 228.583 |
| 12:30:00 AM | 10.734 | 0 | 188.613 |
| 12:45:00 AM | 10.585 | 0 | 185.192 |
| 1:00:00 AM | 10.42 | 0.149 | 181.416 |
| 1:15:00 AM | 10.242 | 0.193 | 111.014 |
| 1:30:00 AM | 10.212 | 0 | 110.583 |
| 1:45:00 AM | 10.085 | 0.234 | 131.068 |
| 2:00:00 AM | 10.035 | 0.354 | 197.614 |
| 2:15:00 AM | 9.942 | 0 | 148.686 |
| 2:30:00 AM | 9.908 | 0.284 | 154.346 |
| 2:45:00 AM | 9.818 | 0.228 | 153.884 |
| 3:00:00 AM | 9.648 | 0 | 120.986 |
| 3:15:00 AM | 9.589 | 0 | 119.994 |
| 3:30:00 AM | 9.599 | 0.248 | 130.86 |
| 3:45:00 AM | 9.614 | 0 | 131.13 |
| 4:00:00 AM | 9.618 | 0.264 | 139.255 |
| 4:15:00 AM | 9.538 | 0 | 137.716 |
| 4:30:00 AM | 9.438 | 0 | 135.777 |
| 4:45:00 AM | 9.402 | 0.192 | 98.33 |
| 5:00:00 AM | 9.427 | 0 | 98.687 |
| 5:15:00 AM | 9.433 | 0 | 98.775 |
| 5:30:00 AM | 9.552 | 0.225 | 117.722 |
| 5:45:00 AM | 9.524 | 0 | 117.252 |
| 6:00:00 AM | 9.416 | 0.255 | 130.804 |
| 6:15:00 AM | 9.537 | 0.263 | 137.301 |
| 6:30:00 AM | 9.513 | 0.269 | 140.085 |
| 6:45:00 AM | 9.522 | 0.211 | 138.957 |
| 7:00:00 AM | 9.638 | 0 | 111.949 |
| 7:15:00 AM | 9.796 | 0 | 114.402 |
| 7:30:00 AM | 10.052 | 0 | 118.386 |
| 7:45:00 AM | 10.042 | 0.329 | 183.611 |
| 8:00:00 AM | 10.175 | 0.524 | 295.258 |
| 8:15:00 AM | 10.313 | 0.396 | 229.571 |
| 8:30:00 AM | 10.324 | 0.336 | 193.748 |
| 8:45:00 AM | 10.591 | 0.393 | 230.544 |
| 9:00:00 AM | 10.847 | 0.411 | 246.74 |
| 9:15:00 AM | 10.975 | 0.592 | 370.711 |
| 9:30:00 AM | 11.201 | 0.455 | 293.602 |
| 9:45:00 AM | 11.566 | 0.374 | 245.995 |
| 10:00:00 AM | 11.542 | 0.5 | 332.878 |
| 10:15:00 AM | 11.562 | 0.477 | 317.844 |
| 10:30:00 AM | 11.578 | 0.451 | 301.394 |
| 10:45:00 AM | 11.741 | 0.482 | 328.436 |
| 11:00:00 AM | 11.763 | 0 | 331.241 |
| 11:15:00 AM | 11.709 | 0.425 | 289.87 |
| 11:30:00 AM | 11.792 | 0.466 | 321.561 |
| 11:45:00 AM | 11.695 | 0.573 | 389.483 |

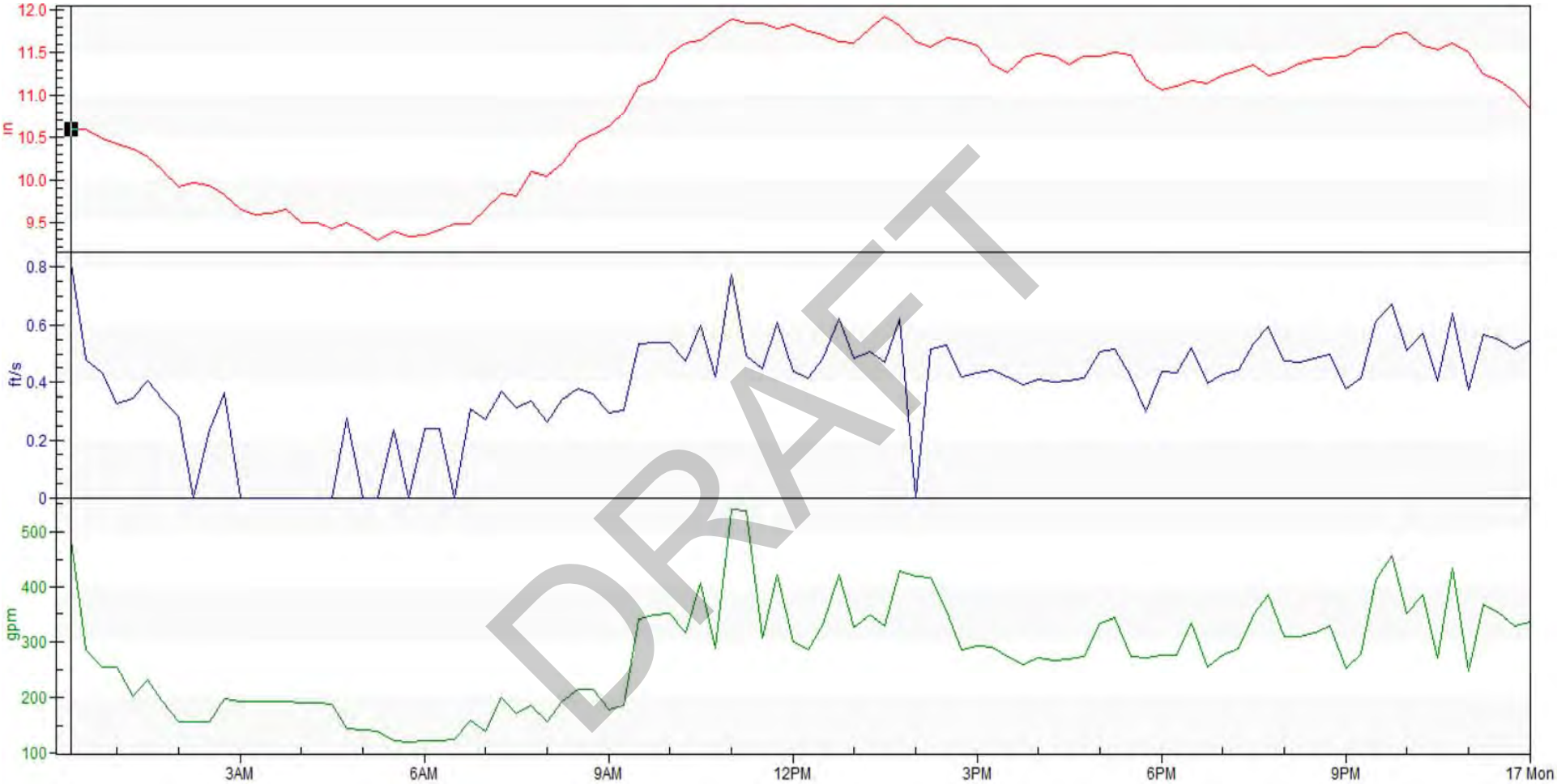
**Saturday - P.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.696 | 0.661 | 449.317 |
| 12:15:00 PM | 11.77 | 0.508 | 349.285 |
| 12:30:00 PM | 11.84 | 0.374 | 259.048 |
| 12:45:00 PM | 11.95 | 0.516 | 360.984 |
| 1:00:00 PM | 11.962 | 0.477 | 361.42 |
| 1:15:00 PM | 11.879 | 0.505 | 349.506 |
| 1:30:00 PM | 11.824 | 0.461 | 318.379 |
| 1:45:00 PM | 11.809 | 0.552 | 381.308 |
| 2:00:00 PM | 11.785 | 0.545 | 374.48 |
| 2:15:00 PM | 11.697 | 0.501 | 340.986 |
| 2:30:00 PM | 11.775 | 0.565 | 389.126 |
| 2:45:00 PM | 11.804 | 0.634 | 437.674 |
| 3:00:00 PM | 11.732 | 0.446 | 373.705 |
| 3:15:00 PM | 11.699 | 0.475 | 324.094 |
| 3:30:00 PM | 11.662 | 0.538 | 365.53 |
| 3:45:00 PM | 11.668 | 0.5 | 340.145 |
| 4:00:00 PM | 11.723 | 0.504 | 343.528 |
| 4:15:00 PM | 11.652 | 0.567 | 382.931 |
| 4:30:00 PM | 11.519 | 0.529 | 354.238 |
| 4:45:00 PM | 11.331 | 0.596 | 390.6 |
| 5:00:00 PM | 11.326 | 0.43 | 390.364 |
| 5:15:00 PM | 11.393 | 0.401 | 264.382 |
| 5:30:00 PM | 11.387 | 0.448 | 295.09 |
| 5:45:00 PM | 11.383 | 0.521 | 343.515 |
| 6:00:00 PM | 11.327 | 0.469 | 305.904 |
| 6:15:00 PM | 11.385 | 0.457 | 301.388 |
| 6:30:00 PM | 11.393 | 0.468 | 308.403 |
| 6:45:00 PM | 11.297 | 0.46 | 299.64 |
| 7:00:00 PM | 11.236 | 0.374 | 242.174 |
| 7:15:00 PM | 11.323 | 0.506 | 331.406 |
| 7:30:00 PM | 11.203 | 0.617 | 388.405 |
| 7:45:00 PM | 11.2 | 0.439 | 282.406 |
| 8:00:00 PM | 11.143 | 0.453 | 290.548 |
| 8:15:00 PM | 11.148 | 0.458 | 293.947 |
| 8:30:00 PM | 11.201 | 0.503 | 323.646 |
| 8:45:00 PM | 11.271 | 0.664 | 430.739 |
| 9:00:00 PM | 11.323 | 0.6 | 388.396 |
| 9:15:00 PM | 11.122 | 0.556 | 383.898 |
| 9:30:00 PM | 11.025 | 0.376 | 237.508 |
| 9:45:00 PM | 10.974 | 0.398 | 249.184 |
| 10:00:00 PM | 11.264 | 0.424 | 268.423 |
| 10:15:00 PM | 11.378 | 0.327 | 215.247 |
| 10:30:00 PM | 11.362 | 0.581 | 380.552 |
| 10:45:00 PM | 11.306 | 0 | 379.592 |
| 11:00:00 PM | 11.193 | 0.454 | 292.946 |
| 11:15:00 PM | 10.992 | 0.412 | 271.602 |
| 11:30:00 PM | 11.033 | 0.538 | 339.645 |
| 11:45:00 PM | 11.024 | 0.505 | 315.834 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.878 | 0.360 | 264.136 |
| Daily Min: | 9.402 | 0 | 98.33 |
| Daily Max: | 11.962 | 0.664 | 449.317 |
| Peak to Avg: | | | 1.70 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/16/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Sunday - A.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.754 | 0.382 | 232.604 |
| 12:15:00 AM | 10.589 | 0.813 | 485.304 |
| 12:30:00 AM | 10.59 | 0.481 | 287.362 |
| 12:45:00 AM | 10.481 | 0.436 | 255.478 |
| 1:00:00 AM | 10.422 | 0.329 | 254.888 |
| 1:15:00 AM | 10.364 | 0.347 | 202.253 |
| 1:30:00 AM | 10.27 | 0.406 | 230.526 |
| 1:45:00 AM | 10.105 | 0.341 | 192.183 |
| 2:00:00 AM | 9.913 | 0.283 | 155.47 |
| 2:15:00 AM | 9.965 | 0 | 156.552 |
| 2:30:00 AM | 9.931 | 0.238 | 155.844 |
| 2:45:00 AM | 9.831 | 0.364 | 196.851 |
| 3:00:00 AM | 9.653 | 0 | 193.151 |
| 3:15:00 AM | 9.597 | 0 | 191.648 |
| 3:30:00 AM | 9.607 | 0 | 191.929 |
| 3:45:00 AM | 9.648 | 0 | 192.998 |
| 4:00:00 AM | 9.498 | 0 | 189.021 |
| 4:15:00 AM | 9.498 | 0 | 189.019 |
| 4:30:00 AM | 9.413 | 0 | 186.749 |
| 4:45:00 AM | 9.493 | 0.278 | 144.316 |
| 5:00:00 AM | 9.384 | 0 | 142.097 |
| 5:15:00 AM | 9.279 | 0 | 139.964 |
| 5:30:00 AM | 9.392 | 0.239 | 122.098 |
| 5:45:00 AM | 9.326 | 0 | 120.955 |
| 6:00:00 AM | 9.345 | 0.24 | 122.161 |
| 6:15:00 AM | 9.406 | 0.24 | 122.884 |
| 6:30:00 AM | 9.478 | 0 | 124.15 |
| 6:45:00 AM | 9.481 | 0.308 | 159.448 |
| 7:00:00 AM | 9.66 | 0.272 | 140.085 |
| 7:15:00 AM | 9.84 | 0.371 | 200.858 |
| 7:30:00 AM | 9.806 | 0.314 | 169.718 |
| 7:45:00 AM | 10.093 | 0.335 | 184.956 |
| 8:00:00 AM | 10.049 | 0.264 | 156.782 |
| 8:15:00 AM | 10.181 | 0.341 | 192.309 |
| 8:30:00 AM | 10.443 | 0.377 | 215.082 |
| 8:45:00 AM | 10.531 | 0.358 | 213.272 |
| 9:00:00 AM | 10.626 | 0.297 | 178.62 |
| 9:15:00 AM | 10.789 | 0.303 | 186.288 |
| 9:30:00 AM | 11.102 | 0.536 | 342.072 |
| 9:45:00 AM | 11.185 | 0.542 | 348.148 |
| 10:00:00 AM | 11.486 | 0.54 | 351.047 |
| 10:15:00 AM | 11.603 | 0.474 | 317.759 |
| 10:30:00 AM | 11.636 | 0.6 | 405.313 |
| 10:45:00 AM | 11.762 | 0.421 | 289.313 |
| 11:00:00 AM | 11.895 | 0.775 | 540.432 |
| 11:15:00 AM | 11.844 | 0.492 | 537.409 |
| 11:30:00 AM | 11.839 | 0.447 | 308.873 |
| 11:45:00 AM | 11.784 | 0.61 | 419.903 |

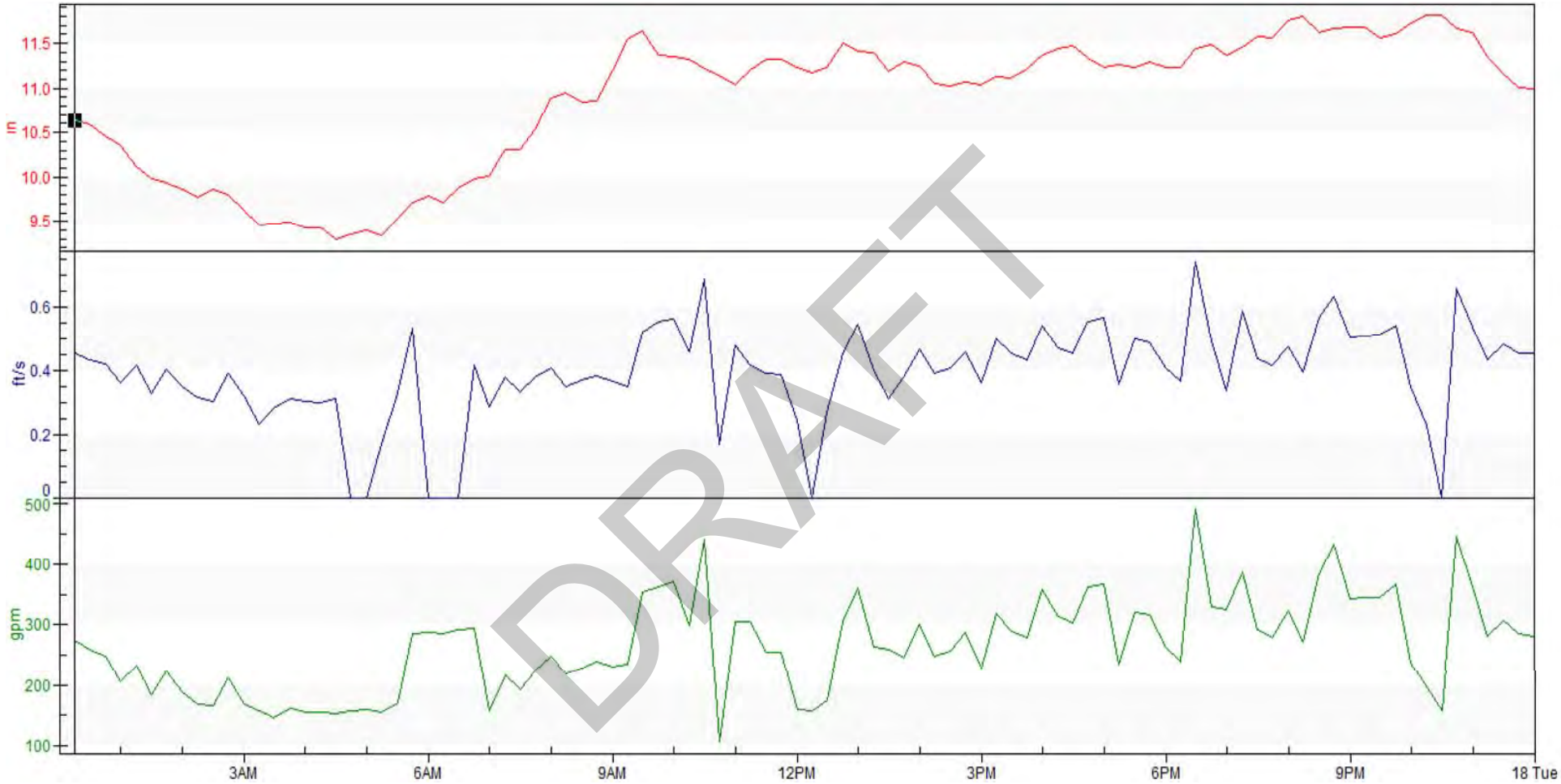
**Sunday - P.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.828 | 0.437 | 300.74 |
| 12:15:00 PM | 11.748 | 0.417 | 286.412 |
| 12:30:00 PM | 11.709 | 0.484 | 330.754 |
| 12:45:00 PM | 11.628 | 0.623 | 421.863 |
| 1:00:00 PM | 11.615 | 0.483 | 326.692 |
| 1:15:00 PM | 11.775 | 0.508 | 349.645 |
| 1:30:00 PM | 11.922 | 0.47 | 328.972 |
| 1:45:00 PM | 11.807 | 0.62 | 428.128 |
| 2:00:00 PM | 11.618 | 0 | 419.361 |
| 2:15:00 PM | 11.565 | 0.515 | 416.895 |
| 2:30:00 PM | 11.668 | 0.532 | 356.269 |
| 2:45:00 PM | 11.635 | 0.421 | 285.592 |
| 3:00:00 PM | 11.575 | 0.436 | 293.349 |
| 3:15:00 PM | 11.359 | 0.443 | 290.98 |
| 3:30:00 PM | 11.267 | 0.422 | 274.59 |
| 3:45:00 PM | 11.436 | 0.391 | 259.005 |
| 4:00:00 PM | 11.486 | 0.409 | 270.991 |
| 4:15:00 PM | 11.446 | 0.402 | 266.551 |
| 4:30:00 PM | 11.357 | 0.409 | 268.423 |
| 4:45:00 PM | 11.455 | 0.416 | 275.099 |
| 5:00:00 PM | 11.445 | 0.509 | 335.351 |
| 5:15:00 PM | 11.496 | 0.518 | 344.367 |
| 5:30:00 PM | 11.471 | 0.42 | 274.721 |
| 5:45:00 PM | 11.193 | 0.303 | 270.924 |
| 6:00:00 PM | 11.063 | 0.437 | 277.544 |
| 6:15:00 PM | 11.102 | 0.434 | 275.906 |
| 6:30:00 PM | 11.166 | 0.521 | 333.311 |
| 6:45:00 PM | 11.139 | 0.397 | 254.147 |
| 7:00:00 PM | 11.233 | 0.428 | 277.125 |
| 7:15:00 PM | 11.302 | 0.445 | 289.522 |
| 7:30:00 PM | 11.359 | 0.536 | 348.083 |
| 7:45:00 PM | 11.241 | 0.595 | 385.264 |
| 8:00:00 PM | 11.276 | 0.476 | 309.904 |
| 8:15:00 PM | 11.373 | 0.472 | 309.394 |
| 8:30:00 PM | 11.419 | 0.482 | 318.044 |
| 8:45:00 PM | 11.429 | 0.497 | 329.146 |
| 9:00:00 PM | 11.46 | 0.381 | 253.081 |
| 9:15:00 PM | 11.558 | 0.414 | 278.232 |
| 9:30:00 PM | 11.559 | 0.611 | 410.025 |
| 9:45:00 PM | 11.699 | 0.671 | 457.882 |
| 10:00:00 PM | 11.738 | 0.512 | 350.798 |
| 10:15:00 PM | 11.572 | 0.571 | 384.499 |
| 10:30:00 PM | 11.534 | 0.408 | 272.462 |
| 10:45:00 PM | 11.61 | 0.642 | 433.712 |
| 11:00:00 PM | 11.5 | 0.372 | 248.602 |
| 11:15:00 PM | 11.243 | 0.568 | 367.196 |
| 11:30:00 PM | 11.178 | 0.548 | 351.052 |
| 11:45:00 PM | 11.039 | 0.518 | 328.301 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.867 | 0.385 | 277.078 |
| Daily Min: | 9.279 | 0 | 120.955 |
| Daily Max: | 11.922 | 0.813 | 540.432 |
| Peak to Avg: | | | 1.95 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/17/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Monday - A.M. 7/17/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 10.846 | 0.548 | 337.004 |
| 12:15:00 AM | 10.632 | 0.456 | 273.097 |
| 12:30:00 AM | 10.594 | 0.435 | 257.864 |
| 12:45:00 AM | 10.463 | 0.42 | 247.71 |
| 1:00:00 AM | 10.353 | 0.362 | 206.835 |
| 1:15:00 AM | 10.113 | 0.415 | 232.693 |
| 1:30:00 AM | 9.985 | 0.331 | 183.51 |
| 1:45:00 AM | 9.939 | 0.404 | 222.608 |
| 2:00:00 AM | 9.858 | 0.348 | 188.961 |
| 2:15:00 AM | 9.772 | 0.316 | 169.336 |
| 2:30:00 AM | 9.862 | 0.305 | 166.245 |
| 2:45:00 AM | 9.808 | 0.392 | 212.19 |
| 3:00:00 AM | 9.62 | 0.32 | 168.873 |
| 3:15:00 AM | 9.465 | 0.234 | 157.584 |
| 3:30:00 AM | 9.478 | 0.281 | 145.669 |
| 3:45:00 AM | 9.485 | 0.312 | 160.908 |
| 4:00:00 AM | 9.426 | 0.303 | 154.921 |
| 4:15:00 AM | 9.433 | 0.3 | 154.335 |
| 4:30:00 AM | 9.294 | 0.31 | 153.911 |
| 4:45:00 AM | 9.357 | 0 | 157.972 |
| 5:00:00 AM | 9.396 | 0 | 158.854 |
| 5:15:00 AM | 9.341 | 0.168 | 156.091 |
| 5:30:00 AM | 9.535 | 0.327 | 170.127 |
| 5:45:00 AM | 9.718 | 0.532 | 284.624 |
| 6:00:00 AM | 9.787 | 0 | 287.309 |
| 6:15:00 AM | 9.706 | 0 | 284.149 |
| 6:30:00 AM | 9.881 | 0 | 290.98 |
| 6:45:00 AM | 9.984 | 0.417 | 295.011 |
| 7:00:00 AM | 10.006 | 0.287 | 158.106 |
| 7:15:00 AM | 10.307 | 0.379 | 217.79 |
| 7:30:00 AM | 10.313 | 0.335 | 193.515 |
| 7:45:00 AM | 10.539 | 0.379 | 222.888 |
| 8:00:00 AM | 10.884 | 0.407 | 246.901 |
| 8:15:00 AM | 10.946 | 0.351 | 219.828 |
| 8:30:00 AM | 10.848 | 0.369 | 228.281 |
| 8:45:00 AM | 10.864 | 0.384 | 238.092 |
| 9:00:00 AM | 11.207 | 0.367 | 229.374 |
| 9:15:00 AM | 11.551 | 0.35 | 234.123 |
| 9:30:00 AM | 11.64 | 0.521 | 353.137 |
| 9:45:00 AM | 11.369 | 0.554 | 361.557 |
| 10:00:00 AM | 11.357 | 0.564 | 370.4 |
| 10:15:00 AM | 11.318 | 0.46 | 299.268 |
| 10:30:00 AM | 11.217 | 0.687 | 442.366 |
| 10:45:00 AM | 11.142 | 0.168 | 107.476 |
| 11:00:00 AM | 11.039 | 0.481 | 304.716 |
| 11:15:00 AM | 11.198 | 0.416 | 305.903 |
| 11:30:00 AM | 11.323 | 0.391 | 255.41 |
| 11:45:00 AM | 11.329 | 0.388 | 253.431 |

**Monday - P.M. 7/17/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.229 | 0.246 | 159.491 |
| 12:15:00 PM | 11.177 | 0 | 158.529 |
| 12:30:00 PM | 11.237 | 0.27 | 174.67 |
| 12:45:00 PM | 11.504 | 0.456 | 304.61 |
| 1:00:00 PM | 11.413 | 0.544 | 359.838 |
| 1:15:00 PM | 11.391 | 0.4 | 264.007 |
| 1:30:00 PM | 11.184 | 0.313 | 257.8 |
| 1:45:00 PM | 11.293 | 0.378 | 246.539 |
| 2:00:00 PM | 11.242 | 0.468 | 300.946 |
| 2:15:00 PM | 11.054 | 0.392 | 248.19 |
| 2:30:00 PM | 11.017 | 0.408 | 257.244 |
| 2:45:00 PM | 11.067 | 0.456 | 287.992 |
| 3:00:00 PM | 11.033 | 0.363 | 228.449 |
| 3:15:00 PM | 11.131 | 0.5 | 318.26 |
| 3:30:00 PM | 11.108 | 0.456 | 289.898 |
| 3:45:00 PM | 11.218 | 0.432 | 279.17 |
| 4:00:00 PM | 11.374 | 0.544 | 357.895 |
| 4:15:00 PM | 11.444 | 0.472 | 312.833 |
| 4:30:00 PM | 11.469 | 0.455 | 302.743 |
| 4:45:00 PM | 11.339 | 0.553 | 362.275 |
| 5:00:00 PM | 11.238 | 0.568 | 365.901 |
| 5:15:00 PM | 11.264 | 0.358 | 234.408 |
| 5:30:00 PM | 11.228 | 0.501 | 319.32 |
| 5:45:00 PM | 11.296 | 0.488 | 315.491 |
| 6:00:00 PM | 11.235 | 0.408 | 264.217 |
| 6:15:00 PM | 11.24 | 0.367 | 238.034 |
| 6:30:00 PM | 11.436 | 0.741 | 491.486 |
| 6:45:00 PM | 11.486 | 0.493 | 328.508 |
| 7:00:00 PM | 11.374 | 0.339 | 324.4 |
| 7:15:00 PM | 11.462 | 0.589 | 387.427 |
| 7:30:00 PM | 11.578 | 0.437 | 292.056 |
| 7:45:00 PM | 11.559 | 0.415 | 277.966 |
| 8:00:00 PM | 11.753 | 0.475 | 321.525 |
| 8:15:00 PM | 11.801 | 0.396 | 273.019 |
| 8:30:00 PM | 11.625 | 0.568 | 384.644 |
| 8:45:00 PM | 11.669 | 0.634 | 431.532 |
| 9:00:00 PM | 11.684 | 0.503 | 342.512 |
| 9:15:00 PM | 11.68 | 0.508 | 345.361 |
| 9:30:00 PM | 11.56 | 0.513 | 343.965 |
| 9:45:00 PM | 11.609 | 0.543 | 366.727 |
| 10:00:00 PM | 11.721 | 0.349 | 237.861 |
| 10:15:00 PM | 11.808 | 0.228 | 195.229 |
| 10:30:00 PM | 11.815 | 0 | 157.805 |
| 10:45:00 PM | 11.671 | 0.657 | 445.772 |
| 11:00:00 PM | 11.625 | 0.536 | 361.149 |
| 11:15:00 PM | 11.353 | 0.432 | 280.524 |
| 11:30:00 PM | 11.162 | 0.485 | 307.19 |
| 11:45:00 PM | 11.008 | 0.452 | 285.299 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.858 | 0.390 | 265.007 |
| Daily Min: | 9.294 | 0 | 107.476 |
| Daily Max: | 11.815 | 0.741 | 491.486 |
| Peak to Avg: | | | 1.85 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/18/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Tuesday- A.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.99 | 0.453 | 280.813 |
| 12:15:00 AM | 10.785 | 0.321 | 197.034 |
| 12:30:00 AM | 10.535 | 0.355 | 210.128 |
| 12:45:00 AM | 10.549 | 0.649 | 386.837 |
| 1:00:00 AM | 10.324 | 0.433 | 248.033 |
| 1:15:00 AM | 10.1 | 0.385 | 214.809 |
| 1:30:00 AM | 9.953 | 0.371 | 204.324 |
| 1:45:00 AM | 9.87 | 0.379 | 206.125 |
| 2:00:00 AM | 9.725 | 0.355 | 188.953 |
| 2:15:00 AM | 9.687 | 0.315 | 166.437 |
| 2:30:00 AM | 9.769 | 0.311 | 167.477 |
| 2:45:00 AM | 9.665 | 0.281 | 158.979 |
| 3:00:00 AM | 9.399 | 0 | 143.777 |
| 3:15:00 AM | 9.366 | 0 | 143.094 |
| 3:30:00 AM | 9.349 | 0.267 | 134.579 |
| 3:45:00 AM | 9.348 | 0.265 | 134.94 |
| 4:00:00 AM | 9.341 | 0.271 | 137.226 |
| 4:15:00 AM | 9.279 | 0.242 | 120.285 |
| 4:30:00 AM | 9.049 | 0.228 | 110.009 |
| 4:45:00 AM | 9.249 | 0.224 | 112.448 |
| 5:00:00 AM | 9.28 | 0.274 | 137.923 |
| 5:15:00 AM | 9.372 | 0.322 | 164.401 |
| 5:30:00 AM | 9.432 | 0.329 | 169.172 |
| 5:45:00 AM | 9.36 | 0 | 107.19 |
| 6:00:00 AM | 9.562 | 0.307 | 160.606 |
| 6:15:00 AM | 9.668 | 0.357 | 189.736 |
| 6:30:00 AM | 9.845 | 0.373 | 202.51 |
| 6:45:00 AM | 9.827 | 0.354 | 191.488 |
| 7:00:00 AM | 9.954 | 0.357 | 197.319 |
| 7:15:00 AM | 10.17 | 0.415 | 235.975 |
| 7:30:00 AM | 10.127 | 0.363 | 205.355 |
| 7:45:00 AM | 10.486 | 0.466 | 270.201 |
| 8:00:00 AM | 10.781 | 0.485 | 294.62 |
| 8:15:00 AM | 10.9 | 0.455 | 279.899 |
| 8:30:00 AM | 10.993 | 0.523 | 328.082 |
| 8:45:00 AM | 10.991 | 0.578 | 362.155 |
| 9:00:00 AM | 11.24 | 0.542 | 351.642 |
| 9:15:00 AM | 11.325 | 0.543 | 354.112 |
| 9:30:00 AM | 11.144 | 0.538 | 340.908 |
| 9:45:00 AM | 11.156 | 0.618 | 396.683 |
| 10:00:00 AM | 11.227 | 0.377 | 243.209 |
| 10:15:00 AM | 11.113 | 0.475 | 303.18 |
| 10:30:00 AM | 10.998 | 0.486 | 305.994 |
| 10:45:00 AM | 11.056 | 0.408 | 255.166 |
| 11:00:00 AM | 11.218 | 0.573 | 370.675 |
| 11:15:00 AM | 11.258 | 0.588 | 381.567 |
| 11:30:00 AM | 11.151 | 0.615 | 393.827 |
| 11:45:00 AM | 11.173 | 0.429 | 274.189 |

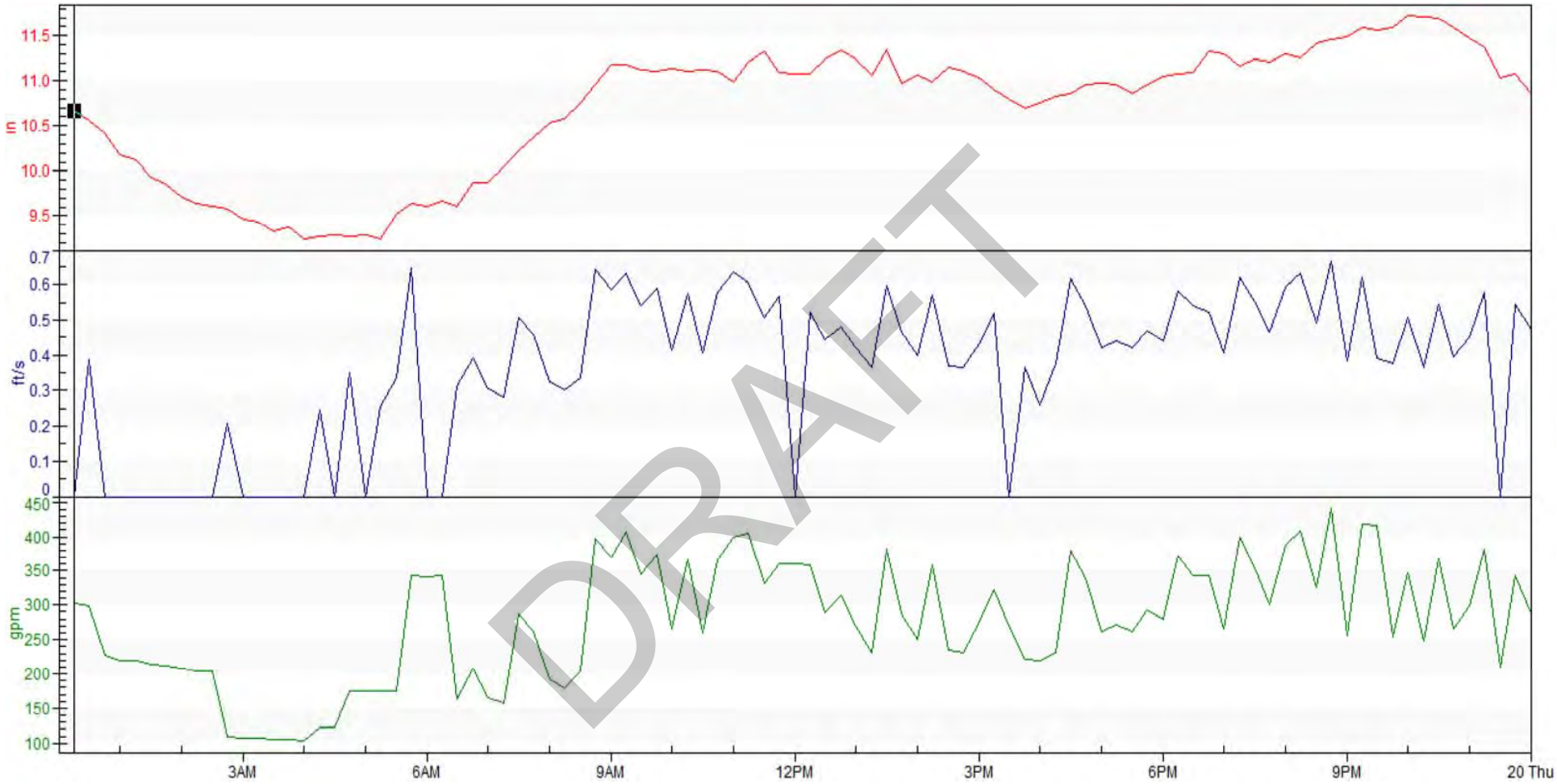
**Tuesday- P.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.157 | 0.422 | 270.205 |
| 12:15:00 PM | 11.297 | 0.468 | 300.893 |
| 12:30:00 PM | 11.354 | 0.459 | 298.275 |
| 12:45:00 PM | 11.183 | 0.513 | 330.518 |
| 1:00:00 PM | 11.198 | 0.498 | 319.734 |
| 1:15:00 PM | 11.202 | 0.592 | 382.042 |
| 1:30:00 PM | 10.95 | 0.375 | 234.073 |
| 1:45:00 PM | 10.904 | 0.359 | 222.787 |
| 2:00:00 PM | 10.851 | 0.348 | 214.669 |
| 2:15:00 PM | 10.857 | 0.407 | 251.653 |
| 2:30:00 PM | 10.878 | 0.358 | 221.373 |
| 2:45:00 PM | 11.023 | 0.354 | 223.721 |
| 3:00:00 PM | 11.033 | 0.406 | 256.725 |
| 3:15:00 PM | 11.09 | 0.564 | 359.226 |
| 3:30:00 PM | 11.145 | 0.484 | 310.109 |
| 3:45:00 PM | 11.11 | 0.442 | 282.454 |
| 4:00:00 PM | 11.089 | 0.503 | 319.585 |
| 4:15:00 PM | 11.059 | 0.378 | 239.727 |
| 4:30:00 PM | 11.064 | 0.388 | 245.379 |
| 4:45:00 PM | 11.298 | 0.353 | 230.441 |
| 5:00:00 PM | 11.277 | 0.382 | 248.954 |
| 5:15:00 PM | 11.137 | 0.441 | 282.619 |
| 5:30:00 PM | 11.039 | 0.576 | 361.669 |
| 5:45:00 PM | 10.927 | 0.369 | 230.838 |
| 6:00:00 PM | 11.205 | 0.534 | 340.388 |
| 6:15:00 PM | 11.31 | 0.406 | 261.582 |
| 6:30:00 PM | 11.27 | 0.588 | 380.885 |
| 6:45:00 PM | 11.259 | 0.607 | 394.434 |
| 7:00:00 PM | 11.283 | 0.595 | 387.801 |
| 7:15:00 PM | 11.466 | 0.554 | 368.35 |
| 7:30:00 PM | 11.525 | 0.368 | 367.073 |
| 7:45:00 PM | 11.588 | 0.606 | 406.431 |
| 8:00:00 PM | 11.598 | 0.61 | 411.487 |
| 8:15:00 PM | 11.537 | 0.475 | 315.868 |
| 8:30:00 PM | 11.466 | 0.659 | 435.441 |
| 8:45:00 PM | 11.435 | 0.588 | 389.848 |
| 9:00:00 PM | 11.462 | 0.384 | 254.585 |
| 9:15:00 PM | 11.54 | 0.277 | 241.919 |
| 9:30:00 PM | 11.61 | 0 | 187.493 |
| 9:45:00 PM | 11.715 | 0.544 | 370.482 |
| 10:00:00 PM | 11.649 | 0.548 | 372.31 |
| 10:15:00 PM | 11.677 | 0.285 | 193.967 |
| 10:30:00 PM | 11.715 | 0 | 194.769 |
| 10:45:00 PM | 11.758 | 0.68 | 466.787 |
| 11:00:00 PM | 11.615 | 0.571 | 378.281 |
| 11:15:00 PM | 11.346 | 0.589 | 381.163 |
| 11:30:00 PM | 11.071 | 0.459 | 329.887 |
| 11:45:00 PM | 10.889 | 0.5 | 308.35 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.750 | 0.418 | 269.795 |
| Daily Min: | 9.049 | 0 | 107.19 |
| Daily Max: | 11.758 | 0.68 | 466.787 |
| Peak to Avg: | | | 1.73 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/19/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Wednesday - A.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.756 | 0 | 305.887 |
| 12:15:00 AM | 10.661 | 0 | 302.345 |
| 12:30:00 AM | 10.563 | 0.387 | 298.71 |
| 12:45:00 AM | 10.423 | 0 | 227.243 |
| 1:00:00 AM | 10.183 | 0 | 220.363 |
| 1:15:00 AM | 10.12 | 0 | 218.568 |
| 1:30:00 AM | 9.936 | 0 | 213.334 |
| 1:45:00 AM | 9.852 | 0 | 210.924 |
| 2:00:00 AM | 9.71 | 0 | 206.878 |
| 2:15:00 AM | 9.631 | 0 | 204.643 |
| 2:30:00 AM | 9.613 | 0 | 204.144 |
| 2:45:00 AM | 9.574 | 0.207 | 108.872 |
| 3:00:00 AM | 9.465 | 0 | 107.212 |
| 3:15:00 AM | 9.43 | 0 | 106.682 |
| 3:30:00 AM | 9.324 | 0 | 105.076 |
| 3:45:00 AM | 9.371 | 0 | 105.785 |
| 4:00:00 AM | 9.246 | 0 | 103.901 |
| 4:15:00 AM | 9.277 | 0.246 | 123.616 |
| 4:30:00 AM | 9.281 | 0 | 123.69 |
| 4:45:00 AM | 9.274 | 0.349 | 175.473 |
| 5:00:00 AM | 9.289 | 0 | 175.876 |
| 5:15:00 AM | 9.24 | 0.258 | 174.388 |
| 5:30:00 AM | 9.525 | 0.335 | 174.623 |
| 5:45:00 AM | 9.633 | 0.647 | 342.136 |
| 6:00:00 AM | 9.608 | 0 | 340.919 |
| 6:15:00 AM | 9.668 | 0 | 343.769 |
| 6:30:00 AM | 9.609 | 0.312 | 163.53 |
| 6:45:00 AM | 9.868 | 0.391 | 208.158 |
| 7:00:00 AM | 9.876 | 0.306 | 165.967 |
| 7:15:00 AM | 10.043 | 0.282 | 157.629 |
| 7:30:00 AM | 10.222 | 0.507 | 287.309 |
| 7:45:00 AM | 10.379 | 0.459 | 262.828 |
| 8:00:00 AM | 10.538 | 0.325 | 192.937 |
| 8:15:00 AM | 10.574 | 0.303 | 179.536 |
| 8:30:00 AM | 10.751 | 0.334 | 204.415 |
| 8:45:00 AM | 10.956 | 0.644 | 397.46 |
| 9:00:00 AM | 11.176 | 0.585 | 369.264 |
| 9:15:00 AM | 11.179 | 0.631 | 406.442 |
| 9:30:00 AM | 11.124 | 0.54 | 345.179 |
| 9:45:00 AM | 11.112 | 0.59 | 374.907 |
| 10:00:00 AM | 11.139 | 0.414 | 265.138 |
| 10:15:00 AM | 11.114 | 0.574 | 365.584 |
| 10:30:00 AM | 11.12 | 0.407 | 260.33 |
| 10:45:00 AM | 11.106 | 0.577 | 366.267 |
| 11:00:00 AM | 10.995 | 0.635 | 399.776 |
| 11:15:00 AM | 11.212 | 0.603 | 403.986 |
| 11:30:00 AM | 11.323 | 0.506 | 330.993 |
| 11:45:00 AM | 11.091 | 0.567 | 361.227 |

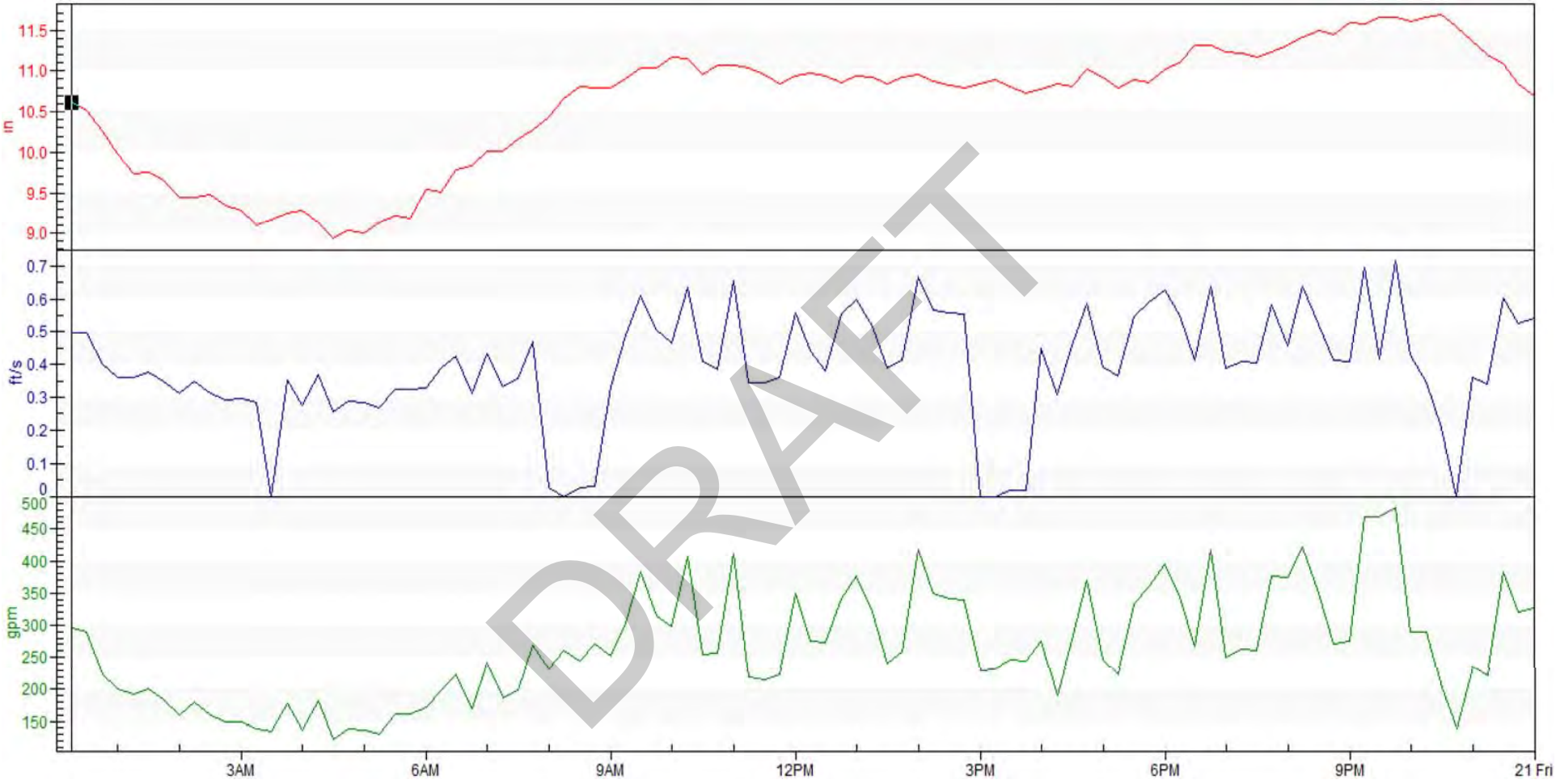
**Wednesday - P.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.085 | 0 | 360.97 |
| 12:15:00 PM | 11.074 | 0.523 | 357.786 |
| 12:30:00 PM | 11.238 | 0.445 | 288.451 |
| 12:45:00 PM | 11.341 | 0.481 | 314.287 |
| 1:00:00 PM | 11.24 | 0.42 | 269.658 |
| 1:15:00 PM | 11.062 | 0.366 | 230.542 |
| 1:30:00 PM | 11.347 | 0.596 | 381.458 |
| 1:45:00 PM | 10.977 | 0.465 | 287.857 |
| 2:00:00 PM | 11.058 | 0.399 | 250.781 |
| 2:15:00 PM | 10.989 | 0.572 | 358.271 |
| 2:30:00 PM | 11.144 | 0.368 | 234.948 |
| 2:45:00 PM | 11.108 | 0.363 | 230.237 |
| 3:00:00 PM | 11.03 | 0.434 | 274.548 |
| 3:15:00 PM | 10.897 | 0.518 | 321.125 |
| 3:30:00 PM | 10.804 | 0 | 269.989 |
| 3:45:00 PM | 10.702 | 0.366 | 222.018 |
| 4:00:00 PM | 10.751 | 0.259 | 220.123 |
| 4:15:00 PM | 10.825 | 0.375 | 231.577 |
| 4:30:00 PM | 10.859 | 0.615 | 379.376 |
| 4:45:00 PM | 10.959 | 0.543 | 338.399 |
| 5:00:00 PM | 10.979 | 0.42 | 262.528 |
| 5:15:00 PM | 10.963 | 0.44 | 272.346 |
| 5:30:00 PM | 10.858 | 0.423 | 261.988 |
| 5:45:00 PM | 10.953 | 0.469 | 293.116 |
| 6:00:00 PM | 11.043 | 0.441 | 279.088 |
| 6:15:00 PM | 11.077 | 0.584 | 371.639 |
| 6:30:00 PM | 11.095 | 0.54 | 343.782 |
| 6:45:00 PM | 11.326 | 0.524 | 342.954 |
| 7:00:00 PM | 11.303 | 0.406 | 265.18 |
| 7:15:00 PM | 11.161 | 0.621 | 398.424 |
| 7:30:00 PM | 11.24 | 0.552 | 354.569 |
| 7:45:00 PM | 11.208 | 0.467 | 301.274 |
| 8:00:00 PM | 11.296 | 0.594 | 387.361 |
| 8:15:00 PM | 11.252 | 0.63 | 408.775 |
| 8:30:00 PM | 11.413 | 0.492 | 325.173 |
| 8:45:00 PM | 11.463 | 0.664 | 441.173 |
| 9:00:00 PM | 11.493 | 0.385 | 256.221 |
| 9:15:00 PM | 11.593 | 0.62 | 418.512 |
| 9:30:00 PM | 11.556 | 0.393 | 416.791 |
| 9:45:00 PM | 11.593 | 0.377 | 254.223 |
| 10:00:00 PM | 11.725 | 0.508 | 347.572 |
| 10:15:00 PM | 11.706 | 0.365 | 248.438 |
| 10:30:00 PM | 11.699 | 0.543 | 367.343 |
| 10:45:00 PM | 11.596 | 0.393 | 265.469 |
| 11:00:00 PM | 11.477 | 0.451 | 298.832 |
| 11:15:00 PM | 11.379 | 0.578 | 380.807 |
| 11:30:00 PM | 11.029 | 0 | 208.912 |
| 11:45:00 PM | 11.072 | 0.546 | 342.511 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.689 | 0.363 | 277.110 |
| Daily Min: | 9.24 | 0 | 103.901 |
| Daily Max: | 11.725 | 0.664 | 441.173 |
| Peak to Avg: | | | 1.59 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/20/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Thursday - A.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.856 | 0.473 | 287.896 |
| 12:15:00 AM | 10.62 | 0.496 | 295.316 |
| 12:30:00 AM | 10.516 | 0.497 | 289.271 |
| 12:45:00 AM | 10.251 | 0.4 | 224.497 |
| 1:00:00 AM | 9.981 | 0.362 | 200.568 |
| 1:15:00 AM | 9.744 | 0.362 | 193.264 |
| 1:30:00 AM | 9.76 | 0.376 | 201.633 |
| 1:45:00 AM | 9.663 | 0.348 | 183.489 |
| 2:00:00 AM | 9.45 | 0.312 | 160.598 |
| 2:15:00 AM | 9.443 | 0.35 | 180.187 |
| 2:30:00 AM | 9.48 | 0.311 | 160.194 |
| 2:45:00 AM | 9.352 | 0.292 | 148.666 |
| 3:00:00 AM | 9.277 | 0.296 | 148.819 |
| 3:15:00 AM | 9.104 | 0.284 | 137.99 |
| 3:30:00 AM | 9.161 | 0 | 135.427 |
| 3:45:00 AM | 9.242 | 0.354 | 177.173 |
| 4:00:00 AM | 9.278 | 0.275 | 137.761 |
| 4:15:00 AM | 9.133 | 0.368 | 181.371 |
| 4:30:00 AM | 8.94 | 0.257 | 122.912 |
| 4:45:00 AM | 9.038 | 0.287 | 139.345 |
| 5:00:00 AM | 9.01 | 0.282 | 136.458 |
| 5:15:00 AM | 9.132 | 0.267 | 129.831 |
| 5:30:00 AM | 9.215 | 0.323 | 160.694 |
| 5:45:00 AM | 9.191 | 0.324 | 160.881 |
| 6:00:00 AM | 9.539 | 0.328 | 171.242 |
| 6:15:00 AM | 9.514 | 0.388 | 198.976 |
| 6:30:00 AM | 9.791 | 0.426 | 222.915 |
| 6:45:00 AM | 9.841 | 0.311 | 169.321 |
| 7:00:00 AM | 10.01 | 0.434 | 241.456 |
| 7:15:00 AM | 10.016 | 0.333 | 185.648 |
| 7:30:00 AM | 10.167 | 0.355 | 199.346 |
| 7:45:00 AM | 10.276 | 0.468 | 269.887 |
| 8:00:00 AM | 10.441 | 0.025 | 231.21 |
| 8:15:00 AM | 10.669 | 0 | 260.871 |
| 8:30:00 AM | 10.815 | 0.027 | 245.169 |
| 8:45:00 AM | 10.787 | 0.032 | 271.34 |
| 9:00:00 AM | 10.801 | 0.332 | 252.148 |
| 9:15:00 AM | 10.903 | 0.488 | 303.935 |
| 9:30:00 AM | 11.031 | 0.61 | 381.691 |
| 9:45:00 AM | 11.031 | 0.504 | 314.903 |
| 10:00:00 AM | 11.173 | 0.467 | 297.622 |
| 10:15:00 AM | 11.15 | 0.634 | 406.486 |
| 10:30:00 AM | 10.961 | 0.41 | 254.681 |
| 10:45:00 AM | 11.071 | 0.386 | 256.302 |
| 11:00:00 AM | 11.068 | 0.655 | 411.585 |
| 11:15:00 AM | 11.038 | 0.346 | 219.064 |
| 11:30:00 AM | 10.951 | 0.343 | 214.488 |
| 11:45:00 AM | 10.849 | 0.362 | 223.781 |

**Thursday - P.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 10.933 | 0.56 | 350.273 |
| 12:15:00 PM | 10.973 | 0.44 | 274.849 |
| 12:30:00 PM | 10.946 | 0.379 | 273.723 |
| 12:45:00 PM | 10.853 | 0.555 | 341.842 |
| 1:00:00 PM | 10.946 | 0.6 | 375.27 |
| 1:15:00 PM | 10.92 | 0.518 | 321.107 |
| 1:30:00 PM | 10.846 | 0.389 | 239.621 |
| 1:45:00 PM | 10.922 | 0.414 | 258.591 |
| 2:00:00 PM | 10.949 | 0.668 | 418.247 |
| 2:15:00 PM | 10.869 | 0.564 | 350.257 |
| 2:30:00 PM | 10.819 | 0.56 | 340.639 |
| 2:45:00 PM | 10.802 | 0.553 | 340.146 |
| 3:00:00 PM | 10.846 | 0 | 229.848 |
| 3:15:00 PM | 10.892 | 0 | 231.13 |
| 3:30:00 PM | 10.806 | 0.018 | 246.913 |
| 3:45:00 PM | 10.734 | 0.018 | 245.169 |
| 4:00:00 PM | 10.784 | 0.448 | 275.024 |
| 4:15:00 PM | 10.844 | 0.309 | 190.596 |
| 4:30:00 PM | 10.817 | 0.457 | 276.67 |
| 4:45:00 PM | 11.029 | 0.585 | 369.692 |
| 5:00:00 PM | 10.923 | 0.394 | 246.348 |
| 5:15:00 PM | 10.79 | 0.363 | 223.34 |
| 5:30:00 PM | 10.888 | 0.547 | 332.938 |
| 5:45:00 PM | 10.867 | 0.59 | 360.007 |
| 6:00:00 PM | 11.017 | 0.625 | 394.801 |
| 6:15:00 PM | 11.106 | 0.551 | 344.014 |
| 6:30:00 PM | 11.314 | 0.413 | 267.678 |
| 6:45:00 PM | 11.313 | 0.639 | 417.678 |
| 7:00:00 PM | 11.233 | 0.388 | 251.18 |
| 7:15:00 PM | 11.212 | 0.408 | 263.525 |
| 7:30:00 PM | 11.163 | 0.404 | 259.759 |
| 7:45:00 PM | 11.237 | 0.584 | 376.314 |
| 8:00:00 PM | 11.316 | 0.456 | 374.922 |
| 8:15:00 PM | 11.404 | 0.639 | 421.043 |
| 8:30:00 PM | 11.497 | 0.523 | 349.129 |
| 8:45:00 PM | 11.447 | 0.411 | 271.01 |
| 9:00:00 PM | 11.584 | 0.408 | 274.629 |
| 9:15:00 PM | 11.573 | 0.697 | 468.567 |
| 9:30:00 PM | 11.65 | 0.418 | 468.708 |
| 9:45:00 PM | 11.651 | 0.714 | 483.119 |
| 10:00:00 PM | 11.609 | 0.429 | 289.946 |
| 10:15:00 PM | 11.649 | 0.346 | 289.348 |
| 10:30:00 PM | 11.689 | 0.206 | 203.294 |
| 10:45:00 PM | 11.543 | 0 | 138.329 |
| 11:00:00 PM | 11.359 | 0.359 | 235.894 |
| 11:15:00 PM | 11.195 | 0.342 | 220.701 |
| 11:30:00 PM | 11.079 | 0.602 | 382.778 |
| 11:45:00 PM | 10.835 | 0.525 | 319.984 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.584 | 0.389 | 263.763 |
| Daily Min: | 8.94 | 0 | 122.912 |
| Daily Max: | 11.689 | 0.714 | 483.119 |
| Peak to Avg: | | | 1.83 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/21/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Friday - A.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.699 | 0.541 | 327.061 |
| 12:15:00 AM | 10.583 | 0.527 | 315.311 |
| 12:30:00 AM | 10.424 | 0.485 | 280.77 |
| 12:45:00 AM | 10.298 | 0.531 | 305.641 |
| 1:00:00 AM | 10.234 | 0.46 | 263.673 |
| 1:15:00 AM | 9.997 | 0.446 | 245.362 |
| 1:30:00 AM | 9.77 | 0.325 | 169.977 |
| 1:45:00 AM | 9.578 | 0.307 | 161.329 |
| 2:00:00 AM | 9.465 | 0.283 | 158.791 |
| 2:15:00 AM | 9.449 | 0 | 145.944 |
| 2:30:00 AM | 9.455 | 0.329 | 169.916 |
| 2:45:00 AM | 9.48 | 0.313 | 170.524 |
| 3:00:00 AM | 9.298 | 0.307 | 157.73 |
| 3:15:00 AM | 9.281 | 0.291 | 154.332 |
| 3:30:00 AM | 9.222 | 0.306 | 152.586 |
| 3:45:00 AM | 9.34 | 0.314 | 159.191 |
| 4:00:00 AM | 9.33 | 0.307 | 155.415 |
| 4:15:00 AM | 9.233 | 0 | 141.077 |
| 4:30:00 AM | 9.062 | 0 | 137.57 |
| 4:45:00 AM | 9.2 | 0.23 | 136.589 |
| 5:00:00 AM | 9.163 | 0 | 113.758 |
| 5:15:00 AM | 9.11 | 0 | 112.867 |
| 5:30:00 AM | 9.342 | 0.34 | 172.815 |
| 5:45:00 AM | 9.375 | 0.335 | 173.345 |
| 6:00:00 AM | 9.571 | 0.374 | 196.045 |
| 6:15:00 AM | 9.676 | 0.283 | 198.927 |
| 6:30:00 AM | 9.55 | 0.356 | 186.087 |
| 6:45:00 AM | 9.901 | 0.369 | 200.38 |
| 7:00:00 AM | 9.896 | 0.395 | 214.721 |
| 7:15:00 AM | 10.081 | 0.427 | 236.167 |
| 7:30:00 AM | 10.124 | 0.407 | 228.469 |
| 7:45:00 AM | 10.262 | 0.486 | 279.914 |
| 8:00:00 AM | 10.533 | 0.329 | 282.143 |
| 8:15:00 AM | 10.681 | 0.416 | 252.313 |
| 8:30:00 AM | 10.651 | 0.351 | 212.286 |
| 8:45:00 AM | 10.668 | 0.51 | 307.206 |
| 9:00:00 AM | 10.766 | 0.596 | 359.034 |
| 9:15:00 AM | 10.902 | 0.676 | 421.087 |
| 9:30:00 AM | 10.887 | 0.553 | 344.006 |
| 9:45:00 AM | 10.854 | 0.655 | 405.828 |
| 10:00:00 AM | 10.976 | 0.566 | 352.687 |
| 10:15:00 AM | 11.075 | 0.55 | 349.694 |
| 10:30:00 AM | 11.24 | 0.624 | 404.619 |
| 10:45:00 AM | 11.216 | 0.489 | 316.336 |
| 11:00:00 AM | 11.08 | 0.661 | 418.948 |
| 11:15:00 AM | 11.213 | 0.646 | 410.548 |
| 11:30:00 AM | 11.304 | 0.593 | 387.498 |
| 11:45:00 AM | 11.281 | 0.56 | 364.485 |

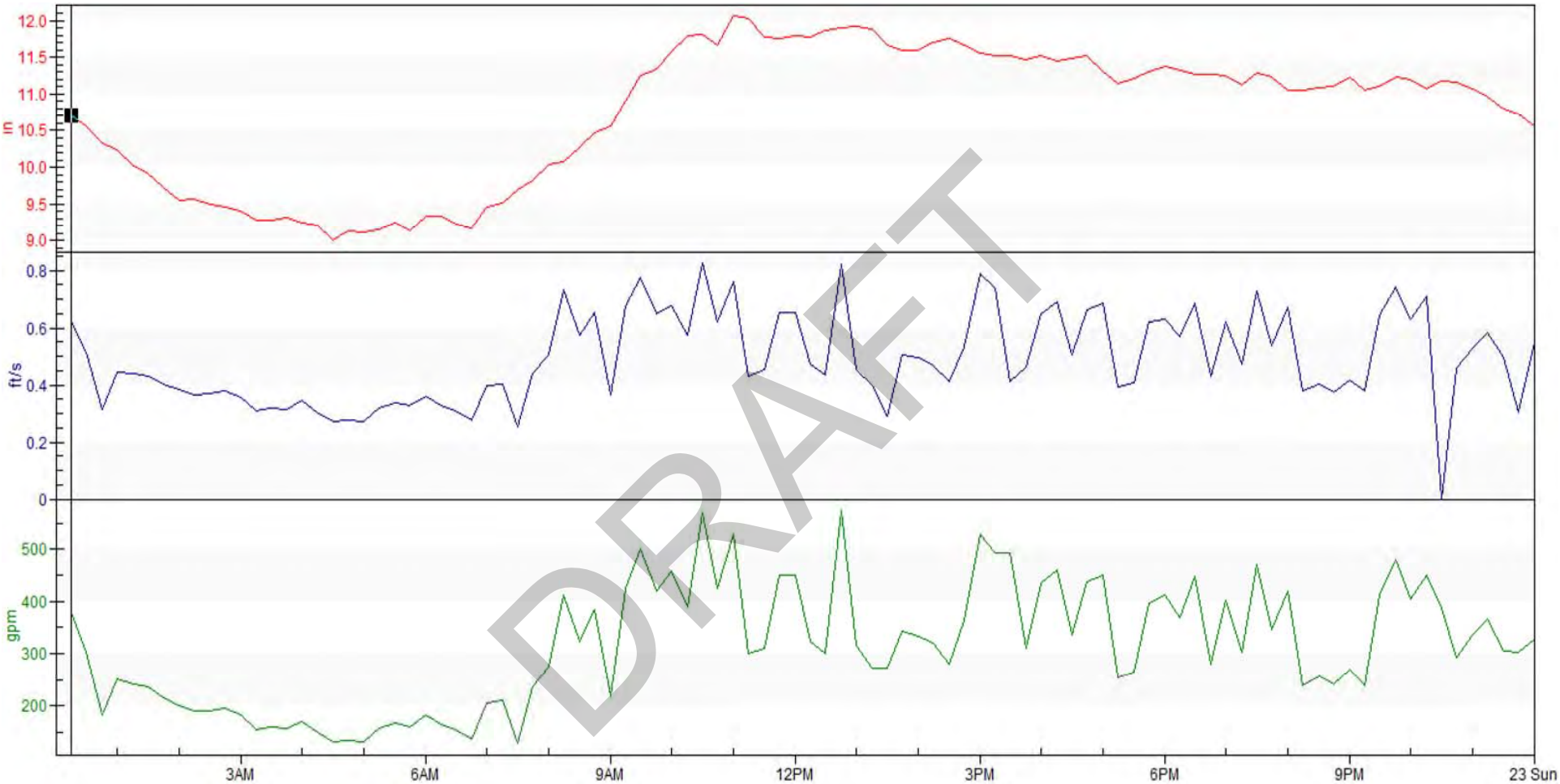
**Friday - P.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.132 | 0.595 | 380.133 |
| 12:15:00 PM | 11.081 | 0.631 | 401.615 |
| 12:30:00 PM | 11.176 | 0.63 | 405.196 |
| 12:45:00 PM | 11.298 | 0.64 | 410.405 |
| 1:00:00 PM | 11.359 | 0.648 | 425.767 |
| 1:15:00 PM | 11.28 | 0.352 | 228.943 |
| 1:30:00 PM | 11.194 | 0.557 | 356.481 |
| 1:45:00 PM | 11.012 | 0.657 | 414.625 |
| 2:00:00 PM | 11.14 | 0.404 | 255.6 |
| 2:15:00 PM | 11.219 | 0.384 | 246.761 |
| 2:30:00 PM | 11.085 | 0.616 | 391.937 |
| 2:45:00 PM | 11.316 | 0.45 | 294.498 |
| 3:00:00 PM | 11.31 | 0.396 | 255.303 |
| 3:15:00 PM | 11.138 | 0.5 | 319.592 |
| 3:30:00 PM | 11.106 | 0.586 | 373.917 |
| 3:45:00 PM | 11.155 | 0.603 | 385.179 |
| 4:00:00 PM | 11.105 | 0.377 | 237.77 |
| 4:15:00 PM | 11.181 | 0.443 | 285.1 |
| 4:30:00 PM | 11.127 | 0.372 | 237.744 |
| 4:45:00 PM | 11.055 | 0.575 | 363.832 |
| 5:00:00 PM | 11.207 | 0.388 | 248.522 |
| 5:15:00 PM | 11.239 | 0.6 | 383.396 |
| 5:30:00 PM | 11.202 | 0.603 | 384.432 |
| 5:45:00 PM | 11.146 | 0.43 | 272.544 |
| 6:00:00 PM | 11.135 | 0.398 | 253.524 |
| 6:15:00 PM | 11.135 | 0.503 | 321.08 |
| 6:30:00 PM | 11.104 | 0.49 | 312.272 |
| 6:45:00 PM | 11.208 | 0.429 | 274.683 |
| 7:00:00 PM | 11.22 | 0.601 | 388.549 |
| 7:15:00 PM | 11.117 | 0.602 | 379.057 |
| 7:30:00 PM | 11.114 | 0.649 | 412.62 |
| 7:45:00 PM | 11.237 | 0.622 | 403.017 |
| 8:00:00 PM | 11.223 | 0.334 | 215.986 |
| 8:15:00 PM | 11.288 | 0.418 | 271.247 |
| 8:30:00 PM | 11.296 | 0.388 | 253.007 |
| 8:45:00 PM | 11.405 | 0.405 | 265.341 |
| 9:00:00 PM | 11.403 | 0.382 | 252.021 |
| 9:15:00 PM | 11.307 | 0.517 | 337.073 |
| 9:30:00 PM | 11.315 | 0.339 | 220.776 |
| 9:45:00 PM | 11.369 | 0.437 | 286.429 |
| 10:00:00 PM | 11.361 | 0.666 | 437.486 |
| 10:15:00 PM | 11.28 | 0.653 | 420.775 |
| 10:30:00 PM | 11.105 | 0.601 | 383.328 |
| 10:45:00 PM | 11.088 | 0.583 | 371.225 |
| 11:00:00 PM | 11.02 | 0.578 | 365.427 |
| 11:15:00 PM | 10.975 | 0.586 | 368.29 |
| 11:30:00 PM | 10.903 | 0.626 | 390.232 |
| 11:45:00 PM | 10.827 | 0.503 | 310.744 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.640 | 0.453 | 287.762 |
| Daily Min: | 9.062 | 0 | 112.867 |
| Daily Max: | 11.405 | 0.676 | 437.486 |
| Peak to Avg: | | | 1.52 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/22/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Saturday - A.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.707 | 0.619 | 376.859 |
| 12:15:00 AM | 10.705 | 0.623 | 378.83 |
| 12:30:00 AM | 10.566 | 0.514 | 303.691 |
| 12:45:00 AM | 10.329 | 0.316 | 183.664 |
| 1:00:00 AM | 10.234 | 0.446 | 251.172 |
| 1:15:00 AM | 10.02 | 0.438 | 240.771 |
| 1:30:00 AM | 9.908 | 0.433 | 236.06 |
| 1:45:00 AM | 9.73 | 0.404 | 215.303 |
| 2:00:00 AM | 9.554 | 0.384 | 201.139 |
| 2:15:00 AM | 9.561 | 0.364 | 190.079 |
| 2:30:00 AM | 9.488 | 0.37 | 191.707 |
| 2:45:00 AM | 9.453 | 0.379 | 195.387 |
| 3:00:00 AM | 9.409 | 0.358 | 183.47 |
| 3:15:00 AM | 9.283 | 0.309 | 155.375 |
| 3:30:00 AM | 9.278 | 0.319 | 160.759 |
| 3:45:00 AM | 9.306 | 0.315 | 158.774 |
| 4:00:00 AM | 9.236 | 0.345 | 171.614 |
| 4:15:00 AM | 9.203 | 0.301 | 149.804 |
| 4:30:00 AM | 9.005 | 0.275 | 132.818 |
| 4:45:00 AM | 9.13 | 0.276 | 135.675 |
| 5:00:00 AM | 9.114 | 0.271 | 132.473 |
| 5:15:00 AM | 9.151 | 0.318 | 157.229 |
| 5:30:00 AM | 9.237 | 0.338 | 167.771 |
| 5:45:00 AM | 9.133 | 0.328 | 161.44 |
| 6:00:00 AM | 9.336 | 0.363 | 183.965 |
| 6:15:00 AM | 9.339 | 0.326 | 164.474 |
| 6:30:00 AM | 9.218 | 0.31 | 154.604 |
| 6:45:00 AM | 9.172 | 0.277 | 136.705 |
| 7:00:00 AM | 9.449 | 0.398 | 205.185 |
| 7:15:00 AM | 9.518 | 0.404 | 210.198 |
| 7:30:00 AM | 9.694 | 0.252 | 130.419 |
| 7:45:00 AM | 9.826 | 0.438 | 236.443 |
| 8:00:00 AM | 10.033 | 0.505 | 275.265 |
| 8:15:00 AM | 10.072 | 0.735 | 412.745 |
| 8:30:00 AM | 10.278 | 0.576 | 323.318 |
| 8:45:00 AM | 10.47 | 0.655 | 384.073 |
| 9:00:00 AM | 10.569 | 0.367 | 219.581 |
| 9:15:00 AM | 10.915 | 0.68 | 424.251 |
| 9:30:00 AM | 11.242 | 0.775 | 501.167 |
| 9:45:00 AM | 11.347 | 0.65 | 420.454 |
| 10:00:00 AM | 11.569 | 0.68 | 457.353 |
| 10:15:00 AM | 11.796 | 0.574 | 388.426 |
| 10:30:00 AM | 11.815 | 0.825 | 570.345 |
| 10:45:00 AM | 11.676 | 0.623 | 424.427 |
| 11:00:00 AM | 12.066 | 0.762 | 527.772 |
| 11:15:00 AM | 12.033 | 0.431 | 299.252 |
| 11:30:00 AM | 11.775 | 0.456 | 311.266 |
| 11:45:00 AM | 11.756 | 0.655 | 448.876 |

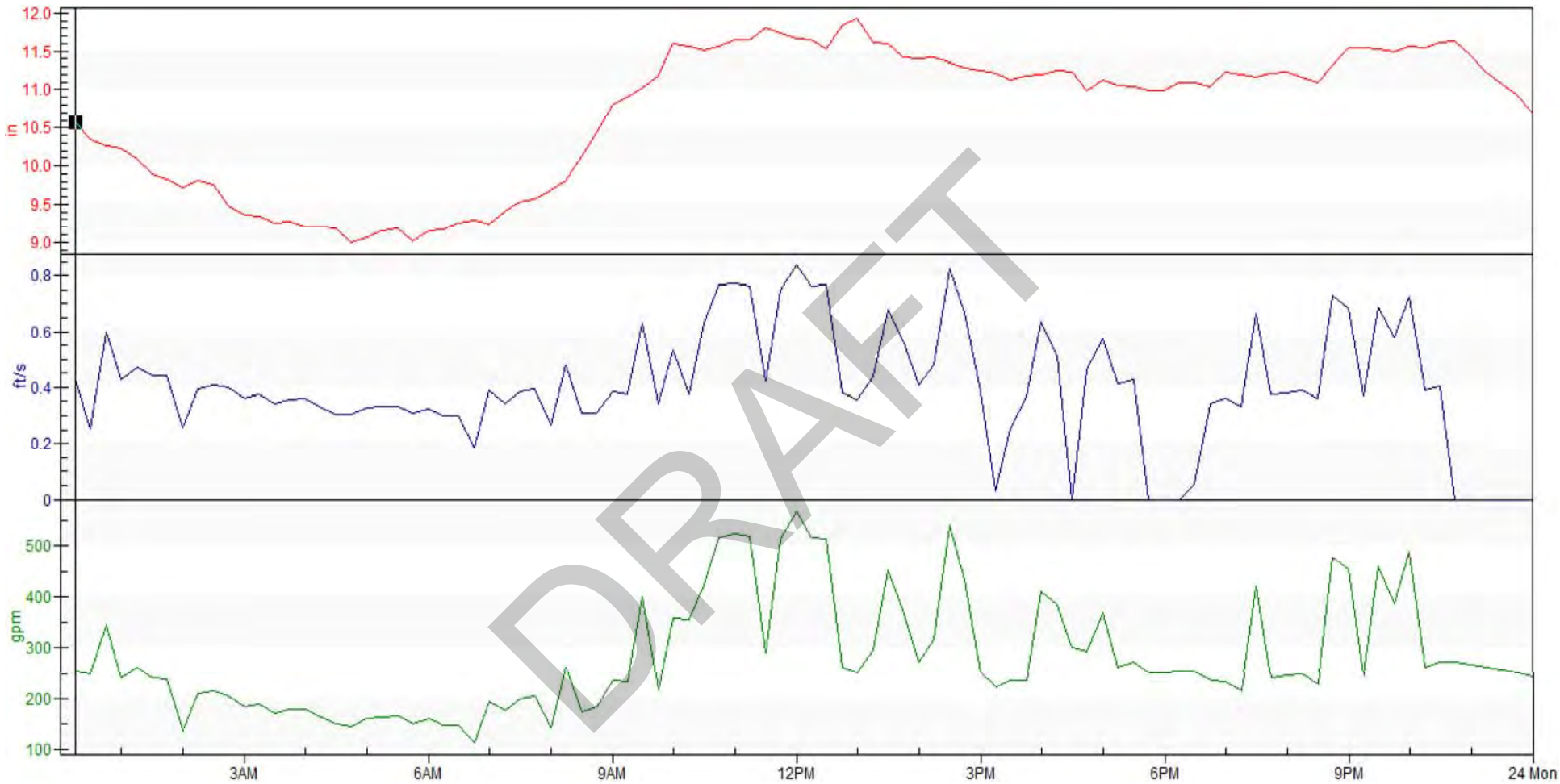
**Saturday - P.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.802 | 0.653 | 450.64 |
| 12:15:00 PM | 11.771 | 0.472 | 323.713 |
| 12:30:00 PM | 11.867 | 0.434 | 300.368 |
| 12:45:00 PM | 11.91 | 0.823 | 573.74 |
| 1:00:00 PM | 11.922 | 0.452 | 316.114 |
| 1:15:00 PM | 11.89 | 0.398 | 272.455 |
| 1:30:00 PM | 11.666 | 0.293 | 270.936 |
| 1:45:00 PM | 11.593 | 0.507 | 341.943 |
| 2:00:00 PM | 11.59 | 0.494 | 332.884 |
| 2:15:00 PM | 11.708 | 0.467 | 319.397 |
| 2:30:00 PM | 11.759 | 0.411 | 280.231 |
| 2:45:00 PM | 11.669 | 0.535 | 363.836 |
| 3:00:00 PM | 11.56 | 0.789 | 529.511 |
| 3:15:00 PM | 11.517 | 0.738 | 493.945 |
| 3:30:00 PM | 11.517 | 0.411 | 493.962 |
| 3:45:00 PM | 11.476 | 0.465 | 309.374 |
| 4:00:00 PM | 11.515 | 0.65 | 433.944 |
| 4:15:00 PM | 11.456 | 0.693 | 460.045 |
| 4:30:00 PM | 11.49 | 0.507 | 335.216 |
| 4:45:00 PM | 11.522 | 0.662 | 436.134 |
| 5:00:00 PM | 11.305 | 0.688 | 449.219 |
| 5:15:00 PM | 11.136 | 0.395 | 253.252 |
| 5:30:00 PM | 11.214 | 0.408 | 263.545 |
| 5:45:00 PM | 11.299 | 0.621 | 397.572 |
| 6:00:00 PM | 11.386 | 0.631 | 411.829 |
| 6:15:00 PM | 11.32 | 0.57 | 367.614 |
| 6:30:00 PM | 11.267 | 0.689 | 446.799 |
| 6:45:00 PM | 11.277 | 0.431 | 280.261 |
| 7:00:00 PM | 11.249 | 0.62 | 402.337 |
| 7:15:00 PM | 11.123 | 0.474 | 303.062 |
| 7:30:00 PM | 11.285 | 0.73 | 470.032 |
| 7:45:00 PM | 11.229 | 0.539 | 345.056 |
| 8:00:00 PM | 11.043 | 0.672 | 419.319 |
| 8:15:00 PM | 11.058 | 0.379 | 240.006 |
| 8:30:00 PM | 11.084 | 0.402 | 255.71 |
| 8:45:00 PM | 11.112 | 0.377 | 240.425 |
| 9:00:00 PM | 11.24 | 0.417 | 269.479 |
| 9:15:00 PM | 11.044 | 0.382 | 239.314 |
| 9:30:00 PM | 11.108 | 0.644 | 411.42 |
| 9:45:00 PM | 11.228 | 0.741 | 479.334 |
| 10:00:00 PM | 11.195 | 0.631 | 404.698 |
| 10:15:00 PM | 11.068 | 0.709 | 450.5 |
| 10:30:00 PM | 11.175 | 0 | 385.39 |
| 10:45:00 PM | 11.156 | 0.457 | 293.27 |
| 11:00:00 PM | 11.077 | 0.527 | 334.896 |
| 11:15:00 PM | 10.952 | 0.584 | 366.107 |
| 11:30:00 PM | 10.791 | 0.496 | 304.227 |
| 11:45:00 PM | 10.72 | 0.303 | 302.156 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.740 | 0.490 | 312.535 |
| Daily Min: | 9.005 | 0 | 130.419 |
| Daily Max: | 12.066 | 0.825 | 573.74 |
| Peak to Avg: | | | 1.84 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/23/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Sunday - A.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 10.568 | 0.548 | 327.576 |
| 12:15:00 AM | 10.568 | 0.429 | 254.559 |
| 12:30:00 AM | 10.347 | 0.253 | 249.379 |
| 12:45:00 AM | 10.269 | 0.6 | 345.507 |
| 1:00:00 AM | 10.231 | 0.426 | 242.282 |
| 1:15:00 AM | 10.089 | 0.472 | 261.903 |
| 1:30:00 AM | 9.903 | 0.441 | 241.982 |
| 1:45:00 AM | 9.821 | 0.442 | 239.386 |
| 2:00:00 AM | 9.724 | 0.255 | 136.573 |
| 2:15:00 AM | 9.811 | 0.395 | 211.2 |
| 2:30:00 AM | 9.759 | 0.408 | 216.179 |
| 2:45:00 AM | 9.473 | 0.398 | 204.938 |
| 3:00:00 AM | 9.352 | 0.361 | 183.269 |
| 3:15:00 AM | 9.351 | 0.374 | 188.754 |
| 3:30:00 AM | 9.264 | 0.342 | 171.931 |
| 3:45:00 AM | 9.281 | 0.359 | 178.871 |
| 4:00:00 AM | 9.204 | 0.361 | 179.605 |
| 4:15:00 AM | 9.209 | 0.329 | 164.087 |
| 4:30:00 AM | 9.189 | 0.304 | 149.748 |
| 4:45:00 AM | 8.995 | 0.305 | 146.332 |
| 5:00:00 AM | 9.069 | 0.329 | 160.134 |
| 5:15:00 AM | 9.149 | 0.333 | 164.512 |
| 5:30:00 AM | 9.18 | 0.334 | 165.268 |
| 5:45:00 AM | 9.01 | 0.311 | 149.944 |
| 6:00:00 AM | 9.15 | 0.324 | 159.956 |
| 6:15:00 AM | 9.169 | 0.302 | 148.074 |
| 6:30:00 AM | 9.253 | 0.301 | 146.699 |
| 6:45:00 AM | 9.286 | 0.188 | 114.499 |
| 7:00:00 AM | 9.239 | 0.389 | 194.562 |
| 7:15:00 AM | 9.405 | 0.344 | 176.144 |
| 7:30:00 AM | 9.53 | 0.388 | 200.596 |
| 7:45:00 AM | 9.56 | 0.393 | 206.066 |
| 8:00:00 AM | 9.693 | 0.265 | 141.394 |
| 8:15:00 AM | 9.814 | 0.482 | 261.589 |
| 8:30:00 AM | 10.123 | 0.31 | 173.398 |
| 8:45:00 AM | 10.442 | 0.31 | 182.766 |
| 9:00:00 AM | 10.793 | 0.385 | 236.705 |
| 9:15:00 AM | 10.908 | 0.374 | 232.847 |
| 9:30:00 AM | 11.023 | 0.631 | 398.58 |
| 9:45:00 AM | 11.176 | 0.342 | 217.976 |
| 10:00:00 AM | 11.591 | 0.53 | 357.397 |
| 10:15:00 AM | 11.563 | 0.378 | 356.288 |
| 10:30:00 AM | 11.507 | 0.633 | 423.179 |
| 10:45:00 AM | 11.569 | 0.769 | 517.298 |
| 11:00:00 AM | 11.655 | 0.772 | 524.537 |
| 11:15:00 AM | 11.657 | 0.765 | 519.318 |
| 11:30:00 AM | 11.811 | 0.424 | 290.629 |
| 11:45:00 AM | 11.745 | 0.747 | 512.572 |

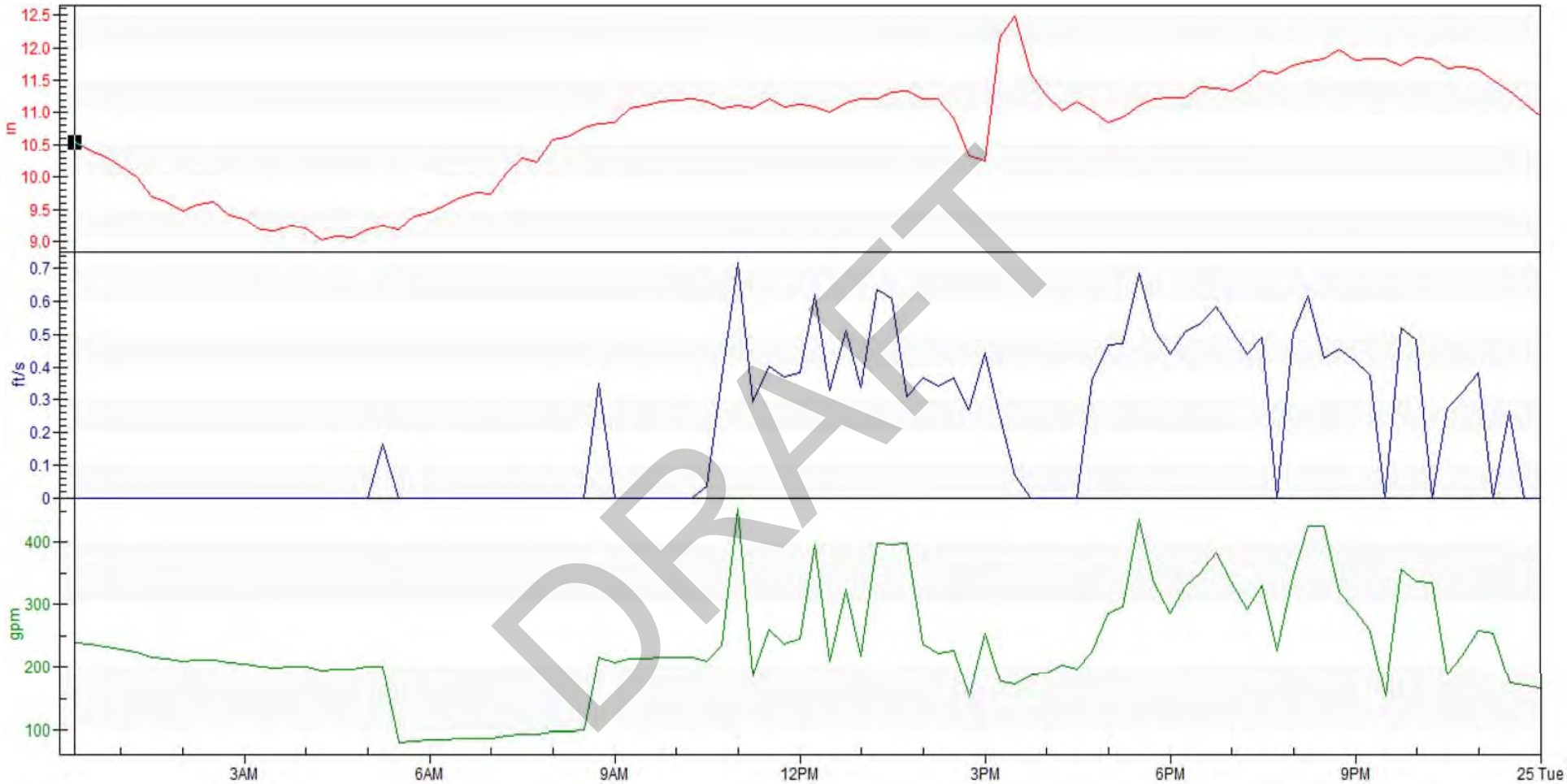
**Sunday - P.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.67 | 0.838 | 567.821 |
| 12:15:00 PM | 11.656 | 0.765 | 517.351 |
| 12:30:00 PM | 11.535 | 0.768 | 514.977 |
| 12:45:00 PM | 11.848 | 0.378 | 261.641 |
| 1:00:00 PM | 11.929 | 0.359 | 251.328 |
| 1:15:00 PM | 11.617 | 0.435 | 294.497 |
| 1:30:00 PM | 11.604 | 0.677 | 451.163 |
| 1:45:00 PM | 11.416 | 0.568 | 374.245 |
| 2:00:00 PM | 11.415 | 0.411 | 271.9 |
| 2:15:00 PM | 11.429 | 0.48 | 317.636 |
| 2:30:00 PM | 11.361 | 0.827 | 539.333 |
| 2:45:00 PM | 11.293 | 0.668 | 433.4 |
| 3:00:00 PM | 11.26 | 0.387 | 251.659 |
| 3:15:00 PM | 11.214 | 0.029 | 223.869 |
| 3:30:00 PM | 11.126 | 0.251 | 235.422 |
| 3:45:00 PM | 11.175 | 0.366 | 235.209 |
| 4:00:00 PM | 11.199 | 0.636 | 410.646 |
| 4:15:00 PM | 11.249 | 0.512 | 383.144 |
| 4:30:00 PM | 11.234 | 0 | 301.893 |
| 4:45:00 PM | 10.994 | 0.466 | 293.252 |
| 5:00:00 PM | 11.128 | 0.576 | 368.769 |
| 5:15:00 PM | 11.056 | 0.413 | 262.258 |
| 5:30:00 PM | 11.04 | 0.429 | 271.22 |
| 5:45:00 PM | 10.993 | 0 | 251.43 |
| 6:00:00 PM | 10.987 | 0 | 251.245 |
| 6:15:00 PM | 11.095 | 0 | 254.465 |
| 6:30:00 PM | 11.095 | 0.053 | 254.303 |
| 6:45:00 PM | 11.036 | 0.343 | 235.422 |
| 7:00:00 PM | 11.233 | 0.362 | 233.149 |
| 7:15:00 PM | 11.201 | 0.335 | 214.802 |
| 7:30:00 PM | 11.17 | 0.663 | 421.186 |
| 7:45:00 PM | 11.221 | 0.376 | 242.365 |
| 8:00:00 PM | 11.231 | 0.382 | 247.355 |
| 8:15:00 PM | 11.165 | 0.389 | 247.731 |
| 8:30:00 PM | 11.088 | 0.36 | 229.157 |
| 8:45:00 PM | 11.323 | 0.731 | 478.106 |
| 9:00:00 PM | 11.545 | 0.681 | 453.628 |
| 9:15:00 PM | 11.547 | 0.37 | 247.154 |
| 9:30:00 PM | 11.527 | 0.688 | 458.041 |
| 9:45:00 PM | 11.492 | 0.58 | 386.023 |
| 10:00:00 PM | 11.566 | 0.728 | 488.191 |
| 10:15:00 PM | 11.542 | 0.392 | 263.202 |
| 10:30:00 PM | 11.608 | 0.403 | 272.048 |
| 10:45:00 PM | 11.627 | 0 | 272.617 |
| 11:00:00 PM | 11.448 | 0 | 267.231 |
| 11:15:00 PM | 11.235 | 0 | 260.836 |
| 11:30:00 PM | 11.083 | 0 | 256.266 |
| 11:45:00 PM | 10.938 | 0 | 251.908 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.688 | 0.404 | 281.788 |
| Daily Min: | 8.995 | 0 | 114.499 |
| Daily Max: | 11.929 | 0.838 | 567.821 |
| Peak to Avg: | | | 2.02 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/24/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 416 Dartmouth

**Monday - A.M. 7/24/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 10.697 | 0 | 244.707 |
| 12:15:00 AM | 10.53 | 0 | 239.71 |
| 12:30:00 AM | 10.424 | 0 | 236.543 |
| 12:45:00 AM | 10.304 | 0 | 232.94 |
| 1:00:00 AM | 10.174 | 0 | 229.066 |
| 1:15:00 AM | 10.003 | 0 | 223.99 |
| 1:30:00 AM | 9.689 | 0 | 214.691 |
| 1:45:00 AM | 9.619 | 0 | 212.617 |
| 2:00:00 AM | 9.465 | 0 | 208.078 |
| 2:15:00 AM | 9.566 | 0 | 211.072 |
| 2:30:00 AM | 9.604 | 0 | 212.176 |
| 2:45:00 AM | 9.413 | 0 | 206.544 |
| 3:00:00 AM | 9.344 | 0 | 204.519 |
| 3:15:00 AM | 9.183 | 0 | 199.803 |
| 3:30:00 AM | 9.166 | 0 | 199.307 |
| 3:45:00 AM | 9.237 | 0 | 201.387 |
| 4:00:00 AM | 9.197 | 0 | 200.219 |
| 4:15:00 AM | 9.018 | 0 | 194.98 |
| 4:30:00 AM | 9.077 | 0 | 196.702 |
| 4:45:00 AM | 9.06 | 0 | 196.22 |
| 5:00:00 AM | 9.173 | 0 | 199.517 |
| 5:15:00 AM | 9.237 | 0.164 | 201.399 |
| 5:30:00 AM | 9.187 | 0 | 81.59 |
| 5:45:00 AM | 9.387 | 0 | 83.981 |
| 6:00:00 AM | 9.459 | 0 | 84.853 |
| 6:15:00 AM | 9.544 | 0 | 85.869 |
| 6:30:00 AM | 9.674 | 0 | 87.437 |
| 6:45:00 AM | 9.761 | 0 | 88.482 |
| 7:00:00 AM | 9.74 | 0 | 88.226 |
| 7:15:00 AM | 10.066 | 0 | 92.173 |
| 7:30:00 AM | 10.288 | 0 | 94.877 |
| 7:45:00 AM | 10.234 | 0 | 94.216 |
| 8:00:00 AM | 10.572 | 0 | 98.338 |
| 8:15:00 AM | 10.612 | 0 | 98.827 |
| 8:30:00 AM | 10.765 | 0 | 100.696 |
| 8:45:00 AM | 10.817 | 0.35 | 215.917 |
| 9:00:00 AM | 10.848 | 0 | 207.029 |
| 9:15:00 AM | 11.079 | 0 | 212.804 |
| 9:30:00 AM | 11.115 | 0 | 213.694 |
| 9:45:00 AM | 11.176 | 0 | 215.225 |
| 10:00:00 AM | 11.185 | 0 | 215.437 |
| 10:15:00 AM | 11.207 | 0 | 215.982 |
| 10:30:00 AM | 11.169 | 0.034 | 208.474 |
| 10:45:00 AM | 11.069 | 0.368 | 233.876 |
| 11:00:00 AM | 11.106 | 0.717 | 453.845 |
| 11:15:00 AM | 11.073 | 0.294 | 185.051 |
| 11:30:00 AM | 11.22 | 0.402 | 260.141 |
| 11:45:00 AM | 11.089 | 0.372 | 236.901 |

**Monday - P.M. 7/24/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 11.138 | 0.384 | 245.678 |
| 12:15:00 PM | 11.09 | 0.622 | 396.127 |
| 12:30:00 PM | 11.01 | 0.331 | 208.776 |
| 12:45:00 PM | 11.159 | 0.51 | 324.131 |
| 1:00:00 PM | 11.216 | 0.337 | 216.732 |
| 1:15:00 PM | 11.21 | 0.639 | 399.944 |
| 1:30:00 PM | 11.313 | 0.607 | 396.873 |
| 1:45:00 PM | 11.342 | 0.309 | 398.159 |
| 2:00:00 PM | 11.217 | 0.366 | 236.354 |
| 2:15:00 PM | 11.209 | 0.344 | 221.441 |
| 2:30:00 PM | 10.907 | 0.364 | 227.046 |
| 2:45:00 PM | 10.33 | 0.27 | 154.547 |
| 3:00:00 PM | 10.241 | 0.443 | 253.854 |
| 3:15:00 PM | 12.156 | 0.248 | 177.557 |
| 3:30:00 PM | 12.487 | 0.066 | 172.544 |
| 3:45:00 PM | 11.611 | 0 | 188.712 |
| 4:00:00 PM | 11.276 | 0 | 190.509 |
| 4:15:00 PM | 11.024 | 0 | 203.084 |
| 4:30:00 PM | 11.172 | 0 | 195.898 |
| 4:45:00 PM | 11.038 | 0.357 | 223.727 |
| 5:00:00 PM | 10.845 | 0.466 | 286.089 |
| 5:15:00 PM | 10.933 | 0.473 | 295.572 |
| 5:30:00 PM | 11.118 | 0.685 | 437.05 |
| 5:45:00 PM | 11.217 | 0.517 | 334.524 |
| 6:00:00 PM | 11.229 | 0.44 | 284.976 |
| 6:15:00 PM | 11.226 | 0.508 | 328.332 |
| 6:30:00 PM | 11.397 | 0.532 | 350.753 |
| 6:45:00 PM | 11.381 | 0.586 | 384.797 |
| 7:00:00 PM | 11.335 | 0.518 | 336.344 |
| 7:15:00 PM | 11.47 | 0.438 | 291.576 |
| 7:30:00 PM | 11.654 | 0.491 | 331.287 |
| 7:45:00 PM | 11.602 | 0 | 226.122 |
| 8:00:00 PM | 11.725 | 0.505 | 345.375 |
| 8:15:00 PM | 11.786 | 0.618 | 425.848 |
| 8:30:00 PM | 11.824 | 0.427 | 427.564 |
| 8:45:00 PM | 11.966 | 0.455 | 319.237 |
| 9:00:00 PM | 11.808 | 0.42 | 289.76 |
| 9:15:00 PM | 11.827 | 0.375 | 257.88 |
| 9:30:00 PM | 11.824 | 0 | 154.073 |
| 9:45:00 PM | 11.723 | 0.522 | 357.073 |
| 10:00:00 PM | 11.859 | 0.484 | 335.972 |
| 10:15:00 PM | 11.833 | 0 | 335.034 |
| 10:30:00 PM | 11.689 | 0.274 | 186.743 |
| 10:45:00 PM | 11.704 | 0.321 | 218.296 |
| 11:00:00 PM | 11.667 | 0.381 | 257.696 |
| 11:15:00 PM | 11.512 | 0 | 253.027 |
| 11:30:00 PM | 11.343 | 0.265 | 173.904 |
| 11:45:00 PM | 11.146 | 0 | 170.02 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 10.744 | 0.206 | 232.653 |
| Daily Min: | 9.018 | 0 | 81.59 |
| Daily Max: | 12.487 | 0.717 | 453.845 |
| Peak to Avg: | | | 1.95 |

DRAFT

# Sewer Line Flow Study Summary

Project: **City of Santa Paula - Sewer Flow Study**
Location: **416 Dartmouth, Santa Paula, CA**
Pipe Size: **24" VCP**
Time Period: **7/11/2023, 12:00 a.m. - 7/25/2023, 12:00 a.m.**

## Level - Inches

| | |
|---|---|
| Average: | 10.757 |
| Maximum: | 12.487 |
| Minimum: | 8.904 |
| Max d/D: | 52.0% |

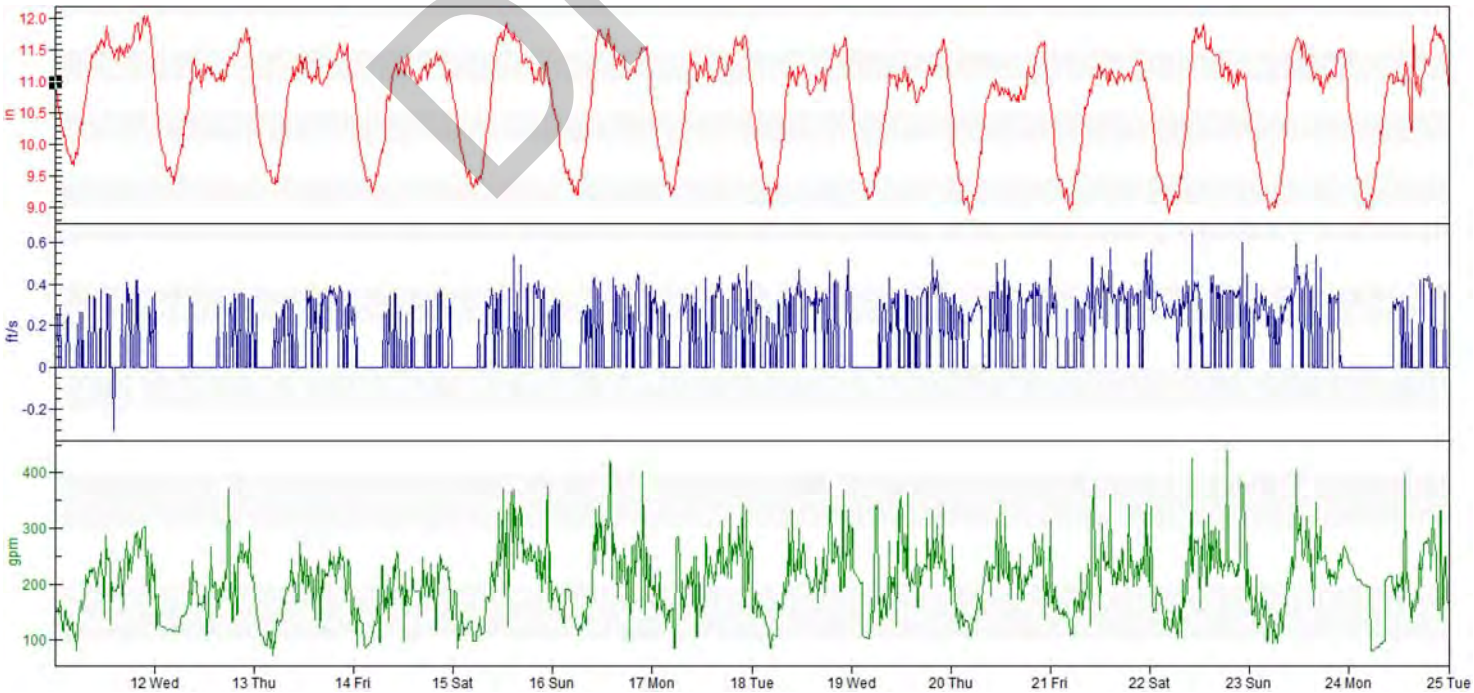
## Velocity - Feet per Second

| | |
|---|---|
| Average: | 0.258 |
| Maximum: | 0.838 |
| Minimum: | 0.194 |

## Flow Rate - Gallons Per Minute

| | |
|---|---|
| Average: | 228.388 |
| Maximum:: | 573.740 |
| Minimum: | 73.413 |
| Peak to Average | 1.70 |

DRAFT




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

# CITY OF SANTA PAULA - SEWER FLOW STUDY

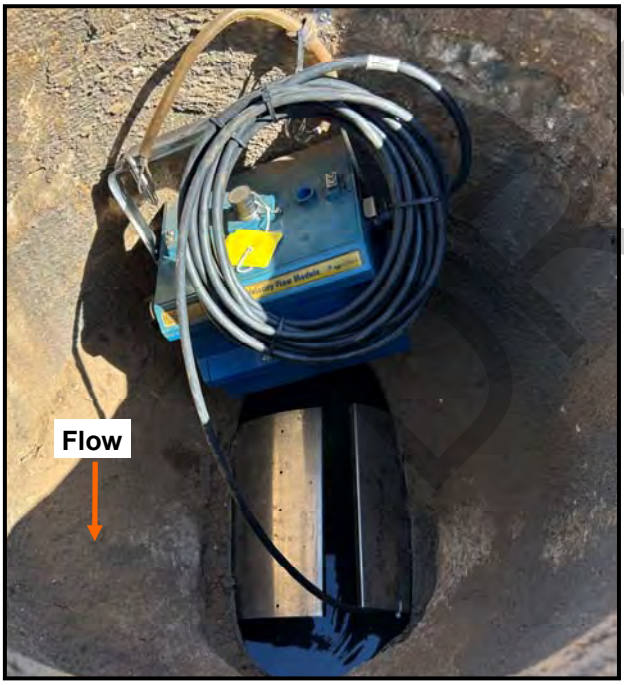
MH Location: **224 S. Palm Ave.**
**Santa Paula, CA 93060**

Pipe Size: **15" VCP**

Time Period: **7/11/2023 - 12:00 a.m. to**
**7/25/2023- 12:00 a.m.**

GPS: **34.347765, -119.070200**

## Manhole - Layout




- This is a very shallow manhole, top of the VCP line is not fully opened, a special spring ring was required to install the meter inside of this line.

## Equipment

**Teledyne Isco 2150 Area Velocity Flow Meter with 10' measuring range:**
**Level Measurement:**

- Method - Submerged pressure transducer mounted in the flow stream
- Transducer Type - Differential linear integrated circuit pressure transducer
- Range (standard) 0.033 to 10 ft (0.010 to 3.05 m); Maximum Allowable Level 34 ft (10.5 m)
- Accuracy ±0.01 ft from 0.033 to 10 ft, (±0.003 m from 0.01 to 3.05 m,)
- Long-Term Stability ±0.023 ft/yr (±0.007 m/yr)
- Compensated Range 32° to 122°F (0° to 50°C)

**Velocity Measurement:**

- Method - Doppler ultrasonic, frequency 500 kHz
- Typical Minimum Depth 0.08 ft (25 mm)
- Range -5 to +20 ft/s (-1.5 to +6.1 m/s)
- Accuracy (in water with uniform velocity profile, speed of sound = 4850 ft/s, for indicated velocity range) ±0.1 ft/s from -5 to 5 ft/s (±0.03 m/s from— 1.5 to +1.5 m/s)
- ±2% of reading from 5 to 20 ft/s (1.5 to 6.1 m/s)

**Method Of Insertion:**

- 15 inch line did not require Confined Space Entry.

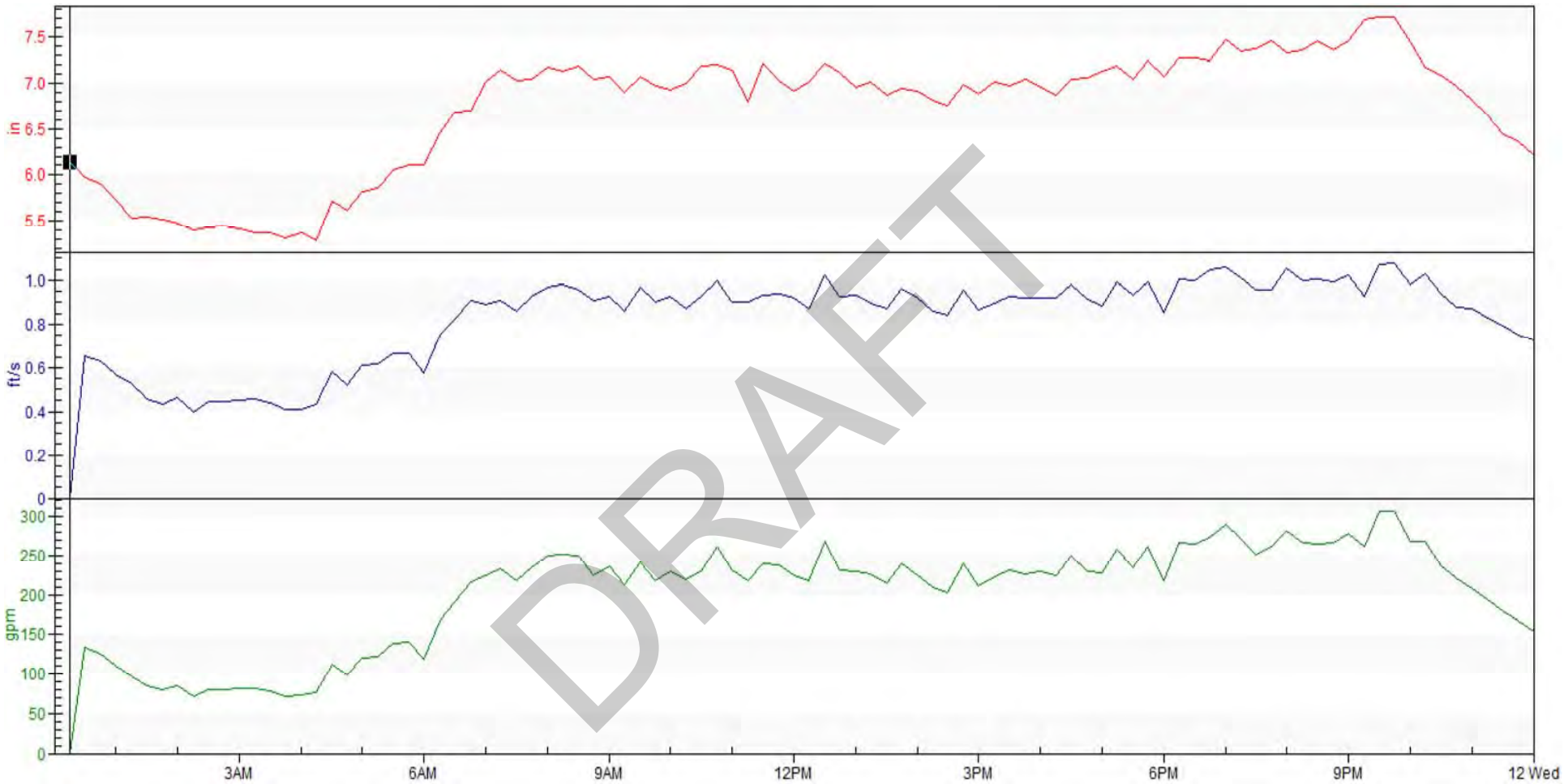
DRAFT

**Gold Coast Environmental**

**Specializing in process instrumentation and calibration.**

1868 Palma Drive, Suite I, Ventura, CA 93003 www.goldcoastenv.com 805.498.3811 ph.

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/11/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Tuesday- A.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| | | | |
| 12:15:00 AM | 6.129 | 0 | 0 |
| 12:30:00 AM | 5.972 | 0.654 | 133.776 |
| 12:45:00 AM | 5.902 | 0.627 | 126.011 |
| 1:00:00 AM | 5.736 | 0.569 | 110.265 |
| 1:15:00 AM | 5.533 | 0.525 | 96.839 |
| 1:30:00 AM | 5.551 | 0.46 | 85.299 |
| 1:45:00 AM | 5.518 | 0.433 | 79.378 |
| 2:00:00 AM | 5.473 | 0.464 | 84.43 |
| 2:15:00 AM | 5.398 | 0.4 | 71.144 |
| 2:30:00 AM | 5.426 | 0.449 | 80.336 |
| 2:45:00 AM | 5.448 | 0.448 | 80.332 |
| 3:00:00 AM | 5.412 | 0.455 | 81.402 |
| 3:15:00 AM | 5.376 | 0.458 | 81.242 |
| 3:30:00 AM | 5.374 | 0.438 | 77.732 |
| 3:45:00 AM | 5.308 | 0.412 | 71.675 |
| 4:00:00 AM | 5.374 | 0.41 | 72.758 |
| 4:15:00 AM | 5.285 | 0.437 | 75.718 |
| 4:30:00 AM | 5.725 | 0.579 | 111.905 |
| 4:45:00 AM | 5.624 | 0.517 | 97.557 |
| 5:00:00 AM | 5.821 | 0.609 | 120.274 |
| 5:15:00 AM | 5.857 | 0.615 | 122.047 |
| 5:30:00 AM | 6.054 | 0.664 | 138.335 |
| 5:45:00 AM | 6.114 | 0.666 | 140.414 |
| 6:00:00 AM | 6.105 | 0.572 | 119.231 |
| 6:15:00 AM | 6.46 | 0.749 | 166.732 |
| 6:30:00 AM | 6.685 | 0.826 | 190.249 |
| 6:45:00 AM | 6.702 | 0.906 | 215.71 |
| 7:00:00 AM | 7.008 | 0.888 | 224.237 |
| 7:15:00 AM | 7.147 | 0.906 | 232.467 |
| 7:30:00 AM | 7.028 | 0.861 | 218.19 |
| 7:45:00 AM | 7.045 | 0.927 | 234.658 |
| 8:00:00 AM | 7.172 | 0.97 | 249.226 |
| 8:15:00 AM | 7.127 | 0.981 | 251.751 |
| 8:30:00 AM | 7.188 | 0.954 | 248.92 |
| 8:45:00 AM | 7.039 | 0.905 | 224.595 |
| 9:00:00 AM | 7.067 | 0.925 | 236.087 |
| 9:15:00 AM | 6.898 | 0.861 | 213.012 |
| 9:30:00 AM | 7.071 | 0.969 | 241.544 |
| 9:45:00 AM | 6.975 | 0.9 | 217.589 |
| 10:00:00 AM | 6.933 | 0.925 | 230.365 |
| 10:15:00 AM | 7.007 | 0.871 | 219.704 |
| 10:30:00 AM | 7.192 | 0.925 | 229.825 |
| 10:45:00 AM | 7.203 | 1 | 261.612 |
| 11:00:00 AM | 7.141 | 0.903 | 231.434 |
| 11:15:00 AM | 6.801 | 0.903 | 218.507 |
| 11:30:00 AM | 7.223 | 0.935 | 239.633 |
| 11:45:00 AM | 7.03 | 0.941 | 238.623 |

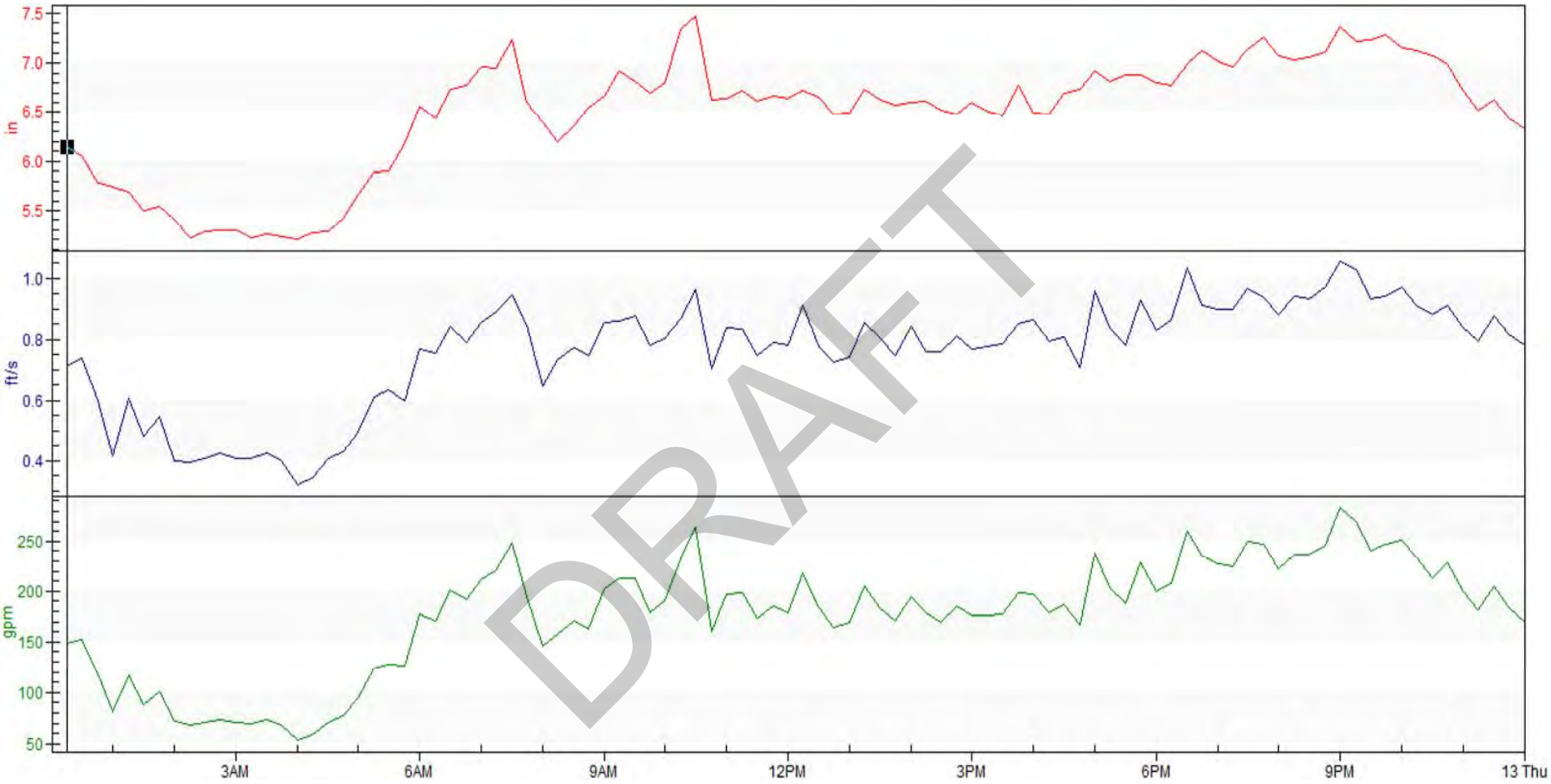
**Tuesday- P.M. 7/11/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.912 | 0.918 | 223.882 |
| 12:15:00 PM | 7.016 | 0.87 | 217.385 |
| 12:30:00 PM | 7.217 | 1.024 | 268.509 |
| 12:45:00 PM | 7.111 | 0.925 | 230.476 |
| 1:00:00 PM | 6.964 | 0.936 | 228.964 |
| 1:15:00 PM | 7.013 | 0.893 | 225.676 |
| 1:30:00 PM | 6.87 | 0.873 | 214.799 |
| 1:45:00 PM | 6.94 | 0.961 | 239.509 |
| 2:00:00 PM | 6.919 | 0.923 | 225.227 |
| 2:15:00 PM | 6.806 | 0.859 | 208.814 |
| 2:30:00 PM | 6.757 | 0.843 | 202.249 |
| 2:45:00 PM | 6.982 | 0.954 | 239.733 |
| 3:00:00 PM | 6.881 | 0.866 | 210.973 |
| 3:15:00 PM | 7.013 | 0.899 | 222.758 |
| 3:30:00 PM | 6.978 | 0.928 | 230.863 |
| 3:45:00 PM | 7.04 | 0.922 | 226.783 |
| 4:00:00 PM | 6.955 | 0.919 | 229.609 |
| 4:15:00 PM | 6.877 | 0.918 | 225.108 |
| 4:30:00 PM | 7.049 | 0.981 | 249.531 |
| 4:45:00 PM | 7.057 | 0.917 | 229.938 |
| 5:00:00 PM | 7.129 | 0.884 | 228.185 |
| 5:15:00 PM | 7.194 | 0.991 | 258.857 |
| 5:30:00 PM | 7.037 | 0.932 | 234.978 |
| 5:45:00 PM | 7.25 | 0.994 | 261.801 |
| 6:00:00 PM | 7.07 | 0.855 | 218.135 |
| 6:15:00 PM | 7.271 | 1.007 | 266.313 |
| 6:30:00 PM | 7.281 | 1 | 265.151 |
| 6:45:00 PM | 7.245 | 1.05 | 272.794 |
| 7:00:00 PM | 7.475 | 1.06 | 290.696 |
| 7:15:00 PM | 7.348 | 1.014 | 272.067 |
| 7:30:00 PM | 7.37 | 0.955 | 252.058 |
| 7:45:00 PM | 7.46 | 0.956 | 261.477 |
| 8:00:00 PM | 7.329 | 1.056 | 281.756 |
| 8:15:00 PM | 7.363 | 0.997 | 265.869 |
| 8:30:00 PM | 7.461 | 1.005 | 265.666 |
| 8:45:00 PM | 7.363 | 0.995 | 266.421 |
| 9:00:00 PM | 7.464 | 1.025 | 278.616 |
| 9:15:00 PM | 7.685 | 0.926 | 260.758 |
| 9:30:00 PM | 7.72 | 1.074 | 306.682 |
| 9:45:00 PM | 7.721 | 1.076 | 307.546 |
| 10:00:00 PM | 7.453 | 0.984 | 267.989 |
| 10:15:00 PM | 7.168 | 1.03 | 267.694 |
| 10:30:00 PM | 7.086 | 0.936 | 236.752 |
| 10:45:00 PM | 6.975 | 0.878 | 220.356 |
| 11:00:00 PM | 6.813 | 0.873 | 207.581 |
| 11:15:00 PM | 6.653 | 0.827 | 194.995 |
| 11:30:00 PM | 6.441 | 0.795 | 179.633 |
| 11:45:00 PM | 6.368 | 0.751 | 167.312 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.718 | 0.822 | 201.070 |
| Daily Min: | 5.285 | 0 | 0 |
| Daily Max: | 7.721 | 1.076 | 307.546 |
| Peak to Avg: | | | 1.53 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/12/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Wednesday - A.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.201 | 0.724 | 153.448 |
| 12:15:00 AM | 6.14 | 0.712 | 149.048 |
| 12:30:00 AM | 6.043 | 0.736 | 152.973 |
| 12:45:00 AM | 5.787 | 0.6 | 117.546 |
| 1:00:00 AM | 5.738 | 0.417 | 80.737 |
| 1:15:00 AM | 5.687 | 0.607 | 116.151 |
| 1:30:00 AM | 5.504 | 0.482 | 87.292 |
| 1:45:00 AM | 5.535 | 0.547 | 101.051 |
| 2:00:00 AM | 5.412 | 0.4 | 71.655 |
| 2:15:00 AM | 5.219 | 0.397 | 67.656 |
| 2:30:00 AM | 5.28 | 0.41 | 70.956 |
| 2:45:00 AM | 5.302 | 0.426 | 73.419 |
| 3:00:00 AM | 5.298 | 0.408 | 70.965 |
| 3:15:00 AM | 5.222 | 0.407 | 69.449 |
| 3:30:00 AM | 5.263 | 0.425 | 72.922 |
| 3:45:00 AM | 5.237 | 0.401 | 68.06 |
| 4:00:00 AM | 5.204 | 0.321 | 53.885 |
| 4:15:00 AM | 5.275 | 0.344 | 59.362 |
| 4:30:00 AM | 5.291 | 0.407 | 70.691 |
| 4:45:00 AM | 5.424 | 0.43 | 77.227 |
| 5:00:00 AM | 5.663 | 0.494 | 94.141 |
| 5:15:00 AM | 5.887 | 0.614 | 123.092 |
| 5:30:00 AM | 5.898 | 0.634 | 127.401 |
| 5:45:00 AM | 6.182 | 0.6 | 125.935 |
| 6:00:00 AM | 6.563 | 0.769 | 177.434 |
| 6:15:00 AM | 6.438 | 0.755 | 170.475 |
| 6:30:00 AM | 6.731 | 0.843 | 201.108 |
| 6:45:00 AM | 6.78 | 0.792 | 191.426 |
| 7:00:00 AM | 6.959 | 0.855 | 211.363 |
| 7:15:00 AM | 6.95 | 0.888 | 220.603 |
| 7:30:00 AM | 7.236 | 0.945 | 248.607 |
| 7:45:00 AM | 6.596 | 0.848 | 194.717 |
| 8:00:00 AM | 6.401 | 0.649 | 145.454 |
| 8:15:00 AM | 6.198 | 0.733 | 157.427 |
| 8:30:00 AM | 6.356 | 0.771 | 171.267 |
| 8:45:00 AM | 6.546 | 0.745 | 162.888 |
| 9:00:00 AM | 6.666 | 0.855 | 202.083 |
| 9:15:00 AM | 6.92 | 0.859 | 213.373 |
| 9:30:00 AM | 6.812 | 0.877 | 213.362 |
| 9:45:00 AM | 6.694 | 0.783 | 178.437 |
| 10:00:00 AM | 6.805 | 0.802 | 191.08 |
| 10:15:00 AM | 7.342 | 0.868 | 232.563 |
| 10:30:00 AM | 7.473 | 0.963 | 264.026 |
| 10:45:00 AM | 6.624 | 0.703 | 160.723 |
| 11:00:00 AM | 6.642 | 0.838 | 197.256 |
| 11:15:00 AM | 6.723 | 0.835 | 198.306 |
| 11:30:00 AM | 6.619 | 0.747 | 173.973 |
| 11:45:00 AM | 6.661 | 0.788 | 185.673 |

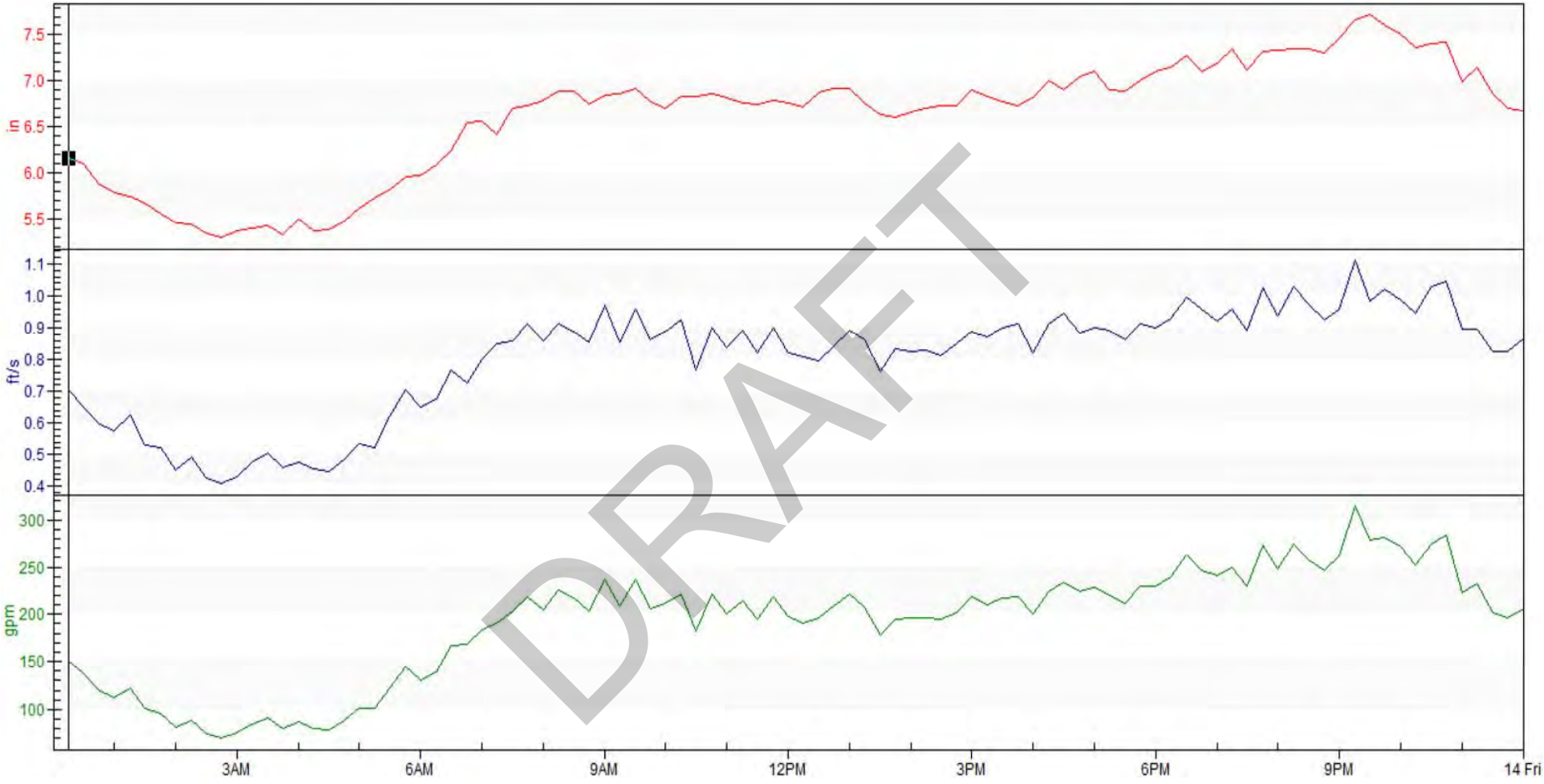
**Wednesday - P.M. 7/12/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.638 | 0.783 | 178.56 |
| 12:15:00 PM | 6.717 | 0.913 | 217.571 |
| 12:30:00 PM | 6.653 | 0.778 | 183.382 |
| 12:45:00 PM | 6.475 | 0.725 | 164.208 |
| 1:00:00 PM | 6.488 | 0.741 | 169.077 |
| 1:15:00 PM | 6.73 | 0.854 | 204.556 |
| 1:30:00 PM | 6.631 | 0.801 | 182.976 |
| 1:45:00 PM | 6.568 | 0.747 | 171.13 |
| 2:00:00 PM | 6.596 | 0.843 | 194.916 |
| 2:15:00 PM | 6.619 | 0.761 | 178.354 |
| 2:30:00 PM | 6.521 | 0.758 | 169.743 |
| 2:45:00 PM | 6.485 | 0.814 | 185.599 |
| 3:00:00 PM | 6.596 | 0.769 | 175.444 |
| 3:15:00 PM | 6.51 | 0.775 | 176.371 |
| 3:30:00 PM | 6.468 | 0.787 | 176.716 |
| 3:45:00 PM | 6.771 | 0.852 | 198.218 |
| 4:00:00 PM | 6.492 | 0.863 | 197.038 |
| 4:15:00 PM | 6.475 | 0.796 | 178.353 |
| 4:30:00 PM | 6.689 | 0.808 | 187.203 |
| 4:45:00 PM | 6.734 | 0.709 | 166.941 |
| 5:00:00 PM | 6.921 | 0.961 | 238.564 |
| 5:15:00 PM | 6.817 | 0.837 | 203.779 |
| 5:30:00 PM | 6.881 | 0.783 | 188.012 |
| 5:45:00 PM | 6.88 | 0.93 | 229.106 |
| 6:00:00 PM | 6.799 | 0.83 | 200.057 |
| 6:15:00 PM | 6.781 | 0.865 | 207.122 |
| 6:30:00 PM | 6.99 | 1.032 | 259.715 |
| 6:45:00 PM | 7.126 | 0.913 | 235.415 |
| 7:00:00 PM | 7.019 | 0.898 | 227.075 |
| 7:15:00 PM | 6.961 | 0.9 | 225.138 |
| 7:30:00 PM | 7.135 | 0.969 | 250.334 |
| 7:45:00 PM | 7.251 | 0.939 | 247.769 |
| 8:00:00 PM | 7.076 | 0.882 | 221.891 |
| 8:15:00 PM | 7.033 | 0.942 | 236.848 |
| 8:30:00 PM | 7.056 | 0.931 | 237.104 |
| 8:45:00 PM | 7.116 | 0.971 | 246.043 |
| 9:00:00 PM | 7.363 | 1.055 | 283.725 |
| 9:15:00 PM | 7.224 | 1.029 | 269.394 |
| 9:30:00 PM | 7.236 | 0.933 | 241.017 |
| 9:45:00 PM | 7.285 | 0.94 | 247.551 |
| 10:00:00 PM | 7.147 | 0.971 | 251.295 |
| 10:15:00 PM | 7.122 | 0.91 | 234.498 |
| 10:30:00 PM | 7.069 | 0.879 | 213.072 |
| 10:45:00 PM | 6.983 | 0.91 | 228.531 |
| 11:00:00 PM | 6.726 | 0.838 | 200.401 |
| 11:15:00 PM | 6.515 | 0.793 | 181.852 |
| 11:30:00 PM | 6.63 | 0.875 | 205.425 |
| 11:45:00 PM | 6.438 | 0.818 | 183.61 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.491 | 0.759 | 177.010 |
| Daily Min: | 5.204 | 0.321 | 53.885 |
| Daily Max: | 7.473 | 1.055 | 283.725 |
| Peak to Avg: | | | 1.60 |

DRAFT

# MAXIMUM DAILY FLOW DATA




**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/13/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Thursday - A.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.326 | 0.781 | 169.149 |
| 12:15:00 AM | 6.161 | 0.703 | 149.807 |
| 12:30:00 AM | 6.099 | 0.652 | 137.209 |
| 12:45:00 AM | 5.873 | 0.596 | 118.661 |
| 1:00:00 AM | 5.786 | 0.576 | 112.03 |
| 1:15:00 AM | 5.745 | 0.626 | 121.472 |
| 1:30:00 AM | 5.666 | 0.53 | 101.012 |
| 1:45:00 AM | 5.549 | 0.522 | 96.251 |
| 2:00:00 AM | 5.45 | 0.45 | 81.254 |
| 2:15:00 AM | 5.44 | 0.493 | 88.675 |
| 2:30:00 AM | 5.333 | 0.425 | 74.604 |
| 2:45:00 AM | 5.295 | 0.409 | 70.732 |
| 3:00:00 AM | 5.365 | 0.432 | 76.39 |
| 3:15:00 AM | 5.396 | 0.477 | 84.396 |
| 3:30:00 AM | 5.429 | 0.505 | 90.882 |
| 3:45:00 AM | 5.32 | 0.46 | 80.445 |
| 4:00:00 AM | 5.498 | 0.478 | 87.373 |
| 4:15:00 AM | 5.367 | 0.453 | 80.286 |
| 4:30:00 AM | 5.38 | 0.446 | 79.167 |
| 4:45:00 AM | 5.464 | 0.486 | 88.119 |
| 5:00:00 AM | 5.61 | 0.535 | 100.505 |
| 5:15:00 AM | 5.724 | 0.52 | 100.511 |
| 5:30:00 AM | 5.807 | 0.621 | 122.334 |
| 5:45:00 AM | 5.954 | 0.707 | 143.948 |
| 6:00:00 AM | 5.97 | 0.652 | 130.53 |
| 6:15:00 AM | 6.092 | 0.676 | 138.483 |
| 6:30:00 AM | 6.238 | 0.768 | 166.507 |
| 6:45:00 AM | 6.551 | 0.728 | 168.205 |
| 7:00:00 AM | 6.565 | 0.801 | 183.53 |
| 7:15:00 AM | 6.414 | 0.849 | 190.782 |
| 7:30:00 AM | 6.699 | 0.858 | 203.396 |
| 7:45:00 AM | 6.73 | 0.913 | 218.672 |
| 8:00:00 AM | 6.788 | 0.861 | 204.739 |
| 8:15:00 AM | 6.89 | 0.912 | 225.285 |
| 8:30:00 AM | 6.891 | 0.889 | 217.24 |
| 8:45:00 AM | 6.75 | 0.855 | 202.595 |
| 9:00:00 AM | 6.844 | 0.97 | 237.442 |
| 9:15:00 AM | 6.858 | 0.856 | 208.565 |
| 9:30:00 AM | 6.913 | 0.957 | 236.532 |
| 9:45:00 AM | 6.779 | 0.862 | 205.611 |
| 10:00:00 AM | 6.704 | 0.886 | 211.006 |
| 10:15:00 AM | 6.832 | 0.927 | 220.859 |
| 10:30:00 AM | 6.831 | 0.768 | 182.661 |
| 10:45:00 AM | 6.856 | 0.9 | 220.705 |
| 11:00:00 AM | 6.816 | 0.837 | 199.856 |
| 11:15:00 AM | 6.759 | 0.892 | 214.755 |
| 11:30:00 AM | 6.75 | 0.822 | 195.234 |
| 11:45:00 AM | 6.79 | 0.901 | 218.193 |

**Thursday - P.M. 7/13/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.759 | 0.823 | 198.174 |
| 12:15:00 PM | 6.719 | 0.811 | 191.121 |
| 12:30:00 PM | 6.873 | 0.797 | 195.522 |
| 12:45:00 PM | 6.911 | 0.844 | 209.271 |
| 1:00:00 PM | 6.918 | 0.893 | 221.7 |
| 1:15:00 PM | 6.753 | 0.861 | 207.211 |
| 1:30:00 PM | 6.626 | 0.761 | 177.354 |
| 1:45:00 PM | 6.605 | 0.832 | 194.501 |
| 2:00:00 PM | 6.662 | 0.828 | 195.544 |
| 2:15:00 PM | 6.699 | 0.831 | 196.077 |
| 2:30:00 PM | 6.729 | 0.815 | 195.033 |
| 2:45:00 PM | 6.729 | 0.852 | 202.232 |
| 3:00:00 PM | 6.909 | 0.89 | 218.277 |
| 3:15:00 PM | 6.833 | 0.872 | 210.337 |
| 3:30:00 PM | 6.767 | 0.902 | 216.979 |
| 3:45:00 PM | 6.737 | 0.914 | 219.121 |
| 4:00:00 PM | 6.821 | 0.823 | 200.51 |
| 4:15:00 PM | 6.999 | 0.914 | 224.589 |
| 4:30:00 PM | 6.908 | 0.945 | 234.103 |
| 4:45:00 PM | 7.049 | 0.884 | 224.473 |
| 5:00:00 PM | 7.101 | 0.9 | 228.312 |
| 5:15:00 PM | 6.91 | 0.89 | 219.798 |
| 5:30:00 PM | 6.889 | 0.861 | 211.838 |
| 5:45:00 PM | 7.001 | 0.914 | 230.278 |
| 6:00:00 PM | 7.099 | 0.9 | 229.797 |
| 6:15:00 PM | 7.152 | 0.93 | 239.162 |
| 6:30:00 PM | 7.277 | 0.996 | 263.91 |
| 6:45:00 PM | 7.108 | 0.961 | 246.36 |
| 7:00:00 PM | 7.197 | 0.92 | 240.362 |
| 7:15:00 PM | 7.351 | 0.96 | 250.014 |
| 7:30:00 PM | 7.119 | 0.893 | 229.897 |
| 7:45:00 PM | 7.326 | 1.024 | 273.501 |
| 8:00:00 PM | 7.334 | 0.937 | 248.154 |
| 8:15:00 PM | 7.353 | 1.03 | 274.889 |
| 8:30:00 PM | 7.351 | 0.976 | 257.081 |
| 8:45:00 PM | 7.311 | 0.926 | 246.93 |
| 9:00:00 PM | 7.462 | 0.958 | 262.19 |
| 9:15:00 PM | 7.659 | 1.113 | 314.718 |
| 9:30:00 PM | 7.722 | 0.984 | 278.427 |
| 9:45:00 PM | 7.604 | 1.021 | 281.535 |
| 10:00:00 PM | 7.502 | 0.988 | 272.291 |
| 10:15:00 PM | 7.356 | 0.945 | 251.856 |
| 10:30:00 PM | 7.402 | 1.028 | 274.952 |
| 10:45:00 PM | 7.419 | 1.048 | 284.643 |
| 11:00:00 PM | 6.986 | 0.898 | 222.373 |
| 11:15:00 PM | 7.146 | 0.898 | 232.483 |
| 11:30:00 PM | 6.862 | 0.826 | 201.946 |
| 11:45:00 PM | 6.707 | 0.826 | 195.659 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.608 | 0.801 | 191.399 |
| Daily Min: | 5.295 | 0.409 | 70.732 |
| Daily Max: | 7.722 | 1.113 | 314.718 |
| Peak to Avg: | | | 1.64 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/14/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Friday - A.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.677 | 0.867 | 205.407 |
| 12:15:00 AM | 6.554 | 0.77 | 175.321 |
| 12:30:00 AM | 6.522 | 0.694 | 159.566 |
| 12:45:00 AM | 6.329 | 0.654 | 144.536 |
| 1:00:00 AM | 6.18 | 0.71 | 151.542 |
| 1:15:00 AM | 6.11 | 0.597 | 125.846 |
| 1:30:00 AM | 6.024 | 0.62 | 128.289 |
| 1:45:00 AM | 6.003 | 0.577 | 116.151 |
| 2:00:00 AM | 5.851 | 0.499 | 97.556 |
| 2:15:00 AM | 5.952 | 0.589 | 118.907 |
| 2:30:00 AM | 5.799 | 0.534 | 102.426 |
| 2:45:00 AM | 5.73 | 0.524 | 100.234 |
| 3:00:00 AM | 5.6 | 0.513 | 95.42 |
| 3:15:00 AM | 5.798 | 0.531 | 104.284 |
| 3:30:00 AM | 5.689 | 0.539 | 101.484 |
| 3:45:00 AM | 5.656 | 0.536 | 101.607 |
| 4:00:00 AM | 5.472 | 0.426 | 77.462 |
| 4:15:00 AM | 5.562 | 0.479 | 89.026 |
| 4:30:00 AM | 5.671 | 0.515 | 97.559 |
| 4:45:00 AM | 5.662 | 0.46 | 87.47 |
| 5:00:00 AM | 5.737 | 0.56 | 108.547 |
| 5:15:00 AM | 5.853 | 0.514 | 100.607 |
| 5:30:00 AM | 5.97 | 0.629 | 128.622 |
| 5:45:00 AM | 6.097 | 0.6 | 126.141 |
| 6:00:00 AM | 6.141 | 0.686 | 142.428 |
| 6:15:00 AM | 6.507 | 0.763 | 174.05 |
| 6:30:00 AM | 6.534 | 0.798 | 183.904 |
| 6:45:00 AM | 6.734 | 0.803 | 192.52 |
| 7:00:00 AM | 6.783 | 0.827 | 200.125 |
| 7:15:00 AM | 6.81 | 0.883 | 214.715 |
| 7:30:00 AM | 6.859 | 0.869 | 212.374 |
| 7:45:00 AM | 6.896 | 0.852 | 210.509 |
| 8:00:00 AM | 7.138 | 0.953 | 242.397 |
| 8:15:00 AM | 7.106 | 1.004 | 257.351 |
| 8:30:00 AM | 7.02 | 0.866 | 217.014 |
| 8:45:00 AM | 6.929 | 0.894 | 222.239 |
| 9:00:00 AM | 7.031 | 0.955 | 237.094 |
| 9:15:00 AM | 6.967 | 0.901 | 224.249 |
| 9:30:00 AM | 7.027 | 0.9 | 227.909 |
| 9:45:00 AM | 7.137 | 0.91 | 235.186 |
| 10:00:00 AM | 7.101 | 0.89 | 228.545 |
| 10:15:00 AM | 7.096 | 0.97 | 248.774 |
| 10:30:00 AM | 6.991 | 0.96 | 241.492 |
| 10:45:00 AM | 7.131 | 0.956 | 243.087 |
| 11:00:00 AM | 7.027 | 0.948 | 234.473 |
| 11:15:00 AM | 6.866 | 0.911 | 223.955 |
| 11:30:00 AM | 6.847 | 0.864 | 211.608 |
| 11:45:00 AM | 6.868 | 0.877 | 211.089 |

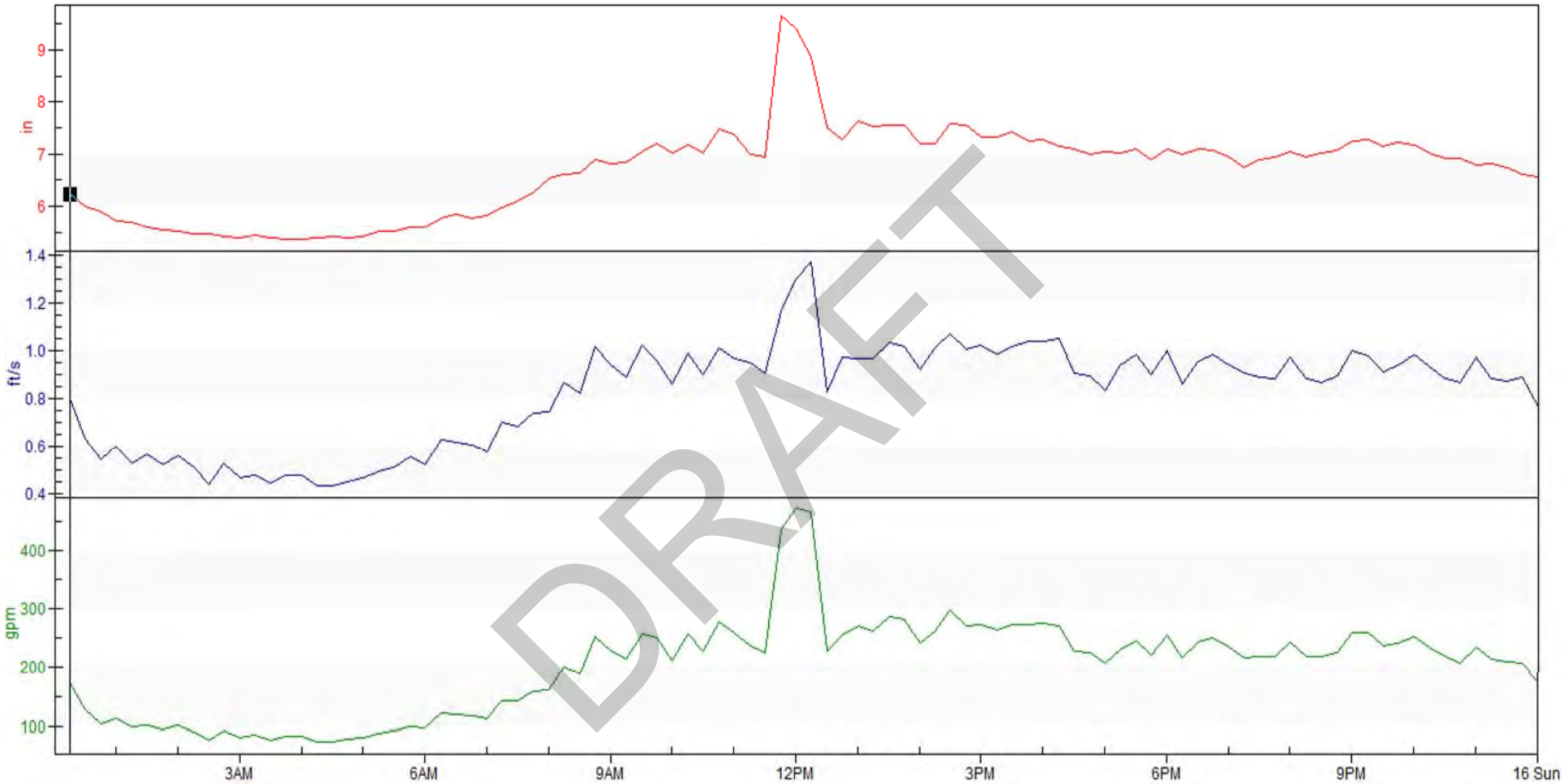
**Friday - P.M. 7/14/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.932 | 0.923 | 229.721 |
| 12:15:00 PM | 6.973 | 0.837 | 209.84 |
| 12:30:00 PM | 6.931 | 0.855 | 203.255 |
| 12:45:00 PM | 6.87 | 0.921 | 226.292 |
| 1:00:00 PM | 6.837 | 0.86 | 210.227 |
| 1:15:00 PM | 6.685 | 0.782 | 184.138 |
| 1:30:00 PM | 6.714 | 0.862 | 205.79 |
| 1:45:00 PM | 6.674 | 0.905 | 211.778 |
| 2:00:00 PM | 6.578 | 0.84 | 195.224 |
| 2:15:00 PM | 6.566 | 0.832 | 190.418 |
| 2:30:00 PM | 6.601 | 0.869 | 202.545 |
| 2:45:00 PM | 6.597 | 0.815 | 190.058 |
| 3:00:00 PM | 6.827 | 0.813 | 198.465 |
| 3:15:00 PM | 6.933 | 0.898 | 223.585 |
| 3:30:00 PM | 6.6 | 0.851 | 198.733 |
| 3:45:00 PM | 6.508 | 0.756 | 173.156 |
| 4:00:00 PM | 6.546 | 0.862 | 198.95 |
| 4:15:00 PM | 6.818 | 0.797 | 190.026 |
| 4:30:00 PM | 6.883 | 0.907 | 220.509 |
| 4:45:00 PM | 6.899 | 0.942 | 231.677 |
| 5:00:00 PM | 6.841 | 0.921 | 225.219 |
| 5:15:00 PM | 7.098 | 0.903 | 231.361 |
| 5:30:00 PM | 6.824 | 0.905 | 220.56 |
| 5:45:00 PM | 6.952 | 0.849 | 212.034 |
| 6:00:00 PM | 6.862 | 0.851 | 206.956 |
| 6:15:00 PM | 6.955 | 0.93 | 232.39 |
| 6:30:00 PM | 6.87 | 0.825 | 202.355 |
| 6:45:00 PM | 6.875 | 0.887 | 218.316 |
| 7:00:00 PM | 7.014 | 0.926 | 227.203 |
| 7:15:00 PM | 6.91 | 1.012 | 250.817 |
| 7:30:00 PM | 6.765 | 0.957 | 230.641 |
| 7:45:00 PM | 6.789 | 0.944 | 228.656 |
| 8:00:00 PM | 6.831 | 0.876 | 210.065 |
| 8:15:00 PM | 6.876 | 0.899 | 221.43 |
| 8:30:00 PM | 6.805 | 0.895 | 217.444 |
| 8:45:00 PM | 6.645 | 0.928 | 218.533 |
| 9:00:00 PM | 6.873 | 0.928 | 225.3 |
| 9:15:00 PM | 6.733 | 0.889 | 212.134 |
| 9:30:00 PM | 6.767 | 0.839 | 198.975 |
| 9:45:00 PM | 6.842 | 0.97 | 234.164 |
| 10:00:00 PM | 6.794 | 0.942 | 223.4 |
| 10:15:00 PM | 7.072 | 0.88 | 224.83 |
| 10:30:00 PM | 6.909 | 0.908 | 225.092 |
| 10:45:00 PM | 6.615 | 0.88 | 205.945 |
| 11:00:00 PM | 6.635 | 0.916 | 215.228 |
| 11:15:00 PM | 6.53 | 0.81 | 183.121 |
| 11:30:00 PM | 6.353 | 0.761 | 167.792 |
| 11:45:00 PM | 6.299 | 0.758 | 166.425 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.597 | 0.804 | 189.542 |
| Daily Min: | 5.472 | 0.426 | 77.462 |
| Daily Max: | 7.138 | 1.012 | 257.351 |
| Peak to Avg: | | | 1.36 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/15/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Saturday - A.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.24 | 0.699 | 151.565 |
| 12:15:00 AM | 6.233 | 0.797 | 172.425 |
| 12:30:00 AM | 6.006 | 0.632 | 130.182 |
| 12:45:00 AM | 5.895 | 0.544 | 105.238 |
| 1:00:00 AM | 5.72 | 0.598 | 114.874 |
| 1:15:00 AM | 5.691 | 0.527 | 100.92 |
| 1:30:00 AM | 5.587 | 0.562 | 104.02 |
| 1:45:00 AM | 5.546 | 0.52 | 96.262 |
| 2:00:00 AM | 5.532 | 0.557 | 102.78 |
| 2:15:00 AM | 5.464 | 0.509 | 92.352 |
| 2:30:00 AM | 5.479 | 0.437 | 78.061 |
| 2:45:00 AM | 5.41 | 0.524 | 93.224 |
| 3:00:00 AM | 5.394 | 0.466 | 82.816 |
| 3:15:00 AM | 5.447 | 0.477 | 86.177 |
| 3:30:00 AM | 5.391 | 0.441 | 78.558 |
| 3:45:00 AM | 5.368 | 0.477 | 84.545 |
| 4:00:00 AM | 5.377 | 0.474 | 84.061 |
| 4:15:00 AM | 5.399 | 0.431 | 76.401 |
| 4:30:00 AM | 5.409 | 0.431 | 76.606 |
| 4:45:00 AM | 5.385 | 0.447 | 79.437 |
| 5:00:00 AM | 5.431 | 0.465 | 82.652 |
| 5:15:00 AM | 5.51 | 0.49 | 89.851 |
| 5:30:00 AM | 5.534 | 0.506 | 93.37 |
| 5:45:00 AM | 5.592 | 0.553 | 101.901 |
| 6:00:00 AM | 5.596 | 0.521 | 97.615 |
| 6:15:00 AM | 5.778 | 0.627 | 122.585 |
| 6:30:00 AM | 5.852 | 0.616 | 120.943 |
| 6:45:00 AM | 5.778 | 0.603 | 117.949 |
| 7:00:00 AM | 5.822 | 0.578 | 114.177 |
| 7:15:00 AM | 5.967 | 0.7 | 142.9 |
| 7:30:00 AM | 6.111 | 0.679 | 143.209 |
| 7:45:00 AM | 6.265 | 0.738 | 160.46 |
| 8:00:00 AM | 6.542 | 0.744 | 160.989 |
| 8:15:00 AM | 6.612 | 0.867 | 199.783 |
| 8:30:00 AM | 6.64 | 0.819 | 189.04 |
| 8:45:00 AM | 6.9 | 1.016 | 251.452 |
| 9:00:00 AM | 6.808 | 0.938 | 228.132 |
| 9:15:00 AM | 6.837 | 0.885 | 213.187 |
| 9:30:00 AM | 7.033 | 1.019 | 257.702 |
| 9:45:00 AM | 7.197 | 0.956 | 249.626 |
| 10:00:00 AM | 7.016 | 0.862 | 212.781 |
| 10:15:00 AM | 7.182 | 0.985 | 256.738 |
| 10:30:00 AM | 7.018 | 0.895 | 226.424 |
| 10:45:00 AM | 7.467 | 1.01 | 276.361 |
| 11:00:00 AM | 7.364 | 0.966 | 259.897 |
| 11:15:00 AM | 6.991 | 0.947 | 236.838 |
| 11:30:00 AM | 6.941 | 0.903 | 224.334 |
| 11:45:00 AM | 9.657 | 1.165 | 436.863 |

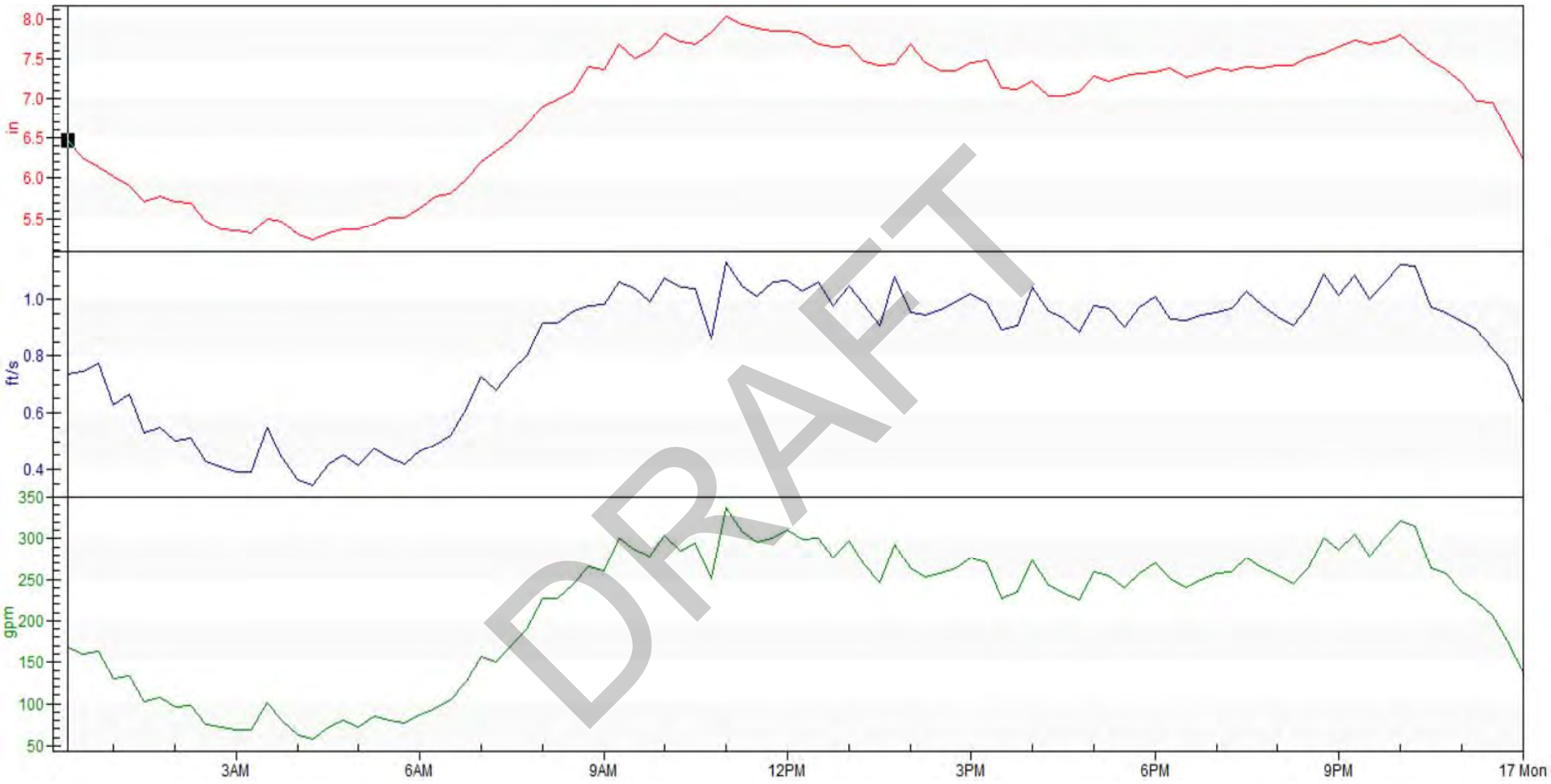
**Saturday - P.M. 7/15/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 9.396 | 1.298 | 471.466 |
| 12:15:00 PM | 8.863 | 1.371 | 464.305 |
| 12:30:00 PM | 7.509 | 0.825 | 227.643 |
| 12:45:00 PM | 7.272 | 0.968 | 254.357 |
| 1:00:00 PM | 7.637 | 0.964 | 270.347 |
| 1:15:00 PM | 7.516 | 0.965 | 262.594 |
| 1:30:00 PM | 7.55 | 1.032 | 286.73 |
| 1:45:00 PM | 7.548 | 1.017 | 282.403 |
| 2:00:00 PM | 7.201 | 0.919 | 240.193 |
| 2:15:00 PM | 7.186 | 1.006 | 261.913 |
| 2:30:00 PM | 7.564 | 1.071 | 298.135 |
| 2:45:00 PM | 7.557 | 1.005 | 270.325 |
| 3:00:00 PM | 7.329 | 1.018 | 272.017 |
| 3:15:00 PM | 7.335 | 0.983 | 263.177 |
| 3:30:00 PM | 7.418 | 1.015 | 272.95 |
| 3:45:00 PM | 7.245 | 1.038 | 273.57 |
| 4:00:00 PM | 7.277 | 1.037 | 274.649 |
| 4:15:00 PM | 7.146 | 1.047 | 269.573 |
| 4:30:00 PM | 7.086 | 0.903 | 227.525 |
| 4:45:00 PM | 6.991 | 0.893 | 224.828 |
| 5:00:00 PM | 7.041 | 0.828 | 207.763 |
| 5:15:00 PM | 7.006 | 0.936 | 230.272 |
| 5:30:00 PM | 7.092 | 0.979 | 245.917 |
| 5:45:00 PM | 6.881 | 0.896 | 220.897 |
| 6:00:00 PM | 7.093 | 1 | 255.107 |
| 6:15:00 PM | 6.982 | 0.86 | 215.731 |
| 6:30:00 PM | 7.093 | 0.956 | 243.559 |
| 6:45:00 PM | 7.071 | 0.982 | 250.657 |
| 7:00:00 PM | 6.938 | 0.937 | 233.457 |
| 7:15:00 PM | 6.732 | 0.905 | 216.736 |
| 7:30:00 PM | 6.89 | 0.888 | 219.007 |
| 7:45:00 PM | 6.943 | 0.879 | 219.136 |
| 8:00:00 PM | 7.041 | 0.971 | 242.972 |
| 8:15:00 PM | 6.955 | 0.879 | 218.373 |
| 8:30:00 PM | 7.024 | 0.865 | 218.95 |
| 8:45:00 PM | 7.064 | 0.89 | 225.492 |
| 9:00:00 PM | 7.236 | 0.998 | 260.2 |
| 9:15:00 PM | 7.27 | 0.977 | 258.496 |
| 9:30:00 PM | 7.156 | 0.911 | 236.245 |
| 9:45:00 PM | 7.216 | 0.937 | 242.225 |
| 10:00:00 PM | 7.158 | 0.983 | 253.022 |
| 10:15:00 PM | 7.011 | 0.934 | 234.554 |
| 10:30:00 PM | 6.915 | 0.879 | 217.351 |
| 10:45:00 PM | 6.909 | 0.862 | 206.58 |
| 11:00:00 PM | 6.792 | 0.969 | 234.706 |
| 11:15:00 PM | 6.803 | 0.881 | 213.842 |
| 11:30:00 PM | 6.743 | 0.872 | 209.382 |
| 11:45:00 PM | 6.615 | 0.886 | 207.333 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.689 | 0.821 | 202.246 |
| Daily Min: | 5.368 | 0.431 | 76.401 |
| Daily Max: | 9.657 | 1.371 | 471.466 |
| Peak to Avg: | | | 2.33 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/16/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Sunday - A.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.558 | 0.763 | 176.515 |
| 12:15:00 AM | 6.467 | 0.736 | 167.343 |
| 12:30:00 AM | 6.258 | 0.744 | 160.279 |
| 12:45:00 AM | 6.143 | 0.772 | 163.834 |
| 1:00:00 AM | 6.027 | 0.63 | 128.944 |
| 1:15:00 AM | 5.909 | 0.665 | 133.615 |
| 1:30:00 AM | 5.708 | 0.531 | 102.198 |
| 1:45:00 AM | 5.773 | 0.548 | 107.058 |
| 2:00:00 AM | 5.702 | 0.502 | 96.535 |
| 2:15:00 AM | 5.695 | 0.514 | 97.81 |
| 2:30:00 AM | 5.466 | 0.428 | 75.17 |
| 2:45:00 AM | 5.367 | 0.41 | 72.57 |
| 3:00:00 AM | 5.353 | 0.392 | 69.191 |
| 3:15:00 AM | 5.311 | 0.393 | 68.548 |
| 3:30:00 AM | 5.488 | 0.549 | 100.108 |
| 3:45:00 AM | 5.462 | 0.44 | 79.811 |
| 4:00:00 AM | 5.294 | 0.363 | 63.16 |
| 4:15:00 AM | 5.23 | 0.344 | 58.126 |
| 4:30:00 AM | 5.306 | 0.419 | 72.693 |
| 4:45:00 AM | 5.371 | 0.453 | 79.693 |
| 5:00:00 AM | 5.361 | 0.416 | 72.834 |
| 5:15:00 AM | 5.428 | 0.473 | 85.072 |
| 5:30:00 AM | 5.518 | 0.44 | 79.495 |
| 5:45:00 AM | 5.518 | 0.42 | 76.936 |
| 6:00:00 AM | 5.629 | 0.465 | 86.356 |
| 6:15:00 AM | 5.774 | 0.489 | 94.523 |
| 6:30:00 AM | 5.814 | 0.524 | 103.314 |
| 6:45:00 AM | 5.986 | 0.613 | 125.746 |
| 7:00:00 AM | 6.206 | 0.725 | 156.05 |
| 7:15:00 AM | 6.335 | 0.679 | 149.639 |
| 7:30:00 AM | 6.488 | 0.75 | 171.254 |
| 7:45:00 AM | 6.674 | 0.804 | 190.349 |
| 8:00:00 AM | 6.907 | 0.918 | 227.303 |
| 8:15:00 AM | 6.987 | 0.917 | 227.374 |
| 8:30:00 AM | 7.099 | 0.959 | 245.127 |
| 8:45:00 AM | 7.398 | 0.978 | 264.741 |
| 9:00:00 AM | 7.37 | 0.983 | 261.401 |
| 9:15:00 AM | 7.682 | 1.061 | 301.284 |
| 9:30:00 AM | 7.498 | 1.041 | 286.545 |
| 9:45:00 AM | 7.601 | 0.991 | 277.532 |
| 10:00:00 AM | 7.805 | 1.075 | 304.46 |
| 10:15:00 AM | 7.704 | 1.046 | 284.47 |
| 10:30:00 AM | 7.679 | 1.039 | 294.807 |
| 10:45:00 AM | 7.832 | 0.863 | 251.112 |
| 11:00:00 AM | 8.026 | 1.133 | 336.989 |
| 11:15:00 AM | 7.925 | 1.046 | 308.056 |
| 11:30:00 AM | 7.871 | 1.013 | 296.525 |
| 11:45:00 AM | 7.839 | 1.061 | 300.76 |

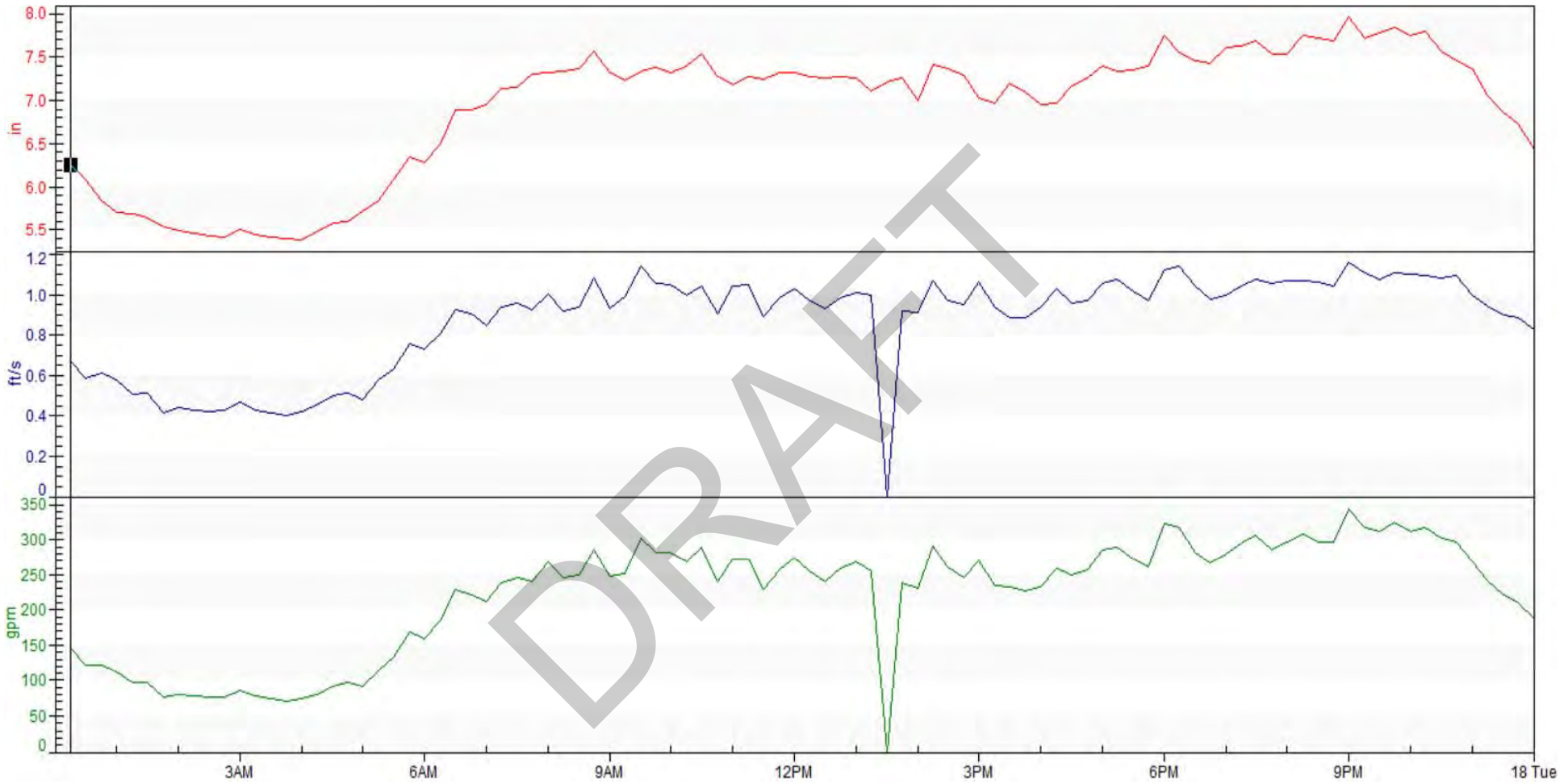
**Sunday - P.M. 7/16/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.838 | 1.069 | 309.653 |
| 12:15:00 PM | 7.811 | 1.031 | 298.86 |
| 12:30:00 PM | 7.678 | 1.061 | 300.683 |
| 12:45:00 PM | 7.648 | 0.981 | 276.906 |
| 1:00:00 PM | 7.667 | 1.049 | 296.987 |
| 1:15:00 PM | 7.465 | 0.981 | 268.699 |
| 1:30:00 PM | 7.406 | 0.91 | 246.546 |
| 1:45:00 PM | 7.423 | 1.082 | 292.385 |
| 2:00:00 PM | 7.679 | 0.958 | 263.137 |
| 2:15:00 PM | 7.441 | 0.945 | 253.105 |
| 2:30:00 PM | 7.343 | 0.966 | 257.921 |
| 2:45:00 PM | 7.353 | 0.991 | 264.097 |
| 3:00:00 PM | 7.447 | 1.02 | 276.846 |
| 3:15:00 PM | 7.48 | 0.986 | 270.632 |
| 3:30:00 PM | 7.129 | 0.895 | 226.501 |
| 3:45:00 PM | 7.119 | 0.911 | 234.669 |
| 4:00:00 PM | 7.213 | 1.043 | 273.31 |
| 4:15:00 PM | 7.039 | 0.961 | 243.689 |
| 4:30:00 PM | 7.028 | 0.936 | 233.964 |
| 4:45:00 PM | 7.08 | 0.885 | 225.991 |
| 5:00:00 PM | 7.275 | 0.98 | 259.645 |
| 5:15:00 PM | 7.223 | 0.97 | 254.618 |
| 5:30:00 PM | 7.282 | 0.905 | 240.118 |
| 5:45:00 PM | 7.307 | 0.975 | 257.054 |
| 6:00:00 PM | 7.326 | 1.013 | 270.077 |
| 6:15:00 PM | 7.383 | 0.932 | 251.569 |
| 6:30:00 PM | 7.26 | 0.926 | 240.304 |
| 6:45:00 PM | 7.307 | 0.944 | 249.913 |
| 7:00:00 PM | 7.382 | 0.954 | 257.45 |
| 7:15:00 PM | 7.348 | 0.969 | 259.246 |
| 7:30:00 PM | 7.4 | 1.03 | 277.345 |
| 7:45:00 PM | 7.383 | 0.978 | 264.083 |
| 8:00:00 PM | 7.422 | 0.944 | 256.389 |
| 8:15:00 PM | 7.409 | 0.911 | 245.07 |
| 8:30:00 PM | 7.511 | 0.973 | 263.667 |
| 8:45:00 PM | 7.568 | 1.093 | 299.849 |
| 9:00:00 PM | 7.652 | 1.015 | 286.816 |
| 9:15:00 PM | 7.727 | 1.084 | 305.143 |
| 9:30:00 PM | 7.686 | 1.003 | 278.082 |
| 9:45:00 PM | 7.706 | 1.06 | 299.954 |
| 10:00:00 PM | 7.786 | 1.125 | 321.224 |
| 10:15:00 PM | 7.636 | 1.118 | 314.966 |
| 10:30:00 PM | 7.469 | 0.973 | 263.674 |
| 10:45:00 PM | 7.371 | 0.954 | 257.063 |
| 11:00:00 PM | 7.201 | 0.921 | 235.595 |
| 11:15:00 PM | 6.96 | 0.897 | 223.863 |
| 11:30:00 PM | 6.946 | 0.826 | 205.97 |
| 11:45:00 PM | 6.6 | 0.771 | 176.301 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.885 | 0.839 | 214.593 |
| Daily Min: | 5.23 | 0.344 | 58.126 |
| Daily Max: | 8.026 | 1.133 | 336.989 |
| Peak to Avg: | | | 1.57 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/17/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Monday - A.M. 7/17/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 6.233 | 0.632 | 136.879 |
| 12:15:00 AM | 6.256 | 0.67 | 145.813 |
| 12:30:00 AM | 6.091 | 0.587 | 120.64 |
| 12:45:00 AM | 5.846 | 0.614 | 122.051 |
| 1:00:00 AM | 5.71 | 0.58 | 111.725 |
| 1:15:00 AM | 5.695 | 0.51 | 97.809 |
| 1:30:00 AM | 5.647 | 0.515 | 97.737 |
| 1:45:00 AM | 5.533 | 0.417 | 75.695 |
| 2:00:00 AM | 5.486 | 0.44 | 80.272 |
| 2:15:00 AM | 5.462 | 0.429 | 77.702 |
| 2:30:00 AM | 5.435 | 0.424 | 75.813 |
| 2:45:00 AM | 5.419 | 0.429 | 76.874 |
| 3:00:00 AM | 5.513 | 0.47 | 86.371 |
| 3:15:00 AM | 5.448 | 0.43 | 77.742 |
| 3:30:00 AM | 5.408 | 0.417 | 74.563 |
| 3:45:00 AM | 5.393 | 0.4 | 71.198 |
| 4:00:00 AM | 5.384 | 0.424 | 75.306 |
| 4:15:00 AM | 5.475 | 0.453 | 80.878 |
| 4:30:00 AM | 5.582 | 0.502 | 90.978 |
| 4:45:00 AM | 5.592 | 0.515 | 96.365 |
| 5:00:00 AM | 5.728 | 0.482 | 91.228 |
| 5:15:00 AM | 5.849 | 0.577 | 114.711 |
| 5:30:00 AM | 6.092 | 0.632 | 132.761 |
| 5:45:00 AM | 6.352 | 0.758 | 168.15 |
| 6:00:00 AM | 6.288 | 0.731 | 159.608 |
| 6:15:00 AM | 6.506 | 0.808 | 184.979 |
| 6:30:00 AM | 6.903 | 0.928 | 229.737 |
| 6:45:00 AM | 6.9 | 0.907 | 221.691 |
| 7:00:00 AM | 6.954 | 0.848 | 211.88 |
| 7:15:00 AM | 7.137 | 0.937 | 237.758 |
| 7:30:00 AM | 7.162 | 0.957 | 245.021 |
| 7:45:00 AM | 7.314 | 0.923 | 240.757 |
| 8:00:00 AM | 7.327 | 1.004 | 268.39 |
| 8:15:00 AM | 7.332 | 0.917 | 245.37 |
| 8:30:00 AM | 7.371 | 0.941 | 250.122 |
| 8:45:00 AM | 7.561 | 1.08 | 284.907 |
| 9:00:00 AM | 7.328 | 0.931 | 247.823 |
| 9:15:00 AM | 7.239 | 0.989 | 251.054 |
| 9:30:00 AM | 7.338 | 1.14 | 302.011 |
| 9:45:00 AM | 7.39 | 1.058 | 282.188 |
| 10:00:00 AM | 7.327 | 1.053 | 281.485 |
| 10:15:00 AM | 7.397 | 0.999 | 268.293 |
| 10:30:00 AM | 7.536 | 1.045 | 289.64 |
| 10:45:00 AM | 7.283 | 0.904 | 239.927 |
| 11:00:00 AM | 7.185 | 1.042 | 271.658 |
| 11:15:00 AM | 7.282 | 1.053 | 273.197 |
| 11:30:00 AM | 7.246 | 0.896 | 229.801 |
| 11:45:00 AM | 7.329 | 0.984 | 258.002 |

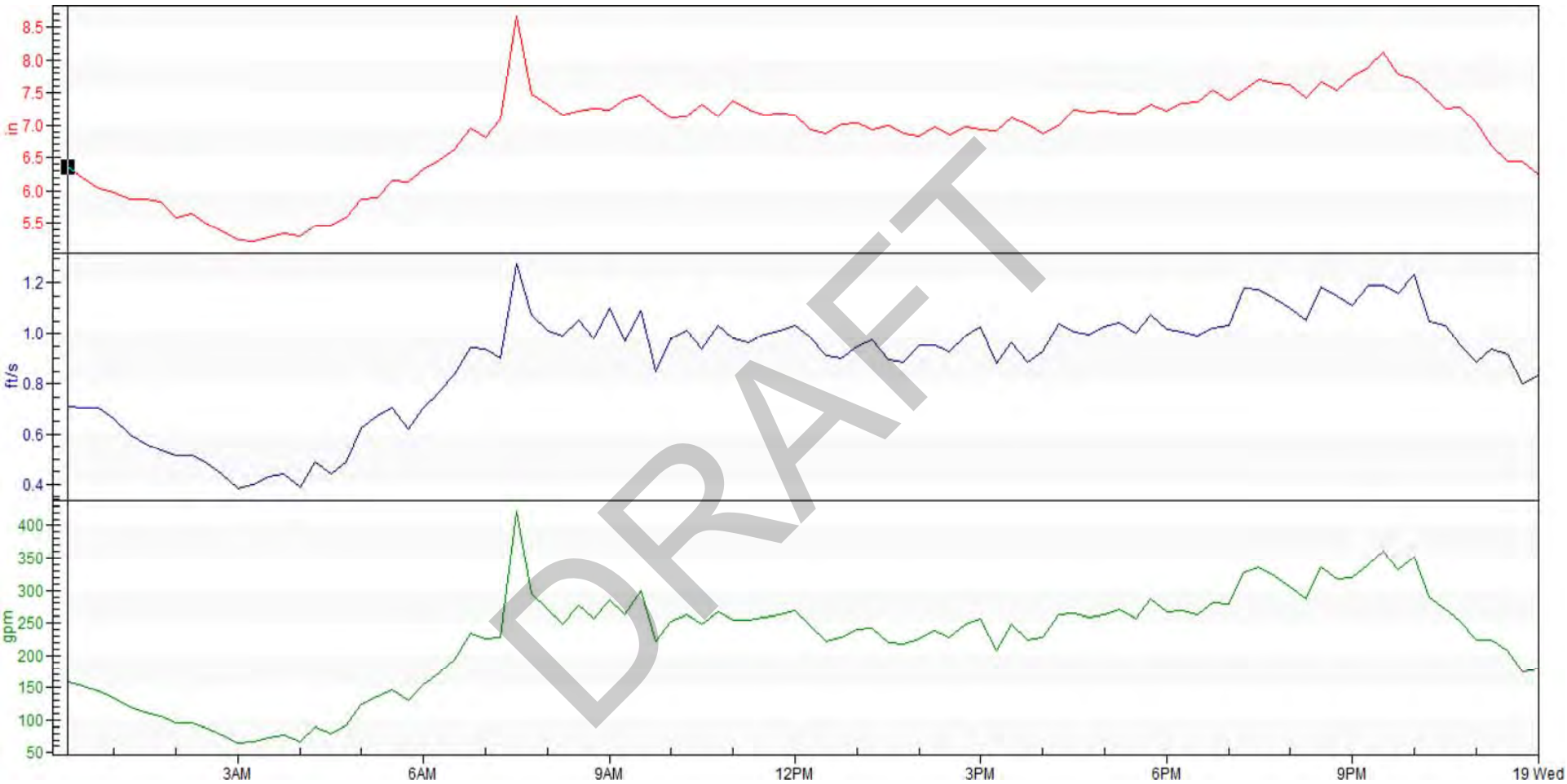
**Monday - P.M. 7/17/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.319 | 1.029 | 274.561 |
| 12:15:00 PM | 7.273 | 0.972 | 254.845 |
| 12:30:00 PM | 7.264 | 0.933 | 241.134 |
| 12:45:00 PM | 7.272 | 0.982 | 259.965 |
| 1:00:00 PM | 7.268 | 1.013 | 267.694 |
| 1:15:00 PM | 7.103 | 0.998 | 255.691 |
| 1:30:00 PM | 7.224 | 0 | 0 |
| 1:45:00 PM | 7.266 | 0.917 | 238.318 |
| 2:00:00 PM | 6.995 | 0.916 | 230.161 |
| 2:15:00 PM | 7.413 | 1.07 | 290.223 |
| 2:30:00 PM | 7.364 | 0.969 | 260.781 |
| 2:45:00 PM | 7.289 | 0.953 | 246.109 |
| 3:00:00 PM | 7.039 | 1.064 | 270.216 |
| 3:15:00 PM | 6.976 | 0.941 | 235.401 |
| 3:30:00 PM | 7.201 | 0.89 | 232.584 |
| 3:45:00 PM | 7.094 | 0.888 | 227.652 |
| 4:00:00 PM | 6.952 | 0.942 | 231.839 |
| 4:15:00 PM | 6.976 | 1.03 | 258.355 |
| 4:30:00 PM | 7.174 | 0.96 | 249.795 |
| 4:45:00 PM | 7.27 | 0.975 | 257.877 |
| 5:00:00 PM | 7.393 | 1.055 | 285.173 |
| 5:15:00 PM | 7.346 | 1.079 | 289.306 |
| 5:30:00 PM | 7.354 | 1.015 | 271.483 |
| 5:45:00 PM | 7.406 | 0.97 | 261.037 |
| 6:00:00 PM | 7.75 | 1.123 | 322.295 |
| 6:15:00 PM | 7.548 | 1.14 | 316.584 |
| 6:30:00 PM | 7.463 | 1.043 | 280.813 |
| 6:45:00 PM | 7.424 | 0.98 | 266.29 |
| 7:00:00 PM | 7.607 | 0.995 | 279.04 |
| 7:15:00 PM | 7.635 | 1.044 | 294.034 |
| 7:30:00 PM | 7.686 | 1.076 | 305.79 |
| 7:45:00 PM | 7.537 | 1.056 | 285.157 |
| 8:00:00 PM | 7.541 | 1.069 | 296.523 |
| 8:15:00 PM | 7.747 | 1.071 | 307.21 |
| 8:30:00 PM | 7.717 | 1.061 | 296.746 |
| 8:45:00 PM | 7.691 | 1.044 | 296.77 |
| 9:00:00 PM | 7.965 | 1.16 | 344.566 |
| 9:15:00 PM | 7.721 | 1.112 | 316.75 |
| 9:30:00 PM | 7.783 | 1.079 | 311.493 |
| 9:45:00 PM | 7.841 | 1.113 | 324.197 |
| 10:00:00 PM | 7.749 | 1.1 | 312.755 |
| 10:15:00 PM | 7.801 | 1.096 | 317.157 |
| 10:30:00 PM | 7.567 | 1.083 | 301.601 |
| 10:45:00 PM | 7.468 | 1.095 | 297.152 |
| 11:00:00 PM | 7.362 | 0.996 | 267.77 |
| 11:15:00 PM | 7.06 | 0.949 | 241.59 |
| 11:30:00 PM | 6.864 | 0.899 | 221.006 |
| 11:45:00 PM | 6.729 | 0.889 | 210.242 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.921 | 0.869 | 222.331 |
| Daily Min: | 5.384 | 0 | 0 |
| Daily Max: | 7.965 | 1.16 | 344.566 |
| Peak to Avg: | | | 1.55 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/18/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Tuesday- A.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.436 | 0.831 | 187.73 |
| 12:15:00 AM | 6.355 | 0.712 | 158.124 |
| 12:30:00 AM | 6.203 | 0.708 | 152.168 |
| 12:45:00 AM | 6.024 | 0.704 | 144.569 |
| 1:00:00 AM | 5.972 | 0.663 | 133.712 |
| 1:15:00 AM | 5.878 | 0.599 | 119.983 |
| 1:30:00 AM | 5.879 | 0.561 | 111.425 |
| 1:45:00 AM | 5.822 | 0.533 | 105.393 |
| 2:00:00 AM | 5.58 | 0.516 | 94.727 |
| 2:15:00 AM | 5.644 | 0.514 | 96.338 |
| 2:30:00 AM | 5.48 | 0.481 | 87.616 |
| 2:45:00 AM | 5.383 | 0.438 | 77.893 |
| 3:00:00 AM | 5.242 | 0.382 | 65.539 |
| 3:15:00 AM | 5.218 | 0.398 | 67.329 |
| 3:30:00 AM | 5.281 | 0.432 | 73.272 |
| 3:45:00 AM | 5.34 | 0.441 | 77.461 |
| 4:00:00 AM | 5.301 | 0.389 | 67.799 |
| 4:15:00 AM | 5.463 | 0.488 | 88.585 |
| 4:30:00 AM | 5.454 | 0.443 | 79.844 |
| 4:45:00 AM | 5.593 | 0.49 | 91.642 |
| 5:00:00 AM | 5.869 | 0.623 | 124.525 |
| 5:15:00 AM | 5.896 | 0.675 | 135.687 |
| 5:30:00 AM | 6.153 | 0.703 | 146.568 |
| 5:45:00 AM | 6.138 | 0.622 | 130.211 |
| 6:00:00 AM | 6.319 | 0.704 | 155.204 |
| 6:15:00 AM | 6.462 | 0.769 | 172.269 |
| 6:30:00 AM | 6.625 | 0.835 | 194.211 |
| 6:45:00 AM | 6.943 | 0.942 | 234.734 |
| 7:00:00 AM | 6.808 | 0.939 | 226.131 |
| 7:15:00 AM | 7.1 | 0.902 | 228.495 |
| 7:30:00 AM | 8.666 | 1.277 | 420.868 |
| 7:45:00 AM | 7.484 | 1.074 | 295.008 |
| 8:00:00 AM | 7.314 | 1.013 | 270.263 |
| 8:15:00 AM | 7.163 | 0.99 | 248.241 |
| 8:30:00 AM | 7.226 | 1.052 | 276.346 |
| 8:45:00 AM | 7.255 | 0.981 | 255.96 |
| 9:00:00 AM | 7.242 | 1.099 | 284.995 |
| 9:15:00 AM | 7.402 | 0.971 | 262.42 |
| 9:30:00 AM | 7.472 | 1.093 | 299.62 |
| 9:45:00 AM | 7.287 | 0.848 | 222.609 |
| 10:00:00 AM | 7.114 | 0.981 | 252.364 |
| 10:15:00 AM | 7.138 | 1.013 | 261.831 |
| 10:30:00 AM | 7.329 | 0.938 | 248.492 |
| 10:45:00 AM | 7.138 | 1.035 | 267.561 |
| 11:00:00 AM | 7.37 | 0.981 | 253.551 |
| 11:15:00 AM | 7.24 | 0.965 | 254.1 |
| 11:30:00 AM | 7.162 | 0.995 | 257.543 |
| 11:45:00 AM | 7.176 | 1.011 | 262.876 |

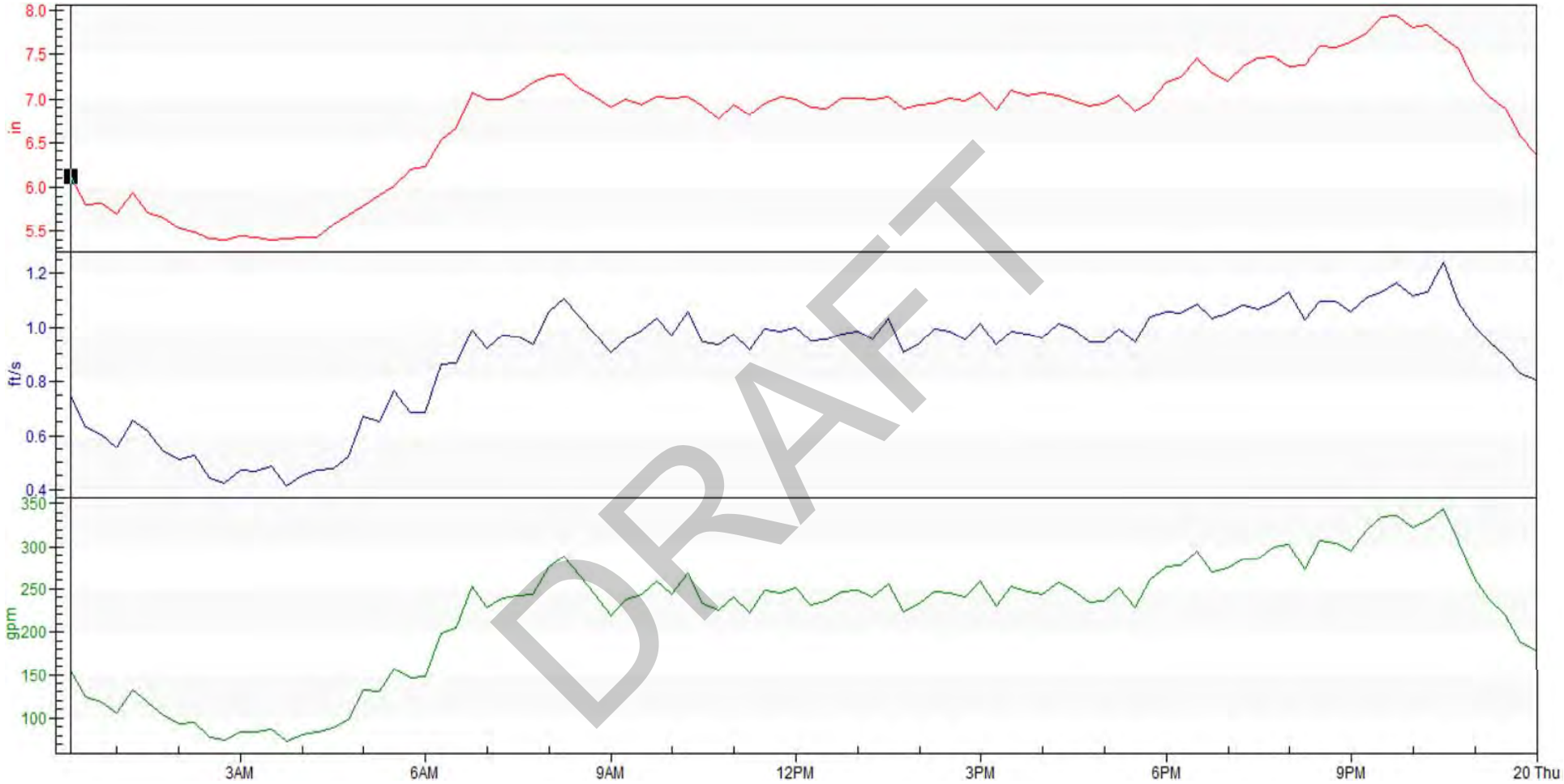
**Tuesday- P.M. 7/18/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.166 | 1.034 | 268.514 |
| 12:15:00 PM | 6.929 | 0.988 | 245.661 |
| 12:30:00 PM | 6.87 | 0.911 | 222.197 |
| 12:45:00 PM | 7.018 | 0.902 | 228.109 |
| 1:00:00 PM | 7.043 | 0.947 | 240.62 |
| 1:15:00 PM | 6.941 | 0.976 | 242.962 |
| 1:30:00 PM | 6.99 | 0.896 | 219.847 |
| 1:45:00 PM | 6.865 | 0.886 | 217.727 |
| 2:00:00 PM | 6.838 | 0.951 | 226.511 |
| 2:15:00 PM | 6.976 | 0.955 | 237.793 |
| 2:30:00 PM | 6.846 | 0.929 | 227.583 |
| 2:45:00 PM | 6.971 | 0.991 | 248.373 |
| 3:00:00 PM | 6.939 | 1.03 | 256.748 |
| 3:15:00 PM | 6.917 | 0.878 | 207.813 |
| 3:30:00 PM | 7.113 | 0.962 | 247.492 |
| 3:45:00 PM | 7.004 | 0.885 | 223.139 |
| 4:00:00 PM | 6.864 | 0.929 | 228.368 |
| 4:15:00 PM | 6.992 | 1.04 | 261.753 |
| 4:30:00 PM | 7.239 | 1.008 | 265.383 |
| 4:45:00 PM | 7.192 | 0.997 | 257.967 |
| 5:00:00 PM | 7.223 | 1.025 | 263.278 |
| 5:15:00 PM | 7.168 | 1.041 | 270.525 |
| 5:30:00 PM | 7.171 | 1 | 256.151 |
| 5:45:00 PM | 7.328 | 1.073 | 286.893 |
| 6:00:00 PM | 7.213 | 1.017 | 266.512 |
| 6:15:00 PM | 7.331 | 1.007 | 268.028 |
| 6:30:00 PM | 7.364 | 0.99 | 262.392 |
| 6:45:00 PM | 7.549 | 1.021 | 281.155 |
| 7:00:00 PM | 7.38 | 1.036 | 279.022 |
| 7:15:00 PM | 7.552 | 1.18 | 327.805 |
| 7:30:00 PM | 7.711 | 1.176 | 335.405 |
| 7:45:00 PM | 7.649 | 1.139 | 321.522 |
| 8:00:00 PM | 7.616 | 1.104 | 305.369 |
| 8:15:00 PM | 7.429 | 1.055 | 287.131 |
| 8:30:00 PM | 7.664 | 1.188 | 334.984 |
| 8:45:00 PM | 7.534 | 1.148 | 317.959 |
| 9:00:00 PM | 7.743 | 1.113 | 319.172 |
| 9:15:00 PM | 7.883 | 1.191 | 339.052 |
| 9:30:00 PM | 8.115 | 1.192 | 361.064 |
| 9:45:00 PM | 7.78 | 1.159 | 332.731 |
| 10:00:00 PM | 7.703 | 1.236 | 352.053 |
| 10:15:00 PM | 7.508 | 1.05 | 289.596 |
| 10:30:00 PM | 7.267 | 1.036 | 270.027 |
| 10:45:00 PM | 7.277 | 0.956 | 253.341 |
| 11:00:00 PM | 7.039 | 0.882 | 224.02 |
| 11:15:00 PM | 6.694 | 0.939 | 223.18 |
| 11:30:00 PM | 6.434 | 0.918 | 207.152 |
| 11:45:00 PM | 6.442 | 0.801 | 174.59 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.843 | 0.891 | 224.429 |
| Daily Min: | 5.218 | 0.382 | 65.539 |
| Daily Max: | 8.666 | 1.277 | 420.868 |
| Peak to Avg: | | | 1.88 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/19/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Wednesday - A.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.237 | 0.831 | 180.038 |
| 12:15:00 AM | 6.121 | 0.746 | 153.35 |
| 12:30:00 AM | 5.804 | 0.631 | 124.168 |
| 12:45:00 AM | 5.812 | 0.602 | 118.697 |
| 1:00:00 AM | 5.697 | 0.556 | 106.623 |
| 1:15:00 AM | 5.94 | 0.655 | 132.951 |
| 1:30:00 AM | 5.706 | 0.618 | 118.953 |
| 1:45:00 AM | 5.651 | 0.539 | 102.284 |
| 2:00:00 AM | 5.532 | 0.51 | 93.335 |
| 2:15:00 AM | 5.491 | 0.525 | 95.948 |
| 2:30:00 AM | 5.413 | 0.443 | 77.572 |
| 2:45:00 AM | 5.397 | 0.425 | 74.992 |
| 3:00:00 AM | 5.443 | 0.469 | 83.85 |
| 3:15:00 AM | 5.432 | 0.466 | 83.859 |
| 3:30:00 AM | 5.394 | 0.488 | 86.998 |
| 3:45:00 AM | 5.414 | 0.413 | 73.923 |
| 4:00:00 AM | 5.43 | 0.45 | 80.892 |
| 4:15:00 AM | 5.431 | 0.47 | 84.649 |
| 4:30:00 AM | 5.574 | 0.479 | 89.196 |
| 4:45:00 AM | 5.688 | 0.522 | 98.129 |
| 5:00:00 AM | 5.783 | 0.673 | 131.839 |
| 5:15:00 AM | 5.903 | 0.654 | 130.775 |
| 5:30:00 AM | 6.016 | 0.764 | 157.711 |
| 5:45:00 AM | 6.192 | 0.684 | 146.855 |
| 6:00:00 AM | 6.229 | 0.688 | 148.261 |
| 6:15:00 AM | 6.527 | 0.864 | 198.646 |
| 6:30:00 AM | 6.668 | 0.869 | 205.605 |
| 6:45:00 AM | 7.067 | 0.99 | 252.551 |
| 7:00:00 AM | 6.992 | 0.919 | 228.477 |
| 7:15:00 AM | 6.996 | 0.968 | 238.277 |
| 7:30:00 AM | 7.074 | 0.964 | 241.347 |
| 7:45:00 AM | 7.189 | 0.934 | 243.655 |
| 8:00:00 AM | 7.269 | 1.059 | 276.431 |
| 8:15:00 AM | 7.277 | 1.108 | 288.957 |
| 8:30:00 AM | 7.113 | 1.039 | 264.811 |
| 8:45:00 AM | 7.023 | 0.974 | 243.826 |
| 9:00:00 AM | 6.908 | 0.908 | 218.987 |
| 9:15:00 AM | 6.988 | 0.957 | 236.991 |
| 9:30:00 AM | 6.937 | 0.989 | 243.414 |
| 9:45:00 AM | 7.026 | 1.035 | 259.231 |
| 10:00:00 AM | 7.003 | 0.969 | 244.305 |
| 10:15:00 AM | 7.019 | 1.06 | 267.858 |
| 10:30:00 AM | 6.926 | 0.945 | 233.404 |
| 10:45:00 AM | 6.769 | 0.935 | 224.424 |
| 11:00:00 AM | 6.931 | 0.977 | 240.408 |
| 11:15:00 AM | 6.807 | 0.914 | 222.136 |
| 11:30:00 AM | 6.942 | 0.996 | 248.339 |
| 11:45:00 AM | 7.021 | 0.985 | 245.514 |

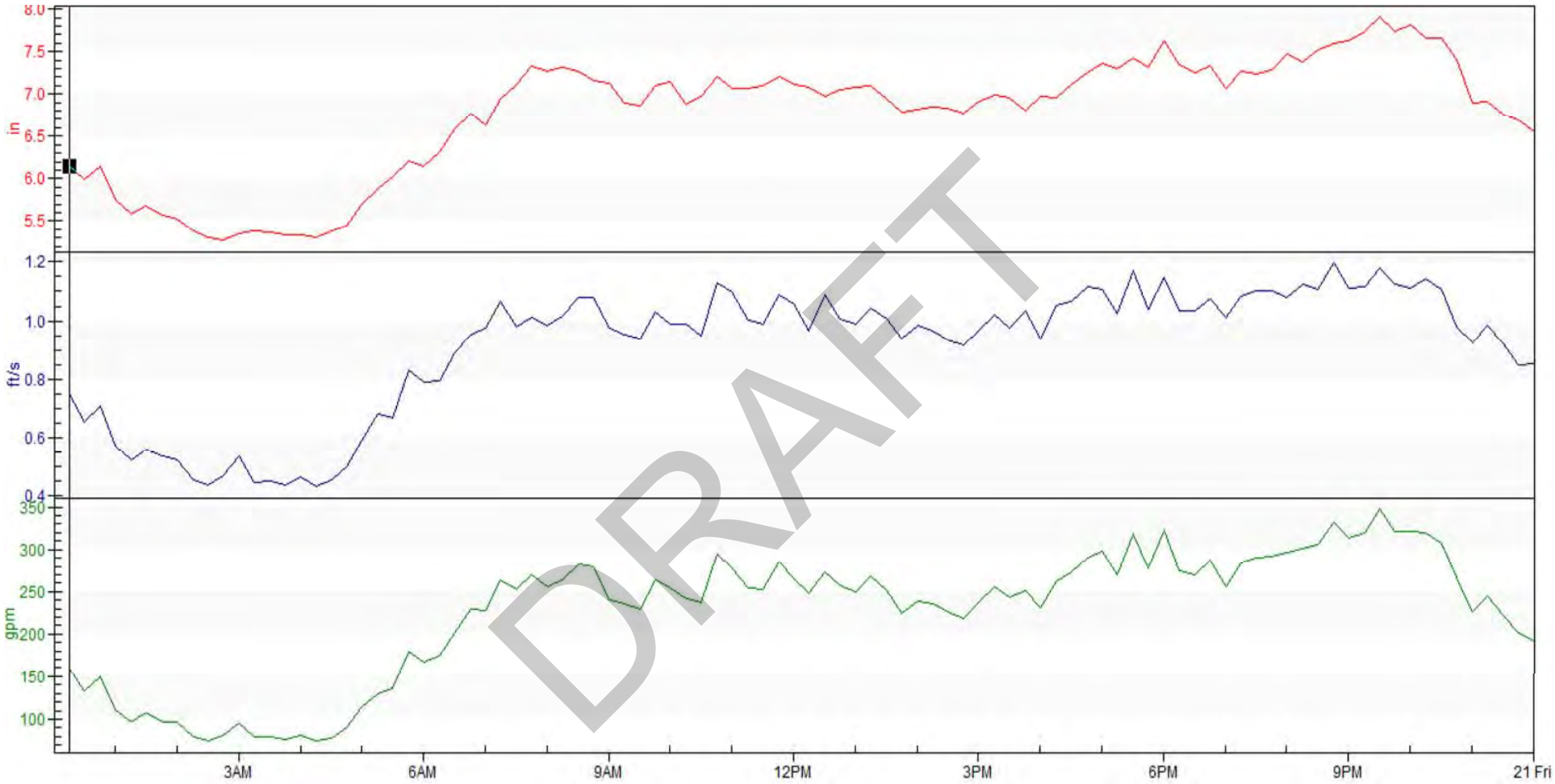
**Wednesday - P.M. 7/19/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 6.997 | 0.999 | 251.739 |
| 12:15:00 PM | 6.904 | 0.951 | 231.554 |
| 12:30:00 PM | 6.881 | 0.956 | 235.629 |
| 12:45:00 PM | 7.006 | 0.977 | 246.594 |
| 1:00:00 PM | 7.003 | 0.985 | 248.381 |
| 1:15:00 PM | 6.989 | 0.956 | 240.359 |
| 1:30:00 PM | 7.019 | 1.034 | 255.474 |
| 1:45:00 PM | 6.884 | 0.907 | 223.77 |
| 2:00:00 PM | 6.94 | 0.942 | 232.874 |
| 2:15:00 PM | 6.944 | 0.993 | 246.52 |
| 2:30:00 PM | 7.003 | 0.985 | 244.554 |
| 2:45:00 PM | 6.98 | 0.956 | 240.036 |
| 3:00:00 PM | 7.069 | 1.015 | 259.03 |
| 3:15:00 PM | 6.874 | 0.934 | 230.016 |
| 3:30:00 PM | 7.102 | 0.983 | 252.43 |
| 3:45:00 PM | 7.045 | 0.974 | 247.418 |
| 4:00:00 PM | 7.076 | 0.96 | 244.211 |
| 4:15:00 PM | 7.038 | 1.012 | 256.787 |
| 4:30:00 PM | 6.982 | 0.993 | 248.991 |
| 4:45:00 PM | 6.925 | 0.946 | 234.854 |
| 5:00:00 PM | 6.954 | 0.946 | 236.331 |
| 5:15:00 PM | 7.046 | 0.993 | 251.524 |
| 5:30:00 PM | 6.851 | 0.945 | 228.756 |
| 5:45:00 PM | 6.96 | 1.04 | 260.162 |
| 6:00:00 PM | 7.183 | 1.059 | 276.024 |
| 6:15:00 PM | 7.255 | 1.054 | 278.208 |
| 6:30:00 PM | 7.455 | 1.087 | 293.875 |
| 6:45:00 PM | 7.293 | 1.033 | 269.574 |
| 7:00:00 PM | 7.202 | 1.055 | 275.078 |
| 7:15:00 PM | 7.37 | 1.081 | 284.797 |
| 7:30:00 PM | 7.461 | 1.067 | 284.716 |
| 7:45:00 PM | 7.472 | 1.09 | 298.861 |
| 8:00:00 PM | 7.368 | 1.129 | 303.105 |
| 8:15:00 PM | 7.379 | 1.028 | 272.874 |
| 8:30:00 PM | 7.591 | 1.099 | 307.293 |
| 8:45:00 PM | 7.581 | 1.097 | 303.897 |
| 9:00:00 PM | 7.637 | 1.059 | 294.715 |
| 9:15:00 PM | 7.749 | 1.113 | 319.342 |
| 9:30:00 PM | 7.935 | 1.132 | 334.137 |
| 9:45:00 PM | 7.945 | 1.166 | 336.256 |
| 10:00:00 PM | 7.806 | 1.115 | 323.036 |
| 10:15:00 PM | 7.841 | 1.131 | 329.522 |
| 10:30:00 PM | 7.684 | 1.239 | 343.754 |
| 10:45:00 PM | 7.57 | 1.093 | 304.701 |
| 11:00:00 PM | 7.212 | 1.003 | 262.816 |
| 11:15:00 PM | 7.03 | 0.947 | 237.472 |
| 11:30:00 PM | 6.89 | 0.89 | 219.648 |
| 11:45:00 PM | 6.575 | 0.828 | 187.262 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.768 | 0.893 | 220.551 |
| Daily Min: | 5.394 | 0.413 | 73.923 |
| Daily Max: | 7.945 | 1.239 | 343.754 |
| Peak to Avg: | | | 1.56 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/20/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Thursday - A.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.361 | 0.804 | 178.766 |
| 12:15:00 AM | 6.14 | 0.751 | 159.216 |
| 12:30:00 AM | 5.989 | 0.654 | 132.689 |
| 12:45:00 AM | 6.14 | 0.708 | 150.257 |
| 1:00:00 AM | 5.748 | 0.575 | 111.304 |
| 1:15:00 AM | 5.584 | 0.523 | 97.336 |
| 1:30:00 AM | 5.675 | 0.56 | 106.975 |
| 1:45:00 AM | 5.572 | 0.537 | 96.664 |
| 2:00:00 AM | 5.52 | 0.526 | 96.205 |
| 2:15:00 AM | 5.377 | 0.455 | 80.251 |
| 2:30:00 AM | 5.298 | 0.438 | 75.525 |
| 2:45:00 AM | 5.271 | 0.471 | 81.009 |
| 3:00:00 AM | 5.352 | 0.538 | 94.862 |
| 3:15:00 AM | 5.38 | 0.445 | 79.043 |
| 3:30:00 AM | 5.368 | 0.453 | 80.248 |
| 3:45:00 AM | 5.334 | 0.436 | 76.337 |
| 4:00:00 AM | 5.334 | 0.467 | 81.646 |
| 4:15:00 AM | 5.296 | 0.433 | 75.333 |
| 4:30:00 AM | 5.381 | 0.454 | 78.69 |
| 4:45:00 AM | 5.438 | 0.501 | 90.382 |
| 5:00:00 AM | 5.694 | 0.593 | 113.811 |
| 5:15:00 AM | 5.884 | 0.681 | 129.839 |
| 5:30:00 AM | 6.016 | 0.667 | 135.908 |
| 5:45:00 AM | 6.206 | 0.831 | 178.907 |
| 6:00:00 AM | 6.153 | 0.789 | 166.525 |
| 6:15:00 AM | 6.317 | 0.794 | 174.811 |
| 6:30:00 AM | 6.587 | 0.888 | 201.03 |
| 6:45:00 AM | 6.763 | 0.952 | 229.384 |
| 7:00:00 AM | 6.623 | 0.976 | 227.859 |
| 7:15:00 AM | 6.948 | 1.067 | 262.936 |
| 7:30:00 AM | 7.111 | 0.982 | 252.49 |
| 7:45:00 AM | 7.325 | 1.011 | 269.277 |
| 8:00:00 AM | 7.267 | 0.987 | 255.735 |
| 8:15:00 AM | 7.313 | 1.019 | 264.162 |
| 8:30:00 AM | 7.268 | 1.078 | 282.516 |
| 8:45:00 AM | 7.162 | 1.078 | 279.84 |
| 9:00:00 AM | 7.132 | 0.976 | 239.853 |
| 9:15:00 AM | 6.899 | 0.953 | 235.707 |
| 9:30:00 AM | 6.87 | 0.938 | 229.923 |
| 9:45:00 AM | 7.091 | 1.028 | 263.388 |
| 10:00:00 AM | 7.15 | 0.987 | 253.952 |
| 10:15:00 AM | 6.88 | 0.991 | 242.308 |
| 10:30:00 AM | 6.966 | 0.948 | 237.325 |
| 10:45:00 AM | 7.205 | 1.128 | 295.081 |
| 11:00:00 AM | 7.07 | 1.096 | 278.083 |
| 11:15:00 AM | 7.06 | 1.003 | 254.047 |
| 11:30:00 AM | 7.101 | 0.991 | 252.803 |
| 11:45:00 AM | 7.211 | 1.09 | 285.406 |

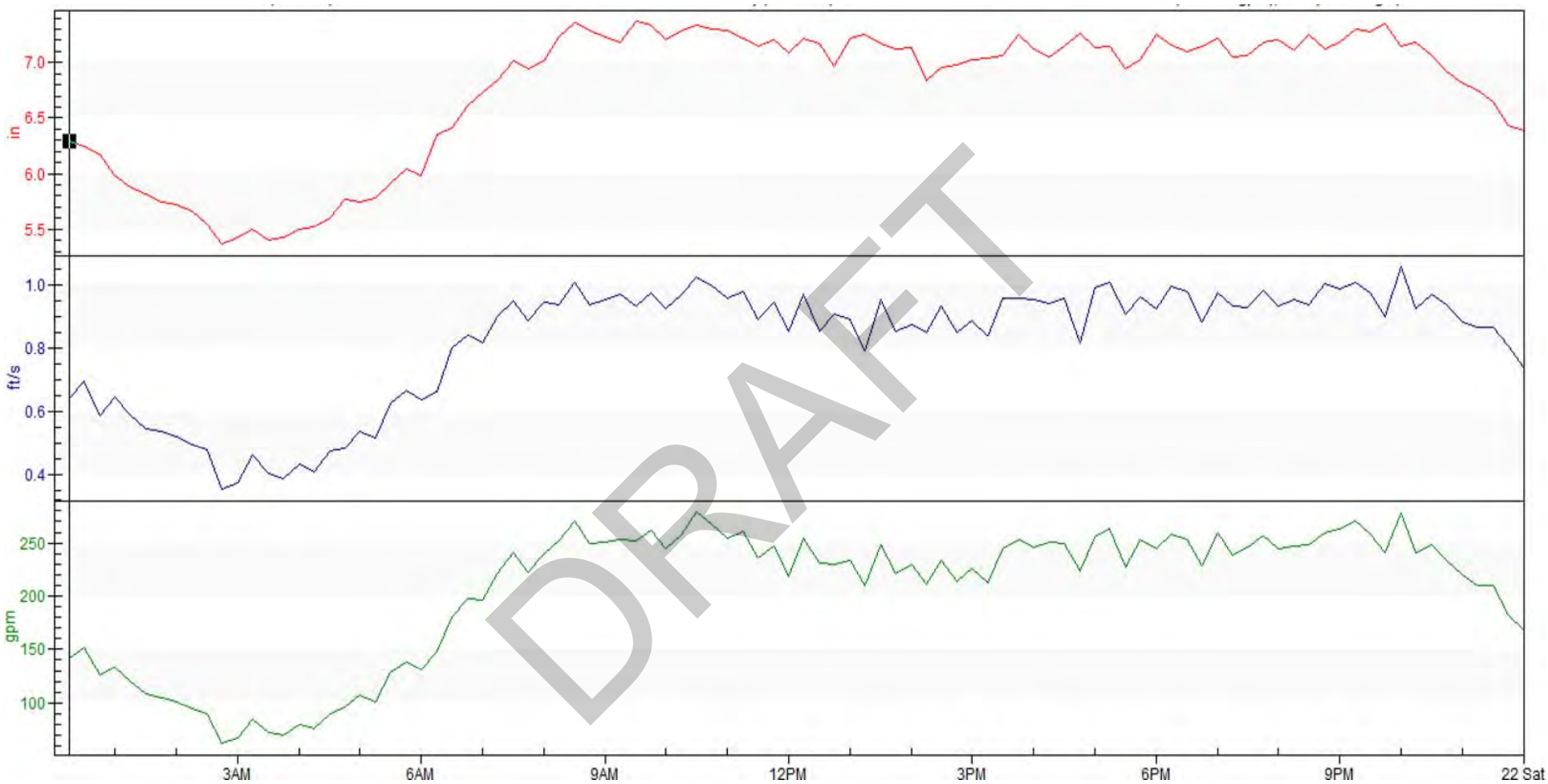
**Thursday - P.M. 7/20/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.115 | 1.056 | 265.161 |
| 12:15:00 PM | 7.086 | 0.967 | 247.568 |
| 12:30:00 PM | 6.976 | 1.09 | 273.454 |
| 12:45:00 PM | 7.058 | 1.009 | 257.122 |
| 1:00:00 PM | 7.08 | 0.989 | 250.068 |
| 1:15:00 PM | 7.104 | 1.044 | 268.081 |
| 1:30:00 PM | 6.946 | 1.008 | 251.513 |
| 1:45:00 PM | 6.78 | 0.939 | 224.211 |
| 2:00:00 PM | 6.811 | 0.984 | 239.392 |
| 2:15:00 PM | 6.842 | 0.968 | 235.827 |
| 2:30:00 PM | 6.834 | 0.937 | 226.976 |
| 2:45:00 PM | 6.77 | 0.918 | 218.521 |
| 3:00:00 PM | 6.913 | 0.967 | 237.385 |
| 3:15:00 PM | 6.981 | 1.021 | 255.721 |
| 3:30:00 PM | 6.951 | 0.974 | 242.974 |
| 3:45:00 PM | 6.806 | 1.036 | 251.821 |
| 4:00:00 PM | 6.977 | 0.938 | 231.072 |
| 4:15:00 PM | 6.958 | 1.051 | 262.849 |
| 4:30:00 PM | 7.114 | 1.068 | 273.365 |
| 4:45:00 PM | 7.248 | 1.117 | 289.59 |
| 5:00:00 PM | 7.369 | 1.107 | 298.195 |
| 5:15:00 PM | 7.297 | 1.024 | 269.329 |
| 5:30:00 PM | 7.43 | 1.171 | 318.791 |
| 5:45:00 PM | 7.319 | 1.04 | 277.683 |
| 6:00:00 PM | 7.626 | 1.147 | 322.596 |
| 6:15:00 PM | 7.342 | 1.036 | 274.293 |
| 6:30:00 PM | 7.259 | 1.037 | 270.628 |
| 6:45:00 PM | 7.327 | 1.075 | 287.289 |
| 7:00:00 PM | 7.068 | 1.013 | 255.22 |
| 7:15:00 PM | 7.271 | 1.085 | 283.675 |
| 7:30:00 PM | 7.233 | 1.104 | 290.181 |
| 7:45:00 PM | 7.278 | 1.103 | 291.728 |
| 8:00:00 PM | 7.475 | 1.079 | 295.896 |
| 8:15:00 PM | 7.386 | 1.126 | 301.621 |
| 8:30:00 PM | 7.523 | 1.109 | 306.529 |
| 8:45:00 PM | 7.59 | 1.197 | 331.801 |
| 9:00:00 PM | 7.635 | 1.112 | 313.392 |
| 9:15:00 PM | 7.737 | 1.116 | 319.766 |
| 9:30:00 PM | 7.909 | 1.18 | 347.513 |
| 9:45:00 PM | 7.735 | 1.123 | 321.537 |
| 10:00:00 PM | 7.81 | 1.111 | 322.024 |
| 10:15:00 PM | 7.66 | 1.143 | 319.435 |
| 10:30:00 PM | 7.652 | 1.106 | 306.915 |
| 10:45:00 PM | 7.41 | 0.982 | 266.225 |
| 11:00:00 PM | 6.9 | 0.925 | 226.501 |
| 11:15:00 PM | 6.917 | 0.985 | 244.336 |
| 11:30:00 PM | 6.751 | 0.923 | 221.993 |
| 11:45:00 PM | 6.692 | 0.848 | 200.6 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.769 | 0.913 | 226.234 |
| Daily Min: | 5.271 | 0.433 | 75.333 |
| Daily Max: | 7.909 | 1.197 | 347.513 |
| Peak to Avg: | | | 1.54 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/21/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Friday - A.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.549 | 0.854 | 191.468 |
| 12:15:00 AM | 6.428 | 0.805 | 179.563 |
| 12:30:00 AM | 6.29 | 0.741 | 162.414 |
| 12:45:00 AM | 6.177 | 0.696 | 148.635 |
| 1:00:00 AM | 6.122 | 0.72 | 147.641 |
| 1:15:00 AM | 6.017 | 0.618 | 126.154 |
| 1:30:00 AM | 5.946 | 0.717 | 145.836 |
| 1:45:00 AM | 5.828 | 0.595 | 117.722 |
| 2:00:00 AM | 5.738 | 0.58 | 112.406 |
| 2:15:00 AM | 5.697 | 0.544 | 104.407 |
| 2:30:00 AM | 5.652 | 0.51 | 96.92 |
| 2:45:00 AM | 5.49 | 0.459 | 83.872 |
| 3:00:00 AM | 5.453 | 0.52 | 94.044 |
| 3:15:00 AM | 5.564 | 0.5 | 91.422 |
| 3:30:00 AM | 5.436 | 0.457 | 82.399 |
| 3:45:00 AM | 5.481 | 0.427 | 76.682 |
| 4:00:00 AM | 5.514 | 0.493 | 90.11 |
| 4:15:00 AM | 5.565 | 0.508 | 94.364 |
| 4:30:00 AM | 5.814 | 0.583 | 113.216 |
| 4:45:00 AM | 5.802 | 0.565 | 111.046 |
| 5:00:00 AM | 5.82 | 0.594 | 115.415 |
| 5:15:00 AM | 5.886 | 0.595 | 119.307 |
| 5:30:00 AM | 6.076 | 0.688 | 144.039 |
| 5:45:00 AM | 6.234 | 0.702 | 152.085 |
| 6:00:00 AM | 6.201 | 0.714 | 153.459 |
| 6:15:00 AM | 6.38 | 0.825 | 183.177 |
| 6:30:00 AM | 6.61 | 0.901 | 204.147 |
| 6:45:00 AM | 6.664 | 0.869 | 204.932 |
| 7:00:00 AM | 6.905 | 1.067 | 264.192 |
| 7:15:00 AM | 6.954 | 0.977 | 244.212 |
| 7:30:00 AM | 7.078 | 0.987 | 251.561 |
| 7:45:00 AM | 7.14 | 1.005 | 250.762 |
| 8:00:00 AM | 7.058 | 0.968 | 245.047 |
| 8:15:00 AM | 7.346 | 1.084 | 290.263 |
| 8:30:00 AM | 7.476 | 1.124 | 308.259 |
| 8:45:00 AM | 7.461 | 1.098 | 300.468 |
| 9:00:00 AM | 7.27 | 1.022 | 269.412 |
| 9:15:00 AM | 7.485 | 1.079 | 296.287 |
| 9:30:00 AM | 7.552 | 1.019 | 276.971 |
| 9:45:00 AM | 7.543 | 1.108 | 307.224 |
| 10:00:00 AM | 7.321 | 1.03 | 274.936 |
| 10:15:00 AM | 7.374 | 1.05 | 279.702 |
| 10:30:00 AM | 7.423 | 1.044 | 281.587 |
| 10:45:00 AM | 7.325 | 1.053 | 280.122 |
| 11:00:00 AM | 7.367 | 1.013 | 272.597 |
| 11:15:00 AM | 7.429 | 1.007 | 272.816 |
| 11:30:00 AM | 7.251 | 1.014 | 262.361 |
| 11:45:00 AM | 7.296 | 0.975 | 259.321 |

**Friday - P.M. 7/21/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.264 | 0.998 | 259.31 |
| 12:15:00 PM | 7.395 | 1.02 | 275.832 |
| 12:30:00 PM | 7.388 | 1.01 | 262.681 |
| 12:45:00 PM | 7.066 | 0.96 | 240.322 |
| 1:00:00 PM | 7.257 | 0.997 | 263.313 |
| 1:15:00 PM | 7.336 | 1.073 | 283.344 |
| 1:30:00 PM | 7.264 | 0.991 | 258.121 |
| 1:45:00 PM | 7.17 | 1.009 | 262.294 |
| 2:00:00 PM | 7.248 | 0.998 | 257.996 |
| 2:15:00 PM | 6.968 | 1.024 | 250.504 |
| 2:30:00 PM | 7.038 | 0.972 | 246.665 |
| 2:45:00 PM | 7.073 | 0.973 | 248.644 |
| 3:00:00 PM | 7.068 | 0.96 | 244.491 |
| 3:15:00 PM | 7.16 | 0.985 | 255.512 |
| 3:30:00 PM | 7.13 | 1.071 | 275.282 |
| 3:45:00 PM | 7.355 | 1.049 | 281.873 |
| 4:00:00 PM | 7.269 | 1.044 | 273.884 |
| 4:15:00 PM | 7.295 | 1.04 | 264.803 |
| 4:30:00 PM | 7.202 | 1.111 | 290.359 |
| 4:45:00 PM | 7.443 | 1.033 | 273.103 |
| 5:00:00 PM | 7.276 | 1.081 | 286.421 |
| 5:15:00 PM | 7.202 | 1.032 | 266.963 |
| 5:30:00 PM | 7.097 | 1.009 | 258.995 |
| 5:45:00 PM | 7.393 | 1.076 | 290.966 |
| 6:00:00 PM | 7.338 | 0.942 | 252.353 |
| 6:15:00 PM | 7.253 | 1.088 | 284.309 |
| 6:30:00 PM | 7.215 | 0.999 | 261.752 |
| 6:45:00 PM | 7.28 | 1.022 | 270.96 |
| 7:00:00 PM | 7.308 | 1.07 | 280.391 |
| 7:15:00 PM | 7.179 | 1.101 | 286.659 |
| 7:30:00 PM | 7.251 | 0.995 | 253.911 |
| 7:45:00 PM | 7.328 | 1.135 | 296.482 |
| 8:00:00 PM | 7.293 | 1.079 | 286.748 |
| 8:15:00 PM | 7.278 | 1.063 | 281.627 |
| 8:30:00 PM | 7.315 | 1 | 266.68 |
| 8:45:00 PM | 7.301 | 1.131 | 300.903 |
| 9:00:00 PM | 7.285 | 1.035 | 272.735 |
| 9:15:00 PM | 7.34 | 1.077 | 288.477 |
| 9:30:00 PM | 7.47 | 1.109 | 301.71 |
| 9:45:00 PM | 7.418 | 1.077 | 292.482 |
| 10:00:00 PM | 7.268 | 1.107 | 291.104 |
| 10:15:00 PM | 7.319 | 1.034 | 276.064 |
| 10:30:00 PM | 7.153 | 0.999 | 258.785 |
| 10:45:00 PM | 7.164 | 0.988 | 255.834 |
| 11:00:00 PM | 7.02 | 0.961 | 243.042 |
| 11:15:00 PM | 6.825 | 0.906 | 221.045 |
| 11:30:00 PM | 6.781 | 0.957 | 230.79 |
| 11:45:00 PM | 6.549 | 0.862 | 199.15 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.866 | 0.915 | 229.149 |
| Daily Min: | 5.436 | 0.427 | 76.682 |
| Daily Max: | 7.552 | 1.135 | 308.259 |
| Peak to Avg: | | | 1.35 |

DRAFT

# MAXIMUM DAILY FLOW DATA

DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/22/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Saturday - A.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.47 | 0.808 | 180.59 |
| 12:15:00 AM | 6.38 | 0.829 | 184.992 |
| 12:30:00 AM | 6.293 | 0.806 | 174.207 |
| 12:45:00 AM | 6.15 | 0.727 | 153.528 |
| 1:00:00 AM | 6.039 | 0.684 | 141.909 |
| 1:15:00 AM | 6.049 | 0.672 | 138.716 |
| 1:30:00 AM | 5.99 | 0.671 | 136.001 |
| 1:45:00 AM | 5.984 | 0.526 | 107.919 |
| 2:00:00 AM | 5.883 | 0.457 | 88.252 |
| 2:15:00 AM | 5.698 | 0.415 | 79.161 |
| 2:30:00 AM | 5.685 | 0.441 | 84.417 |
| 2:45:00 AM | 5.75 | 0.44 | 85.569 |
| 3:00:00 AM | 5.699 | 0.537 | 102.887 |
| 3:15:00 AM | 5.677 | 0.441 | 83.619 |
| 3:30:00 AM | 5.608 | 0.408 | 76.614 |
| 3:45:00 AM | 5.541 | 0.373 | 68.997 |
| 4:00:00 AM | 5.499 | 0.402 | 73.439 |
| 4:15:00 AM | 5.541 | 0.444 | 81.838 |
| 4:30:00 AM | 5.668 | 0.42 | 80.038 |
| 4:45:00 AM | 5.763 | 0.46 | 87.602 |
| 5:00:00 AM | 5.648 | 0.558 | 105.772 |
| 5:15:00 AM | 5.659 | 0.497 | 94.548 |
| 5:30:00 AM | 5.779 | 0.574 | 110.786 |
| 5:45:00 AM | 5.784 | 0.619 | 120.143 |
| 6:00:00 AM | 5.974 | 0.595 | 121.688 |
| 6:15:00 AM | 5.908 | 0.577 | 116.247 |
| 6:30:00 AM | 5.931 | 0.573 | 116.193 |
| 6:45:00 AM | 6.102 | 0.654 | 133.611 |
| 7:00:00 AM | 6.131 | 0.634 | 134.148 |
| 7:15:00 AM | 6.562 | 0.825 | 189.492 |
| 7:30:00 AM | 6.683 | 0.939 | 219.023 |
| 7:45:00 AM | 6.796 | 0.892 | 214.865 |
| 8:00:00 AM | 7.162 | 1.019 | 264.626 |
| 8:15:00 AM | 7.096 | 1.026 | 256.999 |
| 8:30:00 AM | 7.198 | 1.049 | 274.06 |
| 8:45:00 AM | 7.474 | 1.11 | 304.34 |
| 9:00:00 AM | 7.747 | 1.116 | 320.112 |
| 9:15:00 AM | 7.6 | 1.138 | 318.734 |
| 9:30:00 AM | 7.804 | 1.19 | 344.49 |
| 9:45:00 AM | 7.809 | 1.155 | 334.864 |
| 10:00:00 AM | 7.894 | 1.17 | 338.352 |
| 10:15:00 AM | 7.768 | 1.185 | 341.035 |
| 10:30:00 AM | 7.491 | 1.007 | 276.776 |
| 10:45:00 AM | 7.46 | 1.108 | 293.65 |
| 11:00:00 AM | 7.523 | 1.186 | 327.976 |
| 11:15:00 AM | 7.693 | 1.107 | 306.054 |
| 11:30:00 AM | 7.742 | 1.081 | 310.04 |
| 11:45:00 AM | 7.6 | 1.123 | 311.582 |

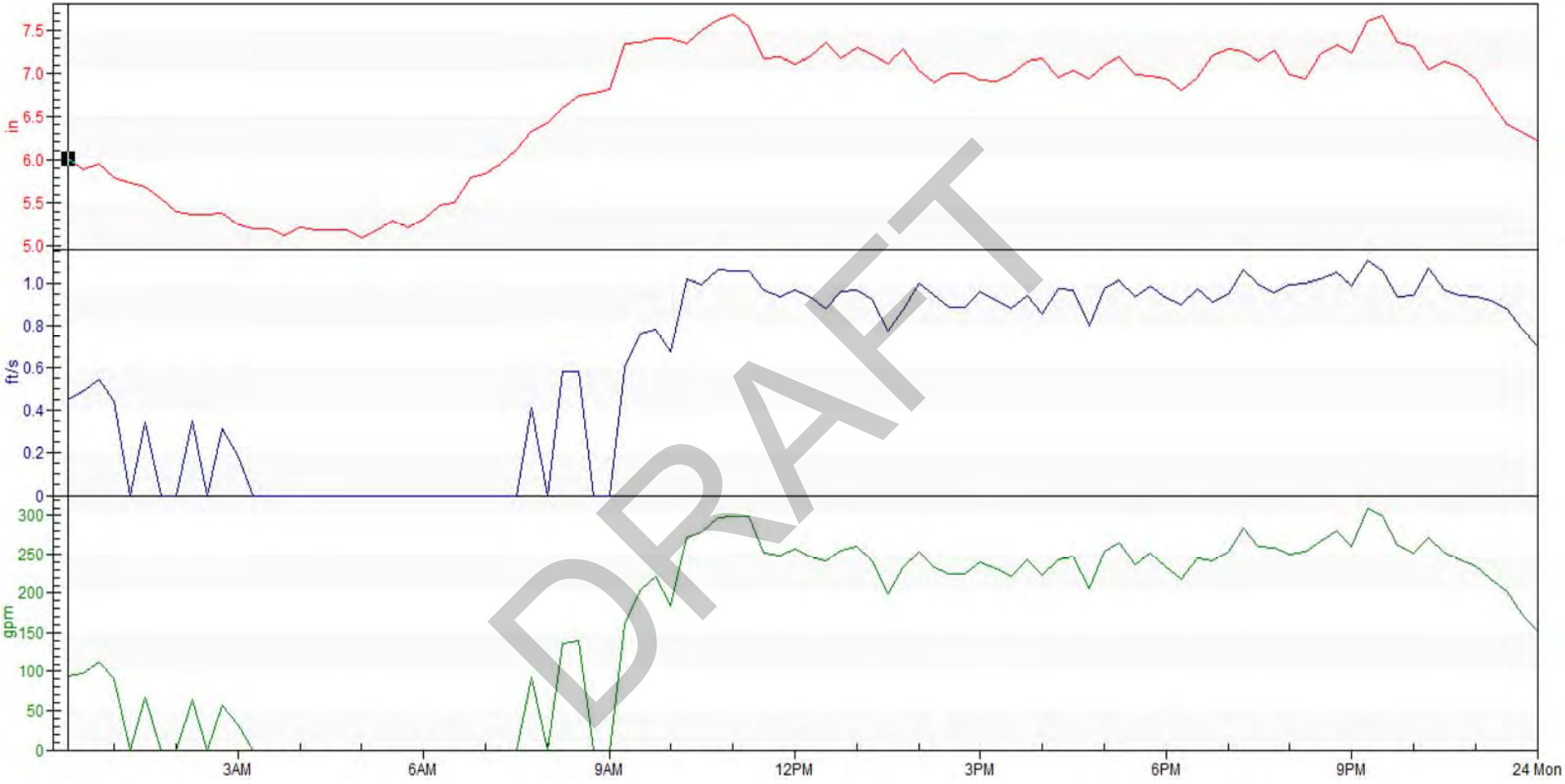
**Saturday - P.M. 7/22/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.427 | 1.149 | 312.411 |
| 12:15:00 PM | 7.581 | 1.101 | 307.458 |
| 12:30:00 PM | 7.69 | 1.137 | 323.331 |
| 12:45:00 PM | 7.542 | 1.09 | 302.445 |
| 1:00:00 PM | 7.267 | 1.117 | 290.88 |
| 1:15:00 PM | 7.391 | 1.115 | 301.292 |
| 1:30:00 PM | 7.517 | 1.093 | 301.918 |
| 1:45:00 PM | 7.635 | 1.068 | 294.068 |
| 2:00:00 PM | 7.357 | 1.048 | 276.028 |
| 2:15:00 PM | 7.308 | 1.092 | 290.974 |
| 2:30:00 PM | 7.391 | 1.047 | 280.814 |
| 2:45:00 PM | 7.331 | 1.069 | 285.924 |
| 3:00:00 PM | 7.212 | 1.093 | 286.268 |
| 3:15:00 PM | 7.295 | 1.037 | 271.8 |
| 3:30:00 PM | 7.067 | 1.106 | 282.144 |
| 3:45:00 PM | 7.137 | 0.997 | 253.24 |
| 4:00:00 PM | 7.12 | 1.084 | 279.231 |
| 4:15:00 PM | 7.269 | 1.046 | 276.552 |
| 4:30:00 PM | 7.143 | 1.068 | 276.351 |
| 4:45:00 PM | 7.105 | 1.119 | 287.541 |
| 5:00:00 PM | 6.983 | 1.001 | 251.415 |
| 5:15:00 PM | 7.103 | 0.967 | 248.169 |
| 5:30:00 PM | 7.122 | 1.013 | 260.988 |
| 5:45:00 PM | 7 | 1.091 | 275.043 |
| 6:00:00 PM | 7.08 | 1.03 | 258.429 |
| 6:15:00 PM | 6.921 | 0.925 | 225.362 |
| 6:30:00 PM | 6.948 | 0.96 | 237.76 |
| 6:45:00 PM | 6.924 | 0.941 | 233.78 |
| 7:00:00 PM | 6.714 | 0.934 | 219.433 |
| 7:15:00 PM | 7.008 | 1.053 | 265.762 |
| 7:30:00 PM | 6.916 | 1.025 | 251.189 |
| 7:45:00 PM | 6.877 | 0.913 | 222.926 |
| 8:00:00 PM | 7.063 | 0.972 | 247.782 |
| 8:15:00 PM | 6.933 | 1.02 | 253.889 |
| 8:30:00 PM | 6.974 | 0.991 | 246.793 |
| 8:45:00 PM | 7.074 | 1.003 | 246.355 |
| 9:00:00 PM | 7.161 | 1.031 | 262.78 |
| 9:15:00 PM | 7.058 | 0.982 | 250.049 |
| 9:30:00 PM | 7.067 | 0.994 | 251.045 |
| 9:45:00 PM | 7.154 | 1.032 | 267.528 |
| 10:00:00 PM | 7.079 | 0.998 | 253.586 |
| 10:15:00 PM | 7.035 | 0.986 | 250.013 |
| 10:30:00 PM | 6.928 | 1.013 | 251.627 |
| 10:45:00 PM | 6.751 | 0.94 | 222.614 |
| 11:00:00 PM | 6.703 | 0.895 | 208.999 |
| 11:15:00 PM | 6.597 | 0.919 | 214.422 |
| 11:30:00 PM | 6.662 | 0.865 | 202.14 |
| 11:45:00 PM | 6.304 | 0.777 | 169.756 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.798 | 0.893 | 222.739 |
| Daily Min: | 5.499 | 0.373 | 68.997 |
| Daily Max: | 7.894 | 1.19 | 344.49 |
| Peak to Avg: | | | 1.55 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/23/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Sunday - A.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 AM | 6.291 | 0.791 | 169.053 |
| 12:15:00 AM | 6.084 | 0.697 | 146.175 |
| 12:30:00 AM | 6.003 | 0.845 | 173.993 |
| 12:45:00 AM | 6.023 | 0.669 | 135.863 |
| 1:00:00 AM | 5.899 | 0.579 | 115.319 |
| 1:15:00 AM | 5.79 | 0.66 | 127.835 |
| 1:30:00 AM | 5.769 | 0.544 | 106.058 |
| 1:45:00 AM | 5.648 | 0 | 0 |
| 2:00:00 AM | 5.505 | 0 | 0 |
| 2:15:00 AM | 5.468 | 0.483 | 86.966 |
| 2:30:00 AM | 5.403 | 0.391 | 69.67 |
| 2:45:00 AM | 5.469 | 0.462 | 83.959 |
| 3:00:00 AM | 5.338 | 0.387 | 66.391 |
| 3:15:00 AM | 5.253 | 0.457 | 78.128 |
| 3:30:00 AM | 5.286 | 0.388 | 65.914 |
| 3:45:00 AM | 5.216 | 0 | 0 |
| 4:00:00 AM | 5.286 | 0 | 0 |
| 4:15:00 AM | 5.288 | 0 | 0 |
| 4:30:00 AM | 5.252 | 0 | 0 |
| 4:45:00 AM | 5.238 | 0 | 0 |
| 5:00:00 AM | 5.161 | 0 | 0 |
| 5:15:00 AM | 5.182 | 0 | 0 |
| 5:30:00 AM | 5.344 | 0 | 0 |
| 5:45:00 AM | 5.358 | 0 | 0 |
| 6:00:00 AM | 5.488 | 0 | 0 |
| 6:15:00 AM | 5.54 | 0 | 0 |
| 6:30:00 AM | 5.603 | 0.498 | 92.456 |
| 6:45:00 AM | 5.797 | 0.33 | 64.788 |
| 7:00:00 AM | 5.932 | 0.371 | 74.533 |
| 7:15:00 AM | 6.046 | 0.467 | 97.015 |
| 7:30:00 AM | 6.377 | 0.541 | 114.088 |
| 7:45:00 AM | 6.491 | 0.597 | 136.293 |
| 8:00:00 AM | 6.632 | 0.52 | 117.725 |
| 8:15:00 AM | 6.787 | 0.71 | 171.962 |
| 8:30:00 AM | 6.781 | 0.663 | 160.238 |
| 8:45:00 AM | 6.934 | 0.766 | 190.704 |
| 9:00:00 AM | 7.338 | 0.948 | 253.79 |
| 9:15:00 AM | 7.493 | 0.981 | 269.82 |
| 9:30:00 AM | 7.661 | 0.867 | 236.112 |
| 9:45:00 AM | 7.643 | 0.864 | 234.083 |
| 10:00:00 AM | 7.423 | 1.099 | 298.605 |
| 10:15:00 AM | 7.464 | 1.22 | 331.823 |
| 10:30:00 AM | 7.817 | 1.234 | 358.139 |
| 10:45:00 AM | 7.784 | 1.182 | 341.238 |
| 11:00:00 AM | 7.809 | 1.194 | 343.669 |
| 11:15:00 AM | 7.669 | 1.153 | 319.97 |
| 11:30:00 AM | 7.495 | 0.998 | 267.649 |
| 11:45:00 AM | 7.275 | 1.013 | 263.945 |

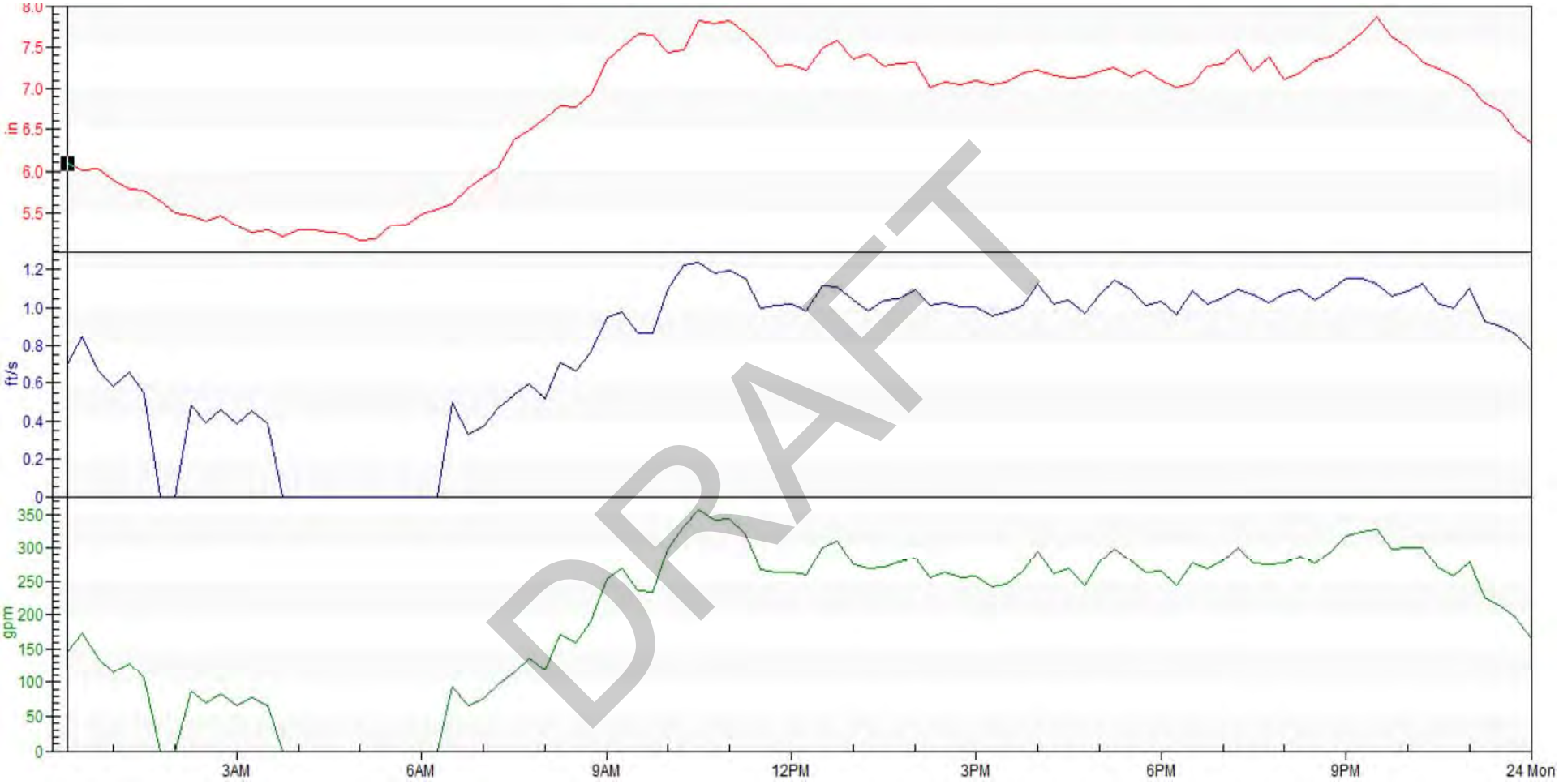
**Sunday - P.M. 7/23/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.283 | 1.018 | 263.539 |
| 12:15:00 PM | 7.224 | 0.986 | 258.621 |
| 12:30:00 PM | 7.473 | 1.115 | 300.549 |
| 12:45:00 PM | 7.58 | 1.109 | 309.633 |
| 1:00:00 PM | 7.353 | 1.039 | 275.98 |
| 1:15:00 PM | 7.418 | 0.989 | 268.508 |
| 1:30:00 PM | 7.267 | 1.042 | 270.911 |
| 1:45:00 PM | 7.304 | 1.051 | 278.984 |
| 2:00:00 PM | 7.322 | 1.1 | 284.405 |
| 2:15:00 PM | 7.019 | 1.014 | 254.833 |
| 2:30:00 PM | 7.075 | 1.028 | 262.611 |
| 2:45:00 PM | 7.05 | 1.007 | 256.227 |
| 3:00:00 PM | 7.087 | 1.009 | 258.525 |
| 3:15:00 PM | 7.048 | 0.96 | 241.953 |
| 3:30:00 PM | 7.081 | 0.98 | 246.16 |
| 3:45:00 PM | 7.191 | 1.017 | 265.406 |
| 4:00:00 PM | 7.216 | 1.122 | 294.073 |
| 4:15:00 PM | 7.159 | 1.02 | 262.355 |
| 4:30:00 PM | 7.134 | 1.041 | 268.998 |
| 4:45:00 PM | 7.142 | 0.971 | 244.344 |
| 5:00:00 PM | 7.204 | 1.068 | 279.295 |
| 5:15:00 PM | 7.259 | 1.148 | 299.36 |
| 5:30:00 PM | 7.142 | 1.099 | 281.367 |
| 5:45:00 PM | 7.218 | 1.016 | 262.616 |
| 6:00:00 PM | 7.097 | 1.035 | 265.42 |
| 6:15:00 PM | 7.013 | 0.967 | 244.218 |
| 6:30:00 PM | 7.069 | 1.087 | 277.58 |
| 6:45:00 PM | 7.265 | 1.024 | 268.898 |
| 7:00:00 PM | 7.301 | 1.057 | 280.16 |
| 7:15:00 PM | 7.458 | 1.098 | 300.193 |
| 7:30:00 PM | 7.211 | 1.069 | 276.367 |
| 7:45:00 PM | 7.376 | 1.029 | 275.611 |
| 8:00:00 PM | 7.111 | 1.08 | 277.726 |
| 8:15:00 PM | 7.188 | 1.099 | 286.568 |
| 8:30:00 PM | 7.337 | 1.042 | 276.931 |
| 8:45:00 PM | 7.377 | 1.1 | 294.449 |
| 9:00:00 PM | 7.506 | 1.154 | 318.18 |
| 9:15:00 PM | 7.671 | 1.154 | 324.99 |
| 9:30:00 PM | 7.862 | 1.124 | 328.558 |
| 9:45:00 PM | 7.614 | 1.064 | 298.582 |
| 10:00:00 PM | 7.489 | 1.093 | 300.583 |
| 10:15:00 PM | 7.323 | 1.124 | 300.193 |
| 10:30:00 PM | 7.237 | 1.023 | 269.25 |
| 10:45:00 PM | 7.156 | 0.999 | 258.493 |
| 11:00:00 PM | 7.033 | 1.101 | 279.228 |
| 11:15:00 PM | 6.824 | 0.932 | 227.156 |
| 11:30:00 PM | 6.721 | 0.904 | 212.342 |
| 11:45:00 PM | 6.494 | 0.864 | 197.352 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.721 | 0.789 | 201.297 |
| Daily Min: | 5.161 | 0 | 0 |
| Daily Max: | 7.862 | 1.234 | 358.139 |
| Peak to Avg: | | | 1.78 |

DRAFT

# MAXIMUM DAILY FLOW DATA




DRAFT

**Maximum Level** — **Maximum Velocity** — **Maximum Flow Rate**

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 S. Palm, Santa Paula, CA**
Flow Meter: **Teledyne Isco 2150 Area Velocity w/ Pressure Transducer**
Time Period: **7/24/2023, 12:00 a.m. - 12:00 p.m.**

Project: City of Santa Paula - Sewer Flow Study
Manhole Location: 224 S. Palm

**Monday - A.M. 7/24/2023**

| Time | Level | Velocity | Velocity |
|---|---|---|---|
| 12:10:00 AM | 6.327 | 0.769 | 165.914 |
| 12:15:00 AM | 6.265 | 0.82 | 178.626 |
| 12:30:00 AM | 5.956 | 0.651 | 125.797 |
| 12:45:00 AM | 6 | 0.749 | 154.044 |
| 1:00:00 AM | 5.924 | 0.619 | 125.203 |
| 1:15:00 AM | 5.738 | 0.593 | 113.569 |
| 1:30:00 AM | 5.628 | 0.571 | 107.896 |
| 1:45:00 AM | 5.632 | 0.475 | 87.068 |
| 2:00:00 AM | 5.65 | 0.581 | 110.239 |
| 2:15:00 AM | 5.632 | 0.538 | 101.631 |
| 2:30:00 AM | 5.433 | 0.43 | 76.119 |
| 2:45:00 AM | 5.325 | 0.437 | 76.252 |
| 3:00:00 AM | 5.378 | 0.479 | 84.995 |
| 3:15:00 AM | 5.357 | 0.518 | 89.023 |
| 3:30:00 AM | 5.384 | 0.523 | 91.596 |
| 3:45:00 AM | 5.273 | 0.529 | 91.492 |
| 4:00:00 AM | 5.294 | 0.434 | 74.443 |
| 4:15:00 AM | 5.293 | 0.47 | 81.326 |
| 4:30:00 AM | 5.414 | 0.473 | 84.676 |
| 4:45:00 AM | 5.516 | 0.568 | 104.365 |
| 5:00:00 AM | 5.65 | 0.63 | 118.33 |
| 5:15:00 AM | 5.789 | 0.66 | 129.423 |
| 5:30:00 AM | 5.963 | 0.666 | 134.334 |
| 5:45:00 AM | 6.033 | 0.819 | 169.785 |
| 6:00:00 AM | 6.12 | 0.86 | 181.49 |
| 6:15:00 AM | 6.284 | 0.802 | 174.909 |
| 6:30:00 AM | 6.515 | 0.913 | 208.795 |
| 6:45:00 AM | 6.71 | 0.956 | 227.962 |
| 7:00:00 AM | 6.738 | 0.941 | 224.86 |
| 7:15:00 AM | 6.892 | 0.956 | 228.679 |
| 7:30:00 AM | 6.932 | 0.985 | 243.035 |
| 7:45:00 AM | 7.03 | 1.091 | 272.32 |
| 8:00:00 AM | 7.011 | 1.065 | 266.739 |
| 8:15:00 AM | 6.968 | 1.06 | 264.585 |
| 8:30:00 AM | 7.002 | 1.108 | 279.348 |
| 8:45:00 AM | 7.161 | 1.057 | 269.283 |
| 9:00:00 AM | 7.041 | 0.992 | 251.893 |
| 9:15:00 AM | 7.006 | 1.076 | 271.33 |
| 9:30:00 AM | 7.104 | 1.043 | 264.416 |
| 9:45:00 AM | 7.139 | 1.061 | 268.97 |
| 10:00:00 AM | 7.504 | 1.119 | 303.799 |
| 10:15:00 AM | 7.378 | 0.968 | 259.272 |
| 10:30:00 AM | 7.574 | 1.103 | 302.61 |
| 10:45:00 AM | 7.358 | 1.078 | 289.722 |
| 11:00:00 AM | 7.406 | 1 | 269.628 |
| 11:15:00 AM | 7.368 | 1.066 | 279.352 |
| 11:30:00 AM | 7.098 | 0.96 | 245.048 |
| 11:45:00 AM | 7.24 | 1.109 | 290.235 |

**Monday - P.M. 7/24/2023**

| Time | Level | Velocity | Flow |
|---|---|---|---|
| 12:00:00 PM | 7.031 | 0.998 | 251.241 |
| 12:15:00 PM | 7.143 | 1.007 | 258.079 |
| 12:30:00 PM | 7.111 | 0.986 | 253.766 |
| 12:45:00 PM | 7.267 | 1.05 | 272.694 |
| 1:00:00 PM | 7.168 | 1.054 | 272.796 |
| 1:15:00 PM | 7.155 | 0.995 | 258.086 |
| 1:30:00 PM | 7.067 | 0.982 | 244.061 |
| 1:45:00 PM | 6.988 | 0.975 | 245.187 |
| 2:00:00 PM | 6.989 | 0.984 | 247.219 |
| 2:15:00 PM | 7.057 | 0.933 | 237.295 |
| 2:30:00 PM | 7.146 | 0.969 | 250.935 |
| 2:45:00 PM | 7.093 | 1.025 | 262.786 |
| 3:00:00 PM | 6.925 | 1.043 | 259.211 |
| 3:15:00 PM | 6.956 | 1.031 | 254.407 |
| 3:30:00 PM | 7.037 | 0.914 | 231.561 |
| 3:45:00 PM | 7.078 | 1.082 | 271.098 |
| 4:00:00 PM | 7.189 | 1.023 | 261.89 |
| 4:15:00 PM | 7.234 | 1.071 | 281.663 |
| 4:30:00 PM | 7.235 | 1.013 | 266.498 |
| 4:45:00 PM | 7.121 | 1.108 | 285.417 |
| 5:00:00 PM | 7.179 | 1.059 | 273.171 |
| 5:15:00 PM | 7.237 | 1.053 | 277.066 |
| 5:30:00 PM | 7.294 | 1.185 | 314.897 |
| 5:45:00 PM | 7.303 | 1.032 | 268.419 |
| 6:00:00 PM | 7.439 | 1.189 | 319.855 |
| 6:15:00 PM | 7.275 | 1.102 | 291.953 |
| 6:30:00 PM | 7.005 | 0.953 | 237.253 |
| 6:45:00 PM | 7.069 | 1.023 | 261.018 |
| 7:00:00 PM | 7.124 | 1.036 | 259.749 |
| 7:15:00 PM | 7.137 | 0.996 | 256.392 |
| 7:30:00 PM | 7.209 | 0.971 | 237.576 |
| 7:45:00 PM | 7.577 | 1.066 | 290.174 |
| 8:00:00 PM | 7.554 | 1.113 | 307.942 |
| 8:15:00 PM | 7.435 | 1.136 | 306.764 |
| 8:30:00 PM | 7.442 | 1.041 | 281.421 |
| 8:45:00 PM | 7.869 | 1.156 | 338.458 |
| 9:00:00 PM | 7.628 | 1.132 | 318.581 |
| 9:15:00 PM | 7.78 | 1.182 | 334.407 |
| 9:30:00 PM | 7.546 | 0.989 | 269.859 |
| 9:45:00 PM | 7.668 | 1.137 | 322.209 |
| 10:00:00 PM | 7.695 | 1.145 | 325.631 |
| 10:15:00 PM | 7.435 | 1.159 | 312.493 |
| 10:30:00 PM | 7.398 | 1.045 | 281.942 |
| 10:45:00 PM | 7.323 | 1.057 | 277.852 |
| 11:00:00 PM | 7.066 | 0.995 | 253.753 |
| 11:15:00 PM | 6.767 | 0.959 | 223.243 |
| 11:30:00 PM | 6.489 | 0.909 | 207.253 |
| 11:45:00 PM | 6.292 | 0.791 | 171.735 |

| | Inches | Feet/Sec | GPM |
|---|---|---|---|
| Daily Avg: | 6.782 | 0.921 | 227.742 |
| Daily Min: | 5.273 | 0.43 | 74.443 |
| Daily Max: | 7.869 | 1.189 | 338.458 |
| Peak to Avg: | | | 1.49 |

DRAFT

# Sewer Line Flow Study Summary

Project: **City of Santa Paula - Sewer Flow Study**
Location: **224 Palm, Santa Paula, CA**
Pipe Size: **15" VCP**
Time Period: **7/11/2023, 12:00 a.m. - 7/25/2023, 12:00 a.m.**

## Level - Inches

| | |
|---|---|
| Average: | 6.675 |
| Maximum: | 9.657 |
| Minimum: | 5.088 |
| Max d/D: | 64.4% |

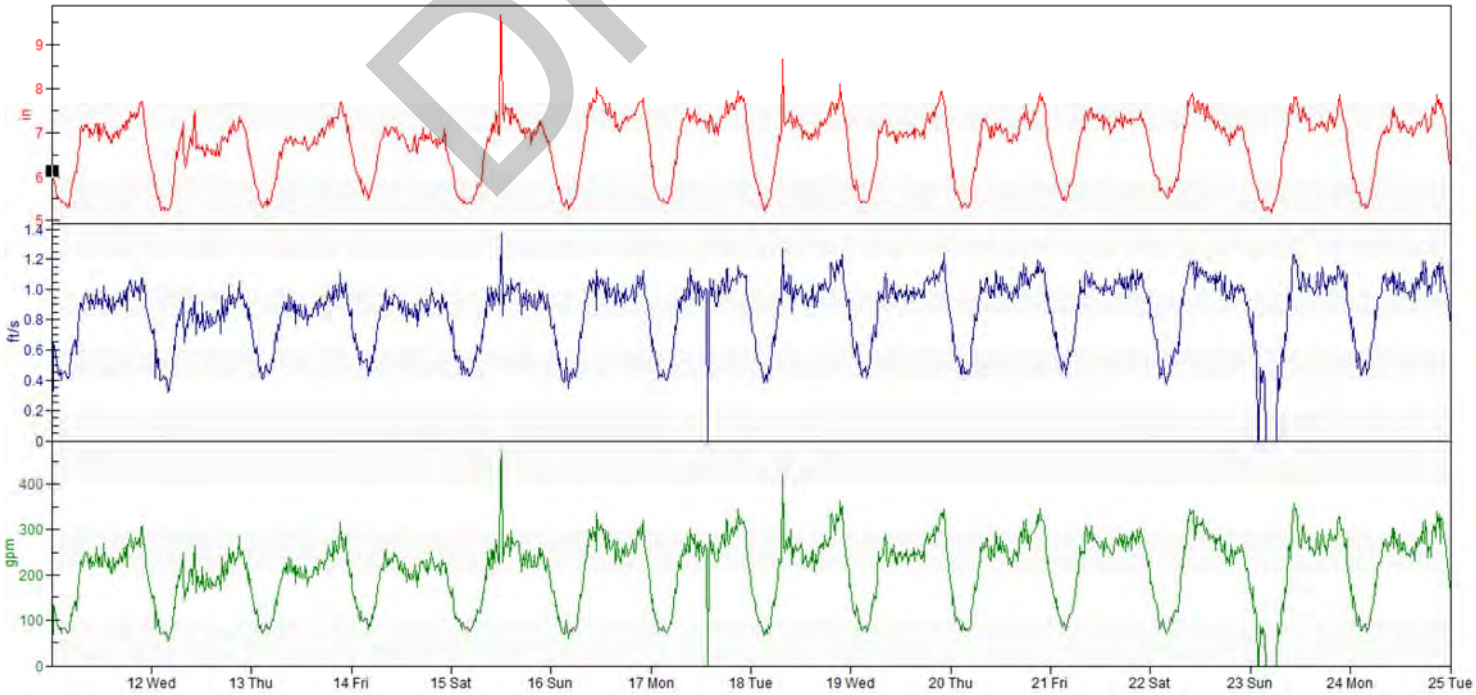
## Velocity - Feet per Second

| | |
|---|---|
| Average: | 0.800 |
| Maximum: | 0.363 |
| Minimum: | 0.408 |

## Flow Rate - Gallons Per Minute

| | |
|---|---|
| Average: | 196.456 |
| Maximum:: | 471.466 |
| Minimum: | 55.449 |
| Peak to Average | 2.33 |

DRAFT




**Maximum Level** **Maximum Velocity** **Maximum Flow Rate**

# Appendix B – Detailed Flow Verification

DRAFT

## Appendix C - Flow Verification

During the flow monitoring study, the average day water demand was 2.72 MGD and the average day flow to the WRF was 2.02 MGD, resulting in an average return factor of 74%, which is slightly lower than the average return factor of 86% from 2020 to 2022. For validating the preliminary return factors, MKN reduced the return factors for all land uses proportionally by 12%. **Table 1** provides the preliminary wastewater return factors adjusted proportionally for validation with the flow monitoring study.

**Table 1: Flow Monitoring Wastewater Return Factors**

| Land Use | Number of Parcels | Acreage | Average Day Demand (MGD)[1] | Average Day Demand (GPM)[1] | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
|---|---|---|---|---|---|---|---|
| Single-Family Residential | 3,405 | 829 | 1.19 | 827 | 68% | 0.74 | 512 |
| Multi-Family Residential | 1,890 | 278 | 0.81 | 562 | 78% | 0.57 | 398 |
| Mobile Homes | 6 | 57 | 0.14 | 99 | 73% | 0.09 | 66 |
| General Commercial | 499 | 266 | 0.43 | 300 | 83% | 0.33 | 226 |
| Commercial Office | 178 | 40 | 0.07 | 52 | 83% | 0.06 | 39 |
| General Industrial | 99 | 130 | 0.11 | 80 | 83% | 0.09 | 60 |
| Public Facilities | 23 | 114 | 0.12 | 81 | 68% | 0.07 | 50 |
| Airport | 9 | 47 | 0.01 | 5 | 73% | 0.00 | 3 |
| Specific Plan | 12 | 124 | 0.11 | 74 | 73% | 0.07 | 49 |
| **Total** | **6,121** | **1,885** | **2.99** | **2,078** | **74%** | **2.02** | **1,403** |
| | | | | | **WRF ADF[2]** | **2.02** | **1,403** |

Notes:
1. Potable water usage was calculated using a three-year average from 2020 to 2022 water billing data. Water usage that did not result in return wastewater flows was not included in this average (ex: hydrant testing, landscaping-specific meters, water losses, etc.)
2. Actual existing average daily flow calculated from influent WRF data from 2020 to 2022

**Table 2** through **Table 5** provide a summary of the estimated average day water demand and average day flow within the FM01, FM02, FM03, and FM04 sewersheds during the flow monitoring study.

DRAFT

| Table 2: Estimated FM01 Results with Adjusted Preliminary Wastewater Return Factors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land Use | Number of Sewered Parcels | Sewered Acres | Average Day Demand (MGD) | Average Day Demand (GPM) | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
| Single-Family Residential | 282 | 45 | 0.07 | 48 | 68% | 0.05 | 32 |
| Multi-Family Residential | 58 | 13 | 0.04 | 27 | 78% | 0.03 | 21 |
| Mobile Homes | 3 | 36 | 0.08 | 54 | 73% | 0.06 | 39 |
| General Commercial | 89 | 52 | 0.09 | 64 | 83% | 0.08 | 53 |
| Commercial Office | 1 | 1 | 0.00 | 0 | 83% | 0.00 | 0 |
| General Industrial | 82 | 77 | 0.05 | 37 | 83% | 0.04 | 31 |
| Public Facilities | 1 | 0 | 0.00 | 0 | 68% | 0.00 | 0 |
| Airport | 9 | 47 | 0.01 | 4 | 73% | 0.00 | 3 |
| Specific Plan | 10 | 92 | 0.09 | 64 | 73% | 0.07 | 47 |
| **Total** | **535** | **363** | **0.43** | **299** | **76%** | **0.33** | **228** |
| | | | | | | | |
| | | | | | **Estimated ADF** | **0.33** | **228** |
| | | | | | **Flow Monitoring ADF** | **0.37** | **256** |
| | | | | | **Percent Difference** | **11%** | |

| Table 3: Estimated FM02 Results with Adjusted Preliminary Wastewater Return Factors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land Use | Number of Sewered Parcels | Sewered Acres | Average Day Demand (MGD) | Average Day Demand (GPM) | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
| Single-Family Residential | 3084 | 852 | 1.00 | 696 | 68% | 0.68 | 474 |
| Multi-Family Residential | 1593 | 234 | 0.63 | 438 | 78% | 0.49 | 341 |
| Mobile Homes | 1 | 13 | 0.01 | 6 | 73% | 0.01 | 5 |
| General Commercial | 378 | 178 | 0.27 | 189 | 83% | 0.23 | 157 |
| Commercial Office | 177 | 40 | 0.07 | 46 | 83% | 0.06 | 39 |
| General Industrial | 9 | 16 | 0.03 | 23 | 83% | 0.03 | 19 |
| Public Facilities | 21 | 103 | 0.10 | 72 | 68% | 0.07 | 49 |
| Airport | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| Specific Plan | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| **Total** | **5,263** | **1,435** | **2** | **1,471** | **74%** | **1.56** | **1,083** |
| | | | | | | | |
| | | | | | **Estimated ADF** | **1.56** | **1,083** |
| | | | | | **Flow Monitoring ADF** | **1.04** | **722** |
| | | | | | **Percent Difference** | **50%** | |

DRAFT

| Table 4: Estimated FM03 Results with Adjusted Preliminary Wastewater Return Factors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land Use | Number of Sewered Parcels | Sewered Acres | Average Day Demand (MGD) | Average Day Demand (GPM) | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
| Single-Family Residential | 1498 | 437 | 0.49 | 339 | 68% | 0.33 | 230 |
| Multi-Family Residential | 667 | 106 | 0.28 | 197 | 78% | 0.22 | 154 |
| Mobile Homes | 1 | 13 | 0.01 | 6 | 73% | 0.01 | 5 |
| General Commercial | 230 | 99 | 0.14 | 100 | 83% | 0.12 | 83 |
| Commercial Office | 128 | 21 | 0.04 | 25 | 83% | 0.03 | 21 |
| General Industrial | 4 | 4 | 0.00 | 1 | 83% | 0.00 | 1 |
| Public Facilities | 15 | 41 | 0.06 | 42 | 68% | 0.04 | 29 |
| Airport | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| Specific Plan | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| **Total** | **6,121** | **1,885** | **2.72** | **1887** | **73%** | **0.75** | **522** |
| | | | | | | | |
| | | | | | **Estimated ADF** | **0.75** | **522** |
| | | | | | **Flow Monitoring ADF** | **0.52** | **361** |
| | | | | | **Percent Difference** | **45%** | |

| Table 5: Estimated FM04 Results with Adjusted Preliminary Wastewater Return Factors | | | | | | | |
|---|---|---|---|---|---|---|---|
| Land Use | Number of Sewered Parcels | Sewered Acres | Average Day Demand (MGD) | Average Day Demand (GPM) | Return Factor % | Estimated ADF (MGD) | Estimated ADF (GPM) |
| Single-Family Residential | 649 | 170 | 0.24 | 168 | 68% | 0.16 | 114 |
| Multi-Family Residential | 346 | 64 | 0.16 | 110 | 78% | 0.12 | 86 |
| Mobile Homes | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| General Commercial | 67 | 22 | 0.03 | 22 | 83% | 0.03 | 18 |
| Commercial Office | 24 | 10 | 0.01 | 10 | 83% | 0.01 | 8 |
| General Industrial | 3 | 10 | 0.01 | 4 | 83% | 0.00 | 3 |
| Public Facilities | 1 | 11 | 0.01 | 7 | 68% | 0.01 | 5 |
| Airport | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| Specific Plan | 0 | 0 | 0.00 | 0 | 73% | 0.00 | 0 |
| **Total** | **6,121** | **1,885** | **2.72** | **1887** | **73%** | **0.34** | **235** |
| | | | | | | | |
| | | | | | **Estimated ADF** | **0.34** | **235** |
| | | | | | **Flow Monitoring ADF** | **0.31** | **213** |
| | | | | | **Percent Difference** | **10%** | |

DRAFT

Estimated ADF for flow meter basins FM01 and FM04 were within approximately 11% of the measured flows, which are within an acceptable range for validation purposes. However, FM02 and FM03 had large discrepancies at approximately 50% and 45%, respectively. Possible explanations could include discrepancies with the flow meter at the WRF or pipeline connections throughout the collection system that may be directing flow to other portions of the collection system not measured by the flow meters.

DRAFT

# Appendix C – Waste Discharge Requirement and Cease-and-Desist Order

DRAFT

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD**
**LOS ANGELES REGION**

320 West 4th Street, Suite 200, Los Angeles, California 90013
(213) 576-6600 • Fax (213) 576-6640
https://www.waterboards.ca.gov/losangeles/

# ORDER NO. R4-2018-0022, AS AMENDED BY ORDER NO. R4-2018-0022-A01
# FILE NO. 06-189
# CI-9259

# WASTE DISCHARGE REQUIREMENTS ISSUED TO CITY OF SANTA PAULA (SANTA PAULA WATER RECYCLING FACILITY)

The California Regional Water Quality Control Board, Los Angeles Region (Regional Water Board) finds:

## PURPOSE OF ORDER

1. The City of Santa Paula (City or Discharger) is the owner of the Santa Paula Water Recycling Facility (SPWRF), a Publicly-Owned Treatment Works (POTW), located at 920 Corporation Street in Santa Paula, California (Figure 1). The SPWRF, currently operated by Ventura Regional Sanitation District, discharges tertiary-treated wastewater to groundwater via three percolation ponds adjacent to the facility.

2. The City was previously regulated under Waste Discharge Requirements (WDRs) contained in Order No. R4-2007-0028, adopted by this Regional Board on May 3, 2007. The Regional Board amended Order No. R4-2007-0028 three times as follows:

   A. Order No. R4-2010-0074, adopted by this Regional Board on May 6, 2010, required that effluent discharged to percolations ponds shall not exceed 2.6 million gallons per day (MGD).

   B. Order No. R4-2007-0028-R02, adopted by this Regional Board on February 2, 2012, incorporated pretreatment program requirements and corresponding monitoring requirements.

   C. Order No. R4-2007-0028-R03, adopted by this Regional Board on April 6, 2017, extended the expiration date of Order No. R4-2007-0028 from May 3, 2010 to December 15, 2017 or upon future issuance of new or revised WDRs.

   D. Order No. R4-2007-0028-R04, adopted by this Regional Board on December 21, 2017, extended the expiration date of Order No. R4-2007-0028 from December 15, 2017 to March 31, 2018 or upon future issuance of new or revised WDRs.

DRAFT

Adopted: February 8, 2018
Amended: May 12, 2022

3. On October 1, 2015, the Regional Board directed the City to submit a Report of Waste Discharge (ROWD) for application of renewal of the City's WDRs to discharge treated wastewater from the SPWRF to the percolation pond. On December 5, 2015, the City filed its ROWD for the SPWRF.

4. To verify the information provided in the ROWD, Regional Board staff conducted inspections of the SPWRF on December 8, 2015 and December 28, 2016, including the wastewater treatment processes, percolation ponds, and groundwater monitoring wells.

5. The purpose of this Order is to renew WDRs for the City's SPWRF. This Order includes updates to effluent limitations, groundwater limitations, and Monitoring and Reporting Program (MRP) CI No. 9259 to ensure that the City's discharge of waste complies with water quality objectives set forth in the *Water Quality Control Plan for the Los Angeles Region: Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties* (Basin Plan) and is protective of beneficial uses.

**BACKGROUND**

6. Before 2010, the City's wastewater was treated at the Santa Paula Wastewater Reclamation Plant (Plant), which discharged the treated wastewater to the Santa Clara River. That discharge was regulated by a National Pollutant Discharge Elimination System (NPDES) permit. Due to the age of the Plant, which was built in 1939, the City was unable to comply with the effluent limitations for biological oxygen demand (BOD), total suspended solids (TSS), turbidity, bacteria, residual chlorine, nitrate-nitrite, sulfate, and toxicity, as set forth in its NPDES permit. More than 3,000 violations at the Plant lead the Regional Board to engage in settlement discussions with the City, resulting in a Stipulated Consent Judgment and Final Order in 2007. The City chose to build a new treatment plant, the SPWRF, to discharge to groundwater through percolation ponds. The City was required to complete construction of the new SPWRF by September 15, 2010 and be in full compliance with WDRs set forth in Order No. R4-2007-0028 by December 15, 2010.

7. Construction of the SPWRF began in July 2008 and was completed in December 2009. The SPWRF began accepting partial flow in April 2010 and then accepted all flow from the City in May 2010. The Plant built in 1939 was thereafter decommissioned.

8. According to the United States Census Bureau, approximately 19% of the population in the City have income levels below the poverty line, and approximately 25% of area in the City is categorized as a disadvantage community (less than 80% of the State's median household income) or a severely disadvantaged community (less than 60% of the State's median household income). The average sewer fee assessed for a single family was about $88, based on the City's *2014 Water and Sewer Rate Study Results*.

DRAFT

9. Drinking water supplied to the City is produced from deep wells including Well 1-B, Well 11, Well 12, Well 13, and Well 14, which are owned and operated by the Water Division of the City and produce up to 10.6 MGD. Water produced at all five wells between 2010 and 2020 complied with all primary state and federal drinking water standards. Table 1 summarizes drinking water test results for total dissolved solids (TDS), sulfate, chloride, and boron from the City's 2010-2020Annual Water Quality Reports, as compared to the groundwater quality objectives (GQOs) set forth in the Basin Plan.

**Table 1. Drinking Water Quality (milligrams per liter, mg/L)**

| Period | TDS | Sulfate | Chloride | Boron |
|---|---|---|---|---|
| 2010 | 941 | 440 | 43 | 0.53 |
| 2011 | 918 | 428 | 41 | 0.54 |
| 2012 | 964 | 442 | 42 | 0.52 |
| 2013 | 693 | 208 | 47 | 0.52 |
| 2014 | 975 | 420 | 42 | 0.54 |
| 2015 | 941 | 405 | 44 | 0.47 |
| 2016 | 981 | 440 | 48 | 0.55 |
| 2017 | 924.2 | 393.6 | 47.8 | 0.4482 |
| 2018 | 924.2[1] | 450.5 | 48 | 0.525 |
| 2019 | 1.036.7 | 477.7 | 48 | 0.4833 |
| 2020 | 1,060 | 446 | 49 | 0.6 |
| GQOs | 2,000 | 800 | 110 | 1.0 |

Table note: [1] Result sampled in 2017.

DRAFT

## CURRENT FACILITY AND TREATMENT PROCESS DESCRIPTION

10. SPWRF and Vicinity

    A. The SPWRF (34º 19' 56.3" N, 119º 04' 57.2" W) is sited on a 50-acre parcel along Calpipe Road and Todd Lane in Santa Paula, California (Figure 1). The SPWRF is approximately 1,200 feet southeast of Highway 126, approximately 1,000 southwest of Shell Road, and approximately 1,300 feet northwest of the Santa Clara River.

    B. The SPWRF is located over the Santa Clara-Santa Paula Groundwater Basin (DWR Basin No. 4-4) (Figure 2).

11. SPWRF Treatment

A. The SPWRF treats wastewater generated within the City and is designed for a flow of 4.2 MGD. Based on the discharge records between July 2010 and June 2017, the monthly average effluent discharged from the SPWRF ranged between 1.36 and 2.44 MGD, with an average of 1.86 MGD. The monthly average effluent discharge flow rates between February 2018 and December 2021 ranged from 1.03 to 3.4 MGD, with an average of 1.86 MGD.

B. The wastewater treatment process at the SPWRF (See Figure 3 for process flow schematic) consists of preliminary treatment (coarse and fine mechanical screening and grit removal at the Influent Lift Station), flow equalization (two flow equalization tanks), secondary treatment (three aeration tanks with nitrification and denitrification activated sludge), tertiary treatment (six membrane bioreactors, providing further carbonaceous oxidation, nitrification/denitrification and solids removal to meet the limits of the WDRs), and disinfection (UV). Treated and disinfected effluent is discharged to three percolation ponds (Figure 5). The returned activated sludge is treated at two of three aerobic digesters (one aerobic digester is for backup) after being thickened at two thickeners. The solids generated at the aerobic digesters receive final dewatering at the screw dewatering press. Final solids are hauled by Synargro to their South Kern Compost Manufacturing Facility where they are composted to the United States Environmental Protection Agency (USEPA) Class A reuse standards for agricultural reuse.

C. To address levels of chloride in the effluent, an advanced treatment system, consisting of reverse osmosis (RO), will be constructed at the SPWRF, which will be designed to reduce the chloride concentration in the effluent to 110 milligrams per liter (mg/L) or less. The RO system will consist of nanofiltration and RO units to reduce effluent chloride concentrations followed by a RO brine concentrator (Figure 4).

D. The City owns and operates the sewer collection system, which conveys domestic, commercial, and industrial wastewater to the SPWRF. Two industrial users within the City are Aurora Casting (metal foundry) and Saticoy Lemon (lemon packing house). The City is required to implement a Pretreatment Program and to comply with requirements for operation and maintenance of the sewer collection system. The City has been implementing an industrial wastewater Pretreatment Program for the SPWRF, which has been approved by the USEPA and the Regional Board.

E. Percolation Ponds

i. The three percolation ponds were built on approximately 34 acres of agriculture land (Figure 5) and are located along Todd Lane in the Santa Clara-Santa Paula Groundwater Basin area.

ii. The Regional Board classified the discharge to the percolation pond as a discharge of treated wastewater to land that is subject to WDRs.

DRAFT

iii. A hydrologic model completed by the City in 2008 indicated that the percolation pond have a maximum discharge capacity of 2.6 MGD during wet years. Therefore, the allowable discharge of the SPWRF was reduced from 8 MGD to 2.6 MGD in Order No. R4-2010-0074 (amending Order No. R4-2007-0028).

12. Depth to groundwater within the shallow aquifer at the site ranges from approximately 15 to 49 feet below ground surface. Groundwater gradients generally appear to parallel the ground surface, gently sloping downward to the southwest. During wet years, groundwater may rise to within 10 to 11 feet below ground surface in the area along the Santa Clara River.

13. On August 23, 2018, the Regional Water Board approved the City's modified groundwater monitoring network dated May 1, 2018 to expand the groundwater monitoring network by including agricultural water supply wells. Subsequently, on April 22, 2019, the Regional Water Board approved the Groundwater Chloride Investigation and Well Production Workplan dated December 2018, which proposed installing one additional off-site groundwater monitoring well, MW-9.

    The City owns and currently samples nine (9) groundwater monitoring wells, including MW-1, MW-2a, MW-3, MW-4, MW-5, MW-6, MW-7a, MW-8, and MW-9 (shown on Figure 5).

**COMPLIANCE HISTORY**

14. Based on data collected from July 2010 to June 2017, the City had the following number of exceedances recorded in the effluent and groundwater at the SPWRF, which are identified in Table 2.

**Table 2. Number of Exceedances Recorded in Effluent and Groundwater**

| Pollutants | Effluent | Groundwater |
|---|---|---|
| Chloride | 84 | 174 |
| Di(2-ethyl)phthalate | 1 | |
| Dioxin | 1 | |
| Total nitrogen | 1 | |
| Nitrate plus nitrite | | 1 |
| Sulfate | | 1 |
| Chromium | | 5 |
| Aluminum | | 10 |
| Nickel | | 1 |

DRAFT

| Pollutants | Effluent | Groundwater |
|---|---|---|
| Boron | | 1 |

Multiple effluent and groundwater limitations were exceeded during the period between the 2nd quarter of 2010 and the 3rd quarter of 2011. Beginning with the 4th quarter of 2011, the City had met all effluent limitations except for chloride. As previously noted, the SPWRF was not designed to remove chloride. The monthly effluent chloride concentration ranged from 125 to 166 mg/L and continuously exceeded the effluent chloride monthly average of 110 mg/L. Table 3 summarizes the annual average chloride concentrations in the SPWRF effluent.

**Table 3. Annual Average Chloride Concentrations[1] (mg/L) in SPWRF Effluent**

| Period | Concentration |
|---|---|
| 2010 | 156 |
| 2011 | 153 |
| 2012 | 149 |
| 2013 | 155 |
| 2014 | 145 |
| 2015 | 134 |
| 2016 | 137 |
| 2017 | 131 |
| 2018 | 121 |
| 2019 | 120 |
| 2020 | 118.88 |
| 2021 | 112 |
| Range[2] | 135.99 ± 15.61 |

Table Notes:
[1] All data collected from grab samples.
[2] Data range is based on one standard deviation.

15. Table 4 summarizes the groundwater annual average chloride concentration before and after the SPWRF began discharging via the percolation pond. The annual average chloride groundwater concentration was 108 mg/L at the downgradient water supply Well AW03 prior to initiation of discharge at the percolation pond in 2010. After the SPWRF began discharging to the percolation pond, the annual average chloride groundwater concentration increased to 135 mg/L at Well AW03.

DRAFT

Monitoring data from the upgradient groundwater monitoring Well MW-3 indicates an annual average chloride groundwater concentration of 100 mg/L. This information suggests that the background groundwater chloride concentration was around 100 mg/L. Groundwater chloride concentrations at the downgradient groundwater monitoring Well MW-5 have been recorded between 135 and 155 mg/L, with an average of 142 mg/L. This data closely aligns with the SPWRF's effluent chloride concentration of approximately 136 mg/L (Table 3). The groundwater and effluent data indicate that the chloride discharges from the SPWRF have impacted, and continue to impact, the receiving groundwater quality in the vicinity of the SPWRF.

**Table 4. Annual Average Chloride Concentration[1] in Groundwater (mg/L)**

| Prior to Discharge from SPWRF | | | |
|---|---|---|---|
| **Period** | **Downgradient MW-5[2]** | **Downgradient 03N21W21G03S[3]** | **Upgradient MW-3[4]** |
| 2003 | | 113 | |
| 2004 | | 111 | |
| 2005 | 115 | 117 | 92 |
| 2006 | 114 | 112 | 88 |
| 2007 | 108 | 110 | 85 |
| 2008 | 87 | 100 | 78 |
| 2009 | 74 | 92 | 96 |
| Range[5] | 99.6 ± 16.3 | 107.9 ± 8.6 | 87.8 ± 6.1 |
| **After Discharge from SPWRF** | | | |
| 2010 (Jul – Dec) | 145 | 138 | 93 |
| 2011 | 145 | 146 | 112 |
| 2012 | 153 | 135 | 87 |
| 2013 | 155 | 136 | 103 |
| 2014 | 135 | 129 | 115 |
| 2015 | 136 | 129 | 108 |
| 2016 | 135 | 134 | 103 |
| 2017 | 121 | 131 | 105 |
| 2018 | 128.2 | 126.6 | 123.6 |
| 2019 | 128.8 | 129.4 | 163.1 |

DRAFT

| | | | |
|---|---|---|---|
| 2020 | 129.5 | 127.4 | 126.3 |
| 2021 | 130.2 | 129.8 | 114.3 |
| Range[5] | 136.8 ± 10.5 | 132.6 ± 5.5 | 112.8 ± 19.5 |

Table Notes:

[1] All data collected from grab samples.

[2] Data were averaged from samples collected at the City-owned groundwater monitoring Well MW-5 with screen intervals of 42 to 62 feet, located approximately 50 feet downgradient from Percolation Pond 3.

[3] Water supply Well AW03 is owned and operated by a private entity. This well is located approximately 300 feet southwest of Well MW-5. The screen intervals of Well AW03 are from 80 to 120 below surface grade. Water produced at this well is used for agricultural irrigation only.

[4] Data were averaged from samples collected at the City-owned groundwater monitoring Well MW-3 with screen intervals of 25 to 45 feet, located approximately 1,800 feet upgradient from Percolation Pond 1.

[5] Data range is based on one standard deviation.

16. The Regional Board issued three Notices of Violation (NOVs) to the City, dated November 3, 2011, December 30, 2014, and March 20, 2017, for exceedances of the chloride effluent and groundwater limitations in Order No. R4-2007-0028. These NOVs required the City to implement corrective and preventative actions to bring the City's discharge to full compliance with the chloride effluent limitation and receiving water requirements specified in Order No. R4-2007-0028.

**PLAN FOR CHLORIDE COMPLIANCE**

17. The City's efforts to reduce the chloride concentration in the influent to the SPWRF are summarized below:

    A. The City identified that the influent to the SPWRF contains brine with elevated chloride concentration from Self-Regenerating Water Softeners (SRWS). There are approximately 1,250 residential SRWS used in the City.

    B. On September 5, 2006, the City established Ordinance No. 1160 prohibiting the installation or replacement of residential SRWS.

    C. On June 22, 2015, the City adopted Resolution No. 6918 approving a SRWS Buyback and Incentive Program. This program offers a financial incentive to residents to voluntarily remove SRWS. A Kick-Off SRWS Buyback event was held on September 19, 2015. The removal of SRWS under this program began in October 2015. Three hundred (300) of the approximately 1,250 SRWS have been removed from October 2015 through February 2022. Decreasing chloride concentrations in the effluent have been observed, but they still cannot meet the chloride discharge limitation set forth in the WDRs.

DRAFT

18. To address the City's chloride exceedances in the effluent and groundwater, the Regional Board required the City to submit a Chloride Reduction Workplan. Board staff also met with the City on several occasions to discuss the City's chloride exceedances. A summary of these events are as follows:

    A. On December 19, 2013 and May 11, 2015, the Regional Board met with the City to discuss its Chloride Reduction Workplan. The City's Chloride Reduction Workplan includes the following tasks:

        i. Prohibit SRWS installations or replacements;

        ii. Implement a SRWS Buyback Program;

        iii. Implement a Recycled Water Program to reduce effluent discharged to the three percolation ponds; and

        iv. Implement Supplemental Strategies, if needed, including advanced treatment (e.g. reverse osmosis) and disposal of brine.

    B. On January 28, 2016, Regional Board staff discussed with the City the necessary actions to reduce the chloride concentration in the effluent, which included the SRWS Buyback Program. The City also proposed to explore application of recycled water at locations other than identified groundwater hot spots and to conduct groundwater impact investigation and remediation activities. The City was notified that detailed schedules and milestones were required for all actions.

    C. On March 8, 2016 and September 14, 2016, the City met with Regional Board staff to provide an update of its SRWS Buyback Program efforts. The City noted that five City employees were deployed to conduct door-to-door visits to encourage participation in the SRWS Buyback Program among 7,500 dwellings within the City.

    D. On October 31, 2016, the City met with Regional Board staff to provide an update on the following topics:

        i. Status of implementing the chloride compliance strategy and potential for reduction of effluent discharged to the three percolation ponds via the City's Recycled Water Program;

        ii. Assimilative capacities for chloride at different groundwater locations beneath the City based on the Salt and Nutrient Management Plan for the Lower Santa Clara River Basin; and

        iii. Groundwater hot spots (i.e., chloride-impaired areas with no assimilative capacity for recycled water applications) in the City.

DRAFT

19. On July 9, 2015, the Regional Board adopted Resolution No. R15-007, an amendment to the Basin Plan that incorporated stakeholder-developed groundwater quality management plan for salts and nutrients in the Lower Santa Clara River groundwater basins. Groundwater quality management measures were developed by stakeholders as part of the Salt and Nutrient Management Plan (SNMP) for the Lower Santa Clara River Basins in Ventura County. Such plans are a requirement of the State Water Resources Control Board's (State Water Board) Recycled Water Policy and are intended to maintain high quality waters and to protect the beneficial uses of groundwater while promoting recycled water use throughout the state. The SNMP utilized a groundwater quality model that characterized the water quality in the Santa Paula Basin and examined the degree of impairment to water quality in the Basin. The model shows there is available assimilative capacity for salts and nutrients, including chloride, in most areas of the Santa Paula Basin to allow for recycled water projects consistent with the Recycled Water Policy. As described below, the City is planning to recycle effluent that is currently discharged to the percolation pond.

20. The City developed and utilized a simple spreadsheet mixing model, the Groundwater Chloride Transportation Model (Chloride Model), to analyze the effect of future effluent discharges on groundwater over time at various distances from the percolation pond. The City's modelling assumed some degradation of groundwater with respect to chloride within a limited range of mixing zone radius below and adjacent to the SPWRF, measured from the boundaries of the percolation pond. This distance is the maximum allowable distance where SPWRF effluent disposed to the percolation pond can mix with groundwater and result in receiving water chloride concentrations of 110 mg/L or less in order to provide protection to groundwater beneficial uses at the first encountered water supply wells which are at 150 feet away from the percolation ponds. Groundwater within the mixing zone will exceed the chloride GQO of 110 mg/L. Mass-volume balance calculations along with Darcy's Law are used to account for travel in porous media. The Chloride Model simulates instantaneous and complete mixing of ambient groundwater with effluent seepage reaching the water table from the percolation pond using SPWRF data for flow and chloride effluent concentrations. It was conservatively assumed that any effluent discharge to the percolation pond would infiltrate into the underlying aquifer and not be diverted for other uses. Groundwater parameters within the spreadsheet model were selected based on recent monitoring reports in order to be representative of average conditions within the vicinity of the SPWRF. The Chloride Model assumes an initial volume of groundwater underlying the ponds possessing background chloride concentrations of 136 mg/L. The volume of the existing groundwater body is calculated as the product of the radius of interest (150-1200 feet), an assumed saturated thickness of potentially impacted groundwater (50 feet), and the porosity of the underlying sediments (assumed to be 0.2) based on the low end of published literature values for a sand and gravel mixture. Based on the regional groundwater quality data documented in the SNMP, regional groundwater inflow is assumed to have a chloride concentration of 91 mg/L.

DRAFT

On December 14, 2016, Regional Board staff met with the City to discuss the results of the Chloride Model, which evaluated compliance with the groundwater quality objectives beneath and adjacent to the three percolation ponds, for various discharge scenarios. Based on Regional Board staff's comments, the City implemented additional discharge scenarios in the Chloride Model, which was discussed in meetings held on February 8, 2017, February 17, 2017, July 24, 2017, and August 7, 2017.

21. The Chloride Model simulated chloride concentrations in the receiving groundwater resulting from chloride mass loading reduction in the three percolation ponds. The Model predicted GQOs being achieved at 150 feet away from the percolation pond when the total mass of chloride in the effluent is significantly reduced. The initial mass of chloride is calculated based on the average chloride effluent concentration of 135 mg/L and the discharge rate of 2.2 MGD [95 percentile of monthly average effluent flows, resulting from data recorded between October 2015 (beginning of the SRWS Buyback Program) and June 2017], which results in 2,479 pounds total mass of chloride discharged per day. The reduction of chloride mass discharged to the percolation pond can be achieved by improving the effluent chloride concentration (e.g., source control or treatment), or diverting a significant amount of flow for recycled water uses, or a combination of both in order to protect water supply Wells AW01, AW02, and, AW03, approximately 150, 150, and 300 feet, respectively, away from percolation ponds. Water produced from these wells is primarily for agricultural irrigation use.

    To achieve the chloride GQO of 110 mg/L in groundwater at least 150 feet away from the percolation pond, the City provided various effluent chloride concentration and allowable flow combinations (Table 5). Based on the hydrology and hydrogeologic condition at the SPWRF percolation ponds area, the higher the concentration of chloride in the effluent, the less volume and mass can be discharged to percolation ponds to comply with the chloride GQO in the Basin Plan. For example, if the chloride concentration in the effluent is 135 mg/L, only 0.07 MGD, which is equivalent to 79 pounds of chloride per day, could be discharged to the percolation pond to achieve the chloride GQO of 110 mg/L at 150 feet away from the percolation pond. If the chloride concentration in the effluent is reduced to 120 mg/L, then more flow (0.2 MGD) can be discharged to the percolation pond and achieve the chloride GQO 150 feet away from the percolation pond.

**Table 5. Groundwater Chloride Transportation Model – Continuous Discharge**

| Chloride Effluent Concentration (mg/L) | Flow to Percolation Ponds (MGD) (% of 2.2 MGD) | Daily Allowable Effluent Mass Load to Groundwater (lbs) | Chloride Groundwater Concentration at 150 feet (mg/L) |
|---|---|---|---|
| 135 | 0.07 (3.2%) | 79 | 110 |
| 130 | 0.1 (4.5%) | 108 | 110 |

DRAFT

| Chloride Effluent Concentration (mg/L) | Flow to Percolation Ponds (MGD) (% of 2.2 MGD) | Daily Allowable Effluent Mass Load to Groundwater (lbs) | Chloride Groundwater Concentration at 150 feet (mg/L) |
|---|---|---|---|
| 125 | 0.13 (5.9%) | 135 | 110 |
| 120 | 0.2 (9.1%) | 200 | 110 |
| 115 | 0.4 (18.2%) | 384 | 110 |

22. To achieve compliance with the chloride GQO in this Order and to conserve potable water, the City plans to reduce the volume of effluent, and thus a reduction of the chloride mass discharged to the percolation pond by providing recycled water for various local uses. The Regional Board has evaluated the planned recycle projects and has determined that they will be consistent with the State Water Board's Recycled Water Policy and will still preserve available assimilative capacity within the Santa Paula Basin consistent with the SNMP. The mass-based effluent limitation for chloride in this Order reflects the City's chosen compliance option. The groundwater limitations are based on the GQOs in the Basin Plan.

23. On December 22, 2015, the City submitted the Recycled Water Program Technical Report and Notice of Intent with the Title 22 Engineering Report to the State Water Board's Division of Drinking Water (DDW) for approval. DDW conditionally approved the Title 22 Engineering Report on August 19, 2016. On June 14, 2017, the Regional Board enrolled the City's recycled water program under separate Water Reclamation Requirements for Recycled Water Use, Order WQ 2016-0068-DDW, issued by the State Water Board on June 7, 2016.

24. In the City's report, Chloride Load Reduction Milestones, submitted to the Regional Board on March 14, 2017, the City included the construction of RO treatment at the SPWRF as an option (under Supplemental Strategies), if needed, in order to comply with the chloride groundwater quality objective (GQO) of 110 mg/L. The City will continue its source control efforts to remove SRWSs and will first focus on recycling most of its effluent in order to bring the groundwater back into compliance with GQOs. Progress with these efforts was assessed at Year 2020 and determination was made to pursue advanced treatment to meet the chloride GQO at Year 2027.

    On April 15, 2020, the City notified the Regional Water Board of its modified approach to install an advanced wastewater treatment system with RO at SPWRF in lieu of the originally proposed recycled water project to meet the effluent limitations in this Order.

25. Due to the following reasons, the City cannot immediately comply with the chloride effluent and groundwater limitations prescribed in this Order: (1) elevated chloride concentrations in the influent, (2) the wastewater treatment process not currently designed to remove chloride out of the waste stream, and (3) time needed to

DRAFT

construct the advanced wastewater treatment system with RO. In addition, the current progress of the City's SRWS Buyback Program does not reliably ensure that the SPWRF will comply with the chloride effluent and groundwater limitations. Therefore, the Regional Board has determined that issuance of an accompanying CDO is appropriate and necessary to put the City on the path towards compliance with the effluent and groundwater limitations for chloride set forth in this Order. The CDO requires the City to comply with interim chloride effluent and groundwater limitations and implement actions pursuant to a prescribed time schedule.

During the pendency of the CDO schedule, there will be permitted degradation of groundwater with respect to chloride within a limited mixing zone radius downgradient and adjacent to the SPWRF percolation ponds, measured from the boundaries of the percolation pond to 150 feet. This distance is the shortest distance where SPWRF effluent disposed to the percolation pond can mix with groundwater and result in receiving water chloride concentrations of 110 mg/L or less. Groundwater within the 150-foot mixing zone will exceed the chloride GQO of 110 mg/L for the duration of the CDO schedule. Based on the available data, there are no water supply wells within the 150-foot mixing zone. The City can arrange for alternative water supplies for any well owners in the mixing zone, if any are discovered. At the end of the CDO schedule, the mixing zone is no longer allowed, and compliance with chloride limitations of 110 mg/L at monitoring wells adjacent and downgradient to the boundaries of the percolation ponds is required. global warming and climate change

26. The observed century-scale rise in the average temperature of the Earth's surface, oceans, and atmosphere, commonly recognized as the Global Warming, has resulted in extreme climate change, such as the extreme drought and extremely heavy rainfall. In Southern California, the predicted impacts of climate change are numerous. Annual average temperatures are expected to increase, coupled with a higher frequency of extreme heat days. A likely consequence of this warmer climate will be more severe drought periods, leading to an increase in the amount and intensity of fires and a longer fire season. In addition, precipitation patterns are likely to be modified. A decrease in snowfall, combined with warmer temperatures, will induce a decrease in the amount and duration of snowpack, an essential source of freshwater to the region. The increasing occurrence of extreme precipitation events will amplify the risk of flooding, which recently happened in Southern California.

    These impacts will affect water quality in multiple ways, including changes in stream flow, aquatic habitats, surface water temperature, pollutant levels, sedimentation, algal growth, and salinity levels and acidification in coastal areas. For permitted facilities such as Publically Owned Treatment Works (POTWs), specific impacts could include, but are not limited to, an increase in the concentration of pollutants entering the facility, an increase in the temperature of effluents and receiving waters, an increase in storm water inflow and infiltration, increase in flooding/inundation of facilities, sewer overflows, power outages, pump maintenance issues, and onsite or nearby hillside destabilization.

DRAFT

Executive Order B-30-15, issued on April 29, 2015, recognizing the challenges posed by climate change, directed state agencies to take climate change into account in their planning decisions, guided by the following principles: Priority should be given to actions that both build climate preparedness and reduce greenhouse gas emissions; where possible, flexible and adaptive approaches should be taken to prepare for uncertain climate impacts; actions should protect the state's most vulnerable populations; and natural infrastructure solutions should be prioritized.

On February 7, 2019, the City submitted a Climate Change Plan. The Climate Change Plan indicated the SPWRF is outside of the 100-year floodplain of the Santa Clara River. This Order requires the City to periodically review and submit a revised Climate Change Plan when conditions at the facility change that may impact water quality. In addition, this Order contains provisions to require planning and actions to address climate-related impacts that can cause or contribute to violations of this Order and/or degradation of waters of the state.

27. The SPWRF was designed to include protection from a 100-year storm event in the Santa Clara River. The SPWRF buildings and percolation ponds are located behind a dike that has an elevation above the elevation anticipated as the result of a 100-year storm event. The design documents and potential flood flow assessment is contained in files in the City's Building & Safety Department. The elevation of the dike at the SPWRF is 23 feet higher than the Santa Clara River located at approximately 1,300 feet southeast. This elevation separation provides additional protection from a possible flood overflow from the Santa Clara River caused by the climate change. It should also be noted that the SPWRF is located outside of the Santa Clara River floodway defined by the Federal Emergency Management Agency and the Ventura County Watershed Protection District. Lastly, the SPWRF is equipped with a backup generator that is capable of operating the SPWRF through power outages and other emergencies.

    Climate change may also increase drought and related impacts such as reduced potable water supply and/or changing water supplies, which may be of less quality.

## APPLICABLE LAWS, PLANS, POLICIES, AND REGULATIONS

28. This Order serves as WDRs pursuant to Division 7, Chapter 4, Article 4 of the California Water Code (commencing with section 13260). WDRs have been established because discharges from the SPWRF have the potential to affect the quality of the waters of the State, to impact the beneficial uses of those waters, and/or to cause a nuisance. The Regional Board developed the requirements of this Order based on information submitted as part of the application, through monitoring and reporting programs, and other available information.

29. Water Quality Control Plan for the Los Angeles Region: Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Basin Plan) - On June 13, 1994, the Regional Board adopted a comprehensive revision to the Basin Plan. The Basin

DRAFT

Plan: (i) designates beneficial uses for surface and groundwater, (ii) establishes narrative and numeric water quality objectives that must be attained or maintained to protect the designated beneficial uses, and (iii) sets forth implementation programs to achieve those objectives for all waters addressed through the Basin Plan. The Basin Plan also incorporates State Water Board Resolution No. 68-16 (see finding below for detail). In addition, the Basin Plan incorporates applicable State and Regional Board plans and policies and other pertinent water quality policies and regulations. The Basin Plan has been amended occasionally since 1994, including recent administrative updates. The requirements in this Order implement the Basin Plan.

30. Beneficial Uses - The SPWRF overlies the Santa Clara-Santa Paula Groundwater Basin (DWR Basin No. 4-4). The Basin Plan identifies beneficial uses for regional waters, including those based on State Water Board Resolution No. 88-63 ("Sources of Drinking Water Policy"), which established state policy that all surface and ground waters of the State, with certain exceptions, are considered suitable or potentially suitable for municipal or domestic water supply. Beneficial uses applicable to the receiving groundwater are as follows:

**Table 6. Basin Plan Beneficial Uses of Groundwater**

| Receiving Water | Beneficial Use(s) |
|---|---|
| Santa Clara-Santa Paula Groundwater (DWR Basin No. 4-4) | Existing:<br>Municipal and domestic supply (MUN), industrial service supply (IND), industrial process supply (PROC), and agricultural supply (AGR) |

31. Title 22, California Code of Regulations (CCR) - To protect sources of drinking water, the Basin Plan (Chapter 3) incorporates the primary and secondary maximum contaminant levels (MCLs) for inorganic, organic, and radioactive contaminants in drinking water as water quality objectives. These MCLs are codified in CCR, Title 22, Division 4. This incorporation by reference is prospective including future changes to the incorporated provisions as the changes take effect. The primary MCLs (see Attachments A-1 to A-6) are applicable water quality objectives for a receiving water to protect beneficial uses when that receiving water is designated as municipal and domestic supply. The Basin Plan also specifies that "Ground waters shall not contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses." Therefore, the secondary MCLs, which are limits based on aesthetic, organoleptic standards, are applicable water quality objectives for a receiving water to protect beneficial uses when that receiving water is designated as municipal and domestic supply. These water quality objectives are implemented in this Order to protect the designated beneficial uses.

32. Domestic Water Quality – In compliance with California Water Code section 106.3, it is the policy of the State of California that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking,



DRAFT

and sanitary purposes. This Order promotes that policy by requiring discharges to meet MCLs implemented by the Basin Plan that are designed to protect human health and ensure that water is safe for domestic use.

33. Impaired Water Bodies on Clean Water Act Section 303(d) List/Total Maximum Daily Loads (TMDLs) – The Santa Clara River is listed on the Clean Water Act Section 303(d) List as impaired by ammonia in Reach 3 and by nitrate plus nitrite in Reach 7. To address this impairment, the Regional Board established the Santa Clara River Nitrogen Compounds TMDL on August 7, 2003 by Regional Board Resolution No. 2003-011. The State Water Board approved the TMDL on November 19, 2003 (Resolution No. 2003-0073) and OAL approved it on February 27, 2004. The TMDL became effective upon approval of the U.S. Environmental Protection Agency on March 18, 2004. Concentration-based loads for nitrogen compounds are allocated for nonpoint sources. The Discharger is subject to the following assigned load allocation for nonpoint sources:

**Table 7. Nonpoint Source Load Allocation for Santa Clara River Nitrogen Compounds TMDL**

| Nitrogen Compounds TMDL | Monthly Average (mg/L) |
|---|---|
| Combined ammonia ($NH_3$-N), nitrite ($NO_2$-N), nitrate ($NO_3$-N) loads as nitrogen | 10 |

34. California Water Code section 13263 requires that the Regional Board, when prescribing waste discharge requirements, take into consideration the factors in section 13241. The Regional Board has considered those factors in establishing the WDRs in this Order.

35. State Water Board Resolution No. 68-16, Antidegradation Policy – State Water Board Resolution No. 68-16 “Statement of Policy with Respect to Maintaining High Quality of Waters in California” (also called the “Antidegradation Policy”) requires the Regional Board, in regulating the discharges of waste, to maintain high quality waters of the state unless it is demonstrated that any change in quality is consistent with maximum benefit to the people of the State, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in the State Water Board’s policies (e.g., quality that exceeds water quality objectives). Further, any activity that produces waste must meet waste discharge requirements that will result in the best practicable treatment or control (BPTC) of the discharge necessary to assure that (a) pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.

    Excepting chloride (discussed below), the SPWRF's discharge is high quality, tertiary-treated effluent meeting groundwater quality objectives in the Basin Plan and MCLs for drinking water. The Regional Board finds that the discharge, as allowed in

DRAFT

this Order, is consistent with Resolution No. 68-16 since this Order: (1) requires compliance with the requirements set forth in this Order, including the use of best practicable treatment and control of the discharges, (2) requires implementation of a Monitoring and Reporting Program (MRP); and (3) requires that the discharges comply with effluent limits to meet water quality objectives. This Order establishes limitations and requirements that will not unreasonably threaten present and anticipated beneficial uses or result in receiving ground water quality that exceeds water quality objectives set forth in the Basin Plan. Limitations for each waste constituent are based on the most stringent applicable water quality objectives to protect the most sensitive beneficial use of the receiving waterbody; thus, all beneficial uses are protected. To ensure such protection, a vigorous monitoring plan is also adopted with this Order. This Order contains requirements for implementing Best Practicable Technology and Control (BPTC). Accordingly, the discharge is consistent with the antidegradation provisions of Resolution 68-16. Based on the results of wastewater treatment and monitoring of effluent and groundwater quality, the Regional Water Board may open this Order to reconsider groundwater limitations and other requirements to comply with Resolution 68-16, if necessary.

Untreated discharges of chloride over the last 10 years have resulted in elevated concentrations of chloride in the effluent and groundwater. The groundwater quality objective for chloride is 110 mg/L and the average effluent chloride concentration in 2016 was 137 mg/L. To comply with the chloride groundwater limitations in this Order, which are based on the chloride groundwater quality objective, the City intends to upgrade the SPWRF with reverse osmosis (RO) in lieu of the recycled water projects to reduce the chloride concentration in the effluent prior to discharge into the percolation pond. This will, in time, restore the impaired groundwater zone adjacent and downgradient to the percolation pond. However, implementation of the RO system will take time to fully implement, which will result in continued localized degradation in the immediate vicinity of the SPWRF percolation ponds. Construction and optimization of the RO system is due to be completed by March 30, 2025, at which time, a chloride concentration in the effluent from the SPWRF of 110 mg/L is required. However, a lag in groundwater quality improvement is expected following the improved quality of the discharge. While groundwater within the 150-foot mixing zone adjacent to the percolation ponds will temporarily exceed the chloride groundwater quality objective, this Order imposes limits on flow and chloride mass loading in the effluent to ensure receiving groundwater beneficial uses will be maintained and supported. Beneficial uses will be maintained as all wells utilized for crop irrigation are located outside the mixing zone. By the final CDO compliance date of February 8, 2028, the mixing zone is no longer allowed and compliance with chloride limitations of 110 mg/L at monitoring wells adjacent and downgradient to the boundaries of the percolation ponds is required.

The Regional Board recognizes that reducing chloride concentrations in the effluent or in the groundwater by using RO can be costly. The current estimated cost for the City to install a RO system is $26.6 million with annual operating and maintenance costs of $1.6 million, including brine waste disposal. These costs would be passed on to the ratepayers, who already pay one of the highest sewer rates in the State.

DRAFT

The City is also a small low-income community. The costs of RO treatment depend on the volume of effluent or groundwater to be treated in order to meet the groundwater quality objectives specified in the Basin Plan. To defray the costs of the upgrade, the City has submitted a State Water Board Clean Water State Revolving Fund application with the State Water Board Division of Financial Assistance. The City plans to complete construction of the RO system within two years of receiving the Final Funding Agreement but no later than December 2024.

Incorporating an RO system to reduce chloride and other salts from the SPWRF effluent prior to discharge into the percolation pond will benefit water quality locally and effectively reduce the contribution of chloride and other salts to the Santa Clara-Santa Paula groundwater basin. This Order establishes limitations and requirements protective of the present and anticipated beneficial uses or result in receiving ground water quality that meets or exceeds water quality objectives set forth in the Basin Plan and is therefore, consistent with State Water Board Resolution No. 68-16.

36. California Water Code section 13267 authorizes the Regional Water Board to require the City to submit monitoring and technical reports as necessary to investigate the impact of a waste discharge on waters of the state. The monitoring and reporting requirements established in this Order are necessary to characterize the discharge, evaluate compliance with this Order, and evaluate groundwater quality and the extent of degradation, if any, caused by the discharge.

37. Publicly Owned Treatment Works (POTW) – The term POTW means a treatment works as defined by section 212 of the federal Clean Water Act, which is owned by a State or municipality (as defined by section 502(4) of the Act). This definition includes any devices and systems used in the storage, treatment, recycling and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes and other conveyances only if they convey wastewater to a POTW treatment facility. The term also means the municipality as defined in section 502(4) of the Clean Water Act, which has jurisdiction over the indirect discharges to and the discharges from such treatment works. (40 C.F.R. section 403.3(q)). The SPWRF meets all of the above criteria and therefore is considered a POTW.

38. Pretreatment – The City is required to implement a Pretreatment Program and to comply with requirements for operation and maintenance of its sewer collection system. Pursuant to CCR, Title 23, section 2233 and Title 40, Code of Federal Regulations (C.F.R.), Part 403, the City has been implementing an approved industrial wastewater Pretreatment Program for the SPWRF since February 2012. The Regional Board finds it appropriate to require the City to continue to implement its approved Pretreatment Program.

39. Endangered Species Act Requirements - This Order does not authorize any act that results in the taking of a threatened or endangered species or any act that is now prohibited, or becomes prohibited in the future, under either the California Endangered Species Act (Fish and Game Code, §§ 2050 to 2097) or the Federal Endangered Species Act (16 U.S.C. §§ 1531 to 1544). This Order requires

DRAFT

compliance with effluent limits, groundwater quality objectives, and other requirements to protect the beneficial uses of waters of the state. The Discharger is responsible for meeting all requirements of the applicable Endangered Species Act.

40. California Environmental Quality Act - This Order involves the renewal of WDRs for an existing facility. Therefore, this action to prescribe WDRs is exempt from the provisions of CEQA (Public Resources Code section 21000 et seq.) in accordance with California Code of Regulations, Title 14, section 15301.

41. Pursuant to CWC section 13263, the requirements of this Order take into consideration the provisions of CWC section 13241, including the following factors.

    A. Past, present, and probable future beneficial uses of water;

    The receiving water for discharges from the SPWRF is the Santa Clara Valley River Groundwater Basin-Santa Paula subbasin-West of Peck Road. The receiving water limitations in this Order are specified to maintain the beneficial uses of this basin: municipal and domestic water supply (MUN), industrial service supply (IND), industrial process supply (PROC), and agricultural supply (AGR). This Order also specifies effluent limitations protective of the beneficial uses and includes effluent and receiving water monitoring and reporting requirements to verify that discharges will not adversely affect the beneficial uses of groundwater.

    B. Environmental characteristics of the hydrographic unit under consideration, including the quality of the water available thereto;

    This Order incorporates the site-specific water quality objectives for groundwater in the Basin Plan considering geology, hydrogeology, and hydrology. Based on recent and historical data, the regional groundwater basin currently has high quality water, but is experiencing increases in salt and nitrogen loading from natural and anthropogenic sources. The SPWRF will produce effluent quality that is better than or equivalent to the groundwater quality objectives and will comply with the state's Antidegradation Policy (Resolution No. 68-16). The project will therefore limit further groundwater degradation.

    C. Water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area;

    The water quality conditions that can be reasonably achieved are those consistent with the site-specific water quality objectives necessary to protect the beneficial uses of the groundwater basin identified in A, above. through the coordinated control of all factors that affect water quality in the area. The City's plans to upgrade the SPWRF with an advanced treatment system, including RO, is part of the coordinated control of all factors that affect water quality in the areas.

DRAFT

D. Economic considerations;

The City of Santa Paula is identified as a disadvantaged community as defined in CWC section 79505.5. A "disadvantaged community means a community with an annual median household income that is less than 80 percent of the statewide annual median household income." According to the United States Census Bureau, the 2019 California median household income is $80,440 and the City of Santa Paula median household income is $60,468.

Based on the City's *Water and Sewer Rate Study* dated September 2019, the monthly wastewater user rate at monthly water use of 8.1 hundred cubic feet is $98.55 per single family residence in the fiscal year 2021-2022.

Therefore, the implementation of the RO system may cause significant economic impact to the community. The City continuously investigates solutions to minimize economic impact, including submittal of an application to the State Revolving Fund to defray costs to the community.

E. The need for developing housing within the region;

According to the United States Census Bureau, the total population in the City of Santa Paula is 30,657 in 2019. The SPWRF is designed to treat 4.2 MGD of wastewater and currently discharges approximately 2 MGD. The SPWRF has sufficient capacity to treat additional wastewater generated from newly developed residential, commercial, and industrial districts.

F. The need to develop and use recycled water;

The State Water Board adopted the *Water Quality Control Policy for Recycled Water* (Recycled Water Policy) in 2018 and encourages the increased use of recycled water in California: 714,000 acre-feet per year (AFY) in 2015 to 1.5 million AFY by 2020 and to 2.5 million AFY by 2030. The Recycled Water Policy categorizes recycled water use as agricultural irrigation, landscape irrigation, golf course irrigation, commercial application, industrial application, geothermal energy production, non-potable uses, groundwater recharge, seawater intrusion barrier, reservoir water augmentation, raw water augmentation, and potable uses.

On June 14, 2017, the City enrolled under State Water Board Water Reclamation Requirements for Recycled Water Use Order No. WQ 2016-0068-DDW. The City may distribute the disinfected tertiary-treated wastewater for recycled water applications, as appropriate, consistent with the Recycled Water Policy when the RO system is implemented at the SPWRF. This will help offset the need for potable water.

DRAFT

**NOTIFICATION**

42. The Regional Board has notified the Discharger and interested agencies and persons of its intent to prescribe WDRs for the discharge and has provided them with an opportunity to submit their written comments and recommendations.

43. The Regional Board, in a public meeting, heard and considered all comments pertaining to the discharge.

44. Any person aggrieved by this action of the Regional Board may petition the State Water Board to review the action in accordance with California Water Code section 13320 and California Code of Regulations, title 23, section 2050 and following. The State Water Board must receive the petition by 5:00 p.m., 30 days after the Regional Board's action, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions will be provided upon request or may be found on the Internet at: http://www.waterboards.ca.gov/public_notices/petitions/water_quality

**IT IS HEREBY ORDERED** that, in order to meet the provisions contained in Division 7 of the California Water Code (commencing with section 13000) and regulations adopted thereunder, the City of Santa Paula shall comply with the following requirements, including all attachments, in all operations and activities at the SPWRF:

## I. INFLUENT LIMITATIONS AND REQUIREMENTS

Influent wastewater shall be limited to wastewater generated within the jurisdiction of the City.

## II. EFFLUENT LIMITATIONS

A. Discharges from the SPWRF shall not exceed the maximum effluent volume of 4.2 MGD and the quarterly average effluent volume of 2.6 MGD.

B. Tertiary-treated effluent shall not exceed the effluent limitations in Table 8 below.

**Table 8. Effluent Limits**

| Constituents | Units | Monthly Average | Daily Maximum |
|---|---|---|---|
| Oil and grease | mg/L | 10[1] | 15[1] |
| Total suspended solids | mg/L | 10[1] | 15[1] |
| | %removal | ≥85[2] | None |

DRAFT

| Constituents | Units | Monthly Average | Daily Maximum |
|---|---|---|---|
| $BOD_{5@20°C}$ | mg/L | 10[1] | 15[1] |
| | %removal | ≥85[2] | None |
| Ammonia as nitrogen + nitrate as nitrogen + nitrite as nitrogen | mg/L | 10[3] | None |
| Nitrite as nitrogen | mg/L | 1 | None |
| Total dissolved solids | mg/L | 2,000[4] | None |
| Sulfate | mg/L | 800[4] | None |
| Boron | mg/L | 1.0[4] | None |
| Chloride | mg/L | 110[4] | None |

Table Notes:

[1] Limit is based on best professional judgment. Limits adopted by this Regional Board exist in the permits for tertiary-treated wastewater treatment plants.

[2] Limit is based on secondary treatment requirements, 40 C.F.R. section 133.102.

[3] Limit is based on the Load Allocations for nonpoint sources set forth in the Santa Clara River Nitrogen Compounds TMDL, Resolution No. 2003-011.

[4] Limit based on Basin Plan Groundwater Quality Objective.

C. The pH of effluent discharged shall at all times be within the range of 6.5 to 8.5. Excursion from this range shall not be considered a violation provided the duration is not more than 10 minutes in a 24-hour period, and pH shall at all times be within 6 to 9.

D. Effluent shall, at all times, be adequately disinfected and oxidized and shall meet the following effluent limitations:

1. the median concentration of total coliform bacteria shall not exceed a most probable number (MPN) of 23 per 100 milliliters utilizing the bacteriological results of the last seven days for which analyses have been completed; and

2. the number of total coliform bacteria shall not exceed an MPN of 240 per 100 milliliters in more than one sample in any 30 day period.

Samples shall be collected at a time when wastewater flow and characteristics are most demanding (e.g., during peak flows) on treatment facilities and disinfection processes.

DRAFT

E. A filtered wastewater shall be an oxidized wastewater that has been passed through a membrane so that the turbidity of the filtered wastewater does not exceed any of the following:

1. An average of 2 Nephelometric Turbidity Units (NTU) within a 24-hour period;

2. 5 NTU more than 5 percent of the time within a 24-hour period; and

3. 10 NTU at any time.

F. Maximum Contaminant Levels: The effluent shall not contain trace, toxic and other constituents in concentrations that exceed the applicable maximum contaminant levels for drinking water established by the State Water Board's Division of Drinking Water (DDW) in sections 64431, 64442, 64443, 64444, 64449, and 64533 of CCR, Title 22, Division 4, or subsequent revisions, or at levels that adversely affect the beneficial uses of receiving groundwater. The effluent shall, at all times, not exceed the following MCLs (Attachment A). In the event of a violation of any primary or secondary MCL, the City shall notify and submit a report in accordance with Provision VI.F. of this Order.

1. Primary MCLs specified in CCR, Title 22, Division 4, Chapter 15 (Domestic Water Quality and Monitoring Regulations):

i. Inorganic chemicals in CCR, Title 22, Division 4, Chapter 15, Section 64431, Table 64431-A, except for nitrogen compounds (Attachment A-1 of this Order);

ii.. Radionuclides in CCR, Title 22, Division 4, Chapter 15, Section 64442, Table 64442 (Attachment A-2 of this Order) and Section 64443, Table 64443 (Attachment A-3 of this Order); and

iii. Organic chemicals in CCR, Title 22, Division 4, Chapter 15, Section 64444, Table 64444-A (Attachment A-4 of this Order).

2. Secondary MCLs specified in CCR, Title 22, Division 4, Chapter 15 (Domestic Water Quality and Monitoring Regulations), Section 64449, Table 64449-A (Attachment A-5 of this Order).

3. Primary MCLs for disinfection byproducts specified in CCR, Title 22, Division 4, Chapter 15.5 (Disinfectant Residuals, Disinfection Byproducts, and Disinfection Byproduct Precursors) Article 2, Section 64533, Table 64533-A (Attachment A-6 of this Order).

## III. GROUNDWATER LIMITATIONS

A. The City is prohibited from negatively altering the quality or elevation of the underlying groundwater.

DRAFT

B. The discharge of treated wastewater from the SPWRF shall not cause an exceedance of the following groundwater limitations in Table 9 below. Except for chloride, compliance with the groundwater limitations will be determined by the groundwater samples collected from monitoring wells located within or on the boundary of the percolation pond. Compliance with the chloride groundwater limitation will be determined by the groundwater samples collected from monitoring wells located 150 feet away from the percolation pond. The specific monitoring well locations will be determined through the Monitoring and Reporting Program (MRP) (Attachment E). Per Section IV.C.3 of the MRP, the City is required to submit a work plan proposing a modified groundwater monitoring network by May 1, 2018.

**Table 9. Groundwater Limitations**

| Constituents | Units | Monthly Average |
|---|---|---|
| Nitrate as nitrogen + nitrite as nitrogen | mg/L | 10[1] |
| Nitrite as nitrogen | mg/L | 1[1] |
| Total dissolved solids | mg/L | 2,000[1] |
| Sulfate | mg/L | 800[1] |
| Chloride | mg/L | 110[1] |
| Boron | mg/L | 1.0[1] |
| Total coliform | MPN/100mL | 1.1[1] |
| Fecal coliform | MPN/100mL | 1.1[1] |

Table Note:
[1] Limit based on Basin Plan Groundwater Quality Objective.

C. Groundwater shall not exceed the MCLs specified in Attachments A-1 to A-6.

E. The minimum vertical separation between the bottom of the percolation pond and groundwater table shall be five feet.

## IV. GENERAL REQUIREMENTS

A. The SPWRF and areas where any potential pollutants are stored shall be adequately protected from inundation and damage by storm flows and runoff.

B. Adequate facilities shall be provided to protect the SPWRF, treatment system devices, sewer collection system and recycling/disposal facilities from damage by storm flows and run-off or run-on generated by a 100-year return storm/24 hour duration.

DRAFT

C. The SPWRF and the collection system that is a part of the treatment and disposal system shall be maintained in such a manner that prevents sewage from surfacing or overflowing at any location.

D. A minimum of two feet of freeboard shall be maintained in the percolation/evaporation ponds at all time to ensure that direct rainfall will not cause overtopping.

E. No disposal areas with treated wastewater shall be located within 600 feet of any domestic water supply well unless all of the following conditions have been met:

1. A geological investigation demonstrates that an aquitard exists at the well between the uppermost aquifer being drawn from and the ground surface;

2. The well contains an annular seal that extends from the surface into the aquitard;

3. The well is housed to prevent any treated wastewater spray from coming into contact with the wellhead facilities;

4. The ground surface immediately around the wellhead is contoured to allow surface water to drain away from the well; and

5. The owner of the well approves of the elimination of the buffer zone requirement.

F. There shall be no storage or impoundment of treated wastewater within 600 feet of any domestic water supply well.

G. No disposal of sludge, waste, and treated wastewater shall take place within 600 feet of any reservoir or stream used as a source of domestic water.

H. Any wastes that do not meet the foregoing requirements shall be held in impervious containers and discharged at a legal point of disposal.

I. Percolation ponds shall be maintained to ensure that percolation rate at the pond bottom shall not decrease over time.

J. The Discharger shall notify well owners within 500 feet radius from the boundary of percolation ponds when there is any exceedance on the effluent limitations and/or groundwater limitations.

K. The City shall, at all times, properly operate and maintain all treatment facilities and control systems (and related appurtenances), which are installed or used by the City to achieve compliance with the conditions of this Order. Proper operation and maintenance include effective performance, adequate funding,

DRAFT

adequate operator staffing and training, and adequate laboratory and process controls (including appropriate quality assurance procedures).

## V. PROHIBITIONS

A. Any discharge of wastewater from the SPWRF (including the wastewater collection system) at any point other than specifically described in this Order is prohibited.

B. There shall be no waste overflows or discharge of untreated or partially-treated waste from the SPWRF's treatment, storage or disposal facilities to adjacent drainage or water ways, adjacent properties, or to waters of the State at any time. The discharge of any wastewater to surface waters or surface water drainage courses is prohibited without a NPDES permit.

C. Industrial wastewater subject to the Prohibited Discharge Standards in 40 C.F.R. section 403.5 shall not be accepted by the SPWRF.

D. Wastes discharged shall not contain tastes, odors, color, foaming, any materials, or other objectionable characteristics in concentrations that would:

1. Affect human, animal, or plant life;

2. Cause nuisance or adversely affect any beneficial uses and quality of the receiving groundwater; and

3. Impact the Santa Clara River that may be in hydraulic connection with groundwater.

E. Odors originating at the SPWRF, including of sewage origin, shall not be perceivable any time outside the boundary of the SPWRF property owned by the City.

F. The percolation pond shall not contain floating materials, including solids, foams, or scum in concentrations that cause nuisance, adversely affect beneficial uses, or serve as a substrate for undesirable bacterial or algae growth or insect vectors. The wastewater treatment shall not result in nuisance conditions caused by breeding of mosquitoes, gnats, midges, or other pests.

G. Discharge of waste classified as "hazardous waste," as defined in CCR, Title 23, section 2521(a), is prohibited. Discharge of waste classified as "designated waste," as defined in California Water Code section 13173, in a manner that causes violation of receiving water limits is prohibited.

H. The percolation/evaporation ponds, drying beds, and the berms surrounding the ponds shall not contain plants, shrubs, or bushes that may damage the berms and the ponds.

DRAFT

I. The percolation pond shall not be altered without the approval by the Regional Board.

J. There shall be no onsite disposal of sludge. Sludge-drying activities are allowed, but only as an intermediate treatment prior to offsite disposal. Any offsite disposal of wastewater or sludge shall be made only to a legal point of disposal. For purposes of this Order, a legal disposal site is one for which requirements have been established by USEPA, and which is in full compliance therewith. Any wastewater or sludge handling shall be in such a manner as to prevent its reaching surface waters or watercourses.

K. Bypass (the intentional diversion of waste streams from any portion of the SPWRF) is prohibited. The Regional Board may take enforcement action against the City for bypass, unless:

1. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage. "Severe property damage" means substantial physical damage to property, damage to the SPWRF that cause it to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass.

2. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated waste, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventive maintenance.

3. Notice

i. Anticipated bypass: If the City knows in advance of the need for a bypass, it shall submit written notice to the Regional Board, if possible at least 10 days before the date of the bypass.

ii. Unanticipated bypass: The City shall provide verbal notice to the Regional Board Executive Officer of an unanticipated bypass within 24 hours from the time the City becomes aware of the circumstances. A written submission shall also be provided within five (5) days of the time the City becomes aware of the circumstances.

L. The wastewater treatment and percolation ponds shall not result in nuisance conditions caused by breeding of mosquitoes, gnats, midges, or other pests.

## VI. PROVISIONS

A. This Order includes "Attachment B - Standard Provisions Applicable to Waste Discharge Requirements" (Standard Provisions). If there is any conflict

DRAFT

between provisions stated herein and the Standard Provisions, the provisions stated herein prevail.

B. The City shall operate and maintain facilities, treatment operations, associated collection systems and outfalls in ways that preclude adverse impacts to surface or groundwater from impacts predicted to occur due to climate change.

C. The City shall evaluate the need to revise its Climate Change Effects Vulnerability Assessment and Management Plan (Climate Change Plan) when conditions change that may impact water quality. The City shall periodically submit a report of its evaluation or a revised Climate Change Plan based on its evaluation. Submittal of the Climate Change Plan is required pursuant to California Water Code section 13267. As required by this provision, a regional board may require a person to submit technical or monitoring program reports that the regional board requires. The Climate Change Plan is needed in order to assess and manage climate change related-effects associated with City operations that may affect water quality.

The Climate Change Plan shall include an assessment of short and long term vulnerabilities of the facility(ies) and operations as well as plans to address vulnerabilities of collection systems, facilities, treatment systems, and outfalls for predicted impacts in order to ensure that facility operations are not disrupted, compliance with permit conditions is achieved, and receiving waters are not adversely impacted by discharges. Control measures shall include, but are not limited to, emergency procedures, contingency plans, alarm/notification systems, training, backup power and equipment, and the need for planned mitigations to ameliorate climate-induced impacts including, but not limited to, changing influent and receiving water quality and conditions, as well as the impact of rising sea level (where applicable) storm surges and back-to-back severe storms that are expected to become more frequent.

D. The City shall comply with MRP No. CI-9259 (Attachment E), which is part of this Order, and any revisions thereto as ordered by the Executive Officer. The submittal dates of Discharger self-monitoring reports shall be no later than the submittal date specified in the MRP. If there is any conflict between the provisions stated herein and the MRP, the provisions stated herein prevail.

E. The City shall file with the Regional Board, under penalty of perjury, annual and quarterly reports on self-monitoring work performed according to the detailed specifications contained in the MRP attached hereto and incorporated herein by reference, as directed by the Executive Officer. The results of any monitoring done in addition to what is required or done more frequently than required at the location and/or times specified in the MRP shall be reported to the Regional Board. The City shall comply with all of the provisions and requirements of the MRP.

DRAFT

F. The City shall notify this Regional Board by telephone or electronic means within 24 hours of knowledge of any discharge exceeding the effluent limits prescribed in this Order from the SPWRF; written confirmation shall follow within 5 working days from date of notification, unless otherwise specified in this Order. The report shall include, but is not limited to, the following information, as appropriate:

1. Nature and extent of the violation;

2. Date and time: when the violation started, when compliance was achieved, and when injection was suspended and restored, as applicable;

3. Duration of violation;

4. Cause(s) of violation;

5. Corrective and/or remedial actions taken and/or will be taken with a time schedule for implementation to prevent future violations; and

6. Impact of the violation.

G. This Order does not exempt the City from compliance with any other laws, regulations, or ordinances that may be applicable; they do not legalize the recycling and use facilities; and they leave unaffected any further constraint on the use of recycled water at certain site(s) that may be contained in other statutes or required by other agencies.

H. This Order does not alleviate the responsibility of the City to obtain other necessary local, state, and federal permits to construct facilities necessary for compliance with this Order; nor does this Order prevent imposition of additional standards, requirements, or conditions by any other regulatory agency. Expansion of the recycled water distribution facility shall be contingent upon issuance of all necessary requirements and permits, including a conditional use permit.

I. After notice and opportunity for a hearing, this Order may be modified, revoked and reissued, or terminated for cause, that includes, but is not limited to: failure to comply with any condition in this Order, endangerment of human health, adverse impacts on water quality and/or beneficial uses of the receiving water resulting from the permitted activities in this Order, obtaining this Order by misrepresentation or failure to disclose all relevant facts, and acquisition of new information that could have justified the application of different conditions if known at the time of Order adoption.

The filing of a request by the City for modification, revocation and reissuance, or termination of this Order; or a notification of planned changes or anticipated noncompliance does not stay any condition of this Order.

DRAFT

J. The City shall furnish, within a reasonable time, any information that the Regional Board may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Order. The City shall also provide the Regional Board, upon request, with copies of records required to be kept under this Order for at least three (3) years.

K. Spill Clean-Up Contingency Plan (SCCP) Requirements – The City is required to periodically submit an updated and revised SCCP, which describes the activities and protocols to address clean-up of spills, overflows, and bypasses of untreated or partially treated wastewater from the City's collection system or treatment facilities. At a minimum, this SCCP shall include sections on spill clean-up and containment measures, public notification, and monitoring. The City shall review and amend this SCCP as appropriate after each spill from the SPWRF or in the service area of the SPWRF. The City shall include a discussion in the annual summary report of any modifications to the SCCP and the application of the SCCP to all spills during the year.

L. Construction, Operation, and Maintenance Requirements

1. The City shall, at all times, properly operate and maintain the SPWRF, including its wastewater collection, treatment, and disposal facilities (and related appurtenances) to ensure compliance with this Order, as well as provide adequate and reliable transport, treatment, and disposal of all wastewater from planned future wastewater sources under the City's responsibilities. Proper operation and maintenance includes, but is not limited to: effective performance, repairs and upgrades when needed, adequate funding, adequate operator staffing and training, adequate operator supervision, and adequate laboratory and process controls (including appropriate quality assurance/quality control procedures).

2. The SPWRF shall be supervised and operated by persons possessing certificates of appropriate grade in accordance with CCR, Title 23, Division 3, Chapter 26 and California Water Code sections 13625 - 13633.

3. The SPWRF shall be operated and maintained in accordance with the operation and maintenance manual prepared by the municipality through the Clean Water Grant Program. The City's Operation, Maintenance, and Monitoring Plan (OMM Plan) shall be available for reference and use by all applicable personnel. The City shall maintain, regularly review, and revise or update as necessary the OMM Plan in order for the document(s) to remain useful and relevant to current equipment and operation practices. Reviews shall be conducted annually, and revisions or updates shall be completed as necessary and submitted to the Regional Board on an annual basis.

4. The City shall maintain in good working order a sufficient alternate power source for operating the wastewater treatment and disposal facilities. All

DRAFT

equipment shall be located to minimize failure due to moisture, liquid spray, flooding, and other physical phenomena. The alternate power source shall be designed to permit inspection and maintenance and shall provide for periodic testing. If such alternate power source is not in existence, the City shall halt, reduce, or otherwise control all discharges upon the reduction, loss, or failure of the primary source of power.

5. The City shall provide standby or emergency power facilities and/or sufficient storage capacity or other means so that in the event of plant upset, outage due to power failure or other cause, or heavy rainfall, discharge of raw or inadequately treated sewage does not occur and infiltration ponds do not exceed their hydraulic capacity.

M. Sludge Disposal Requirements

1. All sludge generated at the wastewater treatment plant shall be disposed of, treated, or applied to land in accordance with federal regulations contained in 40 C.F.R. Part 503. These requirements are enforceable by USEPA.

2. The City shall comply with requirements in State Water Board Order No. 2004-10-DWQ, *"General Waste Discharge Requirements for the Discharge of Biosolids to Land for Use as a Soil Amendment in Agricultural, Silvicultural, Horticultural and Land Reclamation Activities"* for those sites receiving the City's biosolids that a regional water board has placed under this general order, and with the requirements in individual waste discharge requirements issued by a regional water board for sites receiving the City's biosolids.

3. The City shall comply, if applicable, with WDRs issued by other regional water boards to which jurisdiction the biosolids are transported and applied.

4. The City shall provide this Regional Board with a copy of any report(s) submitted to USEPA, the State Water Board, or other regional water boards, with respect to municipal sludge or biosolids.

N. Collection System Requirements

The City must properly enroll under the applicable General WDRs for Sanitary Sewer Systems and comply with the requirements specified in the General WDRs. The State Water Board adopted General WDRs for Sanitary Sewer Systems (Order No. 2006-0003-DWQ) on May 2, 2006 and amended the WDRs by Order No. WQ 2008-0002-EXEC and Order No. WQ 2013-0058-EXEC, to provide a consistent and statewide approach to regulating sanitary sewer systems to prevent and/or reduce sanitary sewer overflows (SSOs). Order No. 2006-0003-DWQ requires public agencies that own or operate sanitary sewer systems to develop and implement sewer system management

DRAFT

plans and report all SSOs to the State Water Board's online SSO database. The City's collection system is part of the system that is subject to Order No. 2006-0003-DWQ. The City enrolled in Order No. 2006-0003-DWQ on July 27, 2006. As such, the City must properly operate and maintain its collection system. The City must also report any non-compliance and mitigate any discharge from the collection system in violation of this Order.

O. Spill Reporting Requirements

1. Initial Notification – Although State and Regional Board staff do not have duties as first responders, this requirement is an appropriate mechanism to ensure that the agencies that do have first responder duties are notified in a timely manner in order to protect public health and beneficial uses. For certain spills, overflows and bypasses, the City shall make notifications as required below:

   i. In accordance with the requirements of Health and Safety Code section 5411.5, the City shall provide notification to the local health officer or the director of environmental health with jurisdiction over the affected water body of any unauthorized release of sewage or other waste that causes, or probably will cause, a discharge to any waters of the state as soon as possible, but no later than two (2) hours after becoming aware of the release.

   ii. In accordance with the requirements of California Water Code section 13271, the City shall provide notification to the California Emergency Management Agency (Cal EMA) of the release of reportable quantities of hazardous substances or sewage that causes, or probably will cause, a discharge to any waters of the state as soon as possible, but not later than two (2) hours after becoming aware of the release. CCR, Title 23, section 2250 establishes 1,000 gallons or more as a reportable quantity of sewage. The phone number for reporting these releases to the Cal EMA is (800) 852-7550.

   iii. The City shall notify the Regional Board of any unauthorized release of sewage from the SPWRF that causes, or probably will cause, a discharge to a water of the state as soon as possible, but not later than two (2) hours after becoming aware of the release. This initial notification does not need to be made if the City has notified Cal EMA and the local health officer or the director of environmental health with jurisdiction over the affected waterbody. The phone number for reporting these releases of sewage to the Regional Board is (213) 576-6683. The phone numbers for after hours and weekend reporting of releases of sewage to the Regional Board are (213) 305-2284 and (213) 305-2253.

DRAFT

At a minimum, the following information shall be provided to the Regional Board:

a. The location, date, and time of the release;

b. The water body that may be impacted by the discharge;

c. An estimate of the amount of sewage or other waste released and the amount that reached the receiving water at the time of notification;

d. If ongoing, the estimated flow rate of the release at the time of the notification;

e. The name, organization, phone number, and email address of the reporting representative; and

f. A certification that the State Office of Emergency Services and the local health officer or directors of environmental health with jurisdiction over the possibly affected water bodies have been notified of the discharge.

2. Monitoring – For spills, overflows and bypasses reported under Section VI.O.1., the City shall monitor as required below:

To define the geographical extent of the spill's impact, the City shall obtain grab samples (if feasible, accessible, and safe) for all spills, overflows or bypasses of any volume that reach any waters of the State (including surface and ground waters). The City shall analyze the samples for total and fecal coliforms, E. coli (if fecal coliform test shows positive), enterococcus, and relevant pollutants of concern, upstream and downstream of the point of entry of the spill (if feasible, accessible and safe). This monitoring shall be done on a daily basis from the time the spill is known until the results of two (2) consecutive sets of bacteriological monitoring indicate the return to the background level or the County Department of Public Health authorizes cessation of monitoring.

3. Reporting – The initial notification required under Section VI.O.1. shall be followed by:

i. As soon as possible, but not later than twenty-four (24) hours after becoming aware of an unauthorized discharge of sewage or other waste from its wastewater treatment plant to a water of the state, the City shall submit a statement to the Regional Board via email. If the discharge is 1,000 gallons or more, this statement shall certify that Cal EMA has been notified of the discharge in accordance with California Water Code section 13271. The statement shall also certify that the local health officer or director of environmental health

DRAFT

with jurisdiction over the affected water bodies has been notified of the discharge in accordance with Health and Safety Code section 5411.5. The statement shall also include at a minimum the following information:

a. Agency, Order No., and MRP CI No.;

b. The location, date, and time of the discharge;

c. The water body that received the discharge;

d. A description of the level of treatment of the sewage or other waste discharged;

e. An initial estimate of the amount of sewage or other waste released and the amount that reached the impacted water body;

f. The Cal EMA control number and the date and time that notification of the incident was provided to Cal EMA; and

g. The name of the local health officer or director of environmental health representative notified (if contacted directly); the date and time of notification; and the method of notification (e.g., phone, fax, email).

ii. A written preliminary report shall be submitted to the Regional Board within five (5) working days after disclosure of the incident via the State Water Board GeoTracker database under Global ID WDR100000359. The final written report shall be included in the next quarterly monitoring report submitted to the GeoTracker database above. The written report shall document the information required in Section VI.O.4. below, monitoring results and any other information required in provisions of the Standard Provisions (Attachment B) including corrective measures implemented or proposed to be implemented to prevent/minimize future occurrences.

iii. The City shall include a certification in the annual summary report (due according to the schedule in the MRP) that states that the sewer system emergency equipment, including alarm systems, backup pumps, standby power generators, and other critical emergency pump station components were maintained and tested in accordance with the City's preventive maintenance plan. Any deviations from or modifications to the preventive maintenance plan shall be approved by the Executive Officer.

4. Records – The City shall prepare and maintain a record of all spills, overflows or bypasses of raw or partially treated sewage from its collection system or the SPWRF. This record shall be made available to the

DRAFT

Regional Board upon request and a spill summary shall be included in the annual report, as required in the MRP. The record shall contain:

i. The date and time of each spill, overflow, or bypass;

ii. The location of each spill, overflow, or bypass;

iii. The estimated volume of each spill, overflow, or bypass including gross volume, amount recovered and amount not recovered, monitoring results as required by Section VI.O.2.;

iv. The cause of each spill, overflow, or bypass;

v. Whether each spill, overflow, or bypass entered a receiving water and, if so, the name of the water body and whether it entered via storm drains or other man-made conveyances;

vi. Any corrective measures implemented or proposed to be implemented to prevent/minimize future occurrences; and

vii. The mandatory information included in Sanitary Sewer Overflows (SSO) online reporting for finalizing and certifying the SSO report for each spill, overflow, or bypass under State Water Board Order No. 2006-0003-DWQ.

5. Activities Coordination – The Regional Board expects that the City will coordinate their compliance activities for consistency and efficiency with other entitles that have responsibilities to implement: (i) this Order, and (ii) State Water Board Order No. 2006-0003-DWQ.

6. Consistency with State Water Board Order No. 2006-0003-DWQ – The requirements contained in this Order in Sections VI.K. (SCCP Requirements), VI.L. (Construction, Operation, and Maintenance Requirements), and VI.O. (Spill Reporting Requirements) are intended to be consistent with the requirements of Order No. 2006-0003-DWQ. The Regional Board recognizes that there may be some overlap between this Order and Order No. 2006-0003-DWQ. The requirements of Order No. 2006-0003-DWQ are considered the minimum thresholds (see Finding 11 of Order No. 2006-0003-DWQ). To encourage efficiency, the Regional Board will accept the documentation prepared by the City under Order No. 2006-0003-DWQ for compliance purposes, as satisfying the requirements in Sections VI.K., VI.L., and VI.O. provided the more stringent provisions enumerated in this Order have also been addressed.

P. Pretreatment Requirements

1. This Order includes the City's Pretreatment Program, as previously submitted to this Regional Board and specified in Order No. R4-2007-

DRAFT

0028-R2, adopted by this Regional board on February 2, 2012. Any change to the Program shall be reported to the Regional Board in writing and shall not become effective until approved by the Executive Officer in accordance with procedures established in 40 C.F.R. section 403.18.

2. The City shall enforce the requirements under Sections 307(b), 307(c), 307(d), and 402(b) of the Federal Clean Water Act with timely, appropriate, and effective enforcement actions. The City shall require industrial users to comply with Federal Categorical Standards and shall initiate enforcement actions against those users who do not comply with the standards. The City shall require industrial users subject to the Federal Categorical Standards to achieve compliance no later than the date specified in those requirements or, in the case of a new industrial user, upon commencement of the discharge.

3. The City shall perform the pretreatment functions as required in 40 C.F.R. Part 403 including, but not limited to:

   i. Implement the necessary legal authorities as provided in 40 C.F.R. section 403.8(f)(1);

   ii. Enforce the pretreatment requirements under 40 C.F.R. sections 403.5 and 403.6;

   iii. Implement the programmatic functions as provided in 40 C.F.R. section 403.8(f)(2); and

   iv. Provide the requisite funding of personnel to implement the Pretreatment Program as provided in 40 C.F.R. section 403.8(f)(3).

4. The City shall submit an annual report of effectiveness of the City's Pretreatment Program. This annual report shall be submitted to the Regional Board, with copies to the State Water Board and USEPA Region 9, describing the City's pretreatment activities over the period and whether such activities have been effective. If the City is not in compliance with any conditions or requirements of this Order, the City shall include the reasons for noncompliance and shall state how and when the City will comply with such conditions and requirements.

5. The City shall be responsible and liable for the performance of all control authority pretreatment requirements contained in 40 C.F.R. Part 403, including subsequent regulatory revisions thereof. Where Part 403 or subsequent revision places mandatory actions upon the City as Control Authority, but does not specify a timetable for completion of the actions, the City shall complete the required actions within six months from the effective date of this Order or the effective date of Part 403 revisions, whichever comes later. For violations of pretreatment requirements, the City shall be subject to enforcement actions, penalties, fines, and other

DRAFT

remedies by the Regional Board, USEPA, or other appropriate parties, as provided in the Federal Clean Water Act. The Regional Board or USEPA may initiate enforcement action against an industrial user for noncompliance with acceptable standards and requirements as provided in the Federal Clean Water Act and/or the California Water Code.

## VII. REOPENER

The Regional Water Board will review this Order periodically and will revise requirements when necessary. The waste discharge requirements and monitoring and reporting requirements in this Order were developed based on currently available technical information and applicable water quality laws, regulations, policies, and plans, and are intended to assure compliance with them. If applicable laws and regulations change, including but not limited to, establishment of total maximum daily loads, or once new information is obtained that will change the overall discharge and its potential to impact waters of the state, it may be appropriate to reopen this Order. This Order may also specifically be reopened to make revisions consistent with an approved salt and nutrient management plan.

## VIII. TERMINATION

Except for enforcement purposes, Order No. R4-2007-0028, adopted by the Regional Board on May 3, 2007, and amended on May 6, 2010, February 2, 2012, April 6, 2017 and December 21, 2017, is hereby terminated.

The Regional Board's termination of prior waste discharge requirements and/or monitoring and reporting requirements do not extinguish any violations that may have occurred during the time those requirements were in effect. The Regional Board reserves the right to take enforcement actions to address violations of prior prohibitions, limitations, specifications, requirements, or provisions of rescinded requirements as allowed by law.

## IX. EFFECTIVE DATE

This Order becomes effective immediately upon its adoption.

I, Renee Purdy, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order originally adopted on February 8, 2018 and amended and adopted by the California Regional Water Quality Control Board, Los Angeles Region on May 12, 2022.

Renee Purdy
Executive Officer

DRAFT

Figure 1 – The Vicinity of Santa Paula Water Recycling Facility (SPWRF)

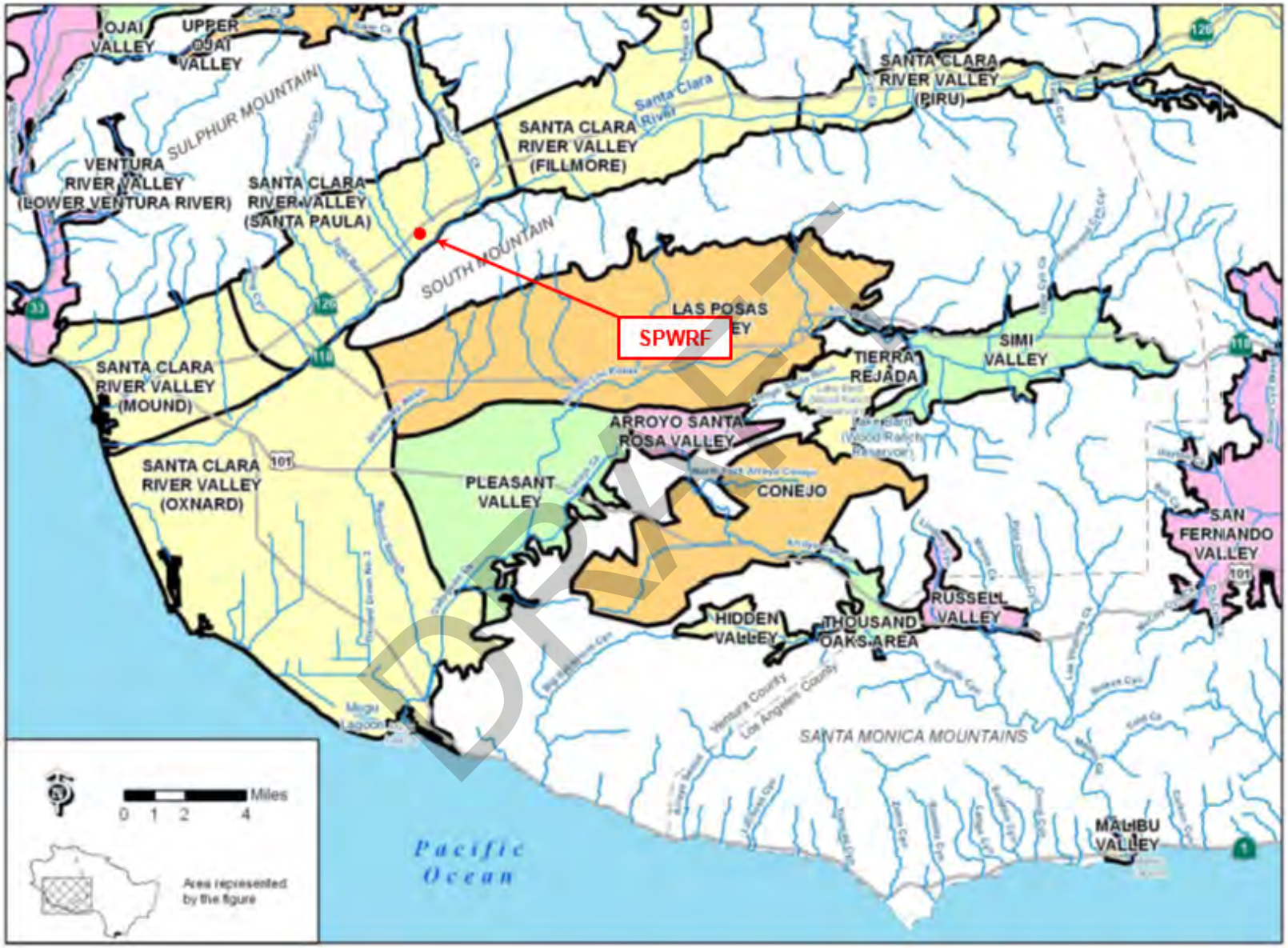



Figure 2 – Santa Paula Groundwater Basin

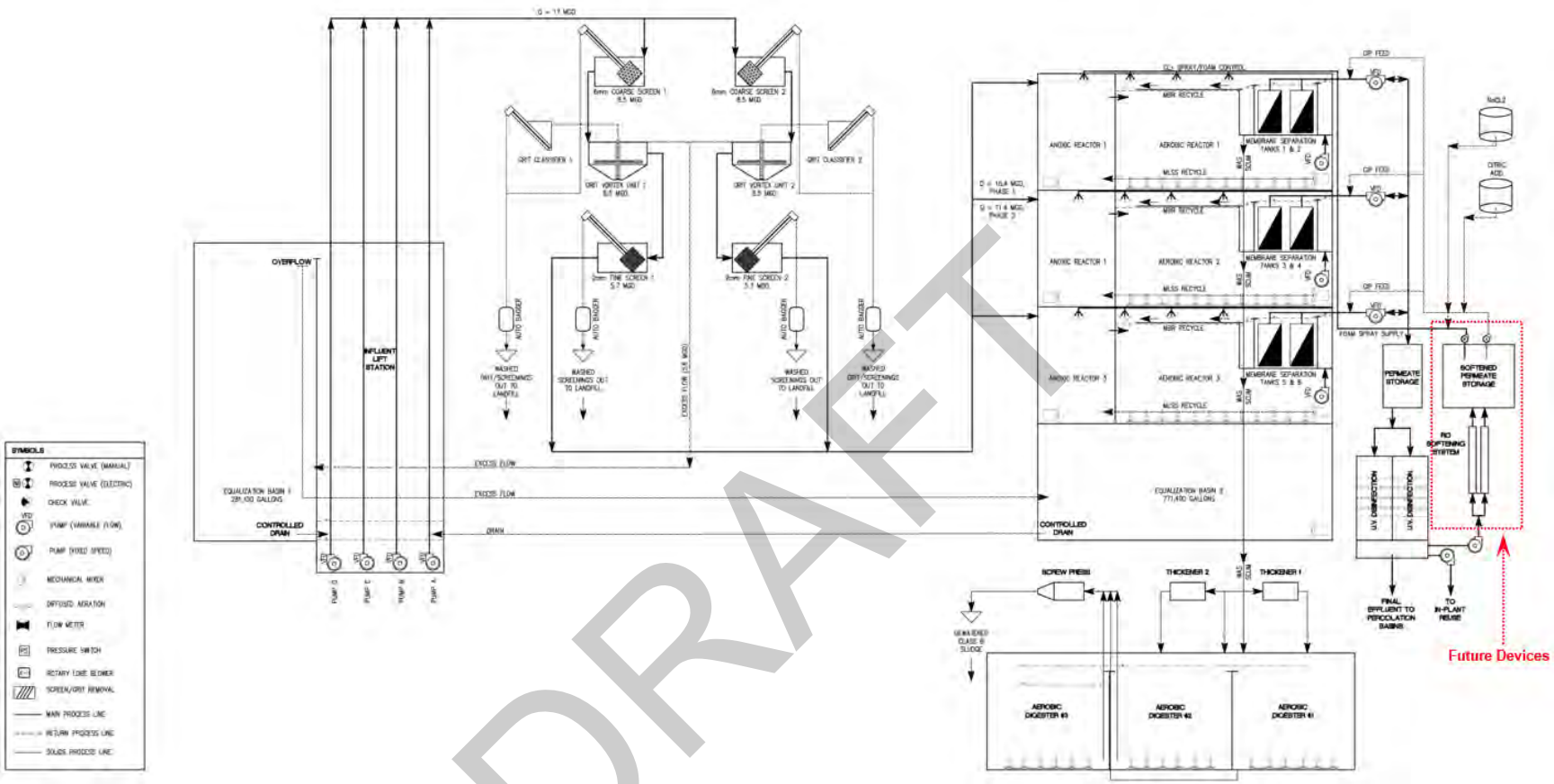
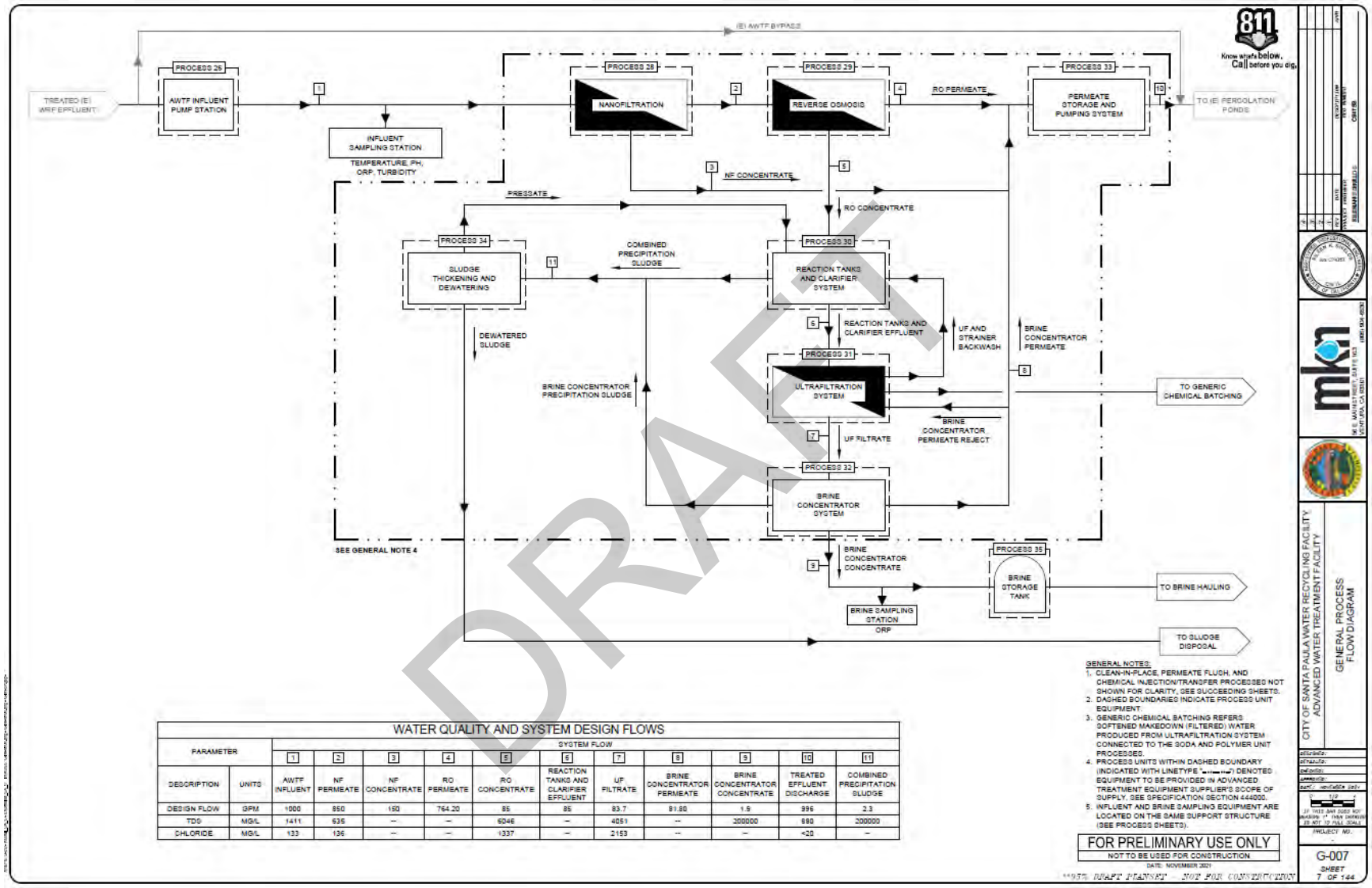



Figure 3 – Process Flow Schematic of Santa Paula Wastewater Recycling Facility

DRAFT




| WATER QUALITY AND SYSTEM DESIGN FLOWS | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PARAMETER | | SYSTEM FLOW | | | | | | | | | | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| DESCRIPTION | UNITS | AWTF INFLUENT | NF PERMEATE | NF CONCENTRATE | RO PERMEATE | RO CONCENTRATE | REACTION TANKS AND CLARIFIER EFFLUENT | UF FILTRATE | BRINE CONCENTRATOR PERMEATE | BRINE CONCENTRATOR CONCENTRATE | TREATED EFFLUENT DISCHARGE | COMBINED PRECIPITATION SLUDGE |
| DESIGN FLOW | GPM | 1000 | 850 | 150 | 764.20 | 85 | 85 | 83.7 | 81.80 | 1.9 | 996 | 2.3 |
| TDS | MG/L | 1411 | 635 | -- | -- | 6046 | -- | 4051 | -- | 200000 | 680 | 200000 |
| CHLORIDE | MG/L | 133 | 136 | -- | -- | 1337 | -- | 2153 | -- | -- | <20 | -- |

Figure 4 – Process Flow Schematic of Reverse Osmosis Advanced Wastewater Treatment System at Santa Paula Water Recycling Facility

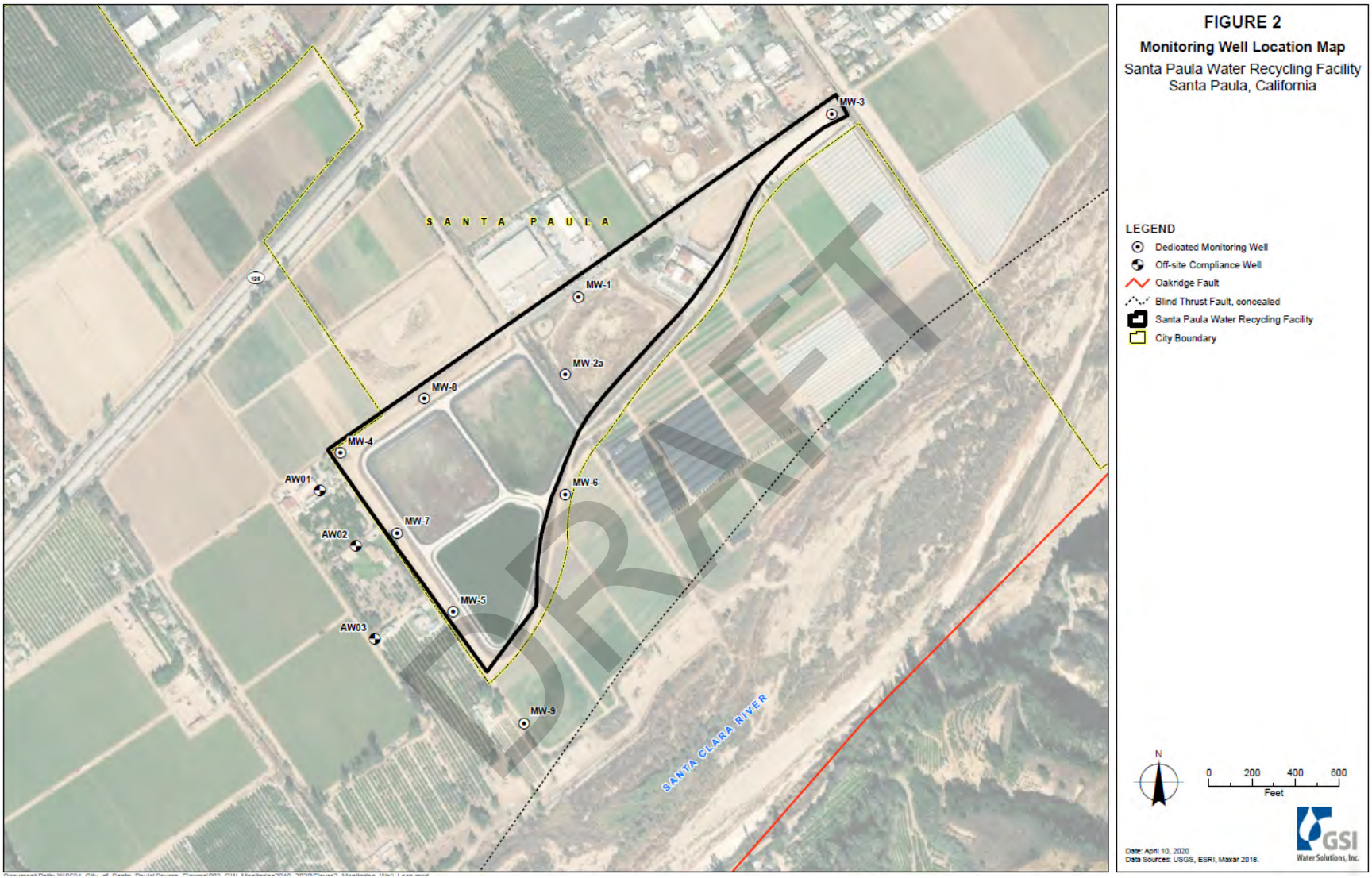



Figure 5 – Locations of Groundwater Monitoring Wells

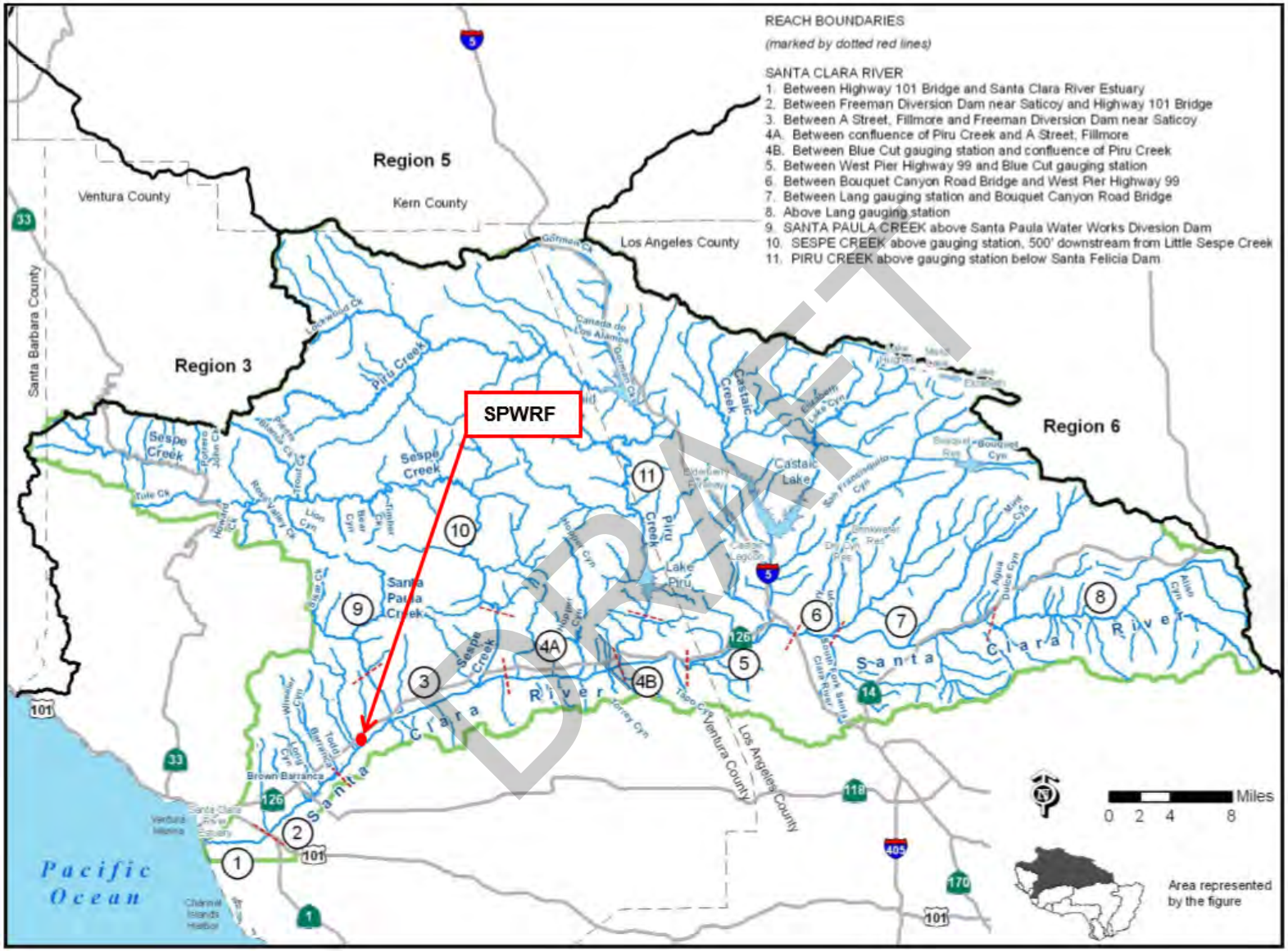



Figure 6 – Santa Clara River Watershed Surface Reaches

## Attachment A – Maximum Contaminant Levels

## Attachment A-1 Inorganic Chemicals

**Table 64431-A**

| Chemical | Maximum Contaminant Levels (mg/L) | Reporting Detection Limit (mg/L) |
|---|---|---|
| Aluminum | 1 | 0.05 |
| Antimony | 0.006 | 0.006 |
| Arsenic | 0.010 | 0.002 |
| Asbestos | 7 MFL [1] | 0.2 MFL [2] |
| Barium | 1 | 0.1 |
| Beryllium | 0.004 | 0.001 |
| Cadmium | 0.005 | 0.001 |
| Chromium | 0.05 | 0.01 |
| Cyanide | 0.15 | 0.1 |
| Fluoride | 2.0 | 0.1 |
| Mercury | 0.002 | 0.001 |
| Nickel | 0.1 | 0.01 |
| Nitrate (as nitrogen) | 10 | 0.4 |
| Nitrate+Nitrite (sum as nitrogen) | 10 | |
| Nitrite (as nitrogen) | 1 | 0.4 |
| Perchlorate | 0.006 | 0.002<br>0.001 [3] |
| Selenium | 0.05 | 0.005 |
| Thallium | 0.002 | 0.001 |

Note: [1] MFL = million fibers per liter; MCL for fibers exceeding 10 µm in length.
[2] Reporting detection limit for fibers exceeding 10 µm in length.
[3] Effective January 1, 2024.

DRAFT

## Attachment A-2 Radioactivity

Gross alpha and gross beta analysis must be performed. If gross alpha is greater than 1 picocurie per liter (pCi/L), uranium analysis must be performed. Compliance with this Order shall then be based on comparing gross alpha minus total uranium to the gross alpha limit of 15 pCi/L.

Radium-226 and radium-228 analysis must be performed, and combined Radium-226 and radium-228 activity must be less than or equal to 5 pCi/L. If gross alpha is less than 50 pCi/L, one can assume radium-226 activity is equal to gross alpha activity for purposes of meeting the 5 pCi/L limit.

**Table 64442**

| Radionuclide | Maximum Contaminant Level (pCi/L) | Reporting Detection Limit (pCi/L) |
|---|---|---|
| Radium-226 | | 1 |
| Radium-228 | | 1 |
| Combined radium-226 and radium-228 | 5 | |
| Gross Alpha particle activity (excluding radon and uranium) | 15 | 3 |
| Uranium | 20 | 1 |

Note: pCi/L = picocuries per liter

**Table 64443**

| Radionuclide | Maximum Contaminant Level (pCi/L) | Reporting Detection Limit (pCi/L) |
|---|---|---|
| Beta/photon emitters | 4 millirem per year annual dose equivalent to the total body or any internal organ | Gross Beta particle activity: 4 |
| Strontium-90 | 8 (= 4 millirem per year dose to bone marrow) | 2 |
| Tritium | 20,000 (=4 millirem per year dose to total body) | 1,000 |

DRAFT

## Attachment A-3 Organic Chemicals

**Table 64444-A**

**(a) Volatile Organic Chemicals (VOCs)**

| Chemical | Maximum Contaminant Levels (mg/L) | Reporting Detection Limit (mg/L) |
|---|---|---|
| Benzene | 0.001 | 0.0005 |
| Carbon Tetrachloride | 0.0005 | 0.0005 |
| 1,2-Dichlorobenzene | 0.6 | 0.0005 |
| 1,4-Dichlorobenzene | 0.005 | 0.0005 |
| 1,1-Dichloroethane | 0.005 | 0.0005 |
| 1,2-Dichloroethane | 0.0005 | 0.0005 |
| 1,1-Dichloroethylene | 0.006 | 0.0005 |
| cis-1,2-Dichloroethylene | 0.006 | 0.0005 |
| trans-1,2-Dichloroethylene | 0.01 | 0.0005 |
| Dichloromethane | 0.005 | 0.0005 |
| 1,2-Dichloropropane | 0.005 | 0.0005 |
| 1,3-Dichloropropene | 0.0005 | 0.0005 |
| Ethylbenzene | 0.3 | 0.0005 |
| Methyl-*tert*-butyl ether | 0.013 | 0.003 |
| Monochlorobenzene | 0.07 | 0.0005 |
| Styrene | 0.1 | 0.0005 |
| 1,1,2,2-Tetrachloroethane | 0.001 | 0.0005 |
| Tetrachloroethylene | 0.005 | 0.0005 |
| Toluene | 0.15 | 0.0005 |
| 1,2,4-Trichlorobenzene | 0.005 | 0.0005 |
| 1,1,1-Trichloroethane | 0.200 | 0.0005 |
| 1,1,2-Trichloroethane | 0.005 | 0.0005 |
| Trichloroethylene | 0.005 | 0.0005 |
| Trichlorofluoromethane | 0.15 | 0.005 |

DRAFT

| | | |
|---|---|---|
| 1,1,2-Trichloro-1,2,2-Trifluoroethane | 1.2 | 0.01 |
| Vinyl Chloride | 0.0005 | 0.0005 |
| Xylenes | 1.750 [1] | 0.0005 |

**(b) Synthetic Organic Chemicals (SOCs)**

| **Chemical** | **Maximum Contaminant Levels (mg/L)** | **Reporting Detection Limit (mg/L)** |
|---|---|---|
| Alachlor | 0.002 | 0.001 |
| Atrazine | 0.001 | 0.0005 |
| Bentazon | 0.018 | 0.002 |
| Benzo(a)pyrene | 0.0002 | 0.0001 |
| Carbofuran | 0.018 | 0.005 |
| Chlordane | 0.0001 | 0.0001 |
| 2,4-D | 0.07 | 0.01 |
| Dalapon | 0.2 | 0.01 |
| Dibromochloropropane | 0.0002 | 0.00001 |
| Di(2-ethylhexyl)adipate | 0.4 | 0.005 |
| Di(2-ethylhexyl)phthalate | 0.004 | 0.003 |
| Dinoseb | 0.007 | 0.002 |
| Diquat | 0.02 | 0.004 |
| Endothall | 0.1 | 0.045 |
| Endrin | 0.002 | 0.0001 |
| Ethylene Dibromide | 0.00005 | 0.00002 |
| Glyphosate | 0.7 | 0.025 |
| Heptachlor | 0.00001 | 0.00001 |
| Heptachlor Epoxide | 0.00001 | 0.00001 |
| Hexachlorobenzene | 0.001 | 0.0005 |
| Hexachlorocyclopentadiene | 0.05 | 0.001 |
| Lindane | 0.0002 | 0.0002 |

DRAFT

| Chemical | Maximum Contaminant Levels (mg/L) | Reporting Detection Limit (mg/L) |
|---|---|---|
| Methoxychlor | 0.03 | 0.01 |
| Molinate | 0.02 | 0.002 |
| Oxamyl | 0.05 | 0.02 |
| Pentachlorophenol | 0.001 | 0.0002 |
| Picloram | 0.5 | 0.001 |
| Polychlorinated Biphenyls | 0.0005 | 0.0005 |
| Simazine | 0.004 | 0.001 |
| Thiobencarb | 0.07 | 0.001 |
| Toxaphene | 0.003 | 0.001 |
| 1,2,3-Trichloropropane | 0.000005 | 0.000005 |
| 2,3,7,8-TCDD (Dioxin) | $3\times10^{-8}$ | $5\times10^{-9}$ |
| 2,4,5-TP (Silvex) | 0.05 | 0.001 |

Note: [1] MCL is for either a single isomer or the sum of the isomers.

DRAFT

## Attachment A-4 Secondary Maximum Contaminant Levels

**Table 64449-A**

| Chemical | Levels/Units |
|---|---|
| Aluminum | 0.2 mg/L |
| Color | 15 Units |
| Copper | 1.0 mg/L |
| Foaming Agents (MBAS) | 0.5 mg/L |
| Iron | 0.3 mg/L |
| Manganese | 0.05 mg/L |
| Methyl-tert-butyl ether (MTBE) | 0.005 mg/L |
| Odor -Threshold | 3 Units |
| Silver | 0.1 mg/L |
| Thiobencarb | 0.001 mg/L |
| Turbidity | 5 Units |
| Zinc | 5.0 mg/L |

DRAFT

## Attachment A-5 Disinfection Byproducts

**Table 64533-A**

| Chemical | Maximum Contaminant Levels (mg/L) | Reporting Detection Limit (mg/L) |
|---|---|---|
| Total trihalomethanes (TTHM) | 0.080 | |
| Bromodichloromethane | | 0.0010 |
| Bromoform | | 0.0010 |
| Chloroform | | 0.0010 |
| Dibromochloromethane | | 0.0010 |
| Haloacetic acids (five) (HAA5) | 0.060 | |
| Monochloroacetic Acid | | 0.0020 |
| Dichloroacetic Acid | | 0.0010 |
| Trichloroacetic Acid | | 0.0010 |
| Monobromoacetic Acid | | 0.0010 |
| Dibromoacetic Acid | | 0.0010 |
| Bromate [1] | 0.010 | 0.0050<br>0.0010 [2] |
| Chlorite [3] | 1.0 | 0.020 |

Notes: [1] Bromate is listed for plant using ozone disinfection only.
[2] For analysis performed using EPA Method 317.0 Revision 2.0, 321.8, or 326.0.
[3] Chlorite is listed for plant using chlorine dioxide only.

DRAFT

## Attachment B – Standard Provisions
## Applicable to Waste Discharge Requirements

1. **Duty to Comply**

The discharger must comply with all conditions of these waste discharge requirements. A responsible party has been designated in the Order for this project, and is legally bound to maintain the monitoring program and permit. Violations may result in enforcement actions, including Regional Board orders or court orders requiring corrective action or imposing civil monetary liability, or in modification or revocation of these waste discharge requirements by the Regional Board. (California Water Code, Sections 13261, 13263, 13265, 13268, 13300, 13301, 13304, 13340, and 13350). Failure to comply with any waste discharge requirement, monitoring and reporting requirement, or other order or prohibition issued, reissued or amended by the Los Angeles Water Board or State Water Resources Control Board is a violation of these waste discharge requirements and the Water Code, which can result in the imposition of civil liability. (California Water Code, Section 13350, subdivision (a).)

2. **General Prohibition**

Neither the treatment nor the discharge of waste shall create a pollution, contamination or nuisance, as defined by California Water Code section 13050. In addition, the discharge of waste classified as hazardous, as defined in California Code of Regulations, Title 23, Section 2521, subdivision (a) is also prohibited.

3. **Availability**

A copy of these waste discharge requirements shall be maintained at the discharge facility and be available at all times to operating personnel. (California Water Code, Section 13263)

4. **Change in Ownership**

The discharger must notify the Executive Officer, in writing at least 30 days in advance of any proposed transfer of this Order's responsibility and coverage to a new discharger containing a specific date for the transfer of this Order's responsibility and coverage between the current discharger and the new discharger. This agreement shall include an acknowledgement that the existing discharger is liable for violations up to the transfer date and that the new discharger is liable from the transfer date forward. (California Water Code, Sections 13267 and 13263)

5. **Change in Discharge**

In the event of a material change in the character, location, or volume of a discharge, the discharger shall file with this Regional Board a new Report of Waste Discharge.

DRAFT

(California Water Code, Section 13260, subdivision (c)). A material change includes, but is not limited to, the following:

(a) Addition of a major industrial waste discharge to a discharge of essentially domestic sewage, or the addition of a new process or product by an industrial facility resulting in a change in the character of the waste.

(b) Significant change in disposal method, e.g., change from a land disposal to a direct discharge to water, or change in the method of treatment which would significantly alter the characteristics of the waste.

(c) Significant change in the disposal area, e.g., moving the discharge to another drainage area, to a different water body, or to a disposal area significantly removed from the original area potentially causing different water quality or nuisance problems.

(d) Increase in flow beyond that specified in the waste discharge requirements.

(e) Increase in the area or depth to be used for solid waste disposal beyond that specified in the waste discharge requirements. (California Code of Regulations, Title 23, Section 2210)

6. **Revision**

These waste discharge requirements are subject to review and revision by the Regional Board. (California Water Code, Sections 13263)

7. **Notification**

Where the discharger becomes aware that it failed to submit any relevant facts in a Report of Waste Discharge or submitted incorrect information in a Report of Waste Discharge or in any report to the Regional Board, it shall promptly submit such facts or information. (California Water Code, Sections 13260 and 13267)

8. **Vested Rights**

This Order does not convey any property rights of any sort or any exclusive privileges. The requirements prescribed herein do not authorize the commission of any act causing injury to persons or property, do not protect the discharger from his liability under Federal, State or local laws, nor do they create a vested right for the discharger to continue the waste discharge. (California Water Code, Section 13263, subdivision (g).)

9. **Severability**

Provisions of these waste discharge requirements are severable. If any provisions of these requirements are found invalid, the remainder of the requirements shall not be affected.

DRAFT

10. **Operation and Maintenance**

The discharger shall, at all times, properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the discharger to achieve compliance with conditions of this Order. Proper operation and maintenance include effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Order. (California Water Code, Section 13263, subdivision (f).)

11. **Notification Requirement**

Except for a discharge which is in compliance with these waste discharge requirements, any person who, without regard to intent or negligence, causes or permits any hazardous substance or sewage to be discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, shall, as soon as (a) that person has knowledge of the discharge, (b) notification is possible, and (c) notification can be provided without substantially impeding cleanup or other emergency measures, immediately notify the Office of Emergency Services of the discharge in accordance with the spill reporting provision of the State toxic disaster contingency plan adopted pursuant to Article 3.7 (commencing with Section 8574.7) of Chapter 7 of Division 1 of Title 2 of the Government Code, and immediately notify the State Board or the appropriate Regional Board of the discharge. This provision does not require reporting of any discharge of less than a reportable quantity as provided for under subdivisions (f) and (g) of Section 13271 of the Water Code unless the discharger is in violation of a prohibition in the applicable Water Quality Control plan. (California Water Code, Section 13271, subdivision (a).)

12. **Oil or Petroleum Releases**

Except for a discharge which is in compliance with these waste discharge requirements, any person who without regard to intent or negligence, causes or permits any oil or petroleum product to be discharged in or on any waters of the State, or discharged or deposited where it is, or probably will be, discharged in or on any waters of the State, shall, as soon as (a) such person has knowledge of the discharge, (b) notification is possible, and (c) notification can be provided without substantially impeding cleanup or other emergency measures, immediately notify the Office of Emergency Services of the discharge in accordance with the spill reporting provision of the State oil spill contingency plan adopted pursuant to Article 3.5 (commencing with Section 8574.1) of Chapter 7 of Division 1 of Title 2 of the Government Code. This provision does not require reporting of any discharge of less than 42 gallons unless the discharge is also required to be reported pursuant to Section 311 of the Clean Water Act or the discharge is in violation of a prohibition in the applicable Water Quality Control Plan. (California Water Code, Section 13272)

DRAFT

13. **Investigations and Inspections**

The discharger shall allow the Regional Board, or an authorized representative upon the presentation of credentials and other documents as may be required by law, to:

(a) Enter upon the discharger's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this Order;

(b) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Order;

(c) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Order; and

(d) Sample or monitor at reasonable times, for the purposes of assuring compliance with this Order, or as otherwise authorized by the California Water Code, any substances or parameters at any location. (California Water Code, Section 13267)

(e) Except for material determined to be confidential in accordance with applicable law, all reports prepared in accordance with the terms of this Order shall be available for public inspection at the office of the Los Angeles Water Board. Data on waste discharges, water quality, geology, and hydrogeology shall not be considered confidential.

14. **Monitoring Program and Devices**

The discharger shall furnish, under penalty of perjury, technical monitoring program reports; such reports shall be submitted in accordance with specifications prepared by the Executive Officer, which specifications are subject to periodic revisions as may be warranted. (California Water Code, Section 13267)

All monitoring instruments and devices used by the discharger to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy. All flow measurement devices shall be calibrated at least once per year, or more frequently, to ensure continued accuracy of the devices. Annually, the discharger shall submit to the Executive Office a written statement, signed by a registered professional engineer, certifying that all flow measurement devices have been calibrated and will reliably achieve the accuracy required.

The analysis of any material required pursuant to Division 7 of the Water Code shall be performed by a laboratory that has accreditation or certification pursuant to Article 3 (commencing with Section 100825) of Chapter 4 of Part 1 of Division 101 of the Health and Safety Code. However, this requirement does not apply to field tests, such as test for color, odor, turbidity, pH, temperature, dissolved oxygen,

DRAFT

conductivity, and disinfectant residual chlorine. (California Water Code, Section 13176). Unless otherwise permitted by the Regional Board Executive officer, all analyses shall be conducted at a laboratory certified for such analyses by the State Water Resources Control Board's Division of Drinking Water. All analyses shall be required to be conducted in accordance with the latest edition of "Guidelines Establishing Test Procedures for Analysis of Pollutants" (40 CFR Part 136) promulgated by the United States, Environmental Protection Agency (USEPA). (California Code of Regulation, Title 23, Section 2230)

The Quality Assurance-Quality Control Program must conform to the USEPA Guidelines "Laboratory Documentation Requirements for Data Validation", January 1990, USEPA Region 9) or procedures approved by the Los Angeles Regional Water Quality Control Board.

All quality assurance and quality control (QA/QC) analyses must be run on the same dates when samples were actually analyzed. All QA/QC data shall be reported, along with the sample results to which they apply, including the method, equipment, analytical detection and quantitation limits, the percent recovery, and explanation for any recovery that falls outside the QC limits, the results of equipment and method blanks, the results of spiked and surrogate samples, the frequency of quality control analysis, and the name and qualifications of the person(s) performing the analyses. Sample results shall be reported unadjusted for lank results or spike recoveries. In cases where contaminants are detected in QA/QC samples (e.g., field, trip, or lab blanks); the accompanying sample results shall be appropriately flagged.

The Discharger shall make all QA/QC data available for inspection by Regional Board staff and submit the QA/QC documentation with its respective quarterly report. Proper chain of custody procedures must be followed and a copy of that documentation shall be submitted with the quarterly report.

15. **Treatment Failure**

In an enforcement action, it shall not be a defense for the discharger that it would have been necessary to halt or to reduce the permitted activity in order to maintain compliance with this Order. Upon reduction, loss, or failure of the treatment facility, the discharger shall, to the extent necessary to maintain compliance with this Order, control production or all discharges, or both, until the facility is restored or an alternative method of treatment is provided. This provision applies, for example, when the primary source of power of the treatment facility fails, is reduced, or is lost. (California Water Code, Section 13263, subdivision (f).)

16. **Discharge to Navigable Waters**

A person who discharges pollutants or proposes to discharge pollutants or proposes to discharge pollutants to the navigable waters of the United States within the jurisdiction of this state or a person who discharges dredged or fill material or proposes to discharge dredged or fill material into the navigable waters of the United

DRAFT

States within the jurisdiction of this state shall file a report of waste discharge in compliance with the procedures set forth in Water Code section 13260. (California Water Code, Section 13376)

17. **Endangerment to Health and Environment**

The discharger shall report any noncompliance which may endanger health or the environment. Any such information shall be provided verbally to the Executive Officer within 24 hours from the time the discharger becomes aware of the circumstances. A written submission shall also be provided within five days of the time the discharger becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected; the anticipated time it is expected to continue and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance. The Executive officer, or an authorized representative, may waive the written report on a case-by-case basis if the oral report has been received within 24 hours. The following occurrence(s) must be reported to the Executive Office within 24 hours:

(a) Any bypass from any portion of the treatment facility.

(b) Any discharge of treated or untreated wastewater resulting from sewer line breaks, obstruction, surcharge or any other circumstances.

(c) Any treatment plan upset which causes the effluent limitation of this Order to be exceeded. (California Water Code, Sections 13263 and 13267)

18. **Maintenance of Records**

The discharger shall retain records of all monitoring information including all calibration and maintenance records, all original strip chart recordings for continuous monitoring instrumentation, copies off all reports required by this Order, and record of all data used to complete the application for this Order. Records shall be maintained for a minimum of three years from the date of the sample, measurement, report, or application. This period may be extended during the course of any unresolved litigation regarding this discharge or when requested by the Regional Board Executive Officer.

Records of monitoring information shall include:

(a) The date, exact place, and time of sampling or measurement;

(b) The individual(s) who performed the sampling or measurement;

(c) The date(s) analyses were performed;

(d) The individual(s) who performed the analyses;

DRAFT

(e) The analytical techniques or method used; and

(f) The results of such analyses.

19. (a) All application reports or information to be submitted to the Executive Office shall be signed and certified as follows:

(1) For a corporation – by a principal executive officer or at least the level of vice president.

(2) For a partnership or sole proprietorship – by a general partner or the proprietor, respectively.

(3) For a municipality, state, federal, or other public agency – by either a principal executive officer or ranking elected official.

(b) A duly authorized representative of a person designated in paragraph (a) of this provision may sign documents if:

(1) The authorization is made in writing by a person described in paragraph (a) of this provision.

(2) The authorization specifies either an individual or position having responsibility for the overall operation of the regulated facility or activity; and

(3) The written authorization is submitted to the Executive Officer.

Any person signing a document under this Section shall make the following certification:

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. [California Water Code Sections 13263, 13267, and 13268]"

20. **Operator Certification**

Supervisors and operators of municipal wastewater treatment plants and privately owned facilities regulated by the Public Utilities Commission, used in the treatment or reclamation of sewage and industrial waste shall possess a certificate of appropriate grade in accordance with California Code of Regulations, Title 23, section 3680. State Boards may accept experience in lieu of qualification training. (California Code of Regulations, Title, 23, Sections 3680 and 3680.2.) In lieu of a properly certified wastewater treatment plant operator, the State Board may approve

DRAFT

use of a water treatment plant operator of appropriate grade certified by the State Department of Public Health where reclamation is involved. (California Code of Regulations, Title, 23, Section 3670.1, subdivision (b).)

## ADDITIONAL PROVISIONS APPLICABLE TO PUBLICLY OWNED TREATEMENT WORKS' ADEQUATE CAPACITY

21. Whenever a regional board finds that a publicly owned wastewater treatment plant will reach capacity within four years, the board shall notify the discharger. Such notification shall inform the discharger that the regional board will consider adopting a time schedule order pursuant to Section 13300 of the Water Code or other enforcement order unless the discharger can demonstrate that adequate steps are being taken to address the capacity problem. The notification shall require the discharger to submit a technical report to the regional board within 120 days showing how flow volumes will be prevented from exceeding existing capacity or how capacity will be increased. A copy of such notification shall be sent to appropriate local elected officials, local permitting agencies and the press. The time for filing the required technical report may be extended by the regional board. An extension of 30 days may be granted by the executive officer. Longer extensions may be granted by the regional board itself. (California Code of Regulations, Title, 23, Section 2232.)

DRAFT

## Attachment C – Monitoring for Constituents of Emerging Concern (CECs)

**Table C-1. Health-based and Performance Indicator CECs and Required Reporting Limits [1]**

| Constituent | Constituent Group | Reporting Limit (µg/L) |
|---|---|---|
| 1,4-Dioxane | Industrial chemical | 0.1 |
| N-Nitrosodimethylamine (NDMA) | Disinfection byproduct | 0.002 |
| N-Nitrosomorpholine (NMOR) | Industrial chemical | 0.002 |
| Perfluorooctane sulfonate (PFOS) | Consumer/industrial chemical | 0.0065 |
| Perfluorooctanoic acid (PFOA) | Consumer/industrial chemical | 0.007 |
| Sucralose | Food additive | 0.1 |
| Sulfamethoxazole | Antibiotic | 0.01 |

Note: [1] *Water Quality Control Policy for Recycled Water* (Recycled Water Policy), effective April 8, 2019.

DRAFT

## Attachment D – Monitoring for Priority Pollutants

Acenaphthene
Acrolein
Acrylonitrile
Benzene
Benzidine
Carbon tetrachloride
Chlorobenzene
1,2,4-trichlorobenzene
Hexachlorobenzene
1,2-dichloroethane
1,1,1-trichloreothane
Hexachloroethane
1,1-dichloroethane
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
Chloroethane
Bis(2-chloroethyl) ether
2-chloroethyl vinyl ethers
2-chloronaphthalene
2,4,6-trichlorophenol
Parachlorometa cresol
Chloroform
2-chlorophenol
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
3,3-dichlorobenzidine
1,1-dichloroethylene
1,2-trans-dichloroethylene
2,4-dichlorophenol
1,2-dichloropropane
1,3-dichloropropylene
2,4-dimethylphenol
2,4-dinitrotoluene
2,6-dinitrotoluene
1,2-diphenylhydrazine
Ethylbenzene
Fluoranthene
4-chlorophenyl phenyl ether
4-bromophenyl phenyl ether
Bis(2-chloroisopropyl) ether
Bis(2-chloroethoxy) methane
Methylene chloride
Methyl chloride
Methyl bromide
Bromoform
Dichlorobromomethane
Chlorodibromomethane
Hexachlorobutadiene
Hexachlorocyclopentadiene
Isophorone
Naphthalene
Nitrobenzene
2-nitrophenol
4-nitrophenol
2,4-dinitrophenol
4,6-dinitro-o-cresol
N-nitrosodimethylamine
N-nitrosodiphenylamine
N-nitrosodi-n-propylamine
Pentachlorophenol
Phenol
Bis(2-ethylhexyl) phthalate
Butyl benzyl phthalate
Di-N-Butyl Phthalate 2
Di-n-octyl phthalate
Diethyl Phthalate
Dimethyl phthalate
Benzo(a) anthracene
Benzo(a) pyrene
Benzo(b) fluoranthene
Benzo(k) fluoranthene
Chrysene
Acenaphthylene
Anthracene
Benzo(ghi) perylene
Fluorene
Phenanthrene
Dibenzo(,h) anthracene
Indeno (1,2,3-cd) pyrene
Pyrene
Tetrachloroethylene
Toluene
Trichloroethylene
Vinyl chloride
Aldrin
Dieldrin
Chlordane

DRAFT

4,4-DDT
4,4-DDE
4,4-DDD
Alpha-endosulfan
Beta-endosulfan
Endosulfan sulfate
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide
Alpha-BHC
Beta-BHC
Gamma-BHC
Delta-BHC
PCB-1242 (Arochlor 1242)
PCB-1254 (Arochlor 1254)
PCB-1221 (Arochlor 1221)
PCB-1232 (Arochlor 1232)
PCB-1248 (Arochlor 1248)
PCB-1260 (Arochlor 1260)
PCB-1016 (Arochlor 1016)
Toxaphene
Antimony
Arsenic
Asbestos
Beryllium
Cadmium
Chromium
Copper
Cyanide, Total
Lead
Mercury
Nickel
Selenium
Silver
Thallium
Zinc
2,3,7,8-TCDD

DRAFT

**Attachment E**

**MONITORING AND REPORTING PROGRAM NO. CI-9259**
**FOR**
**CITY OF SANTA PAULA**
**(SANTA PAULA WATER RECYCLING FACILITY)**
**(File No. 06-189)**

This Monitoring and Reporting Program (MRP) No. CI-9259 is issued pursuant to California Water Code section 13267, which authorizes the Regional Water Quality Control Board, Los Angeles Region (Regional Board) to require the City of Santa Paula (City), who discharges tertiary-treated wastewater generated from the Santa Paula Water Recycling Facility (SPWRF) to groundwater via three percolation ponds, to furnish technical or monitoring reports.

The reports required herein are necessary to:

- Determine compliance with Waste Discharge Requirements (WDRs) Order No. R4-2018-0022 and assure protection of the waters of the state and their beneficial uses.
- Assess treatment plant performance, identify operational problems, and improve plant performance.
- Assess effectiveness of the City's Pretreatment Program.
- Provide information on wastewater characteristics and flows for use in interpreting water quality and biological data.
- Determine total maximum daily load (TMDL) effectiveness.

The evidence that supports the need for the reports is set forth in the WDRs and the Regional Board record.

## I. SUBMITTAL OF REPORTS

A. The City shall comply with the Electronic Submittal of Information (ESI) requirements by submitting all reports required under this MRP, including electronic data format (EDF) groundwater and surface water monitoring data, injection location data, and monitoring reports. These reports shall be received by the Regional Board via the State Water Resources Control Board's (State Water Board) GeoTracker database under Global ID WDR100000849 on the dates indicated as follows:

1. **Quarterly Monitoring Reports** shall be received by the Regional Board by the 30th day of the month following the end of each quarterly monitoring period according to Table 1 below. The first Quarterly Monitoring Report



DRAFT

under this program must be received by the Regional Board by April 30, 2018.

**Table 1. Reporting Period and Due**

| Reporting Period | Report Due |
|---|---|
| January – March | April 30 |
| April – June | July 30 |
| July – September | October 30 |
| October - December | January 30 |

2. **Annual Summary Report** shall be received by the Regional Board by March 1 of each year. The first Annual Summary Report under this program must be received by the Regional Board no later than March 1, 2018.

B. If there is no discharge during any reporting period, the report shall still be submitted and so state.

C. Data collected from monitoring wells shall be included in the quarterly monitoring reports and annual summary report. The data shall include the well specifications, ordinances, well heads elevation to mean sea level (MSL) and the method to develop the well. The California Department of Water Resources sets standards for the construction of groundwater wells, as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 74-81* (December 1981). These well standards, and any more stringent standards adopted by the state or county pursuant to Water Code section 13801, apply to all monitoring wells used to monitor the impacts of wastewater storage or disposal governed by waste discharge or monitoring and reporting requirements.

D. In accordance with California Business and Profession Code sections 6735, 7835, and 7835.1, engineering and geologic evaluations and judgments shall be performed by or under the direction of registered professionals competent and proficient in the fields pertinent to the required activities. All reports submitted to the Regional Board pursuant to waste discharge or monitoring and reporting requirements that contain work plans for investigations and studies, that describe the conduct of investigations and studies, or that contain technical conclusions and recommendations concerning engineering and geology shall be prepared by or under the direction of appropriately qualified professional(s), such a licensed engineer or a certified hydrogeologist in the State of California, even if not explicitly stated. Each report must submitted by the Discharger shall bear the professional's signature and stamp.

E. All monitoring reports must include, at minimum, the following:

DRAFT

1. Well or location identification, date and time of sampling;

2. Sampler identification, laboratory identification, and chain of custody;

3. Quarterly observation of groundwater levels, recorded to 0.01 feet mean sea level (MSL), and flow direction; and

4. Calculation of vertical separation of the water table from the bottom of the disposal system.

## II. MONITORING REQUIREMENTS

A. Monitoring shall be used to determine compliance with waste discharge requirements and shall include, but is not limited to, implementation and documentation of the following:

1. Locations of each groundwater well where representative samples can be obtained and the rationale for the selection. The City must include a map, at a scale of 1 inch equals 1,200 feet or less, that clearly identifies the locations of the SPWRF, and all groundwater monitoring wells.

2. Sampling protocols (specified in 40 C.F.R. Part 136 or American Water Works Association standards where appropriate) and chain of custody procedures.

3. For groundwater monitoring, outline the methods and procedures to be used for measuring water levels; purging wells; collecting samples; decontaminating equipment; containing, preserving, and shipping samples; and maintaining appropriate documentation. Also include the procedures for handling, storing, testing, and disposing of purge and decontamination waters generated from the sampling events.

4. Laboratory or laboratories, which conducted the analyses. Include copy or copies of laboratory certifications by the Environmental Laboratory Accreditation Program (ELAP) of the State Water Board's Division of Drinking Water (DDW) every year or when the City changes their contract laboratory.

5. Analytical test methods used and the corresponding Detection Limits for Purposes of Reporting (DLR) for unregulated and regulated chemicals. Please see the DDW's website at http://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/EDT.shtml for unregulated and regulated chemicals.

6. Quality assurance and control measures.

B. The samples shall be analyzed using analytical methods described in 40 C.F.R. Part 136; or where no methods are specified for a given pollutant, by

DRAFT

commercially available methods approved by the United State Environmental Protection Agency (USEPA) or DDW, Regional Board and/or State Board. The City shall select the analytical methods that provide reporting detection limits (RDLs) lower than the limits prescribed in waste discharge requirements.

C. The City shall instruct its laboratories to establish calibration standards so that the RDLs (or its equivalent if there is a different treatment of samples relative to calibration standards) are the lowest calibration standard. At no time shall the City use analytical data derived from extrapolation beyond the lowest point of the calibration curve.

D. Upon request by the City, the Regional Board, in consultation with the USEPA or DDW and the State Board Quality Assurance Program, may establish RDLs in any of the following situations:

1. When the pollutant has no established method under 40 C.F.R. Part 136 (revised May 14, 1999, or subsequent revision);

2. When the method under 40 C.F.R. Part 136 for the pollutant has a RDL higher than the limit specified in this Order; or

3. When the City agrees to use a test method that is more sensitive than those specified in 40 C.F.R. Part 136 and is commercially available.

E. Samples of influent and disinfected effluent must be analyzed within allowable holding time limits as specified in 40 C.F.R. section 136.3. All quality assurance/quality control (QA/QC) analyses must be run on the same dates when samples were actually analyzed. The City shall make available for inspection and/or submit the QA/QC documentation upon request by the Regional Board. Proper chain of custody procedures must be followed and a copy of that documentation shall be submitted with the quarterly monitoring report.

F. Constituents of emerging concern (CECs): In recent years, the Regional Board has required monitoring of a select group of anthropogenic chemicals, particularly pesticides, pharmaceuticals and personal care products, known collectively as CECs, into monitoring and program requirements to better understand the propensity, persistence and effects of CECs in our environment. Recently adopted permits in this region contain requirements for CEC effluent monitoring, including identification of the CECs to be monitored in the effluent, sample type, sampling frequency, and sampling methodology.

1. The City shall monitor a selective list of CECs identified in Attachment C in the SPWRF's effluent discharge and in the groundwater. The reporting limits in Attachment C shall be used for these constituents.

2. The City shall select methods according to the following approach:

DRAFT

i. Use USEPA drinking water methods, if available;

ii. Use DDW-recommended methods for CECs, if available;

iii. If there is no DDW-recommended drinking water method for a chemical, and more than a single USEPA-approved method is available, use the most sensitive USEPA-approved method;

iv. If there is no USEPA-approved method for a chemical, and more than one method is available from the scientific literature and commercial laboratory, after consultation with DDW, use the most sensitive method; or

v. If no approved method is available for a specific chemical, the City's laboratory may develop or use its own methods and should provide the analytical methods to DDW or the Regional Board for review and approval. Those methods may be used until DDW-recommended or USEPA-approved methods are available.

vi. In the event that subsections II.F.2.i. or II.F.2.v. are applicable, the City shall inform the Regional Board.

3. CECs identified in Attachment C shall be monitored once within six months from the effective date of this Order (by May 2, 2018) and once every five years thereafter. The Regional Board Executive Officer may add or delete chemicals from Attachment C as new analytical methods become available and may also make revisions to approved analytical methods as needed. A revised CECs list will be made available to the City when changes occur. The City shall request (and submit a justification for) any deviation from the attached list for Executive Officer approval, if a change is required, before collecting samples.

4. Monitoring results shall be reported as part of the annual report. Analysis under this section is for monitoring purposes only as there are currently no standards for these constituents.

## III. REPORTING REQUIREMENTS

The City shall submit all reports to the Regional Board by the dates indicated in Section I. All quarterly and annual reports shall clearly list all non-compliance with WDRs, as well as all excursions of effluent limits. All quarterly and annual monitoring reports shall contain a separate section titled "Summary of Non-Compliance", which discusses the compliance records and corrective actions taken or planned that may be needed to bring the discharge into full compliance with WDRs.

DRAFT

## A. Quarterly Monitoring Reports

1. These reports shall include, at a minimum, the following information:

   i. The volume of the effluent used for land disposal via percolation.

   ii. The date and time of sampling and analyses on the influent, effluent, and groundwater.

   iii. All analytical results of samples collected during the monitoring period of the influent, effluent, and groundwater.

   iv. Documentation of all QA/QC procedures that were followed during sampling and laboratory analyses.

   v. Records of any operational problems, plant upset and equipment breakdowns or malfunctions, and any discharge(s) used for land disposal via percolation.

   vi. Discussion of compliance, non-compliance, or violation of waste discharge requirements.

   vii. All corrective and/or preventive action(s) taken or planned with schedule of implementation, if any violation occurs.

2. For the purpose of reporting compliance with numerical limitations, analytical data shall be reported using the following reporting protocols:

   i. Sample results greater than or equal to the RDL must be reported "as measured" by the laboratory (i.e., the measured chemical concentration in the sample);

   ii. Sample results less than the RDL, but greater than or equal to the laboratory's method detection limit (MDL), must be reported as "Detected, but Not Quantified" (DNQ). The laboratory must write the estimated chemical concentration of the sample next to DNQ as well as the words "Estimated Concentration" (may be shortened to Est. Conc.); or

   iii. Sample results less than the laboratory's MDL must be reported as "None-Detected" (ND).

3. If the City samples and performs analyses (other than for process/operational control, startup, research, or equipment testing) on any sample more frequently than required in this MRP using approved analytical methods, the results of those analyses shall be included in the report. These results shall be included in the calculation of the average

DRAFT

used in demonstrating compliance with average effluent limits, receiving groundwater limits, etc.

4. The Regional Board may request supporting documentation, such as daily logs of operations.

**B. Annual Summary Reports**

These reports shall include, at a minimum, the following information:

1. Tabular and graphical summaries of the monitoring data (quality of influent, effluent, and groundwater; quantity of influent and effluent to percolation ponds,) obtained during the previous calendar year. A comparison of laboratory results against effluent limits contained in these WDRs and notations of any exceedances of limits or other requirements shall be summarized and submitted at the beginning of the report.

2. Discussion of the compliance record and corrective and/or preventive action(s) taken or planned that may be needed to bring the treated effluent, including the treated effluent used for recycled water, into full compliance with the requirements in the WDRs.

3. An in-depth discussion of the results of the final effluent monitoring and groundwater monitoring conducted during the previous year includes:

   i. Any change of receiving groundwater resulting from effluent discharges at percolation ponds; and

   ii. Any change of groundwater flow pattern resulting from discharge via percolation ponds.

   Temporal and spatial trends in the data shall be analyzed, with particular reference to comparisons between stations with respect to distances from the monitoring wells and comparisons to data collected during previous years. Appropriate statistical tests and indices, subject to approval by the Regional Board Executive Officer, shall be calculated and included in the annual report.

4. The description of any changes and anticipated changes including any impacts in operation of any unit processes or facilities shall be provided.

5. A list of the analytical methods employed for each test and associated laboratory QA/QC procedures shall be included. The report shall restate the laboratories used by the City to monitor compliance with the accompanying Order, their status of certification, and provide a summary of analyses.

DRAFT

6. The report shall confirm operator certification and provide a list of current operating personnel, their responsibilities, and their corresponding grade of certification.

7. The report shall also summarize any change of the Operation, Maintenance, and Monitoring Plan (OMM Plan) due to the optimization of the existing SPWRF operation. The summary shall discuss conformance with the SPWRF's OMM Plan for operations, maintenance, and monitoring of the SPWRF, and whether the OMM Plan requires revision for the current facilities.

## IV. WATER QUALITY MONITORING REQUIREMENTS

### A. Influent Monitoring

1. The City shall monitor influent to the SPWRF at Influent Pump Station located in the main stream of the influent channel prior to the headworks as specified in Table 2 below.

**Table 2. Influent Monitoring**

| Constituents | Units[1] | Type of Sample | Minimum Frequency of Analysis |
|---|---|---|---|
| Total waste flow | gpd | Recorder | Continuous[2] |
| $BOD_{5@20^oC}$ | mg/L | Grab | Monthly |
| Total suspended solids | mg/L | Grab | Monthly |
| Chloride | mg/L | 24-hour composite | Monthly |
| Sulfate | mg/L | Grab | Monthly |
| Boron | mg/L | Grab | Monthly |
| Total dissolved solids | mg/L | Grab | Monthly |
| Metals[3] | µg/L | Grab | Quarterly |

Table nots: [1] gpd: gallons per day; mg/L: milligrams per liter; µg/L: micrograms per liter
[2] The City shall report the daily minimum, maximum, and average values.
[3] Metals include antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc.

### B. Effluent Monitoring

1. The City shall monitor its discharge of tertiary-treated effluent at downstream of all treated effluent passing through the effluent sampling station, including the final disinfection process.

DRAFT

2. The following shall constitute the effluent monitoring program, specified in Table 3 below:

**Table 3. Effluent Monitoring**

| Constituent | Unit[1] | Type of Sample[2] | Minimum Frequency of Analysis |
|---|---|---|---|
| Total flow | gpd | Recorder | Continuous[3] |
| UV | mW-s/cm$^2$ | Recorder | Continuous[3] |
| Turbidity | NTU | Recorder | Continuous[3][4] |
| pH | pH units | Grab | Daily |
| Fecal coliform | MPN/100mL | Grab | Daily |
| Total coliform | MPN/100mL | Grab | Daily |
| Enterococcus | MPN/100mL | Grab | Weekly |
| Total suspended solids | mg/L | 24-hour composite | Monthly |
| $BOD_{5@20^oC}$ | mg/L | 24-hour composite | Monthly |
| Oil and grease | mg/L | Grab | Monthly |
| Ammonia as nitrogen | mg/L | Grab | Monthly |
| Nitrate as nitrogen | mg/L | Grab | Monthly |
| Nitrite as nitrogen | mg/L | Grab | Monthly |
| Organic nitrogen | mg/L | Grab | Monthly |
| Residual chlorine | mg/L | Grab | Monthly |
| Total dissolved solids | mg/L | Grab | Monthly |
| Sulfate | mg/L | Grab | Monthly |
| Chloride | mg/L | Grab | Weekly |
| Boron | mg/L | Grab | Monthly |
| MBAS[5] | mg/L | Grab | Quarterly |
| CTAS[6] | mg/L | Grab | Quarterly |
| Total hardness | mg/L | 24-hour composite | Quarterly |
| Total phosphorus | mg/L | 24-hour composite | Quarterly |
| Constituents listed in Attachment A-1 to A-6 | various | Grab/24-hour composite | Quarterly |

DRAFT

| Constituent | Unit[1] | Type of Sample[2] | Minimum Frequency of Analysis |
|---|---|---|---|
| CECs in Attachment C | various | Grab | Once within 6 months and every 5 years thereafter[7] |
| Remaining priority pollutants in Attachment D | µg/L | Grab/24-hour composite | Annually |

Table notes: [1] NTU: Nephelometric turbidity unit; mW-s/cm$^2$:milli-watts seconds per square centimeter; MPN/100mL: most probable number per 100 milliliter; µg/L: micrograms per liter

[2] Grab sample is an individual sample collected in a short period of time not exceeding 15 minutes. Grab samples shall be collected during normal peak loading conditions for the parameter of interest, which may or may not be during hydraulic peaks. When an automatic composite sampler is not used, composite sampling shall be done as follows. If the duration of the discharge is equal to or less than 24 hours but greater than eight (8) hours, at least eight (8) flow-weighted samples shall be obtained during the discharge period and composited. For discharge duration of less than eight (8) hours, individual "grab" sample may be substituted. 24-hour composite is for semi-volatile and volatile chemicals.

[3] The City shall report the daily minimum, maximum, and average values.

[4] In the event the continuous turbidity meter and recorder fail, grab sampling may be substituted for a period of up to 24 hours. The turbidity samples must be taken at intervals of no more than 1.2 hours over a 24-hour period to determine compliance for turbidity.

[5] MBAS: Methylene Blue Active Substances

[6] CTAS: Cobalt Thiocyanate Active Substances

[7] CECs shall be monitored once within six months from the effective date of this Order (by May 2, 2018) and once every five years thereafter.

DRAFT

### C. Groundwater Monitoring

1. The City shall monitor the groundwater at and surrounding the SPWRF to assess the water quality impact of the SPWRF's discharges to groundwater.

2. The City shall continue to conduct groundwater monitoring from all existing wells, including MW-1, MW-2a, MW-3, MW-4, MW-5, MW-6, MW-7a, MW-8, and MW-9 until such time as the City's work plan proposing a modified groundwater monitoring network, described in Section IV.C.3 below, is approved by the Executive Officer and is implemented by the City.

3. By May 1, 2018, the City shall submit to the Regional Board a work plan proposing a modified groundwater monitoring network for compliance determination with the groundwater limitations. The proposed

groundwater monitoring network shall include groundwater monitoring wells upgradient, cross gradient, and downgradient to the percolation pond. In addition to installation of new wells, the City may propose continuing to use some or all of the existing groundwater monitoring wells (MW-1, MW-2a, MW-3, MW-4, MW-5, MW-6, MW-7a, MW-8, and MW-9). For compliance determination with the groundwater limitation for chloride, the City's proposed modified groundwater monitoring network shall include wells at approximately 150 feet downgradient from the percolation pond. The work plan shall be submitted to the Regional Board for the Executive Officer's review and approval. If the City proposes to use existing wells (such as water supply or irrigation wells) not owned by the City, or proposes to install new wells on property not owned by the City, the City shall include as part of its work plan any access agreements between the City and property owner(s) to use and/or install groundwater wells on non-City-owned property. The City shall implement the work plan, by completing installation of any new wells and commencing monitoring from them, within 60 days after the Executive Officer's approval.

4. The required groundwater monitoring of constituents/parameter with sample type and frequencies is specified in Table 4 below.

**Table 4. Groundwater Monitoring**

| Constituents | Units | Type of Sample | Minimum Frequency of Analysis[2] |
|---|---|---|---|
| Water level elevation[1] | feet | Recorder | Monthly |
| pH | pH units | Grab | Monthly |
| Total coliform | MPN/100mL | Grab | Monthly |
| Fecal coliform | MPN/100mL | Grab | Monthly |
| Enterococcus | MPN/100mL | Grab | Monthly |
| Ammonia as nitrogen | mg/L | Grab | Monthly |
| Nitrate as nitrogen | mg/L | Grab | Monthly |
| Nitrite as nitrogen | mg/L | Grab | Monthly |
| Organic nitrogen | mg/L | Grab | Monthly |
| Total dissolved solids | mg/L | Grab | Monthly |
| Sulfate | mg/L | Grab | Monthly |
| Chloride | mg/L | Grab | Monthly |
| Boron | mg/L | Grab | Monthly |

DRAFT

| Constituents | Units | Type of Sample | Minimum Frequency of Analysis[2] |
|---|---|---|---|
| Constituents listed in Attachments A-1 to A-5 | various | Grab | Annually |
| CECs in Attachment C | µg/L | Grab | Once within 6 months and every 5 years thereafter |
| Remaining priority pollutants in Attachment D | µg/L | Grab | Annually |

Table notes: [1] Annual samples shall be collected during the dry season each year.
[2] Water level elevations must be measured to the nearest 0.01 feet, and referenced to mean sea level.

**D. Monitoring of Effluent Flow to Percolation Ponds**

The City shall record the volume in gallons per day (GPD) of treated wastewater discharged to the three percolation ponds. This information shall be submitted as part of the quarterly monitoring reports.

## V. GENERAL MONITORING AND REPORTING REQUIREMENTS

A. The City shall comply with all Standard Provisions (Attachment B) related to monitoring, reporting, and recordkeeping.

B. For every requirement not met, the City shall submit a statement of the actions undertaken or proposed that will bring the treated effluent into full compliance with requirements at the earliest possible time, and submit a timetable for implementation of the corrective measures.

C. Monitoring reports shall be signed by either the principal Executive Officer or ranking elected official. A duly authorized representative of the aforementioned signatories may sign documents if:

1. The authorization is made in writing by the signatory;

2. The authorization specifies the representative as either an individual or position having responsibility for the overall operation of the regulated facility or activity; and

3. The written authorization is submitted to the Regional Board Executive Officer.

D. The monitoring report shall contain the following completed declaration:

"I certify under penalty of law that this document, including all attachments and supplemental information, was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly

DRAFT

gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment."

Executed on the ___ day of _____ at _____

_____ Signature

_____ Title

E. The City shall retain records of all monitoring information, including all calibration and maintenance, monitoring instrumentation, and copies of all reports required by this Order, for a period of at least three (3) years from the date of sampling measurement, or report. This period may be extended by request of the Regional Board at any time and shall be extended during the course of any unresolved administrative proceeding or judicial litigation regarding the regulated activity.

F. Records of monitoring information shall include:

1. The date, exact place, and time of sampling or measurements;
2. The individual(s) who performed the sampling or measurements;
3. The date(s) analyses were performed;
4. The individual(s) who performed the analysis;
5. The analytical techniques or methods used; and
6. The results of such analyses.

G. The City shall submit to the Regional Board, together with the first monitoring report required by this Order, a list of all chemicals and proprietary additives that could affect the quality of the treated effluent. Any subsequent changes in types and/or quantities shall be reported promptly. An annual summary of the quantities of all chemicals, listed by both trade and chemical names that are used in the treatment process shall be included in the annual report.

## VI. WASTE HAULING REPORTING

In the event that waste sludge, septage, or other wastes are hauled offsite, the name and address of the hauler shall be reported, along with types and quantities hauled during the reporting period and the location of final point of disposal. In the event that

DRAFT

no wastes are hauled during the reporting period, a statement to that effect shall be submitted in the quarterly monitoring report.

## VII. PRETREATMENT REPORTING

The City shall submit annual reports to the Regional Board, with copies to the State Board, and USEPA Region 9, describing the City's pretreatment activities over the period.

A. The annual reports shall identify:

1. All significant industrial users (SIUs) that violated any standards or reporting requirements during that year;

2. The violations committed;

3. The enforcement actions undertaken; and

4. The status of active enforcement actions from previous periods, including closeouts (facilities under previous enforcement actions that attained compliance during the quarter).

B. By March 1 of each year, beginning January 1, 2018, the City shall submit an annual summary report to the Regional Board describing the pretreatment activities within the service area during the previous year. In the event that any control authority within the service area is not in compliance with any conditions or requirements of this Order or their approved pretreatment program (such as due to industrial user discharges, interjurisdictional agency agreement implementation issues, or other causes,) then the City shall also include the reasons for noncompliance and state how and when the City and the control authority shall comply with such conditions and requirements. The report shall contain, but not be limited to, the following information:

1. A summary of analytical results from representative, flow-proportioned, 24-hour composite sampling of the SPWRF's influent and effluent wastewaters for those pollutants that are known or suspected to be discharged by industrial users (IUs) as identified by the pretreatment program.

2. The summary shall include the result of annual full priority pollutant scan, with quarterly samples analyzed only for those pollutants detected in the full scan.

3. The City shall also provide any influent or effluent monitoring data for non-priority pollutants that the City believes may be causing or contributing to Interference, Pass Through or adversely impacting sludge quality.

DRAFT

4. Sampling and analysis shall be performed in accordance with the techniques prescribed in pretreatment program and amendments thereto.

5. A discussion of any upset, interference, or pass-through incidents at the treatment plant (if any), which the City knows or suspects were caused by IUs of the SPWRF system. The discussion shall include the following:

   i. The reasons why the incidents occurred, the corrective actions taken, and, if known, the name and address of the IU(s) responsible.

   ii. A review of the applicable pollutant limitations to determine whether any additional limitations, or changes to existing requirements, may be necessary to prevent pass through, interference or noncompliance with sludge disposal requirements, if any.

6. A complete and updated list of the City's significant industrial users (SIUs), including names, Standard Industrial Classification code(s) and addresses, and a list of any SIU deletions and/or additions.

7. The City shall provide a brief explanation for each deletion. The SIU list shall identify the SIUs equivalent to Federal Categorical Standards by specifying which standards are applicable to each SIU. The list shall also indicate which SIUs are subject to local limitations and those that are not subject to local limits.

8. A list or table characterizing the industrial compliance status of each SIU, including:

   i. SIU name and address;

   ii. Industrial category;

   iii. The type (processes) of wastewater treatment in place;

   iv. Number of samples taken by the SPWRF during the year;

   v. Number of samples taken by the SIU during the year;

   vi. Whether all needed certifications (if allowed) were provided by SIUs that have limits for total toxic organics;

   vii. Regional Standards violated during the year, reported separately;

   viii. whether the SIU at any time in the year was in Significant Noncompliance (SNC), equivalent to that defined in 40 C.F.R. section 403.12(f)(2)(vii);

DRAFT

ix A summary of enforcement actions against the SIU taken during the year, including the type of action, final compliance date, and amount of fines assessed/collected (if any). Proposed actions, if known, should be included; and

x. Number of inspections conducted at each SIU during the year.

9. A compliance summary table that includes:

   i. SIU's which were in SNC at any time during the year;

   ii. The total number of SIUs that are in SNC with pretreatment, compliance schedules during the year; and

   iii. The total number of notices of violation and administrative orders issued against SIUs during the year:

      a. The total number of civil and criminal judicial actions filed against SIUs during the year;

      b. The number of SIUs that were published as being in SNC during the year; and

      c. The number of IUs from which penalties were collected during the year.

10. A short description of any significant changes in operating the pretreatment program that differ from the previous year including, but not limited to changes concerning:

   i. The program's administrative structure;

   ii. Local industrial discharge limitations;

   iii. Monitoring program or monitoring frequencies;

   iv. Legal authority or enforcement policy;

   v. Funding mechanisms; and

   vi. Resource requirements and/or staffing levels.

11. A summary of the annual pretreatment budget, including the cost of pretreatment program functions and equipment purchases.

12. A summary of public participation activities to involve and inform the public.

DRAFT

13. A description of any changes in sludge disposal methods and a discussion of any concerns not described elsewhere in the report.

14. The cumulative number of industrial users that the City has notified regarding Baseline Monitoring Reports and the cumulative number of industrial user responses.

15. The City shall submit the quarterly compliance status reports and the annual pretreatment report to the Regional Board.

## VIII. MONITORING FREQUENCIES

The Regional Board Executive Officer is delegated authority to revise this Monitoring and Reporting Program, including monitoring frequencies and parameters. The City may make a request (with justification) to reduce the monitoring frequency or to modify the list of monitoring constituents. The City shall not make any adjustment until the Executive Officer provides written approval after determining that the request is adequately justified.

DRAFT

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD**
**LOS ANGELES REGION**

320 West 4th Street, Suite 200, Los Angeles, California 90013
(213) 576-6600 • Fax (213) 576-6640
https://www.waterboards.ca.gov/losangeles/

# CEASE AND DESIST ORDER FOR CITY OF SANTA PAULA ORDER NO. R4-2018-0023, AS AMENDED BY ORDER NO. R4-2018-0023-A01 (SANTA PAULA WATER RECYCLING FACILITY) (FILE NO. 16-189)

REQUIRING CITY OF SANTA PAULA
TO UNDERTAKE ACTIONS TOWARD COMPLIANCE WITH
CHLORIDE REQUIREMENTS IN WASTE DISCHARGE REQUIREMENTS FOR
DISCHARGES FROM SANTA PAULA WATER RECYCLING FACILITY

DRAFT

TENTATIVE

The California Regional Water Quality Control Board, Los Angeles Region (Regional Water Board) finds:

1. The City of Santa Paula (City or Discharger) is the owner of the Santa Paula Water Recycling Facility (SPWRF), a Publicly-Owned Treatment Works (POTW), located at 920 Corporation Street in Santa Paula, California. The SPWRF is operated by Ventura Regional Sanitation District and discharges tertiary-treated wastewater to groundwater via three percolation ponds adjacent to the facility.

2. The SPWRF treats wastewater generated within the City and is designed for a flow of 4.2 million gallons per day (MGD). Based on the discharge records between July 2010 and June 2017, the monthly average effluent discharged from the SPWRF ranged between 1.36 and 2.44 MGD, with an average of 1.86 MGD.

3. The wastewater treatment process at the SPWRF consists of preliminary treatment (coarse and fine mechanical screening and grit removal at the Influent Lift Station), flow equalization (two flow equalization tanks), secondary treatment (three aeration tanks with nitrification and denitrification activated sludge), tertiary treatment (six biomembrane reactors, providing further carbonaceous oxidation, nitrification/denitrification and solids removal to meet the limits of the WDRs), and disinfection (UV). Treated and disinfected effluent is discharged to three percolation ponds. The returned activated sludge is treated at two of three aerobic digesters (one aerobic digester is for backup) after being thickened at two thickeners. The solids generated at the aerobic digesters receive final dewatering at the screw dewatering press. Final solids meeting the United States Environmental Protection Agency (USEPA) Class B reuse standards are sent to the Ventura County Regional Bio-Solids facility.

4. The SPWRF is able to meet all final effluent limitations in the City's waste discharge requirements (WDRs) except for chloride. This is due to the SPWRF not being

Adopted: February 8, 2018
Amended: May 12, 2022

designed to remove chloride. Since the SPWRF has no ability to remove chloride, chloride is passed through to the effluent and then groundwater via discharges to the percolation pond. Noncompliance with chloride effluent and groundwater limitations is the most problematic issue with the SPWRF. Table 1 summarizes the chloride concentrations of effluent discharged from the SPWRF.

**Table 1. Annual Average Chloride Concentrations[1] (milligrams per liter, mg/L) in SPWRF Effluent**

| Period | Effluent of SPWRF |
|---|---|
| 2010 | 156 |
| 2011 | 153 |
| 2012 | 149 |
| 2013 | 155 |
| 2014 | 145 |
| 2015 | 134 |
| 2016 | 137 |
| 2017 | 131 |
| 2018 | 121 |
| 2019 | 120 |
| 2020 | 118.88 |
| 2021 | 112 |
| Range[2] | 135.99 ± 15.61 |

Table 1 notes:

[1] All data were collected from grab samples.

[2] Data range is based on one standard deviation.

A. The monthly effluent chloride concentration ranged from 125 to 166 mg/L between July 2010 and June 2017, which continuously exceeded the chloride effluent limitation of 110 mg/L. This has led to an escalation of the chloride concentrations in groundwater below and surrounding the three percolation ponds with a range of 121 to 168 mg/L and an average of 140 mg/L since July 2010. The groundwater and effluent data indicate that the chloride discharges from the SPWRF have impacted the receiving groundwater quality in the vicinity of the SPWRF.

B. The elevated chloride concentrations in the effluent were believed to be associated with the approximately 1,250 Self-Regenerating Water Softeners (SRWS) installed in the households of the City. These SRWS generate brine

DRAFT

TENTATIVE

containing elevated chloride concentrations, which are discharged to sewers and delivered to the SPWRF as influent.

C. According to the effluent data collected between October 2015 and June 2017, a total of 2,479 pounds/day (lbs/day) of chloride, based on the effluent flow rate of 2.2 MGD [95 percentile of monthly average effluent flows, resulting from data recorded between October 2015 (beginning of the SRWS Buyback Program) and June 2017] and a chloride effluent concentration of 135 mg/L, were discharged to the groundwater underlying the percolation pond.

D. The chloride interim effluent limit of 1,983 lbs/day was exceeded twice between 2018 and 2021: 2,040 lbs/day in February 2021, calculated from February 8, 2021 through March 7, 2021, and 2,030 lbs/day in March 2021, calculated from March 8, 2021 through April 7, 2021.

E. The chloride interim groundwater limitation was exceeded at downgradient wells AW01 in July 2018 and at AW03 in August 2020.

5. The Regional Water Board issued three Notices of Violation (NOVs), described below, to the City for exceedances of the chloride effluent and groundwater limitations in Order No. R4-2007-0028. These NOVs required the City to implement corrective and preventative actions to bring the City's discharge into full compliance with chloride effluent limitations and receiving water requirements specified in Order No. R4-2007-0028, previously adopted by this Regional Water Board on May 3, 2007.

A. The November 3, 2011 NOV summarized chloride limit exceedances between the second quarter of 2010 and the third quarter of 2011. These violations included 15 exceedances of chloride and one exceedance of total nitrogen, di(2-ethyl)phthalate, and dioxin in effluent; and 1 exceedance of sulfate, 5 exceedances of chromium, 10 exceedances of aluminum, 1 exceedance of nickel and boron and nitrate plus nitrite, and 26 chloride exceedances of groundwater limitations.

B. The December 30, 2014 NOV summarized 36 and 88 chloride exceedances in effluent and groundwater, respectively, between the fourth quarter of 2011 and the third quarter of 2014.

C. The March 20, 2017 NOV summarized 27 and 50 chloride exceedances in effluent and groundwater, respectively, between the fourth quarter of 2011 and the fourth quarter of 2016.

6. The City's efforts to reduce the chloride concentration in the influent to the SPWRF are summarized below:

TENTATIVE

DRAFT

A. The City identified that the influent to the SPWRF contains brine with elevated chloride concentration from Self-Regenerating Water Softeners (SRWS). There are approximately 1,250 residential SRWS used in the City.

B. On September 5, 2006, the City established Ordinance No. 1160 prohibiting the installation or replacement of residential SRWS.

C. On June 22, 2015, the City adopted Resolution No. 6918 approving a SRWS Buyback and Incentive Program. This program offers a financial incentive to residents to voluntarily remove SRWS. A Kick-Off SRWS Buyback event was held on September 19, 2015. The removal of SRWS under this program began in October 2015. Three hundred (300) of the approximately 1,250 SRWS have been removed from October 2015 through February 2022. A reliable decreasing trend for chloride has not been observed in the effluent.

7. To address the City's chloride exceedances in the effluent and groundwater, the Regional Water Board required the City to submit a Chloride Reduction Workplan. Board staff also met with the City on several occasions to discuss the City's chloride exceedances. A summary of these events are as follows:

A. On December 19, 2013 and May 11, 2015, the Regional Water Board met with the City to discuss its Chloride Reduction Workplan. The City's Chloride Reduction Workplan includes the following tasks:

i. Prohibit SRWS installations or replacements;

ii. Implement a SRWS Buyback Program;

iii. Implement a Recycled Water Program to reduce effluent discharged to the three percolation ponds; and

iv. Implement Supplemental Strategies, if needed, including advanced treatment (e.g., reverse osmosis) and disposal of brine.

B. On January 28, 2016, Regional Water Board staff discussed with the City the necessary actions to reduce the chloride concentration in the effluent, which included the SRWS Buyback Program. The City also proposed to explore application of recycled water at locations other than identified groundwater hot spots and to conduct groundwater impact investigation and remediation activities. The City was notified that detailed schedules and milestones were required for all actions.

C. On March 8, 2016 and September 14, 2016, the City met with Regional Water Board staff to provide an update of its SRWS Buyback Program efforts. The City noted that five City employees were deployed to conduct door-to-door visits to encourage participation in the SRWS Buyback Program among 7,500 dwellings within the City.

DRAFT

TENTATIVE

D. On October 31, 2016, the City met with Regional Water Board staff to provide an update on the following topics:

   i. Status of implementing the chloride compliance strategy and potential for reduction of effluent discharged to the three percolation ponds via the City's Recycled Water Program;

   ii. Assimilative capacities for chloride at different groundwater locations beneath the City based on the Salt and Nutrient Management Plan for the Lower Santa Clara River Basin; and

   iii. Groundwater hot spots (i.e., chloride impaired areas with no assimilative capacity for recycled water applications) in the City.

E. On May 1, 2018, the City submitted the Self-Regenerating Water Softener Buyback Program Evaluation Report to comply with CDO requirements. The report concluded that the Buyback Program is partially effective in reducing chloride loadings to the SPWRF, but the estimated reduction in the chloride concentration in the effluent has not been met.

F. On January 30, 2019, the City submitted the Recycled Water Project Layout Report to identify potential recycled water opportunities, conduct outreach to potential recycled water users, and draft conceptual recycled water projects and evaluate them. During the process, the City met with potential project partners and interested parties to discuss opportunities, project components, design criteria, and project feasibility. However, the City was unable to accomplish the recycled water project due to an incompatibility in schedules between the City and potential recycled water partners.

G. On September 20, 2019, the City submitted the Alternative Effluent Chloride Mitigation Workplan to request a Basin Plan amendment to adopt a site-specific groundwater quality objective for chloride after discussions on January 30, 2019 and June 27, 2019.

H. On February 28, 2020, the Regional Water Board provided comments on the Alternative Effluent Chloride Mitigation Workplan. The comments required the City to provide supporting information regarding a site-specific chloride groundwater quality objective that would be protective of beneficial uses for agricultural water supply for salt sensitive crops.

I. On April 15, 2020, the City notified the Regional Water Board of its modified approach to upgrade the SPWRF with reverse osmosis (RO), in lieu of the proposed recycled water project, to reduce chloride concentrations in the treated effluent to meet the permit requirements.

DRAFT

TENTATIVE

J. On July 13, 2020, the City requested development of a site-specific groundwater quality objective for chloride of 117 mg/L as a Basin Plan amendment to reduce the cost of the RO implementation.

K. On December 1, 2021, the City and Regional Water Board staff discussed the progress of the RO plant development and the requested Basin Plan amendment. The City decided to implement the advanced wastewater treatment system with RO based on the existing groundwater quality objective for chloride of 110 mg/L.

8. On July 9, 2015, the Regional Water Board adopted Resolution No. R15-007, an amendment to the Basin Plan that incorporated stakeholder-developed groundwater quality management plan for salts and nutrients in the Lower Santa Clara River groundwater basins. Groundwater quality management measures were developed by stakeholders as part of the Salt and Nutrient Management Plan (SNMP) for the Lower Santa Clara River Basins in Ventura County. Such plans are a requirement of the State Water Resources Control Board's (State Water Board) Recycled Water Policy and are intended to maintain high quality waters and to protect the beneficial uses of groundwater while promoting recycled water use throughout the state. The SNMP utilized a groundwater quality model that characterized the water quality in the Santa Paula Basin and examined the degree of impairment to water quality in the Basin. The model shows there is available assimilative capacity for salts and nutrients, including chloride, in most areas of the Santa Paula Basin to allow for recycled water projects consistent with the Recycled Water Policy. As described below, the City is planning to recycle effluent that is currently discharged to the percolation pond.

9. The City developed and utilized a simple spreadsheet mixing model, the *Groundwater Chloride Transportation Model* (Chloride Model), to analyze the effect of future effluent discharges on groundwater overtime at various distances from the percolation pond. The City's modeling assumed some degradation of groundwater with respect to chloride within a limited range of mixing zone radius below and adjacent to the SPWRF, measured from the boundaries of the percolation pond. This distance is the maximum allowable distance where SPWRF effluent disposed to the percolation pond can mix with groundwater and result in receiving water chloride concentrations of 110 mg/L or less in order to provide protection to groundwater beneficial uses at the first encountered water supply wells which are at 150 feet away from the percolation ponds. Groundwater within the mixing zone will exceed the chloride groundwater quality objective (GQO) of 110 mg/L. Mass-volume balance calculations along with Darcy's Law are used to account for travel in porous media. The Chloride Model simulates instantaneous and complete mixing of ambient groundwater with effluent seepage reaching the water table from the percolation pond using SPWRF data for flow and chloride effluent concentrations. It was conservatively assumed that any effluent discharge to the percolation pond would infiltrate into the underlying aquifer and not be diverted for other uses. Groundwater parameters within the spreadsheet model were selected based on recent monitoring reports in order to be representative of average conditions within the vicinity of the

TENTATIVE

DRAFT

SPWRF. The Chloride Model assumes an initial volume of groundwater underlying the ponds possessing background chloride concentrations of 136 mg/L. The volume of the existing groundwater body is calculated as the product of the radius of interest (150-1200 feet), an assumed saturated thickness of potentially impacted groundwater (50 feet), and the porosity of the underlying sediments (assumed to be 0.2) based on the low end of published literature values for a sand and gravel mixture. Based on the regional groundwater quality data documented in the SNMP, regional groundwater inflow is assumed to have a chloride concentration of 91 mg/L.

On December 14, 2016, Regional Water Board staff met with the City to discuss the results of the Chloride Model, which evaluated compliance with the groundwater quality objectives beneath and adjacent to the three percolation ponds, for various discharge scenarios. Based on Regional Water Board staff's comments, the City implemented additional discharge scenarios in the Chloride Model, which was discussed in meetings held on February 8, 2017, February 17, 2017, July 24, 2017, and August 7, 2017.

10. The Chloride Model simulated chloride concentrations in the receiving groundwater resulting from chloride mass loading reduction in the three percolation ponds. The Model predicted GQOs being achieved at 150 feet away from the percolation pond when the total mass of chloride in the effluent is significantly reduced. The initial mass of chloride is calculated based on the average chloride effluent concentration of 135 mg/L and the discharge rate of 2.2 MGD, which results in 2,479 pounds total mass of chloride discharged per day. The reduction of chloride mass discharged to the percolation pond can be achieved by improving the effluent chloride concentration (e.g., source control or treatment), or diverting a significant amount of flow for recycled water uses, or a combination of both in order to protect water supply wells AW01, AW02, and AW03, approximately 150, 150, and 300 feet, respectively, away from percolation pond. Water produced from these wells is primarily for agricultural irrigation use.

    To achieve the chloride GQO of 110 mg/L in groundwater at least 150 feet away from the percolation pond, the City provided various effluent chloride concentrations and allowable flow combinations (Table 2). Based on the hydrology and hydrogeologic condition at the SPWRF percolation ponds area, the higher the concentration of chloride in the effluent, the less volume and mass can be discharged to percolation ponds to comply with the chloride GQO in the Basin Plan. For example, if the chloride concentration in the effluent is 135 mg/L, only 0.07 MGD, which is equivalent to 79 pounds of chloride per day, could be discharged to the percolation pond to achieve the chloride GQO of 110 mg/L at 150 feet away from the percolation pond. If the chloride concentration in the effluent is reduced to 120 mg/L, then more flow (0.2 MGD) can be discharged to the percolation pond and achieve the chloride GQO 150 feet away from the percolation pond.

**Table 2. Groundwater Chloride Transportation Model – Continuous Discharge**

DRAFT

TENTATIVE

| Chloride Effluent Concentration | Flow to Percolation Ponds (% of 2.2 MGD) | Allowable Effluent Mass Load to Groundwater (Daily) | Chloride Groundwater Concentration at 150 feet |
|---|---|---|---|
| 135 mg/L | 0.07 MGD (3.2%) | 79 pounds (lbs) | 110 mg/L |
| 130 mg/L | 0.1 MGD (4.5%) | 108 lbs | 110 mg/L |
| 125 mg/L | 0.13 MGD (5.9%) | 135 lbs | 110 mg/L |
| 120 mg/L | 0.2 MGD (9.1%) | 200 lbs | 110 mg/L |
| 115 mg/L | 0.4 MGD (18.2%) | 384 lbs | 110 mg/L |

11. To achieve compliance with the chloride GQO and to conserve potable water, the City will construct the advanced wastewater treatment system with RO as proposed in the April 15, 2020 letter. The Regional Board has evaluated the proposed RO system and determined that it will be consistent with the State Water Board's Recycled Water Policy and will preserve available assimilative capacity within the Santa Paula Basin consistent with the SNMP. The mass-based effluent limitation for chloride previously established in the WDRs will no longer be applicable, but the concentration-based effluent limitation for chloride is appropriate after implementing the RO system. The groundwater limitations are based on the GQOs in the Basin Plan.

12. On December 22, 2015, the City submitted the Recycled Water Program Technical Report and Notice of Intent with the Title 22 Engineering Report to the State Water Board's Division of Drinking Water (DOW) for approval. DOW conditionally approved the Title 22 Engineering Report on August 19, 2016. On June 14, 2017, the Regional Water Board enrolled the City's recycled water program under separate Water Reclamation Requirements for Recycled Water Use Order WQ 2016-0068-DDW, issued by the State Water Board on June 7, 2016.

    In March 2020, the City decided to upgrade the SPWRF with the RO process to reduce the chloride concentrations in the effluent to meet the permit requirements. In December 2021, the City stated that the RO system would be able to produce 110 mg/L of chloride in the effluent to meet the groundwater quality objective in the Basin Plan. Currently, the City has completed the State Water Board Clean Water State Revolving Fund application with the State Water Board Division of Financial Assistance. The City plans to complete construction of the RO system within two years of receiving the Final Funding Agreement but no later than December 2024.

13. In the City's report, *Chloride Load Reduction Milestones,* submitted to the Regional Water Board on March 14, 2017, the City included the construction of reverse osmosis treatment at the SPWRF as an option (under Supplemental Strategies), if needed, in order to comply with the chloride groundwater quality objective of 110 mg/L. The City will continue its source control efforts to remove SRWSs and will first focus on recycling most of its effluent in order to bring the groundwater back into

DRAFT

TENTATIVE

compliance with GQOs. Progress with these efforts will be assessed at Year 2022 and determination will be made as to whether advanced treatment will be required to meet the chloride GQO at Year 2027. If advanced treatment is required, effluent limits will be applied in a way to ensure protection of all beneficial uses, including salt-sensitive crops.

In March 2020, the City decided to upgrade the SPWRF with an advanced treatment system, including RO, to reduce the chloride concentrations in the effluent to meet the permit requirements. In December 2021, the City stated that the RO system would be able to produce effluent with a chloride concentration of 110 mg/L to meet the groundwater quality objective in the Basin Plan. The City has submitted a State Water Board Clean Water State Revolving Fund application with the State Water Board Division of Financial Assistance. The City plans to complete construction of the RO system within two years of receiving the Final Funding Agreement but no later than December 2024.

14. Due to the following reasons, the City cannot immediately comply with the chloride effluent and groundwater limitations prescribed in this Order: (1) elevated chloride concentrations in the influent, (2) the wastewater treatment process not currently designed to remove chloride out of the waste stream, and (3) time needed to construct the advanced wastewater treatment system with RO. In addition, the current progress of the City's SRWS Buyback Program does not reliably ensure that the SPWRF will comply with the chloride effluent and groundwater limitations. Therefore, the Regional Board has determined that issuance of an accompanying CDO is appropriate and necessary to put the City on the path towards compliance with the effluent and groundwater limitations for chloride set forth in this Order. The CDO requires the City to comply with interim chloride effluent and groundwater limitations and implement actions pursuant to a prescribed time schedule.

During the pendency of the CDO schedule, there will be permitted degradation of groundwater with respect to chloride within a limited mixing zone radius downgradient and adjacent to the SPWRF percolation ponds, measured from the boundaries of the percolation ponds to 150 feet. This distance is the shortest distance where SPWRF effluent disposed to the percolation pond can mix with groundwater and result in receiving water chloride concentrations of 110 mg/L or less. Groundwater within the 150-foot mixing zone will exceed the chloride GQO of 110 mg/L for the duration of the CDO schedule. Based on the available data, there are no water supply wells within the 150-foot mixing zone. The City can arrange for alternative water supplies for any well owners in the mixing zone, if any are discovered. At the end of the CDO schedule, the mixing zone is no longer allowed, and compliance with the chloride limitation of 110 mg/L at monitoring wells adjacent to and downgradient from the boundaries of the percolation ponds is required.

15. California Water Code (CWC) section 13301 provides in pertinent part "When a regional board finds that a discharge of waste is taking place, or threatening to take place, in violation of requirements or discharge prohibitions prescribed by the regional board or the state board, the board may issue an order to cease and desist

TENTATIVE
DRAFT

and direct that those persons not complying with the requirements or discharge prohibitions (a) comply forthwith, (b) comply in accordance with a time schedule set by the board, or (c) in the event of a threatened violation, take appropriate remedial or preventive action ... Cease and desist orders may be issued directly by a board, after notice and hearing."

16. As a result of the historical monitoring data and other activities described in this CDO, the Regional Water Board finds that a discharge of waste is taking place or threatening to take place in violation of requirements or discharge prohibitions prescribed by the Regional Water Board in the City's WDRs, Order No. R4-2018-0022. This CDO requires the City to take appropriate remedial action and to comply in accordance with the time schedule set forth below. The compliance schedules provide the City sufficient time to achieve compliance with the chloride requirements in its WDRs.

17. This Order includes interim effluent and groundwater limitations, identified below, and actions and milestones proposed by the City leading to compliance with the effluent and groundwater limitations for chloride. The interim effluent and groundwater limitations are based on gradual reductions in chloride mass loading. The established compliance schedule is as short as possible, taking into account the technological, operation, and economic factors that affect the design, development, and implementation of the remedial actions that are necessary to comply with the effluent and groundwater limitations.

18. A CDO is appropriate in these circumstances to allow time for the City to implement the advanced wastewater treatment system to bring the SPWRF into compliance with the effluent and groundwater limitations. The temporary exceedances allowed by this CDO are in the public interest given the significant environmental benefits associated with reducing chloride loading to groundwater to promptly achieve compliance with the effluent and groundwater limitations, and to allow for potential recycled water use throughout the City of Santa Paula, especially in light of California's historic drought and predictions for future climatological effects from climate change.

19. CWC section 13267 provides in pertinent part:

    (a) A regional board, in establishing or reviewing any water quality control plan or waste discharge requirements, or in connection with any action relating to any plan or requirement or authorized by this division, may investigate the quality of any waters of the state within its region.

    (b)(1) In conducting an investigation specified in subdivision (a). the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region ... shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the

DRAFT

TENTATIVE

report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports.

20. The technical and/or monitoring reports required by this CDO are necessary to assure compliance with the WDRs Order No. R4-2018-0022 and this CDO. The City operates the SPWRF that produces and discharges the waste subject to WDRs. The actions and reports required by this CDO are directly related to the City's compliance with these requirements and do not require expense that is not already required pursuant to the WDRs. This CDO provides time for the City to comply and to spread costs over several years. The burden of these actions and reports bears a reasonable relationship to the need for the actions and reports.

21. This CDO concerns an existing facility and does not significantly alter the status with respect to the SPWRF. The issuance of this Order is an enforcement action by a regulatory agency and is being taken for the protection of the environment. Therefore, issuance of this Order is exempt from the provisions of the California Environmental Quality Act (Public Resources Code, Section 21100, et seq.) in accordance with sections 15061(b)(3), 15301, 15306, 15307, 15308, and 15321 (a)(2) of Title 14 of the California Code of Regulations.

22. The Regional Water Board has notified the City and interested agencies and persons of its intent to issue this CDO concerning compliance with the WDRs. The Regional Water Board accepted written comments, and heard and considered all comments and evidence pertaining to this matter in a public hearing.

23. Any person aggrieved by this action of the Regional Water Board may petition the State Water Board to review the action in accordance with California Water Code section 13320 and California Code of Regulations, title 23, sections 2050 and following. The State Water Board must *receive* the petition by 5:00 p.m., 30 days after the date of this Order, except that if the thirtieth day following the date of this Order falls on a Saturday, Sunday, or state holiday, the petition must be received by the State Water Board by 5:00 p.m. on the next business day. Copies of the law and regulations applicable to filing petitions may be found on the Internet at Water Quality Petitions | California State Water Resources Control Board (http://www.waterboards.ca.gov/public_notices/petitions/water_quality) or will be provided upon request.

**THEREFORE, IT IS HEREBY ORDERED** that, pursuant to California Water Code sections 13301 and 13267, the City of Santa Paula, as owner of the SPWRF, shall comply with the following measures to ensure compliance with Order No. R4-2018-0022:

1. Cease and desist discharging chloride in violation or threatened violation of Order No. R4-2018-0022. No term or condition of Order No. R4-2018-0022 is superseded or stayed by this CDO.

DRAFT

TENTATIVE

2. The discharge of treated wastewater from the SPWRF shall not cause the exceedance of the following groundwater limitations in Table 3 below. Comply immediately with the interim effluent and groundwater limitations for chloride prescribed in Table 3 below, and in accordance with the following schedule.

**Table 3. Interim Chloride Limitations**

| Effluent Limitation (Monthly Average)[0] | Mass Reduction | Groundwater Limitation (Monthly Average) | Deadline |
|---|---|---|---|
| 2,479 lbs/day[1] | 0% | 136 mg/L[2] | February 8, 2018 |
| 2,231 lbs/day[1] | 10% | 136 mg/L[2] | February 8, 2020 |
| 1,983 lbs/day[1] | 20% | 136 mg/L[2] | February 8, 2021 |
| 1,983 lbs/day[5][6] | 20% | 136 mg/L[2] | July 1, 2022 |
| 110 mg/L[3] | Not applicable | 129 mg/L[4] | March 30, 2025 |
| 110 mg/L[3] | Not applicable | 114 mg/L[4] | February 8, 2027 |

Table 3 notes:

[0] Monthly Average except as noted.

[1] Based on the City's *Chloride Load Reduction Milestones* dated August 8, 2017.

[2] Based on the 95th percentile of chloride effluent concentrations during the implementation of the SRWS Buyback Program from October 2015 to September 2017.

[3] The concentration-based effluent limitation is based on the groundwater quality objective in the Santa Paula Groundwater Basin-West of Peck Road Subbasin. The deadline considers the date of December 30, 2024 for completion of construction of the reverse osmosis unit and a 90-day optimization period.

[4] The change in the groundwater concentration is not expected to be immediate.

[5] Based on paragraph No. 4.D, the City cannot consistently comply with the effluent limitation on a monthly basis due to a lack of flow control measures that would have been in place with the recycled water project.

[6] Compliance with the effluent limitation is based on an annual monthly running average. For example, to meet the July 1, 2022 compliance date, the monthly average from July 2021 to June 2022 must be no greater than 1,983 lbs/day.

3. Comply with the following remedial actions and milestones according to the time schedule below:

A. By **May 1, 2018,** the City shall submit a technical report evaluating the long-term effectiveness of the SRWS Buyback Program for the reduction of chloride concentration in the SPWRF's effluent and the groundwater.

B. By **August 1, 2018,** the City shall submit a *Groundwater Chloride Investigation and Well Protection Workplan* (with schedules and milestones) for the Executive Officer's review and approval. The City shall implement this

DRAFT

TENTATIVE

Workplan within 120 days from the Executive Officer's approval. The Workplan shall:

i. Identify the names/numbers and locations of the groundwater monitoring wells to determine site-specific groundwater flow direction and gradient for the purposes of adequately assessing any impacts of chloride discharges to the quality of the receiving groundwater;

ii. Identify all water supply wells that may be influenced by the discharge of chloride from the SPWRF, the well structures, ownership and associated groundwater quality; and

iii. Include an approach to ensure that groundwater quality influenced by the discharge of chloride from the SPWRF and delivered from agricultural water supply wells to irrigate salt-sensitive crops be no higher than 117 mg/L. Alternatively, the City may voluntarily provide alternative water supplies to private well owners to irrigate salt-sensitive crops, upon request by the well owners.

C. By **March 15, 2022,** the City shall submit the final design report for the advanced treatment system at the SPWRF, including brine concentration facility and brine management plan.

D. By **October 15, 2022,** the City shall complete all necessary regulatory requirements, including compliance with the California Environmental Quality Act (CEQA), and obtain all necessary permits for construction and/or installation of the advanced treatment system.

E. **Within three months** of receiving the Final Funding Agreement from the Department of Financial Assistance, but no later than **March 30, 2023**, the City shall complete and release a Bid Package for the advanced wastewater treatment system with a reverse osmosis process.

F. No later than **June 30, 2023**, the City shall complete contractor selection and award the contract for construction of the advanced wastewater treatment system with a reverse osmosis process.

G. **Within twenty-four months** of receiving the Final Funding Agreement from the Department of Financial Assistance, but no later than **December 30, 2024**, the City shall complete construction and start-up of the advanced wastewater treatment system with a reverse osmosis process.

H. As soon as possible, but no later than **February 8, 2028,** the City shall achieve full compliance with the effluent and groundwater limitations for chloride prescribed in Order No. R4-2018-0022.

DRAFT

TENTATIVE

I. After each date listed in subsection A through G above, the City shall provide a verbal report at the next regularly scheduled Board meeting pertaining to the compliance, or lack thereof, with the requirement.

J. Subsections F and G, above, do not limit the City's ability to propose a Basin Plan amendment for Regional Water Board consideration prior to November 14, 2024. At any time during the term of this CDO, the City may propose a Basin Plan amendment that the Regional Water Board will consider, including an averaging period and/or a site-specific chloride GQO that protects beneficial uses. As with subsection G, the City shall include supporting scientific and technical information and analysis demonstrating that beneficial uses would be protected, as well as documentation that such a proposal was discussed in detail by a stakeholder working group.

4. Submit quarterly progress reports on the status of the City's compliance with the effluent and groundwater limitations for chloride in Order No. R4-2018-0022 and this CDO.

A. Each quarterly progress report shall include, but is not limited to:

i. Continuous SRWS Buyback Program Assessment - The City shall report its progress on the SRWS Buyback Program and evaluate whether the Program is resulting in chloride reductions in the effluent and groundwater.

ii. Groundwater and Well Protection Program - The City shall report its progress on implementing the Groundwater Chloride Investigation and Well Protection Workplan, including the actions taken to protect water supply wells influenced by the discharge of chloride from the SPWRF.

iii. Alternative Effluent Chloride Mitigation Implementation - The City shall provide the progress of implementing the alternative effluent chloride mitigation workplan and evaluate the compliance with the schedule and milestones set forth in the CDO and WDRs.

B. Quarterly progress reports shall be *received* by the Regional Water Board by the 30th day of the month following the end of each quarterly monitoring period according to Table 4 below. The first report is due by April 30, 2018.

**Table 4. Reporting Period and Due**

| Quarterly Report | Reporting Period | Report Due |
|---|---|---|
| First Quarter | January – March | April 30 |
| Second Quarter | April – June | July 30 |
| Third Quarter | July – September | October 30 |

DRAFT

TENTATIVE

| Quarterly Report | Reporting Period | Report Due |
|---|---|---|
| Fourth Quarter | October – December | January 30 |
| Annual | January – December | April 30 |

Table 4 notes if a deadline falls on a Saturday, Sunday, or State holiday, the report must be received by the next business day.

5. Any person signing a document submitted under this CDO shall make the following certification:

   "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

6. In accordance with California Business and Professions Code sections 6735, 7835, and 7835.1, engineering and geologic evaluations and judgments shall be performed by or under the direction of registered professionals competent and proficient in the fields pertinent to the required activities. All technical reports specified herein that contain work plans for, that describe the conduct of investigations and studies, or that contain technical conclusions and recommendations concerning engineering and geology shall be prepared by or under the direction of appropriately qualified professional(s), even if not explicitly stated. Each technical report submitted by the City shall contain the professional's signature and/or stamp of the seal.

7. The City shall submit all reports required under this CDO, including groundwater monitoring data in Electronic Data Format, well and discharge location data, and searchable Portable Document Format (PDF) of reports and correspondence, to the State Water Board's GeoTracker database under Global ID WDR100000849.

8. If the City fails to comply with any provision of this CDO, the Regional Water Board may take any further action authorized by law. The Executive Officer, or his/her delegee, may take appropriate administrative enforcement action pursuant, but not limited to, California Water Code sections 13268 and/or 13350. The Regional Water Board may also refer any violations to the Attorney General for judicial enforcement, including injunction and civil monetary remedies.

9. This CDO may be reopened at the Regional Water Board's discretion to consider limits or other requirements for the SPWRF and may specifically be reopened to make revisions consistent with the City's efforts to reduce chloride discharge from the SPWRF.

DRAFT

TENTATIVE

10. This Order becomes effective immediately upon issuance.

I, Renee Purdy, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Los Angeles Region, on May 12, 2022.

Renee Purdy
Executive Officer

DRAFT

TENTATIVE

# Appendix D – Trussel Technologies, Inc., Evaluation of Biological Design and Process Sizing Technical Memorandum

DRAFT

# Technical Memorandum

City of Santa Paula Water Recycling Facility
Design, Build, Operate, Finance

**Date:** 6 January 2008
**Revised:** 25 January 2008

**Authors:** R. Shane Trussell, Ph.D., P.E.
Joanne Chiu

**Subject:** Evaluation of Biological Design and Process Sizing

DRAFT

## OBJECTIVE OF THIS MEMORANDUM

The purpose of this document is to evaluate the biological design and determine process equipment sizing using process simulation software. The process will be evaluated at the design capacity, at the current wastewater flows, and solids stabilization and handling will also be assessed. In addition, process aeration demands will be determined and recommendations for maintaining a healthy biology through careful process design will also be discussed.

## DESCRIPTION OF EVALUATION PROCEDURE

The City of Santa Paula has selected the membrane bioreactor (MBR) technology to serve as the principle wastewater treatment process for this Water Reclamation Facility (WRF). An MBR is a biological process that combines secondary and tertiary treatment using low-pressure membrane filtration. Because membranes are used to provide the necessary solids-liquid separation, MBR effluent is consistently high quality with low turbidity, low chemical oxygen demand (COD), and non-detect total suspended solids (TSS), making it suitable for feeding directly into an RO process (if required in the future). However, using membranes for solids-liquid separation also means that the biological design requires careful consideration. MBRs are a perfect trap for filamentous bacteria that float and cause biological foaming events. MBRs are also operated at 2 to 4 times the mixed liquor suspended solids (MLSS) concentration compared to conventional activated sludge processes, which means that special attention must be paid to the aeration design. Finally, MBRs have especially high dissolved oxygen (DO) concentrations in the membrane tanks and this fact,

accompanied with required high rates of mixed liquor circulation, means that caution must be exercised to ensure that intended anoxic zones remain anoxic.

Biological modeling simulations were performed using GPS-X process simulator. GPS-X is a modular, multi-purpose modeling environment for the simulation of municipal and industrial wastewater treatment plants (GPS-X Technical Reference, Chapter 3). GPS-X from Hydromantis is similar to BIOWIN or other wastewater models.

## INFLUENT DESIGN CRITERIA

The flow information and annual average influent wastewater characteristics presented in Table 1 and Table 2 were obtained from the Request For Proposal (RFP), Appendix B – Performance Specification, from the City of Santa Paula for a new Water Recycling Facility (WRF).

**Table 1. Design influent wastewater flows**

| *Flow* | *Unit* | *2005* | *2015* |
|---|---|---|---|
| Average Annual Influent Flow | MGD | 2.5 | 3.4 |
| Peak Day Flow | MGD | 6.3 | 7.2 |
| Peak Hour (8 hours) Flow | MGD | - | 10.4 |

**Table 2. Raw influent wastewater characteristics**

| *Parameters* | *Unit* | *Raw Influent* |
|---|---|---|
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand (BOD) | mg/L | 320 |
| Chemical Oxygen Demand (COD) | mg/L | 736 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 53 |
| Ammonia ($NH_3$) | mg/L | 32 |
| Total Suspended Solid (TSS) | mg/L | 210 |
| Alkalinity (as $CaCO_3$) | mg/L | 300 |

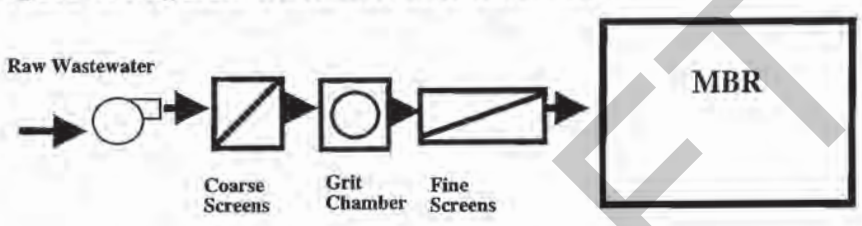
However, screened influent wastewater characteristics presented in Table 3 were used for the described modeling efforts. This is because the changes in wastewater properties through the screening process generally reduce the ratio of BOD/TKN, which will have an important impact on a biological design for nitrogen removal. Additionally, all MBR manufacturers require fine screening of influent wastewater to protect the membranes from physical damage. For this design, the headworks consists of three steps (see Figure 1):

1) coarse bar screens (6 mm),
2) circular grit chambers,
3) Huber Rotomat fine drum screens (2 mm)

DRAFT

The headworks are one of the most common "headaches" associated with operating an MBR facility. With this in mind, this facility is designed with 2 gross solids removal processes ahead of the fine screens to reduce the loading to the fine screens. Additionally, all of these headwork process units are oversized to reduce the frequency of required maintenance and ensure consistent performance. The coarse bar screens and grit chamber have a rated capacity of 17 MGD and the fine screens have a rated capacity of 10.4 MGD when treating raw wastewater. A decision was made not to use 1 mm fine screens because of their increased susceptibility to blinding and the additional unwanted screenings produced by these units. Even though 1 mm fine screens may provide additional protection for the membranes, both membrane manufacturers considered in this design (Koch Puron and GE/Zenon) allow 2 mm fine screens.

**Figure 1. Physical treatment flow schematic**




Based on the specifications provided by Huber Technologies, a 5% to 10% COD reduction and 20% to 40% suspended solid reduction can be achieved in a single step, 1 mm fine screening process of raw wastewater. As a result, it is reasonable to assume a 10% loading reduction of COD, BOD, TKN-organic nitrogen, and TSS could be achieved through the 3-step physical removal process described above. Screened influent wastewater characteristics are summarized in Table 3.

**Table 3. Design screened influent wastewater characteristics**

| *Influent Parameters* | *Unit* | *Screened Influent* |
|---|---|---|
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand (BOD) | mg/L | 288 |
| Chemical Oxygen Demand (COD) | mg/L | 662 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 51 |
| Ammonia ($NH_3$) | mg/L | 32 |
| Total Suspended Solid (TSS) | mg/L | 189 |
| Alkalinity (as $CaCO_3$) | mg/L | 300 |

The peak day flow was used to evaluate the adequacy of the biological sizing of this facility. The peak day flow was estimated in the RFP based on the additional 3.8 MG of inflow volume from a 100-year storm to the annual average flow. It is appropriate to assume that the additional 3.8 MG of wet weather flow contains low organics and solids concentrations and will thus have a limited impact on the

DRAFT

influent loadings of organics and solids as lbs per day. However, to ensure a robust biological process design, the loadings of TSS, BOD, COD, and TKN were all increased by 20% to represent the peak day influent wastewater loads, as detailed in Table 4.

**Table 4. Average and peak day influent loads**

| *Influent Parameters* | *Unit* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|---|
| TSS | 1000 lb/day | 5.4 | 6.4 |
| BOD | 1000 lb/day | 8.2 | 9.8 |
| TKN | 1000 lb/day | 1.4 | 1.7 |
| COD | 1000 lb/day | 18.8 | 22.6 |

As a result of the 20% safety factor that was applied to the peak day loads, the peak day influent wastewater concentrations need to be estimated and are presented in Table 5.

**Table 5. Design peak day influent organic wastewater characteristics**

| *Influent Parameters* | *Unit* | *Values* |
|---|---|---|
| Flow | MGD | 7.2 |
| TSS | mg/L | 107 |
| BOD | mg/L | 163 |
| TKN | mg/L | 28.8 |
| COD | mg/L | 375 |
| Min Design Temperature | °C | 19 |

DRAFT

The influent fractions and coefficients presented in Table 6 were adjusted from the GPS-X default values to accommodate the wastewater characteristics presented in Tables 3 and 5. These adjustments were made using an "Influent Advisor" which was developed by Hydromantis to help users better understand the influent water quality characteristics and to avoid assumption errors.

**Table 6. Influent wastewater fractions and coefficients**

| *Fractions/Coefficients* | *Default Value* | *Value Used* |
|---|---|---|
| xCOD/VSS Ratio | 2.20 | 3.0 - 3.4 |
| VSS/TSS Ratio | 0.60 | 0.785 |
| Ammonia/TKN Ratio | 0.65 | 0.63 |

## EFFLUENT DESIGN CRITERIA

Since the MBR process produces non-detect TSS and low COD water for a wide-range of operating conditions (Merlo et al., 2007), the MBR sizing was controlled by the effluent nitrogen limits that the City is required to meet in its *Waste Discharge Requirements ORDER NO. R4-2007- 0028*. The monthly, or 30-day,

average nitrate + nitrite as nitrogen concentration of 5 mg/L must be achieved through the WRF. For this design, a safety factor of 20% was applied that produced a performance target of nitrate+nitrite as nitrogen of 4 mg/L (Table 7).

**Table 7. WRF Required Effluent Limits and Performance Targets**

| *Constituent* | *Unit* | *Effluent Limit* | *Performance Target* |
|---|---|---|---|
| Nitrate + Nitrite as nitrogen | mg/L | 5 | < 4 |

## PROCESS DESIGN CRITERIA

The following table presents the proposed process tank sizes provided by the PERC team for this MBR design. Approximately one quarter of the biological reactor volume will be used as a dedicated anoxic zone for denitrification. Different from the Kennedy/Jenks design, the second anoxic zone was eliminated as biological modeling (results presented in upcoming sections) demonstrated that this was not needed. Additionally, there were significant concerns expressed by the project team about having an anoxic zone just prior to the membrane separation tank in an MBR. This is because increased rates of membrane fouling have been attributed to anoxic sludge conditions (Jang et al., 2006).

**Table 8. Preliminary tank design operating volumes**

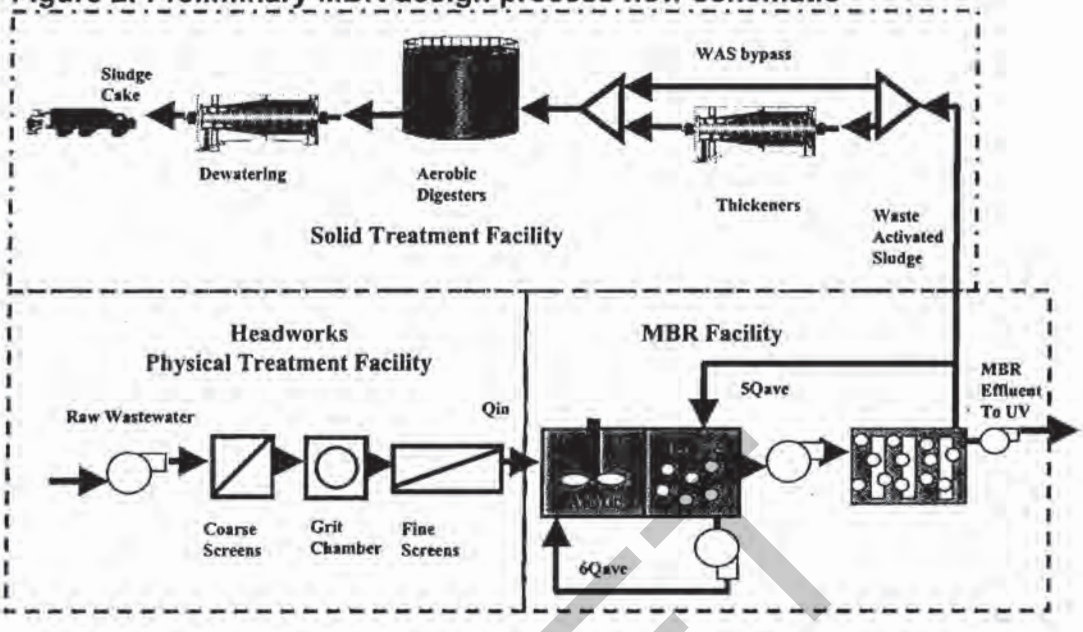
| *MBR VOLUME DISTRIBUTION* | *Size, cu.ft* | *%* | *Size, gal* |
|---|---|---|---|
| Anoxic Volume | 71,205 | 26.7 | 532,650 |
| Aerobic Volume | 180,428 | 67.7 | 1,349,700 |
| Membrane Tank Volume | 15,039 | 5.6 | 112,500 |
| *Total Operating Reactor Volume* | *266,672* | *100* | *1,994,850* |

### Process Flow Schematic

A process flow diagram for the MBR process is presented in Figure 2. The screened raw wastewater first flows into the anoxic zone, then to the aerobic zone, and continues to the membrane tank. Nitrified mixed liquor is recirculated (internal recycle) at a rate of 20.4 MGD (6 $Q_{ave}$) from the end of the aerobic zone to the head of the anoxic zone to provide nitrate and biomass for denitrification. Additionally, 17 MGD (5 $Q_{ave}$) of return activated sludge (RAS) is returned from the membrane tank to the head of the aerobic zone to prevent excessive solids concentrations from occurring in the membrane tank. For the peak day flow, the RAS rate will be increased to 30 MGD.

DRAFT

**Figure 2: Preliminary MBR design process flow schematic**




## BIOLOGICAL MODELING RESULTS FOR THE DESIGN FLOWS

Based on the design criteria presented in previous sections, modeling simulations were performed. A solids residence time (SRT) of 14.7 d was determined for the predicted average flow of 3.4 MGD and 14.0 d for the peak day flow of 7.2 MGD. An SRT of more than 14 d ensures that nitrification will be stable and helps to minimize membrane fouling (Trussell et al., 2006). The MLSS concentrations and operational parameters are summarized in Table 9.

**Table 9. Biological process control and MLSS concentration**

| *Process Control Parameters* | *Units* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|---|
| F/M | gCOD/gMLSS.d | 0.07 | 0.08 |
| Wasting Rate | MGD | 0.11 | 0.11 |
| SRT | d | 14.7 | 13.8 |
| Internal Recycle Rate | MGD | 20.4 | 20.4 |
| RAS Rate | MGD | 17 | 30 |
| **MLSS Concentrations** | | | |
| Anoxic Zone | g/L | 5.7 | 5.3 |
| Aerobic Zone | g/L | 6.6 | 7.1 |
| Membrane Tank | g/L | 7.9 | 8.8 |

With a total reactor volume of 1,994,850 gal, the hydraulic retention time (HRT) is 14.1 h for the average annual flow and 6.6 h for the peak day flow. The filtrate water quality for the annual average and peak day flows is listed in Table 10. Effluent TSS and BOD are essentially non-detect. Also, the total nitrate + nitrite as nitrogen concentration meets the effluent design target value in Table 7.

DRAFT

**Table 10. Filtrate water quality**

| *Filtrate Qualities* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|
| TSS, mg/L | 0.8 | 0.9 |
| COD, mg/L | 33.0 | 33.0 |
| BOD, mg/L | 1.2 | 1.3 |
| Total Nitrogen, mg/L | 6.2 | 6.1 |
| TKN, mg/L | 3.1 | 3.0 |
| $NH_3$-N, mg/L | 0.10 | 0.11 |
| $NO3^-$+$NO2^-$, mg/L | 3.1 | 3.0 |

## BIOLOGICAL MODELING RESULTS FOR THE CURRENT FLOW

Based on the design volumes presented in Table 8, biological modeling was performed with one aeration train offline (of the total 3 trains) and two membrane tanks offline (of the total 6 tanks) for the historical flow of 2.5 MGD. A solids residence time (SRT) of 14.2 d was determined. The mixed liquor suspended solids (MLSS) concentrations and process control parameters are summarized in Table 11 and the simulated filtrate water quality is listed in Table 12.

DRAFT

**Table 11. Biological process control and MLSS concentration**

| *Process Control Parameters* | *Units* | *2.5 MGD* |
|---|---|---|
| F/M | gCOD/gMLSS.d | 0.08 |
| Wasting Rate | MGD | 0.075 |
| SRT | d | 14.2 |
| Internal Recycle Rate | MGD | 20.4 |
| RAS Rate | MGD | 17 |
| **MLSS Concentrations** | | |
| Anoxic Zone | g/L | 6.7 |
| Aerobic Zone | g/L | 7.5 |
| Membrane Tank | g/L | 8.6 |

**Table 12. Filtrate water quality**

| *Filtrate Qualities* | *2.5 MGD* |
|---|---|
| TSS, mg/L | 0.9 |
| COD, mg/L | 33.0 |
| BOD, mg/L | 1.3 |
| Total Nitrogen, mg/L | 5.6 |
| TKN, mg/L | 3.0 |
| $NH_3$-N, mg/L | 0.14 |
| $NO3^-$+$NO2^-$, mg/L | 2.5 |

With a total in-service reactor volume of 1,329,900 gal, the hydraulic retention time (HRT) is 12.8 h. Effluent TSS and BOD are essentially non-detect. Total nitrate+nitrite as nitrogen concentration also meets the effluent design target value in Table 7. As a result, it is concluded that one aeration train and two membrane tanks can be used as standby under the current flow conditions.

## BIOLOGICAL AERATION DESIGN

The adequacy of an aeration system to provide necessary oxygen to the biology is a common concern of process design engineers with any biological process, but is of special concern with the MBR process. In the early days of MBR design, aeration systems were often inadequate for maintaining appropriate dissolved oxygen levels. For this MBR design, the required airflow rates to maintain the aerobic zones at dissolved oxygen (DO) concentrations of 2 mg/L were determined using an alpha-factor of 0.45 ( justification for this selected alpha factor is discussed further in the next section) and a standard oxygen transfer efficiency (SOTE) of 30 percent for the membrane aeration panels. The SOTE of 30 percent is conservative for the membrane aeration panels used in this design and is representative of fouled aeration panels. The aeration panel manufacturer claims SOTEs as high as 40 percent for new panels. Using these established design criteria, the required airflow rates were determined for the aerobic zone and are presented in Table 13 for the annual average and peak day flows.

**Table 13. Design criteria and resulting airflows for fine bubble diffusers**

| *Parameter* | *2.5 MGD* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|---|
| α, -- | 0.45 | 0.45 | 0.45 |
| SOTE, % | 30 | 30 | 30 |
| Air Flow Rate, scfm | 2969 | 3703 | 4385 |

DRAFT

## α-FACTOR AND IMPORTANCE OF MLSS IN MBR AERATION DESIGNS

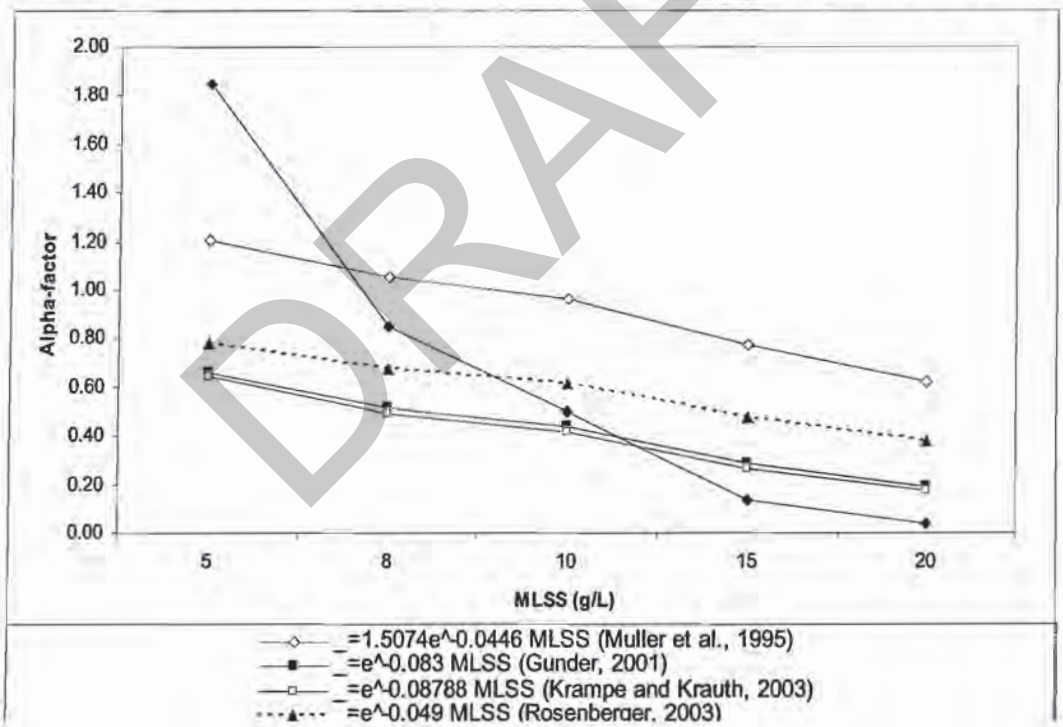
The α-factor is an oxygen transfer correction factor used to estimate the $K_La$ value (i.e. mass transfer coefficient) in the actual process system (Metcalf & Eddy, 2003) and the *oxygen transfer rate* is directly proportional to the $K_La$ value (ASCE & WEF, 2001):

$$\alpha\text{ - factor} = \frac{K_La\text{ (process water)}}{K_La\text{ (clean water)}}$$

Values of α-factor vary with the type of aeration devices, the basin geometry, the degree of mixing, and the wastewater characteristics (Metcalf & Eddy, 2003). A study of a ceramic disc grid system operating in a conventional activated-sludge basin found variations in α-factor from 0.2 when the flow first entered into the aeration tank to 0.55 after the flow had traveled a tank length of 280 ft (ASCE & WEF, 2001). Another study of flexible membrane diffusers installed in a plug-flow aeration system that was not nitrifying, found that the apparent α-factor increase from 0.27 at the aeration tank inlet to 0.42 in the effluent outlet (ASCE &

WEF, 2001). In the membrane bioreactor (MBR) process, additional attention needs to be given to the design of the aeration system due to the increased MLSS concentrations at which MBRs operate compared to conventional processes. This is a classic problem with pioneer MBR facilities (e.g. inadequate dissolved oxygen concentrations) and is still something that requires careful consideration by MBR design engineers today. In fact, the *oxygen transfer rate* is lower at a given airflow rate for the same aeration device in an MBR plant than in a conventional-activated sludge process due to the increased levels of MLSS (Muller et al., 1995; Krampe and Krauth, 2003). The α-factor and MLSS concentration correlation for MBR type sludge was first introduced in by Muller et al. (1995) and the results are shown in Figure 3. Several other studies have also reported an exponential correlation between α-factor and the MLSS concentration. These additional studies are also presented in Figure 3. The results show that an increase in the MLSS concentration leads to an exponential decrease in α-factor.

**Figure 3 – Comparison of the correlations obtained between α-factor and MLSS concentration for several studies (adapted from Germain et al., 2007)**




Although the length of the biological reactor is not known for the data presented in Figure 3, it is known that the α-factor increases as the flow proceeds along the biological reactor and this is an important consideration that provides additional support, other than the more obvious increased oxygen demand, to the concept of tapered aeration (e.g. higher air demand at the head of the reactor than at the end). For this MBR design, the project team has incorporated an aeration system

DRAFT

that will use multiple, redundant DO sensors, to determine aeration demands at various points along the aerobic zone with a target DO of 2 mg/L. To determine the required air flows for this MBR design, the PERC team has modeled the aeration device using an α-factor of 0.45, which provides more than a 10% safety factor from the observed α-factors presented in Figure 3 at the design MLSS concentration of 8 g/L.

## MAJOR PROCESS EQUIPMENT SIZING

Based on the airflow rates presented in Table 13, the required minimum horse power for the aeration blowers have been calculated and are presented in Table 14. These blowers were sized based on the maximum horse power requirement, which occurred at the 7.2 MGD flow as presented in Table 15. The internal recycle rate and membrane RAS rate were used to size the internal recycle pumps and membrane RAS pumps. A 70% operational efficiency was applied in these equipment sizings.

**Table 14. Operation process control rates**

| | *Unit* | *2.5 MGD* | *3.4 MGD* | *7.2 MGD* |
|---|---|---|---|---|
| Actual Required Air Flowrate | scfm | 2969 | 3702 | 4385 |
| Aeration Blowers, Required Min hp | hp/blower | 45 | 55 | 65 |
| Internal Recycle Rate | MGD | 20.4 | 20.4 | 20.4 |
| Membrane RAS Rate | MGD | 17 | 17 | 30 |

**Table 15. Operation energy loads and required equipment sizes**

| *Equipments* | *Duty* | *Standby* | *Total Quantity* | *hp/Ea* | *Total hp* | *Specs.* |
|---|---|---|---|---|---|---|
| Aeration Blowers | 3 | 1 | 4 | 100 | 400 | 1470 SCFM @ 12 psi |
| Internal Recycle Pumps | 3 | 1 | 4 | 4 | 16 | 4730 GPM @ 1.2 psi |
| Membrane RAS Pumps | 3 | 1 | 4 | 27 | 108 | 6950 GPM @ 5.4 psi |

## CONTROL OF BIOLOGICAL FOAMING

MBRs provide a perfect trapping environment for filamentous bacteria that float and cause biological foaming (Trussell et al., 2006). This means that biological foaming is ubiquitous in MBR facilities. Biological foaming at an MBR facility is more than nuisance and can often result in undesired loss of biomass and increased membrane fouling rates. Since the entire process basin will be completely covered in this MBR design, the project team has included a sprayer system that will spray chlorinated MBR effluent over the biological reactor three to four times per day. This has proven to be a very effective means of controlling biological foaming in an MBR (Adham and Trussell, 2001) and essentially oxidizes bacteria that live on the surface, preventing them from establishing a large enough population to cause a biological foaming event.

DRAFT

## SOLIDS HANDLING

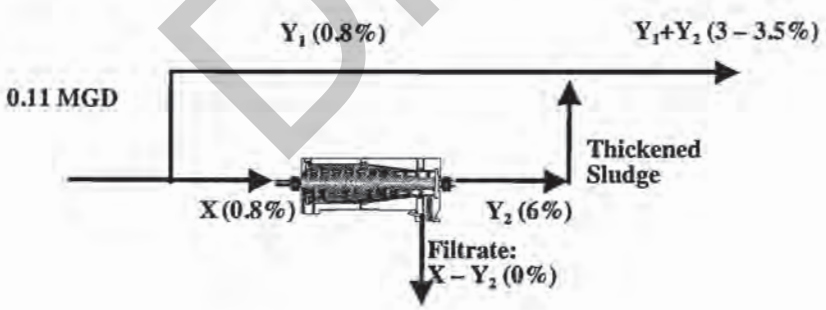
The solids stabilization process selected for this design is an aerobic digester (Figure 2). The target feed WAS solids concentration into the aerobic digesters is about 3 to 3.5%. Drum thickeners will be used to thicken the MBR WAS prior to feeding the solids into the aerobic digester and since the drum thickener will increase the solids concentration to 6 - 8%, about 89% of the WAS flow will be thickened and then combined with a WAS bypass flow stream to produce the target concentrations (details described in upcoming section on the Sludge Thickening Design). This aerobic digester has been designed to produce Class B biosolids. According to EPA Class B biosolids regulations, values for the mean cell residence time (MCRT) and temperature shall be greater than 40 days at 20°C or greater than 60 days at 15°C.

### *Sludge Thickening Design*

Based on the GPS-X process simulation results, the waste activated sludge (WAS) production rate is about 0.11 MGD and the WAS solids concentration is approximately 0.8% for the design average flowrate of 3.4 MGD. The target solids concentration of sludge feed to the digesters is about 3 to 3.5%. Since the drum thickener will increase the solids concentration of the sludge feed to 6 - 8%, a portion of WAS will be fed to the drum thickener and the rest of the WAS will be bypassed; these streams will be combined to produce the target solids concentration of 3 to 3.5%. It is critical to determine the amount of WAS flow being fed to the drum thickener to determining the appropriate sizing and number of required sludge thickeners. Calculations are detailed below and Figure 4 is the sludge thickening flow diagram.

DRAFT

**Figure 4: Sludge thickening flow schematics**




Performing a flow balance on the WAS split flow point, we attain:

$Y_1$=0.11 MGD - X (1)

Performing a solids mass balance around the thickener gives:

X (0.8%) = $Y_2$ (6%) + (X-$Y_2$) (?%) (2)

Where X is the WAS flow to the Drum Thickener, MGD
$Y_1$ is the bypass WAS, MGD
$Y_2$ is the thickened flowrate, MGD

Assuming a solids recovery of 100%, then the filtrate stream (e.g. $X-Y_2$) solids concentration is 0 % and equation 2 simplifies to:

$$X\,(0.8\%) = Y_2\,(6\%) \qquad (3)$$

The solids concentration of sludge feed can be calculated by equation 4.

$$(Y_1)\,(0.8\%) + Y_2\,(6\%) = (Y_1 + Y_2)\,(3 \text{ to } 3.5\%) \qquad (4)$$

For a 3% sludge feed, we can substitute equation 1 into equation 4 and we get:

$$(0.11 - X)\,(0.8\%) + Y_2\,(6\%) = (0.11 - X + Y_2)\,(3\%)$$

$$3Y_2 + 2.2\,X = 0.242$$

Substitute in equation 3, and we get:

$$3Y_2 + 2.2\,(7.5Y_2) = 0.242$$

$$Y_2 = 0.0124$$

and

$$X = 0.0931$$

Thus, X = 0.093 MGD or about 85% of the total WAS flow (e.g. 0.11 MGD) required to be thickened to produce a combined sludge feedflow with 3% solids content.

Following the same procedure for a 3.5% sludge feed concentration, we attain:

$$Y_2 = 0.0131$$

and

$$X = 0.0983$$

As a result, 0.098 MGD or about 89% of the total WAS flow required to be thickened to produce a combined sludge feedflow with 3.5% solids content.

For reference purposes, solids concentration of 2% and 4% are also being calculated as summarized in Table 16.

**Table 16. Percentage of the total WAS flow required to be thickened to attain various feed sludge solids concentrations**

| | 2% | 3% | 3.5% | 4% |
|---|---|---|---|---|
| % of the total WAS flow | 69% | 85% | 89% | 92% |

The thickening capacity of the drum thickener is sized based on the design upper limit solids concentration of 3.5%. Assume the wasting system operates 5 days a week for maximum of 8 hours per day, the required WAS pumping rate is 321 gpm. With the WAS solids concentration of 0.8%, the required solids pumping rate is 1610 lbs/hr. With 89% of the WAS flow feeding to the drum thickener, the required thickening capacity is 1433 lbs/hr. For a thickener operating at 860 lbs/hr, 2 units will be required.

DRAFT

***Current Regulations on Aerobic Digestion Processes***

In aerobic digestion, sewage sludge is biochemically oxidized by bacteria in an aerobic environment that can operate in either a batch or continuous mode (EPA, 2003). According to the Environmental Regulations and Technology – Control of Pathogens and Vector Attraction in Sewage Sludge (EPA/625/R-92/013), there are three alternatives of the Class B pathogen requirements for sewage sludge (biosolids). The three alternative requirements exist as follows (EPA, 2003):

1. Sewage Sludge Alternative 1: Monitoring of Fecal Coliforms [503.32(b)(2)]
   *Seven samples of treated sewage sludge (biosolids) be collected and that the geometric mean fecal coliform density of these samples be less than 2 million CFU or MPN per gram of bioslids (dry weight basis).*

2. Sewage Sludge Alternative 2: Use of a Process to Significantly Reduce Pathogens (PSRPs) [503.32(b)(3)]
   *For aerobic digestion, sewage sludge is agitated with air or oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 40 days at 20˚C (68°F) and 60 days at 15˚C (59°F).*

3. Sewage Sludge Alternative 3: Use of Processes Equivalent to PSRP [503.32(b)(4)]
   1. *Alkaline Addition to achieve Lime Stabilization*
   2. *OxyOzonation*

Class B biosolids and domestic septage also must meet one of the vector attraction reduction requirements. The requirements for aerobic digesters are as follows (EPA, 2003):

1. At least 38% reduction in volatile solids during sewage sludge treatment.

2. The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a temperature between 10 to 20˚C.

3. Less than 15% additional volatile solids reduction can occur during bench-scale aerobic batch digestion for 30 additional days at 20˚C.

**DESIGN OF AEROBIC DIGESTOR**

Based on the Sewage Sludge Alternative 2 of the Class B Pathogen Requirements for Biosolids, GPS-X modeling simulations were performed to estimate the digester volumes. The total digester volume provided in this design is 1.14 MG, which is broken up into two stages. Thickened sludge will be fed to

DRAFT

two of three digesters in parallel and then the digested sludge will be transferred to the third digester which also acts as a sludge storage tank. Based on the GPS-X modeling simulation results ($Q_i$, $X_i$, and X), minimum digester volumes for the various wastewater influent flows modeled for this WRF design were calculated using equation 6(Metcalf&Eddy, 2003):

$$V = \frac{Q_i X_i}{X(k_d P_v + 1/SRT)} \qquad (6)$$

Where V = volume of aerobic digester, MG
$Q_i$ = influent flowrate to digester, mgd
$X_i$ = influent suspended solid, mg/L
X = digester suspended solid, mg/L
$k_d$ = reaction rate constant, $d^{-1}$
$P_v$ = volatile fraction of digester suspended solids
SRT = solids residence time, d

$P_v$ is approximately 0.8 and $k_d$ is typically equal to 0.1 and 0.06 $d^{-1}$ at 20 and 15°C, respectively. The results of the modeling and calculations for a digester operating with a 40 d SRT at 20°C and with a 60 d SRT at 15°C are summarized in Tables 17 and 18, respectively. The maximum required digester volumes were 0.5 and 0.82 MG when the digester was operated at 20 and 15°C, respectively.

**Table 17. Digester sludge volumes at 20°C**

| *Wastewater Influent Flow* | *2.5MGD* | *3.4MGD* | *7.2MGD* | *10.4MGD* |
|---|---|---|---|---|
| $Q_i$ | 0.0203 | 0.0253 | 0.0322 | 0.03121 |
| $X_i$ | 31670 | 34190 | 29850 | 29600 |
| X | 17600 | 20110 | 19640 | 18340 |
| $k_d$ | 0.1 | 0.1 | 0.1 | 0.1 |
| $P_v$ | 0.8 | 0.8 | 0.8 | 0.8 |
| SRT | 40 | 40 | 40 | 40 |
| V | 0.35 | 0.41 | 0.47 | 0.48 |

**Table 18. Digester sludge volumes at 15°C**

| *Wastewater Influent Flow* | *2.5MGD* | *3.4MGD* | *7.2MGD* | *10.4MGD* |
|---|---|---|---|---|
| $Q_i$ | 0.0203 | 0.0253 | 0.0322 | 0.03121 |
| $X_i$ | 31660 | 34190 | 29800 | 29550 |
| X | 17600 | 20110 | 18600 | 18300 |
| $k_d$ | 0.06 | 0.06 | 0.06 | 0.06 |
| $P_v$ | 0.8 | 0.8 | 0.8 | 0.8 |
| SRT | 60 | 60 | 60 | 60 |
| V | 0.56 | 0.67 | 0.80 | 0.78 |

DRAFT

It can be observed from Tables 17 and 18 that the design digester volume of 1.14 MG is more than adequate to meet the 40 day MCRT at 20˚C or 60 day MCRT at 15˚C.

However, the PERC design digesters will be operated at a temperature closer to 30˚C; therefore, the required SRT to produce Class B biosolids needs to be evaluated. With temperature correction, the required SRT at 30˚C can be estimated with equation 7.

$$SRT_T = SRT_{20^oC}(\theta_d)^{T-20^oC} \qquad (7)$$

Where $\theta_d$ is a temperature variation constant for SRT.

First of all, $\theta_d$ is calculated by using the given detention times and temperatures provided in the definition of Class B biosolids.

$$60 = 40(\theta_d)^{15^oC-20^oC}$$
$$\theta_d = 0.922$$

Then, for digester operating at 30˚C, we can calculate the minimum SRT:

$$SRT_{30^oC} = 40\,(0.922)^{30^oC-20^oC}$$
$$SRT_{30^oC} = 18\ days$$

Therefore, the required SRT for aerobic digesters to produce Class B biosolids is approximately 18 days at a digester temperature of 30˚C.

In the option #1 of the vector attraction reduction requirements, it states that a least 38% reduction in volatile solids needs to be achieved during sewage sludge treatment. As shown in Figure 5, with sludge age of 18 days at 30˚C, more than 40% of the volatile solids reduction can be achieved.

DRAFT

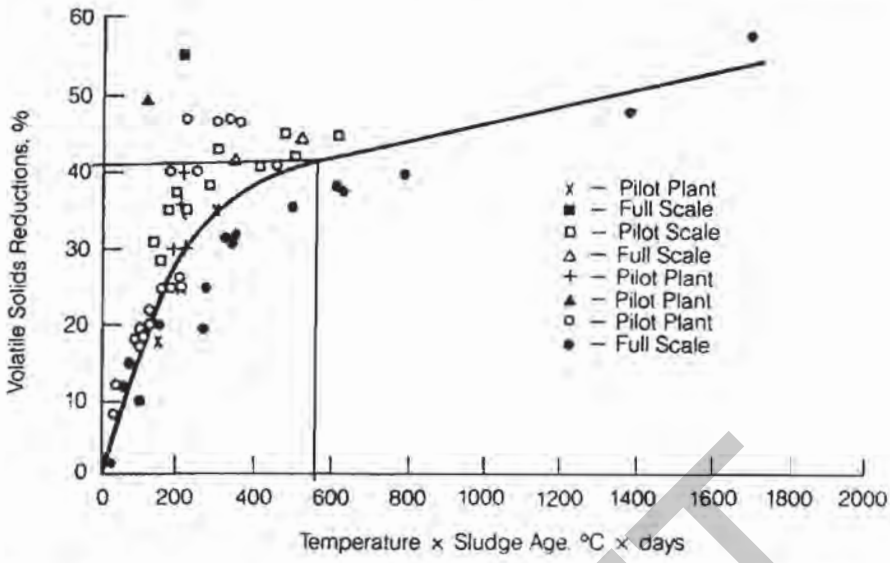



**Figure 18.31** **Typical volatile solids reductions as a function of digester liquid temperature and digester sludge age.[37] VS reduction depends on many variables, including prior processing, sludge characteristics, and digester operating conditions.[37]**

**Figure 5. Typical volatile solids reduction as a function of digester liquid temperature and digester sludge age (adapted from WEF, 1992)**

DRAFT

### GPS-X Modeling Simulation

Operating the digesters in a CSTR (continuous stirred-tank reactor) mode (e.g. no settling mode), the hydraulic detention time (HRT) is equivalent to the SRT, which can be calculated by equation 8.

$$HRT = SRT = \frac{V}{Q} \qquad (8)$$

Where V = total volume of the digesters, MG
Q = influent sludge feed to the digesters, MGD

To evaluate the digesters performance at 30°C, a GPS-X modeling simulation was performed with the design criteria listed in Table 19 and the modeling results are detailed in Table 20.

**Table 19. Digester design criteria.**

| Parameters | |
|---|---|
| SOTE, % | 25 |
| α, – | 0.85 |
| Temperature, °C | 30 |

**Table 20. Digester simulation results.**

| | *Unit* | *3.4 MGD* | *7.2 MGD* | *2.5 MGD* |
|---|---|---|---|---|
| Digester #1 | scfm | 552 | 615 | 458 |
| Digester #2 | scfm | 552 | 615 | 458 |
| Digester #3 | scfm | 258 | 282 | 186 |
| %VS reduction | % | 53 | 51 | 59 |
| SRT (full capacity) | days | 39.9 | 35.7 | 56 |

Observing the data in Table 20, the SRTs vary from 35.7 days for the peak day flow of 7.2 MGD to 56 days for the current annual average influent flow of 2.5 MGD. The percentages of VS reduction are all above 50% which meets the vector attraction reduction requirement of 38%. Thus, it is concluded that the PERC project team's design digester volume is adequate to produce Class B biosolids at an operating temperature of 30˚C.

DRAFT

## REFERENCES


HYDROMANTIS, INC. (2006), "GPS-X TECHNICAL REFERENCE," CHAPTER 3

Adham, S. and Trussell, R. S. (2001) *Membrane Bioreactors: Feasibility and Use in Water Reclamation*.98-CTS-5 WERF, Alexandria, VA.

Jang, N., Ren, X., Choi, K. and Kim, I. S. (2006) Comparison of membrane biofouling in nitrification and denitrification for the membrane bioreactor (MBR). *Water Science and Technology*, **53**, 43.

Merlo, R. P., Trussell, R. S., Hermanowicz, S. W. and Jenkins, D. (2007) A comparison of the physical, chemical, and biological properties of sludges from a complete-mix activated sludge reactor and a submerged membrane bioreactor. *Water Environment Research*, **79**, 320.

Trussell, R. S., Merlo, R. P., Hermanowicz, S. W. and Jenkins, D. (2006) The effect of organic loading on process performance and membrane fouling in a submerged membrane bioreactor treating municipal wastewater. *Water Research*, **40**, 2675.

Germain, E., Nelles, F., Drews, A., Pearce, P., Kraume, M., Reid, E., Judd, S. J., Stephenson, T., 2007. Biomass effects on oxygen transfer in membrane bioreactors. Water Research. 41, 1038-1044.

Metcalf & Eddy (2003). Wastewater Engineering Treatment and Reuse – Forth Edition. McGraw-Hill, New York, NY.

Krampe, J., Krauth, K., 2003. Oxygen transfer into activated sludge with high MLSS concentrations. Water Sci. Technol. 47, 297-303

Muller, E. B., Stouthamer, A. H., Vanverseveld, H.W., Eikelboom, D.H., 1995. Aerobic domestic waste water treatment in a pilot plant with complete sludge retention by cross-flow filtration. Water Res. 29, 1179-1189.

EPA/625/R-92/013 (2003), Environmental Regulations and Technology – Control of Pathogens and Vector Attraction in sewage Sludge, Chapter 5. 8, and 11.

WEF Manual of Practice No. 8, 1992. Design of Municipal Wastewater Treatment Plants Volume II. Pg. 1327.


DRAFT

# Technical Memorandum

City of Santa Paula Water Recycling Facility
Design, Build, Operate, Finance

**Date:** 24 January 2008

**Authors:** R. Shane Trussell, Ph.D., P.E.
Joanne Chiu

**Subject:** Phase II Evaluation of Biological Design and Process Sizing

DRAFT

---

## OBJECTIVE OF THIS MEMORANDUM

The purpose of this document is to evaluate the ability of the Phase I (year 2015) biological and process equipment design to handle the predicted flow from the Phase II design (year 2025) using process simulation software, GPS-X from Hydromantis, Inc. The process will be evaluated at the Phase II flow capacity and solids handling will also be assessed. Recommendations for maintaining a healthy biology at a higher influent flow rate will also be discussed.

## INFLUENT DESIGN CRITERIA

The flow information and annual average influent wastewater characteristics for the Phase II design presented in Tables 1 and 2 were obtained from the Request For Proposal (RFP), Appendix B – Performance Specification, from the City of Santa Paula for a new Water Recycling Facility (WRF).

**Table 1. Design influent wastewater flows**

| *Flow* | *Unit* | *2025* |
|---|---|---|
| Average Annual Influent Flow | MGD | 4.2 |
| Peak Day Flow | MGD | 8.0 |

**Table 2. Raw influent wastewater characteristics**

| *Parameters* | *Unit* | *Raw Influent* |
|---|---|---|
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand (BOD) | mg/L | 320 |
| Chemical Oxygen Demand (COD) | mg/L | 736 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 53 |
| Ammonia ($NH_3$) | mg/L | 32 |
| Total Suspended Solid (TSS) | mg/L | 210 |
| Alkalinity (as $CaCO_3$) | mg/L | 300 |

A10% loading reduction of COD, BOD, TKN-organic nitrogen, and TSS through the 3-step physical removal process was applied. Screened influent wastewater characteristics are summarized in Table 3.

**Table 3. Design screened influent wastewater characteristics**

| *Influent Parameters* | *Unit* | *Screened Influent* |
|---|---|---|
| Minimum Temperature | °C | 19 |
| Biochemical Oxygen Demand (BOD) | mg/L | 288 |
| Chemical Oxygen Demand (COD) | mg/L | 662 |
| Total Kjeldahl Nitrogen (TKN) | mg/L | 51 |
| Ammonia ($NH_3$) | mg/L | 32 |
| Total Suspended Solid (TSS) | mg/L | 189 |
| Alkalinity (as $CaCO_3$) | mg/L | 300 |

DRAFT

The peak day flow was used to evaluate the adequacy of the biological sizing of this facility. The peak day flow was estimated in the RFP based on the additional 3.8 MG of inflow volume from a 100-year storm to the annual average flow. It is appropriate to assume that the additional 3.8 MG of wet weather flow contains low organics and solids concentrations and will thus have a limited impact on the influent loadings of organics and solids as lbs per day. However, to ensure a robust biological process design, the loadings of TSS, BOD, COD, and TKN were all increased by 20% to represent the peak day influent wastewater loads, as detailed in Table 4.

**Table 4. Average and peak day influent loads**

| *Influent Parameters* | *Unit* | *4.2 MGD* | *8.0 MGD* |
|---|---|---|---|
| TSS | 1000 lb/day | 6.6 | 7.9 |
| BOD | 1000 lb/day | 10.1 | 12.1 |
| TKN | 1000 lb/day | 1.8 | 2.1 |
| COD | 1000 lb/day | 23.2 | 27.8 |

As a result of the 20% safety factor that was applied to the peak day loads, the peak day influent wastewater concentrations need to be estimated and are presented in Table 5.

**Table 5. Design peak day influent organic wastewater characteristics**

| *Influent Parameters* | *Unit* | *Values* |
|---|---|---|
| Flow | MGD | 8.0 |
| TSS | mg/L | 119 |
| BOD | mg/L | 181 |
| TKN | mg/L | 32 |
| COD | mg/L | 417 |
| Min Design Temperature | °C | 19 |

The influent fractions and coefficients presented in Table 6 were adjusted from the GPS-X default values to accommodate the wastewater characteristics presented in Table 3 and 5. These adjustments were made using an "Influent Advisor" which was developed by Hydromantis to help users better understand the influent water quality characteristics and to avoid assumption errors.

**Table 6. Influent wastewater fractions and coefficients**

| *Fractions/Coefficients* | *Default Value* | *Value Used* |
|---|---|---|
| xCOD/VSS Ratio | 2.20 | 3.3 - 3.4 |
| VSS/TSS Ratio | 0.60 | 0.79 |
| Ammonia/TKN Ratio | 0.65 | 0.63 |

## EFFLUENT DESIGN CRITERIA

Since the MBR process produces non-detect TSS and low COD water for a wide-range of operating conditions (Merlo et al., 2007), the MBR sizing was controlled by the effluent nitrogen limits that the City is required to meet in its *Waste Discharge Requirements ORDER NO. R4-2007- 0028*. The monthly, or 30-day, average nitrate + nitrite as nitrogen concentration of 5 mg/L must be achieved through the WRF. For this design, a safety factor of 20% was applied that produced a performance target of nitrate+nitrite as nitrogen of 4 mg/L (Table 7).

**Table 7. WRF Required Effluent Limits and Performance Targets**

| *Constituent* | *Unit* | *Effluent Limit* | *Performance Target* |
|---|---|---|---|
| Nitrate + Nitrite as nitrogen | mg/L | 5 | < 4 |

DRAFT

## PROCESS DESIGN CRITERIA

The following table presents the proposed process tank sizes provided by the PERC team for the Phase I MBR design.

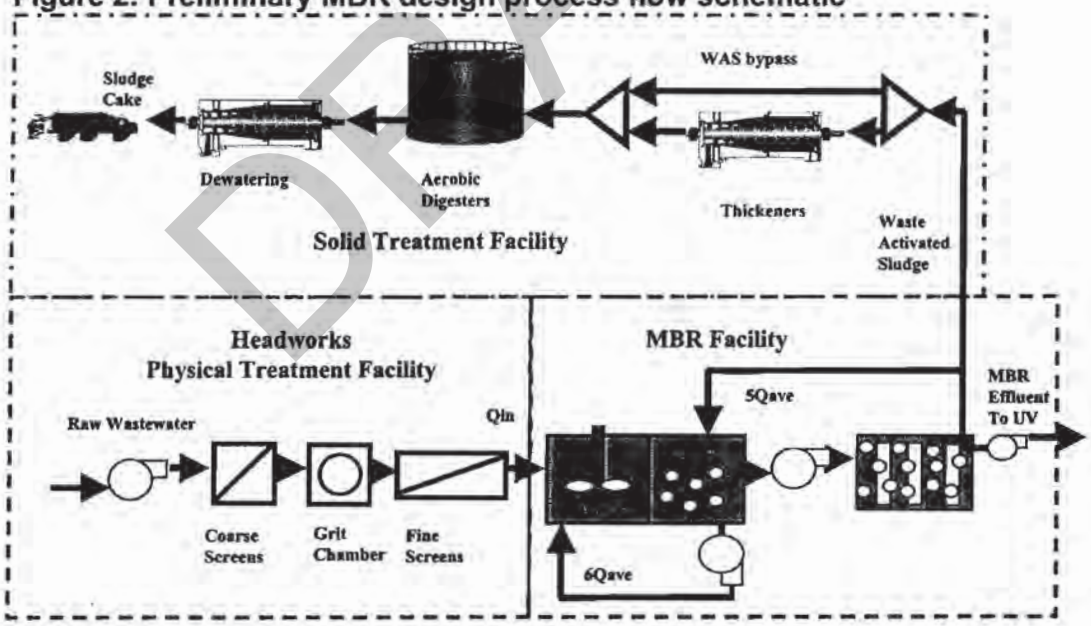
**Table 8. Preliminary tank design operating volumes**

| *MBR VOLUME DISTRIBUTION* | *Size, cu.ft* | *%* | *Size, gal* |
|---|---|---|---|
| Anoxic Volume | 71,205 | 26.7 | 532,650 |
| Aerobic Volume | 180,428 | 67.7 | 1,349,700 |
| Membrane Tank Volume | 15,039 | 5.6 | 112,500 |
| *Total Operating Reactor Volume* | *266,672* | *100* | *1,994,850* |

### Process Flow Schematic

A process flow diagram for the Phase II MBR process is presented in Figure 2. The screened raw wastewater first flows into the anoxic zone, then to the aerobic zone, and continues to the membrane tank. Nitrified mixed liquor is recirculated (internal recycle) at a rate of 25.2 MGD (6 $Q_{ave}$) from the end of the aerobic zone to the head of the anoxic zone to provide nitrate and biomass for denitrification. Additionally, 21 MGD (5 $Q_{ave}$) of return activated sludge (RAS) is returned from the membrane tank to the head of the aerobic zone to prevent excessive solids concentrations from occurring in the membrane tank. A 30 MGD of RAS rates will be operated during peak day.

**Figure 2: Preliminary MBR design process flow schematic**




DRAFT

## BIOLOGICAL MODELING RESULTS FOR THE DESIGN FLOWS

Based on the design criteria presented in previous sections, modeling simulations were performed for the Phase I design reactor volumes for the Phase II influent flow rate and wastewater characteristics. A solids residence time

(SRT) of 14.7 d was determined for the predicted average flow of 4.2 MGD and 12.4 d for the peak day flow of 8.0 MGD. An SRT of more than 14 d ensures that nitrification will be stable and helps to minimize membrane fouling (Trussell et al., 2006). The MLSS concentrations and operational parameters for both Phase I and Phase II designs are presented in Table 9 for comparison purposes.

**Table 9. Biological process control and MLSS concentration**

| *Process Control Parameters* | *Units* | *Phase I* | | *Phase II* | |
|---|---|---|---|---|---|
| | | *3.4 MGD* | *7.2 MGD* | *4.2 MGD* | *8.0 MGD* |
| F/M | gCOD/gMLSS.d | 0.07 | 0.08 | 0.07 | 0.09 |
| Wasting Rate | MGD | 0.11 | 0.11 | 0.11 | 0.12 |
| SRT | d | 14.7 | 13.8 | 14.7 | 12.4 |
| Internal Recycle Rate | MGD | 20.4 | 20.4 | 25.2 | 25.2 |
| RAS Rate | MGD | 17 | 30 | 21 | 30 |
| **MLSS Concentrations** | | | | | |
| Anoxic Zone | g/L | 5.7 | 5.3 | 7.0 | 6.1 |
| Aerobic Zone | g/L | 6.6 | 7.1 | 8.1 | 8.0 |
| Membrane Tank | g/L | 7.9 | 8.8 | 9.7 | 10.1 |

As shown in Table 9, with the Phase I design reactor volume of 1,994,850 gal, the MLSS concentration has increased, but it is still well below the target upper limit of 12 g/L in the membrane tank. The hydraulic retention time (HRT) for Phase II design is 11.4 h for the average annual flow and 6.0 h for the peak day flow. The filtrate water quality for the annual average and peak day flows is provided in Table 10. Effluent TSS and BOD are essentially non-detect. Also, the total nitrate + nitrite as nitrogen concentration meets the effluent design target value in Table 7.

**Table 10. Filtrate water quality**

| *Filtrate Qualities* | *4.2 MGD* | *8.0 MGD* |
|---|---|---|
| TSS, mg/L | 1.0 | 1.0 |
| COD, mg/L | 33.0 | 33.0 |
| BOD, mg/L | 1.3 | 1.3 |
| Total Nitrogen, mg/L | 6.2 | 6.3 |
| TKN, mg/L | 3.1 | 3.1 |
| $NH_3$-N, mg/L | 0.10 | 0.12 |
| $NO3^-$+$NO2^-$, mg/L | 3.1 | 3.2 |

## BIOLOGICAL AERATION DESIGN

For this MBR design, the required airflow rates to maintain the aerobic zones at dissolved oxygen (DO) concentrations of 2 mg/L were determined using an alpha-factor of 0.45 and a standard oxygen transfer efficiency (SOTE) of 30 percent for the membrane aeration panels. Using these established design

DRAFT

criteria, the required airflow rates were determined for the aerobic zone and are presented in Table 11 for the annual average and peak day flows.

**Table 11. Design criteria and resulting airflows for fine bubble diffusers**

| *Parameter* | *4.2 MGD* | *8.0 MGD* |
|---|---|---|
| α, -- | 0.45 | 0.45 |
| SOTE, % | 30 | 30 |
| Air Flow Rate, scfm | 4609 | 5431 |

**MAJOR PROCESS EQUIPMENT SIZING**

Based on the airflow rates presented in Table 11, the required minimum horse power for the aeration blowers have been calculated and are presented in Table 12. A 70% operational efficiency was applied in these equipment sizings.

**Table 12. Operation process control rates**

| | *Unit* | *4.2 MGD* | *8.0 MGD* |
|---|---|---|---|
| Actual Required Air Flowrate | scfm | 4609 | 5431 |
| Aeration Blowers, Required Min hp | hp/blower | 65 | 76 |
| Internal Recycle Rate | MGD | 25.2 | 25.2 |
| Membrane RAS Rate | MGD | 21 | 30 |

Table 13 has detailed the operation energy loads and required equipment sizes for the Phase I design. The aeration blowers from Phase I design are sufficient to handle the flows from the Phase II design based on the required minimum hp listed in Table 12. With the internal recycle rate of 25.2 MGD, 3 hp per pump is required; therefore, the recycle pumps from the Phase I design are also sufficient to handle the higher recycle rate. Since the RAS pumps will be operated at the same rate as the Phase I design for the peak flow, no changes on the RAS pumps is needed. Thus, no additional equipment appears to be required for the biological reactor to achieve the Phase II design.

**Table 13. Operation energy loads and required equipment sizes**

| *Equipments* | *Duty* | *Standby* | *Total Quantity* | *hp/Ea* | *Total hp* |
|---|---|---|---|---|---|
| Aeration Blowers | 3 | 1 | 4 | 100 | 400 |
| Internal Recycle Pumps | 3 | 1 | 4 | 4 | 16 |
| Membrane RAS Pumps | 3 | 1 | 4 | 27 | 108 |

**SOLIDS HANDLING**

With the temperature correction, the estimated SRT for the digesters to produce Class B biosolids was calculated to be 18 days at the digester temperature of 30°C.

DRAFT

To evaluate the digesters performance, a GPS-X modeling simulation was performed with the design criteria listed in Table 16 and the modeling results are detailed in Table 17.

**Table 16. Digester design criteria**

| Parameters | |
|---|---|
| SOTE, % | 25 |
| α, – | 0.85 |
| Temperature, °C | 30 |

**Table 17. Digester simulation results**

| | *Unit* | *4.2 MGD* | *8 MGD* |
|---|---|---|---|
| Digester #1 | scfm | 633 | 748 |
| Digester #2 | scfm | 633 | 748 |
| Digester #3 | scfm | 317 | 357 |
| %VS reduction | % | 49 | 49 |
| SRT (full capacity) | days | 32 | 29.7 |

With an SRT of 29.7 days and 49 % volatile reduction (min vector attraction reduction requirement is 38%) for the peak day flow, it is concluded that the PERC design digester volume is adequate to produce Class B biosolids for the Phase II design.

DRAFT

## REFERENCES

Merlo, R. P., Trussell, R. S., Hermanowicz, S. W. and Jenkins, D. (2007) A comparison of the physical, chemical, and biological properties of sludges from a complete-mix activated sludge reactor and a submerged membrane bioreactor. *Water Environment Research*, **79**, 320.

Trussell, R. S., Merlo, R. P., Hermanowicz, S. W. and Jenkins, D. (2006) The effect of organic loading on process performance and membrane fouling in a submerged membrane bioreactor treating municipal wastewater. *Water Research*, **40**, 2675.

DRAFT

# Appendix E – Lift Station Condition Assessment

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

Location (Add Sketch Pg. 5):_____ Weather:___Sunny_____

Personnel:____Morgan and Tanner_____

Surroundings (i.e., enclosure, lawn, street):_____

Year Built/Improved:_____

As-Builts Available: _____

Design Capacity:_____

Pump Maintenance:_____

Model #:_____

Serial #:_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Configuration / Pumps: | | | |
| Wet well w/ submers. Or suction Lift | | | - round wet well |
| Wet well / dry well | | | - submersibles in wet well |
| Number of Pumps | 2 | | - collects from 1 house located 350+ ft NW of LS and 1 restroom directly W of LS |
| VFDs | N | | - recent seal failure (per operator) |
| Wet well shape and size | | | |
| # of inlets | 2 | | |
| Size? | | | |
| Depth relative to Pumps/Floor | | | |
| Known Pump Issues | | | |
| Overheating/ Noise/ Ragging | | | |
| Lift Station Safety Features: | | | |
| Fall protection | N | | - lighting comes from parking lot |
| Bollards | N | | |
| Lifting equipment | N | | |
| Explosion-proof fixtures | | | |
| Ventilation of wet well/ dry well | | | |
| Lighting | | | |
| Locks of hatches/ covers/ etc. | Y | | |
| Stair Railing | | | |
| Eye wash (if chemical treatment) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Flood Resilience: | | | |
| Backup power | | | - some flooding issues historically but not recently |
| Redundant controls | | | |
| Flood doors | | | |
| Elevated station (or barriers) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Backup Power: | | | |
| Perm. Generator | N | | - use submersible pump |
| Generator Plug Panel | | | - vactor truck |
| Type of fuel | | | |
| Automatic Transfer Switch | N | | |
| Manual Transfer Switch | N | | |
| Space for Temporary Gen. | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Wet Well Structure: | | | |
| Material type / condition | Y | | - coating ok |
| Liner (presence / type) | | | - odor issues |
| Offsets | | | - debris issues |
| Protrusions | | | - grease buildup |
| Exposed reinforcing | | | |
| Access hatch-type/condition | | | |
| Scratch test | | | |
| Odor Control | | | |
| Overflow Level | | | |
| FOG Issues | | | |
| High Water Level Stains | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Dry Well Structure: | | | |
| Shape | | | - good |
| Dimensions | | | |
| Structural Condition | | | |
| Lighting | | | |
| Ventilation | | | |
| Access to Equipment | | | |
| Perm. Lifting Equipment | | | |
| Sump Pump | | | |
| Pipe Supports | | | |
| Equipment Anchors | | | |
| | | | |
| | | | |
| Coatings: | | | |
| Pipe coatings-exposed | | | - good |
| Valve coatings-exposed | | | |
| Pipe coatings-wet well | | | |
| Valve coatings-wet well | | | |
| Pipe coatings-vault | | | |
| Valve coatings-vault | | | |
| Structure Coatings (other than wet well) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Instrumentation: | | | |
| Level controls | | | - level sensor |
| Flow meter | | | - antenna radios to lemonwood 1 (power failure, high level) |
| Gauges | | | |
| Pressure switches | | | |
| SCADA/Telemtry | | | |
| Antennae | | | |
| Alarms (List) | | | |
| MCC Enclosure-style/condition | | | |
| Shade structure (Elec.) | | | |
| Shade structure (Instr.) | | | |
| Intrusion Alarms | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Access: | | | |
| Vehicular | | | - parking lot leads to LS |
| Maint. Equip. (ie vactor truck / crane | | | |
| Surfacing (paved, gravel) | | | |
| Height/orientation of panels | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Bypassing Provisions: | | | |
| Points of connection | | | - none |
| Quick connects | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Site Features: | | | |
| Potable water | Y | | - located in park |
| Spill containment | | | |
| On-site Eqpt. Storage | | | |
| Gates, Site Fencing | | | |
| Lighting | | | |
| Overflow Tank / Containment | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harding Park_____ Date:___9/12/23_____

- rain water comes down through ceiling conduit into panel; fried some of the safeties

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

Location (Add Sketch Pg. 5):_____ Weather:_____

Personnel:_____Morgan and Tanner_____

Surroundings (i.e., enclosure, lawn, street):_____

Year Built/Improved:_____

As-Builts Available: _____

Design Capacity:_____

Pump Maintenance:_____

Model #:_____

Serial #:_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Configuration / Pumps: | | | |
| Wet well w/ submers. Or suction Lift | | | - 2 aboveground pumps over wetwell suction lift |
| Wet well / dry well | | | - flow conditions are ok following installation of new lift station |
| Number of Pumps | 2 | Y | - pumps are old, not super strong |
| VFDs | N | | - operators stated they prefer submersible pumps |
| Wet well shape and size | | | |
| # of inlets | | | |
| Size? | | | |
| Depth relative to Pumps/Floor | | | |
| Known Pump Issues | | | |
| Overheating/ Noise/ Ragging | | | |
| Lift Station Safety Features: | | | |
| Fall protection | N | | - lighting upgrades are recent |
| Bollards | N | | |
| Lifting equipment | | | |
| Explosion-proof fixtures | | | |
| Ventilation of wet well/ dry well | N | | |
| Lighting | Y | | |
| Locks of hatches/ covers/ etc. | Y | | |
| Stair Railing | N/A | | |
| Eye wash (if chemical treatment) | N | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Flood Resilience: | | | |
| Backup power | | | - runoff problems |
| Redundant controls | | | - no flooding issues historically |
| Flood doors | | | |
| Elevated station (or barriers) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Backup Power: | | | |
| Perm. Generator | | | - manual transfer switch |
| Generator Plug Panel | | | - portable generator if needed |
| Type of fuel | | | |
| Automatic Transfer Switch | | | |
| Manual Transfer Switch | | | |
| Space for Temporary Gen. | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Wet Well Structure: | | | |
| Material type / condition | | | - coating is ok |
| Liner (presence / type) | | | - low inlets |
| Offsets | | | |
| Protrusions | | | |
| Exposed reinforcing | | | |
| Access hatch-type/condition | | | |
| Scratch test | | | |
| Odor Control | | | |
| Overflow Level | | | |
| FOG Issues | | | |
| High Water Level Stains | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Dry Well Structure: | | | |
| Shape | | | - N/A |
| Dimensions | | | |
| Structural Condition | | | |
| Lighting | | | |
| Ventilation | | | |
| Access to Equipment | | | |
| Perm. Lifting Equipment | | | |
| Sump Pump | | | |
| Pipe Supports | | | |
| Equipment Anchors | | | |
| | | | |
| | | | |
| Coatings: | | | |
| Pipe coatings-exposed | | | - OK |
| Valve coatings-exposed | | | |
| Pipe coatings-wet well | | | |
| Valve coatings-wet well | | | |
| Pipe coatings-vault | | | |
| Valve coatings-vault | | | |
| Structure Coatings (other than wet well) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Instrumentation: | | | |
| Level controls | | | - radio; works fine; operator called it "sensophone" |
| Flow meter | | | - flow meter |
| Gauges | | | - level sensor (~ 3 yrs) |
| Pressure switches | | | - bubbler control panel; bubbler is cycling consistently |
| SCADA/Telemtry | | | |
| Antennae | Y | | |
| Alarms (List) | | | |
| MCC Enclosure-style/condition | | | |
| Shade structure (Elec.) | Y | | |
| Shade structure (Instr.) | | | |
| Intrusion Alarms | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Access: | | | |
| Vehicular | Y | | - Pavement has some condition issues |
| Maint. Equip. (ie vactor truck / crane | | | - Access by homeless; fence broken |
| Surfacing (paved, gravel) | Y | | - Hard to turn around in vehicle; small site |
| Height/orientation of panels | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Bypassing Provisions: | | | |
| Points of connection | Y | | |
| Quick connects | Y | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Site Features: | | | |
| Potable water | Y | | - graffiti on walls |
| Spill containment | N | | |
| On-site Eqpt. Storage | | | |
| Gates, Site Fencing | | | |
| Lighting | Y | | |
| Overflow Tank / Containment | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Lemonwood 1_____ Date:____9/12/23_____

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

Location (Add Sketch Pg. 5):_____ Weather:____Sunny_____

Personnel:_____Morgan and Tanner_____

Surroundings (i.e., enclosure, lawn, street):_____

Year Built/Improved:_____

As-Builts Available: _____

Design Capacity:_____

Pump Maintenance:_____

Model #:_____

Serial #:_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Configuration / Pumps: | | | |
| Wet well w/ submers. Or suction Lift | | | - round wet well shape |
| Wet well / dry well | | | - submersibles |
| Number of Pumps | 3 | | - no issues w/ pumps |
| VFDs | N | | |
| Wet well shape and size | | | |
| # of inlets | | | |
| Size? | | | |
| Depth relative to Pumps/Floor | | | |
| Known Pump Issues | | | |
| Overheating/ Noise/ Ragging | | | |
| Lift Station Safety Features: | | | |
| Fall protection | Y | | |
| Bollards | N | | |
| Lifting equipment | | | |
| Explosion-proof fixtures | | | |
| Ventilation of wet well/ dry well | | | |
| Lighting | Y | | |
| Locks of hatches/ covers/ etc. | Y | | |
| Stair Railing | | | |
| Eye wash (if chemical treatment) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Flood Resilience: | | | |
| Backup power | | | - N/A |
| Redundant controls | | | |
| Flood doors | | | |
| Elevated station (or barriers) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Backup Power: | | | |
| Perm. Generator | Y | | |
| Generator Plug Panel | | | |
| Type of fuel | | | |
| Automatic Transfer Switch | | | |
| Manual Transfer Switch | | | |
| Space for Temporary Gen. | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Wet Well Structure: | | | |
| Material type / condition | | | - H2S damage on metal piping, switches, electronics, etc. |
| Liner (presence / type) | | | - structure doing well; just coating and piping damage |
| Offsets | | | - ongoing H2S issues |
| Protrusions | | | - has capsule-shaped 10,000 gal overflow tank |
| Exposed reinforcing | | | |
| Access hatch-type/condition | | | |
| Scratch test | | | |
| Odor Control | | | |
| Overflow Level | | | |
| FOG Issues | | | |
| High Water Level Stains | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Dry Well Structure: | | | |
| Shape | | | |
| Dimensions | | | |
| Structural Condition | | | |
| Lighting | | | |
| Ventilation | | | |
| Access to Equipment | | | |
| Perm. Lifting Equipment | | | |
| Sump Pump | | | |
| Pipe Supports | | | |
| Equipment Anchors | | | |
| | | | |
| | | | |
| Coatings: | | | |
| Pipe coatings-exposed | | | - general corrosion |
| Valve coatings-exposed | | | - vault had previous leakage |
| Pipe coatings-wet well | | | - vault has some H2S due to drain to wet well |
| Valve coatings-wet well | | | |
| Pipe coatings-vault | | | |
| Valve coatings-vault | | | |
| Structure Coatings (other than wet well) | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Instrumentation: | | | |
| Level controls | | | - level sensing transmitter |
| Flow meter | | | - no flow metering |
| Gauges | | | |
| Pressure switches | | | |
| SCADA/Telemtry | | | |
| Antennae | | | |
| Alarms (List) | | | |
| MCC Enclosure-style/condition | | | |
| Shade structure (Elec.) | | | |
| Shade structure (Instr.) | | | |
| Intrusion Alarms | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

| Item | Exist. (Y/N) | Oper. (Y/N) | Notes |
|---|---|---|---|
| Access: | | | |
| Vehicular | | | - gated |
| Maint. Equip. (ie vactor truck / crane | | | - no issues |
| Surfacing (paved, gravel) | | | - access a bit tight |
| Height/orientation of panels | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Bypassing Provisions: | | | |
| Points of connection | Y | | |
| Quick connects | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| Site Features: | | | |
| Potable water | Y | | - site ~ 3 yrs old |
| Spill containment | N | | |
| On-site Eqpt. Storage | | | |
| Gates, Site Fencing | Y | | |
| Lighting | Y | | |
| Overflow Tank / Containment | Y | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

DRAFT

# Lift Station Visual Inspection Checklist

Lift stations are considered confined spaced. DO NOT ENTER FOR ANY REASON.
Make observations from the surface using photo/video equipment and lighting.

Name of Observer: _____Sarah Mathews_____

Lift Station Name: _____Harvest_____ Date:____9/12/23_____

DRAFT

# Appendix F – Treated Effluent Monthly Average Monitoring Results 2019-2023

DRAFT

| Treated Effluent Monthly Average Monitoring Results (2019-2023) | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | Total Dissolved Solids (mg/L) | Chloride[1] (mg/L) | Sulfate (mg/L) | Boron (mg/L) | Nitrite-N (mg/L) | Ammonia-N + Nitrate-N + Nitrite-N (mg/L) |
| WDR Limit | | 2,000 | 110 | 800 | 1 | 1 | 10 |
| 2019 | January | 1190 | *118* | 427 | 0.752 | 0 | 7.07 |
| | February | 1370 | *125* | 569 | 0.889 | 0 | 7.95 |
| | March | 1250 | *129* | 511 | 0.74 | 0.02 | 3.74 |
| | April | 1270 | *126* | 500 | 0.766 | 0.01 | 7.48 |
| | May | 1280 | *119* | 474 | 0.842 | 0.02 | 4.62 |
| | June | 1250 | *124* | 521 | 0.694 | 0.04 | 5.24 |
| | July | 1180 | *122* | 482 | 0.685 | 0.2 | 0.54 |
| | August | 1200 | *116* | 457 | 0.846 | 0.04 | 1.58 |
| | September | 1150 | *112* | 437 | 0.787 | ND | 0.7 |
| | October | 1200 | *114* | 446 | 0.673 | ND | 1.5 |
| | November | 1270 | *117* | 435 | 0.736 | 0.03 | 9.07 |
| | December | 1160 | *116* | 413 | 0.684 | 0.02 | 7.36 |
| | | | | | | | |
| 2020 | January | 1270 | *120* | 458 | 0.77 | 0.03 | 5.31 |
| | February | 1230 | *121* | 458 | 0.689 | 0.04 | 4.38 |
| | March | 1220 | *122* | 458 | 0.72 | 0.03 | 1.62 |
| | April | 1300 | *126* | 481 | 0.798 | 0.03 | 6.22 |
| | May | 1250 | *120* | 469 | 0.77 | ND | 2.51 |
| | June | 1250 | *118* | 444 | 0.631 | 0.05 | 4.42 |
| | July | 1260 | *116* | 421 | 0.759 | 0.03 | 4.13 |
| | August | 1220 | *116* | 418 | 0.723 | 0.03 | 3.44 |
| | September | 1210 | *117* | 432 | 0.659 | 0.05 | 4.8 |
| | October | 1240 | *116* | 451 | 0.781 | 0.07 | 5.4 |
| | November | 1190 | *118* | 381 | 0.848 | 0.04 | 7.8 |
| | December | 1200 | *118* | 421 | 0.775 | ND | 8.86 |
| | | | | | | | |
| 2021 | January | 1210 | *113* | 444 | 0.766 | ND | 5.31 |
| | February | 1250 | *122* | 449 | 0.984 | ND | *17.9* |
| | March | 1260 | *128* | 400 | 0.772 | ND | 8.32 |
| | April | 1250 | *112* | 467 | 0.737 | 0.05 | 9.4 |
| | May | 1250 | *117* | 414 | 0.835 | 0.04 | 8.6 |
| | June | 1310 | *115* | 414 | 0.729 | <0.1 | 6.7 |
| | July | 1260 | 106 | 447 | 0.77 | 0.02 | 9.9 |
| | August | 1220 | 107 | 422 | 0.874 | 0.03 | 6.1 |
| | September | 1210 | 110 | 427 | 0.711 | 0.03 | 9.6 |
| | October | 1240 | 104 | 453 | 0.874 | 0.03 | 7.71 |
| | November | 1240 | 97 | 457 | 0.849 | 0.03 | *11.7* |
| | December | 1210 | 109 | 383 | 0.849 | 0.03 | *10.2* |
| | | | | | | | |

DRAFT

| | | Total Dissolved Solids (mg/L) | Chloride[1] (mg/L) | Sulfate (mg/L) | Boron (mg/L) | Nitrite-N (mg/L) | Ammonia-N + Nitrate-N + Nitrite-N (mg/L) |
|---|---|---|---|---|---|---|---|
| WDR Limit | | 2,000 | 110 | 800 | 1 | 1 | 10 |
| 2022 | January | 1240 | 105 | 493 | 0.914 | 0.2 | 3.57 |
| | February | 1220 | 107 | 409 | 0.776 | 0.03 | 9.4 |
| | March | 1200 | 109 | 442 | 0.866 | 0.04 | 6.4 |
| | April | 1200 | 110 | 387 | 0.833 | 0.07 | 7.06 |
| | May | 1260 | 101 | 407 | 0.612 | ND | 6.8 |
| | June | 1220 | 106 | 394 | 0.763 | 0.02 | 8.7 |
| | July | 1240 | 108 | 420 | 0.794 | 0.04 | *16.85* |
| | August | 1250 | 101 | 418 | 0.91 | 0.05 | *22.3* |
| | September | 1230 | 109 | 435 | 0.962 | 0.3 | 8.5 |
| | October | 1200 | *118* | 400 | *1.15* | 0.04 | 5.54 |
| | November | 1230 | *120* | 469 | 0.832 | 0.04 | 8 |
| | December | 1170 | *116* | 445 | 0.836 | ND | *11.2* |
| | | | | | | | |
| 2023 | January | 1380 | *116* | 556 | 0.994 | 0.03 | 7.18 |
| | February | 1290 | *124* | 457 | 0.881 | 0.04 | 4.4 |
| | March | 1420 | *116* | 584 | *1.12* | 0.03 | 8.9 |
| | April | 1390 | *121* | 543 | 0.921 | 0.02 | *13.62* |
| | May | 1310 | *124* | 418 | 0.852 | ND | *11.3* |
| | June | 1250 | *122* | 458 | 0.089 | ND | 9.3 |
| | July | 1390 | *116* | 543 | 0.921 | 0.02 | *13.62* |
| | August | 1290 | *113* | 446 | 0.909 | <0.1 | 6.3 |
| | September | 1230 | *114* | 472 | 0.9 | 0.03 | 6.5 |
| | October | 1260 | *115* | 456 | 0.755 | ND | 7.5 |
| | November | 1250 | *122* | 476 | 0.972 | 0.03 | 8.03 |
| | December | 1240 | *120* | 462 | 0.854 | 0.03 | 7.7 |

Notes:
1. Exceedances are underlined and italicized.
2. ND = Not detected

DRAFT

# Appendix G – WRF Condition Assessment Checklist

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

Name of Observer: Mike Nunley, PE

WWTP Name: Santa Paula Water Recycling Facility

Date: 7/27/23

Personnel: Pete, Ethan

Weather: Clear

Year Built/Improved: 2010

As-Builts Available: Yes

Design Capacity: 4.1 MGD

**Item**

## Influent Pump Station

**Mechanical**

- Lifting chain corroded - needs to be replaced
- Check valves on lift station have issues
- Volutes are in good shape (VRSO, CPO)
- Lift station pumps are the original pumps - evaluate pumps to repair or replace

**Instrumentation**

- Seal failure
- No local HMI

**Electrical**

- Consider changing cords out

**Structural**

- Concrete/liners in bad shape - haven't been in ILS
- Aluminum cover - should be fiberglass, support brackets are failing
- Spalling of slab near influent meter
- Replace manhole cover and ring
- Influent flow weir is worn concrete, no metal protection
- Influent channel needs to be repaired and relined

## Influent Pump Station (Continued)

**Safety**

- Need harnesses, hoists, blowers, gas detectors (confined space equipment; VRSD is currently charging for their own equipment)
- Grating worn
- No fall arrest on any ladder

**Operator Notes and Observations**

- N/A

## Grit Removal/Coarse & Fine Screens

**Mechanical**

- #2 Grit classifier failing - stainless steel rotting out, wear plates missing and need to be replaced
- Total of 2 coarse screen, 2 fine screens, 2 classifiers
- Need manufacturer's maintenance, bearing replacement, screens and augers

**Instrumentation**

- Total of 2 space level transducer, 6 endress hauser panels
- H2S gas causing problem w/ electrical cords + panels
- H2S will damage Huber stainless equipment

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## Grit Removal/Coarse & Fine Screens (Cont.)

**Electrical**
- N/A

**Structural**
- N/A

**Safety**
- N/A

**Operator Notes and Observations**
- Replaced bagging system, which has been working well - less dumpster corrosion

## Flow Equalization Tank 1

**Mechanical**
- No aeration

**Instrumentation**
- Pacing used to be automatic; now operator has to log in every night for shaving
- SCADA needs to be set to work automatically with flow rates, auto shaving

**Electrical**
- Conduit getting corroded (intermittent)

**Structural**
- EQ weirs - concrete doesn't have knife's edge, worn
- Aluminum & orange grating needs to be replaced

**Safety**
- N/A

**Operator Notes and Observations**
- N/A

## Flow Equalization Tank 2

**Mechanical**
- N/A

**Instrumentation**
- N/A

**Electrical**
- N/A

**Structural**
- EQ weirs - concrete doesn't have knife's edge, worn
- Aluminum & orange grating needs to be replaced

**Safety**
- N/A

**Operator Notes and Observations**
- Rarely used; except when plant has high flow events

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## Anoxic Tanks

**Mechanical**

- April/May - exceeded NO3 due to failed RAS/WAS pump
- EQ valve in #3 failed - can now be isolated with first 2 valves

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- Top 3 ft starting to corrode

**Safety**

- N/A

**Operator Notes and Observations**

- N/A

## Aeration Tanks

**Mechanical**

- Need RAS spare pump
- Issues with mixers in RAS + WAS tangling, rails bending, skewed, cut up cables etc.

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- Upper 3-4 ft in general are worn - potential need for coating
- Tank 1 has scars from mixer

**Safety**

- N/A

**Operator Notes and Observations**

- Working well

## Thickeners/Screw Press

**Mechanical**

- Self clean not working - won't run in reverse for cleaning, brushes worn out - needs maintenance
- Oil box needs 10 year overhaul
- Feed pump doesn't prime well
- Rotary lobe pumps feed thickener + press, rotary lobe pumps have worn plates
- Replace bristles

**Instrumentation**

- N/A

**Electrical**

- N/A

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## Thickeners/Screw Press (Cont.)

**Structural**

- N/A

**Safety**

- N/A

**Operator Notes and Observations**

- Needs redundancy
- Need second unit
- Auger to trailer needs maintenance

## Aerobic Digesters

**Mechanical**

- Both blowers working
- Software not compatible with old blower - microsoft doesn't cover HMIs anymore - results in needing new inverter

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- N/A

**Safety**

- N/A

**Operator Notes and Observations**

- N/A

## Membrane Separation Tanks

**Mechanical**

- One blower (MBR #1) shuts off randomly at times
- Return channel - blower not sized adequately

**Instrumentation**

- #2 WAS pump fault - turns off
- Tie citric acid pump into MBR PLC
- MBR PLC #M needs redundant back up just like PLC A&B (not in back up PLC list order #1)

**Electrical**

- N/A

**Structural**

- Coatings starting to chip off

**Safety**

- N/A

**Operator Notes and Observations**

- Tie citric acid pump into MBR PLC
- Permeate pumps need to be evaluated and rebuilt
- Operators prefer separate turbidity meters for each train on MBR

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## UV Disinfection

**Mechanical**

- Only 3 out of 5 modules are seeing flow
- Replaced 2/3 of bulbs
- Lot of shattered bulbs
- Bulbs at 30,000 hrs - should be replaced at 12,000 hrs per manufacturer recommendation

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- N/A

**Safety**

- N/A

**Operator Notes and Observations**

- 3 modules in use at any time
- Recently maintenance had shattered valves
- Electronics need to be replaced - many back panels not working

## Percolation Pond Diversion Structure

**Mechanical**

- N/A

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- N/A

**Safety**

- N/A

**Operator Notes and Observations**

- N/A

## Percolation Pond

**Mechanical**

- Irrigation system not working - cracked pipeline

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- N/A

**Safety**

- N/A

**Operator Notes and Observations**

- Water is beginning to pool in one pond
- Rocks, etc. need to be cleared out
- Replace liners (rips in ponds), perform weed control

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## Biofilter

**Mechanical**

- N/A

**Instrumentation**

- N/A

**Electrical**

- N/A

**Structural**

- N/A

**Safety**

- N/A

**Operator Notes and Observations**

- N/A

## Controls Building

- No insulation on roof
- Windows - leak in control room
- Screens damaged - replace
- Doors - repaint; door locks damaged
- Paint trim
- Fire alarm system - replace panel; smoke detector in building failed
- Two HVAC units need to be replaced
- Lighting poor - replace with LEDs; ballasts need to be replaced

## Headworks Building

- No insulation on roof
- Windows - leak in control room
- Screens damaged - replace
- Doors - repaint; door locks damaged
- Paint trim
- Lighting poor - replace with LEDs; ballasts need to be replaced

## Decorative Pond

- Remove sludge
- Replace transformer
- Need new sump pumps
- New exhaust fan - should be automatic when vault opens and current one is not
- Repair circ. pump and valves
- Fix water leaks into vault
- New pond lights
- Liner is in ok condition
- Ladder rusting
- Hatch is in good condition

DRAFT

# Wastewater Treatment Plant Visual Inspection Checklist

## General Observations

- Dump Station - not used and they do not plan on using it in the future
- Crane - needs maintenance and load certification
- Concrete spalled on pad for old odor control system - repair
- Reuse line - a lot of movement on startup
- Operators requested new tools - tap and die set (SAE and Metric), multi-function welder for SS, electric winches for gantry, blower, battery rachet
- Portable ladders - old, worn out, sun damaged; all fixed ladders are good
- Add rolling stair for sludge truck - 12 foot step ladder unsafe
- Effluent meter - no weir/flume, does not measure accurately
- Paint condition is poor throughout plant
- Blowers need to be replaced or rebuilt in general
- Wasting pumps have problems with SCADA on start
- Generator needs service, filters, hoses, fuel polish, batteries, oil change, and paint
- Transfer switch needs service
- Irrigation system timer runs numerous cycles a day, should only be running once (needs replacement)

DRAFT

# Appendix H – WRF Condition Assessment Photos

DRAFT

# Headworks

Fine Screen Unit

Coarse Screen Unit

Grit Classifier

DRAFT

# Dewatering

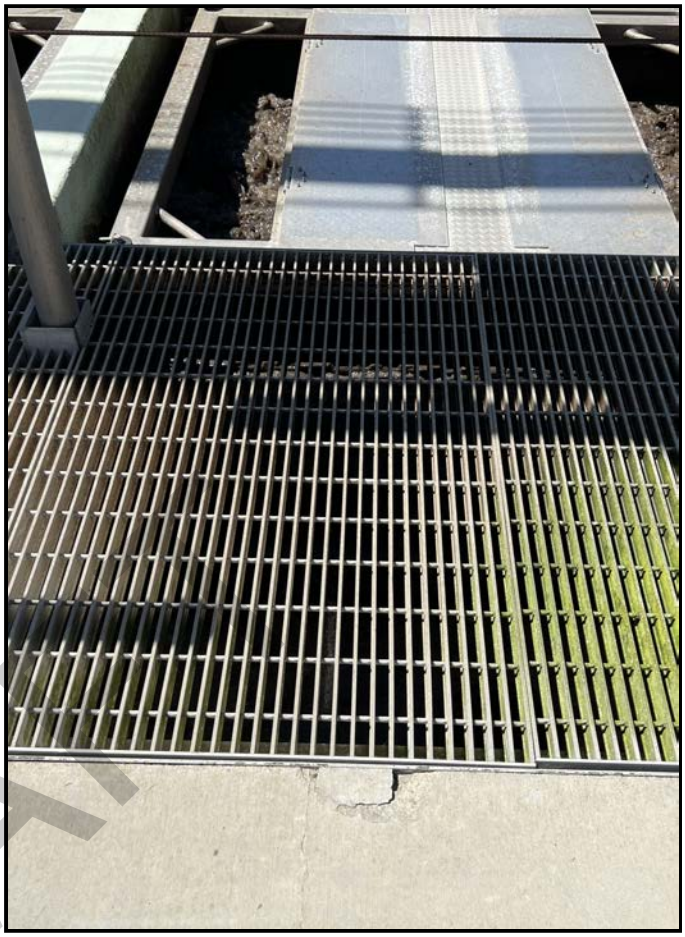
Screw Press

Thickener Feed Pump

Gravity Belt Thickener

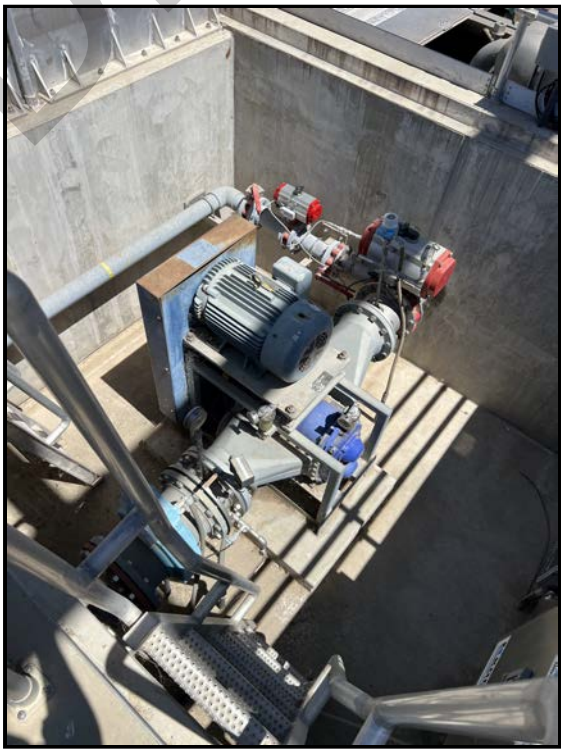
DRAFT

# MBR Basins



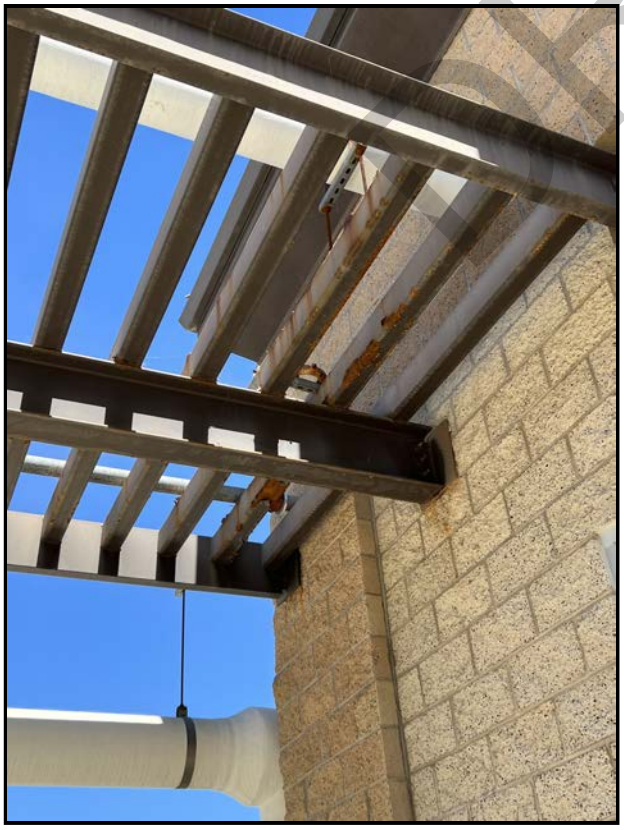
MBR Basins

Permeate Pump



DRAFT

# Headworks/Dewatering and Controls Building



DRAFT

# UV Disinfection

CIP Pump

UV Channels

RO Low Pressure Pump

UV Module Instrumentation

DRAFT

# Appendix I – MBR Process Design Calculations

DRAFT

# Existing Conditions

MBR WW Treatment Process Design Calculations - U.S. Units
User Inputs and Constants

WW INFORMATION

## I. Wastewater Parameters/Characteristics

Enter values in yellow cells only.

| | | | | | |
|---|---|---|---|---|---|
| Design ww Flow Rate, $Q_o$ = | 3.00 | MGD | Influent TSS, $TSS_o$ = | 329 | mg/L |
| Influent BOD, $BOD_o$ = | 420 | mg/L | Influent VSS, $VSS_o$ = | 260 | mg/L |
| Influent sBOD, $sBOD_o$ = | 168 | mg/L | | | |
| | | | Influent TKN, $TKN_o$ = | 70 | mg/L |
| Influent COD, $COD_o$ = | 857 | mg/L | TKN peak/ave factor, **FS** = | 1.0 | |
| Influent sCOD, $sCOD_o$ = | 129 | mg/L | Influent $NH_4$-N, $NH_4$-$N_o$ = | 42 | mg/L |
| Influent rbCOD, $rbCOD_o$ = | 86 | mg/L | Influent Alkalinity, $Alk_o$ = (mg/L as $CaCO_3$) | 300 | |
| ratio, **bCOD/BOD** = | 1.6 | | Aeration WW Temp, $T_{ww}$ = | 66.2 | °F |

BIOL. KINETIC COEFFICIENTS

## II. Biological Kinetic Coefficients - For BOD Removal

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., **Y** = | 0.40 | lb VSS/lb bCOD | Half Veloc. Coeff., $K_s$ = | 20 | mg/L |
| Temp coeff., q, for mm = | 1.07 | | Temp coeff., q, for kd = | 1.04 | |
| | | | Resid. biomass fract., $f_d$ = | 0.15 | |
| Max spec. gwth rate at 20°C, $\mu_{m20}$ = | 6 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{d20}$ = | 0.12 | lb VSS/d/lb VSS | | | |

## III. Biological Kinetic Coefficients - For Nitrification

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., $Y_n$ = | 0.12 | lb VSS/lb NOx | | | |
| Temp coeff., q, for mmn = | 1.070 | | Half Veloc. Coeff. at 20°C, $K_n$ = | 0.7 | mg/L |
| Temp coeff., q, for kdn = | 1.040 | | Half Veloc. Coeff. at 20°C, $K_o$ = | 0.5 | mg/L |
| Temp coeff., q, for Kn = | 1.053 | | Temp coeff., q, for Ko = | 1 | |
| Max spec. gwth rate at 20°C, $\mu_{mn20}$ = | 0.8 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{dn20}$ = | 0.08 | lb VSS/d/lb VSS | | | |

CONSTANTS

## IV. Constants Used in the Calculations

| | | | | | |
|---|---|---|---|---|---|
| Ratio of $BOD_5$ to $BOD_u$, **f** = | 0.68 | | Saturation D.O. in water at 20°C & 1 atm, $C_{ss}$ = | 9.17 | mg/L |
| $BOD_u$ equiv. of VSS = | 1.42 | lb $BOD_u$/lb VSS | Standard Pressure = | 14.7 | psi |
| Spec Wt of water, $\gamma_{H2O}$ = | 62.4 | lb/ft$^3$ | Standard Temperature = | 68.0 | °F |
| Mol. Wt. of Air = | 28.97 | | Mol. Wt. of Oxygen = | 32.0 | |
| Temp Coeff. for $O_2$ rate, $\theta$ = | 1.024 | | $O_2$ mole fraction in Air = | 0.209 | |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

**Activated Sludge Kinetic Coefficients for heterotrophic bacteria at 20°C (for BOD removal)**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_m$ | kg VSS/day/kg VSS | 3.0 - 13.2 | 6.0 |
| $K_s$ | mg/L bCOD | 5.0 - 40.0 | 20.0 |
| Y | kg VSS/day/kg bCOD | 0.30 - 0.50 | 0.40 |
| $k_d$ | kg VSS/day/kg VSS | 0.06 - 0.20 | 0.12 |
| $f_d$ | dimensionless | 0.08 - 0.20 | 0.15 |
| θ values for temperature corrections | | | |
| for $\mu_m$ | dimensionless | 1.03 - 1.08 | 1.07 |
| for $k_d$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_s$ | dimensionless | 1.00 | 1.00 |

The source for the values in the table above is:
Introduction to Water Resource Recovery Facility Design, 2nd Ed., Table 6.1

**Activated Sludge Nitrification Kinetic Coefficients at 20°C**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_{mn}$ | kg VSS/day/kg VSS | 0.2 - 0.90 | 0.75 |
| $K_n$ | mg/L $NH_4$-N | 0.50 - 1.0 | 0.74 |
| $Y_n$ | kg VSS/kg $NH_4$-N | 0.10 - 0.15 | 0.12 |
| $k_{dn}$ | kg VSS/day/kg VSS | 0.05 - 0.15 | 0.08 |
| $K_o$ | mg/L | 0.40 - 0.60 | 0.50 |
| θ values for temperature corrections | | | |
| for $\mu_{mn}$ | dimensionless | 1.06 - 1.123 | 1.07 |
| for $k_{dn}$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_n$ | dimensionless | 1.03 - 1.123 | 1.053 |

The source for the values in the table above is:
Introduction to Water Rsource Recovery Facility Design, 2nd Ed., Table 6.2

DRAFT

MBR WW Treatment Process Design Calculations - U.S. Units
Membrane Module Sizing Calculations

INPUTS

## I. Membrane/Membrane Module Parameters

(Values typically available from membrane manufacturer or vendor - Enter values in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Module packing density, $\phi$ = | 182 | $m^2/m^3$ | equals | 55.5 | $ft^2/ft^3$ |
| Specific Aer. Demand, $SAD_M$ = | 0.2 | $m^3$ air/hr/$m^2$ membrane | | | |
| | | equals | 0.656 | $ft^3$ air/hr/$ft^2$ membrane | |

CALCULATIONS

## II. Process Design Calculations (done by worksheet)

| | | | | | |
|---|---|---|---|---|---|
| Membrane Flux, **J** = | 21.1 | L/hr/$m^2$ | equals | 0.518 | gal/hr/$ft^2$ |
| Membrane Area, $A_M$ = | 241,123 | $ft^2$ | | | |
| Membrane Module Vol., $V_M$ = | 4,347 | $ft^3$ | | | |
| Scouring Air Flow Required = | 2,637 | $ft^3$/min (ACFM) = | | 2,625 | SCFM |

**(This is the scouring air flow rate needed for the membrane module, typically provided by a coarse bubble diffuser system.)**

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

Values given for MBR specific area (module packing density) range from 150 -334 $m^2/m^3$ in Table 8-35 of Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery, 5th Ed.,* McGraw-Hill, 2014

**Equations Used in the Calculations:**

Module packing density, $\phi$, in $ft^2/ft^3$ = ($\phi$ in $m^2/m^3$)/3.28084

Specific Aeration Demand, $SAD_M$, in $ft^3$ air/hr/$ft^2$ membrane =
= $SAD_M$ in $m^3$ air/hr/$m^2$ membrane/3.28084

Membrane Flux, **J**, in L/hr/$m^2$ = $0.4056T_{ww} - 5.7278$ (with $T_{ww}$ in $^oF$)
(See Worksheet 6 for derivation of this eqution)

Membrane Flux, **J**, in gal/hr/$ft^2$ = [(Membrane Flux (**J**) in L/hr/$m^2$)/3.7854]/($3.28084^2$)

Membrane Area, $A_M = (Q_o*10^6/24)/J$

Membrane Module Volume, $V_M = A_M/\phi$

Scouring Air Flow Required, **ACFM** = $(SAD_M)(A_M)/60$ ACFM

Scouring Air Flow Req'd, **SCFM** = (**ACFM**)[($T_{std}$ + 459.67)/($T_{ww}$ + 459.67)]($P_{atm}/P_{std}$) SCFM

DRAFT

# MBR WW Treatment Process Design Calculations - U.S. Units

BOD Removal and Nitrification

INPUTS

## I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| | | | Target Effluent Concentrations: | | |
| MLSS in Aer Tank, **MLSS** = | 8,500 | mg/L | **$BOD_e$** = | 10 | mg/L |
| MLSS in Waste Sludge, **$X_w$** = | 8,500 | mg/L | **$TSS_e$** = | 10 | mg/L |
| DO in Aer. Tank, **$DO_o$** = | 2 | mg/L | **$NH_4$-$N_e$** = | 1.0 | mg/L |
| Number of Aeration Tanks = | 2 | | Tank Freeboard = | 2.0 | ft |
| Liquid Depth in Tank = | 22 | ft | Tank L:W ratio = | 2.3 | |
| Initial Estimate of **$NO_x$** = | 44.93 | mg/L | **(Tank L:W ratio is only used for rectangular tanks)** | | |
| **Note that an initial estimate is needed for $NO_x$ in cell D14 to start an iterative calculation of $NO_x$ below. 80% of the influent TKN is suggested for this initial estimate. 80% of $TKN_o$ =** | 56.0 | mg/L | Influent TKN, **$TKN_o$** = (value transferred from Worksheet 2) | 70 | mg/L |

PROCESS DESIGN CALCULATIONS

## II. Calculate Design SRT

| | | | | | |
|---|---|---|---|---|---|
| $\mu_{mn}$ at $T_{ww}$ = | 0.70 | lb VSS/d/lb VSS | $K_n$ at $T_{ww}$ = | 0.70 | mg/L |
| $k_{dn}$ at $T_{ww}$ = | 0.08 | lb VSS/d/lb VSS | Theor. SRT = | 3.96 | days |
| $\mu_n$ = | 0.25 | lb VSS/d/lb VSS | Design **SRT** = | 3.96 | days |

## III. Calculate the Biomass Production Rate

| | | | | | |
|---|---|---|---|---|---|
| $\mu_m$ at $T_{ww}$ = | 5.61 | lb VSS/d/lb VSS | **bCODo** = | 672 | mg/L |
| $k_d$ at $T_{ww}$ = | 0.1154 | lb VSS/d/lb VSS | **S** = | 1.404 | mg bCOD/L |

Biomass Production Rate, **$P_{x,bio}$** = 5029 lb VSS/day

## IV. Determine the Amount of Nitrogen Oxidized to Nitrate

| | | |
|---|---|---|
| Calculated amount of nitrogen oxidized to nitrate, **$NO_x$** = | 44.932 | mg/L |
| Difference between estimated and calculated values **$NO_x$** = | 0.00000 | mg/L |

**Goal Seek Result:**

Amount of nitrogen oxidized to nitrate, **$NO_x$** = **44.93** mg/L

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $NO_x$ value as follows: Place the cursor on the green cell G42 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell:" G42, "To value:" 0, "By changing cell:" D14, and click on "OK". The calculated value of $NO_x$ will appear in cell F44 and G42 should be zero if the process worked properly. Note that cell D14 needs an initial estimate for $NO_x$ in order for the iterative solution to work properly.**

## IV. Calc. the Prod. Rate and Mass of VSS and TSS in Aeration Basin

| | | | | | |
|---|---|---|---|---|---|
| **bpCOD/pCOD** = | 0.554 | | **nbVSS** = | 115.9 | mg/L |
| Aeration Tank VSS Production Rate, **$P_{X,VSS}$** = | 7928 | lb VSS/day | | | |
| Aeration Tank TSS Production Rate, **$P_{X,TSS}$** = | 9656 | lb TSS/day | | | |
| Mass of **MLVSS** = | 31,413 | lb VSS | Mass of **MLSS** = | 38,258 | lb TSS |

AER. TANK CALC'NS

## V. Aeration Tank Calculations (User input needed in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Req. Aeration Vol., **$V_{aer,min}$** = | 72,149 | $ft^3$ | **Click on green box & then on the arrow to select tank shape** | **rectangular** | |
| Aer. + Membr. Vol., **$V_{tot}$** = | 76,496 | $ft^3$ | | | |
| Req. Vol. per tank, **$V_{tank}$** = | 38,248 | $ft^3$ | **Actual Tank Width =** | 38.3 | ft |
| Calculated Tank Width = | 27.6 | ft | **Actual Tank Length =** | 71.8 | ft |
| Calculated Tank Length = | 63.9 | ft | Act. Aer. Vol., **$V_{aer,act}$** = | 57,500 | $ft^3$ |
| Tank Wall Height = | 23.7 | ft | Memb. Mod. Vol/Tank: | 2,173 | $ft^3$ |
| Aer. Detention Time, **$\tau_{aer}$** = | 6.9 | hr | **MLVSS** = | 6,979 | mg/L |
| Vol. BOD Loading = | 91.4 | lb BOD/d/1000 $ft^3$ | | | |
| **F:M** ratio = | 0.210 | lb BOD/d/lb MLVSS | | | |
| Sludge Wasting Rate, **$Q_w$** = | 217,112 | gal/day | | | |

OXYGEN/AIR/BLOWER REQUIREMENTS

## VI. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| Standard $O_2$ transf. Effic., **SOTE** = (from diffuser mfr or vendor) | 30.0% | | Design Elevation above Sea Level, **Elev** = | 225 | ft |
| | | | ambient air Temp., **$T_{amb}$** = | 70 | °F |
| Ratio of oxygen transfer rate in wastewater to that in clean water, **α** = | 0.5 | | Diffuser Fouling Factor, **F** = | 0.8 | |
| Ratio of D.O. saturation in ww to that in clean water at same T & P, **B** = | 1.0 | | Depth of Diffuser, **$d_{diff}$** = | 21.7 | ft |
| D.O sat'n conc. for clean water at ww temp. & 1 atm, **$C_s$** = | 9.3 | mg/L | Pressure drop across diffuser, **$\Delta P_{diff}$** = (from diffuser mfr or vendor) | 10.8 | in $H_2O$ |

**NOTE:** Derivation of the equation for **$C_s$** as a function of **$T_{ww}$** is shown in wksht 7.

## VII. Air Requirement/Blower Design Calculations

| | | | | | |
|---|---|---|---|---|---|
| Barom. Pressure, **$P_{atm}$** = | 14.6 | psia | Des. Air Flow Rate, **SCFM:** | 4,311 | scfm |
| Pressure at Mid Depth, **$P_D$** = | 19.3 | psia | | | |
| Standard Air Density, **$\rho_{air}$** = (from Ideal Gas Law) | 0.07521 | $lb/ft^3$ | Des. Air Flow Rate, **ACFM:** (at delivery point) | 2591 | acfm |
| $O_2$ Utilization Rate, **$m_{O2}$** = | 8,976 | lb/day | Blower Outlet Press., **$P_{B2}$** = | 24.38 | psia |
| Actual $O_2$ transf. Efficiency, **AOTE** = | 8.33% | | | | |

**(This is the air flow rate needed for the aeration tank, typically provided by a fine bubble diffuser system.)**

ALKALINITY REQUIREMENT

## VIII. User Inputs and Constants - Enter value in yellow cell only

| | | |
|---|---|---|
| Target Effluent Alkalinity = | 20 | mg/L as $CaCO_3$ |
| Equiv. Weight of $CaCO_3$ = | 50 | g/equiv. |
| Equiv. Weight of $NaHCO_3$ = | 84 | g/equiv. |
| Alkalinity used for Nitrification = | 7.14 | g $CaCO_2$/g $NH_3$-N |

## IX. Calculation of Alkalinity Requirement

| | | |
|---|---|---|
| Alkalinity used for Nitrification = | 320.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 40.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 1,021 | lb/day as $CaCO_3$ |
| Sodium Bicarbonate needed per day to maintain alkalinity = | 1,716 | lb/day $NaHCO_3$ |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

rectangular
cylindrical

## Discussion and References

**For background information about Membrane Bioreactors (MBRs) see:**

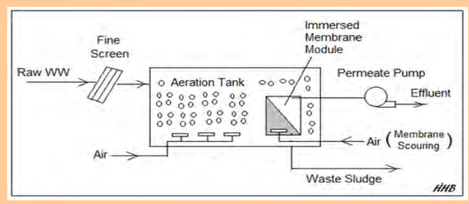
Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

As noted in all four of the above references, MLSS and $X_w$ for MBR processes are typically in the range from 8,000 to 12,000 mg/L.




**Flow Diagram - Membrane Bioreactor for BOD Removal & Nitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process

Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

**Equations Used in the Calculations:**

$\mu_{mn}$ at $T_{ww}$ = $(\mu_{mn_20})*\theta_{\mu mn}^{[((Tww-32)/1.8)-20]}$
$k_{dn}$ at $T_{ww}$ = $(k_{mn_20})*\theta_{Kdn}^{[((Tww-32)/1.8)-20]}$
$K_n$ at $T_{ww}$ = $(K_{n_20})*\theta_{Kn}^{[((Tww-32)/1.8)-20]}$

$\mu_n = [\mu_{mn}*NH_4\text{-}N_e/(K_n + NH_4\text{-}N_e)]*[DO_o/(0.5 + DO_o)] - k_{dn}$

Theor. **SRT = $1/\mu_n$**
Design **SRT = (**Theor. **SRT)FS** ( **FS** = TKN Peak/Ave Factor )

$\mu_m$ at $T_{ww}$ = $(\mu_{m_20})*\theta_{\mu m}^{[((Tww-32)/1.8)-20]}$
$k_d$ at $T_{ww}$ = $(k_{m_20})*\theta_{kd}^{[((Tww-32)/1.8)-20]}$ **bCODo = 1.6*BODo**

$S = K_s*[1 + (k_d*SRT)]/[SRT*(\mu_m - k_d) - 1]$

$P_{x,bio} = (Q_o*Y*(\mu_m - k_d)*8.34/(1 + (k_d*SRT)))$
$+ (f_d*k_d*Q_o*Y*(\mu_m - k_d)SRT*8.34/(1 + (k_d*SRT)))$
$+ (Q_o*Y_n*NO_x*8.34/(1 + (k_{dn}*SRT)))$

$NO_x = TKN_o - NH_4\text{-}N_e - [(0.12\ P_{x,bio}/8.34)/Q_o]$

$bpCOD/pCOD = (bCOD/BOD)*(BOD_o - sBOD_o)/(COD_o - sCOD_o)$

$nbVSS = [1 - (bpCOD/pCOD)]VSS_o$

$P_{x,VSS} = P_{x,bio} + (Q_o*nbVSS*8.34)$ $P_{x,TSS} = P_{x,VSS} + [Q_o(TSS_o - VSS_o)8.34]$

Mass of **MLVSS** = $P_{X,VSS}$*SRT Mass of **MLSS** = $P_{X,TSS}$*SRT

Required Aeration Volume = $V_{aer,min}$ = **(Mass of MLSS/(MLSS*8.34))*($10^6$/7.48)**

Aeration Detntion Time, $\tau = (V_{aer,act}*7.48/10^6)*N*24/Q_o$

Vol. BOD Loading = $Q_o*BOD_o*8.34/((V_{aer,act}/1000)*N)$

**MLVSS = MLSS(Mass of MLVSS/Mass of MLSS)**

**F:M ratio** = $Q_o*8.34*BOD_o/((MLVSS*8.34*(V_{aer,act}*7.48/10^6)*N))$

$Q_w = ((N*V_{aer,act}*7.48/10^6)*MLSS/(SRT*X_w))*10^6$

**Air Requirement/Blower Design Calculations**

$P_{atm} = 14.696*EXP[-32.17*MW_{air}*Elev/(g_c*R*T_{amb})]$

This equation for $P_{atm}$ as a function of elev. above sea level and ambient temperature comes from:
Water Reuse: Issues, Technologies, and Applications, Sec. 2.2

$P_D = P_{atm} + (62.4*d_{diff}/2)/144$ $\rho_{air} = MW_{air}*P_{std}/(10.73*(T_{std} + 459.67))$

lb/day $O_2$: $m_{O2} = Q_o*8.34*(BOD_o - BODe)/f - (1.42*P_{x,VSS}) + (4.57*Q_o*8.34*NO_x)$

This equation for oxygen utilization rate comes from:
Nalco Water Handbook, 4th Ed., Ch. 23 Eqns 23.6 and 23.7

The equation below for the actual oxygen transfer efficiency, AOTE, is found as
Design of Water Resource Recovery Facilities, 6th Ed., Equation 12.32

$$AOTE = SOTE\ \alpha\ F\ \frac{\left(B\left(\frac{P_D}{P_{std.}}\right)C_s - C_L\right)}{C_{ss}}\ \theta^{(Tww-20)}$$

**Note that for use in this equation Tww must be converted to °C**

Design Air Flow Rate, **SCFM = ($m_{O2}$/AOTE)*$MW_{air}$/($O_2$_mole fraction*MW_$O_2$*$\rho_{air}$_std*60*24**

Design Air Flow Rate, **ACFM = SCFM*($P_{std}$/$P_{blower}$)*(($T_{ww}$ + 459.67)/($T_{std}$ + 459.67))**

Blower Outlet Press., $P_{B2} = P_{atm} + \Delta P_{diff}*0.036126 + 62.4*d_{diff}/144$

Alkalinity used for Nitrification, **$Alk_{Nitrif}$ = 7.14*NOx mg/L as $CaCO_3$**

Alkalinity needed = **$Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$ mg/L as $CaCO_3$**

Alkalinity needed **Alk_perday = ($Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$)Qo*8.34 lb/day as $CaCO_3$**

Sodium Bicarbonate needed to maintain alkalinity = **Alk_perday*84/50 lb/day $NaHCO_3$**

DRAFT

MBR WW Treatment Process Design Calculations - U.S. Units
PreAnoxic Denitrification

**This worksheet makes the design calculations for preanoxic denitrification basin(s) to go with the Aeration Tank(s) designed for BOD removal and Nitrification in Worksheet 4. (Wastewater parameters/characteristics and biological kinetic coefficients entered on Worksheet 2 will also be used in this worksheet)**

INPUTS

## I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| Effluent Nitrate conc., $N_e$ = | 5.0 | mg/L | Mixing Energy | | |
| Nitrate conc. in RAS, $N_{RAS}$ = | 5.0 | mg/L | for Anoxic Reactor = | 0.38 | hp/10$^3$ ft$^3$ |
| Temp. Coeff. For **SDNR** = | 1.026 | . | Design % Excess | | |
| Tank Freeboard = | 2.3 | ft | Nitrif. Capacity = | 2% | |
| No. of Anoxic Tanks, $N_{an}$ = | 2 | . | Liquid Depth in Tank = | 22 | ft |
| Est. of detention time, $t_{an}$ = | 0.9654 | hr | Tank L:W ratio = | 1 | |

**Note that an initial estimate is needed for anoxic detention time in cell D19 to start an iterative calculation of minimum required anoxoc detention time below.**

**(Tank L:W ratio is only used for rectangular tanks)**

PROCESS DESIGN CALCULATIONS

## II. Calculate RAS Ratio and Anoxic Tank Active Biomass Conc.

| | | | | |
|---|---|---|---|---|
| RAS ratio, **RAS** = | 7.99 | Aer. Tank Act. Biomass, $P_{xb}$ = | 4609 | lb/d |
| An. Tank MLSS, $MLSS_{AN}$ = | 7554 | mg/L | | |
| Aeration Tank Active Biomass Fraction, $X_{aer,b}$ = | | 0.4773 | | |
| Anoxic Tank Active Biomass Conc., $X_{an,b}$ = | | 3606 | mg/L | |

## III. Calc Feed Rate of $NO_x$ to Anoxic Tank and Anoxic Tank Volume

| | | | | |
|---|---|---|---|---|
| Flow rate to Anoxic Tank = | 24.0 | MGD | | |
| (RAS flow containing nitrate) | | Anoxic Tank Volume, $V_{an}$ = | 16,132 | ft$^3$ |
| $NO_x$ rate to Anoxic Tank = | 999 | lb/day | (based on detention time value in cell D19) | |

## IV. Calculate the SDNR (Specific Denitrification Rate)

| | | | |
|---|---|---|---|
| Anoxic Tank **F/M** ratio = | 2.8979 | lb BOD/day/lb MLVSS | |
| **rbCODo/bCODo** ratio = | 0.1275 | | |
| | | Next lower rbCOD/bCOD value from table = | 0.1 |
| | | Next higher rbCOD/bCOD value from table = | 0.2 |
| **SDNR** for rbCOD/bCOD = | 0.1 | is equal to | 0.26899 |
| **SDNR** for rbCOD/bCOD = | 0.2 | is equal to | 0.33855 |
| **SDNR** for rbCOD/bCOD = | 0.1275 | is equal to | 0.2881 ( at 20°C) |
| **SDNR** at $T_{ww}$ = | 0.2808 | lb $NO_3$-N/day/lb biomass (at $T_{ww}$) | |

TANK VOLUME AND DIMENSIONS

## V. Calculate Anoxic Tank Volume, Dimensions, and Detention Time

| | | | | |
|---|---|---|---|---|
| $NO_3$-N reduction capacity = | 1019 | lb/day | % Excess Nitrif Capacity = | 2.0% |
| Difference between Design and Calculated % Excess Nitrif. Capacity = | | | 0.000 | |
| Anoxic Tank min. Vol, $V_{an}$ = | 16,132 | ft$^3$ | | |
| Min. Anoxic Det'n Time, $t_{an}$ = | 0.97 | hr | | |

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $V_{an}$ and $t_{an}$ values as follows: Place the cursor on the green cell G64 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell" G64 "To value:" 0, "By changing cell:" D19, and click on "OK". The calculated values of $V_{an}$ and $t_{an}$ will be in cells D66 and D68. Cell G64 should be zero if the process worked right. A preliminary estimate for $t_{an}$ is needed in cell D19 in order for the iterative solution to work.**

| | | | | | |
|---|---|---|---|---|---|
| Min. Vol. per tank, $V_{tank}$ = | 8,066 | ft$^3$ | **Click on green box & then on the arrow** | | |
| Calculated Tank Width = | 19.3 | ft | **to select tank shape** | **rectangular** | |
| Calculated Tank Length = | 19.3 | ft | **Actual Tank Width =** | 28.0 | ft |
| Tank Wall Height = | 24.0 | ft | **Actual Tank Length =** | 38.0 | ft |
| | | | Act. Tank Liq. Vol. = | 23,089 | ft$^3$ |
| Anoxic Detention Time, $\tau_{an}$ = | 2.763 | hr | (Preanoxic Tank Liquid Volume) | | |

FINAL CALCULATIONS

## VI. Calc. Revised Air Requirement & Alkalinity Requirement, Mixing Power & Sludge Wasting Rate

| | | | | | |
|---|---|---|---|---|---|
| Oxygen Credit = | 2857 | lb/day | equals: | 119.1 | lb/hr |
| $O_2$ Utilization Rate = | 255 | lb/hr | | | |
| Required Air Flow Rate (in Aeration Tank), SCFM = | | | | 2938.6 | SCFM |
| Required Air Flow Rate (in Aeration Tank), ACFM = | | | | 1766.0 | ACFM |

| | | |
|---|---|---|
| Alkalinity Produced = | 142.6 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -101.7 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -2546 | lb/day as $CaCO_3$ |
| Sodum Bicarbonate Needed per Day to Maintain Alkalinity (lb/day $NaHCO_3$) = | | -4277 |

| | | |
|---|---|---|
| Required Anoxic Tank Mixing Power = | 17.5 | hp |
| Sludge Wasting Rate = | 254,094 | gal/day |

### Discussion and References

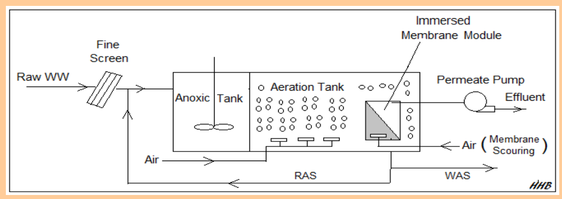
**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes




**Membrane Bioreactor for Preanoxic Denitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process
Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

RAS ratio, **$RAS = (NO_x/N_{RAS}) - 1$**
Aer Tank Act. Biomass, **$P_{xb} = [Q_o*Y*(bCOD_o - S)*8.34]/[1 + (k_d*SRT)]$**
Anaer. Tank MLSS, **$MLSS_{AN} = [RAS/(RAS + 1)]\ MLSS_w$**
Aeration Tank Active Biomass Fraction, **$X_{aer,b} = P_{xb}/P_{x,vss}$**
Anoxic Tank Active Biomass Conc., **$X_{an,b} = X_{aer,b}*MLSS_{AN}$**

Flow Rate to Anoxic Tank , **$Q_{AN} = RAS*Q_o$**
$NO_x$ Rate to Anoxic Tank **$= Q_{AN}*N_{RAS}*8.34$**
Anoxic Tank Volume, **$V_{an} = (Q_o*10^6/7.48)*t_{AN}/24$**

Anoxic Tank F:M ratio, **$F:M = Q_o*BOD_o*8.34/((V_{an}*7.48/10^6)*X_{an,b}/8.34)$**

**Coefficients for: $SDNR = b_o + b_1\ [\ln(F:M)]$**

| rbCOD/bCOD | $b_o$ | $b_1$ |
|---|---|---|
| 0.1 | 0.186 | 0.078 |
| 0.2 | 0.213 | 0.118 |
| 0.3 | 0.235 | 0.141 |
| 0.4 | 0.242 | 0.152 |
| 0.5 | 0.27 | 0.162 |
| 0.10 | 0.1860 | 0.0780 |
| 0.20 | 0.2130 | 0.1180 |

The SDNR equation, coefficient values, and temperature correction equations are from: Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery* , 5th Ed., McGraw-Hill, 2014

Note that for F:M < 0.5, SDNR at 20°C is calculated as: **SDNR = 0.24*F:M**

**SDNR** at $T_{ww}$ = (**SDNR** at **20°C**)*$\theta_{SDNR}^{[((Tww-32)/1.8)-20]}$

$NO_3$-N reduction capacity = **$(V_{an}*7.48/10^6)*SDNR*X_{an,b}*8.34$**

% Excess Nitrif. Capac. = (**$NO_3$-N Reduction Capacity - $NO_x$ Rate to Anoxic Tank**) / **$NO_x$ Rate to Anoxic Tank**

Min. Anoxic Det'n Time, **$t_{an} = V_{an}*24/(Q_o*10^6/7.48)$**

Min. Vol. per Tank, **$V_{tank} = V_{an}/N_{an}$**

Oxygen credit for nitrate reduction = **$2.86\ Q_o(NO_x - N_e)$**

Alkalinity produced by nitrate reduction = **$3.57(NO_x - N_e)$**

Sludge Wasting Rate:
**$Q_w = [((V_{aer}*MLSS + V_{anox}*X_b)/SRT)]/(TSS_w)$**

DRAFT

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

rectangular
cylindrical

# Near-Term Conditions

MBR WW Treatment Process Design Calculations - U.S. Units
User Inputs and Constants

WW INFORMATION

## I. Wastewater Parameters/Characteristics

Enter values in yellow cells only.

| | | | | | |
|---|---|---|---|---|---|
| Design ww Flow Rate, $Q_o$ = | 3.51 | MGD | Influent TSS, $TSS_o$ = | 329 | mg/L |
| Influent BOD, $BOD_o$ = | 420 | mg/L | Influent VSS, $VSS_o$ = | 260 | mg/L |
| Influent sBOD, $sBOD_o$ = | 168 | mg/L | | | |
| | | | Influent TKN, $TKN_o$ = | 70 | mg/L |
| Influent COD, $COD_o$ = | 857 | mg/L | TKN peak/ave factor, **FS** = | 1.0 | |
| Influent sCOD, $sCOD_o$ = | 129 | mg/L | Influent $NH_4$-N, $NH_4$-$N_o$ = | 42 | mg/L |
| Influent rbCOD, $rbCOD_o$ = | 86 | mg/L | Influent Alkalinity, $Alk_o$ = (mg/L as $CaCO_3$) | 300 | |
| ratio, **bCOD/BOD** = | 1.6 | | Aeration WW Temp, $T_{ww}$ = | 66.2 | °F |

BIOL. KINETIC COEFFICIENTS

## II. Biological Kinetic Coefficients - For BOD Removal

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., **Y** = | 0.40 | lb VSS/lb bCOD | Half Veloc. Coeff., $K_s$ = | 20 | mg/L |
| Temp coeff., q, for mm = | 1.07 | | Temp coeff., q, for kd = | 1.04 | |
| | | | Resid. biomass fract., $f_d$ = | 0.15 | |
| Max spec. gwth rate at 20°C, $\mu_{m20}$ = | 6 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{d20}$ = | 0.12 | lb VSS/d/lb VSS | | | |

## III. Biological Kinetic Coefficients - For Nitrification

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., $Y_n$ = | 0.12 | lb VSS/lb NOx | | | |
| Temp coeff., q, for mmn = | 1.070 | | Half Veloc. Coeff. at 20°C, $K_n$ = | 0.7 | mg/L |
| Temp coeff., q, for kdn = | 1.040 | | Half Veloc. Coeff. at 20°C, $K_o$ = | 0.5 | mg/L |
| Temp coeff., q, for Kn = | 1.053 | | Temp coeff., q, for Ko = | 1 | |
| Max spec. gwth rate at 20°C, $\mu_{mn20}$ = | 0.8 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{dn20}$ = | 0.08 | lb VSS/d/lb VSS | | | |

CONSTANTS

## IV. Constants Used in the Calculations

| | | | | | |
|---|---|---|---|---|---|
| Ratio of $BOD_5$ to $BOD_u$, **f** = | 0.68 | | Saturation D.O. in water at 20°C & 1 atm, $C_{ss}$ = | 9.17 | mg/L |
| $BOD_u$ equiv. of VSS = | 1.42 | lb $BOD_u$/lb VSS | Standard Pressure = | 14.7 | psi |
| Spec Wt of water, $\gamma_{H2O}$ = | 62.4 | lb/ft$^3$ | Standard Temperature = | 68.0 | °F |
| Mol. Wt. of Air = | 28.97 | | Mol. Wt. of Oxygen = | 32.0 | |
| Temp Coeff. for $O_2$ rate, $\theta$ = | 1.024 | | $O_2$ mole fraction in Air = | 0.209 | |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

DRAFT

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

**Activated Sludge Kinetic Coefficients for heterotrophic bacteria at 20°C (for BOD removal)**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_m$ | kg VSS/day/kg VSS | 3.0 - 13.2 | 6.0 |
| $K_s$ | mg/L bCOD | 5.0 - 40.0 | 20.0 |
| Y | kg VSS/day/kg bCOD | 0.30 - 0.50 | 0.40 |
| $k_d$ | kg VSS/day/kg VSS | 0.06 - 0.20 | 0.12 |
| $f_d$ | dimensionless | 0.08 - 0.20 | 0.15 |
| θ values for temperature corrections | | | |
| for $\mu_m$ | dimensionless | 1.03 - 1.08 | 1.07 |
| for $k_d$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_s$ | dimensionless | 1.00 | 1.00 |

The source for the values in the table above is:
Introduction to Water Resource Recovery Facility Design, 2nd Ed., Table 6.1

**Activated Sludge Nitrification Kinetic Coefficients at 20°C**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_{mn}$ | kg VSS/day/kg VSS | 0.2 - 0.90 | 0.75 |
| $K_n$ | mg/L $NH_4$-N | 0.50 - 1.0 | 0.74 |
| $Y_n$ | kg VSS/kg $NH_4$-N | 0.10 - 0.15 | 0.12 |
| $k_{dn}$ | kg VSS/day/kg VSS | 0.05 - 0.15 | 0.08 |
| $K_o$ | mg/L | 0.40 - 0.60 | 0.50 |
| θ values for temperature corrections | | | |
| for $\mu_{mn}$ | dimensionless | 1.06 - 1.123 | 1.07 |
| for $k_{dn}$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_n$ | dimensionless | 1.03 - 1.123 | 1.053 |

The source for the values in the table above is:
Introduction to Water Rsource Recovery Facility Design, 2nd Ed., Table 6.2

MBR WW Treatment Process Design Calculations - U.S. Units
Membrane Module Sizing Calculations

INPUTS

## I. Membrane/Membrane Module Parameters

(Values typically available from membrane manufacturer or vendor - Enter values in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Module packing density, $\phi$ = | 148 | $m^2/m^3$ | equals | 45.0 | $ft^2/ft^3$ |
| Specific Aer. Demand, $SAD_M$ = | 0.2 | $m^3$ air/hr/$m^2$ membrane | | | |
| | | equals | 0.656 | $ft^3$ air/hr/$ft^2$ membrane | |

CALCULATIONS

## II. Process Design Calculations (done by worksheet)

| | | | | | |
|---|---|---|---|---|---|
| Membrane Flux, **J** = | 21.1 | L/hr/$m^2$ | equals | 0.518 | gal/hr/$ft^2$ |
| Membrane Area, $A_M$ = | 282,113 | $ft^2$ | | | |
| Membrane Module Vol., $V_M$ = | 6,271 | $ft^3$ | | | |
| Scouring Air Flow Required = | 3,085 | $ft^3$/min (ACFM) = | | 3,071 | SCFM |

**(This is the scouring air flow rate needed for the membrane module, typically provided by a coarse bubble diffuser system.)**

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

Values given for MBR specific area (module packing density) range from 150 -334 $m^2/m^3$ in Table 8-35 of Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery, 5th Ed.,* McGraw-Hill, 2014

**Equations Used in the Calculations:**

Module packing density, $\phi$, in $ft^2/ft^3$ = ($\phi$ in $m^2/m^3$)/3.28084

Specific Aeration Demand, $SAD_M$, in $ft^3$ air/hr/$ft^2$ membrane =
= $SAD_M$ in $m^3$ air/hr/$m^2$ membrane/3.28084

Membrane Flux, **J**, in L/hr/$m^2$ = $0.4056T_{ww} - 5.7278$ (with $T_{ww}$ in $^oF$)
(See Worksheet 6 for derivation of this eqution)

Membrane Flux, **J**, in gal/hr/$ft^2$ = [(Membrane Flux (**J**) in L/hr/$m^2$)/3.7854]/($3.28084^2$)

Membrane Area, $A_M = (Q_o*10^6/24)/J$

Membrane Module Volume, $V_M = A_M/\phi$

Scouring Air Flow Required, **ACFM** = $(SAD_M)(A_M)/60$ ACFM

Scouring Air Flow Req'd, **SCFM** = (**ACFM**)[($T_{std}$ + 459.67)/($T_{ww}$ + 459.67)]($P_{atm}/P_{std}$) SCFM

DRAFT

# MBR WW Treatment Process Design Calculations - U.S. Units

BOD Removal and Nitrification

INPUTS

## I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| | | | Target Effluent Concentrations: | | |
| MLSS in Aer Tank, **MLSS** = | 8,500 | mg/L | **$BOD_e$** = | 10 | mg/L |
| MLSS in Waste Sludge, **$X_w$** = | 8,500 | mg/L | **$TSS_e$** = | 10 | mg/L |
| DO in Aer. Tank, **$DO_o$** = | 2 | mg/L | **$NH_4$-$N_e$** = | 1.0 | mg/L |
| Number of Aeration Tanks = | 2 | | Tank Freeboard = | 2.0 | ft |
| Liquid Depth in Tank = | 22 | ft | Tank L:W ratio = | 2.3 | |
| Initial Estimate of **$NO_x$** = | 44.93 | mg/L | **(Tank L:W ratio is only used for rectangular tanks)** | | |

**Note that an initial estimate is needed for $NO_x$ in cell D14 to start an iterative calculation of $NO_x$ below. 80% of the influent TKN is suggested for this initial estimate. 80% of $TKN_o$ =** 56.0 mg/L

Influent TKN, **$TKN_o$** = 70 mg/L
(value transferred from Worksheet 2)

PROCESS DESIGN CALCULATIONS

## II. Calculate Design SRT

| | | | | | |
|---|---|---|---|---|---|
| $\mu_{mn}$ at $T_{ww}$ = | 0.70 | lb VSS/d/lb VSS | **$K_n$** at $T_{ww}$ = | 0.70 | mg/L |
| $k_{dn}$ at $T_{ww}$ = | 0.08 | lb VSS/d/lb VSS | Theor. SRT = | 3.96 | days |
| $\mu_n$ = | 0.25 | lb VSS/d/lb VSS | Design **SRT** = | 3.96 | days |

## III. Calculate the Biomass Production Rate

| | | | | | |
|---|---|---|---|---|---|
| $\mu_m$ at $T_{ww}$ = | 5.61 | lb VSS/d/lb VSS | **bCODo** = | 672 | mg/L |
| $k_d$ at $T_{ww}$ = | 0.1154 | lb VSS/d/lb VSS | **S** = | 1.404 | mg bCOD/L |

Biomass Production Rate, **$P_{x,bio}$** = 5883 lb VSS/day

## IV. Determine the Amount of Nitrogen Oxidized to Nitrate

| | | |
|---|---|---|
| Calculated amount of nitrogen oxidized to nitrate, **$NO_x$** = | 44.932 | mg/L |
| Difference between estimated and calculated values **$NO_x$** = | 0.00000 | mg/L |

**Goal Seek Result:**
Amount of nitrogen oxidized to nitrate, **$NO_x$** = **44.93** mg/L

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $NO_x$ value as follows: Place the cursor on the green cell G42 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell:" G42, "To value:" 0, "By changing cell:" D14, and click on "OK". The calculated value of $NO_x$ will appear in cell F44 and G42 should be zero if the process worked properly. Note that cell D14 needs an initial estimate for $NO_x$ in order for the iterative solution to work properly.**

## IV. Calc. the Prod. Rate and Mass of VSS and TSS in Aeration Basin

| | | | | | |
|---|---|---|---|---|---|
| **bpCOD/pCOD** = | 0.554 | | **nbVSS** = | 115.9 | mg/L |
| Aeration Tank VSS Production Rate, **$P_{X,VSS}$** = | 9276 | lb VSS/day | | | |
| Aeration Tank TSS Production Rate, **$P_{X,TSS}$** = | 11298 | lb TSS/day | | | |
| Mass of **MLVSS** = | 36,753 | lb VSS | Mass of **MLSS** = | 44,762 | lb TSS |

AER. TANK CALC'NS

## V. Aeration Tank Calculations (User input needed in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Req. Aeration Vol., **$V_{aer,min}$** = | 84,415 | $ft^3$ | **Click on green box & then on the arrow** | | |
| Aer. + Membr. Vol., **$V_{tot}$** = | 90,686 | $ft^3$ | **to select tank shape** | **rectangular** | |
| Req. Vol. per tank, **$V_{tank}$** = | 45,343 | $ft^3$ | **Actual Tank Width =** | 38.3 | ft |
| Calculated Tank Width = | 30.0 | ft | **Actual Tank Length =** | 71.8 | ft |
| Calculated Tank Length = | 69.6 | ft | Act. Aer. Vol., **$V_{aer,act}$** = | 56,538 | $ft^3$ |
| Tank Wall Height = | 23.7 | ft | Memb. Mod. Vol/Tank: | 3,135 | $ft^3$ |
| Aer. Detention Time, $\tau_{aer}$ = | 5.8 | hr | **MLVSS** = | 6,979 | mg/L |
| Vol. BOD Loading = | 108.8 | lb BOD/d/1000 $ft^3$ | | | |
| **F:M** ratio = | 0.250 | lb BOD/d/lb MLVSS | | | |
| Sludge Wasting Rate, **$Q_w$** = | 213,479 | gal/day | | | |

## VI. User Inputs - Enter values in yellow cells only

### Discussion and References

**For background information about Membrane Bioreactors (MBRs) see:**

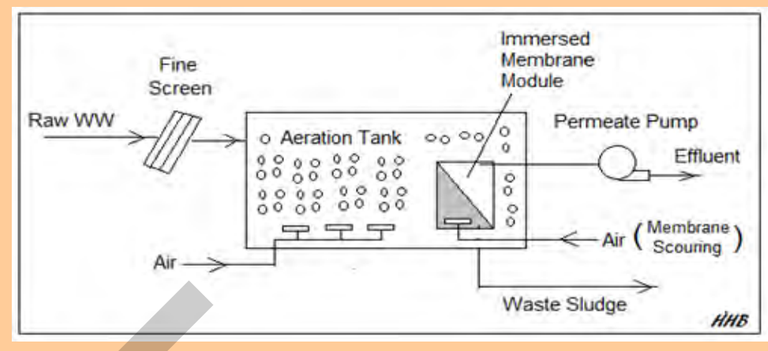
Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

As noted in all four of the above references, MLSS and $X_w$ for MBR processes are typically in the range from 8,000 to 12,000 mg/L.




**Flow Diagram - Membrane Bioreactor for BOD Removal & Nitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process

Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

**Equations Used in the Calculations:**

$\mu_{mn}$ at $T_{ww}$ = $(\mu_{mn_20})*\theta_{\mu mn}^{[((Tww-32)/1.8)-20]}$
$k_{dn}$ at $T_{ww}$ = $(k_{mn_20})*\theta_{kdn}^{[((Tww-32)/1.8)-20]}$
$K_n$ at $T_{ww}$ = $(K_{n_20})*\theta_{Kn}^{[((Tww-32)/1.8)-20]}$

$\mu_n = [\mu_{mn}*NH_4\text{-}N_e/(K_n + NH_4\text{-}N_e)]*[DO_o/(0.5 + DO_o)] - k_{dn}$

Theor. **SRT** = $1/\mu_n$
Design **SRT** = (Theor. **SRT**)**FS** ( **FS** = TKN Peak/Ave Factor )

$\mu_m$ at $T_{ww}$ = $(\mu_{m_20})*\theta_{\mu m}^{[((Tww-32)/1.8)-20]}$
$k_d$ at $T_{ww}$ = $(k_{m_20})*\theta_{kd}^{[((Tww-32)/1.8)-20]}$ **bCODo = 1.6*BODo**

$S = K_s*[1 + (k_d*SRT)]/[SRT*(\mu_m - k_d) - 1]$

$P_{x,bio} = (Q_o*Y*(\mu_m - k_d)*8.34/(1 + (k_d*SRT)))$
$+ (f_d*k_d*Q_o*Y*(\mu_m - k_d)SRT*8.34/(1 + (k_d*SRT)))$
$+ (Q_o*Y_n*NO_x*8.34/(1 + (k_{dn}*SRT)))$

$NO_x = TKN_o - NH_4\text{-}N_e - [(0.12\ P_{x,bio}/8.34)/Q_o]$

$bpCOD/pCOD = (bCOD/BOD)*(BOD_o - sBOD_o)/(COD_o - sCOD_o)$

$nbVSS = [1 - (bpCOD/pCOD)]VSS_o$

$P_{x,VSS} = P_{x,bio} + (Q_o*nbVSS*8.34)$ $P_{x,TSS} = P_{x,VSS} + [Q_o(TSS_o - VSS_o)8.34]$

Mass of **MLVSS** = $P_{X,VSS}$*SRT Mass of **MLSS** = $P_{X,TSS}$*SRT

Required Aeration Volume = $V_{aer,min} = (\text{Mass of MLSS}/(MLSS*8.34))*(10^6/7.48)$

Aeration Detntion Time, $\tau = (V_{aer,act}*7.48/10^6)*N*24/Q_o$

Vol. BOD Loading = $Q_o*BOD_o*8.34/((V_{aer,act}/1000)*N)$

**MLVSS = MLSS(Mass of MLVSS/Mass of MLSS)**

**F:M ratio** = $Q_o*8.34*BOD_o/((MLVSS*8.34*(V_{aer,act}*7.48/10^6)*N))$

$Q_w = ((N*V_{aer,act}*7.48/10^6)*MLSS/(SRT*X_w))*10^6$

**Air Requirement/Blower Design Calculations**

$P_{atm} = 14.696*EXP[-32.17*MW_{air}*Elev/(g_c*R*T_{amb})$

DRAFT

OXYGEN/AIR/BLOWER REQUIREMENTS

| | | | | | |
|---|---|---|---|---|---|
| Standard $O_2$ transf. Effic., **SOTE** = (from diffuser mfr or vendor) | 30.0% | | Design Elevation above Sea Level, **Elev** = | 225 | ft |
| | | | ambient air Temp., $T_{amb}$ = | 70 | °F |
| Ratio of oxygen transfer rate in wastewater to that in clean water, $\alpha$ = | 0.5 | | Diffuser Fouling Factor, **F** = | 0.8 | |
| Ratio of D.O. saturation in ww to that in clean water at same T & P, **B** = | 1.0 | | Depth of Diffuser, $d_{diff}$ = | 21.7 | ft |
| D.O sat'n conc. for clean water at ww temp. & 1 atm, $C_s$ = | 9.3 | mg/L | Pressure drop across diffuser, $\Delta P_{diff}$ = (from diffuser mfr or vendor) | 10.8 | in $H_2O$ |

**NOTE:** Derivation of the equation for $C_s$ as a function of $T_{ww}$ is shown in wksht 7.

## VII. Air Requirement/Blower Design Calculations

| | | | | | |
|---|---|---|---|---|---|
| Barom. Pressure, $P_{atm}$ = | 14.6 | psia | Des. Air Flow Rate, **SCFM:** | 5,044 | scfm |
| Pressure at Mid Depth, $P_D$ = | 19.3 | psia | | | |
| Standard Air Density, $\rho_{air}$ = (from Ideal Gas Law) | 0.07521 | lb/ft$^3$ | Des. Air Flow Rate, **ACFM:** (at delivery point) | 3031 | acfm |
| $O_2$ Utilization Rate, $m_{O2}$ = | 10,502 | lb/day | Blower Outlet Press., $P_{B2}$ = | 24.38 | psia |
| Actual $O_2$ transf. Efficiency, **AOTE** = | 8.33% | | | | |

**(This is the air flow rate needed for the aeration tank, typically provided by a fine bubble diffuser system.)**

This equation for $P_{atm}$ as a function of elev. above sea level and ambient temperature comes from:
Water Reuse: Issues, Technologies, and Applications, Sec. 2.2

$P_D = P_{atm} + (62.4*d_{diff}/2)/144$ $\rho_{air} = MW_{air}*P_{std}/(10.73*(T_{std} + 459.67))$

lb/day $O_2$: $m_{O2} = Q_o*8.34*(BOD_o - BODe)/f - (1.42*P_{x,VSS}) + (4.57*Q_o*8.34*NO_x)$

This equation for oxygen utilization rate comes from:
Nalco Water Handbook, 4th Ed., Ch. 23 Eqns 23.6 and 23.7

The equation below for the actual oxygen transfer efficiency, AOTE, is found as
Design of Water Resource Recovery Facilities, 6th Ed., Equation 12.32

$$AOTE = SOTE\ \alpha\ F\ \frac{\left(B\left(\frac{P_D}{P_{std}}\right)C_s - C_L\right)}{C_{ss}}\ \theta^{(Tww-20)}$$

**Note that for use in this equation Tww must be converted to °C**

Design Air Flow Rate, **SCFM = ($m_{O2}$/AOTE)*$MW_{air}$/($O_2$_mole fraction*MW_$O_2$*$\rho_{air}$_std*60*24**

Design Air Flow Rate, **ACFM = SCFM*($P_{std}$/$P_{blower}$)*(($T_{ww}$ + 459.67)/($T_{std}$ + 459.67))**

Blower Outlet Press., $P_{B2} = P_{atm} + \Delta P_{diff}*0.036126 + 62.4*d_{diff}/144$

Alkalinity used for Nitrification, **$Alk_{Nitrif}$ = 7.14*NOx mg/L as $CaCO_3$**

Alkalinity needed = **$Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$ mg/L as $CaCO_3$**

Alkalinity needed **Alk_perday = ($Alk_{Nitrif}$ + $Alk_{Effl}$ - $Alk_o$)Qo*8.34 lb/day as $CaCO_3$**

Sodium Bicarbonate needed to maintain alkalinity = **Alk_perday*84/50 lb/day $NaHCO_3$**

ALKALINITY REQUIREMENT

## VIII. User Inputs and Constants- Enter value in yellow cell only

| | | |
|---|---|---|
| Target Effluent Alkalinity = | 20 | mg/L as $CaCO_3$ |
| Equiv. Weight of $CaCO_3$ = | 50 | g/equiv. |
| Equiv. Weight of $NaHCO_3$ = | 84 | g/equiv. |
| Alkalinity used for Nitrification = | 7.14 | g $CaCO_2$/g $NH_3$-N |

## IX. Calculation of Alkalinity Requirement

| | | |
|---|---|---|
| Alkalinity used for Nitrification = | 320.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 40.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 1,195 | lb/day as $CaCO_3$ |
| Sodium Bicarbonate needed per day to maintain alkalinity = | 2,007 | lb/day $NaHCO_3$ |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

DRAFT

rectangular
cylindrical

# MBR WW Treatment Process Design Calculations - U.S. Units
## PreAnoxic Denitrification

**This worksheet makes the design calculations for preanoxic denitrification basin(s) to go with the Aeration Tank(s) designed for BOD removal and Nitrification in Worksheet 4. (Wastewater parameters/characteristics and biological kinetic coefficients entered on Worksheet 2 will also be used in this worksheet)**

INPUTS

### I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| Effluent Nitrate conc., $N_e$ = | 5.0 | mg/L | Mixing Energy | | |
| Nitrate conc. in RAS, $N_{RAS}$ = | 5.0 | mg/L | for Anoxic Reactor = | 0.38 | hp/10$^3$ ft$^3$ |
| Temp. Coeff. For **SDNR** = | 1.026 | . | Design % Excess | | |
| Tank Freeboard = | 2.3 | ft | Nitrif. Capacity = | 2% | |
| No. of Anoxic Tanks, $N_{an}$ = | 2 | . | Liquid Depth in Tank = | 22 | ft |
| Est. of detention time, $t_{an}$ = | 0.9654 | hr | Tank L:W ratio = | 1 | |

**Note that an initial estimate is needed for anoxic detention time in cell D19 to start an iterative calculation of minimum required anoxoc detention time below.**

**(Tank L:W ratio is only used for rectangular tanks)**

PROCESS DESIGN CALCULATIONS

### II. Calculate RAS Ratio and Anoxic Tank Active Biomass Conc.

| | | | | |
|---|---|---|---|---|
| RAS ratio, **RAS** = | 7.99 | Aer. Tank Act. Biomass, $P_{xb}$ = | 5393 | lb/d |
| An. Tank MLSS, $MLSS_{AN}$ = | 7554 | mg/L | | |
| Aeration Tank Active Biomass Fraction, $X_{aer,b}$ = | | 0.4773 | | |
| Anoxic Tank Active Biomass Conc., $X_{an,b}$ = | | 3606 | | mg/L |

### III. Calc Feed Rate of $NO_x$ to Anoxic Tank and Anoxic Tank Volume

| | | | | | |
|---|---|---|---|---|---|
| Flow rate to Anoxic Tank = | 28.0 | MGD | | | |
| (RAS flow containing nitrate) | | | Anoxic Tank Volume, $V_{an}$ = | 18,875 | ft$^3$ |
| $NO_x$ rate to Anoxic Tank = | 1169 | lb/day | (based on detention time value in cell D19) | | |

### IV. Calculate the SDNR (Specific Denitrification Rate)

| | | | | |
|---|---|---|---|---|
| Anoxic Tank **F/M** ratio = | 2.8979 | lb BOD/day/lb MLVSS | | |
| **rbCODo/bCODo** ratio = | 0.1275 | | | |
| | | Next lower rbCOD/bCOD value from table = | 0.1 | |
| | | Next higher rbCOD/bCOD value from table = | 0.2 | |
| **SDNR** for rbCOD/bCOD = | 0.1 | is equal to | 0.26899 | |
| **SDNR** for rbCOD/bCOD = | 0.2 | is equal to | 0.33855 | |
| **SDNR** for rbCOD/bCOD = | 0.1275 | is equal to | 0.2881 | ( at 20°C) |
| **SDNR** at $T_{ww}$ = | 0.2808 | lb $NO_3$-N/day/lb biomass (at $T_{ww}$) | | |

TANK VOLUME AND DIMENSIONS

### V. Calculate Anoxic Tank Volume, Dimensions, and Detention Time

| | | | | |
|---|---|---|---|---|
| $NO_3$-N reduction capacity = | 1192 | lb/day | % Excess Nitrif Capacity = | 2.0% |
| Difference between Design and Calculated % Excess Nitrif. Capacity = | | | 0.000 | |
| Anoxic Tank min. Vol, $V_{an}$ = | 18,875 | ft$^3$ | | |
| Min. Anoxic Det'n Time, $t_{an}$ = | 0.97 | hr | | |

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $V_{an}$ and $t_{an}$ values as follows: Place the cursor on the green cell G64 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell" G64 "To value:" 0, "By changing cell:" D19, and click on "OK". The calculated values of $V_{an}$ and $t_{an}$ will be in cells D66 and D68. Cell G64 should be zero if the process worked right. A preliminary estimate for $t_{an}$ is needed in cell D19 in order for the iterative solution to work.**

| | | | | | |
|---|---|---|---|---|---|
| Min. Vol. per tank, $V_{tank}$ = | 9,437 | ft$^3$ | **Click on green box & then on the arrow** | | |
| Calculated Tank Width = | 20.9 | ft | **to select tank shape** | **rectangular** | |
| Calculated Tank Length = | 20.9 | ft | **Actual Tank Width =** | 28.0 | ft |
| Tank Wall Height = | 24.0 | ft | **Actual Tank Length =** | 38.0 | ft |
| | | | Act. Tank Liq. Vol. = | 23,089 | ft$^3$ |
| Anoxic Detention Time, $\tau_{an}$ = | 2.362 | hr | (Preanoxic Tank Liquid Volume) | | |

IONS

### VI. Calc. Revised Air Requirement & Alkalinity Requirement, Mixing Power & Sludge Wasting Rate

| | | | | |
|---|---|---|---|---|
| Oxygen Credit = | 3343 | lb/day | equals: 139.3 | lb/hr |
| $O_2$ Utilization Rate = | 298 | lb/hr | | |

**Discussion and References**

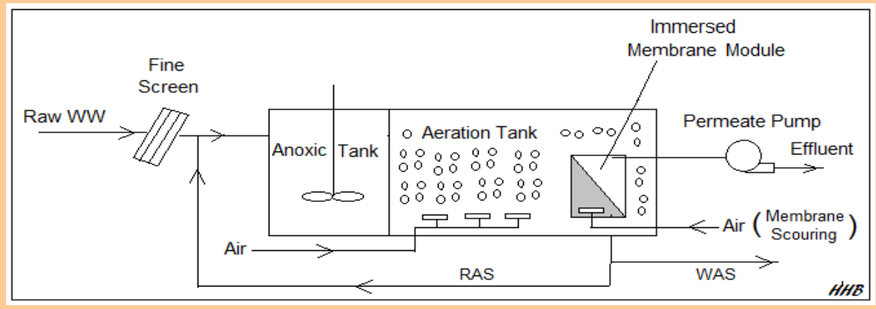
**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes




**Membrane Bioreactor for Preanoxic Denitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process
Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

RAS ratio, **RAS** = $(NO_x/N_{RAS}) - 1$

Aer Tank Act. Biomass, $P_{xb} = [Q_o*Y*(bCOD_o - S)*8.34]/[1 + (k_d*SRT)]$

Anaer. Tank MLSS, $MLSS_{AN} = [RAS/(RAS + 1)]\ MLSS_w$

Aeration Tank Active Biomass Fraction, $X_{aer,b} = P_{xb}/P_{x,vss}$

Anoxic Tank Active Biomass Conc., $X_{an,b} = X_{aer,b}*MLSS_{AN}$

Flow Rate to Anoxic Tank, $Q_{AN} = RAS*Q_o$

$NO_x$ Rate to Anoxic Tank $= Q_{AN}*N_{RAS}*8.34$

Anoxic Tank Volume, $V_{an} = (Q_o*10^6/7.48)*t_{AN}/24$

Anoxic Tank F:M ratio, $F:M = Q_o*BOD_o*8.34/((V_{an}*7.48/10^6)*X_{an,b}/8.34)$

**Coefficients for: $SDNR = b_o + b_1\ [\ln(F:M)]$**

| rbCOD/bCOD | $b_o$ | $b_1$ |
|---|---|---|
| 0.1 | 0.186 | 0.078 |
| 0.2 | 0.213 | 0.118 |
| 0.3 | 0.235 | 0.141 |
| 0.4 | 0.242 | 0.152 |
| 0.5 | 0.27 | 0.162 |
| 0.10 | 0.1860 | 0.0780 |
| 0.20 | 0.2130 | 0.1180 |

The SDNR equation, coefficient values, and temperature correction equations are from: Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery*, 5th Ed., McGraw-Hill, 2014

Note that for F:M < 0.5, SDNR at 20°C is calculated as: **SDNR = 0.24*F:M**

**SDNR** at $T_{ww}$ = (**SDNR** at **20°C**)*$\theta_{SDNR}^{[((Tww-32)/1.8)-20]}$

$NO_3$-N reduction capacity $= (V_{an}*7.48/10^6)*SDNR*X_{an,b}*8.34$

% Excess Nitrif. Capac. = (($NO_3$-N Reduction Capacity - $NO_x$ Rate to Anoxic Tank) / $NO_x$ Rate to Anoxic Tank)

Min. Anoxic Det'n Time, $t_{an} = V_{an}*24/(Q_o*10^6/7.48)$

Min. Vol. per Tank, $V_{tank} = V_{an}/N_{an}$

Oxygen credit for nitrate reduction $= 2.86\ Q_o(NO_x - N_e)$

Alkalinity produced by nitrate reduction $= 3.57(NO_x - N_e)$

Sludge Wasting Rate:

$Q_w = [((V_{aer}*MLSS + V_{anox}*X_b)/SRT)]/(TSS_w)$

DRAFT

FINAL CALCULAT

| | | |
|---|---|---|
| Required Air Flow Rate (in Aeration Tank), SCFM = | 3438.1 | SCFM |
| Required Air Flow Rate (in Aeration Tank), ACFM = | 2066.2 | ACFM |

| | | |
|---|---|---|
| Alkalinity Produced = | 142.6 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -101.7 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -2978 | lb/day as $CaCO_3$ |

Sodum Bicarbonate Needed per Day to Maintain Alkalinity (lb/day $NaHCO_3$) = -5004

| | | |
|---|---|---|
| Required Anoxic Tank Mixing Power = | 17.5 | hp |
| Sludge Wasting Rate = | 250,461 | gal/day |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

rectangular
cylindrical

DRAFT

# Ultimate Conditions

MBR WW Treatment Process Design Calculations - U.S. Units
User Inputs and Constants

WW INFORMATION

## I. Wastewater Parameters/Characteristics

Enter values in yellow cells only.

| | | | | | |
|---|---|---|---|---|---|
| Design ww Flow Rate, $Q_o$ = | 4.12 | MGD | Influent TSS, $TSS_o$ = | 329 | mg/L |
| Influent BOD, $BOD_o$ = | 420 | mg/L | Influent VSS, $VSS_o$ = | 260 | mg/L |
| Influent sBOD, $sBOD_o$ = | 168 | mg/L | | | |
| | | | Influent TKN, $TKN_o$ = | 70 | mg/L |
| Influent COD, $COD_o$ = | 857 | mg/L | TKN peak/ave factor, **FS** = | 1.0 | |
| Influent sCOD, $sCOD_o$ = | 129 | mg/L | Influent $NH_4$-N, $NH_4$-$N_o$ = | 42 | mg/L |
| Influent rbCOD, $rbCOD_o$ = | 86 | mg/L | Influent Alkalinity, $Alk_o$ = (mg/L as $CaCO_3$) | 300 | |
| ratio, **bCOD/BOD** = | 1.6 | | Aeration WW Temp, $T_{ww}$ = | 66.2 | °F |

BIOL. KINETIC COEFFICIENTS

## II. Biological Kinetic Coefficients - For BOD Removal

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., **Y** = | 0.40 | lb VSS/lb bCOD | Half Veloc. Coeff., $K_s$ = | 20 | mg/L |
| Temp coeff., q, for mm = | 1.07 | | Temp coeff., q, for kd = | 1.04 | |
| | | | Resid. biomass fract., $f_d$ = | 0.15 | |
| Max spec. gwth rate at 20°C, $\mu_{m20}$ = | 6 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{d20}$ = | 0.12 | lb VSS/d/lb VSS | | | |

## III. Biological Kinetic Coefficients - For Nitrification

| | | | | | |
|---|---|---|---|---|---|
| Synth. Yield Coeff., $Y_n$ = | 0.12 | lb VSS/lb NOx | | | |
| Temp coeff., q, for mmn = | 1.070 | | Half Veloc. Coeff. at 20°C, $K_n$ = | 0.7 | mg/L |
| Temp coeff., q, for kdn = | 1.040 | | Half Veloc. Coeff. at 20°C, $K_o$ = | 0.5 | mg/L |
| Temp coeff., q, for Kn = | 1.053 | | Temp coeff., q, for Ko = | 1 | |
| Max spec. gwth rate at 20°C, $\mu_{mn20}$ = | 0.8 | lb VSS/d/lb VSS | | | |
| Endog. Decay coeff. at 20°C, $k_{dn20}$ = | 0.08 | lb VSS/d/lb VSS | | | |

CONSTANTS

## IV. Constants Used in the Calculations

| | | | | | |
|---|---|---|---|---|---|
| Ratio of $BOD_5$ to $BOD_u$, **f** = | 0.68 | | Saturation D.O. in water at 20°C & 1 atm, $C_{ss}$ = | 9.17 | mg/L |
| $BOD_u$ equiv. of VSS = | 1.42 | lb $BOD_u$/lb VSS | Standard Pressure = | 14.7 | psi |
| Spec Wt of water, $\gamma_{H2O}$ = | 62.4 | lb/ft$^3$ | Standard Temperature = | 68.0 | °F |
| Mol. Wt. of Air = | 28.97 | | Mol. Wt. of Oxygen = | 32.0 | |
| Temp Coeff. for $O_2$ rate, $\theta$ = | 1.024 | | $O_2$ mole fraction in Air = | 0.209 | |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

DRAFT

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

**Activated Sludge Kinetic Coefficients for heterotrophic bacteria at 20°C (for BOD removal)**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_m$ | kg VSS/day/kg VSS | 3.0 - 13.2 | 6.0 |
| $K_s$ | mg/L bCOD | 5.0 - 40.0 | 20.0 |
| Y | kg VSS/day/kg bCOD | 0.30 - 0.50 | 0.40 |
| $k_d$ | kg VSS/day/kg VSS | 0.06 - 0.20 | 0.12 |
| $f_d$ | dimensionless | 0.08 - 0.20 | 0.15 |
| θ values for temperature corrections | | | |
| for $\mu_m$ | dimensionless | 1.03 - 1.08 | 1.07 |
| for $k_d$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_s$ | dimensionless | 1.00 | 1.00 |

The source for the values in the table above is:
Introduction to Water Resource Recovery Facility Design, 2nd Ed., Table 6.1

**Activated Sludge Nitrification Kinetic Coefficients at 20°C**

| Coefficient | Unit | Range | Typical Value |
|---|---|---|---|
| $\mu_{mn}$ | kg VSS/day/kg VSS | 0.2 - 0.90 | 0.75 |
| $K_n$ | mg/L $NH_4$-N | 0.50 - 1.0 | 0.74 |
| $Y_n$ | kg VSS/kg $NH_4$-N | 0.10 - 0.15 | 0.12 |
| $k_{dn}$ | kg VSS/day/kg VSS | 0.05 - 0.15 | 0.08 |
| $K_o$ | mg/L | 0.40 - 0.60 | 0.50 |
| θ values for temperature corrections | | | |
| for $\mu_{mn}$ | dimensionless | 1.06 - 1.123 | 1.07 |
| for $k_{dn}$ | dimensionless | 1.03 - 1.08 | 1.04 |
| for $K_n$ | dimensionless | 1.03 - 1.123 | 1.053 |

The source for the values in the table above is:
Introduction to Water Rsource Recovery Facility Design, 2nd Ed., Table 6.2

MBR WW Treatment Process Design Calculations - U.S. Units
Membrane Module Sizing Calculations

INPUTS

## I. Membrane/Membrane Module Parameters

(Values typically available from membrane manufacturer or vendor - Enter values in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Module packing density, $\phi$ = | 148 | $m^2/m^3$ | equals | 45.0 | $ft^2/ft^3$ |
| Specific Aer. Demand, $SAD_M$ = | 0.2 | $m^3$ air/hr/$m^2$ membrane | | | |
| | | equals | 0.656 | $ft^3$ air/hr/$ft^2$ membrane | |

CALCULATIONS

## II. Process Design Calculations (done by worksheet)

| | | | | | |
|---|---|---|---|---|---|
| Membrane Flux, **J** = | 21.1 | L/hr/$m^2$ | equals | 0.518 | gal/hr/$ft^2$ |
| Membrane Area, $A_M$ = | 331,142 | $ft^2$ | | | |
| Membrane Module Vol., $V_M$ = | 7,361 | $ft^3$ | | | |
| Scouring Air Flow Required = | 3,621 | $ft^3$/min (ACFM) | = | 3,605 | SCFM |

**(This is the scouring air flow rate needed for the membrane module, typically provided by a coarse bubble diffuser system.)**

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

**Discussion and References**

**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

Values given for MBR specific area (module packing density) range from 150 -334 $m^2/m^3$ in Table 8-35 of Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery, 5th Ed.,* McGraw-Hill, 2014

**Equations Used in the Calculations:**

Module packing density, $\phi$, in $ft^2/ft^3$ = ($\phi$ in $m^2/m^3$)/3.28084

Specific Aeration Demand, $SAD_M$, in $ft^3$ air/hr/$ft^2$ membrane =
= $SAD_M$ in $m^3$ air/hr/$m^2$ membrane/3.28084

Membrane Flux, **J**, in L/hr/$m^2$ = $0.4056T_{ww} - 5.7278$ (with $T_{ww}$ in $^oF$)
(See Worksheet 6 for derivation of this eqution)

Membrane Flux, **J**, in gal/hr/$ft^2$ = [(Membrane Flux (**J**) in L/hr/$m^2$)/3.7854]/($3.28084^2$)

Membrane Area, $A_M = (Q_o*10^6/24)/J$

Membrane Module Volume, $V_M = A_M/\phi$

Scouring Air Flow Required, **ACFM** = $(SAD_M)(A_M)/60$ ACFM

Scouring Air Flow Req'd, **SCFM** = (**ACFM**)[($T_{std}$ + 459.67)/($T_{ww}$ + 459.67)]($P_{atm}/P_{std}$) SCFM

DRAFT

# MBR WW Treatment Process Design Calculations - U.S. Units

BOD Removal and Nitrification

INPUTS

## I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| | | | Target Effluent Concentrations: | | |
| MLSS in Aer Tank, **MLSS** = | 8,500 | mg/L | **$BOD_e$** = | 10 | mg/L |
| MLSS in Waste Sludge, **$X_w$** = | 8,500 | mg/L | **$TSS_e$** = | 10 | mg/L |
| DO in Aer. Tank, **$DO_o$** = | 2 | mg/L | **$NH_4$-$N_e$** = | 1.0 | mg/L |
| Number of Aeration Tanks = | 2 | | Tank Freeboard = | 2.0 | ft |
| Liquid Depth in Tank = | 22 | ft | Tank L:W ratio = | 2.3 | |
| Initial Estimate of **$NO_x$** = | 44.93 | mg/L | **(Tank L:W ratio is only used for rectangular tanks)** | | |

**Note that an initial estimate is needed for $NO_x$ in cell D14 to start an iterative calculation of $NO_x$ below. 80% of the influent TKN is suggested for this initial estimate. 80% of $TKN_o$ =** 56.0 mg/L

Influent TKN, **$TKN_o$** = 70 mg/L
(value transferred from Worksheet 2)

PROCESS DESIGN CALCULATIONS

## II. Calculate Design SRT

| | | | | | |
|---|---|---|---|---|---|
| $\mu_{mn}$ at $T_{ww}$ = | 0.70 | lb VSS/d/lb VSS | **$K_n$** at $T_{ww}$ = | 0.70 | mg/L |
| $k_{dn}$ at $T_{ww}$ = | 0.08 | lb VSS/d/lb VSS | Theor. SRT = | 3.96 | days |
| $\mu_n$ = | 0.25 | lb VSS/d/lb VSS | Design **SRT** = | 3.96 | days |

## III. Calculate the Biomass Production Rate

| | | | | | |
|---|---|---|---|---|---|
| $\mu_m$ at $T_{ww}$ = | 5.61 | lb VSS/d/lb VSS | **bCODo** = | 672 | mg/L |
| $k_d$ at $T_{ww}$ = | 0.1154 | lb VSS/d/lb VSS | **S** = | 1.404 | mg bCOD/L |

Biomass Production Rate, **$P_{x,bio}$** = 6906 lb VSS/day

## IV. Determine the Amount of Nitrogen Oxidized to Nitrate

| | | |
|---|---|---|
| Calculated amount of nitrogen oxidized to nitrate, **$NO_x$** = | 44.932 | mg/L |
| Difference between estimated and calculated values **$NO_x$** = | 0.00000 | mg/L |

**Goal Seek Result:**
Amount of nitrogen oxidized to nitrate, **$NO_x$** = **44.93** mg/L

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $NO_x$ value as follows: Place the cursor on the green cell G42 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell:" G42, "To value:" 0, "By changing cell:" D14, and click on "OK". The calculated value of $NO_x$ will appear in cell F44 and G42 should be zero if the process worked properly. Note that cell D14 needs an initial estimate for $NO_x$ in order for the iterative solution to work properly.**

## IV. Calc. the Prod. Rate and Mass of VSS and TSS in Aeration Basin

| | | | | | |
|---|---|---|---|---|---|
| **bpCOD/pCOD** = | 0.554 | | **nbVSS** = | 115.9 | mg/L |
| Aeration Tank VSS Production Rate, **$P_{X,VSS}$** = | 10888 | lb VSS/day | | | |
| Aeration Tank TSS Production Rate, **$P_{X,TSS}$** = | 13261 | lb TSS/day | | | |
| Mass of **MLVSS** = | 43,141 | lb VSS | Mass of **MLSS** = | 52,541 | lb TSS |

AER. TANK CALC'NS

## V. Aeration Tank Calculations (User input needed in yellow cells)

| | | | | | |
|---|---|---|---|---|---|
| Req. Aeration Vol., **$V_{aer,min}$** = | 99,085 | $ft^3$ | **Click on green box & then on the arrow** | | |
| Aer. + Membr. Vol., **$V_{tot}$** = | 106,446 | $ft^3$ | **to select tank shape** | **rectangular** | |
| Req. Vol. per tank, **$V_{tank}$** = | 53,223 | $ft^3$ | **Actual Tank Width =** | 38.3 | ft |
| Calculated Tank Width = | 32.5 | ft | **Actual Tank Length =** | 71.8 | ft |
| Calculated Tank Length = | 75.4 | ft | Act. Aer. Vol., **$V_{aer,act}$** = | 55,993 | $ft^3$ |
| Tank Wall Height = | 23.7 | ft | Memb. Mod. Vol/Tank: | 3,680 | $ft^3$ |
| Aer. Detention Time, $\tau_{aer}$ = | 4.9 | hr | **MLVSS** = | 6,979 | mg/L |
| Vol. BOD Loading = | 129.0 | lb BOD/d/1000 $ft^3$ | | | |
| **F:M** ratio = | 0.296 | lb BOD/d/lb MLVSS | | | |
| Sludge Wasting Rate, **$Q_w$** = | 211,422 | gal/day | | | |

## VI. User Inputs - Enter values in yellow cells only

### Discussion and References

**For background information about Membrane Bioreactors (MBRs) see:**

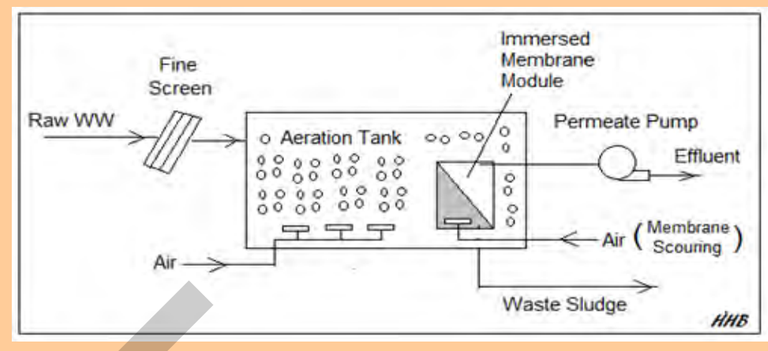
Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes

As noted in all four of the above references, MLSS and $X_w$ for MBR processes are typically in the range from 8,000 to 12,000 mg/L.




**Flow Diagram - Membrane Bioreactor for BOD Removal & Nitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process

Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

**Equations Used in the Calculations:**

$\mu_{mn}$ at $T_{ww}$ = $(\mu_{mn_20})*\theta_{\mu mn}^{[((Tww-32)/1.8)-20]}$
$k_{dn}$ at $T_{ww}$ = $(k_{mn_20})*\theta_{kdn}^{[((Tww-32)/1.8)-20]}$
$K_n$ at $T_{ww}$ = $(K_{n_20})*\theta_{Kn}^{[((Tww-32)/1.8)-20]}$

$\mu_n = [\mu_{mn}*NH_4\text{-}N_e/(K_n + NH_4\text{-}N_e)]*[DO_o/(0.5 + DO_o)] - k_{dn}$

Theor. **SRT** = $1/\mu_n$
Design **SRT** = (Theor. **SRT**)**FS** ( **FS** = TKN Peak/Ave Factor )

$\mu_m$ at $T_{ww}$ = $(\mu_{m_20})*\theta_{\mu m}^{[((Tww-32)/1.8)-20]}$
$k_d$ at $T_{ww}$ = $(k_{m_20})*\theta_{kd}^{[((Tww-32)/1.8)-20]}$ **bCODo = 1.6*BODo**

$S = K_s*[1 + (k_d*SRT)]/[SRT*(\mu_m - k_d) - 1]$

$P_{x,bio} = (Q_o*Y*(\mu_m - k_d)*8.34/(1 + (k_d*SRT)))$
$+ (f_d*k_d*Q_o*Y*(\mu_m - k_d)SRT*8.34/(1 + (k_d*SRT)))$
$+ (Q_o*Y_n*NO_x*8.34/(1 + (k_{dn}*SRT)))$

$NO_x = TKN_o - NH_4\text{-}N_e - [(0.12\ P_{x,bio}/8.34)/Q_o]$

$bpCOD/pCOD = (bCOD/BOD)*(BOD_o - sBOD_o)/(COD_o - sCOD_o)$

$nbVSS = [1 - (bpCOD/pCOD)]VSS_o$

$P_{x,VSS} = P_{x,bio} + (Q_o*nbVSS*8.34)$ $P_{x,TSS} = P_{x,VSS} + [Q_o(TSS_o - VSS_o)8.34]$

Mass of **MLVSS** = $P_{X,VSS}$*SRT Mass of **MLSS** = $P_{X,TSS}$*SRT

Required Aeration Volume = $V_{aer,min} = (\text{Mass of MLSS}/(MLSS*8.34))*(10^6/7.48)$

Aeration Detntion Time, $\tau = (V_{aer,act}*7.48/10^6)*N*24/Q_o$

Vol. BOD Loading = $Q_o*BOD_o*8.34/((V_{aer,act}/1000)*N)$

**MLVSS = MLSS(Mass of MLVSS/Mass of MLSS)**

F:M ratio = $Q_o*8.34*BOD_o/((MLVSS*8.34*(V_{aer,act}*7.48/10^6)*N))$

$Q_w = ((N*V_{aer,act}*7.48/10^6)*MLSS/(SRT*X_w))*10^6$

**Air Requirement/Blower Design Calculations**

$P_{atm} = 14.696*EXP[-32.17*MW_{air}*Elev/(g_c*R*T_{amb})$

DRAFT

OXYGEN/AIR/BLOWER REQUIREMENTS

| | | | | | |
|---|---|---|---|---|---|
| Standard $O_2$ transf. Effic., **SOTE** = (from diffuser mfr or vendor) | 30.0% | | Design Elevation above Sea Level, **Elev** = | 225 | ft |
| | | | ambient air Temp., $T_{amb}$ = | 70 | °F |
| Ratio of oxygen transfer rate in wastewater to that in clean water, $\alpha$ = | 0.5 | | Diffuser Fouling Factor, **F** = | 0.8 | |
| Ratio of D.O. saturation in ww to that in clean water at same T & P, **B** = | 1.0 | | Depth of Diffuser, $d_{diff}$ = | 21.7 | ft |
| D.O sat'n conc. for clean water at ww temp. & 1 atm, $C_s$ = | 9.3 | mg/L | Pressure drop across diffuser, $\Delta P_{diff}$ = (from diffuser mfr or vendor) | 10.8 | in $H_2O$ |

**NOTE:** Derivation of the equation for $C_s$ as a function of $T_{ww}$ is shown in wksht 7.

## VII. Air Requirement/Blower Design Calculations

| | | | | | |
|---|---|---|---|---|---|
| Barom. Pressure, $P_{atm}$ = | 14.6 | psia | Des. Air Flow Rate, **SCFM:** | 5,920 | scfm |
| Pressure at Mid Depth, $P_D$ = | 19.3 | psia | | | |
| Standard Air Density, $\rho_{air}$ = (from Ideal Gas Law) | 0.07521 | lb/ft$^3$ | Des. Air Flow Rate, **ACFM:** (at delivery point) | 3558 | acfm |
| $O_2$ Utilization Rate, $m_{O2}$ = | 12,327 | lb/day | Blower Outlet Press., $P_{B2}$ = | 24.38 | psia |
| Actual $O_2$ transf. Efficiency, **AOTE** = | 8.33% | | | | |

**(This is the air flow rate needed for the aeration tank, typically provided by a fine bubble diffuser system.)**

This equation for $P_{atm}$ as a function of elev. above sea level and ambient temperature comes from:
Water Reuse: Issues, Technologies, and Applications, Sec. 2.2

$P_D = P_{atm} + (62.4*d_{diff}/2)/144$ $\rho_{air} = MW_{air}*P_{std}/(10.73*(T_{std} + 459.67))$

lb/day $O_2$: $m_{O2} = Q_o*8.34*(BOD_o - BODe)/f - (1.42*P_{x,VSS}) + (4.57*Q_o*8.34*NO_x)$

This equation for oxygen utilization rate comes from:
Nalco Water Handbook, 4th Ed., Ch. 23 Eqns 23.6 and 23.7

The equation below for the actual oxygen transfer efficiency, AOTE, is found as
Design of Water Resource Recovery Facilities, 6th Ed., Equation 12.32

$$AOTE = SOTE\ \alpha\ F\ \frac{\left(B\left(\frac{P_D}{P_{std}}\right)C_s - C_L\right)}{C_{ss}}\ \theta^{(Tww-20)}$$

**Note that for use in this equation Tww must be converted to °C**

Design Air Flow Rate, **SCFM = ($m_{O2}$/AOTE)*$MW_{air}$/($O_2$_mole fraction*MW_$O_2$*$\rho_{air}$_std*60*24**

Design Air Flow Rate, **ACFM = SCFM*($P_{std}$/$P_{blower}$)*(($T_{ww}$ + 459.67)/($T_{std}$ + 459.67))**

Blower Outlet Press., $P_{B2} = P_{atm} + \Delta P_{diff}*0.036126 + 62.4*d_{diff}/144$

Alkalinity used for Nitrification, $Alk_{Nitrif}$ = **7.14*NOx mg/L as $CaCO_3$**

Alkalinity needed = $Alk_{Nitrif} + Alk_{Effl} - Alk_o$ **mg/L as $CaCO_3$**

Alkalinity needed **Alk_perday = ($Alk_{Nitrif} + Alk_{Effl} - Alk_o$)Qo*8.34 lb/day as $CaCO_3$**

Sodium Bicarbonate needed to maintain alkalinity = **Alk_perday*84/50 lb/day $NaHCO_3$**

ALKALINITY REQUIREMENT

## VIII. User Inputs and Constants- Enter value in yellow cell only

| | | |
|---|---|---|
| Target Effluent Alkalinity = | 20 | mg/L as $CaCO_3$ |
| Equiv. Weight of $CaCO_3$ = | 50 | g/equiv. |
| Equiv. Weight of $NaHCO_3$ = | 84 | g/equiv. |
| Alkalinity used for Nitrification = | 7.14 | g $CaCO_2$/g $NH_3$-N |

## IX. Calculation of Alkalinity Requirement

| | | |
|---|---|---|
| Alkalinity used for Nitrification = | 320.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 40.8 | mg/L as $CaCO_3$ |
| Alkalinity needed = | 1,403 | lb/day as $CaCO_3$ |
| Sodium Bicarbonate needed per day to maintain alkalinity = | 2,356 | lb/day $NaHCO_3$ |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

DRAFT

rectangular
cylindrical

# MBR WW Treatment Process Design Calculations - U.S. Units
## PreAnoxic Denitrification

**This worksheet makes the design calculations for preanoxic denitrification basin(s) to go with the Aeration Tank(s) designed for BOD removal and Nitrification in Worksheet 4. (Wastewater parameters/characteristics and biological kinetic coefficients entered on Worksheet 2 will also be used in this worksheet)**

INPUTS

### I. User Inputs - Enter values in yellow cells only

| | | | | | |
|---|---|---|---|---|---|
| Effluent Nitrate conc., $N_e$ = | 5.0 | mg/L | Mixing Energy | | |
| Nitrate conc. in RAS, $N_{RAS}$ = | 5.0 | mg/L | for Anoxic Reactor = | 0.38 | hp/10$^3$ ft$^3$ |
| Temp. Coeff. For **SDNR** = | 1.026 | . | Design % Excess | | |
| Tank Freeboard = | 2.3 | ft | Nitrif. Capacity = | 2% | |
| No. of Anoxic Tanks, $N_{an}$ = | 2 | . | Liquid Depth in Tank = | 22 | ft |
| Est. of detention time, $t_{an}$ = | 0.9654 | hr | Tank L:W ratio = | 1 | |

**Note that an initial estimate is needed for anoxic detention time in cell D19 to start an iterative calculation of minimum required anoxoc detention time below.**

**(Tank L:W ratio is only used for rectangular tanks)**

PROCESS DESIGN CALCULATIONS

### II. Calculate RAS Ratio and Anoxic Tank Active Biomass Conc.

| | | | | |
|---|---|---|---|---|
| RAS ratio, **RAS** = | 7.99 | Aer. Tank Act. Biomass, $P_{xb}$ = | 6330 | lb/d |
| An. Tank MLSS, $MLSS_{AN}$ = | 7554 | mg/L | | |
| Aeration Tank Active Biomass Fraction, $X_{aer,b}$ = | | 0.4773 | | |
| Anoxic Tank Active Biomass Conc., $X_{an,b}$ = | | 3606 | mg/L | |

### III. Calc Feed Rate of $NO_x$ to Anoxic Tank and Anoxic Tank Volume

| | | | | | |
|---|---|---|---|---|---|
| Flow rate to Anoxic Tank = | 32.9 | MGD | | | |
| (RAS flow containing nitrate) | | | Anoxic Tank Volume, $V_{an}$ = | 22,155 | ft$^3$ |
| $NO_x$ rate to Anoxic Tank = | 1372 | lb/day | (based on detention time value in cell D19) | | |

### IV. Calculate the SDNR (Specific Denitrification Rate)

| | | | | |
|---|---|---|---|---|
| Anoxic Tank **F/M** ratio = | 2.8979 | lb BOD/day/lb MLVSS | | |
| **rbCODo/bCODo** ratio = | 0.1275 | | | |
| | | Next lower rbCOD/bCOD value from table = | 0.1 | |
| | | Next higher rbCOD/bCOD value from table = | 0.2 | |
| **SDNR** for rbCOD/bCOD = | 0.1 | is equal to | 0.26899 | |
| **SDNR** for rbCOD/bCOD = | 0.2 | is equal to | 0.33855 | |
| **SDNR** for rbCOD/bCOD = | 0.1275 | is equal to | 0.2881 | ( at 20°C) |
| **SDNR** at $T_{ww}$ = | 0.2808 | lb $NO_3$-N/day/lb biomass (at $T_{ww}$) | | |

TANK VOLUME AND DIMENSIONS

### V. Calculate Anoxic Tank Volume, Dimensions, and Detention Time

| | | | | |
|---|---|---|---|---|
| $NO_3$-N reduction capacity = | 1399 | lb/day | % Excess Nitrif Capacity = | 2.0% |
| Difference between Design and Calculated % Excess Nitrif. Capacity = | | | 0.000 | |
| Anoxic Tank min. Vol, $V_{an}$ = | 22,155 | ft$^3$ | | |
| Min. Anoxic Det'n Time, $t_{an}$ = | 0.97 | hr | | |

**NOTE: This is an iterative solution. You must use Excel's "Goal Seek" to find the $V_{an}$ and $t_{an}$ values as follows: Place the cursor on the green cell G64 and click on "goal seek" (in the "tools" menu or under "Data - What If Analysis" depending on the version of Excel). Enter values to "Set cell" G64 "To value:" 0, "By changing cell:" D19, and click on "OK". The calculated values of $V_{an}$ and $t_{an}$ will be in cells D66 and D68. Cell G64 should be zero if the process worked right. A preliminary estimate for $t_{an}$ is needed in cell D19 in order for the iterative solution to work.**

| | | | | | |
|---|---|---|---|---|---|
| Min. Vol. per tank, $V_{tank}$ = | 11,078 | ft$^3$ | **Click on green box & then on the arrow** | | |
| Calculated Tank Width = | 22.6 | ft | **to select tank shape** | **rectangular** | |
| Calculated Tank Length = | 22.6 | ft | **Actual Tank Width =** | 28.0 | ft |
| Tank Wall Height = | 24.0 | ft | **Actual Tank Length =** | 38.0 | ft |
| | | | Act. Tank Liq. Vol. = | 23,089 | ft$^3$ |
| Anoxic Detention Time, $\tau_{an}$ = | 2.012 | hr | (Preanoxic Tank Liquid Volume) | | |

IONS

### VI. Calc. Revised Air Requirement & Alkalinity Requirement, Mixing Power & Sludge Wasting Rate

| | | | | |
|---|---|---|---|---|
| Oxygen Credit = | 3924 | lb/day | equals: 163.5 | lb/hr |
| $O_2$ Utilization Rate = | 350 | lb/hr | | |

**Discussion and References**

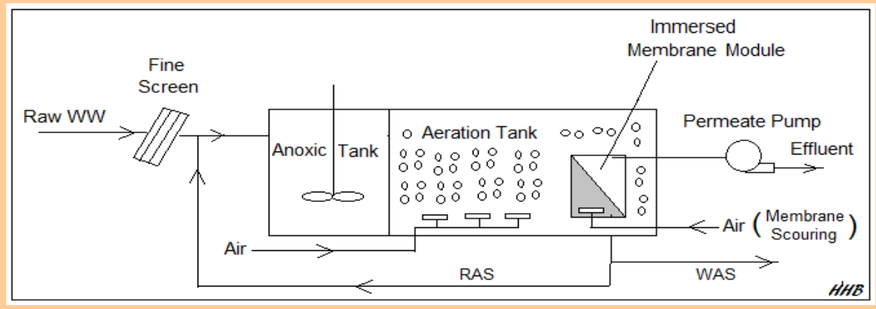
**For background information about Membrane Bioreactors (MBRs) see:**

Design of Water Resource Recovery Facilities, 6th Ed., Sec. 12.6 Membrane Bioreactors

Water and Wastewater Engineering: Design Principles and Practice
Section 23.8, Membrane Bioreactor Design Practice

Membrane Bioreactors: WEF MOP No. 36, Chap. 4, Membrane Bioreactor Process Design

Water Reuse: Issues, Technologies, and Applications
Section 7.8, Analysis and Design of Membrane Bioreactor Processes




**Membrane Bioreactor for Preanoxic Denitrification**

The biological treatment process design calculations for the MBR process are carried out using biological kinetics constants and equations typically used for completely mixed activated sludge systems as described in the following references:

Water and Wastewater Calculations Manual, 3rd Ed., Sec. 6.21, Activated Sludge Process
Handbook of Environmental Eng. Calculations, 2nd Ed., Sec. 1.7.21, Activated Sludge Process

RAS ratio, **RAS** = $(NO_x/N_{RAS}) - 1$

Aer Tank Act. Biomass, $P_{xb} = [Q_o*Y*(bCOD_o - S)*8.34]/[1 + (k_d*SRT)]$

Anaer. Tank MLSS, $MLSS_{AN} = [RAS/(RAS + 1)]\ MLSS_w$

Aeration Tank Active Biomass Fraction, $X_{aer,b} = P_{xb}/P_{x,vss}$

Anoxic Tank Active Biomass Conc., $X_{an,b} = X_{aer,b}*MLSS_{AN}$

Flow Rate to Anoxic Tank, $Q_{AN} = RAS*Q_o$

$NO_x$ Rate to Anoxic Tank $= Q_{AN}*N_{RAS}*8.34$

Anoxic Tank Volume, $V_{an} = (Q_o*10^6/7.48)*t_{AN}/24$

Anoxic Tank F:M ratio, $F:M = Q_o*BOD_o*8.34/((V_{an}*7.48/10^6)*X_{an,b}/8.34)$

**Coefficients for: $SDNR = b_o + b_1\ [\ln(F:M)]$**

| rbCOD/bCOD | $b_o$ | $b_1$ |
|---|---|---|
| 0.1 | 0.186 | 0.078 |
| 0.2 | 0.213 | 0.118 |
| 0.3 | 0.235 | 0.141 |
| 0.4 | 0.242 | 0.152 |
| 0.5 | 0.27 | 0.162 |
| 0.10 | 0.1860 | 0.0780 |
| 0.20 | 0.2130 | 0.1180 |

The SDNR equation, coefficient values, and temperature correction equations are from: Metcalf & Eddy, *Wastewater Engineering Treatment and Resource Recovery*, 5th Ed., McGraw-Hill, 2014

Note that for F:M < 0.5, SDNR at 20°C is calculated as: **SDNR = 0.24*F:M**

**SDNR** at $T_{ww}$ = (**SDNR** at **20°C**)*$\theta_{SDNR}^{[((Tww-32)/1.8)-20]}$

$NO_3$-N reduction capacity $= (V_{an}*7.48/10^6)*SDNR*X_{an,b}*8.34$

% Excess Nitrif. Capac. = (($NO_3$-N Reduction Capacity - $NO_x$ Rate to Anoxic Tank) / $NO_x$ Rate to Anoxic Tank)

Min. Anoxic Det'n Time, $t_{an} = V_{an}*24/(Q_o*10^6/7.48)$

Min. Vol. per Tank, $V_{tank} = V_{an}/N_{an}$

Oxygen credit for nitrate reduction $= 2.86\ Q_o(NO_x - N_e)$

Alkalinity produced by nitrate reduction $= 3.57(NO_x - N_e)$

Sludge Wasting Rate:

$Q_w = [((V_{aer}*MLSS + V_{anox}*X_b)/SRT)]/(TSS_w)$

DRAFT

FINAL CALCULAT

| | | |
|---|---|---|
| Required Air Flow Rate (in Aeration Tank), SCFM = | 4035.6 | SCFM |
| Required Air Flow Rate (in Aeration Tank), ACFM = | 2425.3 | ACFM |

| | | |
|---|---|---|
| Alkalinity Produced = | 142.6 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -101.7 | mg/L as $CaCO_3$ |
| Alkalinity Needed = | -3496 | lb/day as $CaCO_3$ |

Sodum Bicarbonate Needed per Day to Maintain Alkalinity (lb/day $NaHCO_3$) = -5873

| | | |
|---|---|---|
| Required Anoxic Tank Mixing Power = | 17.5 | hp |
| Sludge Wasting Rate = | 248,404 | gal/day |

Copyright © McGraw-Hill Global Education Holdings, LLC. All rights reserved.

rectangular
cylindrical

DRAFT

# Appendix J – Annual Major Service and Replacement Budget

DRAFT

# TECHNICAL MEMORANDUM

**To:** Clete Saunier, Public Works Director
City of Santa Paula

**From:** Becca Bugielski – PE | MKN & Associates, Inc.
Mike Nunley– PE | MKN & Associates, Inc.

**Date:** 3/4/2024

**Re:** Annual Major Service and Replacement Budget

DRAFT

## 1.0 Objectives

As part of the Santa Paula Wastewater Master Plan Update, MKN identified major mechanical equipment and developed recommendations for budgeting to repair and/or replace that equipment. The City of Santa Paula completed the WRF in 2010, and many of the mechanical systems have required replacement or major service since the ten-year milestone is a critical event for evaluating membranes, blowers, pumps, and other major pieces of equipment.

### 1.1 Purpose

The purpose of this evaluation is to allow the City to develop a budget for major service and/or replacement of critical mechanical equipment. These recommendations are based on observation of existing plant systems, cost for ongoing service, and cost for services at similar facilities or for similar pieces of equipment.

## 2.0 Annual Major Service and Replacement Budget

The table on the following page is based on the equipment schedules in Section 4.4 of the Draft Wastewater Master Plan Update. Five year and ten-year intervals are identified, since these are typically the major milestones or design lives for blowers, pumps, and other mechanical equipment.

| Major Service and Replacement Recommendations | | | | | |
|---|---|---|---|---|---|
| | | 5 Year | | 10 Year | |
| Processes | Quantity | Cost Opinion | Comment | Cost Opinion | Comment |
| **Influent Lift Station** | | | | | |
| Pumps | 4 | $ 40,000 | New seals and Impellers | $ 100,000 | Replacement |
| Plug Valves | 4 | $ 20,000 | New internals and operator service | $ 20,000 | New internals and operator service |
| Swing-Flex Check Valves | 4 | $ 20,000 | New internals and operator service | $ 20,000 | New internals and operator service |
| Slide Gates | 2 | $ 10,000 | New internals and operator service | $ 10,000 | New internals and operator service |
| Flap Gates | 2 | $ 10,000 | Inspection and repairs | $ 10,000 | Inspection and repairs |
| **Headworks** | | | | | |
| Primary Screens | 2 | $ 30,000 | New bearings and inspection/ repairs | $ 200,000 | Screen replacement |
| Grit Vortex | 2 | $ 10,000 | New bearings and inspection/ repairs | $ 100,000 | Replacement |
| Grit Classifier | 2 | $ 15,000 | New bearings and inspection/ repairs | $ 30,000 | Replacement |
| Primary Screens Conveyor | 2 | $ 10,000 | New bearings and inspection/ repairs | $ 100,000 | Replacement |
| Fine Screens | 2 | $ 30,000 | New bearings and inspection/ repairs | $ 200,000 | Screen replacement |
| Fine Screens Conveyor | 2 | $ 10,000 | New bearings and inspection/ repairs | $ 100,000 | Replacement |
| Slide Gates | 6 | $ 30,000 | New internals and operator service | $ 30,000 | New internals and operator service |
| **EQ Basins** | | | | | |
| Slide Gates | 2 | $ 20,000 | Inspection and repairs | $ 20,000 | Inspection and repairs |
| **Anoxic Basins** | | | | | |
| Anoxic Mixer | 3 | $ 15,000 | Replacement | $ 15,000 | Replacement |
| Diversion Channel Slide Gates | 3 | $ 20,000 | New internals and operator service | $ 20,000 | New internals and operator service |
| **Aeration Basins** | | | | | |
| MBR Feed Pumps | 3 | $ 30,000 | New seals and Impellers | $ 210,000 | Replacement |
| RAS Pumps | 3 | $ 30,000 | New seals and Impellers | $ 210,000 | Replacement |
| Aeration Panels | 207 | $ 100,000 | Replace panels | $ 100,000 | Replace panels |
| Biological Aeration Blowers | 4 | $ 200,000 | Inspection and repairs | $ 400,000 | Replacement |
| **ML Collection and MLSS Recirculation Channels** | | | | | |
| WAS Pumps | 2 | $ 20,000 | New seals and Impellers | $ 140,000 | Replacement |

DRAFT

| | | | | | |
|---|---|---|---|---|---|
| Mud Valves | 6 | $ 30,000 | New internals and operator service | $ 30,000 | New internals and operator service |
| Slide Gates | 3 | $ 30,000 | Inspection and repairs | $ 30,000 | Inspection and repairs |
| Channel Aeration Blowers | 2 | $ 100,000 | Inspection and repairs | $ 200,000 | Replacement |
| **MBR Filtration Modules** | | | | | |
| Mud Valves | 6 | $ 30,000 | New internals and operator service | $ 30,000 | New internals and operator service |
| Membrane Filtration Modules | 24 | $ 50,000 | Inspection and repairs | $ 250,000 | Replacement |
| Permeate Pumps | 6 | $ 60,000 | New seals and impellers | $ 420,000 | Replacement |
| Membrane Module Aeration | 3 | $ 150,000 | | | |
| **UV Disinfection** | | | | | |
| UV Modules | 10 | $ 50,000 | Inspect modules and replace lamps | $ 100,000 | Replace modules and lamps |
| UV Air Flush-out Compressor | 1 | $ 15,000 | Replacement | $ 15,000 | Replacement |
| Automatic Level Gate | 2 | $ 20,000 | Inspection and repairs | $ 20,000 | Inspection and repairs |
| Channel Weir Gates | 2 | $ 20,000 | Inspection and repairs | $ 20,000 | Inspection and repairs |
| **CIP Storage Tanks and Foam Spray System** | | | | | |
| CIP Pumps | 2 | $ 60,000 | Replacement | $ 60,000 | Replacement |
| Chemical Metering/Injection Pumps | 2 | $ 20,000 | Replacement | $ 20,000 | Replacement |
| Foam Spray Pumps | 2 | $ 20,000 | Replacement | $ 20,000 | Replacement |
| Foam Spray Nozzles | 270 | $ 50,000 | Inspection and repairs | $ 100,000 | Inspection and repairs |
| Storage Tank Drain - Mud Valves | 2 | $ 10,000 | New internals and operator service | $ 10,000 | New internals and operator service |
| **Solids Processing System** | | | | | |
| Gravity Belt Thickeners | 2 | $ 50,000 | Inspection and repairs | $ 300,000 | Replacement |
| Digester Blowers | 3 | $ 150,000 | Inspection and repairs | $ 300,000 | Replacement |
| Rethickening Pumps | 2 | $ 20,000 | New seals and impellers | $ 140,000 | Replacement |
| Screw Press Feed Pumps | 1 | $ 10,000 | New seals and impellers | $ 70,000 | Replacement |
| Screw Press | 1 | $ 30,000 | Inspection and repairs | $ 150,000 | New internals and motor |
| Polymer Units | 3 | $ 15,000 | Inspection and repairs | $ 60,000 | Replacement |
| **Odor Control System** | | | | | |

DRAFT

| | | | | | |
|---|---|---|---|---|---|
| Foul Air Blower | 1 | $ 10,000 | Inspection and repairs | $ 50,000 | Replacement |
| Biological Trickling Filter | 1 | $ 100,000 | | $ 100,000 | |
| **Total (Rounded)** | | **$ 1,800,000** | | **$ 4,600,000** | |

Notes

1) ENR LA CCI (Jan 2024) = 15299.7
2) Future Costs have not been escalated. It is assumed costs will be escalated during development of the rate study.

As shown in the attached table, 5-year major expenditures of $1.8M and 10-year expenditures of $4.6M should be anticipated by the City. These costs are not escalated, but it is recommended the City budget annually to build reserves for payment of these expenses. An annual allocation of $640,000, with annual escalation as recommended by the City's financial consultant, would allow the City to prepare to cover these anticipated costs at these 5- and 10-year milestones.

DRAFT

**CITY OF SANTA PAULA**
**MEMORANDUM**

To: Honorable Mayor and Members of the City Council

From: Dan Singer, City Manager

Subject: FUTURE AGENDA ITEMS

Date: April 3, 2024

Agenda Item: 12.A

---

## RECOMMENDATION:

Staff recommends City Council review future agenda items.

---

## BACKGROUND:

The attached Future Agenda Items forecast identifies anticipated agenda items for upcoming Council meetings as well as Study Session topics and long-range discussion items. Placing this forecast on the agenda affords the Council and the public the opportunity to discuss such topics and to make any recommendations. It should be noted this is only a forecast and may change over the course of time or based on feedback by the Mayor and City Manager during review of future agendas.

## ANALYSIS:

Should a member of the City Council wish to introduce a future agenda topic, it should be done in compliance with the Council's adopted Manual of Procedural Guidelines, Section 5.1. Items introduced by a member of the Council during a Council meeting requires a second and should be reserved for time-sensitive matters needing attention within the proceeding 45 day period.

## STRATEGIC PLAN:

## FISCAL IMPACTS:

## OPTIONS:

## ATTACHMENTS:

4.3.24_Future Agenda Items.docx

# Santa Paula City Council Tentative Agenda Schedule

| | April 17, 2024 AGENDA ITEMS | |
|---|---|---|
| Fire | Ventura County Fire Department Report | April |
| Admin | Police Memorial Week (Sat. May, 111th 9am @ police memorial) | April |
| PW | Public Works Department Report | April |
| PW | Disaster Recovery & Emergency Funding Reimbursement Update | April |
| CDD | Wayfinding Design Options | April |
| PD | AB481 Reporting | April |
| PW | Draft AWTF Design Refinement Study Report | April |
| | **May 1, 2024** | |
| Finance | Finance Department Report | |
| PR | Sports Park Partial Acceptance | |
| CDD | Commercial Building District Live Entertainment Ord | |
| PW | PMP Cycle 1 Final Update and Cycle 2 Five Year Plan | |
| PW | Wastewater Collection System Chloride Study Update | |
| | **STUDY SESSION TOPICS** | |
| Admin | No Smoking Ordinance | |
| Finance | Development Impact Fees (DIF) | |
| CDD | Cultural Arts | |
| CDD | Municipal Code Overview & Housing Element Priorities – Joint Meeting with Council and Planning Commission | April |
| | **FUTURE AGENDA ITEMS** | |
| Finance | Additional Revenue Options | May |
| P&R | Union Oil Building Tenant Selection | May |
| Finance | Update on Utility Bills | |
| PW | Plans & Specifications for 8th Street Streetlight Repair Project | |
| CDD | ADU Ordinance | |
| Legal | Fire MOU Amendment | |
| CDD | Appointment of Housing Trust Fund Oversite Committee | April / May |
| PW | Crosswalk Improvements Project Contract Award | |
| Finance | 2023 City Audit | |
| Clerk | Consolidation with Statewide Election | June |

Updated 3/28/2024