CITY OF CHARLES TOWN
PLANNING COMMISSION
AGENDA • FEBRUARY 26, 2024

Commission/Board Meeting **CITY HALL** **7:00 PM**

101 E Washington Street, Charles Town, WV 25414

1. CALL TO ORDER

2. WORK SESSION

: Text Amendment on residential improvements
1. Report.pdf

: Update on Bond Estimates by Kimley-Horn
2024-01-15_Memo.pdf
2024-01-11_Charles Town Bond Estimate v2.xlsx

3. CALL TO ORDER

4. APPROVAL OF MINUTES

: DRAFT minutes - January 18, 2024 Special Meeting
1.18.24 PC MINUTES_DRAFT.pdf

: DRAFT Minutes January 22, 2024 regular meeting
1.22.24 PC MINUTES_DRAFT.pdf

: DRAFT Minutes January 30, 2024 Special work session
1.30.24 PC MINUTES_DRAFT.pdf

5. UNFINISHED BUSINESS

6. NEW BUSINESS

: **Public Hearing**: *SLD2023-04* - Fairview Major Subdivision
1. Staff Report.pdf
2._Application.pdf
3._Revised_Plan.pdf
4._WVDoH_TIS_Approval.pdf
5._Traffic_Study.pdf
6._KH_Review.pdf
7. Public Comment.pdf

: **Public Hearing**: *TXA2024-02* - Neighborhood Residential update
1. Report.pdf

: *Commission Review*: BR2023-12 - Norborne Glebe Phase 15 Bond Reduction
1. Staff Report.pdf
2. Performance Application.pdf

3. Performance Estimate.pdf
4. Land Disturbance Application.pdf
5. Land Disturbance Estimate.pdf
6. KH Review.pdf

: *Commission Review*: BR2024-01 - Westover Dental Bond Establishment
1. Staff Report.pdf
2. Application.pdf
3. Estimate.pdf
4. KH Review.pdf

: *Commission Review*: BR2024-04 - Tate Manor Bond Extension
1. Staff Report.pdf
2. Application.pdf
3. Narrative.pdf
4. Background bond info.pdf
5. Site Visit Pictures.pdf

: *Commission Review*:SLD2022-04 - Hillside preliminary plan
1. Staff Report.pdf
2. Application.pdf
3. Plans revised.pdf
4. Traffic Study.pdf
5. KH Review.pdf

: *Commission Review*: SLD2022-06 - Norborne Glebe Phases 10B, 11, 12, 13 preliminary plan
1. Staff Report.pdf
2. Application.pdf
3. Plans revised.pdf
4. KH Review.pdf

: *Commission Review*: SLD2024-01 - University Healthcare Foundation sketch plan completeness review
1. Staff Report.pdf
2. Application.pdf
3. Plans.pdf
4. KH Comments.pdf

7. ADJOURNMENT

8. NOTICE: The Public May View the Meeting Live by Clicking on the Event Link at:

https://www.charlestownwv.us/government/agendas-and-minutes/

Planning Commission
101 East Washington Street
Charles Town, WV 25414

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

SCHEDULED

AGENDA ITEM (ID #)

Text Amendment on residential improvements

ATTACHMENTS:

- 1. Report.pdf

TXA2024-03

Infill Development Improvements

Date: For the February 26, 2024 Planning Commission work session
Report by: James Newman, City Planner, Zoning/Subdivision Administrator.

ISSUE

Infill development is characterized by the development of one or a few lots within an existing neighborhood. It is identified in contrast to new greenfield development of a major subdivision.

The current Subdivision and Land Development Ordinance requirements include on-street parking and sidewalks. These requirements can hinder effective infill development, especially requirements that are non-feasible, such as providing improvements on property that the developer may not own.

PLANNING COMMISSION

The Planning Commission discussed this item as part of their January 30, 2024 work session.

TEXT AMENDMENT

The proposed text amendment is in red below:

Section 1333.09, *Sidewalk & On-Street Parking Design Standards*
Sidewalk and on-street parking design standards for the City of Charles Town shall be as follows:

(A) Sidewalks and on-street parking shall be provided in accordance with the requirements specified in Table 1333.09. For in-fill development, provision of on-street parking and sidewalks on both sides of the street are not required. Parking shall be provided in accordance with the City's parking regulations. Sidewalks shall be provided on the subject parcel(s) being developed.

(B) Sidewalks shall be constructed of concrete. The minimum width shall be five (5) feet with weakened plane traverse joints at four (4) foot intervals, and no more than forty (40) feet between expansion joints. Concrete shall have a minimum depth of four (4) inches, and have a minimum PSI of 3,500.

(C) All utility poles, traffic posts, water hydrants, fire hydrants, sign posts and any other object positioned with the sidewalk must be separated with a one-half inch expansion joint providing a clearance of six (6) inches.

(D) Sidewalks shall be constructed in accordance with Standard Detail SW – 1.

(E) Sidewalks shall not be constructed with a curb as a single integral unit.

(F) Sidewalks and curbs shall be separated by at least six (6) feet. This shall be measured from the back of curb to the closest edge of the sidewalk.

(G) Where sidewalks are a part of the Driveway or Access Drive, the sidewalk shall maintain grade, with no depression, except where necessary to tie into the entrance.

(H) Handicap ramps constructed in accordance with West Virginia DOH Standard Detail Book Volume #1, Standard Detail Sheet PVT7, shall be provided at all street intersections and sidewalks.

Table 1333.09 – Sidewalk and Parking Requirements

Land Use	Average Lot Size	Density du/acre	Sidewalk Requirement Street Frontage	On-street Parking Requirement
Residential	> 30,000 ft²	1.46 or more	None	None
Residential	15,001 ft² – 30,000 ft²	2.90 – 1.45	One side of Street	One side of Street
Residential	12,001 – 15,000 ft²	3 – 5.5	Both sides of Street	Both sides of Street
Residential	< 12,001 ft²	> 5.51	Both sides	Both sides
Commercial	N/A	N/A	Yes	Yes

*Planning Commission may require sidewalks or on-street parking to ensure continuity of an existing pedestrian access or street pattern.

…

ARTICLE 1336, DEFINITIONS

…

(B) *Defined Words and Terms*. The following terms or words, when capitalized herein, shall be interpreted or defined as indicated:

…

IN-FILL DEVELOPMENT – The development of vacant or under-utilized parcel(s) within existing urban areas that are already largely developed.

NOTE: Proposed definition source: https://mrsc.org/explore-topics/planning/development-types-and-land-uses/infill-development

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Update on Bond Estimates by Kimley-Horn

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Kimley»Horn

Memorandum

To: James Newman
City of Charles Town
101 E Washington Street
Charles Town, WV 25414

From: Mark Phillips, P.E.
Santiago Zegarra

Date: January 15, 2024

Subject: City of Charles Town Bond Estimate Worksheet - Unit Cost Update

The City of Charles Town tasked Kimley-Horn with reviewing the 2019 Public Improvement Bond Unit Cost List and Bond Reduction Form and updating the unit costs to better align with recent inflation and process since the last update in 2019. The purpose of this memorandum is to summarize the process undertaken to estimate the new set of recommended bond unit costs. The identification of unit cost comparisons was established by reviewing bond unit costs from adjacent jurisdictions including Loudoun County, VA, Jefferson County, WV, and Fairfax County, VA. It should be noted that the current 2019 version of the Unit Cost List is based upon previous Loudoun County Bid Unit Cost items which have since been revised for inflation purposes. The following memorandum summarizes the data collected and methodology for applying the adjacent jurisdiction unit cost data.

In undertaking this task, Kimley-Horn first identified adjacent towns and counties proximate to the City of Charles Town, recognizing that some had outdated data. Ultimately, Fairfax County and Loudoun County emerged as the most relevant sources. It was also noted that Loudoun County was the primary data source for most jurisdictions in the eastern pan handle of West Virginia and western north Virginia.

The subsequent data evaluation process consisted of analyzing the pricing and item data from these counties, addressing discrepancies, and ensuring alignment with the provided list. This thorough examination also involved a comprehensive analysis of pricing data, with the average values from Fairfax County and Loudoun County forming the basis for the new unit cost recommendations. In instances where relevant data was absent, a careful examination of old and new prices facilitated the calculation of updated values.

For instance, to calculate updated values for round concrete pipe (RCP) and high-density polyethylene (HDPE) pipe installations, we adopted a methodical approach. Initially, the City's original unit items account for the size of pipe and depth of pipe whereas Loudoun County only applies the size of the pipe diameter. We set Loudoun County's initial unit price as a starting point for the initial minimum depth pipe installation from the City of Charles Town and applied a percentage increase based on factors such as the type of cut or size of the pipe. This increase was determined by examining the price escalation per item from the current City of Charles Town cost, ensuring a consistent adjustment in the new recommended unit costs.

In situations where relevant data was absent, such as in the case of curb drop inlets with various specifications, a thorough strategy was employed. Despite lacking previous data for these specific items, we leveraged the available data and compared it to the current City costs. We took the total average increase in price from the Loudoun County updated unit price bid tabulations as compared to the overall

average price in the current City of Charles Town bid tabulations and developed an overall inflation factor, which was then utilized to calculate price increases for items which did not have a match from a neighboring jurisdiction. Subsequently, we aligned these values with the previously mentioned percentage increase methodology.

Lastly, certain scenarios, like retaining wall prices, presented unique challenges. In instances where the current City of Charles Town costs exceeded the updated Loudoun and Fairfax costs, a decision was made to retain the existing costs. This determination was based on the acknowledgment that the current costs, being higher, were deemed more appropriate for these specific cases.

The recommended set of bond cost estimate prices reflects this meticulous approach, providing transparency and documentation of the methodology employed in arriving at the new estimates.

KIMLEY-HORN & ASSOCIATES, INC.



Mark Phillips, P.E.
Project Manager
Associate

BOND ESTIMATE					
ITEM	UNIT	RECOMMENDED NEW UNIT COST	Current City of Charles Town Costs	Loudoun County Costs	Fairfax County Costs
					MOBILIZATION GENERAL
Mobilization	LS	$12,440.00	$6,250.00	$12,440.00	
Field Office	EA	$3,490.00	$3,000.00	$3,490.00	
Job Sign	EA	$1,340.00	$1,150.00	$1,340.00	
					SURVEYING
Steel Pipe Property Corner Marker Incl. Survey	EA	$320.38	$275.00		
					R.O.W MONUMENTS SURVEYED IN PLACE
RM--1		$825.00	$825.00	$740.00	$788.00
RM--2		$764.00	$575.00	$740.00	$788.00
					EARTHWORK EXCAVATION
Regular Bulk used as Fill	CY	$4.50	$3.86	$4.50	
Rock, Rip	CY	$51.50	$17.30	$55.00	$48.00
Rock, Blast	CY	$55.00	$38.48	$55.00	
					BORROW MATERIAL
Buy, Load, Haul 10 Mi. Select Material	CY	$42.00	$28.90	$40.00	$44.00
Fill and Compaction of On-site Borrow	CY	$44.00	$5.95	$40.00	$48.00
					UNSUITABLE MATERIAL
Load and Haul, 20 mi R/T	CY	$36.56	$21.95		
Dump Charge	CY	$62.50	$37.50		
Site Grading	SY	$1.25	$0.75	$1.25	
					CLEAR & GRUB
Light	AC	$14,548.50	$6,675.00	$13,600.00	$15,497.00
Heavy	AC	$26,699.49	$12,250.00		
					LANDSCAPING
Seeding	SY	$3.00	$0.77	$3.00	
Sodding	SY	$8.50	$3.64	$8.50	
					PLANTING SHRUBS
18"	EA	$70.00	$40.00	$70.00	

24"	EA	$90.00	$70.00	$90.00	
				TREES	
6'-8' (1-2 in. Caliper)	EA	$400.00	$400.00	$300.00	
8'-10' (2.5-3 in. Caliper)	EA	$700.00	$700.00	$580.00	
Tree Protection	LF	$11.13	$9.00	$10.25	$12.00
				MISCELLANEOUS SITE IMPROVEMENTS	
RETAINING WALLS					
Timber Wall (less than 6 ft)	LF	$325.00	$325.00	$310.00	
Dry Rubble RW-1 (H=6')	LF	$450.00	$450.00		
Mortared Rubble RW-1A (H=6')	LF	$535.00	$535.00		
Concrete Gravity RW-2 (H=6')	LF	$589.50	$339.00	$550.00	$629.00
Concrete Gravity RW-3 (H=6')	LF	$1,037.50	$378.00	$960.00	$1,115.00
FENCING					
Std. Fence (H=5') FR-5	LF	$56.00	$9.31	$50.00	$62.00
Farm Fence (H=5') FR-3A	LF	$37.50	$10.90	$35.00	$40.00
Chain Link Fence (H=6') FR 2-B	LF	$62.00	$14.52		$62.00
Board Fence (H=6')	LF	$62.00	$19.35		$62.00
TOTS LOTS					
Tot Lot	EA	$16,495.00	$16,495.00	$14,010.00	
				STORM DRAINAGE	
STORM SEWER					
NOTE: All pipe unit prices include trench, excavation, bedding, pipe, & backfill					
Rock Excavation for All Pipe Types					
Less than 1,500 CY (Blasting)	CY	$110.00	$110.00	$110.00	
More than 1,500 CY (Blasting)	CY	$90.00	$90.00		
Less than 1,500 CY (Hoe Ram)	CY	$220.00	$135.00	$220.00	
More than 1,500 CY (Hoe Ram)	CY	$180.00	$110.00		
Trench De-Watering					
Trench De-Watering	LF	$4.00	$2.95	$4.00	
				RCP CLASS III ROUND T & G W/MASTIC	
12" Pipe (RCP III)					
0'-8' Cut	LF	$100.00	$44.50	$100.00	
8'-14' Cut	LF	$140.00	$62.50		

Add cost for Class IV	LF	$1.90	$0.85		
O-Ring	LF	$12.36	$5.50		
15" Pipe (RCP III)					
0'-10' Cut	LF	$100.00	$49.75	$100.00	
10'-16'	LF	$156.00	$77.50		
Add Cost for Class IV	LF	$1.48	$0.95		
O-Ring	LF	$8.58	$5.50		
18" Pipe (RCP III)					
0'-10' Cut	LF	$100.00	$50.00	$100.00	
10' -16' Cut	LF	$160.00	$80.00		
Add Cost for Class IV	LF	$3.20	$2.00		
O-Ring	LF	$11.20	$7.00		
21" Pipe (RCP III)					
0'-8' Cut	LF	$115.00	$57.50	$100.00	
8'-14' Cut	LF	$174.80	$87.50		
Add cost for Class IV	LF	$4.40	$2.75		
O-Ring	LF	$20.80	$13.00		
24" Pipe (RCP III)					
0'- 10' Cut	LF	$140.00	$67.50	$140.00	
10'-16'	LF	$196.00	$95.00		
Add Cost for Class IV	LF	$5.04	$3.15		
O-Ring	LF	$22.40	$14.00		
27" Pipe (RCP III)					
0'- 10' Cut	LF	$123.20	$60.00	$140.00	
10' -16' Cut	LF	$195.03	$95.00		
Add Cost for Class IV	LF	$6.40	$4.00		
O-Ring	LF	$24.00	$15.00		
30" Pipe (RCP III)					
0'- 8' Cut	LF	$169.40	$82.50	$140.00	
8'-14' Cut	LF	$256.66	$125.00		
Add cost for Class IV	LF	$9.60	$6.00		
O-Ring	LF	$27.60	$17.25		
33" Pipe (RCP III)					
0'- 10' Cut	LF	$240.00	$115.00	$240.00	

10'-16'	LF	$333.00	$160.00		
Add Cost for Class IV	LF	$13.50	$6.50		
O-Ring	LF	$45.80	$21.95		
36" Pipe (RCP III)					
0'-10' Cut	LF	$249.60	$120.00	$240.00	
10' -16' Cut	LF	$363.92	$175.00		
Add Cost for Class IV	LF	$12.40	$7.75		
O-Ring	LF	$36.40	$22.75		
42" Pipe (RCP III)					
0'- 8' Cut	LF	$289.54	$140.00	$240.00	
8'-14' Cut	LF	$413.46	$200.00		
Add cost for Class IV	LF	$19.20	$12.00		
O-Ring	LF	$56.72	$35.45		
48" Pipe (RCP III)					
0'-10' Cut	LF	$320.52	$155.00	$240.00	
10'-16'	LF	$442.31	$215.00		
Add Cost for Class IV	LF	$20.00	$12.50		
O-Ring	LF	$69.36	$43.35		
54" Pipe (RCP III)					
0' - 10' Cut	LF	$420.00	$190.00	$420.00	
10' -16' Cut	LF	$541.38	$275.00		
Add Cost for Class IV	LF	$30.00	$18.75		
O-Ring	LF	$70.96	$44.35		
60" Pipe (RCP III)					
0'-10' Cut	LF	$420.00	$225.00	$420.00	
10' -16' Cut	LF	$498.48	$335.00		
Add Cost for Class IV	LF	$36.00	$22.50		
O-Ring	LF	$77.84	$48.65		
				ELLIPTICAL PIPE - RCP CLASS III	
23"x14" (18" Equiv- RCP III)					
0'10' Cut	LF	$190.00	$75.00	$190.00	
10'-16' Cut	LF	$278.60	$110.00		
Add cost for Class IV	LF	$41.60	$16.45		
O-Ring	LF	$109.80	$43.35		

30"x19" (24" Equiv- RCP III					
0'10' Cut	LF	$190.00	$90.00	$190.00	
10'-16' Cut	LF	$329.25	$130.00		
Add cost for Class IV	LF	$15.07	$5.95		
O-Ring	LF	$109.79	$43.35		
38"x24" (30" Equiv- RCP III					
0'10' Cut	LF	$190.00	$120.00	$190.00	
10'-16' Cut	LF	$423.78	$167.50		
Add cost for Class IV	LF	$21.38	$8.45		
O-Ring	LF	$129.92	$51.35		
45"x29" (36" Equiv- RCP III)					
0'10' Cut	LF	$370.00	$165.00	$370.00	
10'-16' Cut	LF	$526.88	$235.00		
Add cost for Class IV	LF	$25.45	$11.35		
O-Ring	LF	$119.63	$53.35		
53"x34" (42" Equiv- RCP III)					
0'12' Cut	LF	$370.00	$210.00	$370.00	
10'-18' Cut	LF	$528.36	$300.00		
Add cost for Class IV	LF	$38.87	$15.35		
O-Ring	LF	$149.26	$58.95		
60"x38" (48" Equiv- RCP III)					
0'12' Cut	LF	$370.00	$255.00	$370.00	
10'-18' Cut	LF	$543.90	$375.00		
Add cost for Class IV	LF	$46.46	$18.35		
O-Ring	LF	$177.11	$69.95		
				HDPE PIPE	
8" Pipe					
0'-8' Cut	LF	$50.00	$28.65	$50.00	
8'-14' Cut	LF	$75.30	$43.15		
12" Pipe					
0'-8' Cut	LF	$67.50	$38.95	$50.00	
8'-14' Cut	LF	$100.04	$57.75		
15" Pipe					
0'-8' Cut	LF	$87.08	$50.25	$120.00	

8'-16' Cut	LF	$129.65	$74.85		
18" Pipe					
0'-8' Cut	LF	$114.33	$66.00	$120.00	
8'-16' Cut	LF	$170.69	$98.55		
24" Pipe					
0'-8' Cut	LF	$132.62	$76.90	$120.00	
8'-16' Cut	LF	$197.61	$115.25		
30" Pipe					
0'-8' Cut	LF	$157.42	$91.33	$120.00	
8'-16' Cut	LF	$236.13	$137.27		
36" Pipe					
0'-8' Cut	LF	$200.00	$101.68	$200.00	
8'-16' Cut	LF	$298.00	$152.33		
42" Pipe					
0'-8' Cut	LF	$224.20	$113.99	$200.00	
8'-16' Cut	LF	$334.06	$171.00		
48" Pipe					
0'-8' Cut	LF	$253.35	$129.55	$200.00	
8'-16' Cut	LF	$377.49	$195.66		
				STORM STRUCTURES	
END SECTIONS					
End Sections (ES-1), Concrete Pipe Size					
15"	EA	$1,389.00	$565.00	$1,480.00	$1,298.00
18"	EA	$1,583.46	$646.00	$1,480.00	$1,298.00
21"	EA	$1,805.14	$755.00	$1,480.00	$1,298.00
24"	EA	$2,057.86	$1,065.00	$1,480.00	$1,298.00
27"	EA	$2,345.97	$1,195.00	$1,480.00	$1,298.00
30"	EA	$2,674.40	$1,765.00	$1,480.00	$1,298.00
36"	EA	$3,048.82	$1,795.00	$1,480.00	$1,298.00
42"	EA	$3,558.50	$2,135.00	$3,410.00	$3,707.00
48"	EA	$4,056.69	$2,795.00	$3,410.00	$3,707.00
54"	EA	$4,624.63	$2,795.00	$3,410.00	$3,707.00
60"	EA	$5,272.07	$3,455.00	$3,410.00	$3,707.00
ENDWALLS					

EW-1 (Pre-Cast) Round Pipe Size					
15"	EA	$2,433.00	$800.00	$2,540.00	$2,326.00
18"	EA	$2,724.96	$1,337.00	$2,540.00	$2,326.00
24"	EA	$3,051.96	$2,021.00	$2,540.00	$2,326.00
30"	EA	$3,418.19	$2,133.00	$2,540.00	$2,326.00
36"	EA	$3,828.37	$2,366.00	$2,540.00	$2,326.00
EW-1 Cast in Place [Round Pipe Size]					
15"	EA	$2,591.15	$852.00	$2,230.00	$2,024.00
18"	EA	$2,902.08	$1,053.00	$2,230.00	$2,024.00
24"	EA	$3,250.33	$1,495.00	$2,230.00	$2,024.00
30"	EA	$3,640.37	$2,144.00	$2,230.00	$2,024.00
36"	EA	$4,077.22	$2,383.00	$2,230.00	$2,024.00
EW-1A (Pre-Cast) Elliptical Pipe Size					
23" X 14" (18")	EA	$1,335.00	$695.00	$1,470.00	$1,200.00
30" X 19" (24")	EA	$1,495.20	$969.00	$1,470.00	$1,200.00
38 X 24" (30")	EA	$1,879.50	$1,165.00	$1,930.00	$1,829.00
45 X 29" (36")	EA	$2,105.04	$1,445.00	$1,930.00	$1,829.00
53" X 34" (42")	EA	$2,791.50	$1,840.00	$2,990.00	$2,593.00
EW-1A (Cast in Place)Elliptical Pipe Size					
23" X 14" (18")	EA	$1,318.50	$667.00	$1,510.00	$1,127.00
30" X 19" (24")	EA	$1,318.50	$939.00	$1,510.00	$1,127.00
38 X 24" (30")	EA	$2,257.00	$1,247.00	$2,430.00	$2,084.00
45 X 29" (36")	EA	$2,257.00	$1,618.00	$2,430.00	$2,084.00
53" X 34" (42")	EA	$3,217.50	$2,109.00	$3,370.00	$3,065.00
EW-2 (PreCast) Round Size Pipe Size					
42"	EA	$8,324.00	$5,445.00	$7,500.00	$9,148.00
48"	EA	$9,322.88	$5,695.00	$7,500.00	$9,148.00
54"	EA	$10,441.63	$6,660.00	$7,500.00	$9,148.00
60"	EA	$11,694.62	$7,140.00	$7,500.00	$9,148.00
72"	EA	$12,675.50	$7,990.00	$12,470.00	$12,881.00
84"	EA	$14,196.56	$9,490.00	$12,470.00	$12,881.00
EW-2 (Cast in Place) Round Size Pipe Size					
42"	EA	$9,255.50	$4,723.00	$8,950.00	$9,561.00
48"	EA	$10,366.16	$6,039.00	$8,950.00	$9,561.00

54"	EA	$11,610.10	$6,972.00	$8,950.00	$9,561.00
60"	EA	$13,003.31	$8,179.00	$8,950.00	$9,561.00
72"	EA	$15,747.00	$10,713.00	$14,470.00	$17,024.00
84"	EA	$17,636.64	$12,288.00	$14,470.00	$17,024.00
EW-6PC [Double Pipe] Pipe Size					
2-15"	EA	$2,123.00	$999.00	$2,610.00	$1,636.00
2-18"	EA	$2,377.76	$1,235.00	$2,610.00	$1,636.00
2-24"	EA	$2,663.09	$1,510.00	$2,610.00	$1,636.00
2-30"	EA	$4,096.00	$2,165.00	$4,690.00	$3,502.00
2-36"	EA	$4,587.52	$2,647.00	$4,690.00	$3,502.00
				MANHOLES	
Standard Brick Manhole Std Frame & Cover (MH-1)					
6' Depth	EA	$6,048.00	$3,750.00	$5,590.00	$6,506.00
Depth Below 6'	VF	$230.00	$163.00	$230.00	$230.00
Standard Precast Manhole Std Frame & Cover (MH-2)		$5,337.00	$3,100.00	$5,100.00	$5,574.00
Additional Cost (Amount in parentheses to be added to the above unit costs)					
Watertight Fr/Cover (Add 110)	EA	$579.00	$579.00		
Heavy Duty Fr/ Cover (Add 82)	VF	$599.00	$599.00		
				Drop Inlets	
Cast in Place 48"					
Drop Inlet (DI-1) 12"-24" Pipe0-10 VF	EA	$7,690.00	$3,697.00	$7,690.00	
Drop Inlet (DI-1A) 12"-24" Pipe10-20 VF	EA	$7,690.00	$5,593.00	$7,690.00	
Drop Inlet (DI-2A) 12"-24" Pipe0-10 VF, 10' throat	EA	$9,458.70	$6,911.00		
Drop Inlet (DI-2A) 12"-24" Pipe10-20 VF, 10' throat	EA	$11,634.20	$8,833.00		
				Curb Drop Inlets	
Curb Drop Inlet (DI-3A)					
12"-30" Pipe (Invert Depth (H) =0'-8') Inlet Length 2'-6"	EA	$7,460.00	$4,088.00	$7,460.00	
Curb Drop Inlet (DI-3AA)					

12"-30" Pipe (Invert Depth (H) =8'-	EA	$9,772.60	$5,357.00		
Curb Drop Inlet (DI-3B) 12"-30" Pipe (Invert Depth (H) = 0 '-8') Inlet Length					
4'	EA	$7,758.40	$4,279.00		
6'	EA	$8,534.24	$4,573.00		
8'	EA	$9,387.66	$4,889.00		
10'	EA	$10,326.43	$5,052.00		
12'	EA	$11,359.07	$5,227.00		
16'	EA	$12,494.98	$5,543.00		
20'	EA	$13,744.48	$5,859.00		
Curb Drop Inlet (DI-3BB) 12"-30" Pipe (Invert Depth (H) = 0 '-8') Inlet Length					
4'	EA	$7,680.82	$4,276.00		
6'	EA	$8,448.90	$4,848.00		
8'	EA	$9,293.79	$5,429.00		
10'	EA	$10,223.17	$5,732.00		
12'	EA	$11,245.48	$6,011.00		
16'	EA	$12,370.03	$6,296.00		
20'	EA	$13,607.03	$6,599.00		
Curb Drop Inlet (DI-3C) 12"-30" Pipe (Invert Depth (H) = 0 '-8') Inlet Length					
6'	EA	$7,204.61	$4,013.00		
8'	EA	$7,925.07	$4,588.00		
10'	EA	$8,717.57	$4,893.00		
12'	EA	$9,589.33	$5,178.00		
16'	EA	$10,548.26	$5,766.00		
20'	EA	$11,603.09	$6,339.00		
Curb Drop Inlet (DI-3CC) 12"-30" Pipe (Invert Depth (H) = 0 '-8') Inlet Length					
6'	EA	$8,573.48	$4,746.00		
8'	EA	$9,430.83	$5,293.00		
10'	EA	$10,373.91	$5,627.00		
12'	EA	$11,411.30	$5,988.00		
16'	EA	$12,552.43	$6,772.00		
20'	EA	$13,807.68	$7,465.00		
Curb Drop Inlet (DI-3D)					
12"-30" Pipe (Invert Depth (H) =0'-8') Inlet Length 2'-6"	EA	$6,430.11	$3,633.00		

Curb Drop Inlet (DI-3DD)					
12"-30" Pipe (Invert Depth	EA	$7,587.53	$4,367.00		
Curb Drop Inlet (DI-3E) 12"-30" Pipe (Invert Depth (H) = 0 '-8') Inlet Length					
4'	EA	$7,460.00	$4,093.00	$7,460.00	
8'	EA	$7,982.20	$4,756.00	$7,460.00	
10'	EA	$8,540.95	$5,724.00	$7,460.00	
12'	EA	$9,138.82	$5,833.00	$7,460.00	
16'	EA	$9,778.54	$6,072.00	$7,460.00	
20'	EA	$10,463.04	$6,709.00	$7,460.00	
Curb Drop Inlet (DI-3EE) 12"-30" Pipe (Invert Depth (H) = 8'-20') Inlet Length					
6'	EA	$11,509.34	$7,562.00	$7,460.00	
8'	EA	$12,314.99	$7,869.00	$7,460.00	
10'	EA	$13,177.04	$7,999.00	$7,460.00	
12'	EA	$14,099.44	$8,166.00	$7,460.00	
16'	EA	$15,086.40	$8,471.00	$7,460.00	
20'	EA	$16,142.44	$8,767.00	$7,460.00	
Curb Drop Inlet (DI-3F) 12"-30" Pipe (Invert Depth (H) = 0 '-8') Inlet Length					
6'	EA	$6,855.74	$3,765.00	$7,460.00	
8'	EA	$7,335.64	$4,419.00	$7,460.00	
10'	EA	$7,849.14	$4,749.00	$7,460.00	
12'	EA	$8,398.58	$5,085.00	$7,460.00	
16'	EA	$8,986.48	$5,742.00	$7,460.00	
20'	EA	$9,615.53	$6,395.00	$7,460.00	
Curb Drop Inlet (DI-3FF) 12"-30" Pipe (Invert Depth (H) = 8'-20') Inlet Length					
6'	EA	$14,671.28	$8,077.00	$7,460.00	
8'	EA	$15,698.27	$8,288.00	$7,460.00	
10'	EA	$16,797.15	$8,480.00	$7,460.00	
12'	EA	$17,972.95	$8,669.00	$7,460.00	
16'	EA	$19,231.06	$9,047.00	$7,460.00	
20'	EA	$20,577.23	$9,446.00	$7,460.00	
Curb Drop Inlet (DI-4A) 36"-48" Pipe (Invert Depth (H) = 8'-20') Inlet Length					
4'	EA	$10,020.00	$4,868.00	$10,020.00	
Curb Drop Inlet (DI-4AA) 36"-48" Pipe (Invert Depth (H) = 8'-20') Inlet Length					
4'	EA	$10,020.00	$6,817.00	$10,020.00	

Curb Drop Inlet (DI-4B) 36"-48" Pipe (Invert Depth (H) = 0'-8') Inlet Length					
6'	EA	$8,802.77	$5,172.00	$10,020.00	
8'	EA	$9,418.96	$5,400.00	$10,020.00	
10'	EA	$10,078.29	$5,698.00	$10,020.00	
12'	EA	$10,783.77	$5,870.00	$10,020.00	
16'	EA	$11,538.64	$6,221.00	$10,020.00	
20'	EA	$12,346.34	$6,571.00	$10,020.00	
Curb Drop Inlet (DI-4BB) 36"-48" Pipe (Invert Depth (H) = 8'-20') Inlet Length					
6'	EA	$17,429.48	$10,292.00	$10,020.00	
8'	EA	$18,649.55	$10,643.00	$10,020.00	
10'	EA	$19,955.02	$10,810.00	$10,020.00	
12'	EA	$21,351.87	$10,974.00	$10,020.00	
16'	EA	$22,846.50	$11,309.00	$10,020.00	
20'	EA	$24,445.75	$11,669.00	$10,020.00	
Curb Drop Inlet (DI-4C) 36"-48" Pipe (Invert Depth (H) = 0'-8') Inlet Length					
8'	EA	$9,418.96	$5,612.00	$10,020.00	
10'	EA	$10,078.29	$5,794.00	$10,020.00	
12'	EA	$10,783.77	$5,968.00	$10,020.00	
16'	EA	$11,538.64	$6,315.00	$10,020.00	
20'	EA	$12,346.34	$6,657.00	$10,020.00	
Curb Drop Inlet (DI-4CC) 36"-48" Pipe (Invert Depth (H) = 8'-20') Inlet Length					
8'	EA	$22,417.13	$13,371.00	$10,020.00	
10'	EA	$23,986.33	$13,693.00	$10,020.00	
12'	EA	$25,665.38	$14,097.00	$10,020.00	
16'	EA	$27,461.95	$14,712.00	$10,020.00	
20'	EA	$29,384.29	$15,365.00	$10,020.00	
Curb Drop Inlet (DI-4D)					
36"-48" Pipe (Invert Depth (H) =8'16') Inlet Length 4'	EA	$8,279.27	$4,933.00	$10,020.00	
Curb Drop Inlet (DI-4DD)					
36"-48" Pipe (Invert Depth (H)	EA	$16,392.95	$9,455.00	$10,020.00	
Curb Drop Inlet (DI-4E) 36"-48" Pipe (Invert Depth (H) = 0'-8') Inlet Length					
6'	EA	$9,016.12	$5,267.00	$10,020.00	
8'	EA	$9,647.25	$5,605.00	$10,020.00	

10'	EA	$10,322.56	$5,896.00	$10,020.00	
12'	EA	$11,045.14	$6,233.00	$10,020.00	
16'	EA	$11,818.30	$6,996.00	$10,020.00	
20'	EA	$12,645.58	$7,695.00	$10,020.00	
Curb Drop Inlet (DI-4EE) 36"-48" Pipe (Invert Depth (H) = 8'-16') Inlet Length					
6'	EA	$15,688.06	$9,165.00	$10,020.00	
8'	EA	$16,786.22	$9,495.00	$10,020.00	
10'	EA	$17,961.26	$9,839.00	$10,020.00	
12'	EA	$19,218.54	$10,167.00	$10,020.00	
16'	EA	$20,563.84	$10,838.00	$10,020.00	
20'	EA	$22,003.31	$11,493.00	$10,020.00	
Curb Drop Inlet (DI-4F) 36"-48" Pipe (Invert Depth (H) = 0'-8') Inlet Length					
8'	EA	$10,040.36	$5,877.00	$10,020.00	
10'	EA	$10,743.18	$6,209.00	$10,020.00	
12'	EA	$11,495.20	$6,568.00	$10,020.00	
16'	EA	$12,299.87	$7,259.00	$10,020.00	
20'	EA	$13,160.86	$7,963.00	$10,020.00	
Curb Drop Inlet (DI-4FF) 36"-48" Pipe (Invert Depth (H) = 8'-16') Inlet Length					
8'	EA	$15,140.86	$8,866.00	$10,020.00	
10'	EA	$16,200.72	$9,147.00	$10,020.00	
12'	EA	$17,334.77	$9,435.00	$10,020.00	
16'	EA	$18,548.20	$9,997.00	$10,020.00	
20'	EA	$19,846.57	$10,584.00	$10,020.00	
Median Drop Inlets - CIP					
Median Drop Inlets (DI-6A) 12"-24"Pipe Inlet (H=8')	EA	$6,032.00	$4,205.00	$5,860.00	$6,204.00
Median Drop Inlets (DI-6B) 12"-24"Pipe Inlet (H=8')	EA	$6,080.00	$4,267.00	$5,860.00	$6,300.00
Median Drop Inlets (DI-6C) 30"-48"Pipe Inlet (H=10')	EA	$7,737.50	$5,589.00	$7,200.00	$8,275.00
Median Drop Inlets (DI-6D) 30"-48"Pipe Inlet (H=10')	EA	$7,805.00	$5,692.00	$7,200.00	$8,410.00

Median Drop Inlets (DI-7) Type III Top 12"-42" Pipe Inlet (H=10')	EA	$8,548.00	$5,748.00	$7,790.00	$9,306.00
Median Drop Inlets (DI-7A) Type III Top 12"-42" Pipe Inlet (H=10')	EA	$8,548.00	$6,338.00	$7,790.00	$9,306.00
Median Drop Inlets (DI-7B) Type III Top 12"-42" Pipe Inlet (H=10')	EA	$8,548.00	$6,797.00	$7,790.00	$9,306.00
MISCELLANEOUS INLETS					
Median Drop Inlets (DI-5) Type III Top 12"-42" Pipe Inlet (H=8')	EA	$6,569.08	$5,226.00		
Standard Yard Inlet (YI-1) 12"-48" Pipe (Invert Depth (H)= 0'-8') Inlet Length 4' (No Aprons)		$5,969.49	$4,749.00		
Add Yard Inlet Apron	THROAT	$320.54	$255.00		
Standard Yard Inlet (YI-1) 12"-48" Pipe (Invert Depth (H)= 0'-8') Inlet Length 4' (No Aprons)	EA	$6,444.64	$5,127.00		
Add Yard Inlet Apron	THROAT	$320.54	$255.00		
Culverts					
Single Box Culvert (BC-1A) Fills to 25'					
4' X 4'	LF	$473.00	$336.00	$450.00	$496.00
5' X 5'	LF	$563.00	$410.00	$520.00	$606.00
6' X 6'	LF	$689.00	$498.00	$640.00	$738.00
8' X 8'	LF	$944.00	$699.00	$870.00	$1,018.00
10' X 10'	LF	$1,159.00	$845.00	$1,070.00	$1,248.00
Double Box Culvert (BC-2b) Fills to 25'					
4' X 4'	LF	$792.40	$566.00		
5' X 5'	LF	$987.00	$705.00		
6' X 6'	LF	$1,195.60	$854.00		

8' X 8'	LF	$1,607.20	$1,148.00		
10' X 10'	LF	$1,975.40	$1,411.00		
Oversized Single Box Culvert (BBC-1) Fills to 25'					
12' X 6'	LF	$1,488.50	$1,026.00	$1,390.00	$1,587.00
12' X 8'	LF	$1,488.50	$1,144.00	$1,390.00	$1,587.00
12' X 10'	LF	$1,771.50	$1,239.00	$1,640.00	$1,903.00
12' X 12'	LF	$1,771.50	$1,348.00	$1,640.00	$1,903.00
Triple Box Culvert (BC-3B) Fills to 25'					
4' X 4'	LF	$1,129.55	$779.00		
5' X 5'	LF	$1,399.25	$965.00		
6' X 6'	LF	$1,755.95	$1,211.00		
8' X 8'	LF	$2,367.85	$1,633.00		
10' X 10'	LF	$3,607.60	$2,488.00		
Quadruple Box Culvert (BC-4B) Fills to 25'					
4' X 4'	LF	$1,431.15	$987.00		
5' X 5'	LF	$1,776.25	$1,225.00		
6' X 6'	LF	$2,208.35	$1,523.00		
8' X 8'	LF	$2,170.65	$1,497.00		
10' X 10'	LF	$4,110.75	$2,835.00		
Standard Wing for Box Culvert (1 Side Only) Height of Box					
4'	EA	$926.50	$675.00	$860.00	$993.00
5'	EA	$1,390.00	$995.00	$1,290.00	$1,490.00
6'	EA	$1,853.50	$1,337.00	$1,720.00	$1,987.00
8'	EA	$3,426.50	$2,489.00	$3,170.00	$3,683.00
10'	EA	$4,558.00	$3,315.00	$4,210.00	$4,906.00
Standard Wing for Box Culvert (BBC-W) Height of Box					
6'	EA	$1,817.00	$1,351.00	$1,670.00	$1,964.00
8'	EA	$3,007.50	$2,189.00	$2,780.00	$3,235.00
10'	EA	$4,497.50	$3,269.00	$4,160.00	$4,835.00
12'	EA	$6,567.00	$4,763.00	$6,070.00	$7,064.00
MISCELLANEOUS STORM					
Connection to Existing Structure					
15"-36" Pipe	EA	$1,584.00	$735.00	$2,090.00	$1,078.00
42"-60" Pipe	EA	$1,584.00	$1,125.00	$2,090.00	$1,078.00

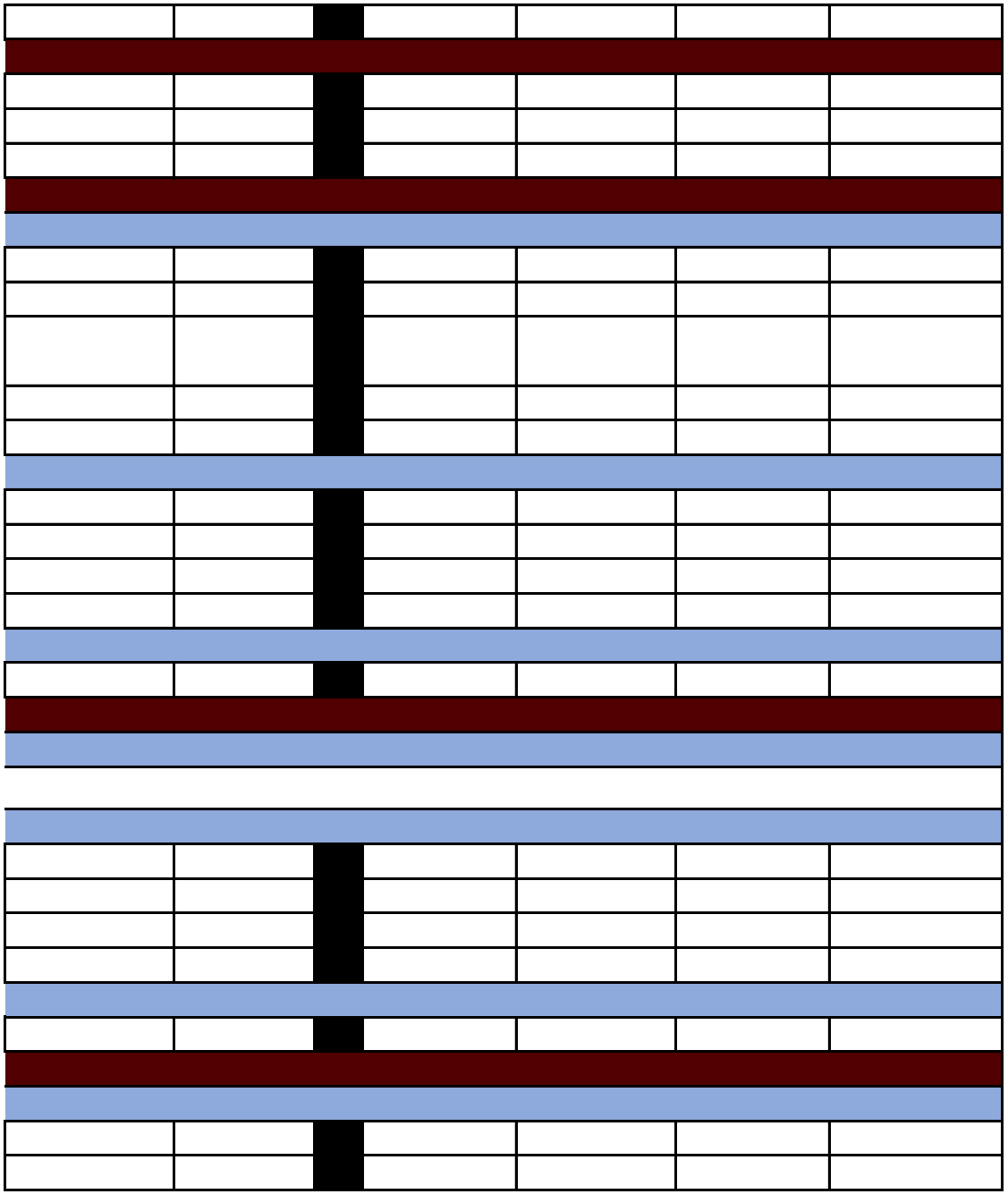
Casing Pipe, Bore and Jack (3/8" wall)					
22" ID (6"-8" Carrier Pipe)	LF	$885.71	$411.00		
24" ID (10" Carrier Pipe)	LF	$971.91	$451.00		
30" ID (12" Carrier Pipe)	LF	$1,226.20	$569.00		
Plug Pipe					
6"-12" Pipe	EA	$444.50	$142.00	$430.00	$459.00
15"-36" Pipe	EA	$444.50	$323.00	$430.00	$459.00
42"-60" Pipe	EA	$574.50	$522.00	$690.00	$459.00
Pavement Edge Pipe					
Standard Pipe Underdrain	LF	$20.50	$19.00	$20.50	
RipRap					
Dry, Class I, 18"	SY	$82.00	$47.87	$80.00	$84.00
Dry, Class II, 18"	SY	$82.00	$51.46	$80.00	$84.00
Grouted, Class I, 18"	SY	$84.00	$69.97		$84.00
Filter Fabric					
Class I	SY	$4.13	$3.50	$4.25	$4.00
Class II	SY	$4.13	$3.00	$4.25	$4.00
Class III	SY	$4.13	$2.25	$4.25	$4.00
Gabions (No excavations)					
Mattress	CY	$237.50	$130.00	$220.00	$255.00
Revetment	CY	$237.50	$164.33	$220.00	$255.00
Wall	CY	$237.50	$212.25	$220.00	$255.00
Paved Ditch (4" Thick)					
Concrete (Non-reinforced)	SY	$94.50	$62.00	$95.00	$94.00
Bituminous Concrete (4")	SY	$43.50	$30.00	$45.00	$42.00
Sodded Ditch					
Sodded Ditch(Incl Fine Grading)	SY	$15.03	$9.86		
				STREET CONSTRUCTION	
ROADS AND PARKING					
Soil Stabilization					
Cement 6%	SY	$20.00	$2.70	$20.00	
Depth (in Inches):	SY				
Lime 6%	SY	$14.00	$1.89		

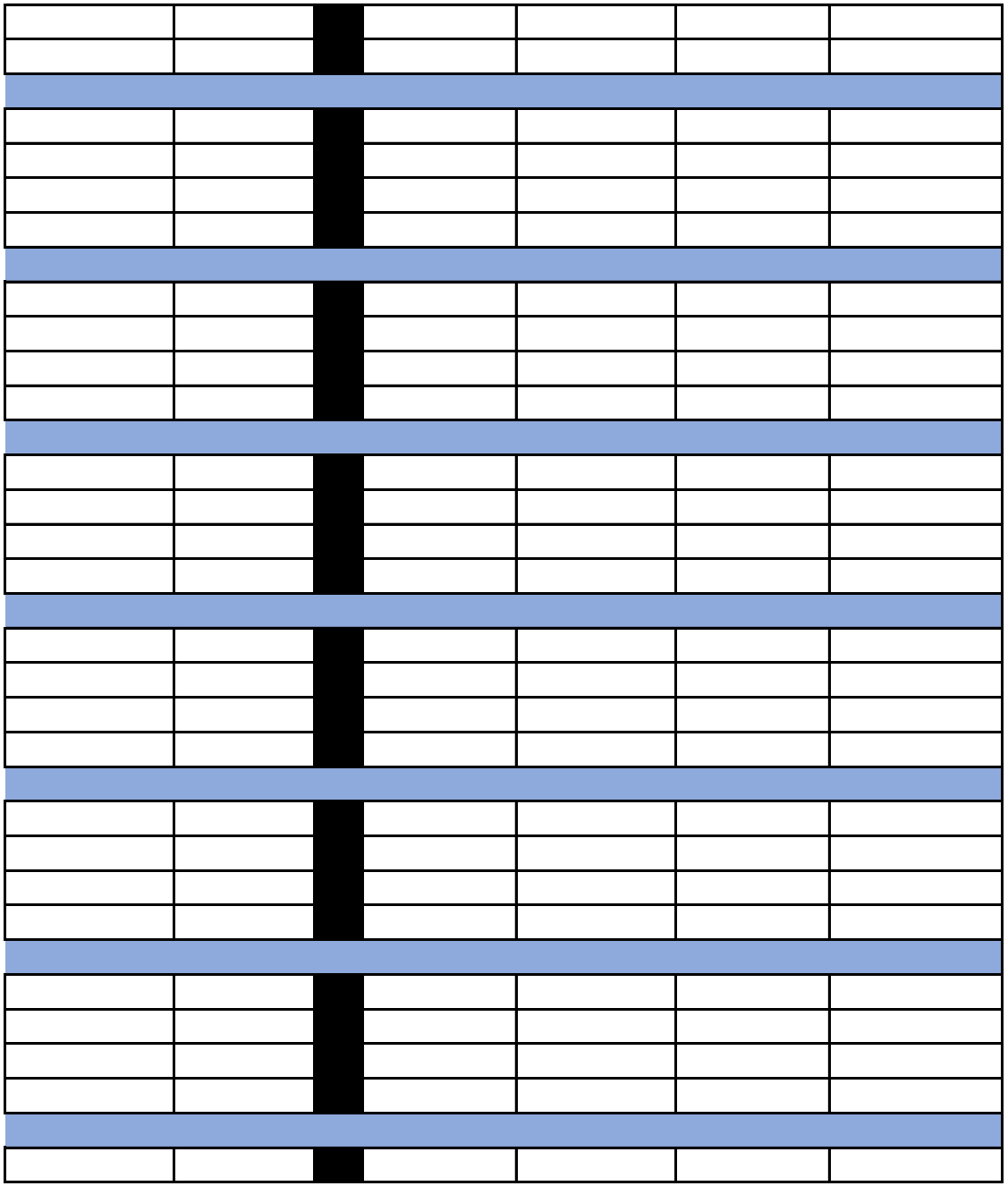
Depth (in Inches):	SY				
Subbase, Aggregated Material					
Base Type I	SY	$12.95	$1.75		
Depth (in Inches):	SY				
Bituminous Concrete					
Base Course	SY	$7.00	$5.59	$7.00	
Depth (in Inches):	SY				
Intermediate Course	SY	$7.00	$5.49		
Depth (in Inches):	SY				
Top Course	SY	$7.00	$5.49	$7.00	
Depth (in Inches):	SY				
Prime Coat	SY	$1.38	$1.10		
Tack Coat	SY	$1.38	$1.10		
Driveway Restoration					
4 Concrete & 4 Gravel	SY	$75.00	$79.95	$75.00	
2 S-5 & 7 6 Gravel	SY	$29.98	$31.96		
Shoulders, Type I					
Aggregated Base, 4	SY	$15.00	$11.50	$15.00	
Concrete Curbing					
Curb & Gutter CG6 & CG7	LF	$31.50	$22.50	$30.00	$33.00
Curb Cut, CG-12 DetectableSurf.	EA	$1,044.00	$569.00	$1,300.00	$788.00
Entrances/ Driveways					
Commercial Entrance CG-11	SY	$87.00	$52.88	$90.00	$84.00
Commercial Entrance CG-13	SY	$87.00	$64.67	$90.00	$84.00
Residential Driveway Apron	SY	$1,252.00	$51.79	$2,420.00	$84.00
Guardrails					
Std. Blocked-out W beam(GR2)	LF	$53.50	$42.50	$55.00	$52.00
Std. W beam, Weak Post GR8	LF	$53.50	$28.50	$55.00	$52.00
Terminal, GR-6 (L=12 -6)	EA	$3,880.50	$2,929.00	$3,810.00	$3,951.00
Terminal, GR-7 (L=6 -3)	EA	$3,880.50	$2,659.00	$3,810.00	$3,951.00
Type I, GR-8 Terminal (L=25)	EA	$3,580.50	$1,399.00	$3,210.00	$3,951.00
Type II, GR-8 Terminal(L=13 -6)	EA	$1,701.00	$695.00	$1,730.00	$1,672.00
Terminal, MB-4 (L=37 -6)	EA	$3,580.50	$3,495.00	$3,210.00	$3,951.00
Type I, MB-5 Terminal(L=27 -1)	EA	$3,580.50	$2,925.00	$3,210.00	$3,951.00

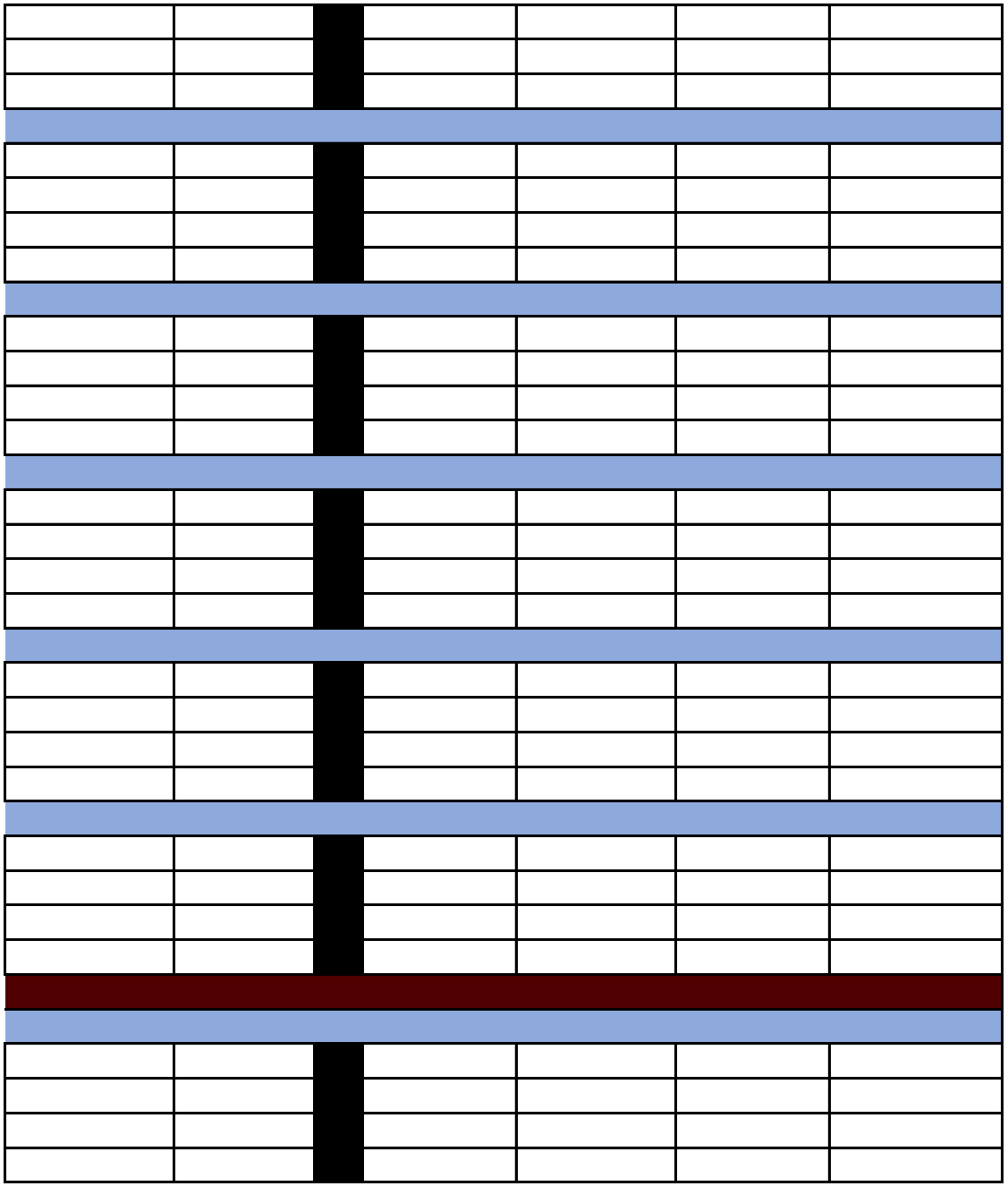
Type II, MB-5 Terminal(L=13 -6)	EA	$1,701.00	$1,675.00	$1,730.00	$1,672.00
Miscellaneous					
Trash enclosure - Brick 6' high	LF	$7,336.50	$325.00	$6,760.00	$7,913.00
Reinforced Concrete Pad 6" to 8"	SY	$150.00	$62.00	$150.00	
Striping 4" width (VDOT Type	LF	$2.50	$2.25	$2.50	
B)					
Concrete Wheel Stops	EA	$90.00	$70.00	$90.00	
Parking Lot Striping	EA	$50.00	$50.00	$50.00	
Sign Island	EA	$850.00	$850.00	$850.00	
Traffic Barricade	EA	$133.50	$43.45	$60.00	$207.00
Street Name Signs	EA	$594.50	$435.00	$560.00	$629.00
Traffic Control Signs	EA	$512.00	$375.00	$480.00	$544.00
Street Light (pole, bracket,light)	EA	$5,938.00	$4,285.00	$5,600.00	$6,276.00
				SIDEWALKS AND TRAILS	
Sidewalk					
Concrete 4 w/WWF, No base	SY	$58.50	$45.23	$55.00	$62.00
Bitum. Conc, 2 w/4 Base	SY	$42.00	$30.00	$40.00	$44.00
4 Conc, No Reinf., No Base	SY	$58.50	$41.00	$55.00	$62.00
				HANDRAIL	
Handrail 3 Rail 1-1/4 #4 Finish	LF	$143.00	$96.50	$140.00	$146.00
Wood Chip Trail					
Trails(Incl Excavation &	SY	$77.00	$17.69	$75.00	$79.00
Grading) Wood chip, 4 wide	SY	$21.00		$20.00	$22.00
Bituminous Trail					
6 to 10' wide	SY	22	$49.25		$22.00
				CRITICAL SLOPE STABILIZATION	
Paved Flume	SY	$100.00	$67.00		$100.00
Stmwtr Conc Channel-Excav	SY	$97.00	$775.00		$97.00
ADD Grass Lined-seeded	SY	$19.00	$5.37		$19.00
ADD Grass Lined-sodded	SY	$26.00	$10.89		$26.00
Outlet Protection					
Non-grouted Riprap 18	SY	$87.00	$52.00		$87.00
Concrete 4	SY	$70.00	$53.50		$70.00

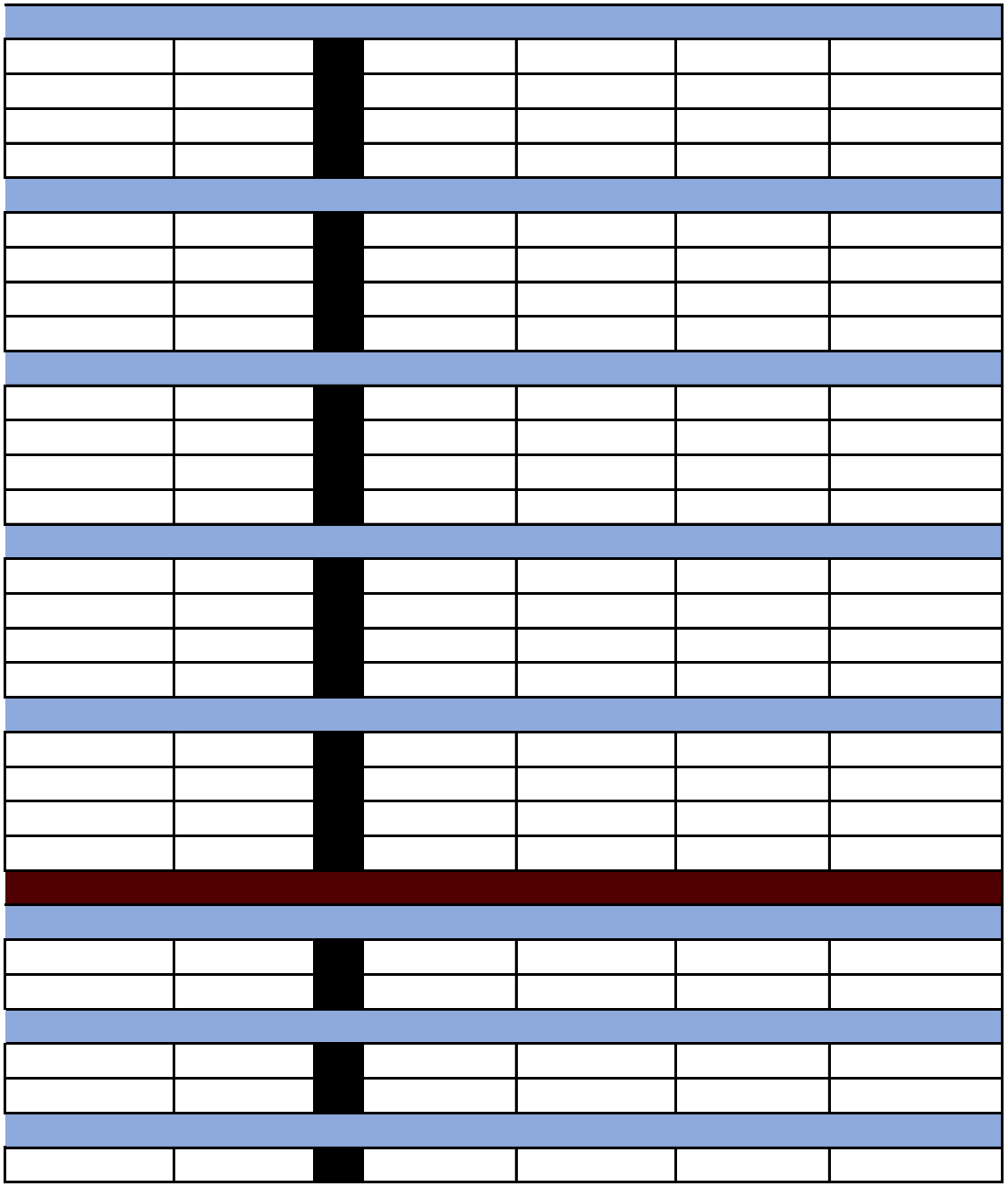
Level Spreader	SY	$5.77	$4.44		
Struc Streambank Protection					
Non-grouted Riprap 18	SY	$87.00	$58.00		$87.00
Gabions	CY	$255.00	$147.00		$255.00
Vegetative Erosion Control					
Sodding incl Fertilizing Banks	SY	$9.00	$7.77		$9.00
Sodding incl Fertilizing Flat	SY	$9.00	$5.36		$9.00
Seeding incl Fertilizing	SY	$3.00	$2.44		$3.00
Soding W/Soil Treat &Watering	SY	$9.00	$3.25		$9.00
Seeding W/Soil Treat &Watering	SY	$3.00	$6.46		$3.00
Straw Mulch w/Tack	SY	$2.00	$1.40		$2.00
Jute Mesh	SY	$2.00	$1.77		$2.00
				SPECIAL ITEMS	
FEMA ProcessingLOMR/CLOMR	EA	$10,240.00	$7,500.00	$10,240.00	
As Built (Record Drawings)	EA	$12,967.50	$9,500.00		
SWM/BMP POND	LS				
SIGNALIZATION	LS				
Subtotal					

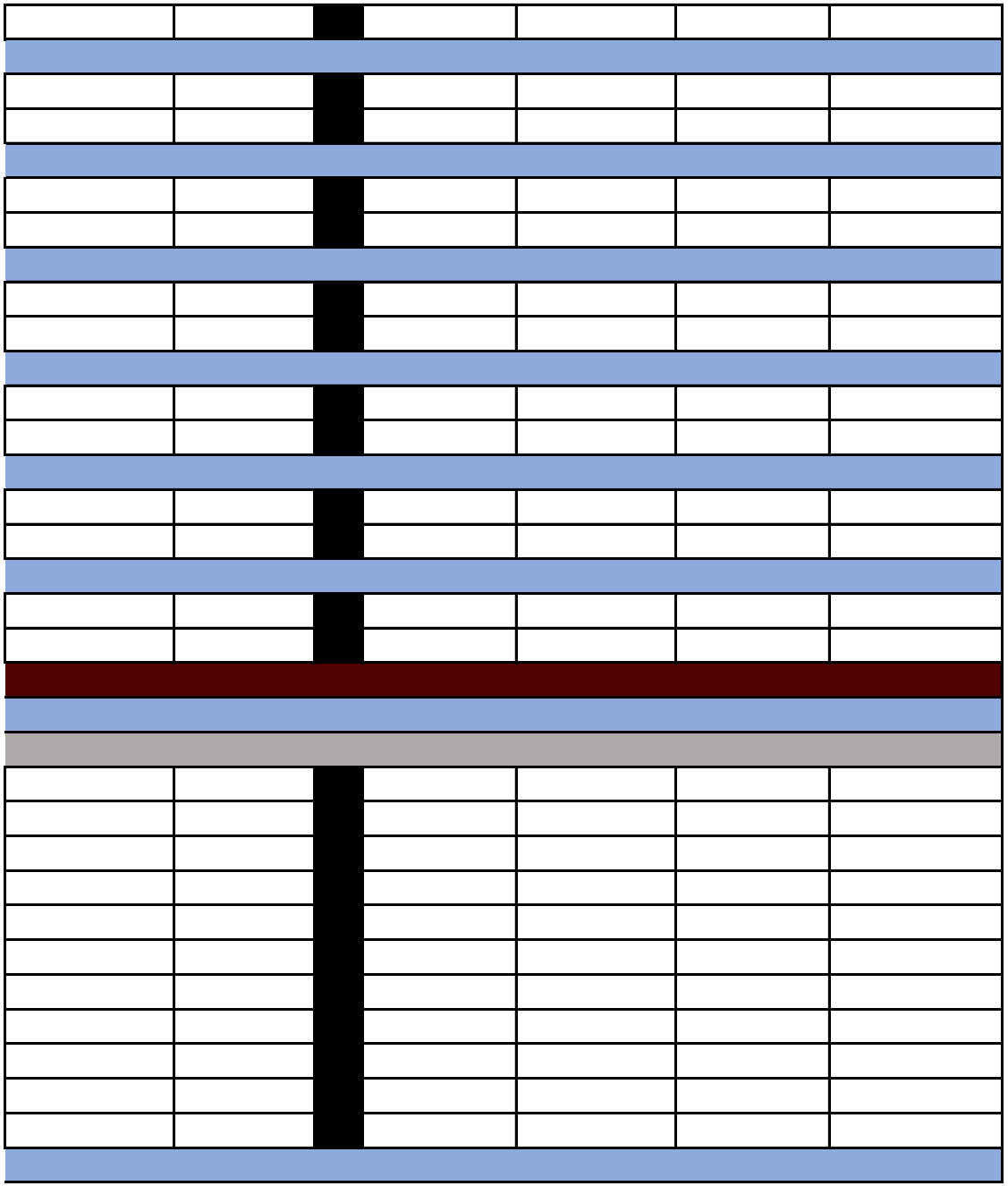
			BOND REDUCTION			City Use Only
QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	%APPROVED

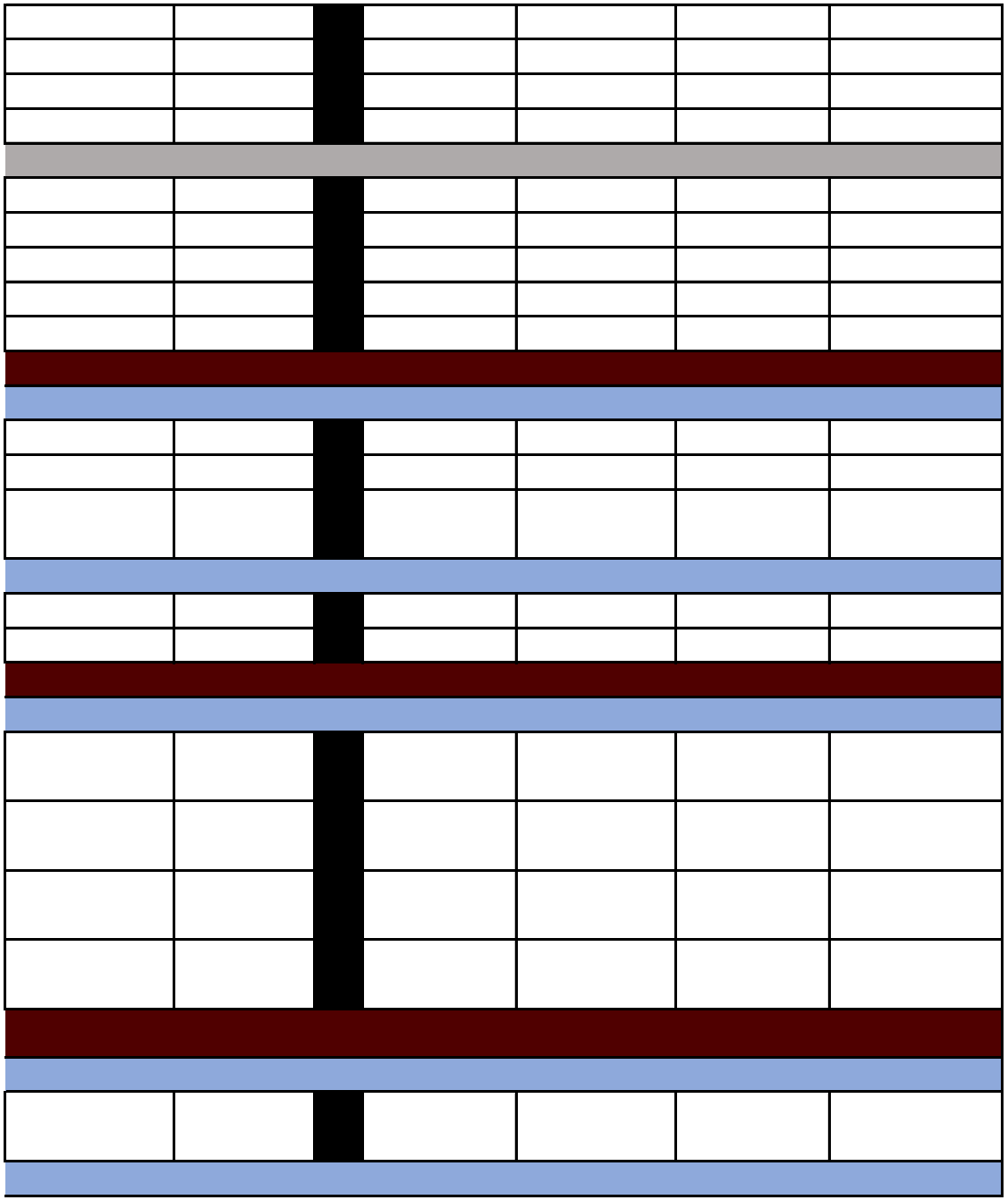


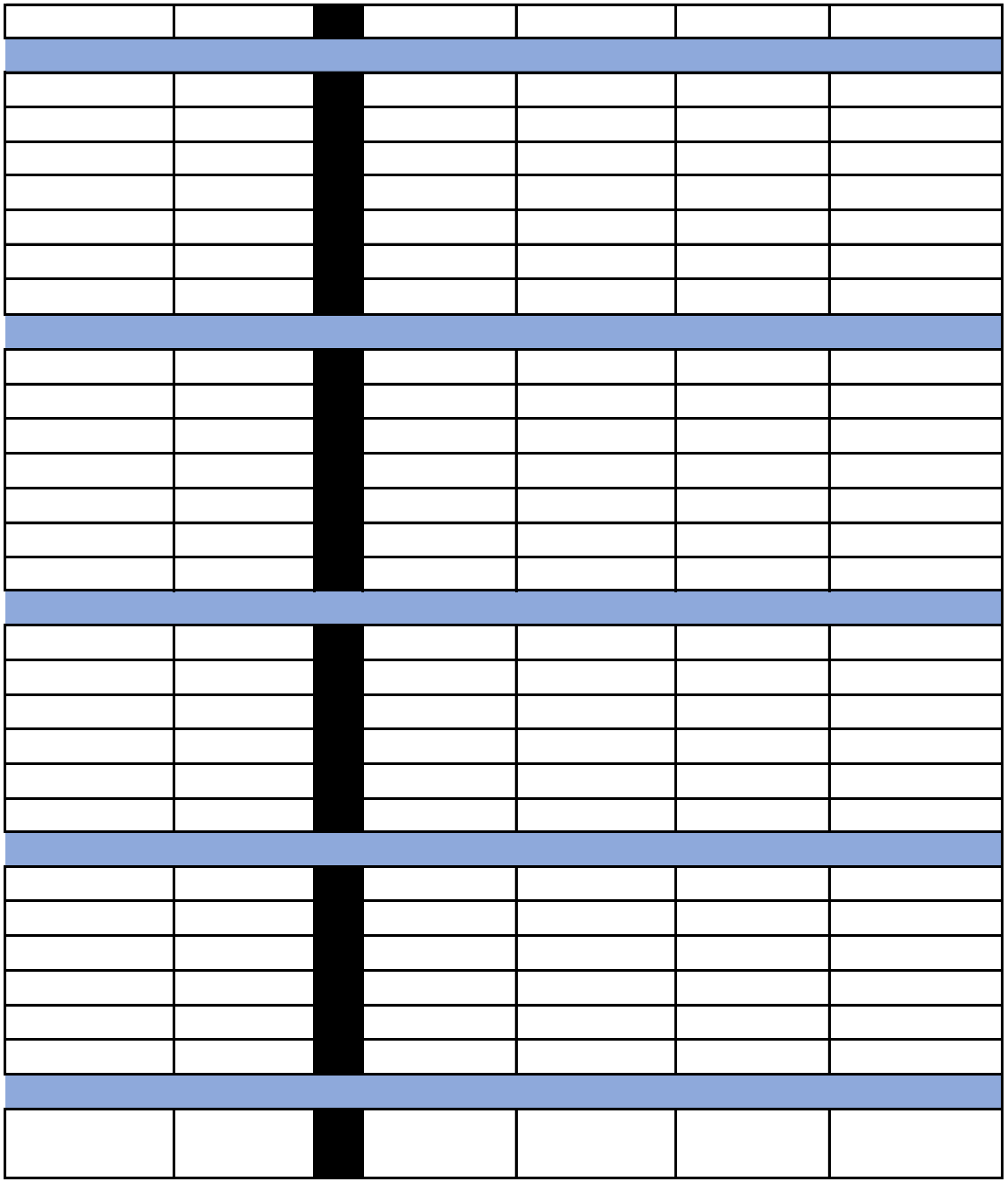


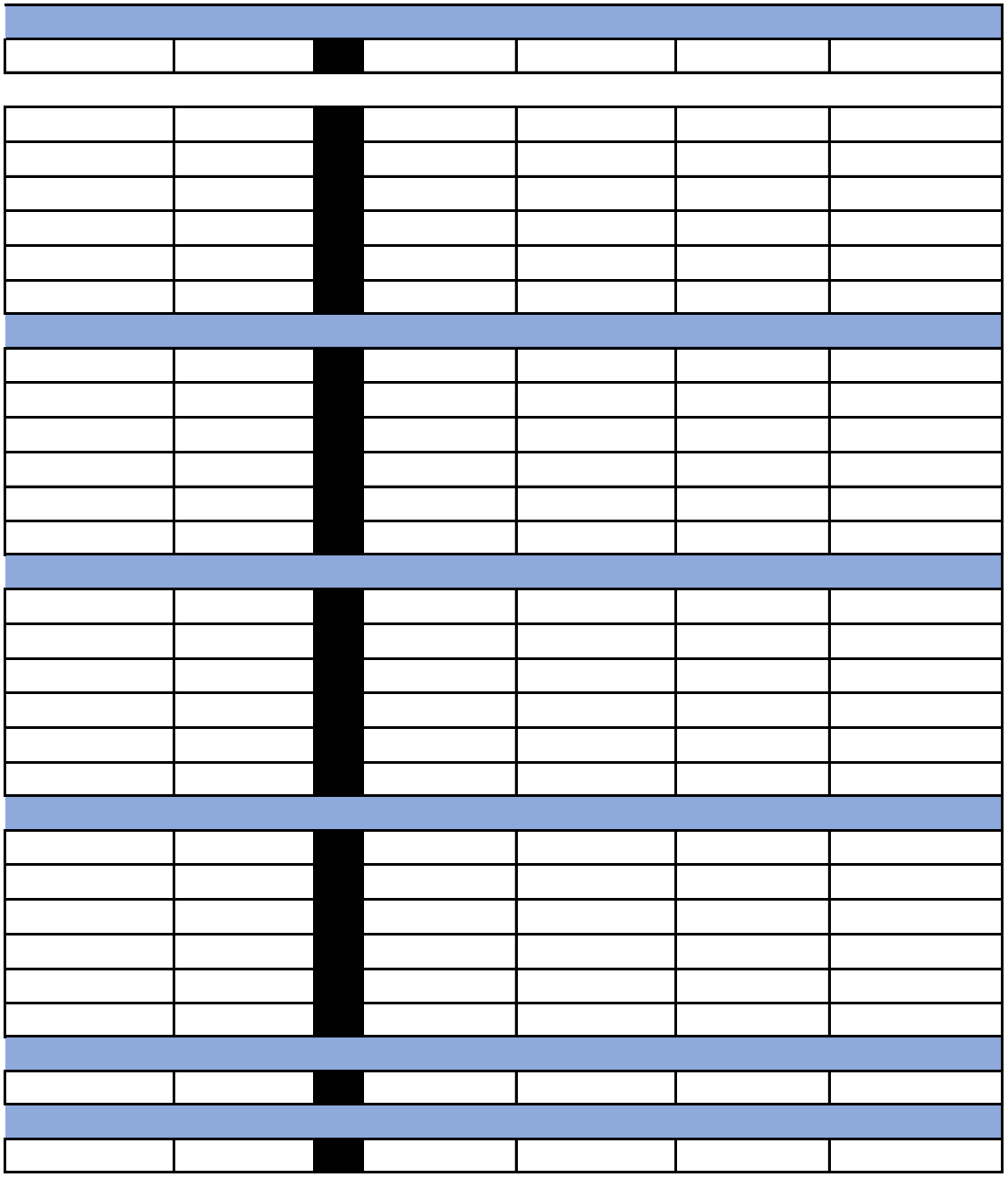


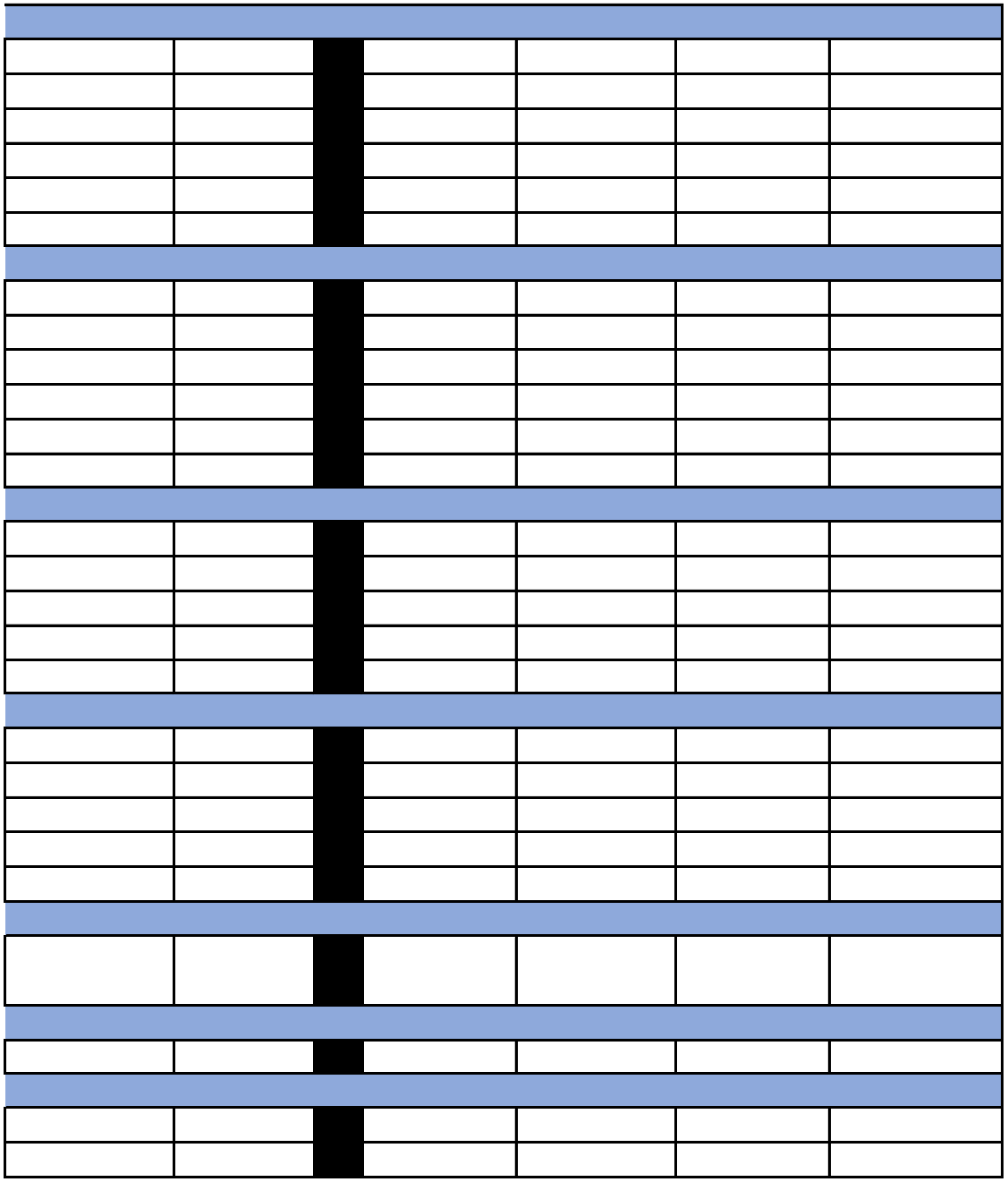


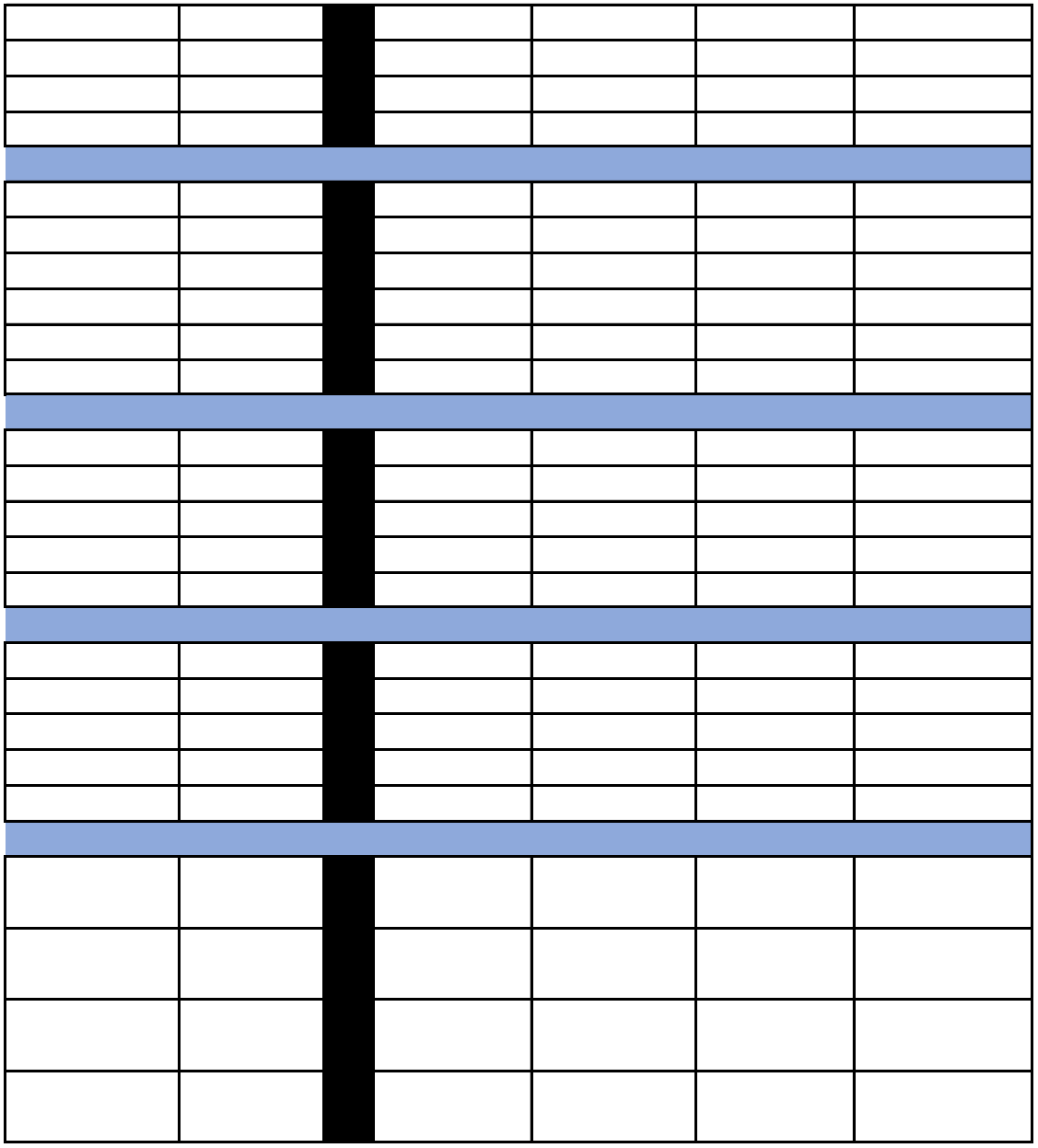


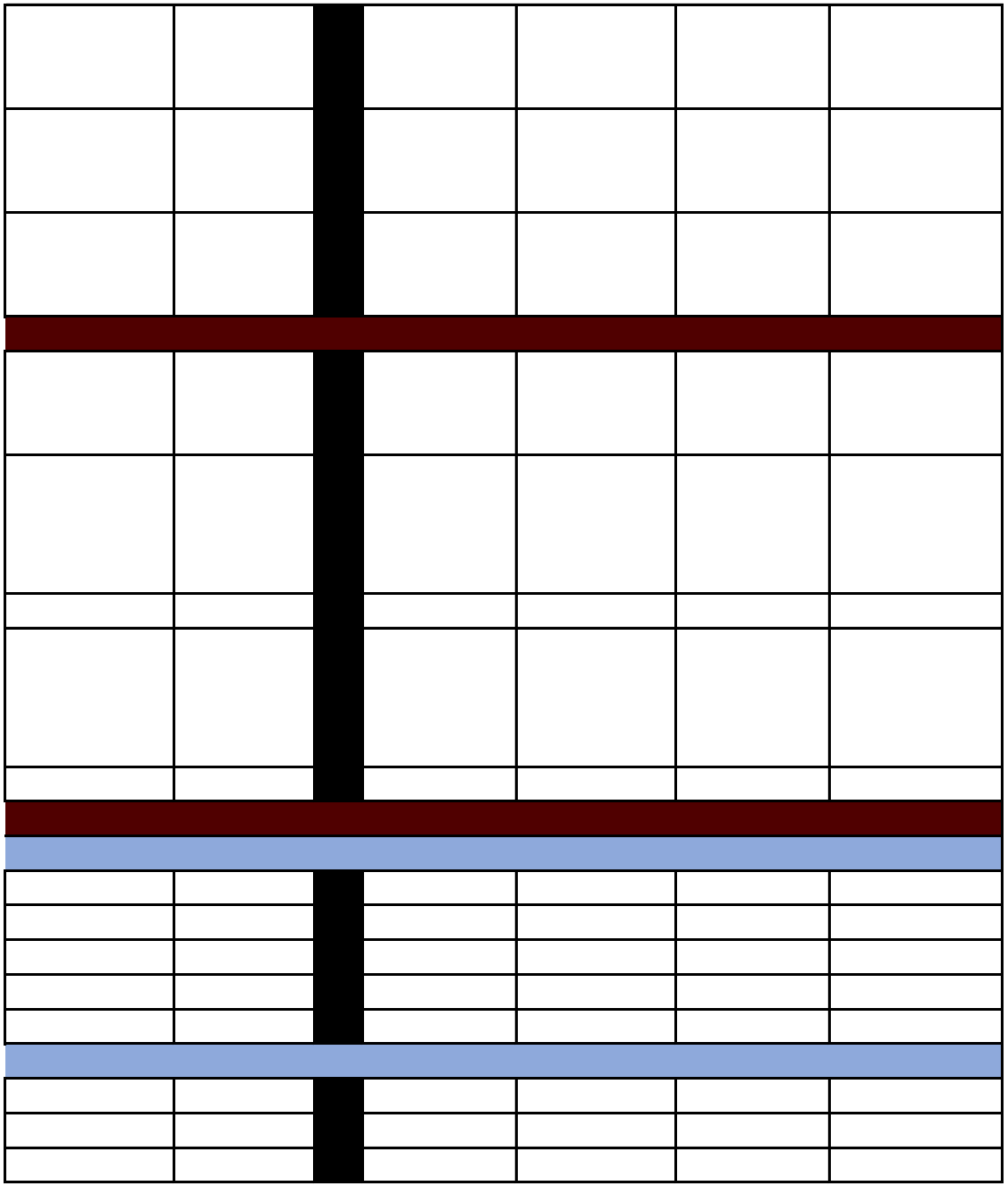


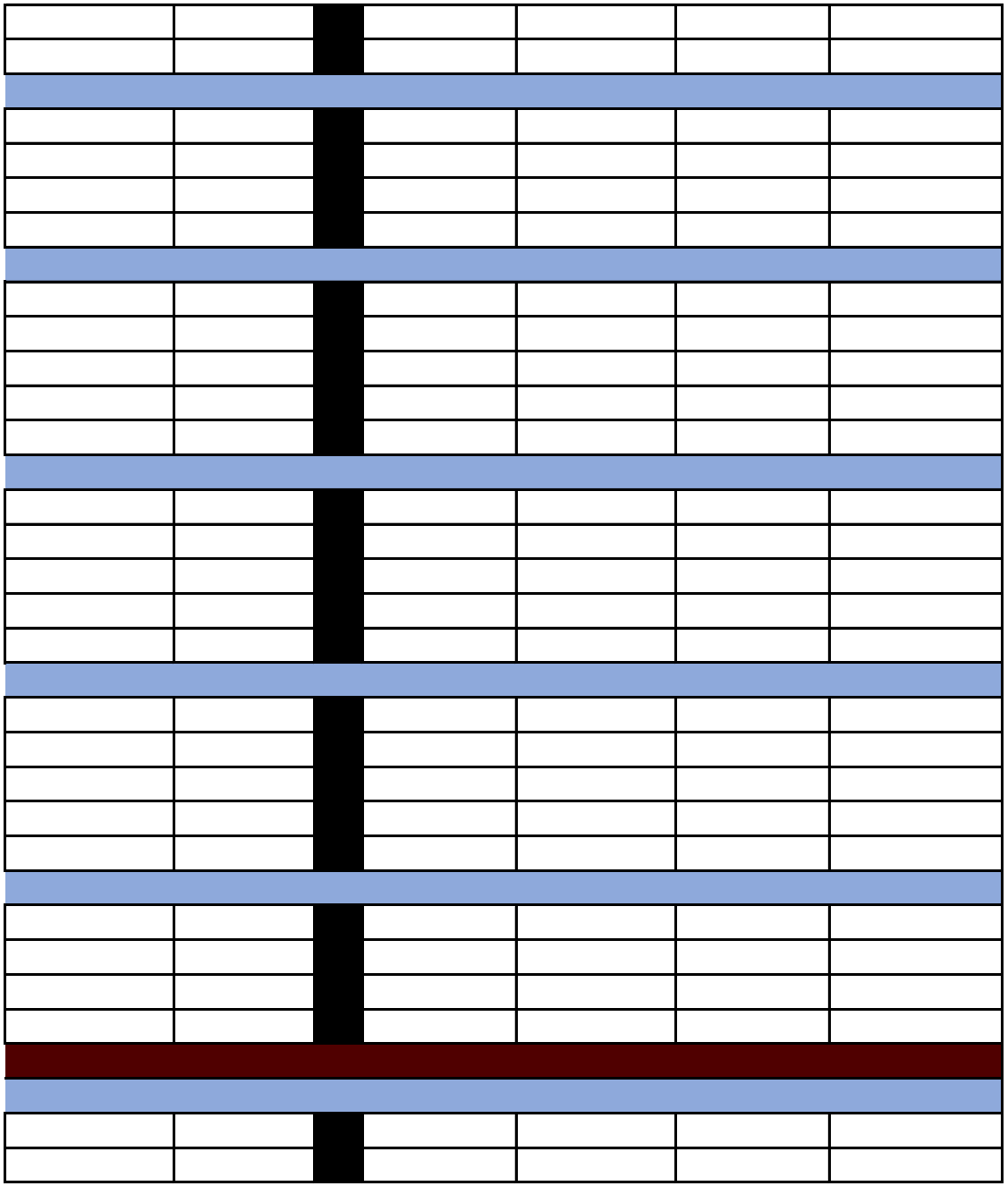


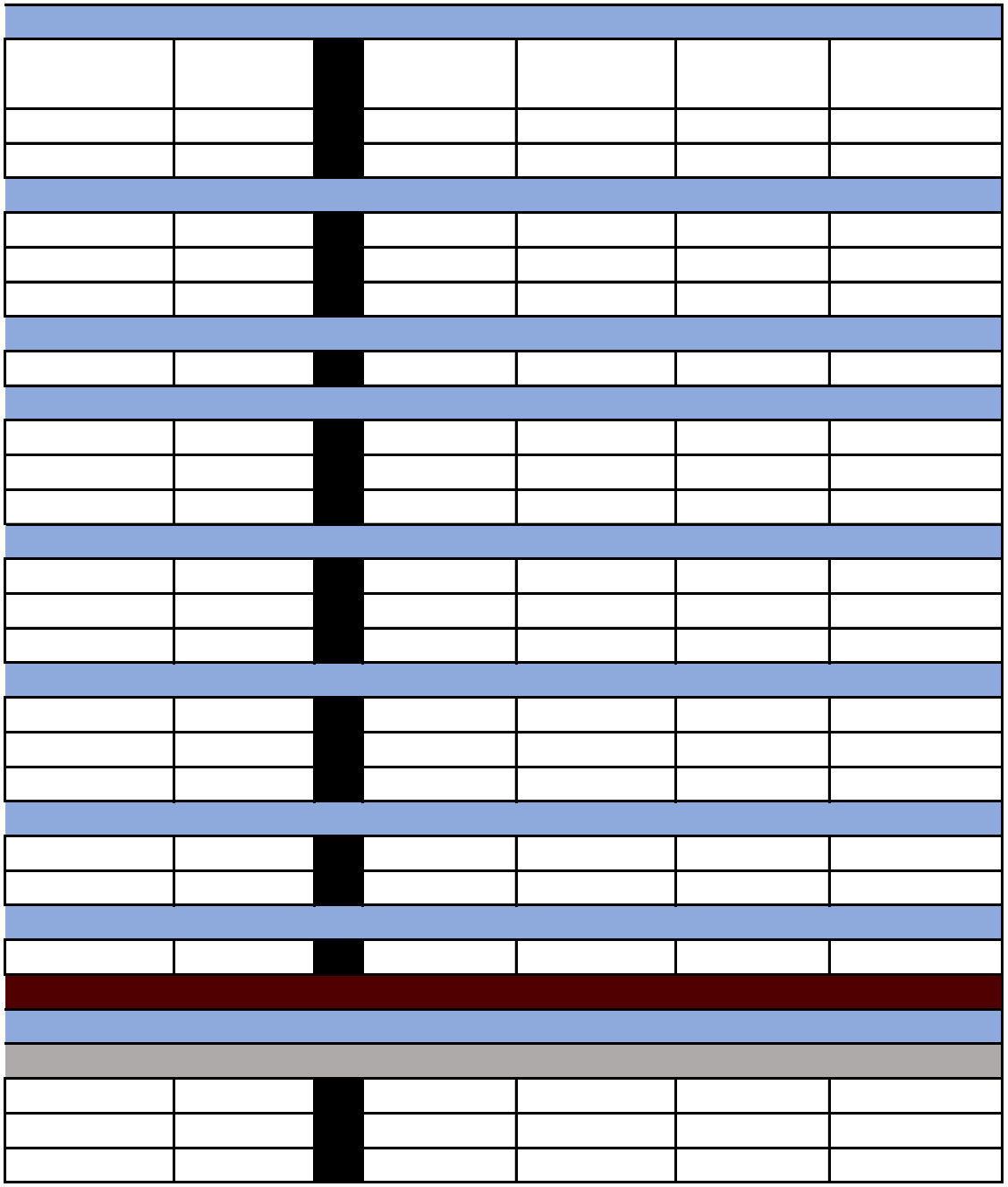


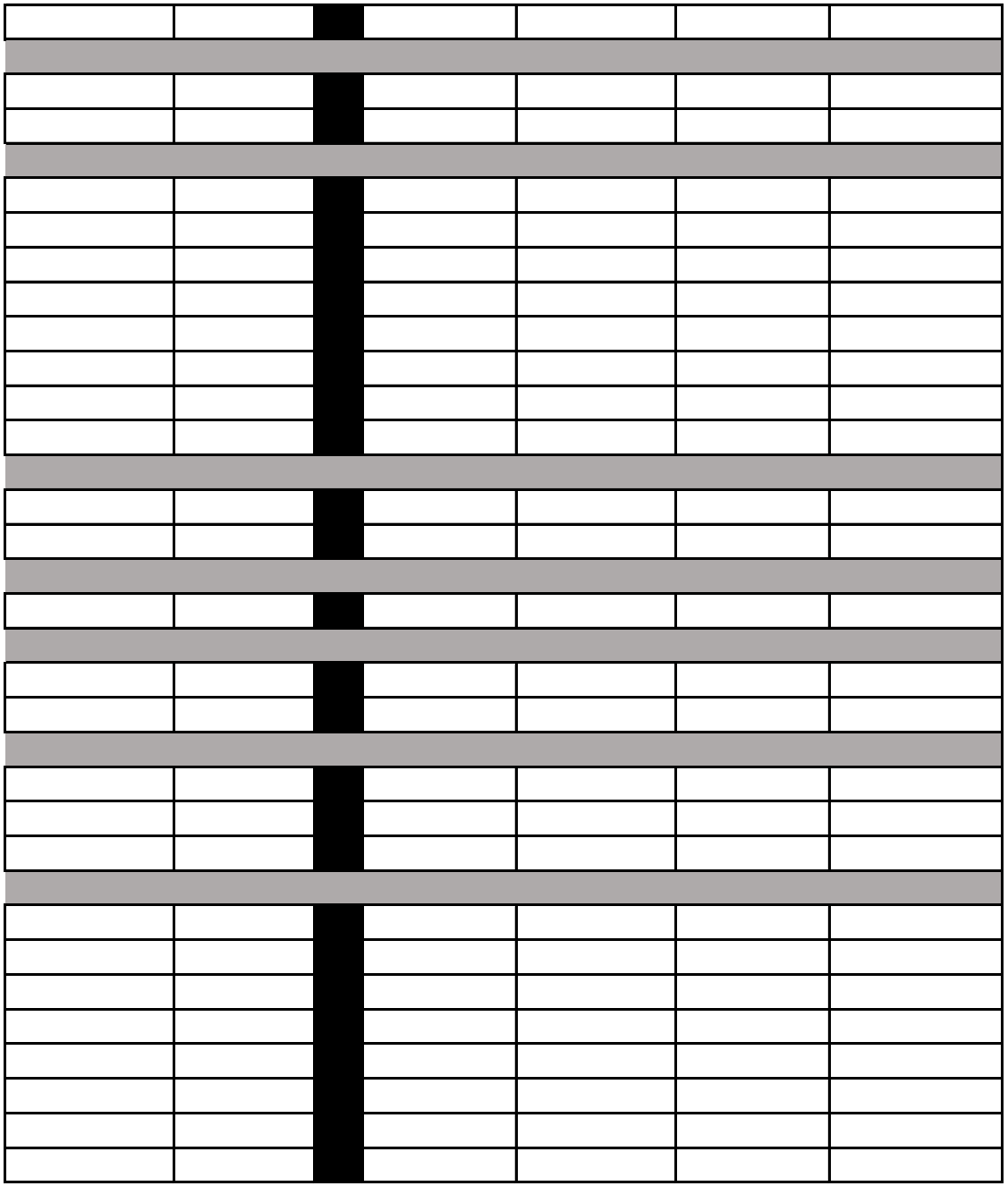


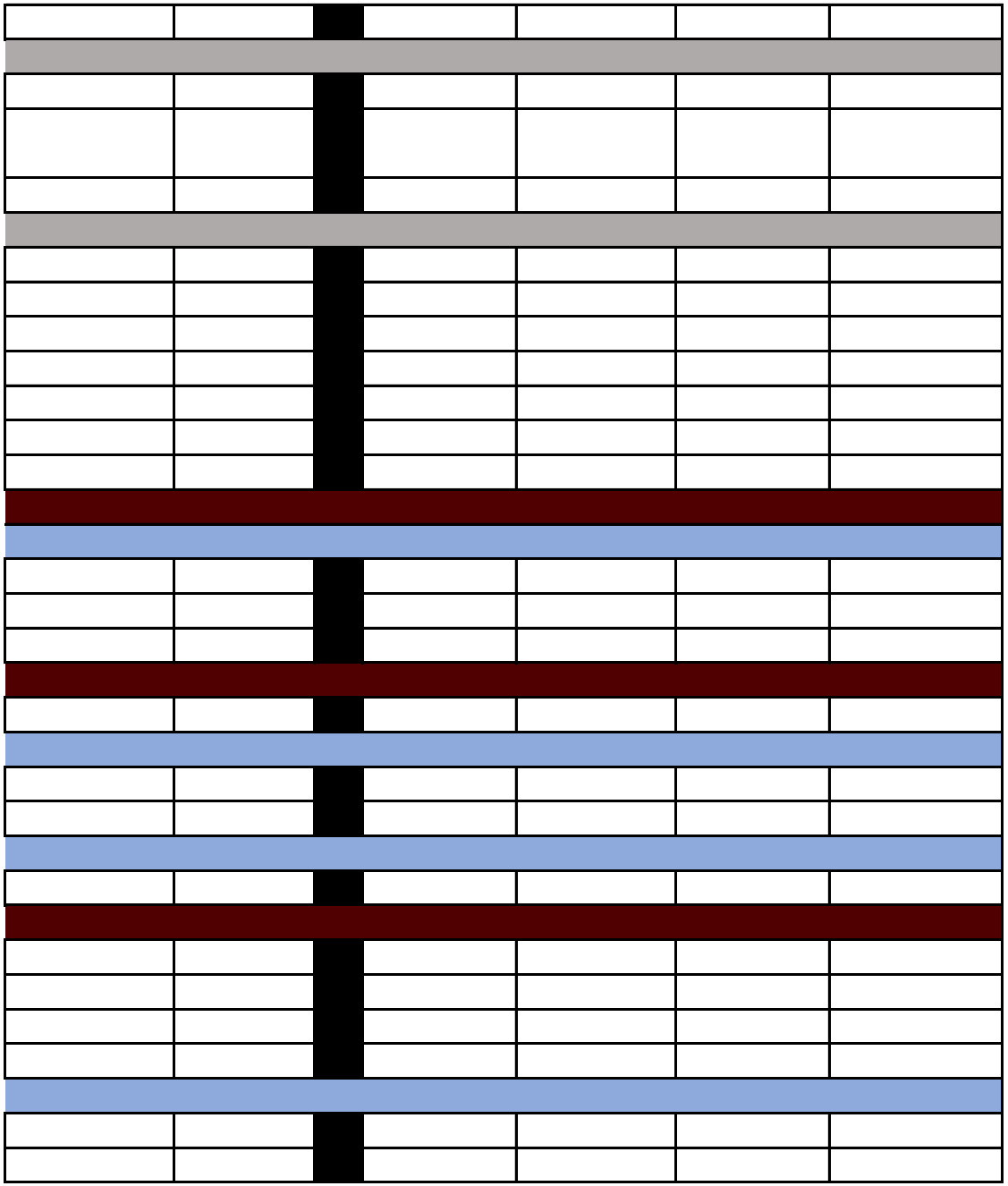


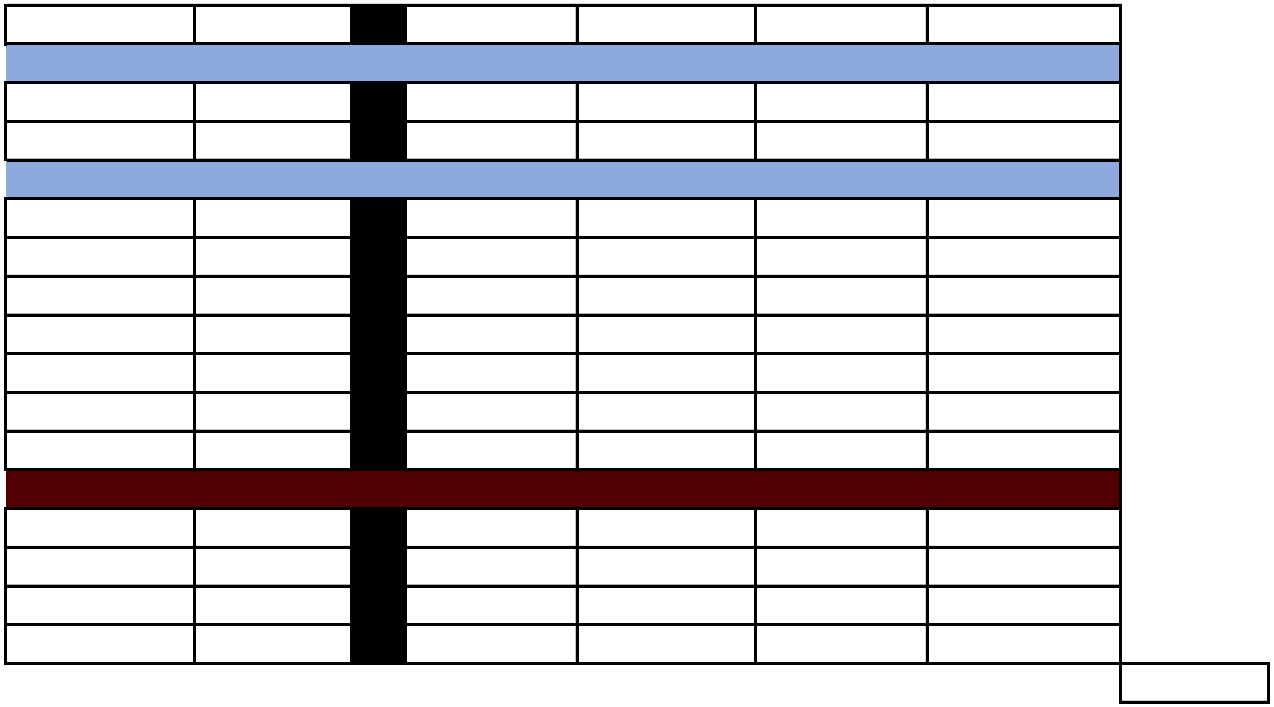












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Planning Commission
101 East Washington Street
Charles Town, WV 25414

SCHEDULED

AGENDA ITEM (ID #)

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

DRAFT minutes - January 18, 2024 Special Meeting

ATTACHMENTS:
- 1.18.24 PC MINUTES_DRAFT.pdf

CITY OF CHARLES TOWN
PLANNING COMMISSION
AGENDA • JANUARY 18, 2024

Special Meeting **CITY HALL** **7:00 PM**
101 E Washington Street, Charles Town, WV 25414

1. CALL TO ORDER

Present: Ann Paonessa, Chair
Jessica Derr
Zakhary Dunning
Jeff Hynes

Kevin Long – Absent

James Newman, City Staff: Zoning Administrator
Kim Crosson, City Staff: Permit Tech

2. CALL TO ORDER

3. NEW BUSINESS

4.2: BR2023-06: Tiny Treasures Daycare – Preliminary Plan

Staff gave presentation.

Planning Commission: Are they doing one shade tree for every ten parking spaces?

Staff: Yes

Planning Commission: Does traffic not require a traffic study?

Staff: They do not meet the threshold for a traffic study.

Applicant present.

No questions, no comments for applicant.

Motion to approve Tiny Treasures Daycare – Preliminary Plan

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Paonessa, Dunning

DRAFT

4.3: BR2023-08: Tiny Treasures Daycare – Bond Establishment

Staff gave presentation.

Applicant not present.

Motion to recommend approval for Tiny Treasures Daycare – Bond Establishment

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Hynes
AYES:	Derr, Hynes, Paonessa, Dunning

Planning Commission: Discussion regarding incorrect amount of bond verbally referenced during motion.

Corrected motion to recommend approval for Tiny Treasures Daycare – Bond Establishment

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Paonessa, Dunning

4.4: BR2023-09: Joan and Joe's Coffee – Bond Establishment

Staff gave presentation.

Applicant present.

No questions, no comments for applicant.

Motion to recommend approval for Joan and Joe's Coffee – Bond Establishment

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Paonessa, Dunning

4.5: BR2023-07: Norborne-Glebe Phases 9 & 10A – Bond Reduction

Staff gave presentation.

Commission discussion. Staff clarified that the reduction would apply to both the performance and land disturbance bonds.

Applicant present.

No questions, no comments for applicant.

Motion to recommend approval for Norborne-Glebe Phases 9 & 10A – Bond Reduction

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Paonessa, Dunning

DRAFT

4. ADJOURNMENT

Motion to adjourn.

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Dunning
AYES:	Derr, Hynes, Paonessa, Dunning

Meeting adjourned at 7:18 pm.

DRAFT

DRAFT

Planning Commission
101 East Washington Street
Charles Town, WV 25414

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

SCHEDULED

AGENDA ITEM (ID #)

DRAFT Minutes January 22, 2024 regular meeting

ATTACHMENTS:

- 1.22.24 PC MINUTES_DRAFT.pdf

CITY OF CHARLES TOWN
PLANNING COMMISSION
AGENDA • JANUARY 22, 2024

Committee Meeting **CITY HALL** **7:00 PM**
101 E Washington Street, Charles Town, WV 25414

1. CALL TO ORDER

Present: Ann Paonessa, Chair
Jessica Derr
Zakhary Dunning
Jeff Hynes

Kevin Long – Absent

James Newman, City Staff: Zoning Administrator
Kim Crosson, City Staff: Permit Tech

2. WORK SESSION

Postponed to later date.

3. CALL TO ORDER

4. UNFINISHED BUSINESS

No unfinished business.

5. NEW BUSINESS

5.1: Election of New Officers:

-President: Ann Paonessa

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

-Vice-President: Jessica Derr

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Dunning
AYES:	Derr, Hynes, Dunning, Paonessa

-Secretary: James Newman

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Hynes
AYES:	Derr, Hynes, Dunning, Paonessa

DRAFT

5.2: Public Hearing: SLD2023-04: Fairview - Sketch Plan

Paonessa: The applicant has requested that this matter be tabled to our February 26, 2024 meeting. However, because this hearing was advertised and we do have a guest that signed up to speak regarding the matter, we are going to proceed and open for public hearing.

Motion to open public hearing.

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

Lyn Widmyer: Concerned about stormwater management. Dust and other effects from farm work will impact the residents. A 60ft. landscape buffer would be much better than a 10 or 20 ft. buffer. Gave documents to staff but those documents were not included in the packet.

Motion to close public hearing.

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Hynes
AYES:	Derr, Hynes, Dunning, Paonessa

Commission: Per applicant's request, tabled to February 26, 2024 meeting. Staff assured Commission there would be a new public hearing and all public comment documents would be included.

Motion to table SLD2023-04 Fairview - Sketch Plan.

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Dunning
AYES:	Derr, Hynes, Dunning, Paonessa

5.3: ZMA2023-03: Vinton Hayes - Rezoning to Urban Reserve

Staff gave presentation.

Steven Kirschner on behalf of the Applicant: After Urban Reserve, new plans and a new rezoning application will be submitted.

Motion to open public hearing.

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

No comments.

DRAFT

Motion to close public hearing.

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Hynes
AYES:	Derr, Hynes, Dunning, Paonessa

Motion to recommend approval of ZMA2023-03 Vinton Hayes - Rezoning to Urban Reserve

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

5.4: WV 2023-08: Happy Retreat – Waiver from lighting standards

Staff gave presentation.

Applicant present via zoom.

Commission: How tall are the parking lot lights?

Staff: They come in a variety of different shapes and sizes, bollard lights are between 3 and 4 feet.

Commission: Asks a clarifying question regarding the purpose of the waiver, confirming it is a waiver of the aesthetics, not of technical requirements such as footcandles or shielding.

Commission: Is there a precedent for approving waivers for the acorn style lighting, have we done that before?

Staff: Not since I have been here at the City.

Motion to open public hearing.

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Hynes
AYES:	Derr, Hynes, Dunning, Paonessa

Walter Washington: In favor of purposed lighting with goal to lesson the overall impact of light and kept minimal.

Motion to close public hearing.

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

Applicant, Mike Stromberg: Waiver would permit low impact lighting, placing the focus on the historic site.

Commission: For the tall parking lot lights, is the lighting going to be on top with all the cuts going up the pole?

DRAFT

Applicant, Mike Stormberg: Lighting will be at top of pole. Each light located at the center island will contain four directional lights. Along the right edge of the parking lot labeled A2, those will have two directional lighting and those labeled A3 will have three directional lighting.

Commission asked clarifying questions regarding light and pole color.

Applicant confirmed the overall choice for color was matte black but would be open to consider suggestions if there were any.

Commission: Did this go to HLC?

Staff: No, property is not within the Historic District. The overall site plan did go to Historic Landmarks Commission (HLC) for comment per the Planning Commission, but this waiver request was not brought to the HLC.

Motion to approve WV 2023-08 Happy Retreat – Waiver from lighting standards

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Dunning
AYES:	Derr, Hynes, Dunning, Paonessa

5.5: WV 2023-09: Mark Letenzi – Waiver from lighting standards

Staff gave presentation.

Motion to open public hearing.

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

Commission: Is there an approved photometric plan for this site?

Staff: No.

Commission: There is a discrepancy between lack of intent to govern aesthetics as part of the ordinance and the explicit design requirements.

Applicant, Mark Letenzi: The lights are less intrusive than the acorn style lights.

Commission: Why did the applicant install the wrong lighting?

Applicant, Mark Letenzi: Acorn style lighting was on back order and it was too long to wait.

Commission: You understand that if the waiver is denied the lights will have to be removed?

Applicant: Understood.

DRAFT

Steven Sheard, St. Thomas Lutheran Church: In favor of lightning waiver request. Installed lighting provides improved security for our parsonage adjacent to the site, low light spillover and overall nice aesthetics.

Michael George: Acorn lights are hard to come by. Current lighting requirements encourage light pollution. In favor of waiver.

Staff read two letters from adjacent property owner Todd Widmyer, both letters expressed opposition to the waiver request.

Motion to close public hearing.

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Dunning
AYES:	Derr, Hynes, Dunning, Paonessa

Planning Commission Discussion. Commission: Can the lights be dialed back and dimmed?

Applicant: Yes.

Commission: Did you reach out to the neighbors regarding their concern of impact?

Applicant: Yes, that is why you received two letters from Todd Widmyer.

Commission: It is understood that acorn style lights are hard to find, but there is a process for a reason. The plans for site development were approved administratively back in March 2023 but these lights were installed recently.

Amended Motion to approve WV 2023-09 Mark Letenzi – Waiver from lighting standards subject to the following: The lights are to be dimmed to decrease the intensity.

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

5.6: BR2023-10 Norborne Glebe Phase Candlewood Drive Ext-Bond Release

Staff gave presentation.

Motion to open public hearing.

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

No public comment.

Motion to close public hearing.

RESULT:	**Approved**
MOVER:	Derr

DRAFT

SECONDER:	Hynes
AYES:	Derr, Hynes, Dunning, Paonessa

Motion to approve BR2023-10 Norborne Glebe Phase Candlewood Drive Ext – Bond Release

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

5.7: BR2023-11 Norborne Glebe Phase 14A-Bond Release

Staff gave presentation.

Motion to open public hearing.

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

No public comment.

Motion to close public hearing.

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Dunning
AYES:	Derr, Hynes, Dunning, Paonessa

Motion to approve BR2023-11 Norborne Glebe Phase 14A-Bond Release

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Dunning
AYES:	Derr, Hynes, Dunning, Paonessa

5.8: SLD2023-02 Westover Dental – Preliminary Plan

Staff gave presentation.

Applicant present via zoom.

Commission: Asked clarifying question regarding height and height requirements.

Staff: They are doing 6 feet around the dumpster in the front and in the back facing the townhomes they are doing 5 foot tall privacy. You can do up to 6 feet.

Applicant: When covenants and restrictions were rewritten the City put in that the grass area where the fence is cannot be covered with trees because they want to reserve it for future utility easements. That is another reason why we did not plant any trees along that back lot.

Motion to approve SLD2023-02 Westover Dental – Preliminary Plan

DRAFT

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

5.9: SLD2023-04 Hillside – Preliminary Plan

Postponed to February 26, 2024 Planning Commission Meeting

5.10: SLD2023-07 Happy Retreat – Preliminary Plan

Postponed to February 26, 2024 Planning Commission Meeting

5.11: 2024 Meeting Calendar

Motion to approve 2024 Meeting Calendar

RESULT:	**Approved**
MOVER:	Hynes
SECONDER:	Derr
AYES:	Derr, Hynes, Dunning, Paonessa

6. APPROVAL OF MINUTES

6.1: September 25, 2023 Minutes

Motion to approve subject to the following: Item 5.1 Huntfield 3.B. Add language about why it was denied. Correct the motion box for the Joan and Joe Coffee waivers to properly list Cummings' Nay vote.

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Hynes
AYES:	Derr, Hynes, Dunning, Paonessa

6.2: October 24, 2023 Minutes

Motion to approve.

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Hynes
AYES:	Derr, Hynes, Dunning, Paonessa

6.3: November 27, 2023 Minutes

Motion to approve subject to the following: Amend language about ZMA2023-02 conditions. Verify if it was a condition or merely an encouragement.

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Hynes
AYES:	Derr, Hynes, Dunning, Paonessa

DRAFT

7. ADJOURNMENT

Motion to adjourn.

RESULT:	**Approved**
MOVER:	Derr
SECONDER:	Dunning
AYES:	Derr, Hynes, Dunning, Paonessa

Meeting adjourned at 8:50 pm

DRAFT

Planning Commission
101 East Washington Street
Charles Town, WV 25414

SCHEDULED

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

AGENDA ITEM (ID #)

DRAFT Minutes January 30, 2024 Special work session

ATTACHMENTS:

- 1.30.24 PC MINUTES_DRAFT.pdf

CITY OF CHARLES TOWN
PLANNING COMMISSION
AGENDA • JANUARY 30, 2024

Special Meeting **CITY HALL** **7:00 PM**
101 E Washington Street, Charles Town, WV 25414

1. CALL TO ORDER

Present: Ann Paonessa, Chair
Jessica Derr
Kevin Long

Zakhary Dunning - Absent
Jeff Hynes - Absent

James Newman, City Staff: Zoning Administrator
Kim Crosson, City Staff: Permit Tech

2. SPECIAL WORK SESSION CALL TO ORDER

3. NEW BUSINESS

3.1: TXA2023-01: Mobile Food Vendors

Staff gave presentation.

Planning Commission Discussion.

Long: In favor of removing the 7:00 pm limit. Would like to make it compatible with the noise ordinance, which has restrictions starting at 10:00 pm. In favor or ordnance as food trucks provide choices for the community and brings people to the downtown area. They act as "restaurant incubators".

Paonessa: Recommends staff to look into adding specific language, either in the ordnance or application, regarding vendors paying for all parking spaces that their vehicles will occupy. Potentially provide parking passes for vendors. Staff should do a site visit and make sure the purposed location requirements are not burdensome.

Derr: Look into permitting at City Park locations in marked parking spaces.

3.2: TXA2023-06: Minor Subdivision Requirements

Staff gave presentation.

Planning Commission Discussion.

Derr: Need correction in language used. Should read "identifiable lots" instead of "identical lots".

Long: Keep requirement to build sidewalks and on-street parking.

Staff discussed with Commission about bringing in a text amendment to revise Subdivision Section 1333.09 at same time as residential lots language amendment.

3.3: TXA2023-09: Neighborhood Residential Uses

Staff gave presentation.

Derr: In favor of text amendment.

Staff: Some of the language is scheduled for a public hearing, tonight's discussion is about the remainder of the ordinances.

Paonessa: Wants a matrix with definitions and potential uses.

Additional Discussion Summary: Future discussion going line by line after definitions are obtained for clarification and absent Commissioners can provide their feedback as well.

3.4: TXA2023-13: Lighting Requirements

Staff gave presentation.

Long: Keep acorn lighting requirements.

Paonessa: Wants information on what options are available to keep acorn top with light bulbs shielded in order to keep light directed downwards.

Derr located some examples of light bulbs that are downward reflecting briefly online.

Staff gave a overview of current lighting regulations.

4. ADJOURNMENT

Meeting adjourned at 7:09 pm.

Planning Commission
101 East Washington Street
Charles Town, WV 25414

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

SCHEDULED

AGENDA ITEM (ID #)

Public Hearing: *SLD2023-04* - Fairview Major Subdivision

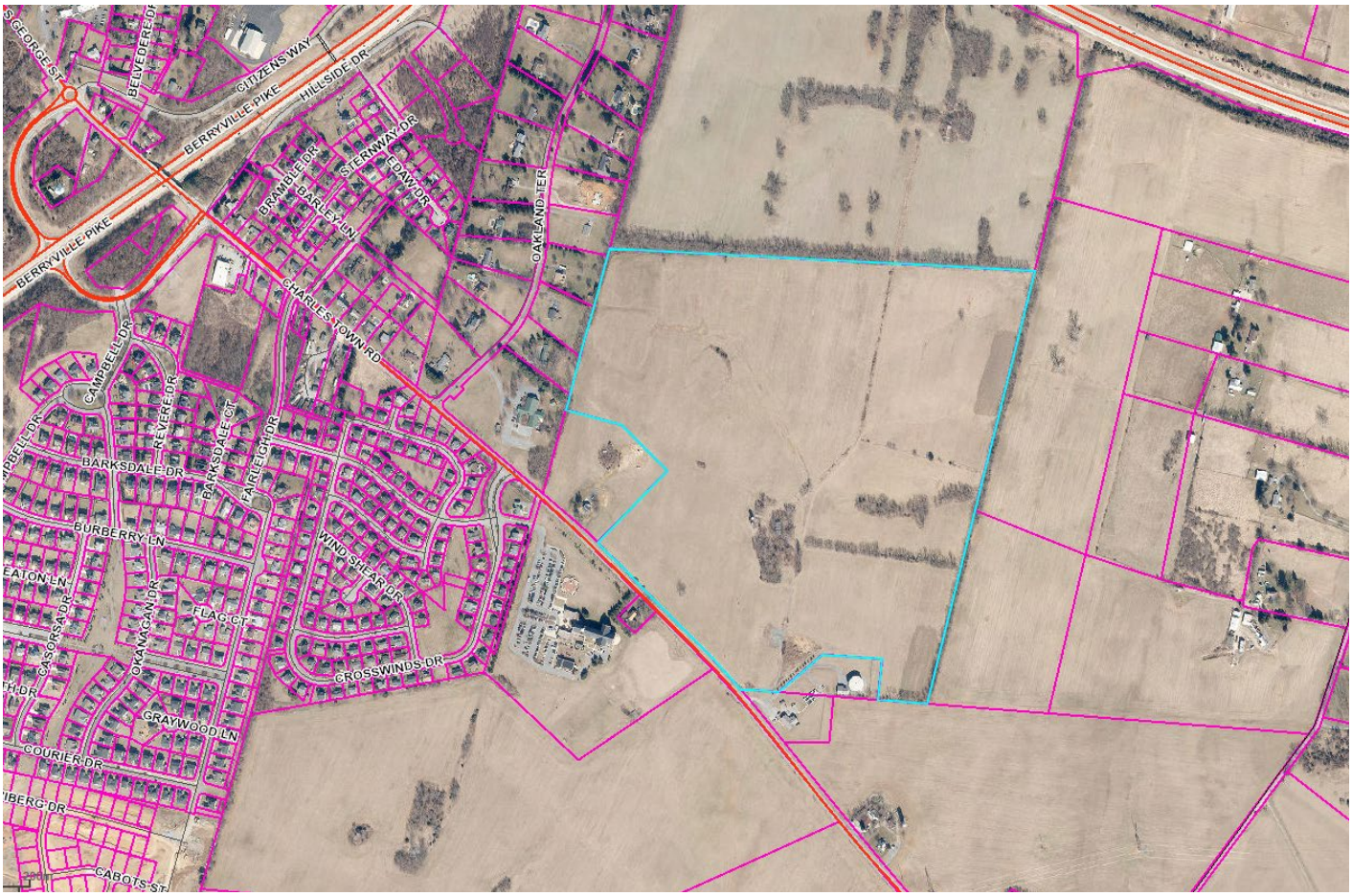
ATTACHMENTS:

- 1. Staff Report.pdf
- 2._Application.pdf
- 3._Revised_Plan.pdf
- 4._WVDoH_TIS_Approval.pdf
- 5._Traffic_Study.pdf
- 6._KH_Review.pdf
- 7. Public Comment.pdf

Sketch Plan - Fairview

SLD2023-04

Date: For the February 26, 2024 Planning Commission meeting
Applicant: LGI Homes-West Virginia LLC
Property Owner: Jaguar IV LC
Report by: James Newman, City Planner, Zoning/Subdivision Administrator.
Proposal: Major Subdivision and Land Development.
Property Location: Located on Charles Town Road
Current Zoning: Neighborhood Residential



PROJECT OVERVIEW

The development of 113.65 acres for 184 townhomes, 266 single-family detached dwelling units, and two commercial site pads.

PLANNING COMMISSION

This item was tabled at the January 22, 2024 meeting. There was one member of the public who spoke in opposition to the request, asking for additional buffers of 60 ft. depth, and with concerns about stormwater runoff.

ZONING REVIEW

The property is zoned Neighborhood Residential (NR). Per the Zoning Ordinance:

The purpose of the NR District is to provide for a mix of housing types and related services and Uses, including Commercial Uses and office services.

…

The intent is to create a cohesive pattern of primarily residential development that allows a mix of Uses, including neighborhood servicing Commercial and office Uses and/or Commercial and office Uses that complement the primarily residential character of the neighborhood.

USE MIXTURE

Total usable land area requirements:

TYPE	REQUIRED	PROVIDED
Residential	50%	50% - 56.82 acres
Commercial	10%	10.10% - 11.48 acres
Open Space	10%	11.18% - 12.49 acres

The commercial use aspect is required to be comprised of Neighborhood Commercial Uses. As Neighborhood Commercial refers to a particular zoning district which allows both commercial and residential uses, the Planning Commission is currently working on a text amendment to clarify that the commercial uses shall be non-residential in nature.

DENSITY

Maximum permitted density is 10 units/acre; proposed density is 4 units/acre.

Net Buildable Land Area is 78.37 acres. Total development acreage is approximately:
Residential -townhomes -----10.49 acres
Residential – Single Family----46.33 acres
Commercial area----------9.06 acres
Common Open Space----------12.49 acres

SIDEWALKS

Sidewalks will be provided on both sides of all roads within the development. Additional details are required at the Preliminary Plan stage. Sidewalks must be between 5-6 ft. in width.

TRAILS

Plan states "*No trails are proposed at this time, trails may be added at a later time in conjunction with project amenity design".* Trails are required per the Conditions of Annexation, and shall be included along the major roadway. This level of detail is required at the Preliminary Plan stage. Trails are required to be between 6-8 ft. in width.

BUFFERS

Buffers between non-residential and residential uses will be provided at time of site plan submission for non-residential development components of this subdivision. An adjacent property is a working farm, which is a non-residential use. Buffers between this development and the farm are appropriate.

There is an existing tree line that can be used as buffering. Additional evergreen plantings would be appropriate as a visual buffer and to partially mitigate dust from farming operations.

OPEN SPACE/RECREATION

The Conditions of Annexation require a variety of recreational and open space options. This level of detail is generally provided at the Preliminary Plan stage. The plans state that the site will contain passive open space throughout the development.

The Conditions of Annexation require that at least 10% of the parcel be designated for open space, with a pro-rated 20% open space based on the percentage of the property that is developed for townhomes. The applicant has provided adequate open-space to meet both requirements.

STORMWATER

Detailed stormwater management plans are not required at the sketch plan phase. Those details will be required at the Preliminary Plan stage. The City's 3rd party engineering firm, Kimley-Horn, has reviewed the plans and has no comments about storm water management at this stage. Additional review will occur for the Preliminary Plan stage.

ROAD DESIGN

The main thoroughfare is designated on the Comprehensive Plan. The applicant is required by the Conditions of Annexation to build a minimum two-lane road designed to *minor collector* road standards. Those details are required at the Preliminary Plan stage. The right-of-way for that road shall be at least 80 feet wide, which is shown on the sketch plan.

TRAFFIC IMPACT STUDY

Per the Conditions of Annexation, a traffic impact study is required if the sketch plan is approved. The applicant has completed the traffic study, and it was approved by the WV Division of Highways on October 4, 2023. A final version was provided to the City on December 20, 2023.

The study was based on 267 single-family homes, 200 townhomes, and 99,000 sq. ft. of self-storage space. The sketch plan shows 266 single-family homes, 184 townhomes, and two commercial pads with no designated use. Self-storage is not a permitted use in the Neighborhood Residential zoning district.

The total number of daily trips is estimated at 4,133, with a morning peak of 335 trips per hour and an evening peak of 421 trips per hour. To adequately handle the increased traffic, multiple improvements are required:

1. Construction of a right-turn slip lane on the US 340 Southbound Ramp to WV 115,
2. Construction of a right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramp/Hillside Drive,
3. Construction of an exclusive left-turn lane on WV 115 eastbound approach to Site Drive #1,
4. Construction of an exclusive left-turn lane on WV 115 eastbound approach to Site Drive #2.
5. Traffic Signal at WV 115 and Jefferson Avenue
6. Widening Rt 115 to include a eastbound left-turn lane
7. WV 115 and Citizens Way – NB US 340 right-turn slip lane
8. Roundabout at WV 115 and Hillside Drive

The results of the 2030 Build Improved Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2030 Build Conditions will be mostly mitigated following implementation of proposed improvements. Traffic movements that are expected to operate worse than LOS D include the following:

1. Farleigh Drive northbound approach to WV 115 LOS F during the evening peak hour
2. Crosswinds Drive northbound left-turn movement to WV 115 LOS E during evening peak hour.

Additional off-site improvements that will improve traffic levels of service include:

1. The WVDoH traffic circle to be located at the intersection of Charles Town Road and Hillside Drive, with a planned construction date of 2025.
2. A traffic signal and exclusive left-turn lane at the intersection of Charles Town Road and Jefferson Avenue. Per the study, that improvement is part of a planned project by WVDoH.

Kimley-Horn reviewed the traffic study and provided the following comments:

"The Applicant should provide mitigation for Intersections 4, and 5 which as shown in Table 4 on Page 34 are shown to have failing LOS in the future 2030 Build Improved condition. The Applicant should commit to making the necessary improvements to conform with providing a minimum LOS D for all approaches."

Level of Service	SIGNALIZED Intersection Control Delay (sec/veh)	UNSIGNALIZED Intersection Control Delay (sec/veh)	Intersection LOS Description
A	≤ 10.0	≤ 10.0	Free flow, insignificant delays.
B	10.1-20.0	10.1-15.0	Stable operation, minimal delays.
C	20.1-35.0	15.1-25.0	Stable operation, acceptable delays.
D	35.1-55.0	25.1-35.0	Restricted flow, common delays.
E	55.1-80.0	35.1-50.0	Maximum capacity, extended delays. Volumes at or near capacity. Long queues form upstream from intersection.
F	> 80.0	> 50.0	Forced flow, excessive delays. Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

VIEW OF NEARBY ROADS



CONDITIONS OF ANNEXATION

On September 18, 2023 City Council approved a set of revised conditions of annexation for the parcel. To summarize, the conditions include:

Economic Impact:

1. A fee of $3,494 per residential unit.
2. A fee of $2,958 per thousand sq. ft. of commercial space.

Zoning:

1. At least 10% of the property shall be open space.
2. Open space standards for townhomes shall be pro-rated at 20% based on the percentage of the property developed for townhomes.

Recreation:

1. Land owner shall create recreation areas, walking path, small parks (1 to 2 acres in size).
2. Outdoor community center consisting of a pavilion with electricity, picnic tables, and BBQ grills.
3. Playground using commercial grade equipment that serves 6-23 month old toddlers, children 2-5 years old, and children 5-12 years old.
4. A multi-purpose play field.

Affordable Housing:

1. 10% of the residential units shall meet the Dept. of Housing and Urban Development's HOME Homeownership value limit.

Note: For a new one-unit dwelling, that limit is currently $337,000 based on 2023 data.

Transportation:

1. Land owner shall coordinate with the Jefferson County Board of Education to provide an adequate number of bus stop shelters.
2. Land owner shall coordinate with the Eastern Panhandle Transit Authority to provide an adequate number of bus stop shelters.
3. The Land owner shall construct a major roadway and trail consistent with the Comprehensive Plan.
4. A traffic impact study will be performed
5. If a traffic light is required per the traffic impact study the applicant shall be responsible for any portion deemed appropriate by the State Department of Highways.

Site Improvement:

1. All commercial lots shall be prepared, to include grading and utility installation. This shall be done during Phase 1 of the project.

COMPREHENSIVE PLAN

Both the 10 and 25 year future land use plans for this parcel designate the area as *Professional Office and Institutional District*, which were based on planned investments by West Virgina University Healthcare Systems. *Professional Office and Institutional District* is defined in the Comp Plan as:

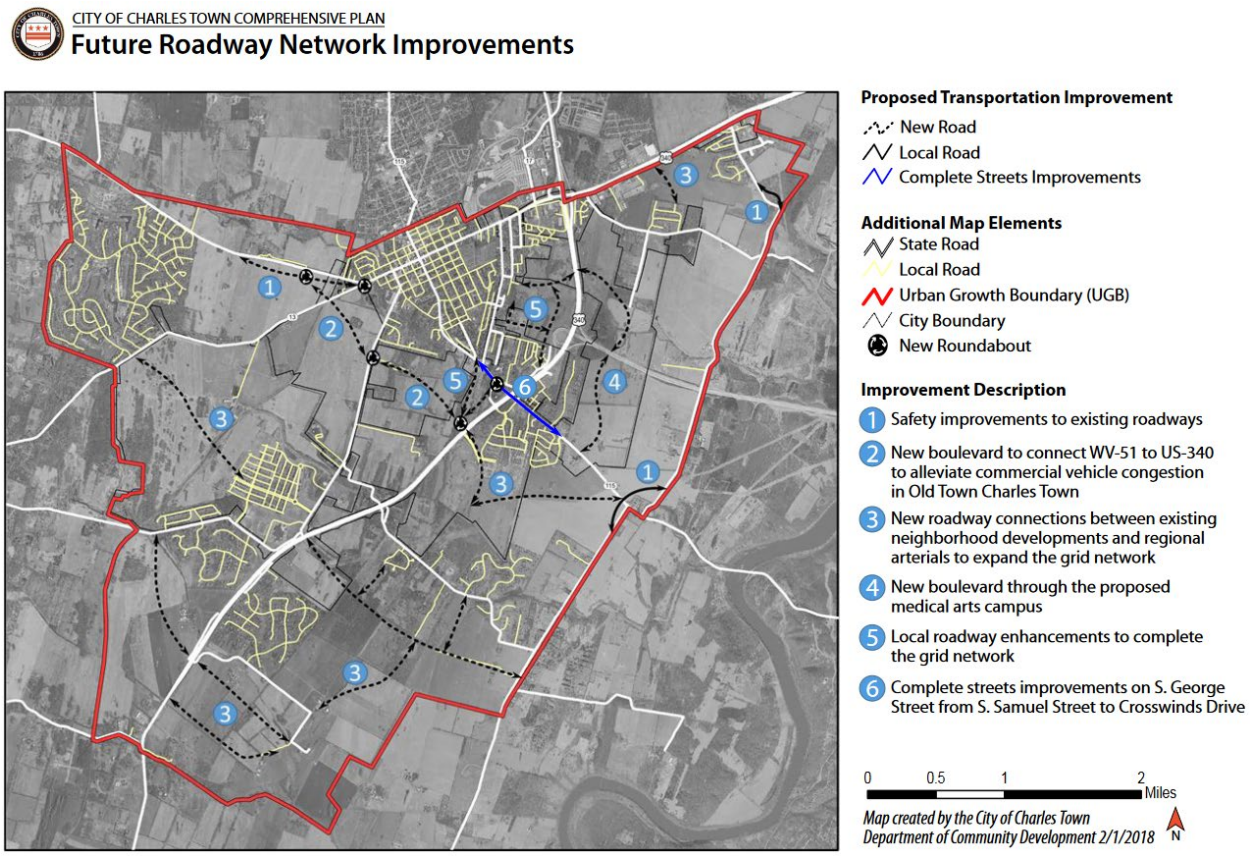
Professional Office/Institutional Future Land Uses are included to enhance the work place environment by providing for the establishment of offices, medical and other institutional uses, limited accessory services for workers' convenience and public space. It is intended to promote attractive office development projects which are compatible with one another, as well as with adjoining residential areas.

A medium to high density residential option is available when such can be achieved through innovative design and include significant natural resource protection. This future land use district is specifically designated to incentivize economic development opportunities and diversify the City's economy and strengthen its tax base to support its critical infrastructure and public service needs.

-Comprehensive Plan pg. 75

This property is designated on the *Future Roadway Network Improvements Plan* as being part of the location for a new boulevard trough a proposed medical arts campus (see item #4 on the map below). The applicant is proposing an eighty-foot wide right of way to account for the Comprehensive Plan required road and trail connection.

City Council approved changes to the Conditions of Annexation. Among the whereas clauses supporting the revisions was a statement that the property has sat vacant for 18 years since the original Conditions were adopted. The Comprehensive Plan future land use designation as Professional Office and Institutional District is no longer appropriate for this site and should be changed. The proposed development provides a medium-density residential development option. While not in compliance with the future land use designation of professional office and institutional uses, the development does include a major thoroughfare envisioned in the Comprehensive Plan.



CONCLUSION

The applicant is seeking to build a development of 184 townhomes, 266 single-family detached homes, and two commercial lots. The proposed development is predominantly residential. While not in compliance with the future land use designation of professional office and institutional uses, the development does include a major thoroughfare envisioned in the Comprehensive Plan. Council, through the revised Conditions of Annexation, requested the Commission to review this site for residential development. Additional details of landscaping and stormwater management are required to be provided at the Preliminary Plan phase.

RECOMMENDATION

Approval subject to conditions:

1. The trail required by the Conditions of Annexation shall be shown on the Preliminary Plan.
2. All recreation amenities required by the Conditions of Annexation shall be shown on the Preliminary Plan.
3. A minimum 10-ft wide evergreen vegetated landscape buffer shall be planted along the eastern and northern property lines. The buffer shall conform to the requirements of Subdivision and Land Development Ordinance Section 1333.15. The buffer shall be shown on the Preliminary Plan.

4. The Applicant shall provide mitigation for Intersections 4, and 5 which as shown in Table 4 on Page 34 of the Traffic Impact Study which are shown to have failing LOS in the future 2030 Build Improved condition. The Applicant shall make the necessary improvements to conform with providing a minimum LOS D for all approaches. The improvements shall be made prior to the issuance of any Certificate of Occupancy.

   This condition shall be void if the West Virginia Department of Transportation - Division of Highways ("WVDOH") does not require mitigation of Intersections 4 and 5 as shown in Table 4 on Page 34 of the Traffic Impact Study or requires mitigation to either intersection which is different than this condition**,** in which case this condition shall be superseded and revised to comply with whatever, if any, mitigation or other improvements the WVDOH may require."

Sketch Plan Application No._____

SKETCH PLAN APPLICATION

SUBDIVISION AND LAND DEVELOPMENT ORDINANCE
ARTICLE 1332, SUBDIVISION AND LAND DEVELOPMENT APPLICATION & APPROVAL REQUIREMENTS

To assist the Subdivision Administrator in the review of a Sketch Plan Application, the Applicant must utilize this form to supply the City with the information prescribed under Section 1332.03 of the Charles Town S/LD Ordinance. The submission of this form, along with the prescribed information and required fees, shall serve as a Sketch Plan Application as required by Ordinance Section 1332.03. Applicant is responsible to ensure the standards of Ordinance Section 1332.04, Sketch Plan Requirements, are met and provided herein is a checklist of the Sketch Plan requirements.

1. DATE March 14, 20 23

2. APPLICATION TYPE*

Zoning Use Permit, Special Exception Use and Sketch Plan requirements found in the Supplemental Regulations of the Zoning Ordinance

- x Submit three (3) copies of the Sketch Plan submitted and in Adobe PDF format

x Major S/LD Development

- x Submit three (3) copies of the Sketch Plan submitted and in Adobe PDF format

*There are two types of Sketch Plan submissions:

1. For Zoning Use Permit, Special Exception Use and Sketch Plan requirements found in the Supplemental Regulations of the Zoning Ordinance. Submission standards are found in Section 1332.04(D).
2. For a Sketch Plan for a Major S/LD application, submission standards are found in Section 1332.04(E)

3. $ 3 3 / , & $ 1 7 ¶ 6 NAME* LGI Homes - West Virginia, LLC

Address: 1450 Lake Robbins Drive #430, The Woodlands, TX 77380

Telephone Number (301) 3556-5970 Fax Number ( )

Email Address mike.dropik@lgihomes.com

4. 3 5 2 3 (5 7 < 2 : 1 (5 ¶ 6 E 1 $ 0 Jaguar IV LC

Address: 2755 Mews Lane; Charlottesville, VA 22901

Telephone Number (703) 209-0111 Fax Number ( )

Email Address ccocke@cst-cpa.com

5. LEGAL DESCRIPTION OF THE SUBJECT PROPERTY (list all parcels that apply)

Property Address: Charles Town Road

Tax Map # and Parcel: TM 10, Parcel 218.1

Deed Book and Page #: 1089 / 144

Property Area in Square Feet or Acres: 4,950,477 SQ. FT. and 113.65 Acres

6. DESCRIPTION OF PROJECT AND PROPOSED USE(S) OF THE PROPERTY:

Mixed use residential and commercial community.

7. DESCRIPTION OF THE EXISTING (OR FORMER) USE(S) OF THE PROPERTY AND CURRENT ZONING:

Existing Use: Agricultural

Current Zoning: Neighborhood Residential (NR)

*Applicants include: Property owner(s), Engineer(s), Surveyor(s), or Consultant(s)

8. ARE THERE ANY ANTICIPATED WAIVERS OR VARIANCES? IF YES, PROVIDE DETAILS.

No

9. HAS THE PROPERTY BEEN THE SUBJECT OF ANY COURT ACTION?

Yes (Please specify nature of all proceedings and current status and attach any documents showing court decisions, etc.)

None known

x No

10. PARCEL HISTORY (List all pending or previously approved applications on the subject parcels inventoried above, including previous site plan applications if this application is a site plan amendment)

Application No.	Project Name and Phase	Status	Approval Date
Conditions of Annexation Resolution 2005-15	Annexation Agreement	Approved	12-05-2005

11. INTERESTED PARTY ADDRESSES, FOR PUBLIC NOTICE (including across street)
(Interested parties are defined as adjacent properties within 100 feet).

Owner	# and Street	City, State, Zip
See attached graphic & list.		

APPLICANT CERTIFICATION

I certify that, to the best of my knowledge, the submitted information and statements are true and correct. I also certify that I have received and read Section 1332.02 of the Charles Town S/LD Ordinance and relevant provisions of the Charles Town City Code.

Signature of Applicant

_____ Date 3-14-2023

Signature of Property Owner (If different than Applicant)

Charles P Cocke Date 3/14/2023

Jaguar IV, LC, Mgr

Please submit an original completed Application and specified number of Site Plan copies to the following:

Subdivision Administrator
City of Charles Town
101 E. Washington Street
Charles Town, WV 25414

FOR CITY USE ONLY

Application Number:_____ Date Application Received:_____

Fee: $_____ Paid:$_____ Check No._____

Receipt No._____

Subdivision Administrator Approval:_____ Date:_____

Planning Commission Approval:_____ Date:_____

Comments:_____

_____

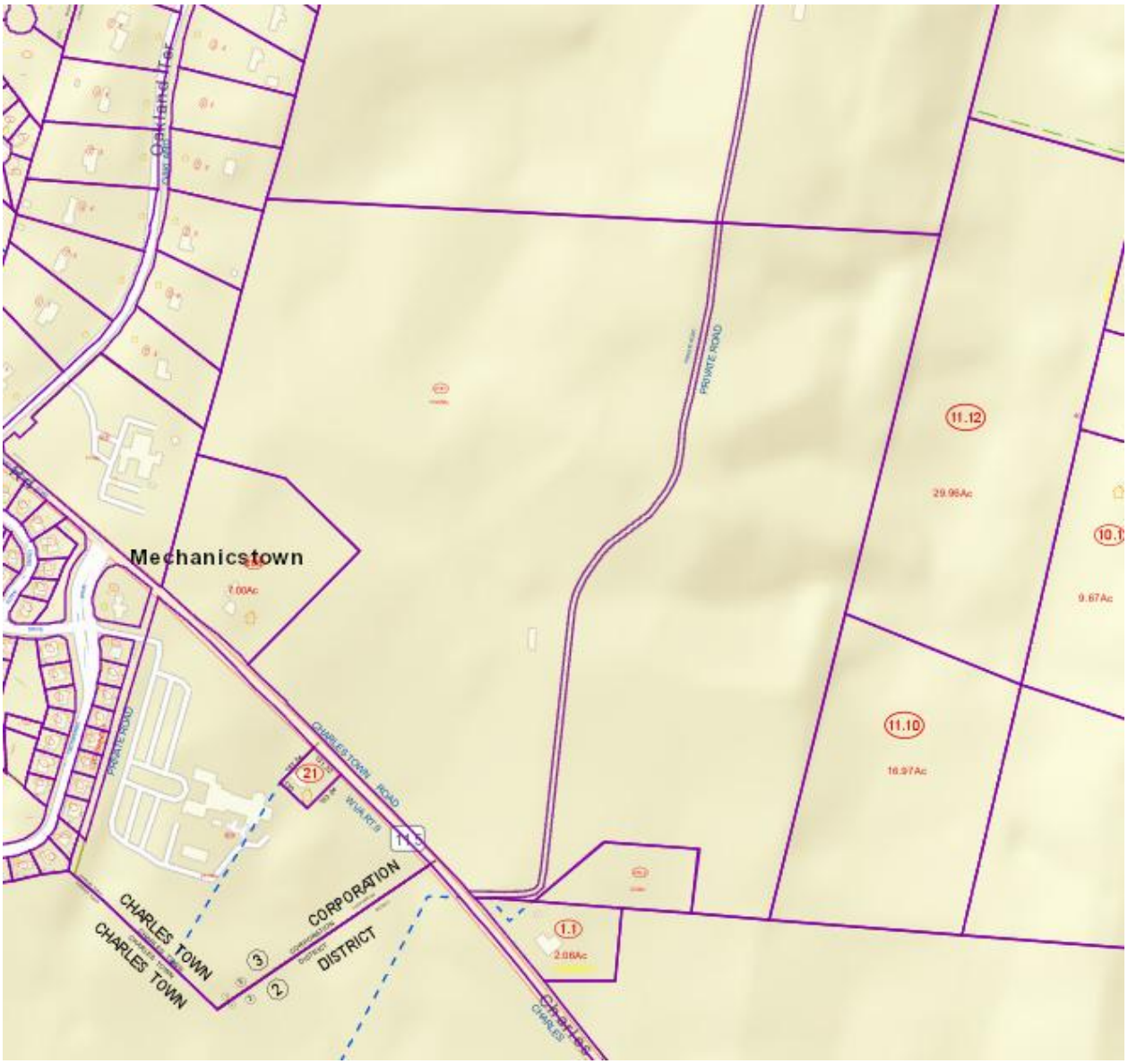
_____

_____

_____

_____

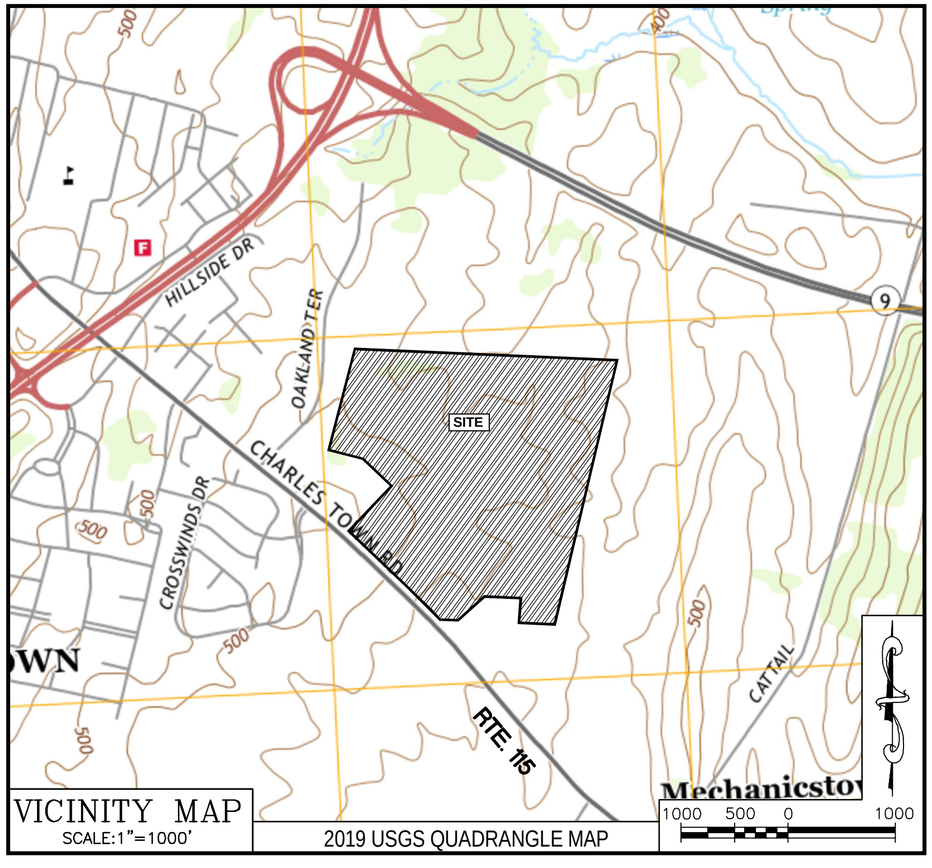
ADJACENT PROPERTY OWNER INFORM		
Reference #	Owner Name	Owner Address
1	OAKLAND COMMUNITY CHU	104 OAKLAND DRIVE, CHARLES TOWN, W
2	OAKLAND U. M. CHURCH TRU	70 OAKLAND TERRACE, CHARLES TOWN, V
3	KENT H TICE ET	104 OAKLAND TERRACE, CHARLES TOWN, V
4	MARK & CHARIS HEN	150 OAKLAND TERRACE, CHARLES TOWN, V
5	NORA SUE PAIN	188 OAKLAND TERRACE, CHARLES TOWN, V
6	DARAL A KIDWELL ES	254 OAKLAND TERRACE, CHARLES TOWN, V
7	MARK F. LANGLET	544 LEGO DRIVE, CHARLOTTESVILLE, \
8	CAROLYN & RONALD WIDM	1434 CATTAIL RUN RD, CHARLES TOWN, W
9	RONALD WIDMY	1434 CATTAIL RUN RD, CHARLES TOWN, W
10	HIGH HORIZONZ FARM	336 ROSEMONT WAY, CHARLES TOWN, W
11	CITY OF CHARLES T	PO BOX 14, CHARLES TOWN, WV
12	CITY OF CHARLES T	PO BOX 14, CHARLES TOWN, WV
13	DR ACQUISITIONS	60 THOMAS JOHNSON DR, FREDERICK, M
14	ROMAN CATHOLIC DIO	1300 BYRON ST, WHEELING, WV
15	HARRY D L	15376 CHARLES TOWN RD, CHARLES TOWN, V


Mechanicstown
CHARLES TOWN
CHARLES TOWN
CORPORATION
DISTRICT
CHARLESTOWN ROAD
PRIVATE ROAD
PRIVATE ROAD
11.12
29.96Ac
11.10
16.97Ac
1.1
2.08Ac
21
7.00Ac
9.67Ac

SKETCH PLAN FOR
FAIRVIEW
CITY OF CHARLES TOWN, WV
TAX MAP 10, PARCEL 218.1
DEED BOOK 1089, PAGE 144

OWNER
JAGUAR IV, LC
2755 MEWS LANE
CHARLOTTESVILLE, VA 22901

APPLICANT
LGI HOMES – WEST VIRGINIA, LLC
1450 LAKE ROBBINS DRIVE #430
THE WOODLANDS, TX 77380



VICINITY MAP
SCALE: 1"=1000'

2019 USGS QUADRANGLE MAP

SKETCH PLAN CHECKLIST NOTES PER SECTION 1332.04, SKETCH PLAN REQUIREMENTS

E.2.a. Existing conditions obtained from aerial survey. Perimeter boundary information shown hereon is based on a survey performed by GORDON.

E.2.b. See Sheets 3-13 for arrangement of land uses. Proposed land uses include single-family detached, single family attached, commercial, parks/open space and associated improvements.

E.2.c. See this sheet for a Vicinity Map. Map is 2019 USGS Quadrangle Map.

E.2.d. See Sheet 2 for all abutting owners; see Sheets 3-13 for adjoining lot lines, and structures within 100'. Owner information obtained from the Jefferson County Assessors Tax Map Viewer website.

E.2.e. See title block for for date, creator of plan and address. See this Sheet for Owner / Applicant information.

E.2.f. The property is zoned Neighborhood Residential (NR) and consists of 113.65+/- acres.

E.2.g. See Net Buildable Land Area Calculation Table Sheet 2 for maximum and proposed densities based on the net buildable land area.

E.2.h. Public water and sanitary sewer services are available through the Charles Town Utility Board (CTUB). Electric service is available from Potomac Edison.

E.2.i. A sanitary sewer pump station is located on Bailey Brooks Way approximately 2,200' north of Fairview.

E.2.j. Residential units will be provided water and sanitary sewer through proposed lines running within the right-of-ways and/or open spaces which will connect to existing within Charles Town Road. Electric will be provided from power lines along Charles Town Road.

E.2.k. There are no existing covenants for the subject property. The development is subject to the Conditions of Annexation (COA) approved in Resolution 2023-12.

E.2.l.
- See Sheets 3-13 for lot layout.
- 184 townhouse units are proposed as part of this application.
  - Average lots are 20'x100' and are 2,000 sf.
  - Townhomes may be up to 3-stories with an approximate height not to exceed 35'.
- 266 single-family detached units are proposed as part of this application.
  - Average lots are 60'x110' and are 6,600 sf.
  - Single-family homes may be up to 3-stories with an approximate height of 35'.
- 2 commercial lots consisting of 9.06 acres in the aggregate are proposed. 2.42 acres were conveyed to the City of Charles Town for expansion of the existing water treatment plant. Pursuant to COA Resolution 2023-12, these 2.42 acres contribute to the 10% commercial requirement.
- Parking for residential units will be provided on-lot and offsite through on-street parking. Commercial parking will be determined at site plan for the specific commercial lot and future uses.

E.2.m. The total acreage of the tract being subdivided is 113.65+/- acres.
- The developments Net Build Land Area is 3,413,925+/- square feet (78.37+/- acres).

E.2.n. See Approximate Acreages Table on Sheet 2.

E.2.o. The development will consist of 184 townhomes and 266 single-family detached units.

E.2.p. See Sheets 3-13 for proposed street layout. Access will be provided through Charles Town Road. Road A extends to the adjacent property to the north as identified in the Comprehensive Plan. Road A will have an 80' right-of-way as identified in the annexation agreement.

E.2.q.
- Sidewalks will be provided on both sides of all proposed streets within the subject property.
- No trails are proposed at this time, trails may be added at a later time in conjunction with project amenity design.

E.2.r. The development will provide passive open space throughout the property. See Approximate Acreages Table on Sheet 2 for additional information.

E.2.s. There are no environmental sensitive areas within the Common Open Space.

E.2.t. No Modifications, Waivers, Variances, Special Exceptions and/or Conditional Uses have been requested.

E.2.u. No buffers are required/proposed within the residential portion of this development. A buffer will be provided for the commercial development as required by City of Charles Town Ordinances based on the specific commercial use at time of site plan.

E.2.v. See Sheets 3-13 for road and right-of-way widths. All roads will be curb & gutter and will be in accordance with the the City's typical roadway section requirements (SDLO Appendix A). Driveways will be provided for each residential unit. Parking for commercial areas will be determined for the specific commercial uses at site plan. All proposed right-of-ways will be 50' (Neighborhood Street), 56' (Neighborhood Center Street), 61' (Minor Collector) or 80' (Road A).

E.2.u. This development will not include any bonus factors.

SHEET INDEX

1. COVER SHEET AND NOTES
2. OVERALL PLAN AND CALCULATIONS
3-13. CONCEPTUAL PLAN
14. CONDITIONS OF ANNEXATION
15. AERIAL OVERLAY

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COVER SHEET AND NOTES

FAIRVIEW
SKETCH PLAN
CITY OF CHARLES TOWN, WEST VIRGINIA
TAX MAP 10, PARCEL 218.1 (D.B. 1089, PG 144)

CT FILE # 2023-04

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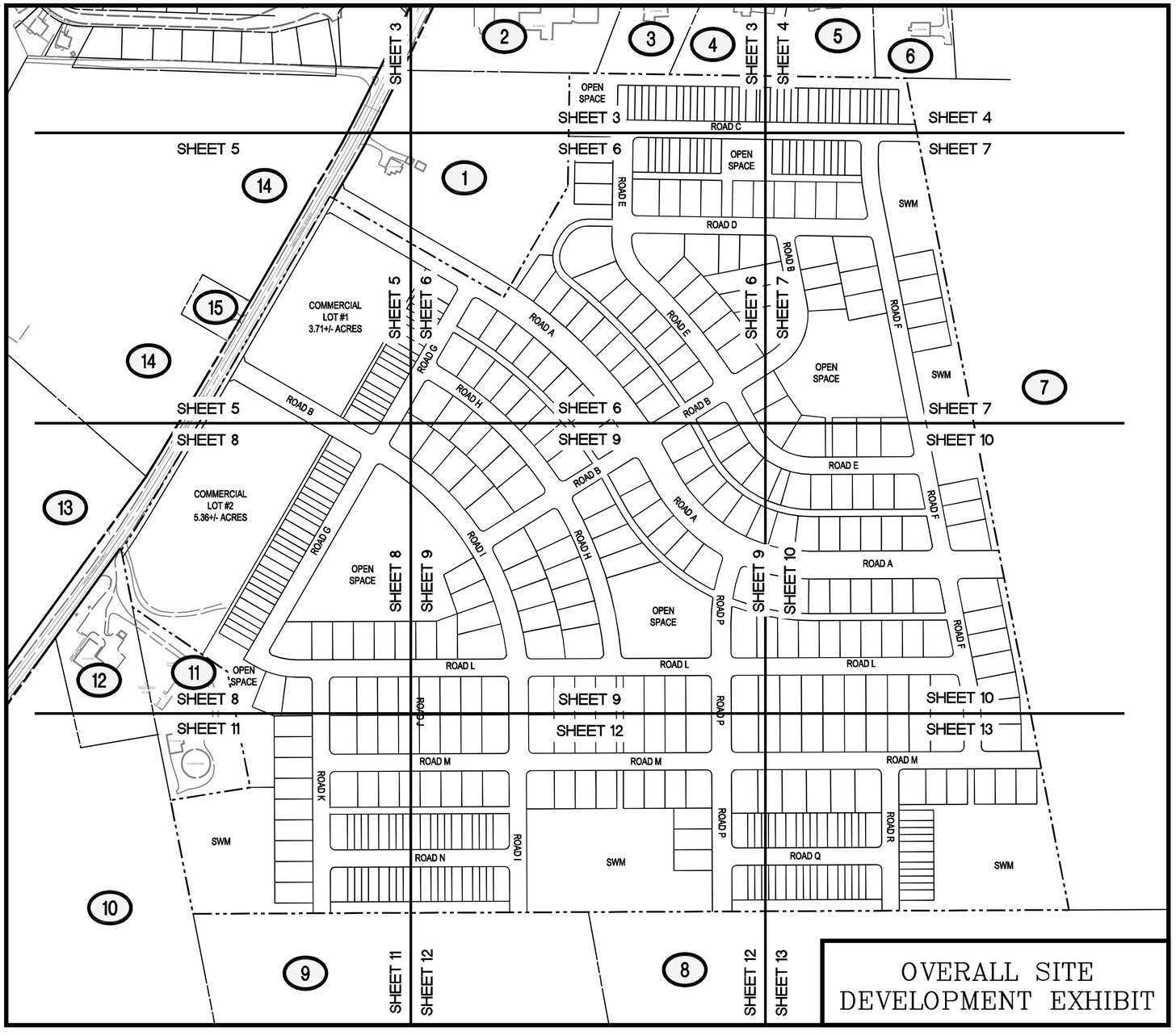

Density Checklist Section - 1332.04(E).2.g.	
Section 1322.08.(B).4.b.	
Maximum Based on NBLA	3,413,925 / 1,750 = 1,950 Units
Proposed	450 Units
Table 1322.08	
Maximum (10 Units Per Acre)	1,136 Units
Proposed	450 Units

Net Buildable Land Area Calculation - Checklist Section 1332.04(E).2.g.		
Area / Use	**Square Feet**	**Acres**
Gross Land Area	4,950,477	113.65
Right-of-Ways	1,124,480	25.81
Charles Town Road Right-of-Way Reservation	17,885	0.41
Stormwater Management Area	394,187	9.05
Sensitive Natural Areas (wetlands & floodplain)	0	0.00
Net Buildable Land Area (NBLA)	3,413,925	78.37

Approximate Acreages - Checklist Section 1332.04(E).2.n.		
Area / Use	**Square Feet**	**Acres**
Common Open Space	544,000	12.49
Residential Lot Area (Townhouse)	456,900	10.49
Residential Lot Area (Single-Family Detached)	2,018,200	46.33
Commercial Lot Area	394,825	9.06
Right-of-Ways	1,124,480	25.81
Charles Town Road Right-of-Way Reservation	17,885	0.41
Stormwater Management Area	394,187	9.05
Total	4,950,477	113.65
*Will vary with final engineering design.		

Common Open Space Calculations - Checklist Section 1332.04(E).2.x.	
ZO Table 1322.07 - 10% Required Open Space (Excludes Townhome Area)	
4,519,577 sf x 0.10	451,958 sf
COA Res. #2023-012 - 20% Required Open Space (Townhome Area Only)	
456,900 sf x 0.20	91,380 sf
Combined Open Space Calculations	
Total Required	543,338 sf
Total Proposed	544,000 sf

Neighborhood Residential Land Use Mix Requirements				
	Requirement		**Provided**	
Use	**%**	**Acres**	**%**	**Acres**
Residential	50	56.82	50.00	56.82
Commercial	10	11.36	10.10	11.48*
Open Space	10	11.36	11.18	12.49

*Per COA Resolution #2023-012 , Commercial includes 2.42 acres conveyed to the City of Charles Town for water treatment plant (PB 1135, Page 420).

ADJACENT PROPERTY OWNER INFORMATION						
Reference #	**Owner Name**	**Owner Address**	**District**	**Tax Map**	**Parcel**	**Zoning District**
1	OAKLAND COMMUNITY CHURCH	104 OAKLAND DRIVE, CHARLES TOWN, WV 25414	3	10	208	GENERAL COMMERCIAL
2	OAKLAND U. M. CHURCH TRUSTEES	70 OAKLAND TERRACE, CHARLES TOWN, WV 25414	3	10	219	GENERAL COMMERCIAL
3	KENT H TICE ET UX	104 OAKLAND TERRACE, CHARLES TOWN, WV 25414	2	18	6.26	RESIDENTIAL GROWTH (COUNTY)
4	MARK & CHARIS HENSON	150 OAKLAND TERRACE, CHARLES TOWN, WV 25414	2	18	6.25	RESIDENTIAL GROWTH (COUNTY)
5	NORA SUE PAINTER	188 OAKLAND TERRACE, CHARLES TOWN, WV 25414	2	18	6.24	RESIDENTIAL GROWTH (COUNTY)
6	DARAL A KIDWELL ESTATE	254 OAKLAND TERRACE, CHARLES TOWN, WV 25414	2	18	6.23	RESIDENTIAL GROWTH (COUNTY)
7	MARK F. LANGLET - TR	544 LEGO DRIVE, CHARLOTTESVILLE, VA 22911	3	15	17	NEIGHBORHOOD RESIDENTIAL
8	CAROLYN & RONALD WIDMYER	1434 CATTAIL RUN RD, CHARLES TOWN, WV 25414	2	18	11.12	RURAL (COUNTY)
9	RONALD WIDMYER	1434 CATTAIL RUN RD, CHARLES TOWN, WV 25414	2	18	11.10	RURAL (COUNTY)
10	HIGH HORIZONZ FARM INC	336 ROSEMONT WAY, CHARLES TOWN, WV 25414	2	19	1	RURAL (COUNTY)
11	CITY OF CHARLES TOWN	PO BOX 14, CHARLES TOWN, WV 25414	3	10	218.2	NEIGHBORHOOD RESIDENTIAL
12	CITY OF CHARLES TOWN	PO BOX 14, CHARLES TOWN, WV 25414	2	19	1.1	RURAL (COUNTY)
13	DR ACQUISITIONS LLC	60 THOMAS JOHNSON DR, FREDERICK, MD 21702	2	17	22	RESIDENTIAL GROWTH (COUNTY)
14	ROMAN CATHOLIC DIOCESE	1300 BYRON ST, WHEELING, WV 26003	3	10	213	NEIGHBORHOOD COMMERCIAL
15	HARRY D LEE	15376 CHARLES TOWN RD, CHARLES TOWN, WV 25414	2	17	21	RES-LIGHT INDUSTRIAL-COMM (COUNTY)

(1) – ADJACENT PROPERTY OWNER REFERENCE NUMBER

250 125 0 250

GRAPHICAL SCALE: 1" = 250'

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OVERALL PLAN AND CALCULATIONS

FAIRVIEW SKETCH PLAN

CITY OF CHARLES TOWN, WEST VIRGINIA
TAX MAP 10, PARCEL 218.1 (D.B. 1089, PG 144)

CT FILE # 2023-04

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LEGEND:

EXISTING		PROPOSED
———	BOUNDARY/RIGHT-OF-WAY LINE	———
———	ADJACENT BOUNDARY LINE	
— — —	EDGE OF PAVEMENT	
	BUILDINGS	
	UTILITY POLE	
OHE	OVERHEAD UTILITY LINE	
590	INDEX CONTOUR LINE (10')	
592	INTERMEDIATE CONTOUR LINE (2')	
	DRIP LINE OF TREES	
	5'-0" SIDEWALK	

(1) – ADJACENT PROPERTY OWNER REFERENCE NUMBER

50 25 0 50 100 150

GRAPHICAL SCALE: 1" = 50'

MATCH LINE - SEE SHEET 4

CHARLES TOWN ROAD , WV ROUTE 115

EX. BUILDING

EX. BUILDING

EX. BUILDING

OPEN SPACE

ROAD C (50' RIGHT-OF-WAY)

MATCH LINE - SEE SHEET 6

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CONCEPTUAL PLAN

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CITY OF CHARLES TOWN, WEST VIRGINIA
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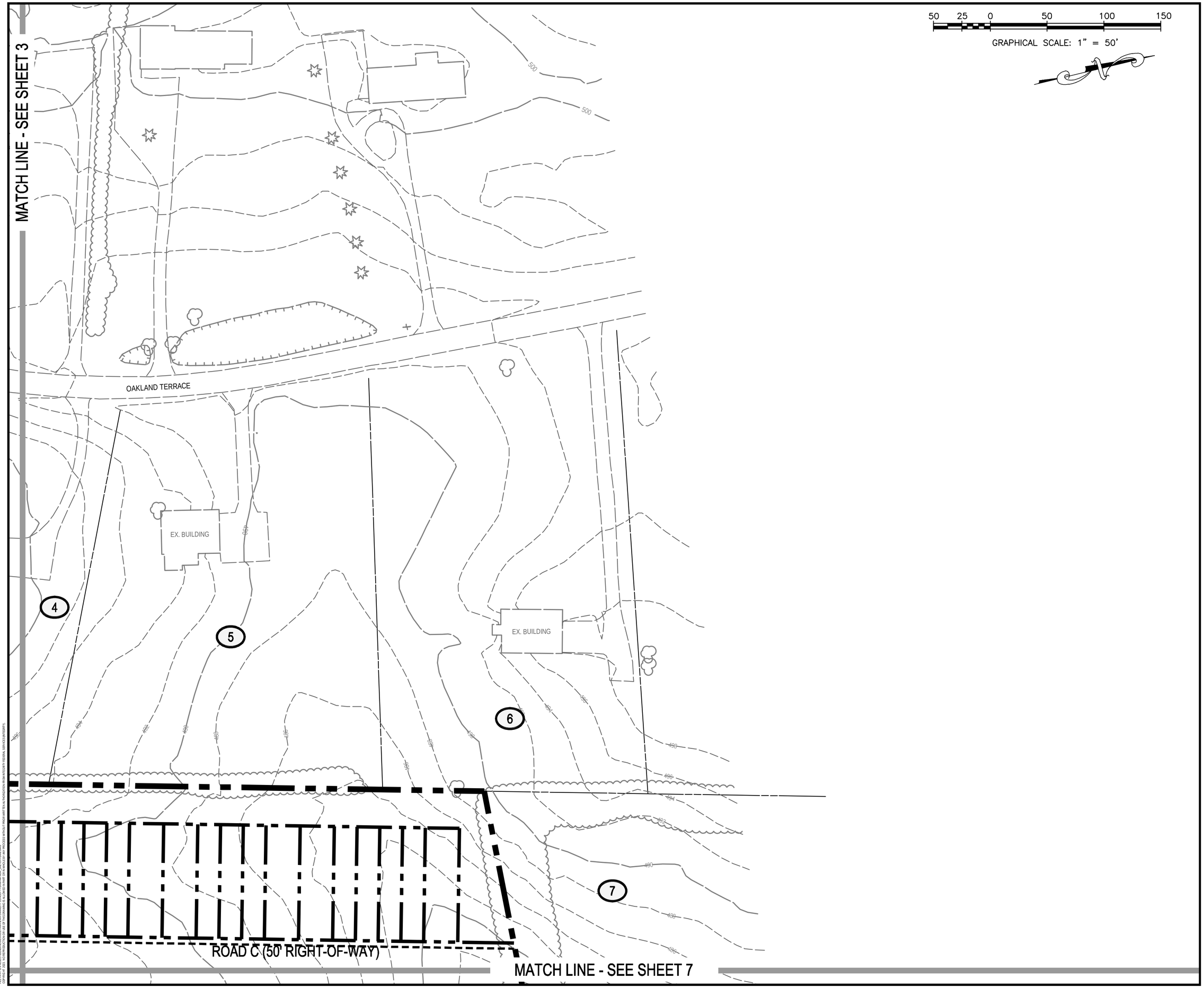

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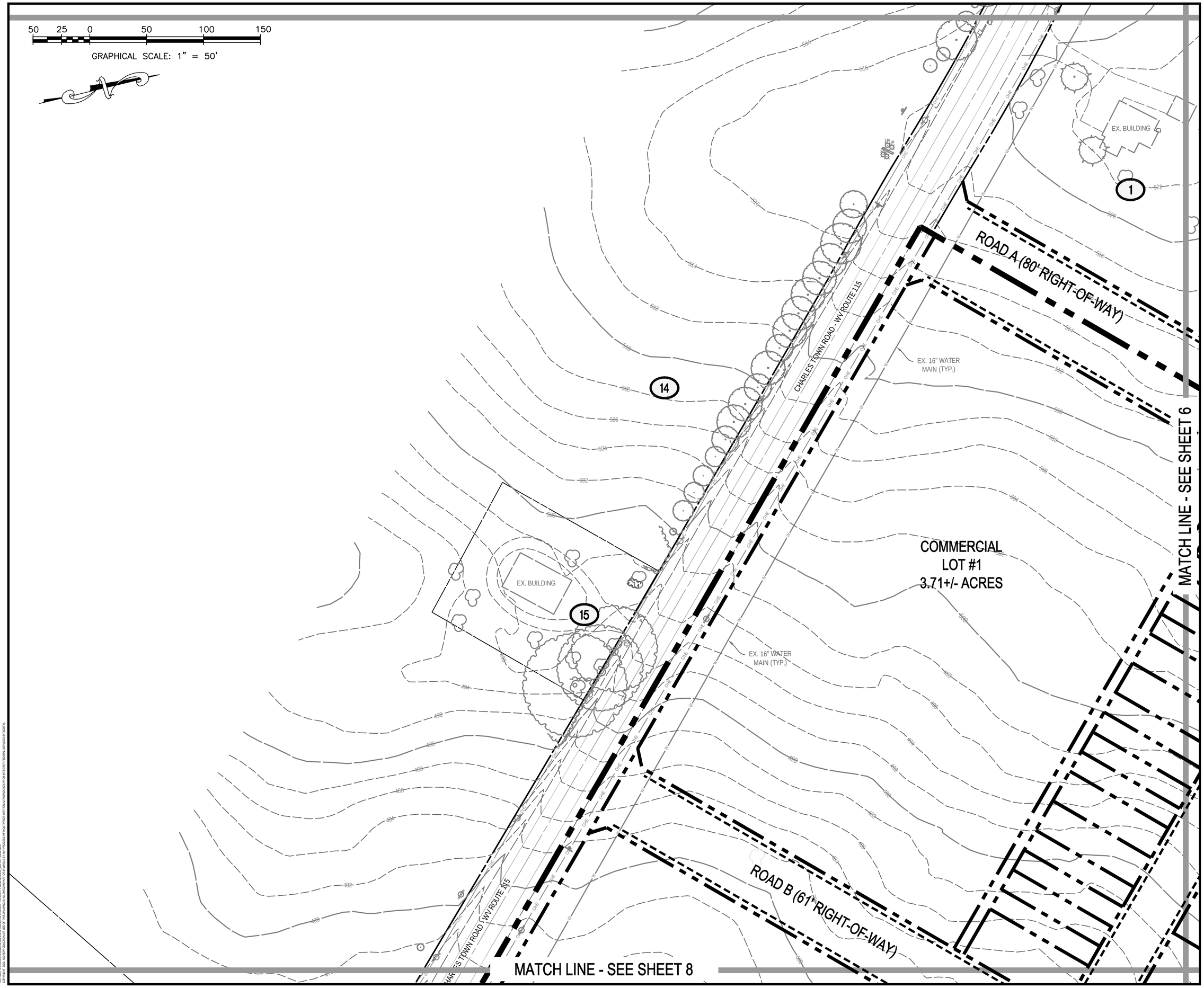

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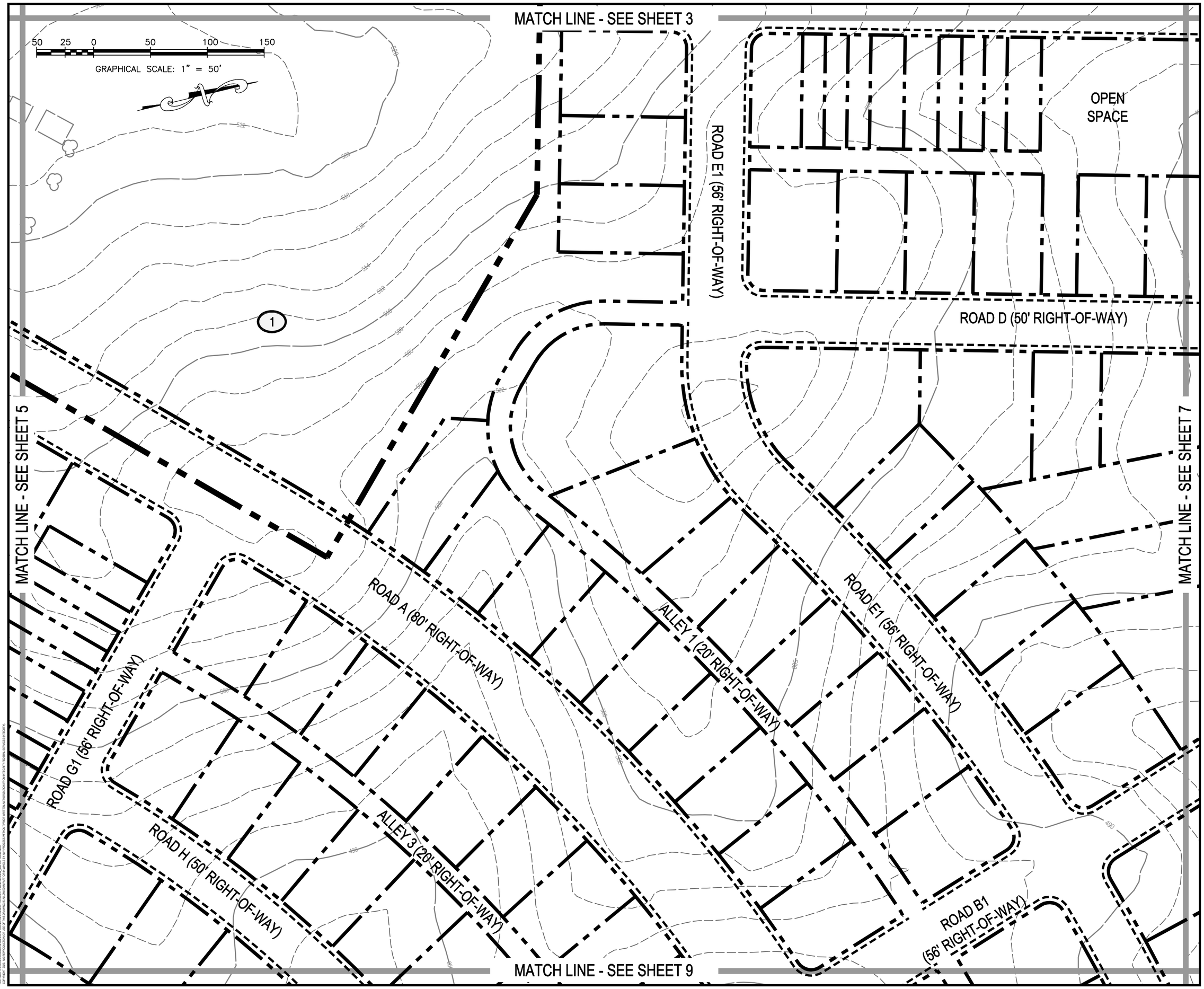

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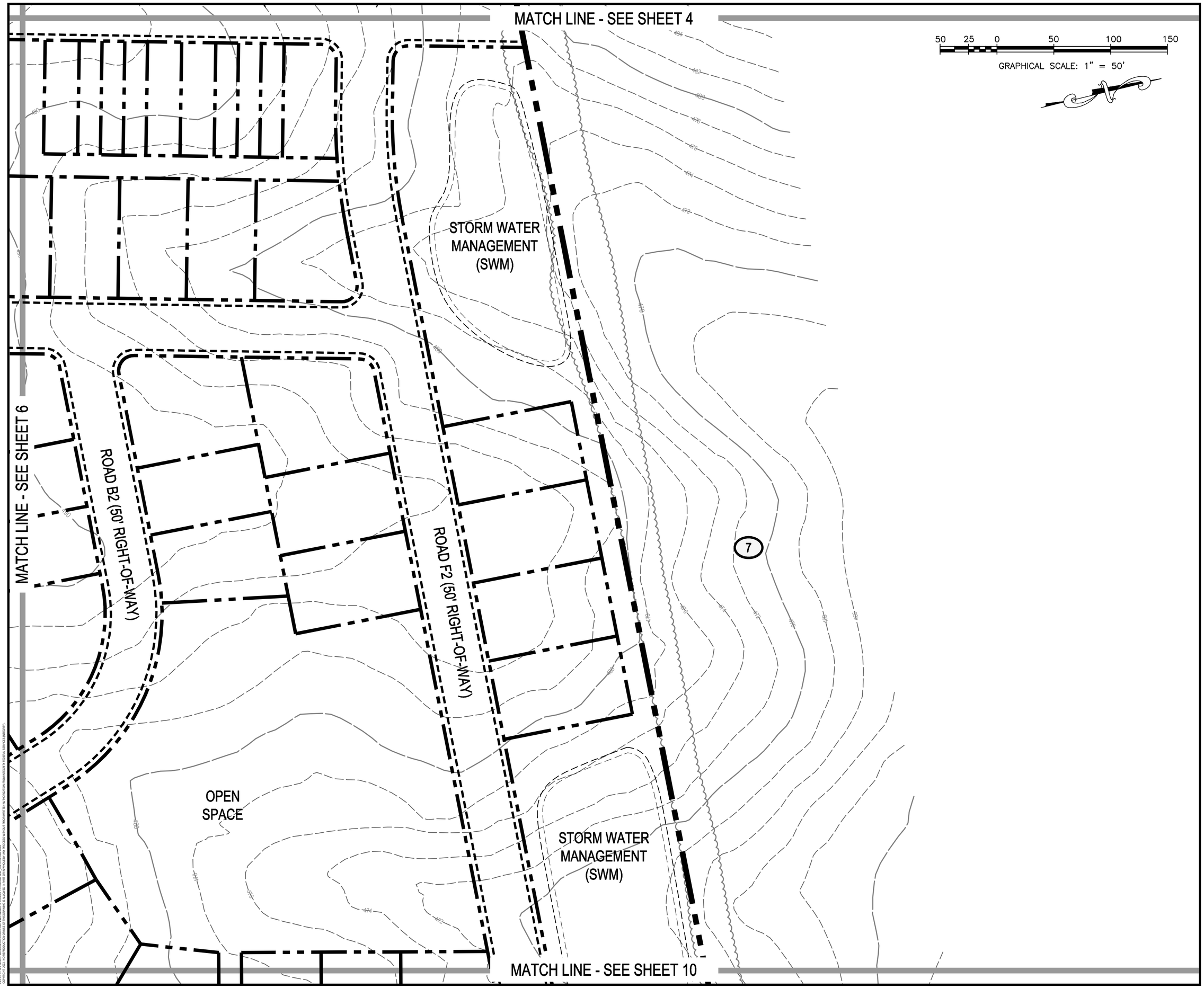

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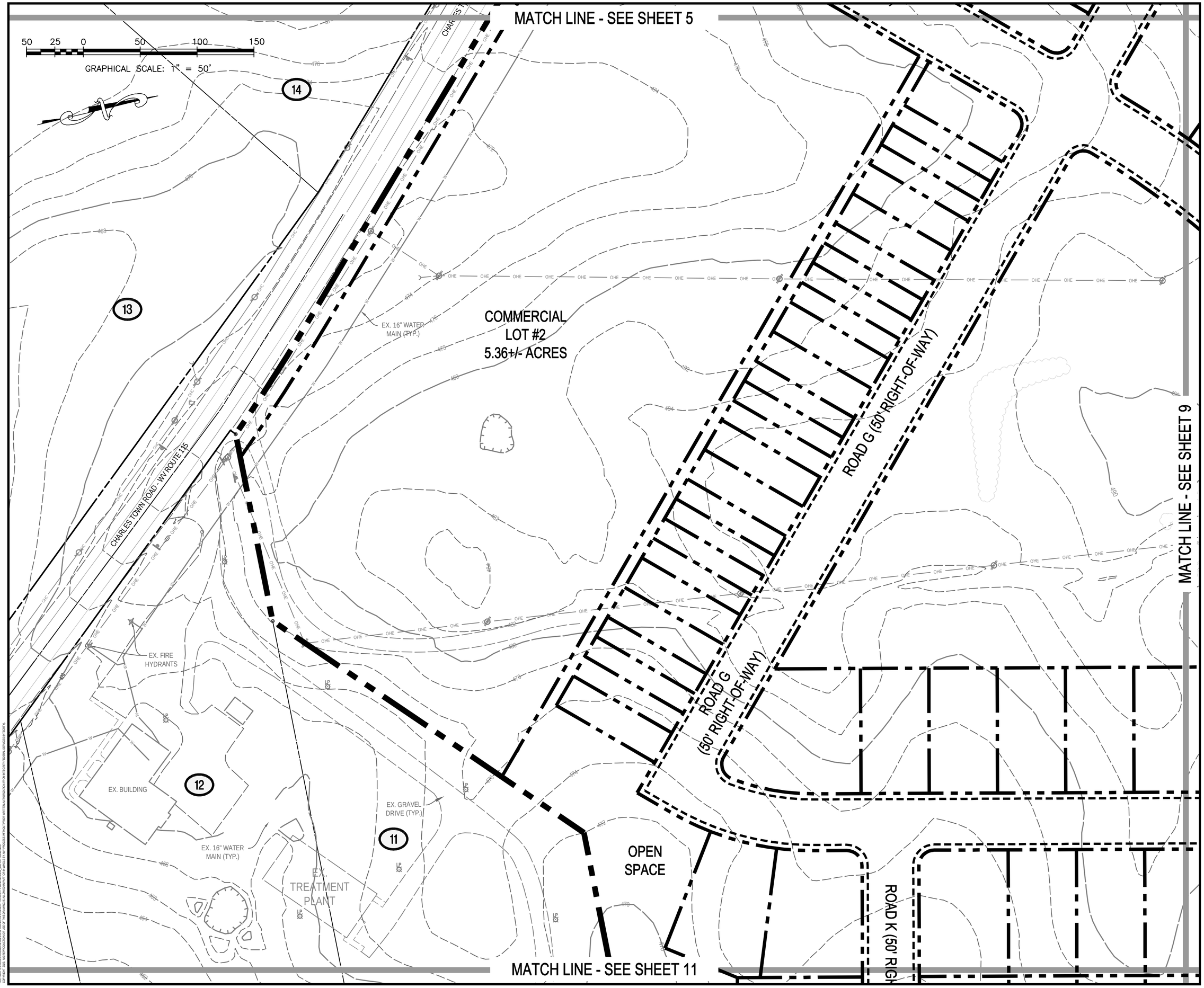

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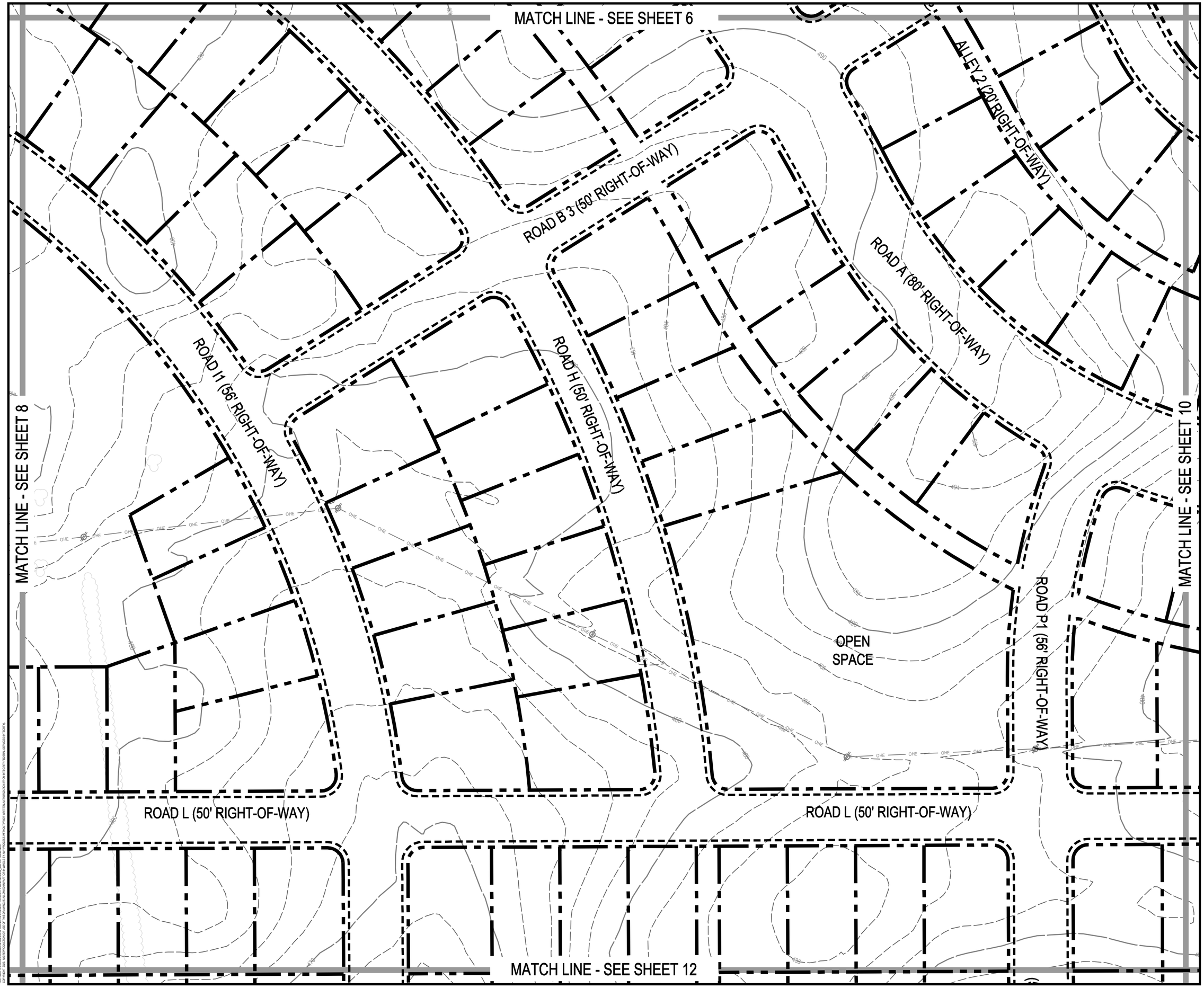

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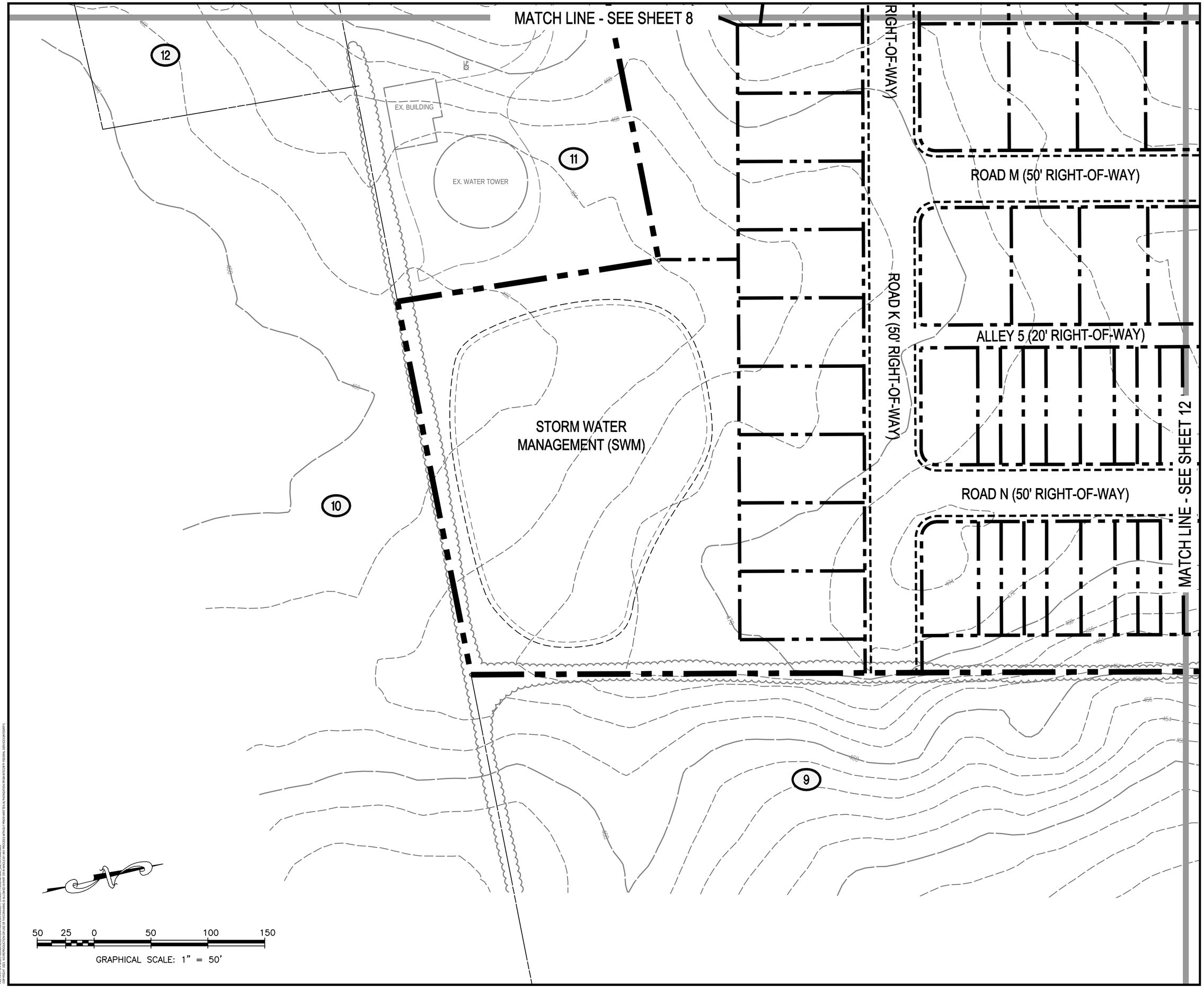

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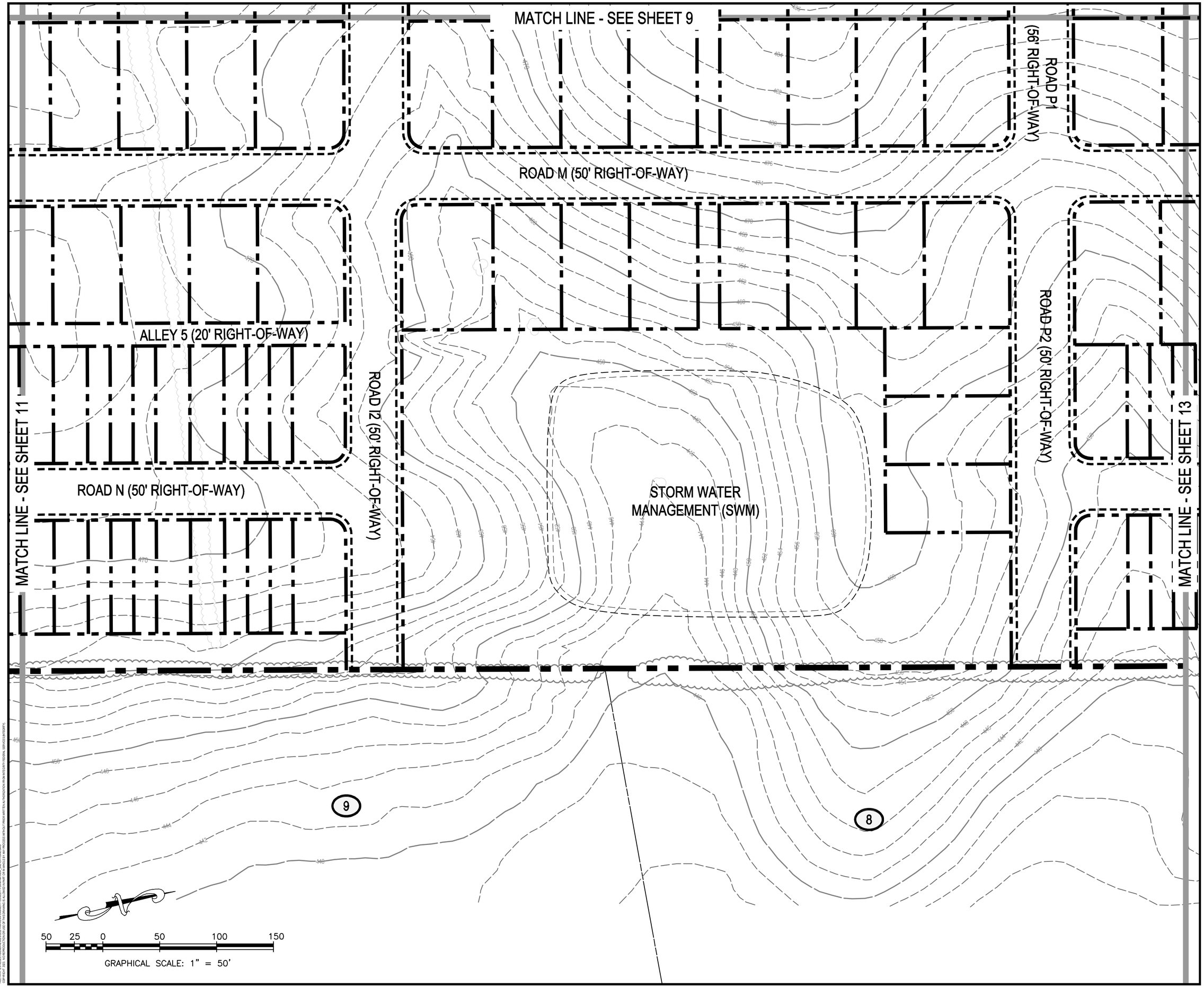

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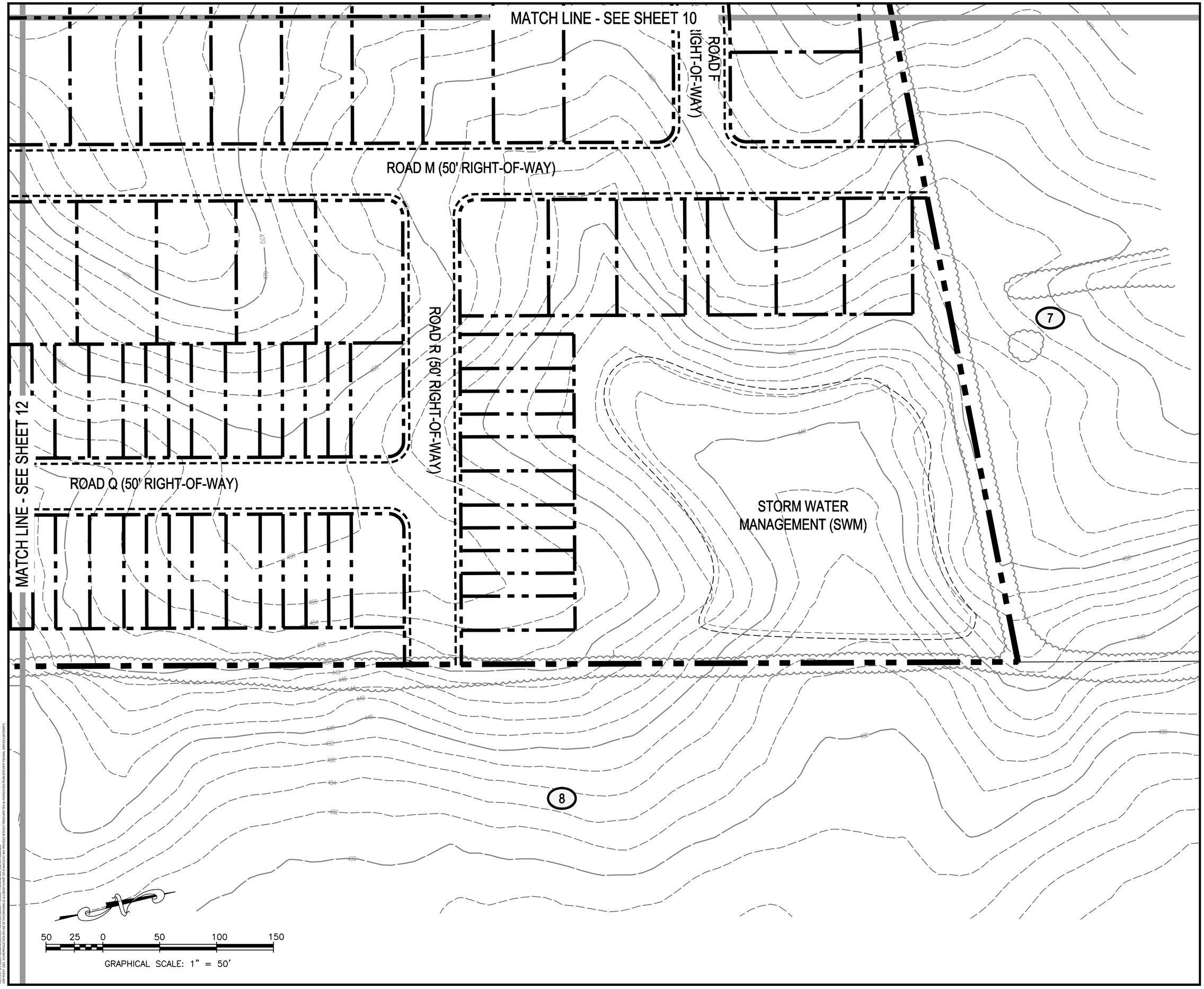

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REVISIONS

4-18-2023: REVISED PER CITY COMMENTS
10-11-2023: REVISED PER CITY COMMENTS & REVISED COA

CONCEPTUAL PLAN

FAIRVIEW SKETCH PLAN

CITY OF CHARLES TOWN, WEST VIRGINIA
TAX MAP 10, PARCEL 218.1 (D.B. 1089, PG 144)

CT FILE # 2023-04

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Resolution #2023-012

City of Charles Town

101 East Washington Street, P.O. Box 14, Charles Town, WV 25414
Phone: (304) 725-2311 ♦ Web: www.charlestownwv.us

Resolution to Repeal and Replace the Conditions of Annexation for Fairview Property

WHEREAS, Oakland United Methodist Church and the Estate of Margaret Z. Dailey, by Bank of Charles Town as executor, presented their petition to annex property into the City of Charles Town (City) at a regular council meeting on the 19th day of September 2005 that was subsequently referred to the Finance Committee (Committee) and the Planning Commission (Commission) for review, analysis, and recommendation; and

WHEREAS, the Committee and Commission recommended, and the Charles Town City Council (Council) received and approved acceptance via Resolution 2005-15 on 5th day of December 2005 for annexation of Oakland United Methodist Church and the Estate of Margaret Z. Dailey, by Bank of Charles, her Executor, to incorporate such land into the City with several conditions including certain parcels with a zoning designation of Neighborhood Residential and General Commercial; and

WHEREAS, the petitioners agree that any conditions of annexation imposed by Council at that time would bind the owners of the property, their successors, and assigns; and

WHEREAS, nearly eighteen years after that initial agreement was made, the subject property remains undeveloped and the current property owners, working with the developer, have requested Council consider amendments to the original agreement that reflect the City's current growth plans and existing economic conditions; and

WHEREAS, the Mayor appointed a Select Committee on the 22nd day of June 2023, including representatives from the City's Community Development Division, Planning Commission, and Council, to work with the current owners to determine if amendments should be recommended to the full Council for further consideration; and

WHEREAS, after several productive discussions with the current property owner and prospective developer of the Fairview Property that was annexed with conditions into the City pursuant to Resolution 2005-15 (Resolution), the special committee recommends repealing the conditions of annexation imposed by the Resolution and replacing with new terms and conditions.

NOW, THEREFORE BE IT RESOLVED Council agrees to the following new terms and conditions with respect to the development of the Fairview Property: See Attached Exhibit 1

NOW, THEREFORE BE IT FURTHER RESOLVED, the Planning Commission shall review the owner/developers' sketch plan dated March 2023 for development during the 24th day of April, 2023 Planning Commission for consistency with the Neighborhood Residential Zoning District standards and other conditions outlined in this resolution, make adjustments with the owner/developer as agreed, and perform all other routine duties as outlined in the City's Subdivision and Land Development Ordinance related to this project; and

NOW, THEREFORE BE IT FUTHER RESOLVED, Council and the property owner agree that the terms and conditions contained in this resolution shall bind the current owner, their successor, and assigns.

Adopted the 18th day of September 2023.

Robert M. Trainor
Mayor

John Nissel
City Manager/Clerk

Exhibit 1 of Resolution 2023-012: City of Charles Town - Conditions of Annexation offered by Jaguar IV, LC, and any future assigns and/or buyers, for the annexation of approximately 113.8 acres into the City of Charles Town.

"Jaguar IV, LC", herein also referred to as "Land Owner", and any future assigns and/or buyers, agrees to the following conditions of annexation for "The Property" identified as Parcel 218.1, Tax Map 10, Charles Town District, for annexation into the City of Charles Town, herein also referred to as "The City":

Economic Impact:

1. In lieu of paying capital improvement fees, and fee in-lieu requirements for Park Dedication under Section 1333.17 of the Subdivision and Land Development Ordinance, the Land Owner proffers to pay a flat fee of $3,494.00 per residential unit at the time of building permit issuance. The Land Owner shall be exempt from any future capital improvement fees implemented by The City.
2. In lieu of paying capital improvement fees, the Land Owner proffers to pay a flat fee of $2,958.00 per thousand square feet of commercial space at the time of building permit issuance. The Land Owner shall be exempt from any future capital improvement fees implemented by The City.

Urban Zoning:

3. The Property is to be zoned (NR) Neighborhood Residential District. At least 10% of the total land area of Parcel 218.1 shall be created as "for-profit" commercial uses. All proposed land uses shall be so designated on the Sketch Plan. The 2.42-acre Parcel 218.2, deeded to the City of Charles Town in 2013 for a water treatment facility, is to be included in the calculation of commercial use.
4. The City agrees to the following clarifications of the Zoning Ordinance:
   a. Townhomes may be constructed on individual lots and do not need to be located on a 5 acre cluster.
   b. For all residential structures, street front set backs shall be measured from the street curb.
5. The Land Owner agrees to provide landscaped buffers between commercial uses and adjoining residential uses. Such buffers shall be as prescribed in the City's Zoning Ordinance or may be landscaped parks or trails.
6. In accordance with the NR Zone regulations, at least 10% of Parcel 218.1 shall be open space. As a mixed-use community, Section 1333.20(O) of the Subdivision and Land Development Ordinance of the City of Charles Town, open space standards for townhouse developments shall be pro-rated at 20% based on the percentage of the property that is developed for townhomes.

Municipal Infrastructure and Services:

7. As part of the development, the Land Owner agrees to create recreation areas, walking paths and a small community park(s) (1 to 2 acres) to be built for use of the residents and users of the planned development. These areas shall be maintained by the HOA created for the development.
8. The following amenities shall be included in the community park(s):
   a. Outdoor community center consisting of a pavilion with electricity, picnic tables and BBQ grills.
   b. Playground: Construct commercial grade playground equipment that serves the following age groups (6-23 months, 2-5 years, and 5-12 years). The playground should meet ADA compliance standards that features ramps and transfer stations with accessible access to the playground area. Playground surfacing should consist of ADA accessible engineered wood fiber, rubber mulch, or pour-in-place rubber surfacing with the goal of facilitating inclusive play opportunities.
   c. Multi-purpose play field.

Affordable Housing:

9. 10% of the residential units in the development shall meet HUD's HOME Homeownership Value Limits for Jefferson County.

Transportation:

10. The Landowner shall co-ordinate with the Jefferson County Board of Education to provide an adequate number of bus stop shelters within the development to be used for school transportation, subject to acceptance by the Jefferson County Board of Education.
11. The Landowner shall co-ordinate with the Eastern Panhandle Transit Authority to provide an adequate number of bus stop shelters for public transportation subject to acceptance by EPTA.
12. The Land Owner shall include the construction of a major roadway and trail consistent with the transportation plan of the City's Comprehensive Plan. The trail shall be fully constructed by the Land Owner to Subdivision and Land Development Ordinance standards under Section 1333.18(A) and Standard Detail ST1. The trail is to be located within the proposed major road right of way, and it shall be accessible by the general public. The road shall be designed as a continuous limited access roadway designed to serve the traffic generated by the subdivision, but not limiting the use of traffic calming features such as roundabouts, narrow travel lanes and raised crosswalks to make the road more compatible for a residential area. The Land Owner shall build this road not more than 2 lanes wide (minor collector road design standards), excluding required turning lanes, and this road shall be located within an eighty-foot wide right of way. The road shall be located to serve the various parts of the subdivision. An eighty foot wide right of way will be reserved and platted to allow completion through the Property of the major road to the property line [adjoining the approximately 92 acre Langlet property (currently Tax District 3/Map 15/Parcel 7)] of the parcel.
13. The City agrees to work with the Land Owner and the WVDOT to create the best main entrances into the development.
14. The Land Owner shall conduct a traffic impact analysis (TIA) once the Sketch Plan for the Development has been developed and actual uses and transportation patterns have been delineated. This TIA will be done in accordance with the guidelines as set by the WVDOH. It will be submitted with the Preliminary Subdivision / Land Development Plat.
15. The Land Owner agrees that if it is determined by the traffic study that traffic lights are required at build out of the development at any of the intersections with Route 115 that it will be responsible for any portion of the light the State Department of Highways deems appropriate.

Other:

16. The Land Owner shall ensure that the above conditions of annexation are binding to the property and upon any assigns and/or buyers of any, or all, portions of the property, excluding land given to the City or WVDOT.
17. To incentivize and attract commercial development within the City, all commercial lots associated with the land shall be prepared in a way that includes grading and utility installation. All commercial lots shall have all pad sites graded with utility installation (stubbed to the property line) completed during the initial start-up of Project Phase 1. Specifically, if Phase 1 includes more than 100 residential units, to include both townhomes and single-family homes, all commercial pad site preparation shall run concurrently with the construction of the first (10) ten residential units. No more than (10) ten residential units shall be constructed until all commercial lots are completed with the above requirements.

City of Charles Town

Robert M. Trainor
Mayor

Attest:

John Nissel
City Clerk

STATE OF WEST VIRGINIA
COUNTY OF Jefferson, to wit:

The foregoing instrument was acknowledged before me this 11 day of October, 2023, by Robert M. Trainor, in his capacity as Mayor of the City of Charles Town, a West Virginia municipal corporation.

(Affix Notarial Seal)

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
Carolyn M. Vazzosi
City of Charles Town
101 E. Washington Street
Charles Town, WV 25414
My Commission Expires June 12, 2025

Carolyn Vezzosi
NOTORY PUBLIC

My commission expires: 6/12/2025

Charles Cocke, Mgr.
Charles Cocke
Charles Cocke, Manager
Jaguar IV LC

STATE OF Maryland
County of Montgomery

The foregoing instrument was acknowledged before me this 5TH day of October, 2023, by Charles Cocke, Manager of Jaguar IV LC

(Affix Notarial Seal)

Michael Dropik
NOTARY PUBLIC
Montgomery County
MARYLAND
MY COMMISSION EXPIRES November 10, 2026

NOTORY PUBLIC

My commission expires: 11-10-26

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CONDITIONS OF ANNEXATION

FAIRVIEW
SKETCH PLAN
CITY OF CHARLES TOWN, WEST VIRGINIA
TAX MAP 10, PARCEL 218.1 (D.B. 1089, PG 144)

CT FILE # 2023-04

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AERIAL OVERLAY

FAIRVIEW SKETCH PLAN

CITY OF CHARLES TOWN, WEST VIRGINIA
TAX MAP 10, PARCEL 218.1 (D.B. 1089, PG 144)

CT FILE # 2023-04

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Glaser, Caleb

From: Keller, Perry J <perry.j.keller@wv.gov>
Sent: Wednesday, October 4, 2023 11:14 AM
To: Glaser, Caleb
Cc: Meadows, Donald R; Ken Clohan; McDonald, Kevin A; James Newman; Jennie Brockman (jbrockman@jeffersoncountywv.org); Mullenax, Matt; Mike Dropik
Subject: Re: 2023_08_04, Fairview Farms TIS, Revision

The TIS is formally approved and a 15% share for the Developer on WV 115 SB RTL has been approved by the WVDOH.

On Thu, Aug 24, 2023 at 10:42 AM Glaser, Caleb <cglaser@amtengineering.com> wrote:

> Good Morning Perry,
>
> In response to your email dated August 22nd, attached is documentation of our comment resolution for your review. Based on the comments, it does not seem like a Revised TIS Report is necessary and the comment resolution document should suffice. As stated in the response to comment #4, the developer is open to having discussions in regards to a contribution for cost of the exclusive right-turn lane on the WV 115 SB (EB in TIS) approach to the proposed roundabout.
>
> The attached file has also been provided via ProjectWise. Please let me know if you have any questions/concerns or need additional information!
>
> Best Regards,
>
> **Caleb Glaser, PE, PTOE**
> **Project Engineer**
> **Direct** 304-903-7010 **Cell** 216-640-5970 **Corporate** 800-881-2545
>
> **From:** Keller, Perry J <perry.j.keller@wv.gov>
> **Sent:** Tuesday, August 22, 2023 7:41 AM
> **To:** Glaser, Caleb <cglaser@amtengineering.com>
> **Cc:** Meadows, Donald R <Donald.R.Meadows@wv.gov>; Ken Clohan <kenneth.l.clohan@wv.gov>; McDonald, Kevin A <kevin.a.mcdonald@wv.gov>; James Newman <JNewman@charlestownwv.us>; Jennie Brockman (jbrockman@jeffersoncountywv.org) <jbrockman@jeffersoncountywv.org>; Mullenax, Matt <mmullenax@washco-md.net>; Mike Dropik <mike.dropik@lgihomes.com>
> **Subject:** Re: 2023_08_04, Fairview Farms TIS, Revision

After reviewing the revised TIS submitted by AMT for the proposed Fairview Farms development the WVDOH has the following comments:

1. While previous comments adequately resolved question concerning proximity of proposed turn lanes for the Fairview Farms and Kings Crossings developments, upon additional review, the proximity of the proposed WV 115 SB LTL approaching Site Dr 1 to the WV 115 NB LTL approaching Crosswinds Dr will need to be reviewed to determine the best method for implementing the proposed new turn lane in relation to the existing lane.

2. Related to above, further review and discussion may need to occur regarding the implementation of the adjacent WV 115 SB LTL approaching Site Dr #2. Once the storage and taper for this turn lane is accounted for, the proximity of the 3 adjacent turn lanes may be close enough that it is undesirable for the WV 115 mainline to have unnecessary minor horizontal "curves" and therefore it may be more desirable for the two new turn lanes to be "connected" with the existing NB turn lane approaching Crosswinds Dr and a short TWLTL section created. These two comments are more geared toward plan development for the project and the recommendations within the TIS can remain as is, and these comments are intended to make developer aware of the concern over the proximity of these turn lanes to one another.

3. While not directly affecting Fairleigh Dr, this development does appear to have an indirect effect on the Fairleigh Dr approach to WV 115, as the delays on this approach increase by over 50 sec/veh from the No Build to the Build Conditions. As such, has consultant reviewed whether any mitigations might improve this approach (understanding HCS 6th Edition analyses would not be affected by potential implementation of TWLTL along this stretch of roadway)?

4. When reviewing the analyses and queuing information related to the 2030 No Build and Build Conditions at the intersection of the WV 115 with US 340 NB and Hillside Dr, while the WV 115 SB approach (EB in TIS) does have indicate queues over 400' in the No Build Conditions (LOS B), this queue increases to over 1200' (LOS E) in the Build Conditions. Based on this information, this development does impact the proposed improvement project at this intersection and it appears that some level of contribution toward the project to implement the recommended WV 115 SB right turn lane would be appropriate. While this project is still in design, this improvement was not accounted for originally and had not been shown/recommended to be necessary until the TIS for this development. It may also be appropriate to modify the narrative associated with the need for this improvement to indicate that its not needed solely due to pre-development conditions.

Consultant should address the above comments and provide written responses to each. Pending those responses, the existing document could potentially remain as is with either the comment response letter/memo or an addendum provided to finalize the study in an approvable form. It may also be appropriate for additional discussion to occur to determine what pro rata share contribution may be appropriate toward the additional improvement with the ongoing roundabout project currently in design. Let me know if you have questions concerning these comments or if you need any additional information.

On Fri, Aug 4, 2023 at 9:44 AM Glaser, Caleb <cglaser@amtengineering.com> wrote:

Good Morning Perry,

In response to your email dated May 30th, attached is a copy of the Revised TIS for the Fairview Farms project and documentation of our comment resolution. In summary, this revision addresses all comments below with the main modification being the inclusion of a roundabout at the WV 115 with US 340 NB/Hillside Drive intersection beginning in 2030 No-Build conditions. All related project files have been provided via ProjectWise.

In addition, Jefferson County Commission, City of Charles Town, and HEPMPO have been copied to this email submission to provide their comments if necessary.

If you have any questions or need additional information, please let me know!

Best Regards,

Caleb Glaser P.E., PTOE

Project Engineer

P 304-400-4952 **| D** 304-903-7010 **| C** 216-640-5970
W www.amtengineering.com

From: Keller, Perry J <perry.j.keller@wv.gov>
Sent: Tuesday, May 30, 2023 1:26 PM
To: Glaser, Caleb <cglaser@amtengineering.com>
Cc: Meadows, Donald R <Donald.R.Meadows@wv.gov>; Ken Clohan <kenneth.l.clohan@wv.gov>; Kirk, Tim <tkirk@amtengineering.com>
Subject: Re: 2023_03_28, Fairview Farms TIS, Preliminary

1. The DOH already has a project programmed to construct a single lane roundabout at the intersection of WV 115 with Hillside Dr/US 340 NB Connector. This improvement is anticipated to be in place prior to the 2030 No Build Conditions (currently estimated for construction in 2025). TIS currently identifies this as a 2030 Build Improved Conditions project. It is recommended this project be included in the TIS beginning with the 2030 No Build Conditions

so that it can be determined if this development is projected to negatively impact the intersection. Also, TIS appears to indicate this improvement to accommodate the Kings Crossing development, however, this improvement was initially discussed internally and ultimately recommended based on information within the Magnolia Springs development TIS.

2. Related to above, in both the Executive Summary and Conclusions sections of the TIS, while it indicates DOH should proceed with planned roundabout at Hillside Dr to address existing capacity issues, it then indicates that an exclusive right turn slip lane on WV 115 EB approaching US 340 NB Connector should be constructed to accommodate additional future volumes unrelated to the Fairview Farms development. It then states that the WV 115 EB approach is anticipated to operate at LOS E in the 2030 No-Build Conditions. Considering the roundabout currently is not included in the analyses (to our knowledge) until the 2030 Build Improved Conditions, this statement causes some level of confusion concerning this proposed improvement. This is further reasoning for the planned roundabout to be included in the TIS and all analyses beginning with the 2030 No-Build scenario.

3. It appears that the included site plan incorrectly refers to a proposed intersection of WV 115 with Kings Crossing as the intersection of WV 115 with Kabletown Rd.

4. Based on the proximity of the Fairview Farms and Kings Crossing developments and the turn lanes proposed along WV 115 for their approaches, its recommended the two developers engage in discussions to implement a section of TWLTL along WV 115 in lieu of multiple exclusive left turn lanes.

5. Although no direction has been provided to date, for the revised TIS and any future TIS, its preferred for any SIDRA analyses that the Site Layout, Intersection Summary, and Lane Summary reports be provided as part of the appendices.

6. Verify TIS has been provided to any appropriate local entity (City, County, MPO) and provide copies of any comments received and how they were addressed.

- Table 1 on page 14 lists US 340 as Williamsport Pike and it should be changed to Berryville Pike.

- Double-check the number of trips for the 200 townhomes since the numbers do not appear to be correct in Table 2 on page 20.

Consultant should address the above comments, as well as any provided by the District, and submit a revised TIS for further review/approval. Let me know if you have any comments or if you need any additional information.

On Tue, Mar 28, 2023 at 8:50 AM Glaser, Caleb <cglaser@amtengineering.com> wrote:

> Good Morning Perry,
>
> On behalf of LGI Homes, attached is the Preliminary Traffic Impact Study (TIS) for the Fairview Farms mixed-use development in Jefferson County. This study is prepared in accordance with the approved SOW document (attached) with WVDOH. In accordance with the SOW, a copy of the study is being provided to the Jefferson County Commission, City of Charles Town, and HEPMPO for comment. All relevant files have been uploaded to ProjectWise.
>
> Please let me know if you have any questions or need additional information.
>
> Best Regards,
>
> **Caleb Glaser** P.E., PTOE
>
> Project Engineer
>
> **P** 304-400-4952| **D** 304-903-7010| **C** 216-640-5970
> **W** www.amtengineering.com

--

Perry J. Keller

Chief Economic Development Officer

Commissioner's Office of Economic Development

Building 5, Room 110

1900 Kanawha Blvd., E.

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--

Perry J. Keller

Chief Economic Development Officer

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--

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Chief Economic Development Officer

Commissioner's Office of Economic Development

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Charleston, WV 25305

304.414.6925 (o)

Fairview Farms Traffic Impact Study - REVISION
Charles Town, Jefferson County, WV

AMT Project File 22-0255.001 | August 4, 2023

PREPARED FOR:
LG Homes – Mid Atlantic
1450 Lake Robbins Drive, Suite 430
The Woodlands, TX 77380

A. MORTON THOMAS AND ASSOCIATES, INC.



PREPARED BY:
Caleb Glaser, P.E., PTOE
A. Morton Thomas and Associates, Inc.
417 Grand Park Drive, Suite 104
Parkersburg, WV 26105
(304) 400-4952

Signature: Date: 08/04/2023

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EXECUTIVE SUMMARY

This report summarizes existing and future traffic analyses conducted in support of the proposed Fairview Farms Mixed-Use Development. The proposed development is to be located north of WV 115 (Charles Town Road) and east of US 340 (Berryville Pike) in Charles Town, Jefferson County. The proposed site plan includes 267 single-family homes, 200 townhomes, and 99,000 square feet (sf) of self-storage. Fairview Farms is expected to be built and completed by the year 2030.

The proposed mixed-use development is anticipated to be served by two site driveways intersecting directly with WV 115. Site Drive #1 is proposed to be located approximately 630 feet east of Crosswinds Drive approaching WV 115 from the north and will operate as a full movement approach utilizing two-way stop-control (TWSC). Site Drive #2 will approach WV 115 from the north approximately 1,270 feet east of Crosswinds Drive and will operate as a full movement approach utilizing TWSC.

Traffic analyses will consider future conditions at the anticipated build-out year of 2030. This report summarizes the analyses of 2022 Existing conditions, 2030 No-Build conditions (without proposed development in place), 2030 Build conditions (with the proposed development in place), and 2030 Build Improved conditions (with the proposed development and improvements in place) during weekday AM and PM peak hours. An annual growth rate of 1.20% was obtained from the WVDOH Performance Management Division.

Three approved traffic impact studies have been included in the future peak hour forecasts as pending developments that will be complete by the Build Year of 2030. These developments are the Tate Manor, Magnolia Springs, and Kings Crossing residential developments. The Tate Manor and Magnolia Springs developments are located north of Crescent Drive/High Street and east of Jefferson Avenue in Charles Town and are anticipated to be completed by the year 2024. The Kings Crossing development is located along the south side of WV 115 opposite the proposed development and is anticipated to be complete by 2025. Estimated traffic generated by the three developments are included in the background traffic volumes beginning in the 2030 No-Build conditions.

AMT (A. Morton Thomas and Associates, Inc.) was retained to determine the projected traffic impacts of the proposed development in accordance with the guidelines set forth by WVDOH in Traffic Engineering Directive (TED) 106-2. The intent of the study is to fully examine the impacts of the traffic generated by the development on the existing transportation system and identify potential mitigation measures. This report presents trip generation, trip distribution, intersection on capacity analysis, queuing analysis, auxiliary lane analysis, and recommendations for transportation improvements necessary to meet the anticipated traffic demands.

Based upon a review of the site plan and adjacent transportation network and following scope of work coordination with WVDOH, the following eight existing and two proposed intersections are included within the scope of the Traffic Impact Study (TIS) for the proposed Fairview Farms residential development:

1) WV 115 (Charles Town Road) with Jefferson Avenue (CR 34) (*TWSC "T" type intersection)*
2) WV 115 with Citizens Way (CR 115/4)/US 340 SB (*Single-lane Roundabout Plus intersection)*
3) WV 115 with Hillside Drive (CR 9/69)/US 340 NB (*TWSC Plus type intersection)*
4) WV 115 with Fairleigh Drive/Bailey Brooks Way *(TWSC Plus type intersection)*

5) WV 115 with Crosswinds Drive *(TWSC "T" type intersection)*
6) WV 115 with Kabletown Road (CR 25) *(TWSC "T" type intersection)*
7) WV 115 with Cattail Run Road (CR 9/3) *(TWSC "T" type intersection)*
8) WV 9 (Veterans Memorial Highway) with Cattail Run Road *(TWSC Plus type intersection)*
9) WV 115 with Site Drive #1 *(Proposed TWSC "T" type intersection)*
10) WV 115 with Site Drive #2 *(Proposed TWSC "T" type intersection)*

Peak Hour Traffic Volumes

Peak hour turning movement counts were collected for the eight existing intersections within the study area by AMT on Friday April 23, 2022 between the hours of 7-9 AM and 3-6 PM. On this date, Jefferson County Schools were fully operational with in-classroom instruction for all students.

The proposed development is expected to be complete by the year 2030. The 2030 No-Build peak hour traffic volumes include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, and an annual traffic growth prior to the year 2030. The growth rate of 1.20% was applied to the existing peak hour traffic counts and compounded annually.

The 2030 Build Conditions include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, an annual traffic growth prior to the year 2030, and the traffic generated by build-out of the Fairview Farms development. Site generated traffic was distributed onto the transportation network based upon existing traffic patterns and anticipated origin and destination of the newly generated site trips.

Site Trip Generation and Distribution

The proposed Fairview Farms mixed-use development includes 267 single-family homes, 200 townhomes, and 99,000 sf of self-storage. Trip generation "Peak Hour of Generator" rates from ITE Trip Generation Manual, 11th Edition, were utilized for Self-Storage (LUC 151), Single-Family Detached Housing (LUC 210), and Multifamily Housing (LUC 220). Trip generation analysis indicates that a total of 4,133 new daily trips will be generated including 335 AM peak hour trips and 421 PM peak hour trips.

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 25% to/from the north on US 340
- 25% to/from the south on US 340
- 15% to/from the east on WV 9
    - 10% to/from north via Cattail Run Road
    - 5% to/from north via US 340
- 30% to/from the west on WV 115
- 5% to/from the east on WV 115

2022 Existing Conditions Analysis

The results of the 2022 Existing Conditions capacity analyses indicate that one traffic movement currently operates worse than LOS D, which is considered the minimum tolerable level. Traffic movements that are expected to operate worse than LOS D include the following (movements shown in bold type indicate they first appear in the milestone analysis being discussed):

- ***US 340 NB Ramp northbound shared left/thru lane to WV 115 LOS F during PM peak hour***

2030 No-Build Conditions Analysis

Improvements included in the 2030 No-Build Conditions include installation of a traffic signal at WV 115 with Jefferson Avenue and construction of an exclusive left-turn lane on WV 115 eastbound at Jefferson Avenue. These improvements were included in the Tate Manor TIS. In addition, construction of a single-lane roundabout at the WV 115 with US 340 NB Ramp/Hillside Drive is included in the 2030 No-Build conditions. This improvement is currently a planned project by WVDOH and requested to be included beginning in this scenario.

The results of the 2030 No-Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2022 Existing Conditions are anticipated to be mitigated following implementation of proposed improvements. One additional movement is anticipated to operate worse than LOS D during the 2030 No-Build conditions (shown in bold). Traffic movements that are expected to operate worse than LOS D include the following:

- ***Farleigh Drive northbound approach to WV 115 LOS E during PM peak hour***

2030 Build Conditions Analysis

Improvements included in the 2030 Build Conditions include construction of the two site driveways intersecting with WV 115.

The results of the 2030 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2030 No-Build Conditions are anticipated to continue. Three additional movements are anticipated to operate worse than LOS D during the 2030 Build conditions (shown in bold). Traffic movements that are expected to operate worse than LOS D include the following:

- ***US 340 SB Ramp northbound shared left/thru/right lane to WV 115 LOS E during PM peak hour***
- ***WV 115 eastbound approach to US 340 NB Ramp/Hillside Drive LOS E during PM peak hour***
- *Farleigh Drive northbound approach to WV 115 LOS F during PM peak hour*
- ***Crosswinds Drive northbound left-turn movement to WV 115 LOS E during PM peak hour***

2030 Build Improved Conditions Analysis

Improvements included in the 2030 Build Improved Conditions comprise construction of a right-turn slip lane on the US 340 Southbound Ramp to WV 115, construction of a right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramp/Hillside Drive, construction of an exclusive left-turn lane on WV 115 eastbound approach to Site Drive #1, and construction of an exclusive left-turn lane on WV 115 eastbound approach to Site Drive #2.

The results of the 2030 Build Improved Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2030 Build Conditions will be mostly mitigated following implementation of proposed improvements. Traffic movements that are expected to operate worse than LOS D include the following:

- *Farleigh Drive northbound approach to WV 115 LOS F during the PM peak hour*
- *Crosswinds Drive northbound left-turn movement to WV 115 LOS E during PM peak hour*

Conclusions/Recommendations

Based on the findings of the Tate Manor TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Tate Manor residential development in order to maintain operation of the existing transportation network:

WV 115 with Jefferson Avenue

- As part of the Tate Manor TIS, it was recommended that a traffic signal be installed at the intersection of WV 115 and Jefferson Avenue. Intersection conditions previously met the MUTCD warranting criteria. Additionally, the 2022 Existing Conditions and 2030 No-Build analysis indicates that the intersection LOS will currently operates at LOS E during the PM peak hour under TWSC.

- In conjunction with installation of a traffic signal identified in previous studies, widening WV 115 to construct an exclusive left-turn lane on the eastbound approach is recommended. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with an appropriate taper.

Based on the findings of the Kings Crossing TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Kings Crossing residential development in order to maintain operation of the existing transportation network:

WV 115 with Citizen Way/US 340 Southbound Ramps

- Construct a low angle right-turn slip lane on for the US 340 northbound ramp approach to WV 115 eastbound. The 2030 Build analysis indicates that the ramp approach will deteriorate to LOS E during the PM peak hour with the overall intersection operating LOS C. The addition of the right-turn slip lane improves the ramp to LOS A during the PM peak hour and the overall intersection to LOS B. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.

Based on the findings of the Magnolia Springs TIS, the following infrastructure improvements are recommended to address existing capacity issues in order to maintain operation of the existing transportation network:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Proceed with the WVDOH planned conversion of the intersection to a single lane roundabout. This project is currently programmed by WVDOH and is expected to be constructed in 2025. For the purpose of this study, the installation of a single lane roundabout is included beginning in 2030 No-Build conditions.

Based on the findings of this study, the following capacity infrastructure improvements are recommended to mitigate future transportation issues prior to construction of the Fairview Farms Development:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Construct an exclusive right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive. The WV 115 eastbound approach is anticipated to experience lengthy queues beginning in the 2030 No-Build conditions. This improvement increases capacity and reduces queue lengths on the approach.

Based on the finding of this study, the following geometric improvements are recommended to mitigate the impacts of the Fairview Farms development and maintain acceptable traffic operations along the existing transportation network in 2030:

WV 115 with Site Drive #1

- Construct Site Drive #1 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 630 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and one egress lane. Site Drive #1 will operate under stop-control, while WV 115 operates as free-flow.

- Construct an exclusive left-turn lane on the WV 115 eastbound approach to Site Drive #1. Peak hour volumes are projected to meet the AASHTO guidelines during 2030 Build Conditions AM and PM peak hours. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper.

WV 115 with Site Drive #2

- Construct Site Drive #2 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 1,270 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and one egress lane. Site Drive #2 will operate under stop-control, while WV 115 operates as free-flow.

- Construct an exclusive left-turn lane on the WV 115 eastbound approach to Site Drive #2. Peak hour volumes are projected to meet the AASHTO guidelines during 2030 Build Conditions PM peak hour. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper.

INTRODUCTION

This report summarizes existing and future traffic analyses conducted in support of the proposed Fairview Farms Mixed-Use Development. The proposed development is to be located north of WV 115 (Charles Town Road) and east of US 340 (Berryville Pike) in Charles Town, Jefferson County. The proposed site plan includes 267 single-family homes, 200 townhomes, and 99,000 sf of self-storage. Fairview Farms is expected to be built and completed by the year 2030.

The proposed mixed-use development is anticipated to be served by two site driveways intersecting directly with WV 115. Site Drive #1 is proposed to be located approximately 630 feet east of Crosswinds Drive approaching WV 115 from the north and will operate as a full movement approach utilizing TWSC. Site Drive #2 will approach WV 115 from the north approximately 1,270 feet east of Crosswinds Drive and will operate as a full movement approach utilizing TWSC.

Traffic analyses will consider future conditions at the anticipated build-out year of 2030. This report summarizes the analyses of 2022 Existing conditions, 2030 No-Build conditions (without proposed development in place), 2030 Build conditions (with the proposed development in place), and 2030 Build Improved conditions (with the proposed development and improvements in place) during weekday AM and PM peak hours. An annual growth rate of 1.20% was obtained from the WVDOH Performance Management Division.

Three approved traffic impact studies have been included in the future peak hour forecasts as pending developments that will be complete by the Build Year of 2030. These developments are the Tate Manor, Magnolia Springs, and Kings Crossing residential developments. The Tate Manor and Magnolia Springs developments are located north of Crescent Drive/High Street and east of Jefferson Avenue in Charles Town and are anticipated to be completed by the year 2024. The Kings Crossing development is located along the south side of WV 115 opposite the proposed development and is anticipated to be complete by 2025. Estimated traffic generated by the three developments are included in the background traffic volumes beginning in the 2030 No-Build conditions. Information regarding both developments is located in **Appendix F**.

AMT was retained to determine the projected traffic impacts of the proposed development in accordance with the guidelines set forth by WVDOH in TED 106-2. The intent of the study is to fully examine the impacts of the traffic generated by the development on the existing transportation system and identify potential mitigation measures. This report presents trip generation, trip distribution, intersection on capacity analysis, queuing analysis, auxiliary lane analysis, and recommendations for transportation improvements necessary to meet the anticipated traffic demands.

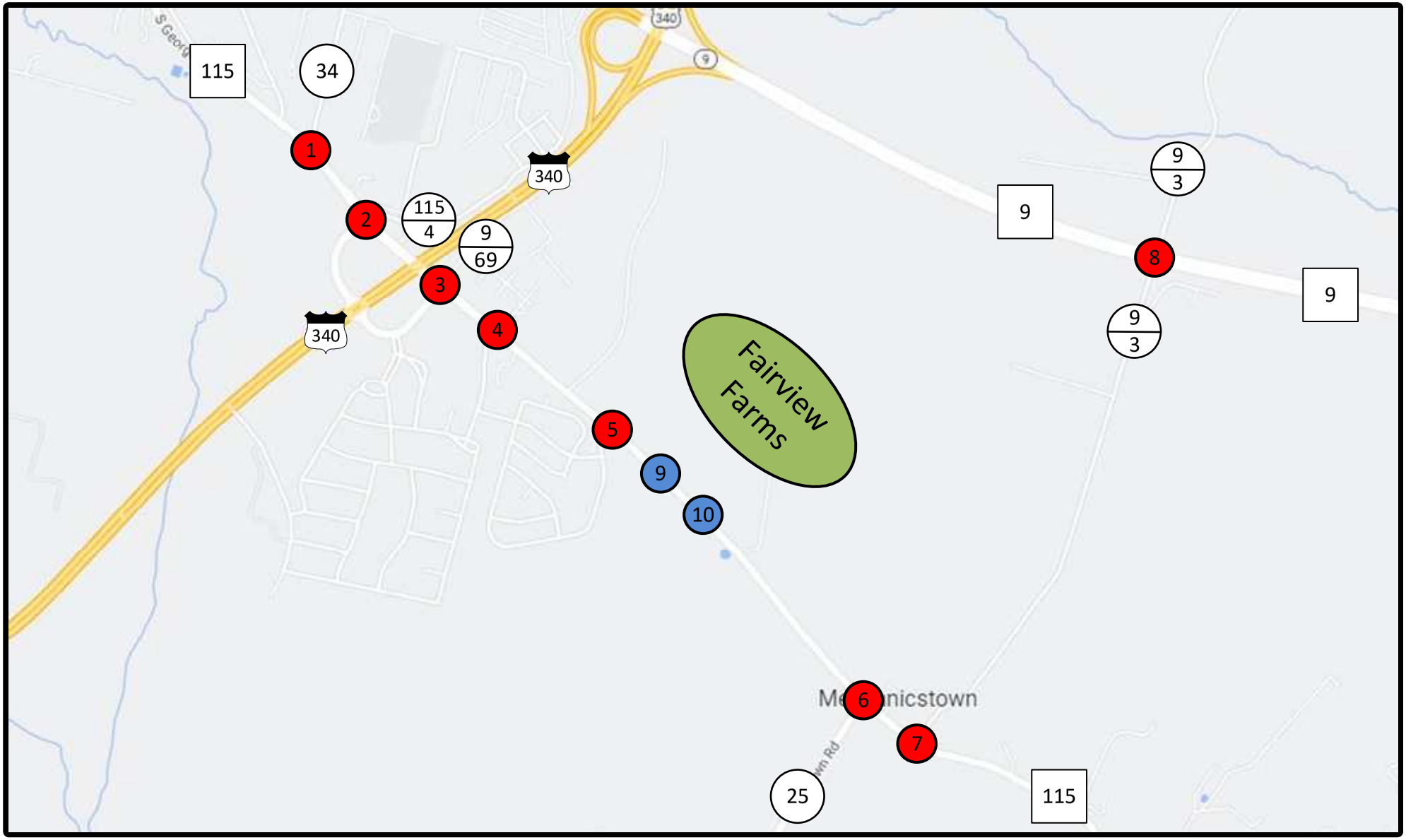
AMT coordinated with WVDOH to determine the intersections to be studied within the scope of work, preliminary trip generation, distribution, and study methodology for this TIS. A copy of the approved Scope of Work (SOW) is included in **Appendix G**.

STUDY AREA DESCRIPTION

Based upon a review of the site plan and adjacent transportation network and following SOW coordination with WVDOH, the following eight existing and two proposed intersections are included within the scope of the TIS for the proposed Fairview Farms mixed-use development:

1) WV 115 (Charles Town Road) with Jefferson Avenue (CR 34) (*TWSC "T" type intersection)*
2) WV 115 with Citizens Way (CR 115/4)/US 340 SB (*Single-lane Roundabout Plus intersection)*
3) WV 115 with Hillside Drive (CR 9/69)/US 340 NB (*TWSC Plus type intersection)*
4) WV 115 with Fairleigh Drive/Bailey Brooks Way *(TWSC Plus type intersection)*
5) WV 115 with Crosswinds Drive *(TWSC "T" type intersection)*
6) WV 115 with Kabletown Road (CR 25) *(TWSC "T" type intersection)*
7) WV 115 with Cattail Run Road (CR 9/3) *(TWSC "T" type intersection)*
8) WV 9 (Veterans Memorial Highway) with Cattail Run Road *(TWSC Plus type intersection)*
9) WV 115 with Site Drive #1 *(Proposed TWSC "T" type intersection)*
10) WV 115 with Site Drive #2 *(Proposed TWSC "T" type intersection)*

The study area and key intersections are shown on **Figure 1**. The proposed site plan overview is shown on **Figure 2** and the proposed commercial lot site plan is shown on **Figure 3**.



LEGEND

= Development

= Existing Intersection

= Proposed Intersection

AMT

N

NOT TO SCALE

Fairview Farms TIS

Site Location Map

DATE: August 2023

FIGURE 1

267 SINGLE FAMILY LOTS

200 TOWNHOUSE LOTS

Neighborhood Residential Land Use Mix Requirements				
	Requirement*		Provided	
Use	%	Acres	%	Acres
Residential	50	58.08	0.50	58.09
Commercial	10	11.62	0.10	11.62
Open Space*	10	7.75	0.13	10.17

*Per Ordinance, 10% of "usable land (Net Builldabal Land Area)" required for open space.

150 75 0 150 300 450

GRAPHICAL SCALE: 1" = 150'

NORTH

COMPREHENSIVE PLAN ROAD
LIMITED ACCESS
(80' RIGHT-OF-WAY)

SWM

SWM

SWM

CENTRAL
OPEN SPACE
(3.42 ACRES)

SWM

Intersection #5 – WV 115 & Crosswinds Dr (Full Access)

Intersection #9 – WV 115 & Site Drive #1 (Full Access)

COMMERCIAL LOT #1
(3.76 ACRES)

15' WIDE ROAD RIGHT-OF-WAY
RESERVATION (ROUTE 115)

COMMERCIAL LOT #2
(5.44 ACRES)

Intersection #10 – WV 115 & Site Drive #2 (Full Access)

WATER PLANT DEDICATION
(2.42 ACRES)

SWM

SINGLE FAMILY LOT (110' DEPTH)

TOWNHOUSE LOT (100' DEPTH)

COMMON OPEN SPACE

STORMWATER MANAGEMENT

COMMERCIAL LOT

Fairview Farms TIS

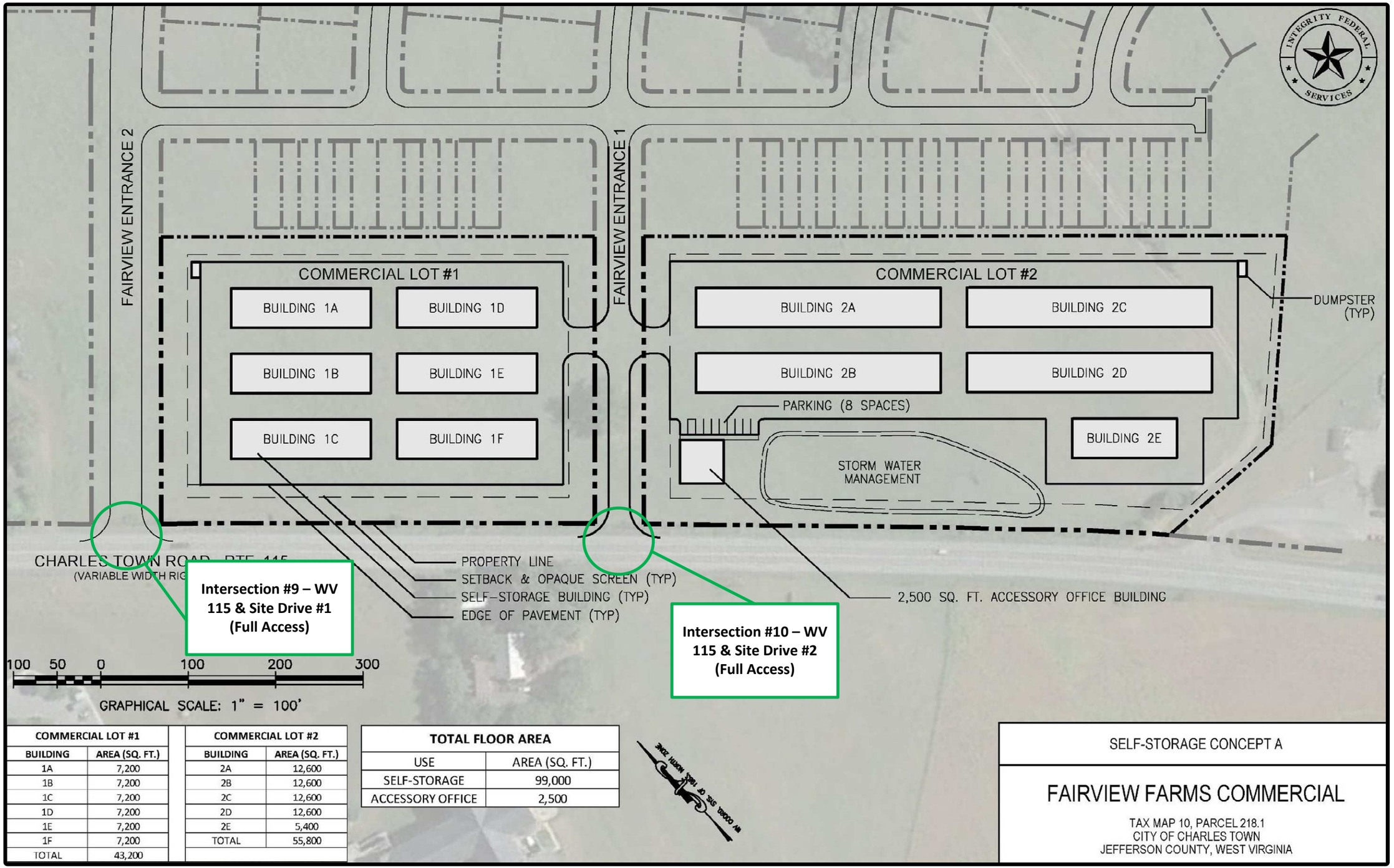
Site Plan - Overview

DATE: August 2023

FIGURE 2

N

NOT TO SCALE



COMMERCIAL LOT #1	
BUILDING	AREA (SQ. FT.)
1A	7,200
1B	7,200
1C	7,200
1D	7,200
1E	7,200
1F	7,200
TOTAL	43,200

COMMERCIAL LOT #2	
BUILDING	AREA (SQ. FT.)
2A	12,600
2B	12,600
2C	12,600
2D	12,600
2E	5,400
TOTAL	55,800

TOTAL FLOOR AREA	
USE	AREA (SQ. FT.)
SELF-STORAGE	99,000
ACCESSORY OFFICE	2,500

SELF-STORAGE CONCEPT A

FAIRVIEW FARMS COMMERCIAL

TAX MAP 10, PARCEL 218.1
CITY OF CHARLES TOWN
JEFFERSON COUNTY, WEST VIRGINIA

Fairview Farms TIS
Site Plan – Commercial Lots
DATE: August 2023
FIGURE 3
NOT TO SCALE

EXISTING ROADWAY CONDITIONS

A detailed description of the existing study area roadway network is provided in this section of the report. AADT (Annual Average Daily Traffic) volume information was obtained from the WVDOH GIS website.

US 340 (Berryville Pike) is a north-south four-lane two way-controlled access divided highway within the project area. US 340 is part of the National Highway System (NHS). US 340 forms a grade separated modified trumpet interchange with WV 115 south of the project site, with the ramps intersecting with surface streets to the north. The posted speed limit on this section of US 340 is 60 miles per hour (mph). The AADT along US 340 is 16,115 vehicles per day (vpd) just north of the US 340 interchange with WV 115.

WV 115 (Charles Town Road) is a north-south two-lane urban major collector within the project area. The posted speed limit on this section of WV 115 is 45 mph east of Kabletown Road before increasing to 55 mph just before Kabletown Road. The AADT along WV 115 in the project area is 4,542 vpd. WV 115 provides a direct connection to Downtown Charles Town, located approximately one-mile northwest of Citizens Way.

WV 9 (Veterans Memorial Highway) is a four-lane divided highway classified as an expressway within the study area. WV 9 overlaps with US 340 in the south of the Charles Town Interchange before splitting from US 340 and continuing east to Hillsboro VA, serving as a primary east/west facility through Jefferson, Berkeley, and Morgan Counties. The speed limit on this section of WV 9 is 60 mph and the AADT is 26,776 vpd.

Jefferson Avenue (CR 34) is a two-lane two-way essential arterial state and local service (SLS) route within the project area. Jefferson Avenue provides access to mostly residential properties and is the only means of access to High Street. High Street connects directly to Charles Town Middle School. The posted speed limit on the section of Jefferson Avenue being analyzed is 35 mph. The AADT in the project area is 4,230.

Kabletown Road (CR 25) is a two-lane two-way collector, state and local service roadway within the project area. Kabletown Road provides access to residential properties while providing a direct connection to WV 115. The posted speed limit on this section of Kabletown Road is 40 mph and the AADT is 1,630 vpd.

Cattail Run Road (CR 9/3) is a two-lane two-way essential arterial within the study area. Cattail Run Road intersects with Keyes Ferry Road to the north and WV 9 to the south serving residential properties and provides access to a rural area. The speed limit on Cattail Run Road is 35 mph and the AADT is 553 vpd.

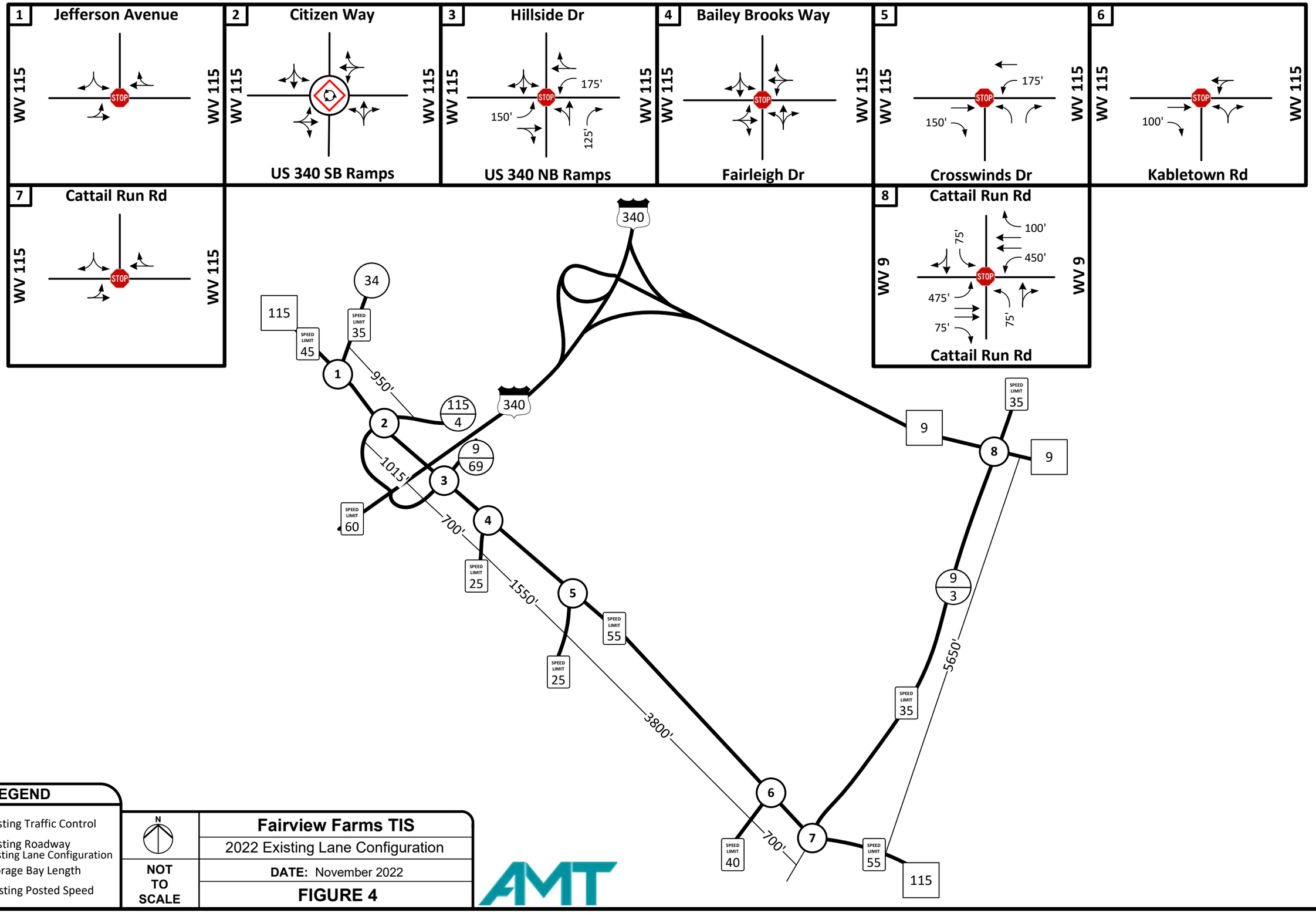
Hillside Drive (CR 9/69) is a two-lane two-way state and local service roadway within the project area. Hillside Drive provides access to residential properties while providing a direct connection to WV 115 opposite US 340 Northbound Ramps. The posted speed limit on this section of Hillside Drive is 35 mph and the AADT is 150 vpd. The AADT for Hillside Drive was not available on WVDOH GIS website, therefore, was calculated based on collected turning movement counts.

Citizens Way (CR 115/4) is a two-lane two-way state and local service roadway within the project area. Citizens Way provides access to the residential neighborhood north of WV 115 and east of Jefferson Avenue. Citizens Way intersects with WV 115 opposite US 340 Southbound Ramps at a four-leg roundabout intersection. The posted speed limit on this section of Citizens Way is 35 mph and the AADT along Citizens Way in the project area is 750 vpd. The AADT for Citizens Way was not available on WVDOH GIS website, therefore, was calculated based on collected turning movement counts.

Table 1 provides a detailed description of the existing study area roadway network. In addition, Estimated Build Year AADT is included in the table which contains Existing volume, Fairview Farms trips, approved background trips (Tate Manor, Magnolia Springs, and Kings Crossing developments), and traffic inflation to 2030. The 2022 existing intersection lane configurations and intersections control are shown on **Figure 4.**

Table 1: Roadway Facility Summary

Name	Code	State Functional Classification	Area	Direction	Speed Limit	Typical Roadway Paved Width (ft)	AADT (Year)	**Estimated Build AADT (2030)**	Description
Berryville Pike	US 340	Trunkline	Jefferson County	N-S	60	72	16,115 (2017)	18,813	N-S Trunkline that forms and interchange with WV 115 west of the proposed development
Veterans Memorial Highway	WV 9	Expressway	Jefferson County	E-W	60	72	26,776 (2017)	31,259	E-W Expressway that runs parallel with CR 17 through study area and connects with US 340
Charles Town Road	WV 115	Trunkline	Jefferson County	N-S	45/55	38	4,542 (2017)	15,730	E-W Trunkline that runs perpendicular with US 340 through study area & is main access to development
Jefferson Avenue	CR 34	Essential Arterial	Jefferson County	N-S	35	28	4,373 (2017)	4,440	N-S SLS Route that intersect with WV 115
Kabletown Road	CR 25	Collector (SLS)	Jefferson County	N-S	40	22	1,630 (2017)	1,820	N-S SLS Route that intersects with WV 115
Citizens Way	CR 115/4	Collector (SLS)	Jefferson County	N-S	35	24	1,990 (2022)	5,120	N-S SLS Route that intersects with WV 115 directly opposite US 340 SB Ramps
Cattail Run Road	CR 9/3	Essential Arterial	Jefferson County	N-S	35	20	553 (2017)	1,340	N-S Essential Arterial that intersects with WV 9 in southern end of study area
Hillside Drive	CR 9/69	Collector (SLS)	Jefferson County	N-S	35	30	150 (2022)	160	N-S SLS Route that intersects with WV 115 directly opposite US 340 NB Ramps



LEGEND

- Existing Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XXX' Storage Bay Length
- Existing Posted Speed

N

NOT TO SCALE

Fairview Farms TIS

2022 Existing Lane Configuration

DATE: November 2022

FIGURE 4

EXISTING & NO-BUILD PROJECT TRAFFIC VOLUMES

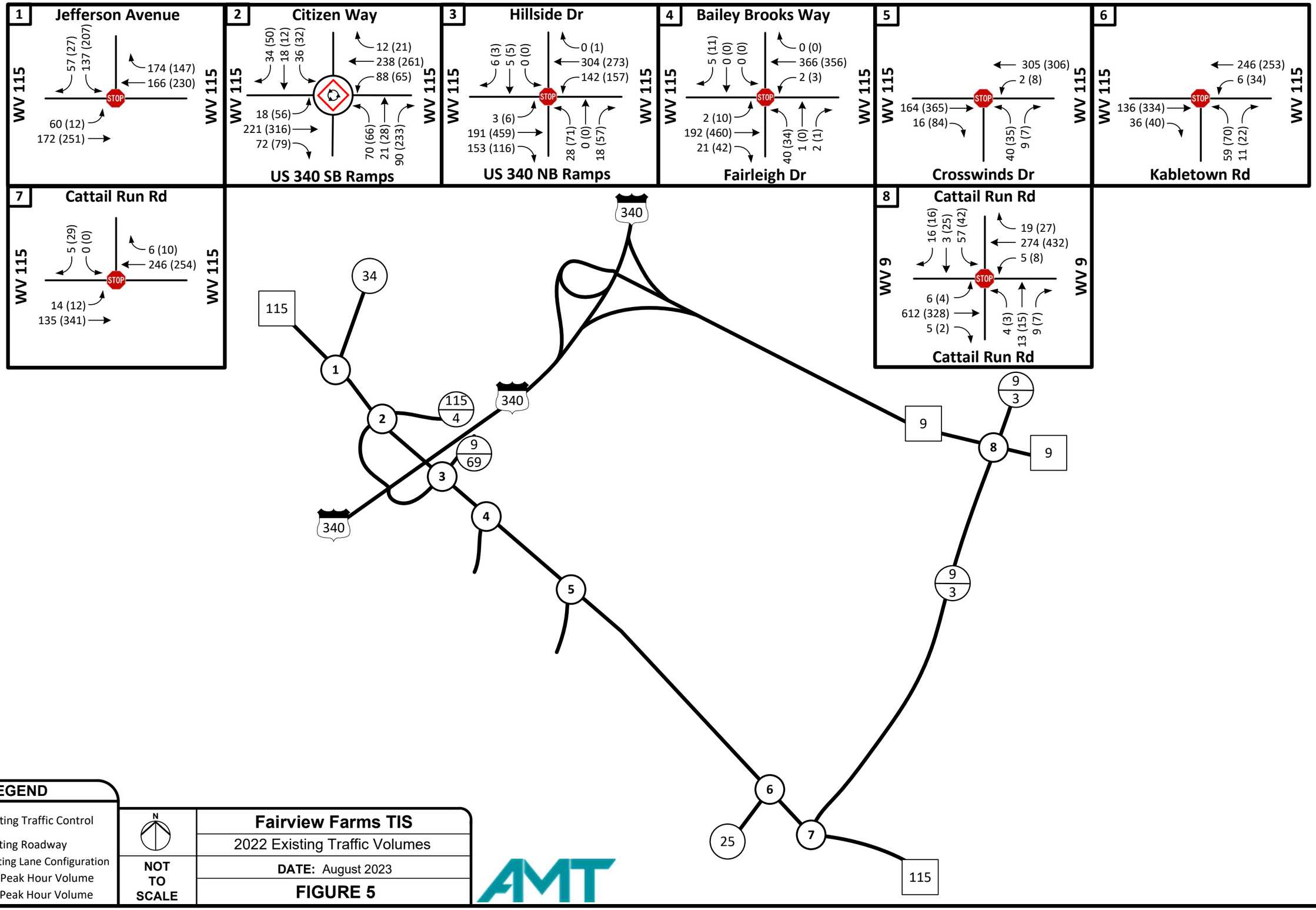
2022 Existing Conditions

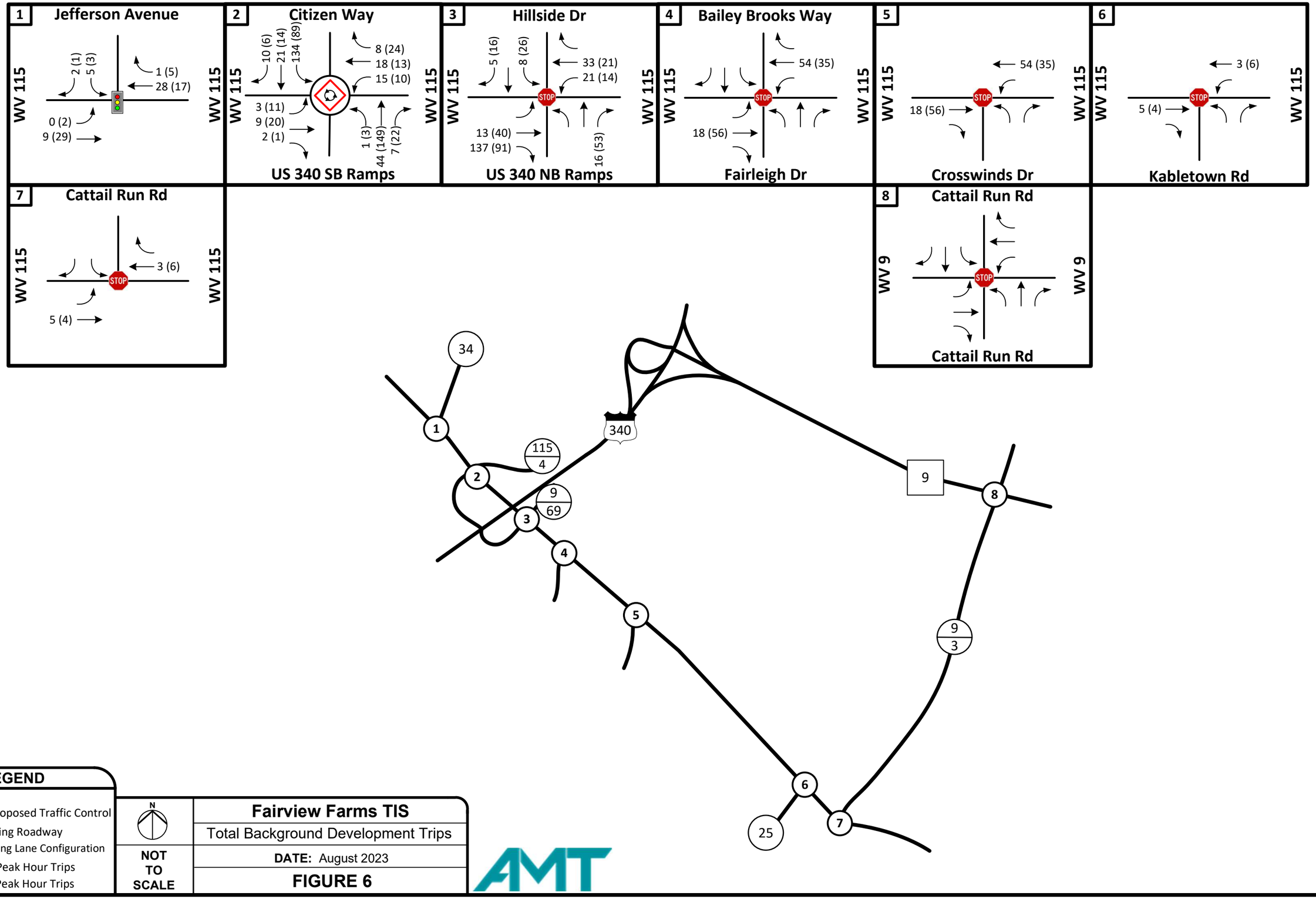
Peak hour turning movement counts were collected for the eight existing intersections within the study area by AMT on Friday April 23, 2022 between the hours of 7-9 AM and 3-6 PM. On this date, Jefferson County Schools were fully operational with in-classroom instruction for all students. The traffic count data is located in **Appendix B** and the 2022 Existing Traffic Volumes for the weekday AM and PM peak hour volumes are shown on **Figure 5**.

2030 No-Build Conditions

The proposed development is expected to be complete by the year 2030. The 2030 No-Build peak hour traffic volumes include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, and annual traffic growth prior to the year 2030. The growth rate of 1.20% was applied to the existing peak hour traffic counts and compounded annually.

The total background development trips for the weekday AM and PM peak hours are shown on **Figure 6** to illustrate the increase in traffic volume resulting from adjacent projects included within this study. The 2030 No-Build peak hour volumes for the weekday AM and PM peak hour volumes are shown on **Figure 7**.


1
Jefferson Avenue
WV 115
WV 115
57 (27)
137 (207)
174 (147)
166 (230)
60 (12)
172 (251)
2
Citizen Way
34 (50)
18 (12)
36 (32)
12 (21)
238 (261)
88 (65)
18 (56)
221 (316)
72 (79)
70 (66)
21 (28)
90 (233)
US 340 SB Ramps
3
Hillside Dr
6 (3)
5 (5)
0 (0)
0 (1)
304 (273)
142 (157)
3 (6)
191 (459)
153 (116)
28 (71)
0 (0)
18 (57)
US 340 NB Ramps
4
Bailey Brooks Way
5 (11)
0 (0)
0 (0)
0 (0)
366 (356)
2 (3)
2 (10)
192 (460)
21 (42)
40 (34)
1 (0)
2 (1)
Fairleigh Dr
5
305 (306)
2 (8)
164 (365)
16 (84)
40 (35)
9 (7)
Crosswinds Dr
6
246 (253)
6 (34)
136 (334)
36 (40)
59 (70)
11 (22)
Kabletown Rd
7
Cattail Run Rd
5 (29)
0 (0)
6 (10)
246 (254)
14 (12)
135 (341)
8
Cattail Run Rd
WV 9
WV 9
16 (16)
3 (25)
57 (42)
19 (27)
274 (432)
5 (8)
6 (4)
612 (328)
5 (2)
4 (3)
13 (15)
9 (7)
Cattail Run Rd
340
115
34
1
2
115
4
340
9
69
3
4
5
6
25
7
115
9
3
8
9
9
3
LEGEND
Existing Traffic Control
Existing Roadway
Existing Lane Configuration
XX AM Peak Hour Volume
(XX) PM Peak Hour Volume
N
NOT TO SCALE
Fairview Farms TIS
2022 Existing Traffic Volumes
DATE: August 2023
FIGURE 5
AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XX AM Peak Hour Trips
- (XX) PM Peak Hour Trips

N

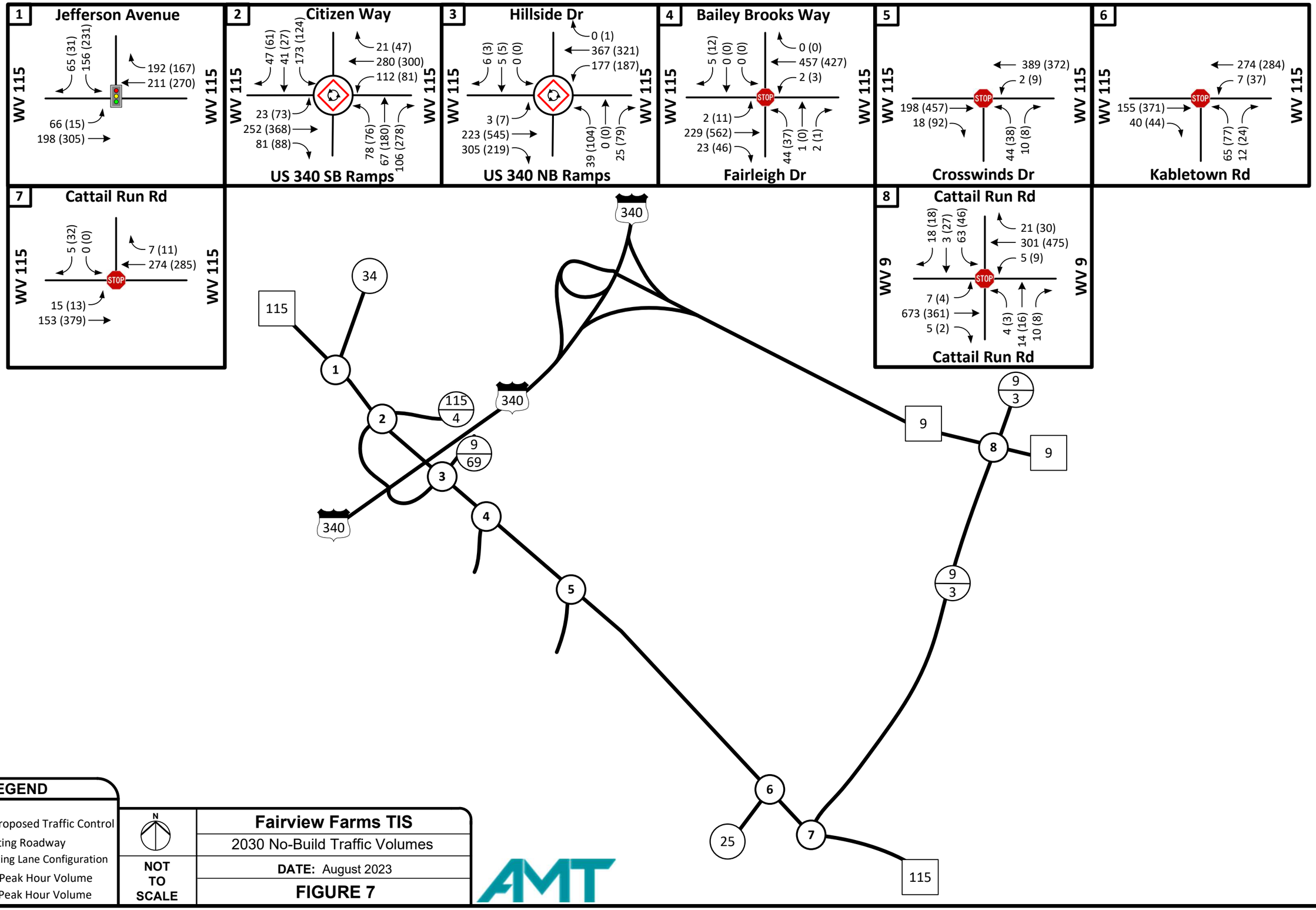
NOT TO SCALE

Fairview Farms TIS

Total Background Development Trips

DATE: August 2023

FIGURE 6


1
Jefferson Avenue
WV 115
WV 115
65 (31)
156 (231)
192 (167)
211 (270)
66 (15)
198 (305)
2
Citizen Way
47 (61)
41 (27)
173 (124)
21 (47)
280 (300)
112 (81)
23 (73)
252 (368)
81 (88)
78 (76)
67 (180)
106 (278)
US 340 SB Ramps
3
Hillside Dr
0 (1)
367 (321)
177 (187)
6 (3)
5 (5)
0 (0)
3 (7)
223 (545)
305 (219)
39 (104)
0 (0)
25 (79)
US 340 NB Ramps
4
Bailey Brooks Way
5 (12)
0 (0)
0 (0)
0 (0)
457 (427)
2 (3)
2 (11)
229 (562)
23 (46)
44 (37)
1 (0)
2 (1)
Fairleigh Dr
5
389 (372)
2 (9)
198 (457)
18 (92)
44 (38)
10 (8)
Crosswinds Dr
6
274 (284)
7 (37)
155 (371)
40 (44)
65 (77)
12 (24)
Kabletown Rd
7
Cattail Run Rd
5 (32)
0 (0)
7 (11)
274 (285)
15 (13)
153 (379)
8
Cattail Run Rd
WV 9
WV 9
18 (18)
3 (27)
63 (46)
21 (30)
301 (475)
5 (9)
7 (4)
673 (361)
5 (2)
4 (3)
14 (16)
10 (8)
Cattail Run Rd
340
34
115
1
2
115
4
340
9
69
3
4
5
6
25
7
115
9
3
8
9
9
3
340
LEGEND
Proposed Traffic Control
Existing Roadway
Existing Lane Configuration
XX AM Peak Hour Volume
(XX) PM Peak Hour Volume
N
NOT TO SCALE
Fairview Farms TIS
2030 No-Build Traffic Volumes
DATE: August 2023
FIGURE 7
AMT

TRIP GENERATION

The proposed Fairview Farms mixed-use development includes 267 single-family homes, 200 townhomes, and 99,000 sf of self-storage. Trip generation "Peak Hour of Generator" rates from ITE Trip Generation Manual, 11th Edition, were utilized for Self-Storage (LUC 151), Single-Family Detached Housing (LUC 210), and Multifamily Housing (LUC 220). As shown in **Table 2** below, the proposed development will generate a total of 4,133 new daily trips including 335 AM peak hour trips and 421 PM peak hour trips.

Table 2: Trip Generation Summary

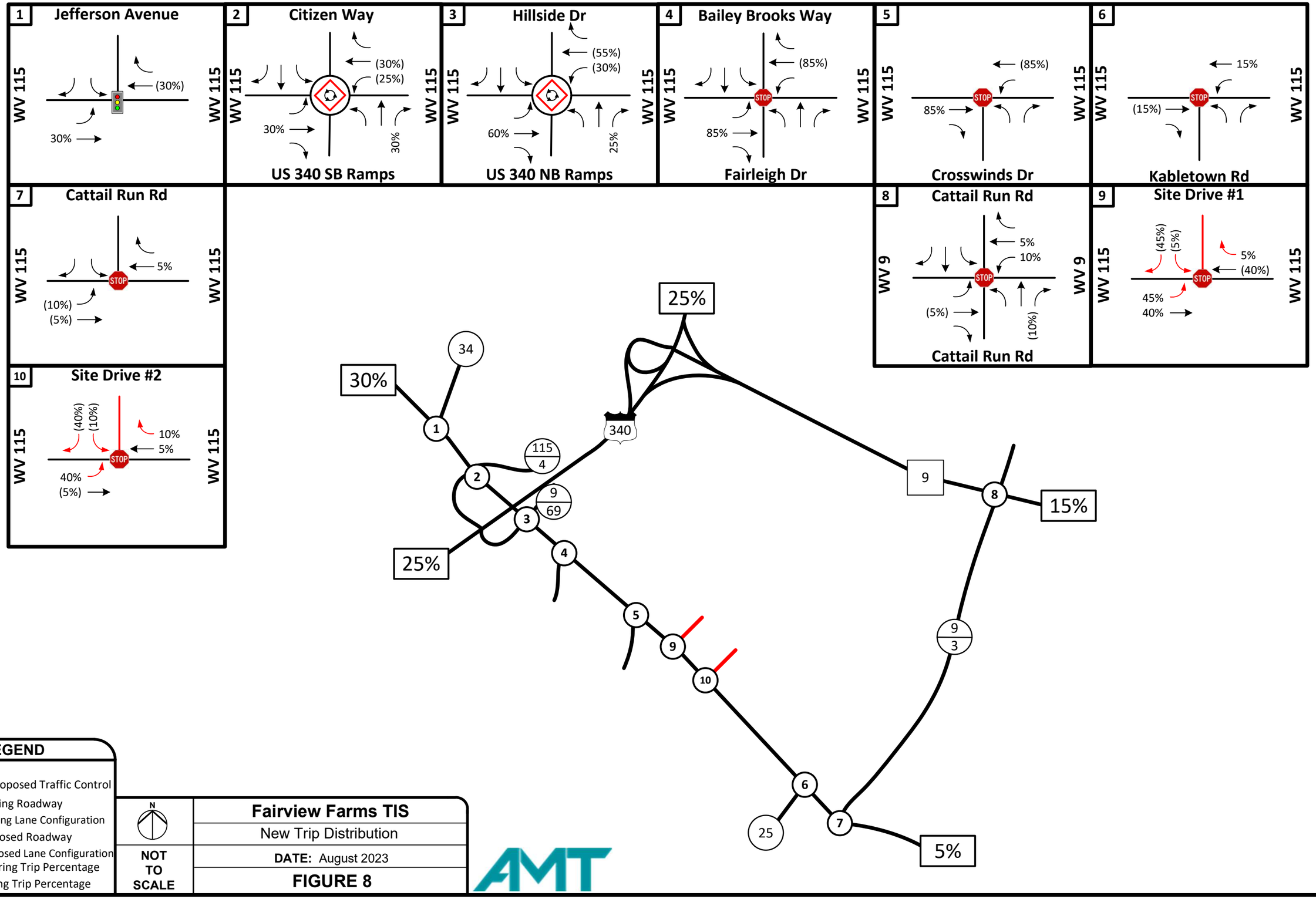
Description	LUC	Density		Daily Trips	AM Peak			PM Peak		
					Enter	Exit	Total	Enter	Exit	Total
Self Storage Facility	151	99,000	S.F.	149	10	10	20	10	10	20
Single-Family Homes	210	267	Units	2,520	53	150	203	171	96	267
Townhomes	220	200	Units	1,464	31	81	112	79	55	134
Net New External Trips				**4,133**	**94**	**241**	**335**	**260**	**161**	**421**

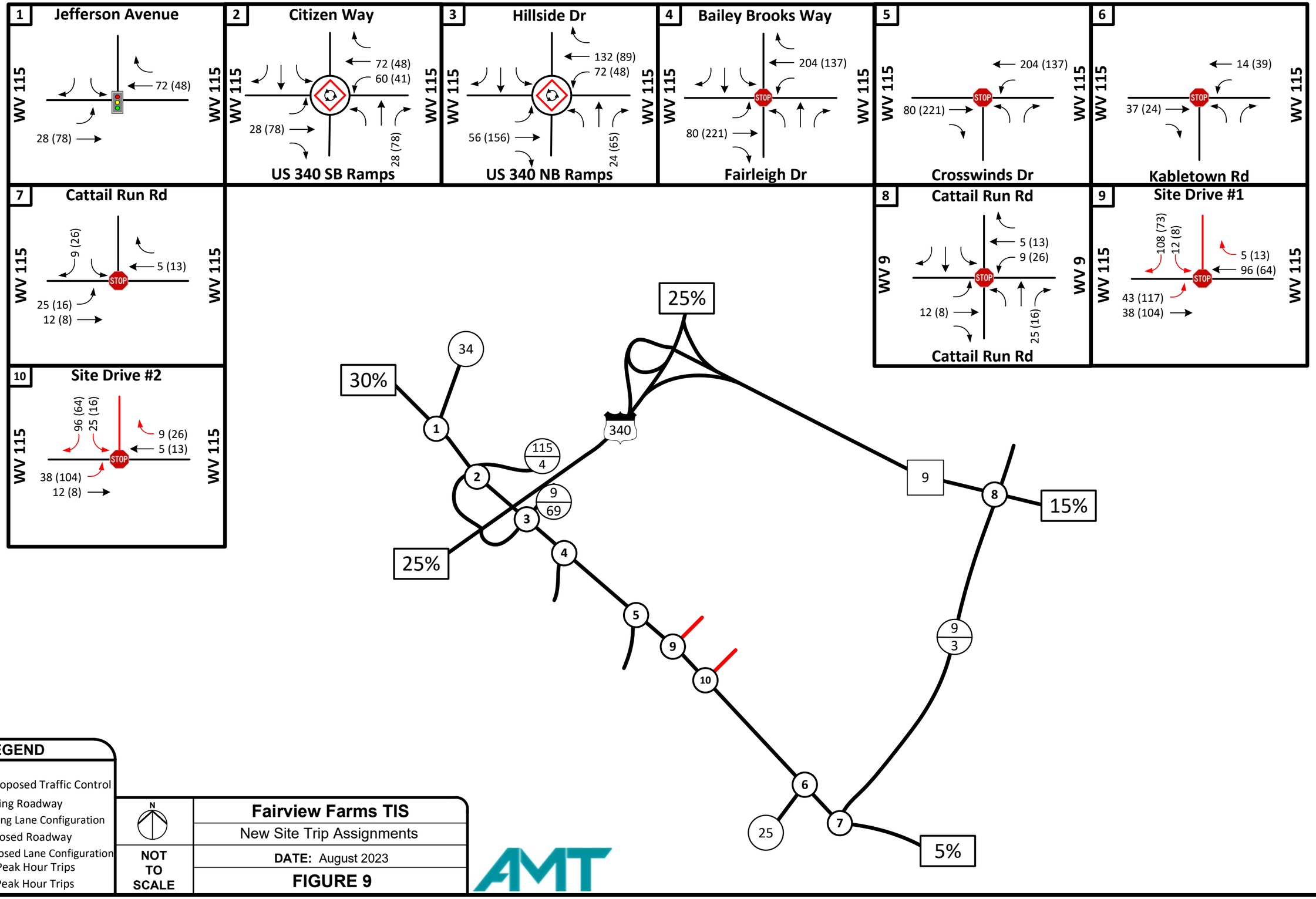
TRIP DISTRIBUTION

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 25% to/from the north on US 340
- 25% to/from the south on US 340
- 15% to/from the east on WV 9
  - 10% to/from north via Cattail Run Road
  - 5% to/from north via US 340
- 30% to/from the west on WV 115
- 5% to/from the east on WV 115

The external trip distribution percentages are shown on **Figure 8** and the AM and PM peak hour new site trip assignments are shown on **Figure 9**.


1
Jefferson Avenue
WV 115
WV 115
(30%)
30%
2
Citizen Way
(30%)
(25%)
30%
30%
US 340 SB Ramps
3
Hillside Dr
(55%)
(30%)
60%
25%
US 340 NB Ramps
4
Bailey Brooks Way
(85%)
STOP
85%
Fairleigh Dr
5
(85%)
STOP
85%
Crosswinds Dr
6
15%
STOP
(15%)
Kabletown Rd
7
Cattail Run Rd
5%
STOP
(10%)
(5%)
8
Cattail Run Rd
WV 9
WV 9
5%
10%
STOP
(5%)
(10%)
Cattail Run Rd
9
Site Drive #1
(45%)
(5%)
5%
(40%)
STOP
45%
40%
10
Site Drive #2
(40%)
(10%)
10%
5%
STOP
40%
(5%)
25%
34
30%
1
340
115
4
2
9
69
3
4
25%
5
9
10
9
3
9
8
15%
6
25
7
5%
LEGEND
Proposed Traffic Control
Existing Roadway
Existing Lane Configuration
Proposed Roadway
Proposed Lane Configuration
XX% Entering Trip Percentage
(X%) Exiting Trip Percentage
N
NOT TO SCALE
Fairview Farms TIS
New Trip Distribution
DATE: August 2023
FIGURE 8
AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX AM Peak Hour Trips
- (XX) PM Peak Hour Trips

N

NOT TO SCALE

Fairview Farms TIS

New Site Trip Assignments

DATE: August 2023

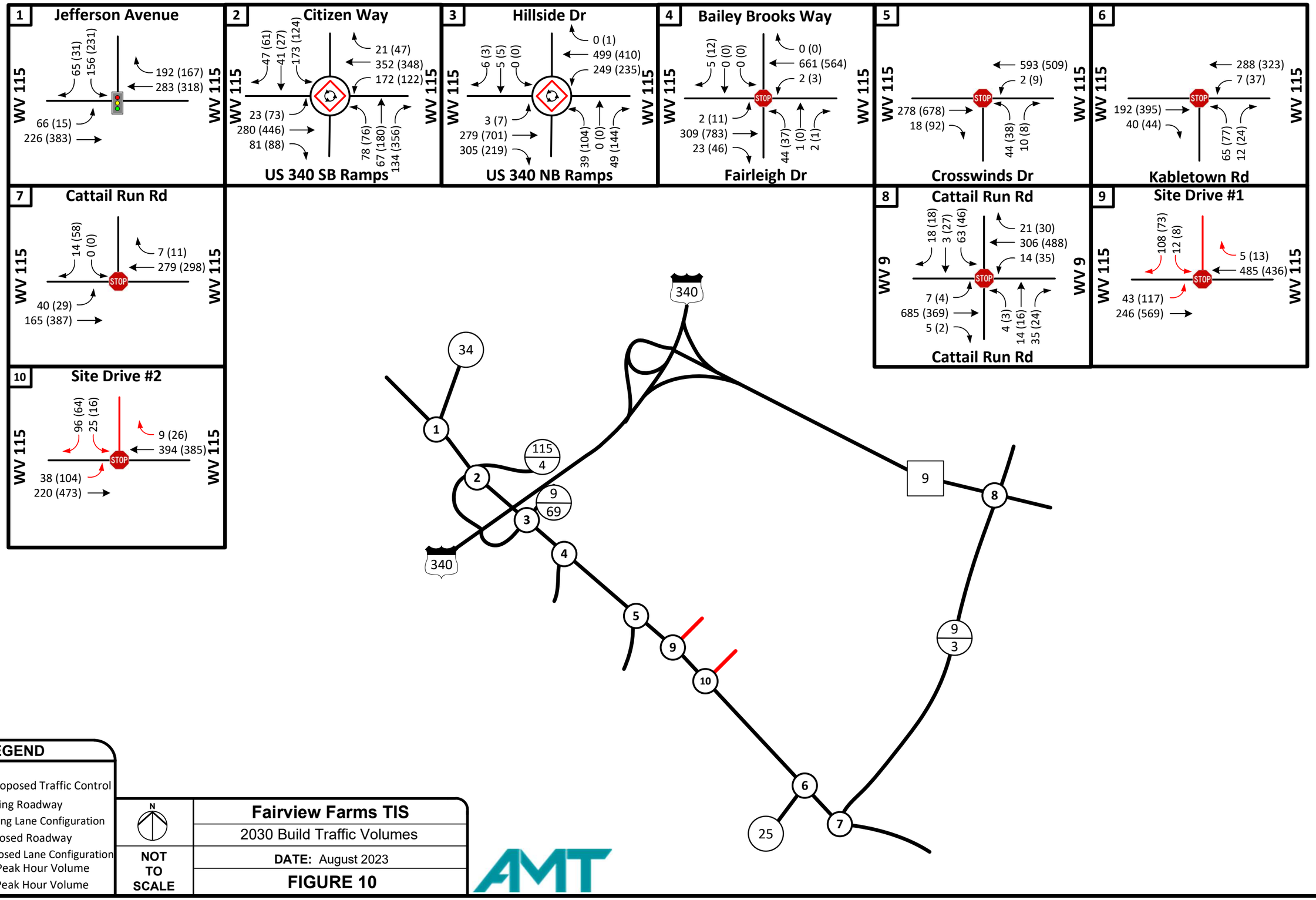
FIGURE 9

BUILD PROJECT TRAFFIC VOLUMES

2030 Build Conditions

The 2030 Build peak hour traffic volumes include existing 2022 traffic volumes, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, anticipated traffic generated by the Kings Crossing development, annual traffic growth prior to the year 2030, and traffic generated by build-out of the Fairview Farms development. Site generated traffic was distributed onto the transportation network based upon existing traffic patterns and anticipated origin and destination of the newly generated site trips (see **Figure 8** and **9**). The 2030 Build Traffic Volumes for the weekday AM and PM peak hour are shown on **Figure 10**.

The peak hour traffic forecast calculations spreadsheet is included in **Appendix B**.


1
Jefferson Avenue
WV 115
WV 115
65 (31)
156 (231)
192 (167)
283 (318)
66 (15)
226 (383)
2
Citizen Way
47 (61)
41 (27)
173 (124)
21 (47)
352 (348)
172 (122)
23 (73)
280 (446)
81 (88)
78 (76)
67 (180)
134 (356)
US 340 SB Ramps
3
Hillside Dr
6 (3)
5 (5)
0 (0)
0 (1)
499 (410)
249 (235)
3 (7)
279 (701)
305 (219)
39 (104)
0 (0)
49 (144)
US 340 NB Ramps
4
Bailey Brooks Way
5 (12)
0 (0)
0 (0)
0 (0)
661 (564)
2 (3)
2 (11)
309 (783)
23 (46)
44 (37)
1 (0)
2 (1)
Fairleigh Dr
5
593 (509)
2 (9)
278 (678)
18 (92)
44 (38)
10 (8)
Crosswinds Dr
6
288 (323)
7 (37)
192 (395)
40 (44)
65 (77)
12 (24)
Kabletown Rd
7
Cattail Run Rd
14 (58)
0 (0)
7 (11)
279 (298)
40 (29)
165 (387)
8
Cattail Run Rd
WV 9
WV 9
18 (18)
3 (27)
63 (46)
21 (30)
306 (488)
14 (35)
7 (4)
685 (369)
5 (2)
4 (3)
14 (16)
35 (24)
Cattail Run Rd
9
Site Drive #1
108 (73)
12 (8)
5 (13)
485 (436)
43 (117)
246 (569)
10
Site Drive #2
96 (64)
25 (16)
9 (26)
394 (385)
38 (104)
220 (473)
340
34
1
2
115
4
9
69
3
4
5
9
10
9
8
9
3
6
7
25
LEGEND
Proposed Traffic Control
Existing Roadway
Existing Lane Configuration
Proposed Roadway
Proposed Lane Configuration
XX AM Peak Hour Volume
(XX) PM Peak Hour Volume
N
NOT TO SCALE
Fairview Farms TIS
2030 Build Traffic Volumes
DATE: August 2023
FIGURE 10
AMT

CAPACITY ANALYSIS

The Highway Capacity Manual defines capacity as the maximum suitable flow rate at which vehicles reasonably can be expected to traverse a point during a specified time period. Capacity uses the measure of efficiency, Level-of-Service (LOS), to describe the traffic performance at intersections. LOS is defined for the overall intersection delay for signalized intersections. An acceptable LOS for a signalized intersection is considered to be LOS D or better (i.e. A, B, C or D).

At unsignalized intersections, the LOS is defined by the control delay for the movement that must yield right-of-way. It may be typical for stop-controlled minor streets to experience long delays during peak periods, while the majority of the traffic flows through the intersection on the major street travel unimpeded.

The procedures outlined in the Highway Capacity Manual; 6th Edition were used as guidelines for the analysis of the study area intersections. This manual provides procedures for the analysis of both signalized and unsignalized intersections. LOS categories range from LOS "A" (best) to "F" (worst) as shown in **Table 3**.

Table 3: Level of Service Criteria

Level of Service	SIGNALIZED Intersection Control Delay (sec/veh)	UNSIGNALIZED Intersection Control Delay (sec/veh)	Intersection LOS Description
A	≤ 10.0	≤ 10.0	Free flow, insignificant delays.
B	10.1-20.0	10.1-15.0	Stable operation, minimal delays.
C	20.1-35.0	15.1-25.0	Stable operation, acceptable delays.
D	35.1-55.0	25.1-35.0	Restricted flow, common delays.
E	55.1-80.0	35.1-50.0	Maximum capacity, extended delays. Volumes at or near capacity. Long queues form upstream from intersection.
F	> 80.0	> 50.0	Forced flow, excessive delays. Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

LOS analysis was completed through the use of Synchro, version 11.1 and Sidra, version 9.0. The software package categorizes the LOS based on HCM methodology and criteria. According to industry standards, any signalized intersection or any approach of an unsignalized intersection is considered acceptable if the average delay is at LOS D or better with LOS A representing little or no delay. Any signalized intersection or approach with a LOS of E or F is considered substandard and may need solutions to improve the operational performance. Copies of the Synchro analyses outputs for each analysis year/scenario are shown in **Appendix C**. Copies of the Sidra analyses outputs for each analysis year/scenario are shown in **Appendix E.**

2022 Existing Conditions Analysis

Since WV 115 and US 340 are both designated as N-S routes, establishment of approach directions utilized throughout the capacity analysis are based on WVDOH cardinal route direction of US 340. While maintaining US 340 as the north-south route through the study area, WV 115 was established as east-west. The bearing direction for WV 115 is east-west through the project area with WV 115 Northbound running west and WV 115 southbound running east.

WV 115 with Jefferson Avenue

Capacity analysis indicates the WV 115 eastbound left-turn movement to Jefferson Avenue currently operates at LOS A during both the AM and PM peak hours. The WV 115 westbound approach to Jefferson Avenue currently operates as free flow traveling unimpeded through the intersection. The Jefferson Avenue southbound approach operates at LOS C during both the AM and PM peak hours under stop control.

WV 115 with US 340 Southbound and Citizens Way

Analysis indicates that the WV 115 eastbound approach to US 340 Southbound/Citizen Way currently operates at LOS A during both the AM and PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Southbound/Citizen Way currently operates at LOS A during both the AM and PM peak hours. The US 340 Southbound Ramp northbound approach to WV 115 currently operates at LOS A during both the AM and PM peak hours. The Citizens Way southbound approach to WV 115 currently operates at LOS A during both AM and PM peak hours. The roundabout is anticipated to operate at an overall LOS A during both the AM and PM peak hours.

WV 115 with US 340 Northbound and Hillside Drive

Analysis indicates the WV 115 eastbound left-turn movement to Hillside Drive currently operates at LOS A both the AM and PM peak hours, while the thru/right movement currently operates as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to US 340 Northbound currently operates at LOS A during both the AM and PM peak hours, while the thru/right movement operates as free flow moving unimpeded through the intersection. The US 340 Northbound Ramp shared left/thru movement to WV 115 currently operates at LOS D during the AM peak hour and LOS F during the PM peak hour, while the right-turn movement currently operates at LOS B during both the AM and PM peak hours under stop control. The Hillside Drive southbound approach to WV 115 currently operates at LOS C during both the AM and PM peak hours under stop control.

WV 115 with Fairleigh Drive and Bailey Brooks Way

Analysis indicates the WV 115 eastbound left-turn movement to Bailey Brooks Way currently operates at LOS A during both the AM and PM peak hours. The WV 115 westbound left-turn movement to Fairleigh Drive currently operates at LOS A during both the AM and PM peak hours. The Fairleigh Drive northbound approach to WV 115 currently operates at LOS C during both the AM and PM peak hours under stop control. The Bailey Brooks Way southbound approach to WV 115 currently operates at LOS B during both the AM and PM peak hours under stop control.

WV 115 with Crosswinds Drive

Analysis indicates the WV 115 eastbound thru and exclusive right-turn movements to Crosswinds Drive currently operates as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to Crosswinds Drive currently operates at LOS A during both the AM and PM peak hours, while the thru movement currently operates as free-flow traveling unimpeded through the intersection. The Crosswinds Drive northbound left-turn movement to WV 115 currently operates at LOS B during the AM peak hour and LOS C during PM peak hour, while the right-turn movement currently operates at LOS A during the AM peak hour and LOS B during the PM peak hour under stop control.

WV 115 with Kabletown Road

Analysis indicates the WV 115 eastbound approach to Kabletown Road currently operates as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to Kabletown Road currently operates at LOS A during both the AM and PM peak hours. The Kabletown Road northbound approach to WV 115 currently operates at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

WV 115 with Cattail Run Road

Analysis indicates the WV 115 eastbound left-turn movement to Cattail Run Road currently operates at LOS A during both the AM and PM peak hours. The WV 115 westbound approach currently operates as free-flow traveling unimpeded through the intersection. The Cattail Run Road southbound approach to WV 115 currently operates at LOS B during both the AM and PM peak hours under stop control.

WV 9 with Cattail Run Road

Analysis indicates the WV 9 eastbound left-turn movement to Cattail Run Road currently operates at LOS A during both the AM and PM peak hours while the exclusive thru and right-turn movements operate as free-flow traveling unimpeded through the intersection. The WV 9 westbound left-turn movement to Cattail Run Road currently operates at LOS A during both the AM and PM peak hours while the exclusive thru and right-turn movements operate as free-flow traveling unimpeded through the intersection. The Cattail Run Road northbound approach to WV 9 currently operates at LOS C during both the AM and PM peak hours under stop control. The Cattail Run Road southbound approach to WV 9 currently operates at LOS C during both the AM and PM peak hours under stop control.

Figure 11 shows the LOS during the weekday AM and PM peak hours for the 2022 Existing Conditions for each lane group movement at each study intersection.

2030 No-Build Conditions Analysis

The 2030 No-Build peak hour traffic volumes include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, and an annual traffic growth prior to the year 2030.

Improvements included in the 2030 No-Build Conditions Analysis comprise installation of a traffic signal at WV 115 with Jefferson Avenue and construction of an exclusive left turn lane on WV 115 eastbound at

Jefferson Avenue. Both of these improvements were included in the Tate Manor TIS and expected to be implemented by 2030. In addition, construction of a single-lane roundabout at the WV 115 with US 340 NB Ramp/Hillside Drive is included in the 2030 No-Build conditions. This improvement is currently a planned project by WVDOH and requested to be included beginning in this scenario.

WV 115 with Jefferson Avenue

Following installation of a traffic signal, capacity analysis indicates the WV 115 eastbound approach is expected to operate at LOS A during both the AM and PM peak hours under signal control. The WV 115 westbound approach to Jefferson Avenue is expected to operate at LOS A during both the AM and PM peak hours. The Jefferson Avenue southbound approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The overall signalized intersection is expected to operate at LOS A during both AM and PM peak hours.

WV 115 with US 340 Southbound and Citizens Way

Analysis indicates that the WV 115 eastbound approach to US 340 Southbound/Citizen Way will continue to operate at a LOS A during both the AM and PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Southbound/Citizen Way will continue to operate at LOS A during both the AM and PM peak hours. The US 340 Southbound Ramp northbound approach to WV 115 is expected to operate at LOS A during the AM peak hour and LOS C during the PM peak hour. The Citizens Way southbound approach to WV 115 will continue to operate at LOS A during both AM and PM peak hours. The overall roundabout intersection is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour.

WV 115 with US 340 Northbound and Hillside Drive

Following construction of a single-lane roundabout, analysis indicates the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS C during the PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS A during both the AM and PM peak hours. The US 340 Northbound Ramp approach to WV 115 is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The Hillside Drive southbound approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The overall roundabout intersection is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour.

WV 115 with Fairleigh Drive and Bailey Brooks Way

Analysis indicates the WV 115 eastbound left-turn movement to Bailey Brooks Way will continue to operate at LOS A during both the AM and PM peak hours. The WV 115 westbound left-turn movement to Fairleigh Drive will continue to operate at LOS A during both the AM and PM peak hours. The Fairleigh Drive northbound approach to WV 115 is expected to operate at LOS C during the AM peak hour and LOS E during the PM peak hour under stop control. The Bailey Brooks Way southbound approach to WV 115 will continue to operate at LOS B during both the AM and PM peak hours under stop control.

WV 115 with Crosswinds Drive

Analysis indicates the WV 115 eastbound thru and exclusive right-turn movements to Crosswinds Drive will continue to operate as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to Crosswinds Drive will continue to operate at LOS A during both the AM and PM peak hours, while the through movement will continue to operate as free-flow traveling unimpeded through the intersection. The Crosswinds Drive northbound left-turn movement to WV 115 will continue to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour, while the right-turn movement will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour under stop control.

WV 115 with Kabletown Road

Analysis indicates the WV 115 eastbound approach to Kabletown Road will continue to operate as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to Kabletown Road will continue to operate at LOS A during both the AM and PM peak hours. The Kabletown Road northbound approach to WV 115 will continue to operate at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

WV 115 with Cattail Run Road

Analysis indicates the WV 115 eastbound left-turn movement to Cattail Run Road will continue to operate at LOS A during both the AM and PM peak hours. The WV 115 westbound approach will continue to operate as free-flow traveling unimpeded through the intersection. The Cattail Run Road southbound approach to WV 115 will continue to operate at LOS B during both the AM and PM peak hours under stop control.

WV 9 with Cattail Run Road

Analysis indicates the WV 9 eastbound left-turn movement to Cattail Run Road will continue to operate at LOS A during both the AM and PM peak hours while the exclusive thru and right-turn movements will continue to operate as free-flow traveling unimpeded through the intersection. The WV 9 westbound left-turn movement to Cattail Run Road will continue to operate at LOS A during both the AM and PM peak hours while the exclusive thru and right-turn movements operate as free-flow traveling unimpeded through the intersection. The Cattail Run Road northbound approach to WV 9 will continue to operate at LOS C during both the AM and PM weekday peak hours under stop control. The Cattail Run Road southbound approach to WV 9 will continue to operate at LOS C during both the AM and PM peak hours under stop control.

Figure 12 shows the LOS during the weekday AM and PM peak hours for the 2030 No-Build Conditions for each lane group movement at each study intersection.

2030 Build Conditions Analysis

The 2030 Build Conditions include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, an annual traffic growth prior to the year 2030, and the traffic generated by build-out of the Fairview Farms development.

Improvements included in the 2030 Build Conditions comprise construction of the two site driveways intersecting with WV 115.

WV 115 with Jefferson Avenue

Capacity analysis indicates the WV 115 eastbound approach to Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours under signal control. The WV 115 westbound approach to Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The Jefferson Avenue southbound approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours. The overall signalized intersection will continue to operate at LOS A during both AM and PM peak hours.

WV 115 with US 340 Southbound and Citizens Way

Analysis indicates that the WV 115 eastbound approach to US 340 Southbound/Citizen Way is expected to operate at LOS B during both the AM and PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Southbound/Citizen Way approach is expected to operate at LOS B during both the AM and PM peak hours. The US 340 Southbound Ramp northbound approach to WV 115 is expected to operate at LOS B during the AM peak hour and LOS E during the PM peak hour. The Citizens Way southbound approach to WV 115 is expected to operate at LOS B during the AM peak hour and LOS A during the PM peak hour. The overall roundabout intersection is expected to operate at LOS B during the AM peak hour and LOS C during the PM peak hour.

WV 115 with US 340 Northbound and Hillside Drive

Analysis indicates the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS B during the AM peak hour and LOS E during the PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS B during both the AM and PM peak hours. The US 340 Northbound Ramp approach to WV 115 is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The Hillside Drive southbound approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours. The overall roundabout intersection is expected to operate at LOS B during the AM peak hour and LOS D during the PM peak hour.

WV 115 with Fairleigh Drive and Bailey Brooks Way

Capacity analysis indicates the WV 115 eastbound left-turn movement to Bailey Brooks Way will continue to operate at LOS A during both the AM and PM peak hours. The WV 115 westbound left-turn movement to Fairleigh Drive will continue to operate at LOS A during both the AM and PM peak hours. The Fairleigh Drive northbound approach to WV 115 is expected to operate at LOS D during the AM peak hour and LOS F during the PM peak hour under stop control. The Bailey Brooks Way southbound approach to WV 115 will continue to operate at LOS B during both the AM and PM peak hours under stop control.

WV 115 with Crosswinds Drive

Analysis indicates the WV 115 eastbound thru and exclusive right-turn movements to Crosswinds Drive will continue to operate as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to Crosswinds Drive will continue to operate at LOS A during both the AM

and PM peak hours, while the thru movement will continue to operate as free-flow traveling unimpeded through the intersection. The Crosswinds Drive northbound left-turn movement to WV 115 is expected to operate at LOS C during the AM peak hour and LOS E during the PM peak hour, while the right-turn movement is expected to operate at LOS B during both the AM and PM peak hours under stop control.

WV 115 with Kabletown Road

Analysis indicates the WV 115 eastbound approach to Kabletown Road will continue to operate as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to Kabletown Road will continue to operate at LOS A during both the AM and PM peak hours. The Kabletown Road northbound approach to WV 115 will continue to operate at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

WV 115 with Cattail Run Road

Analysis indicates the WV 115 eastbound left-turn movement to Cattail Run Road will continue to operate at LOS A during both the AM and PM peak hours. The WV 115 westbound approach will continue to operate as free-flow traveling unimpeded through the intersection. The Cattail Run Road southbound approach to WV 115 will continue to operate at LOS B during both the AM and PM peak hours under stop control.

WV 9 with Cattail Run Road

Analysis indicates the WV 9 eastbound left-turn movement to Cattail Run Road will continue to operate at LOS A during both the AM and PM peak hours while the exclusive thru and right-turn movements will continue to operate as free-flow traveling unimpeded through the intersection. The WV 9 westbound left-turn movement to Cattail Run Road will continue to operate at LOS A during both the AM and PM peak hours while the exclusive thru and right-turn movements operate as free-flow traveling unimpeded through the intersection. The Cattail Run Road northbound approach to WV 9 will continue to operate at LOS C during both the AM and PM peak hours under stop control. The Cattail Run Road southbound approach to WV 9 is expected to operate at LOS C during the AM peak hour and LOS D during the PM peak hour under stop control.

WV 115 with Site Drive #1

Analysis indicates that the WV 115 eastbound left-turn movement to Site Drive #1 is expected operate at LOS A during both the AM and PM peak hours. The WV 115 westbound approach to Site Drive #1 is expected to operate as free-flow traveling unimpeded through the intersection. The Site Drive #1 southbound approach to WV 115 is expected to operate at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

WV 115 with Site Drive #2

Analysis indicates that the WV 115 eastbound left-turn movement to Site Drive #2 is expected to operate at LOS A during both the AM and PM peak hours. The WV 115 westbound approach to Site Drive #2 is expected to operate as free-flow traveling unimpeded through the intersection. The Site Drive #2 southbound approach to WV 115 is expected to operate at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

Figure 13 shows the LOS during the weekday AM and PM peak hours for the 2030 Build Conditions for each lane group movement at each study intersection.

2030 Build Improved Conditions Analysis

Improvements included in the 2030 Build Improved Conditions comprise construction of a right-turn slip lane on the US 340 Southbound Ramp to WV 115, construction of a right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramp/Hillside Drive, construction of an exclusive left-turn lane on WV 115 eastbound approach to Site Drive #1, and construction of an exclusive left-turn lane on WV 115 eastbound approach to Site Drive #2.

Additional analysis is provided for the intersections with proposed improvements implemented. Remaining intersections will operate as described in 2030 Build Conditions and do not necessitate physical improvements.

WV 115 with US 340 Southbound and Citizens Way

Following construction of a northbound exclusive right-turn lane, capacity analysis indicates that the WV 115 eastbound approach to US 340 Southbound/Citizen Way will continue to operate at LOS B during both the AM and PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Southbound/Citizens Way will continue to operate at LOS B during both the AM and PM peak hours. The US 340 Southbound Ramps northbound left/thru movement to WV 115 is expected to operate at LOS A during the both AM and PM peak hours, while the right-turn movement is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The Citizens Way southbound approach to WV 115 will continue to operate at LOS B during the AM peak hour and LOS A during the PM peak hour. The roundabout is anticipated to operate at an overall LOS B during both the AM and PM peak hours.

WV 115 with US 340 Northbound and Hillside Drive

Following construction of an exclusive right-turn lane on the WV 115 eastbound approach, analysis indicates the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Northbound Ramps/Hillside Drive will continue to operate at LOS B during both the AM and PM peak hours. The US 340 Northbound Ramp approach to WV 115 will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The Hillside Drive southbound approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours. The overall roundabout intersection is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour.

WV 115 with Site Drive #1

Following construction of an eastbound exclusive left-turn lane, capacity analysis indicates that the WV 115 eastbound left-turn movement to Site Drive #1 is expected to operate at LOS A during both the AM and PM peak hours, while the thru movement will operate as free-flow traveling unimpeded through the intersection. The WV 115 westbound approach to Site Drive #1 will continue to operate as free-flow traveling unimpeded through the intersection. The Site Drive #1 southbound approach to WV 115 will continue to operate at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

WV 115 with Site Drive #2

Following construction of an eastbound exclusive left-turn lane, capacity analysis indicates that the WV 115 eastbound left-turn movement to Site Drive #2 is expected to operate at LOS A during both the AM and PM peak hours, while the thru movement will operate as free-flow traveling unimpeded through the intersection. The WV 115 westbound approach to Site Drive #2 will continue to operate as free-flow traveling unimpeded through the intersection. The Site Drive #2 southbound approach to WV 115 will continue to operate at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

Figure 14 shows the LOS during the weekday AM and PM peak hours for the 2030 Build Improved Conditions for each lane group movement at each study intersection.

Table 4 shows the LOS results for the intersections within the study area during the weekday AM and PM peak hours for the 2022 Existing Conditions, 2030 No-Build Conditions, 2030 Build Conditions, and 2030 Build Improved Conditions.

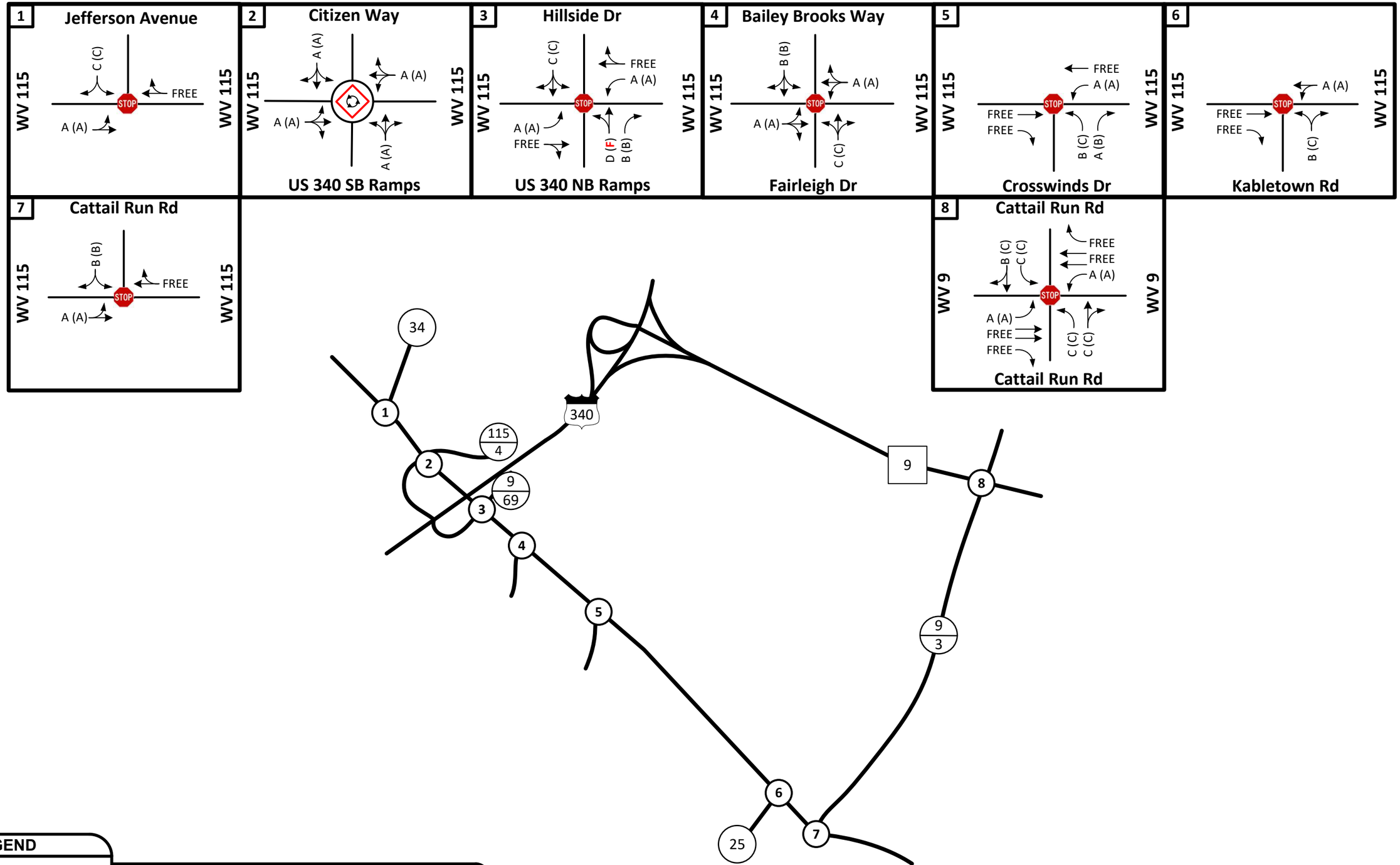
Table 4: Level of Service Analysis Summary

Intersection	Movement	2022 Existing Conditions				2030 No-Build Conditions				2030 Build Conditions				2030 Build Improved Conditions			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Intersection 1 - WV 115 (Charles Town Road) with Jefferson Avenue	EB Left-Turn	A	8.3	A	8.1	A	7.9	A	7.1	A	8.5	A	7.3	A	8.5	A	7.3
	EB Thru	N/A	N/A	N/A	N/A	A	4.3	A	4.8	A	4.1	A	5.0	A	4.1	A	5.0
	EB Approach	N/A	2.2	N/A	0.4	A	5.2	A	4.9	A	5.1	A	5.0	A	5.1	A	5.0
	WB Thru/Right	N/A	FREE	N/A	FREE	A	6.0	A	6.0	A	6.0	A	6.0	A	6.0	A	6.0
Proposed Three-Leg Signalized Intersection	WB Approach	N/A	0.0	N/A	0.0	A	6.0	A	6.0	A	6.0	A	6.0	A	6.0	A	6.0
	SB Left/Right	C	20.6	C	19.5	A	8.1	A	7.0	A	9.3	A	7.7	A	9.3	A	7.7
	SB Approach	C	20.6	C	19.5	A	8.1	A	7.0	A	9.3	A	7.7	A	9.3	A	7.7
Existing Three-Leg Unsignalized Intersection (TWSC)	Overall	N/A	N/A	N/A	N/A	A	6.3	A	5.9	A	6.5	A	6.1	A	6.5	A	6.1
Intersection 2 - WV 115 (Charles Town Road) with US 340 Southbound/Citizens Way	EB Left/Thru/Right	A	6.2	A	6.7	A	9.5	A	9.4	B	11.5	B	12.0	B	11.5	B	12.0
	EB Approach	A	6.2	A	6.7	A	9.5	A	9.4	B	11.5	B	12.0	B	11.5	B	12.0
	WB Left/Thru/Right	A	6.2	A	6.0	A	7.9	A	9.2	B	10.4	B	11.1	B	10.4	B	11.1
	WB Approach	A	6.2	A	6.0	A	7.9	A	9.2	B	10.4	B	11.1	B	10.4	B	11.1
	NB Left/Thru/Right	A	5.8	A	8.4	A	9.1	C	20.6	B	10.3	**E**	**40.8**	N/A	N/A	N/A	N/A
	NB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	6.4	A	9.0
	NB Right-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	6.1	B	10.2
	NB Approach	A	5.8	A	8.4	A	9.1	C	20.6	B	10.3	**E**	**40.8**	A	6.3	A	9.7
	SB Left/Thru/Right	A	5.5	A	5.1	A	9.5	A	7.1	B	12.5	A	8.1	B	12.5	A	8.1
	SB Approach	A	5.5	A	5.1	A	9.5	A	7.1	B	12.5	A	8.1	B	12.5	A	8.1
Existing Four-Leg Roundabout Intersection	Overall	A	6.1	A	6.9	A	8.9	B	12.6	B	11.1	C	20.4	B	10.3	B	10.6
Intersection 3 - WV 115 (Charles Town Road) with US 340 Northbound/Hillside Drive	EB Left-Turn	A	7.9	A	7.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Thru/Right	N/A	FREE	N/A	FREE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Left/Thru/Right	N/A	N/A	N/A	N/A	A	9.6	C	17.3	B	12.8	**E**	**43.0**	N/A	N/A	N/A	N/A
	EB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	6.2	B	14.3
	EB Right-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	6.4	A	5.3
	EB Approach	N/A	0.1	N/A	0.1	A	9.6	C	17.3	B	12.8	**E**	**43.0**	A	6.3	B	12.2
	WB Left-Turn	A	8.5	A	9.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	WB Thru/Right	N/A	FREE	N/A	FREE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	WB Left/Thru/Right	N/A	N/A	N/A	N/A	A	7.5	A	7.9	B	10.8	B	10.2	B	10.8	B	10.2
	WB Approach	N/A	2.7	N/A	3.5	A	7.5	A	7.9	B	10.8	B	10.2	B	10.8	B	10.2
	NB Left/Thru	D	25.3	**F**	**66.8**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	NB Right-Turn	B	10.0	B	12.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Proposed Four-Leg Roundabout Intersection in 2030 No-Build Conditions	NB Left/Thru/Right	N/A	N/A	N/A	N/A	A	4.0	A	8.2	A	4.6	B	12.9	A	4.6	B	12.9
	NB Approach	C	19.3	**E**	**42.8**	A	4.0	A	8.2	A	4.6	B	12.9	A	4.6	B	12.9
	SB Left/Thru/Right	C	16.3	C	24.3	A	5.4	A	5.5	A	6.8	A	6.4	A	6.8	A	6.4
	SB Approach	C	16.3	C	24.3	A	5.4	A	5.5	A	6.8	A	6.4	A	6.8	A	6.4
Existing Four-Leg Unsignalized Intersection (TWSC)	Overall	N/A	N/A	N/A	N/A	A	8.3	B	12.8	B	11.2	D	27.1	A	8.5	B	11.5
Intersection 4 - WV 115 (Charles Town Road) with Fairleigh Drive/Bailey Brooks Way	EB Left-Turn	A	8.2	A	8.2	A	8.4	A	8.4	A	9.2	A	8.9	A	9.2.	A	8.9
	EB Approach	N/A	0.1	N/A	0.2	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.1
	WB Left-Turn	A	7.7	A	8.6	A	7.8	A	9.0	A	8.1	A	10.0	A	8.1	A	10.0
	WB Approach	N/A	0.0	N/A	0.1	N/A	0.0	N/A	0.1	N/A	0.0	N/A	0.1	N/A	0.0	N/A	0.1
	NB Left/Thru/Right	C	15.8	C	24.6	C	19.2	**E**	**35.4**	D	32.2	**F**	**88.1**	D	32.2	**F**	**88.1**
	NB Approach	C	15.8	C	24.6	C	19.2	**E**	**35.4**	D	32.2	**F**	**88.1**	D	32.2	**F**	**88.1**
	SB Left/Thru/Right	B	10.7	B	10.7	B	11.5	B	11.3	B	13.9	B	12.8	B	13.9	B	12.8
Existing Four-Leg Unsignalized Intersection (TWSC)	SB Approach	B	10.7	B	10.7	B	11.5	B	11.3	B	13.9	B	12.8	B	13.9	B	12.8
Intersection 5 - WV 115 (Charles Town Road) with Crosswinds Drive	EB Thru	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	EB Right-Turn	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	EB Approach	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0
	WB Left-Turn	A	7.6	A	8.4	A	7.7	A	8.8	A	7.9	A	9.7	A	7.9	A	9.7
	WB Thru	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	WB Approach	N/A	0.0	N/A	0.2	N/A	0.0	N/A	0.2	N/A	0.0	N/A	0.2	N/A	0.0	N/A	0.2
	NB Left-Turn	B	12.6	C	16.2	B	14.4	C	20.1	C	20.3	**E**	**35.6**	C	20.3	**E**	**35.6**
	NB Right-Turn	A	9.2	B	10.7	A	9.4	B	11.6	B	10.0	B	14.2	B	10.0	B	14.2
Existing Three-Leg Unsignalized Intersection (TWSC)	NB Approach	B	12.0	C	15.3	B	13.5	C	18.6	C	18.4	D	31.9	C	18.4	D	31.9

Table 4 Continued

Intersection	Movement	2022 Existing Conditions				2030 No-Build Conditions				2030 Build Conditions				2030 Build Improved Conditions			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Intersection 6 - WV 115 (Charles Town Road) with Kabletown Road (CR 25)	EB Thru	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	EB Right-Turn	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	EB Approach	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0
	WB Left-Turn	A	7.6	A	8.2	A	7.7	A	8.3	A	7.8	A	8.4	A	7.8	A	8.4
	WB Approach	N/A	0.2	N/A	1.0	N/A	0.2	N/A	1.0	N/A	0.2	N/A	0.9	N/A	0.2	N/A	0.9
	NB Left/Right	B	11.8	C	15.6	B	13.8	C	17.5	B	13.2	C	19.1	B	13.2	C	19.1
Existing Three-Leg Unsignalized Intersection (TWSC)	NB Approach	B	11.8	C	15.6	B	13.8	C	17.5	B	13.2	C	19.1	B	13.2	C	19.1
Intersection 7 - WV 115 (Charles Town Road) with Cattail Run Road (CR 9/3)	EB Left-Turn	A	7.9	A	7.9	A	8.0	A	7.9	A	8.1	A	8.0	A	8.1	A	8.0
	EB Approach	N/A	0.0	N/A	0.3	N/A	0.7	N/A	0.3	N/A	1.6	N/A	0.6	N/A	1.6	N/A	0.6
	WB Thru/Right	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	WB Approach	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0
	SB Left/Right	B	10.0	B	10.0	B	10.2	B	10.2	B	10.4	B	10.5	B	10.4	B	10.5
Existing Three-Leg Unsignalized Intersection (TWSC)	SB Approach	B	10.0	B	10.0	B	10.2	B	10.2	B	10.4	B	10.5	B	10.4	B	10.5
Intersection 8 - WV 9 with Cattail Run Road (CR 9/3)	EB Left-Turn	A	7.9	A	8.6	A	8.0	A	8.8	A	8.0	A	8.9	A	8.0	A	8.9
	EB Thru	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	EB Right-Turn	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	EB Approach	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.1
	WB Left-Turn	A	8.9	A	8.2	A	9.1	A	8.3	A	9.2	A	8.4	A	9.2	A	8.4
	WB Thru	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	WB Right-Turn	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	WB Approach	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.1	N/A	0.4	N/A	0.5	N/A	0.4	N/A	0.5
	NB Left-Turn	C	19.2	C	18.5	C	21.5	C	20.7	C	22.7	C	24.0	C	22.7	C	24.0
	NB Thru/Right	C	16.7	C	18.1	C	18.4	C	20.0	C	15.6	C	18.1	C	15.6	C	18.1
	NB Approach	C	17.1	C	18.1	C	18.8	C	20.1	C	16.1	C	18.5	C	16.1	C	18.5
	SB Left-Turn	C	18.2	C	22.3	C	20.7	D	26.4	C	23.1	D	33.7	C	23.1	D	33.7
	SB Thru/Right	B	10.9	C	18.0	B	11.2	C	20.0	B	11.4	C	22.8	B	11.4	C	22.8
Existing Four-Leg Unsignalized Intersection (TWSC)	SB Approach	C	16.4	C	20.2	C	18.3	C	23.2	C	20.2	D	28.3	C	20.2	D	28.3
Intersection 9 - WV 115 (Charles Town Road) with Site Drive #1	EB Left-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	8.7	A	8.8	A	8.7	A	8.8
	EB Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	FREE	N/A	FREE
	EB Approach	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.3	N/A	1.5	N/A	1.3	N/A	1.5
	WB Thru/Right	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	WB Approach	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0
	SB Left/Right	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	14.9	C	15.6	B	14.9	C	15.2
Proposed Three-Leg Unsignalized Intersection (TWSC)	SB Approach	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	14.9	C	15.6	B	14.9	C	15.2
Intersection 10 - WV 115 (Charles Town Road) with Site Drive #2	EB Left-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	8.4	A	8.6	A	8.4	A	8.6
	EB Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	FREE	N/A	FREE
	EB Approach	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.2	N/A	1.6	N/A	1.2	N/A	1.6
	WB Thru/Right	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	WB Approach	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0
	SB Left/Right	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	14.0	C	16.3	B	14.0	C	15.9
Proposed Three-Leg Unsignalized Intersection (TWSC)	SB Approach	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	14.0	C	16.3	B	14.0	C	15.9

** = Delay exceeding 200 sec/veh



LEGEND

- Existing Traffic Control
- Existing Roadway
- Existing Lane Configuration
- A — AM Level of Service
- (A) — PM Level of Service

N

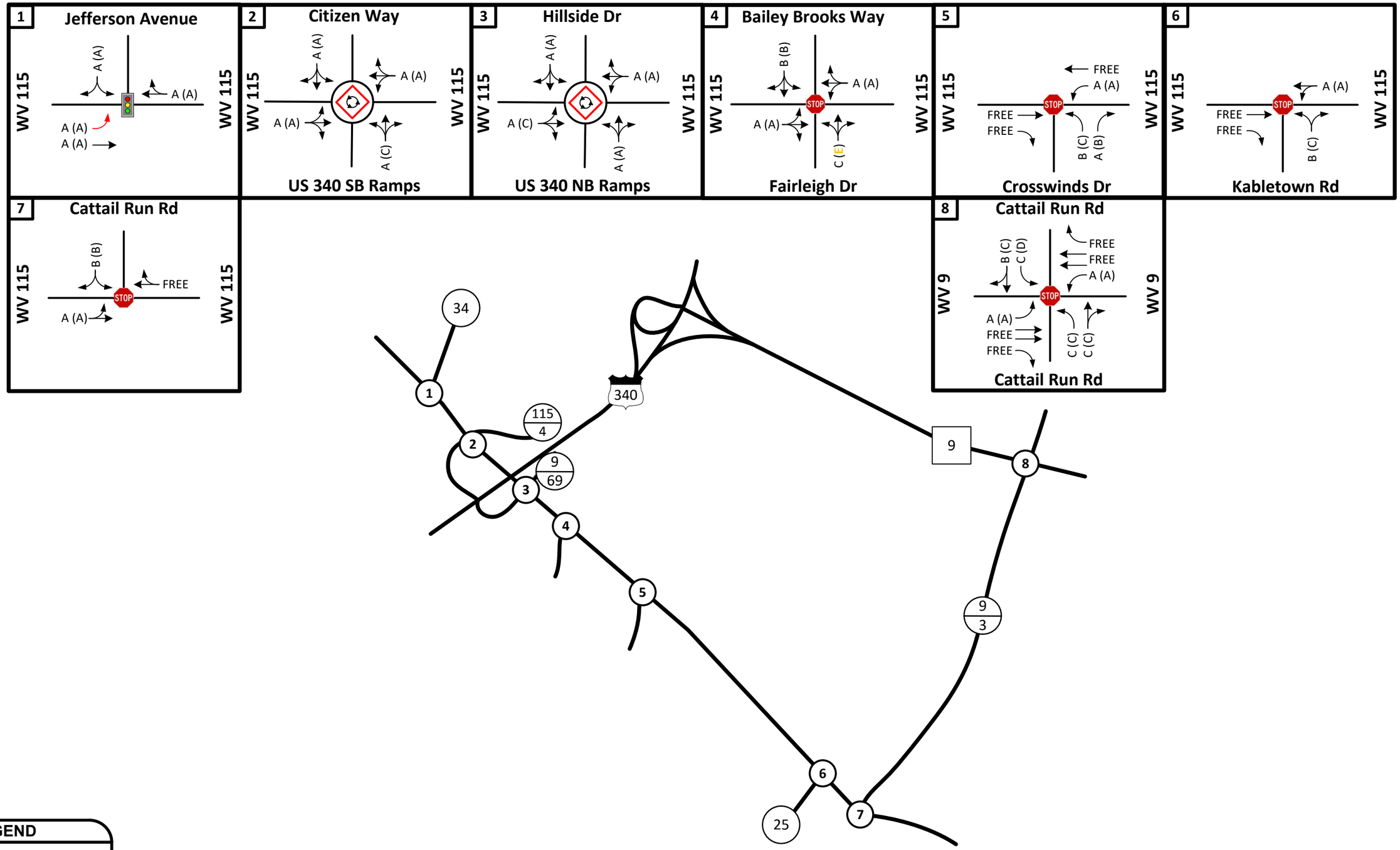
NOT TO SCALE

Fairview Farms TIS

2022 Existing Level of Service

DATE: August 2023

FIGURE 11



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Lane Configuration
- X AM Level of Service
- (X) PM Level of Service

N

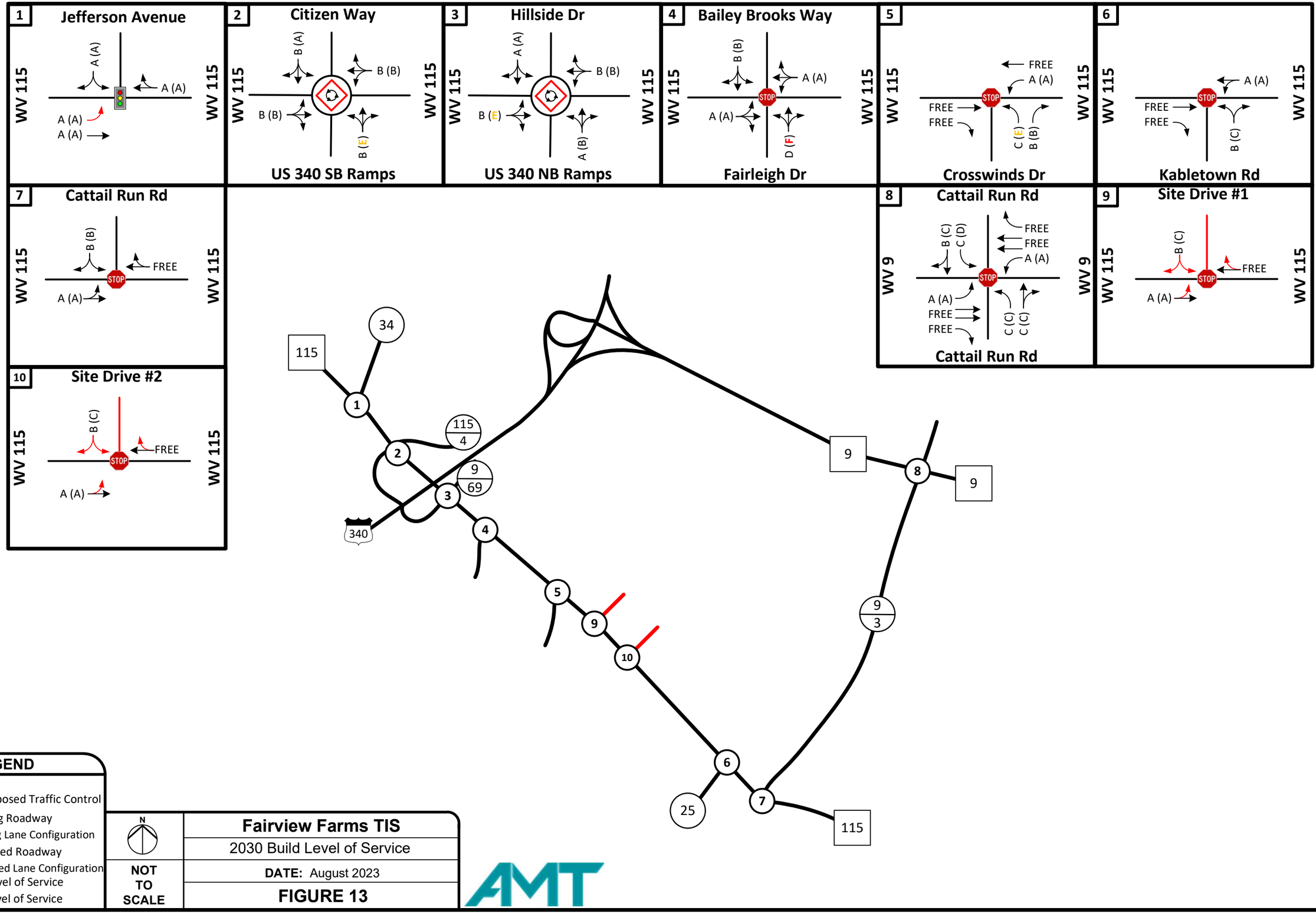
NOT TO SCALE

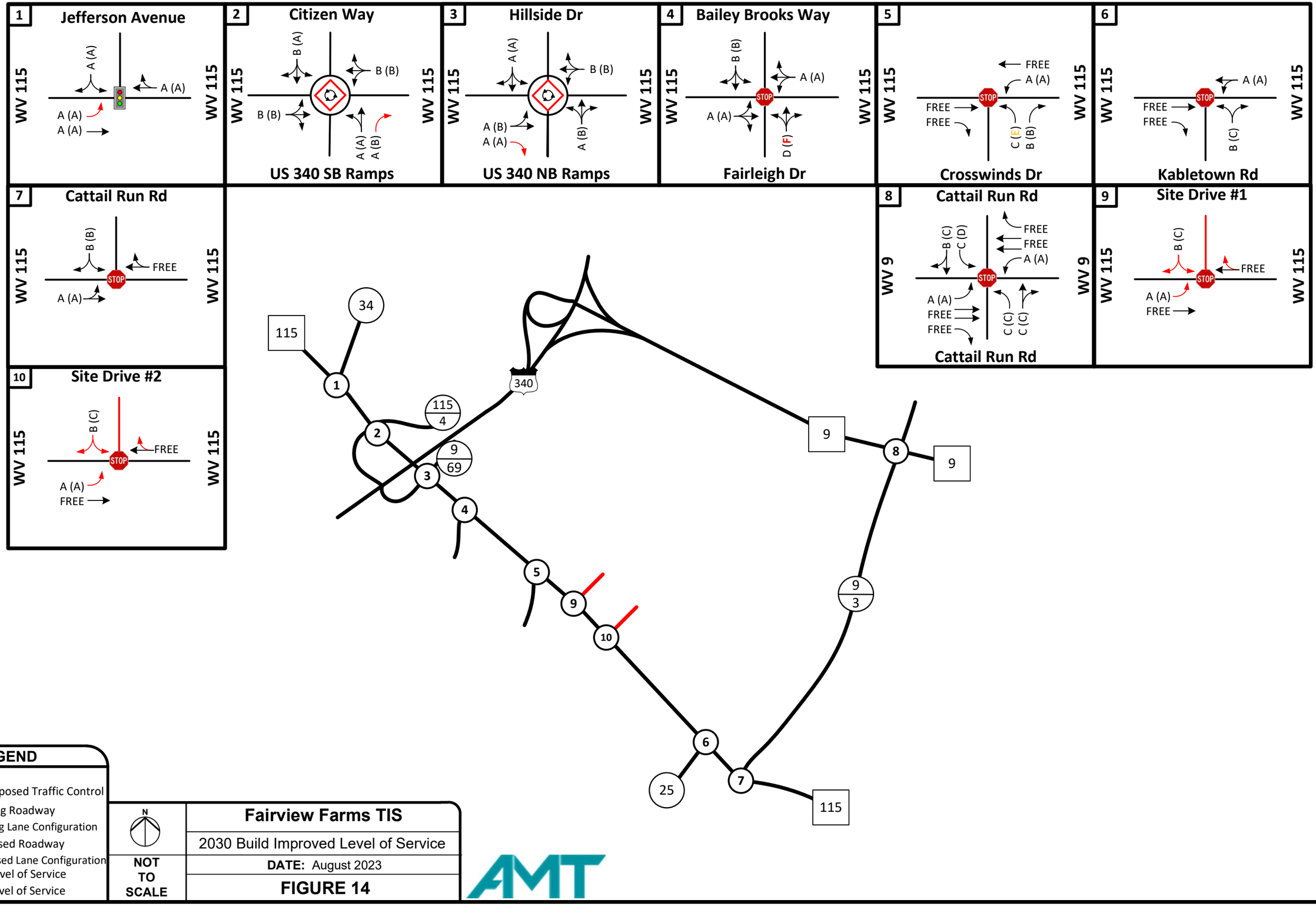
Fairview Farms TIS

2030 No-Build Level of Service

DATE: August 2023

FIGURE 12


1
Jefferson Avenue
WV 115
WV 115
A (A)
A (A)
A (A)
2
Citizen Way
B (A)
B (B)
B (B)
B (E)
US 340 SB Ramps
3
Hillside Dr
A (A)
B (B)
B (E)
A (B)
US 340 NB Ramps
4
Bailey Brooks Way
B (B)
A (A)
STOP
A (A)
D (F)
Fairleigh Dr
5
FREE
A (A)
FREE
FREE
C (E)
B (B)
Crosswinds Dr
6
A (A)
FREE
FREE
B (C)
Kabletown Rd
7
Cattail Run Rd
B (B)
FREE
STOP
A (A)
8
Cattail Run Rd
WV 9
WV 9
B (C)
C (D)
FREE
FREE
A (A)
A (A)
FREE
FREE
C (C)
C (C)
Cattail Run Rd
9
Site Drive #1
B (C)
FREE
A (A)
10
Site Drive #2
B (C)
FREE
A (A)
34
115
1
115
4
2
9
69
3
340
4
5
9
10
6
25
7
115
9
8
9
9
3
LEGEND
Proposed Traffic Control
Existing Roadway
Existing Lane Configuration
Proposed Roadway
Proposed Lane Configuration
A AM Level of Service
(A) PM Level of Service
N
NOT TO SCALE
Fairview Farms TIS
2030 Build Level of Service
DATE: August 2023
FIGURE 13
AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- A — AM Level of Service
- (A) — PM Level of Service

N

NOT TO SCALE

Fairview Farms TIS

2030 Build Improved Level of Service

DATE: August 2023

FIGURE 14

QUEUING ANALYSIS

2022 Existing Conditions Analysis

Queuing analysis was performed for all study intersections during the weekday AM and PM peak hours using the SimTraffic micro-simulation model, which is a simulation complement to the Synchro traffic analysis models utilized for the capacity analysis. The queuing calculations produced by SimTraffic are acknowledged within the industry to be a realistic replication of actual conditions. Each simulation model was seeded for 10 minutes and recorded for 60 minutes. The simulation was run five times and then averaged to estimate the 95th percentile queuing for all scenarios. The queuing analysis for roundabout intersections were performed using Sidra, version 9.0.

The queuing analysis indicates that there are no existing turning movements currently exceeding storage length during the peak periods analyzed.

Figure 15 shows the 2022 Existing Conditions Queuing Analysis for the weekday AM and PM peak hours.

2030 No-Build Conditions Analysis

Queuing analysis indicates that all conditions described in the 2022 Existing Conditions are expected to continue with similar queues with the increase in traffic due to regional growth in the study area. No additional turning movements are expected to exceed storage length during the peak periods analyzed. However, an excessive queue length is expected on the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive following construction of a single-lane roundabout.

Figure 16 shows the 2030 No-Build Queuing Analysis for the weekday AM and PM peak hours.

2030 Build Conditions Analysis

Queuing analysis indicates that all conditions described in the 2030 No-Build Conditions are expected to continue with similar queueing following build-out of the Fairview Farms development. Analysis indicates that no additional lane groups are expected to exceed storage length during peak periods analyzed.

Figure 17 shows the 2030 Build Queuing Analysis for the weekday AM and PM peak hours.

2030 Build Improved Conditions Analysis

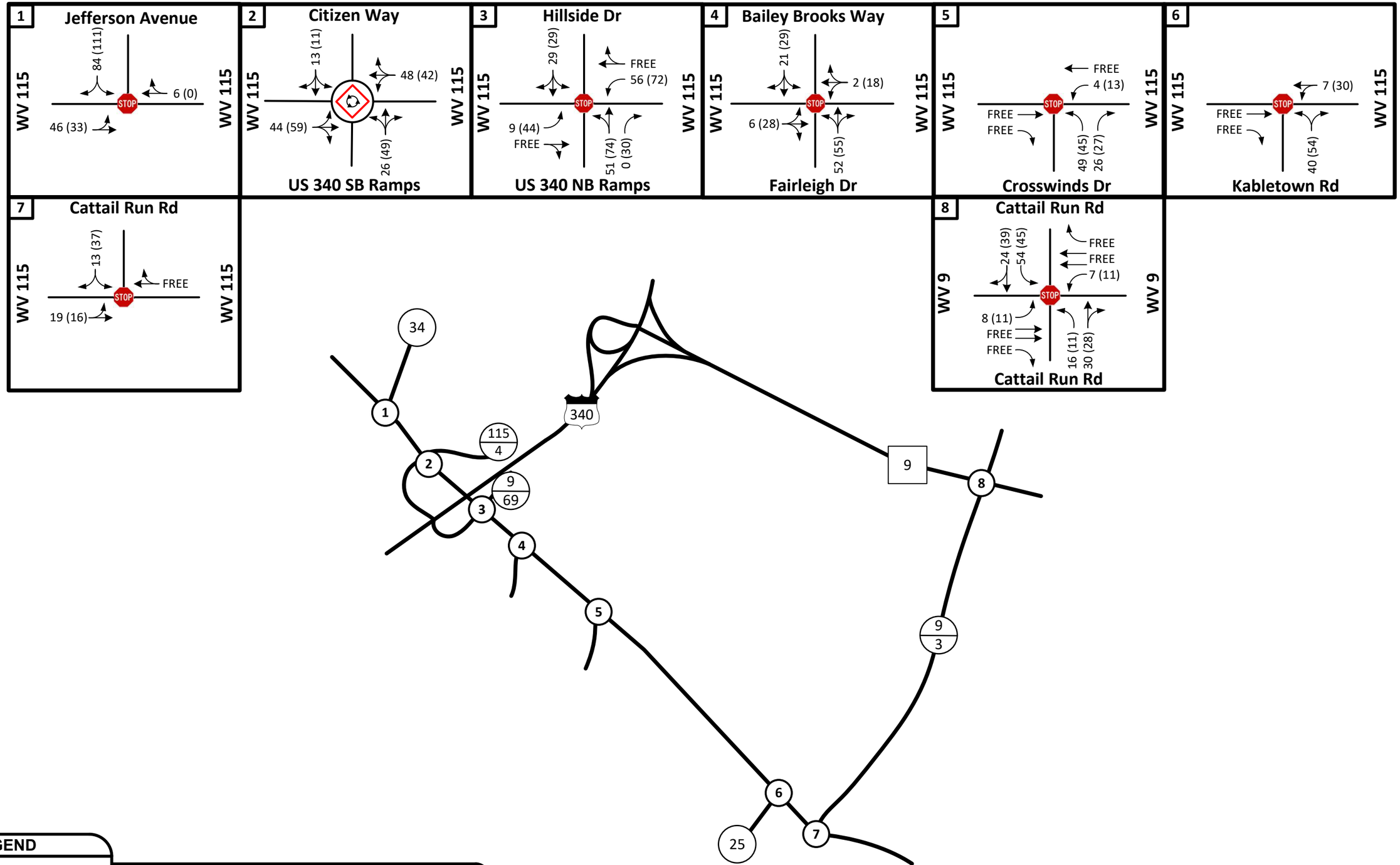
Queuing analysis indicates that all conditions described in the 2030 Build Conditions are expected to be mitigated following implementation of proposed improvements. Analysis indicates that no additional movements are expected to exceed storage length.

Figure 18 shows the 2030 Build Improved Queuing Analysis for the weekday AM and PM peak hours.

Table 5 presents the 95% queuing results for the intersections within the study during the AM and PM peak hours for the 2022 Existing Conditions, 2030 No-Build Conditions, 2030 Build Conditions, and 2030 Build Improved Conditions. Copies of the SimTraffic analyses outputs are included in **Appendix D**.

Table 5: Queueing Analysis Summary

Intersection	Movement	Existing Storage Length (ft)	2022 Existing		Proposed Storage Length (ft)	2030 No-Build		Proposed Storage Length (ft)	2030 Build		Proposed Storage Length (ft)	2030 Build Improved	
			AM	PM		AM	PM		AM	PM		AM	PM
Intersection 1 - WV 115 (Charles Town Road) with Jefferson Avenue	EB Left/Thru	--	46	33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Left-Turn	N/A	N/A	N/A	125	63	33	125	62	35	125	64	57
	EB Thru	N/A	N/A	N/A	--	66	101	--	80	103	--	81	301
	WB Thru/Right	--	6	0	--	103	114	--	109	119	--	115	138
	SB Left/Right	--	84	111	--	106	139	--	116	135	--	115	176
Intersection 2 - WV 115 (Charles Town Road) with US 340 Southbound/Citizens Way	EB Left/Thru/Right	--	44	59	--	71	85	--	104	169	--	104	169
	WB Left/Thru/Right	--	48	42	--	68	69	--	108	123	--	108	123
	NB Left/Thru/Right	--	26	49	--	47	221	--	63	449	N/A	N/A	N/A
	NB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	21	39
	NB Right-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	19	67
	SB Left/Thru/Right	--	13	11	--	54	30	--	70	32	--	68	32
Intersection 3 - WV 115 (Charles Town Road) with US 340 Northbound/Hillside Drive	EB Left-Turn	150	9	44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Thru/Right	--	FREE	FREE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Left/Thru/Right	N/A	N/A	N/A	--	93	435	--	197	1260	N/A	N/A	N/A
	EB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	34	283
	EB Right-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100	38	24
	WB Left-Turn	175	56	72	--	N/A	N/A	--	N/A	N/A	--	N/A	N/A
	WB Thru/Right	--	FREE	FREE	--	N/A	N/A	--	N/A	N/A	--	N/A	N/A
	WB Left/Thru/Right	--	N/A	N/A	--	85	80	--	164	123	--	164	123
	NB Left/Thru	--	51	74	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	NB Right-Turn	115	0	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	NB Left/Thru/Right	N/A	N/A	N/A	--	7	31	--	11	63	--	11	63
	SB Left/Thru/Right	--	29	29	--	2	2	--	2	2	--	2	2
Intersection 4 - WV 115 (Charles Town Road) with Fairleigh Drive/Bailey Brooks Way	EB Left/Thru/Right	--	6	28	--	15	73	--	17	61	--	8	69
	WB Left/Thru/Right	--	2	18	--	7	40	--	6	134	--	7	46
	NB Left/Thru/Right	--	52	55	--	58	56	--	53	66	--	57	64
	SB Left/Thru/Right	--	21	29	--	24	35	--	23	34	--	23	34
Intersection 5 - WV 115 (Charles Town Road) with Crosswinds Drive	EB Thru	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE
	EB Right-Turn	150	FREE	FREE	150	FREE	FREE	150	FREE	FREE	150	FREE	FREE
	WB Left-Turn	175	4	13	175	8	18	175	5	20	175	4	21
	WB Thru	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE
	NB Left-Turn	--	49	45	--	48	51	--	52	54	--	50	53
	NB Right-Turn	--	26	27	--	27	25	--	29	25	--	31	28
Intersection 6 - WV 115 (Charles Town Road) with Kabletown Road (CR 25)	EB Thru	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE
	EB Right-Turn	100	FREE	FREE	100	FREE	FREE	100	FREE	FREE	100	FREE	FREE
	WB Left/Thru	--	7	30	--	14	27	--	10	39	--	3	38
	NB Left/Right	--	40	54	--	48	58	--	46	66	--	52	64
Intersection 7 - WV 115 (Charles Town Road)	EB Left/Thru	--	19	16	--	16	17	--	23	29	--	27	28
	WB Thru/Right	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE
	SB Left/Right	--	13	37	--	13	39	--	21	43	--	24	42
Intersection 8 - WV 9 with Cattail Run Road (CR 9/3)	EB Left-Turn	475	8	11	475	13	9	475	12	10	475	12	8
	EB Thru	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE
	EB Right-Turn	75	FREE	FREE	75	FREE	FREE	75	FREE	FREE	75	FREE	FREE
	WB Left-Turn	450	7	11	450	11	15	450	23	27	450	25	28
	WB Thru	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE	--	FREE	FREE
	WB Right-Turn	100	FREE	FREE	100	FREE	FREE	100	FREE	FREE	100	FREE	FREE
	NB Left-Turn	75	16	11	75	15	10	75	18	15	75	31	11
	NB Thru/Right	--	30	28	--	29	30	--	41	34	--	39	37
	SB Left-Turn	75	54	45	75	49	44	75	58	48	125	61	50
	SB Thru/Right	--	24	39	--	23	42	--	24	40	--	24	43
Intersection 9 - WV 115 (Charles Town Road) with Site Drive #1	EB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	--	47	83	N/A	N/A	N/A
	EB Left-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	125	35	54
	EB Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	FREE	FREE
	WB Thru/Right	N/A	N/A	N/A	N/A	N/A	N/A	--	FREE	FREE	--	FREE	FREE
	SB Left/Right	N/A	N/A	N/A	N/A	N/A	N/A	--	68	58	--	76	54
Intersection 10 - WV 115 (Charles Town Road) with Site Drive #2	EB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	--	39	81	N/A	N/A	N/A
	EB Left-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	125	32	48
	EB Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	FREE	FREE
	WB Thru/Right	N/A	N/A	N/A	N/A	N/A	N/A	--	FREE	FREE	--	FREE	FREE
	SB Left/Right	N/A	N/A	N/A	N/A	N/A	N/A	--	78	57	--	75	59



LEGEND

- Existing Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XX AM Queue (FT)
- (XX) PM Queue (FT)

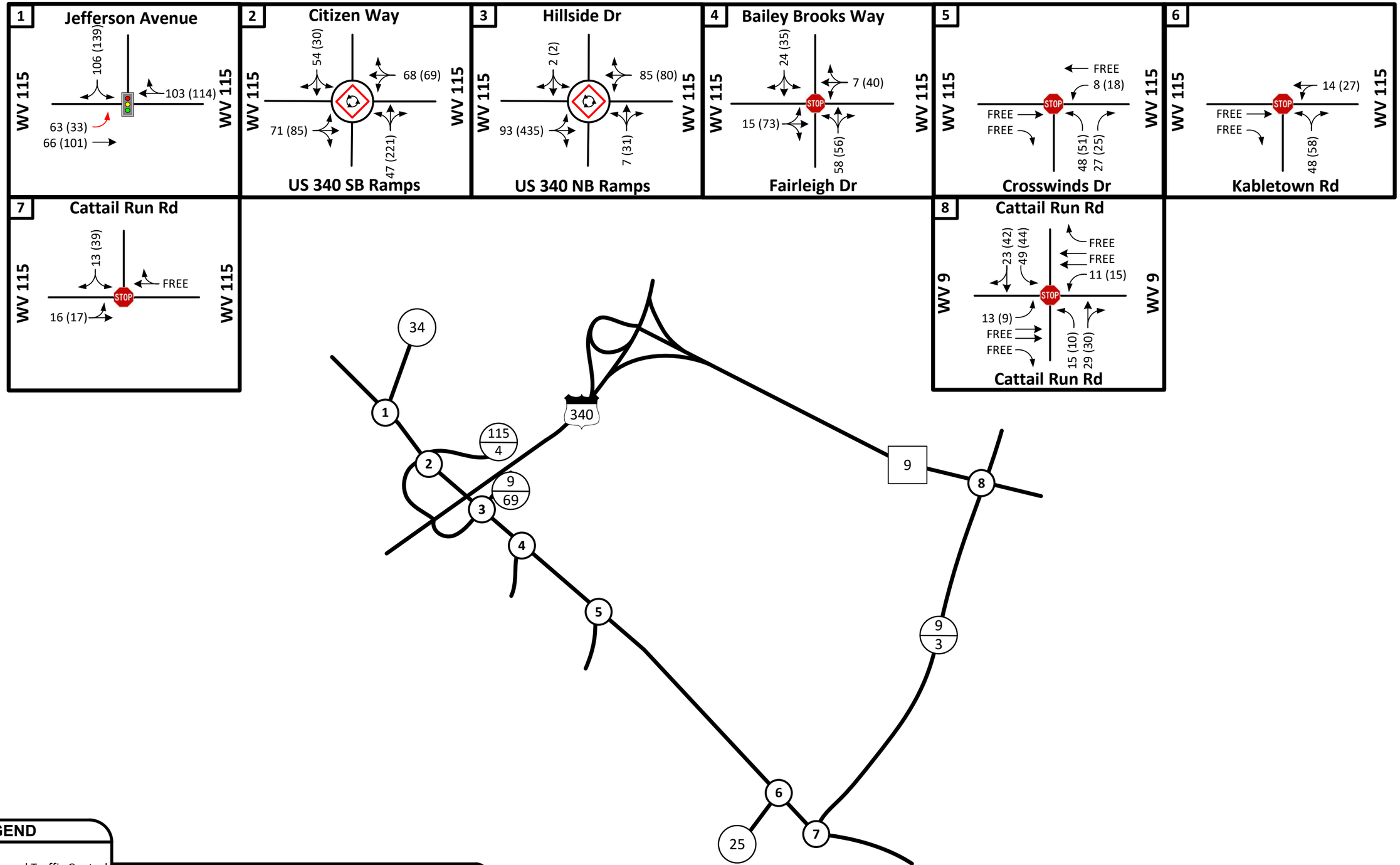
NOT TO SCALE

Fairview Farms TIS

2022 Existing Queuing Analysis

DATE: August 2023

FIGURE 15



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Lane Configuration
- XX AM Queue (FT)
- (XX) PM Queue (FT)

N

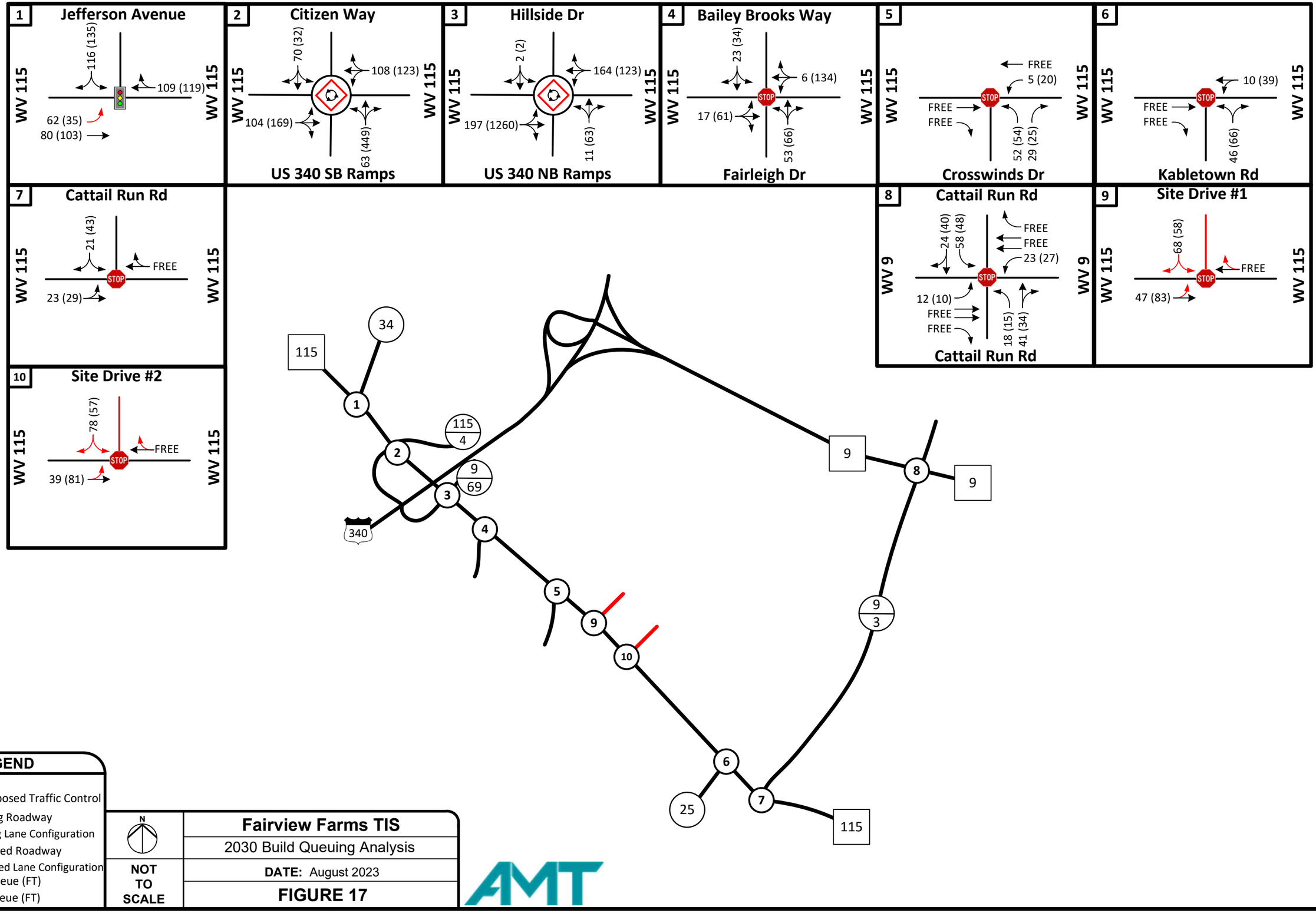
NOT TO SCALE

Fairview Farms TIS

2030 No-Build Queuing Analysis

DATE: August 2023

FIGURE 16



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX AM Queue (FT)
- (XX) PM Queue (FT)

N

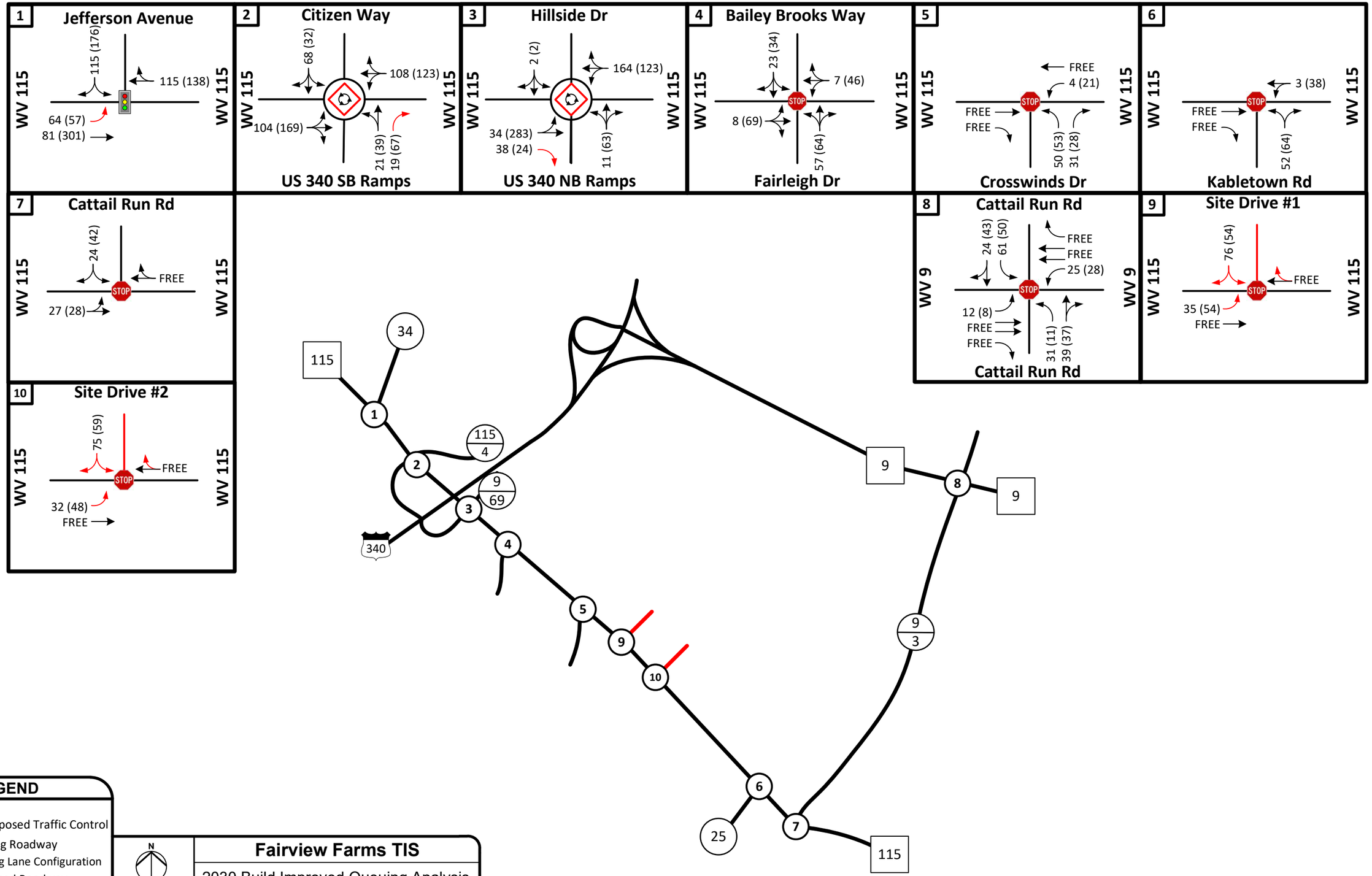
NOT TO SCALE

Fairview Farms TIS

2030 Build Queuing Analysis

DATE: August 2023

FIGURE 17



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX AM Queue (FT)
- (XX) PM Queue (FT)

N

NOT TO SCALE

Fairview Farms TIS

2030 Build Improved Queuing Analysis

DATE: August 2023

FIGURE 18

AASHTO LEFT TURN LANE ANALYSIS

In accordance with WVDOH procedures outlined in TED 106-2, analysis comparing intersection volumes with the AASHTO (American Association of State Highway Transportation Officials) guidelines for left turn lanes on two lane highways is provided as guide to identify potential need for left turn lanes. The guideline is outlined in Table 9-23 of the 2011 AASHTO Green Book and is intended for comparison of rural two-lane roadways where the subject approach is free flow. The need for auxiliary lanes on signalized approaches or low speed stop control approaches is typically based upon capacity analysis. Comparison with the AASHTO criteria is provided for the WV 115 eastbound approaches to Site Drive #1 and Site Drive #2.

Comparison of the AASHTO guideline shows that the guideline criteria is are met for both the WV 115 eastbound approaches to Site Drive #1 and Site Drive #2 during the 2030 Build Conditions PM peak hour as shown in **Table 6**.

Table 6: AASHTO Analysis Summary

AASHTO Left-Turn Analysis			
WV 115 with Site Drive #1		WV 115 with Site Drive #2	
2030 Build Conditions		2030 Build Conditions	
AM Peak	PM Peak	AM Peak	PM Peak
Guideline Met	**Guideline Met**	**Guideline Not Met**	**Guideline Met**

Copies of the review of AASHTO Table 9-23 for each approach are contained in **Appendix B**.

CONCLUSIONS/RECOMMENDATIONS

This report summarizes existing and future traffic analyses conducted in support of the proposed Fairview Farms Mixed-Use Development. The proposed development is to be located north of WV 115 (Charles Town Road) and east of US 340 (Berryville Pike) in Charles Town, Jefferson County. The proposed site plan includes 267 single-family homes, 200 townhomes, and 99,000 sf of self-storage. Fairview Farms is expected to be built and completed by the year 2030.

The proposed mixed-use development is anticipated to be served by two site driveways intersecting directly with WV 115. Site Drive #1 is proposed to be located approximately 630 feet east of Crosswinds Drive approaching WV 115 from the north and will operate as a full movement approach utilizing TWSC. Site Drive #2 will approach WV 115 from the north approximately 1,270 feet east of Crosswinds Drive and will operate as a full movement approach utilizing TWSC.

Based on the findings of the Tate Manor TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Tate Manor residential development in order to maintain operation of the existing transportation network:

WV 115 with Jefferson Avenue

- As part of the Tate Manor TIS, it was recommended that a traffic signal be installed at the intersection of WV 115 and Jefferson Avenue. Intersection conditions previously met the MUTCD warranting criteria. Additionally, the 2022 Existing Conditions and 2030 No-Build analysis indicates that the intersection LOS will currently operates at LOS E during the PM peak hour under TWSC.

- In conjunction with installation of a traffic signal identified in previous studies, widening WV 115 to construct an exclusive left-turn lane on the eastbound approach is recommended. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with an appropriate taper.

Based on the findings of the Kings Crossing TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Kings Crossing residential development in order to maintain operation of the existing transportation network:

WV 115 with Citizen Way/US 340 Southbound Ramps

- Construct a low angle right-turn slip lane on for the US 340 northbound ramp approach to WV 115 eastbound. The 2030 Build analysis indicates that the ramp approach will deteriorate to LOS E during the PM peak hour with the overall intersection operating LOS C. The addition of the right-turn slip lane improves the ramp to LOS A during the PM peak hour and the overall intersection to LOS B. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.

Based on the findings of the Magnolia Springs TIS, the following infrastructure improvements are recommended to address existing capacity issues in order to maintain operation of the existing transportation network:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Proceed with the WVDOH planned conversion of the intersection to a single lane roundabout. This project is currently programmed by WVDOH and is expected to be constructed in 2025. For the purpose of this study, the installation of a single lane roundabout is included beginning in 2030 No-Build conditions.

Based on the findings of this study, the following capacity infrastructure improvements are recommended to mitigate future transportation issues prior to construction of the Fairview Farms Development:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Construct an exclusive right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive. The WV 115 eastbound approach is anticipated to experience lengthy queues beginning in the 2030 No-Build conditions. This improvement increases capacity and reduces queue lengths on the approach.

Based on the finding of this study, the following geometric improvements are recommended to mitigate the impacts of the Fairview Farms development and maintain acceptable traffic operations along the existing transportation network in 2030:

WV 115 with Site Drive #1

- Construct Site Drive #1 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 630 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and one egress lane. Site Drive #1 will operate under stop-control, while WV 115 operates as free-flow.

- Construct an exclusive left-turn lane on the WV 115 eastbound approach to Site Drive #1. Peak hour volumes are projected to meet the AASHTO guidelines during 2030 Build Conditions AM and PM peak hours. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper.

WV 115 with Site Drive #2

- Construct Site Drive #2 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 1,270 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and one egress lane. Site Drive #2 will operate under stop-control, while WV 115 operates as free-flow.

- Construct an exclusive left-turn lane on the WV 115 eastbound approach to Site Drive #2. Peak hour volumes are projected to meet the AASHTO guidelines during 2030 Build Conditions PM peak hour. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper.

APPENDIX A: STUDY AREA PHOTOS



WV 115 Eastbound Approach to Jefferson Avenue



WV 115 Westbound Approach to Jefferson Avenue



Jefferson Avenue Southbound Approach to WV 115



WV 115 Eastbound Approach to US 340 SB Ramps/Citizen Way



WV 115 Westbound Approach to US 340 SB Ramps/Citizen Way



US 340 SB Off Ramp Northbound Approach to WV 115



Citizen Way Southbound Approach to WV 115



WV 115 Eastbound Approach to US 340 NB Ramp/Hillside Dr



WV 115 Westbound Approach to US 340 NB Ramp/Hillside Dr



US 340 NB Off Ramp Northbound Approach to WV 115



Hillside Dr Southbound Approach to WV 115



WV 115 Eastbound Approach to Fairleigh Dr/Bailey Brooks Way



WV 115 Westbound Approach to Fairleigh Dr/Bailey Brooks Way



Fairleigh Dr Northbound Approach to WV 115



Bailey Brooks Way Southbound Approach to WV 115



WV 115 Eastbound Approach to Crosswinds Dr



WV 115 Westbound Approach to Crosswinds Dr



Crosswinds Dr Northbound Approach to WV 115



WV 115 Eastbound Approach to Kabletown Rd



WV 115 Westbound Approach to Kabletown Rd



Kabletown Rd Northbound Approach to WV 115



WV 115 Eastbound Approach to Cattail Run Road



WV 115 Westbound Approach to Cattail Run Road



Cattail Run Road Southbound Approach to WV 115



WV 9 Eastbound Approach to Cattail Run Road



WV 9 Westbound Approach to Cattail Run Road



Cattail Run Road Northbound Approach to WV 9



Cattail Run Road Southbound Approach to WV 9

APPENDIX B: TRAFFIC VOLUMES & CALCULATIONS

APPENDIX B-1: VOLUME CALCULATIONS

22-0255.001 - Fairview Farms Residential Development TIS - Traffic Volume Calculations

	Balanced Existing Traffic (2022)		Future w/o Adj Devs (2030)		Historical Growth (2022-2030)		Magnolia Springs Site Trips (2024)		Tate Manor Site Trips (2024)		Kings Crossing Site Trips (2025)		No Build Volumes (2030)		Site Trip Distribution		Site Trip Assignment		Build Volumes (2030)		Site Impact	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	Enter	Exit	AM	PM	AM	PM	AM	PM
Intersection 1 - WV 115 (Charlestown Road) with Jefferson Avenue (CR 34)																						
EBL	60	12	66	13	6	1			0	2			66	15			0	0	66	15		
EBT	172	251	189	276	17	25	3	11			6	18	198	305	30%		28	78	226	383	9.6%	19.6%
EBR	0	0	0	0	0	0							0	0			0	0	0	0		
WBL	0	0	0	0	0	0							0	0			0	0	0	0		
WBT	166	230	183	253	17	23	10	6			18	11	211	270		30%	72	48	283	318	15.2%	9.9%
WBR	174	147	191	162	17	15			1	5			192	167			0	0	192	167		
NBL	0	0	0	0	0	0							0	0			0	0	0	0		
NBT	0	0	0	0	0	0							0	0			0	0	0	0	0.0%	0.0%
NBR	0	0	0	0	0	0							0	0			0	0	0	0		
SBL	137	207	151	228	14	21			5	3			156	231			0	0	156	231		
SBT	0	0	0	0	0	0							0	0			0	0	0	0	0.0%	0.0%
SBR	57	27	63	30	6	3			2	1			65	31			0	0	65	31		
Intersection 2 - WV 115 (Charles Town Road) with US 340 Southbound/Citizens Way (CR 115/4)																						
EBL	18	56	20	62	2	6	3	11					23	73			0	0	23	73		
EBT	221	316	243	348	22	32			3	2	6	18	252	368	30%		28	78	280	446	7.3%	12.9%
EBR	72	79	79	87	7	8			2	1			81	88			0	0	81	88		
WBL	88	65	97	71	9	6					15	10	112	81		25%	60	41	172	122		
WBT	238	261	262	287	24	26			0	2	18	11	280	300		30%	72	48	352	348	24.2%	17.2%
WBR	12	21	13	23	1	2	7	22	1	2			21	47			0	0	21	47		
NBL	70	66	77	73	7	7			1	3			78	76			0	0	78	76		
NBT	21	28	23	31	2	3	42	141	2	8			67	180			0	0	67	180	10.0%	12.7%
NBR	90	233	99	256	9	23					7	22	106	278	30%		28	78	134	356		
SBL	36	32	39	35	3	3	126	84	8	5			173	124			0	0	173	124		
SBT	18	12	20	13	2	1	19	13	2	1			41	27			0	0	41	27	0.0%	0.0%
SBR	34	50	37	55	3	5	10	6					47	61			0	0	47	61		
Intersection 3 - WV 115 (Charles Town Road) with US 340 Northbound/Hillside Drive (CR 9/69)																						
EBL	3	6	3	7	0	1							3	7			0	0	3	7		
EBT	191	459	210	505	83	98					13	40	223	545	60%		56	156	279	701	9.5%	16.8%
EBR	153	116	168	128	15	12	126	84	11	7			305	219			0	0	305	219		
WBL	142	157	156	173	14	16					21	14	177	187		30%	72	48	249	235		
WBT	304	273	334	300	144	58					33	21	367	321		55%	132	89	499	410	27.3%	21.2%
WBR	0	1	0	1	0	0							0	1			0	0	0	1		
NBL	28	71	31	78	3	7	7	22	1	4			39	104			0	0	39	104		
NBT	0	0	0	0	0	0							0	0			0	0	0	0	27.3%	26.2%
NBR	18	57	20	63	2	6					5	16	25	79	25%		24	65	49	144		
SBL	0	0	0	0	0	0							0	0			0	0	0	0		
SBT	5	5	5	5	0	0							5	5			0	0	5	5	0.0%	0.0%
SBR	6	3	6	3	0	0							6	3			0	0	6	3		
Intersection 4 - WV 115 (Charles Town Road) with Fairleigh Drive/Bailey Brooks Way																						
EBL	2	10	2	11	0	1							2	11			0	0	2	11		
EBT	192	460	211	506	19	46					18	56	229	562	85%		80	221	309	783	24.0%	26.3%
EBR	21	42	23	46	2	4							23	46			0	0	23	46		
WBL	2	3	2	3	0	0							2	3			0	0	2	3		
WBT	366	356	403	392	37	36					54	35	457	427		85%	204	137	661	564	30.8%	24.2%
WBR	0	0	0	0	0	0							0	0			0	0	0	0		
NBL	40	34	44	37	4	3							44	37			0	0	44	37		
NBT	1	0	1	0	0	0							1	0			0	0	1	0	0.0%	0.0%
NBR	2	1	2	1	0	0							2	1			0	0	2	1		
SBL	0	0	0	0	0	0							0	0			0	0	0	0		
SBT	0	0	0	0	0	0							0	0			0	0	0	0	0.0%	0.0%
SBR	5	11	5	12	0	1							5	12			0	0	5	12		

Annual Growth Rate 1.20%

Existing Year 2022

Build Year 2030

	AM		PM	
	Enter	Exit	Enter	Exit
Net New Trips	94	241	260	161
Pass-By Trips	0	0	0	0

	Balanced Existing Traffic (2022)		Future w/o Adj Devs (2030)		Historical Growth (2022-2030)		Magnolia Springs Site Trips (2024)		Tate Manor Site Trips (2024)		Kings Crossing Site Trips (2025)		No Build Volumes (2030)		Site Trip Distribution		Site Trip Assignment		Build Volumes (2030)		Site Impact	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	Enter	Exit	AM	PM	AM	PM	AM	PM
Intersection 5 - WV 115 (Charles Town Road) with Crosswinds Drive																						
EBL	0	0	0	0	0	0							0	0			0	0	0	0		
EBT	164	365	180	401	16	36					18	56	198	457	85%		80	221	278	678	27.0%	28.7%
EBR	16	84	18	92	2	8							18	92			0	0	18	92		
WBL	2	8	2	9	0	1							2	9			0	0	2	9		
WBT	305	306	335	337	30	31					54	35	389	372		85%	204	137	593	509	34.3%	26.4%
WBR	0	0	0	0	0	0							0	0			0	0	0	0		
NBL	40	35	44	38	4	3							44	38			0	0	44	38		
NBT	0	0	0	0	0	0							0	0			0	0	0	0	0.0%	0.0%
NBR	9	7	10	8	1	1							10	8			0	0	10	8		
SBL	0	0	0	0	0	0							0	0			0	0	0	0		
SBT	0	0	0	0	0	0							0	0			0	0	0	0	0.0%	0.0%
SBR	0	0	0	0	0	0							0	0			0	0	0	0		
Intersection 6 - WV 115 (Charles Town Road) with Kabletown Road (CR 25)																						
EBL	0	0	0	0	0	0							0	0			0	0	0	0		
EBT	136	334	150	367	14	33					5	4	155	371		15%	37	24	192	395	15.9%	5.5%
EBR	36	40	40	44	4	4							40	44			0	0	40	44		
WBL	6	34	7	37	1	3							7	37			0	0	7	37		
WBT	246	253	271	278	25	25					3	6	274	284	15%		14	39	288	323	4.7%	10.8%
WBR	0	0	0	0	0	0							0	0			0	0	0	0		
NBL	59	70	65	77	6	7							65	77			0	0	65	77		
NBT	0	0	0	0	0	0							0	0			0	0	0	0	0.0%	0.0%
NBR	11	22	12	24	1	2							12	24			0	0	12	24		
SBL	0	0	0	0	0	0							0	0			0	0	0	0		
SBT	0	0	0	0	0	0							0	0			0	0	0	0	0.0%	0.0%
SBR	0	0	0	0	0	0							0	0			0	0	0	0		
Intersection 7 - WV 115 (Charles Town Road) with Cattail Run Road (CR 9/3)																						
EBL	14	12	15	13	1	1							15	13		10%	25	16	40	29		
EBT	135	341	148	375	13	34					5	4	153	379		5%	12	8	165	387	18.0%	5.8%
EBR	0	0	0	0	0	0							0	0			0	0	0	0		
WBL	0	0	0	0	0	0							0	0			0	0	0	0		
WBT	246	254	271	279	25	25					3	6	274	285	5%		5	13	279	298	1.7%	4.2%
WBR	6	10	7	11	1	1							7	11			0	0	7	11		
NBL	0	0	0	0	0	0							0	0			0	0	0	0		
NBT	0	0	0	0	0	0							0	0			0	0	0	0	#DIV/0!	#DIV/0!
NBR	0	0	0	0	0	0							0	0			0	0	0	0		
SBL	0	0	0	0	0	0							0	0			0	0	0	0		
SBT	0	0	0	0	0	0							0	0			0	0	0	0	64.3%	44.8%
SBR	5	29	5	32	0	3							5	32	10%		9	26	14	58		
Intersection 8 - WV 9 (Veterans Memorial Highway) with Cattail Run Road (CR 9/3)																						
EBL	6	4	7	4	1	0							7	4			0	0	7	4		
EBT	612	328	673	361	61	33							673	361		5%	12	8	685	369	1.7%	2.1%
EBR	5	2	5	2	0	0							5	2			0	0	5	2		
WBL	5	8	5	9	0	1							5	9	10%		9	26	14	35		
WBT	274	432	301	475	27	43							301	475	5%		5	13	306	488	4.1%	7.1%
WBR	19	27	21	30	2	3							21	30			0	0	21	30		
NBL	4	3	4	3	0	0							4	3			0	0	4	3		
NBT	13	15	14	16	1	1							14	16			0	0	14	16	47.2%	37.2%
NBR	9	7	10	8	1	1							10	8		10%	25	16	35	24		
SBL	57	42	63	46	6	4							63	46			0	0	63	46		
SBT	3	25	3	27	0	2							3	27			0	0	3	27	0.0%	0.0%
SBR	16	16	18	18	2	2							18	18			0	0	18	18		

	Balanced Existing Traffic (2022)		Future w/o Adj Devs (2030)		Historical Growth (2022-2030)		Magnolia Springs Site Trips (2024)		Tate Manor Site Trips (2024)		Kings Crossing Site Trips (2025)		No Build Volumes (2030)		Site Trip Distribution		Site Trip Assignment		Build Volumes (2030)		Site Impact	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	Enter	Exit	AM	PM	AM	PM	AM	PM
Intersection 9 - WV 115 (Charles Town Road) with Site Drive #1																						
EBL	0	0	0	0	0	0							0	0	45%		43	117	43	117		
EBT	173	372	190	409	17	37					18	56	208	465	40%		38	104	246	569	28.0%	32.2%
EBR	0	0	0	0	0	0							0	0			0	0	0	0		
WBL	0	0	0	0	0	0							0	0			0	0	0	0		
WBT	305	306	335	337	30	31					54	35	389	372		40%	96	64	485	436	20.6%	17.1%
WBR	0	0	0	0	0	0							0	0	5%		5	13	5	13		
NBL	0	0	0	0	0	0							0	0			0	0	0	0		
NBT	0	0	0	0	0	0							0	0			0	0	0	0	0.0%	0.0%
NBR	0	0	0	0	0	0							0	0			0	0	0	0		
SBL	0	0	0	0	0	0							0	0		5%	12	8	12	8		
SBT	0	0	0	0	0	0							0	0			0	0	0	0	100.0%	100.0%
SBR	0	0	0	0	0	0							0	0		45%	108	73	108	73		
Intersection 10 - WV 115 (Charles Town Road) with Site Drive #2																						
EBL	0	0	0	0	0	0							0	0	40%		38	104	38	104		
EBT	173	372	190	409	17	37					18	56	208	465		5%	12	8	220	473	19.4%	19.4%
EBR	0	0	0	0	0	0							0	0			0	0	0	0		
WBL	0	0	0	0	0	0							0	0			0	0	0	0		
WBT	305	306	335	337	30	31					54	35	389	372	5%		5	13	394	385	3.5%	9.5%
WBR	0	0	0	0	0	0							0	0	10%		9	26	9	26		
NBL	0	0	0	0	0	0							0	0			0	0	0	0		
NBT	0	0	0	0	0	0							0	0			0	0	0	0	0.0%	0.0%
NBR	0	0	0	0	0	0							0	0			0	0	0	0		
SBL	0	0	0	0	0	0							0	0		10%	25	16	25	16		
SBT	0	0	0	0	0	0							0	0			0	0	0	0	100.0%	100.0%
SBR	0	0	0	0	0	0							0	0		40%	96	64	96	64		

APPENDIX B-2: TURNING MOVEMENT COUNTS

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 1: WV 115 @ Jefferson Avenue
COUNT BY	AMT

Friday

STREET	Jefferson Ave								WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	12	0	4	16	0	0	0	0	0	29	25	54	5	27	0	32	16	86	102	102
0715 - 0730	**17**	**0**	**9**	**26**	**0**	**0**	**0**	**0**	**0**	**39**	**44**	**83**	**12**	**47**	**0**	**59**	**26**	**142**	**168**	270
0730 - 0745	**41**	**0**	**17**	**58**	**0**	**0**	**0**	**0**	**0**	**39**	**62**	**101**	**25**	**46**	**0**	**71**	**58**	**172**	**230**	500
0745 - 0800	**55**	**0**	**24**	**79**	**0**	**0**	**0**	**0**	**0**	**46**	**44**	**90**	**13**	**38**	**0**	**51**	**79**	**141**	**220**	720
0800 - 0815	**24**	**0**	**7**	**31**	**0**	**0**	**0**	**0**	**0**	**42**	**24**	**66**	**10**	**41**	**0**	**51**	**31**	**117**	**148**	***766***
0815 - 0830	23	0	5	28	0	0	0	0	0	34	23	57	4	42	0	46	28	103	131	729
0830 - 0845	15	0	8	23	0	0	0	0	0	64	32	96	5	52	0	57	23	153	176	675
0845 - 0900	21	0	8	29	0	0	0	0	0	67	27	94	6	51	0	57	29	151	180	635
1500 - 1515	59	0	19	78	0	0	0	0	0	68	38	106	12	58	0	70	78	176	254	254
1515 - 1530	54	0	16	70	0	0	0	0	0	71	23	94	11	58	0	69	70	163	233	487
1530 - 1545	42	0	5	47	0	0	0	0	0	69	32	101	12	64	0	76	47	177	224	711
1545 - 1600	37	0	8	45	0	0	0	0	0	78	40	118	6	71	0	77	45	195	240	951
1600 - 1615	38	0	11	49	0	0	0	0	0	63	36	99	4	55	0	59	49	158	207	904
1615 - 1630	53	0	9	62	0	0	0	0	0	71	38	109	3	69	0	72	62	181	243	914
1630 - 1645	40	0	10	50	0	0	0	0	0	62	46	108	8	65	0	73	50	181	231	921
1645 - 1700	49	0	14	63	0	0	0	0	0	59	38	97	4	71	0	75	63	172	235	916
1700 - 1715	**49**	**0**	**7**	**56**	**0**	**0**	**0**	**0**	**0**	**61**	**32**	**93**	**2**	**69**	**0**	**71**	**56**	**164**	**220**	929
1715 - 1730	**56**	**0**	**7**	**63**	**0**	**0**	**0**	**0**	**0**	**54**	**38**	**92**	**3**	**65**	**0**	**68**	**63**	**160**	**223**	909
1730 - 1745	**45**	**0**	**7**	**52**	**0**	**0**	**0**	**0**	**0**	**66**	**38**	**104**	**4**	**59**	**0**	**63**	**52**	**167**	**219**	897
1745 - 1800	**57**	**0**	**6**	**63**	**0**	**0**	**0**	**0**	**0**	**49**	**39**	**88**	**3**	**58**	**0**	**61**	**63**	**149**	**212**	***874***
Peak HR AM																				
0715 - 0815	***137***	***0***	***57***	***194***	***0***	***0***	***0***	***0***	***0***	***166***	***174***	***340***	***60***	***172***	***0***	***232***	***194***	***572***	***766***	
Peak HR PM																				
1700 - 1800	***207***	***0***	***27***	***234***	***0***	***0***	***0***	***0***	***0***	***230***	***147***	***377***	***12***	***251***	***0***	***263***	***234***	***640***	***874***	
AM PHF	**0.614**				**0.000**				**0.842**				**0.817**				**0.833**			
PM PHF	**0.929**				**0.000**				**0.906**				**0.926**				**0.980**			

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 2: WV 115 @ US 340 Southbound Ramps/Citizens Way
COUNT BY	AMT

Friday

STREET	Citizens Way				US 340 SB Ramps				WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	14	3	8	25	8	2	14	24	9	31	2	42	4	30	6	40	49	82	131	131
0715 - 0730	**15**	**5**	**10**	**30**	**16**	**6**	**26**	**48**	**28**	**58**	**4**	**90**	**3**	**46**	**17**	**66**	**78**	**156**	**234**	365
0730 - 0745	**8**	**6**	**9**	**23**	**24**	**8**	**17**	**49**	**33**	**74**	**1**	**108**	**7**	**56**	**25**	**88**	**72**	**196**	**268**	633
0745 - 0800	**7**	**3**	**9**	**19**	**15**	**5**	**28**	**48**	**16**	**63**	**4**	**83**	**7**	**66**	**21**	**94**	**67**	**177**	**244**	877
0800 - 0815	**6**	**4**	**6**	**16**	**15**	**2**	**19**	**36**	**11**	**43**	**3**	**57**	**1**	**53**	**9**	**63**	**52**	**120**	**172**	***918***
0815 - 0830	7	2	8	17	10	4	26	40	11	45	3	59	6	53	6	65	57	124	181	865
0830 - 0845	5	4	6	15	10	2	21	33	13	78	1	92	3	55	9	67	48	159	207	804
0845 - 0900	9	2	13	24	12	4	22	38	9	78	2	89	5	55	9	69	62	158	220	780
1500 - 1515	14	2	17	33	29	7	36	72	12	63	11	86	18	82	21	121	105	207	312	312
1515 - 1530	6	2	7	15	24	6	40	70	9	58	4	71	16	84	13	113	85	184	269	581
1530 - 1545	7	2	7	16	28	8	39	75	8	64	6	78	6	87	17	110	91	188	279	860
1545 - 1600	12	0	11	23	30	10	49	89	10	76	4	90	11	82	15	108	112	198	310	1170
1600 - 1615	6	1	9	16	18	6	40	64	12	71	4	87	8	73	12	93	80	180	260	1118
1615 - 1630	7	1	12	20	32	7	58	97	5	65	4	74	10	90	24	124	117	198	315	1164
1630 - 1645	8	2	14	24	20	14	43	77	10	74	5	89	11	82	12	105	101	194	295	1180
1645 - 1700	2	2	9	13	13	10	46	69	7	74	3	84	11	95	15	121	82	205	287	1157
1700 - 1715	**11**	**2**	**11**	**24**	**20**	**8**	**52**	**80**	**19**	**64**	**6**	**89**	**15**	**86**	**16**	**117**	**104**	**206**	**310**	1207
1715 - 1730	**6**	**4**	**18**	**28**	**14**	**5**	**54**	**73**	**8**	**61**	**5**	**74**	**18**	**78**	**26**	**122**	**101**	**196**	**297**	1189
1730 - 1745	**5**	**2**	**16**	**23**	**18**	**11**	**61**	**90**	**19**	**66**	**5**	**90**	**11**	**71**	**21**	**103**	**113**	**193**	**306**	1200
1745 - 1800	**10**	**4**	**5**	**19**	**14**	**4**	**66**	**84**	**19**	**70**	**5**	**94**	**12**	**81**	**16**	**109**	**103**	**203**	**306**	***1219***
Peak HR AM																				
0715 - 0815	***36***	***18***	***34***	***88***	***70***	***21***	***90***	***181***	***88***	***238***	***12***	***338***	***18***	***221***	***72***	***311***	***269***	***649***	***918***	
Peak HR PM																				
1700 - 1800	***32***	***12***	***50***	***94***	***66***	***28***	***233***	***327***	***65***	***261***	***21***	***347***	***56***	***316***	***79***	***451***	***421***	***798***	***1219***	
AM PHF	**0.733**				**0.923**				**0.782**				**0.827**				**0.856**			
PM PHF	**0.839**				**0.908**				**0.923**				**0.924**				**0.983**			

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 3: WV 115 @ US 340 Northbound Ramps/Hillside Drive
COUNT BY	AMT

Friday

STREET	Hillside Dr				US 340 NB Ramps				WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	0	3	0	3	3	0	2	5	28	31	0	59	1	35	39	75	8	134	142	142
0715 - 0730	**0**	**2**	**0**	**2**	**10**	**0**	**3**	**13**	**28**	**41**	**0**	**69**	**1**	**15**	**48**	**64**	**15**	**133**	**148**	290
0730 - 0745	**0**	**0**	**3**	**3**	**4**	**0**	**4**	**8**	**37**	**40**	**0**	**77**	**1**	**43**	**41**	**85**	**11**	**162**	**173**	463
0745 - 0800	**0**	**1**	**2**	**3**	**7**	**0**	**5**	**12**	**42**	**63**	**0**	**105**	**1**	**32**	**32**	**65**	**15**	**170**	**185**	648
0800 - 0815	**0**	**2**	**1**	**3**	**7**	**0**	**6**	**13**	**35**	**46**	**0**	**81**	**0**	**37**	**32**	**69**	**16**	**150**	**166**	***672***
0815 - 0830	0	1	1	2	8	0	5	13	27	46	0	73	1	53	42	96	15	169	184	708
0830 - 0845	0	0	0	0	7	0	4	11	35	49	0	84	1	52	32	85	11	169	180	715
0845 - 0900	0	1	0	1	8	0	4	12	33	54	0	87	0	48	34	82	13	169	182	712
1500 - 1515	0	0	0	0	11	0	7	18	32	60	0	92	0	82	27	109	18	201	219	219
1515 - 1530	0	1	0	1	14	0	21	35	37	53	0	90	2	74	24	100	36	190	226	445
1530 - 1545	0	1	1	2	19	1	17	37	31	44	0	75	0	98	29	127	39	202	241	686
1545 - 1600	0	1	2	3	20	1	12	33	31	44	0	75	4	104	31	139	36	214	250	936
1600 - 1615	0	0	1	1	11	0	14	25	25	50	0	75	2	118	30	150	26	225	251	968
1615 - 1630	0	0	0	0	21	0	8	29	33	54	0	87	3	95	22	120	29	207	236	978
1630 - 1645	0	1	0	1	23	0	13	36	33	70	0	103	1	97	29	127	37	230	267	1004
1645 - 1700	0	1	1	2	18	0	10	28	33	43	1	77	3	98	25	126	30	203	233	987
1700 - 1715	**0**	**1**	**1**	**2**	**20**	**0**	**14**	**34**	**32**	**63**	**0**	**95**	**5**	**95**	**34**	**134**	**36**	**229**	**265**	1001
1715 - 1730	**0**	**0**	**1**	**1**	**15**	**0**	**14**	**29**	**37**	**50**	**0**	**87**	**1**	**104**	**40**	**145**	**30**	**232**	**262**	1027
1730 - 1745	**0**	**2**	**0**	**2**	**17**	**0**	**12**	**29**	**38**	**73**	**0**	**111**	**0**	**88**	**18**	**106**	**31**	**217**	**248**	1008
1745 - 1800	**0**	**2**	**1**	**3**	**19**	**0**	**17**	**36**	**50**	**56**	**1**	**107**	**0**	**120**	**24**	**144**	**39**	**251**	**290**	***1065***
Peak HR AM																				
0715 - 0815	***0***	***5***	***6***	***11***	***28***	***0***	***18***	***46***	***142***	***190***	***0***	***332***	***3***	***127***	***153***	***283***	***57***	***615***	***672***	
Peak HR PM																				
1700 - 1800	***0***	***5***	***3***	***8***	***71***	***0***	***57***	***128***	***157***	***242***	***1***	***400***	***6***	***407***	***116***	***529***	***136***	***929***	***1065***	
AM PHF	**0.917**				**0.885**				**0.790**				**0.832**				**0.908**			
PM PHF	**0.667**				**0.889**				**0.901**				**0.912**				**0.918**			

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 4: WV 115 @ Fairleigh Drive/Baily Brooks Way
COUNT BY	AMT

Friday

STREET	Bailey Brooks Way				Fairleigh Dr				WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	0	0	3	3	2	0	0	2	0	68	0	68	0	20	2	22	5	90	95	95
0715 - 0730	**0**	**0**	**0**	**0**	**10**	**0**	**0**	**10**	**1**	**96**	**0**	**97**	**1**	**46**	**2**	**49**	**10**	**146**	**156**	251
0730 - 0745	**0**	**0**	**2**	**2**	**13**	**0**	**0**	**13**	**0**	**110**	**0**	**110**	**0**	**49**	**6**	**55**	**15**	**165**	**180**	431
0745 - 0800	**0**	**0**	**3**	**3**	**10**	**0**	**1**	**11**	**0**	**86**	**0**	**86**	**0**	**51**	**9**	**60**	**14**	**146**	**160**	591
0800 - 0815	**0**	**0**	**0**	**0**	**7**	**1**	**1**	**9**	**1**	**74**	**0**	**75**	**1**	**46**	**4**	**51**	**9**	**126**	**135**	***631***
0815 - 0830	0	0	4	4	5	0	0	5	0	68	0	68	1	56	4	61	9	129	138	613
0830 - 0845	0	0	2	2	14	0	1	15	1	103	0	104	1	50	4	55	17	159	176	609
0845 - 0900	0	0	5	5	5	0	0	5	0	111	0	111	3	54	5	62	10	173	183	632
1500 - 1515	0	0	0	0	6	0	1	7	0	65	0	65	2	93	9	104	7	169	176	176
1515 - 1530	0	0	1	1	11	0	0	11	0	75	0	75	1	104	9	114	12	189	201	377
1530 - 1545	0	0	1	1	3	0	0	3	1	77	0	78	1	91	12	104	4	182	186	563
1545 - 1600	0	0	2	2	9	0	0	9	1	98	0	99	1	93	15	109	11	208	219	782
1600 - 1615	0	0	0	0	7	0	2	9	0	113	0	113	1	101	20	122	9	235	244	850
1615 - 1630	0	0	1	1	7	0	0	7	0	91	0	91	8	115	7	130	8	221	229	878
1630 - 1645	0	0	3	3	8	0	1	9	1	98	0	99	2	107	10	119	12	218	230	922
1645 - 1700	0	0	2	2	4	0	0	4	2	77	0	79	2	125	4	131	6	210	216	919
1700 - 1715	**0**	**0**	**1**	**1**	**12**	**0**	**0**	**12**	**0**	**84**	**0**	**84**	**1**	**106**	**8**	**115**	**13**	**199**	**212**	887
1715 - 1730	**0**	**0**	**2**	**2**	**5**	**0**	**0**	**5**	**1**	**85**	**0**	**86**	**1**	**110**	**11**	**122**	**7**	**208**	**215**	873
1730 - 1745	**0**	**0**	**6**	**6**	**9**	**0**	**0**	**9**	**1**	**88**	**0**	**89**	**4**	**109**	**11**	**124**	**15**	**213**	**228**	871
1745 - 1800	**0**	**0**	**2**	**2**	**8**	**0**	**1**	**9**	**1**	**99**	**0**	**100**	**4**	**135**	**12**	**151**	**11**	**251**	**262**	***917***
Peak HR AM																				
0715 - 0815	***0***	***0***	***5***	***5***	***40***	***1***	***2***	***43***	***2***	***366***	***0***	***368***	***2***	***192***	***21***	***215***	***48***	***583***	***631***	
Peak HR PM																				
1700 - 1800	***0***	***0***	***11***	***11***	***34***	***0***	***1***	***35***	***3***	***356***	***0***	***359***	***10***	***460***	***42***	***512***	***46***	***871***	***917***	

AM PHF	**0.417**	**0.827**	**0.836**	**0.896**	**0.876**
PM PHF	**0.458**	**0.729**	**0.898**	**0.848**	**0.875**

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 5: WV 115 @ Crosswinds Drive
COUNT BY	AMT

Friday

STREET					Crosswinds Dr				WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	0	0	0	0	4	0	3	7	0	60	0	60	0	13	4	17	7	77	84	84
0715 - 0730	**0**	**0**	**0**	**0**	**5**	**0**	**4**	**9**	**1**	**93**	**0**	**94**	**0**	**43**	**1**	**44**	**9**	**138**	**147**	231
0730 - 0745	**0**	**0**	**0**	**0**	**23**	**0**	**1**	**24**	**0**	**79**	**0**	**79**	**0**	**36**	**5**	**41**	**24**	**120**	**144**	375
0745 - 0800	**0**	**0**	**0**	**0**	**11**	**0**	**2**	**13**	**1**	**68**	**0**	**69**	**0**	**45**	**7**	**52**	**13**	**121**	**134**	509
0800 - 0815	**0**	**0**	**0**	**0**	**1**	**0**	**2**	**3**	**0**	**65**	**0**	**65**	**0**	**40**	**3**	**43**	**3**	**108**	**111**	***536***
0815 - 0830	0	0	0	0	11	0	2	13	2	54	0	56	0	52	6	58	13	114	127	516
0830 - 0845	0	0	0	0	13	0	2	15	3	98	0	101	0	41	6	47	15	148	163	535
0845 - 0900	0	0	0	0	8	0	1	9	1	85	0	86	0	48	4	52	9	138	147	548
1500 - 1515	0	0	0	0	4	0	2	6	1	63	0	64	0	80	12	92	6	156	162	162
1515 - 1530	0	0	0	0	5	0	1	6	0	67	0	67	0	90	8	98	6	165	171	333
1530 - 1545	0	0	0	0	6	0	3	9	4	68	0	72	0	75	9	84	9	156	165	498
1545 - 1600	0	0	0	0	10	0	0	10	1	82	0	83	0	75	12	87	10	170	180	678
1600 - 1615	0	0	0	0	8	0	2	10	4	95	0	99	0	80	16	96	10	195	205	721
1615 - 1630	0	0	0	0	5	0	1	6	0	82	0	82	0	103	7	110	6	192	198	748
1630 - 1645	0	0	0	0	9	0	1	10	1	85	0	86	0	91	7	98	10	184	194	777
1645 - 1700	0	0	0	0	5	0	0	5	5	68	0	73	0	102	17	119	5	192	197	794
1700 - 1715	**0**	**0**	**0**	**0**	**10**	**0**	**1**	**11**	**2**	**67**	**0**	**69**	**0**	**86**	**17**	**103**	**11**	**172**	**183**	772
1715 - 1730	**0**	**0**	**0**	**0**	**10**	**0**	**1**	**11**	**1**	**77**	**0**	**78**	**0**	**95**	**11**	**106**	**11**	**184**	**195**	769
1730 - 1745	**0**	**0**	**0**	**0**	**6**	**0**	**5**	**11**	**2**	**75**	**0**	**77**	**0**	**91**	**18**	**109**	**11**	**186**	**197**	772
1745 - 1800	**0**	**0**	**0**	**0**	**9**	**0**	**0**	**9**	**3**	**87**	**0**	**90**	**0**	**93**	**38**	**131**	**9**	**221**	**230**	***805***
Peak HR AM																				
0715 - 0815	***0***	***0***	***0***	***0***	***40***	***0***	***9***	***49***	***2***	***305***	***0***	***307***	***0***	***164***	***16***	***180***	***49***	***487***	***536***	
Peak HR PM																				
1700 - 1800	***0***	***0***	***0***	***0***	***35***	***0***	***7***	***42***	***8***	***306***	***0***	***314***	***0***	***365***	***84***	***449***	***42***	***763***	***805***	
AM PHF	**0.000**				**0.510**				**0.816**				**0.865**				**0.912**			
PM PHF	**0.000**				**0.955**				**0.872**				**0.857**				**0.875**			

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 6: WV 115 @ Kabletown Road
COUNT BY	AMT

Friday

STREET					Kabletown Rd				WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	0	0	0	0	7	0	7	14	2	55	0	57	0	13	3	16	14	73	87	87
0715 - 0730	**0**	**0**	**0**	**0**	**13**	**0**	**5**	**18**	**0**	**76**	**0**	**76**	**0**	**38**	**6**	**44**	**18**	**120**	**138**	225
0730 - 0745	**0**	**0**	**0**	**0**	**17**	**0**	**1**	**18**	**4**	**64**	**0**	**68**	**0**	**36**	**5**	**41**	**18**	**109**	**127**	352
0745 - 0800	**0**	**0**	**0**	**0**	**13**	**0**	**2**	**15**	**0**	**56**	**0**	**56**	**0**	**26**	**17**	**43**	**15**	**99**	**114**	466
0800 - 0815	**0**	**0**	**0**	**0**	**16**	**0**	**3**	**19**	**2**	**50**	**0**	**52**	**0**	**36**	**8**	**44**	**19**	**96**	**115**	***494***
0815 - 0830	0	0	0	0	6	0	8	14	3	56	0	59	0	43	11	54	14	113	127	483
0830 - 0845	0	0	0	0	19	0	6	25	5	85	0	90	0	39	5	44	25	134	159	515
0845 - 0900	0	0	0	0	11	0	6	17	1	73	0	74	0	36	14	50	17	124	141	542
1500 - 1515	0	0	0	0	4	0	4	8	2	56	0	58	0	66	14	80	8	138	146	146
1515 - 1530	0	0	0	0	11	0	3	14	7	57	0	64	0	74	17	91	14	155	169	315
1530 - 1545	0	0	0	0	8	0	4	12	4	67	0	71	0	66	17	83	12	154	166	481
1545 - 1600	0	0	0	0	16	0	3	19	5	74	0	79	0	59	16	75	19	154	173	654
1600 - 1615	0	0	0	0	16	0	4	20	11	82	0	93	0	71	9	80	20	173	193	701
1615 - 1630	0	0	0	0	14	0	1	15	7	65	0	72	0	88	19	107	15	179	194	726
1630 - 1645	0	0	0	0	19	0	5	24	16	72	0	88	0	86	9	95	24	183	207	767
1645 - 1700	0	0	0	0	12	0	5	17	4	63	0	67	0	77	22	99	17	166	183	777
1700 - 1715	**0**	**0**	**0**	**0**	**15**	**0**	**9**	**24**	**7**	**52**	**0**	**59**	**0**	**78**	**10**	**88**	**24**	**147**	**171**	755
1715 - 1730	**0**	**0**	**0**	**0**	**13**	**0**	**6**	**19**	**11**	**69**	**0**	**80**	**0**	**90**	**11**	**101**	**19**	**181**	**200**	761
1730 - 1745	**0**	**0**	**0**	**0**	**21**	**0**	**6**	**27**	**9**	**63**	**0**	**72**	**0**	**89**	**7**	**96**	**27**	**168**	**195**	749
1745 - 1800	**0**	**0**	**0**	**0**	**21**	**0**	**1**	**22**	**7**	**69**	**0**	**76**	**0**	**77**	**12**	**89**	**22**	**165**	**187**	***753***
Peak HR AM																				
0715 - 0815	***0***	***0***	***0***	***0***	***59***	***0***	***11***	***70***	***6***	***246***	***0***	***252***	***0***	***136***	***36***	***172***	***70***	***424***	***494***	
Peak HR PM																				
1700 - 1800	***0***	***0***	***0***	***0***	***70***	***0***	***22***	***92***	***34***	***253***	***0***	***287***	***0***	***334***	***40***	***374***	***92***	***661***	***753***	
AM PHF	**0.000**				**0.921**				**0.829**				**0.977**				**0.895**			
PM PHF	**0.000**				**0.852**				**0.897**				**0.926**				**0.941**			

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 7: WV 115 @ Cattail Run Road
COUNT BY	AMT

Friday

STREET	Cattail Run Rd								WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	0	0	2	2	0	0	0	0	0	54	2	56	6	15	0	21	2	77	79	79
0715 - 0730	**0**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**76**	**2**	**78**	**8**	**38**	**0**	**46**	**2**	**124**	**126**	205
0730 - 0745	**0**	**0**	**2**	**2**	**0**	**0**	**0**	**0**	**0**	**66**	**1**	**67**	**3**	**31**	**0**	**34**	**2**	**101**	**103**	308
0745 - 0800	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**57**	**3**	**60**	**2**	**26**	**0**	**28**	**0**	**88**	**88**	396
0800 - 0815	**0**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**47**	**0**	**47**	**1**	**40**	**0**	**41**	**1**	**88**	**89**	***406***
0815 - 0830	0	0	0	0	0	0	0	0	0	59	1	60	11	42	0	53	0	113	113	393
0830 - 0845	0	0	2	2	0	0	0	0	0	83	1	84	4	34	0	38	2	122	124	414
0845 - 0900	0	0	3	3	0	0	0	0	0	75	5	80	3	41	0	44	3	124	127	453
1500 - 1515	1	0	3	4	0	0	0	0	0	55	7	62	0	69	0	69	4	131	135	135
1515 - 1530	1	0	9	10	0	0	0	0	0	57	4	61	2	74	0	76	10	137	147	282
1530 - 1545	0	0	5	5	0	0	0	0	0	65	6	71	3	68	0	71	5	142	147	429
1545 - 1600	0	0	2	2	0	0	0	0	0	72	8	80	1	64	0	65	2	145	147	576
1600 - 1615	0	0	13	13	0	0	0	0	0	80	8	88	1	70	0	71	13	159	172	613
1615 - 1630	0	0	4	4	0	0	0	0	0	69	2	71	1	84	0	85	4	156	160	626
1630 - 1645	1	0	12	13	0	0	0	0	0	66	1	67	4	85	0	89	13	156	169	648
1645 - 1700	0	0	4	4	0	0	0	0	0	66	5	71	4	77	0	81	4	152	156	657
1700 - 1715	**0**	**0**	**7**	**7**	**0**	**0**	**0**	**0**	**0**	**53**	**3**	**56**	**4**	**81**	**0**	**85**	**7**	**141**	**148**	633
1715 - 1730	**0**	**0**	**12**	**12**	**0**	**0**	**0**	**0**	**0**	**65**	**3**	**68**	**3**	**93**	**0**	**96**	**12**	**164**	**176**	649
1730 - 1745	**0**	**0**	**5**	**5**	**0**	**0**	**0**	**0**	**0**	**67**	**2**	**69**	**4**	**91**	**0**	**95**	**5**	**164**	**169**	649
1745 - 1800	**0**	**0**	**5**	**5**	**0**	**0**	**0**	**0**	**0**	**69**	**2**	**71**	**1**	**76**	**0**	**77**	**5**	**148**	**153**	***646***
Peak HR AM																				
0715 - 0815	***0***	***0***	***5***	***5***	***0***	***0***	***0***	***0***	***0***	***246***	***6***	***252***	***14***	***135***	***0***	***149***	***5***	***401***	***406***	
Peak HR PM																				
1700 - 1800	***0***	***0***	***29***	***29***	***0***	***0***	***0***	***0***	***0***	***254***	***10***	***264***	***12***	***341***	***0***	***353***	***29***	***617***	***646***	
AM PHF	**0.625**				**0.000**				**0.808**				**0.810**				**0.806**			
PM PHF	**0.604**				**0.000**				**0.930**				**0.919**				**0.918**			

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 8: WV 9 @ Cattail Run Road
COUNT BY	AMT

Friday

STREET	Cattail Run Rd				Cattail Run Rd				WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	14	0	1	15	0	5	3	8	2	60	3	65	0	197	0	197	23	262	285	285
0715 - 0730	**13**	**2**	**4**	**19**	**1**	**6**	**4**	**11**	**1**	**74**	**5**	**80**	**2**	**159**	**0**	**161**	**30**	**241**	**271**	556
0730 - 0745	**12**	**0**	**3**	**15**	**1**	**3**	**1**	**5**	**1**	**72**	**7**	**80**	**0**	**145**	**2**	**147**	**20**	**227**	**247**	803
0745 - 0800	**14**	**1**	**7**	**22**	**1**	**2**	**4**	**7**	**0**	**69**	**2**	**71**	**3**	**149**	**2**	**154**	**29**	**225**	**254**	1057
0800 - 0815	**18**	**0**	**2**	**20**	**1**	**2**	**0**	**3**	**3**	**59**	**5**	**67**	**1**	**159**	**1**	**161**	**23**	**228**	**251**	***1023***
0815 - 0830	7	0	0	7	1	6	3	10	0	70	5	75	0	125	0	125	17	200	217	969
0830 - 0845	12	1	3	16	1	4	4	9	2	74	4	80	0	116	0	116	25	196	221	943
0845 - 0900	11	2	2	15	1	7	0	8	0	65	5	70	0	96	0	96	23	166	189	878
1500 - 1515	8	5	4	17	3	3	0	6	1	183	14	198	2	94	1	97	23	295	318	318
1515 - 1530	15	4	5	24	1	5	1	7	4	164	18	186	1	85	0	86	31	272	303	621
1530 - 1545	7	1	3	11	0	8	1	9	3	191	19	213	1	91	1	93	20	306	326	947
1545 - 1600	6	3	4	13	2	4	2	8	1	181	15	197	0	93	1	94	21	291	312	1259
1600 - 1615	7	3	2	12	1	12	2	15	7	193	19	219	3	83	2	88	27	307	334	1275
1615 - 1630	15	4	5	24	3	0	1	4	0	200	15	215	3	100	0	103	28	318	346	1318
1630 - 1645	8	12	4	24	0	4	1	5	2	110	10	122	2	94	0	96	29	218	247	1239
1645 - 1700	13	3	8	24	5	3	1	9	0	63	9	72	2	96	0	98	33	170	203	1130
1700 - 1715	**7**	**7**	**8**	**22**	**1**	**4**	**4**	**9**	**2**	**99**	**8**	**109**	**2**	**78**	**0**	**80**	**31**	**189**	**220**	1016
1715 - 1730	**7**	**10**	**3**	**20**	**0**	**4**	**0**	**4**	**2**	**101**	**5**	**108**	**0**	**93**	**2**	**95**	**24**	**203**	**227**	897
1730 - 1745	**12**	**6**	**1**	**19**	**1**	**6**	**2**	**9**	**2**	**162**	**8**	**172**	**1**	**84**	**0**	**85**	**28**	**257**	**285**	935
1745 - 1800	**16**	**2**	**4**	**22**	**1**	**1**	**1**	**3**	**2**	**70**	**6**	**78**	**1**	**73**	**0**	**74**	**25**	**152**	**177**	***909***
Peak HR AM																				
0715 - 0815	***57***	***3***	***16***	***76***	***4***	***13***	***9***	***26***	***5***	***274***	***19***	***298***	***6***	***612***	***5***	***623***	***102***	***921***	***1023***	
Peak HR PM																				
1700 - 1800	***42***	***25***	***16***	***83***	***3***	***15***	***7***	***25***	***8***	***432***	***27***	***467***	***4***	***328***	***2***	***334***	***108***	***801***	***909***	
AM PHF	**0.864**				**0.591**				**0.931**				**0.967**				**0.944**			
PM PHF	**0.943**				**0.694**				**0.679**				**0.879**				**0.797**			

APPENDIX B-3: AASHTO LEFT-TURN LANE ANALYSIS

AM Peak 2030 Condition (WV 115 with Site Drive #1)

% LT	Operating Speed
10 % Left Turns	55 mph
Opposing Volume (veh/h)	Advancing Volume (veh/h)
490	289
Required Advancing	AASHTO Analysis
268	Guideline Met

PM Peak 2030 Condition (WV 115 with Site Drive #1)

% LT	Operating Speed
20 % Left Turns	55 mph
Opposing Volume (veh/h)	Advancing Volume (veh/h)
449	686
Required Advancing	AASHTO Analysis
210	Guideline Met

AM Peak 2030 Condition (WV 115 with Site Drive #2)

% LT	Operating Speed
10 % Left Turns	55 mph
Opposing Volume (veh/h)	Advancing Volume (veh/h)
403	258
Required Advancing	AASHTO Analysis
294	Guideline Not Met

PM Peak 2030 Condition (WV 115 with Site Drive #2)

% LT	Operating Speed
20 % Left Turns	55 mph
Opposing Volume (veh/h)	Advancing Volume (veh/h)
411	577
Required Advancing	AASHTO Analysis
218	Guideline Met

APPENDIX C: SYNCHRO OUTPUTS

APPENDIX C-1: 2022 EXISTING CONDITIONS AM PEAK HOUR

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	60	172	166	174	137	57
Future Vol, veh/h	60	172	166	174	137	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	72	207	200	210	165	69

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	410	0	-	0	656	305
Stage 1	-	-	-	-	305	-
Stage 2	-	-	-	-	351	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1149	-	-	-	430	735
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	713	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1149	-	-	-	399	735
Mov Cap-2 Maneuver	-	-	-	-	399	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	713	-

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0	20.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1149	-	-	-	461
HCM Lane V/C Ratio	0.063	-	-	-	0.507
HCM Control Delay (s)	8.3	0	-	-	20.6
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	2.8

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	191	153	142	304	0	28	0	18	0	5	6
Future Vol, veh/h	3	191	153	142	304	0	28	0	18	0	5	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Stop	-	-	None
Storage Length	150	-	-	175	-	-	-	-	125	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	210	168	156	334	0	31	0	20	0	5	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	334	0	0	378	0	0	952	946	294	946	1030	334
Stage 1	-	-	-	-	-	-	300	300	-	646	646	-
Stage 2	-	-	-	-	-	-	652	646	-	300	384	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1225	-	-	1180	-	-	239	262	745	241	233	708
Stage 1	-	-	-	-	-	-	709	666	-	460	467	-
Stage 2	-	-	-	-	-	-	457	467	-	709	611	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1225	-	-	1180	-	-	208	227	745	210	202	708
Mov Cap-2 Maneuver	-	-	-	-	-	-	208	227	-	210	202	-
Stage 1	-	-	-	-	-	-	708	665	-	459	405	-
Stage 2	-	-	-	-	-	-	388	405	-	688	610	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.7	19.3	16.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	208	745	1225	-	-	1180	-	-	331
HCM Lane V/C Ratio	0.148	0.027	0.003	-	-	0.132	-	-	0.037
HCM Control Delay (s)	25.3	10	7.9	-	-	8.5	-	-	16.3
HCM Lane LOS	D	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.5	0.1	0	-	-	0.5	-	-	0.1

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	2	192	21	2	366	0	40	1	2	0	0	5
Future Vol, veh/h	2	192	21	2	366	0	40	1	2	0	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	218	24	2	416	0	45	1	2	0	0	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	416	0	0	242	0	0	657	654	230	656	666	416
Stage 1	-	-	-	-	-	-	234	234	-	420	420	-
Stage 2	-	-	-	-	-	-	423	420	-	236	246	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1143	-	-	1324	-	-	378	386	809	379	380	637
Stage 1	-	-	-	-	-	-	769	711	-	611	589	-
Stage 2	-	-	-	-	-	-	609	589	-	767	703	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1143	-	-	1324	-	-	373	384	809	376	378	637
Mov Cap-2 Maneuver	-	-	-	-	-	-	373	384	-	376	378	-
Stage 1	-	-	-	-	-	-	767	710	-	610	588	-
Stage 2	-	-	-	-	-	-	602	588	-	762	702	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	15.8	10.7
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	383	1143	-	-	1324	-	-	637
HCM Lane V/C Ratio	0.128	0.002	-	-	0.002	-	-	0.009
HCM Control Delay (s)	15.8	8.2	0	-	7.7	0	-	10.7
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	164	16	2	305	40	9
Future Vol, veh/h	164	16	2	305	40	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	175	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	180	18	2	335	44	10

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	198	0	519	180
Stage 1	-	-	-	-	180	-
Stage 2	-	-	-	-	339	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1375	-	517	863
Stage 1	-	-	-	-	851	-
Stage 2	-	-	-	-	722	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1375	-	516	863
Mov Cap-2 Maneuver	-	-	-	-	516	-
Stage 1	-	-	-	-	851	-
Stage 2	-	-	-	-	721	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	516	863	-	-	1375	-
HCM Lane V/C Ratio	0.085	0.011	-	-	0.002	-
HCM Control Delay (s)	12.6	9.2	-	-	7.6	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	136	36	6	246	59	11
Future Vol, veh/h	136	36	6	246	59	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	151	40	7	273	66	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	191	0	438	151
Stage 1	-	-	-	-	151	-
Stage 2	-	-	-	-	287	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1383	-	576	895
Stage 1	-	-	-	-	877	-
Stage 2	-	-	-	-	762	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1383	-	573	895
Mov Cap-2 Maneuver	-	-	-	-	573	-
Stage 1	-	-	-	-	877	-
Stage 2	-	-	-	-	757	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	607	-	-	1383	-
HCM Lane V/C Ratio	0.128	-	-	0.005	-
HCM Control Delay (s)	11.8	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	135	246	6	0	5
Future Vol, veh/h	14	135	246	6	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	18	169	308	8	0	6

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	316	0	-	0	517	312
Stage 1	-	-	-	-	312	-
Stage 2	-	-	-	-	205	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1244	-	-	-	518	728
Stage 1	-	-	-	-	742	-
Stage 2	-	-	-	-	829	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1244	-	-	-	510	728
Mov Cap-2 Maneuver	-	-	-	-	510	-
Stage 1	-	-	-	-	730	-
Stage 2	-	-	-	-	829	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1244	-	-	-	728
HCM Lane V/C Ratio	0.014	-	-	-	0.009
HCM Control Delay (s)	7.9	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	612	5	5	274	19	4	13	9	57	3	16
Future Vol, veh/h	6	612	5	5	274	19	4	13	9	57	3	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	475	-	75	450	-	100	75	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	6	651	5	5	291	20	4	14	10	61	3	17

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	311	0	0	656	0	0	820	984	326	646	969	146
Stage 1	-	-	-	-	-	-	663	663	-	301	301	-
Stage 2	-	-	-	-	-	-	157	321	-	345	668	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1246	-	-	927	-	-	267	247	670	357	252	875
Stage 1	-	-	-	-	-	-	417	457	-	683	664	-
Stage 2	-	-	-	-	-	-	829	650	-	644	455	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1246	-	-	927	-	-	257	245	670	334	249	875
Mov Cap-2 Maneuver	-	-	-	-	-	-	257	245	-	334	249	-
Stage 1	-	-	-	-	-	-	415	455	-	680	661	-
Stage 2	-	-	-	-	-	-	805	647	-	613	453	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	17.1	16.4
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	257	331	1246	-	-	927	-	-	334	626
HCM Lane V/C Ratio	0.017	0.071	0.005	-	-	0.006	-	-	0.182	0.032
HCM Control Delay (s)	19.2	16.7	7.9	-	-	8.9	-	-	18.2	10.9
HCM Lane LOS	C	C	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.1	0.2	0	-	-	0	-	-	0.7	0.1

APPENDIX C-2: 2022 EXISTING CONDITIONS PM PEAK HOUR

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	12	251	230	147	207	27
Future Vol, veh/h	12	251	230	147	207	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	256	235	150	211	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	385	0	-	0	590	310
Stage 1	-	-	-	-	310	-
Stage 2	-	-	-	-	280	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1173	-	-	-	470	730
Stage 1	-	-	-	-	744	-
Stage 2	-	-	-	-	767	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1173	-	-	-	464	730
Mov Cap-2 Maneuver	-	-	-	-	464	-
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	767	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	19.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1173	-	-	-	484
HCM Lane V/C Ratio	0.01	-	-	-	0.493
HCM Control Delay (s)	8.1	0	-	-	19.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	2.7

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	459	116	157	273	1	71	0	57	0	5	3
Future Vol, veh/h	6	459	116	157	273	1	71	0	57	0	5	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Stop	-	-	None
Storage Length	150	-	-	175	-	-	-	-	125	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	499	126	171	297	1	77	0	62	0	5	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	298	0	0	625	0	0	1220	1216	562	1216	1279	298
Stage 1	-	-	-	-	-	-	576	576	-	640	640	-
Stage 2	-	-	-	-	-	-	644	640	-	576	639	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1263	-	-	956	-	-	157	181	526	158	166	741
Stage 1	-	-	-	-	-	-	503	502	-	464	470	-
Stage 2	-	-	-	-	-	-	461	470	-	503	470	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1263	-	-	956	-	-	130	148	526	120	135	741
Mov Cap-2 Maneuver	-	-	-	-	-	-	130	148	-	120	135	-
Stage 1	-	-	-	-	-	-	500	499	-	461	386	-
Stage 2	-	-	-	-	-	-	372	386	-	441	467	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	3.5	42.8	24.3
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	130	526	1263	-	-	956	-	-	195
HCM Lane V/C Ratio	0.594	0.118	0.005	-	-	0.179	-	-	0.045
HCM Control Delay (s)	66.8	12.8	7.9	-	-	9.6	-	-	24.3
HCM Lane LOS	F	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	3	0.4	0	-	-	0.6	-	-	0.1

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	10	460	42	3	356	0	34	0	1	0	0	11
Future Vol, veh/h	10	460	42	3	356	0	34	0	1	0	0	11
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	523	48	3	405	0	39	0	1	0	0	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	405	0	0	571	0	0	987	980	547	981	1004	405
Stage 1	-	-	-	-	-	-	569	569	-	411	411	-
Stage 2	-	-	-	-	-	-	418	411	-	570	593	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1154	-	-	1002	-	-	226	250	537	229	242	646
Stage 1	-	-	-	-	-	-	507	506	-	618	595	-
Stage 2	-	-	-	-	-	-	612	595	-	506	493	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1154	-	-	1002	-	-	219	246	537	225	238	646
Mov Cap-2 Maneuver	-	-	-	-	-	-	219	246	-	225	238	-
Stage 1	-	-	-	-	-	-	500	499	-	609	593	-
Stage 2	-	-	-	-	-	-	598	593	-	498	486	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	24.6	10.7
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	223	1154	-	-	1002	-	-	646
HCM Lane V/C Ratio	0.178	0.01	-	-	0.003	-	-	0.019
HCM Control Delay (s)	24.6	8.2	0	-	8.6	0	-	10.7
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	365	84	8	306	35	7
Future Vol, veh/h	365	84	8	306	35	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	175	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	415	95	9	348	40	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	510	0	781	415
Stage 1	-	-	-	-	415	-
Stage 2	-	-	-	-	366	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1055	-	363	637
Stage 1	-	-	-	-	666	-
Stage 2	-	-	-	-	702	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1055	-	360	637
Mov Cap-2 Maneuver	-	-	-	-	360	-
Stage 1	-	-	-	-	666	-
Stage 2	-	-	-	-	696	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	15.3
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	360	637	-	-	1055	-
HCM Lane V/C Ratio	0.11	0.012	-	-	0.009	-
HCM Control Delay (s)	16.2	10.7	-	-	8.4	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-

Intersection	
Int Delay, s/veh	2.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	334	40	34	253	70	22
Future Vol, veh/h	334	40	34	253	70	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	355	43	36	269	74	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	398	0	696	355
Stage 1	-	-	-	-	355	-
Stage 2	-	-	-	-	341	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1161	-	408	689
Stage 1	-	-	-	-	710	-
Stage 2	-	-	-	-	720	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1161	-	393	689
Mov Cap-2 Maneuver	-	-	-	-	393	-
Stage 1	-	-	-	-	710	-
Stage 2	-	-	-	-	694	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	15.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	438	-	-	1161	-
HCM Lane V/C Ratio	0.223	-	-	0.031	-
HCM Control Delay (s)	15.6	-	-	8.2	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	12	341	254	10	0	29
Future Vol, veh/h	12	341	254	10	0	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	13	371	276	11	0	32

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	287	0	-	0	679	282
Stage 1	-	-	-	-	282	-
Stage 2	-	-	-	-	397	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1275	-	-	-	417	757
Stage 1	-	-	-	-	766	-
Stage 2	-	-	-	-	679	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1275	-	-	-	412	757
Mov Cap-2 Maneuver	-	-	-	-	412	-
Stage 1	-	-	-	-	756	-
Stage 2	-	-	-	-	679	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1275	-	-	-	757
HCM Lane V/C Ratio	0.01	-	-	-	0.042
HCM Control Delay (s)	7.9	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.4

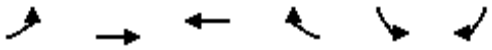
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	328	2	8	432	27	3	15	7	42	25	16
Future Vol, veh/h	4	328	2	8	432	27	3	15	7	42	25	16
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	475	-	75	450	-	100	75	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	410	3	10	540	34	4	19	9	53	31	20

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	574	0	0	413	0	0	726	1014	205	785	983	270
Stage 1	-	-	-	-	-	-	420	420	-	560	560	-
Stage 2	-	-	-	-	-	-	306	594	-	225	423	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	995	-	-	1142	-	-	312	237	802	283	247	728
Stage 1	-	-	-	-	-	-	581	588	-	480	509	-
Stage 2	-	-	-	-	-	-	679	491	-	757	586	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	995	-	-	1142	-	-	271	234	802	260	244	728
Mov Cap-2 Maneuver	-	-	-	-	-	-	271	234	-	260	244	-
Stage 1	-	-	-	-	-	-	578	585	-	478	504	-
Stage 2	-	-	-	-	-	-	614	487	-	721	583	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	18.1	20.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	271	302	995	-	-	1142	-	-	260	329
HCM Lane V/C Ratio	0.014	0.091	0.005	-	-	0.009	-	-	0.202	0.156
HCM Control Delay (s)	18.5	18.1	8.6	-	-	8.2	-	-	22.3	18
HCM Lane LOS	C	C	A	-	-	A	-	-	C	C
HCM 95th %tile Q(veh)	0	0.3	0	-	-	0	-	-	0.7	0.5

APPENDIX C-3: 2030 NO-BUILD AM PEAK HOUR



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	66	198	211	192	156	65
Future Volume (veh/h)	66	198	211	192	156	65
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	80	239	254	231	188	78
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	518	913	440	400	399	165
Arrive On Green	0.49	0.49	0.49	0.41	0.33	0.26
Sat Flow, veh/h	911	1870	902	820	1211	502
Grp Volume(v), veh/h	80	239	0	485	267	0
Grp Sat Flow(s),veh/h/ln	911	1870	0	1723	1719	0
Q Serve(g_s), s	1.9	2.1	0.0	5.7	3.4	0.0
Cycle Q Clear(g_c), s	7.6	2.1	0.0	5.7	3.4	0.0
Prop In Lane	1.00			0.48	0.70	0.29
Lane Grp Cap(c), veh/h	518	913	0	841	566	0
V/C Ratio(X)	0.15	0.26	0.00	0.58	0.47	0.00
Avail Cap(c_a), veh/h	1855	3660	0	3371	1981	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	7.8	4.1	0.0	5.4	7.5	0.0
Incr Delay (d2), s/veh	0.1	0.2	0.0	0.6	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.1	0.0	0.4	0.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.9	4.3	0.0	6.0	8.1	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		319	485		267	
Approach Delay, s/veh		5.2	6.0		8.1	
Approach LOS		A	A		A	

Timer - Assigned Phs			4		6	8
Phs Duration (G+Y+Rc), s			15.8		11.5	15.8
Change Period (Y+Rc), s			4.5		4.5	4.5
Max Green Setting (Gmax), s			51.5		29.5	51.5
Max Q Clear Time (g_c+I1), s			9.6		5.4	7.7
Green Ext Time (p_c), s			1.8		0.8	3.3

Intersection Summary		
HCM 6th Ctrl Delay	6.3	
HCM 6th LOS	A	

Intersection	
Int Delay, s/veh	1.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	2	229	23	2	457	0	44	1	2	0	0	5
Future Vol, veh/h	2	229	23	2	457	0	44	1	2	0	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	260	26	2	519	0	50	1	2	0	0	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	519	0	0	286	0	0	803	800	273	802	813	519
Stage 1	-	-	-	-	-	-	277	277	-	523	523	-
Stage 2	-	-	-	-	-	-	526	523	-	279	290	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1047	-	-	1276	-	-	302	318	766	302	313	557
Stage 1	-	-	-	-	-	-	729	681	-	537	530	-
Stage 2	-	-	-	-	-	-	535	530	-	728	672	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1047	-	-	1276	-	-	298	317	766	299	312	557
Mov Cap-2 Maneuver	-	-	-	-	-	-	298	317	-	299	312	-
Stage 1	-	-	-	-	-	-	728	680	-	536	529	-
Stage 2	-	-	-	-	-	-	528	529	-	723	671	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	19.2	11.5
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	306	1047	-	-	1276	-	-	557
HCM Lane V/C Ratio	0.175	0.002	-	-	0.002	-	-	0.01
HCM Control Delay (s)	19.2	8.4	0	-	7.8	0	-	11.5
HCM Lane LOS	C	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	198	18	2	389	44	10
Future Vol, veh/h	198	18	2	389	44	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	175	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	218	20	2	427	48	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	238	0	649	218
Stage 1	-	-	-	-	218	-
Stage 2	-	-	-	-	431	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1329	-	434	822
Stage 1	-	-	-	-	818	-
Stage 2	-	-	-	-	655	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1329	-	433	822
Mov Cap-2 Maneuver	-	-	-	-	433	-
Stage 1	-	-	-	-	818	-
Stage 2	-	-	-	-	654	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	433	822	-	-	1329	-
HCM Lane V/C Ratio	0.112	0.013	-	-	0.002	-
HCM Control Delay (s)	14.4	9.4	-	-	7.7	-
HCM Lane LOS	B	A	-	-	A	-
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	155	40	7	374	65	12
Future Vol, veh/h	155	40	7	374	65	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	172	44	8	416	72	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	216	0	604	172
Stage 1	-	-	-	-	172	-
Stage 2	-	-	-	-	432	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1354	-	461	872
Stage 1	-	-	-	-	858	-
Stage 2	-	-	-	-	655	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1354	-	457	872
Mov Cap-2 Maneuver	-	-	-	-	457	-
Stage 1	-	-	-	-	858	-
Stage 2	-	-	-	-	650	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	13.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	494	-	-	1354	-
HCM Lane V/C Ratio	0.173	-	-	0.006	-
HCM Control Delay (s)	13.8	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0	-

Intersection	
Int Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	15	163	274	7	0	5
Future Vol, veh/h	15	163	274	7	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	19	204	343	9	0	6

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	352	0	-	0	590	348
Stage 1	-	-	-	-	348	-
Stage 2	-	-	-	-	242	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1207	-	-	-	470	695
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	798	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1207	-	-	-	462	695
Mov Cap-2 Maneuver	-	-	-	-	462	-
Stage 1	-	-	-	-	702	-
Stage 2	-	-	-	-	798	-

Approach	EB	WB	SB
HCM Control Delay, s	0.7	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1207	-	-	-	695
HCM Lane V/C Ratio	0.016	-	-	-	0.009
HCM Control Delay (s)	8	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	1.9

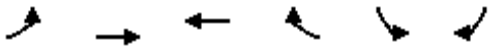
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	673	5	5	301	21	4	14	10	63	3	18
Future Vol, veh/h	7	673	5	5	301	21	4	14	10	63	3	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	475	-	75	450	-	100	75	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	716	5	5	320	22	4	15	11	67	3	19

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	342	0	0	721	0	0	902	1082	358	710	1065	160
Stage 1	-	-	-	-	-	-	730	730	-	330	330	-
Stage 2	-	-	-	-	-	-	172	352	-	380	735	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1214	-	-	877	-	-	233	216	638	321	221	857
Stage 1	-	-	-	-	-	-	380	426	-	657	644	-
Stage 2	-	-	-	-	-	-	813	630	-	614	424	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1214	-	-	877	-	-	223	213	638	296	218	857
Mov Cap-2 Maneuver	-	-	-	-	-	-	223	213	-	296	218	-
Stage 1	-	-	-	-	-	-	378	423	-	653	640	-
Stage 2	-	-	-	-	-	-	786	626	-	579	421	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	18.8	18.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	223	295	1214	-	-	877	-	-	296	604
HCM Lane V/C Ratio	0.019	0.087	0.006	-	-	0.006	-	-	0.226	0.037
HCM Control Delay (s)	21.5	18.4	8	-	-	9.1	-	-	20.7	11.2
HCM Lane LOS	C	C	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.1	0.3	0	-	-	0	-	-	0.9	0.1

APPENDIX C-4: 2030 NO-BUILD PM PEAK HOUR



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	305	270	167	231	31
Future Volume (veh/h)	15	305	270	167	231	31
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	311	276	170	236	32
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	530	854	495	305	538	73
Arrive On Green	0.46	0.46	0.46	0.38	0.35	0.27
Sat Flow, veh/h	944	1870	1083	667	1540	209
Grp Volume(v), veh/h	15	311	0	446	269	0
Grp Sat Flow(s),veh/h/ln	944	1870	0	1750	1756	0
Q Serve(g_s), s	0.3	2.8	0.0	4.9	3.1	0.0
Cycle Q Clear(g_c), s	5.2	2.8	0.0	4.9	3.1	0.0
Prop In Lane	1.00			0.38	0.88	0.12
Lane Grp Cap(c), veh/h	530	854	0	800	613	0
V/C Ratio(X)	0.03	0.36	0.00	0.56	0.44	0.00
Avail Cap(c_a), veh/h	1985	3737	0	3497	2282	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	7.1	4.6	0.0	5.4	6.5	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.6	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.3	0.6	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.1	4.8	0.0	6.0	7.0	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		326	446		269	
Approach Delay, s/veh		4.9	6.0		7.0	
Approach LOS		A	A		A	

Timer - Assigned Phs			4		6	8
Phs Duration (G+Y+Rc), s			14.3		11.5	14.3
Change Period (Y+Rc), s			4.5		4.5	4.5
Max Green Setting (Gmax), s			49.5		31.5	49.5
Max Q Clear Time (g_c+I1), s			7.2		5.1	6.9
Green Ext Time (p_c), s			1.8		0.8	2.9

Intersection Summary	
HCM 6th Ctrl Delay	5.9
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	1.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	11	562	46	3	427	0	37	0	1	0	0	12
Future Vol, veh/h	11	562	46	3	427	0	37	0	1	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	639	52	3	485	0	42	0	1	0	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	485	0	0	691	0	0	1189	1182	665	1183	1208	485
Stage 1	-	-	-	-	-	-	691	691	-	491	491	-
Stage 2	-	-	-	-	-	-	498	491	-	692	717	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1078	-	-	904	-	-	165	190	460	166	183	582
Stage 1	-	-	-	-	-	-	435	446	-	559	548	-
Stage 2	-	-	-	-	-	-	554	548	-	434	434	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1078	-	-	904	-	-	158	185	460	163	178	582
Mov Cap-2 Maneuver	-	-	-	-	-	-	158	185	-	163	178	-
Stage 1	-	-	-	-	-	-	426	437	-	548	545	-
Stage 2	-	-	-	-	-	-	538	545	-	424	425	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	35.4	11.3
HCM LOS			E	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	161	1078	-	-	904	-	-	582
HCM Lane V/C Ratio	0.268	0.012	-	-	0.004	-	-	0.023
HCM Control Delay (s)	35.4	8.4	0	-	9	0	-	11.3
HCM Lane LOS	E	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	457	92	9	372	38	8
Future Vol, veh/h	457	92	9	372	38	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	175	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	519	105	10	423	43	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	624	0	962	519
Stage 1	-	-	-	-	519	-
Stage 2	-	-	-	-	443	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	957	-	284	557
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	647	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	957	-	281	557
Mov Cap-2 Maneuver	-	-	-	-	281	-
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	641	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	18.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	281	557	-	-	957	-
HCM Lane V/C Ratio	0.154	0.016	-	-	0.011	-
HCM Control Delay (s)	20.1	11.6	-	-	8.8	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.5	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	371	44	37	284	77	24
Future Vol, veh/h	371	44	37	284	77	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	395	47	39	302	82	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	442	0	775	395
Stage 1	-	-	-	-	395	-
Stage 2	-	-	-	-	380	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1118	-	366	654
Stage 1	-	-	-	-	681	-
Stage 2	-	-	-	-	691	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1118	-	351	654
Mov Cap-2 Maneuver	-	-	-	-	351	-
Stage 1	-	-	-	-	681	-
Stage 2	-	-	-	-	662	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	17.5
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	394	-	-	1118	-
HCM Lane V/C Ratio	0.273	-	-	0.035	-
HCM Control Delay (s)	17.5	-	-	8.3	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.1	-	-	0.1	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	13	379	285	11	0	32
Future Vol, veh/h	13	379	285	11	0	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	14	412	310	12	0	35

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	322	0	-	0	756	316
Stage 1	-	-	-	-	316	-
Stage 2	-	-	-	-	440	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1238	-	-	-	376	724
Stage 1	-	-	-	-	739	-
Stage 2	-	-	-	-	649	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1238	-	-	-	370	724
Mov Cap-2 Maneuver	-	-	-	-	370	-
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	649	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1238	-	-	-	724
HCM Lane V/C Ratio	0.011	-	-	-	0.048
HCM Control Delay (s)	7.9	0	-	-	10.2
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	2.7

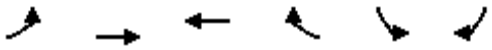
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	361	2	9	475	30	3	16	8	46	27	18
Future Vol, veh/h	4	361	2	9	475	30	3	16	8	46	27	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	475	-	75	450	-	100	75	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	451	3	11	594	38	4	20	10	58	34	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	632	0	0	454	0	0	797	1115	226	862	1080	297
Stage 1	-	-	-	-	-	-	461	461	-	616	616	-
Stage 2	-	-	-	-	-	-	336	654	-	246	464	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	947	-	-	1103	-	-	277	207	777	249	217	699
Stage 1	-	-	-	-	-	-	550	564	-	445	480	-
Stage 2	-	-	-	-	-	-	652	461	-	736	562	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	947	-	-	1103	-	-	233	204	777	225	214	699
Mov Cap-2 Maneuver	-	-	-	-	-	-	233	204	-	225	214	-
Stage 1	-	-	-	-	-	-	547	561	-	443	475	-
Stage 2	-	-	-	-	-	-	580	456	-	697	559	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	20.1	23.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	233	270	947	-	-	1103	-	-	225	296
HCM Lane V/C Ratio	0.016	0.111	0.005	-	-	0.01	-	-	0.256	0.19
HCM Control Delay (s)	20.7	20	8.8	-	-	8.3	-	-	26.4	20
HCM Lane LOS	C	C	A	-	-	A	-	-	D	C
HCM 95th %tile Q(veh)	0	0.4	0	-	-	0	-	-	1	0.7

APPENDIX C-5: 2030 BUILD AM PEAK HOUR



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	66	226	283	192	156	65
Future Volume (veh/h)	66	226	283	192	156	65
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	80	272	341	231	188	78
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	482	976	543	368	372	154
Arrive On Green	0.52	0.52	0.52	0.45	0.31	0.24
Sat Flow, veh/h	840	1870	1039	704	1211	502
Grp Volume(v), veh/h	80	272	0	572	267	0
Grp Sat Flow(s),veh/h/ln	840	1870	0	1744	1719	0
Q Serve(g_s), s	2.2	2.4	0.0	7.0	3.8	0.0
Cycle Q Clear(g_c), s	9.3	2.4	0.0	7.0	3.8	0.0
Prop In Lane	1.00			0.40	0.70	0.29
Lane Grp Cap(c), veh/h	482	976	0	910	528	0
V/C Ratio(X)	0.17	0.28	0.00	0.63	0.51	0.00
Avail Cap(c_a), veh/h	1578	3416	0	3185	1849	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	8.4	3.9	0.0	5.3	8.6	0.0
Incr Delay (d2), s/veh	0.2	0.2	0.0	0.7	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.1	0.0	0.5	0.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.5	4.1	0.0	6.0	9.3	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		352	572		267	
Approach Delay, s/veh		5.1	6.0		9.3	
Approach LOS		A	A		A	

Timer - Assigned Phs		4		6	8
Phs Duration (G+Y+Rc), s		17.8		11.5	17.8
Change Period (Y+Rc), s		4.5		4.5	4.5
Max Green Setting (Gmax), s		51.5		29.5	51.5
Max Q Clear Time (g_c+I1), s		11.3		5.8	9.0
Green Ext Time (p_c), s		2.0		0.8	4.0

Intersection Summary	
HCM 6th Ctrl Delay	6.5
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	2	309	23	2	661	0	44	1	2	0	0	5
Future Vol, veh/h	2	309	23	2	661	0	44	1	2	0	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	351	26	2	751	0	50	1	2	0	0	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	751	0	0	377	0	0	1126	1123	364	1125	1136	751
Stage 1	-	-	-	-	-	-	368	368	-	755	755	-
Stage 2	-	-	-	-	-	-	758	755	-	370	381	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	858	-	-	1181	-	-	182	206	681	182	202	411
Stage 1	-	-	-	-	-	-	652	621	-	401	417	-
Stage 2	-	-	-	-	-	-	399	417	-	650	613	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	858	-	-	1181	-	-	179	205	681	180	201	411
Mov Cap-2 Maneuver	-	-	-	-	-	-	179	205	-	180	201	-
Stage 1	-	-	-	-	-	-	650	619	-	400	416	-
Stage 2	-	-	-	-	-	-	392	416	-	645	611	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	32.2	13.9
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	185	858	-	-	1181	-	-	411
HCM Lane V/C Ratio	0.289	0.003	-	-	0.002	-	-	0.014
HCM Control Delay (s)	32.2	9.2	0	-	8.1	0	-	13.9
HCM Lane LOS	D	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	278	18	2	593	44	10
Future Vol, veh/h	278	18	2	593	44	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	175	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	305	20	2	652	48	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	325	0	961	305
Stage 1	-	-	-	-	305	-
Stage 2	-	-	-	-	656	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1235	-	284	735
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	516	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1235	-	283	735
Mov Cap-2 Maneuver	-	-	-	-	283	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	515	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	18.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	283	735	-	-	1235	-
HCM Lane V/C Ratio	0.171	0.015	-	-	0.002	-
HCM Control Delay (s)	20.3	10	-	-	7.9	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	192	40	7	288	65	12
Future Vol, veh/h	192	40	7	288	65	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	213	44	8	320	72	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	257	0	549	213
Stage 1	-	-	-	-	213	-
Stage 2	-	-	-	-	336	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1308	-	497	827
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	724	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1308	-	494	827
Mov Cap-2 Maneuver	-	-	-	-	494	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	719	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	13.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	527	-	-	1308	-
HCM Lane V/C Ratio	0.162	-	-	0.006	-
HCM Control Delay (s)	13.2	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	40	165	279	7	0	14
Future Vol, veh/h	40	165	279	7	0	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	206	349	9	0	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	358	0	-	0	660	354
Stage 1	-	-	-	-	354	-
Stage 2	-	-	-	-	306	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1201	-	-	-	428	690
Stage 1	-	-	-	-	710	-
Stage 2	-	-	-	-	747	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1201	-	-	-	408	690
Mov Cap-2 Maneuver	-	-	-	-	408	-
Stage 1	-	-	-	-	677	-
Stage 2	-	-	-	-	747	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	10.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1201	-	-	-	690
HCM Lane V/C Ratio	0.042	-	-	-	0.025
HCM Control Delay (s)	8.1	0	-	-	10.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	685	5	14	306	21	4	14	35	63	3	18
Future Vol, veh/h	7	685	5	14	306	21	4	14	35	63	3	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	475	-	75	450	-	100	75	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	729	5	15	326	22	4	15	37	67	3	19

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	348	0	0	734	0	0	938	1121	365	742	1104	163
Stage 1	-	-	-	-	-	-	743	743	-	356	356	-
Stage 2	-	-	-	-	-	-	195	378	-	386	748	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1208	-	-	867	-	-	219	205	632	304	210	853
Stage 1	-	-	-	-	-	-	373	420	-	634	628	-
Stage 2	-	-	-	-	-	-	788	614	-	609	418	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1208	-	-	867	-	-	208	200	632	265	205	853
Mov Cap-2 Maneuver	-	-	-	-	-	-	208	200	-	265	205	-
Stage 1	-	-	-	-	-	-	371	417	-	630	617	-
Stage 2	-	-	-	-	-	-	753	604	-	549	415	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	16.1	20.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	208	391	1208	-	-	867	-	-	265	588
HCM Lane V/C Ratio	0.02	0.133	0.006	-	-	0.017	-	-	0.253	0.038
HCM Control Delay (s)	22.7	15.6	8	-	-	9.2	-	-	23.1	11.4
HCM Lane LOS	C	C	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.1	0.5	0	-	-	0.1	-	-	1	0.1

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	43	246	485	5	12	108
Future Vol, veh/h	43	246	485	5	12	108
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	273	539	6	13	120

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	545	0	-	0	911	542
Stage 1	-	-	-	-	542	-
Stage 2	-	-	-	-	369	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1024	-	-	-	304	540
Stage 1	-	-	-	-	583	-
Stage 2	-	-	-	-	699	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1024	-	-	-	287	540
Mov Cap-2 Maneuver	-	-	-	-	287	-
Stage 1	-	-	-	-	551	-
Stage 2	-	-	-	-	699	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	14.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1024	-	-	-	496
HCM Lane V/C Ratio	0.047	-	-	-	0.269
HCM Control Delay (s)	8.7	0	-	-	14.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1.1

Intersection	
Int Delay, s/veh	2.6

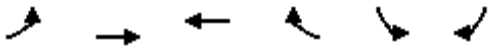
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	220	394	9	25	96
Future Vol, veh/h	38	220	394	9	25	96
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	244	438	10	28	107

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	448	0	-	0	771	443
Stage 1	-	-	-	-	443	-
Stage 2	-	-	-	-	328	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1112	-	-	-	368	615
Stage 1	-	-	-	-	647	-
Stage 2	-	-	-	-	730	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1112	-	-	-	352	615
Mov Cap-2 Maneuver	-	-	-	-	352	-
Stage 1	-	-	-	-	619	-
Stage 2	-	-	-	-	730	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	14
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1112	-	-	-	533
HCM Lane V/C Ratio	0.038	-	-	-	0.252
HCM Control Delay (s)	8.4	0	-	-	14
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1

APPENDIX C-6: 2030 BUILD PM PEAK HOUR



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	383	318	167	231	31
Future Volume (veh/h)	15	383	318	167	231	31
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	391	324	170	236	32
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	512	895	553	290	516	70
Arrive On Green	0.48	0.48	0.48	0.40	0.34	0.26
Sat Flow, veh/h	903	1870	1155	606	1540	209
Grp Volume(v), veh/h	15	391	0	494	269	0
Grp Sat Flow(s),veh/h/ln	903	1870	0	1761	1756	0
Q Serve(g_s), s	0.3	3.7	0.0	5.6	3.3	0.0
Cycle Q Clear(g_c), s	5.9	3.7	0.0	5.6	3.3	0.0
Prop In Lane	1.00			0.34	0.88	0.12
Lane Grp Cap(c), veh/h	512	895	0	843	589	0
V/C Ratio(X)	0.03	0.44	0.00	0.59	0.46	0.00
Avail Cap(c_a), veh/h	1812	3588	0	3379	2191	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	7.3	4.6	0.0	5.4	7.1	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.7	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.4	0.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.3	5.0	0.0	6.0	7.7	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		406	494		269	
Approach Delay, s/veh		5.0	6.0		7.7	
Approach LOS		A	A		A	

Timer - Assigned Phs		4		6	8
Phs Duration (G+Y+Rc), s		15.3		11.5	15.3
Change Period (Y+Rc), s		4.5		4.5	4.5
Max Green Setting (Gmax), s		49.5		31.5	49.5
Max Q Clear Time (g_c+I1), s		7.9		5.3	7.6
Green Ext Time (p_c), s		2.4		0.8	3.3

Intersection Summary	
HCM 6th Ctrl Delay	6.1
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	11	783	46	3	564	0	37	0	1	0	0	12
Future Vol, veh/h	11	783	46	3	564	0	37	0	1	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	890	52	3	641	0	42	0	1	0	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	641	0	0	942	0	0	1596	1589	916	1590	1615	641
Stage 1	-	-	-	-	-	-	942	942	-	647	647	-
Stage 2	-	-	-	-	-	-	654	647	-	943	968	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	943	-	-	728	-	-	86	108	330	87	104	475
Stage 1	-	-	-	-	-	-	316	342	-	460	467	-
Stage 2	-	-	-	-	-	-	456	467	-	315	332	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	943	-	-	728	-	-	81	104	330	84	100	475
Mov Cap-2 Maneuver	-	-	-	-	-	-	81	104	-	84	100	-
Stage 1	-	-	-	-	-	-	307	332	-	447	464	-
Stage 2	-	-	-	-	-	-	440	464	-	305	322	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	88.1	12.8
HCM LOS			F	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	83	943	-	-	728	-	-	475
HCM Lane V/C Ratio	0.52	0.013	-	-	0.005	-	-	0.029
HCM Control Delay (s)	88.1	8.9	0	-	10	0	-	12.8
HCM Lane LOS	F	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	2.2	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	678	92	9	509	38	8
Future Vol, veh/h	678	92	9	509	38	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	175	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	770	105	10	578	43	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	875	0	1368	770
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	598	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	771	-	162	401
Stage 1	-	-	-	-	457	-
Stage 2	-	-	-	-	549	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	771	-	160	401
Mov Cap-2 Maneuver	-	-	-	-	160	-
Stage 1	-	-	-	-	457	-
Stage 2	-	-	-	-	542	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	31.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	160	401	-	-	771	-
HCM Lane V/C Ratio	0.27	0.023	-	-	0.013	-
HCM Control Delay (s)	35.6	14.2	-	-	9.7	-
HCM Lane LOS	E	B	-	-	A	-
HCM 95th %tile Q(veh)	1	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	395	44	37	323	77	24
Future Vol, veh/h	395	44	37	323	77	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	420	47	39	344	82	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	467	0	842	420
Stage 1	-	-	-	-	420	-
Stage 2	-	-	-	-	422	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1094	-	334	633
Stage 1	-	-	-	-	663	-
Stage 2	-	-	-	-	662	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1094	-	319	633
Mov Cap-2 Maneuver	-	-	-	-	319	-
Stage 1	-	-	-	-	663	-
Stage 2	-	-	-	-	633	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	19.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	362	-	-	1094	-
HCM Lane V/C Ratio	0.297	-	-	0.036	-
HCM Control Delay (s)	19.1	-	-	8.4	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	29	387	298	11	0	58
Future Vol, veh/h	29	387	298	11	0	58
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	421	324	12	0	63

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	336	0	-	0	815	330
Stage 1	-	-	-	-	330	-
Stage 2	-	-	-	-	485	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1223	-	-	-	347	712
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	619	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1223	-	-	-	335	712
Mov Cap-2 Maneuver	-	-	-	-	335	-
Stage 1	-	-	-	-	703	-
Stage 2	-	-	-	-	619	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1223	-	-	-	712
HCM Lane V/C Ratio	0.026	-	-	-	0.089
HCM Control Delay (s)	8	0	-	-	10.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	369	2	35	488	30	3	16	24	46	27	18
Future Vol, veh/h	4	369	2	35	488	30	3	16	24	46	27	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	475	-	75	450	-	100	75	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	461	3	44	610	38	4	20	30	58	34	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	648	0	0	464	0	0	881	1207	231	949	1172	305
Stage 1	-	-	-	-	-	-	471	471	-	698	698	-
Stage 2	-	-	-	-	-	-	410	736	-	251	474	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	934	-	-	1094	-	-	241	182	771	215	191	691
Stage 1	-	-	-	-	-	-	542	558	-	397	440	-
Stage 2	-	-	-	-	-	-	589	423	-	731	556	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	934	-	-	1094	-	-	193	174	771	182	182	691
Mov Cap-2 Maneuver	-	-	-	-	-	-	193	174	-	182	182	-
Stage 1	-	-	-	-	-	-	539	555	-	395	422	-
Stage 2	-	-	-	-	-	-	503	406	-	674	553	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.5	18.5	28.3
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	193	325	934	-	-	1094	-	-	182	258
HCM Lane V/C Ratio	0.019	0.154	0.005	-	-	0.04	-	-	0.316	0.218
HCM Control Delay (s)	24	18.1	8.9	-	-	8.4	-	-	33.7	22.8
HCM Lane LOS	C	C	A	-	-	A	-	-	D	C
HCM 95th %tile Q(veh)	0.1	0.5	0	-	-	0.1	-	-	1.3	0.8

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	117	569	436	13	8	73
Future Vol, veh/h	117	569	436	13	8	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	632	484	14	9	81

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	498	0	-	0	1383	491
Stage 1	-	-	-	-	491	-
Stage 2	-	-	-	-	892	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1066	-	-	-	158	578
Stage 1	-	-	-	-	615	-
Stage 2	-	-	-	-	400	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1066	-	-	-	128	578
Mov Cap-2 Maneuver	-	-	-	-	128	-
Stage 1	-	-	-	-	499	-
Stage 2	-	-	-	-	400	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	15.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1066	-	-	-	429
HCM Lane V/C Ratio	0.122	-	-	-	0.21
HCM Control Delay (s)	8.8	0	-	-	15.6
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.4	-	-	-	0.8

Intersection	
Int Delay, s/veh	2.1

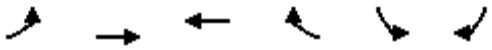
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	104	473	385	26	16	64
Future Vol, veh/h	104	473	385	26	16	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	116	526	428	29	18	71

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	457	0	-	0	1201	443
Stage 1	-	-	-	-	443	-
Stage 2	-	-	-	-	758	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1104	-	-	-	204	615
Stage 1	-	-	-	-	647	-
Stage 2	-	-	-	-	463	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1104	-	-	-	174	615
Mov Cap-2 Maneuver	-	-	-	-	174	-
Stage 1	-	-	-	-	551	-
Stage 2	-	-	-	-	463	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	16.3
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1104	-	-	-	408
HCM Lane V/C Ratio	0.105	-	-	-	0.218
HCM Control Delay (s)	8.6	0	-	-	16.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.3	-	-	-	0.8

APPENDIX C-7: 2030 BUILD IMPROVED AM PEAK



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	66	226	283	192	156	65
Future Volume (veh/h)	66	226	283	192	156	65
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	80	272	341	231	188	78
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	482	976	543	368	372	154
Arrive On Green	0.52	0.52	0.52	0.45	0.31	0.24
Sat Flow, veh/h	840	1870	1039	704	1211	502
Grp Volume(v), veh/h	80	272	0	572	267	0
Grp Sat Flow(s),veh/h/ln	840	1870	0	1744	1719	0
Q Serve(g_s), s	2.2	2.4	0.0	7.0	3.8	0.0
Cycle Q Clear(g_c), s	9.3	2.4	0.0	7.0	3.8	0.0
Prop In Lane	1.00			0.40	0.70	0.29
Lane Grp Cap(c), veh/h	482	976	0	910	528	0
V/C Ratio(X)	0.17	0.28	0.00	0.63	0.51	0.00
Avail Cap(c_a), veh/h	1578	3416	0	3185	1849	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	8.4	3.9	0.0	5.3	8.6	0.0
Incr Delay (d2), s/veh	0.2	0.2	0.0	0.7	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.1	0.0	0.5	0.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.5	4.1	0.0	6.0	9.3	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		352	572		267	
Approach Delay, s/veh		5.1	6.0		9.3	
Approach LOS		A	A		A	

Timer - Assigned Phs		4		6	8
Phs Duration (G+Y+Rc), s		17.8		11.5	17.8
Change Period (Y+Rc), s		4.5		4.5	4.5
Max Green Setting (Gmax), s		51.5		29.5	51.5
Max Q Clear Time (g_c+I1), s		11.3		5.8	9.0
Green Ext Time (p_c), s		2.0		0.8	4.0

Intersection Summary	
HCM 6th Ctrl Delay	6.5
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	2	309	23	2	661	0	44	1	2	0	0	5
Future Vol, veh/h	2	309	23	2	661	0	44	1	2	0	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	351	26	2	751	0	50	1	2	0	0	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	751	0	0	377	0	0	1126	1123	364	1125	1136	751
Stage 1	-	-	-	-	-	-	368	368	-	755	755	-
Stage 2	-	-	-	-	-	-	758	755	-	370	381	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	858	-	-	1181	-	-	182	206	681	182	202	411
Stage 1	-	-	-	-	-	-	652	621	-	401	417	-
Stage 2	-	-	-	-	-	-	399	417	-	650	613	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	858	-	-	1181	-	-	179	205	681	180	201	411
Mov Cap-2 Maneuver	-	-	-	-	-	-	179	205	-	180	201	-
Stage 1	-	-	-	-	-	-	650	619	-	400	416	-
Stage 2	-	-	-	-	-	-	392	416	-	645	611	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0	32.2	13.9
HCM LOS			D	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	185	858	-	-	1181	-	-	411
HCM Lane V/C Ratio	0.289	0.003	-	-	0.002	-	-	0.014
HCM Control Delay (s)	32.2	9.2	0	-	8.1	0	-	13.9
HCM Lane LOS	D	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	1.1	0	-	-	0	-	-	0

Intersection	
Int Delay, s/veh	1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	278	18	2	593	44	10
Future Vol, veh/h	278	18	2	593	44	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	175	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	305	20	2	652	48	11

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	325	0	961	305
Stage 1	-	-	-	-	305	-
Stage 2	-	-	-	-	656	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1235	-	284	735
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	516	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1235	-	283	735
Mov Cap-2 Maneuver	-	-	-	-	283	-
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	515	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	18.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	283	735	-	-	1235	-
HCM Lane V/C Ratio	0.171	0.015	-	-	0.002	-
HCM Control Delay (s)	20.3	10	-	-	7.9	-
HCM Lane LOS	C	B	-	-	A	-
HCM 95th %tile Q(veh)	0.6	0	-	-	0	-

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	192	40	7	288	65	12
Future Vol, veh/h	192	40	7	288	65	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	213	44	8	320	72	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	257	0	549	213
Stage 1	-	-	-	-	213	-
Stage 2	-	-	-	-	336	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1308	-	497	827
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	724	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1308	-	494	827
Mov Cap-2 Maneuver	-	-	-	-	494	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	719	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	13.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	527	-	-	1308	-
HCM Lane V/C Ratio	0.162	-	-	0.006	-
HCM Control Delay (s)	13.2	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0	-

Intersection	
Int Delay, s/veh	0.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	40	165	279	7	0	14
Future Vol, veh/h	40	165	279	7	0	14
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	50	206	349	9	0	18

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	358	0	-	0	660	354
Stage 1	-	-	-	-	354	-
Stage 2	-	-	-	-	306	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1201	-	-	-	428	690
Stage 1	-	-	-	-	710	-
Stage 2	-	-	-	-	747	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1201	-	-	-	408	690
Mov Cap-2 Maneuver	-	-	-	-	408	-
Stage 1	-	-	-	-	677	-
Stage 2	-	-	-	-	747	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	10.4
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1201	-	-	-	690
HCM Lane V/C Ratio	0.042	-	-	-	0.025
HCM Control Delay (s)	8.1	0	-	-	10.4
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.1

Intersection	
Int Delay, s/veh	2.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	7	685	5	14	306	21	4	14	35	63	3	18
Future Vol, veh/h	7	685	5	14	306	21	4	14	35	63	3	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	475	-	75	450	-	100	75	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	94	94	94	94	94	94	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	729	5	15	326	22	4	15	37	67	3	19

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	348	0	0	734	0	0	938	1121	365	742	1104	163
Stage 1	-	-	-	-	-	-	743	743	-	356	356	-
Stage 2	-	-	-	-	-	-	195	378	-	386	748	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1208	-	-	867	-	-	219	205	632	304	210	853
Stage 1	-	-	-	-	-	-	373	420	-	634	628	-
Stage 2	-	-	-	-	-	-	788	614	-	609	418	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1208	-	-	867	-	-	208	200	632	265	205	853
Mov Cap-2 Maneuver	-	-	-	-	-	-	208	200	-	265	205	-
Stage 1	-	-	-	-	-	-	371	417	-	630	617	-
Stage 2	-	-	-	-	-	-	753	604	-	549	415	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.4	16.1	20.2
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	208	391	1208	-	-	867	-	-	265	588
HCM Lane V/C Ratio	0.02	0.133	0.006	-	-	0.017	-	-	0.253	0.038
HCM Control Delay (s)	22.7	15.6	8	-	-	9.2	-	-	23.1	11.4
HCM Lane LOS	C	C	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.1	0.5	0	-	-	0.1	-	-	1	0.1

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	43	246	485	5	12	108
Future Vol, veh/h	43	246	485	5	12	108
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	125	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	48	273	539	6	13	120

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	545	0	-	0	911	542
Stage 1	-	-	-	-	542	-
Stage 2	-	-	-	-	369	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1024	-	-	-	304	540
Stage 1	-	-	-	-	583	-
Stage 2	-	-	-	-	699	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1024	-	-	-	290	540
Mov Cap-2 Maneuver	-	-	-	-	290	-
Stage 1	-	-	-	-	556	-
Stage 2	-	-	-	-	699	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	14.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1024	-	-	-	497
HCM Lane V/C Ratio	0.047	-	-	-	0.268
HCM Control Delay (s)	8.7	-	-	-	14.9
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1.1

Intersection	
Int Delay, s/veh	2.6

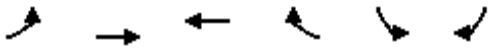
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	38	220	394	9	25	96
Future Vol, veh/h	38	220	394	9	25	96
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	125	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	42	244	438	10	28	107

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	448	0	-	0	771	443
Stage 1	-	-	-	-	443	-
Stage 2	-	-	-	-	328	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1112	-	-	-	368	615
Stage 1	-	-	-	-	647	-
Stage 2	-	-	-	-	730	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1112	-	-	-	354	615
Mov Cap-2 Maneuver	-	-	-	-	354	-
Stage 1	-	-	-	-	622	-
Stage 2	-	-	-	-	730	-

Approach	EB	WB	SB
HCM Control Delay, s	1.2	0	14
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1112	-	-	-	534
HCM Lane V/C Ratio	0.038	-	-	-	0.252
HCM Control Delay (s)	8.4	-	-	-	14
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	1

APPENDIX C-8: 2030 BUILD IMPROVED PM PEAK



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	383	318	167	231	31
Future Volume (veh/h)	15	383	318	167	231	31
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	391	324	170	236	32
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	512	895	553	290	516	70
Arrive On Green	0.48	0.48	0.48	0.40	0.34	0.26
Sat Flow, veh/h	903	1870	1155	606	1540	209
Grp Volume(v), veh/h	15	391	0	494	269	0
Grp Sat Flow(s),veh/h/ln	903	1870	0	1761	1756	0
Q Serve(g_s), s	0.3	3.7	0.0	5.6	3.3	0.0
Cycle Q Clear(g_c), s	5.9	3.7	0.0	5.6	3.3	0.0
Prop In Lane	1.00			0.34	0.88	0.12
Lane Grp Cap(c), veh/h	512	895	0	843	589	0
V/C Ratio(X)	0.03	0.44	0.00	0.59	0.46	0.00
Avail Cap(c_a), veh/h	1812	3588	0	3379	2191	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	7.3	4.6	0.0	5.4	7.1	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.7	0.6	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.4	0.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.3	5.0	0.0	6.0	7.7	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		406	494		269	
Approach Delay, s/veh		5.0	6.0		7.7	
Approach LOS		A	A		A	

Timer - Assigned Phs		4		6	8
Phs Duration (G+Y+Rc), s		15.3		11.5	15.3
Change Period (Y+Rc), s		4.5		4.5	4.5
Max Green Setting (Gmax), s		49.5		31.5	49.5
Max Q Clear Time (g_c+I1), s		7.9		5.3	7.6
Green Ext Time (p_c), s		2.4		0.8	3.3

Intersection Summary	
HCM 6th Ctrl Delay	6.1
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	2.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	11	783	46	3	564	0	37	0	1	0	0	12
Future Vol, veh/h	11	783	46	3	564	0	37	0	1	0	0	12
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	88	88	88	88	88	88	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	13	890	52	3	641	0	42	0	1	0	0	14

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	641	0	0	942	0	0	1596	1589	916	1590	1615	641
Stage 1	-	-	-	-	-	-	942	942	-	647	647	-
Stage 2	-	-	-	-	-	-	654	647	-	943	968	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	943	-	-	728	-	-	86	108	330	87	104	475
Stage 1	-	-	-	-	-	-	316	342	-	460	467	-
Stage 2	-	-	-	-	-	-	456	467	-	315	332	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	943	-	-	728	-	-	81	104	330	84	100	475
Mov Cap-2 Maneuver	-	-	-	-	-	-	81	104	-	84	100	-
Stage 1	-	-	-	-	-	-	307	332	-	447	464	-
Stage 2	-	-	-	-	-	-	440	464	-	305	322	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	88.1	12.8
HCM LOS			F	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	83	943	-	-	728	-	-	475
HCM Lane V/C Ratio	0.52	0.013	-	-	0.005	-	-	0.029
HCM Control Delay (s)	88.1	8.9	0	-	10	0	-	12.8
HCM Lane LOS	F	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	2.2	0	-	-	0	-	-	0.1

Intersection	
Int Delay, s/veh	1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	678	92	9	509	38	8
Future Vol, veh/h	678	92	9	509	38	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	150	175	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	88	88	88	88	88	88
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	770	105	10	578	43	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	875	0	1368	770
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	598	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	771	-	162	401
Stage 1	-	-	-	-	457	-
Stage 2	-	-	-	-	549	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	771	-	160	401
Mov Cap-2 Maneuver	-	-	-	-	160	-
Stage 1	-	-	-	-	457	-
Stage 2	-	-	-	-	542	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	31.9
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBT	EBR	WBL	WBT
Capacity (veh/h)	160	401	-	-	771	-
HCM Lane V/C Ratio	0.27	0.023	-	-	0.013	-
HCM Control Delay (s)	35.6	14.2	-	-	9.7	-
HCM Lane LOS	E	B	-	-	A	-
HCM 95th %tile Q(veh)	1	0.1	-	-	0	-

Intersection	
Int Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	395	44	37	323	77	24
Future Vol, veh/h	395	44	37	323	77	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	420	47	39	344	82	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	467	0	842	420
Stage 1	-	-	-	-	420	-
Stage 2	-	-	-	-	422	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1094	-	334	633
Stage 1	-	-	-	-	663	-
Stage 2	-	-	-	-	662	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1094	-	319	633
Mov Cap-2 Maneuver	-	-	-	-	319	-
Stage 1	-	-	-	-	663	-
Stage 2	-	-	-	-	633	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	19.1
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	362	-	-	1094	-
HCM Lane V/C Ratio	0.297	-	-	0.036	-
HCM Control Delay (s)	19.1	-	-	8.4	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.2	-	-	0.1	-

Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	29	387	298	11	0	58
Future Vol, veh/h	29	387	298	11	0	58
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	32	421	324	12	0	63

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	336	0	-	0	815	330
Stage 1	-	-	-	-	330	-
Stage 2	-	-	-	-	485	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1223	-	-	-	347	712
Stage 1	-	-	-	-	728	-
Stage 2	-	-	-	-	619	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1223	-	-	-	335	712
Mov Cap-2 Maneuver	-	-	-	-	335	-
Stage 1	-	-	-	-	703	-
Stage 2	-	-	-	-	619	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1223	-	-	-	712
HCM Lane V/C Ratio	0.026	-	-	-	0.089
HCM Control Delay (s)	8	0	-	-	10.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0.1	-	-	-	0.3

Intersection	
Int Delay, s/veh	3.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	369	2	35	488	30	3	16	24	46	27	18
Future Vol, veh/h	4	369	2	35	488	30	3	16	24	46	27	18
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	475	-	75	450	-	100	75	-	-	75	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	80	80	80	80	80	80	80	80
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	461	3	44	610	38	4	20	30	58	34	23

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	648	0	0	464	0	0	881	1207	231	949	1172	305
Stage 1	-	-	-	-	-	-	471	471	-	698	698	-
Stage 2	-	-	-	-	-	-	410	736	-	251	474	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	934	-	-	1094	-	-	241	182	771	215	191	691
Stage 1	-	-	-	-	-	-	542	558	-	397	440	-
Stage 2	-	-	-	-	-	-	589	423	-	731	556	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	934	-	-	1094	-	-	193	174	771	182	182	691
Mov Cap-2 Maneuver	-	-	-	-	-	-	193	174	-	182	182	-
Stage 1	-	-	-	-	-	-	539	555	-	395	422	-
Stage 2	-	-	-	-	-	-	503	406	-	674	553	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.5	18.5	28.3
HCM LOS			C	D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	193	325	934	-	-	1094	-	-	182	258
HCM Lane V/C Ratio	0.019	0.154	0.005	-	-	0.04	-	-	0.316	0.218
HCM Control Delay (s)	24	18.1	8.9	-	-	8.4	-	-	33.7	22.8
HCM Lane LOS	C	C	A	-	-	A	-	-	D	C
HCM 95th %tile Q(veh)	0.1	0.5	0	-	-	0.1	-	-	1.3	0.8

Intersection	
Int Delay, s/veh	1.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	117	569	436	13	8	73
Future Vol, veh/h	117	569	436	13	8	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	125	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	632	484	14	9	81

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	498	0	-	0	1383	491
Stage 1	-	-	-	-	491	-
Stage 2	-	-	-	-	892	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1066	-	-	-	158	578
Stage 1	-	-	-	-	615	-
Stage 2	-	-	-	-	400	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1066	-	-	-	139	578
Mov Cap-2 Maneuver	-	-	-	-	139	-
Stage 1	-	-	-	-	540	-
Stage 2	-	-	-	-	400	-

Approach	EB	WB	SB
HCM Control Delay, s	1.5	0	15.2
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1066	-	-	-	441
HCM Lane V/C Ratio	0.122	-	-	-	0.204
HCM Control Delay (s)	8.8	-	-	-	15.2
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.4	-	-	-	0.8

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	104	473	385	26	16	64
Future Vol, veh/h	104	473	385	26	16	64
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	125	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	116	526	428	29	18	71

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	457	0	-	0	1201	443
Stage 1	-	-	-	-	443	-
Stage 2	-	-	-	-	758	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1104	-	-	-	204	615
Stage 1	-	-	-	-	647	-
Stage 2	-	-	-	-	463	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1104	-	-	-	183	615
Mov Cap-2 Maneuver	-	-	-	-	183	-
Stage 1	-	-	-	-	579	-
Stage 2	-	-	-	-	463	-

Approach	EB	WB	SB
HCM Control Delay, s	1.6	0	15.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1104	-	-	-	418
HCM Lane V/C Ratio	0.105	-	-	-	0.213
HCM Control Delay (s)	8.6	-	-	-	15.9
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.3	-	-	-	0.8

APPENDIX D: SIMTRAFFIC OUTPUTS

APPENDIX D-1: 2022 EXISTING AM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	68	9	98
Average Queue (ft)	16	0	52
95th Queue (ft)	46	6	84
Link Distance (ft)	1662	891	2162
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: US 340 NB Ramps/Hillside Dr & WV 115

Movement	EB	EB	WB	NB	SB
Directions Served	L	TR	L	LT	LTR
Maximum Queue (ft)	21	19	68	64	40
Average Queue (ft)	1	1	27	19	7
95th Queue (ft)	9	9	56	51	29
Link Distance (ft)		923		1075	1179
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150		175		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 4: Fairleigh Dr/Bailey Brooks Way & WV 115

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	6	4	60	35
Average Queue (ft)	0	0	25	4
95th Queue (ft)	6	2	52	21
Link Distance (ft)	640	1404	816	393
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Crosswinds Dr & WV 115

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	5	56	26
Average Queue (ft)	0	24	7
95th Queue (ft)	4	49	26
Link Distance (ft)		265	265
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	175		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	16	48
Average Queue (ft)	1	24
95th Queue (ft)	7	40
Link Distance (ft)	627	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: WV 115 & Cattail Run Rd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	33	20
Average Queue (ft)	3	2
95th Queue (ft)	19	13
Link Distance (ft)	627	5539
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Cattail Run Rd & WV 9

Movement	EB	WB	NB	NB	SB	SB
Directions Served	L	L	L	TR	L	TR
Maximum Queue (ft)	19	16	24	34	63	28
Average Queue (ft)	1	1	3	12	26	9
95th Queue (ft)	8	7	16	30	54	24
Link Distance (ft)				5539		2235
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	475	450	75		75	
Storage Blk Time (%)					0	0
Queuing Penalty (veh)					0	0

Intersection: 20: US 340 & US 340 SB Ramps/US 340 NB Ramps

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 0

APPENDIX D-2: 2022 EXISTING PM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	52	136
Average Queue (ft)	8	66
95th Queue (ft)	33	111
Link Distance (ft)	1662	2162
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: US 340 NB Ramps/Hillside Dr & WV 115

Movement	EB	EB	WB	NB	NB	SB
Directions Served	L	TR	L	LT	R	LTR
Maximum Queue (ft)	22	36	81	84	53	35
Average Queue (ft)	1	3	39	40	5	7
95th Queue (ft)	11	20	72	74	30	29
Link Distance (ft)		923		1075		1179
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		175		125	
Storage Blk Time (%)				0		
Queuing Penalty (veh)				0		

Intersection: 4: Fairleigh Dr/Bailey Brooks Way & WV 115

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	59	40	69	35
Average Queue (ft)	4	2	26	7
95th Queue (ft)	28	18	55	29
Link Distance (ft)	640	1404	816	393
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Crosswinds Dr & WV 115

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	27	50	26
Average Queue (ft)	2	22	7
95th Queue (ft)	13	45	27
Link Distance (ft)		265	265
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	175		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	46	65
Average Queue (ft)	8	31
95th Queue (ft)	30	54
Link Distance (ft)	627	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: WV 115 & Cattail Run Rd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	30	51
Average Queue (ft)	3	14
95th Queue (ft)	16	37
Link Distance (ft)	627	5539
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Cattail Run Rd & WV 9

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	L	R	L	TR	L	TR
Maximum Queue (ft)	20	22	4	24	33	56	61
Average Queue (ft)	1	2	0	2	11	21	16
95th Queue (ft)	11	11	3	11	28	45	39
Link Distance (ft)					5539		2235
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	475	450	100	75		75	
Storage Blk Time (%)						0	0
Queuing Penalty (veh)						0	0

Intersection: 20: US 340 & US 340 SB Ramps/US 340 NB Ramps

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 0

APPENDIX D-3: 2030 NO-BUILD AM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	70	70	132	130
Average Queue (ft)	34	34	59	61
95th Queue (ft)	63	66	103	106
Link Distance (ft)		1662	893	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Fairleigh Dr/Bailey Brooks Way & WV 115

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	30	11	68	35
Average Queue (ft)	1	0	29	5
95th Queue (ft)	15	7	58	24
Link Distance (ft)	640	1404	816	393
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Crosswinds Dr & WV 115

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	16	53	31
Average Queue (ft)	1	24	7
95th Queue (ft)	8	48	27
Link Distance (ft)		265	265
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	175		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	37	59
Average Queue (ft)	2	27
95th Queue (ft)	14	48
Link Distance (ft)	627	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: WV 115 & Cattail Run Rd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	30	19
Average Queue (ft)	3	2
95th Queue (ft)	16	13
Link Distance (ft)	627	5539
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Cattail Run Rd & WV 9

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	L	R	L	TR	L	TR
Maximum Queue (ft)	25	22	6	24	32	56	24
Average Queue (ft)	2	2	0	3	11	27	8
95th Queue (ft)	13	11	4	15	29	49	23
Link Distance (ft)					5539		2235
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	475	450	100	75		75	
Storage Blk Time (%)						0	
Queuing Penalty (veh)						0	

Intersection: 20: US 340 & US 340 SB Ramps/US 340 NB Ramps

Movement	WB
Directions Served	R
Maximum Queue (ft)	40
Average Queue (ft)	1
95th Queue (ft)	28
Link Distance (ft)	1075
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

APPENDIX D-4: 2030 NO-BUILD PM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	39	124	145	175
Average Queue (ft)	10	54	67	80
95th Queue (ft)	33	101	114	139
Link Distance (ft)		1662	893	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 4: Fairleigh Dr/Bailey Brooks Way & WV 115

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	134	85	70	40
Average Queue (ft)	13	5	24	11
95th Queue (ft)	73	40	56	35
Link Distance (ft)	640	1404	816	393
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Crosswinds Dr & WV 115

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	27	62	26
Average Queue (ft)	3	24	7
95th Queue (ft)	18	51	25
Link Distance (ft)		265	265
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	175		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	39	71
Average Queue (ft)	7	33
95th Queue (ft)	27	58
Link Distance (ft)	627	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: WV 115 & Cattail Run Rd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	37	49
Average Queue (ft)	3	18
95th Queue (ft)	17	39
Link Distance (ft)	627	5539
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Cattail Run Rd & WV 9

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	L	R	L	TR	L	TR
Maximum Queue (ft)	20	4	23	4	15	35	56	60
Average Queue (ft)	1	0	3	0	1	10	21	19
95th Queue (ft)	9	3	15	3	10	30	44	42
Link Distance (ft)		4218				5539		2235
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	475		450	100	75		75	
Storage Blk Time (%)							0	0
Queuing Penalty (veh)							0	0

Intersection: 20: US 340 & US 340 SB Ramps/US 340 NB Ramps

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Network Summary

Network wide Queuing Penalty: 6

APPENDIX D-5: 2030 BUILD AM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	70	109	136	138
Average Queue (ft)	33	40	66	66
95th Queue (ft)	62	80	109	116
Link Distance (ft)		1662	893	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 4: Fairleigh Dr/Bailey Brooks Way & WV 115

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	35	8	60	30
Average Queue (ft)	2	0	27	5
95th Queue (ft)	17	6	53	23
Link Distance (ft)	640	1404	816	393
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Crosswinds Dr & WV 115

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	6	62	31
Average Queue (ft)	0	26	8
95th Queue (ft)	5	52	29
Link Distance (ft)		265	265
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	175		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	16	66
Average Queue (ft)	1	26
95th Queue (ft)	10	46
Link Distance (ft)	627	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: WV 115 & Cattail Run Rd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	27	26
Average Queue (ft)	6	6
95th Queue (ft)	23	21
Link Distance (ft)	627	5539
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Cattail Run Rd & WV 9

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	L	R	L	TR	L	TR
Maximum Queue (ft)	20	34	10	28	51	75	28
Average Queue (ft)	2	6	0	4	18	28	8
95th Queue (ft)	12	23	7	18	41	58	24
Link Distance (ft)					5539		2235
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	475	450	100	75		75	
Storage Blk Time (%)					0	0	
Queuing Penalty (veh)					0	0	

Intersection: 9: WV 115 & Site Drive #1

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	65	80
Average Queue (ft)	15	41
95th Queue (ft)	47	68
Link Distance (ft)	519	206
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 10: WV 115 & Site Drive #2

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	56	114
Average Queue (ft)	12	43
95th Queue (ft)	39	78
Link Distance (ft)	712	232
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: US 340 & US 340 SB Ramps/US 340 NB Ramps

Movement	WB
Directions Served	R
Maximum Queue (ft)	84
Average Queue (ft)	6
95th Queue (ft)	61
Link Distance (ft)	1075
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

APPENDIX D-6: 2030 BUILD PM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	43	130	158	162
Average Queue (ft)	11	58	68	79
95th Queue (ft)	35	103	119	135
Link Distance (ft)		1662	893	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 4: Fairleigh Dr/Bailey Brooks Way & WV 115

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	117	207	83	39
Average Queue (ft)	10	17	32	10
95th Queue (ft)	61	134	66	34
Link Distance (ft)	640	1404	816	393
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Crosswinds Dr & WV 115

Movement	EB	WB	NB	NB
Directions Served	R	L	L	R
Maximum Queue (ft)	4	29	64	27
Average Queue (ft)	0	4	25	7
95th Queue (ft)	3	20	54	25
Link Distance (ft)			265	265
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	150	175		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Kabletown Rd & WV 115

Movement	EB	WB	NB
Directions Served	R	LT	LR
Maximum Queue (ft)	4	64	91
Average Queue (ft)	0	11	35
95th Queue (ft)	3	39	66
Link Distance (ft)		627	1818
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	100		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: WV 115 & Cattail Run Rd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	49	58
Average Queue (ft)	6	21
95th Queue (ft)	29	43
Link Distance (ft)	627	5539
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Cattail Run Rd & WV 9

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	R	L	R	L	TR	L	TR
Maximum Queue (ft)	19	8	30	9	24	38	57	55
Average Queue (ft)	1	0	8	0	3	15	22	17
95th Queue (ft)	10	5	27	6	15	34	48	40
Link Distance (ft)						5539		2235
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	475	75	450	100	75		75	
Storage Blk Time (%)						0	0	0
Queuing Penalty (veh)						0	0	0

Intersection: 9: WV 115 & Site Drive #1

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	100	78
Average Queue (ft)	37	33
95th Queue (ft)	83	58
Link Distance (ft)	519	206
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 10: WV 115 & Site Drive #2

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	106	67
Average Queue (ft)	33	33
95th Queue (ft)	81	57
Link Distance (ft)	712	232
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: US 340 & US 340 SB Ramps/US 340 NB Ramps

Movement	SB
Directions Served	R
Maximum Queue (ft)	94
Average Queue (ft)	17
95th Queue (ft)	147
Link Distance (ft)	
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	575
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 180

APPENDIX D-7: 2030 BUILD IMPROVED AM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	78	92	134	140
Average Queue (ft)	33	42	68	66
95th Queue (ft)	64	81	115	115
Link Distance (ft)		1662	890	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 4: Fairleigh Dr/Bailey Brooks Way & WV 115

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	16	11	60	30
Average Queue (ft)	1	0	28	5
95th Queue (ft)	8	7	57	23
Link Distance (ft)	622	1404	816	397
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Crosswinds Dr & WV 115

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	6	58	27
Average Queue (ft)	0	24	10
95th Queue (ft)	4	50	31
Link Distance (ft)		265	265
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	175		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 6: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	5	71
Average Queue (ft)	0	28
95th Queue (ft)	3	52
Link Distance (ft)	627	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: WV 115 & Cattail Run Rd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	43	26
Average Queue (ft)	6	8
95th Queue (ft)	27	24
Link Distance (ft)	627	5539
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Cattail Run Rd & WV 9

Movement	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	L	R	L	TR	L	TR
Maximum Queue (ft)	19	34	7	24	51	82	24
Average Queue (ft)	2	7	0	2	17	29	9
95th Queue (ft)	12	25	5	13	39	61	24
Link Distance (ft)					5539		2235
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	475	450	100	75		75	
Storage Blk Time (%)					0	0	
Queuing Penalty (veh)					0	0	

Intersection: 9: WV 115 & Site Drive #1

Movement	EB	WB	SB
Directions Served	L	TR	LR
Maximum Queue (ft)	39	4	110
Average Queue (ft)	13	0	41
95th Queue (ft)	35	3	76
Link Distance (ft)		712	204
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	125		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 10: WV 115 & Site Drive #2

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	39	102
Average Queue (ft)	10	43
95th Queue (ft)	32	75
Link Distance (ft)		226
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	125	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: US 340 & US 340 SB Ramps/US 340 NB Ramps

Movement	WB
Directions Served	R
Maximum Queue (ft)	144
Average Queue (ft)	6
95th Queue (ft)	68
Link Distance (ft)	1056
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

APPENDIX D-8: 2030 BUILD IMPROVED PM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	108	309	155	208
Average Queue (ft)	11	116	80	98
95th Queue (ft)	57	301	138	176
Link Distance (ft)		1662	890	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)		15		
Queuing Penalty (veh)		2		

Intersection: 4: Fairleigh Dr/Bailey Brooks Way & WV 115

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	108	97	72	42
Average Queue (ft)	13	6	30	10
95th Queue (ft)	69	46	64	34
Link Distance (ft)	622	1404	816	397
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Crosswinds Dr & WV 115

Movement	EB	WB	NB	NB
Directions Served	R	L	L	R
Maximum Queue (ft)	4	28	66	31
Average Queue (ft)	0	5	24	8
95th Queue (ft)	3	21	53	28
Link Distance (ft)			265	265
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	150	175		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 6: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	54	74
Average Queue (ft)	11	35
95th Queue (ft)	38	64
Link Distance (ft)	627	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: WV 115 & Cattail Run Rd

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	48	58
Average Queue (ft)	6	20
95th Queue (ft)	28	42
Link Distance (ft)	627	5539
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 8: Cattail Run Rd & WV 9

Movement	EB	WB	NB	NB	SB	SB
Directions Served	L	L	L	TR	L	TR
Maximum Queue (ft)	15	42	19	46	65	64
Average Queue (ft)	1	8	2	16	23	19
95th Queue (ft)	8	28	11	37	50	43
Link Distance (ft)				5539		2235
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	475	450	75		75	
Storage Blk Time (%)				0	0	0
Queuing Penalty (veh)				0	0	0

Intersection: 9: WV 115 & Site Drive #1

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	58	61
Average Queue (ft)	26	32
95th Queue (ft)	54	54
Link Distance (ft)		204
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	125	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 10: WV 115 & Site Drive #2

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	57	68
Average Queue (ft)	20	35
95th Queue (ft)	48	59
Link Distance (ft)		226
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	125	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 20: US 340 & US 340 SB Ramps/US 340 NB Ramps

Movement	SB	SB	SB
Directions Served	T	T	R
Maximum Queue (ft)	1912	1918	745
Average Queue (ft)	816	908	466
95th Queue (ft)	2459	2555	1106
Link Distance (ft)	2371	2371	
Upstream Blk Time (%)	8	16	
Queuing Penalty (veh)	0	0	
Storage Bay Dist (ft)			575
Storage Blk Time (%)		0	51
Queuing Penalty (veh)		0	135

Network Summary

Network wide Queuing Penalty: 1330

APPENDIX E: SIDRA OUTPUTS

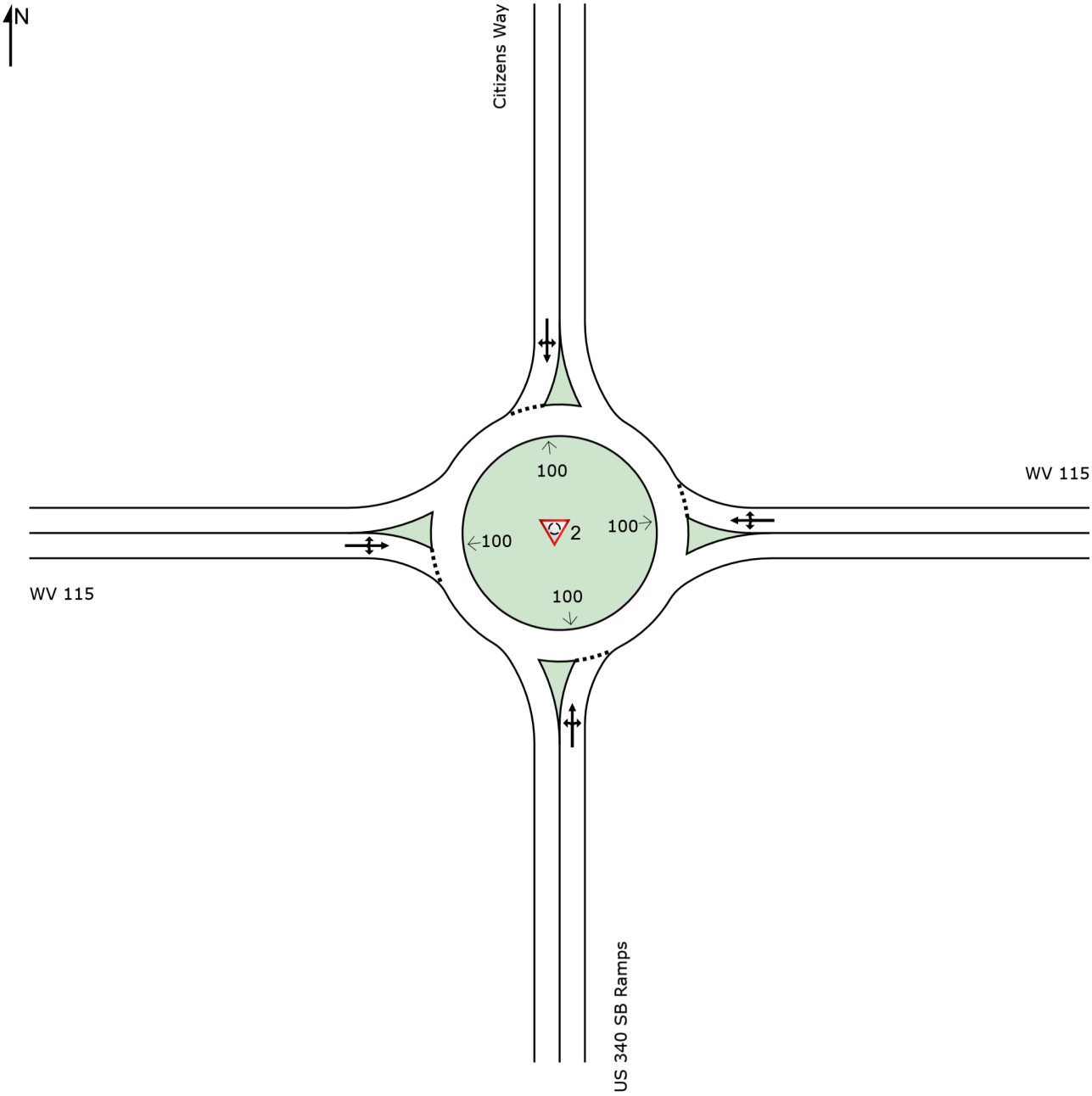
APPENDIX E-1: 2022 EXISTING AM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

2022 Existing AM Peak
Site Category: Existing Design
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

2022 Existing AM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	32.9	mph	32.9	mph
Travel Distance (Total)	584.3	veh-mi/h	701.1	pers-mi/h
Travel Time (Total)	17.7	veh-h/h	21.3	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.82			
Travel Time Index	8.04			
Congestion Coefficient	1.21			
Demand Flows (Total)	1067	veh/h	1281	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.331			
Practical Spare Capacity	156.5	%		
Effective Intersection Capacity	3221	veh/h		
Control Delay (Total)	1.80	veh-h/h	2.16	pers-h/h
Control Delay (Average)	6.1	sec	6.1	sec
Control Delay (Worst Lane)	6.2	sec		
Control Delay (Worst Movement)	6.2	sec	6.2	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	6.1	sec		
Idling Time (Average)	4.0	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	1.9	veh		
95% Back of Queue - Distance (Worst Lane)	47.5	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.02			
Total Effective Stops	301	veh/h	361	pers/h
Effective Stop Rate	0.28		0.28	
Proportion Queued	0.41		0.41	
Performance Index	30.4		30.4	
Cost (Total)	372.14	$/h	372.14	$/h
Fuel Consumption (Total)	23.9	gal/h		
Carbon Dioxide (Total)	213.3	kg/h		
Hydrocarbons (Total)	0.019	kg/h		
Carbon Monoxide (Total)	0.265	kg/h		
NOx (Total)	0.256	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 91.6% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	512,372	veh/y	614,847	pers/y
Delay	862	veh-h/y	1,035	pers-h/y
Effective Stops	144,356	veh/y	173,227	pers/y
Travel Distance	280,450	veh-mi/y	336,540	pers-mi/y
Travel Time	8,513	veh-h/y	10,216	pers-h/y
Cost	178,627	$/y	178,627	$/y
Fuel Consumption	11,452	gal/y		
Carbon Dioxide	102,395	kg/y		
Hydrocarbons	9	kg/y		

LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

2022 Existing AM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps													
Lane 1[d]	210	2.0	970	0.217	100	5.8	LOS A	1.0	25.5	Full	1600	0.0	0.0
Approach	210	2.0		0.217		5.8	LOS A	1.0	25.5				
East: WV 115													
Lane 1[d]	393	2.0	1186	0.331	100	6.2	LOS A	1.9	47.5	Full	1000	0.0	0.0
Approach	393	2.0		0.331		6.2	LOS A	1.9	47.5				
North: Citizens Way													
Lane 1[d]	102	2.0	838	0.122	100	5.5	LOS A	0.5	12.8	Full	1600	0.0	0.0
Approach	102	2.0		0.122		5.5	LOS A	0.5	12.8				
West: WV 115													
Lane 1[d]	362	2.0	1139	0.317	100	6.2	LOS A	1.7	43.8	Full	1600	0.0	0.0
Approach	362	2.0		0.317		6.2	LOS A	1.7	43.8				
Intersection	1067	2.0		0.331		6.1	LOS A	1.9	47.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	81	24	105	210	2.0	970	0.217	100	NA	NA
Approach	81	24	105	210	2.0		0.217			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	102	277	14	393	2.0	1186	0.331	100	NA	NA
Approach	102	277	14	393	2.0		0.331			

North: Citizens Way

Mov. From N	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	42	21	40	102	2.0	838	0.122	100	NA	NA
Approach	42	21	40	102	2.0		0.122			

West: WV 115

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	21	257	84	362	2.0	1139	0.317	100	NA	NA
Approach	21	257	84	362	2.0		0.317			

	Total	%HV	Deg.Satn (v/c)
Intersection	1067	2.0	0.331

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 SB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Citizens Way Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

APPENDIX E-2: 2022 EXISTING PM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

2022 Existing PM Peak
Site Category: Existing Design
Roundabout

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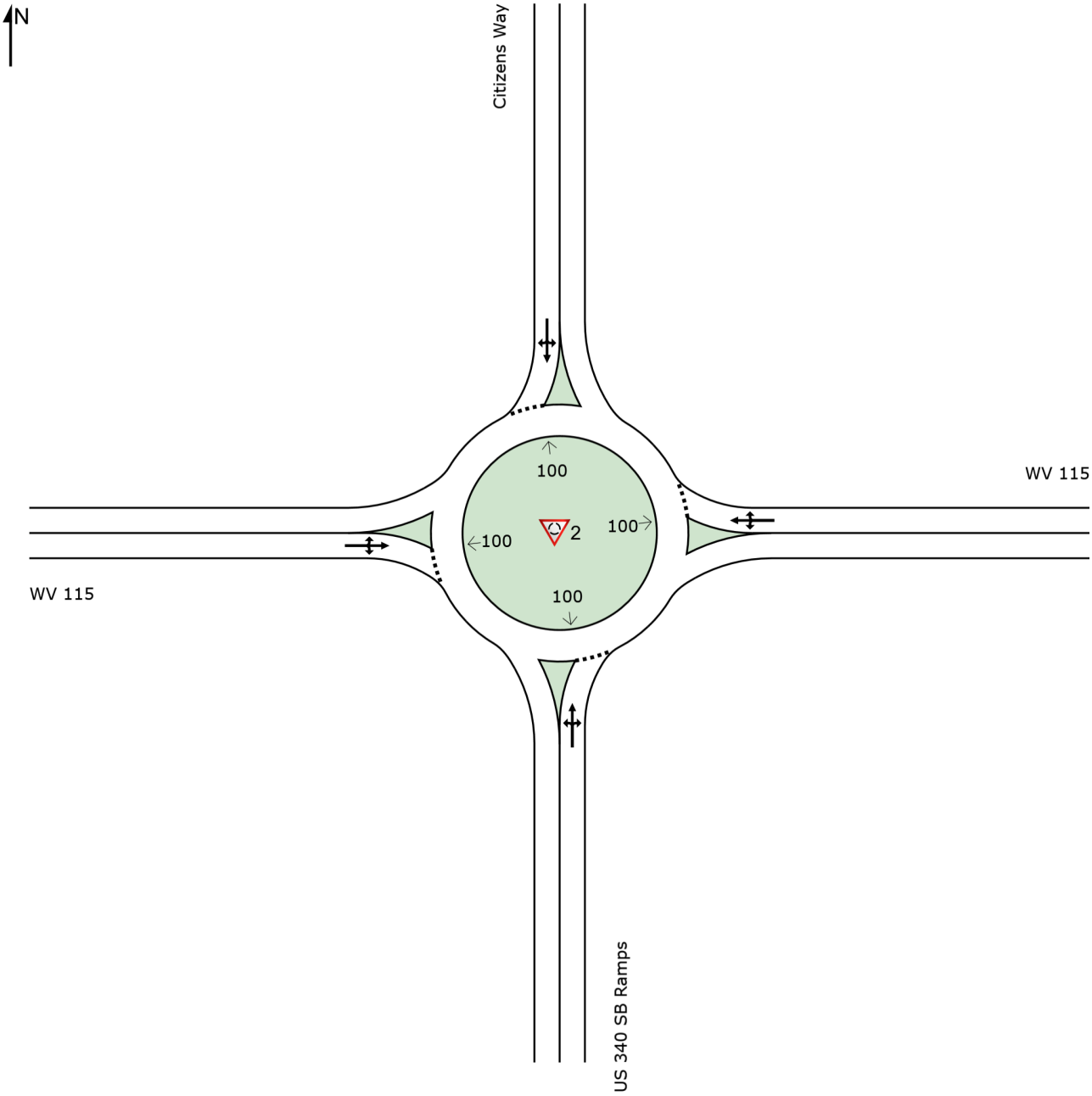

MOVEMENT SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

2022 Existing PM Peak
Site Category: Existing Design
Roundabout

Vehicle Movement Performance

Mov ID	Turn	INPUT VOLUMES [Total veh/h	HV] %	DEMAND FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh. veh	Dist] ft	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed mph
South: US 340 SB Ramps														
3	L2	66	2.0	67	2.0	0.379	8.4	LOS A	1.9	48.9	0.61	0.56	0.61	32.9
8	T1	28	2.0	29	2.0	0.379	8.4	LOS A	1.9	48.9	0.61	0.56	0.61	32.8
18	R2	233	2.0	238	2.0	0.379	8.4	LOS A	1.9	48.9	0.61	0.56	0.61	30.4
Approach		327	2.0	334	2.0	0.379	8.4	LOS A	1.9	48.9	0.61	0.56	0.61	31.2
East: WV 115														
1	L2	65	2.0	66	2.0	0.307	6.0	LOS A	1.7	42.2	0.38	0.24	0.38	33.2
6	T1	261	2.0	266	2.0	0.307	6.0	LOS A	1.7	42.2	0.38	0.24	0.38	33.1
16	R2	21	2.0	21	2.0	0.307	6.0	LOS A	1.7	42.2	0.38	0.24	0.38	32.0
Approach		347	2.0	354	2.0	0.307	6.0	LOS A	1.7	42.2	0.38	0.24	0.38	33.0
North: Citizens Way														
7	L2	32	2.0	33	2.0	0.107	5.1	LOS A	0.4	11.3	0.49	0.39	0.49	33.0
4	T1	12	2.0	12	2.0	0.107	5.1	LOS A	0.4	11.3	0.49	0.39	0.49	34.1
14	R2	50	2.0	51	2.0	0.107	5.1	LOS A	0.4	11.3	0.49	0.39	0.49	33.2
Approach		94	2.0	96	2.0	0.107	5.1	LOS A	0.4	11.3	0.49	0.39	0.49	33.3
West: WV 115														
5	L2	56	2.0	57	2.0	0.382	6.7	LOS A	2.3	58.9	0.35	0.20	0.35	34.0
2	T1	316	2.0	322	2.0	0.382	6.7	LOS A	2.3	58.9	0.35	0.20	0.35	32.7
12	R2	79	2.0	81	2.0	0.382	6.7	LOS A	2.3	58.9	0.35	0.20	0.35	33.0
Approach		451	2.0	460	2.0	0.382	6.7	LOS A	2.3	58.9	0.35	0.20	0.35	33.0
All Vehicles		1219	2.0	1244	2.0	0.382	6.9	LOS A	2.3	58.9	0.44	0.32	0.44	32.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

2022 Existing PM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	32.5	mph	32.5	mph
Travel Distance (Total)	675.9	veh-mi/h	811.1	pers-mi/h
Travel Time (Total)	20.8	veh-h/h	24.9	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.81			
Travel Time Index	7.92			
Congestion Coefficient	1.23			
Demand Flows (Total)	1244	veh/h	1493	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.382			
Practical Spare Capacity	122.6	%		
Effective Intersection Capacity	3257	veh/h		
Control Delay (Total)	2.37	veh-h/h	2.85	pers-h/h
Control Delay (Average)	6.9	sec	6.9	sec
Control Delay (Worst Lane)	8.4	sec		
Control Delay (Worst Movement)	8.4	sec	8.4	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	6.9	sec		
Idling Time (Average)	4.7	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	2.3	veh		
95% Back of Queue - Distance (Worst Lane)	58.9	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.02			
Total Effective Stops	400	veh/h	480	pers/h
Effective Stop Rate	0.32		0.32	
Proportion Queued	0.44		0.44	
Performance Index	36.8		36.8	
Cost (Total)	434.79	$/h	434.79	$/h
Fuel Consumption (Total)	27.7	gal/h		
Carbon Dioxide (Total)	247.6	kg/h		
Hydrocarbons (Total)	0.022	kg/h		
Carbon Monoxide (Total)	0.308	kg/h		
NOx (Total)	0.297	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 91.2% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	597,061	veh/y	716,474	pers/y
Delay	1,138	veh-h/y	1,366	pers-h/y
Effective Stops	192,026	veh/y	230,431	pers/y
Travel Distance	324,443	veh-mi/y	389,332	pers-mi/y
Travel Time	9,978	veh-h/y	11,974	pers-h/y
Cost	208,701	$/y	208,701	$/y
Fuel Consumption	13,296	gal/y		
Carbon Dioxide	118,867	kg/y		
Hydrocarbons	11	kg/y		

Carbon Monoxide	148	kg/y
NOx	142	kg/y

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APPENDIX E-3: 2030 NO-BUILD AM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 No-Build Conditions)]

2030 No-Build AM Peak
Site Category: Existing Design
Roundabout

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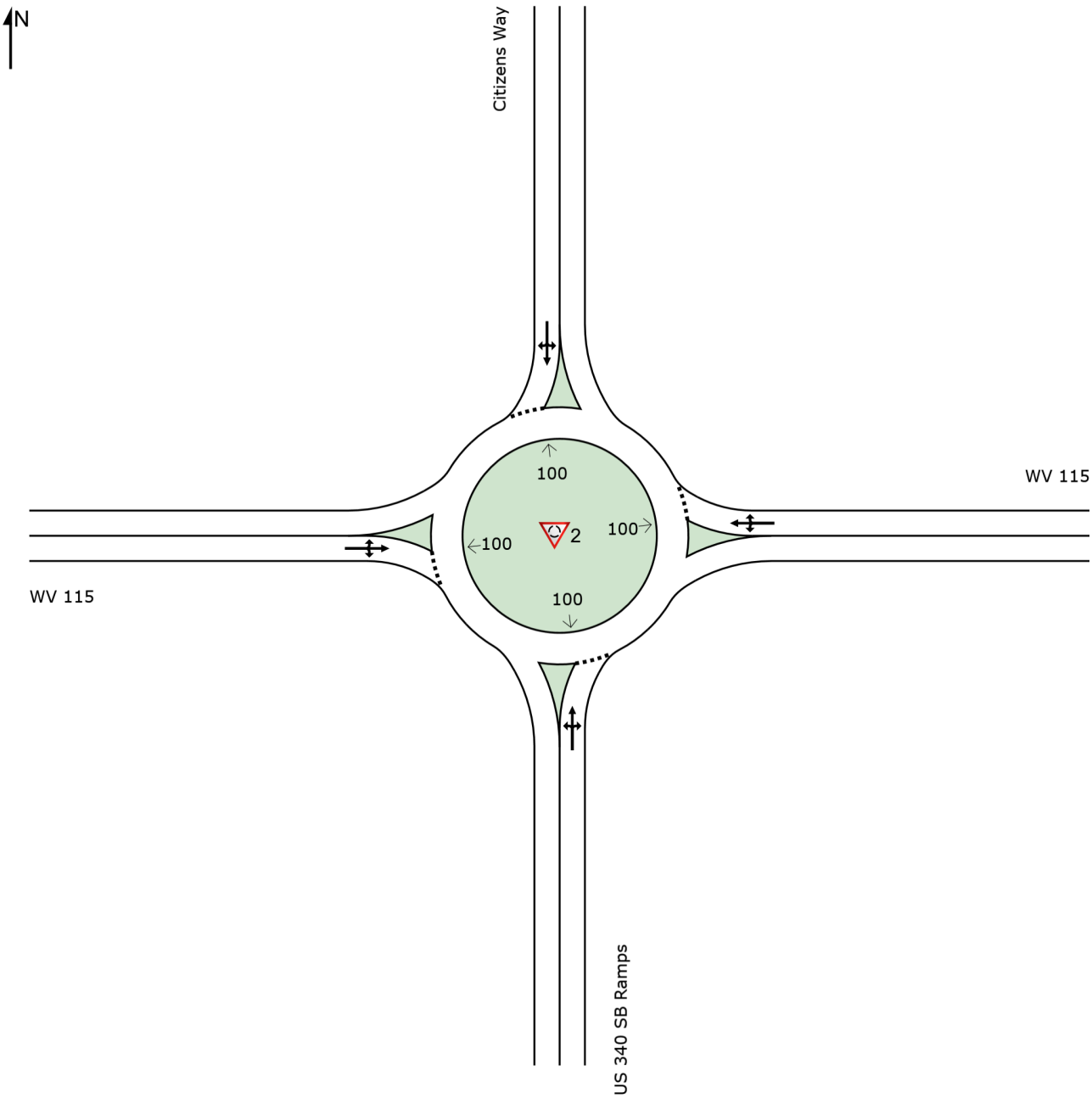


INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 No-Build Conditions)]

2030 No-Build AM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	31.3	mph	31.3	mph
Travel Distance (Total)	819.4	veh-mi/h	983.2	pers-mi/h
Travel Time (Total)	26.2	veh-h/h	31.4	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.78			
Travel Time Index	7.58			
Congestion Coefficient	1.28			
Demand Flows (Total)	1490	veh/h	1787	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.454			
Practical Spare Capacity	87.3	%		
Effective Intersection Capacity	3282	veh/h		
Control Delay (Total)	3.70	veh-h/h	4.44	pers-h/h
Control Delay (Average)	8.9	sec	8.9	sec
Control Delay (Worst Lane)	9.7	sec		
Control Delay (Worst Movement)	9.7	sec	9.7	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	8.9	sec		
Idling Time (Average)	5.6	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	2.8	veh		
95% Back of Queue - Distance (Worst Lane)	71.2	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.03			
Total Effective Stops	825	veh/h	990	pers/h
Effective Stop Rate	0.55		0.55	
Proportion Queued	0.60		0.60	
Performance Index	51.6		51.6	
Cost (Total)	548.51	$/h	548.51	$/h
Fuel Consumption (Total)	35.0	gal/h		
Carbon Dioxide (Total)	313.1	kg/h		
Hydrocarbons (Total)	0.028	kg/h		
Carbon Monoxide (Total)	0.384	kg/h		
NOx (Total)	0.375	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 92.3% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	714,977	veh/y	857,972	pers/y
Delay	1,777	veh-h/y	2,132	pers-h/y
Effective Stops	395,918	veh/y	475,101	pers/y
Travel Distance	393,289	veh-mi/y	471,947	pers-mi/y
Travel Time	12,573	veh-h/y	15,088	pers-h/y
Cost	263,286	$/y	263,286	$/y
Fuel Consumption	16,813	gal/y		
Carbon Dioxide	150,297	kg/y		
Hydrocarbons	14	kg/y		

LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 No-Build Conditions)]

2030 No-Build AM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps													
Lane 1[d]	292	2.0	787	0.371	100	9.1	LOS A	1.8	47.0	Full	1600	0.0	0.0
Approach	292	2.0		0.371		9.1	LOS A	1.8	47.0				
East: WV 115													
Lane 1[d]	480	2.0	1104	0.435	100	7.9	LOS A	2.7	67.7	Full	1000	0.0	0.0
Approach	480	2.0		0.435		7.9	LOS A	2.7	67.7				
North: Citizens Way													
Lane 1[d]	303	2.0	766	0.396	100	9.7	LOS A	2.1	53.9	Full	1600	0.0	0.0
Approach	303	2.0		0.396		9.7	LOS A	2.1	53.9				
West: WV 115													
Lane 1[d]	414	2.0	912	0.454	100	9.5	LOS A	2.8	71.2	Full	1600	0.0	0.0
Approach	414	2.0		0.454		9.5	LOS A	2.8	71.2				
Intersection	1490	2.0		0.454		8.9	LOS A	2.8	71.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	78	123	292	2.0	787	0.371	100	NA	NA
Approach	91	78	123	292	2.0		0.371			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	130	326	24	480	2.0	1104	0.435	100	NA	NA
Approach	130	326	24	480	2.0		0.435			

North: Citizens Way

Mov. From N	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	201	48	55	303	2.0	766	0.396	100	NA	NA
Approach	201	48	55	303	2.0		0.396			

West: WV 115

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	293	94	414	2.0	912	0.454	100	NA	NA
Approach	27	293	94	414	2.0		0.454			

	Total	%HV	Deg.Satn (v/c)
Intersection	1490	2.0	0.454

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

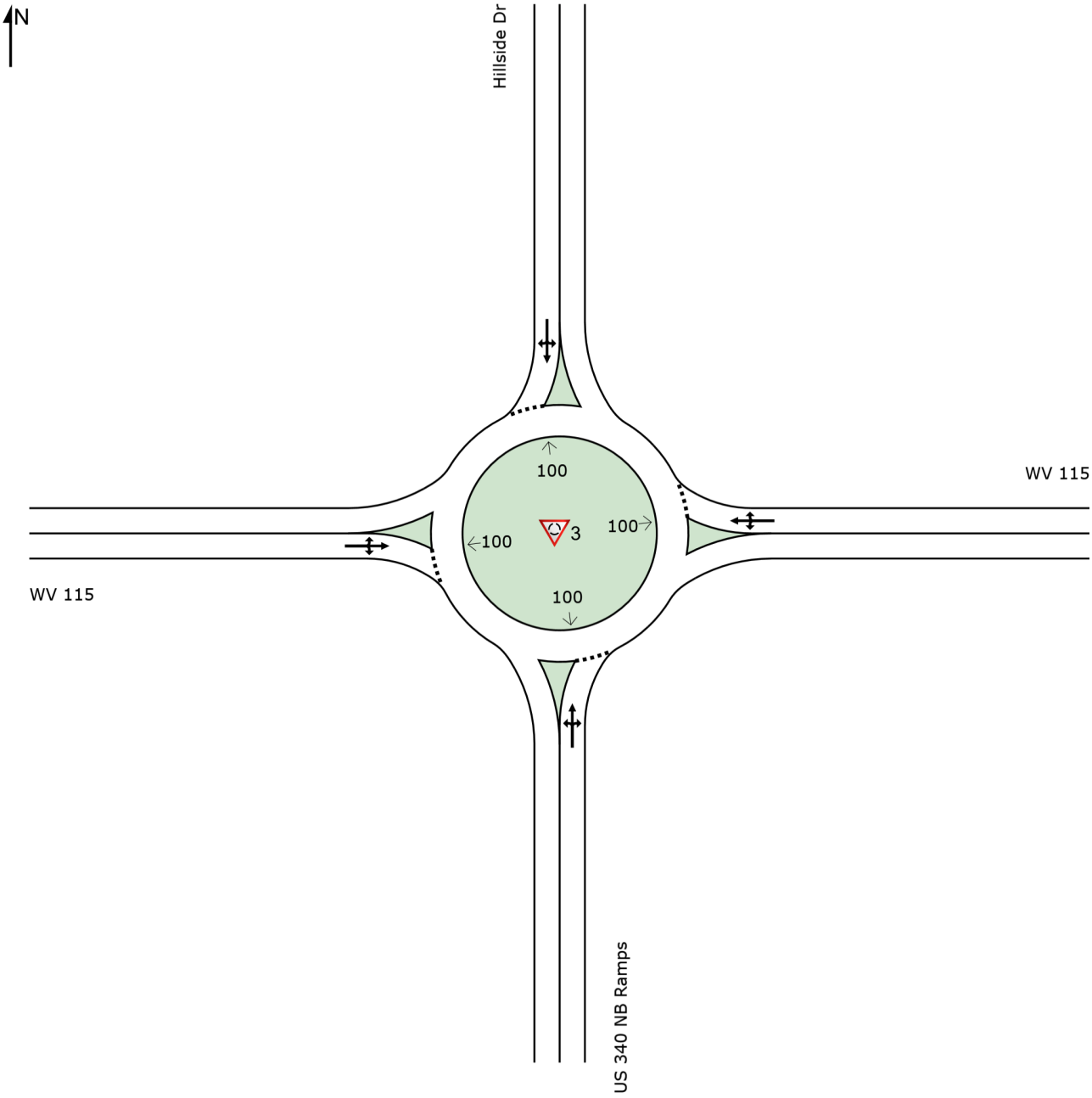
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 SB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Citizens Way Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 No-Build Conditions)]

2030 No-Build AM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 No-Build Conditions)]

2030 No-Build AM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	31.9	mph	31.9	mph
Travel Distance (Total)	699.6	veh-mi/h	839.6	pers-mi/h
Travel Time (Total)	21.9	veh-h/h	26.3	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.80			
Travel Time Index	7.75			
Congestion Coefficient	1.25			
Demand Flows (Total)	1267	veh/h	1520	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.532			
Practical Spare Capacity	59.9	%		
Effective Intersection Capacity	2383	veh/h		
Control Delay (Total)	2.91	veh-h/h	3.49	pers-h/h
Control Delay (Average)	8.3	sec	8.3	sec
Control Delay (Worst Lane)	9.6	sec		
Control Delay (Worst Movement)	9.6	sec	9.6	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	8.3	sec		
Idling Time (Average)	6.2	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	3.7	veh		
95% Back of Queue - Distance (Worst Lane)	93.4	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.03			
Total Effective Stops	327	veh/h	392	pers/h
Effective Stop Rate	0.26		0.26	
Proportion Queued	0.41		0.41	
Performance Index	40.1		40.1	
Cost (Total)	455.41	$/h	455.41	$/h
Fuel Consumption (Total)	28.6	gal/h		
Carbon Dioxide (Total)	255.7	kg/h		
Hydrocarbons (Total)	0.023	kg/h		
Carbon Monoxide (Total)	0.317	kg/h		
NOx (Total)	0.306	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 93.1% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	608,176	veh/y	729,811	pers/y
Delay	1,396	veh-h/y	1,675	pers-h/y
Effective Stops	156,951	veh/y	188,341	pers/y
Travel Distance	335,826	veh-mi/y	402,991	pers-mi/y
Travel Time	10,527	veh-h/y	12,632	pers-h/y
Cost	218,596	$/y	218,596	$/y
Fuel Consumption	13,727	gal/y		
Carbon Dioxide	122,747	kg/y		
Hydrocarbons	11	kg/y		

LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 No-Build Conditions)]

2030 No-Build AM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps													
Lane 1[d]	71	2.0	1044	0.068	100	4.0	LOS A	0.3	7.3	Full	1600	0.0	0.0
Approach	71	2.0		0.068		4.0	LOS A	0.3	7.3				
East: WV 115													
Lane 1[d]	599	2.0	1288	0.465	100	7.5	LOS A	3.4	85.3	Full	1000	0.0	0.0
Approach	599	2.0		0.465		7.5	LOS A	3.4	85.3				
North: Hillside Dr													
Lane 1[d]	13	2.0	695	0.019	100	5.4	LOS A	0.1	1.8	Full	1600	0.0	0.0
Approach	13	2.0		0.019		5.4	LOS A	0.1	1.8				
West: WV 115													
Lane 1[d]	584	2.0	1098	0.532	100	9.6	LOS A	3.7	93.3	Full	1600	0.0	0.0
Approach	584	2.0		0.532		9.6	LOS A	3.7	93.4				
Intersection	1267	2.0		0.532		8.3	LOS A	3.7	93.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	43	1	27	71	2.0	1044	0.068	100	NA	NA
Approach	43	1	27	71	2.0		0.068			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	195	403	1	599	2.0	1288	0.465	100	NA	NA
Approach	195	403	1	599	2.0		0.465			

North: Hillside Dr

Mov. From N	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	1	5	7	13	2.0	695	0.019	100	NA	NA
Approach	1	5	7	13	2.0		0.019			

West: WV 115

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	3	245	335	584	2.0	1098	0.532	100	NA	NA
Approach	3	245	335	584	2.0		0.532			

	Total	%HV	Deg.Satn (v/c)
Intersection	1267	2.0	0.532

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 NB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Hillside Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

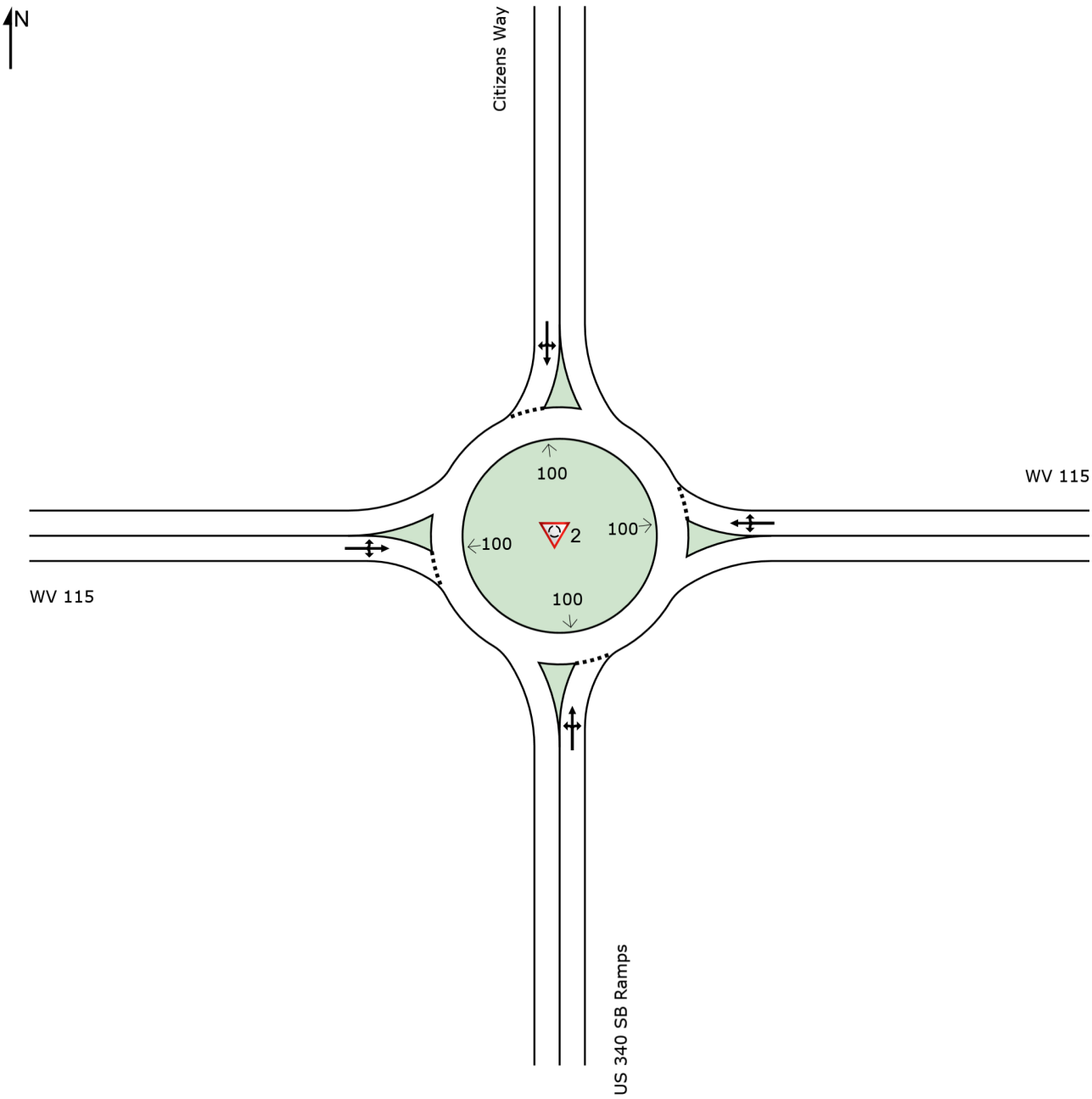
APPENDIX E-4: 2030 NO-BUILD PM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 No-Build Conditions)]

2030 No-Build PM Peak
Site Category: Existing Design
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 No-Build Conditions)]

2030 No-Build PM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	29.7	mph	29.7	mph
Travel Distance (Total)	957.5	veh-mi/h	1149.0	pers-mi/h
Travel Time (Total)	32.2	veh-h/h	38.6	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.74			
Travel Time Index	7.15			
Congestion Coefficient	1.34			
Demand Flows (Total)	1738	veh/h	2085	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.734			
Practical Spare Capacity	15.8	%		
Effective Intersection Capacity	2368	veh/h		
Control Delay (Total)	6.09	veh-h/h	7.30	pers-h/h
Control Delay (Average)	12.6	sec	12.6	sec
Control Delay (Worst Lane)	20.6	sec		
Control Delay (Worst Movement)	20.6	sec	20.6	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	12.6	sec		
Idling Time (Average)	7.3	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	8.7	veh		
95% Back of Queue - Distance (Worst Lane)	220.7	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.06			
Total Effective Stops	1252	veh/h	1502	pers/h
Effective Stop Rate	0.72		0.72	
Proportion Queued	0.68		0.68	
Performance Index	75.4		75.4	
Cost (Total)	665.97	$/h	665.97	$/h
Fuel Consumption (Total)	41.5	gal/h		
Carbon Dioxide (Total)	371.0	kg/h		
Hydrocarbons (Total)	0.034	kg/h		
Carbon Monoxide (Total)	0.453	kg/h		
NOx (Total)	0.445	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 92.6% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	834,122	veh/y	1,000,947	pers/y
Delay	2,922	veh-h/y	3,506	pers-h/y
Effective Stops	600,917	veh/y	721,100	pers/y
Travel Distance	459,614	veh-mi/y	551,537	pers-mi/y
Travel Time	15,450	veh-h/y	18,540	pers-h/y
Cost	319,668	$/y	319,668	$/y
Fuel Consumption	19,924	gal/y		
Carbon Dioxide	178,092	kg/y		
Hydrocarbons	16	kg/y		

LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 No-Build Conditions)]

2030 No-Build PM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps													
Lane 1[d]	545	2.0	743	0.734	100	20.6	LOS C	8.7	220.7	Full	1600	0.0	0.0
Approach	545	2.0		0.734		20.6	LOS C	8.7	220.7				
East: WV 115													
Lane 1[d]	437	2.0	954	0.458	100	9.2	LOS A	2.7	69.4	Full	1000	0.0	0.0
Approach	437	2.0		0.458		9.2	LOS A	2.7	69.4				
North: Citizens Way													
Lane 1[d]	216	2.0	833	0.260	100	7.1	LOS A	1.2	29.9	Full	1600	0.0	0.0
Approach	216	2.0		0.260		7.1	LOS A	1.2	29.9				
West: WV 115													
Lane 1[d]	540	2.0	1058	0.510	100	9.4	LOS A	3.3	84.5	Full	1600	0.0	0.0
Approach	540	2.0		0.510		9.4	LOS A	3.3	84.5				
Intersection	1738	2.0		0.734		12.6	LOS B	8.7	220.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	78	184	284	545	2.0	743	0.734	100	NA	NA
Approach	78	184	284	545	2.0		0.734			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	83	306	48	437	2.0	954	0.458	100	NA	NA
Approach	83	306	48	437	2.0		0.458			

North: Citizens Way

Mov. From N	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	127	28	62	216	2.0	833	0.260	100	NA	NA
Approach	127	28	62	216	2.0		0.260			

West: WV 115

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	74	376	90	540	2.0	1058	0.510	100	NA	NA
Approach	74	376	90	540	2.0		0.510			

	Total	%HV	Deg.Satn (v/c)
Intersection	1738	2.0	0.734

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

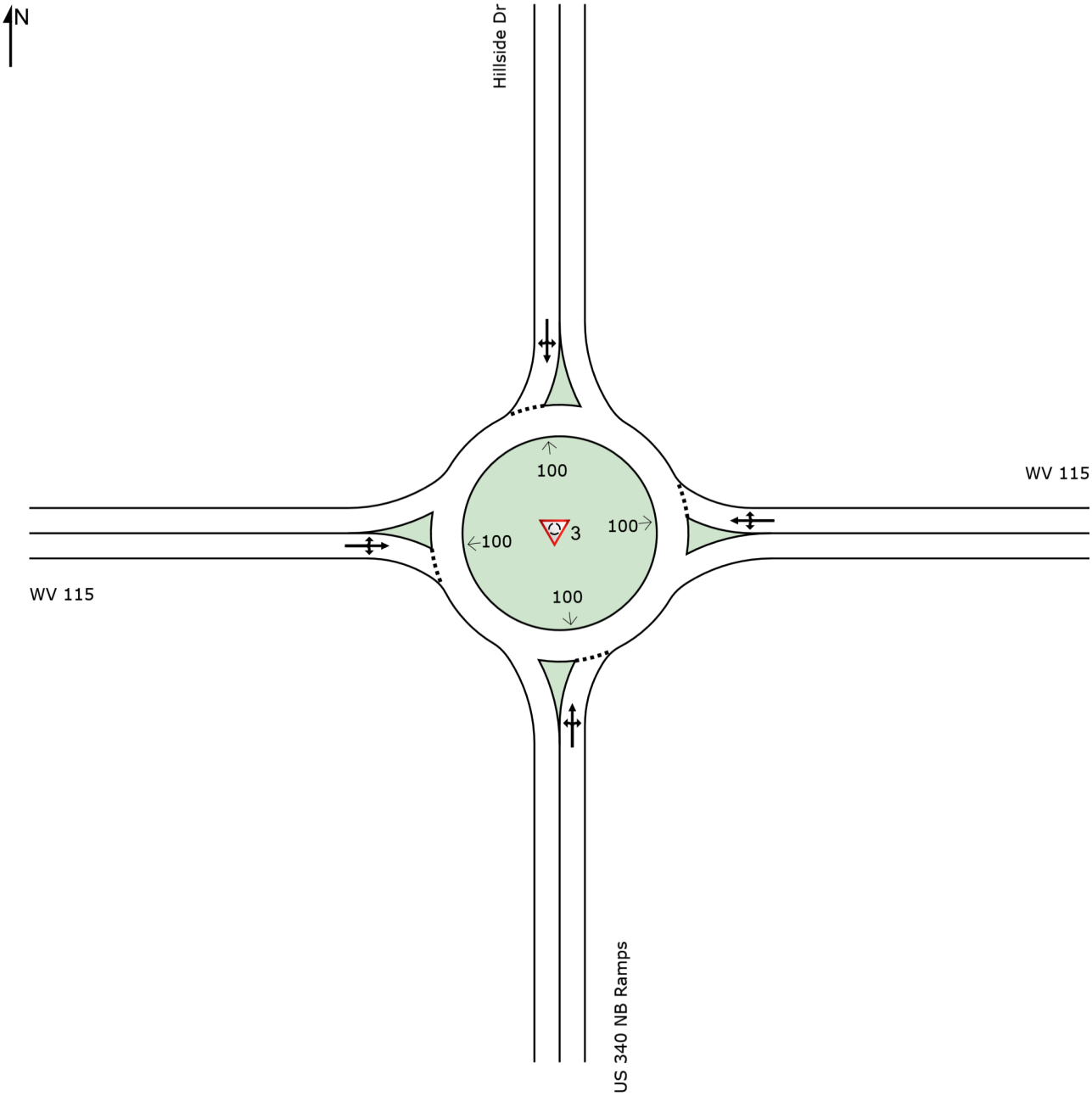
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 SB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Citizens Way Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 No-Build Conditions)]

2030 No-Build PM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 No-Build Conditions)]

2030 No-Build PM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	29.6	mph	29.6	mph
Travel Distance (Total)	871.8	veh-mi/h	1046.2	pers-mi/h
Travel Time (Total)	29.4	veh-h/h	35.3	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.74			
Travel Time Index	7.12			
Congestion Coefficient	1.35			
Demand Flows (Total)	1601	veh/h	1921	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.771			
Practical Spare Capacity	10.3	%		
Effective Intersection Capacity	2078	veh/h		
Control Delay (Total)	5.71	veh-h/h	6.86	pers-h/h
Control Delay (Average)	12.8	sec	12.8	sec
Control Delay (Worst Lane)	17.3	sec		
Control Delay (Worst Movement)	17.3	sec	17.3	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	12.8	sec		
Idling Time (Average)	6.9	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	17.1	veh		
95% Back of Queue - Distance (Worst Lane)	434.8	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.11			
Total Effective Stops	1052	veh/h	1263	pers/h
Effective Stop Rate	0.66		0.66	
Proportion Queued	0.67		0.67	
Performance Index	85.3		85.3	
Cost (Total)	609.44	$/h	609.44	$/h
Fuel Consumption (Total)	38.1	gal/h		
Carbon Dioxide (Total)	340.3	kg/h		
Hydrocarbons (Total)	0.031	kg/h		
Carbon Monoxide (Total)	0.413	kg/h		
NOx (Total)	0.414	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 93.2% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	768,522	veh/y	922,226	pers/y
Delay	2,743	veh-h/y	3,292	pers-h/y
Effective Stops	505,051	veh/y	606,061	pers/y
Travel Distance	418,460	veh-mi/y	502,152	pers-mi/y
Travel Time	14,123	veh-h/y	16,948	pers-h/y
Cost	292,530	$/y	292,530	$/y
Fuel Consumption	18,274	gal/y		
Carbon Dioxide	163,349	kg/y		
Hydrocarbons	15	kg/y		

LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 No-Build Conditions)]

2030 No-Build PM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps													
Lane 1[d]	200	2.0	724	0.276	100	8.2	LOS A	1.2	30.7	Full	1600	0.0	0.0
Approach	200	2.0		0.276		8.2	LOS A	1.2	30.7				
East: WV 115													
Lane 1[d]	553	2.0	1192	0.464	100	7.9	LOS A	3.1	79.5	Full	1000	0.0	0.0
Approach	553	2.0		0.464		7.9	LOS A	3.1	79.5				
North: Hillside Dr													
Lane 1[d]	10	2.0	677	0.014	100	5.5	LOS A	0.1	1.4	Full	1600	0.0	0.0
Approach	10	2.0		0.014		5.5	LOS A	0.1	1.4				
West: WV 115													
Lane 1[d]	838	2.0	1088	0.771	100	17.3	LOS C	17.1	434.8	Full	1600	0.0	0.0
Approach	838	2.0		0.771		17.3	LOS C	17.1	434.8				
Intersection	1601	2.0		0.771		12.8	LOS B	17.1	434.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	113	1	86	200	2.0	724	0.276	100	NA	NA
Approach	113	1	86	200	2.0		0.276			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	203	349	1	553	2.0	1192	0.464	100	NA	NA
Approach	203	349	1	553	2.0		0.464			

North: Hillside Dr

Mov. From N	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	E	S	W			veh/h	v/c	%	%	No.
Lane 1	1	5	3	10	2.0	677	0.014	100	NA	NA
Approach	1	5	3	10	2.0		0.014			

West: WV 115

Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	8	592	238	838	2.0	1088	0.771	100	NA	NA
Approach	8	592	238	838	2.0		0.771			

	Total	%HV	Deg.Satn (v/c)
Intersection	1601	2.0	0.771

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 NB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Hillside Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

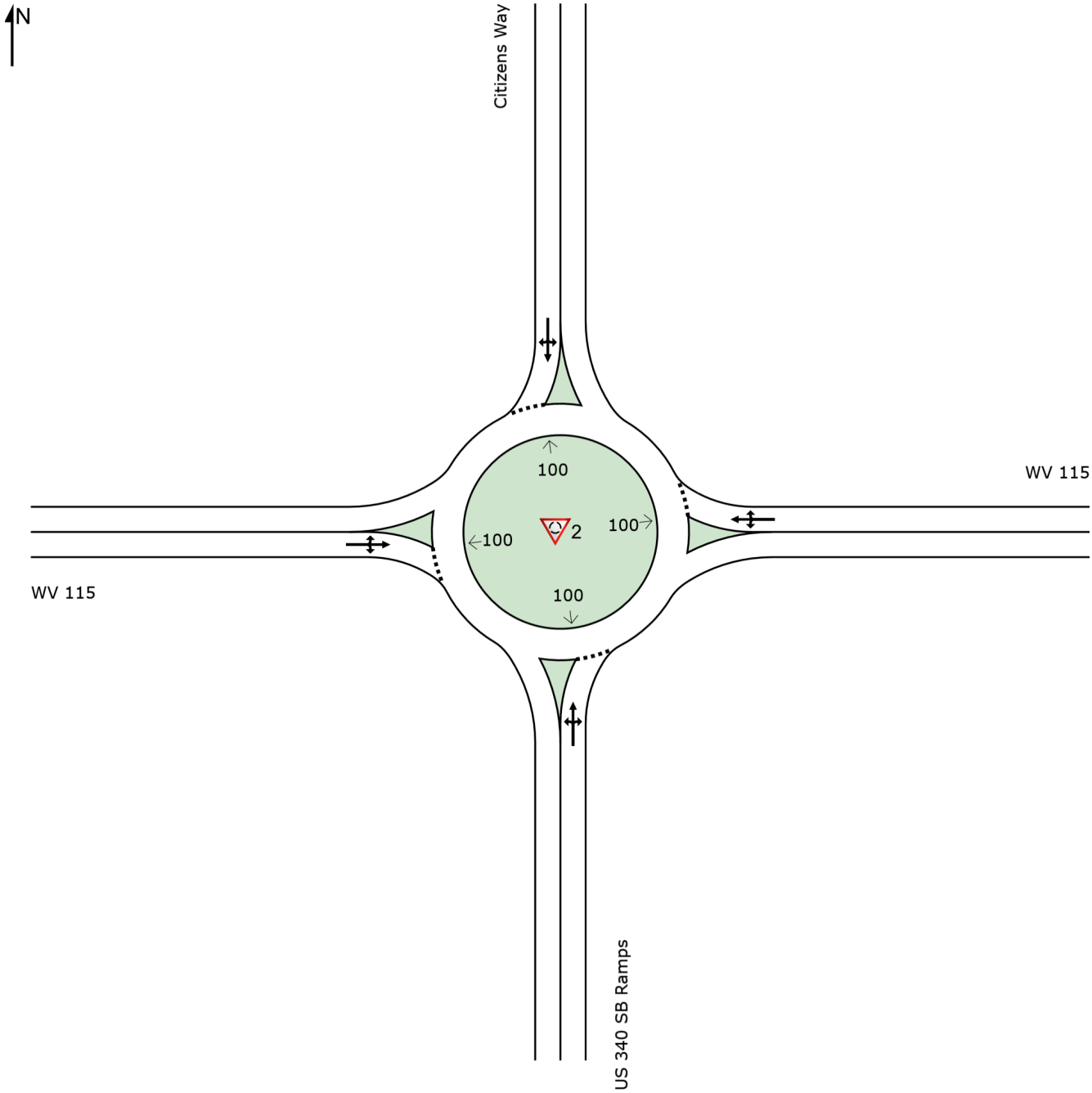
APPENDIX E-5: 2030 BUILD AM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Conditions)]

2030 Build AM Peak
Site Category: Existing Design
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Conditions)]

2030 Build AM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	30.2	mph	30.2	mph
Travel Distance (Total)	933.3	veh-mi/h	1120.0	pers-mi/h
Travel Time (Total)	30.9	veh-h/h	37.1	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.76			
Travel Time Index	7.28			
Congestion Coefficient	1.32			
Demand Flows (Total)	1708	veh/h	2050	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.574			
Practical Spare Capacity	48.1	%		
Effective Intersection Capacity	2976	veh/h		
Control Delay (Total)	5.25	veh-h/h	6.30	pers-h/h
Control Delay (Average)	11.1	sec	11.1	sec
Control Delay (Worst Lane)	12.5	sec		
Control Delay (Worst Movement)	12.5	sec	12.5	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	11.1	sec		
Idling Time (Average)	6.7	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	4.2	veh		
95% Back of Queue - Distance (Worst Lane)	107.7	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.04			
Total Effective Stops	1127	veh/h	1353	pers/h
Effective Stop Rate	0.66		0.66	
Proportion Queued	0.67		0.67	
Performance Index	67.5		67.5	
Cost (Total)	643.91	$/h	643.91	$/h
Fuel Consumption (Total)	40.8	gal/h		
Carbon Dioxide (Total)	364.4	kg/h		
Hydrocarbons (Total)	0.033	kg/h		
Carbon Monoxide (Total)	0.443	kg/h		
NOx (Total)	0.437	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 93.5% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	819,907	veh/y	983,888	pers/y
Delay	2,520	veh-h/y	3,023	pers-h/y
Effective Stops	541,077	veh/y	649,292	pers/y
Travel Distance	447,984	veh-mi/y	537,581	pers-mi/y

LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Conditions)]

2030 Build AM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps													
Lane 1[d]	324	2.0	761	0.426	100	10.3	LOS B	2.5	62.6	Full	1600	0.0	0.0
Approach	324	2.0		0.426		10.3	LOS B	2.5	62.6				
East: WV 115													
Lane 1[d]	634	2.0	1104	0.574	100	10.4	LOS B	4.2	107.7	Full	1000	0.0	0.0
Approach	634	2.0		0.574		10.4	LOS B	4.2	107.7				
North: Citizens Way													
Lane 1[d]	303	2.0	653	0.465	100	12.5	LOS B	2.7	69.7	Full	1600	0.0	0.0
Approach	303	2.0		0.465		12.5	LOS B	2.7	69.7				
West: WV 115													
Lane 1[d]	447	2.0	848	0.526	100	11.5	LOS B	4.1	103.9	Full	1600	0.0	0.0
Approach	447	2.0		0.526		11.5	LOS B	4.1	103.9				
Intersection	1708	2.0		0.574		11.1	LOS B	4.2	107.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	78	156	324	2.0	761	0.426	100	NA	NA
Approach	91	78	156	324	2.0		0.426			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	200	409	24	634	2.0	1104	0.574	100	NA	NA

Approach	200	409	24	634	2.0		0.574			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	48	55	303	2.0	653	0.465	100	NA	NA
Approach	201	48	55	303	2.0		0.465			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	326	94	447	2.0	848	0.526	100	NA	NA
Approach	27	326	94	447	2.0		0.526			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1708	2.0		0.574						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

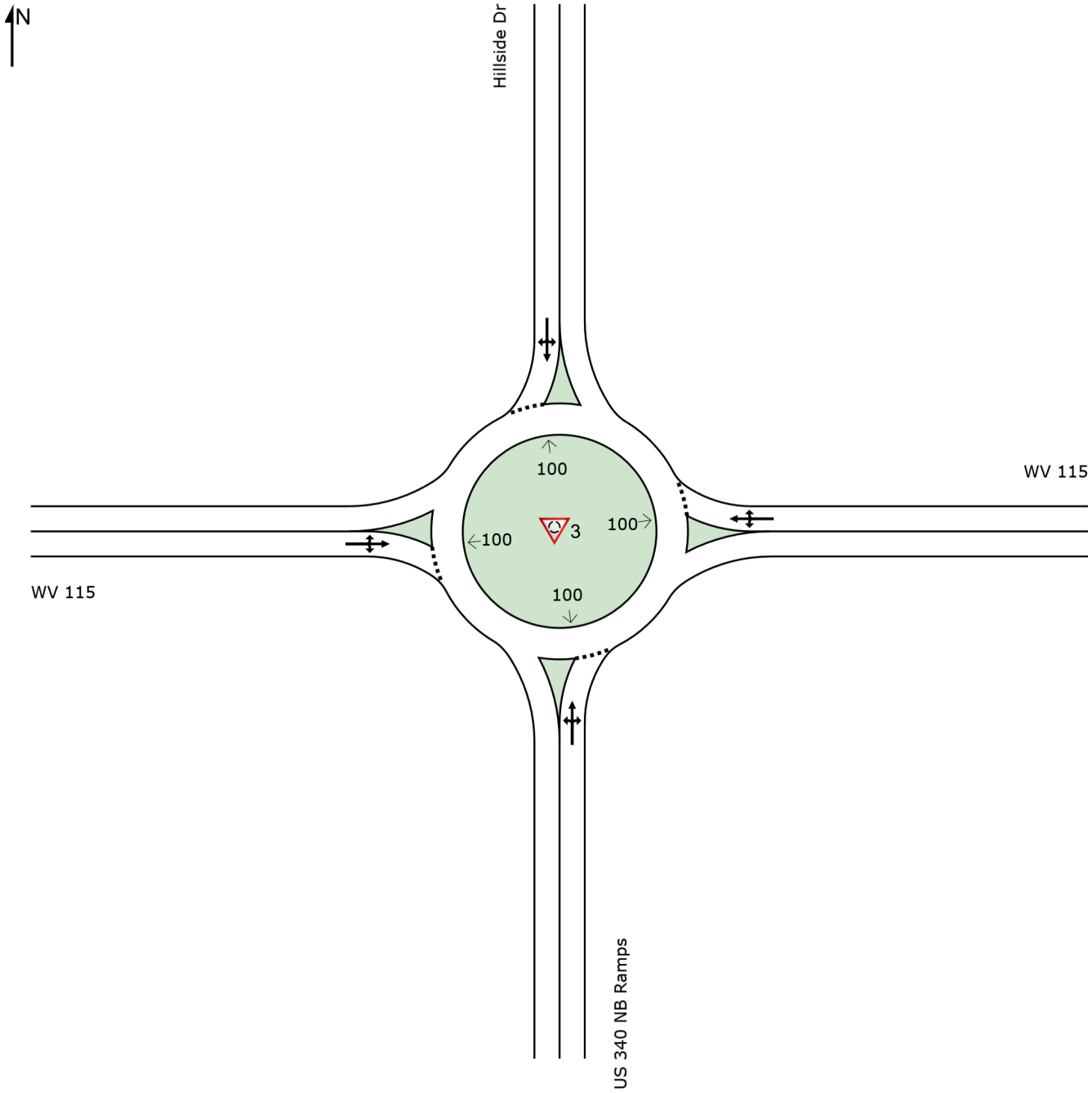
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 SB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Citizens Way Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Conditions)]

2030 Build AM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Conditions)]

2030 Build AM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	30.4	mph	30.4	mph
Travel Distance (Total)	862.3	veh-mi/h	1034.7	pers-mi/h
Travel Time (Total)	28.4	veh-h/h	34.1	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.76			
Travel Time Index	7.33			
Congestion Coefficient	1.32			
Demand Flows (Total)	1579	veh/h	1895	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.639			
Practical Spare Capacity	33.0	%		
Effective Intersection Capacity	2471	veh/h		
Control Delay (Total)	4.91	veh-h/h	5.90	pers-h/h
Control Delay (Average)	11.2	sec	11.2	sec
Control Delay (Worst Lane)	12.8	sec		
Control Delay (Worst Movement)	12.8	sec	12.8	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	11.2	sec		
Idling Time (Average)	7.5	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	7.7	veh		
95% Back of Queue - Distance (Worst Lane)	196.6	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.07			
Total Effective Stops	654	veh/h	784	pers/h
Effective Stop Rate	0.41		0.41	
Proportion Queued	0.51		0.51	
Performance Index	65.6		65.6	
Cost (Total)	586.36	$/h	586.36	$/h
Fuel Consumption (Total)	36.5	gal/h		
Carbon Dioxide (Total)	325.9	kg/h		
Hydrocarbons (Total)	0.029	kg/h		
Carbon Monoxide (Total)	0.400	kg/h		
NOx (Total)	0.392	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 94.5% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	757,978	veh/y	909,574	pers/y
Delay	2,358	veh-h/y	2,830	pers-h/y
Effective Stops	313,779	veh/y	376,535	pers/y
Travel Distance	413,884	veh-mi/y	496,661	pers-mi/y

LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Conditions)]

2030 Build AM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps													
Lane 1[d]	98	2.0	979	0.100	100	4.6	LOS A	0.4	10.7	Full	1600	0.0	0.0
Approach	98	2.0		0.100		4.6	LOS A	0.4	10.7				
East: WV 115													
Lane 1[d]	823	2.0	1288	0.639	100	10.8	LOS B	6.5	164.3	Full	1000	0.0	0.0
Approach	823	2.0		0.639		10.8	LOS B	6.5	164.3				
North: Hillside Dr													
Lane 1[d]	13	2.0	550	0.024	100	6.8	LOS A	0.1	2.2	Full	1600	0.0	0.0
Approach	13	2.0		0.024		6.8	LOS A	0.1	2.2				
West: WV 115													
Lane 1[d]	645	2.0	1011	0.638	100	12.8	LOS B	7.7	196.6	Full	1600	0.0	0.0
Approach	645	2.0		0.638		12.8	LOS B	7.7	196.6				
Intersection	1579	2.0		0.639		11.2	LOS B	7.7	196.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	43	1	54	98	2.0	979	0.100	100	NA	NA
Approach	43	1	54	98	2.0		0.100			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	274	548	1	823	2.0	1288	0.639	100	NA	NA

Approach	274	548	1	823	2.0		0.639			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	5	7	13	2.0	550	0.024	100	NA	NA
Approach	1	5	7	13	2.0		0.024			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	3	307	335	645	2.0	1011	0.638	100	NA	NA
Approach	3	307	335	645	2.0		0.638			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1579	2.0		0.639						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 NB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Hillside Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

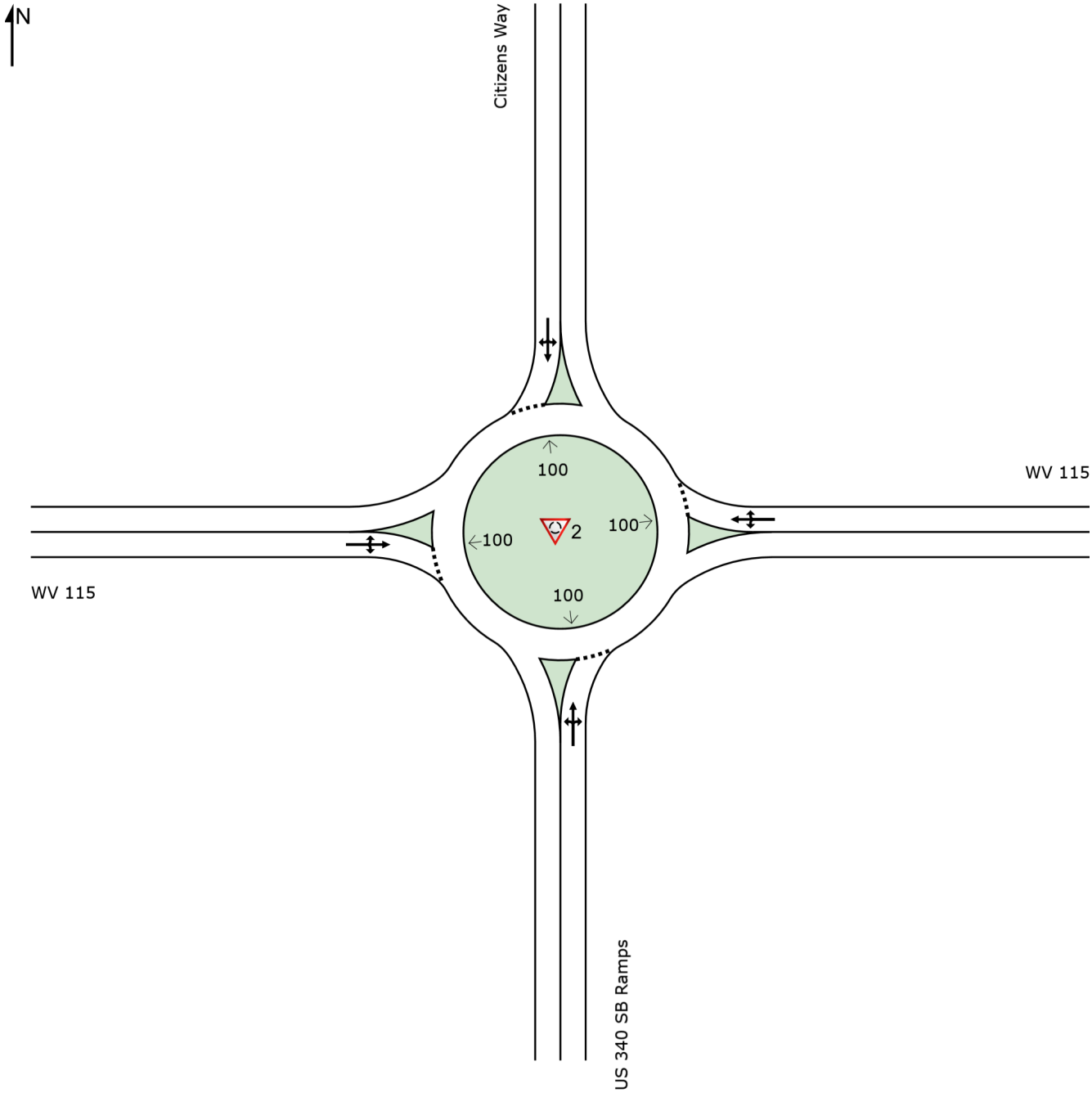
APPENDIX E-6: 2030 BUILD PM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Conditions)]

2030 Build PM Peak
Site Category: Existing Design
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Conditions)]

2030 Build PM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	26.6	mph	26.6	mph
Travel Distance (Total)	1086.5	veh-mi/h	1303.8	pers-mi/h
Travel Time (Total)	40.9	veh-h/h	49.1	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.66			
Travel Time Index	6.27			
Congestion Coefficient	1.51			
Demand Flows (Total)	1988	veh/h	2385	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.914			
Practical Spare Capacity	-7.0	%		
Effective Intersection Capacity	2176	veh/h		
Control Delay (Total)	11.26	veh-h/h	13.51	pers-h/h
Control Delay (Average)	20.4	sec	20.4	sec
Control Delay (Worst Lane)	40.8	sec		
Control Delay (Worst Movement)	40.8	sec	40.8	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	20.4	sec		
Idling Time (Average)	11.3	sec		
Intersection Level of Service (LOS)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	17.7	veh		
95% Back of Queue - Distance (Worst Lane)	448.6	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.11			
Total Effective Stops	2012	veh/h	2414	pers/h
Effective Stop Rate	1.01		1.01	
Proportion Queued	0.78		0.78	
Performance Index	123.0		123.0	
Cost (Total)	829.90	$/h	829.90	$/h
Fuel Consumption (Total)	49.7	gal/h		
Carbon Dioxide (Total)	443.8	kg/h		
Hydrocarbons (Total)	0.041	kg/h		
Carbon Monoxide (Total)	0.531	kg/h		
NOx (Total)	0.531	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 93.2% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	954,122	veh/y	1,144,947	pers/y
Delay	5,406	veh-h/y	6,487	pers-h/y
Effective Stops	965,759	veh/y	1,158,911	pers/y
Travel Distance	521,533	veh-mi/y	625,840	pers-mi/y

LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Conditions)]

2030 Build PM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps													
Lane 1[d]	624	2.0	684	0.914	100	40.8	LOS E	17.7	448.6	Full	1600	0.0	0.0
Approach	624	2.0		0.914		40.8	LOS E	17.7	448.6				
East: WV 115													
Lane 1[d]	528	2.0	954	0.553	100	11.1	LOS B	4.8	122.7	Full	1000	0.0	0.0
Approach	528	2.0		0.553		11.1	LOS B	4.8	122.7				
North: Citizens Way													
Lane 1[d]	216	2.0	758	0.285	100	8.1	LOS A	1.3	32.4	Full	1600	0.0	0.0
Approach	216	2.0		0.285		8.1	LOS A	1.3	32.4				
West: WV 115													
Lane 1[d]	619	2.0	1013	0.612	100	12.0	LOS B	6.6	168.9	Full	1600	0.0	0.0
Approach	619	2.0		0.612		12.0	LOS B	6.6	168.9				
Intersection	1988	2.0		0.914		20.4	LOS C	17.7	448.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	78	184	363	624	2.0	684	0.914	100	NA	NA
Approach	78	184	363	624	2.0		0.914			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	124	355	48	528	2.0	954	0.553	100	NA	NA

Approach	124	355	48	528	2.0		0.553			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	28	62	216	2.0	758	0.285	100	NA	NA
Approach	127	28	62	216	2.0		0.285			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	74	455	90	619	2.0	1013	0.612	100	NA	NA
Approach	74	455	90	619	2.0		0.612			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1988	2.0		0.914						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

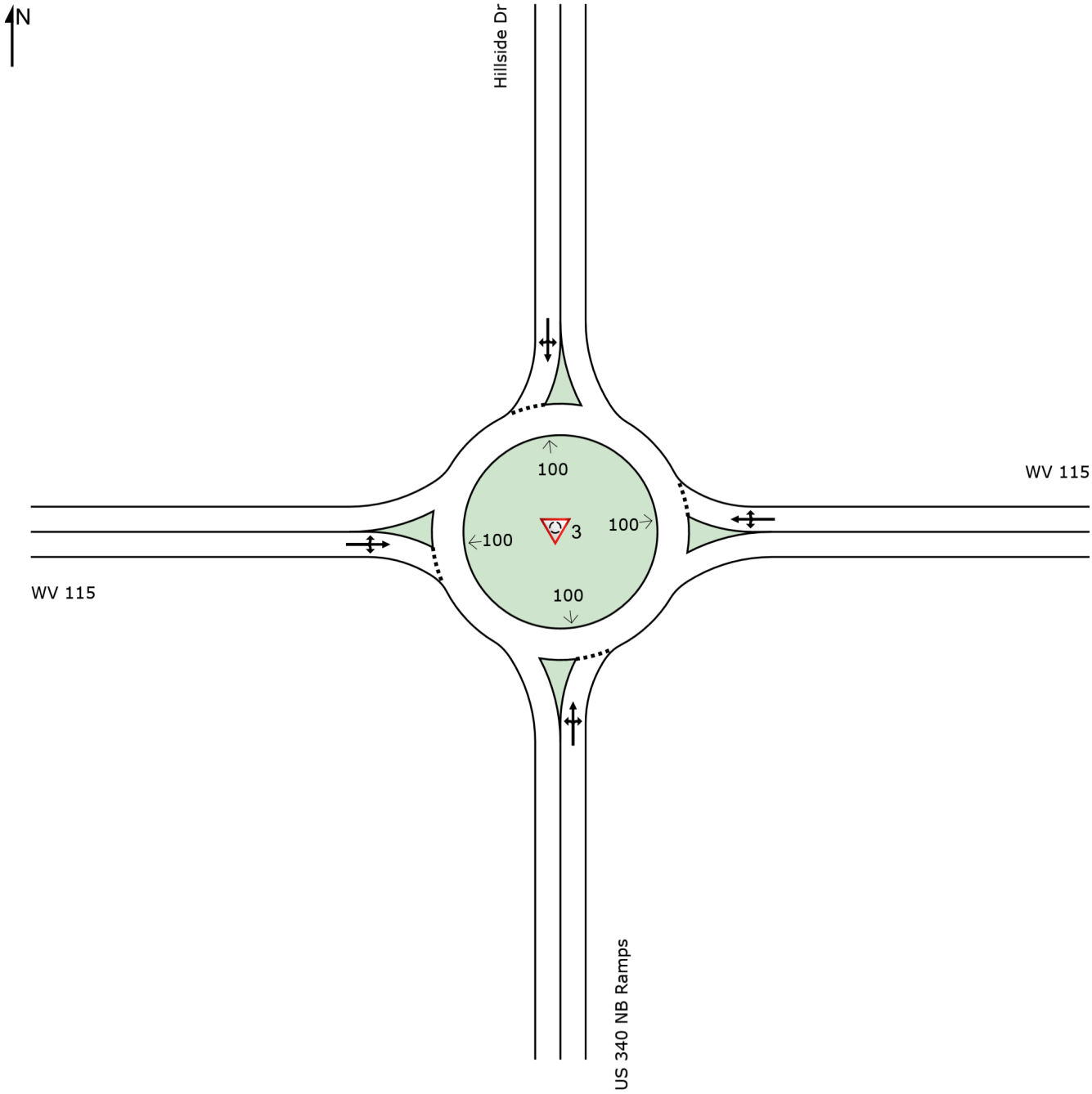
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 SB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Citizens Way Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Conditions)]

2030 Build PM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Conditions)]

2030 Build PM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	24.3	mph	24.3	mph
Travel Distance (Total)	1073.2	veh-mi/h	1287.8	pers-mi/h
Travel Time (Total)	44.2	veh-h/h	53.0	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.61			
Travel Time Index	5.64			
Congestion Coefficient	1.65			
Demand Flows (Total)	1990	veh/h	2388	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.978			
Practical Spare Capacity	-13.1	%		
Effective Intersection Capacity	2035	veh/h		
Control Delay (Total)	15.00	veh-h/h	18.00	pers-h/h
Control Delay (Average)	27.1	sec	27.1	sec
Control Delay (Worst Lane)	43.0	sec		
Control Delay (Worst Movement)	43.0	sec	43.0	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	27.1	sec		
Idling Time (Average)	14.1	sec		
Intersection Level of Service (LOS)	LOS D			
95% Back of Queue - Vehicles (Worst Lane)	49.6	veh		
95% Back of Queue - Distance (Worst Lane)	1259.2	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.32			
Total Effective Stops	2362	veh/h	2835	pers/h
Effective Stop Rate	1.19		1.19	
Proportion Queued	0.79		0.79	
Performance Index	192.4		192.4	
Cost (Total)	885.99	$/h	885.99	$/h
Fuel Consumption (Total)	51.7	gal/h		
Carbon Dioxide (Total)	461.6	kg/h		
Hydrocarbons (Total)	0.044	kg/h		
Carbon Monoxide (Total)	0.537	kg/h		
NOx (Total)	0.563	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 94.2% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	955,304	veh/y	1,146,365	pers/y
Delay	7,201	veh-h/y	8,641	pers-h/y
Effective Stops	1,133,807	veh/y	1,360,568	pers/y
Travel Distance	515,118	veh-mi/y	618,141	pers-mi/y

LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Conditions)]

2030 Build PM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps													
Lane 1[d]	271	2.0	607	0.446	100	12.9	LOS B	2.5	62.5	Full	1600	0.0	0.0
Approach	271	2.0		0.446		12.9	LOS B	2.5	62.5				
East: WV 115													
Lane 1[d]	702	2.0	1192	0.589	100	10.2	LOS B	4.8	123.1	Full	1000	0.0	0.0
Approach	702	2.0		0.589		10.2	LOS B	4.8	123.1				
North: Hillside Dr													
Lane 1[d]	10	2.0	580	0.017	100	6.4	LOS A	0.1	1.6	Full	1600	0.0	0.0
Approach	10	2.0		0.017		6.4	LOS A	0.1	1.6				
West: WV 115													
Lane 1[d]	1008	2.0	1030	0.978	100	43.0	LOS E	49.6	1259.2	Full	1600	0.0	0.0
Approach	1008	2.0		0.978		43.0	LOS E	49.6	1259.2				
Intersection	1990	2.0		0.978		27.1	LOS D	49.6	1259.2				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	113	1	157	271	2.0	607	0.446	100	NA	NA
Approach	113	1	157	271	2.0		0.446			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	255	446	1	702	2.0	1192	0.589	100	NA	NA

Approach	255	446	1	702	2.0		0.589			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	5	3	10	2.0	580	0.017	100	NA	NA
Approach	1	5	3	10	2.0		0.017			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	8	762	238	1008	2.0	1030	0.978	100	NA	NA
Approach	8	762	238	1008	2.0		0.978			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1990	2.0		0.978						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 NB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Hillside Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

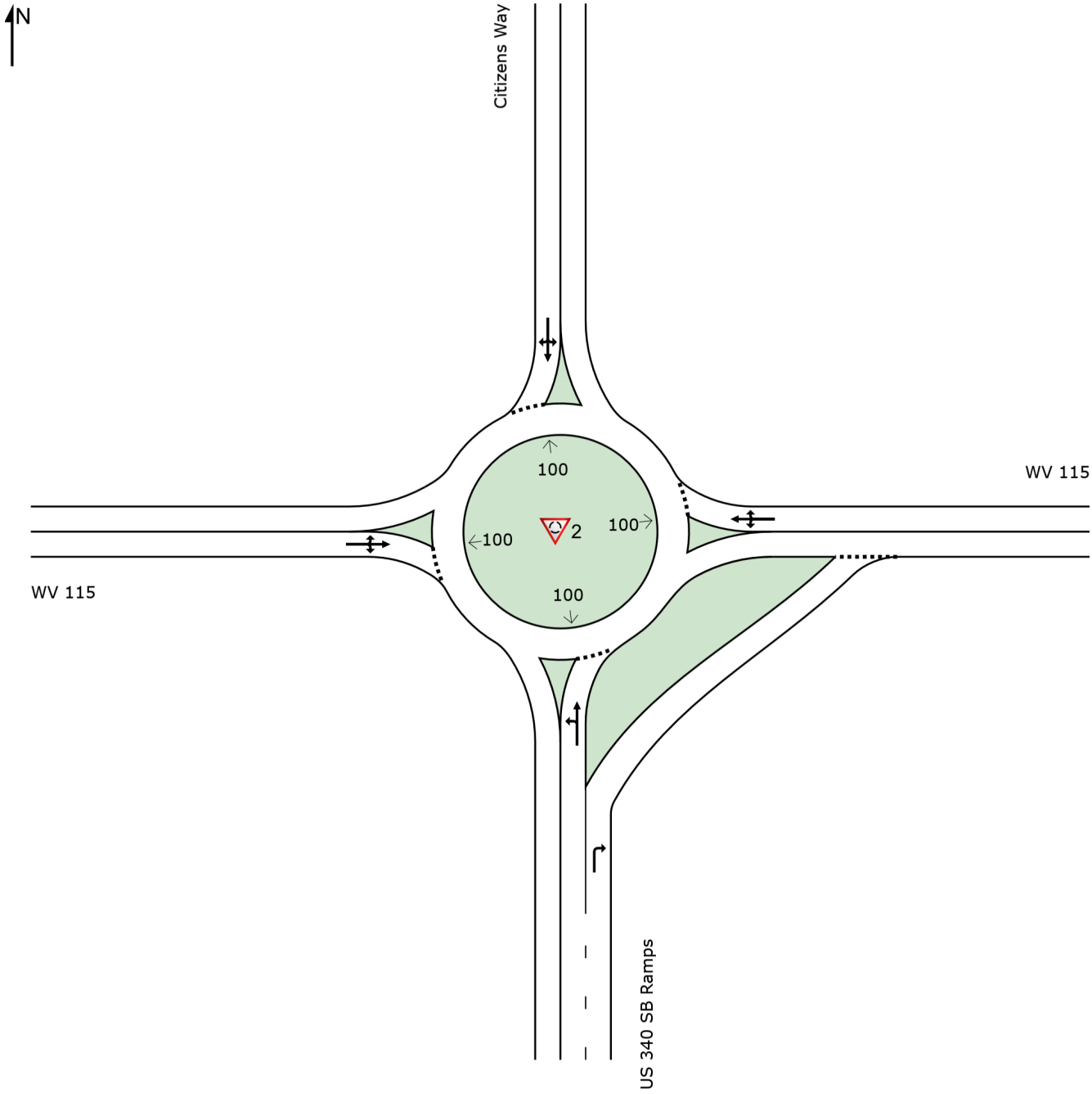
APPENDIX E-7: 2030 BUILD IMPROVED AM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved AM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved AM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	30.6	mph	30.6	mph
Travel Distance (Total)	933.3	veh-mi/h	1120.0	pers-mi/h
Travel Time (Total)	30.5	veh-h/h	36.6	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.76			
Travel Time Index	7.39			
Congestion Coefficient	1.31			
Demand Flows (Total)	1708	veh/h	2050	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.574			
Practical Spare Capacity	48.1	%		
Effective Intersection Capacity	2976	veh/h		
Control Delay (Total)	4.88	veh-h/h	5.86	pers-h/h
Control Delay (Average)	10.3	sec	10.3	sec
Control Delay (Worst Lane)	12.5	sec		
Control Delay (Worst Movement)	12.5	sec	12.5	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	10.3	sec		
Idling Time (Average)	6.3	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	4.2	veh		
95% Back of Queue - Distance (Worst Lane)	107.7	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.04			
Total Effective Stops	1050	veh/h	1260	pers/h
Effective Stop Rate	0.61		0.61	
Proportion Queued	0.64		0.64	
Performance Index	62.7		62.7	
Cost (Total)	637.32	$/h	637.32	$/h
Fuel Consumption (Total)	40.5	gal/h		
Carbon Dioxide (Total)	362.0	kg/h		
Hydrocarbons (Total)	0.033	kg/h		
Carbon Monoxide (Total)	0.441	kg/h		
NOx (Total)	0.434	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 93.5% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	819,907	veh/y	983,888	pers/y
Delay	2,343	veh-h/y	2,812	pers-h/y
Effective Stops	503,969	veh/y	604,763	pers/y
Travel Distance	447,984	veh-mi/y	537,581	pers-mi/y

LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved AM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps													
Lane 1[d]	169	2.0	833	0.202	100	6.4	LOS A	0.8	20.7	Full	1600	0.0	0.0
Lane 2	156	2.0	854	0.182	100	6.1	LOS A	0.7	18.5	Full	1600	0.0	0.0
Approach	324	2.0		0.202		6.3	LOS A	0.8	20.7				
East: WV 115													
Lane 1[d]	634	2.0	1104	0.574	100	10.4	LOS B	4.2	107.7	Full	1000	0.0	0.0
Approach	634	2.0		0.574		10.4	LOS B	4.2	107.7				
North: Citizens Way													
Lane 1[d]	303	2.0	653	0.465	100	12.5	LOS B	2.7	69.7	Full	1600	0.0	0.0
Approach	303	2.0		0.465		12.5	LOS B	2.7	69.7				
West: WV 115													
Lane 1[d]	447	2.0	848	0.526	100	11.5	LOS B	4.1	103.9	Full	1600	0.0	0.0
Approach	447	2.0		0.526		11.5	LOS B	4.1	103.9				
Intersection	1708	2.0		0.574		10.3	LOS B	4.2	107.7				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	91	78	-	169	2.0	833	0.202	100	NA	NA
Lane 2	-	-	156	156	2.0	854	0.182	100	NA	NA
Approach	91	78	156	324	2.0		0.202			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	200	409	24	634	2.0	1104	0.574	100	NA	NA
Approach	200	409	24	634	2.0		0.574			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	48	55	303	2.0	653	0.465	100	NA	NA
Approach	201	48	55	303	2.0		0.465			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	326	94	447	2.0	848	0.526	100	NA	NA
Approach	27	326	94	447	2.0		0.526			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1708	2.0	0.574							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

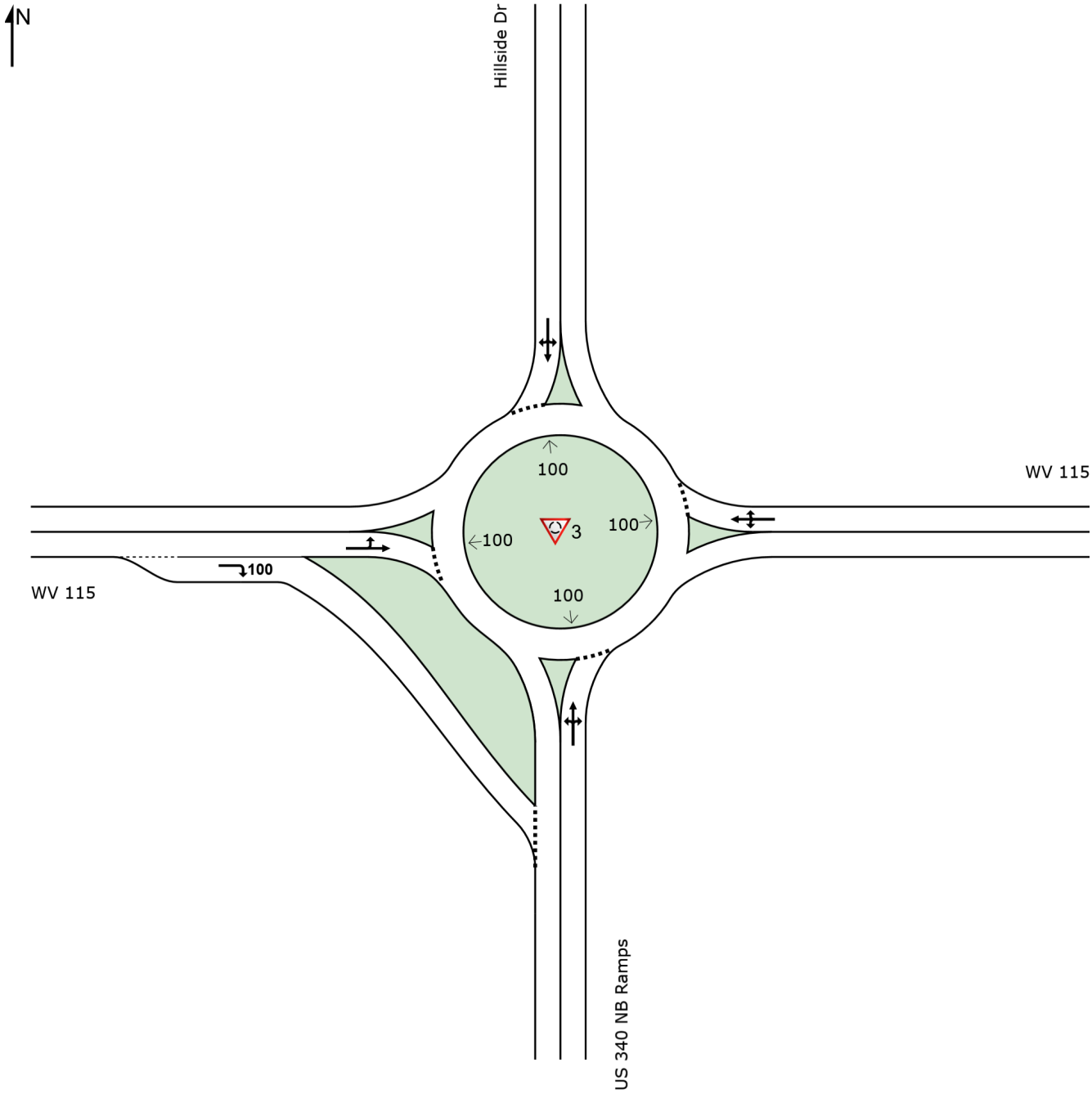
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 SB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Citizens Way Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved AM Peak
Site Category: Proposed Design 2
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved AM Peak
Site Category: Proposed Design 2
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	31.7	mph	31.7	mph
Travel Distance (Total)	862.3	veh-mi/h	1034.7	pers-mi/h
Travel Time (Total)	27.2	veh-h/h	32.6	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.79			
Travel Time Index	7.69			
Congestion Coefficient	1.26			
Demand Flows (Total)	1579	veh/h	1895	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.639			
Practical Spare Capacity	33.0	%		
Effective Intersection Capacity	2471	veh/h		
Control Delay (Total)	3.75	veh-h/h	4.49	pers-h/h
Control Delay (Average)	8.5	sec	8.5	sec
Control Delay (Worst Lane)	10.8	sec		
Control Delay (Worst Movement)	10.8	sec	10.8	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	8.5	sec		
Idling Time (Average)	6.5	sec		
Intersection Level of Service (LOS)	LOS A			
95% Back of Queue - Vehicles (Worst Lane)	6.5	veh		
95% Back of Queue - Distance (Worst Lane)	164.3	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.07			
Total Effective Stops	391	veh/h	469	pers/h
Effective Stop Rate	0.25		0.25	
Proportion Queued	0.40		0.40	
Performance Index	47.7		47.7	
Cost (Total)	564.68	$/h	564.68	$/h
Fuel Consumption (Total)	35.4	gal/h		
Carbon Dioxide (Total)	316.9	kg/h		
Hydrocarbons (Total)	0.028	kg/h		
Carbon Monoxide (Total)	0.392	kg/h		
NOx (Total)	0.379	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 94.5% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	757,978	veh/y	909,574	pers/y
Delay	1,798	veh-h/y	2,157	pers-h/y
Effective Stops	187,657	veh/y	225,188	pers/y
Travel Distance	413,884	veh-mi/y	496,660	pers-mi/y

LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved AM Peak
Site Category: Proposed Design 2
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps													
Lane 1[d]	98	2.0	979	0.100	100	4.6	LOS A	0.4	10.7	Full	1600	0.0	0.0
Approach	98	2.0		0.100		4.6	LOS A	0.4	10.7				
East: WV 115													
Lane 1[d]	823	2.0	1288	0.639	100	10.8	LOS B	6.5	164.3	Full	1000	0.0	0.0
Approach	823	2.0		0.639		10.8	LOS B	6.5	164.3				
North: Hillside Dr													
Lane 1[d]	13	2.0	550	0.024	100	6.8	LOS A	0.1	2.2	Full	1600	0.0	0.0
Approach	13	2.0		0.024		6.8	LOS A	0.1	2.2				
West: WV 115													
Lane 1[d]	310	2.0	1073	0.289	100	6.2	LOS A	1.4	34.3	Full	1600	0.0	0.0
Lane 2	335	2.0	1074	0.312	100	6.4	LOS A	1.5	38.0	Short	100	0.0	NA
Approach	645	2.0		0.312		6.3	LOS A	1.5	38.0				
Intersection	1579	2.0		0.639		8.5	LOS A	6.5	164.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	43	1	54	98	2.0	979	0.100	100	NA	NA
Approach	43	1	54	98	2.0		0.100			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	274	548	1	823	2.0	1288	0.639	100	NA	NA

Approach	274	548	1	823	2.0		0.639			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	5	7	13	2.0	550	0.024	100	NA	NA
Approach	1	5	7	13	2.0		0.024			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	3	307	-	310	2.0	1073	0.289	100	NA	NA
Lane 2	-	-	335	335	2.0	1074	0.312	100	0.0	1
Approach	3	307	335	645	2.0		0.312			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1579	2.0		0.639						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 NB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Hillside Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

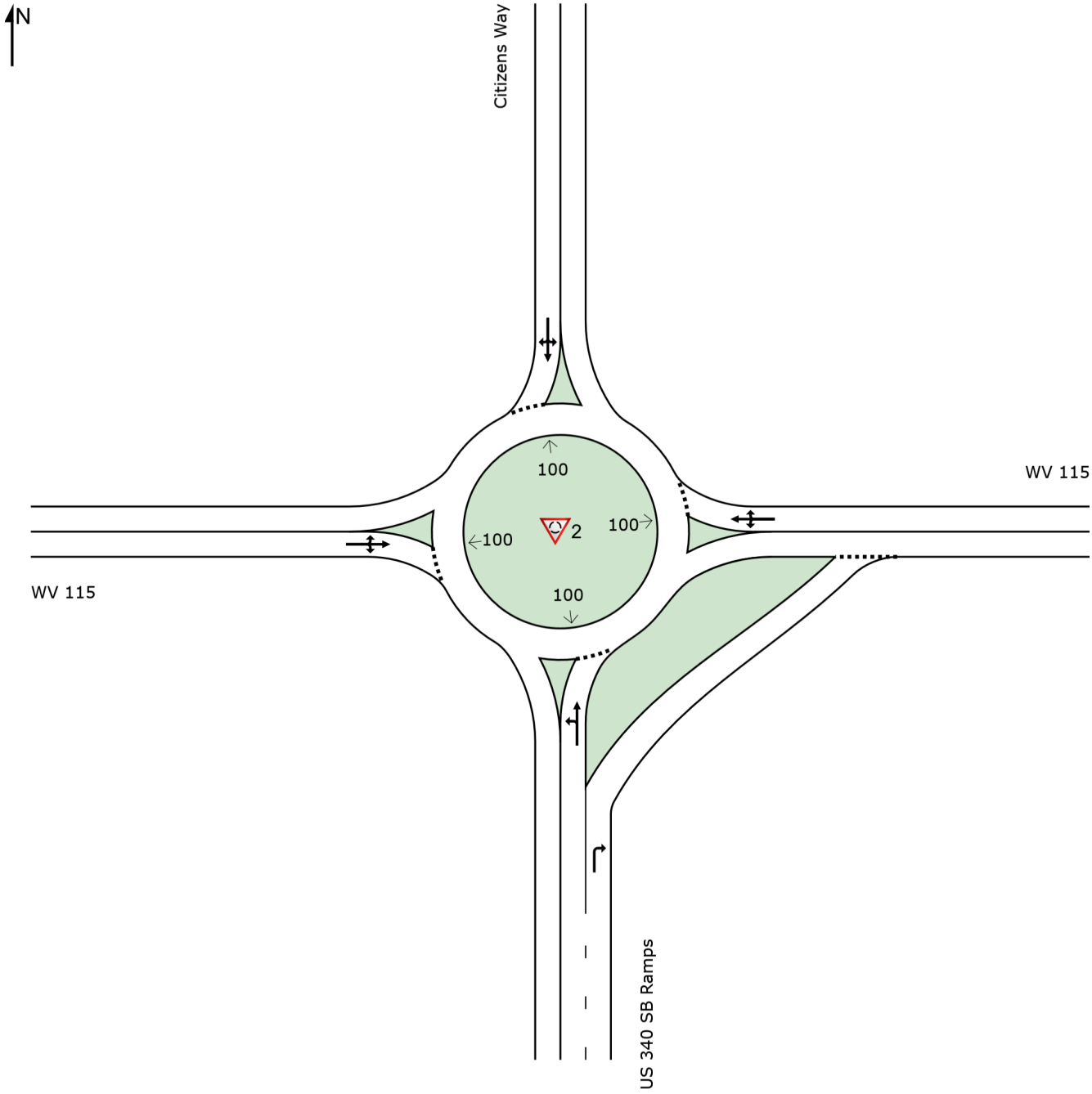
APPENDIX E-8: 2030 BUILD IMPROVED PM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved PM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved PM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	30.6	mph	30.6	mph
Travel Distance (Total)	1086.5	veh-mi/h	1303.8	pers-mi/h
Travel Time (Total)	35.5	veh-h/h	42.6	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.77			
Travel Time Index	7.39			
Congestion Coefficient	1.31			
Demand Flows (Total)	1988	veh/h	2385	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.612			
Practical Spare Capacity	39.0	%		
Effective Intersection Capacity	3249	veh/h		
Control Delay (Total)	5.87	veh-h/h	7.04	pers-h/h
Control Delay (Average)	10.6	sec	10.6	sec
Control Delay (Worst Lane)	12.0	sec		
Control Delay (Worst Movement)	12.0	sec	12.0	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	10.6	sec		
Idling Time (Average)	5.9	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	6.6	veh		
95% Back of Queue - Distance (Worst Lane)	168.9	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.05			
Total Effective Stops	1379	veh/h	1654	pers/h
Effective Stop Rate	0.69		0.69	
Proportion Queued	0.67		0.67	
Performance Index	76.1		76.1	
Cost (Total)	739.44	$/h	739.44	$/h
Fuel Consumption (Total)	46.8	gal/h		
Carbon Dioxide (Total)	417.9	kg/h		
Hydrocarbons (Total)	0.038	kg/h		
Carbon Monoxide (Total)	0.512	kg/h		
NOx (Total)	0.504	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 92.4% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	954,122	veh/y	1,144,947	pers/y
Delay	2,816	veh-h/y	3,379	pers-h/y
Effective Stops	661,748	veh/y	794,098	pers/y
Travel Distance	521,532	veh-mi/y	625,839	pers-mi/y

LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved PM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps													
Lane 1[d]	261	2.0	757	0.345	100	9.0	LOS A	1.5	39.4	Full	1600	0.0	0.0
Lane 2	363	2.0	811	0.448	100	10.2	LOS B	2.6	66.5	Full	1600	0.0	0.0
Approach	624	2.0		0.448		9.7	LOS A	2.6	66.5				
East: WV 115													
Lane 1[d]	528	2.0	954	0.553	100	11.1	LOS B	4.8	122.7	Full	1000	0.0	0.0
Approach	528	2.0		0.553		11.1	LOS B	4.8	122.7				
North: Citizens Way													
Lane 1[d]	216	2.0	758	0.285	100	8.1	LOS A	1.3	32.4	Full	1600	0.0	0.0
Approach	216	2.0		0.285		8.1	LOS A	1.3	32.4				
West: WV 115													
Lane 1[d]	619	2.0	1013	0.612	100	12.0	LOS B	6.6	168.9	Full	1600	0.0	0.0
Approach	619	2.0		0.612		12.0	LOS B	6.6	168.9				
Intersection	1988	2.0		0.612		10.6	LOS B	6.6	168.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	78	184	-	261	2.0	757	0.345	100	NA	NA
Lane 2	-	-	363	363	2.0	811	0.448	100	NA	NA
Approach	78	184	363	624	2.0		0.448			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.

Lane 1	124	355	48	528	2.0	954	0.553	100	NA	NA
Approach	124	355	48	528	2.0		0.553			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	28	62	216	2.0	758	0.285	100	NA	NA
Approach	127	28	62	216	2.0		0.285			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	74	455	90	619	2.0	1013	0.612	100	NA	NA
Approach	74	455	90	619	2.0		0.612			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1988	2.0	0.612							

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

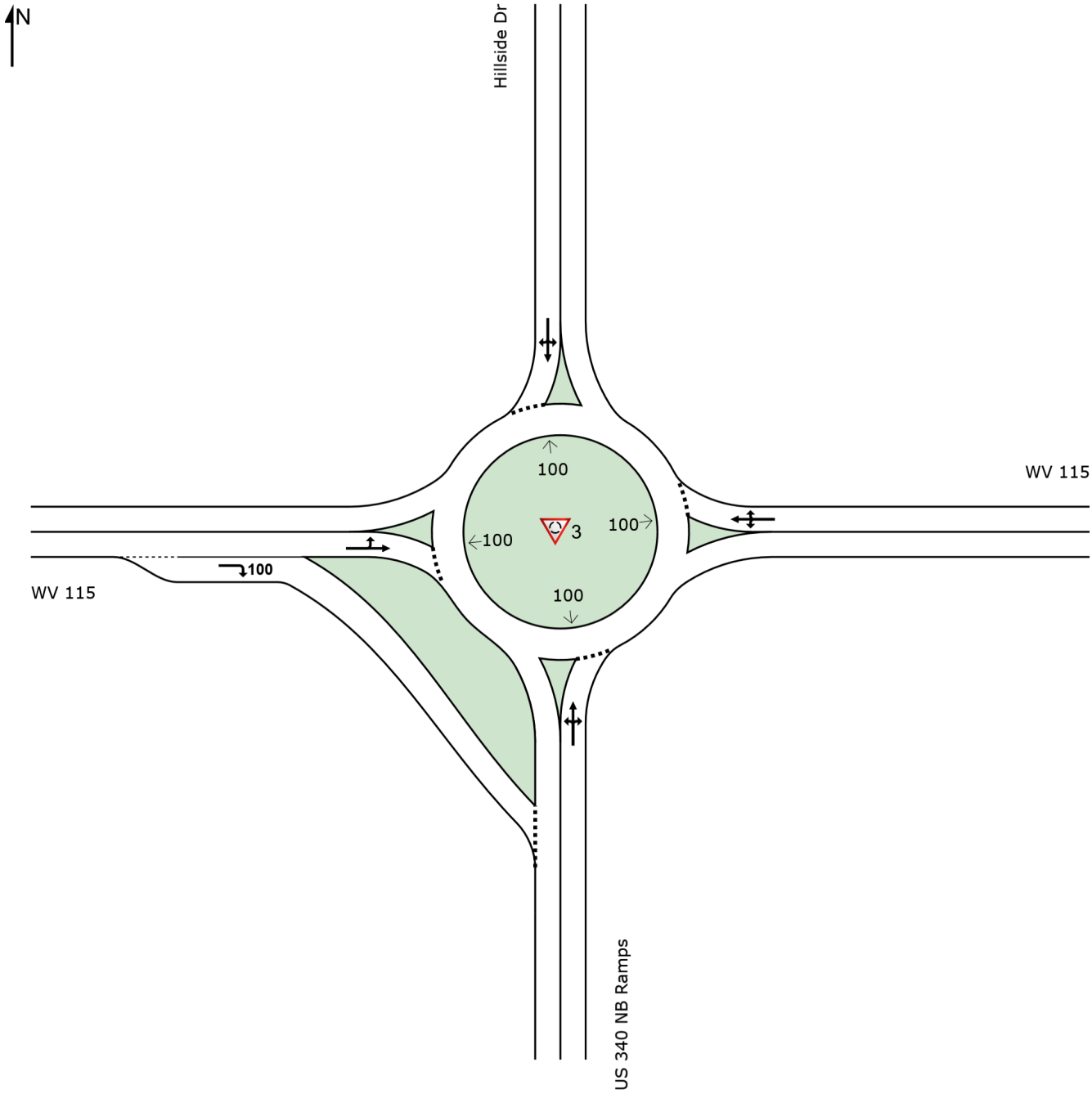
	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 SB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Citizens Way Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved PM Peak
Site Category: Proposed Design 2
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved PM Peak
Site Category: Proposed Design 2
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles**		**Persons**	
Travel Speed (Average)	30.2	mph	30.2	mph
Travel Distance (Total)	1073.2	veh-mi/h	1287.8	pers-mi/h
Travel Time (Total)	35.5	veh-h/h	42.6	pers-h/h
Desired Speed (Program)	40.0	mph		
Speed Efficiency	0.75			
Travel Time Index	7.28			
Congestion Coefficient	1.32			
Demand Flows (Total)	1990	veh/h	2388	pers/h
Percent Heavy Vehicles (Demand)	2.0	%		
Degree of Saturation	0.705			
Practical Spare Capacity	20.6	%		
Effective Intersection Capacity	2823	veh/h		
Control Delay (Total)	6.38	veh-h/h	7.65	pers-h/h
Control Delay (Average)	11.5	sec	11.5	sec
Control Delay (Worst Lane)	14.3	sec		
Control Delay (Worst Movement)	14.3	sec	14.3	sec
Geometric Delay (Average)	0.0	sec		
Stop-Line Delay (Average)	11.5	sec		
Idling Time (Average)	6.6	sec		
Intersection Level of Service (LOS)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	11.2	veh		
95% Back of Queue - Distance (Worst Lane)	283.3	ft		
Ave. Queue Storage Ratio (Worst Lane)	0.07			
Total Effective Stops	1156	veh/h	1387	pers/h
Effective Stop Rate	0.58		0.58	
Proportion Queued	0.62		0.62	
Performance Index	76.1		76.1	
Cost (Total)	737.37	$/h	737.37	$/h
Fuel Consumption (Total)	46.2	gal/h		
Carbon Dioxide (Total)	413.3	kg/h		
Hydrocarbons (Total)	0.038	kg/h		
Carbon Monoxide (Total)	0.504	kg/h		
NOx (Total)	0.501	kg/h		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Site Model Variability Index (Iterations 3 to N): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 94.2% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles**		**Persons**	
Demand Flows (Total)	955,304	veh/y	1,146,365	pers/y
Delay	3,061	veh-h/y	3,673	pers-h/y
Effective Stops	554,680	veh/y	665,616	pers/y
Travel Distance	515,117	veh-mi/y	618,141	pers-mi/y

LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2030 Build Improved Conditions)]

2030 Build Improved PM Peak
Site Category: Proposed Design 2
Roundabout

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% BACK OF QUEUE [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps													
Lane 1[d]	271	2.0	607	0.446	100	12.9	LOS B	2.5	62.5	Full	1600	0.0	0.0
Approach	271	2.0		0.446		12.9	LOS B	2.5	62.5				
East: WV 115													
Lane 1[d]	702	2.0	1192	0.589	100	10.2	LOS B	4.8	123.1	Full	1000	0.0	0.0
Approach	702	2.0		0.589		10.2	LOS B	4.8	123.1				
North: Hillside Dr													
Lane 1[d]	10	2.0	580	0.017	100	6.4	LOS A	0.1	1.6	Full	1600	0.0	0.0
Approach	10	2.0		0.017		6.4	LOS A	0.1	1.6				
West: WV 115													
Lane 1[d]	770	2.0	1092	0.705	100	14.3	LOS B	11.2	283.3	Full	1600	0.0	0.0
Lane 2	238	2.0	1093	0.218	100	5.3	LOS A	1.0	24.4	Short	100	0.0	NA
Approach	1008	2.0		0.705		12.2	LOS B	11.2	283.3				
Intersection	1990	2.0		0.705		11.5	LOS B	11.2	283.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Geometric Delay is not included).
Queue Model: HCM Queue Formula.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	113	1	157	271	2.0	607	0.446	100	NA	NA
Approach	113	1	157	271	2.0		0.446			

East: WV 115

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	255	446	1	702	2.0	1192	0.589	100	NA	NA

Approach	255	446	1	702	2.0		0.589			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	5	3	10	2.0	580	0.017	100	NA	NA
Approach	1	5	3	10	2.0		0.017			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	8	762	-	770	2.0	1092	0.705	100	NA	NA
Lane 2	-	-	238	238	2.0	1093	0.218	100	0.0	1
Approach	8	762	238	1008	2.0		0.705			
	Total	%HV	Deg.Satn (v/c)							
Intersection	1990	2.0		0.705						

Lane flow rates given in this report are based on the arrival flow rates subject to upstream capacity constraint where applicable.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
South Exit: US 340 NB Ramps Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
East Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
North Exit: Hillside Dr Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										
West Exit: WV 115 Merge Type: **Not Applied**												
Full Length Lane	1	Merge Analysis not applied.										

APPENDIX F: APPROVED ADJACENT DEVELOPMENTS

APPENDIX F-1: TATE MANOR TIS

Tate Manor Traffic Impact Study
Jefferson County, WV

AMT Project File 19-0073.001 | December 19, 2019 **REVISED**

PREPARED FOR:

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EXECUTIVE SUMMARY

This report summarizes the existing and future traffic analyses conducted in support of the proposed Tate Manor residential development. The proposed residential development will be located along the east side of Jefferson Avenue (CR 34) and north of Crescent Drive/High Street in Charles Town, Jefferson County. Site access is proposed to Jefferson Avenue, Belvedere Farm Lane, and an extension of Belvedere Drive from Crescent Drive. The proposed site includes 80 townhomes and is expected to be completed by 2024.

The site is proposed to be served by three site driveways – one full-movement connection to Jefferson Avenue, one full-movement connection to Belvedere Farm Lane, and one full-movement connection via extension of Belvedere Drive via Crescent Drive. The proposed site driveways are assumed to operate under stop-control.

The traffic analysis will consider future conditions at the anticipated build-out year of 2024. This report summarizes the analyses of 2019 Existing conditions, 2024 No-Build conditions (without the proposed development in place), and 2024 Build conditions (with the proposed development in place) during the weekday AM and PM peak hours. Traffic generated by the pending Magnolia Springs development is included in the No Build and Build Conditions analysis. The annual growth rate was provided by WVDOH at a compounded rate of 1.31% per year.

AMT (A. Morton Thomas and Associates, Inc.) was retained to determine the potential traffic impacts of the proposed residential development in accordance with the guidelines set forth by the WVDOH (Division of Highways) in Traffic Engineering Directive (TED) 106-2. The intention of the study is to fully examine the impacts of the traffic generated by the residential development on the existing transportation system and identify potential mitigation measures. This report presents trip generation, trip distribution, intersection capacity analysis, queuing analysis, auxiliary lane analysis, signal warrant analysis, and recommendations for transportation improvements required to meet anticipated traffic demands.

Based upon a review of the site plan and adjacent transportation network, the following seven (7) existing and one (1) proposed site driveway intersections are included within the scope of the Traffic Impact Study (TIS) for the proposed Tate Manor residential development:

1) Jefferson Avenue (CR 34) with Euclid Avenue *(Two-way Stop-Control Three-legged intersection)*
2) Euclid Avenue with Belvedere Farm Lane *(Two-way Stop-Control Three-legged intersection)*
3) Jefferson Avenue (CR 34) with High Street *(Two-way Stop-Control Three-legged intersection)*
4) Crescent Drive with Belvedere Drive *(Two-way Stop-Control Three-legged intersection)*
5) WV 115 with Jefferson Avenue (CR 34) *(Two-way Stop-Control Three-legged intersection)*
6) WV 115 with Citizens Way/US 340 *(Single-lane Roundabout Four-legged intersection)*
7) WV 115 with Hillside Drive/US 340 *(Two-way Stop-Control Four-legged intersection)*
8) Jefferson Avenue (CR 34) with Site Driveway #1 *(Proposed Two-way Stop-Control Three-legged intersection)*

The existing Two-way Stop-Control Three-legged intersection of Belvedere Drive with Crescent Drive will be the location of one of the three proposed site driveways. This site driveway will be located in line with Belvedere Drive on the north side of Crescent Drive and will create a fourth leg to the intersection. The

site driveway will be an extension of Belvedere Drive and will operate under stop control. Additional site access will be provided via direct access to Jefferson Avenue and extension of Belvedere Farm Lane, which connects to Euclid Avenue.

Hale Road currently dead ends prior to connection with Crescent Drive just west of Belvedere Drive, and there are no plans to connect these two streets. No traffic from Tate Manor will enter Jefferson Avenue via Hale Road and High Street, which avoids conflict with traffic from Charles Town Middle School.

Site Trip Generation and Distribution

The proposed Tate Manor residential development will include 80 townhomes. The trip generation "Peak Hour of Generator" rates from the ITE Trip Generation Manual, 10th Edition, were utilized for Multifamily Housing (LUC 220). The trip generation analysis indicates that a total of 564 new daily trips will be generated, which includes 39 new AM peak hour trips, and 48 new PM peak hour trips.

The AM and PM peak hour site generated trips to/from the proposed site were distributed based upon interpolation from current traffic patterns. The distribution of the new external trips are as follows:

- 35% to/from the north on US 340
- 10% to/from the south on US 340
- 5% to/from the west on WV 115
- 35% to/from the north on Jefferson Avenue (CR 34)
- 15% to/from the north on Euclid Avenue

2019 Existing Conditions Analysis

The capacity analysis indicates the westbound approach of Euclid Avenue to Jefferson Avenue (CR 34) currently operates at Level of Service (LOS) B during both the AM and PM peak hours with stop control. The southbound approach of Jefferson Avenue currently operates at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue operates as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Farm Lane approach to Euclid Avenue currently operates at LOS A during both the AM and PM peak hour with stop control. The westbound Euclid Avenue approach to Belvedere Farm Lane currently operates at LOS A during both the AM and PM peak hours. The eastbound approach of Euclid Avenue operates as free-flow traveling unimpeded through the intersection.

Analysis indicates that the westbound approach of High Street to Jefferson Avenue currently operates at LOS C during the AM peak hour and LOS B during the PM peak hour with stop control. The southbound approach of Jefferson Avenue currently operates at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue operates as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Drive approach to Crescent Drive currently operates at LOS A during both the AM and PM peak hours with stop control. The westbound Crescent Drive approach to Belvedere Drive currently operates at LOS A during both the AM and PM peak hours. The eastbound approach of Crescent Drive operates as free-flow traveling unimpeded through the

intersection. Hale Road currently dead ends prior to connection with Crescent Drive just west of Belvedere Drive, and there are no plans to connect these two streets.

Additional analysis indicates that the southbound Jefferson Avenue approach to WV 115 currently operates at LOS C during the AM peak hour and LOS E during the PM peak hour with stop control. The eastbound WV 115 approach to Jefferson Avenue currently operates at LOS A during both the AM and PM peak hours. The westbound approach of WV 115 operates as free-flow traveling unimpeded through the intersection.

The intersection of WV 115 with Citizens Way and the US 340 Southbound Ramps was recently modified to a four-legged roundabout. Analysis indicates that the eastbound WV 115 approach to Citizens Way currently operates at LOS A during both the AM and PM peak hours. The westbound WV 115 approach to Citizens Way currently operates at LOS A during both the AM and PM peak hours. The northbound US 340 ramps approach to WV 115 currently operates at LOS A during the AM peak hour and LOS B during the PM peak hour. The southbound Citizens Way approach to WV 115 currently operates at LOS A during both the AM and PM peak hours.

Further analysis indicates that the left turn movement on the eastbound WV 115 approach to Hillside Drive and the US 340 Northbound ramps currently operates at LOS A during both the AM and PM peak hours. The eastbound through movement travels uninhibited through the intersection. The left turn movement on the westbound WV 115 approach to Hillside Drive and the US 340 Northbound ramps currently operates at LOS A during both the AM and PM peak hours. The westbound through movement travels uninhibited through the intersection. The US 340 Northbound Ramps approach currently operates at LOS D during the AM peak hour and LOS F during the PM peak hour. The southbound Hillside Drive approach currently operates at LOS C during the AM peak hour and LOS D during the PM peak hour.

2024 No-Build Conditions Analysis

The 2024 No Build Conditions include the existing 2019 traffic volume, anticipated annual traffic growth to 2024, and the traffic anticipated to be generated by the Magnolia Springs development.

The capacity analysis indicates the westbound approach of Euclid Avenue to Jefferson Avenue (CR 34) will continue to operate at LOS B during both the AM and PM peak hours with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Farm Lane approach to Euclid Avenue will continue to operate at LOS A during both the AM and PM peak hour with stop control. The westbound Euclid Avenue approach to Belvedere Farm Lane will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Euclid Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Analysis indicates that the westbound approach of High Street to Jefferson Avenue is expected to operate at LOS D during the AM peak hour and LOS B during the PM peak hour with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Drive approach to Crescent Drive will continue to operate at LOS A during both the AM and PM peak hours with stop control. The westbound Crescent Drive approach to Belvedere Drive will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Crescent Drive will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the southbound Jefferson Avenue approach to WV 115 is expected to operate at LOS C during the AM peak hour and LOS F during the PM peak hour with stop control in the No Build Condition. The eastbound WV 115 approach to Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The westbound approach of WV 115 will continue to operate as free-flow traveling unimpeded through the intersection. The intersection can be improved to LOS A during the AM and PM peak hours considering No Build conditions if a traffic signal is installed prior to 2024.

The intersection of WV 115 with Citizens Way and the US 340 Southbound Ramps was recently modified to a four-legged single lane roundabout. Analysis indicates that the eastbound WV 115 approach to Citizens Way is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Citizens Way is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during the AM peak hour and LOS D during the PM peak hour. The southbound Citizens Way approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours. The LOS of the US 340 southbound ramp approach can be improved to LOS B in the PM peak hour considering Build conditions if a right turn slip is constructed.

The intersection of WV 115 with Hillside Drive and the US 340 Northbound Ramps is anticipated to be modified to a four-legged single lane roundabout to mirror the newly constructed roundabout at WV 115 with Citizens Drive by 2024. For this traffic study, it was assumed the roundabout would be constructed by 2024 and thus included in the No-Build and Build Conditions. Analysis indicates that the eastbound WV 115 approach to Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Hillside Drive is expected to operate at LOS A during both the AM and PM peak hours. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The southbound Hillside Drive approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours.

2024 Build Conditions Analysis

The 2024 Build Conditions include the existing 2019 traffic volume, anticipated annual traffic growth to 2024, traffic anticipated to be generated by the Magnolia Springs development, and the traffic generated by the Tate Manor development.

The capacity analysis indicates the westbound approach of Euclid Avenue to Jefferson Avenue will continue to operate at LOS B during both the AM and PM peak hours with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Farm Lane approach to Euclid Avenue will continue to operate at LOS A during both the AM and PM peak hour with stop control. The westbound

Euclid Avenue approach to Belvedere Farm Lane will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Euclid Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Analysis indicates that the westbound approach of High Street to Jefferson Avenue will continue to operate at LOS D during the AM peak hour and LOS B during the PM peak hour with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection. Hale Road currently dead ends prior to connection with Crescent Drive just west of Belvedere Drive, and there are no plans to connect these two streets. No traffic from Tate Manor will enter Jefferson Avenue via Hale Road and High Street, which avoids conflict with traffic from Charles Town Middle School.

Additional analysis indicates that the northbound Belvedere Drive approach to Crescent Drive will continue to operate at LOS A during both the AM and PM peak hours with stop control. The proposed southbound Belvedere Drive approach to Crescent Drive is expected to operate at LOS A during both the AM and PM peak hours with stop control. The westbound Crescent Drive approach to Belvedere Drive will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Crescent Drive will continue to operate as free-flow traveling unimpeded through the intersection. Crescent Drive dead ends immediately west of Belvedere Drive.

Additional analysis indicates that the southbound Jefferson Avenue approach to WV 115 is expected to operate at LOS D during the AM peak hour and LOS F during the PM peak hour with stop control. The eastbound WV 115 approach to Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The westbound approach of WV 115 will continue to operate as free-flow traveling unimpeded through the intersection. The intersection can be improved to LOS A during the AM and PM peak hours considering Build conditions if a traffic signal is installed prior to 2024.

The intersection of WV 115 with Citizens Way and the US 340 Southbound Ramps was recently modified to a four-legged single lane roundabout. Analysis indicates that the eastbound WV 115 approach to Citizens Way will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Citizens Way will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The northbound US 340 ramps approach to WV 115 will continue to operate at LOS A during the AM peak hour and LOS D during the PM peak hour. The southbound Citizens Way approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours. The LOS of the US 340 southbound ramp approach can be improved to LOS B in the PM peak hour considering No Build conditions if a right turn slip lane is constructed.

The intersection of WV 115 with Hillside Drive and the US 340 Northbound Ramps is anticipated to be modified to a four-legged single lane roundabout to mirror the newly constructed roundabout at WV 115 with Citizens Drive. For this traffic study, it was assumed the roundabout would be constructed by 2024 and thus included in the No-Build and Build Conditions. Analysis indicates that the eastbound WV 115 approach to Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Hillside Drive is expected to operate at LOS A during both the AM and PM peak hours. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The southbound Hillside Drive approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours.

Further analysis indicates that the westbound Site Drive #1 approach is expected to operate at LOS B during both the AM and PM peak hours with stop control. The southbound Jefferson Avenue approach is expected to operate at LOS A during both the AM and PM peak hours. The northbound Jefferson Avenue approach is expected to operate as free-flow traveling unimpeded through the intersection.

2024 Build Conditions Analysis

The 2024 Build Conditions include the existing 2019 traffic volume, anticipated annual traffic growth to 2024, traffic anticipated to be generated by the Magnolia Springs development, and the traffic generated by the Tate Manor development.

The 2024 Build Improved Conditions also includes a number of proposed roadway improvements that are to mitigate capacity issues along the existing transportation network. These are proposed to mitigate existing issues and not as a result of the proposed Tate Manor residential development. These improvements include, installing a traffic signal at the WV 115 with Jefferson Avenue intersection, constructing an exclusive left-turn lane on the eastbound WV 115 approach to Jefferson Avenue, and constructing an exclusive right-turn slip lane on the US 340 southbound exit ramp approach to WV 115.

The capacity analysis indicates the westbound approach of Euclid Avenue to Jefferson Avenue will continue to operate at LOS B during both the AM and PM peak hours with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Farm Lane approach to Euclid Avenue will continue to operate at LOS A during both the AM and PM peak hour with stop control. The westbound Euclid Avenue approach to Belvedere Farm Lane will continue to operate at LOS A during both the AM and PM peak hours with stop control. The eastbound approach of Euclid Avenue will continue to operate at LOS A during both the AM and PM peak hours with stop control. This intersection is proposed to be modified to an All-Way Stop-Control intersection with the completion of the proposed Magnolia Springs development.

Analysis indicates that the westbound approach of High Street to Jefferson Avenue will continue to operate at LOS D during the AM peak hour and LOS B during the PM peak hour with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection. Hale Road currently dead ends prior to connection with Crescent Drive just west of Belvedere Drive, and there are no plans to connect these two streets. No traffic from Tate Manor will enter Jefferson Avenue via Hale Road and High Street, which avoids conflict with traffic from Charles Town Middle School.

Additional analysis indicates that the northbound Belvedere Drive approach to Crescent Drive will continue to operate at LOS A during both the AM and PM peak hours with stop control. The proposed southbound Belvedere Drive approach to Crescent Drive is expected to operate at LOS A during both the AM and PM peak hours with stop control. The westbound Crescent Drive approach to Belvedere Drive will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Crescent Drive will continue to operate as free-flow traveling unimpeded through the intersection. Crescent Drive dead ends immediately west of Belvedere Drive.

The intersection is proposed to be modified to a signalized intersection with the addition of an exclusive left-turn lane on the eastbound WV 115 approach. Analysis indicates that the southbound Jefferson Avenue approach to WV 115 is expected to operate at LOS B during both the AM and PM peak hours with traffic-signal control. The eastbound WV 115 approach to Jefferson Avenue is expected to operate at LOS A during both the AM and PM peak hours with traffic-signal control. The westbound approach of WV 115 is expected to operate at LOS A during both the AM and PM peak hours with traffic-signal control. The overall intersection is expected to operate at LOS A during both the AM and PM peak hours.

The intersection of WV 115 with Citizens Way and the US 340 Southbound Ramps was recently modified to a four-legged single lane roundabout. Analysis indicates that the eastbound WV 115 approach to Citizens Way will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Citizens Way will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours with the addition of a right-turn slip lane. The southbound Citizens Way approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours.

The intersection of WV 115 with Hillside Drive and the US 340 Northbound Ramps is anticipated to be modified to a four-legged single lane roundabout to mirror the newly constructed roundabout at WV 115 with Citizens Drive. For this traffic study, it was assumed the roundabout would be constructed by 2024 and thus included in the No-Build and Build Conditions. Analysis indicates that the eastbound WV 115 approach to Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Hillside Drive is expected to operate at LOS A during both the AM and PM peak hours. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The southbound Hillside Drive approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours.

Further analysis indicates that the westbound Site Drive #1 approach is expected to operate at LOS B during both the AM and PM peak hours with stop control. The southbound Jefferson Avenue approach is expected to operate at LOS A during both the AM and PM peak hours. The northbound Jefferson Avenue approach is expected to operate as free-flow traveling unimpeded through the intersection.

Conclusions/Recommendations

The proposed Tate Manor residential development will be located along the east side of Jefferson Avenue and north of Crescent Drive/High Street in Charles Town, Jefferson County, West Virginia. Site access is proposed to Jefferson Avenue, Belvedere Farm Lane, and an extension of Belvedere Drive from Crescent Drive. The proposed site includes 80 townhomes. The residential development is expected to be completed by 2024.

The site is proposed to be served by three site driveways – one full-movement connection to Jefferson Avenue, one full-movement connection to Belvedere Farm Lane, and one full-movement connection via extension of Belvedere Drive via Crescent Drive. The proposed site driveways are assumed to operate under stop-control.

The results of the capacity analyses and the queueing analyses indicate that the trips generated by the proposed site can be accommodated within the existing transportation network.

Based on the findings of this study, the following infrastructure improvements are recommended from evaluation of the Tate Manor Residential Traffic Impact Study maintain adequate operation of the existing transportation network:

Jefferson Avenue with Proposed Site Driveway #1

- Construct Site Driveway #1 as a full movement approach located approximately 250 feet north of the Jefferson Avenue and High Street intersection. The driveway should be constructed to provide one ingress lane and two egress lanes. The proposed driveway will operate under stop-control while Jefferson Avenue operates as free-flow.

Crescent Drive with Belvedere Drive (Proposed Site Driveway #2)

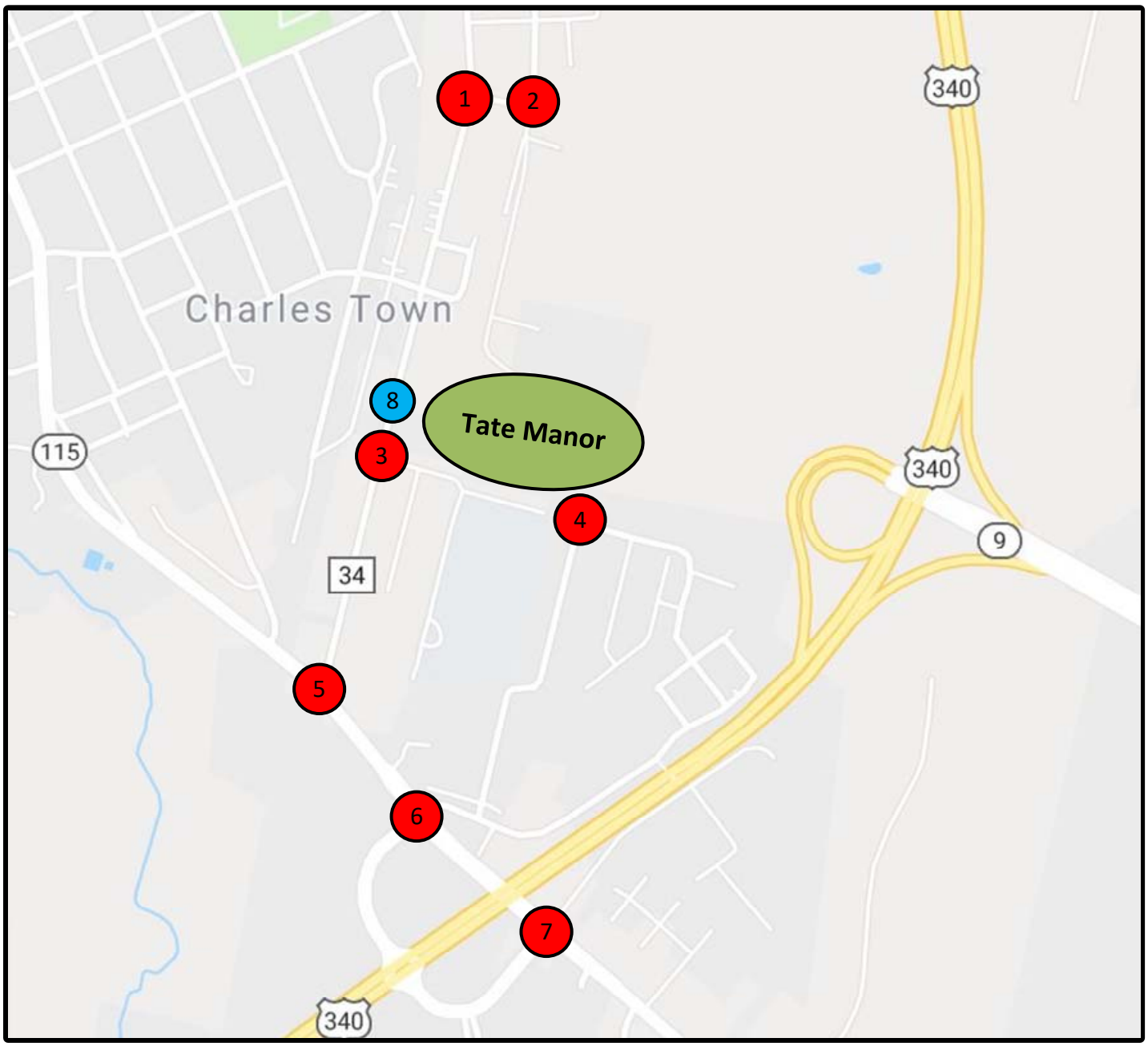
- Construct Site Driveway #2 as a full movement approach as an extension of Belvedere Drive, which will intersect with Crescent Drive opposite existing Belvedere Drive creating a plus type intersection. The driveway should be constructed to provide one ingress lane and one egress lanes. The proposed driveway will operate under stop-control while Crescent Drive operates as free-flow.

WV 115 with Jefferson Avenue

- It is recommended that the WVDOH further evaluate the need for a traffic signal at the intersection of WV 115 with Jefferson Avenue. Evaluation of existing peak hour conditions indicate that the MUTCD Peak Hour Warrant is met for the intersection. In addition, the No Build analysis indicates that LOS will deteriorate to LOS F during the PM peak hour by 2024 with Two Way Stop Control.

WV 115 with Citizens Way and the US 340 Southbound Ramps

- Ideally, consideration should be given to add a right turn slip lane on the US 340 southbound ramp approach to WV 115. The No Build analysis indicates that LOS will deteriorate to LOS D for the ramp approach during the PM peak hour by 2024 with the current configuration. Creating the right turn slip lane improves the ramp approach to LOS B.



LEGEND

= Proposed Site

= Existing Intersection

= Proposed Intersection

N

NOT TO SCALE

Tate Manor
Residential Development TIS

Site Location Map

DATE: December 2019

FIGURE 1

Intersection #8 – Jefferson Ave & Site Drive #1 (Full Access)

Internal Connection to Belvedere Farm Ln Extension

Internal Future Connection

Internal Connection to Belvedere Dr Extension

Intersection #4 – Crescent Drive & Belvedere Drive (Full Access)

Tate Manor Residential Development TIS

Site Plan

DATE: December 2019

FIGURE 2

NOT TO SCALE

TRIP GENERATION

The proposed residential development will be located along the east side of Jefferson Avenue and north of Crescent Drive/High Street in Charles Town, Jefferson County. Site access is proposed to Jefferson Avenue, Belvedere Farm Lane, and an extension of Belvedere Drive from Crescent Drive. The proposed site includes 80 townhomes and is expected to be completed by 2024. The trip generation "Peak Hour of Generator" rates from the ITE Trip Generation Manual, 10th Edition, were utilized for Multifamily Housing (LUC 220).

As shown in **Table 2** below, the proposed residential development will generate a total of 564 new daily trips, including 39 new AM peak hour, and 48 new PM peak hour trips.

Table 2: Trip Generation Summary

Description	LUC	Density		Daily Trips	AM Peak			PM Peak		
					Enter	Exit	Total	Enter	Exit	Total
Multifamily Housing	220	80	Units	564	9	30	39	30	18	48
Total				**564**	**9**	**30**	**39**	**30**	**18**	**48**

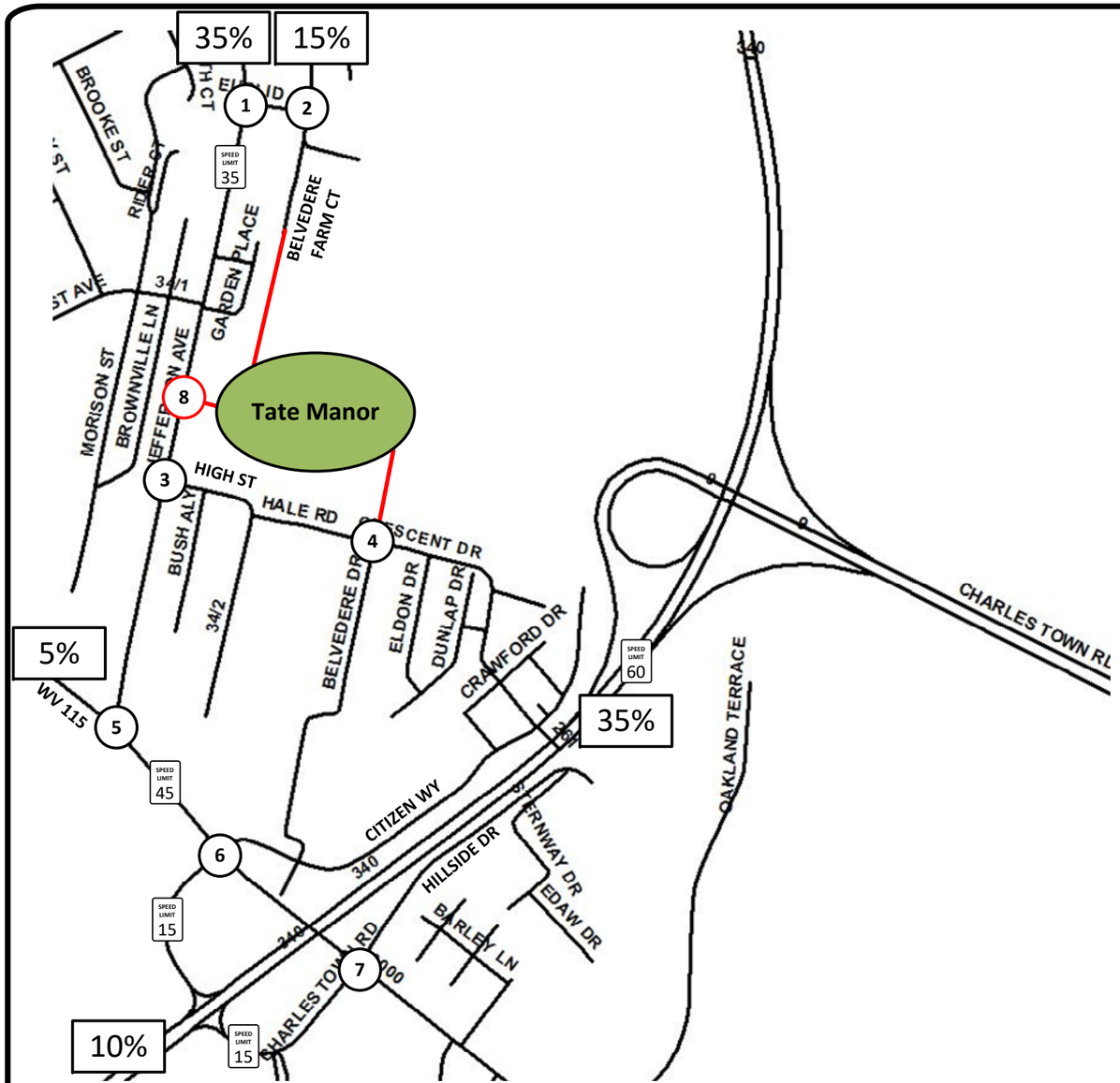
TRIP DISTRIBUTION

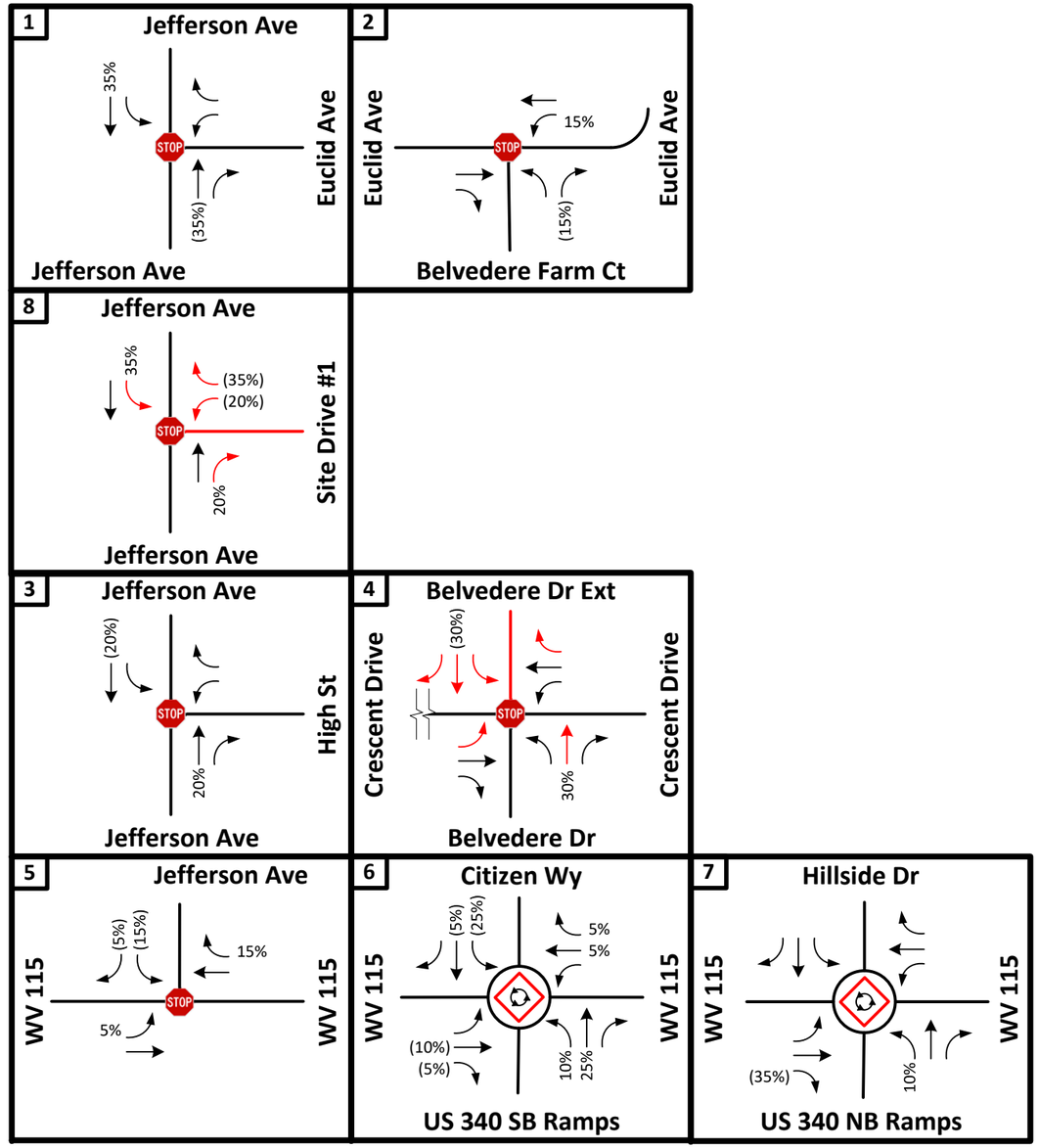
The new AM and PM peak hour site generated trips to/from the proposed site were distributed based upon interpolation from current traffic patterns. The distribution of the new external trips are as follows:

- 35% to/from the north on US 340
- 10% to/from the south on US 340
- 5% to/from the west on WV 115
- 35% to/from the north on Jefferson Avenue
- 15% to/from the north on Euclid Avenue

Traffic generated by the impending Magnolia Springs development located north of the Tate Manor residential development is included as a pending development accounted for in No Build and Build conditions. Magnolia Springs is proposed to have site driveways which intersect with Euclid Avenue and with Citizens Way. An approved Traffic Impact Study by Kittelson & Associates was obtained for this project and future traffic volumes were accounted for in the No Build and Build volume calculations, as directed by the WVDOH.

The external trip distribution percentages are shown in **Figure 4**, and the AM and PM peak hour new site trip assignments are shown on **Figure 5**.





LEGEND

- Existing Traffic Control
- Roundabout
- Existing Roadway
- Proposed Roadway
- XX% Entering Trip Percentage
- (XX%) Exiting Trip Percentage

N

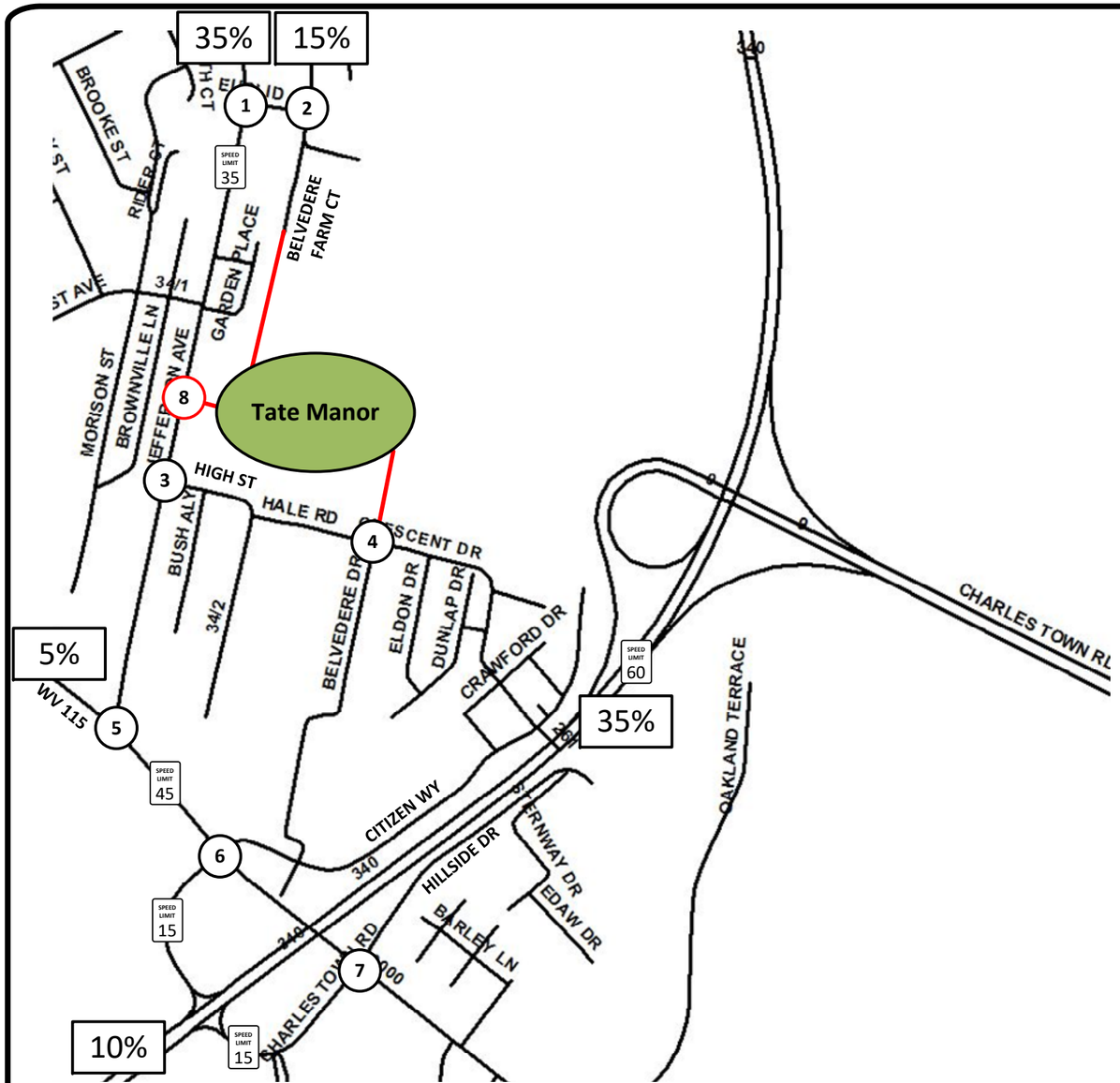
NOT TO SCALE

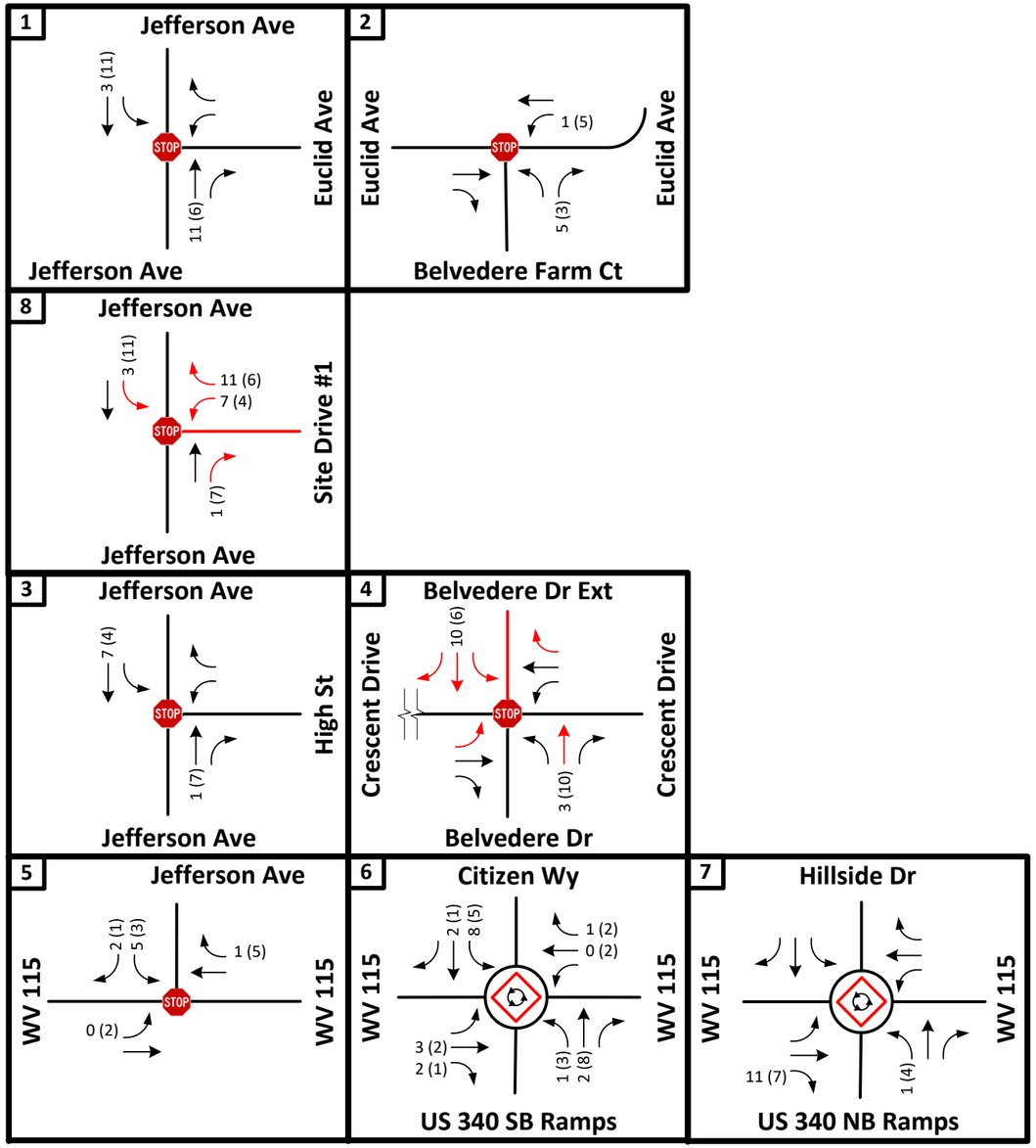
Tate Manor Residential Development TIS

Site Trip Distribution

DATE: December 2019

FIGURE 4





LEGEND

- Existing Traffic Control
- Roundabout
- Existing Roadway
- Proposed Roadway
- XX AM Peak Hour Volume
- (XX) PM Peak Hour Volume

N

NOT TO SCALE

Tate Manor
Residential Development TIS

Site Trip Assignment

DATE: December 2019

FIGURE 5

APPENDIX F-2: MAGNOLIA SPRINGS TIS

Transportation Impact Study

Magnolia Springs

Jefferson County, West Virginia

June 2018
(Revised September 2018)

Transportation Impact Study

Magnolia Springs

Jefferson County, West Virginia

Prepared For:
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Prepared By:
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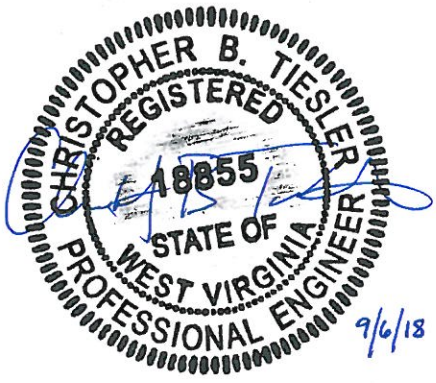
11480 Commerce Park Drive, Suite 450
Reston, Virginia 20191
(703) 885-8970

Project Manager: Amelia Martin
Project Principal: Chris Tiesler, P.E.

Project No. 22481

September 2018



Section 1
Executive Summary

EXECUTIVE SUMMARY

Chandlers Glen, LLC proposes to develop the Magnolia Springs development, located west of US-340 near Charles Town in Jefferson County, West Virginia.

A traffic operations analysis has been conducted to confirm that the transportation system can adequately support the proposed Magnolia Springs, in fulfillment of West Virginia Division of Highways (WVDOH) requirements. The scope of the project analysis was developed through collaboration with WVDOH staff in accordance with WVDOH's Traffic Engineering Directive (TED) 106-2.

Specifically, this analysis includes:

- Year 2018 existing land use and transportation system conditions within the site vicinity;
- Planned development improvements in the study area;
- Forecast year 2022 background traffic conditions during the Friday a.m. and Friday p.m. peak periods, including regional growth;
- Trip generation and distribution estimates for the proposed development;
- Forecast year 2022 total traffic conditions with full build-out of the site during the Friday a.m. and Friday p.m. peak periods;
- Conclusions and recommendations.

TRANSPORTATION IMPACT ANALYSIS FINDINGS

The results of the traffic impact analysis indicate that the proposed development can be constructed while not impacting operations on the surrounding transportation system assuming provision of mitigations specified in this report. The findings of this analysis and our recommendations are discussed below.

Existing Conditions

- The study intersections operate at acceptable levels of service during the Friday a.m. and Friday p.m. peak hours, with the exception of the Route 115 & Hillside Drive & US-340 NB Ramps intersection.
    - During the Friday a.m. peak hour, the northbound approach operates at LOS E.
    - During the Friday p.m. peak hour, the northbound approach operates at LOS F.

Year 2022 Background Traffic Conditions

- A 0.625 percent growth rate (compounded annually) was used to account for regional growth in development of year 2022 background traffic volumes.
- In-process traffic from the Jefferson Heights North development was added to background traffic to project year 2022 background traffic volumes.

- The Euclid Avenue & Belvedere Farm Court intersection will also be realigned and changed to All-Way Stop Control with the Jefferson Heights North development.
- The study intersections operate at acceptable levels of service during the Friday a.m. and Friday p.m. peak hours, with the exception of the Route 115 & Hillside Drive & US-340 NB Ramps intersection.
    - During both peak hours, the northbound approach is expected to experience an increase in delay but maintain levels of service consistent with existing conditions.
        - To help mitigate increased delay at the intersection, MUTCD traffic signal warrants were evaluated. Only Warrant 3 (Peak Hour) will be met under year 2022 background conditions, which is generally a warrant reserved for special cases.
        - A single-lane roundabout was also evaluated to help mitigate the northbound approach delays. Based on these analyses, the intersection would operate acceptably with a roundabout during the Friday a.m. and p.m. peak hours.
- All forecast queues are anticipated to be accommodated with existing storage lengths.

Proposed Development Plan

- The Magnolia Springs development is anticipated to be fully built-out in year 2022.
- The current development plan consists of up to 350 single-family homes.
- Access to the site is proposed via an extension of Citizens Way to the south and a driveway off Belvedere Farm Court to the north. The following driveway distributions were assumed and confirmed during the scoping process:
    - Citizens Way (south): 80 percent
    - Belvedere Farm Court (north): 20 percent
- The proposed development would be estimated to generate approximately 259 Friday a.m. (65 in; 194 out), and 347 Friday p.m. (218 in; 129 out) net new peak hour trips. These estimates are based on data available from the *Trip Generation Manual, 10th Edition* and the number of dwelling units (Single-family Detached Housing: ITE Land Use Code 210).

Year 2022 Total Traffic Conditions

- All of the study intersections are forecast to operate at the same level-of-service during both the Friday a.m. and Friday p.m. peak periods relative to year 2022 background traffic conditions with the following exceptions:
    - Route 115 & Citizens Way & US-340 SB Ramps: The critical movements are anticipated to operate at LOS "B" during the Friday a.m. peak hour and LOS "D" during the Friday p.m. peak hour with v/c ratios of 0.45 and 0.80, respectively. Under year 2022 background conditions, the critical movements are anticipated to operate at LOS "A" during the Friday a.m. peak hour and LOS "B" during the Friday p.m. peak hour.

- Note the intersection is still forecast to operate acceptably, so adding roadway capacity does not appear warranted as part of the development.

- Route 115 & Hillside Drive & US-340 NB Ramps: The critical northbound movement is anticipated to operate at LOS "F" during the Friday a.m. and p.m. peak hours with a v/c ratio of 0.78 and over 1.0, respectively. Under year 2022 background conditions, this approach is anticipated to operate at LOS "E" during the Friday a.m. peak hour and LOS "F" during the Friday p.m. peak hour.

  - To help mitigate increased delay at the intersection, MUTCD traffic signal warrants were evaluated. Warrant 1 (Eight-Hour Vehicular Volume), Warrant 2 (Four-Hour Vehicular Volume), and Warrant 3 (Peak Hour) are expected to be met under year 2022 total traffic conditions at the 70 and 100 percent volume thresholds.

    - With the installation of a traffic signal, the westbound left-turn 95th percentile queue is anticipated to exceed the available storage capacity during the Friday p.m. peak hour. If this improvement is implemented, the westbound left-turn lane could be extended to 250 feet of storage to accommodate queues.

  - A single-lane roundabout was also evaluated to help mitigate the northbound approach delays. Based on these analyses, the intersection would operate acceptably with a roundabout during the Friday a.m. and p.m. peak hours.

- Increases to queueing is typically less than the assumed length of one vehicle and is anticipated to have only minor impacts operations beyond conditions already noted under year 2022 background conditions. The largest disparity in queuing between year 2022 background and year 2022 total conditions is projected to occur on the northbound approach of the Route 115 & Citizens Way & US-340 SB Ramps intersection (approximately five vehicles); however, this increase can be accommodated by the existing roadway geometry and the level of service is expected to be acceptable.

RECOMMENDATIONS

Both the City of Charles Town and Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO) prefer the installation of a roundabout at the Route 115 & Hillside Drive & US-340 NB ramps intersection, which operates with deficiencies under existing and background conditions. A preliminary cost estimate provided by WVDOH indicates the cost of a roundabout at this location would be approximately $950,000.

Per discussions with WVDOH, the applicant is willing to make a one-time contribution of $50,000 to a future intersection improvement at the Route 115 & Hillside Drive & US-340 NB ramps intersection once a project is formally programmed. No other improvements to the roadway network are recommended with the Magnolia Springs development.

Section 2
Introduction

Trip Generation

Trip generation estimates for the proposed development were developed using the standard reference *Trip Generation, 10th Edition* (Reference 4) published by the Institute of Transportation Engineers (ITE). **Table 6** shows the estimated trip generation potential of the site when completed.

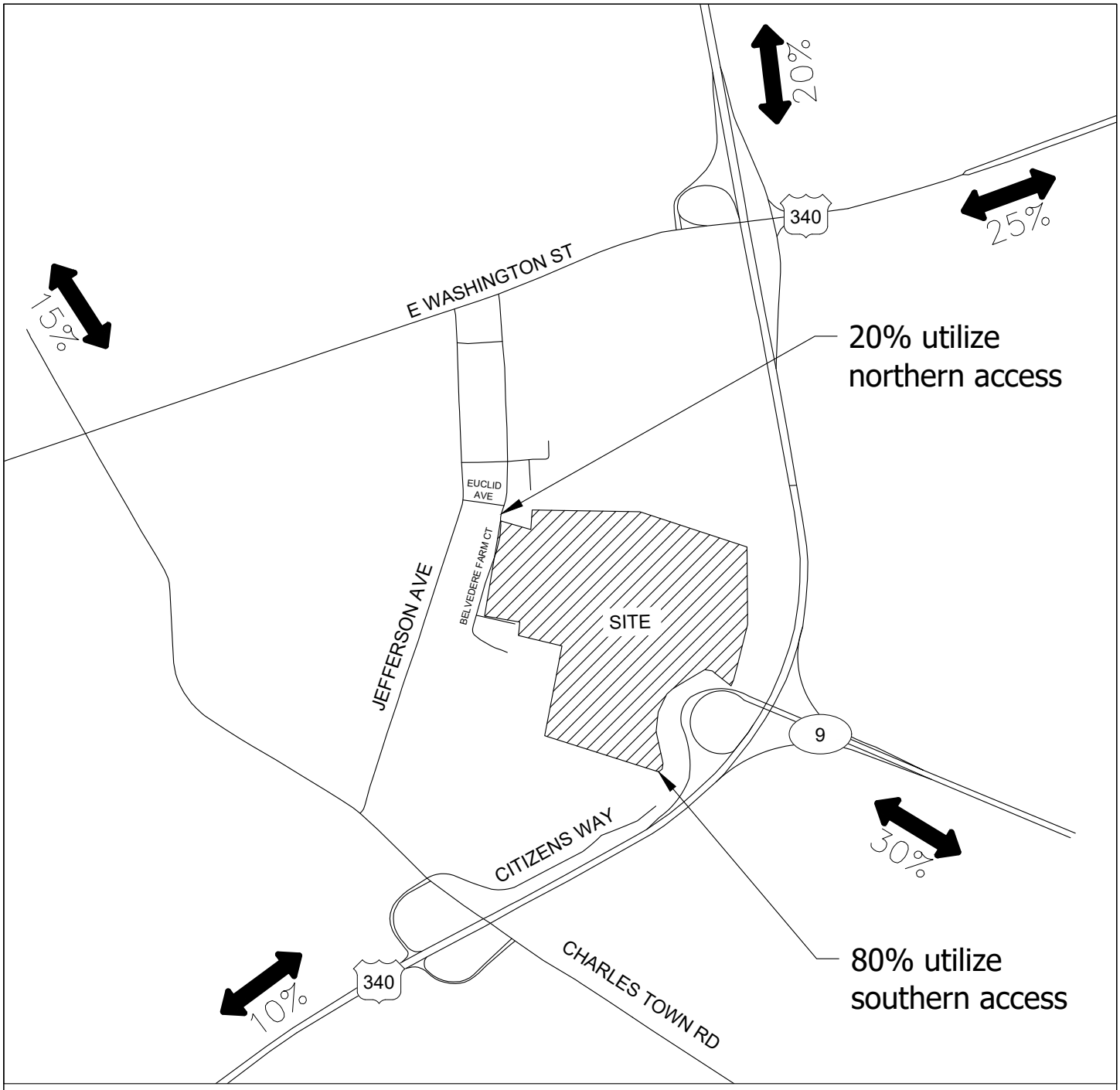
Table 6. Estimated Trip Generation

Land Use	ITE Code	Units		Peak Hour of Adjacent Street						
				Weekday Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
					Total	In	Out	Total	In	Out
Single-family Detached Housing	210	350	Dwelling Units	3,304	259	65	194	347	218	129

As shown in **Table 6**, the proposed development would be estimated to generate approximately 259 Friday a.m. (65 in; 194 out), and 347 Friday p.m. (218 in; 129 out) net new peak hour trips.

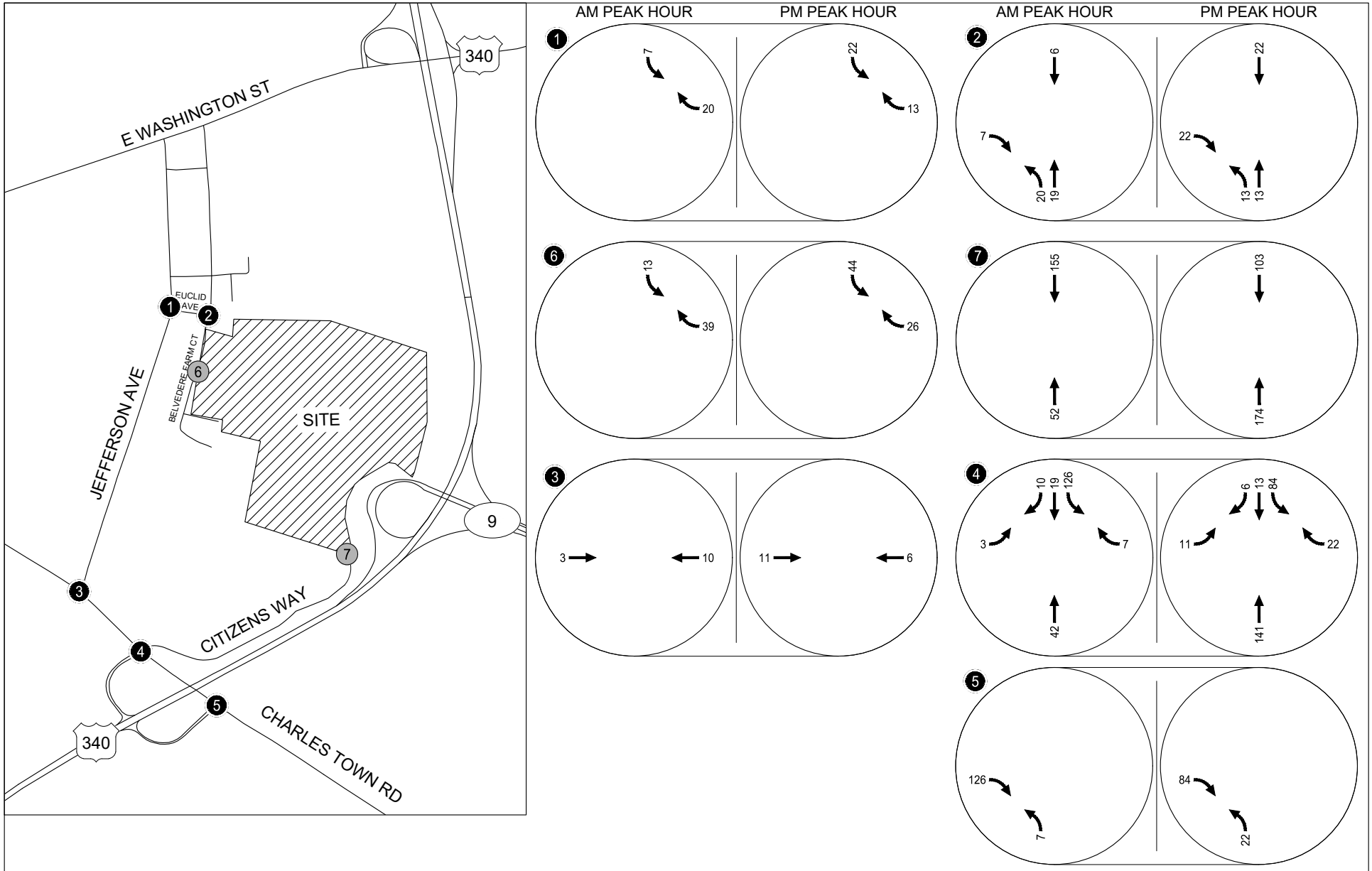
Site Trip Distribution/Trip Assignment

The estimated trip distribution pattern was confirmed by WVDOH through scoping correspondence. **Figure 10** illustrates the estimated trip distribution pattern. **Figure 11** shows the assignment of net new site-generated trips to the roadway network during the Friday a.m. and Friday p.m. peak hours.



Trip Distribution
Jefferson County, West Virginia

Figure
10



Site-Generated Trips
Friday AM and PM Peak Hours
Jefferson County, West Virginia

Figure
11

KITTELSON & ASSOCIATES

Section 5
Conclusions and Recommendations

CONCLUSIONS AND RECOMMENDATIONS

The results of the traffic impact analysis indicate that the proposed development can be constructed while not impacting operations on the surrounding transportation system assuming provision of mitigations specified in this report. The findings of this analysis and our recommendations are discussed below.

FINDINGS

Existing Conditions

- The study intersections operate at acceptable levels of service during the Friday a.m. and Friday p.m. peak hours, with the exception of the Route 115 & Hillside Drive & US-340 NB Ramps intersection.
    - During the Friday a.m. peak hour, the northbound approach operates at LOS E.
    - During the Friday p.m. peak hour, the northbound approach operates at LOS F.

Year 2022 Background Traffic Conditions

- A 0.625 percent growth rate (compounded annually) was used to account for regional growth in development of year 2022 background traffic volumes.
- In-process traffic from the Jefferson Heights North development was added to background traffic to project year 2022 background traffic volumes.
- The Euclid Avenue & Belvedere Farm Court intersection will also be realigned and changed to All-Way Stop Control with the Jefferson Heights North development.
- The study intersections operate at acceptable levels of service during the Friday a.m. and Friday p.m. peak hours, with the exception of the Route 115 & Hillside Drive & US-340 NB Ramps intersection.
    - During both peak hours, the northbound approach is expected to experience an increase in delay but maintain levels of service consistent with existing conditions.
        - To help mitigate increased delay at the intersection, MUTCD traffic signal warrants were evaluated. Only Warrant 3 (Peak Hour) will be met under year 2022 background conditions, which is generally a warrant reserved for special cases.
        - A single-lane roundabout was also evaluated to help mitigate the northbound approach delays. Based on these analyses, the intersection would operate acceptably with a roundabout during the Friday a.m. and p.m. peak hours.
- All forecast queues are anticipated to be accommodated with existing storage lengths.

Proposed Development Plan

- The Magnolia Springs development is anticipated to be fully built-out in year 2022.
- The current development plan consists of up to 350 single-family homes.
- Access to the site is proposed via an extension of Citizens Way to the south and a driveway off Belvedere Farm Court to the north. The following driveway distributions were assumed and confirmed during the scoping process:
    - Citizens Way (south): 80 percent
    - Belvedere Farm Court (north): 20 percent
- The proposed development would be estimated to generate approximately 259 Friday a.m. (65 in; 194 out), and 347 Friday p.m. (218 in; 129 out) net new peak hour trips. These estimates are based on data available from the *Trip Generation Manual, 10th Edition* and the number of dwelling units (Single-family Detached Housing: ITE Land Use Code 210).

Year 2022 Total Traffic Conditions

- All of the study intersections are forecast to operate at the same level-of-service during both the Friday a.m. and Friday p.m. peak periods relative to year 2022 background traffic conditions with the following exceptions:
    - Route 115 & Citizens Way & US-340 SB Ramps: The critical movements are anticipated to operate at LOS "B" during the Friday a.m. peak hour and LOS "D" during the Friday p.m. peak hour with v/c ratios of 0.45 and 0.80, respectively. Under year 2022 background conditions, the critical movements are anticipated to operate at LOS "A" during the Friday a.m. peak hour and LOS "B" during the Friday p.m. peak hour.
        - Note the intersection is still forecast to operate acceptably, so adding roadway capacity does not appear warranted as part of the development.
    - Route 115 & Hillside Drive & US-340 NB Ramps: The critical northbound movement is anticipated to operate at LOS "F" during the Friday a.m. and p.m. peak hours with a v/c ratio of 0.78 and over 1.0, respectively. Under year 2022 background conditions, this approach is anticipated to operate at LOS "E" during the Friday a.m. peak hour and LOS "F" during the Friday p.m. peak hour.
        - To help mitigate increased delay at the intersection, MUTCD traffic signal warrants were evaluated. Warrant 1 (Eight-Hour Vehicular Volume), Warrant 2 (Four-Hour Vehicular Volume), and Warrant 3 (Peak Hour) are expected to be met under year 2022 total traffic conditions at the 70 and 100 percent volume thresholds.
            - With the installation of a traffic signal, the westbound left-turn 95th percentile queue is anticipated to exceed the available storage capacity during the Friday p.m. peak hour. If this improvement is implemented, the westbound left-turn lane could be extended to 250 feet of storage to accommodate queues.

- A single-lane roundabout was also evaluated to help mitigate the northbound approach delays. Based on these analyses, the intersection would operate acceptably with a roundabout during the Friday a.m. and p.m. peak hours.

- Increases to queueing is typically less than the assumed length of one vehicle and is anticipated to have only minor impacts operations beyond conditions already noted under year 2022 background conditions. The largest disparity in queuing between year 2022 background and year 2022 total conditions is projected to occur on the northbound approach of the Route 115 & Citizens Way & US-340 SB Ramps intersection (approximately five vehicles); however, this increase can be accommodated by the existing roadway geometry and the level of service is expected to be acceptable.

RECOMMENDATIONS

Both the City of Charles Town and Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO) prefer the installation of a roundabout at the Route 115 & Hillside Drive & US-340 NB ramps intersection, which operates with deficiencies under existing and background conditions. A preliminary cost estimate provided by WVDOH indicates the cost of a roundabout at this location would be approximately $950,000.

Per discussions with WVDOH, the applicant is willing to make a one-time contribution of $50,000 to a future intersection improvement at the Route 115 & Hillside Drive & US-340 NB ramps intersection once a project is formally programmed. No other improvements to the roadway network are recommended with the Magnolia Springs development.

APPENDIX F-3: KINGS CROSSING TIS

Kings Crossing Residential Traffic Impact Study
Charles Town, Jefferson County, WV

AMT Project File 21-0261.001 | May 4, 2022 **REVISED**

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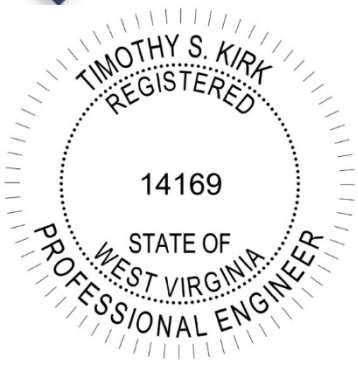

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EXECUTIVE SUMMARY

This report summarizes existing and future traffic analyses conducted in support of the proposed Kings Crossing Residential Development. The proposed residential development is to be located south of WV 115 (Charles Town Road) and east of US 340 (Berryville Pike) near Charles Town, Jefferson County, West Virginia. The proposed site plan includes 177 single-family homes and 227 townhomes and is expected to be built and completed by the year 2025. The development will be constructed in three phases. Phase 1 will include 43 single-family homes and 72 townhomes and is planned to be completed in 2022. Phase 2 includes an additional 81 single-family homes and 83 townhomes and is planned to be completed in 2024. Phase 3 includes an additional 53 single-family homes and 72 townhomes and is planned to be completed in 2025.

The proposed residential development is anticipated to be served by two site driveways intersecting directly with WV 115. Site Drive #1 and Site Drive #2 intersect with WV 115. Site Drive #1 (addressed as Road 1 on the site plan) is proposed to be located approximately 2,000 feet east of Crosswinds Drive approaching WV 115 from the south and will operate as a full movement approach utilizing two-way stop-control (TWSC). Site Drive #2 (addressed as Road 12 on the site plan) will approach WV 115 from the south approximately 2,600 feet east of Crosswinds Drive and will operate as a full movement approach utilizing TWSC.

Traffic analyses will consider future conditions at the anticipated milestone years of 2022, 2024, and 2025. This report summarizes the analyses of 2021 Existing conditions, 2022 No-Build conditions (without proposed development in place), 2022 Phase 1 Build conditions (with phase 1 of proposed development in place), 2024 Partial Build, 2024 Phase 2 Build (with phase 1 and 2 of the proposed development in place), 2025 Partial Build, 2025 Full Build (with complete development in place), and 2025 Build Improved conditions (with the proposed development and proposed improvements in place) during weekday AM and PM peak hours. An annual growth rate of 1.20% was obtained from the WVDOH.

Two approved traffic impact studies have been included in the future peak hour forecasts as pending developments that will be complete by the Full Build Year of 2025. These developments are the Tate Manor and Magnolia Springs residential developments. Both developments are located north of Crescent Drive/High Street and east of Jefferson Avenue in Charles Town and are anticipated to be completed by the year 2024. Estimated traffic generated by the two developments are included in the background traffic volumes beginning in the 2024 Partial Build conditions. Information regarding both developments is located in **Appendix F**.

AMT (A. Morton Thomas and Associates, Inc.) was retained to determine the projected traffic impacts of the proposed development in accordance with the guidelines set forth by WVDOH in Traffic Engineering Directive (TED) 106-2. The intent of the study is to fully examine the impacts of the traffic generated by the development on the existing transportation system and identify potential mitigation measures. This report presents trip generation, trip distribution, intersection on capacity analysis, queuing analysis, signal warrant analysis, auxiliary lane analysis, and recommendations for transportation improvements necessary to meet the anticipated traffic demands.

Based upon a review of the site plan and adjacent transportation network and following scope of work coordination with WVDOH, the following seven (7) existing and two (2) proposed intersections are

included within the scope of the Traffic Impact Study (TIS) for the proposed Kings Crossing residential development:

1) US 340 (Berryville Pike) with Candlewood Drive *(TWSC "T" type intersection)*
2) WV 115 (S. George Street) with Jefferson Avenue (CR 34) (*TWSC "T" type intersection)*
3) WV 115 with Citizens Way (CR 115/4)/US 340 SB (*Single-lane Roundabout Plus intersection)*
4) WV 115 with Hillside Drive (CR 9/69)/US 340 NB (*TWSC Plus type intersection)*
5) WV 115 with Fairleigh Drive/Bailey Brooks Way *(TWSC Plus type intersection)*
6) WV 115 with Crosswinds Drive *(TWSC "T" type intersection)*
7) WV 115 with Kabletown Road (CR 25) *(TWSC "T" type intersection)*
8) WV 115 with Site Drive #1 *(Proposed TWSC "T" type intersection)*
9) WV 115 with Site Drive #2 *(Proposed TWSC "T" type intersection)*

Peak Hour Traffic Volumes

Peak hour turning movement counts were collected for six (6) of the seven (7) existing intersections within the study area by AMT on Friday April 23, 2021 between the hours of 7-9 AM and 3-6 PM. Following submission of the Scope of Work document, WVDOH requested that the intersection of WV 115 with Jefferson Avenue intersection be included as part of the study area. Peak hour turning movement counts were collected for the additional intersection on May 4, 2018 by Quality Counts, in support of the Magnolia Springs TIS prepared by Kittelson & Associates Inc. The peak hour turning movement counts conducted by Quality Counts were balanced into the existing system. It was assumed that the additional trips produced from balancing the counts would proceed to enter and exit the system via US 340. On both May 4, 2018 and April 23, 2021, Jefferson County Schools were fully operational with in-classroom instruction for all students. The turning movement counts were compared with existing AADT and determined to be reasonable as a check and calibration for COVID-19 impacts.

The first phase of the proposed development is expected to be complete by the year 2022. The 2022 No-Build peak hour traffic volumes include: existing 2021 peak hour traffic and an annual traffic growth prior to the year 2022. The growth rate of 1.20% was applied to the existing peak hour traffic counts and compounded annually.

The 2022 Phase 1 Build traffic volumes include: the existing peak hour traffic volume, annual traffic growth until 2022, and new trips generated by phase 1 of the proposed development.

The 2024 Partial Build volumes include: the existing peak hour traffic volumes, annual traffic growth until 2024, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, and new trips generated by phase 1 of the proposed development.

The 2024 Phase 2 Build Volumes include: the existing peak hour traffic volumes, annual traffic growth until 2024, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, and new trips generated by phase 1 and phase 2 of the proposed development.

The 2025 Partial Build Volumes include: the existing peak hour traffic volumes, annual traffic growth until 2025, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, and new trips generated by phase 1 and phase 2 of the proposed development.

The 2025 Full Build Conditions include: existing 2021 peak hour traffic volume, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, an annual traffic growth prior to the year 2025, and the new peak hour trips to be generated by the full build out of Kings Crossing development. Site generated traffic was distributed onto the transportation network based upon existing traffic patterns and anticipated origin and destination of the newly generated site trips.

Site Trip Generation and Distribution

The proposed Kings Crossing residential development includes 177 single-family homes and 227 townhomes. The development will be constructed in three phases. Trip generation "Peak Hour of Generator" rates from ITE Trip Generation Manual, 10th Edition, were utilized for Single-Family Detached Housing (LUC 210) and Multifamily Housing (LUC 220). Phase 1 will include 43 single-family homes and 72 townhomes. Trip generation analysis indicates that Phase 1 will generate a total of 933 trips which includes 73 AM peak hour trips and 91 PM peak hour trips. Phase 2 includes an additional 81 single-family homes and 83 townhomes. Phase 2 will generate a total of 1,373 additional trips which includes 108 AM peak hour trips and 137 PM peak hour trips. Phase 3 will include 53 single-family homes and 72 townhomes. Phase 3 will generate a total of 1,027 additional trips which includes 80 AM peak hour trips and 101 PM peak hour trips. Trip generation analysis indicates that a total of 3,333 new daily trips will be generated including 261 AM peak hour trips and 329 PM peak hour trips at full build out in 2025.

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 35% to/from the north on US 340
- 25% to/from the south on US 340
- 30% to/from the west on WV 115
- 10% to/from the east on WV 115

2021 Existing Conditions Analysis

The results of the 2021 existing conditions capacity analyses indicate that three (3) traffic movements currently operate worse than LOS D, which is considered the minimum tolerable level. Traffic movements that are expected to operate worse than LOS D include the following:

- ***Candlewood Drive westbound shared left-turn to US 340 LOS E during the PM peak hour***
- ***Jefferson Avenue southbound shared left/right lane to WV 115 LOS E during the PM peak hour***
- ***US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during the PM peak hour***

2022 No-Build Conditions Analysis

The results of the 2028 No-Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2021 Existing Conditions are anticipated to continue. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during the PM peak hour*

- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during the PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*

2022 Phase 1 Build Conditions Analysis

Geometric improvements included in the Phase 1 2022 Build Conditions include the construction of Site Drive #1 and Site Drive #2. Site Drive #1 is a full movement approach connecting to WV 115 creating a "T" type intersection approximately 2,000 feet east of Crosswinds Drive and will operate under stop control. Site Drive #2 is a full movement approach connecting to WV 115 creating a "T" type intersection approximately 2,600 feet east of Crosswinds Drive and will operate under stop control.

The results of the Phase 1 2022 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2022 No-Build Conditions are anticipated to continue with no additional movements expected to operate worse than LOS D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS E during the AM peak hour and LOS F during the PM peak hour*

2024 Partial Build Conditions Analysis

The results of the 2022 Phase 1 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2021 Existing Conditions are anticipated to continue with no additional traffic movements operating worse than LOS D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during the PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during the PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*

2024 Phase 2 Build Conditions Analysis

The results of the Phase 2 2024 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2024 Partial Build Conditions are anticipated to continue with no additional movements expected to operate worse than LOS D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*

2025 Partial Build Conditions Analysis

The results of the 2024 Phase 2 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2021 Existing Conditions are anticipated to continue with no additional movements operating at LOS worse than D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during the PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during the PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*

2025 Full Build Conditions Analysis

The results of the Phase 3 2025 Full Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2025 Partial Build Conditions are anticipated to continue with two additional movements expected to operate worse than LOS D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during PM peak hour*
- ***US 340 SB Ramp northbound shared left/through/right lane to WV 115 LOS E during the PM peak hour***
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*
- ***Hillside Drive southbound shared left/through/right lane to WV 115 LOS E during the PM peak hour***

2025 Full Build Improved Conditions Analysis

Geometric improvements included in the Phase 3 2028 Build Improved Conditions include:

1. Construction of an exclusive left-turn lane on WV 115 westbound approach to Site Drive #1.
2. Construction of a roundabout at the WV 115 with US 340 Northbound Ramp/Hillside Drive intersection.
3. Construction of a right turn slip lane at WV 115 with US 340 Southbound Ramp/Citizen Way.
4. Installation of a traffic signal at WV 115 with Jefferson Avenue.
5. Construction of an exclusive left turn lane on WV 115 eastbound at Jefferson Avenue identified in the Tate Manor TIS.

The results of the Phase 3 2025 Full Build Improved Conditions capacity analyses indicate that no traffic movements will operate worse than LOS D, which is considered the minimum tolerable level, except for Candlewood Drive to US 340 and US 340 SB Ramp to WV 115.

- *Candlewood Drive westbound shared left-turn movement to US 340 LOS E during the PM peak hour.*

Conclusions/Recommendations

Based on the findings of this study, the following infrastructure improvements are recommended to address existing capacity issues and maintain operation of the existing transportation network:

US 340 with Candlewood Drive

- Install pavement markings on the Candlewood Drive approach to US 340. Previous pavement markings are no longer visible and need to be reinstalled to delineate separate left and right turn lanes.

WV 115 with Jefferson Avenue

- As part of the Tate Manor TIS, it was recommended that a traffic signal be installed at the intersection of WV 115 and Jefferson Avenue. Intersection conditions previously met the MUTCD warranting criteria. Additionally, the 2021 Existing Conditions and 2022 No-Build analysis indicates that the intersection LOS will currently operates at LOS E during the PM peak hour under Two Way Stop Control. The previously completed signal warrant is located in **Appendix G**.

- In conjunction with installation of a traffic signal identified in previous studies, widening WV 115 to construct an exclusive left-turn lane on the eastbound approach is recommended. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with an appropriate taper.

WV 115 with Hillside Drive/ US 340 Northbound Ramps

- Proceed with the DOH planned conversion of the intersection to a single lane roundabout. The 2021 Existing Conditions analysis indicates that the northbound movement currently operates at LOS E during the PM peak hour. Under roundabout yield control, this intersection would operate at an overall LOS C during the PM peak hour for 2025 Full Build Conditions, with the northbound movement operating at LOS A.

Based on the finding of this study, the following improvements are recommended for Phase 1 of the Kings Crossing Residential Development:

WV 115 with Site Drive #1

- Construct Site Drive #1 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 2,000 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and two egress lanes to provide separate left and right turn lanes exiting the development. Site Drive #1 will operate under stop-control, while WV 115 operates as free-flow.

WV 115 with Site Drive #2

- Construct Site Drive #2 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 2,600 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and two egress lanes to provide separate left and right turn

lanes exiting the development. Site Drive #2 will operate under stop-control, while WV 115 operates as free-flow.

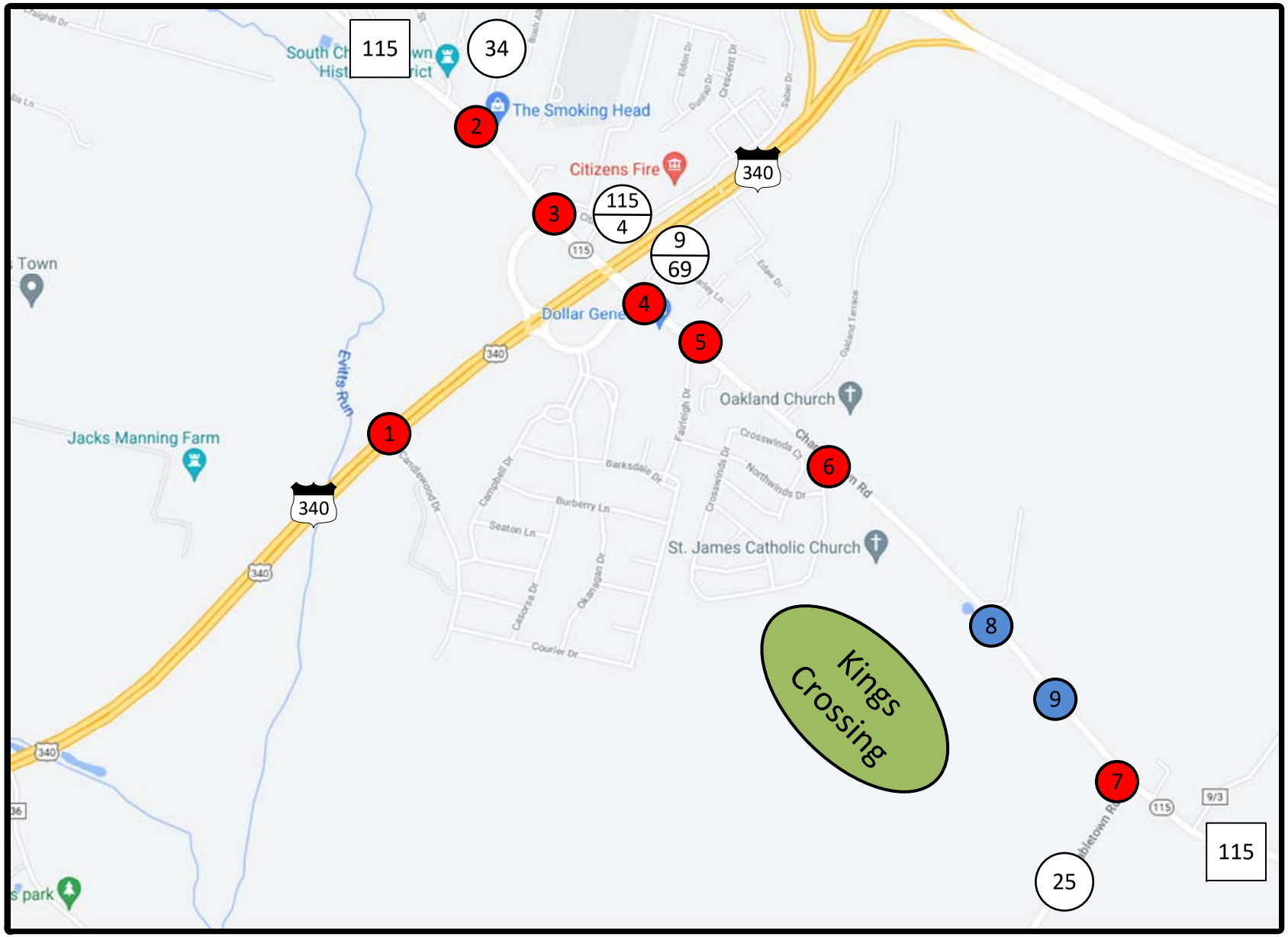
Based on the finding of this study, the following geometric improvements are recommended to mitigate the impacts of the Kings Crossing residential development and maintain acceptable traffic operations along the existing transportation network after the full build out of Kings Crossing Residential development in 2025:

WV 115 with Citizen Way/US 340 Southbound Ramps

- Construct a low angle right turn slip lane on for the US 340 northbound ramp approach to WV 115 eastbound. The 2025 Partial Build analysis indicates that the ramp approach will deteriorate to LOS C during the PM peak hour with the overall intersection operating LOS B. The 2025 Build analysis indicates that the US 340 southbound ramp approach will deteriorate to LOS E during the PM peak hour with the overall intersection operating at LOS C. The addition of the right turn slip lane improves the ramp to LOS B during the PM peak hour and the overall intersection to LOS B. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.

WV 115 with Site Drive #1

- Construct an exclusive left-turn lane on the WV 115 westbound approach to Site Drive #2. Peak hour volumes are projected to meet the AASHTO guidelines following 2025 Build Conditions PM peak hour. The left-turn should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.



LEGEND

= Development

= Existing Intersection

= Proposed Intersection

AMT

N

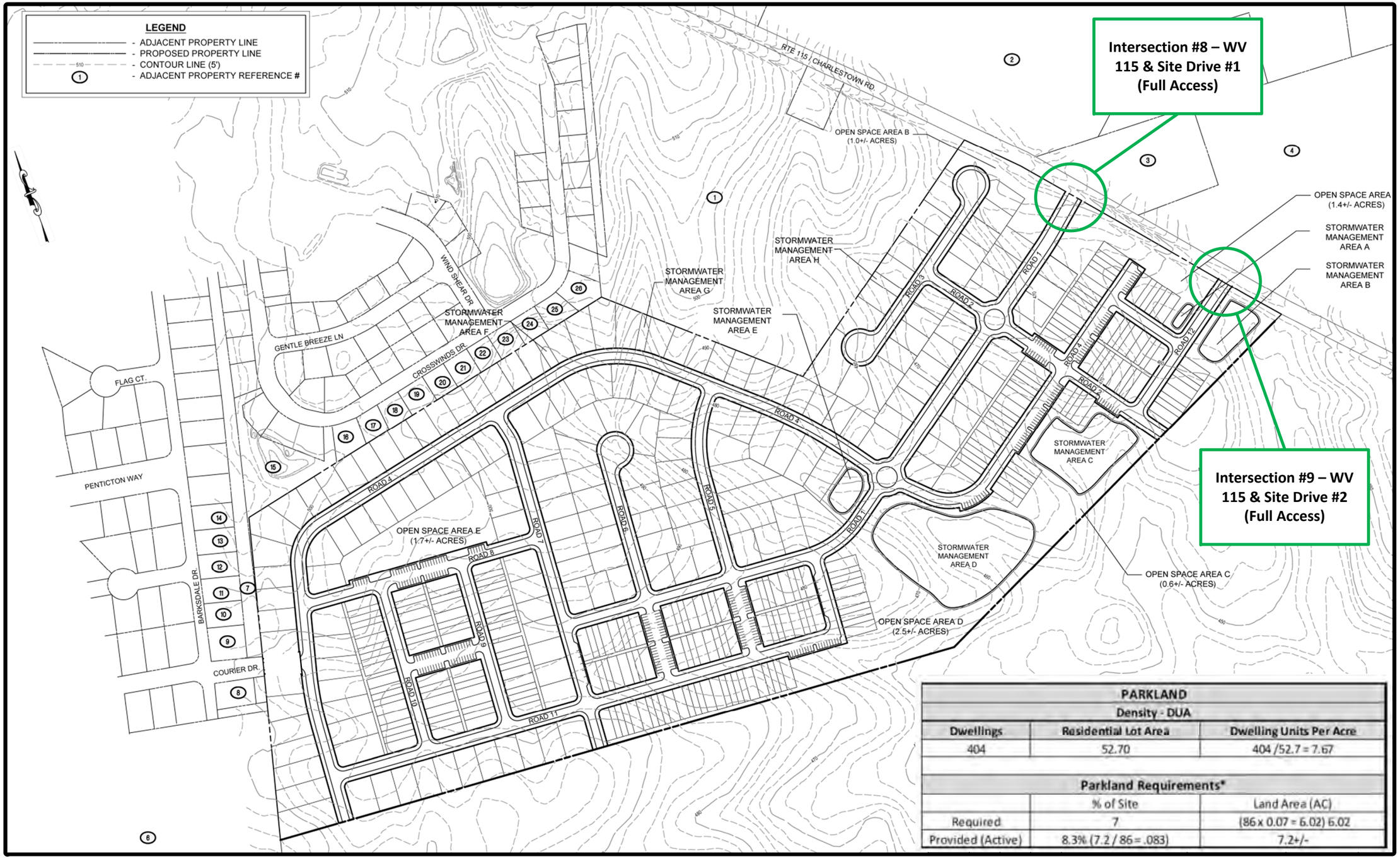
NOT TO SCALE

Kings Crossing Residential TIS

Site Location Map

DATE: May 2022

FIGURE 1



PARKLAND		
Density - DUA		
Dwellings	Residential Lot Area	Dwelling Units Per Acre
404	52.70	404 /52.7 = 7.67
Parkland Requirements*		
	% of Site	Land Area (AC)
Required	7	(86 x 0.07 = 6.02) 6.02
Provided (Active)	8.3% (7.2 / 86 = .083)	7.2+/-

AMT

Kings Crossing Residential TIS

Site Plan

NOT TO SCALE

DATE: May 2022

FIGURE 2

TRIP GENERATION

The proposed Kings Crossing residential development includes 177 single-family homes and 227 townhomes. The development will be constructed in three phases. Trip generation "Peak Hour of Generator" rates from ITE Trip Generation Manual, 10th Edition, were utilized for Single-Family Detached Housing (LUC 210) and Multifamily Housing (LUC 220). Phase 1 will include 43 single-family homes and 72 townhomes. Trip generation analysis indicates that Phase 1 will generate a total of 933 trips which includes 73 AM peak hour trips and 91 PM peak hour trips. Phase 2 includes an additional 81 single-family homes and 83 townhomes. Phase 2 will generate a total of 1,373 additional trips which includes 108 AM peak hour trips and 137 PM peak hour trips. Phase 3 will include 53 single-family homes and 72 townhomes. Phase 3 will generate a total of 1,027 additional trips which includes 80 AM peak hour trips and 101 PM peak hour trips. Trip generation analysis indicates that a total of 3,333 new daily trips will be generated including 261 AM peak hour trips and 329 PM peak hour trips at full build out in 2025.

Table 2 shows the summary of the Trip Generation for all three phases of Kings Crossing.

Table 2: Trip Generation Summary

Phase 1

Description	LUC	Density	Daily Trips	AM Peak			PM Peak		
				Enter	Exit	Total	Enter	Exit	Total
Single-Family Homes	210	43 Units	406	9	24	33	28	15	43
Townhomes	220	72 Units	527	11	29	40	28	20	48
Total Net New External Trips			**933**	**20**	**53**	**73**	**56**	**35**	**91**

Phase 2

Description	LUC	Density	Daily Trips	AM Peak			PM Peak		
				Enter	Exit	Total	Enter	Exit	Total
Single-Family Homes	210	81 Units	765	16	46	62	52	29	81
Townhomes	220	83 Units	608	13	33	46	33	23	56
Total Net New External Trips			**1,373**	**29**	**79**	**108**	**85**	**52**	**137**

Phase 3

Description	LUC	Density	Daily Trips	AM Peak			PM Peak		
				Enter	Exit	Total	Enter	Exit	Total
Single-Family Homes	210	53 Units	500	10	30	40	34	19	53
Townhomes	220	72 Units	527	11	29	40	28	20	48
Total Net New External Trips			**1,027**	**21**	**59**	**80**	**62**	**39**	**101**

Full Build (Summary)

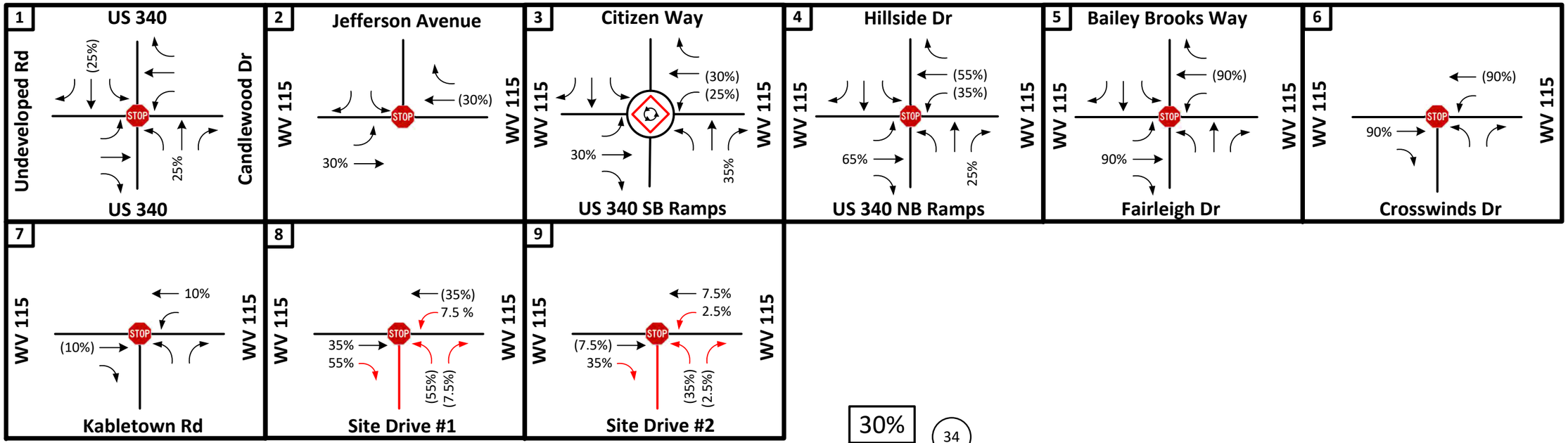
Description	LUC	Density	Daily Trips	AM Peak			PM Peak		
				Enter	Exit	Total	Enter	Exit	Total
Single-Family Homes	210	177 Units	1,671	35	100	135	114	63	177
Townhomes	220	227 Units	1,662	35	91	126	89	63	152
Total Net New External Trips			**3,333**	**70**	**191**	**261**	**203**	**126**	**329**

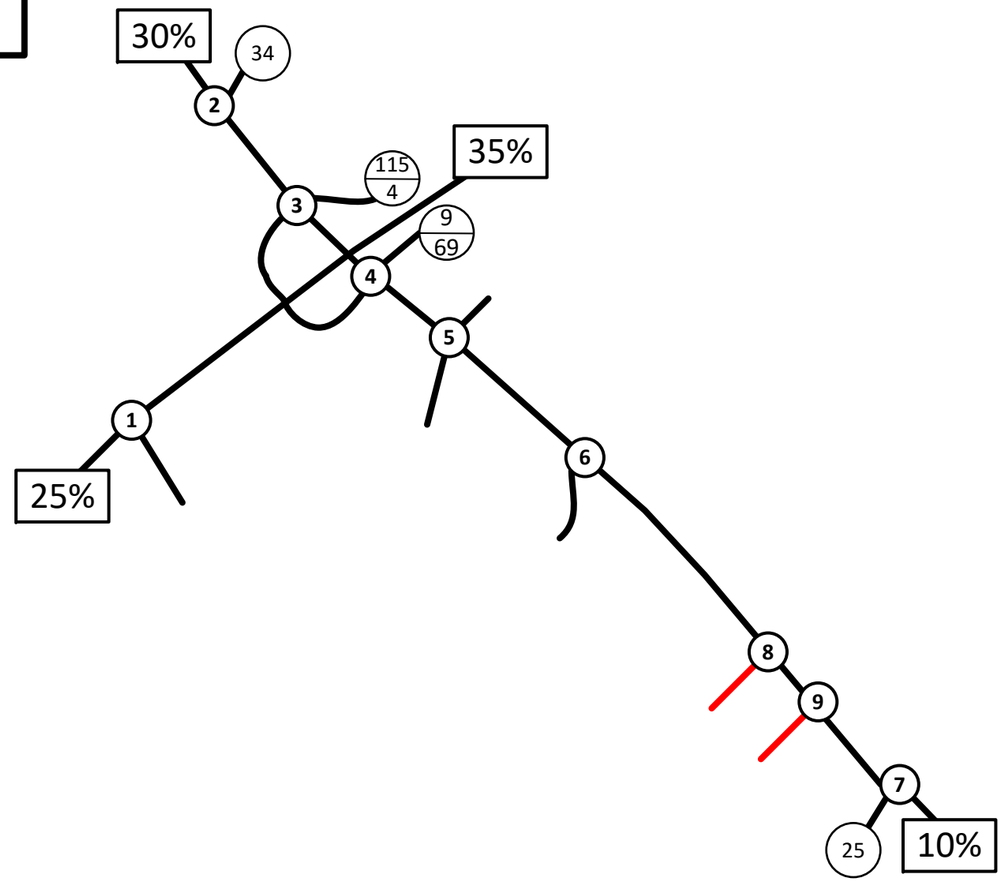
TRIP DISTRIBUTION

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 35% to/from the north on US 340
- 25% to/from the south on US 340
- 30% to/from the west on WV 115
- 10% to/from the east on WV 115

The external trip distribution percentages are shown on **Figure 6** and the AM and PM peak hour new site trip assignments are shown on **Figure 7** through **9**.





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX% Entering Trip Percentage
- (X%) Exiting Trip Percentage

N

NOT TO SCALE

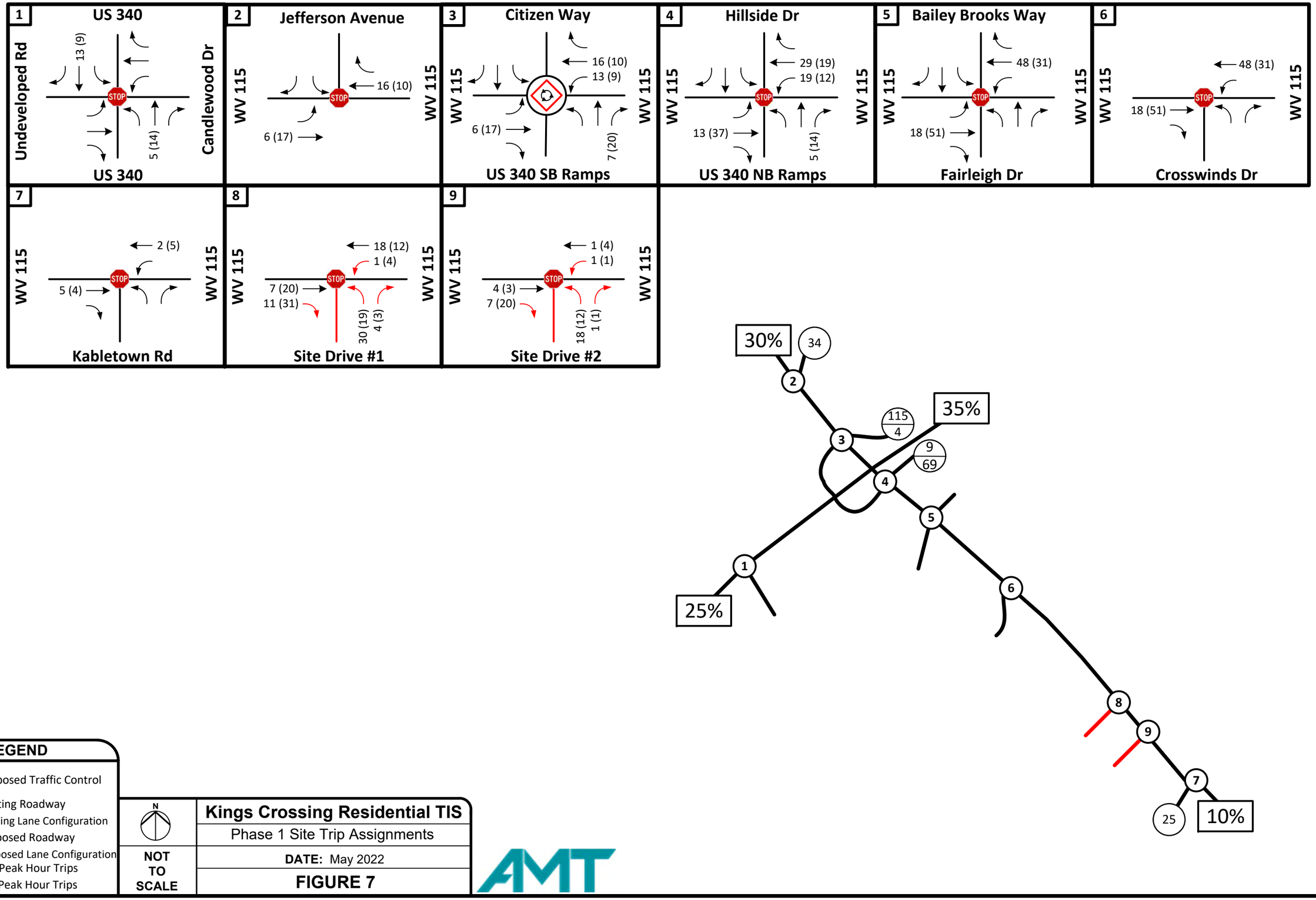
Kings Crossing Residential TIS

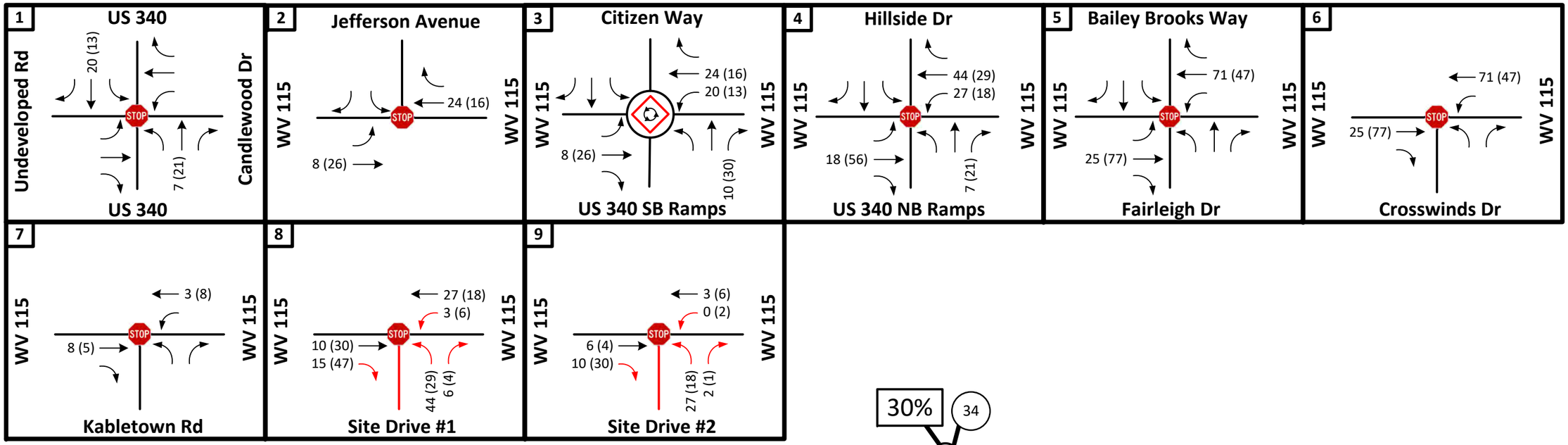
New Trip Distribution

DATE: May 2022

FIGURE 6

AMT


1
US 340
Undeveloped Rd
Candlewood Dr
US 340
13 (9)
5 (14)
2
Jefferson Avenue
WV 115
WV 115
16 (10)
6 (17)
3
Citizen Way
WV 115
WV 115
16 (10)
13 (9)
6 (17)
7 (20)
US 340 SB Ramps
4
Hillside Dr
WV 115
WV 115
29 (19)
19 (12)
13 (37)
5 (14)
US 340 NB Ramps
5
Bailey Brooks Way
WV 115
WV 115
48 (31)
18 (51)
Fairleigh Dr
6
WV 115
WV 115
48 (31)
18 (51)
Crosswinds Dr
7
WV 115
WV 115
2 (5)
5 (4)
Kabletown Rd
8
WV 115
WV 115
18 (12)
1 (4)
7 (20)
11 (31)
30 (19)
4 (3)
Site Drive #1
9
WV 115
WV 115
1 (4)
1 (1)
4 (3)
7 (20)
18 (12)
1 (1)
Site Drive #2
30%
34
2
3
115
4
35%
9
69
4
5
1
25%
6
8
9
7
25
10%
LEGEND
Proposed Traffic Control
Existing Roadway
Existing Lane Configuration
Proposed Roadway
Proposed Lane Configuration
XX AM Peak Hour Trips
(XX) PM Peak Hour Trips
N
NOT TO SCALE
Kings Crossing Residential TIS
Phase 1 Site Trip Assignments
DATE: May 2022
FIGURE 7
AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX AM Peak Hour Trips
- (XX) PM Peak Hour Trips

N

NOT TO SCALE

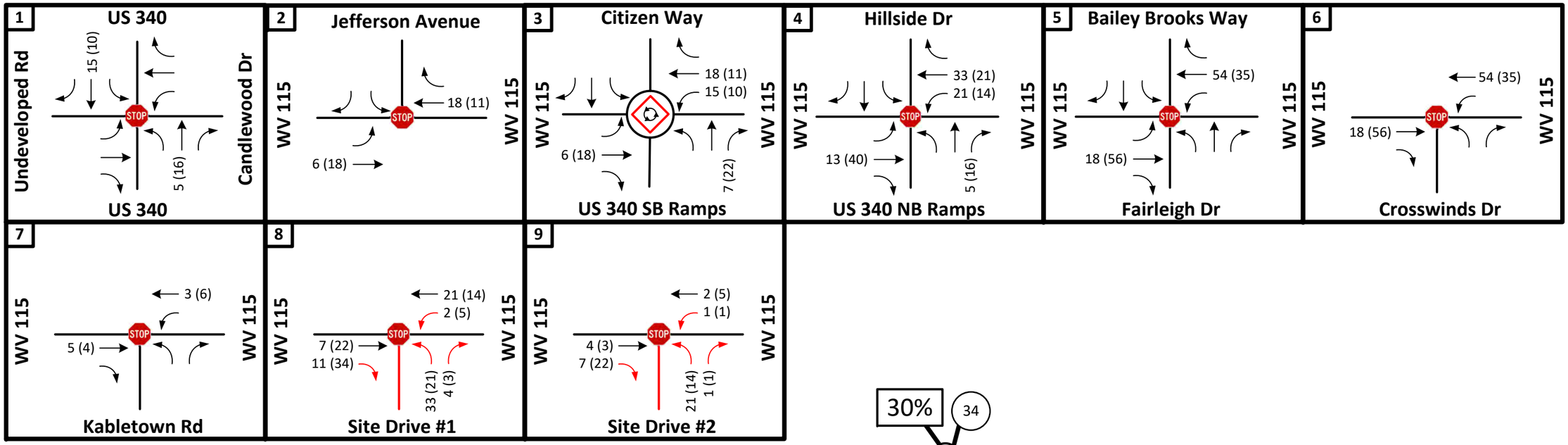
Kings Crossing Residential TIS

Phase 2 Site Trip Assignments

DATE: May 2022

FIGURE 8

AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX AM Peak Hour Trips
- (XX) PM Peak Hour Trips

N

NOT TO SCALE

Kings Crossing Residential TIS

Phase 3 Site Trip Assignments

DATE: May 2022

FIGURE 9

CONCLUSIONS/RECOMMENDATIONS

This report summarizes existing and future traffic analyses conducted in support of the proposed Kings Crossing Residential Development. The proposed residential development is to be located south of WV 115 (Charles Town Road) and east of US 340 (Berryville Pike) near Charles Town, Jefferson County, West Virginia. The proposed site plan includes 177 single-family homes and 227 townhomes and is expected to be built and completed by the year 2025. The development will be constructed in three phases. Phase 1 will include 43 single-family homes and 72 townhomes and is planned to be completed in 2022. Phase 2 includes an additional 81 single-family homes and 83 townhomes and is planned to be completed in 2024. Phase 3 includes an additional 53 single-family homes and 72 townhomes and is planned to be completed in 2025.

The proposed residential development is anticipated to be served by two site driveways intersecting directly with WV 115. Site Drive #1 and Site Drive #2 intersect with WV 115. Site Drive #1 (addressed as Road 1 on the site plan) is proposed to be located approximately 2,000 feet east of Crosswinds Drive approaching WV 115 from the south and will operate as a full movement approach utilizing two-way stop-control (TWSC). Site Drive #2 (addressed as Road 12 on the site plan) will approach WV 115 from the south approximately 2,600 feet east of Crosswinds Drive and will operate as a full movement approach utilizing TWSC.

Based on the findings of this study, the following infrastructure improvements are recommended to address existing capacity issues and maintain operation of the existing transportation network:

US 340 with Candlewood Drive

- Install pavement markings on the Candlewood Drive approach to US 340. Previous pavement markings are no longer visible and need to be reinstalled to delineate separate left and right turn lanes.

WV 115 with Jefferson Avenue

- As part of the Tate Manor TIS, it was recommended that a traffic signal be installed at the intersection of WV 115 and Jefferson Avenue. Intersection conditions previously met the MUTCD warranting criteria. Additionally, the 2021 Existing Conditions and 2022 No-Build analysis indicates that the intersection LOS will currently operates at LOS E during the PM peak hour under Two Way Stop Control. The previously completed signal warrant is located in **Appendix G**.

- In conjunction with installation of a traffic signal identified in previous studies, widening WV 115 to construct an exclusive left-turn lane on the eastbound approach is recommended. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with an appropriate taper.

WV 115 with Hillside Drive/ US 340 Northbound Ramps

- Proceed with the DOH planned conversion of the intersection to a single lane roundabout. The 2021 Existing Conditions analysis indicates that the northbound movement currently operates at LOS E during the PM peak hour. Under roundabout yield control, this intersection would operate at an overall LOS C during the PM peak hour for 2025 Full Build Conditions, with the northbound movement operating at LOS A.

Based on the finding of this study, the following improvements are recommended for Phase 1 of the Kings Crossing Residential Development:

WV 115 with Site Drive #1

- Construct Site Drive #1 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 2,000 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and two egress lanes to provide separate left and right turn lanes exiting the development. Site Drive #1 will operate under stop-control, while WV 115 operates as free-flow.

WV 115 with Site Drive #2

- Construct Site Drive #2 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 2,600 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and two egress lanes to provide separate left and right turn lanes exiting the development. Site Drive #2 will operate under stop-control, while WV 115 operates as free-flow.

Based on the finding of this study, the following geometric improvements are recommended to mitigate the impacts of the Kings Crossing residential development and maintain acceptable traffic operations along the existing transportation network after the full build out of Kings Crossing Residential development in 2025:

WV 115 with Citizen Way/US 340 Southbound Ramps

- Construct a low angle right turn slip lane on for the US 340 northbound ramp approach to WV 115 eastbound. The 2025 Partial Build analysis indicates that the ramp approach will deteriorate to LOS C during the PM peak hour with the overall intersection operating LOS B. The 2025 Build analysis indicates that the US 340 southbound ramp approach will deteriorate to LOS E during the PM peak hour with the overall intersection operating at LOS C. The addition of the right turn slip lane improves the ramp to LOS B during the PM peak hour and the overall intersection to LOS B. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.

WV 115 with Site Drive #1

- Construct an exclusive left-turn lane on the WV 115 westbound approach to Site Drive #2. Peak hour volumes are projected to meet the AASHTO guidelines following 2025 Build Conditions PM peak hour. The left-turn should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.

APPENDIX G: PROJECT CORRESPONDENCE

APPENDIX G-1: SCOPE OF WORK

Proposed TIS Scope of Work (SOW)

Fairview Farms Mixed-Use Development TIS

Charles Town, Jefferson County

Purpose

The purpose of this SOW document is to delineate the assumptions of the Traffic Impact Study (TIS) for the proposed development project. Confirming assumptions at the beginning of the project helps to assure that the TIS will be completed only once and in a timely matter. This memorandum aims to create a communicative line between the WVDOH, the client, and the traffic engineer to discuss all of the issues involved with completing the TIS. This document will cover the following topics:

- Client Information
- Study Methodology
- Intersections to be studied
- Existing Traffic Data Collection
- Trip Generation
- Trip Distribution
- Site Access
- Approved Developments
- Additional Data Needs
- Local Government Coordination

Client Information

AMT is preparing this study on behalf of *LGI Homes.* Our Point of Contact is *Jay Amin*.

1450 Lake Robins Drive, Suite 430
The Woodlands, TX 77380
Jay.amin@lgihomes.com

Study Methodology

The site is located on the north side of WV 115 (Charles Town Road) southeast of Downtown Charles Town, Jefferson County. Site access is proposed to WV 115 (Charles Town Road) via two (2) site driveways. Both the AM (7-9 AM) and PM (3-6 PM) peak hours will be studied.

The analysis will follow the TED 106-2 along with applicable ITE and Highway Capacity methodologies which include four milestones:

- 2022 Existing Conditions
- 2026 Future No-Build Conditions (without proposed development and with any approved adjacent development in place)
- 2026 Future Build Conditions (with the proposed development in place)
- 2026 Future Build Improved Conditions (with the proposed development and recommended improvements in place)

Traffic analysis will consider Future Build conditions at the build-out year. Based upon current information, the development is assumed to fully built by 2026. A growth rate has been requested from WVDOH Performance Management Division and will be utilized to determine future traffic volumes.

The analyses will be performed using the SYNCHRO 11.1 and SIDRA 9.0 (as applicable) software packages. The use of the software helps to ensure that the intersections will be analyzed in real life situations with intersections in coordination in all conditions.

Number of Intersections to be Studied

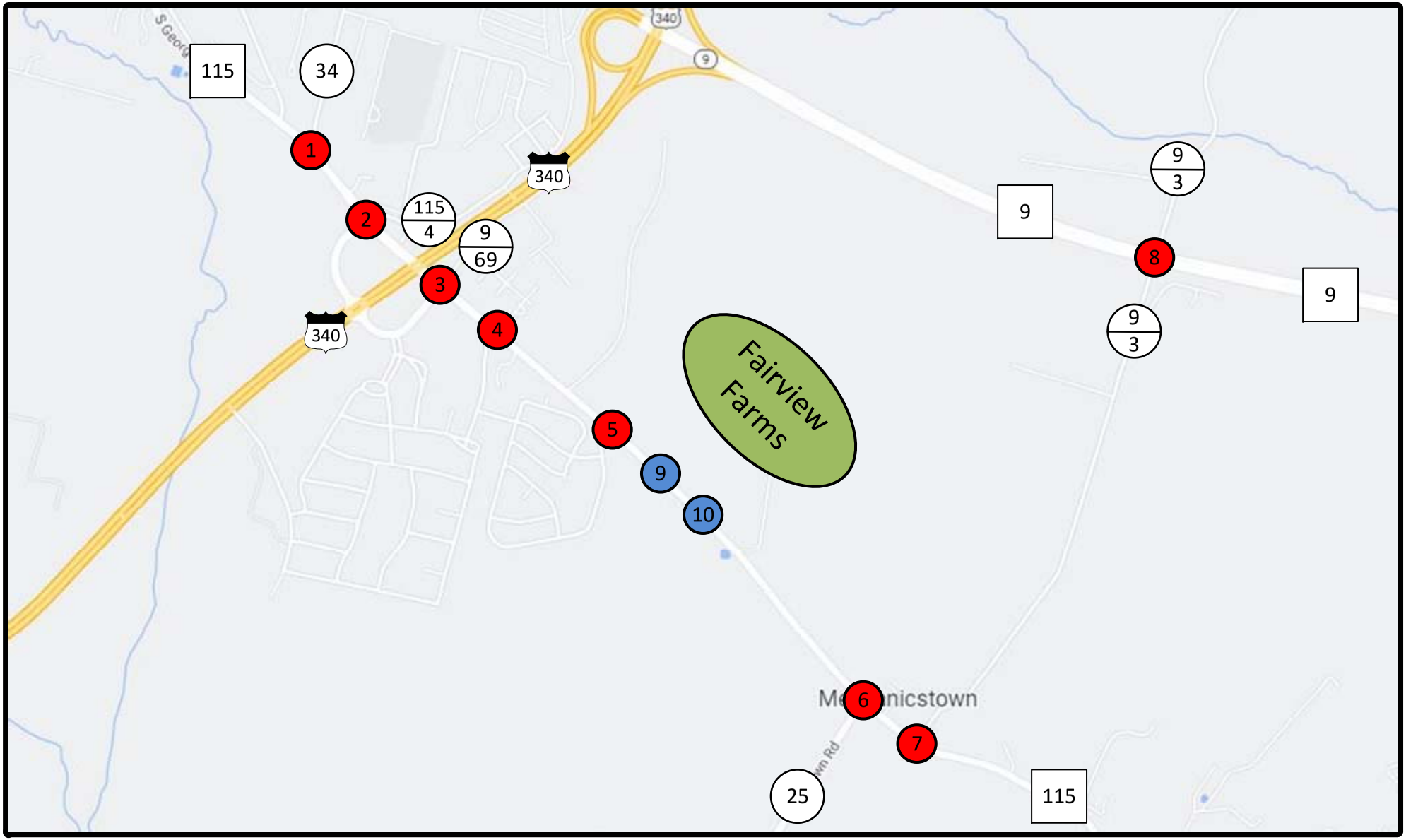
The following eight (8) existing intersections will be included in the study for capacity analysis:

1. WV 115 with Jefferson Avenue (CR 34)
    - Existing: Stop Controlled "T" Intersection
2. WV 115 with Citizens Way (CR 115/4)/US 340 SB Ramps
    - Existing: Roundabout Plus Intersection
3. WV 115 with Hillside Drive (CR 9/69)/US 340 NB Ramps
    - Existing: Stop Controlled Plus Intersection
4. WV 115 with Fairleigh Drive
    - Existing: Stop Controlled "T" Intersection
5. WV 115 with Crosswinds Drive
    - Existing: Stop Controlled "T" Intersection
6. WV 115 with Kabletown Road (CR 25)
    - Existing: Stop Controlled "T" Intersection
7. WV 115 with Cattail Run Road (CR 9/3)
    - Existing: Stop Controlled "T" Intersection
8. WV 9 with Cattail Run Road (CR 9/3)
    - Existing: Stop Controlled Plus Intersection

The following two (2) new intersections will be included in the study for capacity analysis:

9. WV 115 with Site Drive #1
    - Proposed: Stop Controlled "T" Intersection
10. WV 115 with Site Drive #2
    - Proposed: Stop Controlled "T" Intersection

Figure 1 shows the study area and key intersections. Figure 2 shows the current overall conceptual site plan with proposed access. Figure 3 shows the current conceptual site plan for the commercial section of the property with proposed access.



LEGEND

= Development

= Existing Intersection

= Proposed Intersection

N

NOT TO SCALE

Fairview Farms TIS

Site Location Map

DATE: August 2022

FIGURE 1

267 SINGLE FAMILY LOTS

200 TOWNHOUSE LOTS

Neighborhood Residential Land Use Mix Requirements				
	Requirement*		Provided	
Use	%	Acres	%	Acres
Residential	50	58.08	0.50	58.09
Commercial	10	11.62	0.10	11.62
Open Space*	10	7.75	0.13	10.17

*Per Ordinance, 10% of "usable land (Net Buildabal Land Area)" required for open space.

150 75 0 150 300 450

GRAPHICAL SCALE: 1" = 150'

NORTH

COMPREHENSIVE PLAN ROAD
LIMITED ACCESS
(80' RIGHT-OF-WAY)

SWM

SWM

SWM

CENTRAL
OPEN SPACE
(3.42 ACRES)

SWM

COMMERCIAL LOT #1
(3.76 ACRES)

COMMERCIAL LOT #2
(5.44 ACRES)

WATER PLANT DEDICATION
(2.42 ACRES)

SWM

15' WIDE ROAD RIGHT-OF-WAY
RESERVATION (ROUTE 115)

Intersection #5 – WV 115 & Crosswinds Dr (Full Access)

Intersection #9 – WV 115 & Site Drive #1 (Full Access)

Intersection #10 – WV 115 & Site Drive #2 (Full Access)

Intersection #6 – WV 115 & Kabletown Rd (Full Access)

SINGLE FAMILY LOT (110' DEPTH)

TOWNHOUSE LOT (100' DEPTH)

COMMON OPEN SPACE

STORMWATER MANAGEMENT

COMMERCIAL LOT

Fairview Farms TIS

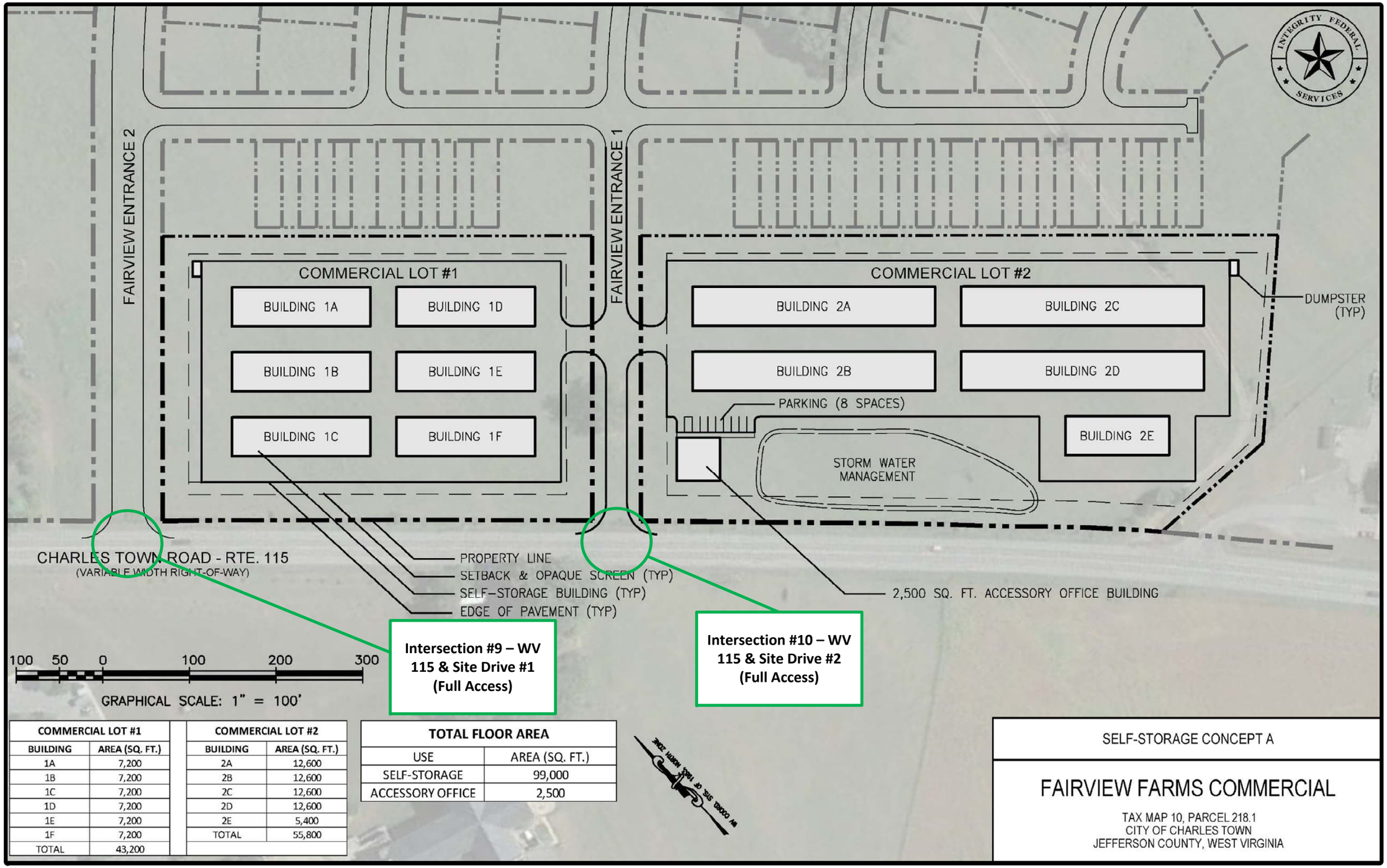
Overall Site Plan

DATE: August 2022

FIGURE 2

N

NOT TO SCALE



COMMERCIAL LOT #1	
BUILDING	AREA (SQ. FT.)
1A	7,200
1B	7,200
1C	7,200
1D	7,200
1E	7,200
1F	7,200
TOTAL	43,200

COMMERCIAL LOT #2	
BUILDING	AREA (SQ. FT.)
2A	12,600
2B	12,600
2C	12,600
2D	12,600
2E	5,400
TOTAL	55,800

TOTAL FLOOR AREA	
USE	AREA (SQ. FT.)
SELF-STORAGE	99,000
ACCESSORY OFFICE	2,500

SELF-STORAGE CONCEPT A

FAIRVIEW FARMS COMMERCIAL

TAX MAP 10, PARCEL 218.1
CITY OF CHARLES TOWN
JEFFERSON COUNTY, WEST VIRGINIA

Fairview Farms TIS

Site Plan – Commercial Property

DATE: August 2022

FIGURE 3

NOT TO SCALE

Existing Traffic Data Collection

Peak hour turning movement counts at each existing intersection will be collected on a typical Friday when Jefferson County Schools are in session between the hours of 7AM to 9AM and 3PM to 6PM. New Turning Movement counts will be collected at the following locations:

- WV 115 with Jefferson Avenue (CR 34)
- WV 115 with Citizens Way (CR 115/4)/US 340 SB Ramps
- WV 115 with Hillside Drive (CR 9/69)/US 340 NB Ramps
- WV 115 with Fairleigh Drive
- WV 115 with Crosswinds Drive
- WV 115 with Kabletown Road (CR 25)
- WV 115 with Cattail Run Road (CR 9/3)
- WV 9 with Cattail Run Road (CR 9/3)

Trip Generation

The proposed site will be a self-storage facility comprising 99,000 square feet of storage units, 267 single-family homes, and 200 townhomes (See Figure 2 and Figure 3). Peak hour trip generation will be determined using trip rate data from the latest version of the ITE Trip Generation Manual using Land Use Codes (LUC) 157 (Self Storage Facility), 210 (Single-Family Detached Housing), and 220 (Multi-Family Housing).

Trip Distribution

The site-generated trips to and from the proposed residential development will be distributed in accordance with the existing traffic patterns and land uses in the vicinity of the study area. Proposed trip distribution based upon current conditions is as follows:

- 25% to/from the north on US 340
- 25% to/from the south on US 340
- 15% to/from the east on WV 9
    - 10% to/from north via Cattail Run Road
    - 5% to/from north via US 340
- 30% to/from the west on WV 115
- 5% to/from the east on WV 115

This proposed distribution results in an 15/85 east/west split for traffic entering the site from WV 115. Trip distribution will be confirmed once turning movement data is collected and discussed with WVDOH prior to submission of the preliminary TIS document.

Site Access

Access to the site is proposed to be provided by two (2) site access points. Each of these are detailed below:

Site Drive #1 (Site Access 1)
Site Drive #1 is proposed as a full movement two-way approach to WV 115 near the western end of the parcel. Site Drive #1 is to be located approximately 630 feet east of Crosswinds Drive.

Site Drive #2 (Site Access 2)
Site Drive #2 is proposed as a full movement two-way approach to WV 115 near the eastern end of the parcel. Site Drive #2 is to be located approximately 1,270 feet east of Crosswinds Drive.

Approved Developments

The TIS will potentially include any applicable approved or pending TIS documents for projects in the vicinity of this proposed development, as determined by WVDOH. Preliminary adjacent pending developments will include the following:

- Magnolia Springs TIS (parcel north of WV 115 and east of US 340)
- Jefferson Heights South TIS (parcel east of CR 34 near Belvedere Farms Lane)
- Kings Crossing TIS (parcel opposite proposed development along WV 115)

Additional Data Needs

The following information is requested in order to complete the analysis for this project:

- Any potential DOH improvement projects planned in this area

Local Government Coordination

AMT will provide the preliminary and final TIS reports to local government in accordance with the pending Development Agreement with *LGI Homes*. The TIS will be provided to the following entities, plus any added through the development agreement process:

- City of Charles Town
- Jefferson County Commission
- Hagerstown Eastern Panhandle MPO (HEPMPO)

Glaser, Caleb

From: Meadows, Donald R <donald.r.meadows@wv.gov>
Sent: Monday, August 15, 2022 9:22 AM
To: Glaser, Caleb
Cc: Cramer, David E; Kenneth L Clohan; Luke I Miller; Trixie A Willis; Alanna J Keller; Kirk, Tim
Subject: Re: Proposed Fairview Farms TIS SOW - Jefferson County

Dave,
Appears the revised SOW submitted by AMT for the proposed Fairview Farms development has adequately addressed our previous comments and the consultant could proceed with the preparation of the study. Let me know if you have any questions or if you need any additional information. THANKS>DON

Donald R. Meadows
West Virginia Division of Highways
Traffic Engineering - Operations
1900 Kanawha Blvd. E.
Charleston, WV 25305
Office Ph: 304-414-7354
Cell Ph: 304-382-3160

On Wed, Aug 3, 2022 at 12:03 PM Glaser, Caleb <cglaser@amtengineering.com> wrote:

> Good Morning Dave,
>
> Attached is a revised Scope of Work for the proposed Fairview Farms Mixed-Use development along the north side of WV 115 in Charles Town, Jefferson County. The revised document details the commercial portion of the site and includes an additional site plan figure for that portion of the development.
>
> In regards to your first two comments below, the northern stub shown in the site plan will ultimately connect with WV 9 but that will not happen for some time and is within the City's Comp plan (would be part of a future unrelated development). For the purposes of this study, site generated traffic is proposed to access the development via WV 115 only. Also, there is currently a shared-use access agreement on the property line in place with the adjacent property owner (Oakland Church).
>
> Please let me know if you have any questions or concerns!
>
> Best Regards,

Caleb Glaser P.E., PTOE

Engineer

P 304-400-4952 **| D** 304-903-7010 **| C** 216-640-5970
W www.amtengineering.com

From: Cramer, David E <david.e.cramer@wv.gov>
Sent: Wednesday, April 27, 2022 4:12 PM
To: Glaser, Caleb <cglaser@amtengineering.com>
Cc: Donald R Meadows <donald.r.meadows@wv.gov>; Kenneth L Clohan <kenneth.l.clohan@wv.gov>; Luke I Miller <Luke.I.Miller@wv.gov>; Trixie A Willis <trixie.a.willis@wv.gov>; Alanna J Keller <Alanna.J.Keller@wv.gov>
Subject: Fwd: Proposed Fairview Farms TIS SOW - Jefferson County

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you verify that the attachment and content are safe.

The results of our review of the proposed scope and the preliminary site plan indicate we have a couple questions/comments. Please review/address each of the following:

- The "Comprehensive Plan Road" extends from this Development site into the adjacent property to the north.
    - This roadway stub is approximately 1600' from the existing stubbed access from WV 9; are there any known plans to ultimately connect to this existing access?
    - Does this Developer have in hand an agreement with the landowner of the property to the north allowing this stub to be constructed within that adjacent property?

- The site plan appears to indicate centerline of proposed westernmost WV 115 access is concurrent with property line. If so, does this Developer have in hand a shared-use access agreement with the adjacent landowner? If TIS analysis includes shared-use access that later is not feasible, Developer may need to submit to DOH new/updated/revised analysis or TIS.
- Some trips (assign 10 percent of the trips) would be anticipated to travel to/from WV 9 to/from the east. Based on proximity to Cattail Run Rd, TIS is to include Cattail Run Rd (CR 9/3) intersections with WV 9 and with WV 115.
- Site plan identifies commercial parcels along WV 115 as part of the Development, but the commercial lots are not included in the trip generation. Any potential development will need to be included within the study.

If additional info is needed, let us know.

Dave

---------- Forwarded message ---------
From: **Glaser, Caleb** <cglaser@amtengineering.com>
Date: Mon, Apr 25, 2022 at 11:13 AM
Subject: Proposed Fairview Farms TIS SOW - Jefferson County
To: Cramer, David E <David.E.Cramer@wv.gov>, Meadows, Donald R <Donald.R.Meadows@wv.gov>, Ken Clohan <kenneth.l.clohan@wv.gov>
Cc: Kirk, Tim <tkirk@amtengineering.com>

Good Morning Dave,

Attached is our proposed Scope of Work (SOW) for a residential project near Charles Town, Jefferson County. The site is proposed to have two site driveways to WV 115 between Crosswinds Drive and Kabletown Road. Please let us know if you have any questions or need additional information.

Best Regards,

Caleb Glaser P.E.

Engineer

P 304-400-4952| **D** 304-903-7010| **C** 216-640-5970
W www.amtengineering.com

--

David E. Cramer, PE

WV Department of Transportation

Commissioner's Office of Economic Development

Interim Director - Aeronautics Commission

1900 Kanawha Boulevard, East

APPENDIX G-2: GROWTH RATE

Glaser, Caleb

From: Skeen, Jeremy P <jeremy.p.skeen@wv.gov>
Sent: Tuesday, May 17, 2022 2:18 PM
To: Glaser, Caleb
Subject: Re: [External] WV 115 Growth Rate - Jefferson County

Caleb,

The same growth rate can be used from the previous year.

Thank you,
Jeremy

On Tue, May 17, 2022 at 9:47 AM Glaser, Caleb <cglaser@amtengineering.com> wrote:

> Good Morning Jeremy,
>
> We have a new TIS starting across from this previous project on WV 115. This is another residential development for a private client and was wondering if we would be able to utilize the same growth rate you provided about a year ago? The site driveways will intersect with WV 115 between Candlewood Drive & Kabletown Road intersections.
>
> Please let me know if this is possible or if the growth rate would've changed in the past year. As always I appreciate your assistance.
>
> Best Regards,
>
> **Caleb Glaser** P.E.
>
> Engineer
>
> **P** 304-400-4952 **| D** 304-903-7010 **| C** 216-640-5970
> **W** www.amtengineering.com
>
> **From:** Skeen, Jeremy P <Jeremy.P.Skeen@wv.gov>
> **Sent:** Wednesday, May 5, 2021 7:36 AM
> **To:** Glaser, Caleb <cglaser@amtengineering.com>

Cc: Johnson, Leland W <Leland.W.Johnson@wv.gov>
Subject: RE: [External] WV 115 Growth Rate - Jefferson County

Caleb,

According to the MPO Model of Jefferson County, the growth rate of WV 115 just East of the US 340 interchange is: 1.1978%

Thanks,

Jeremy

From: Johnson, Leland W <Leland.W.Johnson@wv.gov>
Sent: Friday, April 30, 2021 1:18 PM
To: Skeen, Jeremy P <Jeremy.P.Skeen@wv.gov>
Cc: cglaser@amtengineering.com
Subject: FW: [External] WV 115 Growth Rate - Jefferson County

Jeremy,

Please handle this request.

Leland

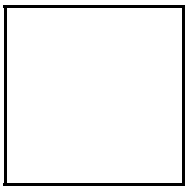
From: Glaser, Caleb <cglaser@amtengineering.com>
Sent: Friday, April 30, 2021 1:16 PM
To: Johnson, Leland W <Leland.W.Johnson@wv.gov>
Cc: Elsayed, Gehan M <Gehan.M.Elsayed@wv.gov>
Subject: [External] WV 115 Growth Rate - Jefferson County

CAUTION: External email. Do not click links or open attachments unless you verify sender.

Good Afternoon Leland,

Could you provide the anticipated annual traffic growth rate for WV 115 in Jefferson County at the US 340 interchange? We are preparing a TIS for a residential development just east of the interchange. In June 2019 you provided us with a growth rate in this area at 1.31% and was unsure if it would've changed.

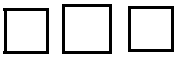
Thank you,



Caleb Glaser EIT

Engineer

P 304-400-4952 **| D** 304-903-7010 **| C** 216-640-5970
W www.amtengineering.com



APPENDIX G-3: COMMENT RESOLUTION

Glaser, Caleb

From: Keller, Perry J <perry.j.keller@wv.gov>
Sent: Tuesday, May 30, 2023 1:26 PM
To: Glaser, Caleb
Cc: Meadows, Donald R; Ken Clohan; Kirk, Tim
Subject: Re: 2023_03_28, Fairview Farms TIS, Preliminary

Follow Up Flag: Follow up
Flag Status: Flagged

1. The DOH already has a project programmed to construct a single lane roundabout at the intersection of WV 115 with Hillside Dr/US 340 NB Connector. This improvement is anticipated to be in place prior to the 2030 No Build Conditions (currently estimated for construction in 2025). TIS currently identifies this as a 2030 Build Improved Conditions project. It is recommended this project be included in the TIS beginning with the 2030 No Build Conditions so that it can be determined if this development is projected to negatively impact the intersection. Also, TIS appears to indicate this improvement to accommodate the Kings Crossing development, however, this improvement was initially discussed internally and ultimately recommended based on information within the Magnolia Springs development TIS.

2. Related to above, in both the Executive Summary and Conclusions sections of the TIS, while it indicates DOH should proceed with planned roundabout at Hillside Dr to address existing capacity issues, it then indicates that an exclusive right turn slip lane on WV 115 EB approaching US 340 NB Connector should be constructed to accommodate additional future volumes unrelated to the Fairview Farms development. It then states that the WV 115 EB approach is anticipated to operate at LOS E in the 2030 No-Build Conditions. Considering the roundabout currently is not included in the analyses (to our knowledge) until the 2030 Build Improved Conditions, this statement causes some level of confusion concerning this proposed improvement. This is further reasoning for the planned roundabout to be included in the TIS and all analyses beginning with the 2030 No-Build scenario.

3. It appears that the included site plan incorrectly refers to a proposed intersection of WV 115 with Kings Crossing as the intersection of WV 115 with Kabletown Rd.

4. Based on the proximity of the Fairview Farms and Kings Crossing developments and the turn lanes proposed along WV 115 for their approaches, its recommended the two developers engage in discussions to implement a section of TWLTL along WV 115 in lieu of multiple exclusive left turn lanes.

5. Although no direction has been provided to date, for the revised TIS and any future TIS, its preferred for any SIDRA analyses that the Site Layout, Intersection Summary, and Lane Summary reports be provided as part of the appendices.

6. Verify TIS has been provided to any appropriate local entity (City, County, MPO) and provide copies of any comments received and how they were addressed.

- Table 1 on page 14 lists US 340 as Williamsport Pike and it should be changed to Berryville Pike.
- Double-check the number of trips for the 200 townhomes since the numbers do not appear to be correct in Table 2 on page 20.

Consultant should address the above comments, as well as any provided by the District, and submit a revised TIS for further review/approval. Let me know if you have any comments or if you need any additional information.

On Tue, Mar 28, 2023 at 8:50 AM Glaser, Caleb <cglaser@amtengineering.com> wrote:

> Good Morning Perry,
>
> On behalf of LGI Homes, attached is the Preliminary Traffic Impact Study (TIS) for the Fairview Farms mixed-use development in Jefferson County. This study is prepared in accordance with the approved SOW document (attached) with WVDOH. In accordance with the SOW, a copy of the study is being provided to the Jefferson County Commission, City of Charles Town, and HEPMPO for comment. All relevant files have been uploaded to ProjectWise.
>
> Please let me know if you have any questions or need additional information.
>
> Best Regards,
>
> **Caleb Glaser** P.E., PTOE
>
> Project Engineer
>
> **P** 304-400-4952| **D** 304-903-7010| **C** 216-640-5970
> **W** www.amtengineering.com

--

Perry J. Keller

Chief Economic Development Officer

Commissioner's Office of Economic Development

Building 5, Room 110

1900 Kanawha Blvd., E.

Charleston, WV 25305

304.414.6925 (o)

August 04, 2023

Mr. Perry J. Keller
WV Department of Transportation
Commissioner's Office of Economic Development
1900 Kanawha Boulevard, East
Building 5, Room 164
Charleston, West Virginia 25305

Re: Traffic Impact Study
Fairview Farms
Charles Town, Jefferson County
AMT File No.: 22-0225.001

Dear Mr. Keller:

This letter is in reference to your email dated May 30, 2023 transmitting review comments regarding the Traffic Impact Study for the Fairview Farms development prepared by A. Morton Thomas and Associates, Inc. (AMT). Following are responses and intended resolution to your comments:

1) *The DOH already has a project programmed to construct a single lane roundabout at the intersection of WV 115 with Hillside Dr/US 340 NB Connector. This improvement is anticipated to be in place prior to the 2030 No Build Conditions (currently estimated for construction in 2025). TIS currently identifies this as a 2030 Build Improved Conditions project. It is recommended this project be included in the TIS beginning with the 2030 No Build Conditions so that it can be determined if this development is projected to negatively impact the intersection. Also, TIS appears to indicate this improvement to accommodate the Kings Crossing development, however, this improvement was initially discussed internally and ultimately recommended based on information within the Magnolia Springs development TIS.*

   Acknowledged. This Revised TIS Report includes the proposed roundabout within No-Build conditions and onward. The Revised TIS Report has been modified to indicate the project is DOH planned and is expected to be constructed in 2025.

2) *Related to above, in both the Executive Summary and Conclusions sections of the TIS, while it indicates DOH should proceed with planned roundabout at Hillside Dr to address existing capacity issues, it then indicates that an exclusive right turn slip lane on WV 115 EB approaching US 340 NB Connector should be constructed to accommodate additional future volumes unrelated to the Fairview Farms development. It then states that the WV 115 EB approach is anticipated to operate at LOS E in the 2030 No-Build Conditions. Considering the roundabout currently is not included in the analyses (to our knowledge) until the 2030 Build Improved Conditions, this statement causes some level of confusion concerning this proposed improvement. This is further reasoning for the planned roundabout to be included in the TIS and all analyses beginning with the 2030 No-Build scenario.*

   Acknowledged. Revised analysis with the single-lane roundabout at Intersection 3 indicates an excessive queue length is expected on the WV 115 eastbound approach during 2030 No-Build conditions. The proposed improvement of an exclusive right-turn lane (shown in 2030 Build Improved conditions) on the approach would mitigate this issue.

3) *It appears that the included site plan incorrectly refers to a proposed intersection of WV 115 with Kings Crossing as the intersection of WV 115 with Kabletown Rd.*

Acknowledged. The figure has been modified within the Revised TIS Report.

4) *Based on the proximity of the Fairview Farms and Kings Crossing developments and the turn lanes proposed along WV 115 for their approaches, its recommended the two developers engage in discussions to implement a section of TWLTL along WV 115 in lieu of multiple exclusive left turn lanes.*

Acknowledged. The Kings Crossing TIS states that an exclusive left-turn lane be constructed on WV 115 westbound approach to Site Drive #2, which is approximately 1,300 feet east of Site Drive #2 for the Fairview Farms development. I do not believe it makes sense for the two developers to contribute to a TWLTL section between these two site driveways and should simply construct the exclusive left-turn lanes as described in their respective TIS reports.

5) *Although no direction has been provided to date, for the revised TIS and any future TIS, its preferred for any SIDRA analyses that the Site Layout, Intersection Summary, and Lane Summary reports be provided as part of the appendices.*

Acknowledged. All described reports are included in the Revised TIS Report and for all future TIS projects.

6) *Verify TIS has been provided to any appropriate local entity (City, County, MPO) and provide copies of any comments received and how they were addressed.*

The TIS was submitted to the City of Charles Town (James Newman), Jefferson County (Jennifer Brockman), and HEPMPO (Matt Mullenax) on March 28th. No comments were provided by any of the offices.

Please let us know if you have any additional questions or desire clarification of any information provided in this response to your comments regarding the Fairview Farms Revised TIS. We are available at your convenience to discuss this project.

Sincerely,
A. Morton Thomas and Associates, Inc.



Caleb Glaser, P.E., PTOE
Engineer
cglaser@amtengineering.com

cc: Mike Dropik (LGI)
Tom Evans (IGS)

Kimley»Horn

Memorandum

To: Mark A. McDonald
Integrity Federal Services
148 S. Queen Street, Suite 201
Martinsburg, WV 25401

From: Mark Phillips, P.E.
Olivia A. Smith

Through: James Newman
City of Charles Town
101 E Washington Street
Charles Town, WV 25414

Date: April 10, 2023

Subject: Fairview Sketch Plan Review

This memorandum summarizes our review of the Sketch Plan for the Fairview Development (dated March, 2023, prepared by Integrity Federal Services) for a proposed development of 184 townhouses, 266 single family detached units and 2 commercial lots on approximately 113.65 acres. The site is currently zoned Neighborhood Residential (NR) per the City of Charles Town Zoning Ordinance dated June 18, 2012 (Rev. July 6, 2020). This application proposes a by-right development of approximately 13.71 acres of property.

Kimley-Horn's review of this application is limited to the Sketch Plan and Application provided. Based upon our review, we have no comments on the materials provided.

Thank you for the opportunity to review this Sketch Plan. Please feel free to contact us at 703-870-3631 should you have any questions.

KIMLEY-HORN & ASSOCIATES, INC.



Mark Phillips, P.E.
Project Manager, Associate

James Newman

December 19, 2023

To: City of Charles Town Planning Commission

From Ron and Lyn Widmyer

Subject: Sketch Plan, LGI Homes "Fairview"

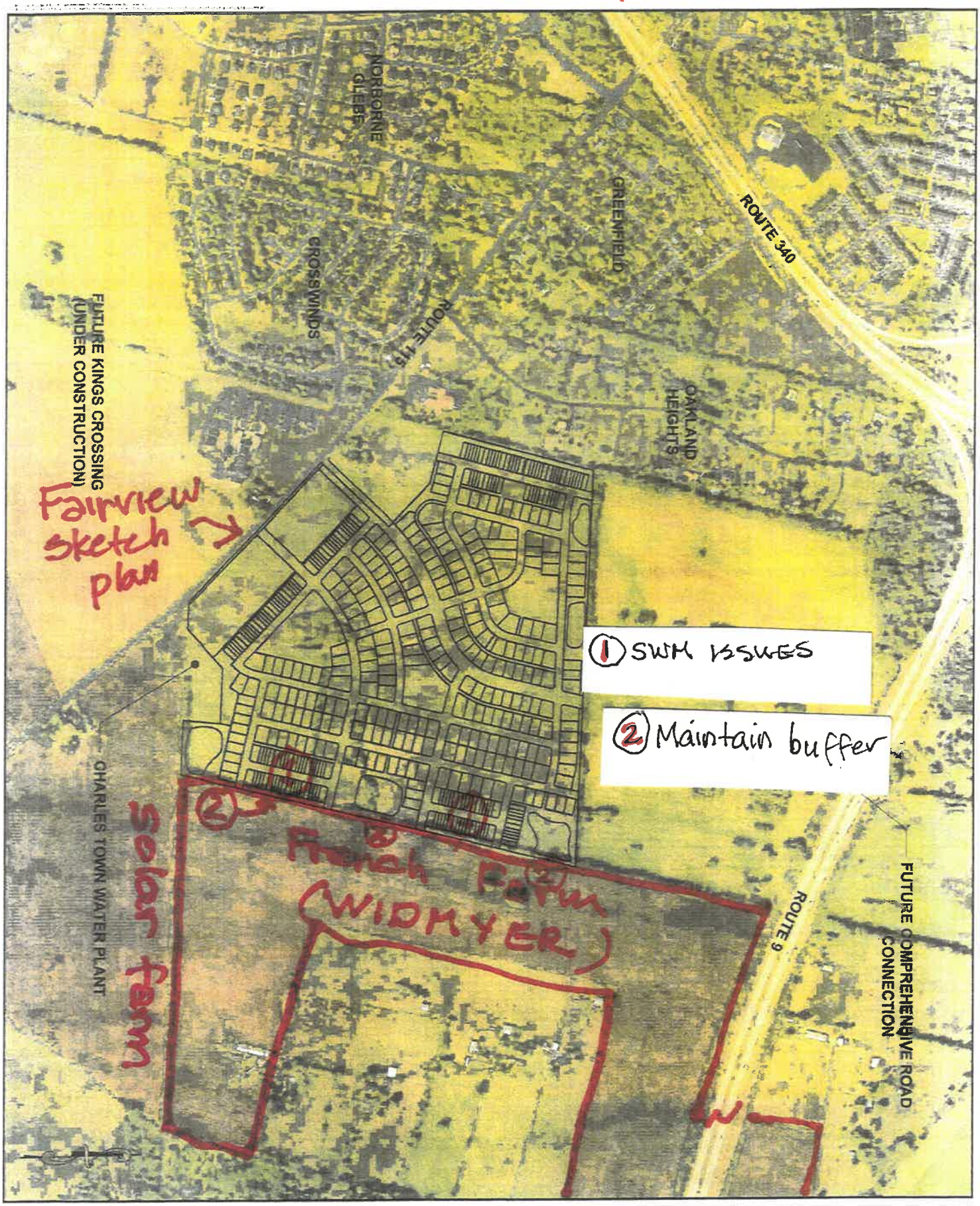
We are adjoining property owners of the subject application. (see Attachment 1) The property has been farmed by Ron for almost 50 years. . We commented on the annexation proposal for the Fairview property in 2009 and we have many of the same concerns. They are:

1. Stormwater management. Run off from some of the townhouse clusters will drain directly onto our property which is active farmland (see Attachment 1). No mention of this is made in the sketch plan and in fact no reference at all is made to the fact that rh property adjoins active farmland.
2. Buffer between townhomes and active farm fields. Townhouses will adjoin an active farming operation. The existing tree line should be preserved, protected, and enhanced (see Attachment 2) to 60 feet. .The city zoning ordinance appears to have no buffering standards for development adjoining farmland.
3. Relationship to existing and future development on adjoining properties. There is no map or discussion as to how the development relates to proposed development on adjacent properties.. The proposed plan for Shenandoah Crossing, submitted in 2009, is shown in Attachment 2. The Plan for Fairview also does not show the solar farm underway as an adjoining property use.
4. Transportation issues There is no area-wide transportation vision. Roads dead end at the property line. Are these the most suitable locations for a future thoroughfares? How will these roads connect with future planned development?
5. Lack of greenway and trail concept. There is no trail or greenway concept that relates to an overall park vision for this part of the city. Has this plan been referred to the Parks and Recreation Committee?

The subject sketch plan is submitted without thoughtful consideration of the city's vision for this part of the city and ignores the needs of a working farm in terms of buffering and stormwater management. We hope the Planning Commission will direct the applicant to address these concerns in the next phase of development.

Hopefully, the map presented to the Planning Commission on December 27 will include existing and proposed development adjoining this property If they are to be successful and meaningful, roads, trail systems and green networks should be planned in a comprehensive fashion and each subdivision reviewed to implement this broader vision.

Attachment 1



15 OF 15	AERIAL OVERLAY FAIRVIEW SKETCH PLAN CITY OF CHARLES TOWN, WEST VIRGINIA TAX MAP 10, PARCEL 218.1 (D.B. 1089, PG 144)	4-18-2023 REVISED PER CITY COMMENTS 10-11-2023 REVISED PER CITY COMMENTS & REVISED COA	INTEGRITY FEDERAL SERVICES CIVIL ENGINEERING • LANDSCAPE ARCHITECTURE • PLANNING



SCALE	HORIZ. NTS VERT
DATE	MARCH 2023
JOB	FAIRVIEW
DRAWN	BC
CHECK	CW
CADD	
INCS	
SHEET	15 OF 15

AERIAL OVERLAY

CITE # 2023-04

FAIRVIEW SKETCH PLAN

CITY OF CHARLES TOWN, WEST VIRGINIA
TAX MAP 10, PARCEL 218.1 (D.B. 1089, PG 144)

4-18-2023 REVISED PER CITY COMMENTS
10-11-2023 REVISED PER CITY COMMENTS & REVISED COA

REVISIONS

SEAL

INTEGRITY FEDERAL SERVICES
CIVIL ENGINEERING • LANDSCAPE ARCHITECTURE • PLANNING

Planning Commission
101 East Washington Street
Charles Town, WV 25414

SCHEDULED

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

AGENDA ITEM (ID #)

Public Hearing: *TXA2024-02* - Neighborhood Residential update

ATTACHMENTS:
- 1. Report.pdf

TXA2024-02

Neighborhood Residential Commercial Requirements

Date: For the February 26, 2024 Planning Commission meeting
Report by: James Newman, City Planner, Zoning/Subdivision Administrator.

ISSUE

While the NR zoning district requires that 10% of the area under development be set aside for Neighborhood Commercial uses. Neighborhood Commercial is a Zoning District which permits residential and non-residential uses. The10% requirement does not specify that such Neighborhood Commercial uses must be commercial in nature, and must be corrected.

PURPOSE

The purpose of the NR District is to provide for a mix of housing types and related services and Uses, including Commercial Uses and office services. It is the intent of the zoning classification to allow mixed development on undeveloped land and, where applicable as may be further described in this Ordinance, the Redevelopment of specific parcels within the City.

The NR District applies to parcels or tracts larger than five (5) acres. The intent is to create a cohesive pattern of primarily residential development that allows a mix of Uses, including neighborhood servicing Commercial and office Uses and/or Commercial and office Uses that complement the primarily residential character of the neighborhood.

CITY COUNCIL

On January 17, 2024, City Council referred this item to the Planning Commission for discussion and eventual public hearing.

PLANNING COMMISSION

The Planning Commission discussed this item as part of their January 30, 2024 work session.

SECTION 1332.08 NEIGHBORHOOD RESIDENTIAL

Purpose: The purpose of the NR District is to provide for a mix of housing types and related services and Uses, including Commercial Uses and office services. It is the intent of the zoning classification to allow mixed development on undeveloped land and, where applicable as may be further described in this Ordinance, the Redevelopment of specific parcels within the City. The NR District applies to parcels or tracts larger than five (5) acres. The intent is to create a cohesive pattern of primarily residential development that allows a mix of Uses, including neighborhood servicing Commercial and office Uses and/or Commercial and office Uses that complement the primarily residential character of the neighborhood.

TEXT AMENDMENT

The proposed text amendment is in red below:

Section 1322.08, Neighborhood Residential (NR) District

…

(B) *Application*:

…

3. The NR District must contain a mix of Uses compatible with surrounding Uses, particularly existing residential neighborhoods adjoining the proposed development or Redevelopment. At least fifty percent (50%) of the total area must be residential, ten percent (10%) of the total usable land area must be Open Space and not less than ten percent (10%) of the total area must be comprised of ~~Neighborhood Commercial~~ non-residential uses. A market assessment substantiating the proposed mix of residential, Commercial and Open Space Uses shall be submitted with the application;

Planning Commission
101 East Washington Street
Charles Town, WV 25414

SCHEDULED

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

AGENDA ITEM (ID #)

Commission Review: BR2023-12 - Norborne Glebe Phase 15 Bond Reduction

ATTACHMENTS:

- 1. Staff Report.pdf
- 2. Performance Application.pdf
- 3. Performance Estimate.pdf
- 4. Land Disturbance Application.pdf
- 5. Land Disturbance Estimate.pdf
- 6. KH Review.pdf

Bond Reduction Request
BR2023-12

Date: For the February 26, 2024 Planning Commission Meeting
Applicant: Gary Endler on behalf of Arcadia Land Inc.
Report by: James Newman, City Planner, Zoning/Subdivision Administrator.
Proposal: Bond reductions for performance and land disturbance bonds

Norborne-Glebe Phase 15



BACKGROUND
The applicant has submitted a bond reduction request for their performance and land disturbance bonds for Norborne-Glebe subdivision Phase 15.

Upon review of the request the City Engineer, Kimley-Horn, has determined that the bond amount is a reasonable assessment of the work completed thus far.

Existing Performance Bond: $3,086,207.27
Proposed Performance Bond: $1,342,383.94
Reduction Amount: $1,743,823.34

Existing Land Disturbance Bond Amount: $271,159.22
Proposed Land Disturbance Bond Amount: $19,519.16
Reduction Amount: $251,640.06

BOND COMMITTEE
The Bond Committee reviewed this item at their February 20, 2024 meeting. The Committee recommended approval of the bond reduction request.

STAFF RECOMMENDATION
The City Engineer and City Staff have reviewed the bond reduction request and recommend the bond reduction request be **approved**.

Bond Request No._____

Norborne Glebe - Phase 15
Performance Bond

BOND REQUEST AND REDUCTION

To assist the Subdivision Administrator in the review of a Bond Request Application, the Applicant must utilize this form to supply the City with the information prescribed under Article 1335 and Section 1332 of the Subdivision and Land Development Ordinance. The submission of this form, along with the prescribed information and required fees, shall serve as the Applicant's Bond Request Application as required by Ordinance Article 1335.

1. DATE December 14, 20 23

2. APPLICATION TYPE ☐ Bond | Initiation ☒ Bond | Reduction

☐ Bond | Reallocation ☐ Bond | Release**

3. PROJECT NAME Norborne Glebe Subdivision - Phase 15

Address N/A

4. APPLICANT'S NAME* Arcadia Land, Inc. Attn: Gary Endler

Address 108 N. George Street - 2nd Floor Charles Town, WV 25414

Telephone Number (703-771-8000 Fax Number (___)

Email Address gendler@arcadiacompanies.com

5. PROPERTY OWNER'S NAME Arcadia Land, Inc, Attn: Gary Endler

Address 108 N George Street - 2nd Floor Charles Town, WV 25414

Telephone Number (703-771-8000 Fax Number (___)

Email Address gendler@arcadiacompanies.com

*Applicants include: Property owner(s), Engineer(s), Surveyor(s), or Consultant(s)

**Requires a Public Hearing and landscaping surety for one year after release

Bond Request No._____

6. DESCRIPTION OF REQUETED INITIATION, REDUCTION, OR RELEASE:

Requesting Bond Amount Reduction for the Performance Bond for Phase 15, Norborne Glebe Subdivision

7. A) CURRENT BOND AMOUNT $3,086,207.27

B) PROPOSED BOND AMOUNT $1,342,383.94

8. PARCEL INVENTORY: (List all parcels that are part of this application):

Tax Map No.	Parcel No.	Deed Book	Page No.	Zoning District
Phase 15	3-12-209.4	1173	85	NR

9. PARCEL HISTORY: (List all pending or previously approved applications on the subject parcels inventoried above, including previous plat applications if this application is an amendment)

Application No.	Project Name and Phase	Status	Approval Date

10. BOND RELEASE ATTACHMENTS.

The following shall be included with this request:

A. To the extent not previously submitted pursuant to bond reduction request, copies of inspection and test reports if work was inspected and tested by a third-party inspector.

B. Certification that all bonded Improvements, other than Improvements accepted by West Virginia Department of Highways (WVDOH), have been completed in accordance with the approved plans, profiles, and specifications and the requirements of any applicable manual. For Improvements to be accepted for maintenance by WVDOH, such Certification shall state that the Improvements have been installed and inspected in accordance with WVDOH's requirements.

C. A copy of the City-approved As-Built Drawings as required for facilities within public rights-of-way or Easements submitted pursuant to Section 1332.10 of this Ordinance.

Date of As-Builts _____ Prepared By _____

D. A letter from a Professional Engineer or Professional Land Surveyor certifying that property corners and Monuments have been set as required under this Ordinance.

E. Documentation of acceptance by WVDOH for public roadways and rights-of-way, or a maintenance and indemnification agreement and bond approved by the Planning Commission for public roadways that have been completed in accordance with WVDOH standards but which, due to factors other than their quality of construction, are not eligible for acceptance by WVDOH.

F. For private roadways, a letter of acceptance by the entity responsible for maintenance and a Latent Defects Indemnification Agreement and Bond in accordance with this Section.

G. Private Roadway Maintenance Bonds. Before a Performance Agreement and surety for private roadway construction shall be released, a Latent Defects Indemnification Agreement and Bond shall be provided by the applicant/Developer and approved by the Planning Commission. The guarantee provided by such Agreement and Bond must be for a period of two (2) years following the date of performance bond release, and must be in an amount equal to no less than 5% of the original performance bond estimate in accordance with Section 1335.07 (F) of the Subdivision Ordinance.

H. Landscaping Surety. Surety is required to ensure the landscaping shown on the Major S/LD plans is maintained for one (1) year. The one (1) year shall start from the date at which the surety for the site has been released, with the exception of this landscaping surety. The landscaping surety amount shall not be less than $5,000.00 or 10% of the total landscaping cost for the project, which every is greater.

Bond Request No._____

APPLICANT CERTIFICATION

I certify that, to the best of my knowledge, the submitted information and statements are true and correct. I also certify that I have received and read Article 1335 of the S/LD Ordinance.

Signature of Applicant

_____ Date _____

Signature of Property Owner (If different than Applicant)

_____ Date _____

Please submit an original completed Application, 1 digital copy and 1 paper copy of the As-Built Plans (if applicable) to the following:

Subdivision Administrator
City of Charles Town
101 E. Washington Street
Charles Town, WV 25414

Please also send a copy of the completed Application as well as the As-Builts to the following:

Hatch/Chester Engineers
Attn: Elizabeth Adamowicz
705 Quince Orchard Road, Suite 310
Gaithersburg, MD 20878

FOR CITY USE ONLY

Application Number:_____ Date Application Received:_____

Fee: $_____ Check No._____

Receipt No._____

Site Inspection Date:_____ Inspector:_____

Subdivision Administrator Approval:_____ Date:_____

Engineer Approval:_____ Date:_____

Planning Commission Approval:_____ Date:_____

City Council Approval:_____ Date:_____

Comments:_____

_____

_____

_____

_____

CITY OF CHARLES TOWN

PUBLIC IMPROVEMENT BOND UNIT COST LIST AND BOND REDUCTION FORM

This form shall be used to calculate the amount of the bond required to guarantee public improvements to be constructed under the approved Final S/LD Application. This form shall also be used in calculating the amount of bond reductions to be approved by the Planning Commission. **Note**: No bond shall be reduced until completion of at least thirty (30) percent of the physical
Improvements secured by the bond.

PROJECT NAME:	Norborne Glebe - Phase 15
PREPARED BY:	Greenway Engineering
DATE OF SUBMISSION	10/11/2022, Reduction 12/14/2023, Revised 01/18/2024

BOND ESTIMATE					BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION	QUANTITY	EXTENSION	%COMPLETE	% Approved
MOBILIZATION GENERAL								
Mobilization	LS	$6,250.00	1	$6,250.00	0.5	$3,125.00	50%	
Field Office	EA	$3,000.00						
Job Sign	EA	$1,150.00						
SURVEYING								
Steel Pipe Property Corner Marker Incl. Survey	EA	$275.00	355	$97,625.00	0.0	$0.00	0%	
R.O.W. MONUMENTS SURVEYED IN PLACE								
RM -- 1	EA	$825.00						
RM -- 2	EA	$575.00						
EARTHWORK EXCAVATION								
Regular Bulk used as Fill	CY	3.86	28,397.00	$109,612.42	28,397.0	$109,612.42	100%	
Rock, Rip	CY	17.30						
Rock, Blast	CY	38.48						
BORROW MATERIAL								
Buy, Load, Haul 10 Mi. Select Material	CY	28.90						
Fill and Compaction of On-site Borrow	CY	5.95	58,594.00	$348,634.30	58,594.0	$348,634.30	100%	
UNSUITABLE MATERIAL								
Load and Haul, 20 mi R/T	CY	$21.95						
Dump Charge	CY	37.50						
Site Grading	SY	0.75						
CLEAR & GRUB								
Light	AC	6,675.00	20	$133,500.00	20.0	$133,500.00	100%	

Moderate	AC	9,750.00							
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Heavy	AC	$12,250.00							
Very Heavy	AC	$14,250.00							
PLANTING SHRUBS									
18”	EA	$40.00							
24”	EA	$70.00							
TREES									
6’ – 8’ (1-2 in. Caliper)	EA	$400.00	270	$108,000.00		0.0	$0.00	0%	
8’ – 10’ (2.5-3 in. Caliper)	EA	$700.00							
Tree Protection	LF	$9.00							
MISCELLANEOUS SITE IMPROVEMENTS									
RETAINING WALLS									
Timber Wall (Less Than 6 ft)	LF	$325.00							
Dry Rubble RW-1 (H=6')	LF	$450.00							
Mortared Rubble RW-1A (H=6')	LF	$535.00							
Concrete Gravity RW-2 (H=6')	LF	$339.00							
Concrete Gravity RW-3 (H=6')	LF	$378.00							
FENCING									
Std. Fence (H=5’) FR-5	LF	$9.31							
Farm Fence (H=5’) FR-3A	LF	$10.90							
Chain Link Fence (H=6’)FR 2-B	LF	$14.52							
Board Fence (H=6’)	LF	$19.35							
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
TOT LOTS									
Tot Lot	EA	$16,495.00	1	$16,495.00		0.0	$0.00	0%	
STORM DRAINAGE									
STORM SEWER									
NOTE: All pipe unit prices include trench, excavation, bedding, pipe, & backfill									
Rock Excavation for All Pipe Types									
Less than 1,500 CY (Blasting)	CY	$110.00							
More than 1,500 CY (Blasting)	CY	$90.00							
Less than 1,500 CY (Hoe Ram)	CY	$135.00							

More than 1,500 CY (Hoe Ram)	CY	$110.00							
Trench De-watering									
Trench De-watering	LF	$2.95							
RCP CLASS III ROUND T & G W/MASTIC									
12" Pipe (RCP III)									
0' – 8' Cut	LF	$44.50							
8' – 14' Cut	LF	$62.50							
Add cost for Class IV	LF	$0.85							
O-Ring	LF	$5.50							
15" Pipe (RCP III)									
0' – 10' Cut	LF	$49.75							
10' – 16'	LF	$77.50							
Add Cost for Class IV	LF	$0.95							
O-Ring	LF	$5.50							
18" Pipe (RCP III)									
0' – 10' Cut	LF	$50.00							
10' – 16' Cut	LF	$80.00							
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Add Cost for Class IV	LF	$2.00							
O-Ring	LF	$7.00							
21" Pipe (RCP III)									
0' – 10' Cut	LF	$57.50							
10' – 16' Cut	LF	$87.50							
Add Cost for Class IV	LF	$2.75							
O-Ring	LF	$13.00							
24" Pipe (RCP III)									
0' – 10' Cut	LF	$67.50							
10' – 16' Cut	LF	$95.00							
Add Cost for Class IV	LF	$3.15							
O-Ring	LF	$14.00							
27" Pipe (RCP III)									
0' – 10' Cut	LF	$60.00							
10' – 16' Cut	LF	$95.00							
Add Cost for Class IV	LF	$4.00							
O-Ring	LF	$15.00							
30" Pipe (RCP III)									
0' – 10' Cut	LF	$82.50							
10' – 16' Cut	LF	$125.00							
Add Cost for Class IV	LF	$6.00							
O-Ring	LF	$17.25							

33" Pipe (RCP III)									
0' – 12' Cut	LF	$115.00							
10' – 18' Cut	LF	$160.00							
Add Cost for Class IV	LF	$6.50							
O-Ring	LF	$21.95							
36" Pipe (RCP III)									
0' – 12' Cut	LF	$120.00							
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
12' – 18' Cut	LF	$175.00							
Add Cost for Class IV	LF	$7.75							
O-Ring	LF	$22.75							
42" Pipe (RCP III)									
0' – 12' Cut	LF	$140.00							
12' – 18' Cut	LF	$200.00							
Add Cost for Class IV	LF	$12.00							
O-Ring	LF	$35.45							
48" Pipe (RCP III)									
0' – 12' Cut	LF	$155.00							
12' – 18' Cut	LF	$215.00							
Add Cost for Class IV	LF	$12.50							
O-Ring	LF	$43.35							
54" Pipe (RCP III)									
0' – 12' Cut	LF	$190.00							
12' – 18' Cut	LF	$275.00							
Add Cost for Class IV	LF	$18.75							
O-Ring	LF	$44.45							
60" Pipe (RCP III)									
0' – 12' Cut	LF	$225.00							
12' – 18' Cut	LF	$335.00							
Add Cost for Class IV	LF	$22.50							
O-Ring	LF	$48.65							
ELLIPTICAL PIPE – RCP CLASS III									
23" X 14" (18" Equiv-RCP III									
0' – 10' Cut	LF	$75.00							
10' – 16' Cut	LF	$110.00							
Add Cost for Class IV	LF	$16.45							
O-Ring	LF	$43.35							
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved

30" X 19" (24" Equiv-RCP III)									
0' – 10' Cut	LF	$90.00							
10' – 16' Cut	LF	$130.00							
Add Cost for Class IV	LF	$5.95							
O-Ring	LF	$43.35							
38" X 24" (30" Equiv-RCP III)									
0' – 10' Cut	LF	$120.00							
10' – 16' Cut	LF	$167.50							
Add Cost for Class IV	LF	$8.45							
O-Ring	LF	$51.35							
45" X 29" (36" Equiv-RCP III)									
0' – 10' Cut	LF	$165.00							
10' – 16' Cut	LF	$235.00							
Add Cost for Class IV	LF	$11.35							
O-Ring	LF	$53.35							
53" X 34" (42" Equiv-RCP III)									
0' – 12' Cut	LF	$210.00							
10' – 18' Cut	LF	$300.00							
Add Cost for Class IV	LF	$15.35							
O-Ring	LF	$58.95							
60" X 38" (48" Equiv-RCP III)									
0' – 12' Cut	LF	$255.00							
10' – 18' Cut	LF	$375.00							
Add Cost for Class IV	LF	$18.35							
O-Ring	LF	$69.95							
HDPE PIPE									
8" Pipe									
0'-8' Cut	LF	$28.65							
8'-14' Cut	LF	$43.15							
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
12" Pipe									
0'-8' Cut	LF	$38.95	30	$1,168.50		30.0	$1,168.50	100%	
8'-14' Cut	LF	$57.75							
15" Pipe									
0'-8' Cut	LF	$50.25	1,993	$100,148.25		1,993.0	$100,148.25	100%	
8'-16' Cut	LF	$74.85							
18" Pipe									
0'-8' Cut	LF	$66.00	275	$18,150.00		275.0	$18,150.00	100%	
8'-16' Cut	LF	$98.55							
21" Pipe									
0'-8' Cut	LF	$71.45	548	$39,154.60		548.0	$39,154.60	100%	

8'-16' Cut	LF	$106.90							
24" Pipe									
0'-8' Cut	LF	$76.90	606	$46,601.40		606.0	$46,601.40	100%	
8'-16' Cut	LF	$115.25							
30" Pipe									
0'-8' Cut	LF	$91.33	419	$38,267.27		419.0	$38,267.27	100%	
8'-16' Cut	LF	$137.27							
36" Pipe									
0'-8' Cut	LF	$101.68	267	$27,148.56		267.0	$27,148.56	100%	
8'-16' Cut	LF	$152.33							
42" Pipe									
0'-8' Cut	LF	$113.99							
8'-16' Cut	LF	$171.00							
48" Pipe									
0'-8' Cut	LF	$129.55							
8'-16' Cut	LF	$195.66							
60" Pipe									
0'-8' Cut	LF	$275.00	48	$13,200.00		48.0	$13,200.00	100%	
8'-16' Cut	LF								
66" Pipe									
0'-8' Cut	LF	$365.00	94	$34,310.00		94.0	$34,310.00	100%	
8'-16' Cut	LF								
STORM STRUCTURES									
END SECTIONS									
End Section (ES-1), Concrete Pipe Size									
15”	EA	$485.00	1	$485.00					
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
18”	EA	$565.00							
21”	EA	$645.00							
24”	EA	$755.00							
27”	EA	$1,065.00							
30”	EA	$1,195.00	1	$1,195.00		1.0	$1,195.00	100%	
36”	EA	$1,765.00							
42”	EA	$1,795.00							
48”	EA	$2,135.00							
54”	EA	$2,795.00							
60”	EA	$3,455.00	1	$3,455.00		1.0	$3,455.00	100%	
ENDWALLS									
EW-1(Pre-cast) Round Pipe Size									
15”	EA	$800.00							
18”	EA	$1,337.00							

24”	EA	$2,021.00							
30”	EA	$2,133.00							
36”	EA	$2,366.00							
EW-1 Cast in Place [Round Pipe Size]									
15”	EA	$852.00							
18”	EA	$1,053.00							
24”	EA	$1,495.00							
30”	EA	$2,144.00							
36”	EA	$2,383.00							
EW-1A (Pre-Cast) Elliptical Pipe Size									
23” X 14” (18”)	EA	$695.00							
30” X 19” (24”)	EA	$969.00							
38” X 24” (30”)	EA	$1,165.00							
45” X 29” (36”)	EA	$1,445.00							
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
53” X 34” (42”)	EA	$1,840.00							
EW-1A (Cast in Place) Elliptical Pipe Size									
23” X 14” (18”)	EA	$667.00							
30” X 19” (24”)	EA	$939.00							
38” X 24” (30”)	EA	$1,247.00							
45” X 29” (36”)	EA	$1,618.00							
53” X 34” (42”)	EA	$2,109.00							
EW-2 (PreCast) Round Pipe Size									
42”	EA	$5,445.00							
48”	EA	$5,695.00							
54”	EA	$6,660.00							
60”	EA	$7,140.00	1	$7,140.00		1.0	$7,140.00	100%	
72”	EA	$7,990.00							
84”	EA	$9,490.00							
EW-2 (Cast in Place) Round Pipe Size									
42”	EA	$4,723.00							
48”	EA	$6,039.00							
54”	EA	$6,972.00							
60”	EA	$8,179.00							
72”	EA	$10,713.00							
84”	EA	$12,288.00							
(EW-6PC) [Double Pipe] Pipe Size									
2-15”	EA	$999.00							
2-18”	EA	$1,235.00							
2-24”	EA	$1,510.00							

2-30"	EA	$2,165.00							
2-36"	EA	$2,647.00							
MANHOLES									
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Standard Brick Manhole Std Frame & Cover (MH-1)									
6' Depth	EA	$3,750.00							
Depth below 6'	VF	$163.00							
Standard Precast Manhole Std Frame & Cover (MH-2)									
6' Depth	EA	$3,100.00	4	$12,400.00		4.0	$12,400.00	100%	
Depth below 6'	VF	$177.00	1.140	$201.78		1.1	$201.78	100%	
Additional Cost (Amounts in parentheses to be added to the above unit costs)									
Watertight Fr/Cover (Add 110)	EA	$579.00							
Heavy Duty Fr/Cover (Add 82)	EA	$599.00							
DROP INLETS									
Cast in Place 48"									
Drop Inlet (DI-1) 12" – 24" Pipe0-10 VF	EA	$3,697.00	5	$18,485.00		5.0	$18,485.00	100%	
Drop Inlet (DI-1A) 12" – 24" Pipe 10-20 VF	EA	$5,593.00							
Drop Inlet (DI-2) 12" – 24" Pipe0-10 VF, 10' throat	EA	$6,911.00							
Drop Inlet (DI-2A) 12" – 24" Pipe 10-20 VF, 10' throat	EA	$8,833.00	1	$8,833.00		1.0	$8,833.00	100%	
CURB DROP INLETS									
Curb Drop Inlet (DI-3A)									
12"-30" Pipe (Invert Depth (H) =0'-8') Inlet Length 2'-6"	EA	$4,088.00							
Curb Drop Inlet (DI-3AA)									
12"-30" Pipe (Invert Depth (H) =8'-20') Inlet Length 2'-6"	EA	$5,357.00							
Curb Drop Inlet (DI-3B & DI-12) 12"-30" Pipe (Invert Depth (H) =0'-8') Inlet Length									
4'	EA	$4,279.00	1	$4,279.00		1.0	$4,279.00	100%	
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
6'	EA	$4,573.00	14	$64,022.00		14.0	$64,022.00	100%	
8'	EA	$4,889.00	19	$92,891.00		19.0	$92,891.00	100%	
10'	EA	$5,052.00							
12'	EA	$5,227.00							
16'	EA	$5,543.00							

20’	EA	$5,859.00							
Curb Drop Inlet (DI-3BB) 12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length									
4’	EA	$4,276.00							
6’	EA	$4,848.00		$0.00					
8’	EA	$5,429.00		$0.00					
10'	EA	$5,732.00		$0.00					
12’	EA	$6,011.00							
16’	EA	$6,296.00							
20’	EA	$6,599.00							
Curb Drop Inlet (DI-3C) 12”-30” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
6’	EA	$4,013.00		$0.00					
8’	EA	$4,588.00							
10'	EA	$4,893.00	3	$14,679.00		3.0	$14,679.00	100%	
12’	EA	$5,178.00							
16’	EA	$5,766.00							
20’	EA	$6,339.00							
Curb Drop Inlet (DI-3CC) 12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length									
6’	EA	$4,746.00							
8’	EA	$5,293.00							
10'	EA	$5,627.00							
12’	EA	$5,988.00							
16’	EA	$6,772.00							
20’	EA	$7,465.00							
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Curb Drop Inlet (DI-3D)									
12”-30” Pipe (Invert Depth (H) =0’-8’) Inlet Length 2’-6”	EA	$3,633.00							
Curb Drop Inlet (DI-3DD)									
12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length 2’-6”	EA	$4,367.00							
Curb Drop Inlet (DI-3E) 12”-30” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
4’	EA	$4,093.00							
8’	EA	$4,756.00							
10'	EA	$5,724.00							
12'	EA	$5,833.00							
16’	EA	$6,072.00							
20’	EA	$6,709.00							
Curb Drop Inlet (DI-3EE) 12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length									
6’	EA	$7,562.00							
8’	EA	$7,869.00							

10'	EA	$7,999.00							
12’	EA	$8,166.00							
16’	EA	$8,471.00							
20’	EA	$8,767.00							
Curb Drop Inlet (DI-3F) 12”-30” Pipe Inlet Length (Invert Depth (H)=0’-8’)									
6’	EA	$3,765.00							
8’	EA	$4,419.00							
10'	EA	$4,749.00							
12’	EA	$5,085.00							
16’	EA	$5,742.00							
20’	EA	$6,395.00							
Curb Drop Inlet (DI-3FF) 12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length									
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
6’	EA	$8,077.00							
8’	EA	$8,288.00							
10'	EA	$8,480.00							
12’	EA	$8,669.00							
16’	EA	$9,047.00							
20’	EA	$9,446.00							
Curb Drop Inlet (DI-4A) 36”–48” Pipe (Invert Depth (H)=0’-8’) Inlet Length									
4’	EA	$4,868.00							
Curb Drop Inlet (DI-4AA) 36”–48” Pipe (Invert Depth (H)=0’-8’) Inlet Length									
4'	EA	$6,817.00							
Curb Drop Inlet (DI-4B) 36”-48” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
6’	EA	$5,172.00							
8’	EA	$5,499.00							
10'	EA	$5,698.00							
12’	EA	$5,870.00							
16’	EA	$6,221.00							
20’	EA	$6,571.00							
Curb Drop Inlet (DI-4BB) 36”-48” Pipe (Invert Depth (H) =8’-20') Inlet Length									
6’	EA	$10,292.00							
8’	EA	$10,643.00							
10'	EA	$10,810.00							
12’	EA	$10,974.00							
16’	EA	$11,309.00							
20’	EA	$11,669.00							
Curb Drop Inlet (DI-4C) 36”-48” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
8’	EA	$5,612.00							
10'	EA	$5,794.00							
12’	EA	$5,968.00							

16’	EA	$6,315.00							
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
20’	EA	$6,657.00							
Curb Drop Inlet (DI-4CC) 36”-48” Pipe (Invert Depth (H) =8’-20’) Inlet Length									
8’	EA	$13,371.00							
10'	EA	$13,693.00							
12’	EA	$14,097.00							
16’	EA	$14,712.00							
20’	EA	$15,365.00							
Curb Drop Inlet (DI-4D)									
36”-48” Pipe (Invert Depth (H) =0’-8’) Inlet Length 4'	EA	$4,933.00							
Curb Drop Inlet (DI-4DD)									
36”-48” Pipe (Invert Depth (H) =8’-16’) Inlet Length 4'	EA	$9,455.00							
Curb Drop Inlet (DI-4E) 36”-48” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
6'	EA	$5,267.00							
8’	EA	$5,605.00							
10'	EA	$5,896.00							
12'	EA	$6,233.00							
16’	EA	$6,996.00							
20’	EA	$7,695.00							
Curb Drop Inlet (DI-4EE) 36”-48” Pipe (Invert Depth (H) =8’-16’) Inlet Length									
6’	EA	$9,165.00							
8’	EA	$9,495.00							
10'	EA	$9,839.00							
12’	EA	$10,167.00							
16’	EA	$10,838.00							
20’	EA	$11,483.00							
Curb Drop Inlet (DI-4F) 36”-48" Pipe Inlet Length (Invert Depth (H)=0’-8’)									
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
8’	EA	$5,877.00							
10'	EA	$6,209.00							
12’	EA	$6,568.00							
16’	EA	$7,259.00							
20’	EA	$7,963.00							
Curb Drop Inlet (DI-4FF) 36”-48” Pipe (Invert Depth (H) =8’-16’) Inlet Length									
8’	EA	$8,866.00							

10'	EA	$9,147.00							
12’	EA	$9,435.00							
16’	EA	$9,997.00							
20’	EA	$10,584.00							
Median Drop Inlets - CIP									
Median Drop Inlet **(DI-6A)** 12”-24” Pipe Inlet (H=8’)	EA	$4,205.00							
Median Drop Inlet **(DI-6B)** 12”-24” Pipe Inlet (H=8’)	EA	$4,267.00							
Median Drop Inlet **(DI-6C)** 30”-48” Pipe Inlet (H=10’)	EA	$5,589.00							
Median Drop Inlet **(DI-6D)** 30”-48” Pipe Inlet (H=10’)	EA	$5,692.00							
Median Drop Inlet **(DI-7)** Type III Top 12”-42” Pipe Inlet (H=10’)	EA	$5,748.00		$0.00					
Median Drop Inlet **(DI-7A)** Type III Top 12”-42” Pipe Inlet (H=10’)	EA	$6,338.00							
Median Drop Inlet **(DI-7B)** Type III Top 12”-42” Pipe Inlet (H=10’)	EA	$6,797.00							
BOND ESTIMATE						**BOND REDUCTION**			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
MISCELLANEOUS INLETS									
Ditch Drop Inlet, **(DI-5)** Type III Tip 12”-42” Pipe Inlet (H=8’)	EA	$5,226.00							
Standard Yard Inlet **(YI-1)** 12”-48” Pipe (Invert Depth (H)=0’-8’) Inlet Length 4’(No Aprons)	EA	$4,749.00		$0.00					
Add Yard Inlet Apron	THROAT	$255.00							
Standard Yard Inlet **(YI-3)** 12”-48” Pipe (Invert Depth (H)=0’-8’) Inlet Length 4’(No Aprons)	EA	$5,127.00							
Add Yard Inlet Apron	THROAT	$255.00							
CULVERTS									
Single Box Culvert (BC-1A) Fills to 25’									
4’ X 4’	LF	$336.00							
5’ x 5”	LF	$410.00							

6’ X 6’	LF	$498.00							
8’ X 8’	LF	$699.00							
10’ X 10’	LF	$845.00							
Double Box Culvert (BC-2b) Fills to 25’									
4’ X 4’	LF	$566.00							
5’ x 5”	LF	$705.00							
6’ X 6’	LF	$854.00							
8’ X 8’	LF	$1,148.00							
10’ X 10’	LF	$1,411.00							
Oversized Single Box Culvert (BBC-1) Fills to 25’									
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
12’ X 6’	LF	$1,026.00							
12’ X 8’	LF	$1,144.00							
12’ X 10’	LF	$1,239.00							
12’ X 12’	LF	$1,348.00							
Triple Box Culvert (BC-3B) Fills to 25’									
4’ X 4’	LF	$779.00							
5’ x 5”	LF	$965.00							
6’ X 6’	LF	$1,211.00							
8’ X 8’	LF	$1,633.00							
10’ X 10’	LF	$2,488.00							
Quadruple Box Culvert (BC-4B) Fills to 25’									
4’ X 4’	LF	$987.00							
5’ x 5”	LF	$1,225.00							
6’ X 6’	LF	$1,523.00							
8’ X 8’	LF	$1,497.00							
10’ X 10’	LF	$2,835.00							
Standard Wing for Box Culvert (1 Side Only) Height of Box									
4’	EA	$675.00							
5’	EA	$995.00							
6’	EA	$1,337.00							
8’	EA	$2,489.00							
10’	EA	$3,315.00							
Standard Wing for Oversized Box Culvert(BBC-W) Height of Box									
6’	EA	$1,351.00							
8’	EA	$2,189.00							
10’	EA	$3,269.00							
12’	EA	$4,763.00							
MISCELLANEOUS STORM									
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**

ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Connection to Existing Structure									
15"-36" Pipe	EA	$735.00							
42"- 60" Pipe	EA	$1,125.00							
Casing Pipe, Bore and Jack (3/8" wall)									
22" ID (6"-8" Carrier Pipe)	LF	$411.00							
24" ID (10" Carrier Pipe)	LF	$451.00							
30" ID (12" Carrier Pipe)	LF	$569.00							
Plug Pipe									
6" –12" Pipe	EA	$142.00							
15"-36" Pipe	EA	$323.00							
42"- 60" Pipe	EA	$522.00							
Pavement Edge Pipe									
Standard Pipe Underdrain	LF	$19.00							
Riprap									
Dry, Class I, 18"	SY	$47.87	28.00	$1,340.36		28.0	$1,340.36	100%	
Dry, Class II, 18"	SY	$51.46							
Grouted, Class I, 18"	SY	$69.97							
Filter Fabric									
Class I	SY	$3.50							
Class II	SY	$3.00							
Class III	SY	$2.25							
Gabions (No excavation)									
Mattress	CY	$130.00							
Revetment	CY	$164.33							
Wall	CY	$212.25							
Paved Ditch (4" Thick)									
Concrete (Non-reinforced)	SY	$62.00							
Bituminous Concrete(4")	SY	$30.00							
Sodded Ditch									
BOND ESTIMATE						**BOND REDUCTION**			**City Use Only**
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Sodded Ditch (Incl Fine Grading)	SY	$9.86							
STREET CONSTRUCTION									
ROADS AND PARKING									
Soil Stabilization	**Inches**								
Cement 6%	SY/Inch Depth	$2.70							
Depth (in Inches):									

Lime 6%	SY/Inch Depth	$1.89							
Depth (in Inches):									
Subbase, Aggregated Material									
Base Type I	SY/Inch Depth	$1.75	16,213	$226,982.00		16,213.0	$28,372.75	100%	
Depth (in Inches):		8							
Bituminous Concrete									
Base Course	SY/Inch Depth	$5.59	16,213	$271,892.01		16,213.0	$90,630.67	100%	
Depth (in Inches):		3							
Intermediate Course	SY/Inch Depth	$5.49							
Depth (in Inches):									
Top Course	SY/Inch Depth	$5.49	16,213	$178,018.74		0.0	$0.00	0%	
Depth (in Inches):		2							
Prime Coat	SY	$1.10							
Tack Coat	SY	$1.10							
Driveway Restoration									
4” Concrete & 4” Gravel	SY	$79.95							
BOND ESTIMATE						**BOND REDUCTION**			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
2” S-5 & 7 6” Gravel	SY	$31.96							
Shoulders, Type I									
Aggregated Base, 4” (Sidewalk)	SY	$11.50		$0.00					
Concrete Curbing									
Curb & Gutter CG6 & CG7	LF	$22.50	9,412.00	$211,770.00		9,412.0	$211,770.00	100%	
Curb Cut, CG-12 Detectable Surf.	EA	$569.00	25	$14,225.00		25.0	$14,225.00	100%	
Entrances/Driveways									
Commercial Entrance CG-11	SY	$52.88							
Commercial Entrance CG-13	SY	$64.67							
Residential Driveway Apron	SY	$51.79							
Guardrails									
Std. Blocked-out W beam (GR2)	LF	$42.50							
Std. W beam, Weak Post GR8	LF	$28.50							
Terminal, GR-6 (L=12’-6”)	EA	$2,929.00							
Terminal, GR-7 (L=6’-3”)	EA	$2,659.00							
Type I, GR-8 Terminal (L=25’)	EA	$1,399.00							
Type II, GR-8 Terminal (L=13’-6”)	EA	$695.00							

Terminal, MB-4 (L=37’-6”)	EA	$3,495.00							
Type I, MB-5 Terminal (L=27’-1)	EA	$2,925.00							
Type II, MB-5 Terminal (L=13’-6)	EA	$1,675.00							
Miscellaneous									
Trash enclosure - Brick 6' high	LF	$325.00							
Reinforced Concrete Pad 6" to 8"	SY	$62.00							
Striping 4" width (VDOT Type	LF	$2.25							
BOND ESTIMATE						**BOND REDUCTION**			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
B)									
Concrete Wheel Stops	EA	$70.00							
Parking Lot Striping	EA	$50.00							
Sign Island	EA	$850.00							
Traffic Barricade	LF	$43.45							
Street Name Signs	EA	$435.00	5	$2,175.00		5.0	$2,175.00	100%	
Traffic Control Signs	EA	$375.00	13	$4,875.00		13.0	$4,875.00	100%	
Street Light (pole, bracket, light)	EA	$4,285.00	47	$201,395.00		0.0	$0.00	0%	
SIDEWALKS AND TRAILS									
Sidewalk									
Concrete 4” w/WWF, No base	SY	$45.23	3,353	$151,656.19		670.6	$30,331.24	20%	
Bitum. Conc, 2” w/4” Base	SY	$30.00							
4” Conc, No Reinf., No Base	SY	$41.00							
HANDRAIL									
Handrail 3 Rail 1-1/4” #4 Finish	LF	$96.50							
Wood Chip Trail									
Trails(Incl Excavation & Grading) Wood chip, 4’ wide	SY	$17.69							
Bituminous Trail									
6’ to 10' wide	SY	$49.25	1,169	$57,573.25		0.0	$0.00	0%	
CRITICAL SLOPE STABILIZATION									
Paved Flume	SY	$67.00							
Stmwtr Conc Channel-Excav	SY	$7.75							
ADD Grass Lined-seeded	SY	$5.37							
ADD Grass Lined-sodded	SY	$10.89							
Outlet Protection									
Non-grouted Riprap 18”	SY	$52.00		$0.00					
Concrete 4”	SY	$53.50							
BOND ESTIMATE						**BOND REDUCTION**			City Use Only

ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Level Spreader	SY	$4.44							
Struc Streambank Protection									
Non-grouted Riprap 18”	SY	$58.00							
Gabions	CY	$147.00							
Vegetative Erosion Control									
Sodding incl Fertilizing – Banks	SY	$7.77							
Sodding incl Fertilizing – Flat	SY	$5.36							
Seeding incl Fertilizing	SY	$2.44							
Soding W/Soil Treat & Watering	SY	$3.25							
Seeding W/Soil Treat & Watering	SY	$6.46							
Straw Mulch w/Tack	SY	$1.40							
Jute Mesh	SY	$1.77							
SPECIAL ITEMS									
FEMA Processing LOMR/CLOMR	EA	$7,500.00							
As Built (Record Drawings)	EA	$9,500.00	1	$9,500.00		0.0	$0.00	0%	
SWM/BMP POND	LS								
SIGNALIZATION	LS								
Subtotal				$2,697,733.63			$1,524,321.10		

TOTAL ESTIMATE OF COMPLETED WORK:		
SubTOTAL:		$2,697,733.63
CONTINGENCIES:	10.0%	$269,773.36
TOTAL:		$2,967,506.99
INFLATION FACTOR:	4.0%	$118,700.28
Grand Total:		$3,086,207.27

TOTAL ESTIMATE OF REDUCTION:	
SubTOTAL:	$1,524,321.10
CONTINGENCIES:	$152,432.11
TOTAL:	$1,676,753.21
INFLATION :	$67,070.13
Grand Total:	$1,743,823.34
Bond Remaining:	**$1,342,383.94**

Bond Request No._____

Norborne Glebe - Phase 15
Land Disturbance Bond

BOND REQUEST AND REDUCTION

To assist the Subdivision Administrator in the review of a Bond Request Application, the Applicant must utilize this form to supply the City with the information prescribed under Article 1335 and Section 1332 of the Subdivision and Land Development Ordinance. The submission of this form, along with the prescribed information and required fees, shall serve as the Applicant's Bond Request Application as required by Ordinance Article 1335.

1. DATE December 14, 20 23

2. APPLICATION TYPE ☐ Bond | Initiation ☒ Bond | Reduction

☐ Bond | Reallocation ☐ Bond | Release**

3. PROJECT NAME Norborne Glebe Subdivision - Phase 15

Address N/A

4. APPLICANT'S NAME* Arcadia Land, Inc. Attn: Gary Endler

Address 108 N. George Street - 2nd Floor Charles Town, WV 25414

Telephone Number (703-771-8000 Fax Number (___)

Email Address gendler@arcadiacompanies.com

5. PROPERTY OWNER'S NAME Arcadia Land, Inc, Attn: Gary Endler

Address 108 N George Street - 2nd Floor Charles Town, WV 25414

Telephone Number (703-771-8000 Fax Number (___)

Email Address gendler@arcadiacompanies.com

*Applicants include: Property owner(s), Engineer(s), Surveyor(s), or Consultant(s)

**Requires a Public Hearing and landscaping surety for one year after release

Bond Request No._____

6. DESCRIPTION OF REQUETED INITIATION, REDUCTION, OR RELEASE:

Requesting Bond Amount Reduction for the Land Disturbance Bond for Phase 15, Norborne Glebe Subdivision

7. A) CURRENT BOND AMOUNT $271,159.22

B) PROPOSED BOND AMOUNT $19,519.16

8. PARCEL INVENTORY: (List all parcels that are part of this application):

Tax Map No.	Parcel No.	Deed Book	Page No.	Zoning District
Phase 15	3-12-209.4	1173	85	NR

9. PARCEL HISTORY: (List all pending or previously approved applications on the subject parcels inventoried above, including previous plat applications if this application is an amendment)

Application No.	Project Name and Phase	Status	Approval Date

10. BOND RELEASE ATTACHMENTS.

The following shall be included with this request:

A. To the extent not previously submitted pursuant to bond reduction request, copies of inspection and test reports if work was inspected and tested by a third-party inspector.

B. Certification that all bonded Improvements, other than Improvements accepted by West Virginia Department of Highways (WVDOH), have been completed in accordance with the approved plans, profiles, and specifications and the requirements of any applicable manual. For Improvements to be accepted for maintenance by WVDOH, such Certification shall state that the Improvements have been installed and inspected in accordance with WVDOH's requirements.

C. A copy of the City-approved As-Built Drawings as required for facilities within public rights-of-way or Easements submitted pursuant to Section 1332.10 of this Ordinance.

Date of As-Builts _____ Prepared By _____

D. A letter from a Professional Engineer or Professional Land Surveyor certifying that property corners and Monuments have been set as required under this Ordinance.

E. Documentation of acceptance by WVDOH for public roadways and rights-of-way, or a maintenance and indemnification agreement and bond approved by the Planning Commission for public roadways that have been completed in accordance with WVDOH standards but which, due to factors other than their quality of construction, are not eligible for acceptance by WVDOH.

F. For private roadways, a letter of acceptance by the entity responsible for maintenance and a Latent Defects Indemnification Agreement and Bond in accordance with this Section.

G. Private Roadway Maintenance Bonds. Before a Performance Agreement and surety for private roadway construction shall be released, a Latent Defects Indemnification Agreement and Bond shall be provided by the applicant/Developer and approved by the Planning Commission. The guarantee provided by such Agreement and Bond must be for a period of two (2) years following the date of performance bond release, and must be in an amount equal to no less than 5% of the original performance bond estimate in accordance with Section 1335.07 (F) of the Subdivision Ordinance.

H. Landscaping Surety. Surety is required to ensure the landscaping shown on the Major S/LD plans is maintained for one (1) year. The one (1) year shall start from the date at which the surety for the site has been released, with the exception of this landscaping surety. The landscaping surety amount shall not be less than $5,000.00 or 10% of the total landscaping cost for the project, which every is greater.

Bond Request No._____

APPLICANT CERTIFICATION

I certify that, to the best of my knowledge, the submitted information and statements are true and correct. I also certify that I have received and read Article 1335 of the S/LD Ordinance.

Signature of Applicant

_____ Date _____

Signature of Property Owner (If different than Applicant)

_____ Date _____

Please submit an original completed Application, 1 digital copy and 1 paper copy of the As-Built Plans (if applicable) to the following:

Subdivision Administrator
City of Charles Town
101 E. Washington Street
Charles Town, WV 25414

Please also send a copy of the completed Application as well as the As-Builts to the following:

Hatch/Chester Engineers
Attn: Elizabeth Adamowicz
705 Quince Orchard Road, Suite 310
Gaithersburg, MD 20878

FOR CITY USE ONLY

Application Number:_____ Date Application Received:_____

Fee: $_____ Check No._____

Receipt No._____

Site Inspection Date:_____ Inspector:_____

Subdivision Administrator Approval:_____ Date:_____

Engineer Approval:_____ Date:_____

Planning Commission Approval:_____ Date:_____

City Council Approval:_____ Date:_____

Comments:_____

_____

_____

_____

_____

CITY OF CHARLES TOWN

LAND DISTURBANCE BOND UNIT COST LIST AND BOND REDUCTION FORM

This form shall be used to calculate the amount of the bond required to guarantee public improvements to be constructed under the approved Final S/LD Application. This form shall also be used in calculating the amount of bond reductions to be approved by the Planning Commission. **Note**: No bond shall be reduced until completion of at least thirty (30) percent of the physical Improvements secured by the bond.

PROJECT NAME:	Norborne Glebe - Phase 15
PREPARED BY:	Greenway Engineering
DATE OF SUBMISSION	10-11-2022 Reduction 12/14/2023 Revised 01/18/2024

BOND ESTIMATE					BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION	QUANTITY	EXTENSION	%COMPLETE	% Approved
MOBILIZATION GENERAL								
Mobilization	LS	$6,250.00	1	$6,250.00	0.5	$3,125.00	50%	
Field Office	EA	$3,000.00			0.0	$0.00		
Job Sign	EA	$1,150.00			0.0	$0.00		
EROSION & SEDIMENT CONTROL								
Curb Inlet Protection	EA	$176.80	36	$6,364.80	36.0	$6,364.80	100%	
Grate Inlet Protection	EA	$200.00	10	$2,000.00	10.0	$2,000.00	100%	
Rock Check Dam	EA	$150.00	26	$3,900.00	26.0	$3,900.00	100%	
Outlet Protection (18" Thick)	SY	$210.00	28.00	$5,880.00	28.0	$5,880.00	100%	
Temporary Seeding	SY	$0.77		$0.00	0.0	$0.00	0%	
Permanent Seeding	SY	$0.77	33,035	$25,436.95	16,517.5	$12,718.48	50%	
Permanent Sodding	SY	$3.64		$0.00	0.0	$0.00	0%	
Clearing and Grubbing (Light)	AC	$6675.00	19	$129,294.75	19.4	$129,294.75	100%	
Silt Fence	LF	$3.25	1,832	$5,954.00	1,832.0	$5,954.00	100%	
Sediment Trap	EA	$3500.00	0	$0.00	0.0	$0.00	100%	
Level Spreader	SY	$3500.00		$0.00	0.0	$0.00	0%	
Stabilized Construction Entrance	EA	$2500.00	1	$2,500.00	1.0	$2,500.00	100%	
TOPSOIL REPLACEMENT								
Fine Grading	SY	$1.01	27,634.22	$27,910.56	27,634.2	$27,910.56	100%	
Respread Topsoil	CY	$1.00	4,605.71	$4,605.71	4,605.7	$4,605.71	100%	
SPECIAL ITEMS								
Sediment Basin	LS			$0.00	0.0	$0.00		
Subtotal				$220,096.77				

TOTAL ESTIMATE OF COMPLETED WORK:

SubTOTAL:		$220,096.77
CONTINGENCIES:	10.0%	$22,009.68
TOTAL W/ CONTINGENCY:		$242,106.45

TOTAL ESTIMATE OF REDUCTION:

SubTOTAL:	$204,253.30
CONTINGENCIES:	$20,425.33
TOTAL:	$224,678.63

BOND PERIOD:	3	Years		INFLATION :	$26,961.44
ANNUAL INFLATION FACTOR:	4.00%	$29,052.77		Grand Total:	$251,640.06
Grand Total:		$271,159.22		Bond Remaining:	**$19,519.16**

Kimley»Horn

Memorandum

To: Mr. Gary Endler, Attn
Arcadia Land, Inc.
108 N. George Street - 2nd Floor
Charles Town, WV 25414

From: Mark Phillips, P.E.

Through: Mr. James Newman, AICP
City of Charles Town
101 E Washington Street
Charles Town, WV 25414

Date: January 25, 2024

Subject: Norborne Glebe Subdivision Phase 15 Bond Reduction Review

This memorandum summarizes our review of the Bond Reduction request for the Norborne Glebe Subdivision Phase 15 Erosion and Sediment Control and the Performance Bond Initiation application (dated December 14, 2023, prepared by Arcadia Land, Inc.) for an E&S Control Bond reduction of $251,640.06 to $19,519.16 and Performance Bond reduction of $1,743,823.33 to $1,342,383.94 respectively. Using the Final Subdivision/Land Development Plat dated September 20, 2022, site visit observations, and the respective bond reduction application, we have no comments.

Thank you for the opportunity to review this Bond Reduction request. In the meantime, please feel free to contact us at 703-870-3631 should you have any questions.

KIMLEY-HORN & ASSOCIATES, INC.

Mark Phillips, P.E.
Project Manager
Associate

Planning Commission
101 East Washington Street
Charles Town, WV 25414

SCHEDULED

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

AGENDA ITEM (ID #)

Commission Review: BR2024-01 - Westover Dental Bond Establishment

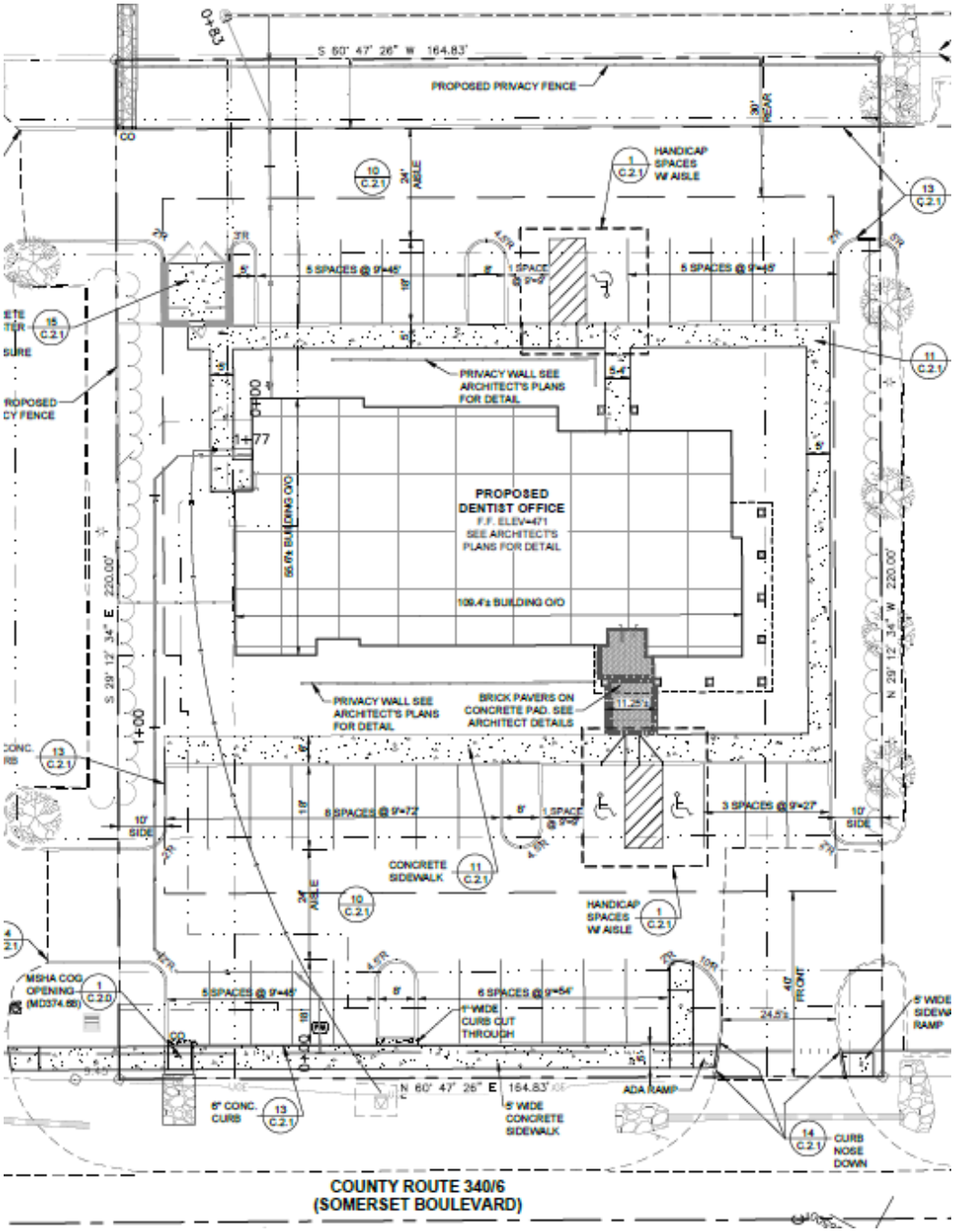
ATTACHMENTS:

- 1. Staff Report.pdf
- 2. Application.pdf
- 3. Estimate.pdf
- 4. KH Review.pdf

Bond Establishment Request
BR2024-01

Date: For the February 26, 2024 Planning Commission meeting
Applicant: Westover Holdings LLC
Report by: James Newman, City Planner, Zoning/Subdivision Administrator.
Proposal: A bond establishment of $252,412.48

Westove Dental - Site



BACKGROUND
The applicant has submitted a bond establishment request for construction. The applicant is requesting a bond establishment of the **performance and land disturbance bond** in the amount of $252,412.48

Upon review of the request the City Engineer, Kimley-Horn, has determined that the bond amount is a reasonable assessment of the cost of the project.

BOND COMMITTEE
The Bond Committee reviewed this item at their February 20, 2024 meeting. The Committee recommended approval of the bond reduction request.

STAFF RECOMMENDATION
The City Engineer and City Staff have reviewed the bond reduction request and recommends the bond reduction request be **approved**.

Bond Request No._____

BOND REQUEST AND REDUCTION

To assist the Subdivision Administrator in the review of a Bond Request Application, the Applicant must utilize this form to supply the City with the information prescribed under Article 1335 and Section 1332 of the Subdivision and Land Development Ordinance. The submission of this form, along with the prescribed information and required fees, shall serve as the Applicant's Bond Request Application as required by Ordinance Article 1335.

1. DATE January 25, 2024

2. APPLICATION TYPE ☒ Bond | Initiation ☐ Bond | Reduction

☐ Bond | Reallocation ☐ Bond | Release**

3. PROJECT NAME Westover Dental Office c/o Austin Westover

Address Sommerset Blvd, Charles Town, WV

4. APPLICANT'S NAME* Westover Holdings, LLC

Address 11 Meadow Branch Ave, Winchester, VA 22601

Telephone Number (804) 405-9873 Fax Number (___)

Email Address Austinwestover@gmail.com

5. PROPERTY OWNER'S NAME Same as applicant

Address _____

Telephone Number (___) _____ Fax Number (___) _____

Email Address _____

*Applicants include: Property owner(s), Engineer(s), Surveyor(s), or Consultant(s)

**Requires a Public Hearing and landscaping surety for one year after release

Bond Request No._____

6. DESCRIPTION OF REQUETED INITIATION, REDUCTION, OR RELEASE:

Initiation of Bond for the earthwork, storm drains, parking lots & sidewalk construction

7. A) CURRENT BOND AMOUNT 0

B) PROPOSED BOND AMOUNT $252,412.48

8. PARCEL INVENTORY: (List all parcels that are part of this application):

Tax Map No.	Parcel No.	Deed Book	Page No.	Zoning District
16A	0006	1309	109	GC

9. PARCEL HISTORY: (List all pending or previously approved applications on the subject parcels inventoried above, including previous plat applications if this application is an amendment)

Application No.	Project Name and Phase	Status	Approval Date

10. BOND RELEASE ATTACHMENTS.

The following shall be included with this request:

A. To the extent not previously submitted pursuant to bond reduction request, copies of inspection and test reports if work was inspected and tested by a third-party inspector.

B. Certification that all bonded Improvements, other than Improvements accepted by West Virginia Department of Highways (WVDOH), have been completed in accordance with the approved plans, profiles, and specifications and the requirements of any applicable manual. For Improvements to be accepted for maintenance by WVDOH, such Certification shall state that the Improvements have been installed and inspected in accordance with WVDOH's requirements.

C. A copy of the City-approved As-Built Drawings as required for facilities within public rights-of-way or Easements submitted pursuant to Section 1332.10 of this Ordinance.

Date of As-Builts _____ Prepared By _____

D. A letter from a Professional Engineer or Professional Land Surveyor certifying that property corners and Monuments have been set as required under this Ordinance.

E. Documentation of acceptance by WVDOH for public roadways and rights-of-way, or a maintenance and indemnification agreement and bond approved by the Planning Commission for public roadways that have been completed in accordance with WVDOH standards but which, due to factors other than their quality of construction, are not eligible for acceptance by WVDOH.

F. For private roadways, a letter of acceptance by the entity responsible for maintenance and a Latent Defects Indemnification Agreement and Bond in accordance with this Section.

G. Private Roadway Maintenance Bonds. Before a Performance Agreement and surety for private roadway construction shall be released, a Latent Defects Indemnification Agreement and Bond shall be provided by the applicant/Developer and approved by the Planning Commission. The guarantee provided by such Agreement and Bond must be for a period of two (2) years following the date of performance bond release, and must be in an amount equal to no less than 5% of the original performance bond estimate in accordance with Section 1335.07 (F) of the Subdivision Ordinance.

H. Landscaping Surety. Surety is required to ensure the landscaping shown on the Major S/LD plans is maintained for one (1) year. The one (1) year shall start from the date at which the surety for the site has been released, with the exception of this landscaping surety. The landscaping surety amount shall not be less than $5,000.00 or 10% of the total landscaping cost for the project, which every is greater.

Bond Request No._____

APPLICANT CERTIFICATION

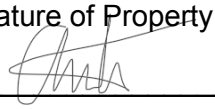
I certify that, to the best of my knowledge, the submitted information and statements are true and correct. I also certify that I have received and read Article 1335 of the S/LD Ordinance.

Signature of Applicant



_____ Date 1/30/24

Signature of Property Owner (If different than Applicant)



_____ Date 1/30/24

Please submit an original completed Application, 1 digital copy and 1 paper copy of the As-Built Plans (if applicable) to the following:

Subdivision Administrator
City of Charles Town
101 E. Washington Street
Charles Town, WV 25414

Please also send a copy of the completed Application as well as the As-Builts to the following:

Hatch/Chester Engineers
Attn: Elizabeth Adamowicz
705 Quince Orchard Road, Suite 310
Gaithersburg, MD 20878

FOR CITY USE ONLY

Application Number:_____ Date Application Received:_____

Fee: $_____ Check No._____

Receipt No._____

Site Inspection Date:_____ Inspector:_____

Subdivision Administrator Approval:_____ Date:_____

Engineer Approval:_____ Date:_____

Planning Commission Approval:_____ Date:_____

City Council Approval:_____ Date:_____

Comments:_____

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CITY OF CHARLES TOWN

PUBLIC IMPROVEMENT BOND UNIT COST LIST AND BOND REDUCTION FORM

This form shall be used to calculate the amount of the bond required to guarantee public improvements to be constructed under the approved Final S/LD Application. This form shall also be used in calculating the amount of bond reductions to be approved by the Planning Commission. **Note**: No bond shall be reduced until completion of at least thirty (30) percent of the physical Improvements secured by the bond.

PROJECT NAME:	Westover Dental Office
PREPARED BY:	Triad Engineering, Inc (Eric Iser)
DATE OF SUBMISSION	January 28, 2024

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
MOBILIZATION GENERAL									
Mobilization	LS	$6,250.00	1	6250.00					
Field Office	EA	$3,000.00	n/a	0					
Job Sign	EA	$1,150.00	n/a	0					
SURVEYING									
Steel Pipe Property Corner Marker Incl. Survey	EA	$275.00	n/a	0					
R.O.W. MONUMENTS SURVEYED IN PLACE									
RM -- 1	EA	$825.00	n/a	0					
RM -- 2	EA	$575.00	n/a	0					
EARTHWORK EXCAVATION									
Regular Bulk used as Fill	CY	$3.86	20	77.20					
Rock, Rip	CY	$17.30	n/a	0					
Rock, Blast	CY	$38.48	n/a	0					
BORROW MATERIAL									
Buy, Load, Haul 10 Mi. Select Material	CY	$28.90	2079	60083.10					
Fill and Compaction of On-site Borrow	CY	$5.95	20	119.00					
UNSUITABLE MATERIAL									
Load and Haul, 20 mi R/T	CY	$21.95	n/a	0					
Dump Charge	CY	$37.50	n/a	0					
Site Grading	SY	$0.75	n/a	0					
CLEAR & GRUB									
Light	AC	$6,675.00	0.83	5540.25					
Moderate	AC	$9,750.00	n/a	0					

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Heavy	AC	$12,250.00	n/a	0					
Very Heavy	AC	$14,250.00	n/a	0					
LANDSCAPING									
Seeding	SY	$0.77	1240	954.80					
Sodding	SY	$3.64	n/a	0					
PLANTING SHRUBS									
18”	EA	$40.00	53	2120.00					
24”	EA	$70.00	n/a	0					
TREES									
6’ – 8’ (1-2 in. Caliper)	EA	$400.00	22	8800.00					
8’ – 10’ (2.5-3 in. Caliper)	EA	$700.00	7	4900.00					
Tree Protection	LF	$9.00	n/a	0					
MISCELLANEOUS SITE IMPROVEMENTS									
RETAINING WALLS									
Timber Wall (Less Than 6 ft)	LF	$325.00							
Dry Rubble RW-1 (H=6')	LF	$450.00							
Mortared Rubble RW-1A (H=6')	LF	$535.00							
Concrete Gravity RW-2 (H=6')	LF	$339.00							
Concrete Gravity RW-3 (H=6')	LF	$378.00							
FENCING									
Std. Fence (H=5’) FR-5	LF	$9.31							
Farm Fence (H=5’) FR-3A	LF	$10.90							
Chain Link Fence (H=6’)FR 2-B	LF	$14.52							
Board Fence (H=6’)	LF	$19.35	165	3192.75					

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
TOT LOTS									
Tot Lot	EA	$16,495.00							
STORM DRAINAGE									
STORM SEWER									
NOTE: All pipe unit prices include trench, excavation, bedding, pipe, & backfill									
Rock Excavation for All Pipe Types									
Less than 1,500 CY (Blasting)	CY	$110.00							
More than 1,500 CY (Blasting)	CY	$90.00							
Less than 1,500 CY (Hoe Ram)	CY	$135.00							
More than 1,500 CY (Hoe Ram)	CY	$110.00							
Trench De-watering									
Trench De-watering	LF	$2.95							
RCP CLASS III ROUND T & G W/MASTIC									
12” Pipe (RCP III)									
0’ – 8’ Cut	LF	$44.50							
8’ – 14’ Cut	LF	$62.50							
Add cost for Class IV	LF	$0.85							
O-Ring	LF	$5.50							
15” Pipe (RCP III)									
0’ – 10’ Cut	LF	$49.75							
10’ – 16’	LF	$77.50							
Add Cost for Class IV	LF	$0.95							
O-Ring	LF	$5.50							
18” Pipe (RCP III)									
0’ – 10’ Cut	LF	$50.00							
10’ – 16’ Cut	LF	$80.00							

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Add Cost for Class IV	LF	$2.00							
O-Ring	LF	$7.00							
21" Pipe (RCP III)									
0' – 10' Cut	LF	$57.50							
10' – 16' Cut	LF	$87.50							
Add Cost for Class IV	LF	$2.75							
O-Ring	LF	$13.00							
24" Pipe (RCP III)									
0' – 10' Cut	LF	$67.50							
10' – 16' Cut	LF	$95.00							
Add Cost for Class IV	LF	$3.15							
O-Ring	LF	$14.00							
27" Pipe (RCP III)									
0' – 10' Cut	LF	$60.00							
10' – 16' Cut	LF	$95.00							
Add Cost for Class IV	LF	$4.00							
O-Ring	LF	$15.00							
30" Pipe (RCP III)									
0' – 10' Cut	LF	$82.50							
10' – 16' Cut	LF	$125.00							
Add Cost for Class IV	LF	$6.00							
O-Ring	LF	$17.25							
33" Pipe (RCP III)									
0' – 12' Cut	LF	$115.00							
10' – 18' Cut	LF	$160.00							
Add Cost for Class IV	LF	$6.50							
O-Ring	LF	$21.95							
36" Pipe (RCP III)									
0' – 12' Cut	LF	$120.00							

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
12’ – 18’ Cut	LF	$175.00							
Add Cost for Class IV	LF	$7.75							
O-Ring	LF	$22.75							
42” Pipe (RCP III)									
0’ – 12’ Cut	LF	$140.00							
12’ – 18’ Cut	LF	$200.00							
Add Cost for Class IV	LF	$12.00							
O-Ring	LF	$35.45							
48” Pipe (RCP III)									
0’ – 12’ Cut	LF	$155.00							
12’ – 18’ Cut	LF	$215.00							
Add Cost for Class IV	LF	$12.50							
O-Ring	LF	$43.35							
54” Pipe (RCP III)									
0’ – 12’ Cut	LF	$190.00							
12’ – 18’ Cut	LF	$275.00							
Add Cost for Class IV	LF	$18.75							
O-Ring	LF	$44.45							
60” Pipe (RCP III)									
0’ – 12’ Cut	LF	$225.00							
12’ – 18’ Cut	LF	$335.00							
Add Cost for Class IV	LF	$22.50							
O-Ring	LF	$48.65							
ELLIPTICAL PIPE – RCP CLASS III									
23” X 14” (18” Equiv-RCP III									
0’ – 10’ Cut	LF	$75.00							
10’ – 16’ Cut	LF	$110.00							
Add Cost for Class IV	LF	$16.45							
O-Ring	LF	$43.35							

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
30” X 19” (24” Equiv-RCP III)									
0’ – 10’ Cut	LF	$90.00							
10’ – 16’ Cut	LF	$130.00							
Add Cost for Class IV	LF	$5.95							
O-Ring	LF	$43.35							
38” X 24” (30” Equiv-RCP III)									
0’ – 10’ Cut	LF	$120.00							
10’ – 16’ Cut	LF	$167.50							
Add Cost for Class IV	LF	$8.45							
O-Ring	LF	$51.35							
45” X 29” (36” Equiv-RCP III)									
0’ – 10’ Cut	LF	$165.00							
10’ – 16’ Cut	LF	$235.00							
Add Cost for Class IV	LF	$11.35							
O-Ring	LF	$53.35							
53” X 34” (42” Equiv-RCP III)									
0’ – 12’ Cut	LF	$210.00							
10’ – 18’ Cut	LF	$300.00							
Add Cost for Class IV	LF	$15.35							
O-Ring	LF	$58.95							
60” X 38” (48” Equiv-RCP III)									
0’ – 12’ Cut	LF	$255.00							
10’ – 18’ Cut	LF	$375.00							
Add Cost for Class IV	LF	$18.35							
O-Ring	LF	$69.95							
HDPE PIPE									
8" Pipe									
0'-8' Cut	LF	$28.65							
8'-14' Cut	LF	$43.15							

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
12" Pipe									
0'-8' Cut	LF	$38.95							
8'-14' Cut	LF	$57.75							
15" Pipe									
0'-8' Cut	LF	$50.25							
8'-16' Cut	LF	$74.85							
18" Pipe									
0'-8' Cut	LF	$66.00							
8'-16' Cut	LF	$98.55							
24" Pipe									
0'-8' Cut	LF	$76.90							
8'-16' Cut	LF	$115.25							
30" Pipe									
0'-8' Cut	LF	$91.33							
8'-16' Cut	LF	$137.27							
36" Pipe									
0'-8' Cut	LF	$101.68							
8'-16' Cut	LF	$152.33							
42" Pipe									
0'-8' Cut	LF	$113.99							
8'-16' Cut	LF	$171.00							
48" Pipe									
0'-8' Cut	LF	$129.55							
8'-16' Cut	LF	$195.66							
STORM STRUCTURES									
END SECTIONS									
End Section (ES-1), Concrete Pipe Size									
15”	EA	$485.00							

BOND ESTIMATE						BOND REDUCTION		City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION	QUANTITY	EXTENSION	%COMPLETE	% Approved
18”	EA	$565.00						
21”	EA	$645.00						
24”	EA	$755.00						
27”	EA	$1,065.00						
30”	EA	$1,195.00						
36”	EA	$1,765.00						
42”	EA	$1,795.00						
48”	EA	$2,135.00						
54”	EA	$2,795.00						
60”	EA	$3,455.00						
ENDWALLS								
EW-1(Pre-cast) Round Pipe Size								
15”	EA	$800.00						
18”	EA	$1,337.00						
24”	EA	$2,021.00						
30”	EA	$2,133.00						
36”	EA	$2,366.00						
EW-1 Cast in Place [Round Pipe Size]								
15”	EA	$852.00						
18”	EA	$1,053.00						
24”	EA	$1,495.00						
30”	EA	$2,144.00						
36”	EA	$2,383.00						
EW-1A (Pre-Cast) Elliptical Pipe Size								
23” X 14” (18”)	EA	$695.00						
30” X 19” (24”)	EA	$969.00						
38” X 24” (30”)	EA	$1,165.00						
45” X 29” (36”)	EA	$1,445.00						

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
53” X 34” (42”)	EA	$1,840.00							
EW-1A (Cast in Place) Elliptical Pipe Size									
23” X 14” (18”)	EA	$667.00							
30” X 19” (24”)	EA	$939.00							
38” X 24” (30”)	EA	$1,247.00							
45” X 29” (36”)	EA	$1,618.00							
53” X 34” (42”)	EA	$2,109.00							
EW-2 (PreCast) Round Pipe Size									
42”	EA	$5,445.00							
48”	EA	$5,695.00							
54”	EA	$6,660.00							
60”	EA	$7,140.00							
72”	EA	$7,990.00							
84”	EA	$9,490.00							
EW-2 (Cast in Place) Round Pipe Size									
42”	EA	$4,723.00							
48”	EA	$6,039.00							
54”	EA	$6,972.00							
60”	EA	$8,179.00							
72”	EA	$10,713.00							
84”	EA	$12,288.00							
(EW-6PC) [Double Pipe] Pipe Size									
2-15”	EA	$999.00							
2-18”	EA	$1,235.00							
2-24”	EA	$1,510.00							
2-30”	EA	$2,165.00							
2-36”	EA	$2,647.00							
MANHOLES									

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Standard Brick Manhole Std Frame & Cover (MH-1)									
6' Depth	EA	$3,750.00							
Depth below 6'	VF	$163.00							
Standard Precast Manhole Std Frame & Cover (MH-2)									
6' Depth	EA	$3,100.00							
Depth below 6'	VF	$177.00							
Additional Cost (Amounts in parentheses to be added to the above unit costs)									
Watertight Fr/Cover (Add 110)	EA	$579.00							
Heavy Duty Fr/Cover (Add 82)	EA	$599.00							
DROP INLETS									
Cast in Place 48"									
Drop Inlet (DI-1) 12" – 24" Pipe0-10 VF	EA	$3,697.00							
Drop Inlet (DI-1A) 12" – 24" Pipe 10-20 VF	EA	$5,593.00							
Drop Inlet (DI-2) 12" – 24" Pipe0-10 VF, 10' throat	EA	$6,911.00							
Drop Inlet (DI-2A) 12" – 24" Pipe 10-20 VF, 10' throat	EA	$8,833.00							
CURB DROP INLETS									
Curb Drop Inlet (DI-3A)									
12"-30" Pipe (Invert Depth (H) =0'-8') Inlet Length 2'-6"	EA	$4,088.00							
Curb Drop Inlet (DI-3AA)									
12"-30" Pipe (Invert Depth (H) =8'-20') Inlet Length 2'-6"	EA	$5,357.00							
Curb Drop Inlet (DI-3B & DI-12) 12"-30" Pipe (Invert Depth (H) =0'-8') Inlet Length									
4'	EA	$4,279.00							

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
6’	EA	$4,573.00							
8’	EA	$4,889.00							
10'	EA	$5,052.00							
12’	EA	$5,227.00							
16’	EA	$5,543.00							
20’	EA	$5,859.00							
Curb Drop Inlet (DI-3BB) 12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length									
4’	EA	$4,276.00							
6’	EA	$4,848.00							
8’	EA	$5,429.00							
10'	EA	$5,732.00							
12’	EA	$6,011.00							
16’	EA	$6,296.00							
20’	EA	$6,599.00							
Curb Drop Inlet (DI-3C) 12”-30” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
6’	EA	$4,013.00							
8’	EA	$4,588.00							
10'	EA	$4,893.00							
12’	EA	$5,178.00							
16’	EA	$5,766.00							
20’	EA	$6,339.00							
Curb Drop Inlet (DI-3CC) 12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length									
6’	EA	$4,746.00							
8’	EA	$5,293.00							
10'	EA	$5,627.00							
12’	EA	$5,988.00							
16’	EA	$6,772.00							
20’	EA	$7,465.00							

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Curb Drop Inlet (DI-3D)									
12”-30” Pipe (Invert Depth (H) =0’-8’) Inlet Length 2’-6”	EA	$3,633.00							
Curb Drop Inlet (DI-3DD)									
12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length 2’-6”	EA	$4,367.00							
Curb Drop Inlet (DI-3E) 12”-30” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
4’	EA	$4,093.00							
8’	EA	$4,756.00							
10'	EA	$5,724.00							
12'	EA	$5,833.00							
16’	EA	$6,072.00							
20’	EA	$6,709.00							
Curb Drop Inlet (DI-3EE) 12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length									
6’	EA	$7,562.00							
8’	EA	$7,869.00							
10'	EA	$7,999.00							
12’	EA	$8,166.00							
16’	EA	$8,471.00							
20’	EA	$8,767.00							
Curb Drop Inlet (DI-3F) 12”-30” Pipe Inlet Length (Invert Depth (H)=0’-8’)									
6’	EA	$3,765.00							
8’	EA	$4,419.00							
10'	EA	$4,749.00							
12’	EA	$5,085.00							
16’	EA	$5,742.00							
20’	EA	$6,395.00							
Curb Drop Inlet (DI-3FF) 12”-30” Pipe (Invert Depth (H) =8’-20’) Inlet Length									

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
6’	EA	$8,077.00							
8’	EA	$8,288.00							
10'	EA	$8,480.00							
12’	EA	$8,669.00							
16’	EA	$9,047.00							
20’	EA	$9,446.00							
Curb Drop Inlet (DI-4A) 36”–48” Pipe (Invert Depth (H)=0’-8’) Inlet Length									
4’	EA	$4,868.00							
Curb Drop Inlet (DI-4AA) 36”–48” Pipe (Invert Depth (H)=0’-8’) Inlet Length									
4'	EA	$6,817.00							
Curb Drop Inlet (DI-4B) 36”-48” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
6’	EA	$5,172.00							
8’	EA	$5,499.00							
10'	EA	$5,698.00							
12’	EA	$5,870.00							
16’	EA	$6,221.00							
20’	EA	$6,571.00							
Curb Drop Inlet (DI-4BB) 36”-48” Pipe (Invert Depth (H) =8’-20') Inlet Length									
6’	EA	$10,292.00							
8’	EA	$10,643.00							
10'	EA	$10,810.00							
12’	EA	$10,974.00							
16’	EA	$11,309.00							
20’	EA	$11,669.00							
Curb Drop Inlet (DI-4C) 36”-48” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
8’	EA	$5,612.00							
10'	EA	$5,794.00							
12’	EA	$5,968.00							
16’	EA	$6,315.00							

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ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
20’	EA	$6,657.00							
Curb Drop Inlet (DI-4CC) 36”-48” Pipe (Invert Depth (H) =8’-20’) Inlet Length									
8’	EA	$13,371.00							
10'	EA	$13,693.00							
12’	EA	$14,097.00							
16’	EA	$14,712.00							
20’	EA	$15,365.00							
Curb Drop Inlet (DI-4D)									
36”-48” Pipe (Invert Depth (H) =0’-8’) Inlet Length 4'	EA	$4,933.00							
Curb Drop Inlet (DI-4DD)									
36”-48” Pipe (Invert Depth (H) =8’-16’) Inlet Length 4'	EA	$9,455.00							
Curb Drop Inlet (DI-4E) 36”-48” Pipe (Invert Depth (H) =0’-8’) Inlet Length									
6'	EA	$5,267.00							
8’	EA	$5,605.00							
10'	EA	$5,896.00							
12'	EA	$6,233.00							
16’	EA	$6,996.00							
20’	EA	$7,695.00							
Curb Drop Inlet (DI-4EE) 36”-48” Pipe (Invert Depth (H) =8’-16’) Inlet Length									
6’	EA	$9,165.00							
8’	EA	$9,495.00							
10'	EA	$9,839.00							
12’	EA	$10,167.00							
16’	EA	$10,838.00							
20’	EA	$11,483.00							
Curb Drop Inlet (DI-4F) 36”-48" Pipe Inlet Length (Invert Depth (H)=0’-8’)									

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ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION	QUANTITY	EXTENSION	%COMPLETE	% Approved
8’	EA	$5,877.00						
10'	EA	$6,209.00						
12’	EA	$6,568.00						
16’	EA	$7,259.00						
20’	EA	$7,963.00						
Curb Drop Inlet (DI-4FF) 36”-48” Pipe (Invert Depth (H) =8’-16’) Inlet Length								
8’	EA	$8,866.00						
10'	EA	$9,147.00						
12’	EA	$9,435.00						
16’	EA	$9,997.00						
20’	EA	$10,584.00						
Median Drop Inlets - CIP								
Median Drop Inlet **(DI-6A)** 12”-24” Pipe Inlet (H=8’)	EA	$4,205.00						
Median Drop Inlet **(DI-6B)** 12”-24” Pipe Inlet (H=8’)	EA	$4,267.00						
Median Drop Inlet **(DI-6C)** 30”-48” Pipe Inlet (H=10’)	EA	$5,589.00						
Median Drop Inlet **(DI-6D)** 30”-48” Pipe Inlet (H=10’)	EA	$5,692.00						
Median Drop Inlet **(DI-7)** Type III Top 12”-42” Pipe Inlet (H=10’)	EA	$5,748.00						
Median Drop Inlet **(DI-7A)** Type III Top 12”-42” Pipe Inlet (H=10’)	EA	$6,338.00						
Median Drop Inlet **(DI-7B)** Type III Top 12”-42” Pipe Inlet (H=10’)	EA	$6,797.00						

BOND ESTIMATE					BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION	QUANTITY	EXTENSION	%COMPLETE	% Approved
MISCELLANEOUS INLETS								
Ditch Drop Inlet, **(DI-5)** Type III Tip 12"-42" Pipe Inlet (H=8')	EA	$5,226.00						
Standard Yard Inlet **(YI-1)** 12"-48" Pipe (Invert Depth (H)=0'-8') Inlet Length 4'(No Aprons)	EA	$4,749.00						
Add Yard Inlet Apron	THROAT	$255.00						
Standard Yard Inlet **(YI-3)** 12"-48" Pipe (Invert Depth (H)=0'-8') Inlet Length 4'(No Aprons)	EA	$5,127.00						
Add Yard Inlet Apron	THROAT	$255.00						
CULVERTS								
Single Box Culvert (BC-1A) Fills to 25'								
4' X 4'	LF	$336.00						
5' x 5"	LF	$410.00						
6' X 6'	LF	$498.00						
8' X 8'	LF	$699.00						
10' X 10'	LF	$845.00						
Double Box Culvert (BC-2b) Fills to 25'								
4' X 4'	LF	$566.00						
5' x 5"	LF	$705.00						
6' X 6'	LF	$854.00						
8' X 8'	LF	$1,148.00						
10' X 10'	LF	$1,411.00						
Oversized Single Box Culvert (BBC-1) Fills to 25'								

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
12’ X 6’	LF	$1,026.00							
12’ X 8’	LF	$1,144.00							
12’ X 10’	LF	$1,239.00							
12’ X 12’	LF	$1,348.00							
Triple Box Culvert (BC-3B) Fills to 25’									
4’ X 4’	LF	$779.00							
5’ x 5”	LF	$965.00							
6’ X 6’	LF	$1,211.00							
8’ X 8’	LF	$1,633.00							
10’ X 10’	LF	$2,488.00							
Quadruple Box Culvert (BC-4B) Fills to 25’									
4’ X 4’	LF	$987.00							
5’ x 5”	LF	$1,225.00							
6’ X 6’	LF	$1,523.00							
8’ X 8’	LF	$1,497.00							
10’ X 10’	LF	$2,835.00							
Standard Wing for Box Culvert (1 Side Only) Height of Box									
4’	EA	$675.00							
5’	EA	$995.00							
6’	EA	$1,337.00							
8’	EA	$2,489.00							
10’	EA	$3,315.00							
Standard Wing for Oversized Box Culvert(BBC-W) Height of Box									
6’	EA	$1,351.00							
8’	EA	$2,189.00							
10’	EA	$3,269.00							
12’	EA	$4,763.00							
MISCELLANEOUS STORM									

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
Connection to Existing Structure									
15”-36” Pipe	EA	$735.00							
42”- 60” Pipe	EA	$1,125.00							
Casing Pipe, Bore and Jack (3/8” wall)									
22” ID (6”-8” Carrier Pipe)	LF	$411.00							
24” ID (10” Carrier Pipe)	LF	$451.00							
30” ID (12” Carrier Pipe)	LF	$569.00							
Plug Pipe									
6” –12” Pipe	EA	$142.00							
15”-36” Pipe	EA	$323.00							
42”- 60” Pipe	EA	$522.00							
Pavement Edge Pipe									
Standard Pipe Underdrain	LF	$19.00							
Riprap									
Dry, Class I, 18”	SY	$47.87	21	1005.27					
Dry, Class II, 18”	SY	$51.46							
Grouted, Class I, 18”	SY	$69.97							
Filter Fabric									
Class I	SY	$3.50	21	73.50					
Class II	SY	$3.00							
Class III	SY	$2.25							
Gabions (No excavation)									
Mattress	CY	$130.00							
Revetment	CY	$164.33							
Wall	CY	$212.25							
Paved Ditch (4” Thick)									
Concrete (Non-reinforced)	SY	$62.00							
Bituminous Concrete(4”)	SY	$30.00							
Sodded Ditch									

BOND ESTIMATE					BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION	QUANTITY	EXTENSION	%COMPLETE	% Approved
Sodded Ditch (Incl Fine Grading)	SY	$9.86						
STREET CONSTRUCTION								
ROADS AND PARKING								
Soil Stabilization	**Inches**							
Cement 6%	SY/Inch Depth	$2.70						
Depth (in Inches):								
Lime 6%	SY/Inch Depth	$1.89						
Depth (in Inches):								
Subbase, Aggregated Material								
Base Type I	SY/Inch Depth	$1.75	1600	19600.00				
Depth (in Inches):	7"							
Bituminous Concrete								
Base Course	SY/Inch Depth	$5.59	1600	26832.00				
Depth (in Inches):	3"							
Intermediate Course	SY/Inch Depth	$5.49						
Depth (in Inches):								
Top Course	SY/Inch Depth	$5.49	1767	14551.25				
Depth (in Inches):	1.5							
Prime Coat	SY	$1.10						
Tack Coat	SY	$1.10						
Driveway Restoration								
4” Concrete & 4” Gravel	SY	$79.95						

BOND ESTIMATE						BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION		QUANTITY	EXTENSION	%COMPLETE	% Approved
2” S-5 & 7 6” Gravel	SY	$31.96							
Shoulders, Type I									
Aggregated Base, 4”	SY	$11.50							
Concrete Curbing									
Curb & Gutter CG6 & CG7	LF	$22.50	956	21510.00					
Curb Cut, CG-12 Detectable Surf.	EA	$569.00	4	2276.00					
Entrances/Driveways									
Commercial Entrance CG-11	SY	$52.88							
Commercial Entrance CG-13	SY	$64.67							
Residential Driveway Apron	SY	$51.79							
Guardrails									
Std. Blocked-out W beam (GR2)	LF	$42.50							
Std. W beam, Weak Post GR8	LF	$28.50							
Terminal, GR-6 (L=12’-6”)	EA	$2,929.00							
Terminal, GR-7 (L=6’-3”)	EA	$2,659.00							
Type I, GR-8 Terminal (L=25’)	EA	$1,399.00							
Type II, GR-8 Terminal (L=13’-6”)	EA	$695.00							
Terminal, MB-4 (L=37’-6”)	EA	$3,495.00							
Type I, MB-5 Terminal (L=27’-1)	EA	$2,925.00							
Type II, MB-5 Terminal (L=13’-6)	EA	$1,675.00							
Miscellaneous									
Trash enclosure - Brick 6' high	LF	$325.00	40	13000.00					
Reinforced Concrete Pad 6" to 8"	SY	$62.00	160	9920.00					
Striping 4" width (VDOT Type	LF	$2.25	180	405.00					

BOND ESTIMATE					BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION	QUANTITY	EXTENSION	%COMPLETE	% Approved
B)								
Concrete Wheel Stops	EA	$70.00						
Parking Lot Striping	EA	$50.00	34	1700.00				
Sign Island	EA	$850.00						
Traffic Barricade	LF	$43.45						
Street Name Signs	EA	$435.00						
Traffic Control Signs	EA	$375.00						
Street Light (pole, bracket, light)	EA	$4,285.00						
SIDEWALKS AND TRAILS								
Sidewalk								
Concrete 4” w/WWF, No base	SY	$45.23	392	17730.16				
Bitum. Conc, 2” w/4” Base	SY	$30.00						
4” Conc, No Reinf., No Base	SY	$41.00						
HANDRAIL								
Handrail 3 Rail 1-1/4” #4 Finish	LF	$96.50						
Wood Chip Trail								
Trails(Incl Excavation & Grading) Wood chip, 4’ wide	SY	$17.69						
Bituminous Trail								
6’ to 10' wide	SY	$49.25						
CRITICAL SLOPE STABILIZATION								
Paved Flume	SY	$67.00						
Stmwtr Conc Channel-Excav	SY	$7.75						
ADD Grass Lined-seeded	SY	$5.37						
ADD Grass Lined-sodded	SY	$10.89						
Outlet Protection								
Non-grouted Riprap 18”	SY	$52.00						
Concrete 4”	SY	$53.50						

BOND ESTIMATE					BOND REDUCTION			City Use Only
ITEM	UNIT	UNIT COST	QUANTITY	EXTENSION	QUANTITY	EXTENSION	%COMPLETE	% Approved
Level Spreader	SY	$4.44						
Struc Streambank Protection								
Non-grouted Riprap 18”	SY	$58.00						
Gabions	CY	$147.00						
Vegetative Erosion Control								
Sodding incl Fertilizing – Banks	SY	$7.77						
Sodding incl Fertilizing – Flat	SY	$5.36						
Seeding incl Fertilizing	SY	$2.44						
Soding W/Soil Treat & Watering	SY	$3.25						
Seeding W/Soil Treat & Watering	SY	$6.46						
Straw Mulch w/Tack	SY	$1.40						
Jute Mesh	SY	$1.77						
SPECIAL ITEMS								
FEMA Processing LOMR/CLOMR	EA	$7,500.00						
As Built (Record Drawings)	EA	$9,500.00						
SWM/BMP POND	LS	See Note 1						
SIGNALIZATION	LS	See Note 2						
Subtotal				220640.28				

TOTAL ESTIMATE OF COMPLETED WORK:			

TOTAL:	220640.28
+ 10% CONTINGENCIES:	22064.03
GRAND TOTAL:	242704.31
+ 4% INFLATION FACTOR:	9708.17
	252412.48

Kimley»Horn

Memorandum

To: Westover Holding, LLC
11 Meadow Branch Ave
Winchester, VA 22601

From: Mark Phillips, P.E.

Through: Mr. James Newman, AICP
City of Charles Town
101 E Washington Street
Charles Town, WV 25414

Date: February 12, 2024

Subject: Westover Dental Bond Initiation Application Review

This memorandum summarizes our review of the Bond Initiation Application for Westover Dental Performance Bond Application (dated January 25, 2024, prepared by Westover Holdings LLC) for a proposed bond of $252,412.48. Kimley-Horn's review of this application is limited to the Final Plan and Application provided. Based upon our review, we have no comments. Thank you for the opportunity to review this Bond Initiation. In the meantime, please feel free to contact us at 703-870-3631 should you have any questions.

KIMLEY-HORN & ASSOCIATES, INC.

Mark Phillips, P.E.
Project Manager
Associate

Planning Commission
101 East Washington Street
Charles Town, WV 25414

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

SCHEDULED

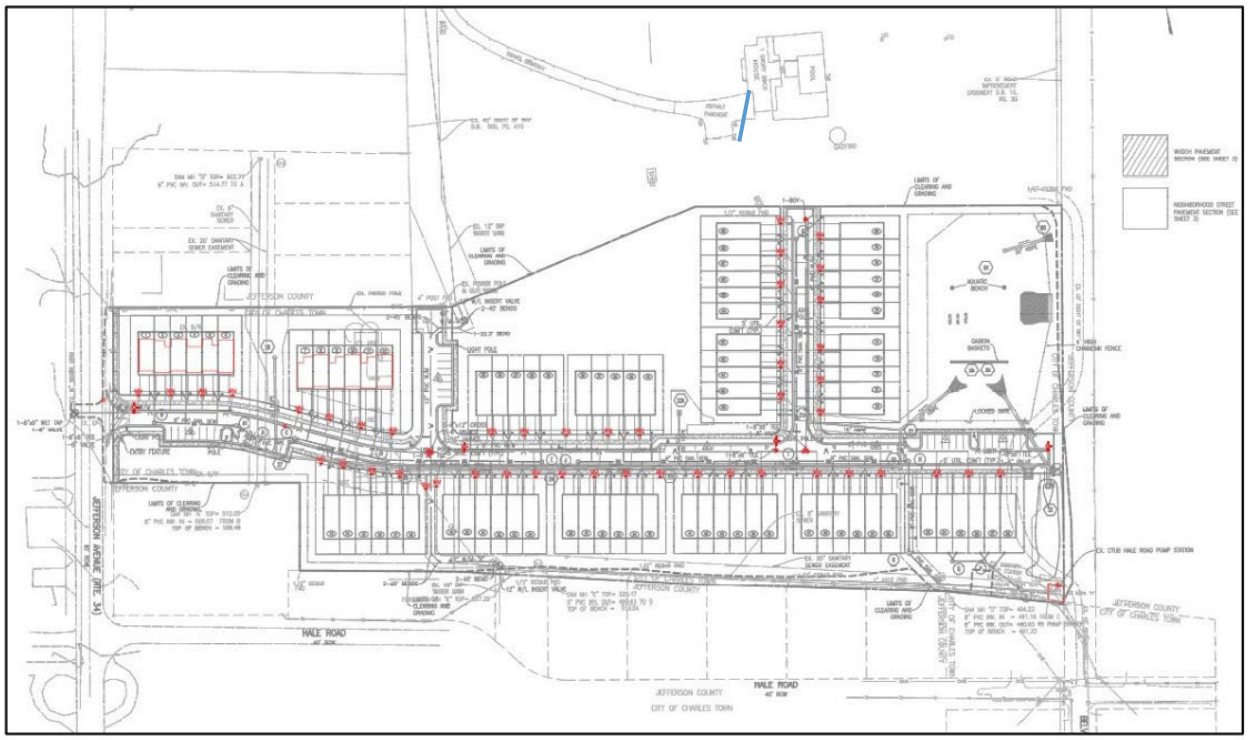
AGENDA ITEM (ID #)

Commission Review: BR2024-04 - Tate Manor Bond Extension

ATTACHMENTS:

- 1. Staff Report.pdf
- 2. Application.pdf
- 3. Narrative.pdf
- 4. Background bond info.pdf
- 5. Site Visit Pictures.pdf

Date: For the February 26, 2024 Planning Commission meeting
Applicant: DR Acquisitions, LLC
Report by: James Newman, City Planner, Zoning/Subdivision Administrator.
Proposal: A bond extension for Tate Manor development



CURRENT BOND: $261,680.11

BACKGROUND: *Hatch Engineering* recommended approval of the performance bond during the November 16, 2020 City Council meeting, Council approved the initial letter of credit in the amount of $1,278,000.00.

On November 22, 2021, the Planning Commission heard a request for a bond reduction for Tate Manor. The reduced bond amount was set at $261,680.11 On December 6, 2021, City Council voted in **approval** of the bond reduction.

The performance bond expired on June 28, 2022 with the option of a single period of six (6) months extension; thus, reaching its final expiration date on December 30, 2022.

On December 27, 2022 the Planning Commission heard a request to extend the bond for one year. The Commission voted to **approve** the extension, which expired on December 30, 2023.

APPLICANT NARRATIVE:
"DR Acquisitions is requesting an extension for the expired performance agreement for Tate Manor. The developer is asking for the extension, which enables DR Acquisitions to renew the Irrevocable Letter of Credit to its current amount of $261,680.11 to remain in good standing with the City of Charlestown.

The current surety amount held is for all close out work that DR Acquisitions fully intends to complete in the coming spring months. During December of 2023 the last remaining townhome lots have built and settled. With the completion of the remaining units, DR Acquisitions will be able to move forward with street surface paving to close out the subdivision. Unfortunately, the remaining work cannot be completed until spring weather conditions allow for the proper completion of surface paving and remaining work."

BOND COMMITTEE: The Bond Committee discussed this item at their February 20, 2024 meeting. The Committee thought it appropriate to extend the bond only for a couple of months, and if the work is not completed then the City would pull the bond and complete the work.

SITE VISIT: Staff visited the site on February 20, 2024. Pictures are attached to this report. The sidewalks, stormwater management, and street lighting all appeared to be installed correctly; the road was missing the top layer of asphalt.

STAFF RECOMMENDATION: Approval of the bond extension until July 1, 2024.

Bond Request No._____

BOND REQUEST AND REDUCTION

To assist the Subdivision Administrator in the review of a Bond Request Application, the Applicant must utilize this form to supply the City with the information prescribed under Article 1335 and Section 1332 of the Subdivision and Land Development Ordinance. The submission of this form, along with the prescribed information and required fees, shall serve as the Applicant's Bond Request Application as required by Ordinance Article 1335.

1. DATE Feb. 2, 20 24

2. APPLICATION TYPE ☑ Bond | Initiation ☐ Bond | Reduction

☐ Bond | Reallocation ☐ Bond | Release**

3. PROJECT NAME Tate Manor

Address City of Charles Town, WV.

4. APPLICANT'S NAME* DR Acquisitions, LLC

Address 7945 Wormans Mill Rd. Frederick MD 21701

Telephone Number (301) 582-8208 Fax Number ( )

Email Address debersole@dmrdev.com.

5. PROPERTY OWNER'S NAME DR Acquisitions, LLC.

Address 7945 Wormans Mill Rd. Frederick MD 21701

Telephone Number (301) 582 8208 Fax Number ( )

Email Address debersole@dmrdev.com.

*Applicants include: Property owner(s), Engineer(s), Surveyor(s), or Consultant(s)

**Requires a Public Hearing and landscaping surety for one year after release

Bond Request No._____

6. DESCRIPTION OF REQUETED INITIATION, REDUCTION, OR RELEASE:

Request for extension of Performance Agreement until December 31, 2024 for Tate Manor. Work will be completed by late Spring of 2024, we are allowing extra months for the bond release process..

7. A) CURRENT BOND AMOUNT $261,680.11

B) PROPOSED BOND AMOUNT $261,680.11

8. PARCEL INVENTORY: (List all parcels that are part of this application):

Tax Map No.	Parcel No.	Deed Book	Page No.	Zoning District

9. PARCEL HISTORY: (List all pending or previously approved applications on the subject parcels inventoried above, including previous plat applications if this application is an amendment)

Application No.	Project Name and Phase	Status	Approval Date

Bond Request No._____

10. BOND RELEASE ATTACHMENTS.

The following shall be included with this request:

A. To the extent not previously submitted pursuant to bond reduction request, copies of inspection and test reports if work was inspected and tested by a third-party inspector.

B. Certification that all bonded Improvements, other than Improvements accepted by West Virginia Department of Highways (WVDOH), have been completed in accordance with the approved plans, profiles, and specifications and the requirements of any applicable manual. For Improvements to be accepted for maintenance by WVDOH, such Certification shall state that the Improvements have been installed and inspected in accordance with WVDOH's requirements.

C. A copy of the City-approved As-Built Drawings as required for facilities within public rights-of-way or Easements submitted pursuant to Section 1332.10 of this Ordinance.

Date of As-Builts _____ Prepared By _____

D. A letter from a Professional Engineer or Professional Land Surveyor certifying that property corners and Monuments have been set as required under this Ordinance.

E. Documentation of acceptance by WVDOH for public roadways and rights-of-way, or a maintenance and indemnification agreement and bond approved by the Planning Commission for public roadways that have been completed in accordance with WVDOH standards but which, due to factors other than their quality of construction, are not eligible for acceptance by WVDOH.

F. For private roadways, a letter of acceptance by the entity responsible for maintenance and a Latent Defects Indemnification Agreement and Bond in accordance with this Section.

G. Private Roadway Maintenance Bonds. Before a Performance Agreement and surety for private roadway construction shall be released, a Latent Defects Indemnification Agreement and Bond shall be provided by the applicant/Developer and approved by the Planning Commission. The guarantee provided by such Agreement and Bond must be for a period of two (2) years following the date of performance bond release, and must be in an amount equal to no less than 5% of the original performance bond estimate in accordance with Section 1335.07 (F) of the Subdivision Ordinance.

H. Landscaping Surety. Surety is required to ensure the landscaping shown on the Major S/LD plans is maintained for one (1) year. The one (1) year shall start from the date at which the surety for the site has been released, with the exception of this landscaping surety. The landscaping surety amount shall not be less than $5,000.00 or 10% of the total landscaping cost for the project, which every is greater.

Bond Request No._____

APPLICANT CERTIFICATION

I certify that, to the best of my knowledge, the submitted information and statements are true and correct. I also certify that I have received and read Article 1335 of the S/LD Ordinance.

Signature of Applicant

_____ Date 2/2/24

Signature of Property Owner (If different than Applicant)

_____ Date 2/2/24

Please submit an original completed Application, 1 digital copy and 1 paper copy of the As-Built Plans (if applicable) to the following:

Subdivision Administrator
City of Charles Town
101 E. Washington Street
Charles Town, WV 25414

Please also send a copy of the completed Application as well as the As-Builts to the following:

Hatch/Chester Engineers
Attn: Elizabeth Adamowicz
705 Quince Orchard Road, Suite 310
Gaithersburg, MD 20878

FOR CITY USE ONLY

Application Number:_____ Date Application Received:_____

Fee: $_____ Check No._____

Receipt No._____

Site Inspection Date:_____ Inspector:_____

Subdivision Administrator Approval:_____ Date:_____

Engineer Approval:_____ Date:_____

Planning Commission Approval:_____ Date:_____

City Council Approval:_____ Date:_____

Comments:_____

_____

_____

_____

_____

DRAcquisitions

February 5, 2024

City of Charles Town
101 E. Washington Street
Charles Town, WV 25414

Attn: James Newman
City Planner, Zoning/Subdivision Administrator

Re: Tate Maner

Subj: **Performance Agreement Request for Extension**

Dear Mr. Newman,

DR Acquisitions is requesting an extension for the expired performance agreement for Tate Manor. The developer is asking for the extension, which enables DR Acquisitions to renew the Irrevocable Letter of Credit to its current amount of $261,680.11 to remain in good standing with the City of Charlestown. The current surety amount held is for all close out work that DR Acquisitions fully intends to complete in the coming spring months. During December of 2023 the last remaining townhome lots have built and settled. With the completion of the remaining units, DR Acquisitions will be able to move forward with street surface paving to close out the subdivision. Unfortunately, the remaining work cannot be completed until spring weather conditions allow for the proper completion of surface paving and remaining work.

Sincerely,

DR ACQUISITIONS, LLC



Matthew Stare
Director of Land

DR ACQUISITIONS, LLC 7945 Wormans Mill Rd, Frederick, Maryland, 21701 P. 301.788.0703

City of Charles Town

Department of Community Development
Division of Planning and Zoning

101 East Washington Street, P.O. Box 14, Charles Town, WV 25414
Phone: (304) 724-3248 ♦ Fax: (304) 725-1014 ♦ Web: www.charlestownwv.us

December 17, 2021

Andrew Hauer (Land Development Associate)
DRB Group
10212 Governor Lane Blvd, Ste 1006,
Williamsport, MD 21795

Re: SLD-2020-02-BR- Bond Reduction for Tate Manor

Dear Applicant,

This letter is to inform you that on November 22, 2021, the Planning Commission reviewed and recommended the approval of the performance bond reduction in the amount of $798,737.82 and leaving a balance of $261,680.11 to the City Council for the development of Tate Manor. On December 6, 2021, City Council accepted the Planning Commission's recommendation and reduced the bond amount as mentioned above.

Should you have any questions concerning this matter, please contact me at 304-724-3251 or email me at rdeepon@charlestownwv.us.

Respectfully,

Rashedul H. Deepon
Rashedul Hasan Deepon
City Planner I

UNITED BANK

MODIFICATION TO APPLICATION AND AGREEMENT FOR IRREVOCABLE STANDBY LETTER OF CREDIT NO. 4832911-52

Modification Date: January 10, 2022
Original Application and Agreement Execution Date: December 30, 2020
Original Letter of Credit Issue Date: December 30, 2020
Original Letter of Credit Amount: $1,278,000.00
Current Letter of Credit Amount: $1,278,000.00
New Letter of Credit Amount: $ 261,680.11

Applicant: DR ACQUISITIONS, LLC

Beneficiary: CITY OF CHARLES TOWN

The Application and Agreement for the above Letter of Credit is hereby modified and amended as follows:

1) By the request of the Beneficiary and the Applicant, the amount available for draft for the Letter of Credit is being reduced to **TWO HUNDRED SIXTY-ONE THOUSAND SIX HUNDRED EIGHTY AND 11/100 U.S. DOLLARS ($261,680.11)**. Accordingly, any occurrence of the sum "ONE MILLION TWO HUNDRED SEVENTY-EIGHT THOUSAND AND 00/100 U.S. DOLLARS ($1,278,000.00)" is hereby replaced and restated as "TWO HUNDRED SIXTY-ONE THOUSAND SIX HUNDRED EIGHTY AND 11/100 U.S. DOLLARS ($261,680.11)", as if originally set forth therein.

All other terms and conditions remain unchanged. By executing below, the Applicant herein acknowledges the above changes in indebtedness for which it is obligated.

{Signature Page to Follow}

Agreed to and accepted this _____ day of _____, 2022.

APPLICANT:

DR ACQUISITIONS, LLC,
a West Virginia limited liability company

By: _____ (SEAL)
Name: Daniel M. Ryan
Its: Manager

BRANDY MATHEWS
NOTARY
PUBLIC
EXP. 5-26-2025
WASHINGTON COUNTY, MARYLAND

STATE/COMMONWEALTH OF Maryland

CITY/COUNTY OF Washington **, TO WIT:**

I HEREBY CERTIFY, that on this 11 day of January, 2022, before me, the undersigned Notary Public of said State, personally appeared **Daniel M. Ryan**, who acknowledged himself to be the **Manager** of **DR ACQUISITIONS, LLC**, a West Virginia limited liability company, known to me (or satisfactorily proven) to be the person whose name is subscribed to the foregoing instrument and acknowledged that he executed the same for the purposes therein contained as the duly authorized agent of said company by signing its name as its **Manager**.

WITNESS my hand and Notarial Seal.

My Commission Expires: 5/26/25 Notary Public: Brandy Mathews

UNITED BANK

IRREVOCABLE STANDBY LETTER OF CREDIT No. 4832911-52
AMENDMENT No. 2

CITY OF CHARLES TOWN
101 East Washington Street
P. O. Box 14
Charles Town, WV 25414

Amendment Issuing Date:	December 14, 2022
Beneficiary:	City of Charles Town
Applicant:	DR Acquisitions, LLC
Original Letter of Credit Amount:	$1,278,000.00
Current Letter of Credit Amount:	$261,680.11

Gentlemen:

United Bank hereby amends the above Letter of Credit as follows:

1) By the request of the Beneficiary and the Applicant, the Letter of Credit shall reach its final expiration date on **December 30, 2023**. As such, any occurrence of the date "December 30, 2022" is hereby replaced and restated as "December 30, 2023", as if originally set forth therein.

All other terms and conditions of this Letter of Credit remain unchanged.

This Amendment is to be considered part of the above-mentioned original Letter of Credit and must be attached thereto.

Very Truly Yours,

UNITED BANK

Robert M. Anderson
Assistant Vice President

DMR ENTERPRISES

7945 Wormans Mill Rd
Frederick, MD. 21701

December 20, 2022

Via Federal Express
Alissa J. Meeks
Director of Community Development
City of Charles Town
101 E. Washington St.
Charles Town, WV 25414

In RE: LOC (Tate Manor) No. 4832911-52

Dear Alissa:

Please find enclosed the amended Irrevocable Standby Letter of Credit for Tate Manor.

Please do not hesitate to contact me should you need anything else.

Best regards,

Anne Wolf, Paralegal

:aw
Enc.


2024/02/20 11:38:14
534


2024/02/20 11:38:24
535


TATE MANOR DR
2024/02/20 11:39:16
536


2024/02/20 11:39:38
537

Planning Commission
101 East Washington Street
Charles Town, WV 25414

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

SCHEDULED

AGENDA ITEM (ID #)

Commission Review:SLD2022-04 - Hillside preliminary plan

ATTACHMENTS:

- 1. Staff Report.pdf
- 2. Application.pdf
- 3. Plans revised.pdf
- 4. Traffic Study.pdf
- 5. KH Review.pdf

Preliminary Plan Report

SLD2022-04

Date: For the February 26, 2024 Planning Commission meeting

Applicant: Christopher Consultants Ltd.

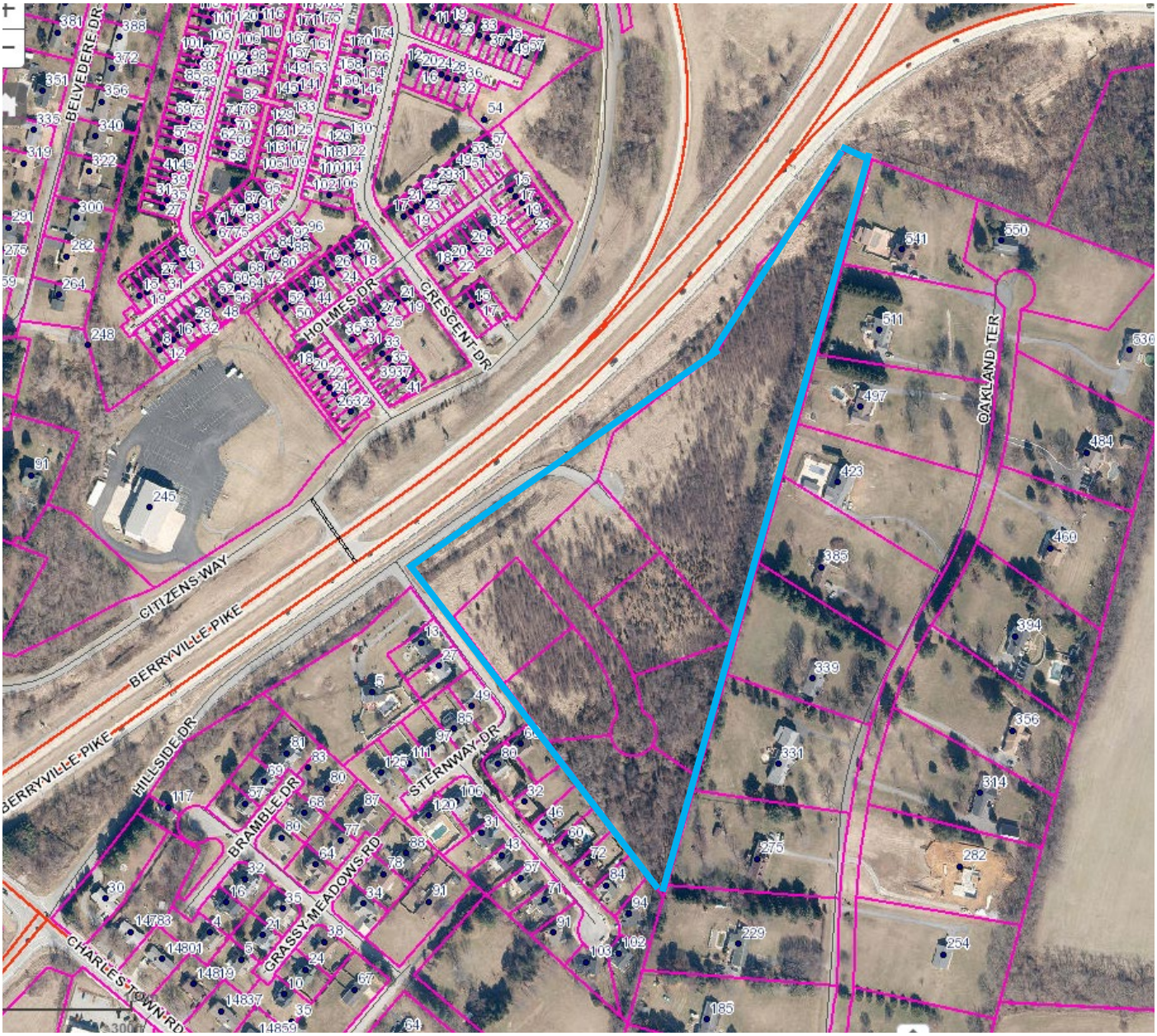
Property Owner: Hillside Investments LLC.

Report by: James Newman, City Planner, Zoning/Subdivision Administrator.

Proposal: Major Subdivision and Land Development, waiver for electric meter location.

Property Location: Located on Hillside Drive. Property roughly outlined in **blue** below.

Current Zoning: Residential Medium-High Density (R-15).



PROJECT OVERVIEW

The development of 13.71 acres into 124 townhouses.

SKETCH PLAN

The sketch plan was deemed complete by the Planning Commission on February 27th, 2023.

The sketch plan was approved by the Planning Commission on April 24, 2023, subject to conditions:

1. The plans must meet the 30% open space requirement of townhome developments.
2. Respectfully, that Council reach out to the WV Division of Highways about traffic mitigation possibilities, including a right turn only lane, at the intersection of Hillside Drive and Charles Town Road.

WAIVER

The Planning Commission approved a waiver from townhome electric meter locations on March 27, 2023.

ZONING REVIEW

The properties are zoned residential Medium-High Density (R-15).

Density

Maximum density is 15 units per acre. Density is calculated on net buildable land area. Out of a 14.47 acre site, net buildable land area is 9.9 acres/431, 473 sq. ft. Applicant proposes 124 townhomes. 124 units / 9.9 acres = 12.5 units per acre, which is within the density limit of the zoning district.

Open Space

30% of the property must be open space. Open Space is partly defined in Code as land "*intended for the use and enjoyment of the residents living within the development*." Open space does not include land dedicated to buffer areas, streets, parking, stormwater management ponds, or other areas not practically useable by residents.

Proposed active open space includes a playground. Overall open space occupied 32%/3.14 acres of the site.

Additionally, Subdivision Ordinance Section 1333.17 requires that some open space be dedicated to the City as parkland, or a fee-in-lieu-of $500 per unit be paid. The applicant has informed staff that they will pay a fee-in-lieu-of.

Parking

Required off-street parking for townhomes is 1.8 spaces per unit, which would total 223 spaces. Applicant is proposing 269 spaces.

Street Connections

The City's Engineering firm, Kimley-Horn, had no comments about street connections or road design. Both Hillside and Sternway Drives are shown as local roads on the *2040 Comprehensive Plan*.

Interior sidewalks connections between are shown. Proposed sidewalks within the development would connect to existing sidewalks on Sternway Drive. There is no existing sidewalk along Hillside Drive, and no sidewalks are proposed there.

Landscaping

Street trees are required for every 50 feet of street frontage. Up to 10 % of these trees may be planted in open space rather than along the street.

Buffers

Opaque screening of at least 6 ft. in height is required between townhomes and single family detached dwelling units. Opaque screening shall consist of a wall, fence, landscaped earth berm, planted vegetation, existing vegetation, or a combination thereof and shall be intended to prevent visibility and reduce noise.

A vegetated landscape buffer is shown adjacent to Sternway Drive, Edaw Drive and the residences there, and Oakland Terrace and the residence there. No buffer is shown between this property and US Rte 340.

Stormwater

The City's Engineering firm, Kimley-Horn, had no comments about stormwater control facilities.

Utilities

A waiver was approved for the location of electric meters. The applicant does not yet have a letter confirming availability of water and sewage utilities from the Charels Town Utility Board.

Lighting

The applicant has **not** provided photometric data.

Floodplain

The narrative states that a small portion of the property lies within a flood hazard area. However, a view of the Federal Emergency Management Agency flood maps shows no such flood hazard for this property. It is entirely located within Zone X, which is areas of low flood risk outside of the .2% annual chance floodplain.

TRAFFIC IMPACT STUDY

The following analysis was prepared by the City's 3rd party engineering firm Kimley-Horn:

The Hillside Residential TIS is predicated and built upon three prior approved traffic studies and one study pending approval for. These developments and their proposed mitigation measures are included in the forecasts as background developments that will be fully or partially complete by the Build Year of 2029. These developments are the Tate Manor, Magnolia Springs, Kings Crossing, and Fairview Farms developments. The Tate Manor and Magnolia Springs developments are located north of Crescent Drive/High Street and east of Jefferson Avenue in Charles Town and are anticipated to be completed by the year 2024. The Kings Crossing development is located along the south side of WV 115 between Crosswinds Drive and Kabletown Road and is anticipated to be complete by 2025. The pending Fairview Farms development is located along the north side of WV 115 opposite Kings Crossing and is anticipated to be complete by 2030 (assumed 90% complete by 2029).

The developments previously mentioned include the following improvements which are considered a background condition of the study:

- Tate Manor TIS:
  - Installation of a Traffic Signal at WV 115 and Jefferson Avenue
  - Construction of an exclusive left-turn lane on WV 115 EB at Jefferson Avenue
  - Installation of a single lane roundabout at WV 115 and US 340 NB Ramp/Hillside Drive
- Kings Crossing TIS:
  - Construction of a right-turn slip lane on the US 340 SB Ramp approach at WV 115 eastbound
- Magnolia Springs TIS:
  - Proceed with the Single Lane Roundabout at WV 115 and US 340 NB Ramp/Hillside Drive (Planned by WVDOH to be installed in 2025)
- Fairview Farms TIS:
  - Construction of an exclusive right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive

Should these background improvements not be implemented prior to the Hillside Residential Development Intersections #2 (Charles Town Road at US 340/Citizens Way) and #3 (Charles Town Road at US 340/Hillside Drive) will be operating under failing levels of service without the implementation of the slip lanes and single lane roundabout respectively.

The Hillside Residential Development proposes 128 new Townhouse Units which will add 896 average daily trips, 63 AM Peak Hour Trips and 76 PM Peak Hour Trips.

The Hillside Residential Development TIS recommends the following additional mitigation measures to provide adequate levels of service in the future build condition with the assumption the aforementioned improvements would be in place:

- Construction of an exclusive full movement approach along Hillside Drive to Site Drive #1,
- Construction of an exclusive full movement approach on Sternway Drive to Site Drive #2.

With the proposed mitigation measures in place by 2029 and the two additional site entrance improvements proposed by the Hillside Residential Development all study intersections are forecast to operate with acceptable levels of service (LOS D or better) in the 2029 Future Build Improved Scenario.

TOWNHOUSE DEVELOPMENT STANDARDS

Section 1333.20 of the Subdivision and Land Development Ordinance lays out use standards which apply to townhome developments:

(A) ***Density****. The overall density in a townhouse project shall not exceed the Maximum Density specified in the Charles Town Zoning Ordinance for the Zoning District in which it is located except when designed and developed as a Planned Unit Development under provisions set forth in the Charles Town Zoning Ordinance. Density shall be calculated using the Net Buildable Land Area (as such term is defined in the Zoning Ordinance) of the Lot.*

Maximum density in R-15 is 15 units per acre. 12.5 units per acre. This criterion is **met**.

(B) ***Land Area****. The Net Buildable Land Area (as such term is defined in the Zoning Ordinance) of a townhouse Development shall equal at least 3,500 square feet for each dwelling unit. Each dwelling unit shall have a minimum lot size of 2,000 square feet. The difference between the Net Buildable Land Area and the total area of the dwelling unit Lots shall be allocated to open space common area*.

This criterion is **not met**. The net buildable land area is calculated by subtracting areas where building is prohibited or subject to significant restrictions from the gross lot area. The calculation is based on subtracting the land devoted to sensitive areas such as wetland, sinkholes, and floodplains, public rights-of-way, and stormwater management areas. Setback requirements are not part of this calculation.

Per the applicant, the overall size of the site is 14.47 acres/630,313 sq. ft. Following the removal of public and private rights-of-way dedication, the net buildable area is 9.9 acres/431,473 sq. ft. As there are 124 proposed townhomes, the total land area for each dwelling unit is 3,479 sq. ft. per dwelling unit, which does not meet the 3,500 sq. ft. threshold requirement.

(C) ***Tract Frontage****. Each townhouse development shall have at least 50 foot of street frontage. This does not apply to single or multiple contiguous townhouses on an existing platted street. For a townhouse development on a pipestem lot, the minimum pipestem width shall be the right-of-way width as required per Table 1333.02.*

This criterion is **met**. Each section of townhomes meets this requirement.

(D) ***Townhouse Lot Width****. The minimum townhouse lot width shall be in accordance with the minimum lot with specified in the Charles Town Zoning Ordinance for the Zoning District in which the townhouse is located. Each Lot on the end of a row of townhouses shall have an additional width necessary to accommodate the required side yard.*

This criterion is **met**. The minimum lot width requirement in R-15 zoning is 18 ft.

*(E) **Length of Townhouse Row**. There shall be not be more than ten (10) nor less than three (3) contiguously connected townhouse units.*

This criterion is **met**.

*(F) **Yards**. The following minimum Setback requirements shall apply:*

*1. **Front Yard**. Each townhouse shall have a minimum front yard Setback that is in accordance with the minimum front yard setback specified in the Charles Town Zoning Ordinance for the Zoning District in which the townhouse is located. Townhouses, however, may be arranged to face onto a common open space. In such instances, such a space shall not be less than fifty (50) feet in width and shall be arranged to permit access for emergency vehicles.*

With such an arrangement, the front yard requirement may be reduced by ten (10) feet. If the townhouses have rear loaded garages or parking, the setback can be reduced from the required setback distance to zero (0) feet, or any distance in between, provided that no steps or stoops shall be allowed within the right of way or upon sidewalk, unless the sidewalk has a clear walking path of five (5) feet from the closest edge of the steps or stoop to the edge of curb. This reduced setback shall supersede the Zoning Ordinance requirements.

*2. **Side Yard**. Each townhouse shall have a minimum side yard Setback that is in accordance with the minimum side yard setback specified in the Charles Town Zoning Ordinance for the Zoning District in which the townhouse is located. When the yard adjoining the corner Lot along the rear lot line fronts the side Street of the corner Lot, the width of the corner Lot shall be increased to provide a minimum side yard Setback equal to the adjoining front yards.*

*3. **Rear Yard**. Each townhouse shall have a minimum rear yard Setback that is in accordance with the minimum rear yard setback specified in the Charles Town Zoning Ordinance for the Zoning District in which the townhouse is located. However, access to the rear yard for purposes of maintenance and fire protection shall be accommodated by a private access drive or a minimum ten (10) foot property service easement, which shall be perpetually recorded with each dwelling unit property.*

An accessory Building shall be located only in a rear yard and shall occupy not over twenty-five (25) percent of the rear yard area and shall be located not less than five (5) from any Alley or rear service Street Line. Enclosing of the rear yard space is permitted pursuant to the fencing requirements specified under Article 1323 (H) of the Charles Town Zoning Ordinance.

These setback criteria are **met**. The proposed development meets the setback requirements, which are:
Front: 25 ft.
Sides: 10 ft., or 0 ft. for a shared party-wall.
Rear: 20 ft.

*(G) **Access Drives and Off-Street Parking**. Off-street parking space shall be provided at the rate of 1.8 spaces per dwelling unit. In a Subdivision/Land Development of townhouse Lots, it will not be necessary that off-street parking be provided on a specific Lot so long as the required number of parking spaces are provided in the Subdivision/Land Development for the number of Lots to be served; provided that, no parking area shall be more than 200 feet from the dwelling unit it serves.*

This criterion is **met**. Each unit features a driveway, and parking is available on-street.

*(H) **Townhouse garages** may be attached to or detached from the townhouse unit and may be accessed from either the front or rear yard. When detached the garage structure must be consistent and compatible with the architecture and materials of the respective townhouse unit.*

This criterion is **met**.

*(I) Townhouses abutting each other shall have complimentary but not identical **facades**.*

This criterion will be enforced during the building permit process. No architectural plans have been provided for staff review yet.

*(J) No more than two abutting townhouses shall have a **common roof line**.*

This criterion will be enforced during the building permit process. No architectural plans have been provided for staff review yet.

(K) When townhouse Lots do not front on a Public Street, they shall front on private roads, parking lots or access Easements. The length and extent of private roads, parking lots or access Easements providing access to Lots shall be minimized, and Public Streets shall be provided in larger Subdivisions/Land Developments when substantial distances are involved.

Private roads, parking lots, and access Easements shall be no more than 500 feet from a Public Street, as measured along the centerline of the access Road. Private roads, parking lots, and access Easements may be located up to 800 feet from a public Road where enhanced circulation is provided with two connection points to the Public Street. The average daily trip for private roads, parking lots, or access Easements shall not exceed 250 VPD. Townhouse Developments that include the use of private roads, parking lots and access Easements shall conform to the West Virginia Code Chapter 36B, Uniform Common Interest Ownership Act, as specified under Section 1333.21 of this Ordinance.

The applicant completed a traffic impact study. The average daily trips and peak hour trips to be generated are:

-896 average daily trips
-63 AM Peak Hour Trips
-76 PM Peak Hour Trips.

(L) ***Site Coverage****. The minimum townhouse lot width shall be in accordance with the minimum lot with specified in the Charles Town Zoning Ordinance for the Zoning District in which the townhouse is located.*

This criterion is **met**. Minimum lot size is 2,000 sq. ft.

(M) Adequate provision shall be made for ***storage of collection and refuse*** *where applicants desire a centralized collection point(s) in lieu of curb-side trash pick-up. This area shall be screened and the dumpsters placed on a concrete pad pursuant to Article 1333.23(L) of this Ordinance.*

The plan does not show any centralized dumpster or waste collection facilities or pads. This criteria would only apply if such facilities were proposed.

(N) ***Permeable areas*** *of the site shall be planted with ground cover, shrubs, and trees as required by this Ordinance.*

Ground cover in the form of grass and other landscaping will be used on permeable areas.

(O) ***Required Open Space****.*

1. The difference between the Net Buildable Land Area of a townhouse Development and the total area of the dwelling unit Lots shall be allocated to open space common area as specified in Section 1333.20(B) above.

2. In the event that the Planning Commission, by waiver, permits dwelling unit Lots of less than the 2,000 square foot minimum specified in Section 1333.20(B), compensating open space must be established and provided within the project site equal to the aggregate area by which such Lots are under the 2,000 square foot minimum.

3. In a townhouse Development, open space for the Subdivision/Land Development must at least equal 30 percent of the Net Buildable Land Area of the Subdivision/Land Development.

Open space is provided at 32% of the site.

(P) ***Maintenance of Common Areas****. All common areas and facilities including, but not limited to, recreational facilities, off-street parking and common open space shall be maintained in a satisfactory manner without expense to the general taxpayers of the City. In order to insure the maintenance of and the payment of taxes on the commonly held non-public property, a mandatory homeowners association shall be created and a declaration regarding the same shall be recorded to the satisfaction of the Planning Commission in the Office of the Clerk of Jefferson County.*

A homeowner's association must be established to care for common areas.

RECOMMENDATION

While the site layout is generally in conformance with the approved sketch plan, the Planning Commission should **table action** so that the applicant can provide additional data per Kimley-Horns comments dated Feb 22, 2024, along with photometric data, revised net build area calculations, and a CTUB approval letter.

CHARLES TOWN, WEST VIRGINIA
Department of Community Development
Division of Planning and Zoning
101 East Washington Street, P.O. Box 14
Charles Town, West Virginia 25414

Phone: (304) 725-2311 □

Fax (304) 725-1014

File Number: _____
Staff Initials: _____
Fees Paid: _____

https://goo.gl/KGzDMZ

Sketch Plan Review Checklist
Amended 2017 Subdivsion Ordinance

(please check one) ___✓___**Major S/LD Application** or
_____**Zoning Use Permit, Special Exception Use, or Sketch Plan (requirements found in the Supplemental Regulations of the Zoning Ordinance)**

Project Name: _____

Property Owner Information					
Property Owner:	Hillside Investment LLC				
Mailing Address:	175 John J Thomas Way				
City:	Charles Town	State:	WV	Zip Code:	25414
Phone Number:	304)283-2601	Email:			
Signature:				Date:	6-2-22

Applicant's Registered Engineer or Surveyor or Design Consultant					
Name:	Christopher Consultants Ltd - Attn. Sylke Knuppel				
Mailing Address:	4601 Forbes Boulevard # 140				
City:	Lanham	State:	MD	Zip Code:	20706
Phone Number:	240) 296-1574	Email:	sylkeknuppel@ccl-eng.com		

Physical Property Details					
Physical Address:					
City:	Charles Town	State:	WV	Zip Code:	25414
Tax District:		Map No:	9	Parcel No:	67
Parcel Size:	13.71 Acres	Deed Book:	691	Page No:	432

Zoning of Subject Property			**Is the Project to Be:**	**Is Property In:**
Urban Reserve (UR)	Residential Medium-High Density (R-15)	Neighborhood Commercial (NC)	Planned Unit Development (PUD)	Historic Overlay District (HOD)
General Commercial (GC)	Old Town Residential (OT-R)			Floodplain Overlay District (FOD)
Old Town Mixed Use Commercial (OT-MUC)	Neighborhood Residential (NR)			

City Use Only	1st Review	2nd Review	3rd Review	4th Review
Submittal Date				
Zoning Administrator				
City Planner				
GIS/Addressing				
Return Date				

Sketch Plan Application No._____

SKETCH PLAN APPLICATION

SUBDIVISION AND LAND DEVELOPMENT ORDINANCE
ARTICLE 1332, SUBDIVISION AND LAND DEVELOPMENT APPLICATION & APPROVAL REQUIREMENTS

To assist the Subdivision Administrator in the review of a Sketch Plan Application, the Applicant must utilize this form to supply the City with the information prescribed under Section 1332.03 of the Charles Town S/LD Ordinance. The submission of this form, along with the prescribed information and required fees, shall serve as the Applicant's Sketch Plan Application as required by Ordinance Section 1332.03. Applicant is responsible to ensure the standards of Ordinance Section 1332.04, Sketch Plan Requirements, are met and provided herein is a checklist of the Sketch Plan requirements.

1. DATE _____ 5/26, 2022

2. APPLICATION TYPE*

☐ Zoning Use Permit, Special Exception Use and Sketch Plan requirements found in the Supplemental Regulations of the Zoning Ordinance
- Submit Three (3) 11" x 17" copies of the Sketch Plan shall be submitted and in Adobe PDF format

☑ Major S/LD Development
- Submit Three (3) 18" x 24" copies of the Sketch Plan shall be submitted and in Adobe PDF format

*There are two types of Sketch Plan submissions:

1. For Zoning Use Permit, Special Exception Use and Sketch Plan requirements found in the Supplemental Regulations of the Zoning Ordinance. Submission standards are found in Section 1332.04(D).
2. For a Sketch Plan for a Major S/LD application, submission standards are found in Section 1332.04(E)

3. APPLICANT'S NAME* Christopher Consultants Ltd - Attn. Sylke Knuppel

Address: 4601 Forbes Boulevard # 140, Lanham, MD 20706

Telephone Number (240) 296-1574 Fax Number ( )

Email Address sylkeknuppel@ccl-eng.com

4. PROPERTY OWNER'S NAME Hillside Investment LLC

Address: 175 John J Thomas Way, Charles Town, WV 25414

Telephone Number (304)283-2601 Fax Number ( )

Email Address

5. LEGAL DESCRIPTION OF THE SUBJECT PROPERTY (list all parcels that apply)

Property Address:

Tax Map # and Parcel: Tax Map#: 9 Parcel#: 67

Deed Book and Page #: Deed Book: 691 Page#: 432

Property Area in Square Feet or Acres: 13.71 Acres

6. DESCRIPTION OF PROJECT AND PROPOSED USE(S) OF THE PROPERTY:

The project proposes a Subdivision, Parcel 67, Lots 2A and 2B, and consists of 126 Townhouse lots. The acreage to be developed is approximately 13.71 acres. Each townhouse unit is three(3) stories, 20' x 40', and 2,400 SF.

7. DESCRIPTION OF THE EXISTING (OR FORMER) USE(S) OF THE PROPERTY AND CURRENT ZONING:

The property is located south of Berryville Pike and is accessible from Hillside Drive. They are currently vacant and are designated as General Commercial in the City of Charles Town Zoning Map. The property is in Neighborhood Residential (NR) Zone.

*Applicants Include: Property owner(s), Engineer(s), Surveyor(s), or Consultant(s)

8. ARE THERE ANY ANTICIPATED WAIVERS OR VARIANCES? IF YES, PROVIDE DETAILS.

n/a

9. HAS THE PROPERTY BEEN THE SUBJECT OF ANY COURT ACTION?

☐ Yes (Please specify nature of all proceedings and current status and attach any documents showing court decisions, etc.)

☑ No

10. PARCEL HISTORY (List all pending or previously approved applications on the subject parcels inventoried above, including previous site plan applications if this application is a site plan amendment)

Application No.	Project Name and Phase	Status	Approval Date

11. INTERESTED PARTY ADDRESSES, FOR PUBLIC NOTICE (including across street)
(Interested parties are defined as adjacent properties within 100 feet).

Owner	# and Street	City, State, Zip

APPLICANT CERTIFICATION

I certify that, to the best of my knowledge, the submitted information and statements are true and correct. I also certify that I have received and read Section 1332.02 of the Charles Town S/LD Ordinance and relevant provisions of the Charles Town City Code.

Signature of Applicant

_____ Date 6-2-22

Signature of Property Owner (If different than Applicant)

_____ Date _____

Please submit an original completed Application and specified number of Site Plan copies to the following:

Subdivision Administrator
City of Charles Town
101 E. Washington Street
Charles Town, WV 25414

FOR CITY USE ONLY

Application Number:_____ Date Application Received:_____

Fee: $_____ Paid:$_____ Check No._____

Receipt No._____

Subdivision Administrator Approval:_____ Date:_____

Planning Commission Approval:_____ Date:_____

Comments:_____

_____

_____

_____

_____

_____

Conditions of Approval (Attach Additional Comments As Needed)

Instructions

1. This checklist is provided as a quick reference guide only. The Consultant/Developer is responsible for reading the regulations and fully complying with all the requirements. All references to the Subdivision Ordinance and Zoning Ordinance are cited for informational purposes only.

2. The checklist shall be completed by the Engineer/Surveyor or Design Consultant and attached to the Sketch Plan review submission.

Requried Submittal Information

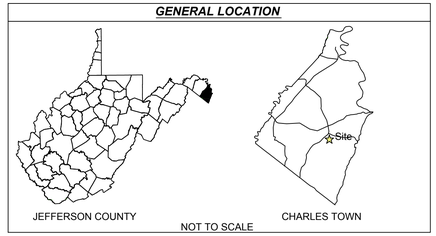
_____ 1 Check for Application Fees

_____ 1 Completed Application and Checklist (Signed by owner)

_____ 3 Sets of Sketch Plans and Adobe PDF Format

Sub-Section	*Ordinance Requirements: (See instructions on page 2)*	Engineer /Surveyor	1st Review	2nd Review	3rd Review	4th Review	Review Key
							✓ Ok
							O Incomplete
							N/A Not Applicable
							X Unacceptable
Sub-Section	**SUBDIVISION ORDINANCE Section 1332.04, Sketch Plan Requirements**						
A	**THERE ARE TWO TYPES OF SKETCH PLAN SUBMISSIONS:** **Sections in Red and Blue are depict the different types.**						
A1 and D	For: **• Zoning Use Permit** **• Special Exception Use** **• Sketch Plan requirements found in the Supplemental Regulations of the Zoning Ordinance** The following information shall be provided for Sketch Plan review:						
D1	Three (3) 11" x 17" copies of the Sketch Plan shall be submitted and in Adobe PDF format.						
D2	The Sketch Plan shall be drawn to a 1"=50' scale						
D2	The Sketch Plan must illustrate the following elements in such a way that the Subdivision Administrator or authorized designee can determine if the proposed Subdivision or Land Development meets the criteria of this Ordinance, **as applicable:**						
D2a	Existing conditions, including boundary lines of the property						
D2b	A land use plan, showing the location, arrangement and approximate boundaries of all proposed land uses						
D2c	Vicinity map, north arrow, scale (written and graphic) and date						
D2d	Name of proposed project or other identifying title and date plan was prepared. Name and address of the Engineer, Surveyor, Architect, Landscape Architect, Land Planner or Property Owner who prepared the plan						
D2e	Current zoning and total area of the property						
D2f	Maximum and proposed density						
D2g	Available utilities						
D2h	All existing sanitary sewer facilities and combined sewer facilities						
D2i	Depict location or statement of proposed water and sewer supply and other utility improvements						
D2j	Existing covenants						
D2k	General layout of any proposed number of Lots, average Lot sizes and any proposed commercial uses, including any associated parking. Include proposed height of structures						
D2l	Statement of total acreage of the tract being subdivided or developed						
D2m	Location of proposed Street layout, including connections to adjoining streets or vacant lots						
D2n	The location of sidewalks, trails and crosswalks						
D2o	Proposed open space and/or recreation areas, including notes on the plan describing the proposed use, activity area and/or improvement						
D2p	Any other information requested by the Subdivision Administrator in order for the Subdivision Administrator to make an accurate determination.						
A2 and E	For a **Major S/LD Application.** The following information shall be provided for Sketch Plan review:						
E1	Three (3) 18" x 24" copies of the Sketch Plan shall be submitted and in Adobe PDF format.	✓					
E2	The Sketch Plan shall be drawn to a 1"=50' scale	✓					
E2	The Sketch Plan must illustrate the following elements in such a way that the Subdivision Administrator or authorized designee can determine if the proposed Subdivision or Land Development meets the criteria of this Ordinance:						
E2a	Existing conditions, including boundary lines of the property	✓					
E2b	A land use plan, showing the location, arrangement and approximate boundaries of all proposed land uses	✓					

	Ordinance Requirements: (See instructions on page 2)	Engineer /Surveyor	1st Review	2nd Review	3rd Review	4th Review	Review Key	
							✓	Ok
							O	Incomplete
							N/A	Not Applicable
							X	Unacceptable
E2c	Vicinity Map, North arrow, scale (written and graphic) and date	✓						
E2d	Names of the abutting owners, adjoining lot lines and structures on abutting lots within 100 feet of the property	✓						
E2e	Title of the proposed project; the date, month and year the plan was prepared or revised; the name of the applicant(s), owner(s), and contract owner(s) and the name and address of the Engineer, Surveyor, Architect, Landscape Architect, or Land Planner who prepared the plan, including firm name	✓						
E2f	Current zoning and total area of the property	✓						
E2g	Maximum and proposed density based on the Net Buildable Land Area	✓						
E2h	Available utilities	✓						
E2i	All existing sanitary sewer facilities and combined sewer facilities	✓						
E2j	Depict location or statement of proposed water and sewer supply and other utility improvements	✓						
E2k	Existing covenants	N/A						
E2l	General layout of any proposed number of Lots, average Lot sizes and any proposed commercial uses, including any associated parking. Include proposed height of structures	✓						
E2m	Statement of total acreage of the tract being subdivided or developed, including the Net Buildable Land Area	✓						
E2n	The approximate acreage in common open space, in each use and housing type and in roads, streets or rights-of-way for the total development	✓						
E2o	The proposed number of dwelling units of each type in each in the total development	✓						
E2p	Location of proposed Street layout, including connections to adjoining streets or vacant lots	✓						
E2q	The location of sidewalks, trails and crosswalks, as may be applicable	✓						
E2r	Proposed open space and/or recreation areas, including notes on the plan describing the proposed use, activity area and/or improvement. The amount, approximate boundaries and location of common open space, with the percentage of the total acreage of the site to be placed in common open space	✓						
E2s	The location of environmental sensitive land to be included in common open space	N/A						
E2t	Notes indicating any modifications, waivers, variances, special exceptions and/or conditional uses that are required	N/A						
E2u	The location and extent of proposed buffers	✓						
E2v	The proposed location, arrangement, and right-of-way widths of roads and streets, including roads and streets providing access to adjoining parcels. The location and arrangement of street entrances, driveways and parking areas	✓						
E2w	Calculations describing all proposed bonus factors with the location of and specifications for bonus improvements, when proposed	N/A						
E2x	Any other information requested by the Subdivision Administrator in order for the Subdivision Administrator to make an accurate determination	N/A						
Sub-Section	**SUBDIVISION ORDINANCE Section 1333.01, General Site Planning and Design Specifications**							
D1d	There is **no** requirement that a Sketch Plan or Preliminary Plat show phasing.							



HILLSIDE

PRELIMINARY SUBDIVISION/LAND DEVELOPMENT PLAT
MAJOR SLD 2022-TBD

CHARLES TOWN CORP. DISTRICT (3) - MAP 9 - PARCEL 67, LOTS 2A & 2B
DEED BOOK 691 - PAGE 432
CITY OF CHARLES TOWN, WEST VIRGINIA
ZONED RESIDENTIAL MEDIUM-HIGH DENSITY (R-15)



VICINITY MAP

600 300 0 600 1200
GRAPHIC SCALE
1" = 600'

Sheet List Table

SHEET NUMBER	SHEET TITLE
C000	Cover Sheet
C100	General Notes
C101	Adjoining Owner Information and Phasing Key
C200	Exisiting Conditions and Demo Plan
C201	Exisiting Conditions and Demo Plan
C300	Grading and SD Plan
C301	Grading and SD Plan
C301A	Grading and SD Plan
C302	Storm Profiles
C303	Storm Profiles
C304	Storm Profiles
C305	Storm Sewer Computations
C306	Storm Sewer Computations
C307	Storm Sewer Computations
C308	Storm Drain Drainage Area Map
C309	Storm Sewer Details
C400	Site Plan
C401	Site Plan
C402	Road Profiles
C403	Road Profiles
C404	Road Profiles
C405	Road Profiles
C406	Sight Distance Profiles
C407	Sight Distance Profiles
C408	Sight Distance Profiles
C409	Site Details
C410	Site Details
C500	Utilities Plan
C501	Utilities Plan
C502	Sanitary Sewer Profiles
C503	Sanitary Sewer Profiles
C504	Sanitary Sewer Profiles
C505	Sanitary Sewer Profiles
C506	Sanitary Lateral Computations
C507	Waterline Profiles
C508	Waterline Profiles
C509	Waterline Profiles
C510	Utility Details
C511	Utility Details
C600	SWM NARRATIVE
C601	SWM PRE-DEVELOPED DRAINAGE AREA MAP
C602	SWM POST-DEVELOPED DRAINAGE AREA MAP
C610	SWM PRE-DEVELOPED HYDROGRAPHS
C620	SWM POST-DEVELOPED HYDROGRAPHS AREA A
C621	SWM POST-DEVELOPED HYDROGRAPHS AREA B
C630	SWM BMP MAP
C640	SWM BMP COMPUTATIONS
C641	SWM BMP COMPUTATIONS
C650	SWM POND A
C651	SWM POND A PROFILES
C652	SWM POND A INFLOW COMPUTATIONS
C653	SWM POND A OUTLET COMPUTATIONS
C654	SWM POND A DETAILS
C655	SWM POND A CONSTRUCTION INSPECTION CHECKLIST
C660	SWM BIORETENTION B
C661	SWM BIORETENTION B PROFILE
C662	SWM BIORETENTION B INFLOW COMPUTATIONS
C663	SWM BIORETENTION B OUTLET COMPUTATIONS
C664	SWM BIORETENTION B DETAILS
C665	SWM BIORETENTION B CONSTRUCTION INSPECTION CHECKLIST
C670	SWM ADDITIONAL POND DETAILS
C700	Erosion & Sediment Control Plan Phase 1
C701	Erosion & Sediment Control Plan Phase 1
C702	Erosion & Sediment Control Plan Phase 2
C703	Erosion & Sediment Control Plan Phase 2
C704	Erosion & Sediment Control Plan Narrative
C705	Erosion & Sediment Control Plan Details
C800	Fire Signage and Lighting Plan
C801	Lighting Details
C802	Photometric Plan
C900	Preliminary Plat
L100	LANDSCAPE PLAN
L101	LANDSCAPE PLAN
L102	LANDSCAPE PLAN
L200	LANDSCAPE NOTES AND DETAILS

STATE & LOCAL PERMITS

AGENCY	PERMIT #/APPROVAL DATE

CALL "MISS UTILITY"

MISS UTILITY OF WEST VIRGINIA (MUWV) AT 811 OR 1-800-245-4848, 48 HOURS PRIOR TO THE START OF WORK. EXCAVATORS MUST NOTIFY ALL PUBLIC UTILITY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATING OR BLASTING AND HAVE THOSE FACILITIES LOCATED BY THE UTILITY COMPANIES PRIOR TO COMMENCING EXCAVATION. THE EXCAVATOR IS RESPONSIBLE FOR COMPLIANCE WITH ALL COUNTY REQUIREMENTS, WEST VIRGINIA CODE AND REGULATIONS.

UTILITY NOTICE (AS NEEDED)

Contractors shall notify all public utility operators who maintain underground utility lines in the area of proposed excavating or blasting at least two (2) working days, but not more than ten (10) working days, prior to commencement of excavation or demolition. Names and telephone numbers of the operators of underground utility lines appear below. These numbers shall also be used to serve in an emergency condition.

Water: Charles Town Utility Board
832 S. George Street
Charles Town, WV 25414
(304) 725-2316

Sewer: Charles Town Utility Board
832 S. George Street
Charles Town, WV 25414
(304) 725-2316

Power: Potomac Edison
P.O.Box 3615
Akron, OH 44309
(800) 686-0011

Phone: Frontier Communications
1108 N. Mildred Street
Ranson, WV 25438
(304) 728-8500

Soil Conservation: Eastern Panhandle Conservation District
151 Aikens Center, Suite 2
Martinsburg, WV 25404
(304) 263-4376

CIVIL ENGINEER
IMEG
SYLKE KNUPPEL
4601 FORBES BOULEVARD
SUITE 140
LANHAM, MARYLAND 20706
(240) 296-1574

DEVELOPER
APPLICANT/OWNER
HILLSIDE INVESTMENT LLC
175 JOHN J THOMAS WAY
CHARLES TOWN, WEST VIRGINIA 25414
(304) 283-2601

PRELIMINARY PLAN AND PLAT APPROVAL

"This Preliminary Plan was approved by the City of Charles Town, on the _____ day of _____ , 20_____ , subject to any conditions specified hereon.

This plan is vested and valid for one (1) year with the possibility of a one (1) year extension per Section 1332.03(C)(2)(F)(5) of the City of Charles Town Subdivision and Land development Ordinance.

All expenses incurred with respect to improvements for all utility services, paving, grading, landscaping, curbs, gutters, sidewalks, road lighting, road signs, flood protection devices, drainage structures and all other improvements that may be required shall be the responsibility of the subdivider and not the City.

_____ _____
Secretary of the Planning Commision Date

STATEMENT OF ACCEPTANCE

"The developer, in signing this plat/plan, agrees to abide by all conditions, terms and specifications provided heron; and to complete all the improvements required by the Preliminary Plat and Plan or site plan."

_____ _____
HILLSIDE INVESTMENT LLC Date
175 JOHN J THOMAS WAY
CHARLES TOWN, WEST VIRGINIA 25414

ENGINEER/SURVEYOR'S CERTIFICATION

"The plat represents a survey made by him/her; all Monuments and improvements indicated thereon actually exist, and that their location, size and material are correctly shown; his/her best knowledge and belief, all requirements of the Ordinance have been fully complied therewith."

_____ _____
CHRIS LEMON Date
IMEG

STATEMENT OF ACCURACE

"The Engineer and/or Surveyor, in signing this plat/plan, attests to the best of his or her knowledge, is plan is complete and accurate."

_____ _____
CHRIS LEMON Date
IMEG

IMEG
50 Catoctin Circle NE, Suite 210
Leesburg, VA 20176 P 703.777.2755
engineering • surveying • land planning

PRELIM PLAN - COVER SHEET
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

COVER SHEET

SHEET No.

C000

P:\Projects\22063\000\000\112742 Prelim Subdivision - Land Development Plan\C000 Cover Sheet.dwg, 2/13/2024 8:05:22 PM, Andrew H. Frazer,

GENERAL NOTES

1. Methods and materials used in the construction of the improvements herein shall conform to current Jefferson County Construction Standards and Specifications and/or current WVDOH Standards and Specifications.
2. The Engineer shall not have control over or charge of and shall not be responsible for construction means, methods, techniques, sequences or procedures nor for safety precautions and programs in connection with work shown on these plans. The Engineer is not responsible for the contractor's schedules or failure to carry out the work. The Engineer is not responsible for acts or omissions of the contractor, subcontractor, or their agents or employees, or any other person performing portions of the work.
3. The Contractor, Owner or Developer shall be responsible for securing any third party inspection/testing service to insure construction compliance with these plans and specifications. It is IMEG Engineering's recommendation that a third party inspection/testing service be employed to ensure that project is completed and materials installed meet the details and specifications in these plans.
4. The location of existing utilities shown in these plans are taken from existing records and available asbuilt data. It shall be the contractors responsibility to verify the exact horizontal and vertical location of all existing utilities as needed prior to construction. The contractor shall be responsible for the digging of all test holes that may be required, whether recommended or not by these plans, to determine the exact location and elevation of existing utilities. If any conflicts arising from this existing utility work verification or if during the course of construction, any object of an unusual nature is encountered, the contractor shall cease work in that area and immediately notify IMEG Engineering at (240) 296-1569 and/or the proper authority. IMEG Engineering or any engineer associated with these plans shall not be responsible or liable for any construction cost that may be associated with the installation or reinstallation any utility or other improvements if not notified of any discrepancies between actual field conditions and the approved plan.
5. The approval of these plans in no way relieve the developer, the contractor, or their agents of any legal responsibility which may be required by the code of West Virginia or any other ordinance enacted by Jefferson County nor does it guarantee the issuance of any required permit by Jefferson County, WVDOH or any other Agency.
6. An approved set of plans and all applicable permits must be available at the construction site at all times during construction. A representative of the developer must be available at all times.
7. The contractor shall provide adequate means of cleaning mud from trucks and/or other equipment prior to entering public streets, and it is the contractors responsibility to clean streets, allay dust, and to take whatever measures are necessary to insure that public streets are maintained in a clean, mud and dust free condition at all times.
8. The developer will be responsible for any damage to the existing streets and utilities which occurs as a result of his construction project within or contiguous to the existing right-of-way.
9. Warning signs, markers, barricades or flagmen should be in accordance with the State and Federal Manual on Uniform Traffic Control Devices (MUTCD).
10. All unsuitable material shall be removed from the construction limits of the site plan before placing embankment.
11. All pavement sections shown on these approved plans are based on a minimum CBR value of 6 and are for preliminary design only. Final pavement design shall be based upon actual field tested CBR values. The Contractor or Developer shall be responsible for field tests per WVDOH standards to obtain actual CBR values for final design. Final pavement designs will be approved by WVDOH and/or the Owner/Developer, which ever applicable, prior to installation.
12. All springs shall be capped and piped to the nearest storm sewer manholes or curb inlet. The pipe shall be minimum 6" diameter.
13. When grading is proposed within easements of utilities, letters of permission from all involved companies must be provided to Jefferson County & Charles Town Utility Board (CTUB) prior to issuance of grading and/or site development permits.
14. a. Notification shall be given to the Charles Town Utility Board two weeks prior to construction so they can arrange to have a project representative during construction. The District would like to be in the pre-construction project meetings with the contractor.

    b. Notification shall be given to the Charles Town Utility Board prior to construction of water lines. Information should also be obtained from the appropriate authority concerning permits, cut sheets, and connections to existing lines.
15. The Developer and/or Contractor shall be responsible to supply all utility companies with copies of the approved plans and advise them that all grading shall conform to the approved plans, and further that the utility companies shall be responsible for honoring these plans and the finished grades in the installation of their utility lines.
16. All utilities to be located underground.
17. Contractors shall notify operators who maintain underground utility lines in the area of proposed excavating or blasting at least two (2) working days, but not more than ten (10) working days, prior to commencement of excavation or demolition.
18. The developer will be responsible for the relocation of any utilities which is required as a result of his project. The relocation should be done prior to construction.
19. All parking lot/street light and dry utility design shall be performed and provided separately by others. All dry utility and or lighting information shown hereon is as specified by others and is included for informational purposes only, as directed by the Owner, Developer and/or public agency requirements. IMEG Engineering has not performed the lighting and/or dry utility design and does not warrant and is not responsible for the degree and/or adequacy of illumination on this project or the adequacy of the dry utility to service the site.
20. All sanitary sewers, water mains and appurtenances shall be constructed in accordance with the current standards and specifications of the Charles Town Utility Board.
21. All stormwater piping and structures shown on these plans are only accurate to the inlet or manhole locations as shown hereon. Detail design of stormwater structures were not provided to Greenway Engineering. Actual pipe alignments will be based upon developed structural shop drawings as provided by the manufacturer. Contractor shall make adjustments to pipe alignments base on provided shop drawings. Greenway Engineering will not be held responsible or liable for any discrepancies or changes caused by the structural design. Contractor may submit shop drawings to Greenway Engineering for review and approval at contractor's expense. Shop drawings will be reviewed for compliance with design plans. The Owner or Developer will be responsible for any redesign as a result of structural shop drawing design.
22. Controlled fills shall be compacted to 95% of maximum density as determined by method "A" per standard proctor AASHTO-T99, ASTM-D698, or VTM-1 as applicable. Density shall be certified by a registered professional engineer and results submitted to Jefferson County, prior to pavement construction. If a geotechnical report has been prepared, it should supersede the requirements in this note.
23. Refer to Geotechnical Engineer for methods, materials and details for construction of all earthwork activities.
24. Any retaining wall 2 ft, or greater in height shall require the issuance of a separate building permit.
25. Construction debris shall be containerized. No less than one liter receptacle shall be provided at the construction site.
26. IMEG Engineering, Inc. (IE) issued this plan set based on project criteria dictated by the client and municipal codes. This plan set is not considered complete or appropriate for construction until ALL necessary agencies have given approval AND this plan set is signed and sealed by a licensed professional. Any work, planning, scheduling, material purchases and/or construction prior to approvals and licensed/professional sealing will be performed at the risk of the personnel authorizing work. IE shall be held harmless from any costs, time delay and/or material changes incurred on work started before this plan set receives approvals and seals.
27. There are no known FEMA 100-year floodplains Floodplains on the subject property, per FEMA Map Number 54037C0139E, Effective December, 18 2009.
28. No known wetlands have been identified on the subject property.
29. The HOA or Individual lot owners shall be responsible for trash pick up service to the u nits. No dumpsters are proposed for this section.

WATER AND SEWER NOTES

1. Easements shall be given to the Jefferson County Public Service District for the construction and maintenance of sewer facilities, as depicted herein.
2. Installation and maintenance of water and sewer lines shall be in accordance with the WV Department of Health, Jefferson County Public Sewer District, the City of Charles Town and the Charles Town Utility Board requirements.
3. Complete water lateral prior to final paving.
4. Water lines to have a minimum of forty-two inches (42") of cover to crown of pipe. Water lines to have seal of the National Sanitation Foundation. Mechanical joints or slip-on joints with rubber gaskets are preferred by the Health Department.
5. Provide concrete thrust blocking at all water line intersections and direction changes.
6. All water mains must be AWWA C900, CL235 PVC. All sanitary sewer to be PVC ASTM 3034 SDR-35 unless otherwise specified.
7. Water easements are to be dedicated to the Charles Town Utility Board.
8. Storm drain easements are to be dedicated to the City of Charles Town.
9. Sanitary sewer and force main easements are to be dedicated to the Jefferson County Public Sewer District.
10. A horizontal separation of at least 10 foot must be maintained between sanitary sewer and potable water lines except when they are crossing. When water and sewer lines cross, the water line shall be at least 18 inches above the sewer line.

Summary of Water Requirements - Charles Town Utility Board, Charles Town, WV

1. All water mains must be AWWA C900, CL235 PVC. Line extensions must have permitted approval prior to installation.
2. All service lines to be minimum 200 PSI PVC or copper. Final Line size will depend on the type of service. The City will not allow any galvanized lines or fittings. A standard shut off valve must be installed on the property side of the meter for the owner's use; the meter valve is for the city use only,
3. All meters, vaults, and crooks will be set at the property line; the CTUB will install the meters.
4. All service lines will be no deeper than 36" at the meter location to allow access to the setter by the meter installers. Deeper service lines may be acceptable if a crossing conflict is encountered or site conditions dictate.
5. The CTUB will supply the meters, setter and boxes. All non-metallic lines will be installed with tracer ribbon. (Located 6" above the newly installed service line with 3" wide detectable tape.)
6. All multi-meter installations, such as a business or apartment complex are to be set in an outside vault, or an accessible mechanical room, and are to be supplied by the owner. These areas are to be inspected prior to the availability of water service.
7. Fire Hydrants must be American Darling Mark B62B 5-1/4" valve opening with 6" base or equal,
8. Valves are to be AWWA C515 gate valves resilient seated opening left. Valve boxes must be screw type Tyler #562S or equal. All valve riser sleeves are to be cast iron with cap. PVC risers to be approved on a use basis by the CTUB Water Representatives.
9. All valves, bends (45's, 22's and 90's), tees and elbows shall have mechanical restraints (such as mega lugs) and thrust blocks.
10. The CTUB must inspect all work. The contractor must give 24-hour notice to the CTUB for an inspection request. The CTUB may request as-built sketches, photos etc. (as back up)
11. All West Virginia Public Service Commission and WV Health Department, rules and regulations, applying to water and sewer must be followed, and all local state and federal permits and approvals must be obtained prior to performing any water or sewer extensions or upgraded work.

Submittals

1. Prior to the installation of any material or equipment on the project supplied by the Contractor, the Contractor shall submit to the City, three (3) copies of all shop drawings, laying schedules, manufacturer specifications, certification and drawings in accordance with the General Conditions. (Water/Sewer) One copy is for the application file, One copy is for the final inspection compliance, One copy is for inspection review or comments to be completed prior to beginning work. A copy of a current WV Contractors License and proof of Liability Insurance must accompany the submittal.
2. City will require as-built drawings and a copy of submittals for all pipe and and appurtenances used on the project. As-builts shall be furnished in both PDF and AutoCAD formats. An O&M Manual containing, at a minimum, all submittals is to be furnished.

Field Copies of Construction Information
The Contractor shall keep a minimum of one (1) complete copy of the Contract construction plans and specifications (including all revisions and addendums), and all shop drawings issued at the project site. All information shall be kept in a neat and good order and shall be made available for the City's Representative to use at his request.

Open Excavation

1. The depth of trenches shall be such that the location of the proposed pipes will conform with the lines and grades shown on the plans. The shape of all trenches above and within the pipe zone, the construction methods employed, the general protections requirements, the general excavation requirements, the general trenching requirements, and the minimum regulations for trench shoring, shall conform with the regulations set forth under OSHA Regulations 29CFR part 1926 650, 651 & 652. No trenching excavation work shall be performed which is not in accordance with those regulations.
2. The shape of the trenches in the "pipe zone" (which shall be construed to be that portion of the trench between the trench bottom and an elevation 1 foot above the top of the pipe) shall conform to the configuration identified as "Typical Bedding" on Pipe Bedding Drawing #1. The contractor is herein advised that if trench widths in the pipe zone exceed the outside diameter of the pipe plus two feet, and if the City determines that such excessive widths will result in a structural loading for which the pipe is not designed, he shall be required to bed the pipe on a concrete cradle at no additional cost.
3. The Contractor shall shape trenches which are located adjacent to existing above ground or underground structures and/or facilities or in other confined areas, so that such structures and facilities are properly protected against damage or disturbance from settlement or displacement. Adequate sheeting, shoring and/or bracing shall be installed and maintained to provide such protection and the Contractor shall be responsible for all damages resulting to such proposed and existing structures, pipelines, and/or facilities as the result of his failure to use and maintain adequate trench wall support, as well as a result of any other construction activities. The bottoms of all trenches shall be excavated to a depth of 6 inches below the bottom of the proposed lines to accommodate the bedding hereinafter specified.

Pipe Installation

1. Before any pipe is installed in trenches, it shall be inspected for damage and the inside of the pipe shall be swabbed to remove loose dirt and foreign objects, No damaged pipe will be permitted to be installed.
2. All pipes shall be installed to the lines and grades shown on the drawings. No pipes shall be constructed in trenches in which water flows or is pooled and, all pipes shall be carefully handled in the ditch to keep the jointing ends and materials free from dirt during installation. During shut down periods and at the end of each day, all open ends of pipe shall be suitably plugged to prevent the inflow of water, dirt, foreign objects, etc.

Pipe Bedding and Pipe Zone Backfill Material
All proposed pipelines shall be supported on stone dust or #10's small diameter stone. The material shall be placed to a minimum depth of 6 inches below the bottom of the pipe and 6 inches above of the top of the pipe. The material shall be placed in the pipe zone in such a manner as to not disturb, displace, or otherwise misalign the installed pipelines.

Backfill Material Above the Pipe Zone
The material used above the pipe zone shall be such that a satisfactory compaction can be made. At no time shall material bigger than 2 inches in diameter be used. But any material used must be approved by the City before hand. After approval, the entire depth within the backfilled area shall be compacted to provide the minimum percentage of density specified for each area of classification.

Special Backfill Material Below the Pipe Zone
Where muck, quicksand, soft clay, swampy or other material is encountered in the trench bottom, which in the opinion of the City is unsuitable for pipe foundation subgrade or backfill, such material shall be removed to a depth satisfactory to the City. The trench shall then be backfilled to grade with acceptable City approved material, mechanically compacted in successive layers.

Ductile Iron Pipe and Fittings
Ductile iron pipe and fittings under this Contract shall be furnished by the Contractor. All pipes will be slip type joint unless otherwise noted and all fittings will be mechanical joint.

PVC Pipe and Fittings
No glue joints are to be used within the CTUB water or JCPSD right of way. Onsite sewer laterals are to be schedule 40 PVC Pipe or equivalent.

Fire Hydrants
Hydrants shall be furnished and installed complete where shown on the drawings and as approved by the CTUB. This installation shall be adapted to the location of the hydrant so as to make the best installation possible. (note: hydrants no-more than 500 ft apart)

Service Connections for Water Lines

1. Service connections shall be made as indicated on the Contract Drawings.
2. The Contractor shall furnish all fittings required to make the necessary connections. All service line connections shall be made in the presence of the CTUB representative.

Valves and Boxes
Each valve installed underground shall be equipped with a valve box furnished by the Contractor and installed by the Contractor.

Anchoring and Blocking

1. All bends in excess of 10 deg, plugs, caps, tees, and wyes branches along pipelines shall be adequately blocked or anchored to prevent the lines from pulling apart under pressure (see typical concrete blocking).
2. Lugged fitting and tie rods, clamps collars, restrained joints, and anchoring fittings may be substituted in lieu of blocking after having received the approval of the CTUB. Concrete used for blocking and anchoring pipelines in trenches shall consist of concrete as specified elsewhere in these specifications.

Pressure and Leakage Tests
All pipeline shall be tested by the Contractor according with AWWA and witnessed by the CTUB Representative. The Contractor shall furnish all equipment, apparatus, temporary blocking, pumps, taps and gauges to conduct the tests.

Blow Off
Blow off valves shall not be installed.

Minimum Pipe Size and System Design

1. The minimum size of water pipe shall be six-inch diameter. This may be increased at the discretion of the City if hydraulic modeling indicates that a larger size is needed to provide pressure and/or fireflow in the area.
2. Dead ends shall be minimized by looping of all mains.
3. Where dead-end mains occur they should be provided with a fire hydrant, for flushing purposes.
4. No flushing device shall be directly connected to any sewer.

Separation of Water Services & Mains from Other Utilities
5 foot horizontal separation from all non-sewer utility lines - electric, phone etc.

Parallel Installation

1. Normal conditions - Water mains shall be laid at least ten feet horizontally from any sanitary sewer, storm sewer or sewer manhole, whenever possible; the distance shall be measured edge-to-edge.
2. Unusual conditions - When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a storm sewer provided that:

A. The bottom of the water main is at least 18 inches above the top of the sewer
B. Where this vertical separation cannot be obtained, the water main will be sleeved and all voids will be filled.

Crossings

1. Normal conditions - Water mains crossing house sewers, storm sewers or sanitary sewer shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer, whenever possible.
2. Unusual conditions - When local conditions prevent a vertical separation as described, Charles Town Utility Board shall be contacted for direction.
3. Water mains passing under sewer shall be protected by providing:

A. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.
B. Adequate structural support for the sewers to prevent excessive deflection of the joints and settling on and breaking the water mains;
C. That the length of the water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.
D. Water line shall be sleeved and the void area filled.

4. Sewer manholes - No water pipe shall pass through or come within 5 feet of any part of a sewer manhole.

Private Fire Protection Service
No pipe or fixtures connected with a private fire service served by the CTUB shall be connected with pipes or fixtures supplied with water from any other source.

WVDOH NOTES

WV1. All work, construction methods and materials shall conform with the West Virginia Division of Highways "STANDARD SPECIFICATIONS ROADS AND BRIDGES Adopted January 1, 2017" and Supplemental Specifications dated January 1, 2020. All work on this project shall also conform with The Soil Conservation Service Erosion and Sediment Control Regulations and any other state, federal, or local regulations applicable. In the event of conflict between any of these standards, specifications, or plans, the most stringent shall govern.

WV2. All construction shall comply with the latest U.S. Department of Labor Occupational Safety & Health Administration.

WV3. When working on WVDOH right-of-way, all traffic control, whether permanent or temporary, shall be in accordance with "Manual on Temporary Traffic Control for Streets and highways" 2006 Edition as published by WVDOH.

WV4. Design features relating to construction or to regulation, control, and safety of traffic maybe subject to change as deemed necessary by WVDOH.

WV 5. Prior to initiation of work, Contractor shall be responsible for acquiring all necessary WVDOH land use permits for any work on WVDOH right-of-way,

WV 6. If required by the local WVDOH Residency Office, a preconstruction conference must be arranged and held by the engineer and/or developer with the attendance of the contractor, various County agencies, utility companies and WVDOH prior to initiation of work.

WV 7. Contractor shall notify the local WVDOH Residency Office when work is to begin or cease for any undetermined length of time. WVDOH will also require 48 hours notice for any inspection. Please contact the Burlington, WV field office at 304-289-3521.

WV 8. The Contractor will be responsible for maintaining adequate access to the project from the adjacent public roadway through construction and maintenance of a construction entrance in accordance with the Soil Conservation Service Erosion & Sediment Control Handbook. Furthermore, access to other properties affected by this project shall be maintained through construction.

WV 9. Contractor shall ensure adequate drainage is achieved and maintained on the site during and at the end of construction.

WV 10. All water and sewer lines within existing or proposed WVDOH right-of-way are to have minimum 36" cover and, when possible, to be installed under roadway drainage facilities.

WV 11. Any unusual subsurface conditions encountered during the course of construction shall be immediately brought to the attention of the engineer and WVDOH. Work shall cease in that vicinity until an adequate design can be determined by the engineer and approved by WVDOH.

WV 12. All undercut areas and borrow material shall be inspected and approved by WVDOH Inspector prior to placement of fill.

WV 13. All roadway fill, base, subsurface material and backfill of utility/storm sewer trenches shall be compacted in 6" lifts to 98% of theoretical maximum density as determined by AASHTO T-99 Method A, within plus or minus 2% of optimum moisture for the full width of any dedicated street right-of-way. At the direction of WVDOH Inspector density tests performed by a qualified independent agency shall be conducted as required in the WVDOH Road and Bridge Specifications. A copy of all tests shall be submitted to WVDOH prior to final WVDOH approval.

WV 14. WVDOH Standard CD and UD underdrains shall be installed where indicated on these plans and further where determined necessary by WVDOH Inspector.

WV 15. The installation of any entrances and mailboxes within any dedicated street right-of-wayshall meet WVDOH minimum design standards and is the developer's responsibility.

WV 16. If required by the local WVDOH Residency Office, copies of all invoices for materials within any dedicated street right-of-way must be provided to the WVDOH Inspector prior to acceptance of work. Unit and total prices may be obscured.

WV 17. Prior to acceptance by WVDOH of any streets, any required street signage and/or pavement markings must be installed by the developer.

GENERAL CTUB SEWER NOTES

- Refer to the Charles Town Utility Board (CTUB) sewer system specifications dated May 2016, and the latest modifications or revisions thereto, for sanitary system construction methods, materials, field quality control, and for all details and specifications for all sanitary sewer systems to be served by the Charles Town Utility Board.
- No gravity sewer shall be less than 8" diameter
- A minimum of 3 feet of earth covering is required on all sewer lines.
- Sewers shall be laid in straight line with uniform slope between manholes. Sewers on 20% slope or greater shall be anchored securely with concrete anchors, or approved equal.
- Bedding - No. 8 or No. 10 limestone shall be used for bedding unless otherwise approved by CTUB.
- There shall be no physical connection between a drinking water supply system and a sewer system
- Horizontal Separation - A minimum of 10 feet separation between sewer lines and water lines must be maintained. In cases where the 10 feet minimum cannot be maintained, the sewer line shall be 18" lower than the water line and constructed of a pressure type pipe. When the lines are placed within 5 feet of each other, permanent identification tape must be buried directly above the lines denoting "Sewer Line" or "Potable Water Line".
- Vertical Separation - A minimum of 18" of separation between the top of the sewer lines and the bottom of the water lines must be maintained. In case where the 18" cannot be maintained, the sewer line shall cross at midpoint of a 20' long joint of the water line and be constructed of pressure type pipe. A sewer line shall not be constructed over top of a water line. If the standard vertical installation requirements cannot be maintained the sewer line shall be encased so that the casing extends at least 15 feet each side of the crossing with a minimum of 18" of vertical separation.
- Manholes - Shall be pre-cast concrete meeting requirement of American Society for Testing and Materials (ASTM). The minimum base diameter shall be 48" (Minimum opening 24"). The inside base of the manhole shall be filled with concrete to form a bench sloping toward the flow channel. Watertight manhole covers are to be used wherever the manhole covers may be flooded by street runoff or high water. Pipe connections to manholes and joints on manholes shall be watertight. Concrete manholes shall be waterproofed on the exterior where groundwater conditions are unfavorable.
- Gravity sewers shall be PVC pipe, schedule SDR-35. All pipes and fittings shall meet or exceed all requirements of ASTM specifications D-3034 and /or other requirements of UNI-BELL UNI B4. Joints shall be either O-ring type "or" mechanical seal joint meeting material requirements of ASTM 1784 and joint requirements of ASTM 3212. No solvent cement joints will be permitted in field construction, except as specifically authorized by CTUB.
- Lateral piping and fittings sizes 4" through 6" for use in lateral piping shall meet the requirements of schedule 40.
- Refer to CTUB Sewer System Specifications and the latest modifications or revisions thereto, for:
  - Gravity sewer construction methods and pipeline testing.
  - Manholes submittals, delivery, storage and handling, inspection, preparation, construction methods and vacuum testing.
  - Cast in-place concrete specifications and requirements.
- The developer shall furnish and install the wye branches, riser pipe, service laterals, transition fittings, and incidentals where shown on the plans or where directed by CTUB.
- Home owner installed service laterals - pipe shall be 4" minimum SDR-35 or schedule 40 installed at 2% minimum slope. Lateral should be placed with 3 feet minimum cover unless otherwise approved by CTUB. Laterals shall be installed with minimum 6" bedding below pipe and 12" over pipe. Connection of home owner lateral to existing lateral shall be fitting of same type of pipe. Bedding shall be No. 8 or No. 10 limestone or other material as approved by CTUB. The lateral and connections shall be inspected and approved by a representative of CTUB prior to covering with bedding.
- Contractor shall contact CTUB at least 48 hours before connecting to the lateral system to allow for CTUB representatives to perform the onsite inspection of the connection.
- Contractor shall notify CTUB prior to installation of any improvements within the water and sewer easements to ensure that no fence posts or other improvements are placed on top of the utilities.
- Charles Town Utility Board
  661 S. George Street
  Charles Town, WV 25414
  (304) 725-2316

PROJECT NOTES

PARCEL IDENTIFICATION NO.	19-03-009B-0001-0000, 19-03-009B-0002-0000, 19-03-009B-0003-0000, 19-03-009B-0004-0000, 19-03-009B-0005-0000, 19-03-009B-0006-0000, 19-03-0009-0067-0000
STREET ADDRESS:	HILLSIDE DR.
PROJECT SITE AREA:	14.47 ACRES
CURRENT ZONING:	RESIDENTIAL MEDIUM-HIGH DENSITY (R-15)
CURRENT USE:	NEIGHBORHOOD RESIDENTIAL VACANT
PROPOSED USE:	RESIDENTIAL SUBDIVISION
BUILDING SETBACKS	25' (FROM FACE OF CURB)
FRONT:	13.5'
REAR:	20'
SIDE:	10'
MAX BUILDING HEIGHT:	(MAX. 3 STORIES)
MAX. DENSITY ALLOWED:	NBLA SF / 1,750 SF = ALLOWABLE DUs
MAX. DENSITY PROVIDED:	431,473 SF / 1,750 SF = 246 DUs (124 SHOWN)
MIN. LOT AREA:	2,000 SF END UNITS
LOT AREA PROVIDED:	2,000 SF INTERIOR UNITS
	28' END UNITS
MIN. LOT WIDTH:	18' INTERIOR UNITS
	30' END UNITS
LOT WIDTH PROVIDED:	20' INTERIOR UNITS
OFF STREET PARKING REQUIRED:	1.8 SPACES /DU = 1.8x124 = 223 SPACES
OFF STREET PARKING PROVIDED:	2.0 SPACES /DU = 2X124 = 248 SPACES
ADDITIONAL SPACES PROVIDED:	21 SPACES
TOTAL PARKING PROVIDED:	269 TOTAL SPACES (OFF STREET PARKING SHALL BE NO MORE THAN 200' FROM UNIT BEING SERVED)

NOTE: SEC 1322.08(C)2
a. STATES, UNENCLOSED EXTERIOR STAIRWAYS MAY PROJECT INTO A REQUIRED SIDE OR REAR YARD NOT MORE THAN 4', AND
b. NO FRONT PORCH OR DECK SHALL EXTEND INTO THE REQUIRED FRONT YARD UNLESS DEVELOPMENT PATTERNS WITHIN THE BLOCK ARE SUCH THAT A PORCH WOULD BE APPROPRIATE. IN NO CASE, SHALL A FRONT PORCH EXTEND MORE THAN 8' INTO A REQUIRED FRONT YARD.

AREA TABULATIONS

PROPOSED LOTS:	124 TOTAL LOTS
TOTAL PROPERTY AREA:	14.47 ACRES
PROPOSED IMPERVIOUS LOT AREA:	4.97 ACRES
PROPOSED PERVIOUS LOT AREA:	3.36 ACRES
PROPOSED PAVED/GRAVEL AREA:	1.59 ACRES
PROPOSED SIDEWALK AREA:	0.43 ACRES
PROPOSED TOTAL IMPERVIOUS AREA:	4.97 ACRES
PROPOSED LOT AREA:	291,487 S.F. OR 6.69 ACRES
RIGHT OF WAY:	137,622 S.F. OR 3.16 ACRES
SWM FACILITIES & PUBLIC UTILITY EASEMENTS:	61,376 S.F. OR 1.41 ACRES
OPEN SPACE AREA:	136,747 S.F. OR 3.14 ACRES
NET BUILDABLE LAND AREA:	431,473 S.F. OR 9.91 ACRES
30% MIN. OPEN SPACE :	129,442 S.F. OR 2.97 ACRES
32% OPEN SPACE AREA PROVIDED:	136,747 S.F. OR 3.14 ACRES

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PRELIM PLAN - GENERAL NOTES
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
GENERAL NOTES

SHEET No.
C100

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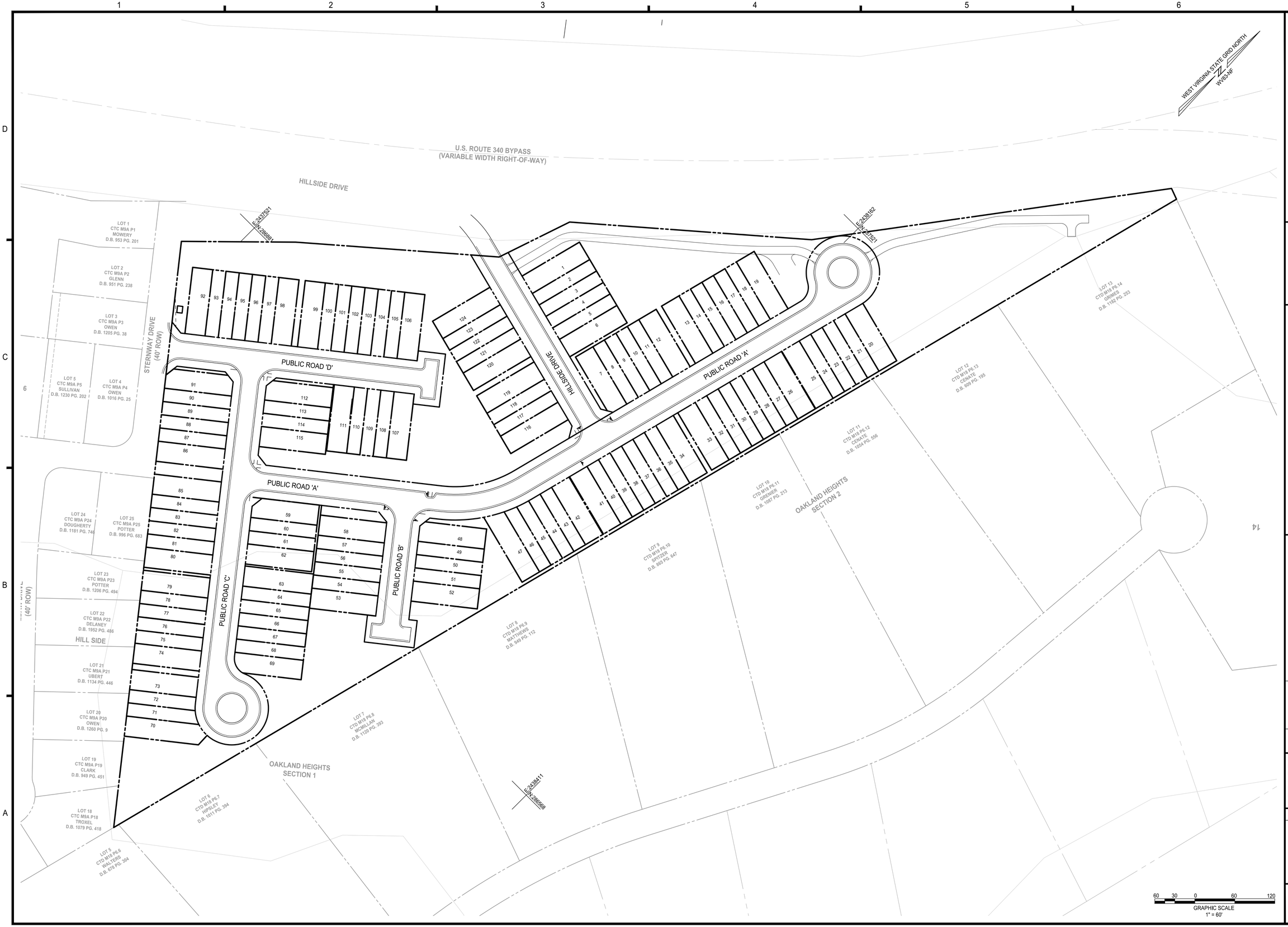

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PRELIM PLAN - ADJOINING OWNER INFORMATION AND PHASING KEY

691/432 MAP 9 PARCEL 67

LOTS 2A (RESIDUE) & 2B

DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 60'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

ADJOINING OWNER INFORMATION AND PHASING KEY

SHEET No.

C101

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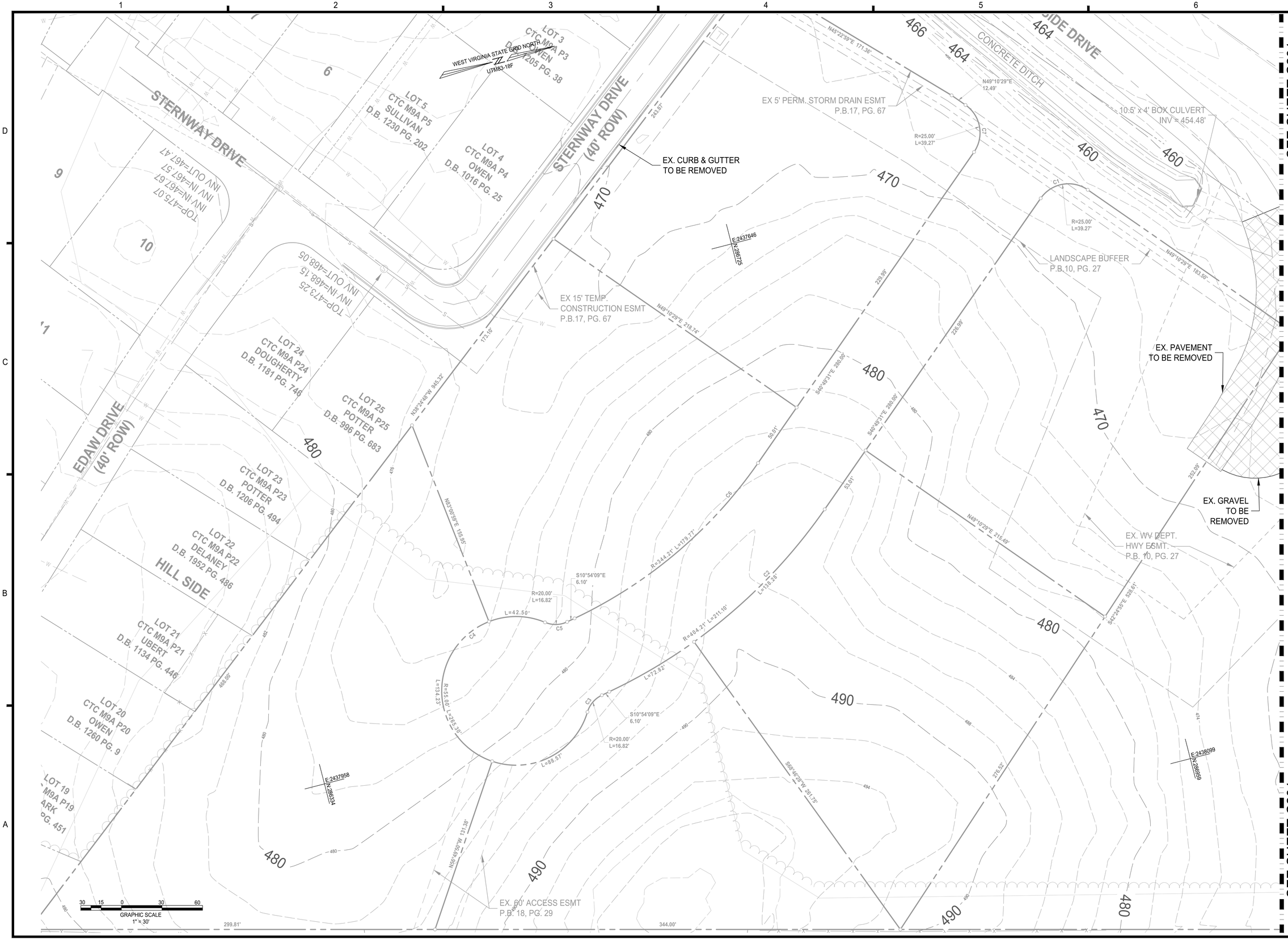

SEE SHEET C201

SEE SHEET C201

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PRELIM PLAN - EXISITING CONDITIONS AND DEMO PLAN
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 05/22/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: PS
CHECKED: SK

SHEET TITLE:

EXISITING CONDITIONS AND DEMO PLAN

SHEET No.

C200

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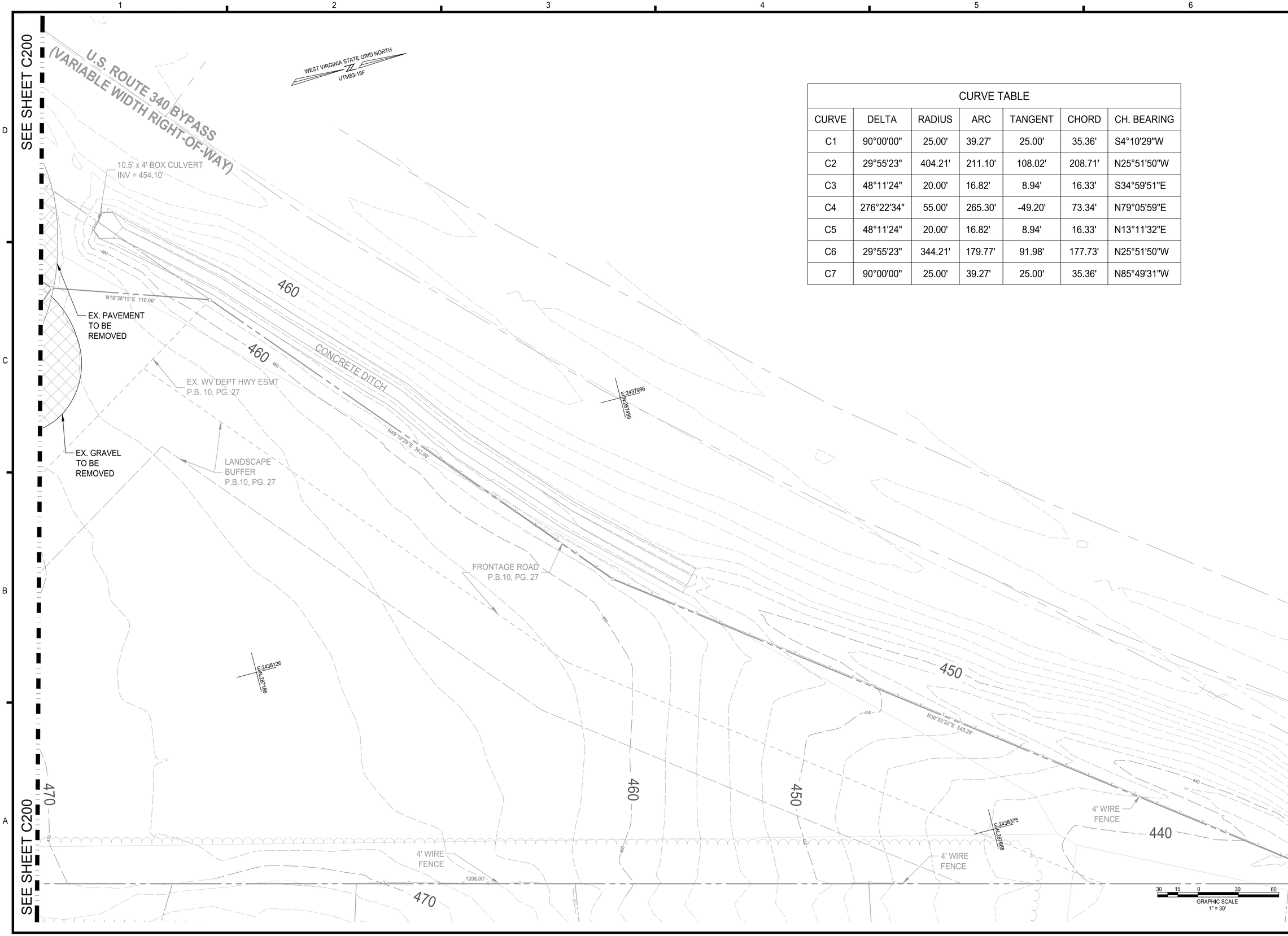

CURVE TABLE						
CURVE	DELTA	RADIUS	ARC	TANGENT	CHORD	CH. BEARING
C1	90°00'00"	25.00'	39.27'	25.00'	35.36'	S4°10'29"W
C2	29°55'23"	404.21'	211.10'	108.02'	208.71'	N25°51'50"W
C3	48°11'24"	20.00'	16.82'	8.94'	16.33'	S34°59'51"E
C4	276°22'34"	55.00'	265.30'	-49.20'	73.34'	N79°05'59"E
C5	48°11'24"	20.00'	16.82'	8.94'	16.33'	N13°11'32"E
C6	29°55'23"	344.21'	179.77'	91.98'	177.73'	N25°51'50"W
C7	90°00'00"	25.00'	39.27'	25.00'	35.36'	N85°49'31"W

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PRELIM PLAN - EXISITING CONDITIONS AND DEMO PLAN
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

EXISITING CONDITIONS AND DEMO PLAN

SHEET No.

C201

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PRELIM PLAN - GRADING AND SD
PLAN HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 05/22/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: PS
CHECKED: SK

SHEET TITLE:

GRADING AND SD PLAN

SHEET No.

C300

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WEST VIRGINIA STATE GRID NORTH
UTM83-18F

LOT 1
CTC M9A P1
MOWERY
D.B. 953 PG. 201

LOT 2
CTC M9A P2
GLENN
D.B. 951 PG. 238

LOT 3
CTC M9A P3
OWEN
D.B. 1205 PG. 38

LOT 4
CTC M9A P4
OWEN
D.B. 1016 PG. 25

LOT 5
CTC M9A P5
SULLIVAN
.B. 1230 PG. 202

STERNWAY DRIVE (40' ROW)

HILLSIDE DRIVE

PUBLIC ROAD 'D'

SEE SHEET C300

SEE SHEET C301A

SEE SHEET C300

SEE SHEET C301A

30 15 0 30 60
GRAPHIC SCALE
1" = 30'

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PRELIM PLAN - GRADING AND SD PLAN HILLSIDE

691/432 MAP 9 PARCEL 67

LOTS 2A (RESIDUE) & 2B

DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 05/22/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: PS
CHECKED: SK

SHEET TITLE:

GRADING AND SD PLAN

SHEET No.

C301

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SHEET No.
C301A

GRADING AND SD PLAN

SHEET TITLE:

PROJECT No: 22063.001.00
DRAWING No: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

MARK	DATE	DESCRIPTION

PRELIM PLAN - GRADING AND SD PLAN HILLSIDE

691/432 MAP 9 PARCEL 67

LOTS 2A (RESIDUE) & 2B

DISTRICT 3, JEFFERSON COUNTY, WV

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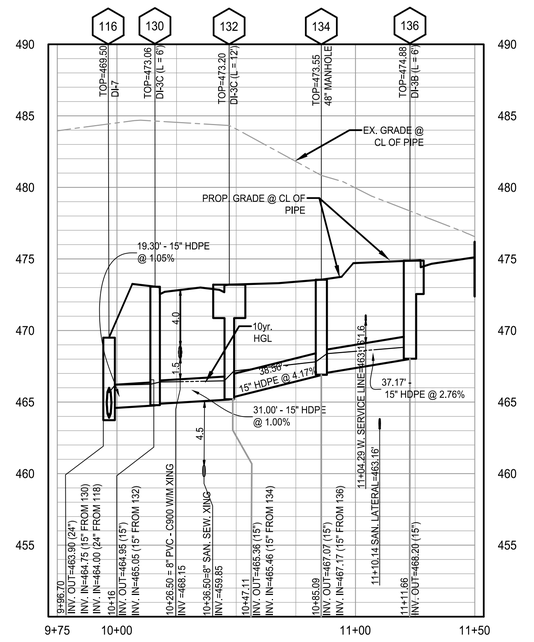
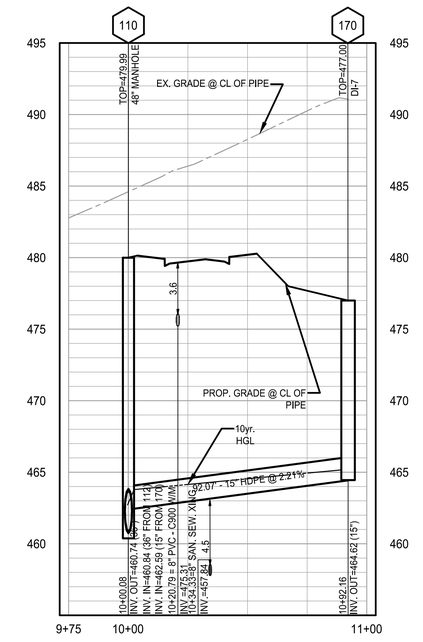


STRM STR 116 TO STR 136 PROFILE

STRM STR 148 TO STR 114 PROFILE



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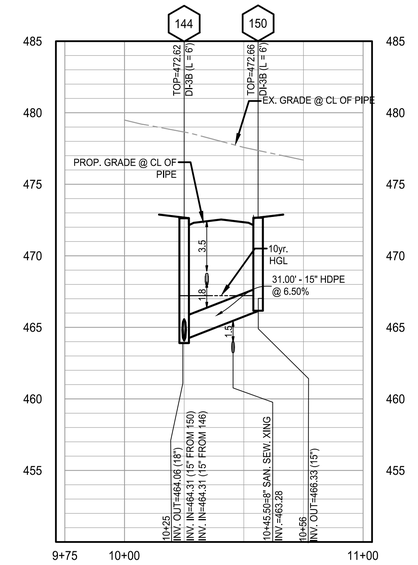
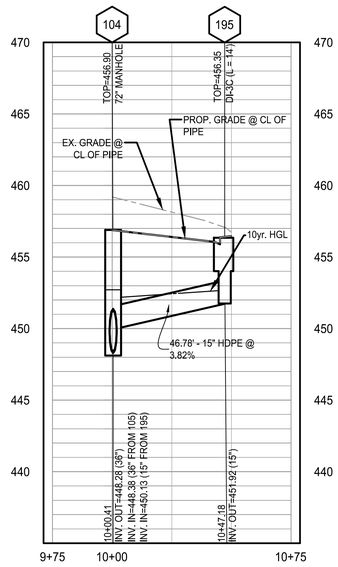


STRM STR 144 TO STR 150 PROFILE



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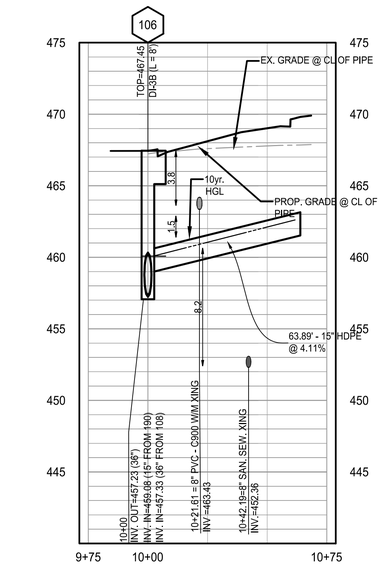
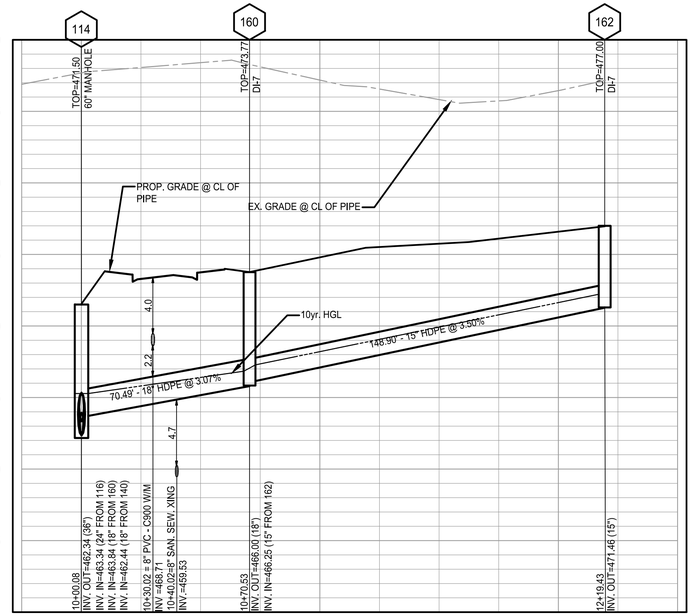


STRM STR 106 TO STR 190 PROFILE



STRM STR 114 TO STR162 PROFILE

NOTES

1. ALL STORM DRAIN STRUCTURES ARE WVDOH STANDARDS. ALL SEWER STRUCTURES ARE CHARLES TOWN UTILITY BOARD STANDARDS. CONTRACTOR MAY USE PRECAST STRUCTURE WHERE AVAILABLE TO MEET THE STANDARD STRUCTURE SPECIFIED.
2. ELEVATIONS ARE GIVEN TO TOP OF LID FOR MANHOLES. CONTRACTOR TO ADJUST ELEVATIONS PROVIDED TO MATCH EXISTING PAVEMENT ELEVATIONS AND FIELD CONDITIONS WHERE APPROPRIATE.

NOTE:

CONTRACTOR SHALL TEST PIT AND LOCATE ALL EXISTING UNDERGROUND UTILITIES AT ALL PROPOSED UTILITY CROSSINGS AND CONNECTIONS TO OBTAIN ACTUAL VERTICAL AND HORIZONTAL LOCATIONS AND VERIFY THAT NO CONFLICTS EXIST WITH NEW UTILITIES WELL IN ADVANCE OF CONSTRUCTION START.
REPORT ANY CONFLICTS TO ENGINEER SO ANY DESIGN ADJUSTMENTS CAN BE MADE PRIOR TO CONSTRUCTION.

5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

30 15 0 30 60
GRAPHIC SCALE
HORIZONTAL: 1" = 30'

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PRELIM PLAN - STORM PROFILES
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
STORM PROFILES

SHEET No.
C302

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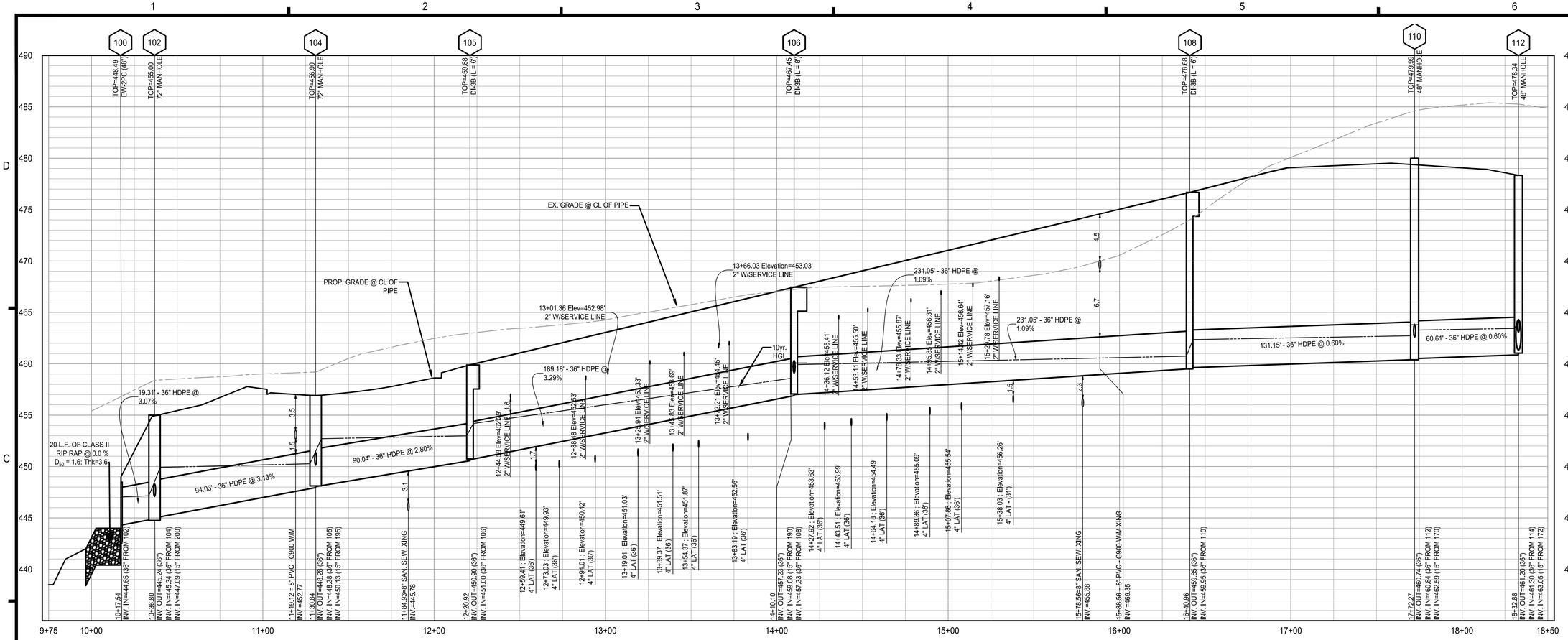
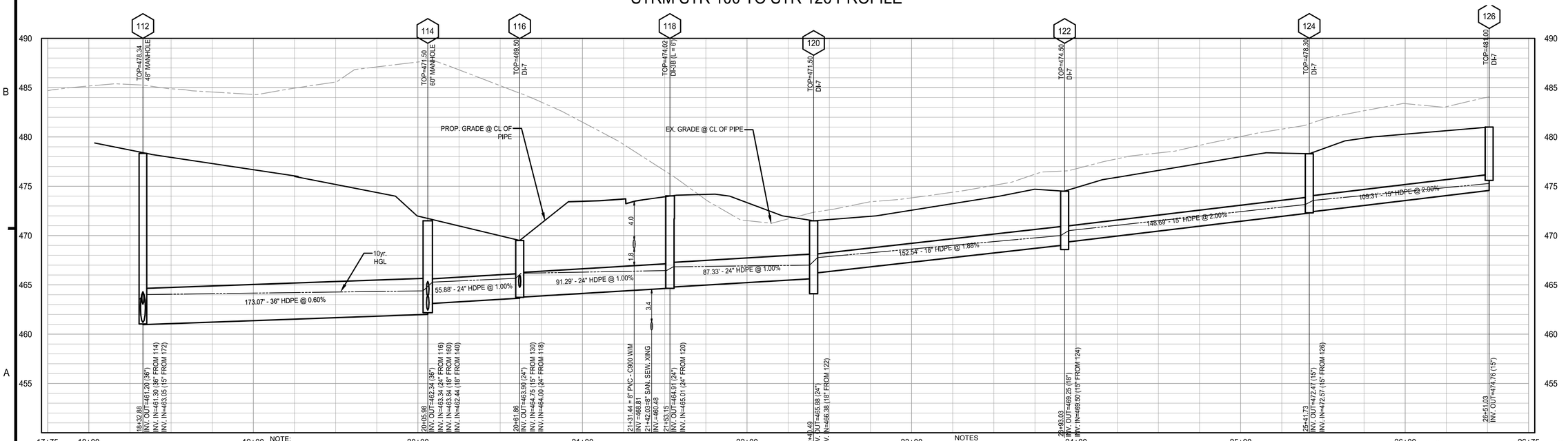


STRM STR 100 TO STR 126 PROFILE



STRM STR 112 TO STR 126 PROFILE

NOTE:

CONTRACTOR SHALL TEST PIT AND LOCATE ALL EXISTING UNDERGROUND UTILITIES AT ALL PROPOSED UTILITY CROSSINGS AND CONNECTIONS TO OBTAIN ACTUAL VERTICAL AND HORIZONTAL LOCATIONS AND VERIFY THAT NO CONFLICTS EXIST WITH NEW UTILITIES WELL IN ADVANCE OF CONSTRUCTION START. REPORT ANY CONFLICTS TO ENGINEER SO ANY DESIGN ADJUSTMENTS CAN BE MADE PRIOR TO CONSTRUCTION.

NOTES

1. ALL STORM DRAIN STRUCTURES ARE WVDOH STANDARDS. ALL SEWER STRUCTURES ARE CHARLES TOWN UTILITY BOARD STANDARDS. CONTRACTOR MAY USE PRECAST STRUCTURE WHERE AVAILABLE TO MEET THE STANDARD STRUCTURE SPECIFIED.
2. ELEVATIONS ARE GIVEN TO TOP OF LID FOR MANHOLES. CONTRACTOR TO ADJUST ELEVATIONS PROVIDED TO MATCH EXISTING PAVEMENT ELEVATIONS AND FIELD CONDITIONS WHERE APPROPRIATE.

GRAPHIC SCALE
VERTICAL: 1" = 5'

5 2.5 0 5 10

GRAPHIC SCALE
HORIZONTAL: 1" = 30'

30 15 0 30 60

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PRELIM PLAN - STORM PROFILES
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

STORM PROFILES

SHEET No.

C303

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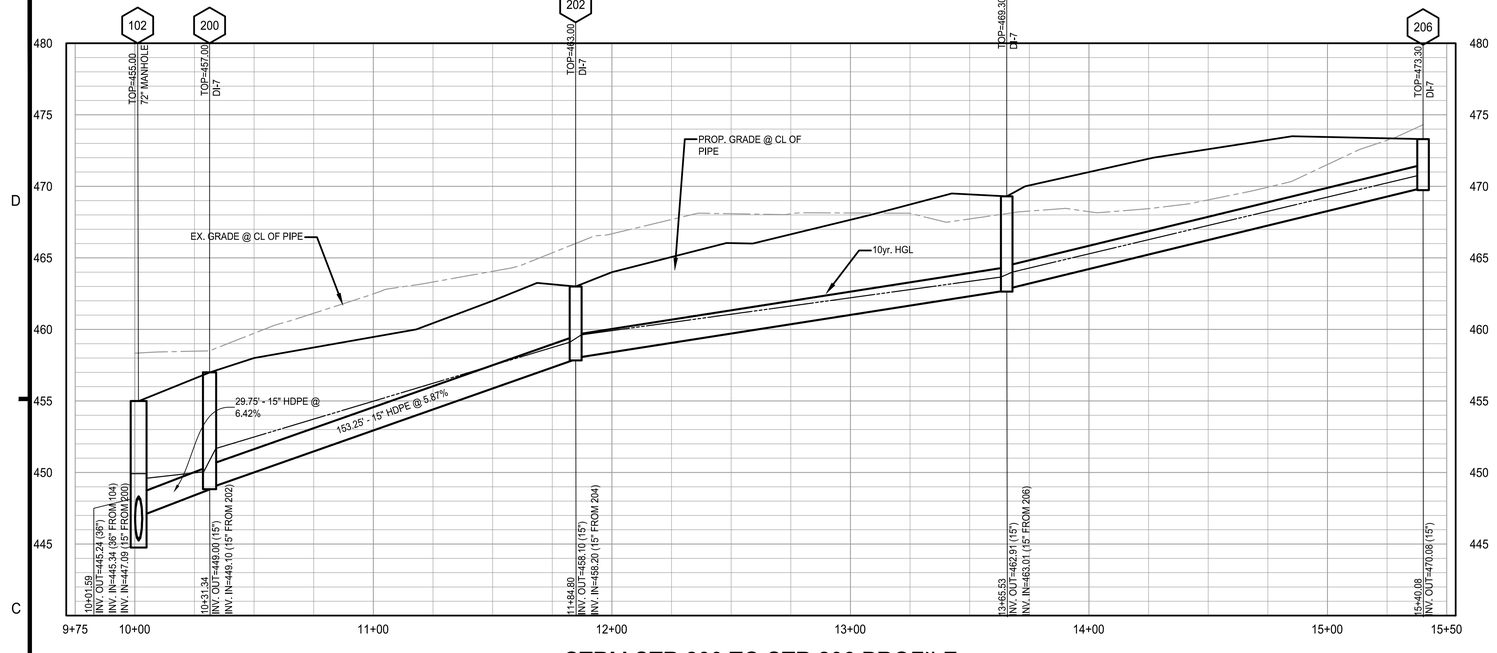

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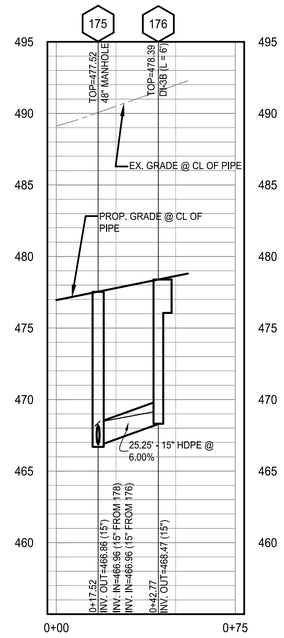
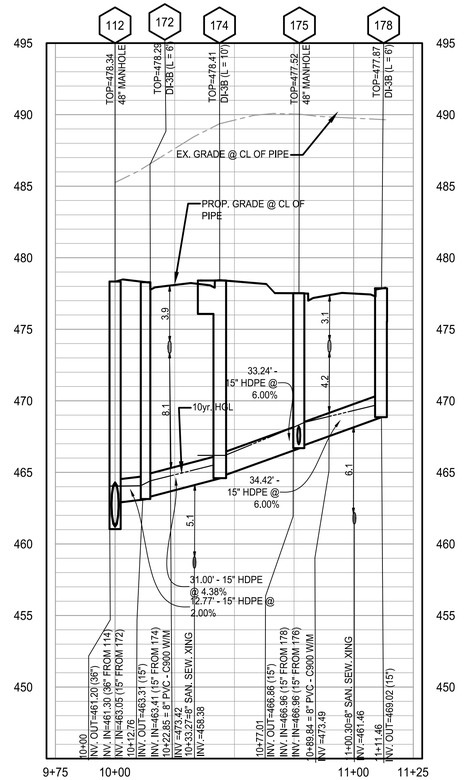
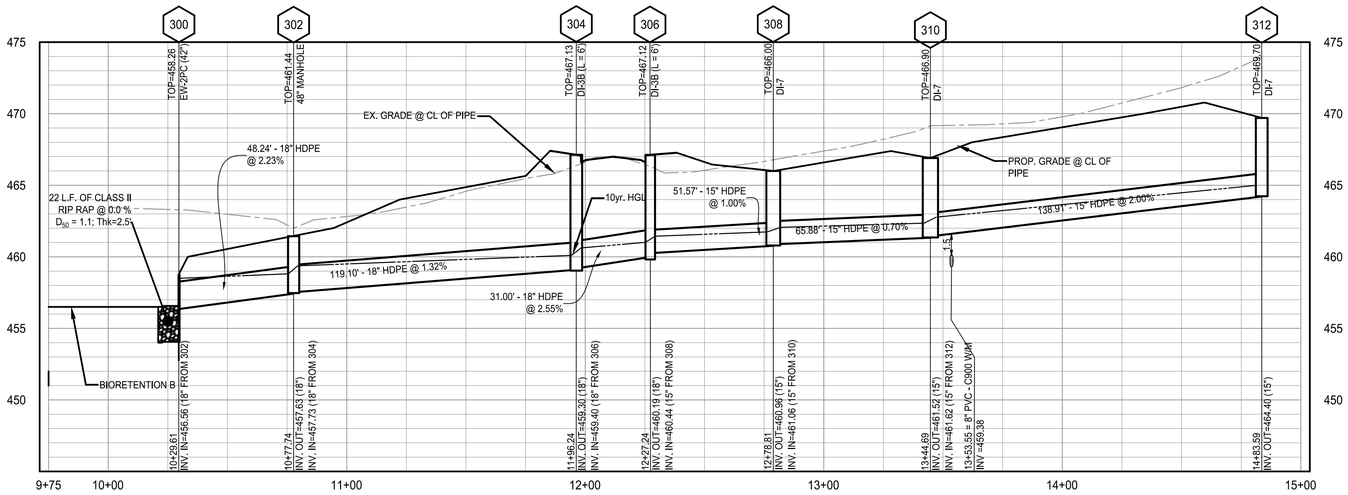


STRM STR 175TO STR 176 PROFILE



STRM STR 112 TO STR 178 PROFILE



STRM STR 300 TO STR 312 PROFILE

NOTES

1. ALL STORM DRAIN STRUCTURES ARE WVDOH STANDARDS. ALL SEWER STRUCTURES ARE CHARLES TOWN UTILITY BOARD STANDARDS. CONTRACTOR MAY USE PRECAST STRUCTURE WHERE AVAILABLE TO MEET THE STANDARD STRUCTURE SPECIFIED.
2. ELEVATIONS ARE GIVEN TO TOP OF LID FOR MANHOLES. CONTRACTOR TO ADJUST ELEVATIONS PROVIDED TO MATCH EXISTING PAVEMENT ELEVATIONS AND FIELD CONDITIONS WHERE APPROPRIATE.

NOTE:

CONTRACTOR SHALL TEST PIT AND LOCATE ALL EXISTING UNDERGROUND UTILITIES AT ALL PROPOSED UTILITY CROSSINGS AND CONNECTIONS TO OBTAIN ACTUAL VERTICAL AND HORIZONTAL LOCATIONS AND VERIFY THAT NO CONFLICTS EXIST WITH NEW UTILITIES WELL IN ADVANCE OF CONSTRUCTION START. REPORT ANY CONFLICTS TO ENGINEER SO ANY DESIGN ADJUSTMENTS CAN BE MADE PRIOR TO CONSTRUCTION.

5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

30 15 0 30 60
GRAPHIC SCALE
HORIZONTAL: 1" = 30'

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PRELIM PLAN - STORM PROFILES
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

STORM PROFILES

SHEET No.

C304

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STORM SEWER DESIGN COMPUTATIONS

FROM	TO	TYPE OF STR.	DRAIN. AREA (AC.)	RUNOFF COEF. C	CxA INCR.	CxA ACCUM.	TIME OF CONCENTRATION TC TO PIPE	TIME IN PIPE	ACCUM. TIME	I (IN/HRS)	TOTAL FLOW (CFS)	TYPE PIPE	MANNINGS N	PIPE RUN LENGTH (FT)	DIA (IN)	UPPER INVERT	LOWER INVERT	SLOPE (%)	CAPACITY OF PIPE CAPACITY (CFS)	CAPACITY %	VELOCITY (FPS)	ACTUAL VELOCITY (FPS)
126	124	DI-7	0.32	0.89	0.29	0.29	5.00	0.29	5.29	6.75	1.93	HDPE	0.012	109.31	15	474.76	472.57	2.00	9.91	20%	8.07	6.27
124	122	DI-3B	0.53	0.87	0.46	0.75	5.29	0.30	5.60	6.75	5.04	HDPE	0.012	148.69	15	472.47	469.50	2.00	9.89	51%	8.06	8.13
122	120	DI-3B	0.56	0.86	0.49	1.23	5.60	0.28	5.88	6.75	8.32	HDPE	0.012	152.54	18	469.25	466.38	1.88	15.60	53%	8.83	8.99
120	118	DI-3B	0.46	0.85	0.39	1.62	5.88	0.19	6.07	6.75	10.94	HDPE	0.012	87.33	24	465.88	465.01	1.00	24.50	45%	7.80	7.60
118	116	MH-2	0.63	0.71	0.45	2.07	6.07	0.19	6.26	6.41	13.27	HDPE	0.012	91.29	24	464.91	464.00	1.00	24.51	54%	7.80	7.97
136	134	DI-3B	0.46	0.83	0.38	0.38	5.00	0.08	5.08	6.75	2.58	HDPE	0.012	37.17	15	468.20	467.17	2.76	11.63	22%	9.48	7.67
134	132	DI-3B	0.00	0.90	0.00	0.38	5.08	0.07	5.15	6.75	2.58	HDPE	0.012	38.56	15	467.07	465.46	4.17	14.29	18%	11.64	8.85
132	130	MH-2	0.14	0.82	0.12	0.50	5.15	0.09	5.24	6.75	3.39	HDPE	0.012	31.00	15	465.36	465.05	1.00	7.00	48%	5.70	5.68
130	116	MH-2	0.13	0.81	0.11	0.61	5.24	0.05	5.30	6.75	4.11	HDPE	0.012	19.30	15	464.95	464.75	1.05	7.16	57%	5.83	6.04
116	114	DI-7	0.56	0.87	0.48	3.16	6.26	0.11	6.37	6.41	20.27	HDPE	0.012	55.88	24	463.90	463.34	1.00	24.51	83%	7.80	8.74
148	146	DI-3C	0.25	0.77	0.19	0.19	5.00	0.14	5.14	6.75	1.30	HDPE	0.012	31.00	15	465.50	465.31	0.60	5.42	24%	4.42	3.63
146	144	DI-3C	0.74	0.67	0.50	0.69	5.14	0.51	5.65	6.75	4.66	HDPE	0.012	150.51	15	465.21	464.31	0.60	5.40	86%	4.40	4.96
150	144	DI-3B	0.28	0.83	0.23	0.23	5.00	0.06	5.06	6.75	1.57	HDPE	0.012	31.00	15	466.33	464.31	6.50	17.84	9%	14.54	8.94
144	142	DI-3B	0.21	0.84	0.18	1.10	5.65	0.20	5.85	6.75	7.43	HDPE	0.012	68.91	18	464.06	463.65	0.60	8.82	84%	4.99	5.60
142	140	DI-3B	0.00	0.90	0.00	1.10	5.85	0.07	5.92	6.75	7.43	HDPE	0.012	23.65	18	463.55	463.41	0.60	8.82	84%	4.99	5.61
140	114	DI-3B	0.07	0.35	0.03	1.13	5.92	0.28	6.21	6.75	7.61	HDPE	0.012	108.17	18	463.31	462.44	0.81	10.21	74%	5.78	6.34
162	160	DI-3C	0.59	0.90	0.53	0.53	5.00	0.27	5.27	6.75	3.55	HDPE	0.012	148.81	15	471.46	466.25	3.50	13.09	27%	10.67	9.12
160	114	MH-2	0.46	0.89	0.41	0.93	5.27	0.12	5.39	6.75	6.30	HDPE	0.012	70.49	18	466.00	463.84	3.07	19.94	32%	11.29	10.03
114	112	DI-7	0.00	0.90	0.00	5.22	6.37	0.35	6.72	6.41	33.47	HDPE	0.012	173.07	36	462.34	461.30	0.60	55.96	60%	7.92	8.29
178	175	DI-3B	0.21	0.82	0.17	0.17	5.00	0.07	5.07	6.75	1.14	HDPE	0.012	34.42	15	469.03	466.96	6.00	17.14	7%	13.97	8.06
176	175	DI-3B	0.24	0.74	0.18	0.18	5.00	0.05	5.05	6.75	1.19	HDPE	0.012	25.25	15	468.48	466.96	6.00	17.14	7%	13.97	7.95
175	174	MH-2	0.00	0.90	0.00	0.34	5.07	0.07	5.14	6.75	2.33	HDPE	0.012	40.91	15	467.32	464.87	6.00	17.14	14%	13.97	9.79
174	172	DI-3B	0.07	0.81	0.06	0.40	5.14	0.06	5.20	6.75	2.71	HDPE	0.012	31.00	15	464.77	463.41	4.38	14.65	18%	11.94	9.15
172	112	DI-3B	0.05	0.79	0.04	0.44	5.20	0.03	5.23	6.75	2.98	HDPE	0.012	12.77	15	463.31	463.05	2.00	9.89	30%	8.06	7.07
112	110	DI-7	0.00	0.90	0.00	5.67	6.72	0.12	6.83	6.41	36.30	HDPE	0.012	60.61	36	461.20	460.84	0.60	56.00	65%	7.92	8.45
170	110	DI-7	0.39	0.86	0.33	0.33	5.00	0.23	5.23	6.75	2.25	HDPE	0.012	92.07	18	464.62	462.59	2.21	16.91	13%	9.57	6.64
110	108	DI-7	0.00	0.90	0.00	6.00	6.83	0.26	7.09	6.41	38.43	HDPE	0.012	131.16	36	460.74	459.95	0.60	55.97	69%	7.92	8.55
108	106	DI-7	0.07	0.81	0.06	6.06	7.09	0.36	7.45	6.10	36.96	HDPE	0.012	231.05	36	459.85	457.33	1.09	75.45	49%	10.67	10.64
190	106	DI-3B	0.44	0.80	0.35	0.35	5.00	0.05	5.05	6.75	2.39	HDPE	0.012	34.78	15	461.71	459.08	7.56	19.24	12%	15.68	10.78
106	105	DI-3B	0.18	0.06	0.01	6.42	7.45	0.19	7.65	6.10	39.19	HDPE	0.012	189.18	36	457.23	451.00	3.29	131.13	30%	18.55	16.24
105	104	DI-3B	0.25	0.83	0.21	6.63	7.65	0.10	7.74	6.10	40.47	HDPE	0.012	90.04	36	450.90	448.38	2.80	120.81	33%	17.09	15.42
												HDPE										
195	104	DI-3C	0.63	0.85	0.53	0.53	5.00	0.08	5.08	6.75	3.61	HDPE	0.012	46.78	15	451.92	450.13	3.82	13.68	26%	11.15	9.41
104	102	DI-3B	0.13	0.82	0.11	7.28	7.74	0.10	7.84	6.10	44.40	HDPE	0.012	94.03	36	448.28	445.34	3.13	127.83	35%	18.08	16.48
206	204	DI-7	0.31	0.90	0.28	0.28	5.00	0.39	5.39	6.75	1.90	HDPE	0.012	185.06	15	470.08	463.01	3.82	13.68	14%	11.15	7.88
204	202	DI-7	0.31	0.90	0.28	0.56	5.39	0.27	5.66	6.75	3.76	HDPE	0.012	145.61	15	462.91	458.20	3.23	12.59	30%	10.26	9.00
202	200	DI-7	0.22	0.90	0.20	0.76	5.66	0.21	5.87	6.75	5.12	HDPE	0.012	153.26	15	458.10	449.10	5.87	16.96	30%	13.82	12.15
200	102	DI-7	0.22	0.90	0.20	0.96	5.87	0.04	5.91	6.75	6.45	HDPE	0.012	29.75	15	449.00	447.09	6.42	17.73	36%	14.45	13.32
102	100	MH-2	0.13	0.82	0.11	8.34	7.84	0.02	7.86	6.10	50.89	HDPE	0.012	19.31	36	445.24	444.65	3.07	126.61	40%	17.91	16.97
312	310	DI-7	0.51	0.90	0.46	0.46	5.00	0.32	5.32	6.75	3.09	HDPE	0.012	138.91	15	464.40	461.62	2.00	9.90	31%	8.06	7.12
310	308	DI-7	0.26	0.90	0.23	0.69	5.32	0.21	5.53	6.75	4.67	HDPE	0.012	65.88	15	461.52	461.06	0.70	5.85	80%	4.77	5.31
308	306	DI-7	0.11	0.90	0.10	0.79	5.53	0.14	5.67	6.75	5.34	HDPE	0.012	51.57	15	460.96	460.44	1.00	7.00	76%	5.70	6.29
306	304	DI-3B	0.34	0.90	0.31	1.10	5.67	0.05	5.72	6.75	7.42	HDPE	0.012	31.00	18	460.19	459.40	2.55	18.18	41%	10.29	9.78
304	302	DI-3B	0.27	0.81	0.22	1.32	5.72	0.25	5.97	6.75	8.91	HDPE	0.012	119.10	18	459.30	457.73	1.32	13.07	68%	7.39	7.96
302	300	MH-2	0.00	0.35	0.00	1.32	5.97	0.08	6.05	6.75	8.91	HDPE	0.012	48.24	18	457.63	456.56	2.23	16.99	52%	9.61	9.76

RIP RAP COMPUTATIONS

OUTLET NO.	TAILWATER CONDITION	Do (PIPE SIZE)	FLOW (cfs)	W1 (ft)	W2 (ft)	La (ft)	VDOT CLASS	D_{50} (ft.)	D_{MAX} (ft.)	Depth (ft.)	VELOCITY (fps)
100	Tw < 0.5 D	36	50.89	9	17	20	II	1.60	2.40	3.6	16.97
POND A OUTFALL	Tw < 0.5 D	30	12.00	7.5	16.3	22	II	1.60	2.40	3.6	8.47
300	Tw < 0.5 D	18	8.50	4.5	8.1	9	I	1.10	1.65	2.5	6.64

(1) LENGTH OF RIP RAP WAS OBTAINED FROM PLATE 3.18-3 OR 4 (AS APPLICABLE) OF THE VESCH MANUAL
(2) RIP RAP CLASS WAS DETERMINED FROM TABLE 3 OF SECTION 5.220 OF THE LOUDOUN COUNTY FSM

IMEG
50 Catoctin Circle NE, Suite 210
Leesburg, VA 20176 P 703.777.2755
engineering • surveying • land planning

PRELIM PLAN - STORM SEWER COMPUTATIONS HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
STORM SEWER COMPUTATIONS

SHEET No.
C305

P:\Projects\22063\001\001111742 Prelim Subdivision - Land Development Plan\C305 Storm Sewer Computations.dwg, 2/13/2024 8:10:13 PM, Andrew H. Fraser,

GRATE INLET COMPUTATIONS

INLET NO.	C	I	AREA	INLET	INLET TYPE	Q10 TO INLET	PONDED DEPTH	% INTER-CEPTION	PICKUP Q	GRATE CAPACITY	BYPASS Q	TOP ELEV	50% BLOCKED ELEV (10 YR)	OVERFLOW ELEV	FREEBOARD	COMMENTS
200	0.90	6.75	0.22 AC.	DI-7	A-I	1.32 CFS	0.17 FT.	100	1.32 CFS	5.30 CFS	0.00 CFS	457.00	457.17	457.50	0.33 ft.	
202	0.90	6.75	0.22 AC.	DI-7	A-I	1.36 CFS	0.17 FT.	100	1.36 CFS	5.45 CFS	0.00 CFS	461.53	461.70	461.90	0.20 ft.	
204	0.90	6.75	0.31 AC.	DI-7	A-I	1.87 CFS	0.21 FT.	100	1.87 CFS	7.46 CFS	0.00 CFS	466.31	466.52	466.90	0.38 ft.	
206	0.90	6.75	0.31 AC.	DI-7	A-I	1.90 CFS	0.21 FT.	100	1.90 CFS	7.59 CFS	0.00 CFS	473.40	473.61	474.00	0.39 ft.	
170	0.86	6.75	0.39 AC.	DI-7	A-I	2.25 CFS	0.24 FT.	100	2.25 CFS	9.00 CFS	0.00 CFS	477.00	477.24	478.30	1.06 ft.	
160	0.89	6.75	0.46 AC.	DI-7	A-I	2.75 CFS	0.27 FT.	100	2.75 CFS	11.00 CFS	0.00 CFS	473.80	474.08	474.73	0.65 ft.	
162	0.90	6.75	0.59 AC.	DI-7	A-I	3.55 CFS	0.32 FT.	100	3.55 CFS	14.19 CFS	0.00 CFS	477.00	477.32	477.80	0.48 ft.	
120	0.85	6.75	0.46 AC.	DI-7	A-I	2.62 CFS	0.26 FT.	100	2.62 CFS	10.50 CFS	0.00 CFS	473.11	473.37	473.80	0.43 ft.	
122	0.86	6.75	0.56 AC.	DI-7	A-I	3.28 CFS	0.31 FT.	100	3.28 CFS	13.11 CFS	0.00 CFS	475.00	475.31	476.50	1.19 ft.	
124	0.87	6.75	0.53 AC.	DI-7	A-I	3.11 CFS	0.30 FT.	100	3.11 CFS	12.43 CFS	0.00 CFS	478.30	478.60	479.00	0.40 ft.	
126	0.89	6.75	0.32 AC.	DI-7	A-I	1.94 CFS	0.22 FT.	100	1.94 CFS	7.74 CFS	0.00 CFS	480.00	480.22	480.60	0.38 ft.	
140	0.35	6.75	0.07 AC.	DI-8	A-I	0.17 CFS	0.05 FT.	101	0.18 CFS	0.99 CFS	0.00 CFS	472.10	472.15	472.30	0.15 ft.	
116	0.87	6.75	0.56 AC.	DI-7	A-I	3.27 CFS	0.31 FT.	100	3.27 CFS	13.08 CFS	0.00 CFS	469.50	469.81	473.90	4.09 ft.	
308	0.90	6.75	0.11 AC.	DI-7	A-I	0.67 CFS	0.11 FT.	100	0.67 CFS	2.67 CFS	0.00 CFS	466.00	466.11	466.50	0.39 ft.	
310	0.90	6.75	0.26 AC.	DI-7	A-I	1.58 CFS	0.19 FT.	100	1.58 CFS	6.34 CFS	0.00 CFS	467.32	467.51	467.65	0.14 ft.	
312	0.90	6.75	0.51 AC.	DI-7	A-I	3.09 CFS	0.30 FT.	100	3.09 CFS	12.36 CFS	0.00 CFS	469.72	470.01	470.50	0.49 ft.	

ULTIMATE ON GRADE CURB INLET COMPUTATIONS

STR NO.	TYPE	CAT	AREA	C	I	Q	CARRY	Q TOT	S %	SX %	SX % CALC	T FT	W/T	SWSX	Eo	a	S'W	Se	LT	L	E	Q INT	BY-PASS	DPTH
118	DI-3B	N/A	0.63	0.71	4.00 IN/HR	1.80 CFS	0.00	1.80 CFS	2.00%	2.08%	2.08%	6.0	0.33	4.01	0.82	3.5	0.146	0.140	9.6	6	0.62	1.12	0.68	-
144	DI-3B	N/A	0.21	0.84	4.00 IN/HR	0.71 CFS	0.00	0.71 CFS	3.00%	2.08%	2.08%	2.3	0.87	4.01	1.00	3.5	0.146	0.167	6.6	6	0.91	0.65	0.07	-
																				6				-
150	DI-3B	N/A	0.28	0.83	4.00 IN/HR	0.93 CFS	0.00	0.93 CFS	3.00%	2.08%	2.08%	3.1	0.65	4.01	0.99	3.5	0.146	0.165	7.5	6	0.80	0.75	0.18	-
																				6				
136	DI-3B	N/A	0.46	0.83	4.00 IN/HR	1.53 CFS	0.00	1.53 CFS	2.00%	2.08%	2.08%	5.4	0.37	4.01	0.86	3.5	0.146	0.146	8.8	6	0.69	1.05	0.48	-
174	DI-3B	N/A	0.07	0.81	4.00 IN/HR	0.23 CFS	0.00	0.23 CFS	2.50%	2.08%	8.33%	1.4	1.43	1.00	1.00	2.0	0.083	0.167	3.9	10	1.00	0.23	0.00	
176	DI-3B	N/A	0.24	0.74	4.00 IN/HR	0.70 CFS	0.00	0.70 CFS	3.50%	2.08%	8.33%	2.0	1.00	1.00	1.00	2.0	0.083	0.167	6.9	6	0.87	0.61	0.09	-
178	DI-3B	N/A	0.21	0.82	4.00 IN/HR	0.68 CFS	0.00	0.68 CFS	3.50%	2.08%	8.33%	2.0	1.00	1.00	1.00	2.0	0.083	0.167	6.8	6	0.89	0.60	0.08	
							0.00																	
172	DI-3B	N/A	0.05	0.79	4.00 IN/HR	0.16 CFS	0.00	0.16 CFS	3.00%	2.08%	8.33%	1.2	1.67	1.00	1.00	2.0	0.083	0.167	3.5	6	1.00	0.16	0.00	-
																								-
108	DI-3B	N/A	0.07	0.81	4.00 IN/HR	0.23 CFS	0.00	0.23 CFS	4.20%	2.08%	8.33%	1.3	1.54	1.00	1.00	2.0	0.083	0.167	4.6	6	1.00	0.23	0.00	-
109	DI-3C	N/A	0.07	0.81	4.00 IN/HR	0.23 CFS	0.00	0.23 CFS	4.00%	2.08%	8.33%	1.3	1.54	1.00	1.00	2.0	0.083	0.167	4.5	6	1.00	0.23	0.00	-
106	DI-3B	N/A	0.18	0.06	4.00 IN/HR	0.04 CFS	0.00	0.04 CFS	4.00%	2.08%	8.33%	0.7	2.86	1.00	1.00	2.0	0.083	0.167	2.2	6	1.00	0.04	0.00	-
105	DI-3B	N/A	0.25	0.83	4.00 IN/HR	0.84 CFS	0.00	0.84 CFS	4.00%	2.08%	2.08%	2.3	0.87	4.01	1.00	3.5	0.146	0.167	7.7	6	0.78	0.65	0.19	-
							0.00													6				
304	DI-3B	N/A	0.27	0.81	4.00 IN/HR	0.88 CFS	0.00	0.88 CFS	2.50%	2.08%	2.08%	3.2	0.63	4.01	0.98	3.5	0.146	0.164	6.9	8	1.00	0.88	0.00	-
306	DI-3B	N/A	0.34	0.90	4.00 IN/HR	1.23 CFS	0.00	1.23 CFS	2.40%	2.08%	2.08%	4.4	0.45	4.01	0.92	3.5	0.146	0.156	8.1	10	1.00	1.23	0.00	-

ULTIMATE SAG CURB INLET COMPUTATIONS

	TYPE	CAT	AREA	C	I	Q	CARRY	Q TOT	S %	SX %	SX % CALC	T FT	W/T	SWSX	Eo	a	S'W	Se	LT	L	E	Q INT	BY-PASS	DPTH
146	DI-3C	N/A	0.74	0.67	4.00 IN/HR	1.99 CFS	0.68	2.67	0.00%	2.08%	-	11.7	-	-	-	-	-	-	-	6	-	-	-	0.24
	RIGHT		0.04	0.67	4.00 IN/HR	0.11 CFS	0	0.11	0.30%	2.08%	8.33%	1.6	1.25	1.00	1.00	2.0	0.083	0.167	1.5		1.00	0.11	-	-
	LEFT		0.10	0.67	4.00 IN/HR	0.26 CFS	0.68	0.94	0.30%	2.08%	2.08%	7.0	0.29	4.01	0.75	3.5	0.146	0.130	4.3		1.00	0.94	-	-
148	DI-3C	N/A	0.25	0.77	4.00 IN/HR	0.77 CFS	0.74	1.51	0.00%	2.08%	-	7.1	-	-	-	-	-	-	-	8	-	-	-	0.15
	RIGHT		0.25	0.77	4.00 IN/HR	0.77 CFS	0.74	1.51	0.30%	2.08%	2.08%	8.9	0.22	4.01	0.63	3.5	0.146	0.113	5.8		1.00	1.51	-	-
	LEFT		0.00	0.77	4.00 IN/HR	0.00 CFS	0.00	0.00	0.30%	2.08%	8.33%	0.4	5.00	1.00	1.00	2.0	0.083	0.167	0.3		1.00	0.00	-	-
132	MH-2	N/A	0.14	0.82	4.00 IN/HR	0.48 CFS	0.65	1.13	0.00%	2.08%	-	4.8	-	-	-	-	-	-	-	12	-	-	-	0.10
	RIGHT		0.42	0.82	4.00 IN/HR	1.38 CFS	0.17	1.55	0.14%	2.08%	2.08%	10.8	0.19	4.01	0.54	3.5	0.146	0.099	5.0		1.00	1.55	-	-
	LEFT		0.10	0.82	4.00 IN/HR	0.32 CFS	0.48	0.80	0.40%	2.08%	2.08%	6.0	0.33	4.01	0.82	3.5	0.146	0.140	4.2		1.00	0.80	-	-
130	MH-2	N/A	0.13	0.81	4.00 IN/HR	0.43 CFS	0.00	0.43	0.00%	2.08%	-	3.5	-	-	-	-	-	-	-	6	-	-	-	0.07
	RIGHT		0.03	0.81	4.00 IN/HR	0.08 CFS	0	0.08	0.80%	2.08%	8.33%	1.2	1.67	1.00	1.00	2.0	0.083	0.167	1.8		1.00	0.08	-	-
	LEFT		0.10	0.81	4.00 IN/HR	0.33 CFS	0	0.33	0.30%	2.08%	2.08%	3.5	0.57	4.01	0.97	3.5	0.146	0.163	2.5		1.00	0.33	-	-
195	DI-3C	N/A	0.63	0.85	4.00 IN/HR	2.14 CFS	0.19	2.33	0.67%	2.08%	-	7.2	-	-	-	-	-	-	-	14	-	-	-	0.15
	RIGHT		0.38	0.85	4.00 IN/HR	1.28 CFS	0	1.28	0.82%	2.08%	2.08%	6.4	0.31	4.01	0.79	3.5	0.146	0.136	6.5		1.00	1.28	-	-
	LEFT		0.22	0.85	4.00 IN/HR	0.75 CFS	0.19	0.94	0.97%	2.08%	2.08%	5.0	0.40	4.01	0.89	3.5	0.146	0.150	5.6		1.00	0.94	-	-

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COMMONWEALTH OF VIRGINIA
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05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

STORM SEWER COMPUTATIONS

SHEET No.

C306

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C307A STROM COMPUTATION A.dwg, 2/13/2024 8:17:41 PM, Andrew H. Fraser,

HYDRAULIC GRADE LINE - TO POND A AND BIORETENTION

INLET STATION	OUTLET WATER SURFACE ELEVATION	Do	Qo	Lo	n	Sfo%	Hf	JUNCTION LOSSES													FINAL H	INLET WATER SURFACE ELEVATION	RIM ELEVATION	REMARKS	FREE-BOARD (FT)	HOW OUTLET WSE DETERMINED
								Vo	Ho	Qi	Vi	QiVi	Vi2/2g	Hi	ANGLE	H □	Ht	1.3 Ht	0.5 Ht	0.65 Ht					
																				Downstream WSE=		444.65				
102	447.05	36	50.89	19.31	0.012	0.50%	0.10	16.97	1.12	44.40	16.48	731.65	4.22	1.48	90	2.95	5.55	7.21	2.77	3.60	2.87	449.92	455.00	OK	5.08	0.8D
104	449.92	36	44.40	94.03	0.012	0.38%	0.35	16.48	1.05	40.47	15.42	624.11	3.69	1.29	86	2.53	4.87	6.33	2.44	3.17	2.79	452.71	456.90	OK	4.19	IWE
105	452.71	36	40.47	90.04	0.012	0.31%	0.28	15.42	0.92	39.19	16.24	636.29	4.09	1.43	1	0.05	2.40	3.13	1.20	1.56	1.48	454.19	459.88	OK	5.69	IWE
106	454.19	36	39.19	189.18	0.012	0.29%	0.56	16.24	1.02	36.96	10.64	393.28	1.76	0.62	63	1.04	2.68	3.48	1.34	1.74	1.89	459.92	467.45	OK	7.53	IWE
108	459.92	36	36.96	231.05	0.012	0.26%	0.60	10.64	0.44	38.43	8.55	328.59	1.14	0.40	10	0.15	0.98	1.28	0.49	0.64	1.10	461.23	476.68	OK	15.45	IWE
110	462.35	36	38.43	131.16	0.012	0.28%	0.37	8.55	0.28	36.30	8.45	306.57	1.11	0.39	81	0.45	1.13	1.46	0.56	0.73	0.93	463.28	479.37	OK	16.09	0.8D
112	463.28	36	36.30	60.61	0.012	0.25%	0.15	8.45	0.28	33.47	8.29	277.30	1.07	0.37	80	0.51	1.16	1.51	0.58	0.76	0.73	464.02	478.34	OK	14.32	IWE
114	464.02	36	33.47	173.07	0.012	0.21%	0.37	8.29	0.27	20.27	8.74	177.15	1.19	0.42	90	1.09	1.78	2.31	0.89	1.15	1.26	465.28	471.00	OK	5.72	IWE
116	465.28	24	20.27	55.88	0.012	0.68%	0.38	8.74	0.30	13.27	7.97	105.75	0.99	0.35	90	0.40	1.04	1.35	0.52	0.68	0.90	466.18	469.50	OK	3.32	IWE
118	466.18	24	13.27	91.29	0.012	0.29%	0.27	7.97	0.25	10.94	7.60	83.10	0.90	0.31	18	0.20	0.76	0.99	0.38	0.50	0.65	466.83	474.02	OK	7.20	IWE
120	466.83	24	10.94	87.33	0.012	0.20%	0.17	7.60	0.22	8.32	8.99	74.80	1.26	0.44	89	0.87	1.54	2.00	0.77	1.00	0.94	467.77	473.11	OK	5.34	IWE
122	467.77	18	8.32	152.54	0.012	0.53%	0.81	8.99	0.31	5.04	8.13	41.00	1.03	0.36	0	0.00	0.67	0.88	0.34	0.44	1.15	470.34	475.00	OK	4.66	IWE
124	470.50	15	5.04	148.69	0.012	0.52%	0.77	8.13	0.26	1.93	6.27	12.12	0.61	0.21	0	0.00	0.47	0.61	0.24	0.31	1.01	473.38	478.30	OK	4.92	0.8D
126	473.57	15	1.93	109.31	0.012	0.08%	0.08	6.27	0.15	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.15	0.20	0.08	0.10	0.16	475.36	480.00	OK	4.64	0.8D
																						449.92				
200	449.92	15	6.45	29.75	0.012	0.85%	0.25	13.32	0.69	5.12	12.15	62.27	2.29	0.80	82	1.53	3.02	3.93	1.51	1.97	1.76	451.68	457.00	OK	5.32	IWE
202	451.68	15	5.12	153.26	0.012	0.54%	0.82	12.15	0.57	3.76	9.00	33.87	1.26	0.44	0	0.00	1.01	1.32	0.51	0.66	1.33	459.62	461.53	OK	1.91	IWE
204	459.62	15	3.76	145.61	0.012	0.29%	0.42	9.00	0.31	1.90	7.88	14.95	0.96	0.34	0	0.00	0.65	0.85	0.33	0.42	0.75	463.99	466.31	OK	2.33	IWE
206	464.01	15	1.90	185.06	0.012	0.07%	0.14	7.88	0.24	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.24	0.31	0.12	0.16	0.26	470.86	473.40	OK	2.54	0.8D
																						452.71				
195	452.71	15	3.61	46.78	0.012	0.27%	0.12	9.41	0.34	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.34	0.45	0.17	0.22	0.30	453.00	456.35	OK	3.34	IWE
																						459.92				
190	460.08	15	2.39	34.78	0.012	0.12%	0.04	10.78	0.45	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.45	0.59	0.23	0.29	0.27	462.83	468.21	OK	5.37	0.8D
																						463.28				
170	463.79	18	2.25	92.07	0.012	0.04%	0.04	6.64	0.17	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.17	0.22	0.09	0.11	0.12	465.26	477.00	OK	11.74	0.8D
																						464.02				
172	464.05	15	2.98	12.77	0.012	0.18%	0.02	7.07	0.19	2.71	9.15	24.78	1.30	0.45	0	0.00	0.65	0.84	0.32	0.42	0.35	464.40	478.29	OK	13.90	0.8D
174	464.41	15	2.71	31.00	0.012	0.15%	0.05	9.15	0.32	2.33	9.79	22.78	1.49	0.52	49	0.48	1.33	1.73	0.66	0.86	0.71	466.19	478.41	OK	12.22	0.8D
175	466.19	15	2.33	40.91	0.012	0.11%	0.05	9.79	0.37	1.19	7.95	9.44	0.98	0.34	#N/A	0.00	0.72	0.93	0.36	0.47	0.40	468.49	477.88	OK	9.39	IWE
178	468.49	15	1.14	34.42	0.012	0.03%	0.01	8.06	0.25	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.25	0.33	0.13	0.16	0.14	469.82	477.87	OK	8.05	IWE
																						468.49				
176	468.49	15	1.19	25.25	0.012	0.03%	0.01	7.95	0.25	0.00	0.00	0.00	0.00	0.00	42	0.45	0.69	0.90	0.35	0.45	0.35	469.48	479.87	OK	10.39	Norm. Depth
																						465.28				
140	465.28	18	7.61	108.17	0.012	0.45%	0.48	6.34	0.16	7.43	5.61	41.67	0.49	0.17	4	0.02	0.35	0.46	0.18	0.23	0.66	465.94	472.10	OK	6.16	Norm. Depth
142	465.94	18	7.43	23.65	0.012	0.43%	0.10	5.61	0.12	7.43	5.60	41.65	0.49	0.17	90	0.34	0.63	0.82	0.32	0.41	0.42	466.35	474.51	OK	8.16	IWE
144	466.35	18	7.43	68.91	0.012	0.43%	0.29	5.60	0.12	4.66	4.96	23.11	0.38	0.13	90	0.87	1.12	1.46	0.56	0.73	0.86	467.21	472.62	OK	5.41	IWE
146	467.21	15	4.66	150.51	0.012	0.44%	0.67	4.96	0.10	1.30	3.63	4.73	0.20	0.07	90	0.14	0.31	0.40	0.16	0.20	0.82	468.03	469.51	OK	1.47	IWE
148	468.03	15	1.30	31.00	0.012	0.03%	0.01	3.63	0.05	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.05	0.07	0.03	0.03	0.04	468.07	469.51	OK	1.44	IWE
																						467.21				
150	467.21	15	1.57	31.00	0.012	0.05%	0.02	8.94	0.31	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.31	0.40	0.16	0.20	0.17	467.38	472.66	OK	5.28	IWE
																						465.28				
160	465.28	18	6.30	70.49	0.012	0.31%	0.22	10.03	0.39	3.55	9.12	32.35	1.29	0.45	3	0.05	0.89	1.16	0.44	0.58	0.66	467.28	473.80	OK	6.52	IWE
162	467.28	15	3.55	148.81	0.012	0.26%	0.38	9.12	0.32	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.32	0.42	0.16	0.21	0.54	472.38	477.00	OK	4.62	IWE
																						466.18				
130	466.18	15	4.11	19.30	0.012	0.34%	0.07	6.04	0.14	3.39	5.68	19.23	0.50	0.18	0	0.00	0.32	0.41	0.16	0.21	0.23	466.40	473.06	OK	6.66	IWE
132	466.40	15	3.39	31.00	0.012	0.23%	0.07	5.68	0.13	2.58	8.85	22.89	1.22	0.43	87	0.84	1.39	1.81	0.69	0.90	0.77	467.17	473.20	OK	6.03	IWE
134	467.17	15	2.58	38.56	0.012	0.14%	0.05	8.85	0.30	2.58	7.67	19.83	0.91	0.32	61	0.52	1.14	1.48	0.57	0.74	0.62	468.38	473.55	OK	5.17	IWE
136	468.38	15	2.58	37.17	0.012	0.14%	0.05	7.67	0.23	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.23	0.30	0.11	0.15	0.16	468.95	474.88	OK	5.93	IWE
																						458.50				
302	458.50	18	8.91	48.24	0.012	0.61%	0.30	9.76	0.37	8.91	7.96	70.93	0.98	0.34	41	0.43	1.14	1.49	0.57	0.74	0.87	459.37	461.44	OK	2.07	IWE
304	459.37	18	8.91	119.10	0.012	0.61%	0.73	7.96	0.25	7.42	9.78	72.54	1.49	0.52	15	0.28	1.05	1.36	0.52	0.68	1.25	460.62	467.13	OK	6.51	IWE
306	460.62	18	7.42	31.00	0.012	0.42%	0.13	9.78	0.37	5.34	6.29	33.59	0.61	0.22	16	0.12	0.71	0.92	0.36	0.46	0.49	461.36	467.12	OK	5.76	IWE
308	461.44	15	5.34	51.57	0.012	0.58%	0.30	6.29	0.15	4.67	5.31	24.79	0.44	0.15	41	0.19	0.49	0.64	0.25	0.32	0.55	461.99	466.00	OK	4.01	0.8D
310	462.06	15	4.67	65.88	0.012	0.45%	0.29	5.31	0.11	3.09	7.12	22.00	0.79	0.28	66	0.46	0.85	1.10	0.42	0.55	0.72	462.77	467.32	OK	4.54	0.8D
312	462.77	15	3.09	138.91	0.012	0.19%	0.27	7.12	0.20	0.00	0.00	0.00	0.00	0.00	#N/A	0.00	0.20	0.26	0.10	0.13	0.37	465.09	469.72	OK	4.63	IWE

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05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

STORM SEWER COMPUTATIONS

SHEET No.

C307

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C307 Storm Sewer Computations .dwg, 2/13/2024 8:18:05 PM, Andrew H. Fraser,

ULTIMATE DA TO POND A		
STR #	AREA	C
100	0.21 AC.	0.36
102	0.13 AC.	0.82
105	0.25 AC.	0.83
104	0.14 AC.	0.80
106	0.18 AC.	0.06
108	0.07 AC.	0.81
110	0.00 AC.	0.90
112	0.00 AC.	0.90
114	0.00 AC.	0.90
116	0.56 AC.	0.87
118	0.63 AC.	0.71
120	0.46 AC.	0.85
122	0.56 AC.	0.86
124	0.53 AC.	0.87
126	0.32 AC.	0.89
128	0.46 AC.	0.35
130	0.13 AC.	0.81
132	0.14 AC.	0.82
134	0.00 AC.	0.90
136	0.46 AC.	0.83
140	0.07 AC.	0.35
142	0.00 AC.	0.90
144	0.21 AC.	0.84
146	0.74 AC.	0.67
148	0.25 AC.	0.77
150	0.28 AC.	0.83
160	0.46 AC.	0.89
162	0.59 AC.	0.90
170	0.39 AC.	0.86
172	0.05 AC.	0.79
174	0.07 AC.	0.81
175	0.00 AC.	0.90
176	0.24 AC.	0.74
178	0.21 AC.	0.82
180	0.00 AC.	0.00
182	0.00 AC.	0.00
183	0.27 AC.	0.66
184	0.34 AC.	0.53
185	0.11 AC.	0.90
186	0.26 AC.	0.90
187	0.51 AC.	0.86
190	0.44 AC.	0.80
195	0.63 AC.	0.85
200	0.22 AC.	0.90
202	0.22 AC.	0.90
204	0.31 AC.	0.90
206	0.31 AC.	0.90
300	0.00 AC.	0.90
302	0.00 AC.	0.35
304	0.27 AC.	0.81
306	0.34 AC.	0.90
308	0.11 AC.	0.90
310	0.26 AC.	0.90
312	0.51 AC.	0.90

WEST VIRGINIA STATE GRID NORTH
UTM83-18F

STERNWAY DRIVE
STERNWAY DRIVE (40' ROW)
EDAW DRIVE (40' ROW)
HILL SIDE DRIVE
U.S. ROUTE 340 BYPASS (VARIABLE WIDTH RIGHT-OF-WAY)
HILL SIDE DRIVE
HUNTER ROAD
HUNTER ROAD
HILL SIDE

OAKLAND HEIGHTS SECTION 1
OAKLAND HEIGHTS SECTION 2

LOT 1 CTC MBA P1 MOHERN D.B. 963 PG. 291
LOT 2 CTC MBA P2 GLENN D.B. 951 PG. 238
LOT 3 CTC MBA P3 OWEN D.B. 1205 PG. 38
LOT 4 CTC MBA P4 OWEN D.B. 1016 PG. 25
LOT 5 CTC MBA P5 SULLIVAN D.B. 1230 PG. 202
LOT 23 CTC MBA P23 FOSTER D.B. 1206 PG. 494
LOT 24 CTC MBA P24 DOUGHERTY D.B. 1181 PG. 744
LOT 25 CTC MBA P25 POTTER D.B. 998 PG. 883
LOT 32 CTC MBA P32 MCKINNEY D.B. 1062 PG. 496
LOT 31 CTC MBA P31 UNDERLAND D.B. 1134 PG. 446
LOT 29 CTC MBA P29 OWEN D.B. 1240 PG. 9
LOT 19 CTC MBA P19 CLARK D.B. 1454 PG. 451
LOT 6 CTD M18 P6.7 HIPSLEY D.B. 1011 PG. 394
LOT 7 CTD M18 P6.8 MCMILLAN D.B. 1120 PG. 393
LOT 8 CTD M18 P6.9 MATTHEWS D.B. 949 PG. 112
LOT 9 CTD M18 P6.10 SPITZER D.B. 865 PG. 647
LOT 10 CTD M18 P6.11 GRENIER D.B. 1087 PG. 213
LOT 11 CTD M18 P6.12 CENATE D.B. 1054 PG. 556
LOT 12 CTD M18 P6.13 CENATE D.B. 609 PG. 195
LOT 13 CTD M18 P6.14 GRIMES D.B. 1182 PG. 253

STR 100, STR 102, STR 104, STR 105, STR 106, STR 108, STR 110, STR 110, STR 112, STR 114, STR 116, STR 117, STR 118, STR 120, STR 122, STR 122, STR 124, STR 126, STR 128, STR 130, STR 132, STR 134, STR 136, STR 140, STR 142, STR 144, STR 145, STR 146, STR 147, STR 148, STR 149, STR 150, STR 152, STR 154, STR 155, STR 156, STR 158, STR 159, STR 160, STR 161, STR 162, STR 163, STR 163, STR 165, STR 166, STR 167, STR 169, STR 170, STR 171, STR 172, STR 174, STR 175, STR 176, STR 178, STR 180, STR 182, STR 183, STR 184, STR 185, STR 186, STR 187, STR 190, STR 195, STR 200, STR 202, STR 204, STR 206, STR 214, STR 215, STR 271, STR 300, STR 302, STR 304, STR 306, STR 308, STR 310, STR 312

30 15 0 30 60
GRAPHIC SCALE
1" = 30'

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PRELIM PLAN - STORM DRAIN DRAINAGE AREA MAP HILLSIDE

691/432 MAP 9 PARCEL 67

LOTS 2A (RESIDUE) & 2B

DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
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DRAWN: KMS
CHECKED: SK

SHEET TITLE:

STORM DRAIN DRAINAGE AREA MAP

SHEET No.

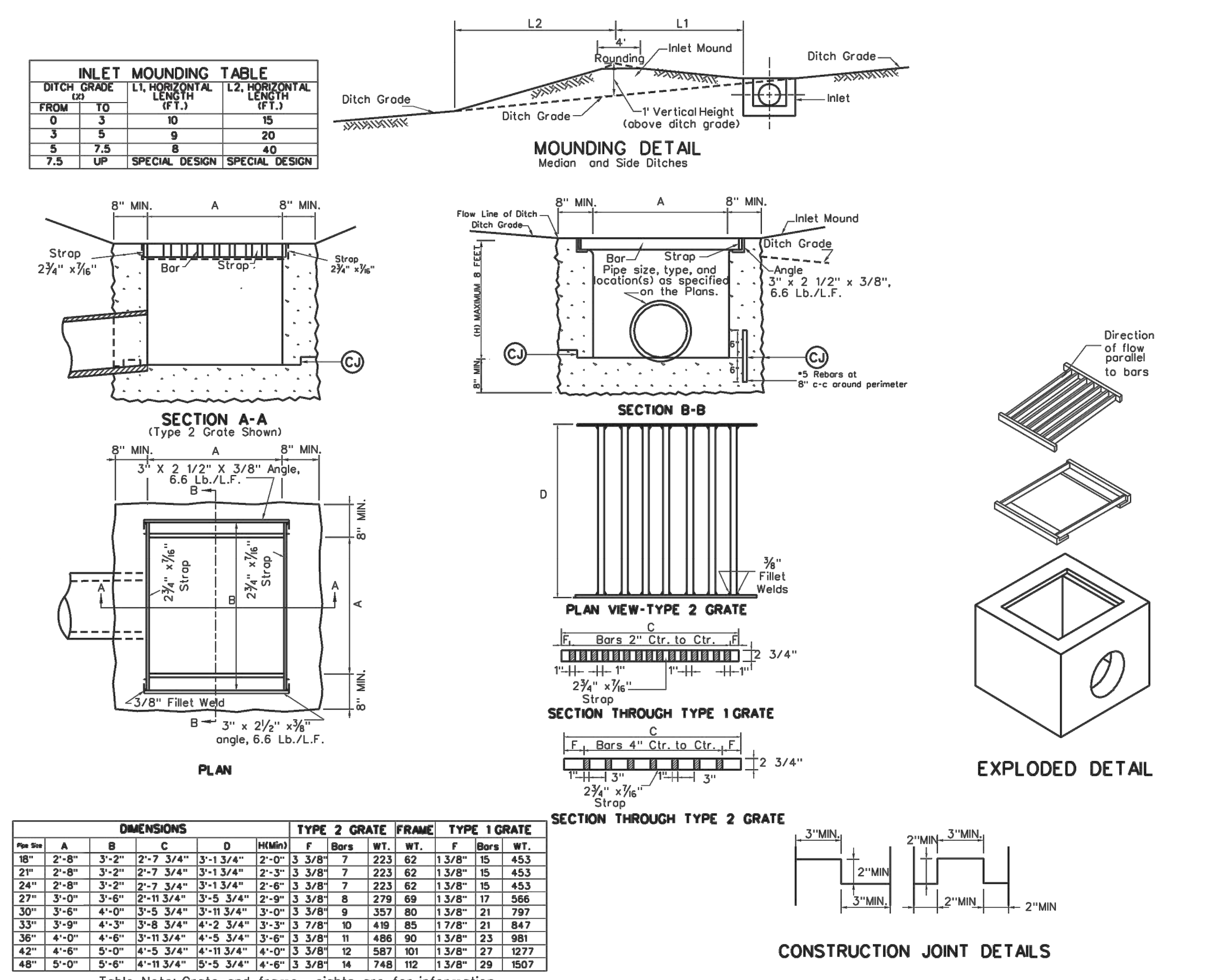
C308

P:\Projects\22063\001001\112742 Prelim Subdivision - Land Development Plan\C308 Storm Drain Drainage Area Map.dwg, 2/13/2024 8:19:26 PM, Andrew H. Fraser,

1 2 3 4 5 6

TYPE G INLET

INLET MOUNDING TABLE			
DITCH GRADE (%) FROM	TO	L1, HORIZONTAL LENGTH (FT.)	L2, HORIZONTAL LENGTH (FT.)
0	3	10	15
3	5	9	20
5	7.5	8	40
7.5	UP	SPECIAL DESIGN	SPECIAL DESIGN



Pipe Size	A	B	C	D	H(Min)	TYPE 2 GRATE F	Bars	WT.	FRAME WT.	TYPE 1 GRATE F	Bars	WT.
18"	2'-8"	3'-2"	2'-7 3/4"	3'-1 3/4"	2'-0"	3 3/8"	7	223	62	1 3/8"	15	453
21"	2'-8"	3'-2"	2'-7 3/4"	3'-1 3/4"	2'-3"	3 3/8"	7	223	62	1 3/8"	15	453
24"	2'-8"	3'-2"	2'-7 3/4"	3'-1 3/4"	2'-6"	3 3/8"	7	223	62	1 3/8"	15	453
27"	3'-0"	3'-6"	2'-11 3/4"	3'-5 3/4"	2'-9"	3 3/8"	8	279	69	1 3/8"	17	566
30"	3'-6"	4'-0"	3'-5 3/4"	3'-11 3/4"	3'-0"	3 3/8"	9	357	80	1 3/8"	21	797
33"	3'-9"	4'-3"	3'-8 3/4"	4'-2 3/4"	3'-3"	3 7/8"	10	419	85	1 7/8"	21	847
36"	4'-0"	4'-6"	3'-11 3/4"	4'-5 3/4"	3'-6"	3 3/8"	11	486	90	1 3/8"	23	981
42"	4'-6"	5'-0"	4'-5 3/4"	4'-11 3/4"	4'-0"	3 3/8"	12	587	101	1 3/8"	27	1277
48"	5'-0"	5'-6"	4'-11 3/4"	5'-5 3/4"	4'-6"	3 3/8"	14	748	112	1 3/8"	29	1507

Table Note: Grate and frame weights are for information only and will increase if larger straps and bars are used.
The following substitutions in dimensions are acceptable for fabricating the grate and frame:
Strap Thickness: 1/2" Strap Depth: 3" Bar Depth: 3"

NOTES

The final installed top surface of inlet and grate shall be flush with adjacent finished surfaces such as pavement, gutters, curbs, and sidewalks. Top of grate elevation, if shown on the plans, is for information only.

Construction may be cast-in place, precast in one or multiple sections, or any combination of cast-in-place and precast.

Type 2 Grate shall be used at all locations unless otherwise specified on the Plans. Type 1 Urban Grates shall be used only at specially designated locations as shown on the plans.

The Contractor, at his option, may omit use of the frame by forming a ledge in the concrete.

Special care shall be excised in forming the 2" wide concrete ledge to provide a smooth, even surface for supporting the grates if the shallow frame is not used. no projections shall exist on the bearing surfaces of the ledge or the grates, and the grates shall seat on the ledge without rocking.

The Mounding Detail as shown is not required when an inlet is placed in a sag.

Optional construction joints labeled "CJ" may be roughened concrete, keyed or doweled as per the typical details shown herein or as approved by the Engineer. Non shrink grout meeting the requirements of subsection 715.5 of the specifications may be used to a depth of 1/2" for leveling between precast sections. Thicker depths will be allowed as per the manufacturer's recommendations.

This inlet is to be installed in roadside or median ditches only. It is not to be placed adjacent to pavement or in the gutter pan of combination curb and gutter.

The minimum distance from the top of any pipe opening to any construction joint above the opening shall be four (4) inches.

The number and location of pipe openings shall be as shown in the plans. The contractor at no additional cost, shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.

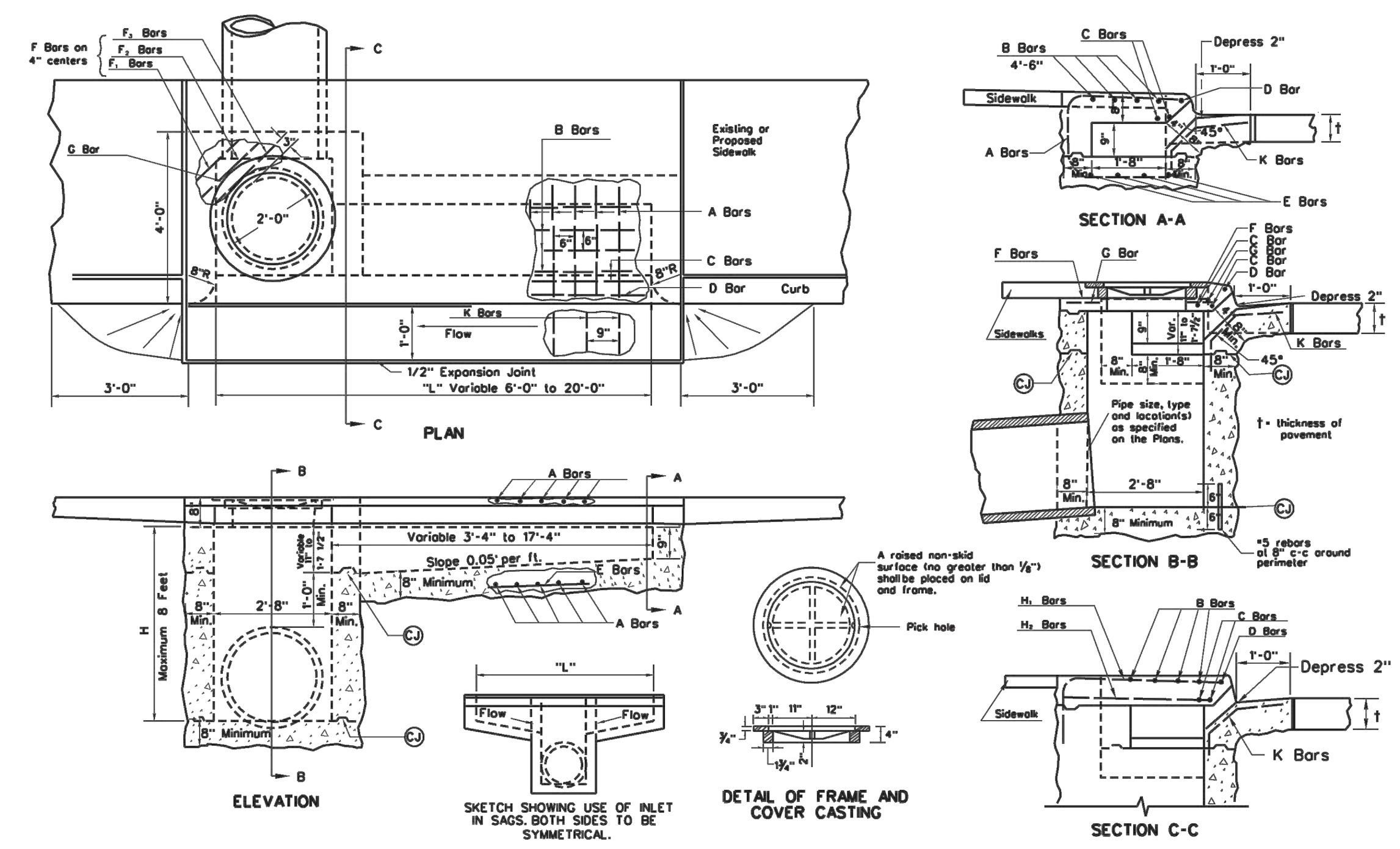
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

TYPE G INLET

STANDARD SHEET DR6-G

TYPE E INLET



CONCRETE AND REINFORCING STEEL QUANTITIES

"L" Feet	Concrete C.Y.*	Reinforcing Steel lbs.	A Bars (Bent) No.	Size	Length	B Bars (Straight) No.	Size	Length	C Bars (Straight) No.	Size	Length	D Bars (Straight) No.	Size	Length	E Bars (Straight) No.	Size	Length
6	2.59	189	5	#5	7'-1" to 7'-3"	4	#5	3'-9"	2	#5	7'-1"	1	#5	7'-1"	4	#5	3'-6"
8	3.07	250	9	#5	7'-1" to 7'-4"	4	#5	5'-9"	2	#5	9'-1"	1	#5	9'-1"	4	#5	5'-6"
10	3.57	308	13	#5	7'-1" to 7'-5"	4	#5	7'-9"	2	#5	11'-1"	1	#5	11'-1"	4	#5	7'-6"
12	4.09	369	17	#5	7'-1" to 7'-6"	4	#5	9'-9"	2	#5	13'-1"	1	#5	13'-1"	4	#5	9'-6"
14	4.62	444	21	#5	7'-1" to 7'-7"	4	#5	11'-9"	2	#6	15'-1"	1	#5	15'-1"	4	#5	11'-6"
16	5.17	506	25	#5	7'-1" to 7'-9"	4	#5	13'-9"	2	#6	17'-1"	1	#5	17'-1"	4	#5	13'-6"
18	5.74	570	29	#5	7'-1" to 7'-10"	4	#5	15'-9"	2	#6	19'-1"	1	#5	19'-1"	4	#5	15'-6"
20	6.19	636	33	#5	7'-1" to 8'-0"	4	#5	17'-9"	2	#6	21'-1"	1	#5	21'-1"	4	#5	17'-6"

"L" Feet	F1 Bars (Straight) No.	Size	Length	F2 Bars (Straight) No.	Size	Length	F3 Bars (Straight) No.	Size	Length	G Bar (Bent) No.	Size	Length	H1 Bars (Straight) No.	Size	Length	H2 Bars (Straight) No.	Size	Length	K Bars (Bent) No.	Size	Length
6	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	10	#5	2'-3"
8	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	13	#5	2'-3"
10	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	15	#5	2'-3"
12	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	18	#5	2'-3"
14	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	21	#5	2'-3"
16	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	23	#5	2'-3"
18	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	26	#5	2'-3"
20	4	#5	2'-0"	4	#5	2'-6"	4	#5	3'-0"	1	#5	8'-0"	2	#7	6'-5"	2	#6	3'-4"	29	#5	2'-3"

* The quantities shown above are for an H of five feet. If deeper inlets are required the quantities must be adjusted accordingly.
The above table to be used for estimating purposes only.

NOTES

Type E Inlet detailed herein is for use on a grade. If it is to be used in a sag (see sketch herein) it should be built symmetrically about centerline of pipe and length of opening specified.

The covering for reinforcing steel shall be two inches, measured from the surface of the concrete to the face of the bar, unless otherwise shown. All reinforcing steel shall be epoxy-coated and meet the requirements of Section 602 of the Specifications.

Optional construction joints labeled "CJ" may be keyed or doweled as per the typical details shown herein or as approved by the Engineer.

If Type E Inlet is to be constructed along with a sidewalk, the sidewalk shall be constructed monolithic with the top slab on the inlet. The sidewalk shall be reinforced with Type B Fabric placed 2" from bottom of sidewalk and extended into the top slab of the inlet a minimum distance of 8". Cost of Type B Fabric shall be included in the unit price bid for Concrete Sidewalk.

This inlet shall not be placed in a pedestrian cross walk.

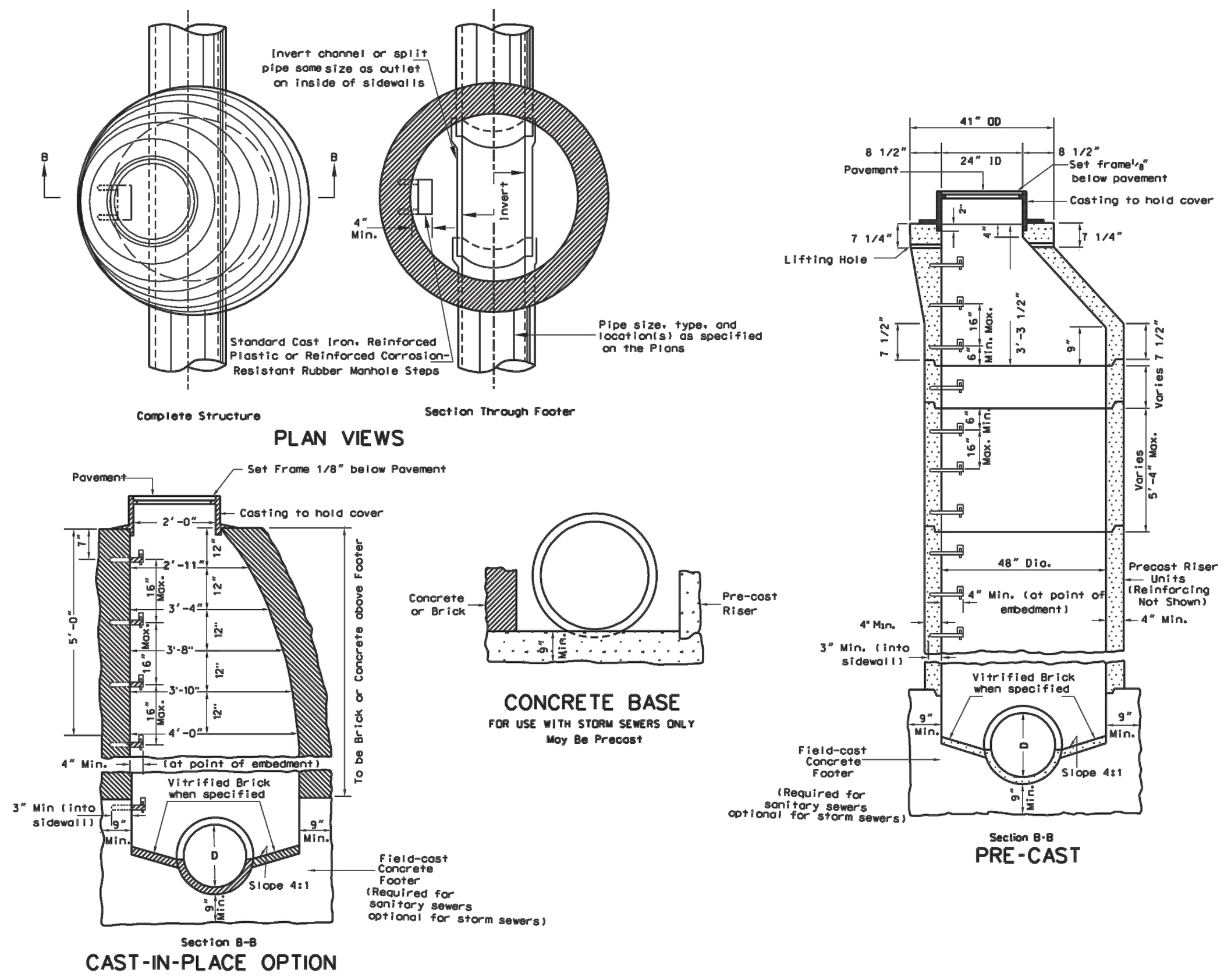
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

TYPE E INLET

STANDARD SHEET DR6-E

TYPE A MANHOLE



NOTES

Type A Manholes, when specified on the Plans, may be constructed in either method (cast-in-place or pre-cast option) as shown herein.

Steps, frames, and covers shall be as shown on Standard Sheet DR7-X.
"Keyed" or "doweled" type construction joints, acceptable to the Engineer, may be used in the construction of concrete manholes.

If the cast-in-place manhole is over twelve feet (12') in depth, the sidewalls below that depth will be double thickness.

Pipe at elevations other than shown may be joined to the manhole by cutting a hole the size of the connecting pipe in the manhole. Inserting the pipe the thickness of the manhole shell and closing all openings around the connecting pipe with joint mortar.

Drawing shows pipe entering and leaving manhole in a straight line. However, the pipes may enter or leave at an angle or place as called for or shown on the Plans.

Minimum height of bench wall above flowline of pipe is 25% of the diameter of the pipes.

The use of brick for manhole construction will not be allowed when a manhole is located in the roadway.

The following additional notes are applicable for pre-cast manholes:
Manhole steps shall be placed into plastic concrete wall during manufacture or mortared into holes after the concrete has set.

Sidewall sections may be used in any combination to produce a manhole of desired depth, except the tapered top section shall be retained as shown.

The tapered top section shall be manufactured and meet the same requirements as the manhole's sidewalls, but shall conform to the dimensions detailed herein.

Lifting holes in the tapered top section and the circumferential notches in the manhole cover are for handling purposes only.

The pre-cast sidewall units shall be set in joint mortar or sealed with O-ring gaskets.

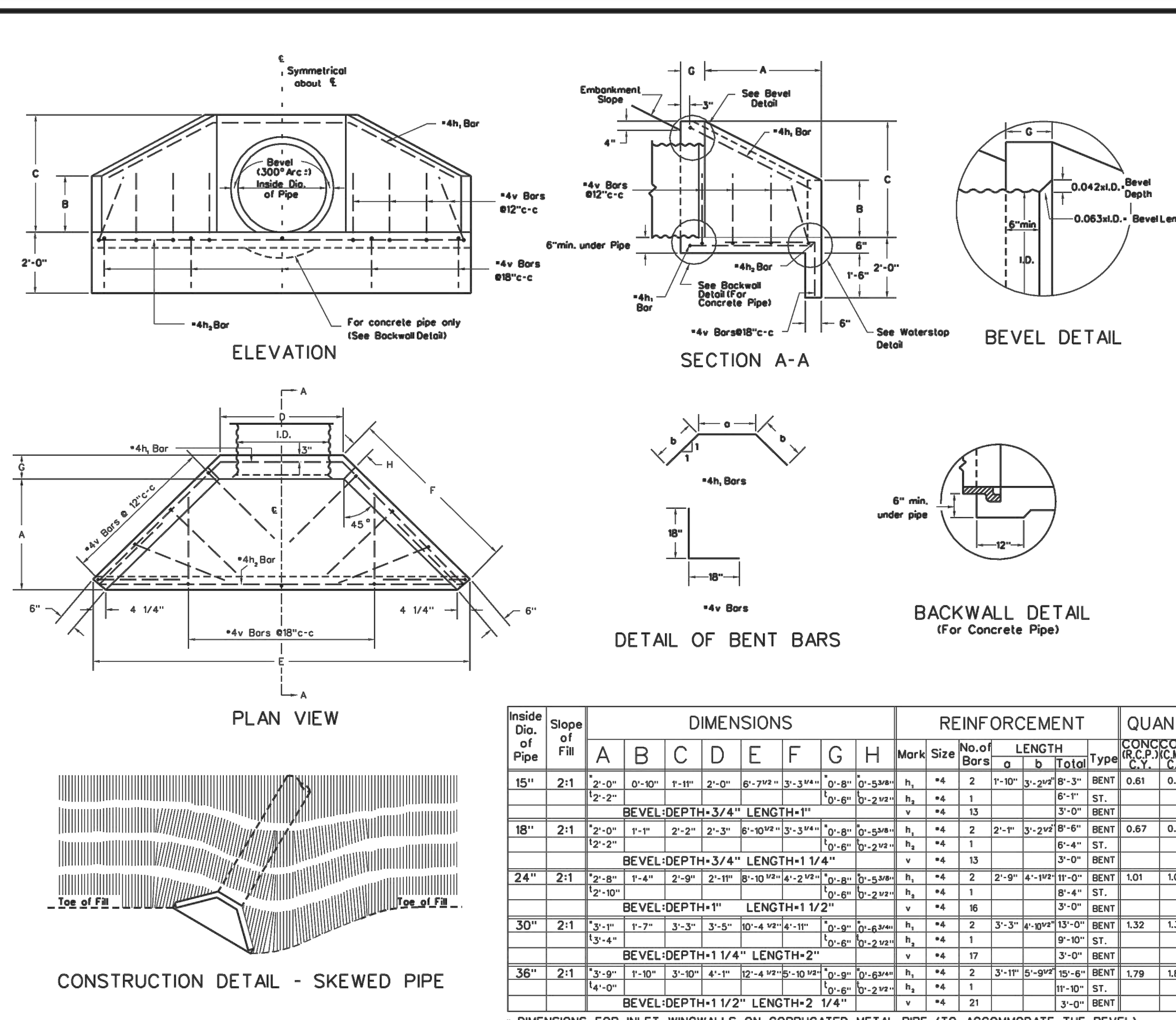
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

TYPE A MANHOLE

STANDARD SHEET DR7-A

PIPE CULVERT WINGWALLS



NOTES

All concrete shall be Class B Concrete.
Reinforcing steel shall be new billet steel and shall conform to the requirements of 709.1 of the Specifications.
The covering for Reinforcing Steel shall be 2" measured from the surface of the concrete to the face of the bar, unless otherwise noted on the Plans. Reinforcement in members where concrete is deposited on the ground shall have 3" of concrete from the face of the bar to the ground contact surface.
All exposed edges shall have a 3/4" x 45° chamfer. Chamfer on vertical edges shall be continued a minimum of one foot below finished ground line.
When wingwalls are placed on the inlet end of corrugated metal or structural plate pipe, a bevel shall be used at the inlet opening. The end of the pipe shall be set in from the face of the wall as shown on the "Bevel Detail", and the bevel constructed from the end of the pipe to the face of the wall.
When wingwalls are placed on the inlet end of concrete pipe, the "bell" or "groove" of the pipe shall be placed in the wall, and the inside of the "bell" or "groove" shall be filled with concrete up to the flow line.
Bevels are not required on outlet wingwalls or on inlet wingwalls for concrete pipe.
Keyed or doweled type construction joints, acceptable to the Engineer, may be used during construction.
If embankment slope above wingwalls is flatter than 2:1, provide wings for 2:1 slope and warp embankment to 2:1 slope at wingwall.
The pay quantity for wingwalls, constructed in accordance with the details herein, will be the cubic yards of Class B Concrete specified on this sheet. Cost of all reinforcing steel shall be included in the unit price bid for Class B Concrete.
Waterstop meeting the requirements of 708.10 shall be placed as shown when concrete gutter is to abut the wingwall.

Inside Dia. of Pipe	Slope of Fill	A	B	C	D	E	F	G	H	Mark	Size	No. of Bars	LENGTH a	b	Total	Type	CONC (R.C.P.) C.Y.	CONC (C.M.P.) C.Y.	STEEL LBS.
15"	2:1	*2'-0"	0'-10"	1'-11"	2'-0"	6'-7 1/2"	3'-3 1/4"	*0'-8"	0'-5 3/8"	h1	#4	2	1'-10"	3'-2 1/2"	8'-3"	BENT	0.61	0.62	41.2
		†2'-2"						†0'-6"	0'-2 1/2"	h2	#4	1			6'-1"	ST.			
		BEVEL: DEPTH=3/4" LENGTH=1"								v	#4	13			3'-0"	BENT			
18"	2:1	*2'-0"	1'-1"	2'-2"	2'-3"	6'-10 1/2"	3'-3 1/4"	*0'-8"	0'-5 3/8"	h1	#4	2	2'-1"	3'-2 1/2"	8'-6"	BENT	0.67	0.68	41.8
		†2'-2"						†0'-6"	0'-2 1/2"	h2	#4	1			6'-4"	ST.			
		BEVEL: DEPTH=3/4" LENGTH=1 1/4"								v	#4	13			3'-0"	BENT			
24"	2:1	*2'-8"	1'-4"	2'-9"	2'-11"	8'-10 1/2"	4'-2 1/2"	*0'-8"	0'-5 3/8"	h1	#4	2	2'-9"	4'-1 1/2"	11'-0"	BENT	1.01	1.02	52.4
		†2'-10"						†0'-6"	0'-2 1/2"	h2	#4	1			8'-4"	ST.			
		BEVEL: DEPTH=1" LENGTH=1 1/2"								v	#4	16			3'-0"	BENT			
30"	2:1	*3'-1"	1'-7"	3'-3"	3'-5"	10'-4 1/2"	4'-11"	*0'-9"	0'-6 3/4"	h1	#4	2	3'-3"	4'-10 1/2"	13'-0"	BENT	1.32	1.37	58.1
		†3'-4"						†0'-6"	0'-2 1/2"	h2	#4	1			9'-10"	ST.			
		BEVEL: DEPTH=1 1/4" LENGTH=2"								v	#4	17			3'-0"	BENT			
36"	2:1	*3'-9"	1'-10"	3'-10"	4'-1"	12'-4 1/2"	5'-10 1/2"	*0'-9"	0'-6 3/4"	h1	#4	2	3'-11"	5'-9 1/2"	15'-6"	BENT	1.79	1.86	70.8
		†4'-0"						†0'-6"	0'-2 1/2"	h2	#4	1			11'-10"	ST.			
		BEVEL: DEPTH=1 1/2" LENGTH=2 1/4"								v	#4	21			3'-0"	BENT			

* DIMENSIONS FOR INLET WINGWALLS ON CORRUGATED METAL PIPE (TO ACCOMMODATE THE BEVEL).
† DIMENSIONS FOR INLET WINGWALLS ON CONCRETE PIPE AND ALL OUTLET WINGWALLS.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

PIPE CULVERT WINGWALLS
(SHEET 1 OF 4)

STANDARD SHEET DR2

D C B A

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PRELIM PLAN - STORM SEWER
DETAILS HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

STORM SEWER DETAILS

SHEET No.

C309

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WEST VIRGINIA STATE GRID NORTH
UTM83-18F

LOT 5
CTC M9A P5
SULLIVAN
D.B. 1230 PG. 202

LOT 4
CTC M9A P4
OWEN
D.B. 1016 PG. 25

LOT 3
CTC M9A P3
OWEN
D.B. 1205 PG. 38

VARYING WIDTH SIGHT DISTANCE ESMT.

STERNWAY DRIVE (40' ROW)

LOT 24
CTC M9A P24
DOUGHERTY
D.B. 1181 PG. 746

LOT 25
CTC M9A P25
POTTER
D.B. 996 PG. 683

LOT 23
CTC M9A P23
POTTER
D.B. 1206 PG. 494

LOT 22
CTC M9A P22
DELANEY
D.B. 1952 PG. 486

HILL SIDE

LOT 21
CTC M9A P21
UBERT
D.B. 1134 PG. 446

LOT 20
C M9A P20
OWEN
260 PG. 9

EX. CONCRETE CHANNEL

PUBLIC ROAD 'D'

PUBLIC ROAD 'A'

PUBLIC ROAD 'C'

PUBLIC ROAD 'B'

HILLSIDE DRIVE

6' CONC. S/W

CG-6 (TYP)

CG-12 (TYP)

15' W/M ESMT.

15' SD ESMT.

VARYING WIDTH SD ESMT.

E: 2437651
N: 286870

E: 2438021
N: 286897

E: 2437396
N: 286858

21'00

27'00

60'00

SEE SHEET C401

SEE SHEET C401

GRAPHIC SCALE
1" = 30'

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PRELIM PLAN - SITE PLAN HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SITE PLAN

SHEET No.

C400

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WEST VIRGINIA STATE GRID NORTH
UTM83-18F

SEE SHEET C400

EX. CONCRETE CHANNEL

15' SD ESMT.

E:2438000
N:287200

15' SAN. SEWER ESMT.

PUMP STATION

30' SAN. SEWER ESMT.

6' CONC. S/W

CG-6 (TYP)

PUBLIC ROAD 'A'

VARYING WIDTH SWM ESMT.

E:2438300
N:287600

E:2438197
N:287097

15' SD ESMT.

SEE SHEET C400

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38

30 15 0 30 60
GRAPHIC SCALE
1" = 30'

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PRELIM PLAN - SITE PLAN HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SITE PLAN

SHEET No.
C401

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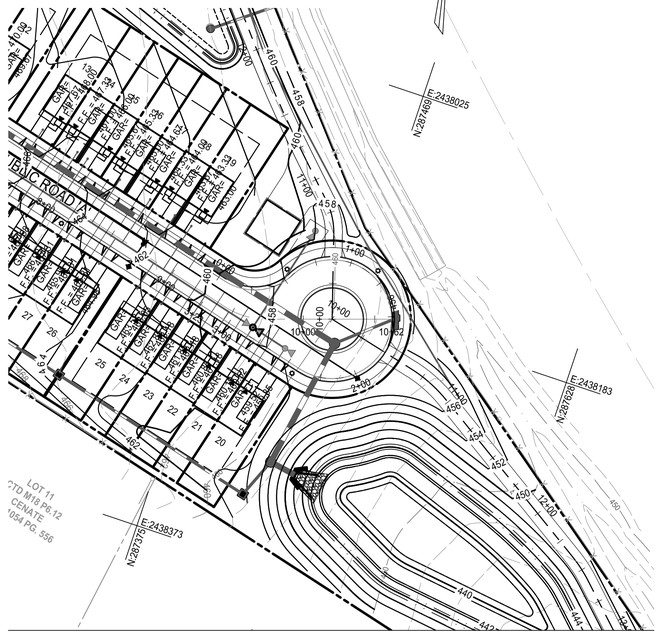
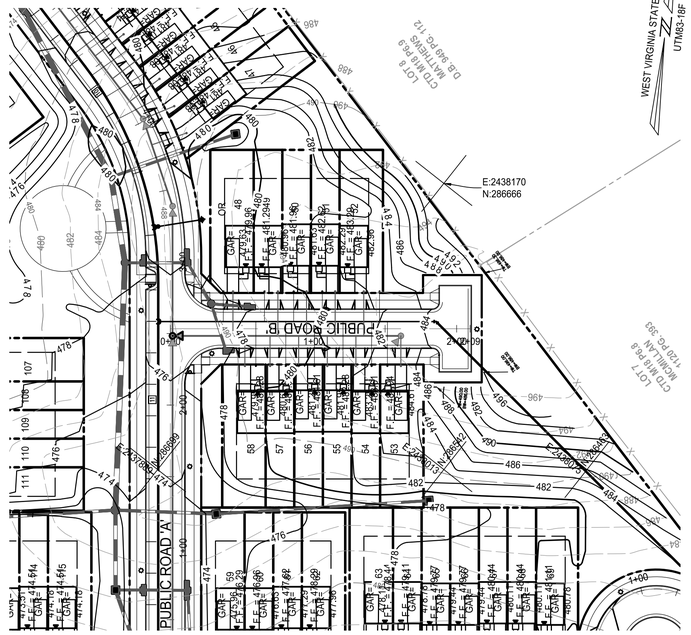
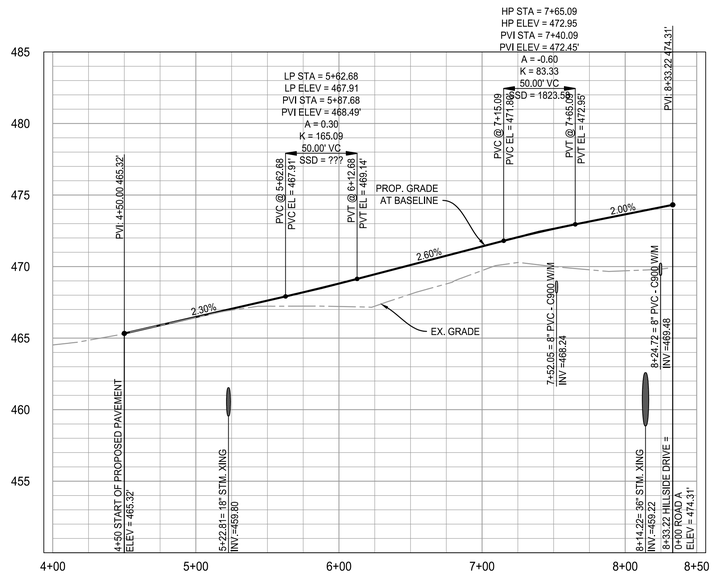
HILLSIDE DRIVE EXTENSION PLAN VIEW
SCALE: 1" = 50'



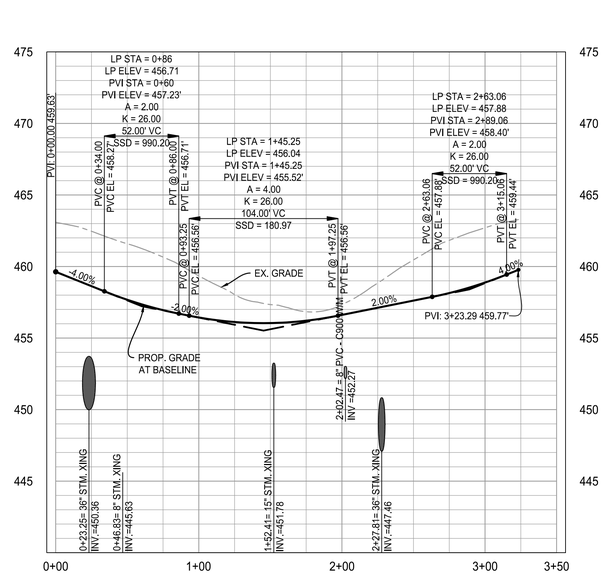
ROAD A COURT UNWRAP PLAN VIEW
SCALE: 1" = 50'



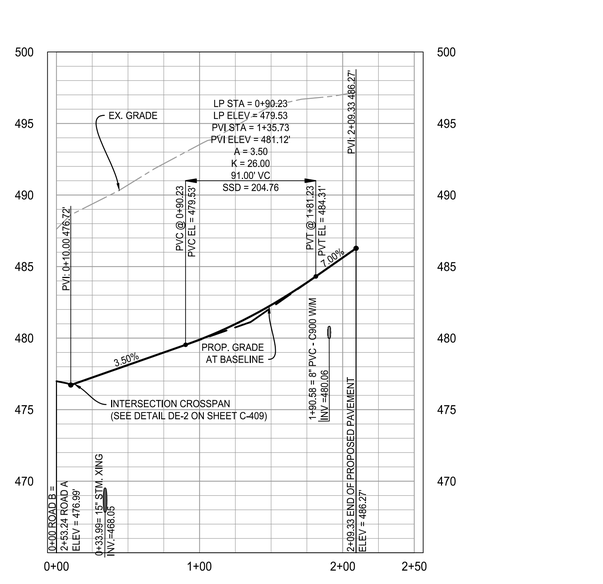
ROAD B PLAN VIEW
SCALE: 1" = 50'



HILLSIDE DRIVE EXTENSION PROFILE



ROAD A COURT UNWRAP PROFILE



ROAD B PROFILE

5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

50 25 0 50 100
GRAPHIC SCALE
HORIZONTAL: 1" = 50'

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PRELIM PLAN - ROAD PROFILES
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
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SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

ROAD PROFILES

SHEET No.
C402

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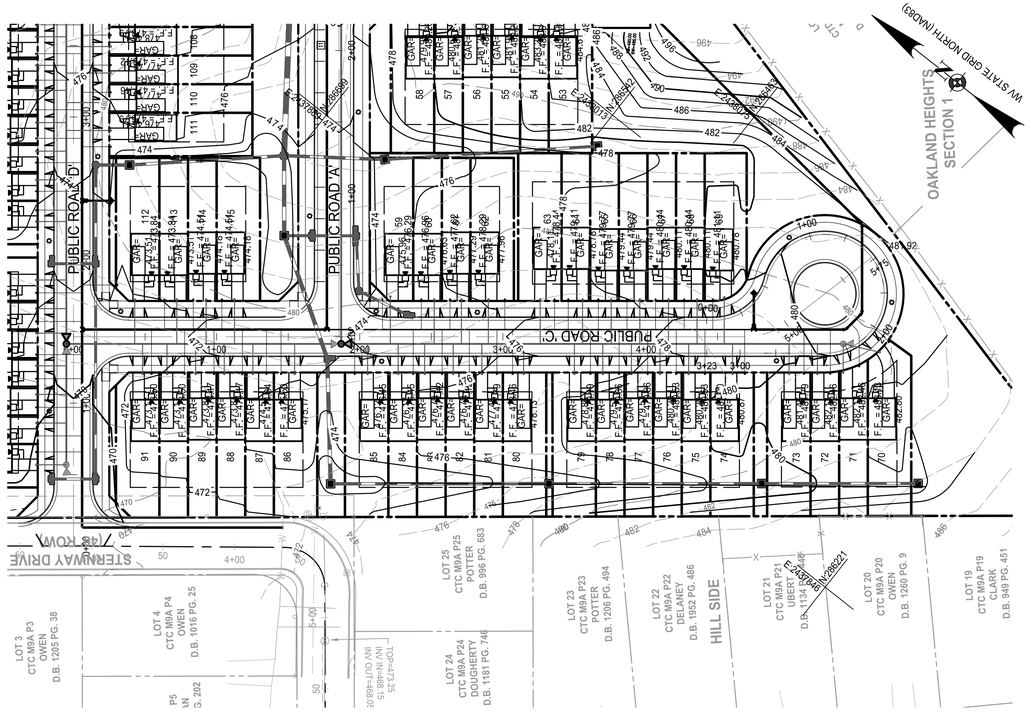
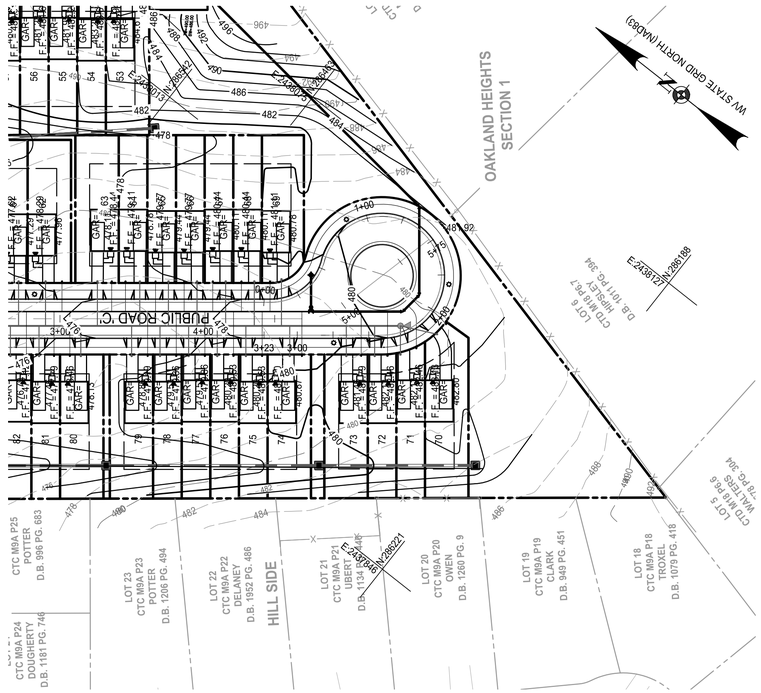
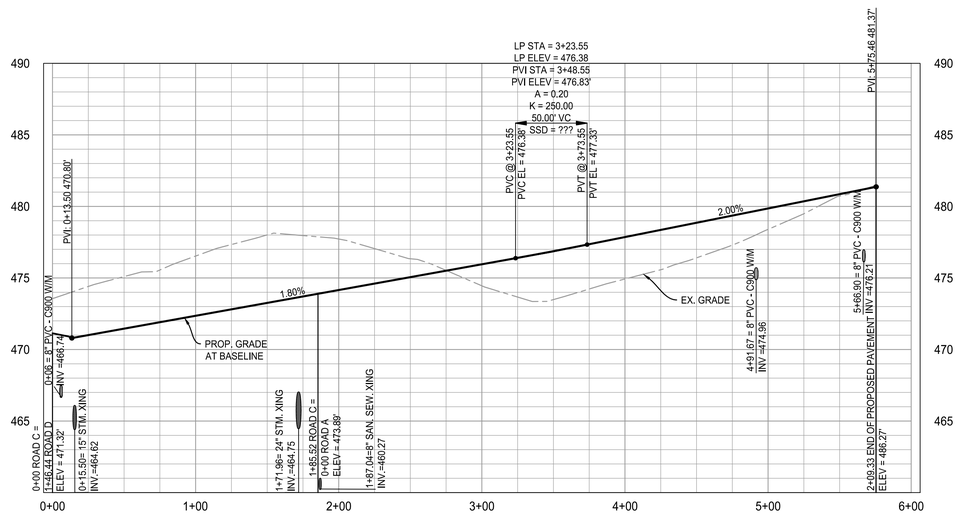


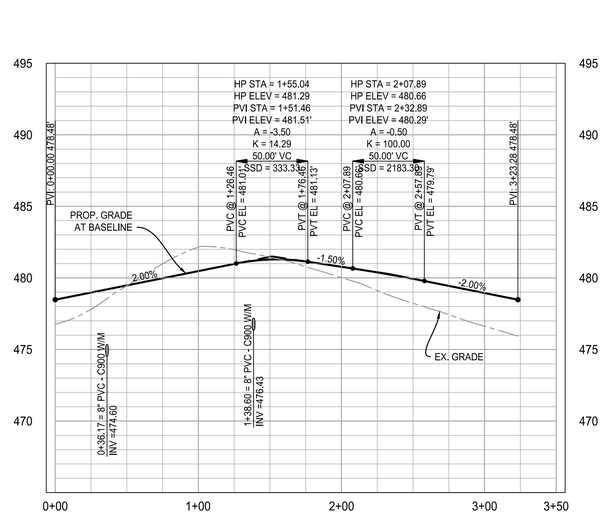
ROAD C PLAN VIEW
SCALE: 1" = 50'



ROAD C COURT UNWRAP PLAN VIEW
SCALE: 1" = 50'



ROAD C PROFILE



ROAD C COURT UNWRAP PROFILE

GRAPHIC SCALE
VERTICAL: 1" = 5'

GRAPHIC SCALE
HORIZONTAL: 1" = 50'

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PRELIM PLAN - ROAD PROFILES
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

ROAD PROFILES

SHEET No.

C403

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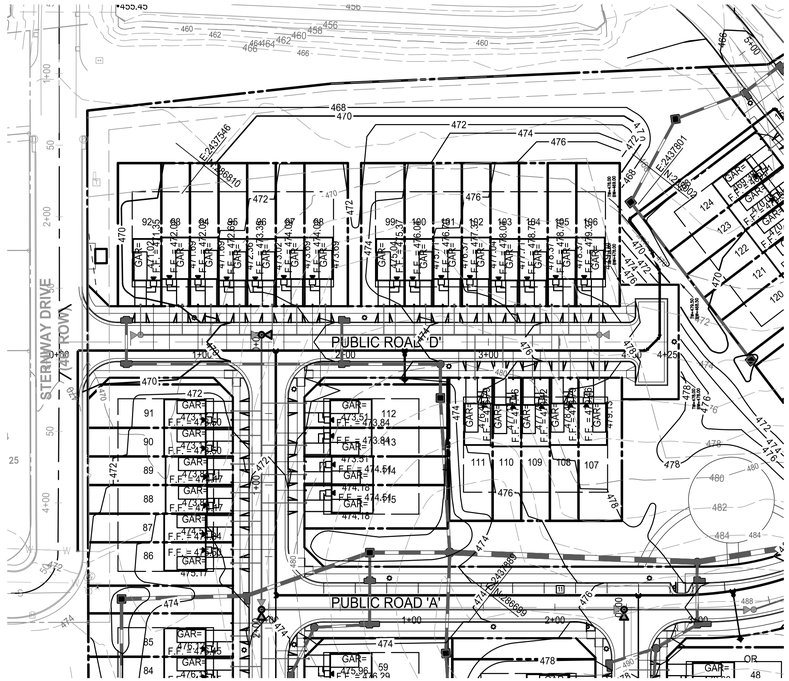
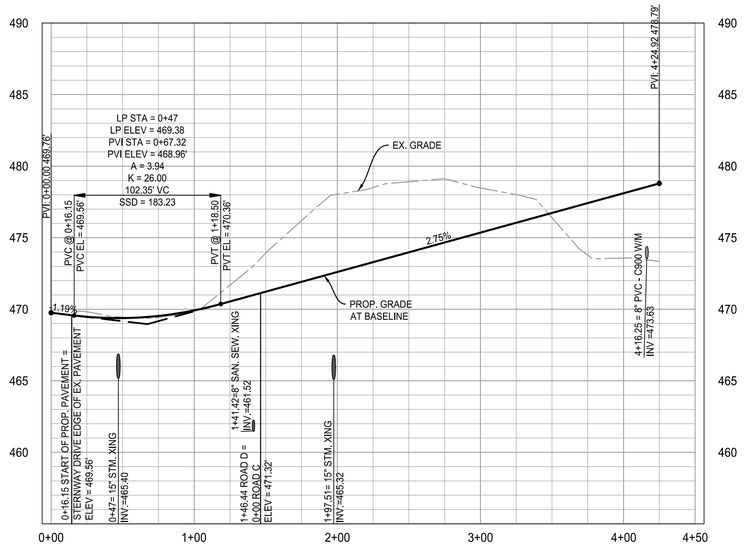


ROAD D PLAN VIEW
SCALE: 1" = 50'



ROAD D PROFILE

GRAPHIC SCALE
VERTICAL: 1" = 5'

GRAPHIC SCALE
HORIZONTAL: 1" = 50'

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PRELIM PLAN - ROAD PROFILES
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

ROAD PROFILES

SHEET No.

C404

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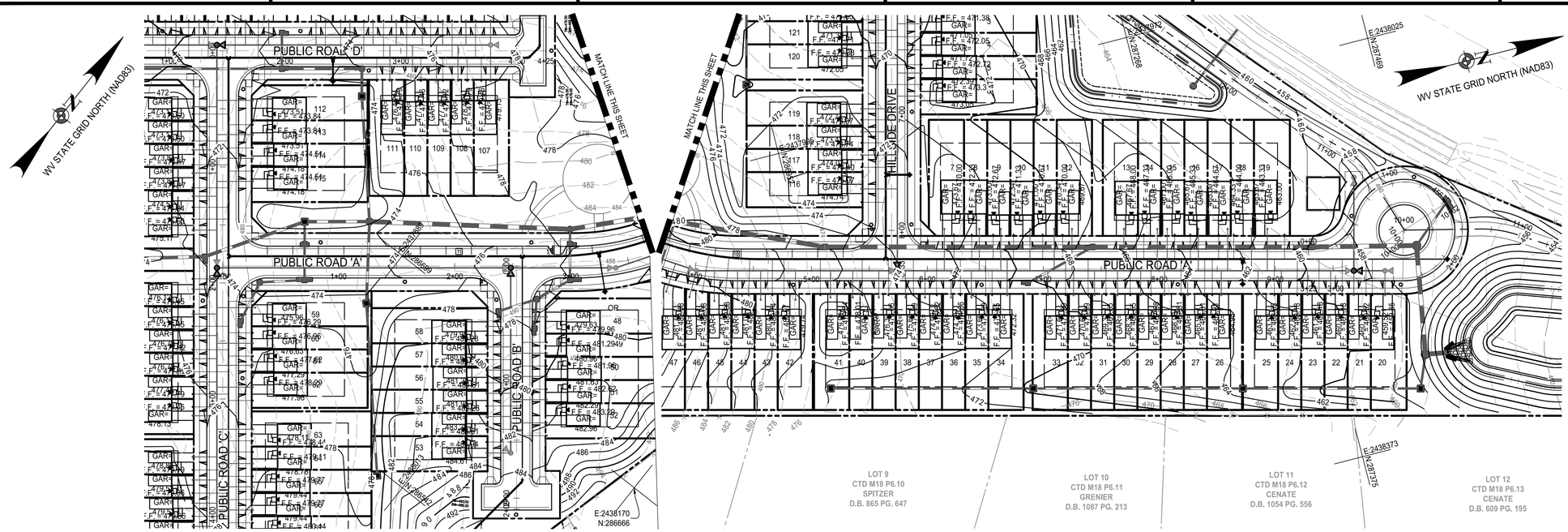
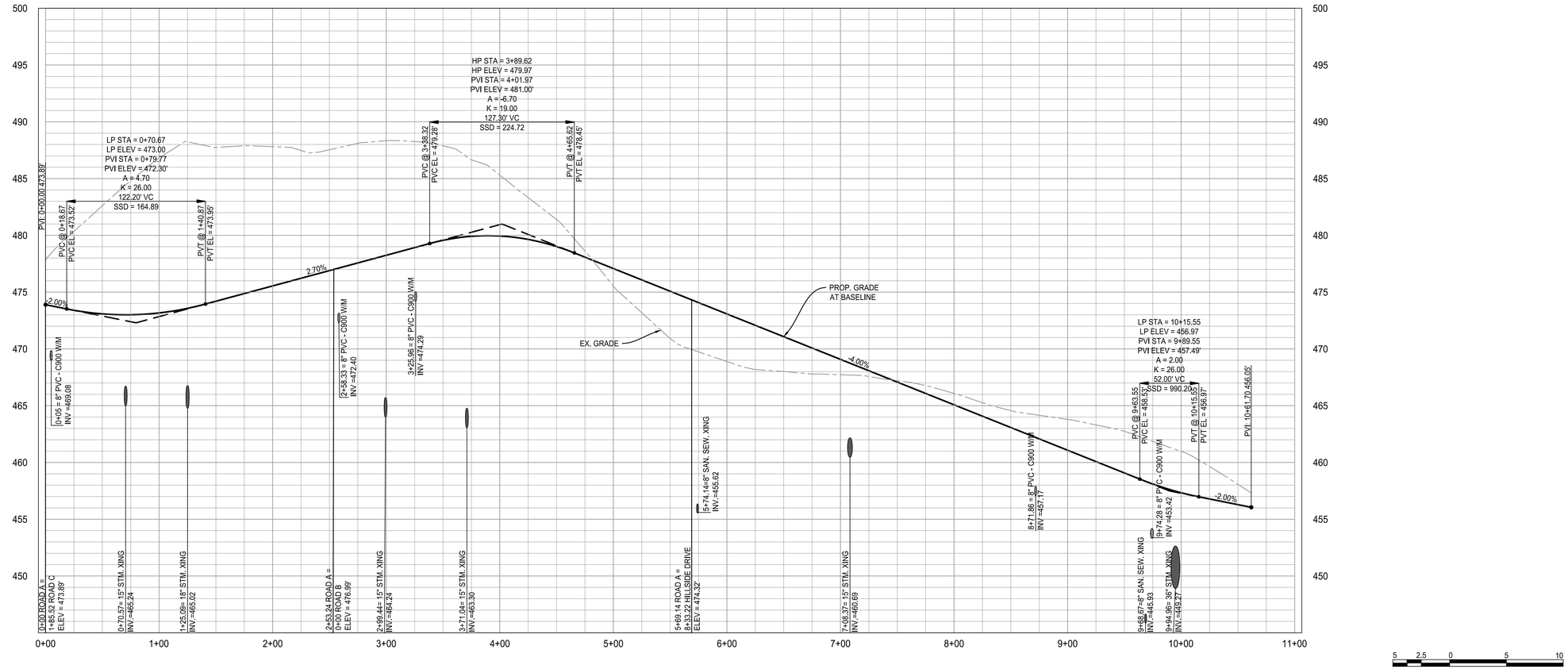


ROAD A PLAN VIEW
SCALE: 1" = 50'



ROAD A PROFILE

GRAPHIC SCALE
VERTICAL: 1" = 5'

GRAPHIC SCALE
HORIZONTAL: 1" = 50'

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PRELIM PLAN - ROAD PROFILES
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

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DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

ROAD PROFILES

SHEET No.

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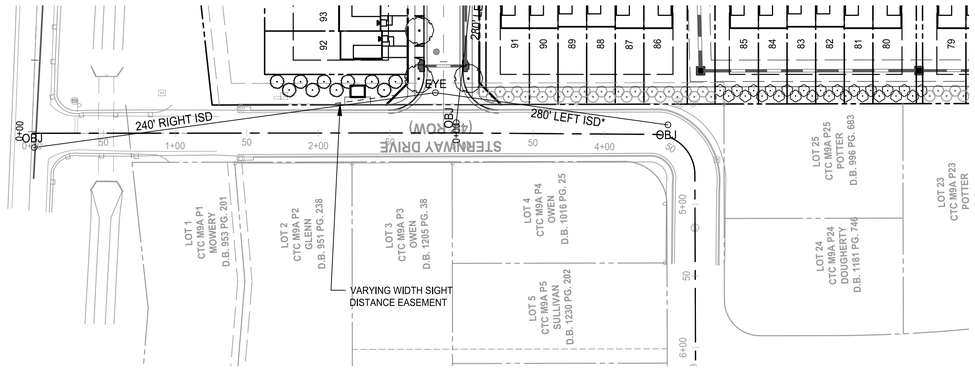
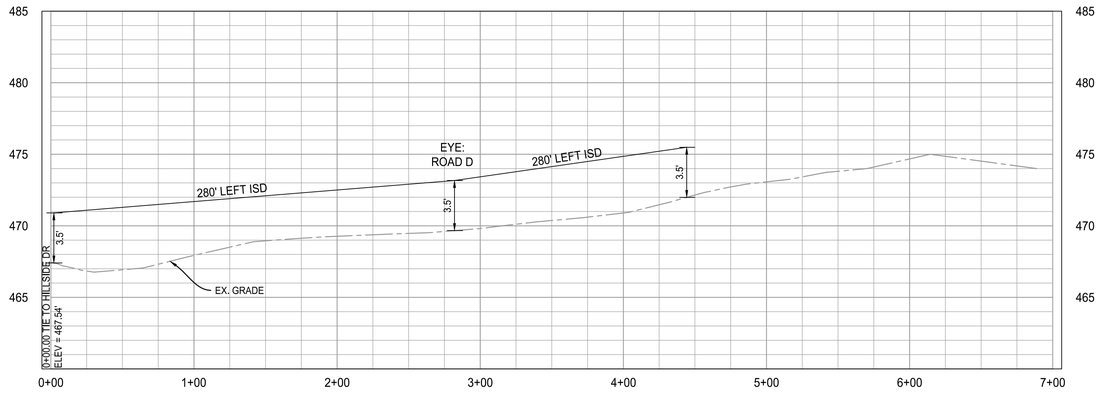


ROAD D SIGHT DISTANCES
SCALE: 1" = 50'

NOTE:
ALL STREET TREES WITHIN THE SIGHT DISTANCE SHALL BE PRUNED 7' FROM GROUND LEVEL.

*ASSUMES SIGHT DISTANCE IS REQUIRED TO THE 90° TURN OF STERNWAY DRIVE.



ROAD D SIGHT DISTANCE PROFILE
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 5'

5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

50 25 0 50 100
GRAPHIC SCALE
HORIZONTAL: 1" = 50'

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PRELIM PLAN - SIGHT DISTANCE PROFILES HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
SIGHT DISTANCE PROFILES

SHEET No.
C406

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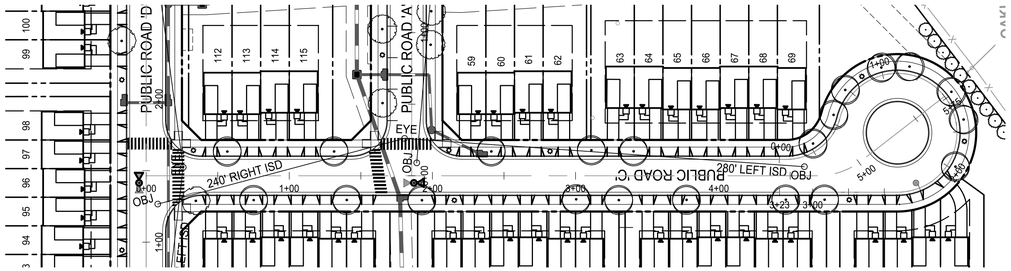
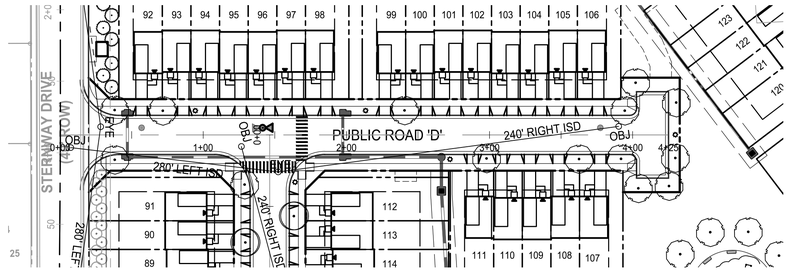
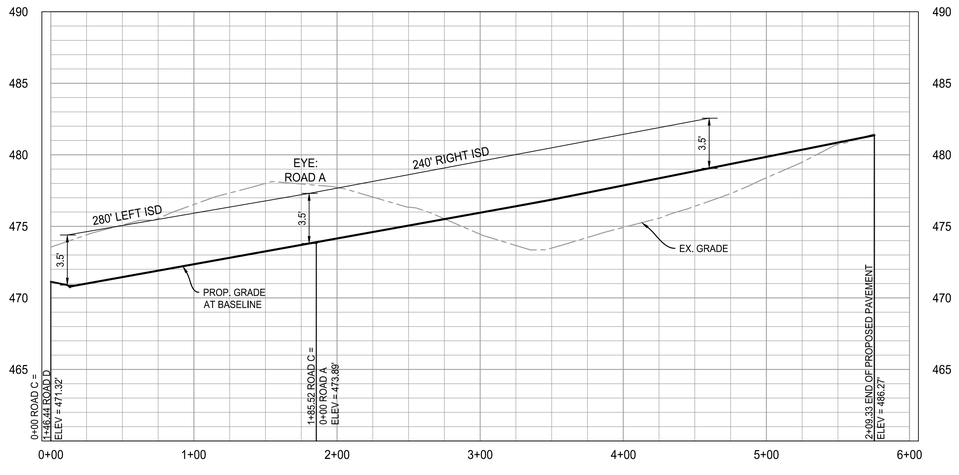


ROAD A SIGHT DISTANCES
SCALE: 1" = 50'

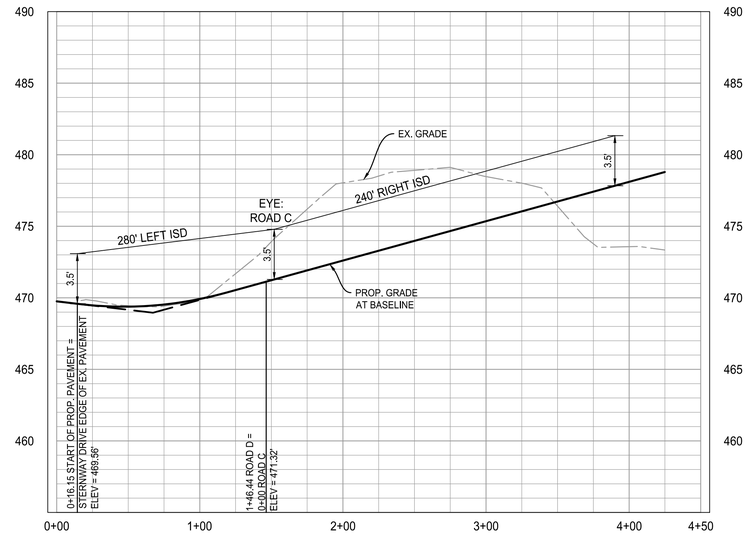


ROAD C SIGHT DISTANCES
SCALE: 1" = 50'

NOTE:
ALL STREET TREES WITHIN THE SIGHT DISTANCE SHALL BE PRUNED 7' FROM GROUND LEVEL.



ROAD A SIGHT DISTANCE PROFILE
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 5'



ROAD C SIGHT DISTANCE PROFILE
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 5'

5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

50 25 0 50 100
GRAPHIC SCALE
HORIZONTAL: 1" = 50'

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PRELIM PLAN - SIGHT DISTANCE PROFILES
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
SIGHT DISTANCE PROFILES

SHEET No.
C407

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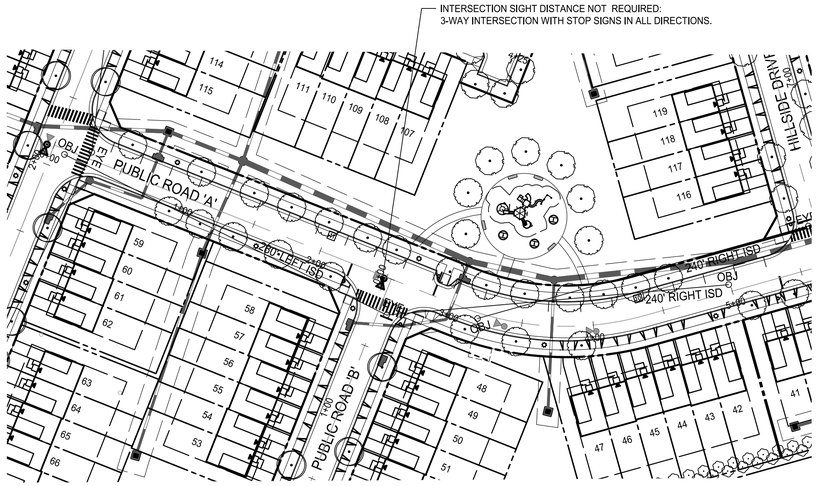
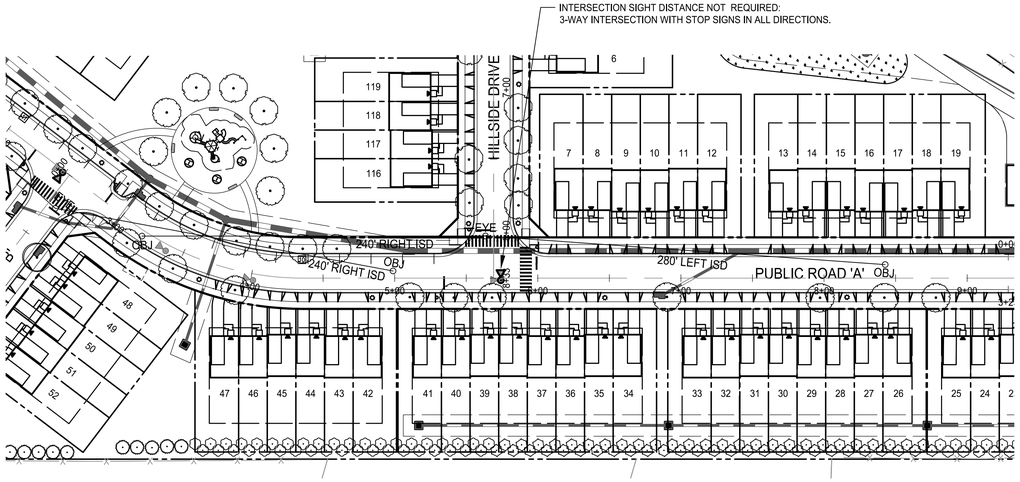
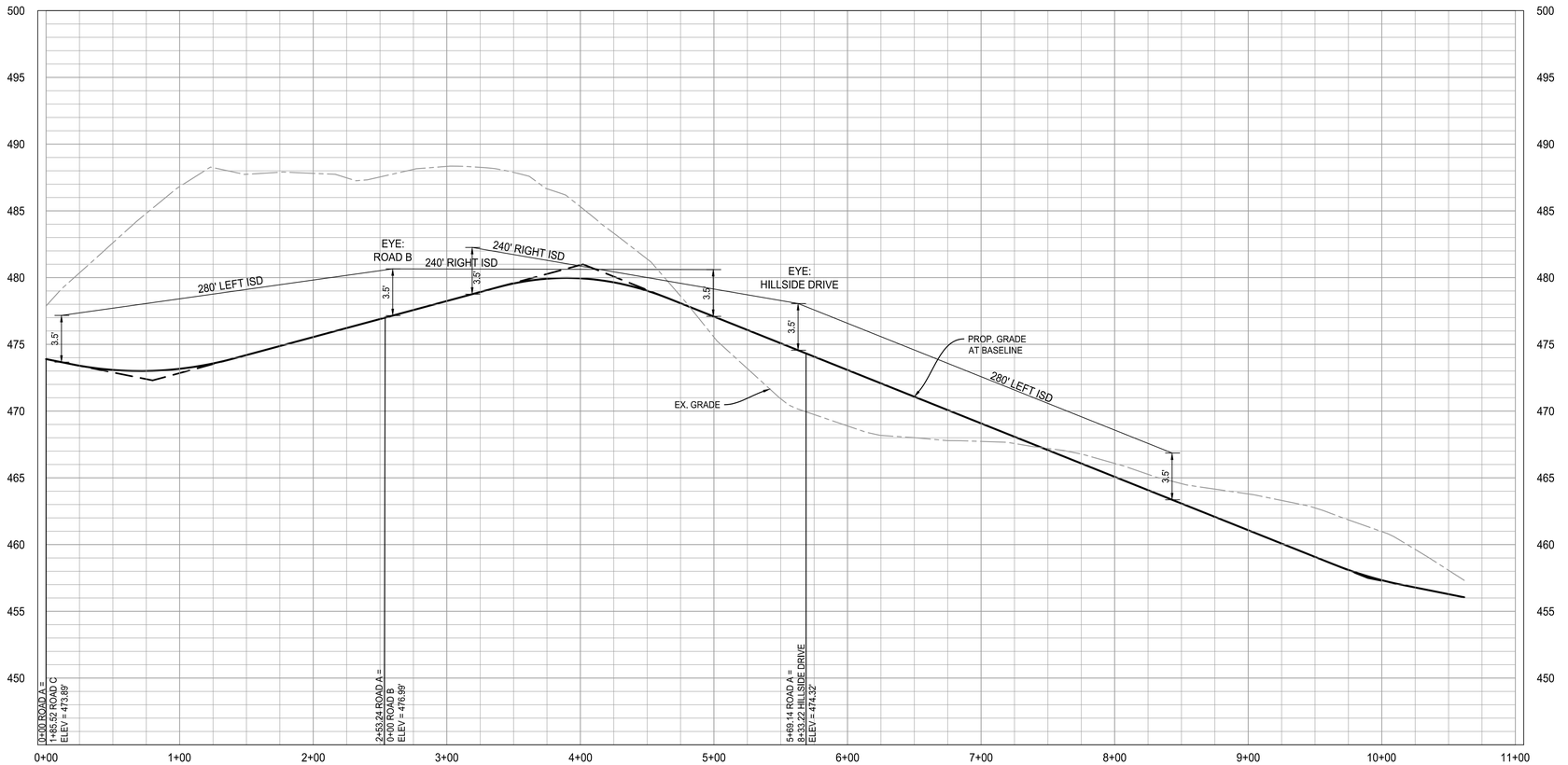


ROAD B SIGHT DISTANCES
SCALE: 1" = 50'



HILLSIDE DRIVE SIGHT DISTANCES
SCALE: 1" = 50'

NOTE:
ALL STREET TREES WITHIN THE SIGHT DISTANCE
SHALL BE PRUNED 7' FROM GROUND LEVEL.



ROAD B AND HILLSIDE DRIVE
SIGHT DISTANCE PROFILE
HORIZONTAL SCALE: 1" = 50'
VERTICAL SCALE: 1" = 5'

5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

50 25 0 50 100
GRAPHIC SCALE
HORIZONTAL: 1" = 50'

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PRELIM PLAN - SIGHT DISTANCE PROFILES HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
SIGHT DISTANCE PROFILES

SHEET No.
C408

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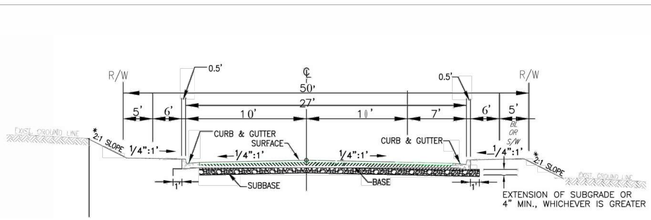
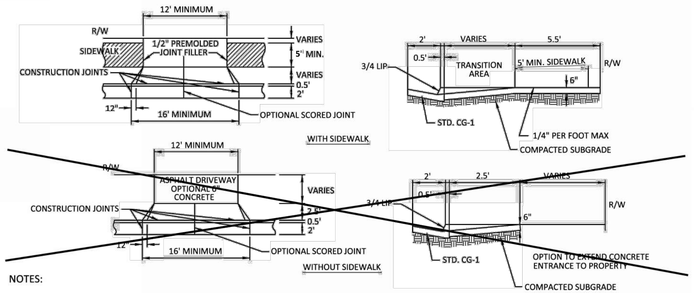


TYPICAL ROADWAY SECTION WITH CURB AND GUTTER

* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

TYPICAL SECTION - NEIGHBORHOOD STREET
(0-500 VPD)
City of Charles Town



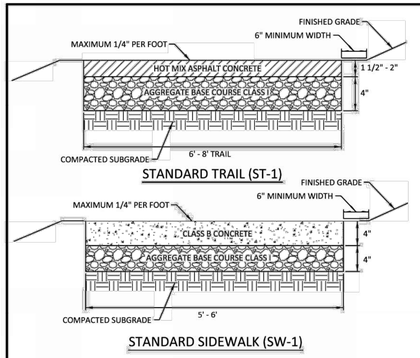
NOTES:

1. GRADING PLANS MUST PROVIDE FOR ADEQUATE VEHICULAR CLEARANCE FOR DRIVEWAY APPROACH, DEPARTURE, AND BREAKOVER TRANSITIONS.

NOT TO SCALE

DRIVEWAY ENTRACE WITH CURB AND GUTTER
City of Charles Town

DE-2



STANDARD TRAIL (ST-1)

STANDARD SIDEWALK (SW-1)

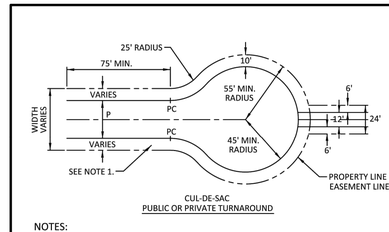
NOTES:

1. ALL PEDESTRIAN AND BIKE TRAILS LOCATED OUTSIDE OF CITY OF CHARLESTOWN RIGHT OF WAY SHALL BE A MINIMUM OF 5' IN WIDTH FOR SIDEWALKS, 6' FOR ALL PEDESTRIAN TRAILS, AND 8' FOR ALL BIKE TRAILS.
2. A PRIVATE ACCESS EASEMENT SHALL BE PROVIDED FOR ALL SIDEWALKS AND TRAILS OUTSIDE OF CITY OF CHARLES TOWN RIGHT OF WAY AND SHALL INCLUDE A MINIMUM OF 3' OF WIDTH ON BOTH SIDES OF THE TRAIL OR SIDEWALK.
3. THE MAXIMUM GRADE FOR ALL PEDESTRIAN TRAILS SHALL BE 10%.
4. THE MAXIMUM GRADE FOR ALL BIKE TRAILS SHALL BE 8%, EXCEPT UP TO 15% IS ALLOWED FOR DISTANCES OF LESS THAN 150 FEET.
5. APPROPRIATE LIGHTING AND SIGNAGE, LANDSCAPING, BUFFERING AND DRAINAGE MEASURES, ALONG WITH CONSIDERATIONS FOR SECURITY SHALL BE INCORPORATED IN THE DESIGN OF THESE FACILITIES.

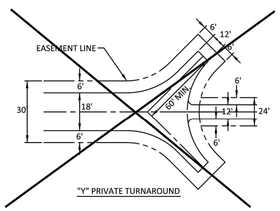
NOT TO SCALE

TRAIL AND TYPICAL SIDEWALK
City of Charles Town

ST-1
SW-1



CUL-DE-SAC
PUBLIC OR PRIVATE TURNAROUND



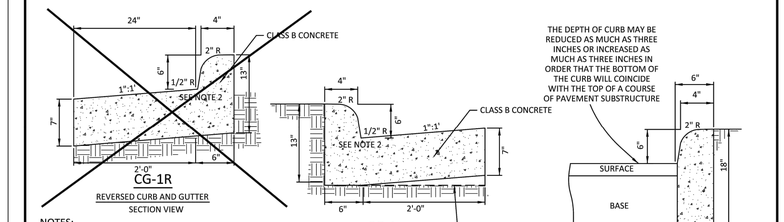
"Y" PRIVATE TURNAROUND

NOTES:

1. SIDEWALKS ON PUBLIC CUL-DE-SAC STREETS SHALL BE PROVIDED WITHIN THE RIGHT-OF-WAY.
2. A MAXIMUM GRADE OF 3% IN ALL DIRECTIONS SHALL BE MAINTAINED ACROSS THE CUL-DE-SAC.
3. THE 45' MINIMUM RADIUS MAY BE REDUCED TO AN ABSOLUTE MINIMUM RADUIS OF 30' ON SHORT LOW VOLUME CUL-DE-SAC'S, WHICH WILL REQUIRE THE APPROVAL OF THE PLANNING COMMISSION.

NOT TO SCALE

TYPICAL CUL-DE-SAC AND "Y" TURNAROUND
City of Charles Town



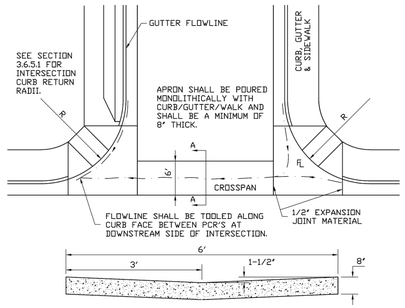
NOTES:

1. THE USE OF CG-1R SHALL NOT BE UTILIZED WITHIN THE LIMITS OF PUBLIC RIGHT OF WAY.
2. A MAXIMUM OF A 2" RADIUS IS ACCEPTABLE WITH CURB AND GUTTER.
3. SUBGRADE FOR ALL CURB AND GUTTER SHALL BE COMPACTED TO 95 PERCENT DENSITY AT OPTIMUM MOISTURE TO THE FULL WIDTH OF RIGHT OF WAY IN ACCORDANCE WITH AASHTO, T99.

NOT TO SCALE

TYPICAL COMBINATION CURB AND GUTTER
City of Charles Town

CG-1
CG-1R
CG-2



SECTION A – A
6 FOOT CROSSPAN

NOTE:

- SEE STANDARD NO. 10 FOR CONCRETE JOINT DETAILS.
- EXPANSION JOINTS ARE REQUIRED AT P.C.R.'S.
- CROSSPANS ARE NOT PERMITTED ACROSS ARTERIAL/COLLECTOR STREETS.

File: Stand-5
Typical Intersection Crosspan

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PRELIM PLAN - SITE DETAILS
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SITE DETAILS

SHEET No.

C409

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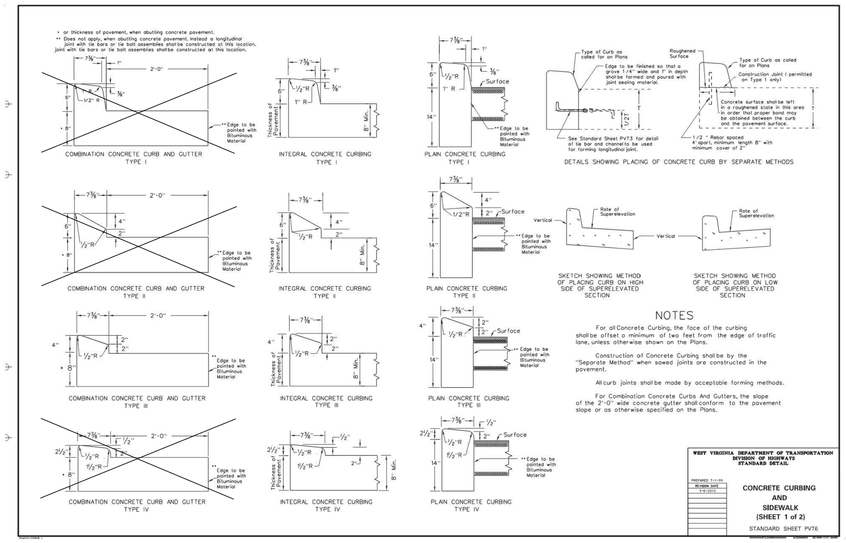
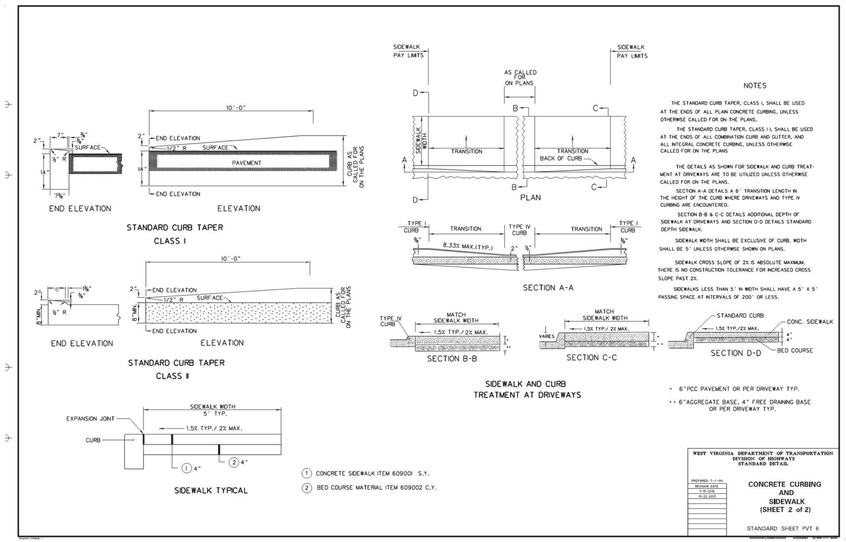
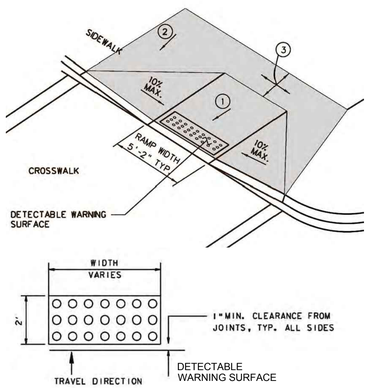






NOTES

RAMP CONCRETE SHALL MEET THE REQUIREMENTS OF SECTION 609 OF THE SPECIFICATIONS. RAMP SURFACE SHALL INCLUDE A "DETECTABLE WARNING SURFACE" (SEE PVT7 SHT. 3 OF 3) AS SHOWN FOR EACH RAMP TYPE. A COARSE BROOM FINISH, TRAVERSE TO FLARE SLOPES, OR EQUAL NON-SKID FINISH SHALL BE PROVIDED ON CONCRETE SURFACES.

NORMAL GUTTER FLOW LINE AND PROFILE SHALL BE MAINTAINED THROUGH THE RAMP AREA. UNLESS OTHERWISE SHOWN OR SPECIFIED.

1/4" PREFORMED EXPANSION JOINT FILLER, MEETING THE REQUIREMENTS OF SECTION 609 OF THE SPECIFICATIONS, SHALL BE PLACED AT ALL LOCATIONS WHERE RAMP CONTACTS CURB. GUTTER, OR CONCRETE PAVEMENT. WHEN THE RAMP IS POURED SEPARATELY FROM THE SIDE WALK, THE EXPANSION MATERIAL SHALL BE PLACED AT ALL LOCATIONS WHERE THE NORMAL SIDE WALK AND THE RAMP ABUT.

DETECTABLE WARNING SURFACES SHALL EXTEND ACROSS THE FULL WIDTH OF THE CURB RAMP, LANDING OR TRANSITION.

DOMES SHALL BE ALIGNED IN THE PREDOMINANT DIRECTION OF THE CURB RAMP.

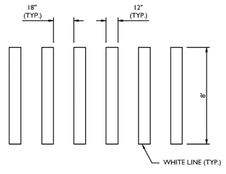
DESIGN AND PLACEMENT OF DETECTABLE WARNING SYSTEMS SHALL BE IN ACCORDANCE WITH SECTION 609 OF THE SPECIFICATIONS AND THE PUBLIC RIGHTS OF WAY ACCESSIBILITY GUIDELINES (PROWAG).

LEGEND

1. 8.33% (12:1) MAX. RAMP SLOPE. INCLUDING CONSTRUCTION TOLERANCE.
2. CROSS SLOPE. 2.00% MAX. INCLUDING CONSTRUCTION TOLERANCE.
3. CURB RAMPS REQUIRE A (4'-0") TURNING SPACE WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS. SEE NOTE REGARDING OBSTRUCTIONS ON SHEET I OF 3. SLOPE TO DRAIN TO CURB.

1 CURB RAMP DETAILS TYPE I

NOT TO SCALE

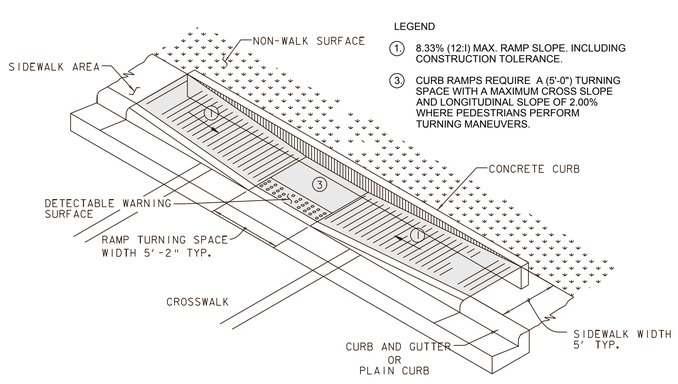


NOTE:

1. ALL STOP LINE USED FOR CROSSWALK SHALL BE WVDOH TYPE V (SECTION 715.40.2)

2 CROSSWALK DETAIL

NOT TO SCALE



LEGEND

1. 8.33% (12:1) MAX. RAMP SLOPE. INCLUDING CONSTRUCTION TOLERANCE.
3. CURB RAMPS REQUIRE A (5'-0") TURNING SPACE WITH A MAXIMUM CROSS SLOPE AND LONGITUDINAL SLOPE OF 2.00% WHERE PEDESTRIANS PERFORM TURNING MANEUVERS.

3 CURB RAMP DETAILS TYPE III

NOT TO SCALE

SELECT ROAD PAVEMENT SECTIONS FROM DETAIL A-05B AS FOLLOWS:

1. Check Soils Survey to determine soils series of soil to be used in the subgrade.
2. Determine the Subgrade Support Class of the soils series from the table below.

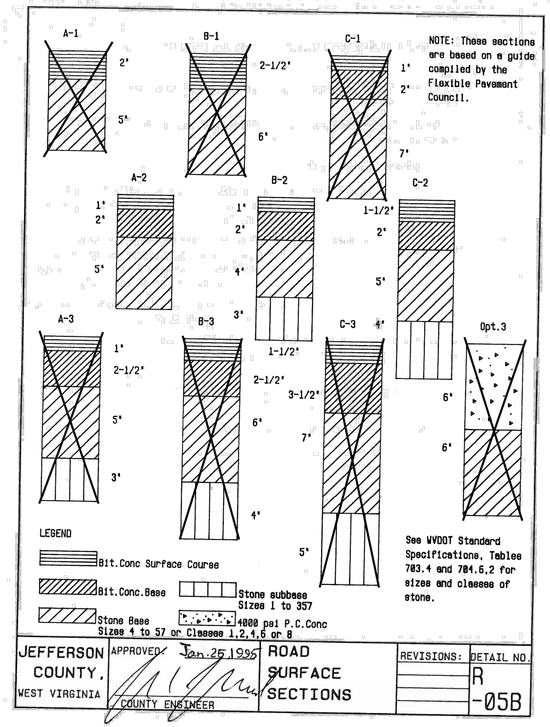
SUBGRADE SUPPORT CLASS	SOILS SERIES
A (good - excellent)	Berks and rock land and Weikert when Weikert when shale content is high (40% or greater retained on the No.4 screen).
B (medium)	Ashton,Berks,Blairton,Braddock,Dekalb, Edgemont,Huntington,Laidig,Landes,Lindeide, Melvin,Monongahela,and Weikert, and Frakestown when shale content is medium to high.
C (poor)	Benevola,Chilhowie,Clifton,Duffield,Frankstown, Fedwick,Hagerstown,Opequon

3. Select the appropriate road section based on the proposed use of the pavement and the Subgrade Support Class.

USE	ROAD SECTION
Residential driveways and small parking lots with 50 stalls or less and no trucks	A-1,B-1,C-1
Subdivision roads and large parking lots	A-2,B-2,C-2
State road widening,industrial parking lots, and truck driveways	A-3,B-3,C-3

Final selection of road surface section to be based on subgrade support class. See Geotechnical Report for existing soil series.

JEFFERSON COUNTY, WEST VIRGINIA	APPROVED: Jan. 25,1995 COUNTY ENGINEER	SURFACE SECTION SELECTION	REVISIONS:	DETAIL NO. R -05A



JEFFERSON COUNTY, WEST VIRGINIA	APPROVED: Jan.25,1995 COUNTY ENGINEER	ROAD SURFACE SECTIONS	REVISIONS:	DETAIL NO. R -05B

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PRELIM PLAN - SITE DETAILS
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
SITE DETAILS

SHEET No.
C410

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Xref .\DESIGN\C-BRDR-111766.dwg

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PRELIM PLAN - UTILITIES PLAN
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

UTILITIES PLAN

SHEET No.

C500

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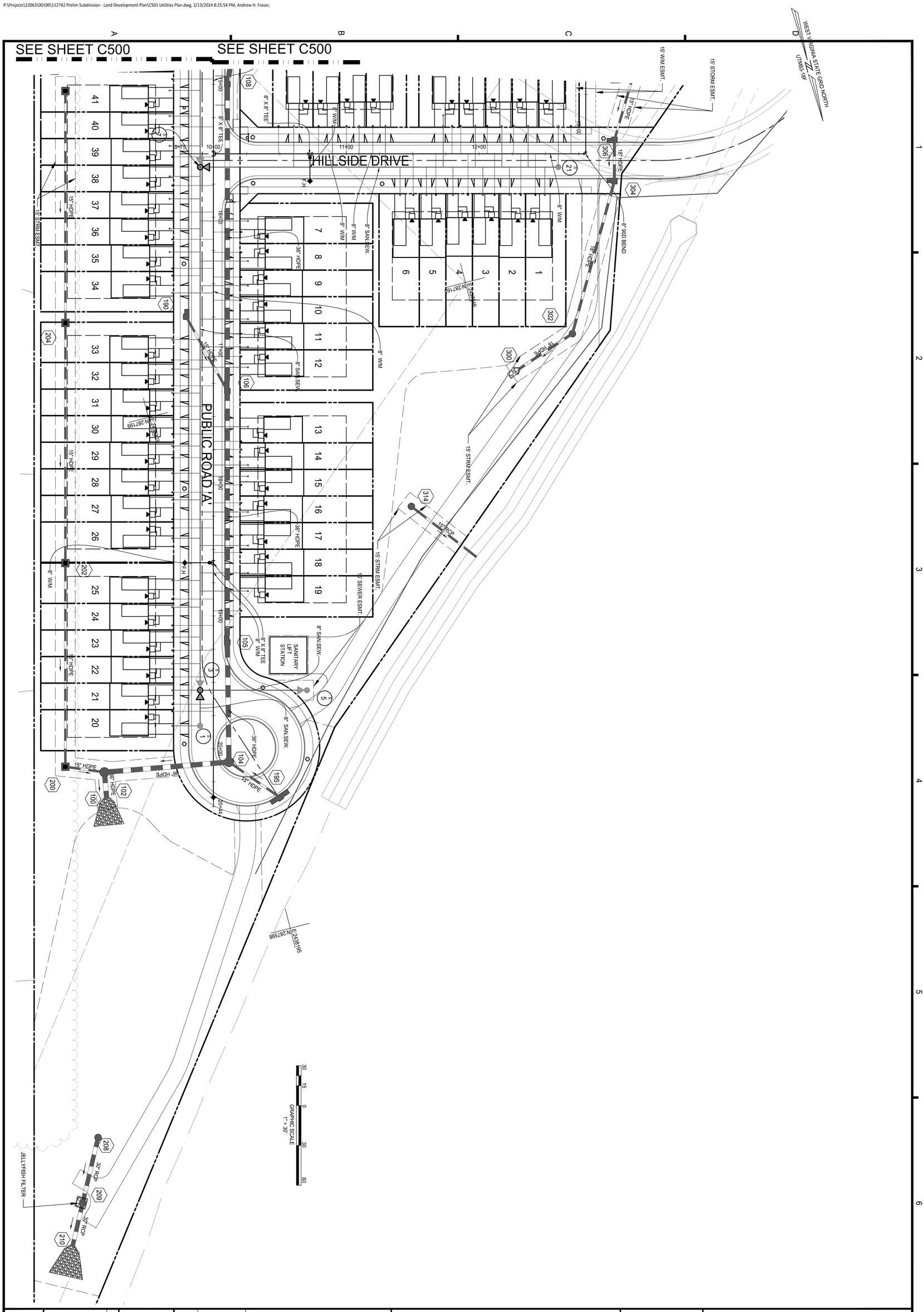

SHEET No.	SHEET TITLE
C501	UTILITIES PLAN

PROJECT No: 220631.001.00
DRAWING No: 112742
DATE: 02/13/2023
SCALE: 1" = 40'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

MARK	DATE	DESCRIPTION

PRELIM PLAN - UTILITIES PLAN
HILLSIDE
691/432 MAP 9 PARCEL 67

LOTS 2A (RESIDUE) & 2B

DISTRICT 3, JEFFERSON COUNTY, WV

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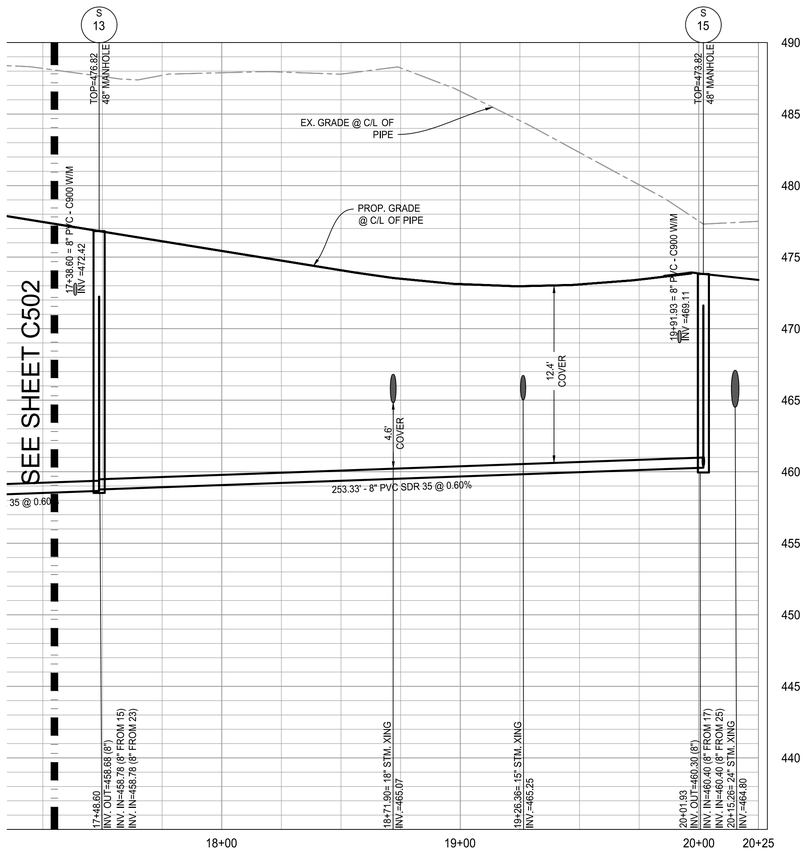
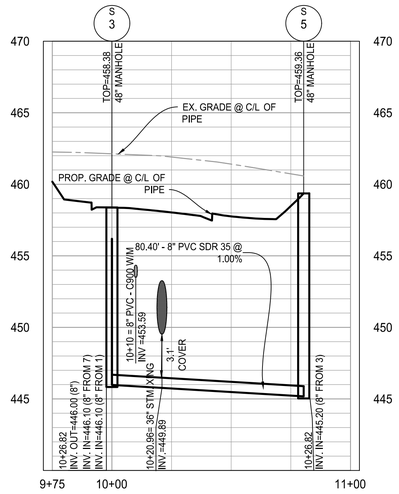


SAN SEW MH1 - MH15 PROFILE CONT.



SAN SEW MH3 - MH5 PROFILE

NOTES

1. ALL STORM DRAIN STRUCTURES ARE WVDOH STANDARDS. ALL SEWER STRUCTURES ARE CHARLES TOWN UTILITY BOARD STANDARDS. CONTRACTOR MAY USE PRECAST STRUCTURE WHERE AVAILABLE TO MEET THE STANDARD STRUCTURE SPECIFIED.
2. ELEVATIONS ARE GIVEN TO TOP OF LID FOR MANHOLES. CONTRACTOR TO ADJUST ELEVATIONS PROVIDED TO MATCH EXISTING PAVEMENT ELEVATIONS AND FIELD CONDITIONS WHERE APPROPRIATE.

NOTE:

CONTRACTOR SHALL TEST PIT AND LOCATE ALL EXISTING UNDERGROUND UTILITIES AT ALL PROPOSED UTILITY CROSSINGS AND CONNECTIONS TO OBTAIN ACTUAL VERTICAL AND HORIZONTAL LOCATIONS AND VERIFY THAT NO CONFLICTS EXIST WITH NEW UTILITIES WELL IN ADVANCE OF CONSTRUCTION START. REPORT ANY CONFLICTS TO ENGINEER SO ANY DESIGN ADJUSTMENTS CAN BE MADE PRIOR TO CONSTRUCTION.

5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

30 15 0 30 60
GRAPHIC SCALE
HORIZONTAL: 1" = 30'

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PRELIM PLAN - SANITARY SEWER
PROFILES HILLSIDE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SANITARY SEWER PROFILES

SHEET No.

C503

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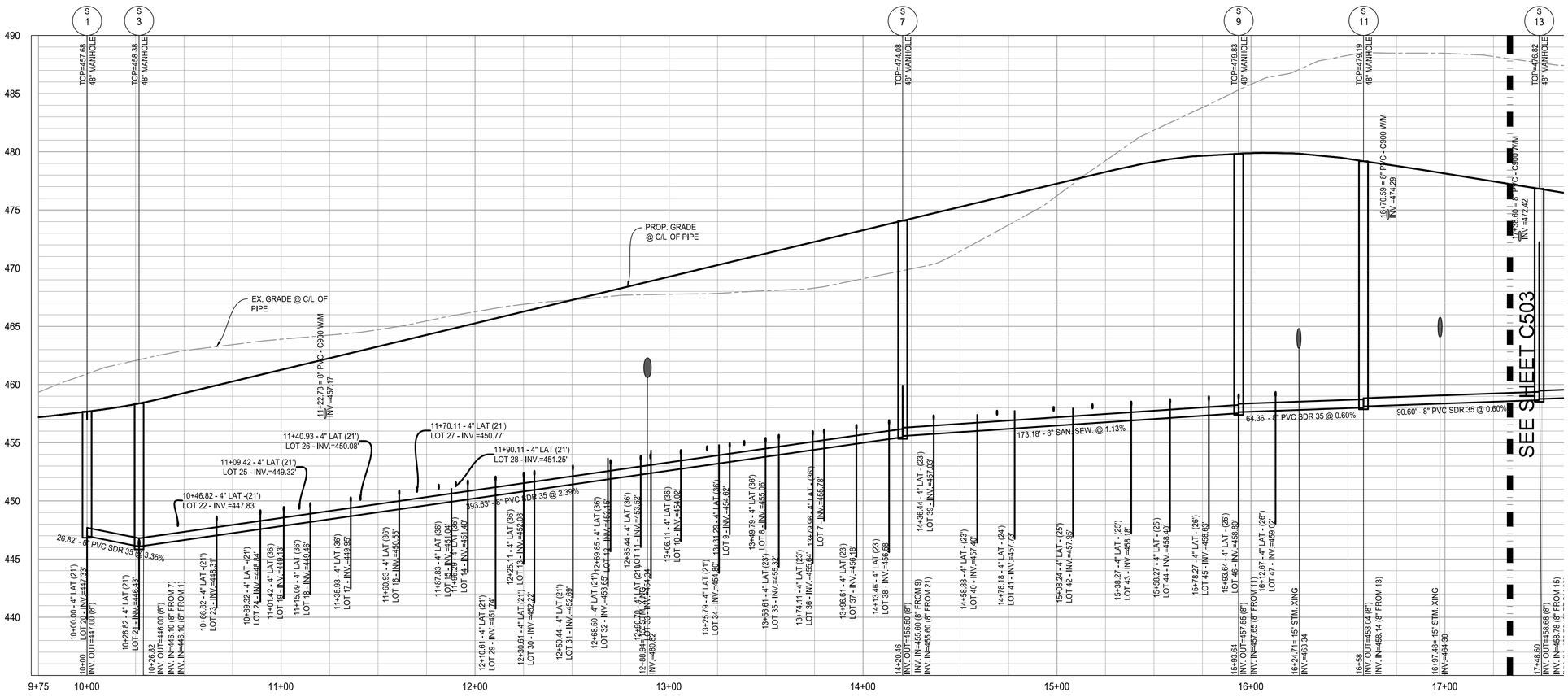

SAN SEW MH1- MH15 PROFILE

NOTES

1. ALL STORM DRAIN STRUCTURES ARE WVDOH STANDARDS. ALL SEWER STRUCTURES ARE CHARLES TOWN UTILITY BOARD STANDARDS. CONTRACTOR MAY USE PRECAST STRUCTURE WHERE AVAILABLE TO MEET THE STANDARD STRUCTURE SPECIFIED.
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5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

30 15 0 30 60
GRAPHIC SCALE
HORIZONTAL: 1" = 30'

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PRELIM PLAN - SANITARY SEWER
PROFILES HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SANITARY SEWER PROFILES

SHEET No.

C502

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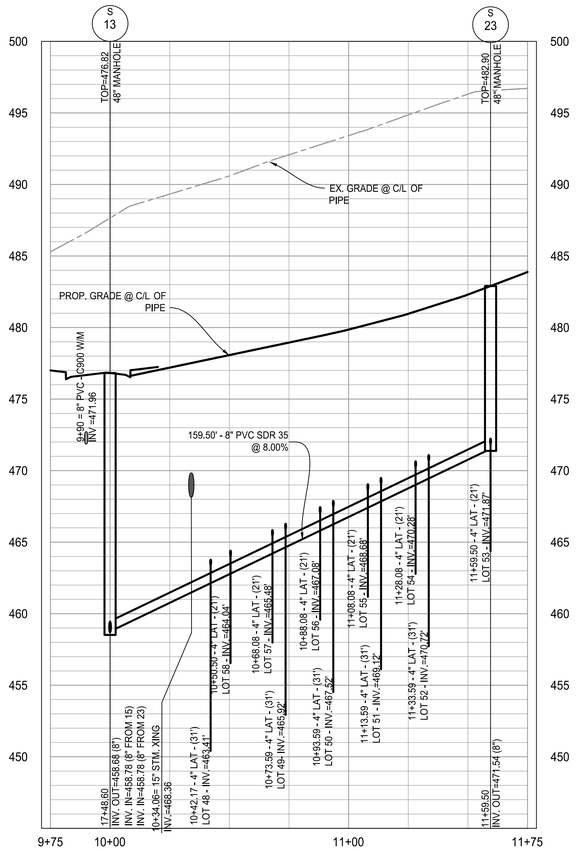

SAN SEW MH13 - MH23 PROFILE

SAN SEW MH7 - MH21 PROFILE

NOTES

1. ALL STORM DRAIN STRUCTURES ARE WVDOH STANDARDS. ALL SEWER STRUCTURES ARE CHARLES TOWN UTILITY BOARD STANDARDS. CONTRACTOR MAY USE PRECAST STRUCTURE WHERE AVAILABLE TO MEET THE STANDARD STRUCTURE SPECIFIED.
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GRAPHIC SCALE
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30 15 0 30 60
GRAPHIC SCALE
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PRELIM PLAN - SANITARY SEWER
PROFILES HILLSIDE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SANITARY SEWER PROFILES

SHEET No.

C504

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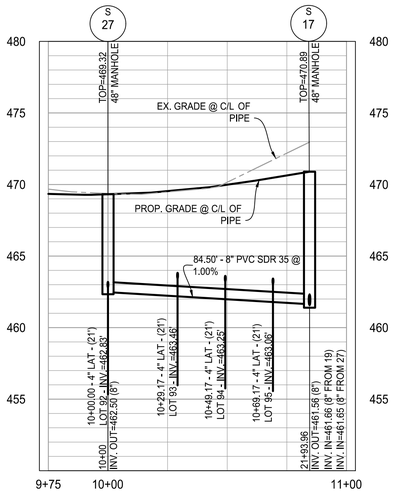
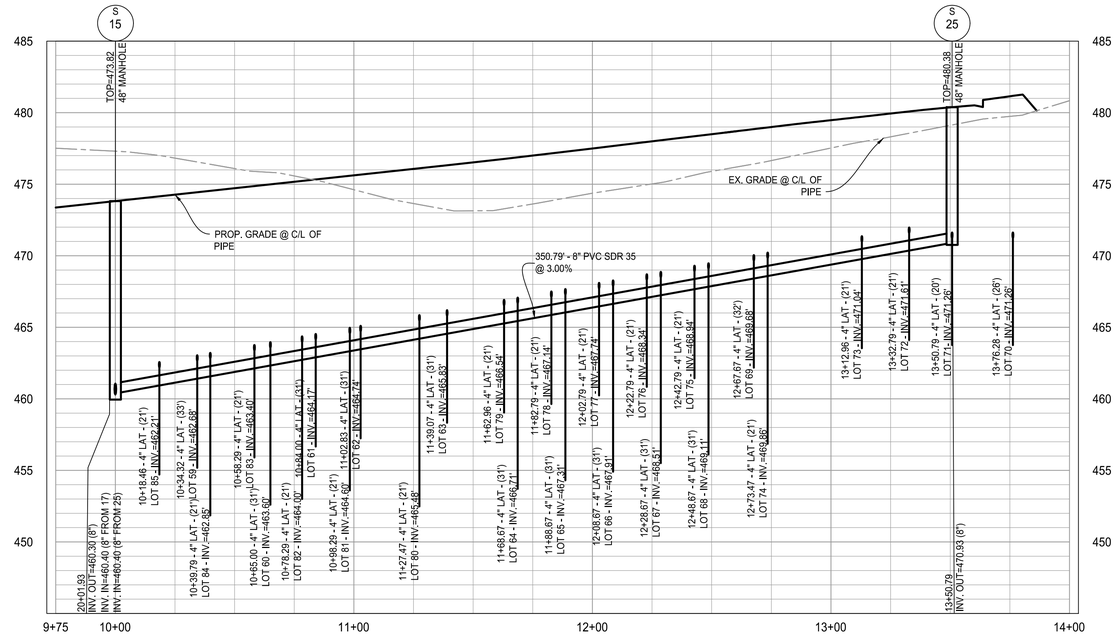


SAN SEW MH17 - MH27 PROFILE



SAN SEW MH15 - MH25 PROFILE

NOTES

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GRAPHIC SCALE
HORIZONTAL: 1" = 30'

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LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
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MARK	DATE	DESCRIPTION

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CHECKED: SK

SHEET TITLE:

SANITARY SEWER PROFILES

SHEET No.

C505

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SANITARY LATERAL TABULATION

LOT #	LOWER MH	UPPER MH	LOWER MH INV. IN	UPPER MH INV. OUT	DISTAN BETWEEN MH	PIPE SLOPE %	HEIGHT OF LAT. ABOVE MAIN	DISTANC FROM LOWER MH	INV.@ SEWER	LATERAL SLOPE	LENGTH TO RISER	INV.@ RISER	HEIGHT OF RISER	INV. @ END	TOTAL LENGTH	FF	GARAGE	INV. END TO GAR
TH 1	7	21	455.60	459.21	270	1.34%	1.25	259.50	460.32	2.08%	12	460.57	4	464.68	21.00	470.05	469.72	5.04
TH 2	7	21	455.60	459.21	270	1.34%	1.25	232.83	459.97	2.08%	12	460.22	5	465.30	21.00	470.72	470.39	5.09
TH 3	7	21	455.60	459.21	270	1.34%	1.25	212.83	459.70	2.08%	12	459.95	6	466.01	21.00	471.38	471.05	5.04
TH 4	7	21	455.60	459.21	270	1.34%	1.25	190.33	459.40	2.08%	12	459.65	7	466.69	21.00	472.05	471.72	5.03
TH 5	7	21	455.60	459.21	270	1.34%	1.25	170.33	459.13	2.08%	12	459.38	8	467.40	21.00	472.72	472.39	4.99
TH 6	7	21	455.60	459.21	270	1.34%	1.25	150.50	458.87	2.08%	12	459.12	8	467.14	21.00	473.38	473.05	5.91
TH 116	7	21	455.60	459.21	270	1.34%	1.25	70.49	457.79	2.08%	19	458.19	11.00	469.21	31.00	475.07	474.74	5.53
TH 117	7	21	455.60	459.21	270	1.34%	1.25	99.67	458.18	2.08%	19	458.58	10.00	468.62	31.00	474.40	474.07	5.45
TH 118	7	21	455.60	459.21	270	1.34%	1.25	119.67	458.45	2.08%	19	458.85	9.00	467.91	31.00	473.74	473.41	5.50
TH 119	7	21	455.60	459.21	270	1.34%	1.25	139.50	458.72	2.08%	19	459.11	8.00	467.20	31.00	473.07	472.74	5.54
TH 120	7	21	455.60	459.21	270	1.34%	1.25	182.99	459.30	2.08%	19	459.70	7.00	466.80	31.00	472.38	472.05	5.25
TH 121	7	21	455.60	459.21	270	1.34%	1.25	207.17	459.62	2.08%	19	460.02	6.00	466.14	31.00	471.71	471.38	5.24
TH 122	7	21	455.60	459.21	270	1.34%	1.25	227.17	459.89	2.08%	19	460.29	5.00	465.43	31.00	471.05	470.72	5.29
TH 123	7	21	455.60	459.21	270	1.34%	1.25	246.92	460.16	2.08%	19	460.55	4.00	464.72	31.00	470.38	470.05	5.33
TH 124	7	21	455.60	459.21	270	1.34%	0.33	269.67	459.54	2.08%	19	459.94	4.00	464.10	31.00	469.71	469.38	5.28
TH 7	3	7	446.10	455.50	394	2.39%	1.25	353.14	455.78	2.08%	24	456.28	12.00	468.28	36.00	473.83	473.50	5.22
TH 8	3	7	446.10	455.50	394	2.39%	1.25	322.94	455.06	2.08%	24	455.56	11.00	466.58	36.00	472.50	472.17	5.59
TH 9	3	7	446.10	455.50	394	2.39%	1.25	304.46	454.62	2.08%	24	455.12	11.00	466.14	36.00	471.83	471.50	5.36
TH 10	3	7	446.10	455.50	394	2.39%	1.25	279.29	454.02	2.08%	24	454.52	10.00	464.56	36.00	471.17	470.17	5.61
TH 11	3	7	446.10	455.50	394	2.39%	1.25	258.36	453.52	2.08%	24	454.02	11.00	465.04	36.00	470.50	470.17	5.13
TH 12	3	7	446.10	455.50	394	2.39%	1.25	243.03	453.15	2.08%	24	453.65	10.00	463.70	36.00	469.83	469.50	5.80
TH 13	3	7	446.10	455.50	394	2.39%	1.25	198.18	452.08	2.08%	24	452.58	9.00	461.64	36.00	467.64	467.31	5.67
TH 14	3	7	446.10	455.50	394	2.39%	1.25	169.46	451.40	2.08%	24	451.90	9.00	460.96	36.00	466.89	466.56	5.60
TH 15	3	7	446.10	455.50	394	2.39%	1.25	154.46	451.04	2.08%	24	451.54	9.00	460.60	36.00	466.31	465.89	5.29
TH 16	3	7	446.10	455.50	394	2.39%	1.25	134.11	450.55	2.08%	24	451.05	8.00	459.14	36.00	464.89	464.65	5.51
TH 17	3	7	446.10	455.50	394	2.39%	1.25	108.86	449.95	2.08%	24	450.45	8.00	458.53	36.00	464.31	463.89	5.36
TH 18	3	7	446.10	455.50	394	2.39%	1.25	88.27	449.46	2.08%	24	449.96	8.00	458.04	36.00	463.64	463.31	5.27
TH 19	3	7	446.10	455.50	394	2.39%	1.25	74.60	449.13	2.08%	24	449.63	7.00	456.74	36.00	462.82	462.56	5.82
TH 20	3	1	446.10	447.00	27	3.36%	0.33	26.82	447.33	2.08%	10	447.54	8.00	455.60	21.00	459.85	459.52	3.92
TH 21	3	7	446.10	455.50	394	2.39%	0.33		446.43	2.08%	10	446.64	8.00	454.70	21.00	460.52	460.19	5.49
TH 22	3	7	446.10	455.50	394	2.39%	1.25	20.00	447.83	2.08%	10	448.04	7.00	455.12	21.00	461.18	460.85	5.73
TH 23	3	7	446.10	455.50	394	2.39%	1.25	40.00	448.31	2.08%	10	448.51	8.00	456.58	21.00	461.85	461.85	5.27
TH 24	3	7	446.10	455.50	394	2.39%	1.25	62.50	448.84	2.08%	10	449.05	9.00	458.09	21.00	463.81	462.85	4.76
TH 25	3	7	446.10	455.50	394	2.39%	1.25	82.60	449.32	2.08%	10	449.53	9.00	458.57	21.00	463.85	463.52	4.95
TH 26	3	7	446.10	455.50	394	2.39%	1.25	114.36	450.08	2.08%	10	450.29	10.00	460.31	21.00	465.12	464.79	4.48
TH 27	3	7	446.10	455.50	394	2.39%	1.25	143.28	450.77	2.08%	10	450.98	11.00	461.98	21.00	466.13	466.79	4.81
TH 28	3	7	446.10	455.50	394	2.39%	1.25	163.28	451.25	2.08%	10	451.46	10.00	461.48	21.00	467.12	466.79	5.31
TH 29	3	7	446.10	455.50	394	2.39%	1.25	183.78	451.74	2.08%	10	451.95	10.00	461.97	21.00	467.79	467.46	5.49
TH 30	3	7	446.10	455.50	394	2.39%	1.25	203.78	452.22	2.08%	10	452.42	11.00	463.42	21.00	468.46	468.46	5.04
TH 31	3	7	446.10	455.50	394	2.39%	1.25	223.62	452.69	2.08%	10	452.90	11.00	463.90	21.00	469.12	468.79	4.89
TH 32	3	7	446.10	455.50	394	2.39%	1.25	263.86	453.65	2.08%	10	453.86	11.00	464.86	21.00	470.66	470.33	5.47
TH 33	3	7	446.10	455.50	394	2.39%	1.25	292.79	454.34	2.08%	9	454.53	12.00	466.53	21.00	471.99	471.66	5.13
TH 34	3	7	446.10	455.50	394	2.39%	1.25	311.96	454.80	2.08%	9	454.99	12.00	466.99	21.00	472..66	472.33	5.34
TH 35	3	7	446.10	455.50	394	2.39%	1.25	329.79	455.23	2.08%	9	455.41	13.00	468.43	23.00	473.99	473.66	5.23
TH 36	3	7	446.10	455.50	394	2.39%	1.25	347.29	455.64	2.08%	9	455.83	13.00	468.85	23.00	474.66	474.33	5.48
TH 37	3	7	446.10	455.50	394	2.39%	1.25	369.79	456.18	2.08%	9	456.37	14.00	470.37	23.00	475.32	474.99	4.62
TH 38	3	7	446.10	455.50	394	2.39%	1.25	386.63	456.58	2.08%	9	456.77	14.00	470.77	23.00	475.99	475.66	4.89
TH 39	7	9	455.60	457.55	173	1.13%	1.25	15.99	457.03	2.08%	10	457.24	13.00	470.24	23.00	476.66	476.33	6.09
TH 40	7	9	455.60	457.55	173	1.13%	1.25	48.64	457.40	2.08%	9	457.59	14.00	471.59	23.00	478.01	477.68	6.09
TH 41	7	9	455.60	457.55	173	1.13%	1.25	77.82	457.73	2.08%	9	457.92	15.00	472.92	24.00	479.34	479.01	6.09
TH 42	7	9	455.60	457.55	173	1.13%	1.25	97.82	457.95	2.08%	9	458.14	16.00	474.14	25.00	480.01	479.68	5.54
TH 43	7	9	455.60	457.55	173	1.13%	1.25	117.86	458.18	2.08%	9	458.37	16.00	474.37	25.00	480.74	480.41	6.04
TH 44	7	9	455.60	457.55	173	1.13%	1.25	137.82	458.40	2.08%	9	458.59	16.00	474.59	25.00	481.34	480.41	5.82
TH 45	7	9	455.60	457.55	173	1.13%	1.25	157.82	458.63	2.08%	9	458.82	17.00	475.82	26.00	482.01	481.68	5.86
TH 46	7	9	455.60	457.55	173	1.13%	1.25	173.18	458.80	2.08%	9	458.99	17.00	475.99	26.00	482.01	481.68	5.69
TH 47	9	11	457.65	458.04	64	0.60%	1.25	19.00	459.02	2.08%	9	459.20	17.00	476.20	26.00	482.01	481.86	5.66
TH 48	13	23	458.78	471.54	160	8.00%	1.25	42.17	463.41	2.08%	20	463.82	10	473.84	31.00	479.96	479.63	5.79
TH 49	13	23	458.78	471.54	160	8.00%	1.25	73.59	465.92	2.08%	19	466.32	9	475.38	31.00	481.29	480.96	5.58
TH 50	13	23	458.78	471.54	160	8.00%	1.25	93.59	467.52	2.08%	19	467.92	8	476.00	31.00	481.96	481.63	5.63
TH 51	13	23	458.78	471.54	160	8.00%	1.25	113.59	469.12	2.08%	19	469.52	7	476.62	31.00	482.62	482.29	5.67
TH 52	13	23	458.78	471.54	160	8.00%	1.25	133.59	470.72	2.08%	19	471.12	6	477.24	31.00	483.29	482.96	5.72
TH 53	13	23	458.78	471.54	160	8.00%	0.33	159.50	471.87	2.08%	10	472.08	7	479.16	21.00	484.94	484.61	5.45
TH 54	13	23	458.78	471.54	160	8.00%	1.25	128.08	470.28	2.08%	10	470.49	7	477.57	21.00	483.61	483.28	5.71
TH 55	13	23	458.78	471.54	160	8.00%	1.25	108.08	468.68	2.08%	10	468.89	7	475.97	21.00	482.28	481.95	5.98
TH 56	13	23	458.78	471.54	160	8.00%	1.25	88.08	467.08	2.08%	10	467.29	9	476.33	21.00	481.61	481.61	5.28
TH 57	13	23	458.78	471.54	160	8.00%	1.25	68.08	465.48	2.08%	10	465.69	9	474.73	21.00	480.94	480.61	5.88
TH 58	13	23	458.78	471.54	160	8.00%	1.25	50.05	464.04	2.08%	10	464.25	10	474.27	21.00	480.28	479.95	5.68
TH 59	15	25	460.40	470.93	351	3.00%	1.25	34.32	462.68	2.08%	26	463.22	7	470.22	33.00	476.29	475.96	5.74
TH 60	15	25	460.40	470.93	351	3.00%	1.25	65.00	463.60	2.08%	19	464.00	8	472.08	31.00	476.96	476.63	4.55
TH 61	15	25	460.40	470.93	351	3.00%	1.25	84.00	464.17	2.08%	19	464.57	8	472.65	31.00	477.62	477.29	4.64
TH 62	15	25	460.40	470.93	351	3.00%	1.25	102.83	464.74	2.08%	19	465.13	8	473.22	31.00	478.29	477.96	4.74
TH 63	15	25	460.40	470.93	351	3.00%	1.25	139.07	465.83	2.08%	19	466.22	7	473.33	31.00	478.44	478.11	4.78
TH 64	15	25	460.40	470.93	351	3.00%	1.25	168.67	466.71	2.08%	19	467.11	7	474.21	31.00	479.11	478.78	4.57
TH 65	15	25	460.40	470.93	351	3.00%	1.25	188.67	467.31	2.08%	19	467.71	7	474.81	31.00	479.77	479.44	4.63
TH 66	15	25	460.40	470.93	351	3.00%	1.25	208.67	467.91	2.08%	19	468.31	6	474.43	31.00	479.77	479.44	5.01
TH 67	15	25	460.40	470.93	351	3.00%	1.25	228.67	468.51	2.08%	19	468.91	7	476.01	31.00	480.44	480.11	4.10
TH 68	15	25	460.40	470.93	351	3.00%	1.25	248.67	469.11	2.08%	19	469.51	6	475.63	31.00	480.44	480.11	4.48
TH 69	15	25	460.40	470.93	351	3.00%	1.25	267.67	469.68	2.08%	20	470.10	6	476.22	32.00	481.11	480.78	4.56
TH 70	15	25	460.40	470.93	351	3.00%	0.33	350.79	471.26	2.08%	20	471.67	6	477.67	26.00	483.13	482.80	5.13
TH 71	15	25	460.40	470.93	351	3.00%	0.33	350.79	471.26	2.08%	8	471.42	6	477.55	20.00	482.46	482.13	4.58
TH 72	15	25	460.40	470.93	351	3.00%	1.25	331.89	471.61	2.08%	10	471.82	6	477.92	21.00	482.46	482.13	4.21
TH 73	15	25	460.40	470.93	351	3.00%	1.25	312.96	471.04	2.08%	10	471.25	5	476.38	21.00	481.79	481.46	5.08
TH 74	15	25	460.40	470.93	351	3.00%	1.25	273.47	469.86	2.08%	10	470.07	6	476.17	21.00	480.90	480.57	4.40
TH 75	15	25	460.40	470.93	351	3.00%	1.25	242.79	468.94	2.08%	10	469.15	6	475.25	21.00	480.23	479.90	4.65

SANITARY LATERAL TABULATION

LOT #	LOWER MH	UPPER MH	LOWER MH INV. IN	UPPER MH INV. OUT	DISTAN BETWEEN MH	PIPE SLOPE %	HEIGHT OF LAT. ABOVE MAIN	DISTANC FROM LOWER MH	INV.@ SEWER	LATERAL SLOPE	LENGTH TO RISER	INV.@ RISER	HEIGHT OF RISER	INV. @ END	TOTAL LENGTH	FF	GARAGE	INV. END TO GAR
TH 76	15	25	460.40	470.93	351	3.00%	1.25	222.79	468.34	2.08%	10	468.55	7	475.63	21.00	480.23	479.90	4.27
TH 77	15	25	460.40	470.93	351	3.00%	1.25	202.79	467.74	2.08%	10	467.95	7	475.03	21.00	479.56	479.23	4.20
TH 78	15	25	460.40	470.93	351	3.00%	1.25	182.79	467.14	2.08%	10	467.35	7	474.43	21.00	479.56	479.23	4.80
TH 79	15	25	460.40	470.93	351	3.00%	1.25	162.96	466.54	2.08%	10	466.75	7	473.83	21.00	478.89	478.56	4.73
TH 80	15	25	460.40	470.93	351	3.00%	1.25	127.47	465.48	2.08%	10	465.69	7	472.77	21.00	477.99	477.66	4.89
TH 81	15	25	460.40	470.93	351	3.00%	1.25	98.29	464.60	2.08%	10	464.81	8	472.87	21.00	477.79	477.46	4.59
TH 82	15	25	460.40	470.93	351	3.00%	1.25	78.29	464.00	2.08%	10	464.21	8	472.27	21.00	477.12	476.79	4.52
TH 83	15	25	460.40	470.93	351	3.00%	1.25	58.29	463.40	2.08%	10	463.61	9	472.65	21.00	477.12	476.79	4.14
TH 84	15	25	460.40	470.93	351	3.00%	1.25	39.79	462.85	2.08%	10	463.06	9	472.10	21.00	476.46	476.13	4.03
TH 85	15	25	460.40	470.93	351	3.00%	1.25	18.46	462.21	2.08%	10	462.42	9	471.46	21.00	476.46	476.13	4.67
TH 86	15	17	460.40	461.56	192	0.60%	1.25	32.53	461.85	2.08%	10	462.06	8	470.12	21.00	475.50	475.17	5.05
TH 87	15	17	460.40	461.56	192	0.60%	1.25	60.71	462.02	2.08%	10	462.23	7	469.31	21.00	474.84	474.51	5.20
TH 88	15	17	460.40	461.56	192	0.60%	1.25	81.71	462.14	2.08%	10	462.35	6	468.46	21.00	474.17	473.84	5.38
TH 89	15	17	460.40	461.56	192	0.60%	1.25	101.71	462.26	2.08%	10	462.47	6	468.58	21.00	474.17	473.84	5.26
TH 90	15	17	460.40	461.56	192	0.60%	1.25	121.71	462.38	2.08%	10	462.59	5	467.72	21.00	473.50	473.17	5.45
TH 91	15	17	460.40	461.56	192	0.60%	1.25	138.79	462.49	2.08%	10	462.69	5	467.82	21.00	473.50	473.17	5.35
TH 112	15	17	460.40	461.56	192	0.60%	1.25	144.29	462.52	2.08%	20	462.94	5	468.06	31.00	473.84	473.51	5.45
TH 113	15	17	460.40	461.56	192	0.60%	1.25	114.87	462.34	2.08%	20	462.76	5	467.88	31.00	473.84	473.51	5.63
TH 114	15	17	460.40	461.56	192	0.60%	1.25	94.37	462.22	2.08%	20	462.64	6	468.74	31.00	474.51	474.18	5.44
TH 115	15	17	460.40	461.56	192	0.60%	1.25	74.53	462.10	2.08%	20	462.52	6	468.62	31.00	473.51	474.18	5.56
TH 92	17	27	461.66	462.50	85	1.00%	0.33	84.50	462.83	2.08%	10	463.04	5	468.16	21.00	473.10	472.77	4.61
TH 93	17	27	461.66	462.50	85	1.00%	1.25	55.33	463.46	2.08%	10	463.67	5	468.79	21.00	473.77	473.44	4.65
TH 94	17	27	461.66	462.50	85	1.00%	1.25	34.50	463.25	2.08%	10	463.46	6	469.56	21.00	474.43	474.10	4.54
TH 95	17	27	461.66	462.50	85	1.00%	1.25	15.33	463.06	2.08%	10	463.27	6	469.37	21.00	474.43	474.10	4.73
TH 96	17	19	461.66	468.50	236	2.90%	1.25	7.50	463.12	2.08%	10	463.33	4	467.48	21.00	473.35	473.02	5.54
TH 97	17	19	461.66	468.50	236	2.90%	1.25	24.67	463.62	2.08%	10	463.83	4	467.97	21.00	474.02	473.69	5.72
TH 98	17	19	461.66	468.50	236	2.90%	1.25	44.67	464.20	2.08%	10	464.41	4	468.55	21.00	474.02	473.69	5.14
TH 99	17	19	461.66	468.50	236	2.90%	1.25	85.50	465.38	2.08%	10	465.59	4	469.74	21.00	475.37	475.04	5.30
TH 100	17	19	461.66	468.50	236	2.90%	1.25	114.67	466.23	2.08%	10	466.44	7	473.52	21.00	476.04	475.71	2.19
TH 101	17	19	461.66	468.50	236	2.90%	1.25	134.67	466.81	2.08%	10	467.02	4	471.17	21.00	476.70	476.37	5.20
TH 102	17	19	461.66	468.50	236	2.90%	1.25	154.67	467.39	2.08%	10	467.60	4	471.75	21.00	477.37	477.04	5.29
TH 103	17	19	461.66	468.50	236	2.90%	1.25	177.17	468.04	2.08%	10	468.25	4	472.40	21.00	478.04	477.71	5.31
TH 104	17	19	461.66	468.50	236	2.90%	1.25	194.67	468.55	2.08%	10	468.76	4	472.91	21.00	478.70	478.37	5.46
TH 105	17	19	461.66	468.50	236	2.90%	1.25	214.67	469.13	2.08%	10	469.34	4	473.49	21.00	478.70	478.37	4.88
TH 106	17	19	461.66	468.50	236	2.90%	0.33	235.99	468.83	2.08%	10	469.04	5	474.16	21.00	479.37	479.04	4.88
TH 107	17	19	461.66	468.50	236	2.90%	0.33	235.99	468.83	2.08%	20	469.25	5	474.37	31.00	479.46	479.13	4.76
TH 108	17	19	461.66	468.50	236	2.90%	1.25	207.82	468.93	2.08%	20	469.35	4	473.50	31.00	478.79	478.46	4.96
TH 109	17	19	461.66	468.50	236	2.90%	1.25	189.32	468.40	2.08%	20	468.81	4	472.96	31.00	478.12	477.79	4.83
TH 110	17	19	461.66	468.50	236	2.90%	1.25	168.67	467.80	2.08%	20	468.21	4	472.36	31.00	477.46	477.13	4.77
TH 111	17	19	461.66	468.50	236	2.90%	1.25	149.17	467.23	2.08%	20	467.65	4	471.79	31.00	476.79	476.46	4.67

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PRELIM PLAN - SANITARY LATERAL COMPUTATIONS HILLSIDE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SANITARY LATERAL COMPUTATIONS

SHEET No.

C506

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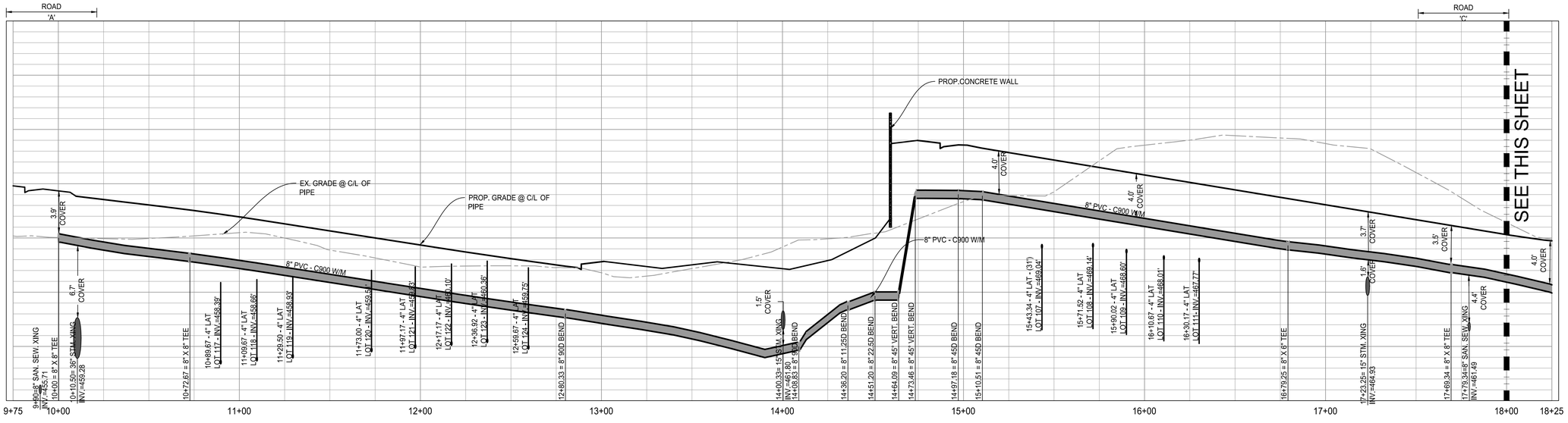
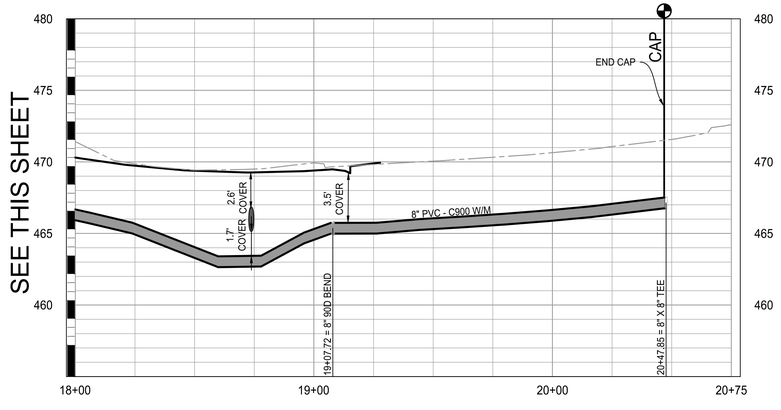


WATER-A PROFILE



WATER-A PROFILE

NOTES

1. ALL STORM DRAIN STRUCTURES ARE WVDOH STANDARDS. ALL SEWER STRUCTURES ARE CHARLES TOWN UTILITY BOARD STANDARDS. CONTRACTOR MAY USE PRECAST STRUCTURE WHERE AVAILABLE TO MEET THE STANDARD STRUCTURE SPECIFIED.
2. ELEVATIONS ARE GIVEN TO TOP OF LID FOR MANHOLES. CONTRACTOR TO ADJUST ELEVATIONS PROVIDED TO MATCH EXISTING PAVEMENT ELEVATIONS AND FIELD CONDITIONS WHERE APPROPRIATE.

NOTE:

CONTRACTOR SHALL TEST PIT AND LOCATE ALL EXISTING UNDERGROUND UTILITIES AT ALL PROPOSED UTILITY CROSSINGS AND CONNECTIONS TO OBTAIN ACTUAL VERTICAL AND HORIZONTAL LOCATIONS AND VERIFY THAT NO CONFLICTS EXIST WITH NEW UTILITIES WELL IN ADVANCE OF CONSTRUCTION START. REPORT ANY CONFLICTS TO ENGINEER SO ANY DESIGN ADJUSTMENTS CAN BE MADE PRIOR TO CONSTRUCTION.

5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

30 15 0 30 60
GRAPHIC SCALE
HORIZONTAL: 1" = 30'

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PRELIM PLAN - WATERLINE PROFILES HILLSIDE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

WATERLINE PROFILES

SHEET No.

C507

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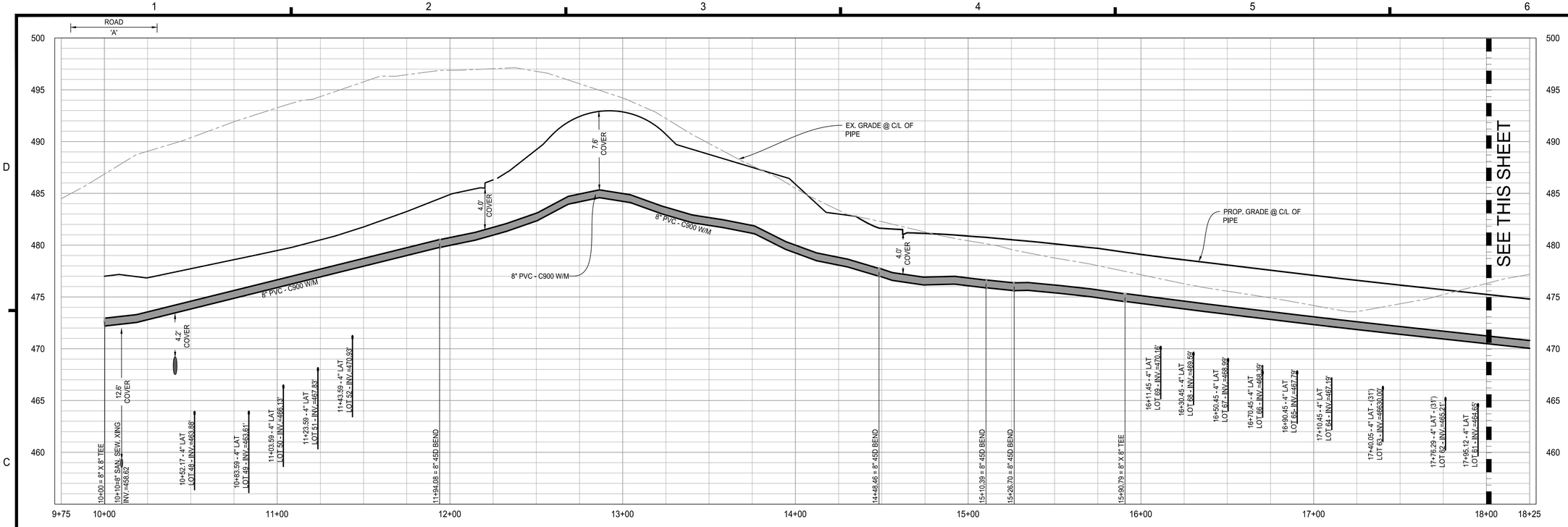
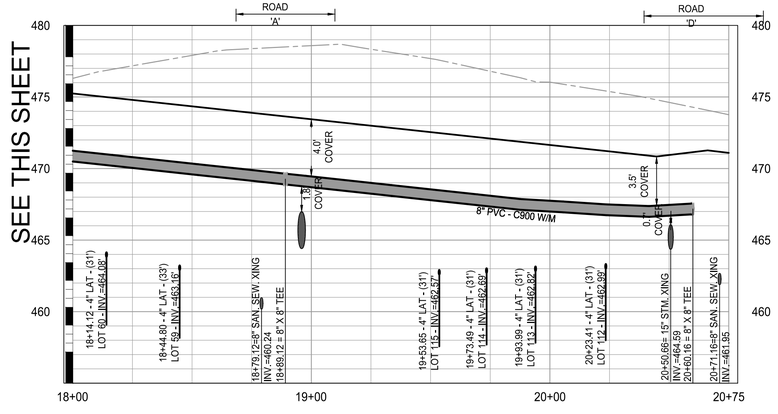


WATER-B PROFILE



WATER-B PROFILE

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5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

50 25 0 50 100
GRAPHIC SCALE
HORIZONTAL: 1" = 50'

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PRELIM PLAN - WATERLINE
PROFILES HILLSIDE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
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DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

WATERLINE PROFILES

SHEET No.

C508

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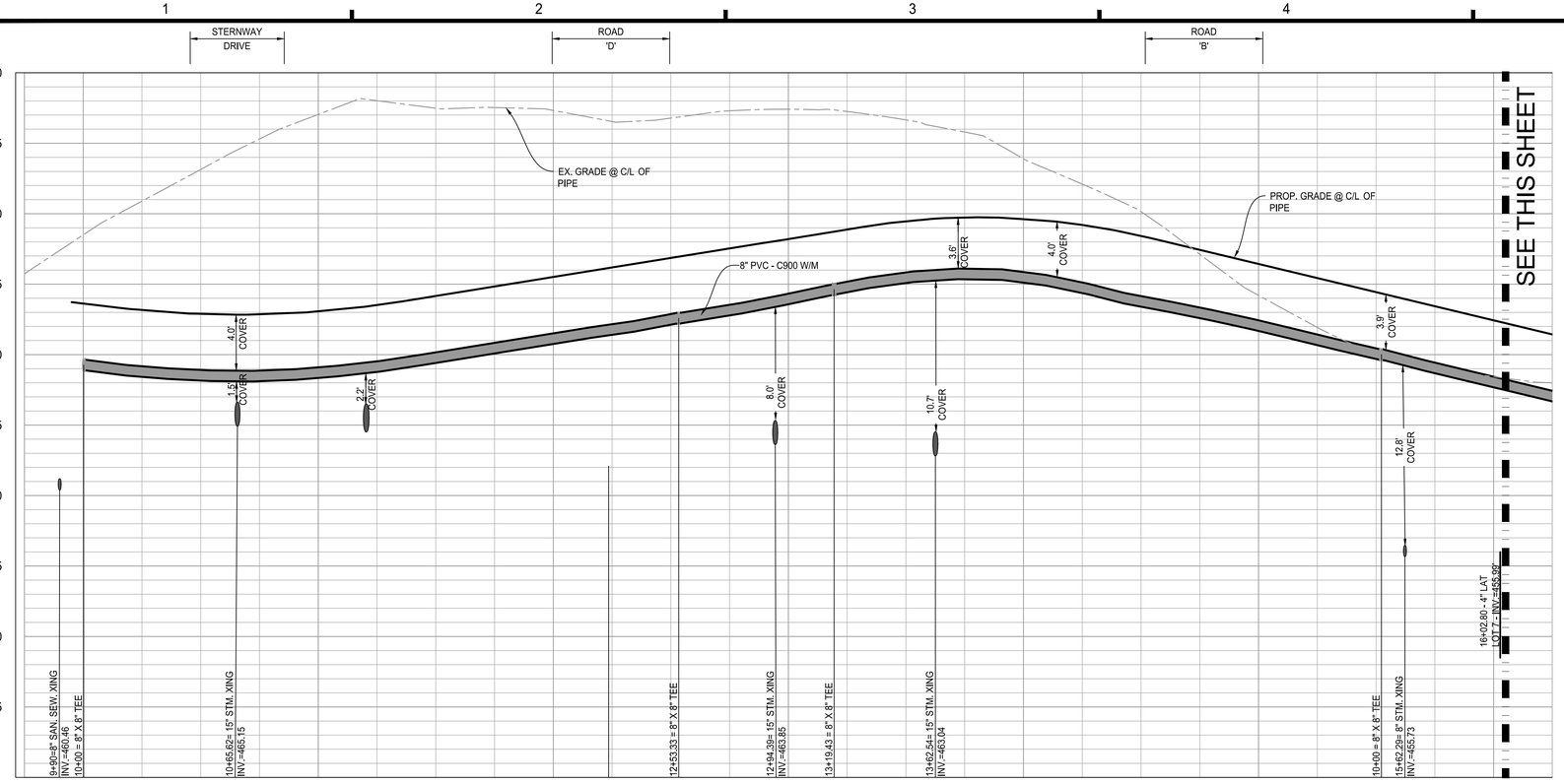

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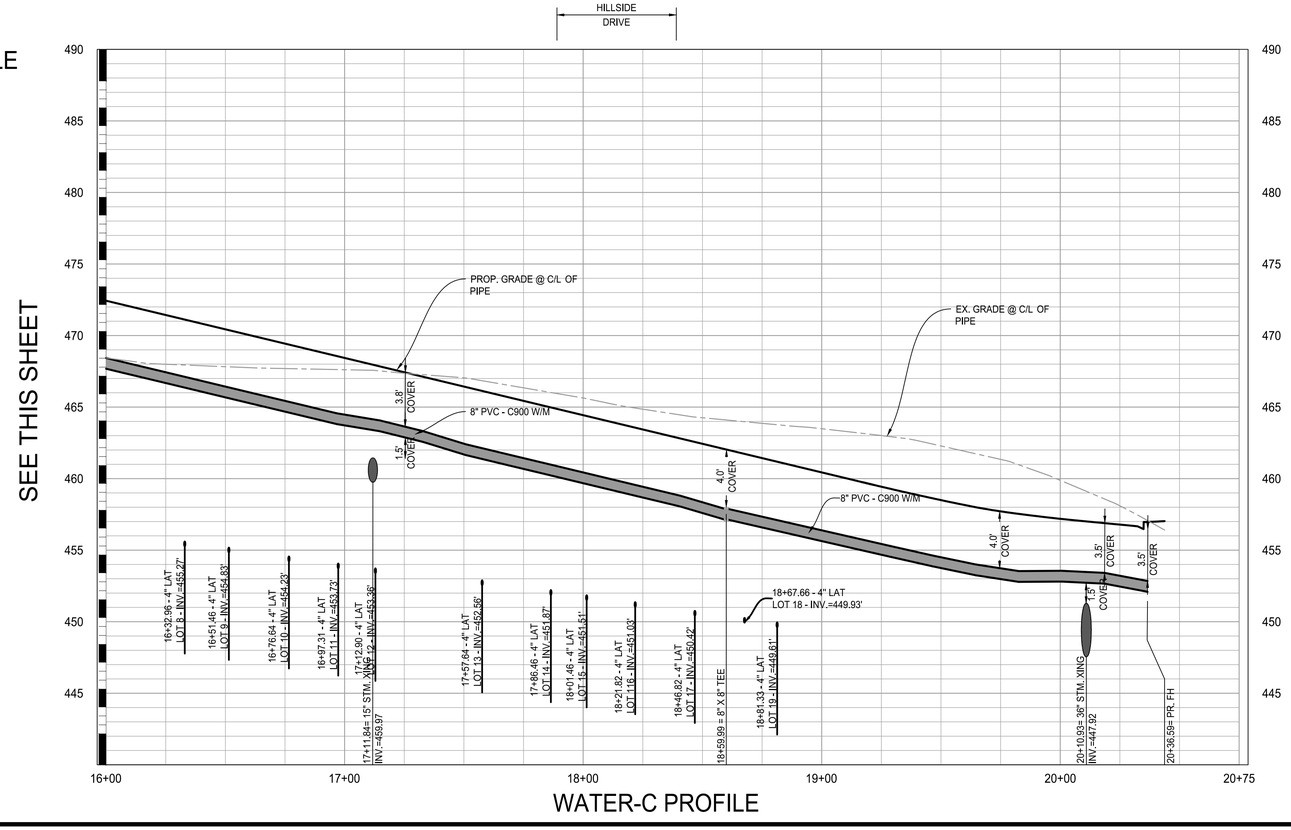
5 2.5 0 5 10
GRAPHIC SCALE
VERTICAL: 1" = 5'

50 25 0 50 100
GRAPHIC SCALE
HORIZONTAL: 1" = 50'

WATER-C PROFILE



WATER-C PROFILE

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PRELIM PLAN - WATERLINE PROFILES HILLSIDE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

WATERLINE PROFILES

SHEET No.

C509

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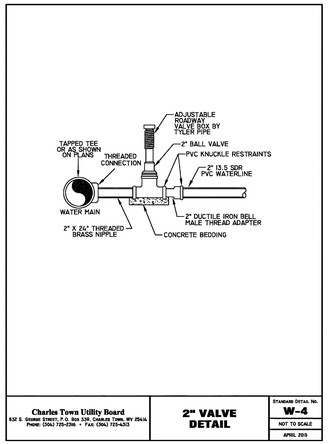
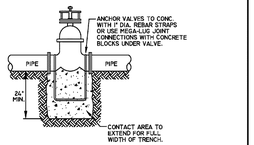
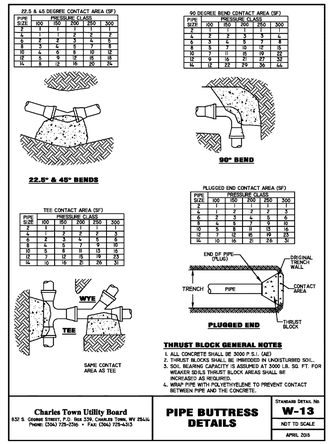


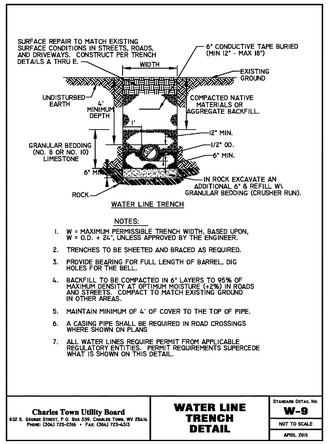
Charles Town Utility Board	2" VALVE DETAIL	Standard Detail No. W-4
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		APRIL 2015



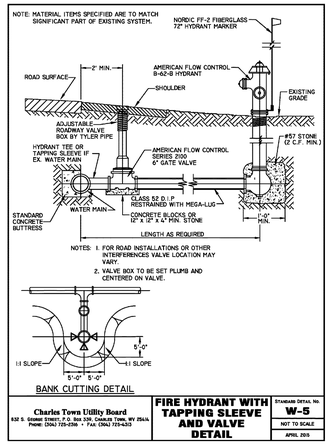
Charles Town Utility Board	WATER VALVES DETAIL	Standard Detail No. W-3
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		APRIL 2015



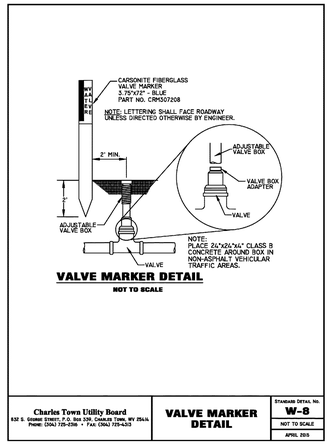
Charles Town Utility Board	PIPE BUTTRESS DETAILS	Standard Detail No. W-13
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		APRIL 2015



Charles Town Utility Board	WATER LINE TRENCH DETAIL	Standard Detail No. W-9
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		APRIL 2015



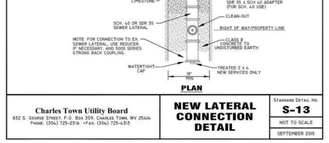
Charles Town Utility Board	FIRE HYDRANT WITH TAPPING SLEEVE AND VALVE DETAIL	Standard Detail No. W-5
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		APRIL 2015



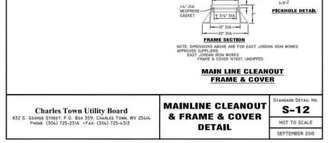
VALVE MARKER DETAIL

NOT TO SCALE

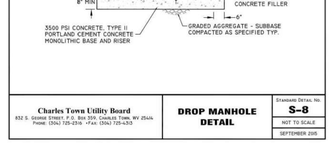
Charles Town Utility Board	VALVE MARKER DETAIL	Standard Detail No. W-8
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		APRIL 2015



Charles Town Utility Board	NEW LATERAL CONNECTION DETAIL	Standard Detail No. S-13
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



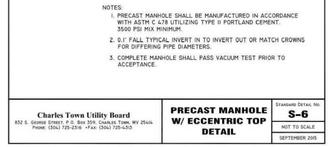
Charles Town Utility Board	MAINLINE CLEANOUT & FRAME & COVER DETAIL	Standard Detail No. S-12
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



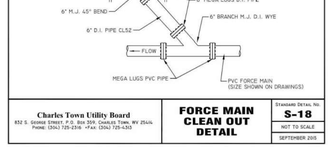
Charles Town Utility Board	DROP MANHOLE DETAIL	Standard Detail No. S-8
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



Charles Town Utility Board	MANHOLE FRAME & COVER ANCHOR FOR FRAME & COVER DETAIL	Standard Detail No. S-7
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



Charles Town Utility Board	PRECAST MANHOLE W/ ECCENTRIC TOP DETAIL	Standard Detail No. S-23
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



Charles Town Utility Board	FORCE MAIN CLEAN OUT DETAIL	Standard Detail No. S-18
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

Charles Town Utility Board	STREAM CROSSING DETAIL	Standard Detail No. W-11
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		APRIL 2015

Charles Town Utility Board	CONCRETE ENCASEMENT DETAIL	Standard Detail No. W-12
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		APRIL 2015

Charles Town Utility Board	FORCE MAIN TRENCH DETAIL	Standard Detail No. S-2
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

Charles Town Utility Board	SEWER LINE TRENCH DETAIL	Standard Detail No. S-1
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

Charles Town Utility Board	AIR RELEASE & VACUUM RELIEF VALVE DETAIL	Standard Detail No. S-22
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

Charles Town Utility Board	FORCE MAIN TO GRAVITY CONNECTION DETAIL	Standard Detail No. S-21
832 S. George Street, P.O. Box 309, Charles Town, WV 25414. Phone: (304) 725-2356 • Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

IMEG
50 Catoctin Circle NE, Suite 210
Leesburg, VA 20176 . P 703.777.2755
engineering • surveying • land planning

PRELIM PLAN - UTILITY DETAILS
HILLSIDE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

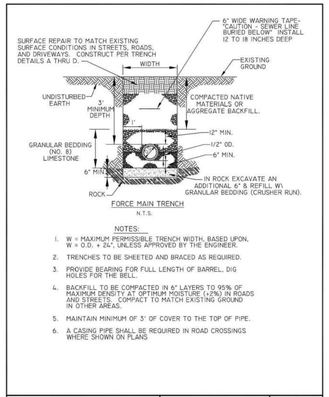
MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
UTILITY DETAILS

SHEET No.
C510

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\CS11 Utility Details.dwg, 2/13/2024 8:28:29 PM, Andrew H. Fraser,



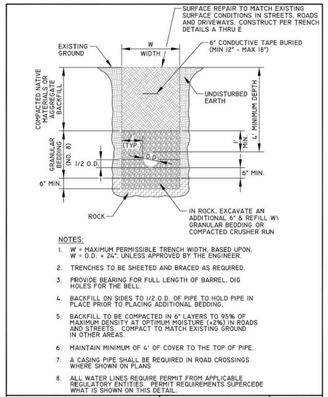
FORCE MAIN TRENCH

N.T.S.

NOTES:

1. W = MAXIMUM PERMISSIBLE TRENCH WIDTH, BASED UPON, W = O.D. + 24", UNLESS APPROVED BY THE ENGINEER.
2. TRENCHES TO BE SHEETED AND BRACED AS REQUIRED.
3. PROVIDE BEARING FOR FULL LENGTH OF BARREL, DIG HOLES FOR THE BELL.
4. BACKFILL TO BE COMPACTED IN 6" LAYERS TO 95% OF MAXIMUM DENSITY AT OPTIMUM MOISTURE (+2%) IN ROADS AND STREETS. COMPACT TO MATCH EXISTING GROUND IN OTHER AREAS.
5. MAINTAIN MINIMUM OF 3' OF COVER TO THE TOP OF PIPE.
6. A CASING PIPE SHALL BE REQUIRED IN ROAD CROSSINGS WHERE SHOWN ON PLANS

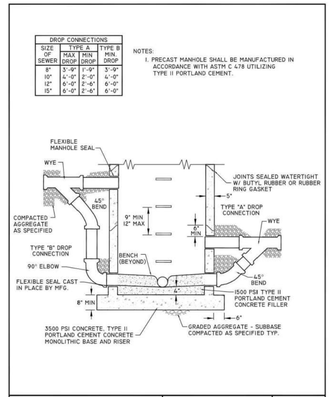
Charles Town Utility Board	FORCE MAIN TRENCH DETAIL	Standard Detail No. S-2
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



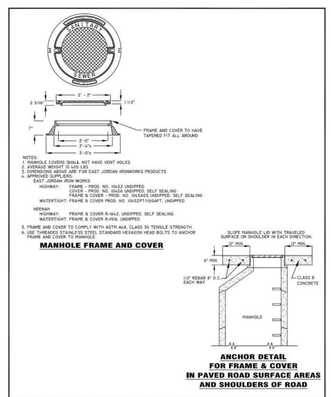
NOTES:

1. W = MAXIMUM PERMISSIBLE TRENCH WIDTH, BASED UPON, W = O.D. + 24", UNLESS APPROVED BY THE ENGINEER.
2. TRENCHES TO BE SHEETED AND BRACED AS REQUIRED.
3. PROVIDE BEARING FOR FULL LENGTH OF BARREL, DIG HOLES FOR THE BELL.
4. BACKFILL ON SIDES TO 1/2 O.D. OF PIPE TO HOLD PIPE IN PLACE PRIOR TO PLACING ADDITIONAL BEDDING.
5. BACKFILL TO BE COMPACTED IN 6" LAYERS TO 95% OF MAXIMUM DENSITY AT OPTIMUM MOISTURE (+2%) IN ROADS AND STREETS. COMPACT TO MATCH EXISTING GROUND IN OTHER AREAS.
6. MAINTAIN MINIMUM OF 4' OF COVER TO THE TOP OF PIPE.
7. A CASING PIPE SHALL BE REQUIRED IN ROAD CROSSINGS WHERE SHOWN ON PLANS.
8. ALL WATER LINES REQUIRE PERMIT FROM APPLICABLE REGULATORY ENTITIES. PERMIT REQUIREMENTS SUPERCEDE WHAT IS SHOWN ON THIS DETAIL.

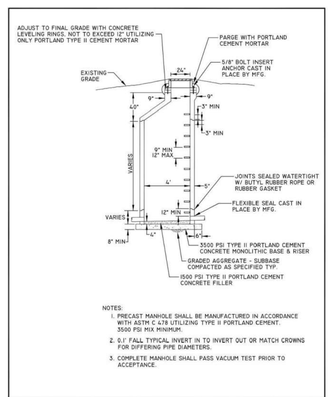
Charles Town Utility Board	SEWER LINE TRENCH DETAIL	Standard Detail No. S-1
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



Charles Town Utility Board	DROP MANHOLE DETAIL	Standard Detail No. S-8
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



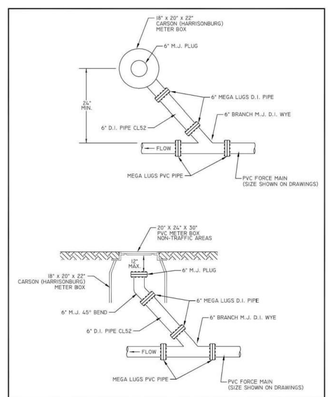
Charles Town Utility Board	MANHOLE FRAME & COVER ANCHOR FOR FRAME & COVER DETAIL	Standard Detail No. S-7
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



NOTES:

1. PRECAST MANHOLE SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM C 478 UTILIZING TYPE II PORTLAND CEMENT. 3500 PSI MIX MINIMUM.
2. 0.1' FALL TYPICAL INVERT IN TO INVERT OUT OR MATCH CROWNS FOR DIFFERING PIPE DIAMETERS.
3. COMPLETE MANHOLE SHALL PASS VACUUM TEST PRIOR TO ACCEPTANCE.

Charles Town Utility Board	PRECAST MANHOLE W/ ECCENTRIC TOP DETAIL	Standard Detail No. S-6
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015



Charles Town Utility Board	FORCE MAIN CLEAN OUT DETAIL	Standard Detail No. S-18
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

Charles Town Utility Board	NEW LATERAL CONNECTION DETAIL	Standard Detail No. S-13
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

Charles Town Utility Board	MAINLINE CLEANOUT & FRAME & COVER DETAIL	Standard Detail No. S-12
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

Charles Town Utility Board	AIR RELEASE & VACUUM RELIEF VALVE DETAIL	Standard Detail No. S-23
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

Charles Town Utility Board	FORCE MAIN TO GRAVITY CONNECTION DETAIL	Standard Detail No. S-21
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

Charles Town Utility Board	FORCEMAIN MANHOLE FORCEMAIN ANCHOR STRAP DETAIL	Standard Detail No. S-9
852 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2516 •Fax: (304) 725-4353		NOT TO SCALE
		SEPTEMBER 2015

IMEG
50 Catoctin Circle NE, Suite 210
Leesburg, VA 20176 P 703.777.2755
engineering • surveying • land planning

PRELIM - UTILITY DETAILS
HILLSIDE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

UTILITY DETAILS

SHEET No.

C511

P:\Projects\22063\001000\112742 Prelim Subdivision - Land Development Plan\C511 Utility Details.dwg, 2/13/2024 8:28:31 PM, Andrew H. Fraser,

STORMWATER MANAGEMENT NARRATIVE

OVERVIEW

HILLSIDE STORMWATER MANAGEMENT (SWM) PLAN.THE PROJECT SITE IS IN CHARLES COUNTY WEST VIRGINIA LOCATED ON THE ADJACENT OF ROUT 340. THE SITE IS 14.474 ACRES, AND THE STORMWATER MANAGEMENT PLANNING AREA IS 14.474 AC THE EXISTING SITE AREA IS UNDEVELOPED AND WITH MOST OF THE AREA BEING OPEN SPACE THE PROJECT SITE WILL BE DEVELOPED INTO A RESIDENTIAL TOWNHOUSES COMMUNITY, WITH ASSOCIATED PARKING AND INFRASTRUCTURE IMPROVEMENTS. THE SITE USE AND ACTIVITIES ASSOCIATED WITH THIS PROJECT WILL NOT STORE, HANDLE, AND/OR DISPENSE PETROLEUM PRODUCTS AND HAZARDOUS SUBSTANCES. THE EXISTING SITE CONSIST OF TYPE "B ,C & D" HYDRAULIC SOILS . THERE ARE NO WETLAND IMPACTS ASSOCIATED WITH THIS DEVELOPMENT.

WATER QUANTITY

THE EXISTING DRAINAGE SYSTEM FLOWS FROM SOUTHWEST TO NORTHEAST AND DRAINS INTO AN EXISTING DITCH OUTFALL THAT IS ADJACENT TO ROUTE 340.

THE PROPOSED DEVELOPMENT AIMS TO MINIMIZE SHEET FLOW RUNOFF BY CAPTURING SITE RUNOFF WITH GRADING OR STORM DRAIN AND DIRECTING IT TO THE PROPOSED POND OR BIORETENTION. THE CONVEYANCE SYSTEM PROTECTION AND FLOOD PROTECTION REQUIREMENTS OF THE WEST VIRGINIA STORMWATER MANAGEMENT MANUAL ARE MET TO SATISFY WATER QUANTITY REQUIREMENTS OF ENERGY BALANCE EQ. REQUIRED FLOW.

THE BIORETENTION POND OUT DRAINS TO AN EXISTING CONCRETE DITCH THAT REACHES DOWNSTREAM OF THE POND A OUTFALL AND ULTIMATELY ENDS UP AT THE SAME LOCATION AS THE POND A OUTFALL. SINCE THE SITE HAS ONLY ONE ULTIMATE OUTFALL, WE CONSIDER ONE WATER ANALYSIS THAT IS LIMITED TO THE SITE BOUNDARY.

THE SITE FLOOD PROTECTION CONCENTRATED OUTFALLS ARE SATISFIED WITH LESS POST CONDITION FLOWS OF 2 AND 10 YEARS THAN PRE CONDITION FLOWS OF 2 AND 10 YEARS.

WATER QUALITY

THE REQUIRED PHOSPHORUS REMOVAL RATE WAS DETERMINED USING THE VIRGINIA RUNOFF REDUCTION METHOD (VRRM) FOR NEW DEVELOPMENTS. THE TOTAL PHOSPHORUS LOAD REDUCTION REQUIRED FOR THIS SITE IS 12.49 POUNDS PER YEAR. VRRM SPREADSHEET COMPUTATIONS PROVIDED ON SHEET C640.

THE TOTAL PHOSPHORUS LOAD REDUCTION REQUIRED FOR THE HILLSIDE DEVELOPMENT IS 10.88 LBS/YEAR. THE PHOSPHORUS REMOVAL WILL BE ACCOMPLISHED USING AN ON-SITE BIORETENTION WITH TP REMOVED 1.52 LB, ONE ON-SITE JELLYFISH FILTERS FROM CONTECH WITH TP REMOVED 3.12 LB, AND WET POND A WITH TP REMOVED 6.24 LB,

SWM/BMP FACILITY NAME	TYPE OF FACILITY	IMPERVIOUS AREA TREATED	LATITUDE	LONGITUDE	DESCRIPTION OF DISCHARGE POINT
POND # A	LEVEL 1 WET POND	5.797 ac.	39.2776050021	-77.8403452014	Principal spillway for the pond is through a riser structure and 30" RCP pipe which then outfalls directly into an existing 60" culvert that crosses under Crosstrail Blvd which then discharged to exisitng natural channel. The pond has no emergency spillway and the 100 year storm will pass through the riser structure while meeting the freeboard requirments.
POND # B	LEVEL 1 BIO POND	1.715 ac.	39.2768390025	-77.8414102356	The principal spillway for the pond is through a riser structure and a 30" rcp pipe. Pond runoff will have outlet protection prior to entering an existing natural channel. The pond has no emergency spillway and the 100 year storm will pass though through the riser structure while meeting the freeboard requiements.
STOM FILTER	MANUFACTURE DTREATMENT DEVICE - FILTERING: JELLYFISH FILTER	5.797 ac.	39.2776050021	-77.8403452014	Outfalls is to a propsed storm drain system that connects into an existing storm drain system located offsite. The existing storm drain system flows into exsiting natural channel.

WATER QUANTITY
CONVEYANCE SYSTEM PROTECTION (CONCENTRATED OUTFALLS)

ENERGY BALANCE - AREA A

$$Q_{Dev.} \leq I.F * (Q_{Pre-Dev.} * Rv_{Pre-Dev.})/Rv_{Dev.}$$

$(Q_{Pre-Dev.}) =$ 9.826 cfs

$(Rv_{Pre-Dev.}) =$ 30,377 cf

$(Rv_{Dev.}) =$ 49,228 cf

$(I.F.) =$ 0.80

$(Q_{Dev.}) \leq$ 4.851 cfs

ENERGY BALANCE SUMMARY TABLE

AREA ID	EX. DA	EX. CN-	EX. Tc	EX. HYD. VOL.	EX Q_1	EX Q_{1MAX}	PR. DA	PR. CN-	PR. Tc	PR. HYD. VOL.	POST Q_1
AREA	**14.474 ac.**	**75**	**15.9 min.**	**30,377.00 cfs**	**9.83 cfs**	**4.85 cfs**	**12.700 ac.**	**83**	**5.0 min.**	**49.16 cfs**	**3.49 cfs**

WATER QUANTITY
FLOOD PROTECTION (CONCENTRATED OUTFALLS)

FLOOD PROTECTION SUMMARY TABLE

AREA ID	EX. DA	EX. CN-	EX. Tc	EX Q_2	EX Q_{10}	EX Q_{25}	PR. DA	PR. CN-	PR. Tc	POST Q_2	POST Q_{10}	POST Q_{25}
AREA	**14.474 ac.**	**75**	**15.9 min.**	**15.32 cfs**	**32.91 cfs**	**45.88 cfs**	**12.700 ac.**	**83**	**5.0 min.**	**4.78 cfs**	**21.04 cfs**	**39.58 cfs**

SWM PRE-DEV. DA SUMMARY TABLE

EXISTING

	A-SOIL	0 SF	0.00 AC.	B-SOIL	139,746 SF	3.21 AC.	C-SOIL	1,976 SF	0.05 AC.	D-SOIL	488,749 SF	11.22 AC.
	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS
				139,746 SF	0 SF	0 SF		1,976 SF		0 SF	481,329 SF	7,420 SF
				3.208 AC.	0.000 AC.	0.000 AC.		0.045 AC.		0.000 AC.	11.050 AC.	0.170 AC.
RCN	30	39	98	55	61	98	70	74	98	77	80	98
Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95
C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9

TOTAL AREA= 630,471 SF OR 14.474 AC.
TOTAL WOODS= 139,746 SF OR 3.208 AC.
TOTAL PERV.= 483,305 SF OR 11.095 AC.
TOTAL IMP.= 7,420 SF OR 0.170 AC.

WOODS= 72
PRE-DEV.= 75
Rv.= 0.21
C-VALUE= 0.3

SWM POST-DEV. DA SUMMARY TABLE

PROPOSED

	A-SOIL	0 SF	0.00 AC.	B-SOIL	139,746 SF	3.21 AC.	C-SOIL	1,976 SF	0.05 AC.	D-SOIL	488,749 SF	11.22 AC.
	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS
					107,814 SF	31,932 SF		1,976 SF			286,301 SF	202,448 SF
					2.475 AC.	0.733 AC.		0.045 AC.			6.573 AC.	4.648 AC.
					77.1%	22.9%		100.0%			58.6%	41.4%
RCN	30	39	98	55	61	98	70	74	98	77	80	98
Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95
C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9

TOTAL AREA= 630,471 SF OR 14.474 AC.
TOTAL WOODS= 0 SF OR 0.000 AC.
TOTAL PERV.= 396,091 SF OR 9.093 AC.
TOTAL IMP.= 234,380 SF OR 5.381 AC.

WOODS= 72
POST-DEV.= 83
Rv.= 0.5
C-VALUE= 0.52

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COMMONWEALTH OF VIRGINIA
CHRISTOPHER H. LEMON
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05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM NARRATIVE

SHEET No.

C600

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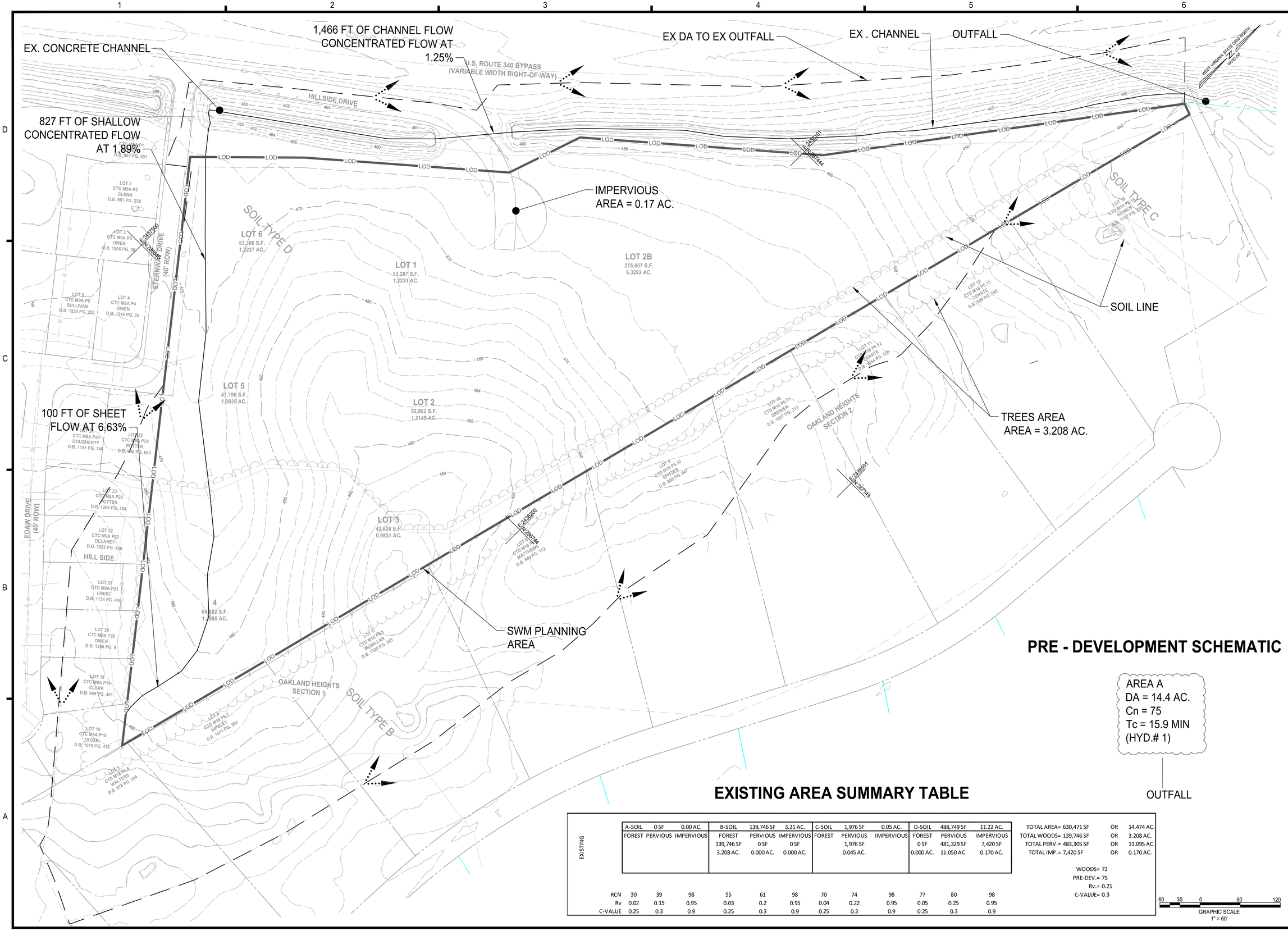

PRE - DEVELOPMENT SCHEMATIC

AREA A
DA = 14.4 AC.
Cn = 75
Tc = 15.9 MIN
(HYD.# 1)

OUTFALL

EXISTING AREA SUMMARY TABLE

EXISTING

A-SOIL	0 SF	0.00 AC.	B-SOIL	139,746 SF	3.21 AC.	C-SOIL	1,976 SF	0.05 AC.	D-SOIL	488,749 SF	11.22 AC.
FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS
			139,746 SF	0 SF	0 SF		1,976 SF		0 SF	481,329 SF	7,420 SF
			3.208 AC.	0.000 AC.	0.000 AC.		0.045 AC.		0.000 AC.	11.050 AC.	0.170 AC.

RCN	30	39	98	55	61	98	70	74	98	77	80	98
Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95
C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9

TOTAL AREA= 630,471 SF OR 14.474 AC.
TOTAL WOODS= 139,746 SF OR 3.208 AC.
TOTAL PERV.= 483,305 SF OR 11.095 AC.
TOTAL IMP.= 7,420 SF OR 0.170 AC.

WOODS= 72
PRE-DEV.= 75
Rv.= 0.21
C-VALUE= 0.3

60 30 0 60 120
GRAPHIC SCALE
1" = 60'

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COMMONWEALTH OF VIRGINIA
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PRELIM PLAN - SWM
PRE-DEVELOPED DRAINAGE AREA MAP
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

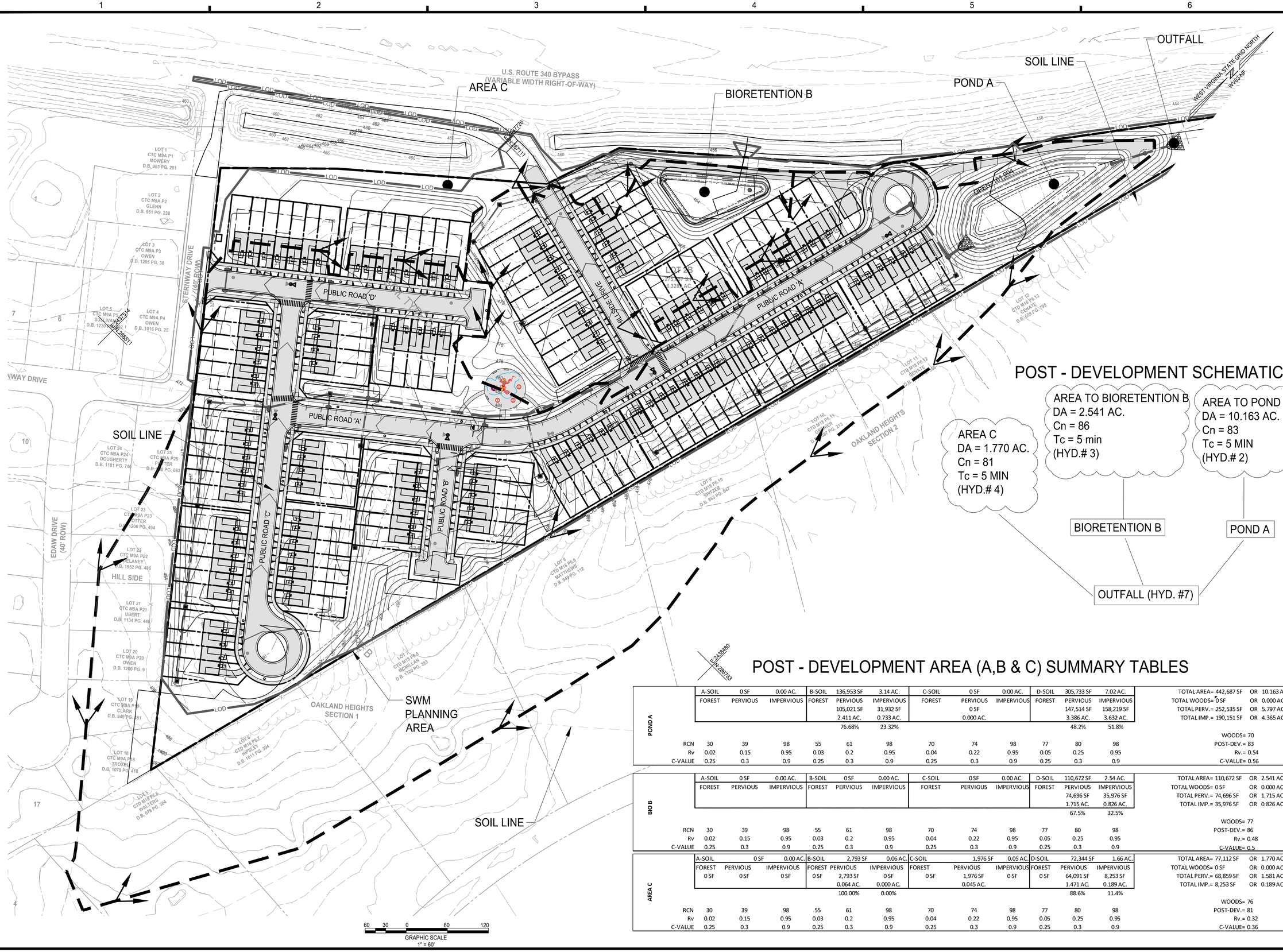
SHEET TITLE:

SWM
PRE-DEVELOPED
DRAINAGE AREA
MAP

SHEET No.

C601

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C601 SWM PRE-DEVELOPED DRAINAGE AREA MAP.dwg, 2/13/2024 8:29:34 PM, Andrew H. Fraser,



POST - DEVELOPMENT SCHEMATIC

AREA C
DA = 1.770 AC.
Cn = 81
Tc = 5 MIN
(HYD.# 4)

AREA TO BIORETENTION B
DA = 2.541 AC.
Cn = 86
Tc = 5 min
(HYD.# 3)

AREA TO POND A
DA = 10.163 AC.
Cn = 83
Tc = 5 MIN
(HYD.# 2)

BIORETENTION B

POND A

OUTFALL (HYD. #7)

POST - DEVELOPMENT AREA (A,B & C) SUMMARY TABLES

POND A

	A-SOIL	0 SF	0.00 AC.	B-SOIL	136,953 SF	3.14 AC.	C-SOIL	0 SF	0.00 AC.	D-SOIL	305,733 SF	7.02 AC.			
	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	TOTAL AREA=	442,687 SF	OR 10.163 AC.
					105,021 SF	31,932 SF		0 SF			147,514 SF	158,219 SF	TOTAL PERV.=	252,535 SF	OR 5.797 AC.
					2.411 AC.	0.733 AC.		0.000 AC.			3.386 AC.	3.632 AC.	TOTAL IMP.=	190,151 SF	OR 4.365 AC.
					76.68%	23.32%					48.2%	51.8%			
RCN	30	39	98	55	61	98	70	74	98	77	80	98	WOODS=	70	
Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95	POST-DEV.=	83	
C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	Rv.=	0.54	
													C-VALUE=	0.56	

BIO B

	A-SOIL	0 SF	0.00 AC.	B-SOIL	0 SF	0.00 AC.	C-SOIL	0 SF	0.00 AC.	D-SOIL	110,672 SF	2.54 AC.			
	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	TOTAL AREA=	110,672 SF	OR 2.541 AC.
											74,696 SF	35,976 SF	TOTAL WOODS=	0 SF	OR 0.000 AC.
											1.715 AC.	0.826 AC.	TOTAL PERV.=	74,696 SF	OR 1.715 AC.
											67.5%	32.5%	TOTAL IMP.=	35,976 SF	OR 0.826 AC.
RCN	30	39	98	55	61	98	70	74	98	77	80	98	WOODS=	77	
Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95	POST-DEV.=	86	
C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	Rv.=	0.48	
													C-VALUE=	0.5	

AREA C

	A-SOIL	0 SF	0.00 AC.	B-SOIL	2,793 SF	0.06 AC.	C-SOIL	1,976 SF	0.05 AC.	D-SOIL	72,344 SF	1.66 AC.			
	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	TOTAL AREA=	77,112 SF	OR 1.770 AC.
	0 SF	0 SF	0 SF	0 SF	2,793 SF	0 SF	0 SF	1,976 SF	0 SF	0 SF	64,091 SF	8,253 SF	TOTAL WOODS=	0 SF	OR 0.000 AC.
					0.064 AC.	0.000 AC.		0.045 AC.			1.471 AC.	0.189 AC.	TOTAL PERV.=	68,859 SF	OR 1.581 AC.
					100.00%	0.00%					88.6%	11.4%	TOTAL IMP.=	8,253 SF	OR 0.189 AC.
RCN	30	39	98	55	61	98	70	74	98	77	80	98	WOODS=	76	
Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95	POST-DEV.=	81	
C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	Rv.=	0.32	
													C-VALUE=	0.36	

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PRELIM PLAN - SWM
POST-DEVELOPED DRAINAGE AREA MAP

691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM POST-DEVELOPED DRAINAGE AREA MAP

SHEET No.

C602

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C602 SWM POST-DEVELOPED DRAINAGE AREA MAP.dwg, 2/13/2024 8:30:57 PM, Andrew H. Fraser,

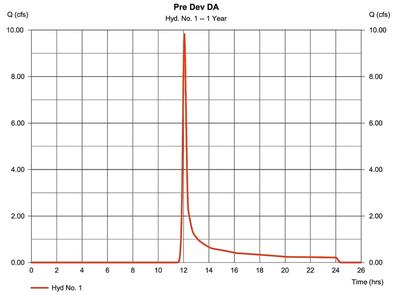
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Monday, 10 / 16 / 2023

Hyd. No. 1

Pre Dev DA

Hydrograph type	= SCS Runoff	Peak discharge	= 9.826 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 30,377 cuft
Drainage area	= 14.474 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.90 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



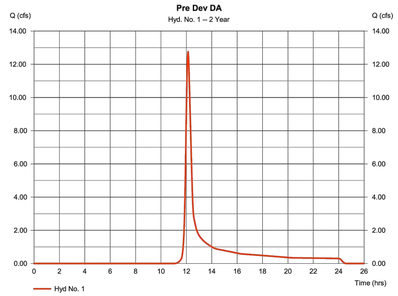
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 1

Pre Dev DA

Hydrograph type	= SCS Runoff	Peak discharge	= 12.76 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 47,233 cuft
Drainage area	= 14.474 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.90 min
Total precip.	= 2.88 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



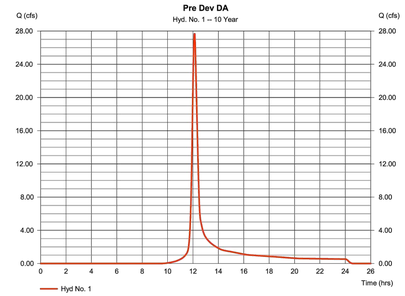
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 1

Pre Dev DA

Hydrograph type	= SCS Runoff	Peak discharge	= 27.67 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 97,231 cuft
Drainage area	= 14.474 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 20.90 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



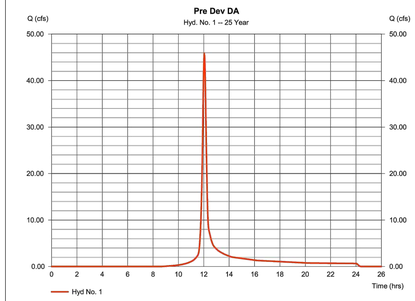
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Monday, 10 / 16 / 2023

Hyd. No. 1

Pre Dev DA

Hydrograph type	= SCS Runoff	Peak discharge	= 45.88 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 128,801 cuft
Drainage area	= 14.474 ac	Curve number	= 75
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= TR55	Time of conc. (Tc)	= 15.90 min
Total precip.	= 5.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



EXISTING T_C COMPUTATION

TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No. 1

Pre Dev DA

Description	A	B	C	Totals
Sheet Flow				
Manning's n-value	= 0.150	0.011	0.011	
Flow length (ft)	= 100.0	0.0	0.0	
Two-year 24-hr precip. (in)	= 2.88	0.00	0.00	
Land slope (%)	= 6.63	0.00	0.00	
Travel Time (min)	**= 6.39 +**	**0.00 +**	**0.00 =**	**6.39**
Shallow Concentrated Flow				
Flow length (ft)	= 827.00	0.00	0.00	
Watercourse slope (%)	= 1.89	0.00	0.00	
Surface description	= Unpaved	Paved	Paved	
Average velocity (ft/s)	=2.22	0.00	0.00	
Travel Time (min)	**= 6.21 +**	**0.00 +**	**0.00 =**	**6.21**
Channel Flow				
X sectional flow area (sqft)	= 4.50	0.00	0.00	
Wetted perimeter (ft)	= 10.24	0.00	0.00	
Channel slope (%)	= 1.25	0.00	0.00	
Manning's n-value	= 0.013	0.015	0.015	
Velocity (ft/s)	=7.39			
		0.00		
			0.00	
Flow length (ft)	({0})1466.0	0.0	0.0	
Travel Time (min)	**= 3.31 +**	**0.00 +**	**0.00 =**	**3.31**

Total Travel Time, Tc ..... 15.92 min

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05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM
PRE-DEVELOPED
HYDROGRAPHS

SHEET No.
C610

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Hydrograph Report

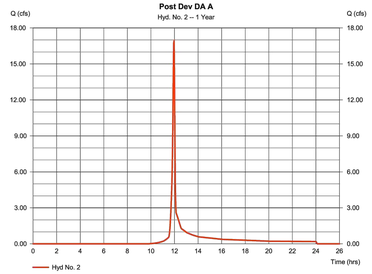
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 2

Post Dev DA A

Hydrograph type	= SCS Runoff	Peak discharge	= 16.94 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 33,926 cuft
Drainage area	= 10.163 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 55) + (4.440 x 61) + (6.280 x 80) + (0.780 x 98) + (3.240 x 98)] / 10.163



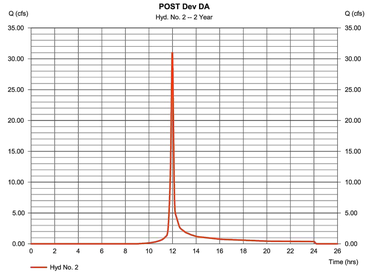
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 2

POST Dev DA

Hydrograph type	= SCS Runoff	Peak discharge	= 30.99 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 70,961 cuft
Drainage area	= 14.474 ac	Curve number	= 83
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 8.00 min
Total precip.	= 2.88 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

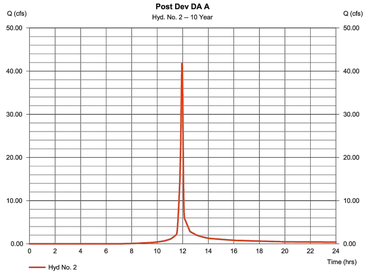
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 18 / 2023

Hyd. No. 2

Post Dev DA A

Hydrograph type	= SCS Runoff	Peak discharge	= 41.79 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 85,105 cuft
Drainage area	= 10.163 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 55) + (4.440 x 61) + (6.280 x 80) + (0.780 x 98) + (3.240 x 98)] / 10.163



Hydrograph Report

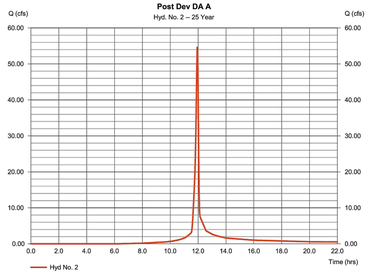
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 2

Post Dev DA A

Hydrograph type	= SCS Runoff	Peak discharge	= 54.60 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 112,286 cuft
Drainage area	= 10.163 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 55) + (4.440 x 61) + (6.280 x 80) + (0.780 x 98) + (3.240 x 98)] / 10.163



Hydrograph Report

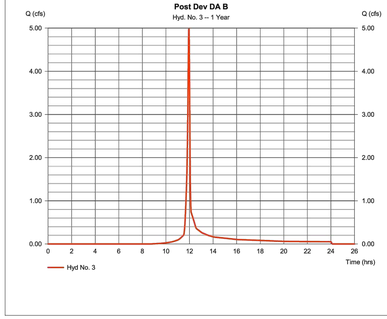
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 3

Post Dev DA B

Hydrograph type	= SCS Runoff	Peak discharge	= 4.978 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 10,051 cuft
Drainage area	= 2.541 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 55) + (0.310 x 61) + (1.300 x 80) + (0.790 x 98)] / 2.541



Hydrograph Report

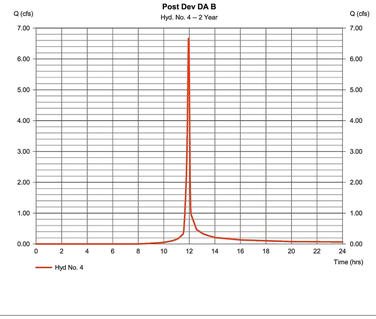
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 4

Post Dev DA B

Hydrograph type	= SCS Runoff	Peak discharge	= 6.661 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 13,491 cuft
Drainage area	= 2.541 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.88 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 55) + (0.310 x 61) + (1.300 x 80) + (0.790 x 98)] / 2.541



Hydrograph Report

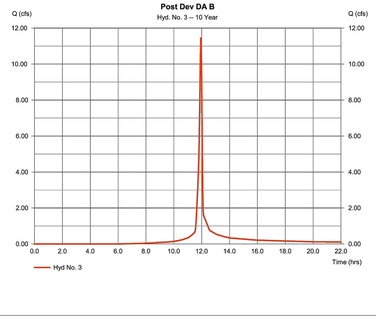
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Friday, 10 / 20 / 2023

Hyd. No. 3

Post Dev DA B

Hydrograph type	= SCS Runoff	Peak discharge	= 11.45 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 23,591 cuft
Drainage area	= 2.541 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 55) + (0.310 x 61) + (1.300 x 80) + (0.790 x 98)] / 2.541



Hydrograph Report

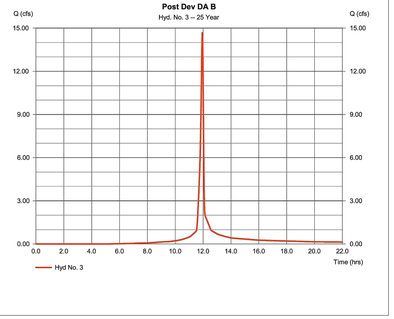
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 3

Post Dev DA B

Hydrograph type	= SCS Runoff	Peak discharge	= 14.67 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 30,627 cuft
Drainage area	= 2.541 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 55) + (0.310 x 61) + (1.300 x 80) + (0.790 x 98)] / 2.541



Hydrograph Report

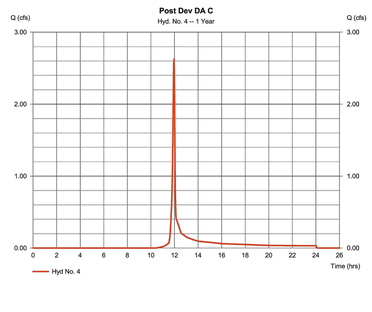
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 4

Post Dev DA C

Hydrograph type	= SCS Runoff	Peak discharge	= 2.626 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 5,251 cuft
Drainage area	= 1.770 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.827 x 98) + (5.986 x 80)] / 1.770



Hydrograph Report

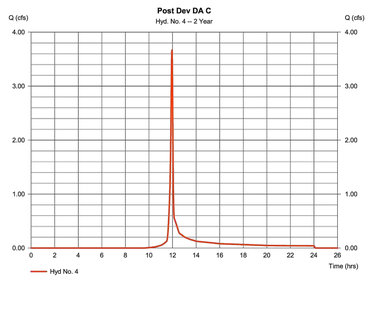
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 18 / 2023

Hyd. No. 4

Post Dev DA C

Hydrograph type	= SCS Runoff	Peak discharge	= 3.670 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 7,360 cuft
Drainage area	= 1.770 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.88 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.827 x 98) + (5.986 x 80)] / 1.770



Hydrograph Report

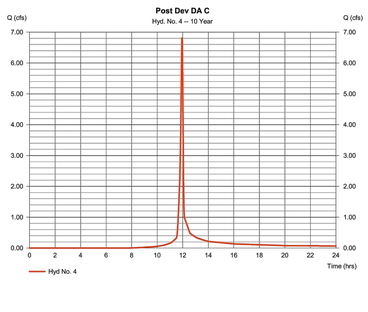
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 4

Post Dev DA C

Hydrograph type	= SCS Runoff	Peak discharge	= 6.810 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 13,798 cuft
Drainage area	= 1.770 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.827 x 98) + (5.986 x 80)] / 1.770



Hydrograph Report

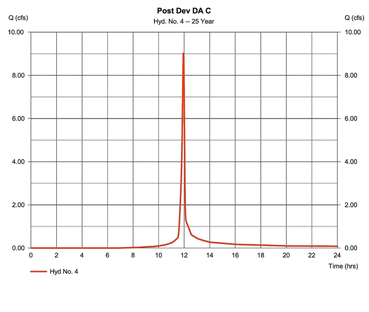
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 4

Post Dev DA C

Hydrograph type	= SCS Runoff	Peak discharge	= 9.017 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 18,409 cuft
Drainage area	= 1.770 ac	Curve number	= 81*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.827 x 98) + (5.986 x 80)] / 1.770



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COMMONWEALTH OF VIRGINIA
CHRISTOPHER H. LEMON
Lic. No. 047091
05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM POST-DEVELOPED HYDROGRAPHS AREA A

SHEET No.

C620

P:\Projects\22063\001\001112742 Prelim Subdivision - Land Development Plan\C620 SWM POST-DEVELOPED HYDROGRAPHS AREA A.dwg, 2/13/2024 8:31:41 PM, Andrew H. Fraser,

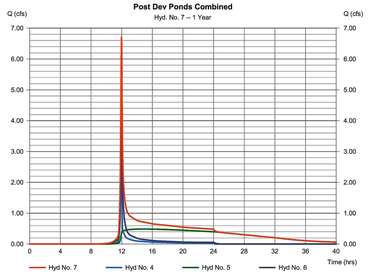
CONTROLLED 1-YEAR

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 7

Post Dev Ponds Combined

Hydrograph type	= Combine	Peak discharge	= 6.710 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 49,196 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 1.770 ac



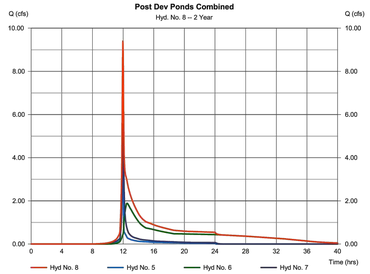
CONTROLLED 2-YEAR

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 8

Post Dev Ponds Combined

Hydrograph type	= Combine	Peak discharge	= 9.397 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 67,488 cuft
Inflow hyds.	= 5, 6, 7	Contrib. drain. area	= 1.770 ac



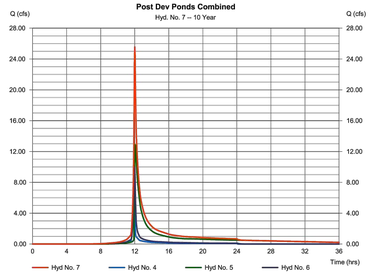
CONTROLLED 10-YEAR

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 7

Post Dev Ponds Combined

Hydrograph type	= Combine	Peak discharge	= 25.55 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 122,462 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 1.770 ac



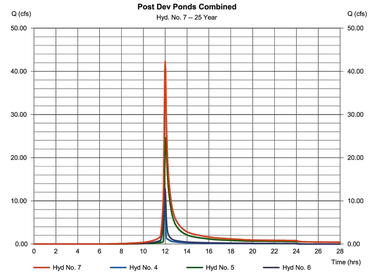
CONTROLLED 25-YEAR

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 7

Post Dev Ponds Combined

Hydrograph type	= Combine	Peak discharge	= 42.28 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 161,289 cuft
Inflow hyds.	= 4, 5, 6	Contrib. drain. area	= 1.770 ac



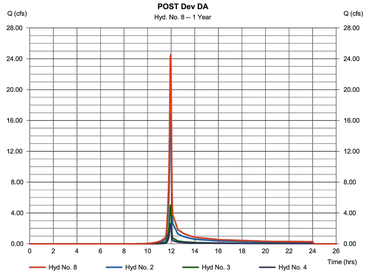
UNCONTROLLED 1-YEAR

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 8

POST Dev DA

Hydrograph type	= Combine	Peak discharge	= 24.53 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 49,228 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 14.474 ac



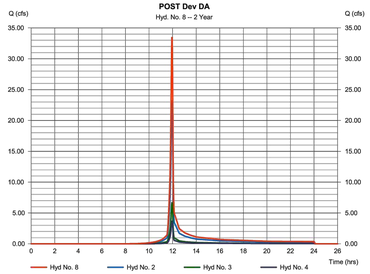
UNCONTROLLED 2-YEAR

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 18 / 2023

Hyd. No. 8

POST Dev DA

Hydrograph type	= Combine	Peak discharge	= 33.43 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 67,563 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 14.474 ac



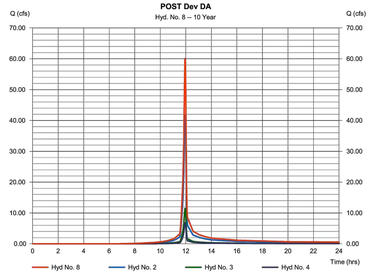
UNCONTROLLED 10-YEAR

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 8

POST Dev DA

Hydrograph type	= Combine	Peak discharge	= 60.05 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 122,494 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 14.474 ac



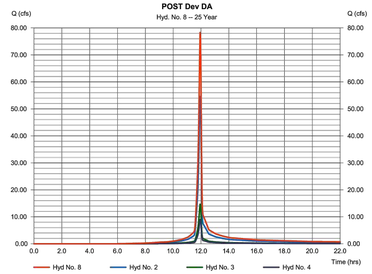
UNCONTROLLED 25-YEAR

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 8

POST Dev DA

Hydrograph type	= Combine	Peak discharge	= 78.29 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 161,321 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 14.474 ac



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COMMONWEALTH OF VIRGINIA
CHRISTOPHER H. LEMON
Lic. No. 047091
05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

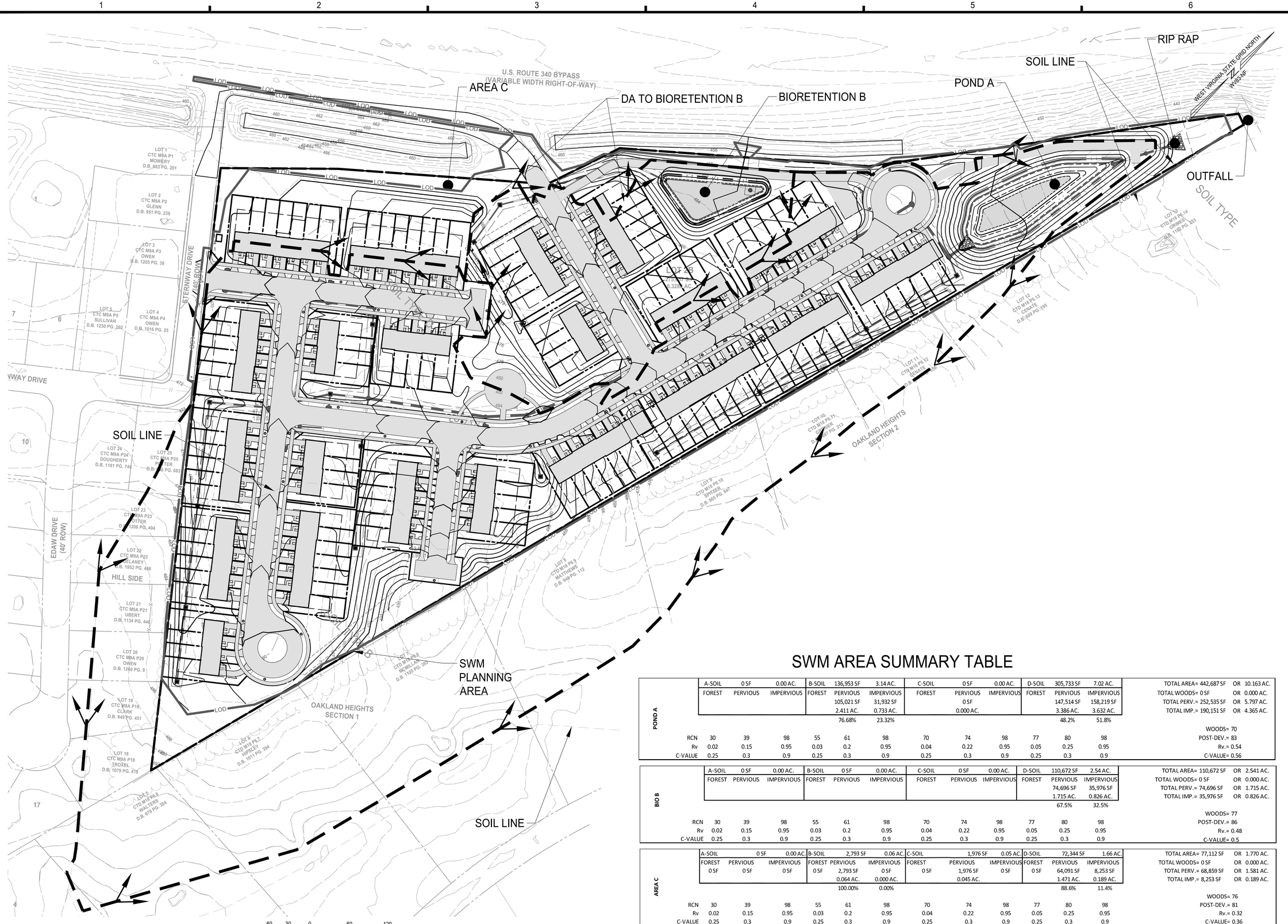
SHEET TITLE:

SWM POST-DEVELOPED HYDROGRAPHS AREA B

SHEET No.

C621

P:\Projects\22063\001\001112742 Prelim Subdivision - Land Development Plan\C621 SWM POST-DEVELOPED HYDROGRAPHS AREA B.dwg, 2/13/2024 8:32:08 PM, Andrew H. Fraser,



SWM AREA SUMMARY TABLE

POND A	A-SOIL	0 SF	0.00 AC.	B-SOIL	136,953 SF	3.14 AC.	C-SOIL	0 SF	0.00 AC.	D-SOIL	305,733 SF	7.02 AC.	TOTAL AREA= 442,687 SF	OR	10.163 AC.
	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	TOTAL WOODS= 0 SF	OR	0.000 AC.
					105,021 SF	31,932 SF		0 SF			147,514 SF	158,219 SF	TOTAL PERV.= 252,535 SF	OR	5.797 AC.
					2.411 AC.	0.733 AC.		0.000 AC.			3.386 AC.	3.632 AC.	TOTAL IMP.= 190,151 SF	OR	4.365 AC.
					76.68%	23.32%					48.2%	51.8%			
	RCN	30	39	98	55	61	98	70	74	98	77	80	98	WOODS= 70	
	Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95	POST-DEV.= 83	
	C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	Rv.= 0.54	
														C-VALUE= 0.56	

BIO B	A-SOIL	0 SF	0.00 AC.	B-SOIL	0 SF	0.00 AC.	C-SOIL	0 SF	0.00 AC.	D-SOIL	110,672 SF	2.54 AC.	TOTAL AREA= 110,672 SF	OR	2.541 AC.
	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	TOTAL WOODS= 0 SF	OR	0.000 AC.
											74,696 SF	35,976 SF	TOTAL PERV.= 74,696 SF	OR	1.715 AC.
											1.715 AC.	0.826 AC.	TOTAL IMP.= 35,976 SF	OR	0.826 AC.
											67.5%	32.5%			
	RCN	30	39	98	55	61	98	70	74	98	77	80	98	WOODS= 77	
	Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95	POST-DEV.= 86	
	C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	Rv.= 0.48	
														C-VALUE= 0.5	

AREA C	A-SOIL	0 SF	0.00 AC.	B-SOIL	2,793 SF	0.06 AC.	C-SOIL	1,976 SF	0.05 AC.	D-SOIL	72,344 SF	1.66 AC.	TOTAL AREA= 77,112 SF	OR	1.770 AC.
	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	TOTAL WOODS= 0 SF	OR	0.000 AC.
	0 SF	0 SF	0 SF	0 SF	2,793 SF	0 SF	0 SF	1,976 SF	0 SF	0 SF	64,091 SF	8,253 SF	TOTAL PERV.= 68,859 SF	OR	1.581 AC.
					0.064 AC.	0.000 AC.		0.045 AC.			1.471 AC.	0.189 AC.	TOTAL IMP.= 8,253 SF	OR	0.189 AC.
					100.00%	0.00%					88.6%	11.4%			
	RCN	30	39	98	55	61	98	70	74	98	77	80	98	WOODS= 76	
	Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95	POST-DEV.= 81	
	C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	Rv.= 0.32	
														C-VALUE= 0.36	

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PRELIM PLAN - SWM BMP MAP
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM BMP MAP

SHEET No.

C630

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C630 SWM BMP MAP.dwg, 2/13/2024 8:33:33 PM, Andrew H. Fraser,

Project Name:	Hillside
Date:	8/1/2023

BMP Design Specifications List: 2013 Draft Stds & Specs

CLEAR ALL *(Ctrl+Shift+R)*

data input cells
constant values
calculation cells
final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be		2.48	0.05	6.57	9.09
Impervious Cover (acres)		0.73		4.65	5.38
					14.47

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	**10.62**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary	
Forest/Open Space Cover (acres)	0.00
Weighted Rv (forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	9.09
Weighted Rv (turf)	0.24
% Managed Turf	63%
Impervious Cover (acres)	5.38
Rv (impervious)	0.95
% Impervious	37%
Site Area (acres)	**14.47**
Site Rv	**0.50**

Treatment Volume and Nutrient Loads	
Treatment Volume (acre-ft)	0.6050
Treatment Volume (cubic feet)	26,354
TP Load (lb/yr)	16.56
TN Load (lb/yr) (Informational Purposes Only)	118.46

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft³)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	**1.715**	**0.826**	**4,404.82**	**0.00**	**2.76**	**1.52**	**1.24**	

Total Impervious Cover Treated (acres)	0.83
Total Turf Area Treated (acres)	1.72
Total TP Load Reduction Achieved in D.A. (lb/yr)	1.52
Total TN Load Reduction Achieved in D.A. (lb/yr)	12.66

DEQ Virginia Runoff Reduction Method New Development Compliance Spreadsheet - Version 3.0

BMP Design Specifications List: **2013 Draft Stds & Specs**

Update Summary Sheet

Print Preview | Print

Site Summary

Project Title: Hillside
Date: 45139

Total Rainfall = 43 inches

Site Land Cover Summary

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	2.48	0.05	6.57	9.09	63
Impervious Cover (acres)	0.00	0.73	0.00	4.65	5.38	37
					14.47	100

Site Tv and Land Cover Nutrient Loads

Site Rv	0.50
Treatment Volume (ft³)	26,354
TP Load (lb/yr)	16.56
TN Load (lb/yr)	118.46
Total TP Load Reduction Required (lb/yr)	10.62

Site Compliance Summary

Total Runoff Volume Reduction (ft³)	1,762
Total TP Load Reduction Achieved (lb/yr)	10.88
Total TN Load Reduction Achieved (lb/yr)	39.43
Remaining Post Development TP Load (lb/yr)	5.68
Remaining TP Load Reduction (lb/yr) Required	0.00

** TARGET TP REDUCTION EXCEEDED BY 0.25 LB/YEAR **

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	5.80	1.72	0.00	0.00	0.00	7.51
Impervious Cover (acres)	4.37	0.83	0.00	0.00	0.00	5.19
Total Area (acres)	**10.16**	**2.54**	**0.00**	**0.00**	**0.00**	**12.70**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	9.36	1.52	0.00	0.00	0.00	10.88
TN Load Reduced (lb/yr)	26.77	12.66	0.00	0.00	0.00	39.43

Drainage Area A Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	2.41	0.00	3.39	5.80	57
Impervious Cover (acres)	0.00	0.73	0.00	3.63	4.37	43
					10.16	

BMP Selections

Practice	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft³)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed
13.a. Wet Pond #1 (Spec #14)	**5.797**	**4.365**	**19,875.88**	**0.00**	**12.47**	**6.24**	**6.24**	**14.b. MTD - Filtering**
14.b. Manufactured Treatment Device-Filtering			**19,875.88**	**6.24**	**0.00**	**3.12**	**3.12**	

Total Impervious Cover Treated (acres)	4.37
Total Turf Area Treated (acres)	5.80
Total TP Load Reduction Achieved in D.A. (lb/yr)	9.36
Total TN Load Reduction Achieved in D.A. (lb/yr)	26.77

Drainage Area B Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	1.72	1.72	67
Impervious Cover (acres)	0.00	0.00	0.00	0.83	0.83	33
					2.54	

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05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM BMP COMPUTATIONS

SHEET No.

C640

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Drainage Area A

Drainage Area A Land Cover (acres)

CLEAR BMP AREAS

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)		2.41		3.39	5.80	0.23
Impervious Cover (acres)		0.73		3.63	4.37	0.95
				Total	10.16	

Total Phosphorus Available for Removal in D.A. A (lb/yr)	12.49
Post Development Treatment Volume in D.A. A (ft^3)	19,876

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists-

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
13. Wet Ponds (no RR)													
13.a. Wet Pond #1 (Spec #14)	0	5.80	4.37	0	0	19,876	19,876	50	0.00	12.47	6.24	6.24	14.b. MTD - Filtering
13.b. Wet Pond #1 (Coastal Plain) (Spec #14)	0			0	0	0	0	45	0.00	0.00	0.00	0.00	
13.c. Wet Pond #2 (Spec #14)	0			0	0	0	0	75	0.00	0.00	0.00	0.00	
13.d. Wet Pond #2 (Coastal Plain) (Spec #14)	0			0	0	0	0	65	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0			19,876	0	19,876	19,876	50	6.24	0.00	3.12	3.12	
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

Drainage Area B

Drainage Area A Land Cover (acres)

CLEAR BMP AREAS

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				1.72	1.72	0.25
Impervious Cover (acres)				0.83	0.83	0.95
				Total	2.54	

Total Phosphorus Available for Removal in D.A. B (lb/yr)	2.77
Post Development Treatment Volume in D.A. B (ft^3)	4,405

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists-

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	1.72	0.83	0	1,762	2,643	4,405	25	0.00	2.76	1.52	1.24	
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	

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HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM BMP COMPUTATIONS

SHEET No.

C641

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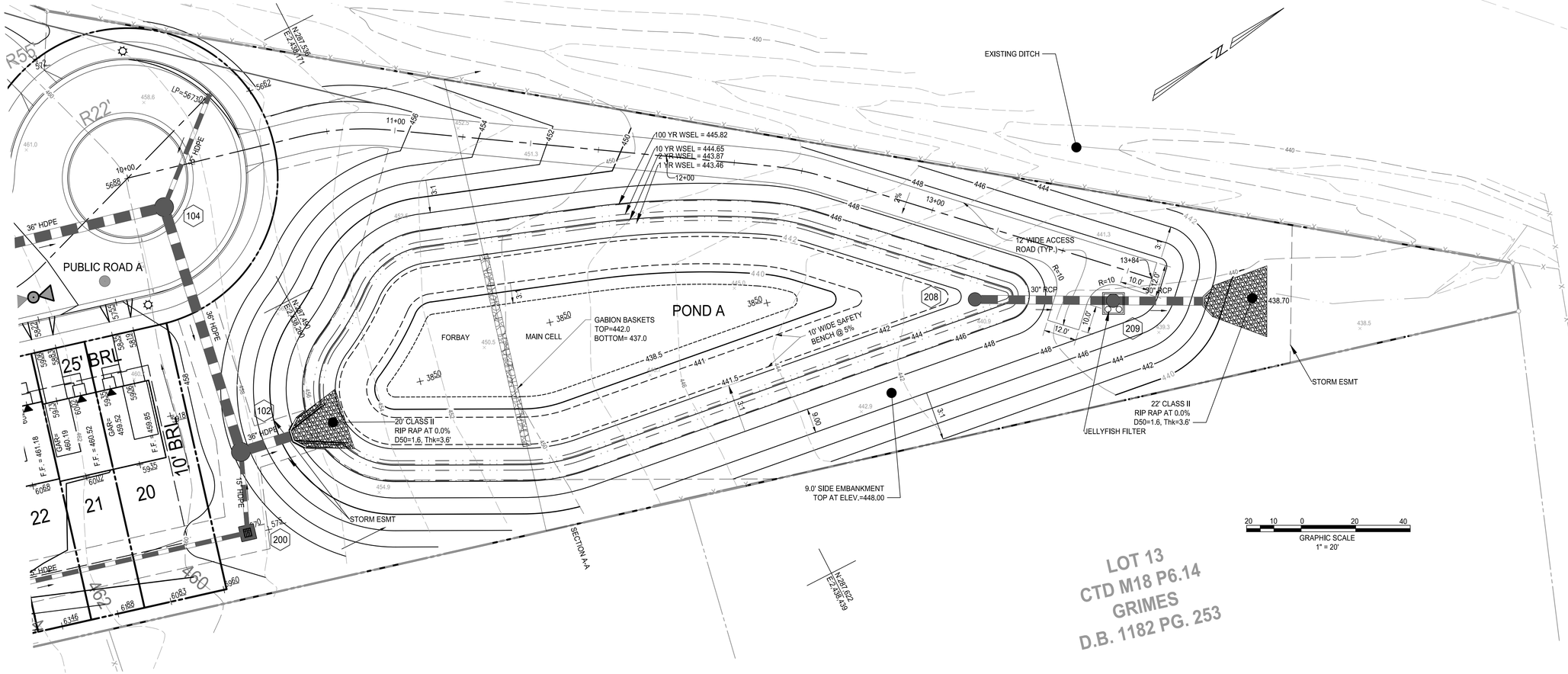

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HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

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DRAWING No.: 112742
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CHECKED: SK

SHEET TITLE:

SWM POND A

SHEET No.

C650

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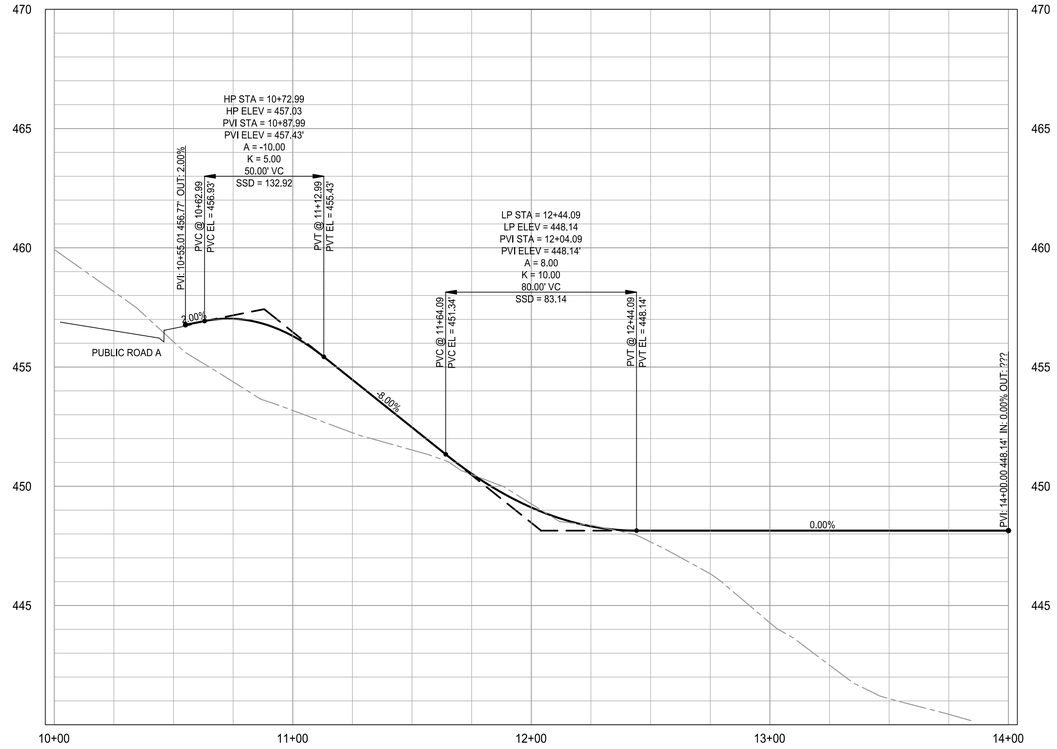
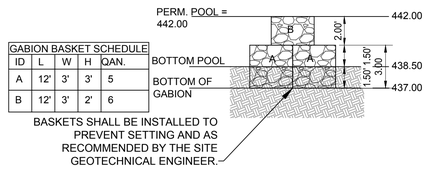
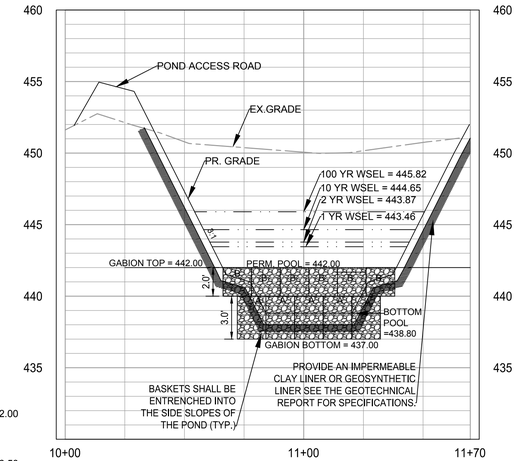
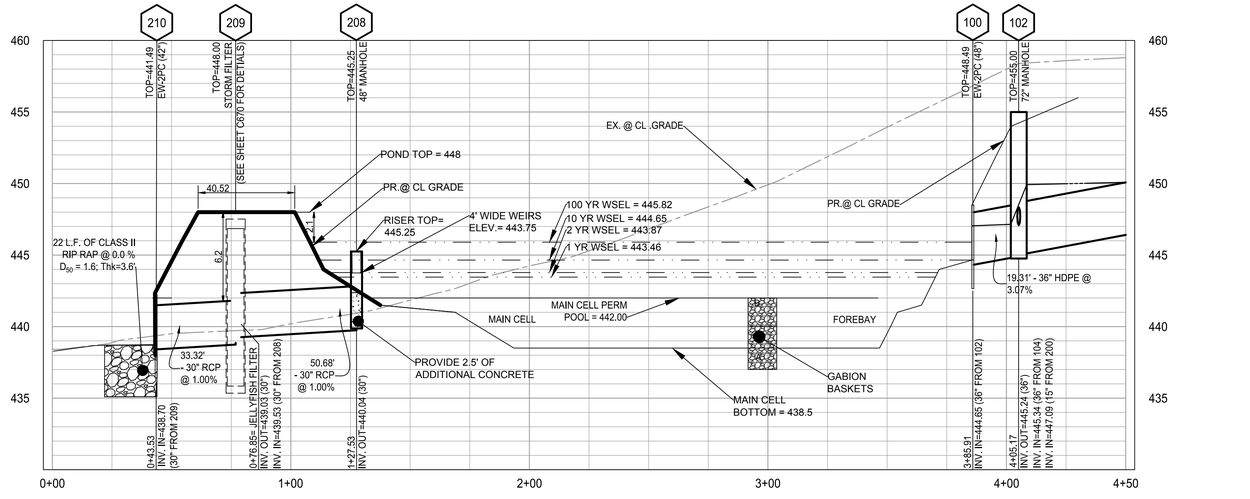


SWM POND A ACCESS PROFILE





POND A SECTION A-A PROFILE



POND A OUTFALL PROFILE

50 25 0 50 100
HORIZONTAL SCALE
1" = 50'

5 2.5 0 5 10
VERTICAL SCALE
1" = 5'

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691/432 MAP 9 PARCEL 67
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DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM POND A PROFILES

SHEET No.
C651

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POND INFLOW HYDROGRAPH 1-YEAR

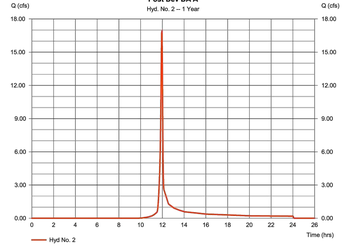
Hydroflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 2

Post Dev DA A

Hydrograph type	= SCS Runoff	Peak discharge	= 16.94 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 33,926 cuft
Drainage area	= 10.163 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 55) + (4.440 x 61) + (6.280 x 80) + (0.780 x 98) + (3.240 x 98)] / 10.163



POND INFLOW HYDROGRAPH 2-YEAR

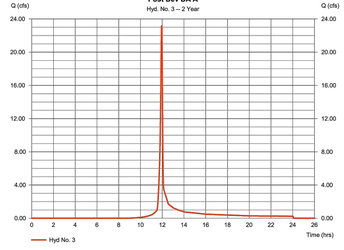
Hydroflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 3

Post Dev DA A

Hydrograph type	= SCS Runoff	Peak discharge	= 23.16 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 46,711 cuft
Drainage area	= 10.163 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.88 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 55) + (4.440 x 61) + (6.280 x 80) + (0.780 x 98) + (3.240 x 98)] / 10.163



POND INFLOW HYDROGRAPH 10-YEAR

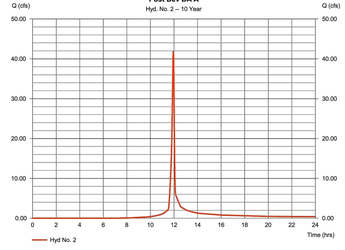
Hydroflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 2

Post Dev DA A

Hydrograph type	= SCS Runoff	Peak discharge	= 41.79 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 85,105 cuft
Drainage area	= 10.163 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 55) + (4.440 x 61) + (6.280 x 80) + (0.780 x 98) + (3.240 x 98)] / 10.163



POND INFLOW HYDROGRAPH 25-YEAR

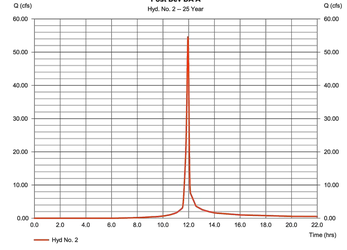
Hydroflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 2

Post Dev DA A

Hydrograph type	= SCS Runoff	Peak discharge	= 54.60 cfs
Storm frequency	= 25 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 112,286 cuft
Drainage area	= 10.163 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 5.08 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 55) + (4.440 x 61) + (6.280 x 80) + (0.780 x 98) + (3.240 x 98)] / 10.163



POND INFLOW HYDROGRAPH 100-YEAR

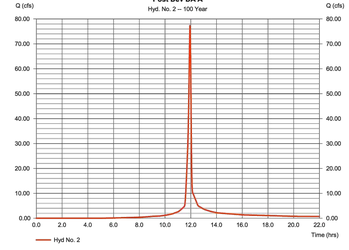
Hydroflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 2

Post Dev DA A

Hydrograph type	= SCS Runoff	Peak discharge	= 77.34 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 161,846 cuft
Drainage area	= 10.163 ac	Curve number	= 83*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.840 x 55) + (4.440 x 61) + (6.280 x 80) + (0.780 x 98) + (3.240 x 98)] / 10.163



POND - REQUIRED VOLUME COMPUTATIONS

$TARGET\ VOL. =$	$\{[Target\ Rainfall\ Event] * [(R_{V_{TURF}} * AREA_{Turf}) + (R_{V_{IMP.}} * AREA_{IMP.})] * [43560\ FT^2/_{AC.}] * [1FT/_{12\ IN.}]\}$
Target Rainfall	*1.00 in.*
$R_{V_{TURF}} =$	$\frac{(0.15 * AREA_{A-SOIL}) + (0.20 * AREA_{B-SOIL}) + (0.22 * AREA_{C-SOIL}) * (0.25 * AREA_{D-SOIL})}{AREA_{TURF}}$
$R_{V_{TURF}} =$	*0.23*
$R_{V_{IMP.}} =$	*0.95*
$AREA_{TURF} =$	*5.797 ac.*
$AREA_{IMP.} =$	*4.365 ac.*
$TARGET\ VOL. =$	*19,877.22 cf*

FOREBAY # 1 - REQUIRED VOLUME COMPUTATIONS

Target Vol=15% $*$	$\{[Target\ Rainfall\ Event] * [(R_{V_{TURF}} * AREA_{Turf}) + (R_{V_{IMP.}} * AREA_{IMP.})] * [43560\ FT^2/_{AC.}] * [1FT/_{12\ IN.}]\}$
Target Rainfall	*1.00 in.*
$R_{V_{TURF}} =$	$\frac{(0.15 * AREA_{A-SOIL}) + (0.20 * AREA_{B-SOIL}) + (0.22 * AREA_{C-SOIL}) * (0.25 * AREA_{D-SOIL})}{AREA_{TURF}}$
$R_{V_{TURF}} =$	*0.23*
$R_{V_{IMP.}} =$	*0.95*
$AREA_{TURF} =$	*5.797 ac.*
$AREA_{IMP.} =$	*4.365 ac.*
$TARGET\ VOL. =$	*2,981.58 cf*

FOREBAY CELL STAGE STORAGE VOLUME			
ELEV.	SURFACE AREA	INCREMENTAL VOLUME	COMULATIVE VOLUME
438.50	1,144 sf	0.00 cf	0.00 cf
440.00	1,647 sf	2,093.66 cf	2,093.66 cf
441.00	2,018 sf	1,832.50 cf	3,926.16 cf
441.50	2,214 sf	1,057.89 cf	4,984.05 cf
442.00	2,417 sf	1,157.62 cf	6,141.67 cf

MAIN CELL WET STAGE STORAGE VOLUME			
ELEV.	SURFACE AREA	INCREMENTAL VOLUME	COMULATIVE VOLUME
438.50	2,612 sf	0.00 cf	0.00 cf
440.00	3,732 sf	4,757.59 cf	4,757.59 cf
441.00	4,553 sf	4,142.50 cf	8,900.09 cf
441.50	8,967 sf	3,380.12 cf	12,280.20 cf
442.00	9,540 sf	4,626.88 cf	16,907.08 cf

TOTAL VOL. FOREBAY + MAIN CELL= 13,146.00 CF

POND STAGE STORAGE TABLE			
ELEV.	SURFACE AREA	INCREMENTAL VOLUME	COMULATIVE VOLUME
442.00	11,957 sf	0.00 cf	0.00 cf
444.00	15,282 sf	27,239.00 cf	27,239.00 cf
446.00	18,832 sf	34,114.00 cf	61,353.00 cf
448.00	22,609 sf	41,441.00 cf	102,794.00 cf

ENERGY BALANCE - AREA A

$$Q_{Dev.} \leq I.F * (Q_{Pre-Dev.} * Rv_{Pre-Dev.})/Rv_{Dev.}$$

$(Q_{Pre-Dev.}) =$ 9.826 cfs

$(Rv_{Pre-Dev.}) =$ 30,377 cf

$(Rv_{Dev.}) =$ 49,228 cf

$(I.F._{.}) =$ 0.80

$(Q_{Dev.}) \leq$ 4.851 cfs

Pond Report

Hydroflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Thursday, 10 / 19 / 2023

Pond No. 1 - Pond A

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 442.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	442.00	11,973	0	0
2.00	444.00	15,282	27,255	27,255
4.00	446.00	18,832	34,114	61,369
6.00	448.00	22,609	41,441	102,810

Culvert / Orifice Structures

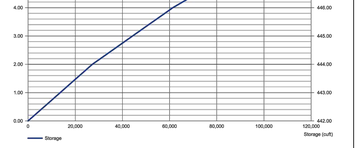
	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	4.00	Inactive	0.00
Span (in)	= 30.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 439.26	442.00	0.00	0.00
Length (ft)	= 84.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.78	4.00	Inactive	Inactive
Crest El. (ft)	= 445.25	443.75	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	Rect	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr)	= 0.000 (by Contour)
TW Elev. (ft)	= 0.00

*Note: Culvert/Orifice outflows are analyzed under Inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



POND - WATER BALANCE EQUATION

$DP > ET + INF + RES - MB$	
DP >	3.5 in
ET=	8.0 in.
INF=	7.2 in.
RES=	24.0 in
MB=	0.0 in
DP=	39.2 in

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LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM POND A INFLOW COMPUTATIONS

SHEET No.

C652

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C652 SWM POND A INFLOW COMPUTATIONS.dwg, 2/13/2024 8:42:59 PM, Andrew H. Fraser,

POND OUTLET HYDROGRAPH 1-YEAR

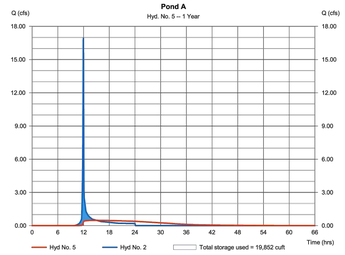
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 11 / 1 / 2023

Hyd. No. 5

Pond A

Hydrograph type	= Reservoir	Peak discharge	= 0.477 cfs
Storm frequency	= 1 yrs	Time to peak	= 15.07 hrs
Time interval	= 2 min	Hyd. volume	= 33,894 cuft
Inflow hyd. No.	= 2 - Post Dev DA A	Max. Elevation	= 443.46 ft
Reservoir name	= Pond A	Max. Storage	= 19,852 cuft

Storage Indication method used.



POND OUTLET HYDROGRAPH 2-YEAR

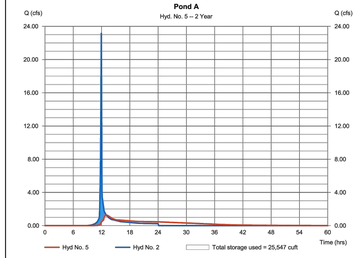
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 11 / 1 / 2023

Hyd. No. 5

Pond A

Hydrograph type	= Reservoir	Peak discharge	= 1.264 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.00 hrs
Time interval	= 2 min	Hyd. volume	= 46,679 cuft
Inflow hyd. No.	= 2 - Post Dev DA A	Max. Elevation	= 443.97 ft
Reservoir name	= Pond A	Max. Storage	= 25,547 cuft

Storage Indication method used.



POND OUTLET HYDROGRAPH 10-YEAR

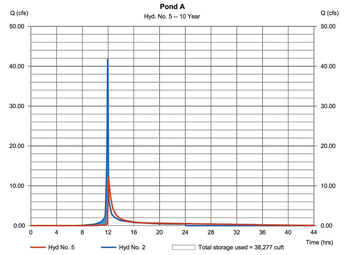
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 11 / 1 / 2023

Hyd. No. 5

Pond A

Hydrograph type	= Reservoir	Peak discharge	= 12.00 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 85,072 cuft
Inflow hyd. No.	= 2 - Post Dev DA A	Max. Elevation	= 444.65 ft
Reservoir name	= Pond A	Max. Storage	= 38,277 cuft

Storage Indication method used.



POND OUTLET HYDROGRAPH 25-YEAR

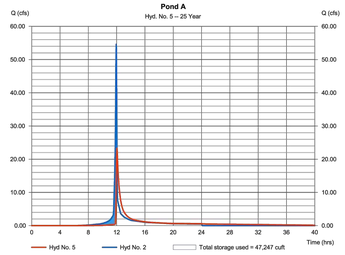
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 11 / 1 / 2023

Hyd. No. 5

Pond A

Hydrograph type	= Reservoir	Peak discharge	= 23.34 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 112,253 cuft
Inflow hyd. No.	= 2 - Post Dev DA A	Max. Elevation	= 445.17 ft
Reservoir name	= Pond A	Max. Storage	= 47,247 cuft

Storage Indication method used.



POND OUTLET HYDROGRAPH 100-YEAR

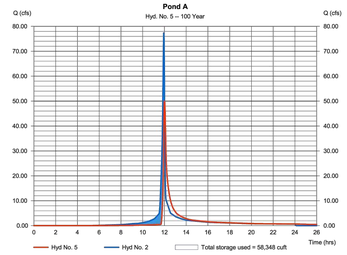
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 11 / 1 / 2023

Hyd. No. 5

Pond A

Hydrograph type	= Reservoir	Peak discharge	= 49.91 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 161,813 cuft
Inflow hyd. No.	= 2 - Post Dev DA A	Max. Elevation	= 445.82 ft
Reservoir name	= Pond A	Max. Storage	= 58,348 cuft

Storage Indication method used.



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Pond No. 1 - Pond A

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 442.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	442.00	8,865	0	0
0.50	442.50	9,873	4,685	4,685
0.90	442.90	15,839	5,142	9,827
2.00	444.00	18,588	18,935	28,762
4.00	446.00	23,818	42,406	71,168
6.00	448.00	29,406	53,224	124,392

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	4.00	Inactive	0.00
Span (in)	= 30.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 441.00	442.00	0.00	0.00
Length (ft)	= 60.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	5.00	Inactive	Inactive
Crest El. (ft)	= 444.75	443.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	Rect	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	442.00	0.00	0.00	---	---	0.00	0.00	---	---	---	---	0.000
0.05	468	442.05	6.37 ic	0.01 ic	---	---	0.00	0.00	---	---	---	---	0.006
0.10	937	442.10	6.37 ic	0.02 ic	---	---	0.00	0.00	---	---	---	---	0.024
0.15	1,405	442.15	6.37 ic	0.05 ic	---	---	0.00	0.00	---	---	---	---	0.051
0.20	1,874	442.20	6.37 ic	0.08 ic	---	---	0.00	0.00	---	---	---	---	0.083
0.25	2,342	442.25	6.37 ic	0.12 ic	---	---	0.00	0.00	---	---	---	---	0.120
0.30	2,811	442.30	6.37 ic	0.15 ic	---	---	0.00	0.00	---	---	---	---	0.154
0.35	3,279	442.35	6.37 ic	0.18 ic	---	---	0.00	0.00	---	---	---	---	0.180
0.40	3,748	442.40	6.37 ic	0.20 ic	---	---	0.00	0.00	---	---	---	---	0.203
0.45	4,216	442.45	6.37 ic	0.22 ic	---	---	0.00	0.00	---	---	---	---	0.224
0.50	4,685	442.50	6.37 ic	0.24 ic	---	---	0.00	0.00	---	---	---	---	0.243
0.54	5,199	442.54	6.37 ic	0.26 ic	---	---	0.00	0.00	---	---	---	---	0.257
0.58	5,713	442.58	6.37 ic	0.27 ic	---	---	0.00	0.00	---	---	---	---	0.270
0.62	6,227	442.62	6.37 ic	0.28 ic	---	---	0.00	0.00	---	---	---	---	0.283
0.66	6,741	442.66	6.37 ic	0.30 ic	---	---	0.00	0.00	---	---	---	---	0.295
0.70	7,256	442.70	6.37 ic	0.31 ic	---	---	0.00	0.00	---	---	---	---	0.307
0.74	7,770	442.74	6.37 ic	0.32 ic	---	---	0.00	0.00	---	---	---	---	0.318
0.78	8,284	442.78	6.37 ic	0.33 ic	---	---	0.00	0.00	---	---	---	---	0.329
0.82	8,798	442.82	6.37 ic	0.34 ic	---	---	0.00	0.00	---	---	---	---	0.340
0.86	9,312	442.86	6.37 ic	0.35 ic	---	---	0.00	0.00	---	---	---	---	0.350
0.90	9,827	442.90	6.37 ic	0.36 ic	---	---	0.00	0.00	---	---	---	---	0.360
1.01	11,720	443.01	6.37 ic	0.39 ic	---	---	0.00	0.00	---	---	---	---	0.386
1.12	13,614	443.12	6.37 ic	0.41 ic	---	---	0.00	0.00	---	---	---	---	0.410
1.23	15,507	443.23	6.37 ic	0.43 ic	---	---	0.00	0.00	---	---	---	---	0.433
1.34	17,401	443.34	6.37 ic	0.46 ic	---	---	0.00	0.00	---	---	---	---	0.455
1.45	19,294	443.45	6.37 ic	0.48 ic	---	---	0.00	0.00	---	---	---	---	0.476
1.56	21,188	443.56	6.37 ic	0.50 ic	---	---	0.00	0.24	---	---	---	---	0.740
1.67	23,081	443.67	6.37 ic	0.52 ic	---	---	0.00	1.17	---	---	---	---	1.681
1.78	24,975	443.78	6.37 ic	0.53 ic	---	---	0.00	2.47	---	---	---	---	2.999
1.89	26,868	443.89	6.37 ic	0.55 ic	---	---	0.00	4.05	---	---	---	---	4.605
2.00	28,762	444.00	6.59 ic	0.57 ic	---	---	0.00	5.89	---	---	---	---	6.456
2.20	33,002	444.20	10.33 ic	0.58 ic	---	---	0.00	9.75	---	---	---	---	10.33
2.40	37,243	444.40	14.78 ic	0.58 ic	---	---	0.00	14.22	---	---	---	---	14.78
2.60	41,484	444.60	19.77 oc	0.52 ic	---	---	0.00	19.21	---	---	---	---	19.73
2.80	45,724	444.80	25.12 oc	0.43 ic	---	---	0.75	23.94 s	---	---	---	---	25.12
3.00	49,965	445.00	33.24 oc	0.34 ic	---	---	8.33	24.57 s	---	---	---	---	33.24
3.20	54,205	445.20	38.74 ic	0.22 ic	---	---	17.83 s	20.70 s	---	---	---	---	38.74

Continues on next page...

Pond A

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Civ A cfs	Civ B cfs	Civ C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.40	58,446	445.40	40.99 ic	0.16 ic	---	---	22.19 s	18.63 s	---	---	---	---	40.98
3.60	62,687	445.60	42.69 ic	0.12 ic	---	---	25.18 s	17.36 s	---	---	---	---	42.67
3.80	66,927	445.80	44.16 ic	0.10 ic	---	---	27.51 s	16.53 s	---	---	---	---	44.14
4.00	71,168	446.00	45.51 ic	0.09 ic	---	---	29.43 s	15.96 s	---	---	---	---	45.48
4.20	76,490	446.20	46.78 ic	0.07 ic	---	---	31.11 s	15.57 s	---	---	---	---	46.76
4.40	81,813	446.40	48.00 ic	0.07 ic	---	---	32.61 s	15.30 s	---	---	---	---	47.98
4.60	87,135	446.60	49.18 ic	0.06 ic	---	---	33.95 s	15.10 s	---	---	---	---	49.11
4.80	92,457	446.80	50.32 ic	0.05 ic	---	---	35.22 s	14.98 s	---	---	---	---	50.25
5.00	97,780	447.00	51.43 ic	0.05 ic	---	---	36.40 s	14.90 s	---	---	---	---	51.35
5.20	103,102	447.20	52.52 ic	0.04 ic	---	---	37.57 s	14.88 s	---	---	---	---	52.50
5.40	108,425	447.40	53.58 ic	0.04 ic	---	---	38.64 s	14.87 s	---	---	---	---	53.55
5.60	113,747	447.60	54.62 ic	0.04 ic	---	---	39.63 s	14.86 s	---	---	---	---	54.53
5.80	119,069	447.80	55.64 ic	0.04 ic	---	---	40.68 s	14.92 s	---	---	---	---	55.63
6.00	124,392	448.00	56.64 ic	0.03 ic	---	---	41.44 s	14.89 s	---	---	---	---	56.37

...End

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Pond No. 1 - Pond A

Pond Data

Contours -User-defined contour areas. Average end area method used for volume calculation. Begining Elevation = 442.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	442.00	8,865	0	0
0.50	442.50	9,873	4,685	4,685
0.90	442.90	15,839	5,142	9,827
2.00	444.00	18,588	18,935	28,762
4.00	446.00	23,818	42,406	71,168
6.00	448.00	29,406	53,224	124,392

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 30.00	4.00	Inactive	0.00
Span (in)	= 30.00	4.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 441.00	442.00	0.00	0.00
Length (ft)	= 60.00	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	No	No

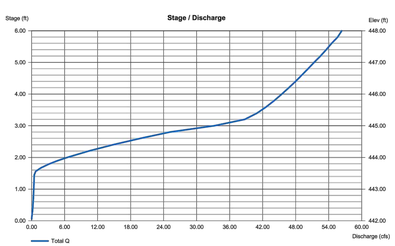
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 20.00	5.00	Inactive	Inactive
Crest El. (ft)	= 444.75	443.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	Rect	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



EMBANKMENT DATA	
TOP =	448.00
BOTTOM =	438.50
EMBANKMENT HEIGHT =	9.50 ft
100 YR WSEL =	445.82
FREEBOARD =	2.18 ft
SETTLEMENT (10% H) =	0.95 ft
SETTLED TOP =	447.05

WEIR COMPS	
RISER DIAM.=	5.000 ft
WEIR LENGTH=	15.708 ft
BREADTH OF WEIR=	0.500 ft
H=	0.820 ft
WEIR COEFF.	3.33
MIDDLE DIAM.=	5.833 ft
WEIR LENGTH=	18.326 ft
MAX. SPACING	0.500 ft
# OF REBAR=	37
REBAR SIZE=	0.042 ft
TOTAL REBAR LENGTH=	1.542 ft
ACTUAL WEIR LENGTH	16.784 ft

POND COMPUTATION SUMMARY TABLE			
STORM EVENT	Q	PONDING DEPTH (OVER WEIR)	POND WSEL
1-YEAR	0.477 cfs	1.46 ft	443.46
2-YEAR	1.26 cfs	0.12 ft	443.87
10-YEAR	12.00 cfs	0.90 ft	444.65
25-YEAR	23.34 cfs	1.42 ft	445.17
100-YEAR	49.91 cfs	0.57 ft	445.82

POND DATA	
POND BOTTOM	438.50
POND TOP	448.00
OUTFALL PIPE SIZE=	30 in.
OUTFALL PIPE ELEV.=	434.42
LOW FLOW ORIFICE SIZE=	4.0 in.
LOW FLOW ORIFICE ELEV.=	442.00
LOW FLOW ORIFICE COEFF.=	0.60
WEIR LENGTH=	4.00 ft
WEIR ELEV.=	443.75
WEIR COEFF.=	3.33
PRINCIPAL SPILLWAY	12.78 ft
PRINCIPAL SPILLWAY ELEV.=	445.25
PRINCIPAL SPILLWAY BREADTH=	0.50 ft
WEIR COEFF.=	3.330

BUOYANCY CALCULATIONS - SWM POND A

Outside Diameter=	72 in.	OR	6.00 ft
Inside Diamater=	60 in.	OR	5.00 ft
Diamater Thickness=	6 in.	OR	0.50 ft
Top of Riser=	445.25		
Bottom Of Pond=	438.50		
Outfall Pipe Size=	30 in.	OR	2.50 ft
Orifice$_1$ Size=	4 in.	OR	0.33 ft
Orifice$_2$ Size=	N/A	OR	N/A
Orifice$_3$ Size=	N/A	OR	N/A
Weir$_1$ Size=	4.00 ft	AT 443.75	Area= 6.00 sq.ft
Weir$_2$ Size=	N/A	AT N/A	Area= N/A
Depth of Concerete in Riser=	2.50 ft		
Total Vol of Riser Structure and Base=	190.85 cf		
Total Bouyant Force=	11,909.15 lbs.		
Total Bouyant Force @ FS of 1.25 =	14,886.44 lbs.		
Vol of Riser Structure and Base=	129.00 cf		
Vol of Outfall Pipe=	2.45 cf		
Orifice$_1$ =	0.04 cf		
Orifice$_2$ =	N/A		
Orifice$_3$ =	N/A		
Weir$_1$ =	3.00 cf		
Weir$_2$ =	N/A		
Total Downward Force=	18,525.55 lbs.		
Downward Force is Greater than the Buoyant Force with a FS of 1.25			

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Leesburg, VA 20176 P 703.777.2755
engineering • surveying • land planning

COMMONWEALTH OF VIRGINIA
CHRISTOPHER H. LEMON
Lic. No. 047091
05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

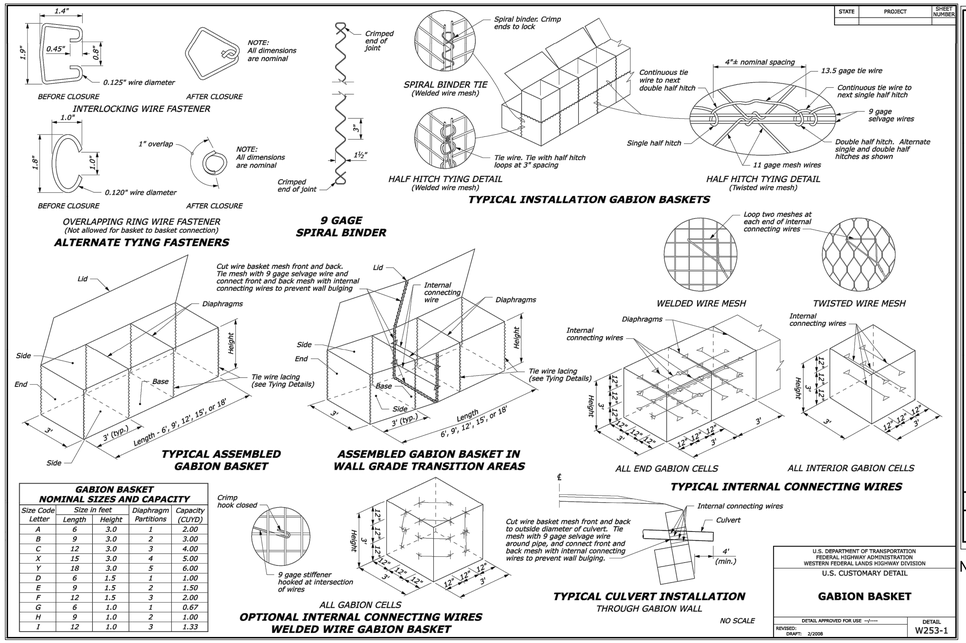
SHEET TITLE:

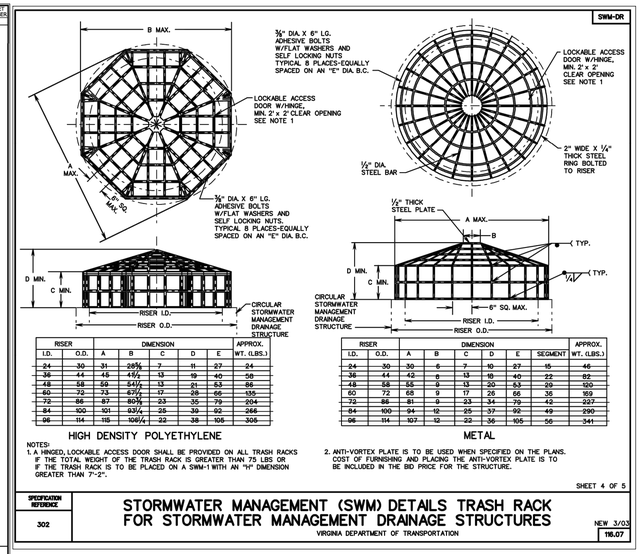
SWM POND A OUTLET COMPUTATIONS

SHEET No.

C653

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C664 SWM POND A OUTLET COMPUTATIONS.dwg, 2/13/2024 8:43:24 PM, Andrew H. Frazer,

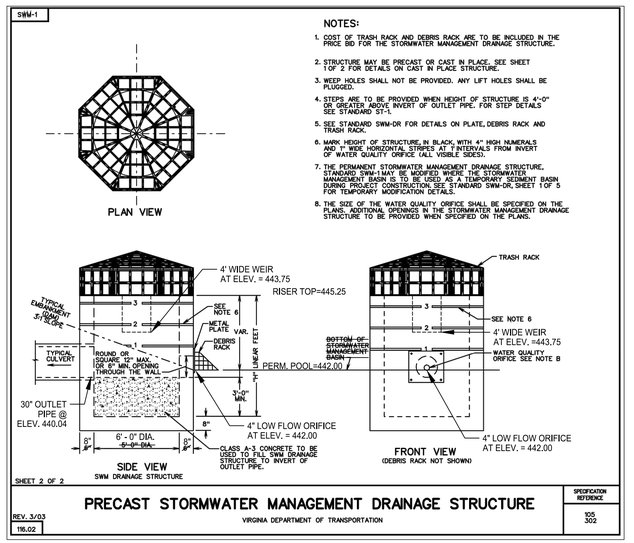


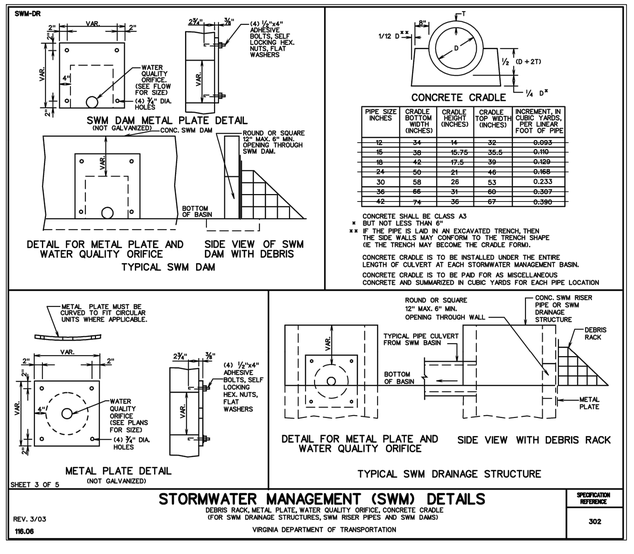


RISER I.D.	RISER O.D.	A	B	C	D	E	APPROX. WT. (LBS.)
24	30	31	28½	7	11	27	24
36	44	45	41½	13	19	40	58
48	58	59	54½	13	21	53	86
60	72	73	67½	17	28	66	155
72	86	87	80½	23	35	79	204
84	100	101	93½	25	39	92	266
96	114	115	106½	23	38	105	305

RISER I.D.	RISER O.D.	A	B	C	D	E	SEGMENT	APPROX. WT. (LBS.)
24	30	30	6	7	10	27	15	46
36	44	42	6	13	18	40	22	82
48	58	55	6	13	20	53	20	120
60	72	68	9	17	25	66	35	169
72	86	81	9	23	34	79	42	227
84	100	94	12	25	37	92	49	290
96	114	107	12	22	36	105	56	341

NOTE: ANTI-VORTEX PLAT SHALL BE PROVIDED.





SECTION 8: CONSTRUCTION

8.1. Construction Sequence

The following is a typical construction sequence to properly install a wet pond. The steps may be modified to reflect different wet pond designs, site conditions, and the size, complexity and configuration of the proposed facility.

Step 1: Use of Wet Pond as an E&S Control. A wet pond may serve as a sediment basin during project construction. If this is done, the volume should be based on the more stringent sizing rule (erosion and sediment control requirement vs. water quality treatment requirement). Installation of the permanent riser should be initiated during the construction phase, and design elevations should be set with final cleanout of the sediment basin and conversion to the post-construction wet pond in mind. The bottom elevation of the wet pond should be lower than the bottom elevation of the temporary sediment basin. Appropriate procedures should be implemented to prevent discharge of turbid waters when the basin is being converted into a wet pond.

Step 2: Stabilize the Drainage Area. Wet ponds should only be constructed after the contributing drainage area to the pond is completely stabilized. If the proposed pond site will be used as a sediment trap or basin during the construction phase, the construction notes should clearly indicate that the facility will be de-watered, dredged and re-graded to design dimensions after the original site construction is complete.

Step 3: Assemble Construction Materials on-site, make sure they meet design specifications, and prepare any staging areas.

Step 4: Install E&S Controls prior to construction, including temporary de-watering devices and stormwater diversion practices. All areas surrounding the pond that are graded or denuded during construction must be planted with turf grass, native plantings, or other approved methods of soil stabilization.

Step 5: Clear and Strip the project area to the desired sub-grade.

Step 6: Excavate the Core Trench and Install the Spillway Pipe.

Step 7: Install the Riser or Outflow Structure, and ensure the top invert of the overflow weir is constructed level at the design elevation.

Step 8: Construct the Embankment and Any Internal Berms in 8- to 12-inch lifts, or as directed by geotechnical recommendations, and compact as required with appropriate equipment.

Step 9: Excavate/Grade until the appropriate elevation and desired contours are achieved for the bottom and side slopes of the pond.

Step 10: Construct the Emergency Spillway in cut or structurally stabilized soils.

Step 11: Install Outlet Protection**,** including emergency and primary outlet apron protection.

Step 12: Stabilize Exposed Soils with temporary seed mixtures appropriate for the pond buffer. All areas above the normal pool elevation should be permanently stabilized by hydroseeding or seeding over straw.

Step 13: Plant the Pond Buffer Area, following the pondscaping plan (**Section 6.7**).

8.2. Construction Inspection

Multiple inspections are critical to ensure that stormwater ponds are properly constructed. Inspections are recommended during the following stages of construction:

- Pre-construction meeting
- Initial site preparation (including installation of E&S controls)
- Excavation/Grading (interim and final elevations)
- Installation of the embankment, the riser/primary spillway, and the outlet structure
- Implementation of the pondscaping plan and vegetative stabilization
- Final inspection (develop a punchlist for facility acceptance)

Upon final inspection and acceptance, the GPS coordinates for all wet ponds should be logged for entry into the VSMP Authority's BMP maintenance tracking data base.

A construction phase inspection checklist for Wet Ponds can be accessed at the end of this specification.

See the E & S Narrative on sheet XX for additional pond / basin construction details.

SECTION 9: MAINTENANCE

9.1. Maintenance Agreements

The Virginia Stormwater Management regulations (4 VAC 50-60) specify the circumstances under which a maintenance agreement must be executed between the owner and the VSMP authority, and sets forth inspection requirements, compliance procedures if maintenance is neglected, notification of the local program upon transfer of ownership, and right-of-entry for local program personnel.

- Restrictive covenants or other mechanism enforceable by the VSMP authority must be in place to help ensure that wet ponds are maintained, as well as to pass the knowledge along to any subsequent property owners.
- Access to wet ponds should be covered by a drainage easement to allow access by the VSMP authority to conduct inspections and perform maintenance when necessary.
- All wet ponds must include a long term maintenance agreements consistent with the provisions of the VSMP regulations, and must include the recommended maintenance tasks and a copy of an annual inspection checklist.
- The maintenance agreement should also include contact information for owners to get local or state assistance to solve common nuisance problems, such as mosquito control, geese, invasive plants, vegetative management and beaver removal.

9.2. First Year Maintenance Operations

Successful establishment of wet ponds requires that the following tasks be undertaken during the first year following construction.

Initial inspections. For the first six months following construction, the site should be inspected at least twice after storm events that exceed a 1/2-inch of rainfall.

Planting of Aquatic Benches. The aquatic benches should be planted with emergent wetland species, following the planting recommendations contained in Stormwater Design Specification No. 13 (Constructed Wetlands).

Spot Reseeding. Inspectors should look for bare or eroding areas in the contributing drainage area or around the pond buffer, and make sure they are immediately stabilized with grass cover.

9.3. Maintenance Inspections

Maintenance of a wet pond is driven by annual inspections that evaluate the condition and performance of the pond, including the following:

- Measure sediment accumulation levels in the forebay.
- Monitor the growth of wetland plants, trees and shrubs planted. Record the species and their approximate coverage, and note the presence of any invasive plant species.
- Inspect the condition of stormwater inlets to the pond for material damage, erosion or undercutting.
- Inspect the banks of upstream and downstream channels for evidence of sloughing, animal burrows, boggy areas, woody growth, or gully erosion that may undermine embankment integrity.
- Inspect the pond outfall channel for erosion, undercutting, rip-rap displacement, woody growth, etc.
- Inspect the condition of the principal spillway and riser for evidence of spalling, joint failure, leakage, corrosion, etc.
- Inspect the condition of all trash racks, reverse-sloped pipes, or flashboard risers for evidence of clogging, leakage, debris accumulation, etc.
- Inspect maintenance access to ensure it is free of woody vegetation, and check to see whether valves, manholes and locks can be opened and operated.
- Inspect internal and external side slopes of the pond for evidence of sparse vegetative cover, erosion, or slumping, and make needed repairs immediately.

Based on inspection results, specific maintenance tasks will be triggered. Example maintenance inspection checklists for Wet Ponds can be accessed in Appendix C of Chapter 9 of the *Virginia Stormwater Management Handbook* (2010).

9.4 Common Ongoing Maintenance Tasks

Maintenance is needed so stormwater ponds continue to operate as designed on a long-term basis. Routine stormwater pond maintenance, such as removing debris and trash, is needed several times each year (See **Table 14.6**). More significant maintenance (e.g., removing accumulated sediment) is needed less frequently but requires more skilled labor and special equipment. Inspection and repair of critical structural features (e.g., embankments and risers) needs to be performed by a qualified professional (e.g., a structural engineer) who has experience in the construction, inspection, and repair of these features.

The maintenance plan should clearly outline how vegetation in the pond and its buffer will be managed or harvested in the future. Periodic mowing of the stormwater buffer is only required along maintenance rights-of-way and the embankment. The remaining buffer can be managed as a meadow (mowing every other year) or forest. The maintenance plan should schedule a shoreline cleanup at least once a year to remove trash and floatables.

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05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
SWM POND A DETAILS

SHEET No.
C654

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LoCo BMP Construction Inspection Checklist:

Wet Pond

Project Name _____ **Project #** _____ **Dates Inspected** _____ **to** _____

LOCATION of BMP (e.g., BMP 1 @ SE corner of parking lot) _____

GEOGRAPHIC COORDINATES from Plans (Optional): Latitude_____ Longitude_____ (decimal °)

The following checklist provides a basic outline of the anticipated items for the construction inspection of a Wet Pond. Inspectors should review the plans carefully, and adjust these items and the timing of inspection verification as needed to ensure the intent of the design and the inspection is met. Please use "Notes" section at the end of this form to describe additional observations & for explanation when "No" is checked.

Inspections Performed By One or More of the Following:

(Please insert appropriate code adjacent to each inspection item)

01 Owner/Operator or their Representative

02 Installer/Contractor

03 Geotechnical Engineer

Prior to Construction:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	All pervious areas of the contributing drainage areas have been adequately stabilized with a thick layer of vegetation or adequate erosion control measures remain in place.	

Construction of Embankment and Principal Spillway:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Digital Photos taken during this stage.	
0__	☐	☐	☐	Stormwater has been diverted around or through the area of the wet pond embankment to a stabilized conveyance and perimeter erosion control measures to protect the facility during construction have been installed.	

Construction of Embankment and Principal Spillway cont'd:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Materials for construction of the embankment and principal spillway meet the specifications of the approved plans.	
0__	☐	☐	☐	Construction of "cut-off" trench, principal spillway, including the riser and barrel, anti-seepage controls, outlet protection, etc., is built in accordance with approved plans.	
03	☐	☐	☐	Geotechnical engineer's analysis and approval of the core (if required) and embankment material has been provided, and the material has been placed in lifts and compacted in accordance with the approved plans. Sign below to verify installation.*	

***Name** _____ **Signature** _____

Virginia License # _____ **Date** _____

03	☐	☐	☐	Design & Construction of "filter and drainage diaphragms," if included, has been supervised by the Geotechnical Engineer. Sign below to verify installation.*	

***Name** _____ **Signature** _____

Virginia License # _____ **Date** _____

Excavation of Wet Pond:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Digital Photos taken during this stage.	
0__	☐	☐	☐	Excavation of the wet pond geometry (including bottom width, side slopes, check dams, weir overflow and outlet protection, etc) achieves the elevations in accordance with approved plans.	
0__	☐	☐	☐	Excavation of internal features: deep pool, forebays, etc., is in accordance with approved plans.	

Excavation of Wet Pond cont'd:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Impermeable geotextile liner (minimum 30 mil poly-liner), when required, meets project specifications as certified by the manufacturer and verified by the installer.	
03	☐	☐	☐	Impermeable clay liner, when required, is placed per geotechnical engineer's oversight. Note: clay liners must meet the minimum requirements found in Table 14.4 in Specification 14 of the Va. BMP Clearinghouse. Sign below to verify installation.*	

***Name** _____ **Signature** _____

Virginia License # _____ **Date** _____

Landscaping Plan and Stabilization:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Digital Photos taken during this stage.	
0__	☐	☐	☐	Exposed soils on pond side slopes above permanent pool elevation are stabilized with specified seed mixtures, stabilization matting, mulch, etc., in accordance with approved plans.	
0__	☐	☐	☐	Appropriate number and spacing of plants are installed and protected on the aquatic bench and pond buffer in accordance with the approved plans.	

Date:	Additional Inspection Notes:

Date:	Additional Inspection Notes:

Note: Provide this report, along with digital photos, to the LoCo Dept. of Building & Development coincident with E&S Bond Release. "As-Built" plans of the BMP & P.E. certification must be provided to B&D prior to VSMP Permit Termination.

BMP INSPECTION CHECKLIST INSTRUCTIONS

1. **Checklist Basics**

A. The person noted as the **"operator"** on the VSMP permit for the site where the BMP is constructed is ultimately responsible for the inspections being performed & completion of the checklist.

B. There will be one (1) Construction Inspection Checklist per BMP.

C. Use dark ink (blue or black) to fill out the document. ✔

D. Make sure to fill out the grey information box (on the 1st page) describes the location of the BMP on the site, as well as its geographic coordinates (obtain from the approved plans).

E. If construction of a BMP is already underway when this program begins on **August 1, 2017**, please denote all checklist items that have been completed. However, if there is insufficient information available to verify completion of a construction item, check the N/A (not applicable) box and provide a brief explanation in the **"Additional Inspection Notes"** section.

F. Each checklist is divided into phases of construction (e.g., excavation, bioretention soil media placement, etc.) with individual construction items within each phase.

G. For the majority of the checklist items, any of the following individuals may perform inspections and fill out the document*:

i. The operator/owner or his representative (e.g., project engineer);

ii. The contractor who installs the BMP; and/or,

iii. The geotechnical engineer for the project.

*The individual filling out the checklist must indicate so **for each construction item** (i.e., **enter designated number**).

H. Note: A licensed Geotechnical Engineer must inspect & verify the installation of the specific checklist items below via this signature block found in the document:

Name _____ **Signature** _____

Virginia License # _____ **Date** _____

i. Bioretention Facility – Impervious clay liner (when required) must meet specifications found in the Va. BMP Clearinghouse.

ii. Wet Pond & Extended Detention Pond –

a. Embankment core (if required) and embankment material;

BMP INSPECTION CHECKLIST INSTRUCTIONS (cont'd)

b. Design & construction of filter & drainage diaphragms (if included); &

c. Impervious clay liner (if required).

iii. Wet & Dry Swales – Impervious clay liner (when required) must meet specifications found in the Va. BMP Clearinghouse.

G. When filling out the checklist, check **"Yes"** when construction of the item is completed per the explanation/description. Concurrently, enter the "Date Completed."

H. Check **"N/A"** (not applicable) if the construction item is not part of the approved design (e.g., an impervious liner is not required) or there is an approved field modification which changes or eliminates the item. When N/A is checked, always explain the reason in the **"Additional Inspection Notes"** section at the end of the checklist.

I. Also use **"Additional Inspection Notes"** for any notes/clarification that will help verify that the BMP was properly constructed.

2. **Photos**

A. Digital photos are required for most phases of BMP construction.

B. The photos will help to verify that each stage of construction met the standards required in the checklist.

3. **Location of BMP Checklists on Site & Checklist Updates**

A. The checklist for a particular BMP will be updated as the different phases of the installation occur. Once the construction of a BMP has begun, attach the **up-to-date** checklist to the on-site Stormwater Pollution & Prevention Plan (SWPPP).

B. BMP Checklists may be reviewed on site by a member of B&D's VSMP Team (as well as the Erosion & Sediment Control Field Manager) during spot checks of the BMP installation.

4. **Construction Complete - Final Step**

A. Once construction of the BMP is complete, submit the completed Loudoun County BMP Checklist along with all digital photos to B&D coincident with Erosion & Sediment Control Bond release.

- **Reminder** – "As-Built" plans & P.E. Certification related to BMP construction must still be provided to B&D for review prior to VSMP Permit Termination.

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05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

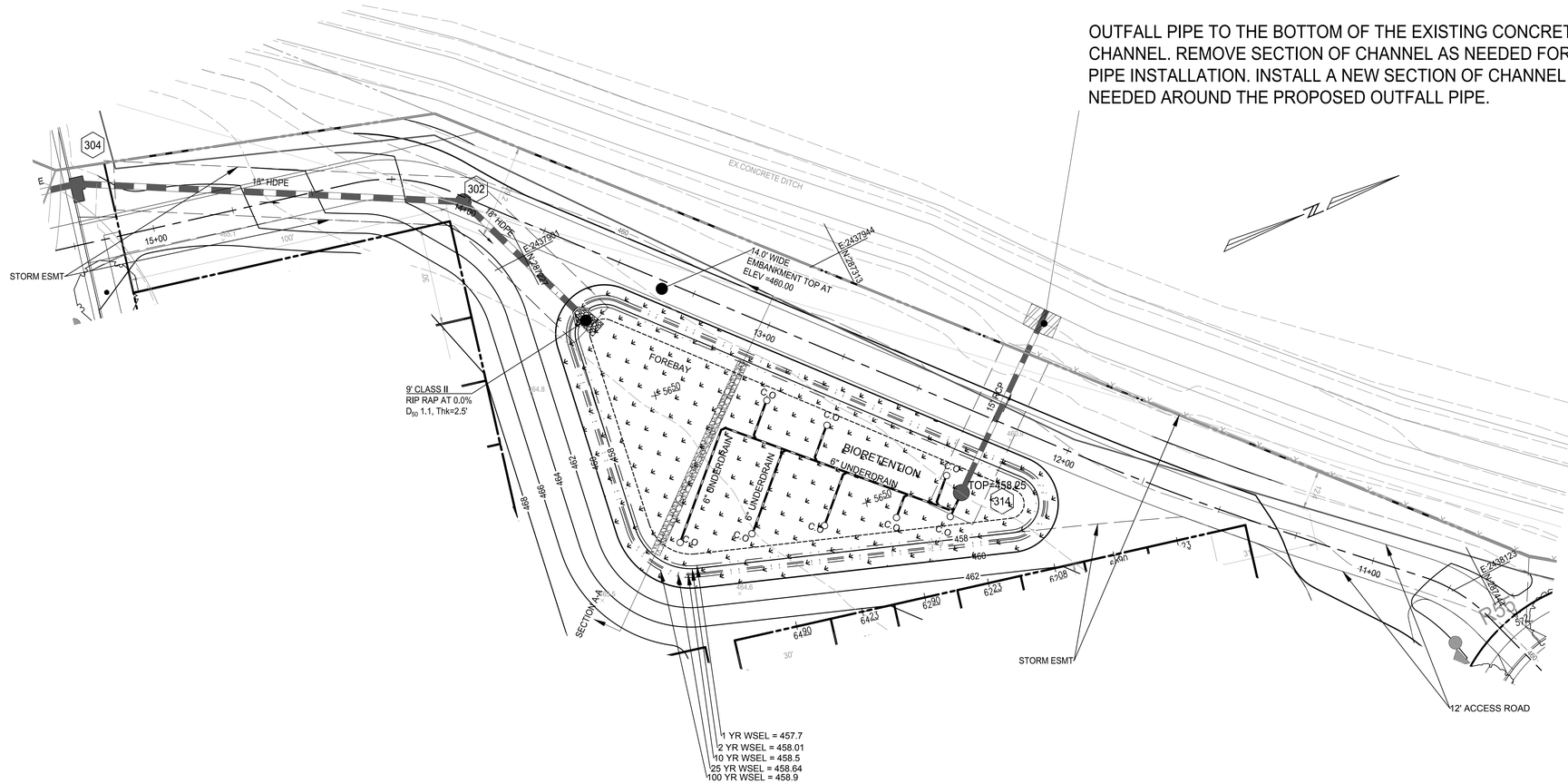
SWM POND A CONSTRUCTION INSPECTION CHECKLIST

SHEET No.

C655

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C655 SWM POND A CONSTRUCTION INSPECTION CHECKLIST.dwg, 2/13/2024 8:44:11 PM, Andrew H. Fraser,

OUTFALL PIPE TO THE BOTTOM OF THE EXISTING CONCRETE CHANNEL. REMOVE SECTION OF CHANNEL AS NEEDED FOR THE PIPE INSTALLATION. INSTALL A NEW SECTION OF CHANNEL AS NEEDED AROUND THE PROPOSED OUTFALL PIPE.



20 10 0 20 40
GRAPHIC SCALE
1" = 20'

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MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM
BIORETENTION B

SHEET No.

C660

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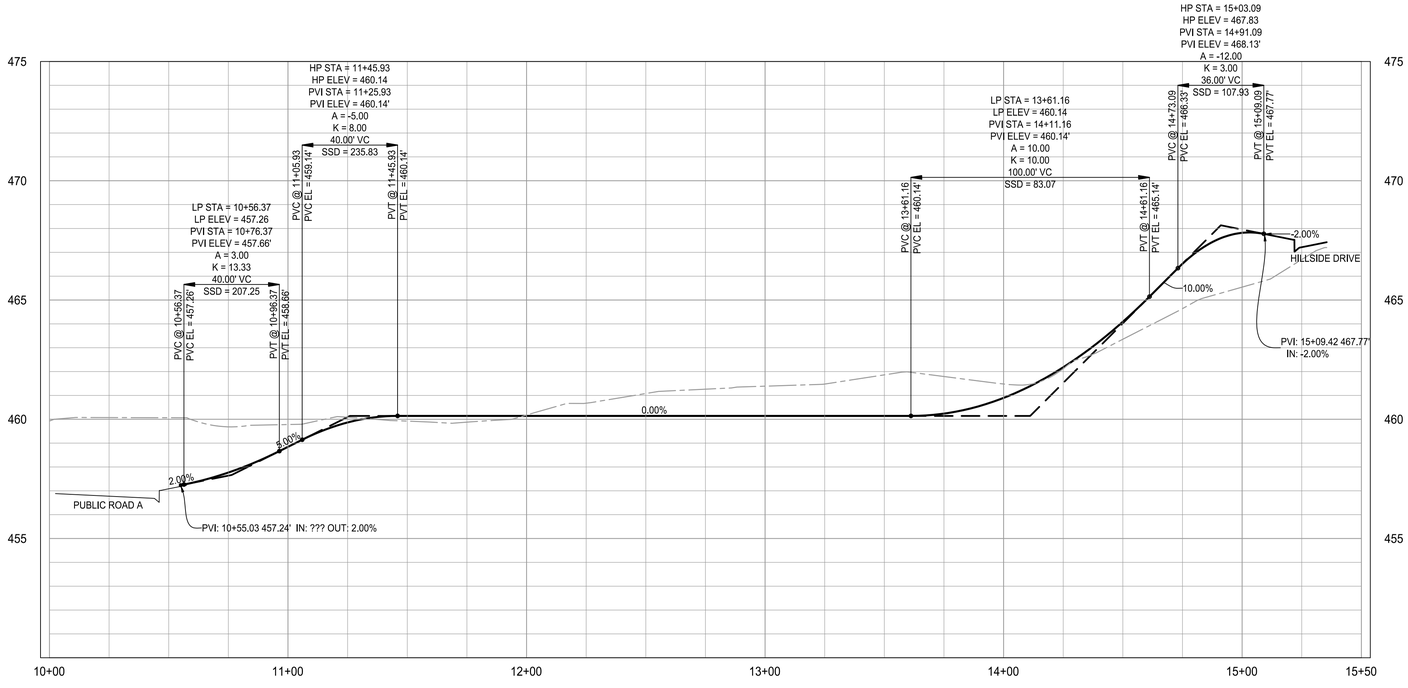

SWM BIORETENTION B ACCESS PROFILE

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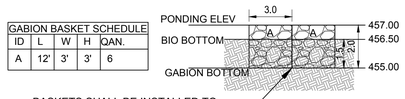
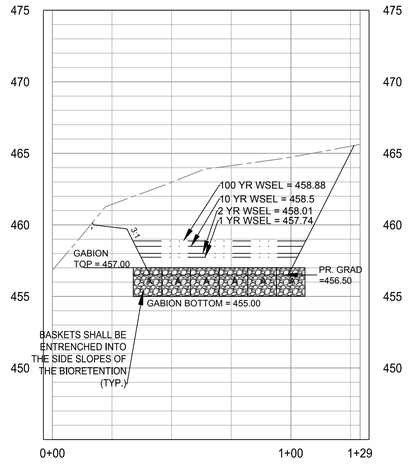
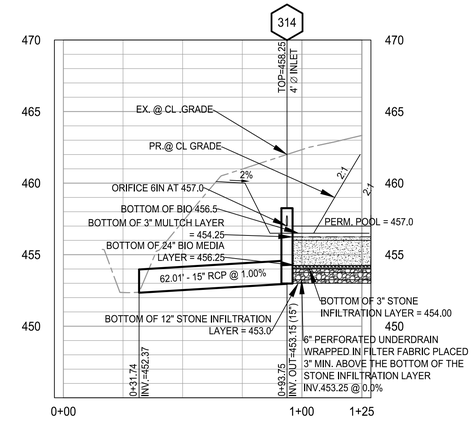




BIORETENTION B SECTION A-A PROFILE



BIORETENTION- B-OUTFALL PROFILE

50 25 0 50 100
HORIZONTAL SCALE
1" = 50'

5 2.5 0 5 10
VERTICAL SCALE
1" = 5'

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DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM BIORETENTION B PROFILE

SHEET No.
C661

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C661 SWMBIORETENTION B PROFILES.dwg, 2/13/2024 8:47:14 PM, Andrew H. Fraser,

POND INFLOW HYDROGRAPH 1-YEAR

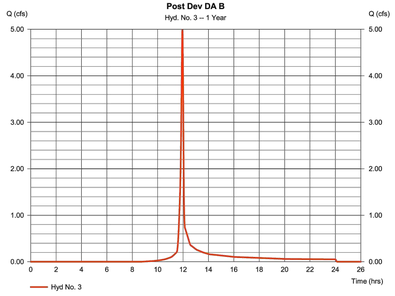
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 3

Post Dev DA B

Hydrograph type	= SCS Runoff	Peak discharge	= 4.978 cfs
Storm frequency	= 1 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 10,051 cuft
Drainage area	= 2.541 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.40 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 55) + (0.310 x 61) + (1.300 x 80) + (0.790 x 98)] / 2.541



POND INFLOW HYDROGRAPH 2-YEAR

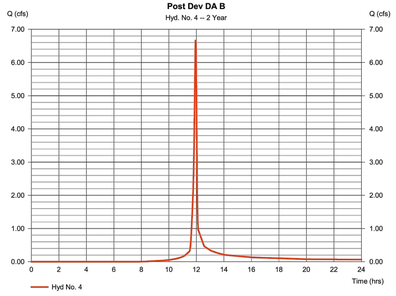
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 4

Post Dev DA B

Hydrograph type	= SCS Runoff	Peak discharge	= 6.661 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 13,491 cuft
Drainage area	= 2.541 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.88 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 55) + (0.310 x 61) + (1.300 x 80) + (0.790 x 98)] / 2.541



POND INFLOW HYDROGRAPH 10-YEAR

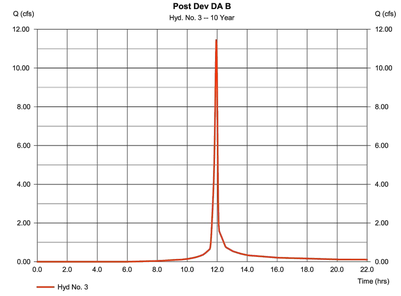
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Friday, 10 / 20 / 2023

Hyd. No. 3

Post Dev DA B

Hydrograph type	= SCS Runoff	Peak discharge	= 11.45 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 23,591 cuft
Drainage area	= 2.541 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 55) + (0.310 x 61) + (1.300 x 80) + (0.790 x 98)] / 2.541



POND INFLOW HYDROGRAPH 25-YEAR

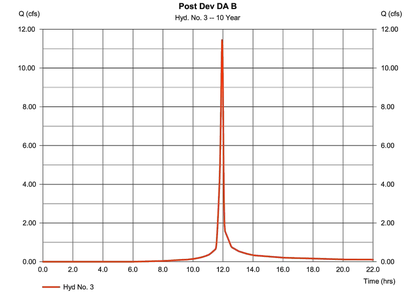
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Friday, 10 / 20 / 2023

Hyd. No. 3

Post Dev DA B

Hydrograph type	= SCS Runoff	Peak discharge	= 11.45 cfs
Storm frequency	= 10 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 23,591 cuft
Drainage area	= 2.541 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.20 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 55) + (0.310 x 61) + (1.300 x 80) + (0.790 x 98)] / 2.541



POND INFLOW HYDROGRAPH 100-YEAR

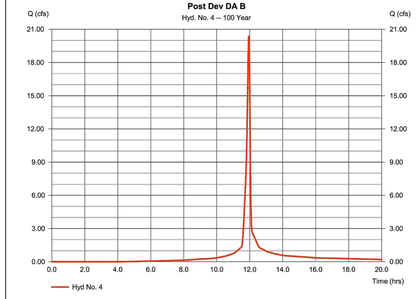
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 10 / 4 / 2023

Hyd. No. 4

Post Dev DA B

Hydrograph type	= SCS Runoff	Peak discharge	= 20.35 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.93 hrs
Time interval	= 2 min	Hyd. volume	= 43,328 cuft
Drainage area	= 2.541 ac	Curve number	= 86*
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 6.63 in	Distribution	= Type II
Storm duration	= 24 hrs	Shape factor	= 484

* Composite (Area/CN) = [(0.230 x 55) + (0.310 x 61) + (1.300 x 80) + (0.790 x 98)] / 2.541



Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Thursday, 11 / 2 / 2023

Pond No. 2 - BIORETENTION

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 457.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	457.00	5,416	0	0
0.50	457.50	5,938	2,837	2,837
1.00	458.00	6,474	3,102	5,939
1.50	458.50	7,025	3,373	9,312
2.00	459.00	7,589	3,652	12,965
2.50	459.50	8,168	3,938	16,903
3.00	460.00	8,761	4,231	21,134

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	6.00	Inactive	Inactive
Span (in)	= 15.00	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 452.53	457.00	0.00	0.00
Length (ft)	= 62.01	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

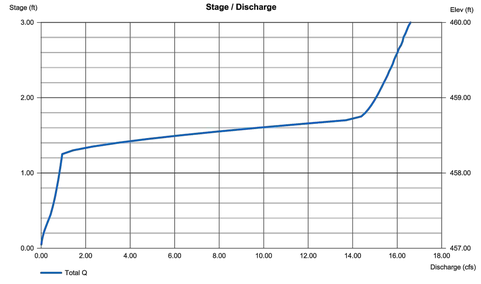
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.50	Inactive	Inactive	Inactive
Crest El. (ft)	= 458.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	Rect	---
Multi-Stage	= Yes	No	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



BIORETENTION SWM SUMMARY TABLE

BIO B	A-SOIL	0 SF	0.00 AC.	B-SOIL	0 SF	0.00 AC.	C-SOIL	0 SF	0.00 AC.	D-SOIL	110,672 SF	2.54 AC.
	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS	FOREST	PERVIOUS	IMPERVIOUS
											74,696 SF	35,976 SF
											1.715 AC.	0.826 AC.
											67.5%	32.5%
RCN	30	39	98	55	61	98	70	74	98	77	80	98
Rv	0.02	0.15	0.95	0.03	0.2	0.95	0.04	0.22	0.95	0.05	0.25	0.95
C-VALUE	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9	0.25	0.3	0.9

TOTAL AREA= 110,672 SF OR 2.541 AC.
TOTAL WOODS= 0 SF OR 0.000 AC.
TOTAL PERV.= 74,696 SF OR 1.715 AC.
TOTAL IMP.= 35,976 SF OR 0.826 AC.

WOODS= 77
POST-DEV.= 86
Rv.= 0.48
C-VALUE= 0.5

REQUIRED VOL. FOR THE BIO = 4,405.0)

REQUIRED VOL. FOR THE FOREBAY (606.75)

BIO AREA PONDING DEPTH			
ELEV.	SURFACE AREA	INCREMENTAL VOLUME	COMULATIVE VOLUME
456.50	3,295 sf	0.00 cf	0.00 cf
457.00	**3,700 sf**	**1,748.75 cf**	**1,748.75 cf**

FORBAY PONDING DEPTH TABLE			
ELEV.	SURFACE AREA	INCREMENTAL VOLUME	COMULATIVE VOLUME
456.50	1,625 sf	0.00 cf	0.00 cf
457.00	**1,813 sf**	**859.50 cf**	**859.50 cf**

PROVIDED VOLUME				
LAYER	DEPTH	VOID RATIO	VOLUME	*EQUATION*
Ponding Depth=	6 in.	1	2,608.25 cf	*see main cell area table*
Mulch Layer=	3 in.	0.25	205.94 cf	*3,295*(3/12)*0.25*
Soil Media=	24 in.	0.25	1,647.50 cf	*3,295*(30/12)*0.25*
Shoker Stone Layer=	3 in.	0.4	329.50 cf	*3,295*(3/12)*0.40*
Infiltration Sump=	3 in.	0.4	329.50 cf	*3,295*(3/12)*0.40*

TOTAL VOL.= **5,120.69 cf**

POND STAGE STORAGE VOL.			
ELEV.	AREA	CUM. VOL.	TOTAL VOL.
457	5,400 sf	0.00 cf	0.00 cf
458	6,475 sf	5,937.50 cf	5,937.50 cf
460	8,761 sf	15,236.42 cf	21,173.92 cf

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CHRISTOPHER H. LEMON
Lic. No. 047091
05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM BIORETENTION B INFLOW COMPUTATIONS

SHEET No.

C662

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C662 SWM BIORETENTION B INFLOW COMPUTATIONS.dwg, 2/13/2024 8:47:34 PM, Andrew H. Fraser,

Hydrograph Report

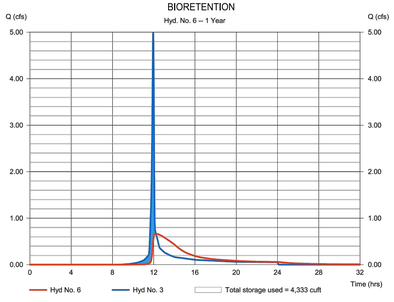
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Thursday, 11 / 2 / 2023

Hyd. No. 6

Pond B

Hydrograph type	= Reservoir	Peak discharge	= 0.662 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.23 hrs
Time interval	= 2 min	Hyd. volume	= 10,014 cuft
Inflow hyd. No.	= 3 - Post Dev DA B	Max. Elevation	= 457.74 ft
Reservoir name	= Pond B	Max. Storage	= 4,333 cuft

Storage Indication method used.



Hydrograph Report

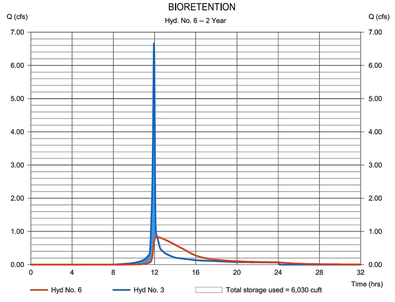
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 11 / 1 / 2023

Hyd. No. 6

Pond B

Hydrograph type	= Reservoir	Peak discharge	= 0.826 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.27 hrs
Time interval	= 2 min	Hyd. volume	= 13,455 cuft
Inflow hyd. No.	= 3 - Post Dev DA B	Max. Elevation	= 458.01 ft
Reservoir name	= Pond B	Max. Storage	= 6,030 cuft

Storage Indication method used.



Hydrograph Report

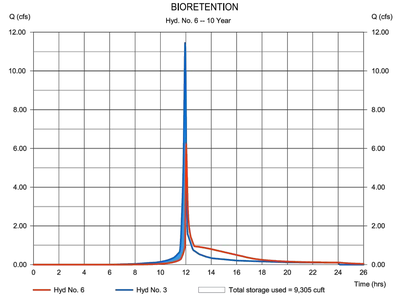
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 11 / 1 / 2023

Hyd. No. 6

Pond B

Hydrograph type	= Reservoir	Peak discharge	= 6.228 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 23,555 cuft
Inflow hyd. No.	= 3 - Post Dev DA B	Max. Elevation	= 458.50 ft
Reservoir name	= Pond B	Max. Storage	= 9,305 cuft

Storage Indication method used.



Hydrograph Report

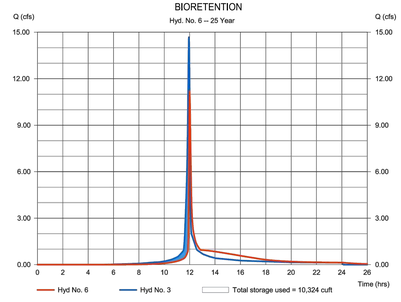
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Wednesday, 11 / 1 / 2023

Hyd. No. 6

Pond B

Hydrograph type	= Reservoir	Peak discharge	= 11.20 cfs
Storm frequency	= 25 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 30,590 cuft
Inflow hyd. No.	= 3 - Post Dev DA B	Max. Elevation	= 458.64 ft
Reservoir name	= Pond B	Max. Storage	= 10,324 cuft

Storage Indication method used.



Hydrograph Report

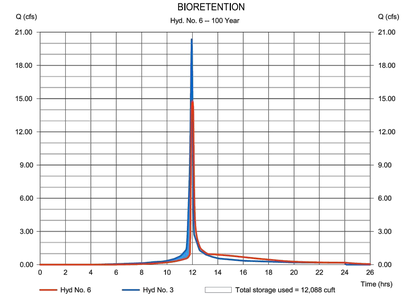
Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Thursday, 11 / 2 / 2023

Hyd. No. 6

Pond B

Hydrograph type	= Reservoir	Peak discharge	= 14.79 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 43,292 cuft
Inflow hyd. No.	= 3 - Post Dev DA B	Max. Elevation	= 458.88 ft
Reservoir name	= Pond B	Max. Storage	= 12,088 cuft

Storage Indication method used.



BIORETENTION COMPUTATION SUMMARY TABLE			
STORM EVENT	Q	PONDING DEPTH (OVER WEIR)	POND WSEL
1-YEAR	0.662 cfs	0.70 ft	457.70
2-YEAR	0.83 cfs	1.01 ft	458.01
10-YEAR	6.23 cfs	0.25 ft	458.50
25-YEAR	11.20 cfs	0.39 ft	458.64
100-YEAR	14.14 cfs	0.65 ft	458.90

EMBANKMENT DATA	
TOP =	460.00
BOTTOM =	456.50
EMBANKMENT HEIGHT =	3.50 ft
100 YR WSEL =	458.90
FREEBOARD =	1.10 ft
SETTLEMENT (10% H) =	0.35 ft
SETTLED TOP =	459.65

POND DATA	
POND BOTTOM	456.50
POND TOP	460.00
OUTFALL PIPE SIZE=	15 in.
OUTFALL PIPE ELEV.=	452.53
LOW FLOW ORIFICE SIZE=	6.0 in.
LOW FLOW ORIFICE ELEV.=	457.00
LOW FLOW ORIFICE COEFF.=	0.60
PRINCIPAL SPILLWAY LENGTH=	12.50 ft
PRINCIPAL SPILLWAY ELEV.=	458.25
PRINCIPAL SPILLWAY BREADTH=	0.5 ft
WEIR COEFF.=	3.33 ft

Pond Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Thursday, 11 / 2 / 2023

Pond No. 2 - BIORETENTION

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 457.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	457.00	5,416	0	0
0.50	457.50	5,938	2,837	2,837
1.00	458.00	6,474	3,102	5,939
1.50	458.50	7,025	3,373	9,312
2.00	459.00	7,589	3,652	12,965
2.50	459.50	8,168	3,938	16,903
3.00	460.00	8,761	4,231	21,134

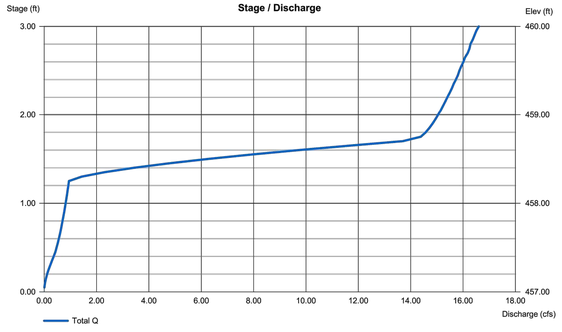
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 15.00	6.00	Inactive	Inactive
Span (in)	= 15.00	6.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (ft)	= 452.53	457.00	0.00	0.00
Length (ft)	= 62.01	0.00	0.00	0.00
Slope (%)	= 1.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 12.50	Inactive	Inactive	Inactive
Crest El. (ft)	= 458.25	0.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Rect	Rect	---
Multi-Stage	= Yes	No	No	No
Exfil.(in/hr)	= 0.000 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



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PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

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PROJECT No.: 22063.001.00
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DATE: 02/13/2023
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DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM BIORETENTION B OUTLET COMPUTATIONS

SHEET No.

C663

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C663 SWM BIORETENTION B OUTLET COMPUTATIONS.dwg, 2/13/2024 8:47:57 PM, Andrew H. Fraser,

BIORETENTION DETAILS

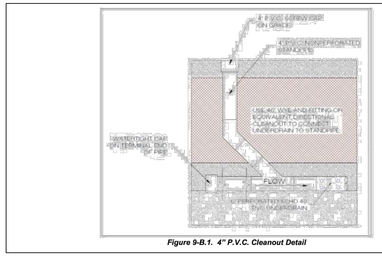

Figure 9-B.1. 4" P.V.C. Cleanout Detail

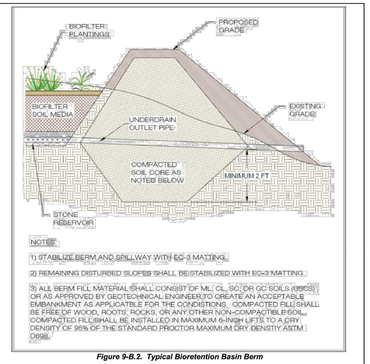

Figure 9-B.2. Typical Bioretention Basin Berm

SECTION 8: CONSTRUCTION

8.1. Construction Sequence

Construction Stage E&S Controls. Micro-bioretention and small-scale bioretention areas should be fully protected by silt fence or construction fencing, particularly if they will rely on infiltration (i.e., have no underdrains). Ideally, bioretention should remain outside the limit of disturbance during construction to prevent soil compaction by heavy equipment. Bioretention basin locations may be used as small sediment traps or basins during construction. However, these must be accompanied by notes and graphic details on the ESC plan specifying that (1) the maximum excavation depth at the construction stage must be at least 1 foot above the post-construction maximum excavation, (2) the facility must contain an underdrain, and (3) the plan must also show the proper procedures for converting the temporary sediment control practice to a permanent bioretention facility, including dewatering, cleanout and stabilization.

8.2 Bioretention Installation

The following is a typical construction sequence to properly install a bioretention basin. The installation of a bioretention basin will include intermediate inspections at critical stages of construction with inspector sign-off that the particular elements of the bioretention are constructed according the approved plans and specifications. As an alternative, if allowed by the VSMP Authority, the contractor may rely on the engineer of record or other qualified individual to conduct the intermediate inspections and certifications of compliance. The construction sequence for micro-bioretention is more simplified. These steps may be modified to reflect different bioretention applications or expected site conditions:

Step 1. Construction of the bioretention area may only begin after the entire contributing drainage area has been stabilized with vegetation. It may be necessary to block certain curb or other inlets while the bioretention area is being constructed. The proposed site should be checked for existing utilities prior to any excavation.

Step 2. The designer and the installer should have a preconstruction meeting, checking the boundaries of the contributing drainage area and the actual inlet elevations to ensure they conform to original design. Since other contractors may be responsible for constructing portions of the site, it is quite common to find subtle differences in site grading, drainage and paving elevations that can produce hydraulically important differences for the proposed bioretention area. The designer should clearly communicate, in writing, any project changes determined during the preconstruction meeting to the installer and the plan review/inspection authority.

Step 3. Temporary E&S controls are needed during construction of the bioretention area to divert stormwater away from the bioretention area and the actual inlet elevations to ensure they conform to original design. Since other contractors may be responsible for constructing portions of the site, it is quite common to find subtle differences in site grading, drainage and paving elevations that can produce hydraulically important differences for the proposed bioretention area. The designer should clearly communicate, in writing, any project changes determined during the preconstruction meeting to the installer and the plan review/inspection authority.

Step 4. Any pre-treatment cells should be excavated first and then sealed to trap sediments.

Step 5. Excavators or backhoes should work from the sides to excavate the bioretention area to its appropriate design depth and dimensions. Excavating equipment should have scoops with adequate reach so they do not have to sit inside the footprint of the bioretention area. Contractors should use a cell construction approach in larger bioretention basins, whereby the basin is split into 500 to 1,000 sq. ft. temporary cells with a 10-15 foot earth bridge in between, so that cells can be excavated from the side.

Step 6. It may be necessary to rip the bottom soils to a depth of 6 to 12 inches to promote greater infiltration.

Step 7. Place geotextile fabric on the sides of the bioretention area with a 6-inch overlap on the sides. If a stone storage layer will be used, place the appropriate depth of #57 stone on the bottom, install the perforated underdrain pipe, pack #57 stone to 3 inches above the underdrain pipe, and add approximately 3 inches of choker stone/pea gravel as a filter between the underdrain and the soil media layer. If no stone storage layer is used, start with 6 inches of #57 stone on the bottom, and proceed with the layering as described above.

Step 8. Obtain soil the media from a qualified vendor, and store it on an adjacent impervious area or plastic sheeting. After verifying that the media meets the specifications, apply the media in 12-inch lifts until the desired top elevation of the bioretention area is achieved. Wait a few days to check for settlement, and add additional media, as needed, to achieve the design elevation.

Step 9. Prepare planting holes for any trees and shrubs, install the vegetation, and water accordingly. Install any temporary irrigation.

Step 10. Place the surface cover in both cells (mulch, river stone or turf), depending on the design. If coir or jute matting will be used in lieu of mulch, the matting will need to be installed prior to planting (**Step 9**), and holes or slits will have to be cut in the matting to install the plants.

Step 11. Install the plant materials as shown in the landscaping plan, and water them during weeks of no rain for the first two months.

8.3 Construction Inspection

Inspections during and immediately after construction are needed to ensure that all the elements of bioretention basins are built in accordance with these specifications. Use a detailed inspection checklist that requires sign-offs by qualified individuals at critical stages of construction and to ensure that the contractor's interpretation of the plan is consistent with the designer's intent. The following identifies the critical stages of construction where an intermediate inspection and sign-off by a qualified individual is recommended since the items can't be verified after construction is completed. A construction inspection checklist that includes certifications of inspection at critical stages is provided at the end of this specification.

The following represents items that are frequently overlooked during construction inspection but represent important elements for ensuring the success of the bioretention facility during the initial break-in period.

- Verify the proper coverage and depth of mulch, vegetation, or soil matting has been achieved following construction, both on the filter bed and the side-slopes.
- Inspect the pre-treatment forbays and filter strips to verify that they are properly installed, stabilized, and working effectively before opening the facility to runoff.
- Check that outfall protection/energy dissipation measures at concentrated inflow and outflow points are stable.

Upon final acceptance of the facility, log the practice's GPS coordinates and submit them for entry into the VSMP Authority's BMP maintenance tracking database.

SECTION 9: MAINTENANCE

9.1. Maintenance Agreements

The Virginia Stormwater Management regulations (4 VAC 50-60) specify the circumstances under which a maintenance agreement must be executed between the owner and the VSMP authority, and sets forth inspection requirements, compliance procedures if maintenance is neglected, notification of the local program upon transfer of ownership, and right-of-entry for local program personnel.

- All bioretention practices must include a long term maintenance agreements consistent with the provisions of the VSMP regulations, and must include the recommended maintenance tasks and a copy of an annual inspection checklist.
- When micro-scale bioretention practices are applied on private residential lots, homeowners should be educated regarding their routine maintenance needs by being provided a simple document that explains their purpose and routine maintenance needs. .
- A deed restriction, drainage easement or other mechanism enforceable by the VSMP authority must be in place to help ensure that rain gardens and bioretention filters are maintained and not converted or disturbed, as well as to pass the knowledge along to any subsequent owners.
- The mechanism should, if possible, grant authority for the VSMP authority to access the property for inspection or corrective action.

9.2. First Year Maintenance Operations

Successful establishment of bioretention areas requires that the following tasks be undertaken in the first year following installation:

- ***Initial inspections.*** For the first 6 months following construction, the site should be inspected at least twice after storm events that exceed 1/2 inch of rainfall.
- ***Spot Reseeding.*** Inspectors should look for bare or eroding areas in the contributing drainage area or around the bioretention area, and make sure they are immediately stabilized with grass cover.
- ***Fertilization.*** One-time, spot fertilization may be needed for initial plantings.
- ***Watering.*** Watering is needed once a week during the first 2 months, and then as needed during first growing season (April-October), depending on rainfall.
- ***Remove and replace dead plants.*** Since up to 10% of the plant stock may die off in the first year, construction contracts should include a care and replacement warranty to ensure that vegetation is properly established and survives during the first growing season following construction. The typical thresholds below which replacement is required are 85% survival of plant material and 100% survival of trees.

9.3. Maintenance Inspections

It is highly recommended that a spring maintenance inspection and cleanup be conducted at each bioretention area. The following is a list of some of the key maintenance problems to look for:

- Check to see if 75% to 90% cover (mulch plus vegetative cover) has been achieved in the bed, and measure the depth of the remaining mulch.
- Check for sediment buildup at curb cuts, gravel diaphragms or pavement edges that prevents flow from getting into the bed, and check for other signs of bypassing.
- Check for any winter- or salt-killed vegetation, and replace it with hardier species.
- Note presence of accumulated sand, sediment and trash in the pre-treatment cell or filter beds, and remove it.
- Inspect bioretention side slopes and grass filter strips for evidence of any rill or gully erosion, and repair it.
- Check the bioretention bed for evidence of mulch flotation, excessive ponding, dead plants or concentrated flows, and take appropriate remedial action.
- Check inflow points for clogging, and remove any sediment.
- Look for any bare soil or sediment sources in the contributing drainage area, and stabilize them immediately.
- Check for clogged or slow-draining soil media, a crust formed on the top layer, inappropriate soil media, or other causes of insufficient filtering time, and restore proper filtration characteristics.

Example maintenance inspection checklists for Bioretention areas can be accessed in Appendix C of Chapter 9 of the *Virginia Stormwater Management Handbook* (2010).

9.4. Routine and Non-Routine Maintenance Tasks

Maintenance of bioretention areas should be integrated into routine landscape maintenance tasks. If landscaping contractors will be expected to perform maintenance, their contracts should contain specifics on unique bioretention landscaping needs, such as maintaining elevation differences needed for ponding, proper mulching, sediment and trash removal, and limited use of fertilizers and pesticides. A customized maintenance schedule must be prepared for each bioretention facility, since the maintenance tasks will differ depending on the scale of bioretention, the landscaping template chosen, and the type of surface cover. A generalized summary of common maintenance tasks and their frequency is provided in **Table 9.8**.

The most common non-routine maintenance problem involves standing water. If water remains on the surface for more than 48 hours after a storm, adjustments to the grading may be needed or underdrain repairs may be needed. The surface of the filter bed should also be checked for accumulated sediment or a fine crust that builds up after the first several storm events. There are several methods that can be used to rehabilitate the filter (try the easiest things first, as listed below):

- Open the underdrain observation well or cleanout and pour in water to verify that the underdrains are functioning and not clogged or otherwise in need of repair. The purpose of this check is to see if there is standing water all the way down through the soil. If there is standing water on top, but not in the underdrain, then there is a clogged soil layer. If the underdrain and stand pipe indicates standing water, then the underdrain must be clogged and will need to be snaked.
- Remove accumulated sediment and till 2 to 3 inches of sand into the upper 8 to 12 inches of soil.
- Install sand wicks from 3 inches below the surface to the underdrain layer. Sand wicks can be installed by excavating or augering (using a tree auger or similar tool) down to the gravel storage zone to create vertical columns which are then filled with a clean open-graded coarse sand material (coarse sand mix similar to the gradation used for the soil media). A sufficient number of wick drains of sufficient dimension should be installed to meet the design dewatering time for the facility.
- Last resort - remove and replace some or all of the soil media.

Table 9.8. Suggested Annual Maintenance Activities for Bioretention

Maintenance Tasks	Frequency
• Mowing of grass filter strips and bioretention turf cover	At least 4 times a year
• Spot weeding, erosion repair, trash removal, and mulch raking	Twice during growing season
• Add reinforcement planting to maintain desired the vegetation density • Remove invasive plants using recommended control methods • Stabilize the contributing drainage area to prevent erosion	As needed
• Spring inspection and cleanup • Supplement mulch to maintain a 3 inch layer • Prune trees and shrubs	Annually
• Remove sediment in pre-treatment cells and inflow points	Once every 2 to 3 years
• Replace the mulch layer	Every 3 years

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COMMONWEALTH OF VIRGINIA
CHRISTOPHER H. LEMON
Lic. No. 047091
05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

SWM BIORETENTION B DETAILS

SHEET No.

C664

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C664 SWM BIORETENTION B DETAILS.dwg, 2/13/2024 8:48:17 PM, Andrew H. Fraser,



LoCo BMP Construction Inspection Checklist:

Wet Pond

Project Name _____ **Project #** _____ **Dates Inspected** _____ **to** _____

LOCATION of BMP (e.g., BMP 1 @ SE corner of parking lot) _____

GEOGRAPHIC COORDINATES from Plans (Optional): Latitude_____ Longitude_____ (decimal °)

The following checklist provides a basic outline of the anticipated items for the construction inspection of a Wet Pond. Inspectors should review the plans carefully, and adjust these items and the timing of inspection verification as needed to ensure the intent of the design and the inspection is met. Please use "Notes" section at the end of this form to describe additional observations & for explanation when "No" is checked.

Inspections Performed By One or More of the Following:

(Please insert appropriate code adjacent to each inspection item)

01 Owner/Operator or their Representative

02 Installer/Contractor

03 Geotechnical Engineer

Prior to Construction:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	All pervious areas of the contributing drainage areas have been adequately stabilized with a thick layer of vegetation or adequate erosion control measures remain in place.	

Construction of Embankment and Principal Spillway:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Digital Photos taken during this stage.	
0__	☐	☐	☐	Stormwater has been diverted around or through the area of the wet pond embankment to a stabilized conveyance and perimeter erosion control measures to protect the facility during construction have been installed.	

Construction of Embankment and Principal Spillway cont'd:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Materials for construction of the embankment and principal spillway meet the specifications of the approved plans.	
0__	☐	☐	☐	Construction of "cut-off" trench, principal spillway, including the riser and barrel, anti-seepage controls, outlet protection, etc., is built in accordance with approved plans.	
03	☐	☐	☐	Geotechnical engineer's analysis and approval of the core (if required) and embankment material has been provided, and the material has been placed in lifts and compacted in accordance with the approved plans. Sign below to verify installation.*	

***Name** _____ **Signature** _____

Virginia License # _____ **Date** _____

03	☐	☐	☐	Design & Construction of "filter and drainage diaphragms," if included, has been supervised by the Geotechnical Engineer. Sign below to verify installation.*	

***Name** _____ **Signature** _____

Virginia License # _____ **Date** _____

Excavation of Wet Pond:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Digital Photos taken during this stage.	
0__	☐	☐	☐	Excavation of the wet pond geometry (including bottom width, side slopes, check dams, weir overflow and outlet protection, etc) achieves the elevations in accordance with approved plans.	
0__	☐	☐	☐	Excavation of internal features: deep pool, forebays, etc., is in accordance with approved plans.	

Excavation of Wet Pond cont'd:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Impermeable geotextile liner (minimum 30 mil poly-liner), when required, meets project specifications as certified by the manufacturer and verified by the installer.	
03	☐	☐	☐	Impermeable clay liner, when required, is placed per geotechnical engineer's oversight. Note: clay liners must meet the minimum requirements found in Table 14.4 in Specification 14 of the Va. BMP Clearinghouse. Sign below to verify installation.*	

***Name** _____ **Signature** _____

Virginia License # _____ **Date** _____

Landscaping Plan and Stabilization:

Inspector	Yes	No	N/A	Construction Item	Date Completed
0__	☐	☐	☐	Digital Photos taken during this stage.	
0__	☐	☐	☐	Exposed soils on pond side slopes above permanent pool elevation are stabilized with specified seed mixtures, stabilization matting, mulch, etc., in accordance with approved plans.	
0__	☐	☐	☐	Appropriate number and spacing of plants are installed and protected on the aquatic bench and pond buffer in accordance with the approved plans.	

Date:	Additional Inspection Notes:

Date:	Additional Inspection Notes:

Note: Provide this report, along with digital photos, to the LoCo Dept. of Building & Development coincident with E&S Bond Release. "As-Built" plans of the BMP & P.E. certification must be provided to B&D prior to VSMP Permit Termination.

BMP INSPECTION CHECKLIST INSTRUCTIONS

1. **Checklist Basics**

A. The person noted as the **"operator"** on the VSMP permit for the site where the BMP is constructed is ultimately responsible for the inspections being performed & completion of the checklist.

B. There will be one (1) Construction Inspection Checklist per BMP.

C. Use dark ink (blue or black) to fill out the document. ✔

D. Make sure to fill out the grey information box (on the 1st page) describes the location of the BMP on the site, as well as its geographic coordinates (obtain from the approved plans).

E. If construction of a BMP is already underway when this program begins on **August 1, 2017**, please denote all checklist items that have been completed. However, if there is insufficient information available to verify completion of a construction item, check the N/A (not applicable) box and provide a brief explanation in the **"Additional Inspection Notes"** section.

F. Each checklist is divided into phases of construction (e.g., excavation, bioretention soil media placement, etc.) with individual construction items within each phase.

G. For the majority of the checklist items, any of the following individuals may perform inspections and fill out the document*:

i. The operator/owner or his representative (e.g., project engineer);

ii. The contractor who installs the BMP; and/or,

iii. The geotechnical engineer for the project.

*The individual filling out the checklist must indicate so **for each construction item** (i.e., **enter designated number**).

H. Note: A licensed Geotechnical Engineer must inspect & verify the installation of the specific checklist items below via this signature block found in the document:

Name _____ **Signature** _____

Virginia License # _____ **Date** _____

i. Bioretention Facility – Impervious clay liner (when required) must meet specifications found in the Va. BMP Clearinghouse.

ii. Wet Pond & Extended Detention Pond –

a. Embankment core (if required) and embankment material;

BMP INSPECTION CHECKLIST INSTRUCTIONS (cont'd)

b. Design & construction of filter & drainage diaphragms (if included); &

c. Impervious clay liner (if required).

iii. Wet & Dry Swales – Impervious clay liner (when required) must meet specifications found in the Va. BMP Clearinghouse.

G. When filling out the checklist, check **"Yes"** when construction of the item is completed per the explanation/description. Concurrently, enter the "Date Completed."

H. Check **"N/A"** (not applicable) if the construction item is not part of the approved design (e.g., an impervious liner is not required) or there is an approved field modification which changes or eliminates the item. When N/A is checked, always explain the reason in the **"Additional Inspection Notes"** section at the end of the checklist.

I. Also use **"Additional Inspection Notes"** for any notes/clarification that will help verify that the BMP was properly constructed.

2. **Photos**

A. Digital photos are required for most phases of BMP construction.

B. The photos will help to verify that each stage of construction met the standards required in the checklist.

3. **Location of BMP Checklists on Site & Checklist Updates**

A. The checklist for a particular BMP will be updated as the different phases of the installation occur. Once the construction of a BMP has begun, attach the **up-to-date** checklist to the on-site Stormwater Pollution & Prevention Plan (SWPPP).

B. BMP Checklists may be reviewed on site by a member of B&D's VSMP Team (as well as the Erosion & Sediment Control Field Manager) during spot checks of the BMP installation.

4. **Construction Complete - Final Step**

A. Once construction of the BMP is complete, submit the completed Loudoun County BMP Checklist along with all digital photos to B&D coincident with Erosion & Sediment Control Bond release.

- **Reminder** – "As-Built" plans & P.E. Certification related to BMP construction must still be provided to B&D for review prior to VSMP Permit Termination.

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COMMONWEALTH OF VIRGINIA
CHRISTOPHER H. LEMON
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05/13/2022
PROFESSIONAL ENGINEER

HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
SWM BIORETENTION B CONSTRUCTION INSPECTION CHECKLIST

SHEET No.
C665

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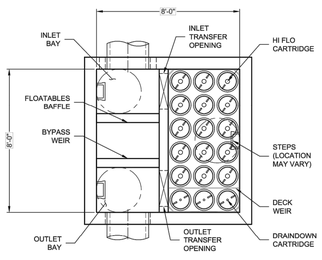
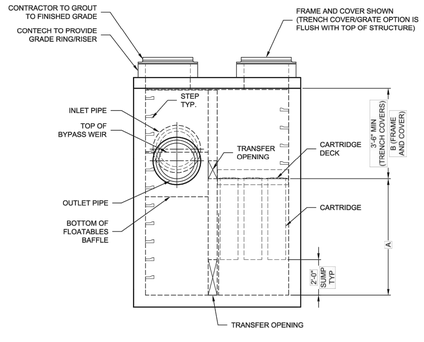
PROPRIETARY PRODUCTS NOTE

CONTRACTOR SHALL CONTACT THE MANUFACTURER AND OBTAIN THE MOST CURRENT SPECIFICATIONS AND INSTALLATION GUIDELINES PRIOR TO INITIATING WORK AND REVIEW FOR CONFORMANCE WITH PLAN SPECIFICATIONS AND GUIDELINES. ANY DISCREPANCIES OR CHANGES SHALL BE BROUGHT TO THE ATTENTION OF ENGINEER OR OWNER FOR NEEDED ACTION.

IMEG CORP. CERTIFIES THAT THIS SHEET SPECIFIES A PRODUCT PRODUCED AND DESIGNED BY OTHERS. THIS PLAN HAS BEEN DESIGNED TO INCORPORATE THE PRODUCT INTO THE SITE DESIGN IN A MANNER CONSISTENT WITH THE INTENDED USE OF THE PRODUCT. SEE PLANS, PROFILES AND SCHEMATIC DETAILS INCLUDED IN THIS PLAN FOR SITE SPECIFIC INFORMATION APPLICABLE TO ITS USE ON THIS SITE. THE PRODUCT MANUFACTURER IS RESPONSIBLE FOR PROVIDING CURRENT SPECIFICATIONS FOR THE INSTALLATION AND USE OF THE PRODUCT.

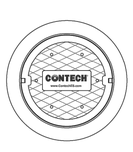


PLAN VIEW
(TOP SLAB NOT SHOWN FOR CLARITY)

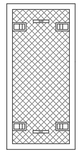


ELEVATION VIEW

JELLYFISH DESIGN NOTES				
JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE LENGTH AND THE NUMBER OF CARTRIDGES. THE STANDARD PEAK DIVERSION STYLE WITH PRECAST TOP SLAB IS SHOWN. ALTERNATE OFFLINE VAULT AND/OR SHALLOW ORIENTATIONS ARE AVAILABLE. PEAK CONVEYANCE CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD				
CARTRIDGE SELECTION				
CARTRIDGE LENGTH	54"	40"	27"	15"
OUTLET INVERT TO STRUCTURE INVERT (A)	6'-6"	5'-4"	4'-3"	3'-3"
FLOW RATE HI-FLO / DRAINDOWN (CFS) (PER CART)	0.178 / 0.089	0.133 / 0.067	0.089 / 0.045	0.049 / 0.025
MAX. TREATMENT (CFS)	2.94	2.21	1.47	0.81
DECK TO INSIDE TOP (MIN) (B)	5.00	4.00	4.00	4.00



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.



24" TRENCH COVER
(LENGTH VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS						
STRUCTURE ID						*
WATER QUALITY FLOW RATE (cfs)						*
PEAK FLOW RATE (cfs)						*
RETURN PERIOD OF PEAK FLOW (yrs)						*
# OF CARTRIDGES REQUIRED (HF / DD)						*
CARTRIDGE LENGTH						*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL	
INLET #1	*	*	*	*	*	
INLET #2	*	*	*	*	*	
OUTLET	*	*	*	*	*	
SEE GENERAL NOTES 6-7 FOR INLET AND OUTLET HYDRAULIC AND SIZING REQUIREMENTS.						
RIM ELEVATION						*
ANTI-FLOTATION BALLAST			WIDTH		HEIGHT	
			*		*	
NOTES/SPECIAL REQUIREMENTS:						
* PER ENGINEER OF RECORD						

GENERAL NOTES:
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE. www.ContechES.com
3. JELLYFISH WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS-20 OR PER APPROVING JURISDICTION REQUIREMENTS, WHICHEVER IS MORE STRINGENT, ASSUMING EARTH COVER OF 0' - 10', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 LOAD RATING AND BE CAST WITH THE CONTECH LOGO.
5. STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-857, ASTM C-978, AND AASHTO LOAD FACTOR DESIGN METHOD.
6. OUTLET PIPE INVERT IS EQUAL TO THE CARTRIDGE DECK ELEVATION.
7. THE OUTLET PIPE DIAMETER FOR NEW INSTALLATIONS IS RECOMMENDED TO BE ONE PIPE SIZE LARGER THAN THE INLET PIPE AT EQUAL OR GREATER SLOPE.
8. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE.
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT).
D. CARTRIDGE INSTALLATION, BY CONTECH, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE JELLYFISH UNIT IS CLEAN AND FREE OF DEBRIS. CONTACT CONTECH TO COORDINATE CARTRIDGE INSTALLATION WITH SITE STABILIZATION.

Jellyfish® Filter
THIS PRODUCT MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING: U.S. PATENT NO. 8,287,726; 8,221,618; US 8,123,935; OTHER INTERNATIONAL PATENTS PENDING

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

JELLYFISH JFPD0808
STANDARD DETAIL
PEAK DIVERSION CONFIGURATION

I:\COMMON\CAD\TREATMENT\13 JELLYFISH FILTER\40 STANDARD DRAWINGS\JFPD\DWG\JFPD0808.DTL.NEW.DWG 1/29/2018 10:50 AM

CONTECH ENGINEERED SOLUTIONS

Project Name:	Hillside		
Site Designation:	JF	**Date:**	10/30/23
County or Independent City:	Charles Town	**Design Engineer:**	
State:	WV		

Mass Loading Calculations:

Peak Design Flow (cfs)	TBD
Water Quality Flow (cfs)	0.48
Annual Rainfall (inches)	43
Total Drainage Area, A (ac)	10.17
Post Development Impervious Area, A_I (ac)	4.37
Pervious Area, A_P (ac)	0.58
Impervious Runoff Coefficient, Rv	0.95
Pervious Runoff Coefficient, Rv	0.25
% Impervious	43%
Runoff Coefficient, Rc	0.42
TSS Removal By Pretreatment	40%
Agency Required TSS % Removal	80%
Required TSS Removal Efficiency of Filter	67%
Percent Runoff Capture	90%
Mean Annual Runoff, V_t (ft^3)	603,577
Event Mean Concentration of Pollutant, EMC (mg/L)	60
Annual Mass Load, M_{total} (lbs)	2259.46

Mass Based Filter Sizing:

Mass to be Captured by System (lbs)	903.78
Filter Type	Jellyfish
Structure Type	Peak Diversion
Cartridge Length	54"
Allowable Load Per Hi-Flo Cartridge (lbs)	125
Allowable Load Per Draindown Cartridge (lbs)	63
# Hi-Flo Cartridges Required	7
# Draindown Cartridges Required	2
Recommended Model	8'x8' Peak Diversion
TSS Treatment Capacity (lbs)	1001.00
Maximum Water Quality Flow	1.43 cfs

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PRELIM PLAN - SWM POND DETAILS
HILLSIDE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
SWM ADDITIONAL POND DETAILS

SHEET No.
C670

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C670 SWM Additional Pond Details.dwg, 2/13/2024 8:49:01 PM, Andrew H. Fraser,

SEDIMENT BASIN KEY DESIGN ASPECTS

BASIN NUMBER	1	2	3	4	5	6
TYPE (stone weir/pipe)	Pipe	Pipe				
DRAINAGE AREA	6.40 AC	5.67 AC				
WET STORAGE REQ	11,520 CF	10,206 CF				
WET STORAGE PROV	13,754 CF	23,049 CF				
DRY STORAGE REQ	11,520 CF	10,206 CF				
DRY STORAGE PROV	13,163 CF	23,834 CF				
WEIR WIDTH	N/A	N/A				
PIPE DIAMETER	24 in	30 in				
WEIR/PIPE ELEVATIONS	N/A	N/A				
STORAGE DEPTH	7 ft	9.5 ft				
CLEANOUT ELE	462.80 ft	440.25 ft				
EMBANKMENT ELE	468.00 ft	448.00 ft				
BASIN BOTTOM ELE	462.00 ft	438.50 ft				

LEGEND

- CE — TEMPORARY CONSTRUCTION ENTRANCE
- IP — INLET PROTECTION
- SF — SILT FENCE
- SSF — SUPER SILT FENCE
- DD — DIVERSION DIKE

STERNWAY DRIVE (40' ROW)

PROPOSED SEDIMENT TRAP
PIPE OUTFALL CONNECTION

80'-24" RCP
@ 3.50%

INVERT=460.00

INVERT= 462.80

BAFFLE BOARD

PROPOSED RIP-RAP
INFLOW PROTECTION
(TYP.)

INSET

PROP. TEMPORARY SEDIMENT BASIN (SB) #1
(SEE SCHEDULE ON THIS SHEET)
(SEE PIPE RISER SEDIMENT BASIN
DETAIL ON SHEET C705)

SEE INSET THIS SHEET

SEE SHEET C701

DA= 0.78 AC
TO SF

DA= 6.40 AC
TO SB 1

PROP. LIMITS OF
CLEARING AND
GRADING

SOIL TYPE D

SOIL TYPE B

TEMPORARY
STOCKPILE/
WASTE AREA

WEST VIRGINIA STATE GRID NORTH
WV83-NF

E:2437641
N:286879

E:2437891
N:286366

E:2439001
N:286710

40 20 0 40 80
GRAPHIC SCALE
1" = 40'

60 30 0 60 120
GRAPHIC SCALE
1" = 60'

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PRELIM PLAN - EROSION &
SEDIMENT CONTROL PLAN PHASE 1
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 60'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

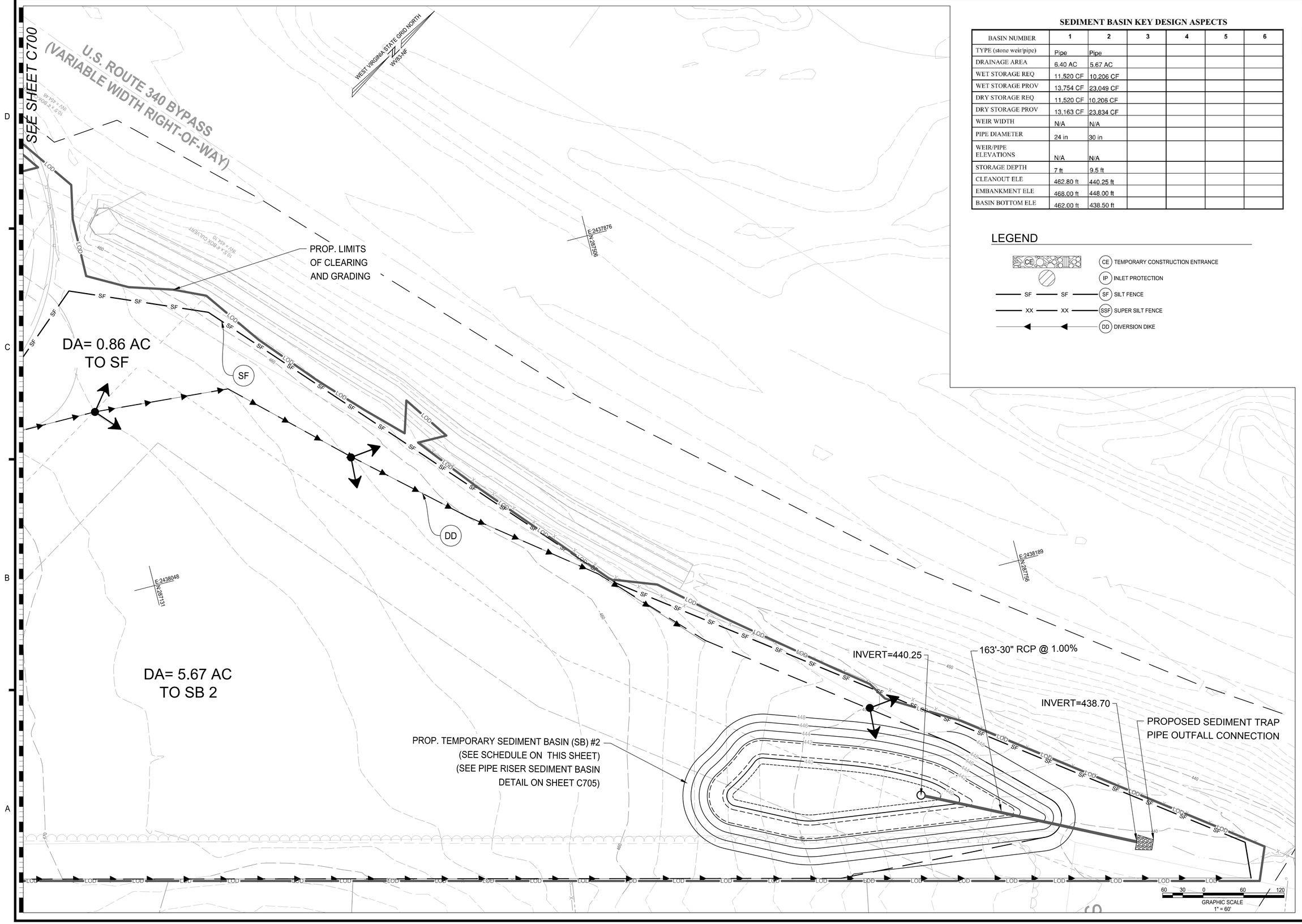
SHEET TITLE:

EROSION &
SEDIMENT
CONTROL PLAN
PHASE 1

SHEET No.

C700

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C701 Erosion & Sediment Control Plan Phase 1.dwg, 2/13/2024 8:49:44 PM, Andrew H. Fraser,



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LEGEND

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- SF — SILT FENCE
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PRELIM PLAN - EROSION & SEDIMENT CONTROL PLAN PHASE 1
LOTS 2A (RESIDUE) & 2B
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EROSION & SEDIMENT CONTROL PLAN PHASE 1

SHEET No.

C701

P:\Projects\22063\001001\112742 Prelim Subdivision - Land Development Plan\C701 Erosion & Sediment Control Plan Phase 1.dwg, 2/13/2024 8:49:52 PM, Andrew H. Fraser,

SOIL TYPE D

SOIL TYPE B

STERNWAY DRIVE

STERNWAY DRIVE (40' ROW)

EDAW DRIVE (40' ROW)

PUBLIC ROAD 'A'

PUBLIC ROAD 'B'

PUBLIC ROAD 'C'

DA= 0.25 AC
C= 0.77
TO 148

DA= 0.74 AC
C= 0.67
TO 146

DA= 0.28 AC
C= 0.83
TO 150

DA= 0.21 AC
C= 0.84
TO 144

DA= 0.26 AC
C= 0.90
TO 310

DA= 0.46 AC
C= 0.85
TO 120

DA= 0.07 AC
C= 0.35
TO 140

DA= 0.63 AC
C= 0.71
TO 118

DA= 0.56 AC
C= 0.87
TO 116

DA= 0.56 AC
C= 0.86
TO 122

DA= 0.46 AC
C= 0.83
TO 136

DA= 0.13 AC
C= 0.81
TO 130

DA= 0.14 AC
C= 0.82
TO 132

DA= 0.05 AC
C= 0.79
TO 172

DA= 0.51 AC
C= 0.90
TO 312

DA= 0.53 AC
C= 0.87
TO 124

DA= 0.21 AC
C= 0.82
TO 178

DA= 0.07 AC
C= 0.81
TO 174

DA= 0.32 AC
C= 0.89
TO 126

DA= 0.24 AC
C= 0.74
TO 176

DA= 0.59 AC
C= 0.90
TO 162

DA= 0.39 AC
C= 0.86
TO 170

SEE SHEET C703

E 2437686
N 286460

E 2438031
N 286550

TW=496.00
BW=486.00

TW=496.30

GRAPHIC SCALE
1" = 30'

30 15 0 30 60

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PRELIM PLAN - EROSION & SEDIMENT CONTROL PLAN PHASE 1
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

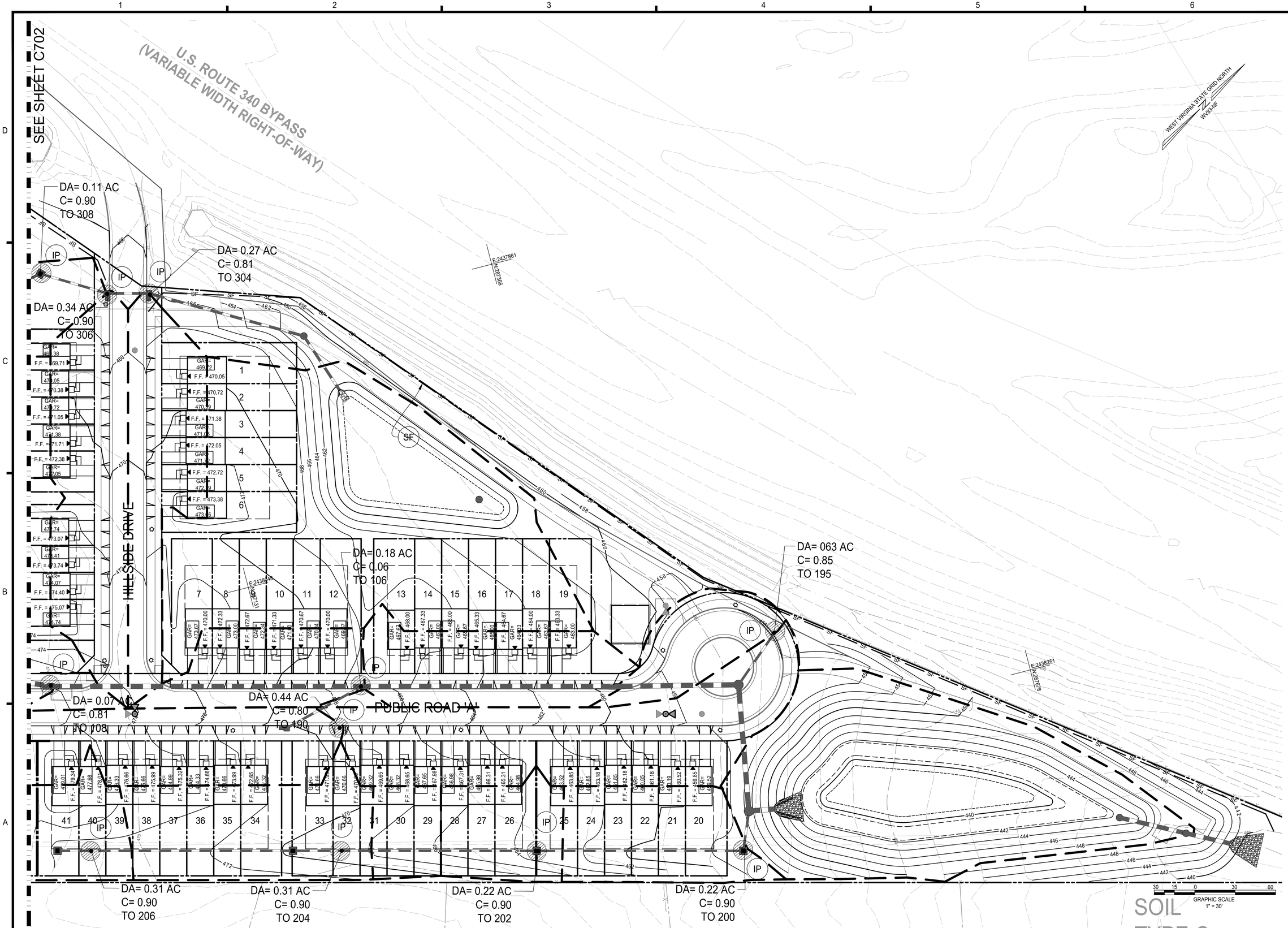
EROSION & SEDIMENT CONTROL PLAN PHASE 2

SHEET No.

C702

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C703 Erosion & Sediment Control Plan Phase 2.dwg, 2/13/2024 8:51:04 PM, Andrew H. Fraser,

620



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PRELIM PLAN - EROSION & SEDIMENT CONTROL PLAN PHASE 1

LOTS 2A (RESIDUE) & 2B

LOTS 2A (RESIDUE) & 2B

DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

EROSION & SEDIMENT CONTROL PLAN PHASE 2

SHEET No.

C703

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EROSION AND SEDIMENT CONTROL NARRATIVE

Description: The Project delineated hereon is located in the City of Charles Town, WV. This plan proposes construction of127 town home lots and associated roads and utilities. Approximately 14.255 acres will be disturbed for construction.

Date of construction: Construction will begin following plan approval and is estimated to take up to 4 years to complete the project.

Offsite areas: Top soil will be stripped from graded areas and stockpiled for use in final grading and permanent stabilization. Stockpiles will be kept on site and clear of all construction activities. The stockpiles will be be stabilized with temporary seeding and protected with silt fence or earthern berms.

Erosion And Sediment Control Measures: Unless otherwise indicated, all vegetative and structural erosion and sediment control measures shall be constructed and maintained according to the minimum standards and specifications of the West Virginia Erosion and Sediment Control Handbook.

Management Strategies:

Construction shall be sequenced such that grading operations will begin and end as quickly as possible.

The site superintendent shall be responsible for the installation and maintenance of all erosion and sediment control measures. Maintenance of these measures throughout the project is critical to the effectiveness of the program.

After areas above controls have been stabilized, the controls shall be cleaned up and removed.

Electric power, telephone, storm, sanitary, water & gas supply trenches (as applicable) are to be compacted, seeded and mulched within four (4) days after backfilling. No more than 500 feet are to be open at any one time.

All cut and fill slopes are to be seeded and mulched within four (4) days of completion of grading.

Drainage swales shall be stabilized with check dams until vegetation has been well established, at which time the temporary check dams shall be removed.

Devices listed above are considered minimum erosion and sediment controls. Additional control measures may be necessary due to contractor phasing or other unforeseen conditions. It is the contractor's responsibility to provide additional measures to those shown, as needed, in order to control erosion and contain sediment on site. All measures shall be installed according to the standards and specifications in the West Virginia erosion and sediment control handbook.

Maintenance Program:

All control measures shall be inspected daily by the site superintendent or his representative and within 24 hours after any storm event greater than 0.25 inches of rain per 24-hour period. Any damaged structural measures are to be repaired by the end of the day. Seeded areas shall be checked regularly to ensure that a good stand of grass is maintained. All areas shall be fertilized and reseeded as needed until grass is established.

Trapped sediment is to be removed as required to maintain 50% trap efficiency and disposed of by spreading on site.

Inlet protection shall be checked regularly for sediment build-up. If the gravel outlet is clogged by sediment, it shall be removed and cleaned or replaced immediately.

The contractor is responsible for keeping existing public roads in a clean, dust and mud free, condition at all times.

Erosion and sediment control program:

1. Hold pre-construction meeting on site with inspector.
2. Install construction entrance.
3. Clearing and grubbing for sediment control devices only.
4. Placement of sediment control devices.
5. Obtain inspector's approval prior to beginning grading operations.
6. Clear and grub remainder of site.
7. Rough grade site.
8. Install drainage devices with sediment control. This includes drainage swales with RIP-RAP.
9. Final grading.
10. Restoration and stabilization of disturbed areas.
11. Convert trap to Bio-retention (see Bio-retention Sequence of Construction for details).
12. Remove erosion and sediment control measures with the approval of the inspector.

Note: City of Charles Town Public Officials retain the right to add and/or modify these erosion and sediment control measures during the construction process, within reason, to ensure adequate protection to the public and the environment.

Seeding schedule (soil stabilization):

1. All permanent seeding shall be in accordance with the West Virginia Erosion & Sediment Control Manual.
2. Spread topsoil at a minimum depth of four (4) inches.
3. Incorporate pulverized agricultural limestone into the topsoil at a rate of 92 lbs. per 1,000 square feet (2 tons per acre).
4. Fertilize with 10-10-10 fertilizer at a rate of 23 lbs per 1,000 square feet (1,000 lbs per acre).
5. Seed all areas with a seed mix consisting of 67% Kentucky 31 Tall Fescue and 33% Red Top Clover.
6. Mulch all seeded areas with straw mulch applied at a rate of 3,500 lbs per acre anchored with cutback or emulsified asphalt applied at a rate of 200 gallons per acre.

Dust control:

1. Temporary seeding shall be applied to all disturbed areas subject to little or no construction traffic.
2. All haul roads and other heavy traffic routes shall be sprinkled with water until the surface is wet and repeated as needed to control dust.

Stormwater Management Narrative:

The existing Stormwater Management Facility was approved to service the full build out of the development within its drainage area. The existing pond, as designed, meets the 1999 Virginia Stormwater Management Handbook, which is one of the practices allowable by the City of Charles Town Code. Chapter 2 of the VSMH states sites are allowed to use the Technology-based water quality criteria so that for land development, "the post developed stormwater runoff from the impervious cover shall be treated by an appropriate BMP as required by the post-developed condition percent impervious cover as specified in Table 2-3." Table 2-3 allows an Extended Detention facility to be utilized when the impervious cover is from 22-37%. Our conservative calculations have the existing pond and it contributing drainage area (both currently developed and the proposed full build-out of the remaining drainage area) to be 37% impervious and therefore meeting the technology based criteria. No additional measures are anticipated.

MINIMUM CONSTRUCTION STANDARDS

An erosion and sediment control program adopted with this plan must be consistent with the VSECH for 9VAC25-840-40 minimum standards:

1. **Permanent or temporary soil stabilization shall be applied to denuded areas within four days after final grade is reached on any portion of the site. Temporary soil stabilization shall be applied within four days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days. Permanent stabilization shall be applied to areas that are to be left dormant for more than one year.**
2. **During construction of the project, soil stock piles and borrow areas shall be stabilized or protected with sediment trapping measures. The applicant is responsible for the temporary protection and permanent stabilization of all soil stockpiles on site as well as borrow areas and soil intentionally transported from the project site.**
3. **A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.**
4. **Sediment basins and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place.**
5. **Stabilization measures shall be applied to earthen structures such as dams, dikes and diversions immediately after installation.**
6. **Sediment traps and sediment basins shall be designed and constructed based upon the total drainage area to be served by the trap or basin.**
   a. **The minimum storage capacity of a sediment trap shall be 134 cubic yards per acre of drainage area and the trap shall only control drainage areas less than three acres.**
   b. **Surface runoff from disturbed areas that is comprised of flow from drainage areas greater than or equal to three acres shall be controlled by a sediment basin. The minimum storage capacity of a sediment basin shall be 134 cubic yards per acre of drainage area. The outfall system shall, at a minimum, maintain the structural integrity of the basin during a 100-year storm of 24-hour duration. Runoff coefficients used in runoff calculations shall correspond to a bare earth condition or those conditions expected to exist while the sediment basin is utilized.**
7. **Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Slopes that are found to be eroding excessively within one year of permanent stabilization shall be provided with additional slope stabilizing measures until the problem is corrected.**
8. **Concentrated runoff shall not flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume or slope drain structure.**
9. **Whenever water seeps from a slope face, adequate drainage or other protection shall be provided.**
10. **All storm sewer inlets that are made operable during construction shall be protected so that sediment-laden water cannot enter the conveyance system without first being filtered or otherwise treated to remove sediment.**
11. **Before newly constructed stormwater conveyance channels or pipes are made operational, adequate outlet protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel and receiving channel.**
12. **When work in a live watercourse is performed, precautions shall be taken to minimize encroachment, control sediment transport and stabilize the work area to the greatest extent possible during construction. Nonerodible material shall be used for the construction of causeways and cofferdams. Earthen fill may be used for these structures if armored by nonerodible cover materials.**
13. **When a live watercourse must be crossed by construction vehicles more than twice in any six-month period, a temporary vehicular stream crossing constructed of nonerodible material shall be provided.**
14. **All applicable federal, state and local requirements pertaining to working in or crossing live watercourses shall be met.**
15. **The bed and banks of a watercourse shall be stabilized immediately after work in the watercourse is completed.**
16. **Underground utility lines shall be installed in accordance with the following standards in addition to other applicable criteria:**
    a. **No more than 500 linear feet of trench may be opened at one time.**
    b. **Excavated material shall be placed on the uphill side of trenches.**
    c. **Effluent from dewatering operations shall be filtered or passed through an approved sediment trapping device, or both, and discharged in a manner that does not adversely affect flowing streams or off-site property.**
    d. **Material used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization.**
    e. **Restabilization shall be accomplished in accordance with this chapter.**
    f. **Applicable safety requirements shall be complied with.**
17. **Where construction vehicle access routes intersect paved or public roads, provisions shall be made to minimize the transport of sediment by vehicular tracking onto the paved surface. Where sediment is transported onto a paved or public road surface, the road surface shall be cleaned thoroughly at the end of each day. Sediment shall be removed from the roads by shoveling or sweeping and transported to a sediment control disposal area. Street washing shall be allowed only after sediment is removed in this manner. This provision shall apply to individual development lots as well as to larger land-disturbing activities.**
18. **All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed, unless otherwise authorized by the City of Charles Town authority. Trapped sediment and the disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.**
19. **Properties and waterways downstream from development sites shall be protected from sediment deposition, erosion and damage due to increases in volume, velocity and peak flow rate of stormwater runoff for the stated frequency storm of 24-hour duration in accordance with the following standards and criteria. Stream restoration and relocation projects that incorporate natural channel design concepts are not man-made channels and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels:**
    a. **Concentrated stormwater runoff leaving a development site shall be discharged directly into an adequate natural or man-made receiving channel, pipe or storm sewer system. For those sites where runoff is discharged into a pipe or pipe system, downstream stability analyses at the outfall of the pipe or pipe system shall be performed.**
    b. **Adequacy of all channels and pipes shall be verified in the following manner:**
       (1) **The applicant shall demonstrate that the total drainage area to the point of analysis within the channel is one hundred times greater than the contributing drainage area of the project in question; or**
       (2) (a) **Natural channels shall be analyzed by the use of a two-year storm to verify that stormwater will not overtop channel banks nor cause erosion of channel bed or banks.**
       (b) **All previously constructed man-made channels shall be analyzed by the use of a 10-year storm to verify that stormwater will not overtop its banks and by the use of a two-year storm to demonstrate that stormwater will not cause erosion of channel bed or banks; and**
       (c) **Pipes and storm sewer systems shall be analyzed by the use of a 10-year storm to verify that stormwater will be contained within the pipe or system.**
    c. **If existing natural receiving channels or previously constructed man-made channels or pipes are not adequate, the applicant shall:**
       (1) **Improve the channels to a condition where a 10-year storm will not overtop the banks and a two-year storm will not cause erosion to the channel, the bed, or the banks; or**
       (2) **Improve the pipe or pipe system to a condition where the 10-year storm is contained within the appurtenances;**
       (3) **Develop a site design that will not cause the pre-development peak runoff rate from a two-year storm to increase when runoff outfalls into a natural channel or will not cause the pre-development peak runoff rate from a 10-year storm to increase when runoff outfalls into a man-made channel; or**
       (4) **Provide a combination of channel improvement, stormwater detention or other measures which is satisfactory to the City of Charles Town authority to prevent downstream erosion.**
    d. **The applicant shall provide evidence of permission to make the improvements.**
    e. **All hydrologic analyses shall be based on the existing watershed characteristics and the ultimate development condition of the subject project.**
    f. **If the applicant chooses an option that includes stormwater detention, he shall obtain approval from the City of Charles Town of a plan for maintenance of the detention facilities. The plan shall set forth the maintenance requirements of the facility and the person responsible for performing the maintenance.**
    g. **Outfall from a detention facility shall be discharged to a receiving channel, and energy dissipators shall be placed at the outfall of all detention facilities as necessary to provide a stabilized transition from the facility to the receiving channel.**
    h. **All on-site channels must be verified to be adequate.**
    i. **Increased volumes of sheet flows that may cause erosion or sedimentation on adjacent property shall be diverted to a stable outlet, adequate channel, pipe or pipe system, or to a detention facility.**
    j. **In applying these stormwater management criteria, individual lots or parcels in a residential, commercial or industrial development shall not be considered to be separate development projects. Instead, the development, as a whole, shall be considered to be a single development project. Hydrologic parameters that reflect the ultimate development condition shall be used in all engineering calculations.**
    k. **All measures used to protect properties and waterways shall be employed in a manner which minimizes impacts on the physical, chemical and biological integrity of rivers, streams and other waters of the state.**
    l. **Any plan approved prior to July 1, 2014, that provides for stormwater management that addresses any flow rate capacity and velocity requirements for natural or man-made channels shall satisfy the flow rate capacity and velocity requirements for natural or man-made channels if the practices are designed to (i) detain the water quality volume and to release it over 48 hours; (ii) detain and release over a 24-hour period the expected rainfall resulting from the one year, 24-hour storm; and (iii) reduce the allowable peak flow rate resulting from the 1.5, 2, and 10-year, 24-hour storms to a level that is less than or equal to the peak flow rate from the site assuming it was in a good forested condition, achieved through multiplication of the forested peak flow rate by a reduction factor that is equal to the runoff volume from the site when it was in a good forested condition divided by the runoff volume from the site in its proposed condition, and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels as defined in any regulations promulgated pursuant to § 62.1-44.15:54 or 62.1-44.15:65 of the Act.**
    m. **For plans approved on and after July 1, 2014, the flow rate capacity and velocity requirements of § 62.1-44.15:52 A of the Act and this subsection shall be satisfied by compliance with water quantity requirements in the Stormwater Management Act (§ 62.1-44.15:24 et seq. of the Code of Virginia) and attendant regulations, unless such land-disturbing activities are in accordance with 9VAC25-870-48 of the Virginia Stormwater Management Program (VSMP) Regulation or are exempt pursuant to subdivision C 7 of § 62.1-44.15:34 of the Act.**
    n. **Compliance with the water quantity minimum standards set out in 9VAC25-870-66 of the Virginia Stormwater Management Program (VSMP) Regulation shall be deemed to satisfy the requirements of this subdivision 19.**

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PRELIM - EROSION & SEDIMENT CONTROL PLAN NARRATIVE
LOTS 2A (RESIDUE) & 2B
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
EROSION & SEDIMENT CONTROL PLAN NARRATIVE

SHEET No.
C704

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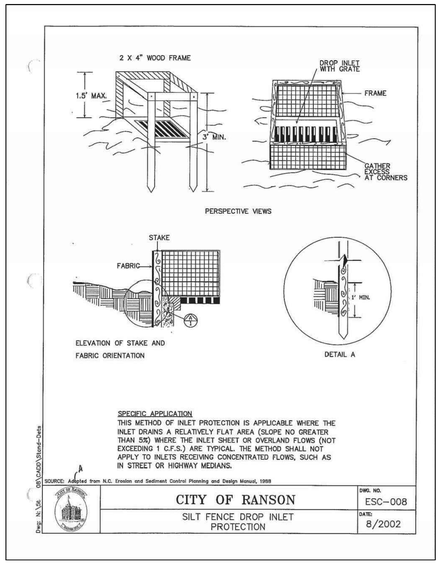

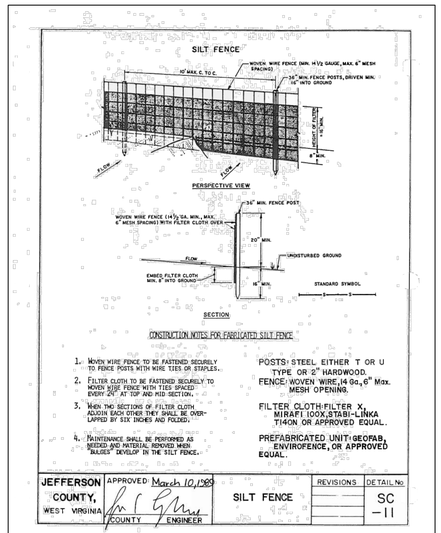

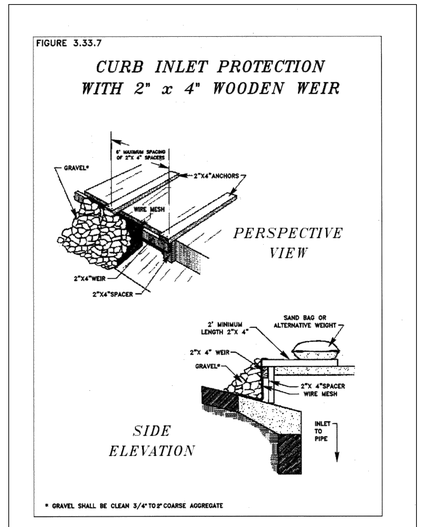

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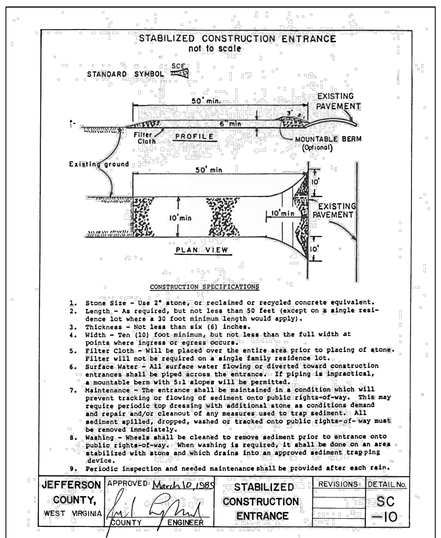

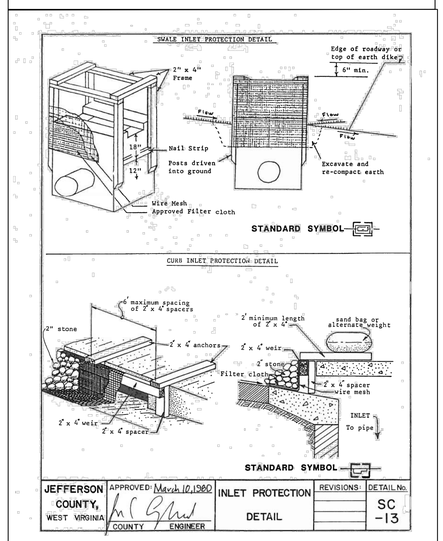

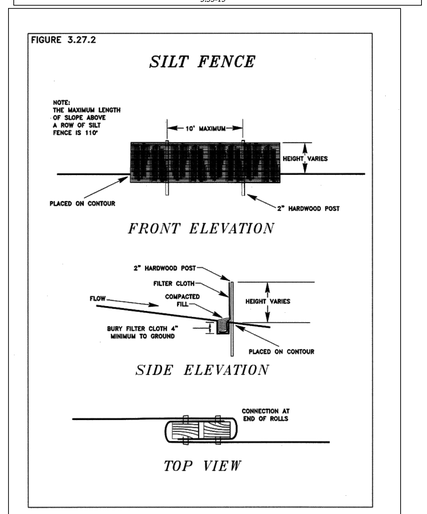

3.27-4

SEQUENCE OF CONSTRUCTION

1. CONTRACTOR TO NOTIFY MISS UTILITY (WV811.COM, DIAL 811 OR 1-800-245-4848) 72 HOURS PRIOR TO ANY EXCAVATION.
2. CONTRACTOR TO CONTACT CITY OF RANSON 48 HOURS BEFORE BEGINNING CONSTRUCTION.
3. ESTABLISH THE LIMIT OF DISTURBANCE AND CLEAR AND GRUB THE SITE TO THE EXTENT NECESSARY TO INSTALL PERIMETER SEDIMENT & EROSION CONTROLS. UTILIZE THE STOCKPILE AREA AS SHOWN ON THE PLAN, AS NEEDED.
4. CONSTRUCT SILT FENCE, SUPER SILT FENCE, STABILIZE CONSTRUCTION ENTRANCE AND INLET PROTECTION AS SHOWN ON PLANS.
5. BEGIN SITE DEMOLITION AS SHOWN ON THE DEMOLITION PLAN.
6. AFTER SITE DEMOLITION, BEGIN MASS GRADING, UTILITY AND STORM DRAIN INSTALLATION.
7. UPON COMPLETION OF UTILITIES AND STORM DRAIN INSTALLATION, BEGIN BUILDING CONSTRUCTION AND UNDER SLAB UTILITIES.
8. UPON COMPLETION OF EXTERIOR UTILITY WORK, SAW CUT EXISTING PAVING ALONG OAK LEE DRIVE AND WHISKERS WAY TO PROVIDE CLEAN AND STRAIGHT CONNECTION TO EXISTING ROADWAYS PAVING TO REMAIN.
9. CONSTRUCT CURB AND GUTTER AND CONCRETE SIDEWALKS.
10. UPON COMPLETION OF CURB AND GUTTER AND SIDEWALKS, INSTALL BASE PAVING. DELAY INSTALLATION OF TOP COURSE UNTIL ALL HEAVY EQUIPMENT HAS BEEN REMOVED FROM THE SITE.
11. UPON COMPLETION OF ALL SITE WORK AND BUILDING CONSTRUCTION, REPAIR ANY DAMAGED PAVING AND INSTALL TOP COURSE PAVING AND MILL AND OVERLAY PAVING AS NECESSARY.
12. APPLY PAVEMENT MARKINGS UPON COMPLETION OF PAVING WORK. STABILIZE ALL LANDSCAPE AREAS WITH GRASS OR PLANT MATERIALS AS SHOWN ON THE PLANS AND INSTALL LIGHTING.
13. UPON COMPLETE STABILIZATION OF ALL AREAS, OBTAIN INSPECTOR APPROVAL AND REMOVE SEDIMENT CONTROL DEVICES. STABILIZE ANY REMAINING AREAS. INSPECTOR MAY APPROVE PHASES STABILIZATION BASED ON BUILDING COMPLETION PHASING.

Soil Survey Information

Soil Name	Uu	Ua	PmC
Soil Description	Urban land-Udorthents	Udorthents, smoothed	Poplimento silt loam, 8 to 15 percent slopes
Hydrological Group	No	No	B
Impervious	0	0	0
Open Space	52,887	50,291	282

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PRELIM - EROSION & SEDIMENT CONTROL PLAN DETAILS
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
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SHEET TITLE:
EROSION & SEDIMENT CONTROL PLAN DETAILS

SHEET No.
C705

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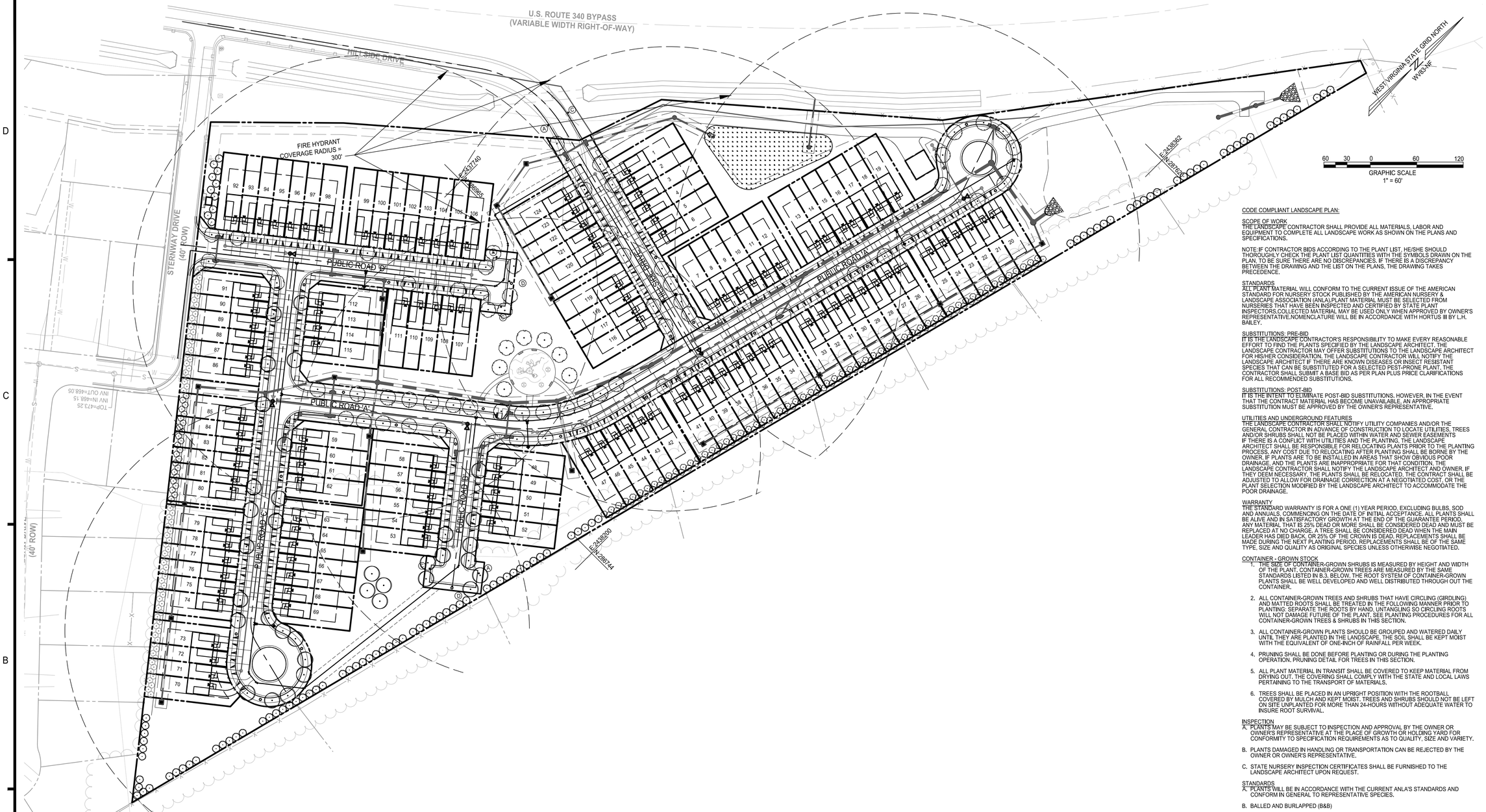

CODE COMPLIANT LANDSCAPE PLAN:

SCOPE OF WORK
THE LANDSCAPE CONTRACTOR SHALL PROVIDE ALL MATERIALS, LABOR AND EQUIPMENT TO COMPLETE ALL LANDSCAPE WORK AS SHOWN ON THE PLANS AND SPECIFICATIONS.

NOTE:IF CONTRACTOR BIDS ACCORDING TO THE PLANT LIST, HE/SHE SHOULD THOROUGHLY CHECK THE PLANT LIST QUANTITIES WITH THE SYMBOLS DRAWN ON THE PLAN. TO BE SURE THERE ARE NO DISCREPANCIES. IF THERE IS A DISCREPANCY BETWEEN THE DRAWING AND THE LIST ON THE PLANS, THE DRAWING TAKES PRECEDENCE.

STANDARDS
ALL PLANT MATERIAL WILL CONFORM TO THE CURRENT ISSUE OF THE AMERICAN STANDARD FOR NURSERY STOCK PUBLISHED BY THE AMERICAN NURSERY & LANDSCAPE ASSOCIATION (ANLA).PLANT MATERIAL MUST BE SELECTED FROM NURSERIES THAT HAVE BEEN INSPECTED AND CERTIFIED BY STATE PLANT INSPECTORS.COLLECTED MATERIAL MAY BE USED ONLY WHEN APPROVED BY OWNER'S REPRESENTATIVE.NOMENCLATURE WILL BE IN ACCORDANCE WITH HORTUS III BY L.H. BAILEY.

SUBSTITUTIONS: PRE-BID
IT IS THE LANDSCAPE CONTRACTOR'S RESPONSIBILITY TO MAKE EVERY REASONABLE EFFORT TO FIND THE PLANTS SPECIFIED BY THE LANDSCAPE ARCHITECT. THE LANDSCAPE CONTRACTOR MAY OFFER SUBSTITUTIONS TO THE LANDSCAPE ARCHITECT FOR HIS/HER CONSIDERATION. THE LANDSCAPE CONTRACTOR WILL NOTIFY THE LANDSCAPE ARCHITECT IF THERE ARE KNOWN DISEASES OR INSECT RESISTANT SPECIES THAT CAN BE SUBSTITUTED FOR A SELECTED PEST-PRONE PLANT, THE CONTRACTOR SHALL SUBMIT A BASE BID AS PER PLAN PLUS PRICE CLARIFICATIONS FOR ALL RECOMMENDED SUBSTITUTIONS.

SUBSTITUTIONS: POST-BID
IT IS THE INTENT TO ELIMINATE POST-BID SUBSTITUTIONS. HOWEVER, IN THE EVENT THAT THE CONTRACT MATERIAL HAS BECOME UNAVAILABLE, AN APPROPRIATE SUBSTITUTION MUST BE APPROVED BY THE OWNER'S REPRESENTATIVE.

UTILITIES AND UNDERGROUND FEATURES
THE LANDSCAPE CONTRACTOR SHALL NOTIFY UTILITY COMPANIES AND/OR THE GENERAL CONTRACTOR IN ADVANCE OF CONSTRUCTION TO LOCATE UTILITIES. TREES AND/OR SHRUBS SHALL NOT BE PLACED WITHIN WATER AND SEWER EASEMENTS IF THERE IS A CONFLICT WITH UTILITIES AND THE PLANTING, THE LANDSCAPE ARCHITECT SHALL BE RESPONSIBLE FOR RELOCATING PLANTS PRIOR TO THE PLANTING PROCESS. ANY COST DUE TO RELOCATING AFTER PLANTING SHALL BE BORNE BY THE OWNER. IF PLANTS ARE TO BE INSTALLED IN AREAS THAT SHOW OBVIOUS POOR DRAINAGE, AND THE PLANTS ARE INAPPROPRIATE FOR THAT CONDITION, THE LANDSCAPE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT AND OWNER. IF THEY DEEM NECESSARY, THE PLANTS SHALL BE RELOCATED. THE CONTRACT SHALL BE ADJUSTED TO ALLOW FOR DRAINAGE CORRECTION AT A NEGOTIATED COST, OR THE PLANT SELECTION MODIFIED BY THE LANDSCAPE ARCHITECT TO ACCOMMODATE THE POOR DRAINAGE.

WARRANTY
THE STANDARD WARRANTY IS FOR A ONE (1) YEAR PERIOD, EXCLUDING BULBS, SOD AND ANNUALS, COMMENCING ON THE DATE OF INITIAL ACCEPTANCE. ALL PLANTS SHALL BE ALIVE AND IN SATISFACTORY GROWTH AT THE END OF THE GUARANTEE PERIOD. ANY MATERIAL THAT IS 25% DEAD OR MORE SHALL BE CONSIDERED DEAD AND MUST BE REPLACED AT NO CHARGE. A TREE SHALL BE CONSIDERED DEAD WHEN THE MAIN LEADER HAS DIED BACK, OR 25% OF THE CROWN IS DEAD. REPLACEMENTS SHALL BE MADE DURING THE NEXT PLANTING PERIOD. REPLACEMENTS SHALL BE OF THE SAME TYPE, SIZE AND QUALITY AS ORIGINAL SPECIES UNLESS OTHERWISE NEGOTIATED.

CONTAINER - GROWN STOCK
1. THE SIZE OF CONTAINER-GROWN SHRUBS IS MEASURED BY HEIGHT AND WIDTH OF THE PLANT. CONTAINER-GROWN TREES ARE MEASURED BY THE SAME STANDARDS LISTED IN 8.3, BELOW. THE ROOT SYSTEM OF CONTAINER-GROWN PLANTS SHALL BE WELL DEVELOPED AND WELL DISTRIBUTED THROUGH OUT THE CONTAINER.
2. ALL CONTAINER-GROWN TREES AND SHRUBS THAT HAVE CIRCLING (GIRDLING) AND MATTED ROOTS SHALL BE TREATED IN THE FOLLOWING MANNER PRIOR TO PLANTING: SEPARATE THE ROOTS BY HAND, UNTANGLING SO CIRCLING ROOTS WILL NOT DAMAGE FUTURE OF THE PLANT. SEE PLANTING PROCEDURES FOR ALL CONTAINER-GROWN TREES & SHRUBS IN THIS SECTION.
3. ALL CONTAINER-GROWN PLANTS SHOULD BE GROUPED AND WATERED DAILY UNTIL THEY ARE PLANTED IN THE LANDSCAPE. THE SOIL SHALL BE KEPT MOIST WITH THE EQUIVALENT OF ONE-INCH OF RAINFALL PER WEEK.
4. PRUNING SHALL BE DONE BEFORE PLANTING OR DURING THE PLANTING OPERATION. PRUNING DETAIL FOR TREES IN THIS SECTION.
5. ALL PLANT MATERIAL IN TRANSIT SHALL BE COVERED TO KEEP MATERIAL FROM DRYING OUT. THE COVERING SHALL COMPLY WITH THE STATE AND LOCAL LAWS PERTAINING TO THE TRANSPORT OF MATERIALS.
6. TREES SHALL BE PLACED IN AN UPRIGHT POSITION WITH THE ROOTBALL COVERED BY MULCH AND KEPT MOIST. TREES AND SHRUBS SHOULD NOT BE LEFT ON SITE UNPLANTED FOR MORE THAN 24-HOURS WITHOUT ADEQUATE WATER TO INSURE ROOT SURVIVAL.

INSPECTION
A. PLANTS MAY BE SUBJECT TO INSPECTION AND APPROVAL BY THE OWNER OR OWNER'S REPRESENTATIVE AT THE PLACE OF GROWTH OR HOLDING YARD FOR CONFORMITY TO SPECIFICATION REQUIREMENTS AS TO QUALITY, SIZE AND VARIETY.

B. PLANTS DAMAGED IN HANDLING OR TRANSPORTATION CAN BE REJECTED BY THE OWNER OR OWNER'S REPRESENTATIVE.

C. STATE NURSERY INSPECTION CERTIFICATES SHALL BE FURNISHED TO THE LANDSCAPE ARCHITECT UPON REQUEST.

STANDARDS
A. PLANTS WILL BE IN ACCORDANCE WITH THE CURRENT ANLA'S STANDARDS AND CONFORM IN GENERAL TO REPRESENTATIVE SPECIES.

B. BALLED AND BURLAPPED (B&B)

1. BALLED AND BURLAPPED PLANTS SHALL BE DUG WITH FIRM ROOT BALLS FREE OF NOXIOUS WEEDS. THERE SHOULD BE NO EXCESS SOIL ON TOP OF THE ROOTBALL OR AROUND THE TRUNK.
2. BALL SIZES SHALL BE IN ACCORDANCE WITH ANLA STANDARDS.
3. CALIPER AND HEIGHT MEASUREMENT: IN SIZE GRADING B&B SINGLE TRUNK TREES, CALIPER SHALL TAKE PRECEDENCE OVER HEIGHT. CALIPER OF THE TRUNK SHALL BE TAKEN 6" ABOVE GROUND LEVEL (UP TO AND INCLUDING 4" CALIPER SIZE) AND 12" ABOVE THE GROUND LEVEL FOR LARGER TREES. FOR MULTIPLE-TRUNK TREES, HEIGHT MEASUREMENT SHALL TAKE PRECEDENCE OVER CALIPER.

NOTES:

1) ALL PLANTING SHALL CONFORM WITH SECTION 1333.15, BUFFER AND SCREENING STANDARDS,AND/OR SECTION 1333.16, LANDSCAPING STANDARDS OF THE CHARLESTOWN SUBDIVISION AND LAND DEVELOPMENT ORDINANCE

2) ANY PLANT SUBSTITUTIONS MUST BE APPROVED IN WRITING BY THE CHARLESTOWN DEPARTMENT OF COMMUNITY DEVELOPMENT ZONING AND PLANNING DIVISION.

3) ANY TREES LOCATED ON AN INDIVIDUAL LOT WILL BE INSTALLED PRIOR TO THE REQUEST FOR AN OCCUPANCY PERMIT FOR THAT SPECIFIC LOT. ALL OTHER LANDSCAPING SHOWN ON THIS PLAN WILL BE INSTALLED PRIOR TO BOND RELEASE.

4.) ALL GRADED/DISTURBED AREAS WITHIN THE PROJECT LIMITS EXCEPT FOR BUT NOT LIMITED TO WALKS, ROADS, DRIVES, TEMPORARY EASEMENTS UNDER CULTIVATION, AND AREAS DESIGNATED AS PLANTING BEDS SHALL BE SODDED OR SEEDED

FIRE LANE SIGNS

SIGN TYP "A"



SIGN TYP "C"



SIGN TYP "D"



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PRELIM PLAN - LANDSCAPE, FIRE SIGNAGE AND LIGHTING PLAN
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 60'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

FIRE SIGNAGE AND LIGHTING PLAN

SHEET No.

C800

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C800 Fire Signage and Lighting Plan.dwg, 2/13/2024 8:52:56 PM, Andrew H. Fraser,

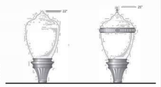
WLS LIGHTING SYSTEMS

Type: _____

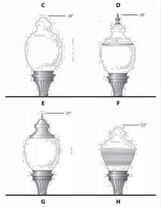
288 SERIES DECORATIVE ACORN



15 1/4" DIAMETER GLOBES



16" DIAMETER GLOBES



Made in the U.S.A. of the U.S. and imported parts.
Meets Buy American requirements for ARRA.

WLS LIGHTING SYSTEMS
1919 Windsor Place
Fort Worth, TX 76110
800.633.8711
www.wlslighting.com

SPECIFICATIONS

LUMINAIRE
Heavy wall cast aluminum globe holder with clear texture acrylic or polycarbonate globe.

PRISMATIC GLOBE
High impact resistant, UV stabilized, Type III or Type V light distribution (please specify).

GLOBE FITTER
Heavy wall cast aluminum.

BALLAST ASSEMBLY
Ballast is high power factor, mounted on aluminum tray.

DRIVER
Electronic LED driver, (120-277V)

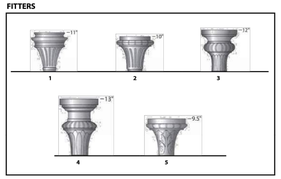
LAMP SOCKET
Spring loaded center contact. Pulse rated for HPS lamps.

ELECTRICAL
All components are UL recognized. Luminaire is shipped complete and ready to install. Luminaire is designed for operation in wet locations.

FINISH
Polyester powder coat. Standard colors are Black, White, Green and Bronze. Custom colors are available. Consult factory.

WARRANTY
7 year limited warranty on system.

FITTERS



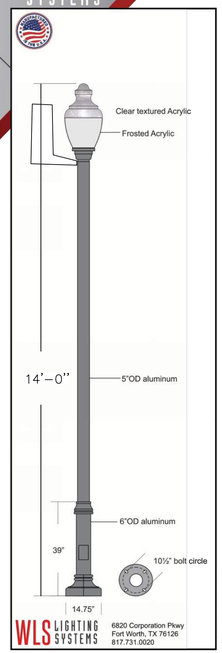
Project Name: _____
Date: _____
Location: _____
Notes: _____

03 REV. 12/19
Specifications subject to change without notice.

WLS LIGHTING SYSTEMS

Suitable for wet locations

M43T SERIES



WLS LIGHTING SYSTEMS
6820 Corporation Pkwy
Fort Worth, TX 76126
817.731.0020

SYSTEM PERFORMANCE SPECIFICATIONS

LED:	100W
Life Hours:	50,000
CRI:	70
CCT:	4000K°
Voltage:	120V - 277V (SMT)

FEATURES/BENEFITS

. High quality LED light that meets industry norms.
. High efficiency and energy savings.
. Environmentally friendly.
. Reliable and low maintenance.
. 5 year limited warranty on system.
. All electrical components are UL recognized.

Ordering Example:
M43T-VC-118T-100W-4K-SMT-TYPE V-PT-COLOR
SRAP5/6-15'-AB03-COLOR

SPECIFICATIONS

LUMINAIRE: Shall be corrosion resistant all aluminum construction.
DIFFUSER: High impact resistant frosted injection molded lens.
DRIVER: Electronic LED driver (120V-277V).
OPTICS: Type V light distribution.
LIGHT SOURCE: 10W LED 4000K.
POLE: 5"O.D smooth aluminum shaft, .125", with anchor plate, reinforced hand hole & cover, and grounding lug.
BASE: AB03 cast aluminum base.
ANCHOR BOLTS: (4)3/4"x 24" x 3" galvanized anchor bolts.
ELECTRICAL: All components are UL recognized. Luminaire is shipped complete and ready to install. Luminaire is designed for operation in wet locations.
FINISH: Powder coat. Standard colors are Black,White, Dark Green and Dark Bronze.
(Custom colors available. Consult factory.)
All exposed hardware shall be stainless steel.

Project name: Briar Run
Date: _____
Location: _____
Notes: _____

Specifcations subject to change without notice.

288 SERIES DECORATIVE ACORN

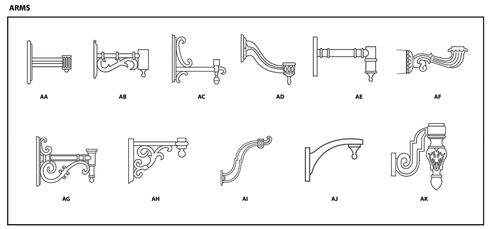
ORDERING INFORMATION SELECT APPROPRIATE CHOICE FROM EACH COLUMN TO FORMULATE ORDER CODE.
Refer to example below.

SERIES	FITTER STYLE	ARM STYLE	MOUNT STYLE	LAMP WATTAGE	LIGHT SOURCE	COLOR TEMP[1]	LINE VOLTAGE	OPTICS	LUMINAIRE FINISH	OPTIONS
288A **288B** **288C** **288D** **288E** **288F** **288G** **288H**	**1** **2** **3** **4** **5**	**AA** **AB** **AC** **AD** **AE** **AF** **AG** **AH** **AI** **AJ** **AK**	**PT** Pole Top Mount **S** SINGLE **D90** D90° **D180** D180° **T90** T90° **TN120** TN120° **Q90** Q90°	**70** 70W **100** 100W **150** 150W **175** 175W **250** 250W	**PSMH** Pulse Start Metal Halide **MH** Metal Halide [1] **HPS** High Pressure Sodium **I** Incandescent		**120** 120V **208** 208V **240** 240V **277** 277V **480** 480V **MT** Multi Tap [2]	**III** **V**	**DBZ** Dark Bronze **BLK** Black **BTX** Black Texture **DBT** Bronze Texture **WHT** White **GRN** Green **SLV** Silver **CC** Custom Color	**PC** Photocell **GR** Glass Refractor **SR** Stacked Louver Refractor **IS** Inside Shield **NO** No Options
				32 32W **50** 50W **64** 64W **100** 100W	**LED**	**30** 3000K **35** 3500K **40** 4000K **50** 5000K	**SMT** 120V/277V **480** 480V			**DIM** Dimming **PC** Photocell **HSS** House Side Shield **NO** No Options
ORDER:										
WLS-288										

Example: WLS-288D-5-AA-D180-250-PSMH-208-III-BRZ-NO

FOOTNOTES:
1 - Consult factory for International voltages.
2 - MT - Multi Tap is shipped standard unless otherwise specified. (Multi Tap consists of 120V, 208V, 240V, and 277V. Multi Tap is pre-wired for highest voltage. Alternate voltages will require field re-wiring.
3 - Other CCT available upon request.

ARMS



WLS LIGHTING SYSTEMS
1919 Windsor Place
Fort Worth, TX 76110
800.633.8711
www.wlslighting.com

Project Name: _____
Date: _____
Location: _____
Notes: _____

03 REV. 12/19
Specifications subject to change without notice.

Notes:
1. Proposed light fixture, pole, footer and base to match existing light fixture, pole, footer and base.
2. Contractor to provide architect with signed and sealed shop drawing for final footer design approval.

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Leesburg, VA 20176 P 703.777.2755
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PRELIM PLAN - LIGHTING DETAILS
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: AS SHOWN
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
LIGHTING DETAILS

SHEET No.
C801

P:\Projects\22063\001\001\112742 Prelim Subdivision - Land Development Plan\C801 Lighting Details.dwg, 2/13/2024 8:53:15 PM, Andrew H. Fraser,

U.S. ROUTE 340 BYPASS
(VARIABLE WIDTH RIGHT-OF-WAY)

HILLSIDE DRIVE

STERNWAY DRIVE
(40' ROW)

PUBLIC ROAD 'D'

PUBLIC ROAD 'A'

HILLSIDE DRIVE

PUBLIC ROAD 'A'

PUBLIC ROAD 'C'

PUBLIC ROAD 'B'

STERNWAY DRIVE
(40' ROW)

WEST VIRGINIA STATE GRID NORTH
WV83-NF

60 30 0 60 120
GRAPHIC SCALE
1" = 60'

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PRELIM PLAN - PHOTOMETRIC PLAN
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 60'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:

PHOTOMETRIC PLAN

SHEET No.
C802

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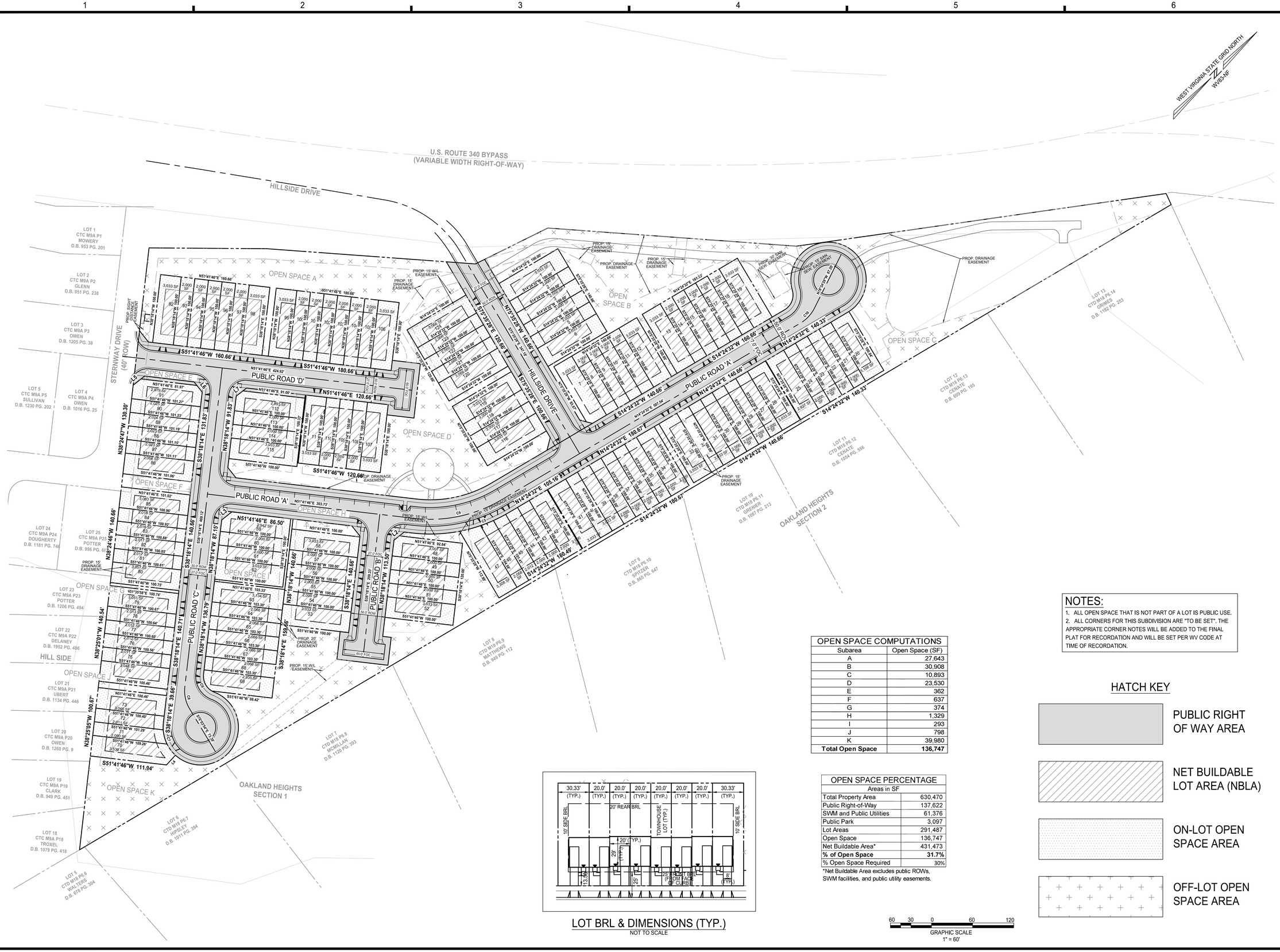

OPEN SPACE COMPUTATIONS	
Subarea	Open Space (SF)
A	27,643
B	30,908
C	10,893
D	23,530
E	362
F	637
G	374
H	1,329
I	293
J	798
K	39,980
Total Open Space	**136,747**

OPEN SPACE PERCENTAGE	
Areas in SF	
Total Property Area	630,470
Public Right-of-Way	137,622
SWM and Public Utilities	61,376
Public Park	3,097
Lot Areas	291,487
Open Space	136,747
Net Buildable Area*	431,473
% of Open Space	**31.7%**
% Open Space Required	30%

*Net Buildable Area excludes public ROWs, SWM facilities, and public utility easements.

LOT BRL & DIMENSIONS (TYP.)
NOT TO SCALE

NOTES:
1. ALL OPEN SPACE THAT IS NOT PART OF A LOT IS PUBLIC USE.
2. ALL CORNERS FOR THIS SUBDIVISION ARE "TO BE SET". THE APPROPRIATE CORNER NOTES WILL BE ADDED TO THE FINAL PLAT FOR RECORDATION AND WILL BE SET PER WV CODE AT TIME OF RECORDATION.

HATCH KEY

PUBLIC RIGHT OF WAY AREA

NET BUILDABLE LOT AREA (NBLA)

ON-LOT OPEN SPACE AREA

OFF-LOT OPEN SPACE AREA

60 30 0 60 120
GRAPHIC SCALE
1" = 60'

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PRELIM PLAN - PRELIMINARY PLAT
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 60'
DESIGN: AF
DRAWN: KMS
CHECKED: SK

SHEET TITLE:
PRELIMINARY PLAT

SHEET No.
C900

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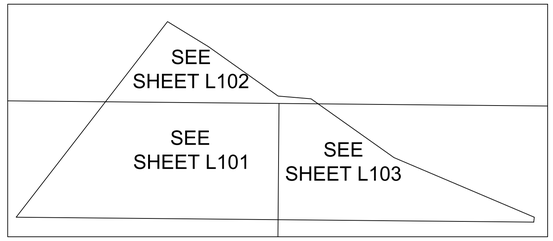
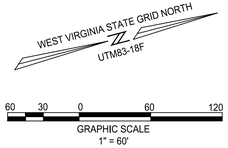
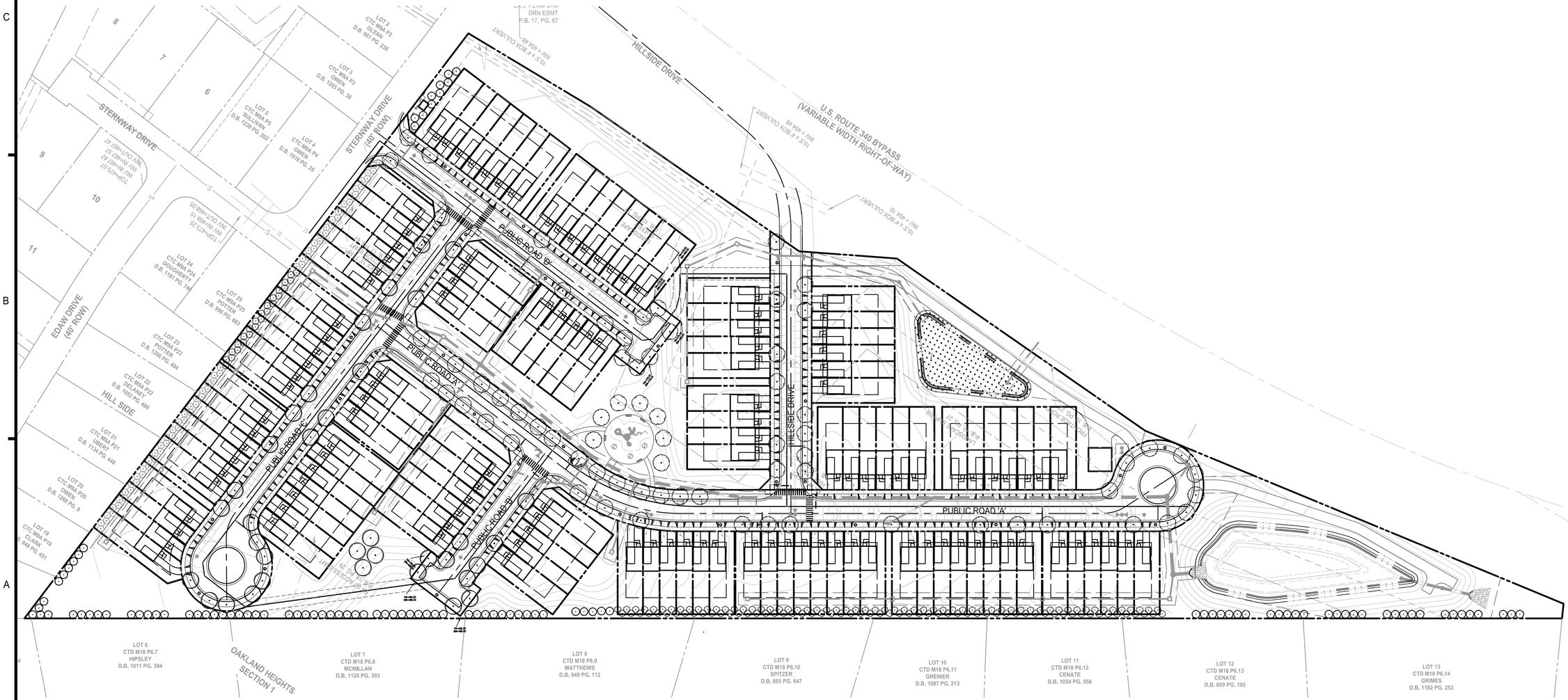


PLANT SCHEDULE

SCREENING TREES	CODE	BOTANICAL NAME	COMMON NAME	SIZE	NATIVE
	IA	Ilex opaca	American Holly	6`-8` ht.	B&B
	IN	Ilex x 'Nellie R. Stevens'	Nellie R. Stevens Holly	6`-8` ht.	B&B
	IF	Ilex x attenuata 'Fosteri'	Foster's Holly	6`-8` ht.	B&B
	TI	Thuja x 'Green Giant'	Green Giant Arborvitae	6`-8` ht.	B&B
STREET TREES	**CODE**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**NATIVE**
	CK	Cladrastis kentukea	American Yellowwood	2" Cal.	B&B
	PB	Platanus x acerifolia 'Bloodgood'	Bloodgood London Plane Tree	2" Cal.	B&B
	TS	Tilia cordata 'Baileyi' TM	Shamrock Littleleaf Linden	2" Cal.	B&B





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COMMONWEALTH OF VIRGINIA
CHRISTOPHER H. LEMON
Lic. No. 047091
02/12/2024
PROFESSIONAL ENGINEER

PRELIM PLAN - LANDSCAPE PLAN
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION
	10/20/2023	QC SUB. TO PWC
	11/06/2023	1ST SUB TO PWC
	02/12/2024	2ND SUB TO PWC

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1"=60'
DESIGN: GB
DRAWN: GB
CHECKED:

SHEET TITLE:

LANDSCAPE PLAN

SHEET No.

L100

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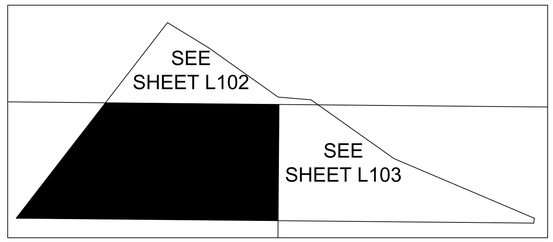

PLANT SCHEDULE

SCREENING TREES	CODE	BOTANICAL NAME	COMMON NAME	SIZE	NATIVE
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	IN	Ilex x 'Nellie R. Stevens'	Nellie R. Stevens Holly	6`-8` ht.	B&B
	IF	Ilex x attenuata 'Fosteri'	Foster's Holly	6`-8` ht.	B&B
	TI	Thuja x 'Green Giant'	Green Giant Arborvitae	6`-8` ht.	B&B
STREET TREES	**CODE**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**NATIVE**
	CK	Cladrastis kentukea	American Yellowwood	2" Cal.	B&B
	PB	Platanus x acerifolia 'Bloodgood'	Bloodgood London Plane Tree	2" Cal.	B&B
	TS	Tilia cordata 'Baileyi' TM	Shamrock Littleleaf Linden	2" Cal.	B&B

WEST VIRGINIA STATE GRID NORTH
UTM83-18F

30 15 0 30 60
GRAPHIC SCALE
1" = 30'

SEE SHEET L102

SEE SHEET L102

SEE SHEET L103

EDAW DRIVE
(40' ROW)

LOT 25
CTC M9A P25
POTTER
D.B. 996 PG. 683

LOT 23
CTC M9A P23
POTTER
D.B. 1206 PG. 494

LOT 22
CTC M9A P22
DELANEY
D.B. 1952 PG. 486

HILL SIDE

LOT 21
CTC M9A P21
UBERT
D.B. 1134 PG. 446

LOT 20
CTC M9A P20
OWEN
D.B. 1260 PG. 9

LOT 19
CTC M9A P19
CLARK
D.B. 949 PG. 451

PUBLIC ROAD 'A'

PUBLIC ROAD 'C'

PUBLIC ROAD 'B'

HILLSIDE DRIVE

TW=496.00
BW=486.00

TW=496.30
BW=486.00

LOT 6
CTD M18 P6.7
HIPSLEY
D.B. 1011 PG. 394

OAKLAND HEIGHTS
SECTION

LOT 7
CTD M18 P6.8
MCMILLAN
D.B. 1120 PG. 393

LOT 8
CTD M18 P6.9
MATTHEWS
D.B. 949 PG. 112

LOT 9
CTD M18 P6.10
SPITZER
D.B. 865 PG. 647

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COMMONWEALTH OF VIRGINIA
CHRISTOPHER H. LEMON
Lic. No. 047091
02/12/2024
PROFESSIONAL ENGINEER

PRELIM PLAN - LANDSCAPE PLAN
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION
	10/20/2023	QC SUB. TO PWC
	11/08/2023	1ST SUB TO PWC
	02/12/2024	2ND SUB TO PWC

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: GB
DRAWN: GB
CHECKED:

SHEET TITLE:

LANDSCAPE PLAN

SHEET No.

L101

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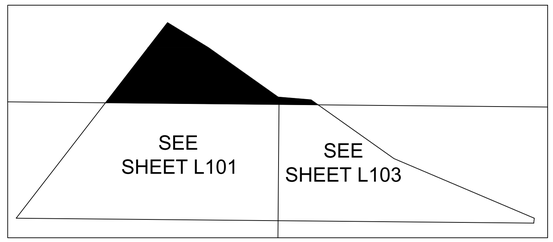
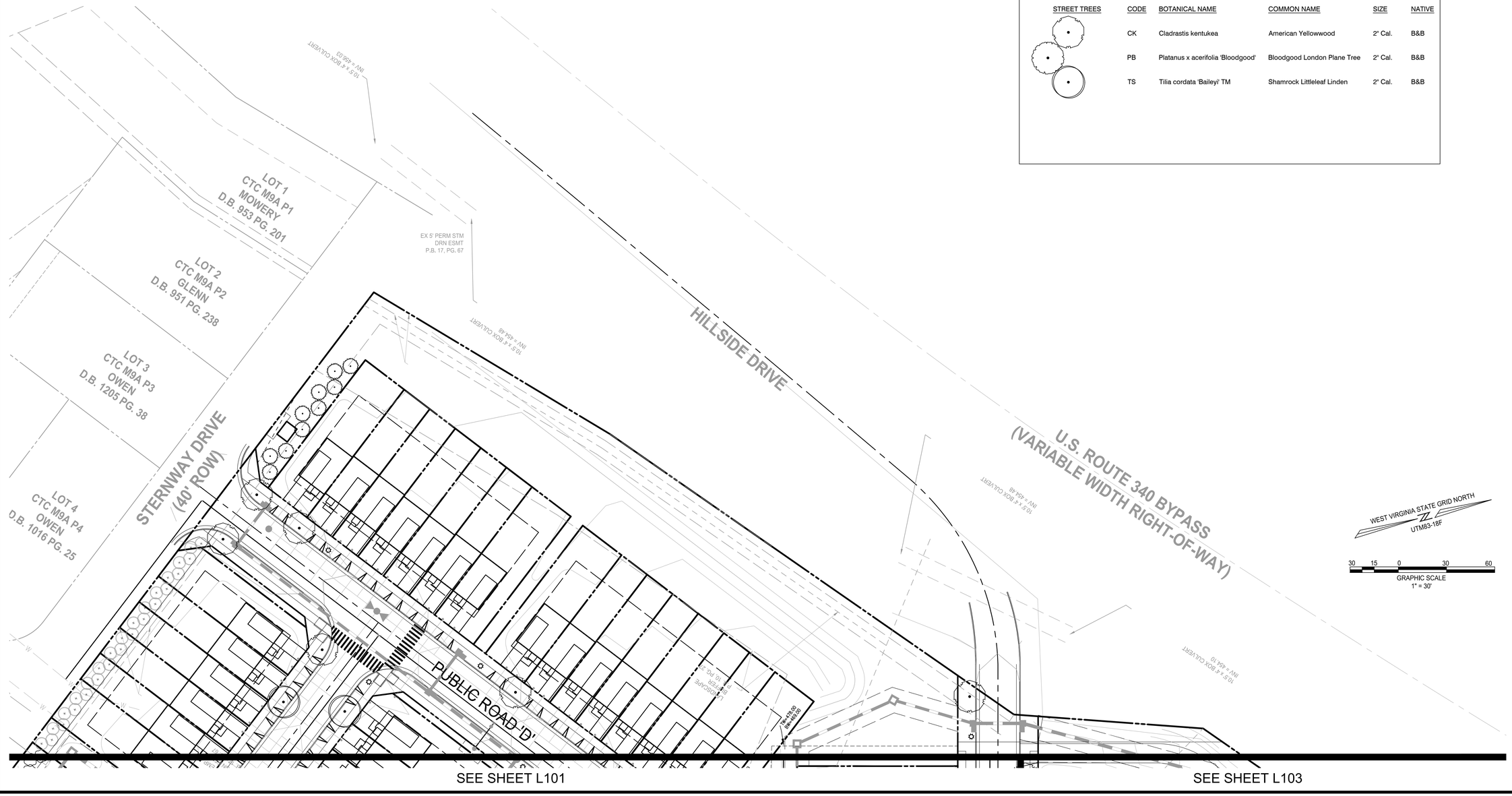


PLANT SCHEDULE

SCREENING TREES	CODE	BOTANICAL NAME	COMMON NAME	SIZE	NATIVE
	IA	Ilex opaca	American Holly	6`-8` ht.	B&B
	IN	Ilex x 'Nellie R. Stevens'	Nellie R. Stevens Holly	6`-8` ht.	B&B
	IF	Ilex x attenuata 'Fosteri'	Foster's Holly	6`-8` ht.	B&B
	TI	Thuja x 'Green Giant'	Green Giant Arborvitae	6`-8` ht.	B&B
STREET TREES	**CODE**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE**	**NATIVE**
	CK	Cladrastis kentukea	American Yellowwood	2" Cal.	B&B
	PB	Platanus x acerifolia 'Bloodgood'	Bloodgood London Plane Tree	2" Cal.	B&B
	TS	Tilia cordata 'Baileyi' TM	Shamrock Littleleaf Linden	2" Cal.	B&B



SEE SHEET L101

SEE SHEET L103

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COMMONWEALTH OF VIRGINIA
CHRISTOPHER H. LEMON
Lic. No. 047091
02/12/2024
PROFESSIONAL ENGINEER

PRELIM PLAN - LANDSCAPE PLAN
HILLSIDE
691/432 MAP 9 PARCEL 67
LOTS 2A (RESIDUE) & 2B
DISTRICT 3, JEFFERSON COUNTY, WV

MARK	DATE	DESCRIPTION
	10/20/2023	QC SUB. TO PWC
	11/06/2023	1ST SUB TO PWC
	02/12/2024	2ND SUB TO PWC

PROJECT No.: 22063.001.00
DRAWING No.: 112742
DATE: 02/13/2023
SCALE: 1" = 30'
DESIGN: GB
DRAWN: GB
CHECKED:

SHEET TITLE:

LANDSCAPE PLAN

SHEET No.

L102

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IMEG General Landscape Specification Summary - Short Form

Specification: This is a summary of IMEG Consultants Corp. general landscape specification. All work shall follow the procedures outlined in the specifications and details contained herein, which are designed to exceed current industry standards. Should there exist a discrepancy between this specification and the included construction details, the written specification shall take precedence.

References: In lieu of providing comprehensive proprietary specifications, the following are referenced to be general default specifications with the following modifications. These modifications and the construction details shown in this plan set shall take precedence over the general referenced specifications.

- "Landscape Specification Guidelines" Landscape Contractors Association of MD, DC, VA - Most current edition.
- "American Standard for Nursery Stock - ANSI Z60.1" by AmericanHort - Most Current Edition
- "TT-77 Recommended Turfgrass Cultivars for Certified Sod Production in Maryland" - Maryland Turfgrass Council
- ""Landscape Architecture/Design Specifications for Compost Use" - US Composting Council

If there are discrepancies or contradictions in specification sections or details, the stricter specification shall take precedence. A Request for Information (RFI) can also be submitted for clarification.

List of Plant Material: The contractor will verify plant quantities prior to bidding and any discrepancies shall be brought to the attention of the Owner's Representative. The Contractor shall furnish and install all plant materials required to complete the work as shown on the drawings. Quantities in the planting schedule shall take precedence over quantities graphically shown on the plan. Substitutions shall not be made without the written approval of the Owner's Representative.

Plant Identification: All trees shall be true to name as on plant schedule or shown on planting plans and shall be correctly labeled individually or in groups by genus, species, variety and cultivar. Labels are to remain intact until site is approved through agency inspection, substantial completion approval, or per Owner's Representative's instruction.

Plant Quality: All plant materials shall conform to the size and form standards set forth in the latest edition of AmericanHort's "American Standard for Nursery Stock - ANSI Z60.1". Above Ground: Trees shall be healthy with the color, shape, size, and distribution of trunk, stems, branches, buds and leaves typical of the plant specified. Any signs of stress, improper handling (wounds or broken branches), insect or disease damage, or dead/distorted branches should not be present. Trees shall have one central leader (unless otherwise specified) and grafts should be fully closed and visible above the soil line. Below Ground: A minimum of 3 structural roots should be reasonably distributed around the trunk (reject a tree with structural roots only on one side), the root crown should not be more than 2 inches below the soil line, the top 2 structural roots should not be more than 3 inches below the soil line when measured 4 inches away from the trunk. The top of the other structural root should not be more than 5 inches below the surface. The root system should be free of potentially stem-girdling or kinked roots above the root collar and main structural roots.

Inspection: Plants are to be inspected upon delivery to contractor by a contractor's representative and/or owner's representative. Trees not presenting proper form, incorrect variety, signs of poor health or over-stress, and girdling roots are to be rejected.

Storage & Transport: Plant materials should be protected from dessication during transport via breathable fabric covering the canopy and by watering rootball/pot thoroughly immediately prior to transport. Plant materials should be installed on day of delivery to site. If that is not possible, a temporary storage area can be constructed on-site. Plants are not to be stored on bare asphalt. If storage area is asphalt, cover bare asphalt with a layer of woodchips. Storage should be in shade, and plants be regularly watered at root-ball level, and spaced so foliage from one plant does not interfere with foliage of another. Tall plant materials are to remain upright during storage. Longer term storage plants are to be heeled-in or stored in mulch to the top of the container/root ball. Plant materials shall not be stored on-site for more than two weeks. Plants stored improperly or for too long may be subject to rejection and replacement dependent on ultimate planting condition.

Planting: Plantings shall be installed in accordance with details and specifications on this sheet. Details and specifications for other specific landscape items, such as tree preservation or erosion control may be found elsewhere in this drawing set on their own respective sheet. For items not specifically addressed by this plan set, refer to the latest edition of the "Landscape Specification Guidelines" developed by the Landscape Contractors Association of MD, DC, and VA. Should there be any ambiuguities or questions, please utilize the formal RFI/Submittal process.

Trees: The planting hole diameter is to be at a minimum three times the diameter of the root ball. The depth of the planting hole shall be dug so that the shoulder of the root ball is level with the existing grade leaving the root flare slightly higher. When planting on a slope, the depth of the hole shall be dug so that the bottom of the root flare is at the level of the existing grade at the sides of the hole. If the planting hole is mechanically dug, the hole is to be scarified by slightly enlarging hole by hand digging the sides and bottom to prevent glazing. The sides of the hole should be vertical or sloping outwards. Holes are not to be dug when soil is saturated. For balled and burlapped trees, the wire root ball cage is to be removed and burlap is to be cut and completely removed from the top and a minimum of 8" to 12" down the side of the root ball. Do not fold burlap down into hole, it must be removed. Any synthetic materials are to be completely removed from the trunk and root ball. Backfill in lifts using the same soil dug to create the hole, being careful not to over-compact the soil. Inoculate backfill soil or rootball with an approved balanced (Endo/Ecto) commercial mycorrhizae application. Do not amend or add fertilizer unless expressly specified to do so or is part of the approved mycorrhizae innoculant product. Do not place any soil on top of root ball. Trees are to be mulched to full depth specified immediately after planting. A ½" layer of approved compost is to be placed under the mulch layer. Do not place mulch against tree trunk.

Staking: Staking (if any) is to be installed per the accompanying details, utilizing tree webbing straps with grommets to prevent wire from coming in contact with the tree. While not preferred, full tree webbing systems are also permissible if approved through submittal, and installed per manufacturer's instructions. Wire is to be tensioned to allow for 1/2 inch of deflection up or down, and tension shall be rechecked and adjusted on a regular basis. Staking is to be removed as soon as possible after one year. GARDEN HOSE IS NOT TO BE UTILIZED FOR STAKING.

Irrigation: For permanent systems, irrigation should be largely installed prior to plant installation to avoid having to disturb planting beds or move plants to accommodate the installation of the irrigation system. For sites with no permanent irrigation system, Trees are to be irrigated until established by the use of temporary water bags through one growing year or until established. Shrubs, perennial beds, and lawns are to be thoroughly hand-watered or by movable temporary irrigation (sprinklers or drip hose) as necessary to reflect local weather conditions. Watering is to be deep into the soil and infrequent, as opposed to light surficial watering performed often.

Shrubs: For container shrubs, the planting hole is to be dug 3 times the width of the intact container. The container is to be completely removed and the sides of the soil/root clump scarified with a sterile sharp knife. They shall be planted so that the top of the soil level of the container is no more than 1.5" above the original grade. For balled and burlapped shrubs, remove as much burlap as possible from the top and sides of the rootball. Do not fold burlap into hole. Plant with the root flare slightly higher than the surrounding grade. Backfill with soil dug to create the hole. Do not cover top of root ball/clump.

Ground Covers/Perennials: Beds are to be prepared by tilling well to a minimum depth of 6", and soils shall be amended by incorporating 1" of compost meeting the US Composting Council reference specification, 1" of worm castings and/or well decomposed commercially produced compost, or a Class A biosolid also meeting the referenced US Composting Council specification prior to planting. Apply 3" of shredded non-dyed hardwood mulch immediately after planting.

Compacted or Poorly Drained Soils: For sites with heavily compacted or poorly draining soils, alternate planting methods will need to be employed. Contact project Landscape Architect for additional planting details and specifications should either unforeseen condition be encountered.

Conflicts with Existing Roots: Proposed landscape may be shown to be planted in the Critical Root Zones of existing large trees. Should, in the course of planting, large woody roots be discovered belonging to adjacent large trees that are to be preserved, shift the planting location of the tree to be planted to avoid cutting the woody root. Should a suitable planting location not be found within the proximity of where a proposed tree is to be planted, contact the project landscape architect for alternate planting location and recording of the discrepancy for landscape inspection/approval purposes.

Irrigation: New plant materials are to be watered as necessary to maintain health. If no permanent irrigation system is installed, trees are to be watered until established through the use of temporary water bags. Shrubs, perennials, and ground covers shall be hand-watered. Infrequent deep watering is preferred to more frequent quick/shallow watering.

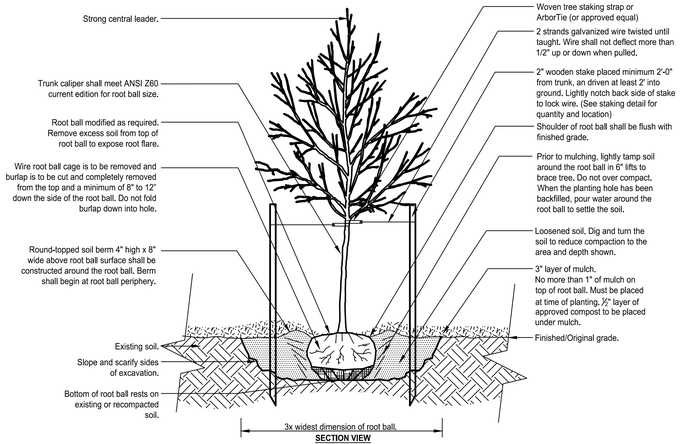
Lawn Areas:

Seeded Lawn Area: Areas to be seeded shall have planting soil tilled to a depth of 6" and free of stones greater than 1" diameter or length. Any amendments that are to be added should be tilled into soil prior to seeding. A seed mix composition chart shall be submitted for review prior to installation. Unless specified by the Owner's Representative, the seed mix must contain a minimum of three cultivars or types of grass in the blend, chosen from the recommended cultivars list of the most recent "TT-77 Recommended Turfgrass Cultivars for Certified Sod Production in Maryland" document produced by the University of Maryland and the Maryland Turfgrass Council. Use of cultivars also appearing on the Turfgrass Water Conservation Alliance approved list is encouraged. Seeds coatings that aid in germination, moisture retention and prevent loss to bird consumption are acceptable. Seeded areas are to be covered by a light and loose layer of rapidly degradable mulch such as straw or hydraulically applied cellulose. Use of erosion control blankets or any synthetic webbing is not permissible for lawn areas unless specified by the Owner's Representative.

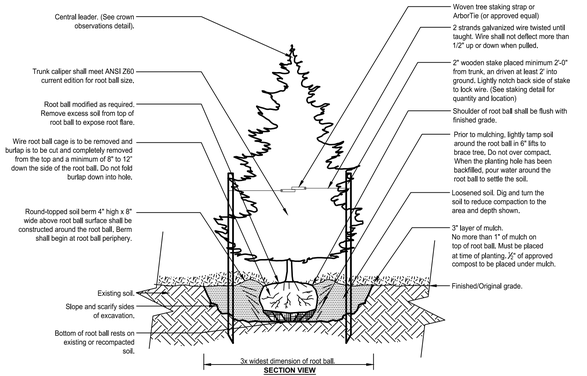
Sodded Lawn Area: Unless a proprietary sod is specified by the Owner's Representative, sod must be of a Maryland or Virginia certified variety suited to the specific growing requirements of where it is to be installed, Grower and variety to be submitted to Owner's Representative for review prior to ordering. Certification documentation for all sod is to be provided to the Owner's Representative upon delivery. For installation on slopes, the Contractor shall use biodegradable sod spikes to secure sod in place. Metal sod staples are not to be utilized for installation.

Invasive Species: Existing invasive species are to be removed utilizing appropriate approved methods including in the invasive species management plan (if applicable) prior to the installation of new plant materials, and is subject to inspection, and is a factor in the Certification of Installation.

NOTE: These specifications and details are based on those developed by the Urban Tree Foundation, and have been improved to reflect current research and in planting. The ISA has also accepted and reference the UTF details in place of their own. The specifications and details illustrated in this plan set exceed the standards set in the ISA, LCA, and local jurisdictional planting details and specifications.



DECIDUOUS TREE PLANTING DETAIL
SCALE: NOT TO SCALE



EVERGREEN TREE PLANTING DETAIL
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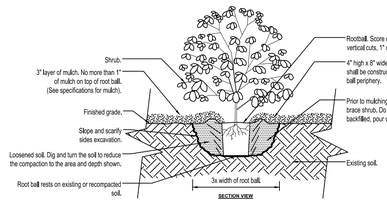
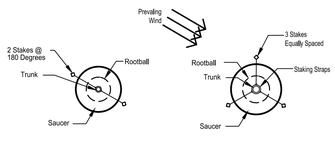


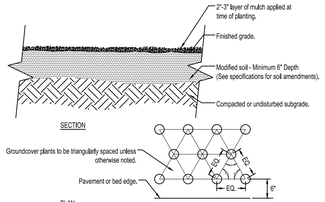
Notes:
1. For ball and burlapped shrubs, remove completely as much burlap as possible, minimum halfway down the side of the rootball. Do not fold burlap down into hole.
2. See specifications for further requirements relited to this detail.

SHRUB PLANTING DETAIL
SCALE: NOT TO SCALE



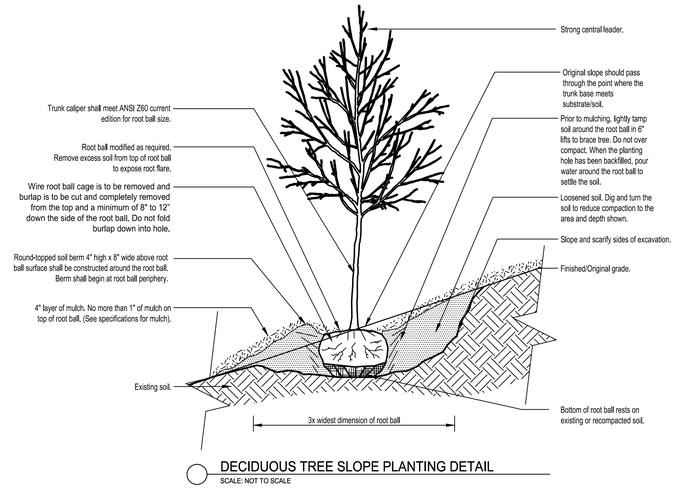
Notes:
1. Utilize only Arbor-tie or approved equal or staking straps against tree trunks.
2. Reference manufacturer's detail of approved system for installation instructions.
3. Wire tension (if used) should not allow greater than 1/2" of play in any direction.
4. Staking should be removed on year after planting or as instructed.

TREE STAKING DETAIL
SCALE: NOT TO SCALE



Notes:
1. Plant in triangular arrangement unless otherwise noted on plan.
2. See planting schedule for groundcover species, size, and spacing dimension.
3. Small roots (½" or less) that grow around, up, or down the root ball periphery are considered a normal condition in container production and are acceptable however they should be eliminated at the time of planting. Roots on the periphery can be removed at the time of planting. (See root ball shaving container detail).
4. Settle soil around root ball of each groundcover prior to mulching.

PERENNIAL/GROUNDCOVER DETAIL
SCALE: NOT TO SCALE



DECIDUOUS TREE SLOPE PLANTING DETAIL
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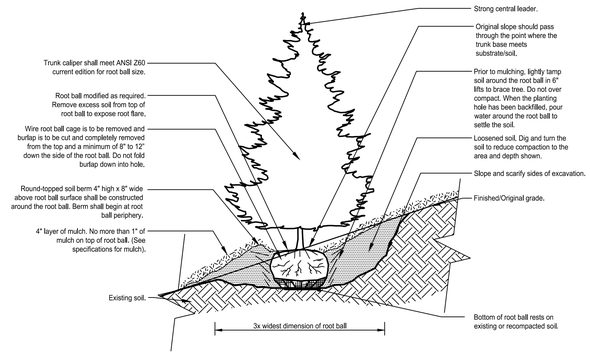

EVERGREEN TREE SLOPE PLANTING DETAIL
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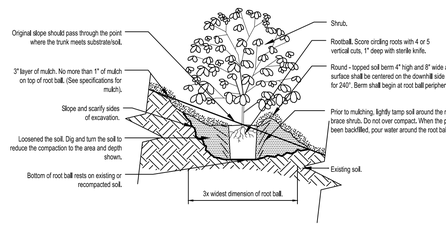

Notes:
1. For ball and burlapped shrubs, remove completely as much burlap as possible, minimum halfway down the side of the rootball. Do not fold burlap down into hole.
2. See written specifications for further requirements relited to this detail.

SHRUB SLOPE PLANTING DETAIL
SCALE: NOT TO SCALE

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PRELIM PLAN - LANDSCAPE PLAN
HILLSIDE
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LOTS 2A (RESIDUE) & 2B
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DRAWN: GB
CHECKED:

SHEET TITLE:

LANDSCAPE NOTES AND DETAILS

SHEET No.

L200

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Hillside Development Traffic Impact Study
Charles Town, Jefferson County, WV

AMT Project File 23-0501.001 | October 4, 2023

PREPARED FOR:
Hillside Investments LLC
175 John J Thomas Way
Charles Town, WV 25414

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Signature: Date: 10/04/2023

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EXECUTIVE SUMMARY

This report summarizes existing and future traffic analyses conducted in support of the proposed Hillside residential development. The proposed development is to be located north of WV 115 (Charles Town Road) and east of US 340 (Berryville Pike) in Charles Town, Jefferson County. The proposed site plan includes 128 townhome lots. Hillside is expected to be built and completed by the year 2029.

The proposed residential development is anticipated to be served by two site driveways; one connecting with Hillside Drive (CR 9/69) from the north and one site driveway intersecting with Sternway Drive from the north just east of Hillside Drive. Site Drive #1 is proposed to be located approximately 1,650 feet north of WV 115 approaching from the north and will operate as a full movement approach operating as free-flow. Site Drive #2 is proposed to be located approximately 275 feet east of Hillside Drive and will operate as a full movement approach utilizing Two-Way Stop-Control (TWSC).

Traffic analyses will consider future conditions at the anticipated build-out year of 2029. This report summarizes the analyses of 2022 Existing conditions, 2029 No-Build conditions (without proposed development in place), 2029 Build conditions (with the proposed development in place), and 2029 Build Improved conditions (with the proposed development and improvements in place) during weekday AM and PM peak hours. An annual growth rate of 1.20% was obtained from the WVDOH Performance Management Division.

Three approved and one pending traffic impact studies have been included in the future peak hour forecasts as background developments that will be fully or partially complete by the Build Year of 2029. These developments are the Tate Manor, Magnolia Springs, Kings Crossing, and Fairview Farms developments. The Tate Manor and Magnolia Springs developments are located north of Crescent Drive/High Street and east of Jefferson Avenue in Charles Town and are anticipated to be completed by the year 2024. The Kings Crossing development is located along the south side of WV 115 between Crosswinds Drive and Kabletown Road and is anticipated to be complete by 2025. The pending Fairview Farms development is located along the north side of WV 115 opposite Kings Crossing and is anticipated to be complete by 2030 (assumed 90% complete by 2029). Estimated traffic generated by the four developments are included in the background traffic volumes beginning in the 2029 No-Build conditions.

AMT (A. Morton Thomas and Associates, Inc.) was retained to determine the projected traffic impacts of the proposed development in accordance with the guidelines set forth by WVDOH in Traffic Engineering Directive (TED) 106-2. The intent of the study is to fully examine the impacts of the traffic generated by the development on the existing transportation system and identify potential mitigation measures. This report presents trip generation, trip distribution, capacity analysis, queuing analysis, and recommendations for transportation improvements necessary to meet the anticipated traffic demands.

Based upon a review of the site plan and adjacent transportation network and following scope of work coordination with WVDOH, the following four existing intersections are included within the scope of the Traffic Impact Study (TIS) for the proposed Hillside residential development:

1) WV 115 (Charles Town Road) with Jefferson Avenue (CR 34) (*TWSC "T" type intersection)*
2) WV 115 with Citizens Way (CR 115/4)/US 340 SB (*Single-lane Roundabout Plus intersection)*
3) WV 115 with Hillside Drive (CR 9/69)/US 340 NB (*TWSC Plus type intersection)*
4) WV 115 with Kabletown Road (CR 25) *(TWSC "T" type intersection)*

Peak Hour Traffic Volumes

Peak hour turning movement counts were collected for the four existing intersections within the study area on Friday April 23, 2022 between the hours of 7-9 AM and 3-6 PM. These counts were collected as part of the pending Fairview Farms TIS. On this date, Jefferson County Schools were fully operational with in-classroom instruction for all students.

The proposed development is expected to be complete by the year 2029. The 2029 No-Build peak hour traffic volumes include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, the anticipated traffic generated by partial build-out of the Fairview Farms development, and annual traffic growth prior to the year 2029. The growth rate of 1.20% was applied to the existing peak hour traffic counts in order to develop 2029 No-Build conditions without the site development in place.

The 2029 Build Conditions include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, the anticipated traffic generated by partial build-out of the Fairview Farms development, an annual traffic growth prior to the year 2029, and the traffic generated by build-out of the Hillside development. Site generated traffic was distributed onto the transportation network based upon existing traffic patterns and anticipated origin and destination of the newly generated site trips.

Site Trip Generation and Distribution

The proposed Hillside Residential development includes 128 townhome lots. Trip generation "Peak Hour of Adjacent Street Traffic" rates from ITE Trip Generation Manual, 11th Edition, were utilized for Multifamily Housing (LUC 220). Trip generation analysis indicates that a total of 896 new daily trips will be generated including 63 AM peak hour trips and 76 PM peak hour trips.

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 40% to/from the north on US 340
    - 25% to/from the north on US 340
    - 15% to/from the east on WV 9
- 25% to/from the south on US 340
- 30% to/from the west on WV 115
- 5% to/from the east on WV 115

2022 Existing Conditions Analysis

The results of the 2022 Existing Conditions capacity analyses indicate that one traffic movement currently operates worse than LOS D, which is considered the minimum tolerable level. Traffic movements that are expected to operate worse than LOS D include the following (movements shown in bold type indicate they first appear in the milestone analysis being discussed):

- ***US 340 NB Ramp northbound shared left/thru lane to WV 115 LOS F during PM peak hour***

2029 No-Build Conditions Analysis

Improvements included in the 2029 No-Build Conditions include installation of a traffic signal at WV 115 with Jefferson Avenue and construction of an exclusive left-turn lane on WV 115 eastbound at Jefferson Avenue. These improvements were included in the Tate Manor TIS. In addition, construction of a single-lane roundabout at the WV 115 with US 340 NB Ramp/Hillside Drive is included in the 2029 No-Build conditions. This improvement is currently a planned project by WVDOH and was requested to be included beginning in this scenario.

The results of the 2029 No-Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2022 Existing Conditions are anticipated to be mitigated following implementation of proposed improvements. One additional movement is anticipated to operate worse than LOS D during the 2029 No-Build conditions (shown in bold). Traffic movements that are expected to operate worse than LOS D include the following:

- ***US 340 Southbound Exit Ramp approach to WV 115 LOS E during PM peak hour***

2029 Build Conditions Analysis

The results of the 2029 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2029 No-Build Conditions are anticipated to continue. One additional movement is anticipated to operate worse than LOS D during the 2029 Build conditions (shown in bold). Traffic movements that are expected to operate worse than LOS D include the following:

- *US 340 Southbound Exit Ramp approach to WV 115 LOS E during PM peak hour*
- ***WV 115 eastbound approach to US 340 NB Ramp/Hillside Drive LOS E during PM peak hour***

2029 Build Improved Conditions Analysis

Improvements included in the 2029 Build Improved Conditions comprise construction of a right-turn slip lane on the US 340 Southbound Ramp to WV 115 and construction of a right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramp/Hillside Drive.

The results of the 2029 Build Improved Conditions capacity analyses indicate that all traffic movements that operate worse than LOS D during 2029 Build Conditions will be mitigated following implementation of proposed improvements.

Conclusions/Recommendations

Based on the findings of the Tate Manor TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Tate Manor residential development in order to maintain operation of the existing transportation network:

<u>WV 115 with Jefferson Avenue</u>

- As part of the Tate Manor TIS, it was recommended that a traffic signal be installed at the intersection of WV 115 and Jefferson Avenue. Intersection conditions previously met the

MUTCD warranting criteria. Additionally, the 2022 Existing Conditions and 2029 No-Build analysis indicates that the intersection LOS will currently operates at LOS E during the PM peak hour under TWSC.

- In conjunction with installation of a traffic signal identified in previous studies, widening WV 115 to construct an exclusive left-turn lane on the eastbound approach is recommended. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with an appropriate taper.

Based on the findings of the Kings Crossing TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Kings Crossing residential development in order to maintain operation of the existing transportation network:

WV 115 with Citizen Way/US 340 Southbound Ramps

- Construct a low angle right-turn slip lane on for the US 340 northbound ramp approach to WV 115 eastbound. The 2029 Build analysis indicates that the ramp approach will deteriorate to LOS E during the PM peak hour with the overall intersection operating LOS C. The addition of the right-turn slip lane improves the ramp to LOS A during the PM peak hour and the overall intersection to LOS B. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3 of the Kings Crossing development.

Based on the findings of the Magnolia Springs TIS, the following infrastructure improvements are recommended to address existing capacity issues in order to maintain operation of the existing transportation network:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Proceed with the WVDOH planned conversion of the intersection to a single lane roundabout. This project is currently programmed by WVDOH and is expected to be constructed in 2025. For the purpose of this study, the installation of a single lane roundabout is included beginning in 2029 No-Build conditions.

Based on the findings of the Fairview Farms TIS, the following infrastructure improvements are recommended to address existing capacity issues in order to maintain operation of the existing transportation network:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Construct an exclusive right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive. The WV 115 eastbound approach is anticipated to experience lengthy queues beginning in the 2029 No-Build conditions. This improvement increases capacity and reduces queue lengths on the approach.

Based on the finding of this study, the following geometric improvements are recommended to mitigate the impacts of the Hillside development and maintain acceptable traffic operations along the existing transportation network in 2029:

Hillside Drive with Site Drive #1

- Construct Site Drive #1 as a full movement approach connecting with Hillside Drive approximately 1,650 feet north of WV 115 approaching from the north connecting at the existing cul de sac. The site driveway is recommended to include one ingress and one egress lane. Site Drive #1 will operate as free-flow traveling uninhibited through the intersection.

Sternway Drive with Site Drive #2

- Construct Site Drive #2 as a full movement approach intersecting with Sternway Drive creating a "T" type intersection approximately 275 feet east of Hillside Drive. The site driveway is recommended to include one ingress and one egress lane. Site Drive #2 will operate under TWSC with traffic on Sternway Drive traveling uninhibited through the intersection.

INTRODUCTION

This report summarizes existing and future traffic analyses conducted in support of the proposed Hillside residential development. The proposed development is to be located north of WV 115 and east of US 340 in Charles Town, Jefferson County. The proposed site plan includes 128 townhome lots. Hillside is expected to be built and completed by the year 2029.

The proposed residential development is anticipated to be served by two site driveways; one connecting with Hillside Drive from the north and one site driveway intersecting with Sternway Drive from the north just east of Hillside Drive. Site Drive #1 is proposed to be located approximately 1,650 feet north of WV 115 approaching from the north and will operate as a full movement approach operating as free-flow. Site Drive #2 is proposed to be located approximately 275 feet east of Hillside Drive and will operate as a full movement approach utilizing TWSC.

Traffic analyses will consider future conditions at the anticipated build-out year of 2029. This report summarizes the analyses of 2022 Existing conditions, 2029 No-Build conditions (without proposed development in place), 2029 Build conditions (with the proposed development in place), and 2029 Build Improved conditions (with the proposed development and improvements in place) during weekday AM and PM peak hours. An annual growth rate of 1.20% was obtained from the WVDOH Performance Management Division.

Three approved and one pending traffic impact studies have been included in the future peak hour forecasts as pending developments that will be fully or partially complete by the Build Year of 2029. These developments are the Tate Manor, Magnolia Springs, Kings Crossing, and Fairview Farms developments. The Tate Manor and Magnolia Springs developments are located north of Crescent Drive/High Street and east of Jefferson Avenue in Charles Town and are anticipated to be completed by the year 2024. The Kings Crossing development is located along the south side of WV 115 between Crosswinds Drive and Kabletown Road and is anticipated to be complete by 2025. The pending Fairview Farms development is located along the north side of WV 115 opposite Kings Crossing and is anticipated to be complete by 2030 (assumed 90% complete by 2029). Estimated traffic generated by the four developments are included in the background traffic volumes beginning in the 2029 No-Build conditions. Information regarding both developments is located in **Appendix F**.

AMT was retained to determine the projected traffic impacts of the proposed development in accordance with the guidelines set forth by WVDOH in TED 106-2. The intent of the study is to fully examine the impacts of the traffic generated by the development on the existing transportation system and identify potential mitigation measures. This report presents trip generation, trip distribution, intersection on capacity analysis, queuing analysis, and recommendations for transportation improvements necessary to meet the anticipated traffic demands.

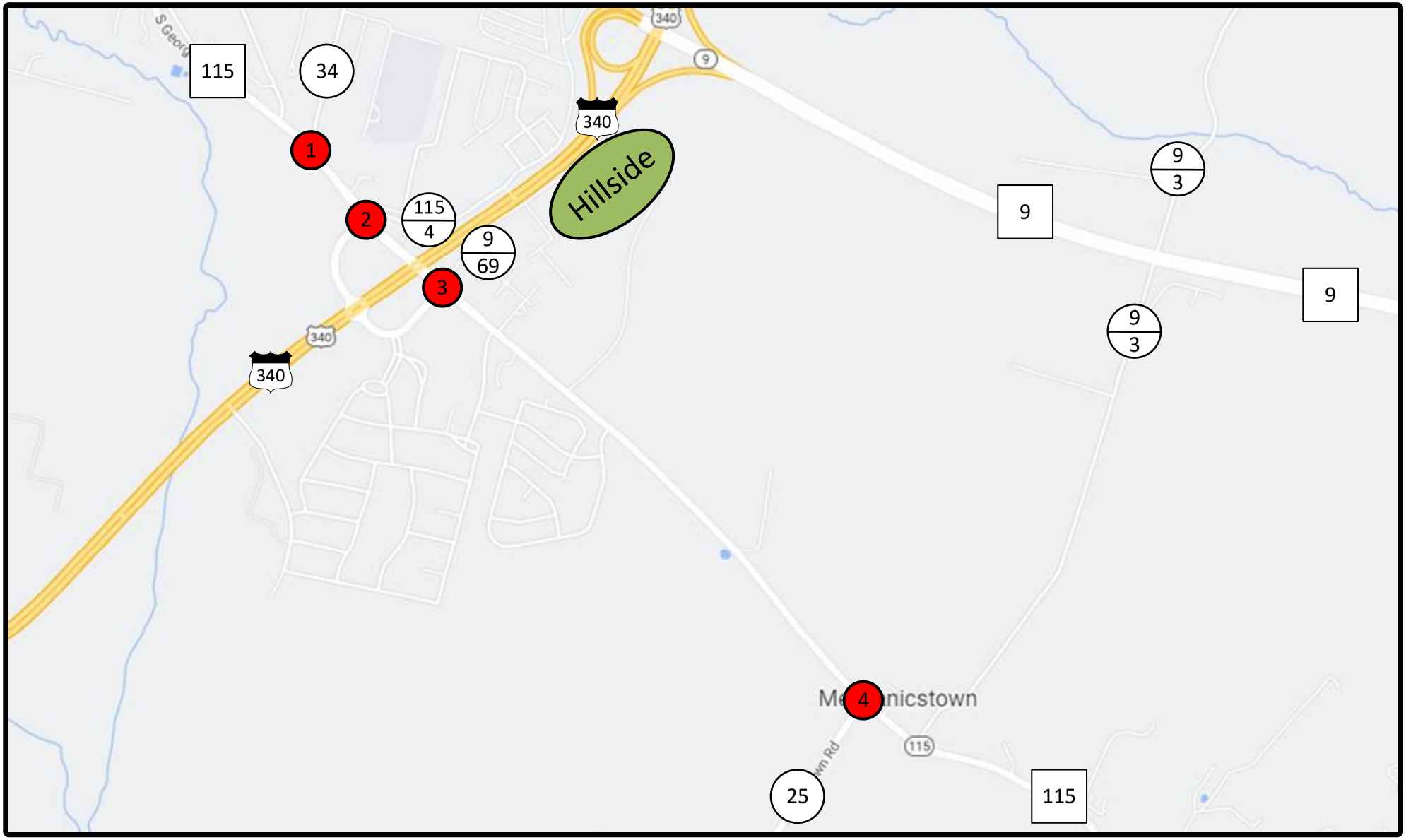
AMT coordinated with WVDOH to determine the intersections to be studied, preliminary trip generation, distribution, and study methodology for this TIS. A copy of the approved Scope of Work (SOW) is included in **Appendix G**.

STUDY AREA DESCRIPTION

Based upon a review of the site plan and adjacent transportation network and following SOW coordination with WVDOH, the following four existing intersections are included within the scope of the TIS for the proposed Hillside Residential development:

1) WV 115 (Charles Town Road) with Jefferson Avenue (CR 34) (*TWSC "T" type intersection)*
2) WV 115 with Citizens Way (CR 115/4)/US 340 SB (*Single-lane Roundabout Plus intersection)*
3) WV 115 with Hillside Drive (CR 9/69)/US 340 NB (*TWSC Plus type intersection)*
4) WV 115 with Kabletown Road (CR 25) *(TWSC "T" type intersection)*

The study area and key intersections are shown on **Figure 1**. The proposed site plan is shown on **Figure 2**.



LEGEND

= Development

= Existing Intersection

= Proposed Intersection

AMT

N

NOT TO SCALE

Hillside TIS

Site Location Map

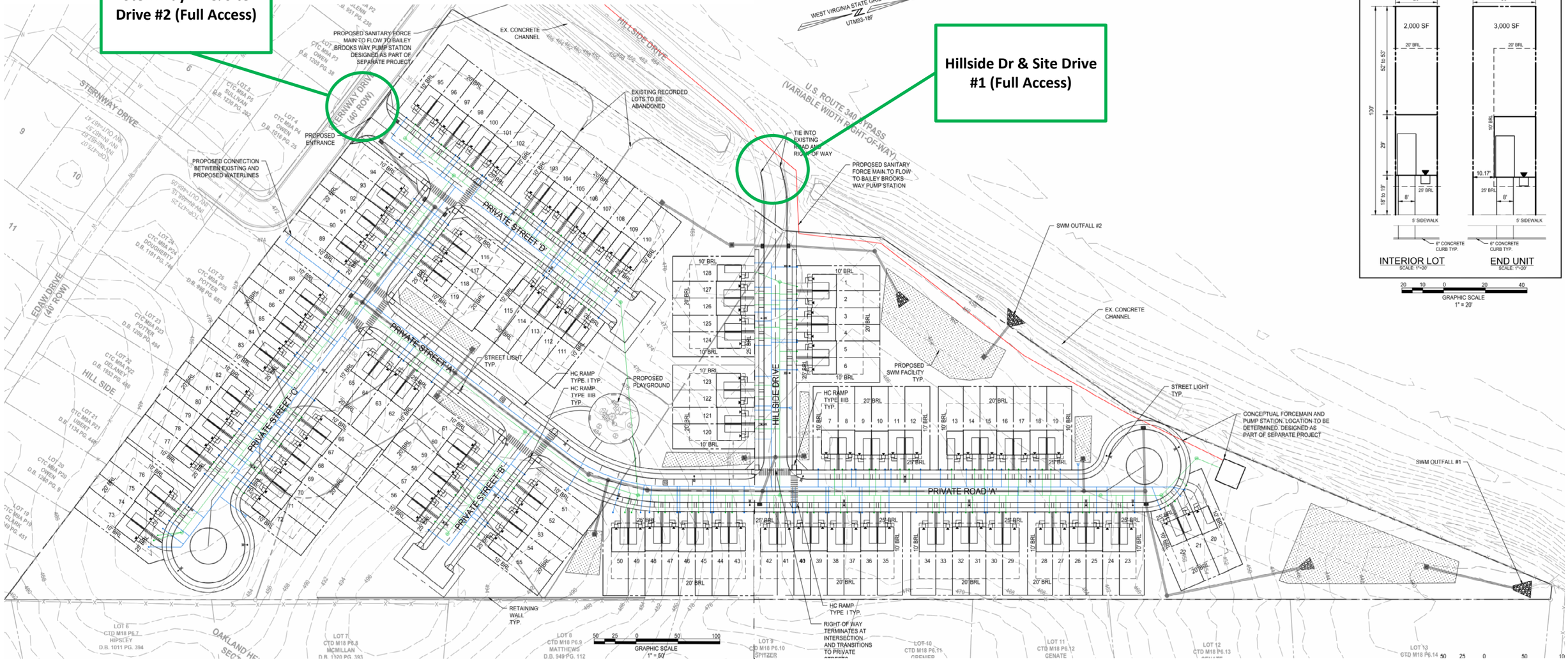
DATE: October 2023

FIGURE 1

642

Sternway Dr & Site Drive #2 (Full Access)

Hillside Dr & Site Drive #1 (Full Access)



NOT TO SCALE	**Hillside TIS**
	Site Plan
	DATE: October 2023
	FIGURE 2

EXISTING ROADWAY CONDITIONS

A detailed description of the existing study area roadway network is provided in this section of the report. AADT (Annual Average Daily Traffic) volume information was obtained from the WVDOH GIS website.

US 340 (Berryville Pike) is a north-south four-lane two way-controlled access divided highway within the project area. US 340 is part of the National Highway System (NHS). US 340 forms a grade separated modified trumpet interchange with WV 115 south of the project site, with the ramps intersecting with surface streets to the north. The posted speed limit on this section of US 340 is 60 miles per hour (mph). The AADT along US 340 is 16,115 vehicles per day (vpd) just north of the US 340 interchange with WV 115.

WV 115 (Charles Town Road) is a north-south two-lane urban major collector within the project area. The posted speed limit on this section of WV 115 is 45 mph east of Kabletown Road before increasing to 55 mph just before Kabletown Road. The AADT along WV 115 in the project area is 4,542 vpd. WV 115 provides a direct connection to Downtown Charles Town, located approximately one-mile northwest of Citizens Way.

WV 9 (Veterans Memorial Highway) is a four-lane divided highway classified as an expressway within the study area. WV 9 overlaps with US 340 in the south of the Charles Town Interchange before splitting from US 340 and continuing east to Hillsboro VA, serving as a primary east/west facility through Jefferson, Berkeley, and Morgan Counties. The speed limit on this section of WV 9 is 60 mph and the AADT is 26,776 vpd.

Jefferson Avenue (CR 34) is a two-lane two-way essential arterial state and local service (SLS) route within the project area. Jefferson Avenue provides access to mostly residential properties and is the only means of access to High Street. High Street connects directly to Charles Town Middle School. The posted speed limit on the section of Jefferson Avenue being analyzed is 35 mph. The AADT in the project area is 4,230.

Kabletown Road (CR 25) is a two-lane two-way collector, state and local service roadway within the project area. Kabletown Road provides access to residential properties while providing a direct connection to WV 115. The posted speed limit on this section of Kabletown Road is 40 mph and the AADT is 1,630 vpd.

Hillside Drive (CR 9/69) is a two-lane two-way state and local service roadway within the project area. Hillside Drive provides access to residential properties while providing a direct connection to WV 115 opposite US 340 Northbound Ramps. The posted speed limit on this section of Hillside Drive is 35 mph and the AADT is 150 vpd. The AADT for Hillside Drive was not available on WVDOH GIS website, therefore, was calculated based on collected turning movement counts.

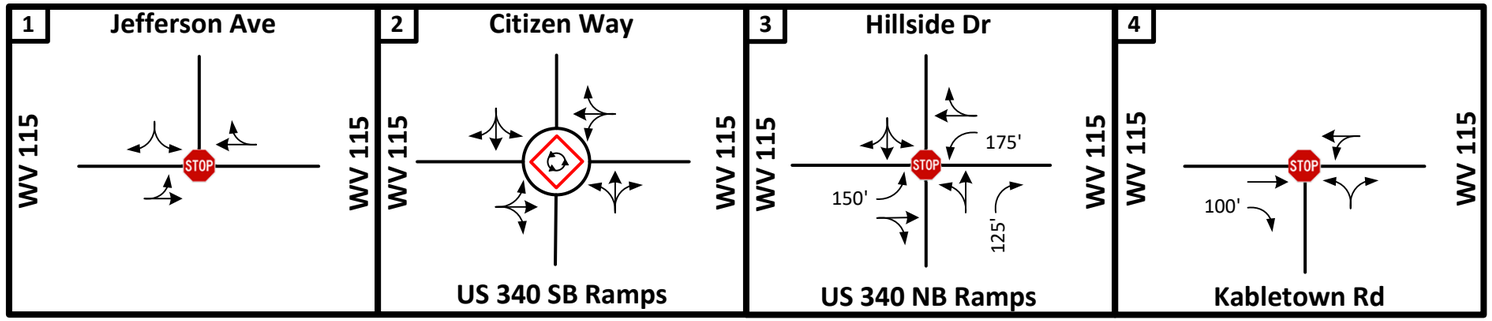
Citizens Way (CR 115/4) is a two-lane two-way state and local service roadway within the project area. Citizens Way provides access to the residential neighborhood north of WV 115 and east of Jefferson Avenue. Citizens Way intersects with WV 115 opposite US 340 Southbound Ramps at a four-leg roundabout intersection. The posted speed limit on this section of Citizens Way is 35 mph and the AADT along Citizens Way in the project area is 750 vpd. The AADT for Citizens Way was not available on WVDOH GIS website, therefore, was calculated based on collected turning movement counts.

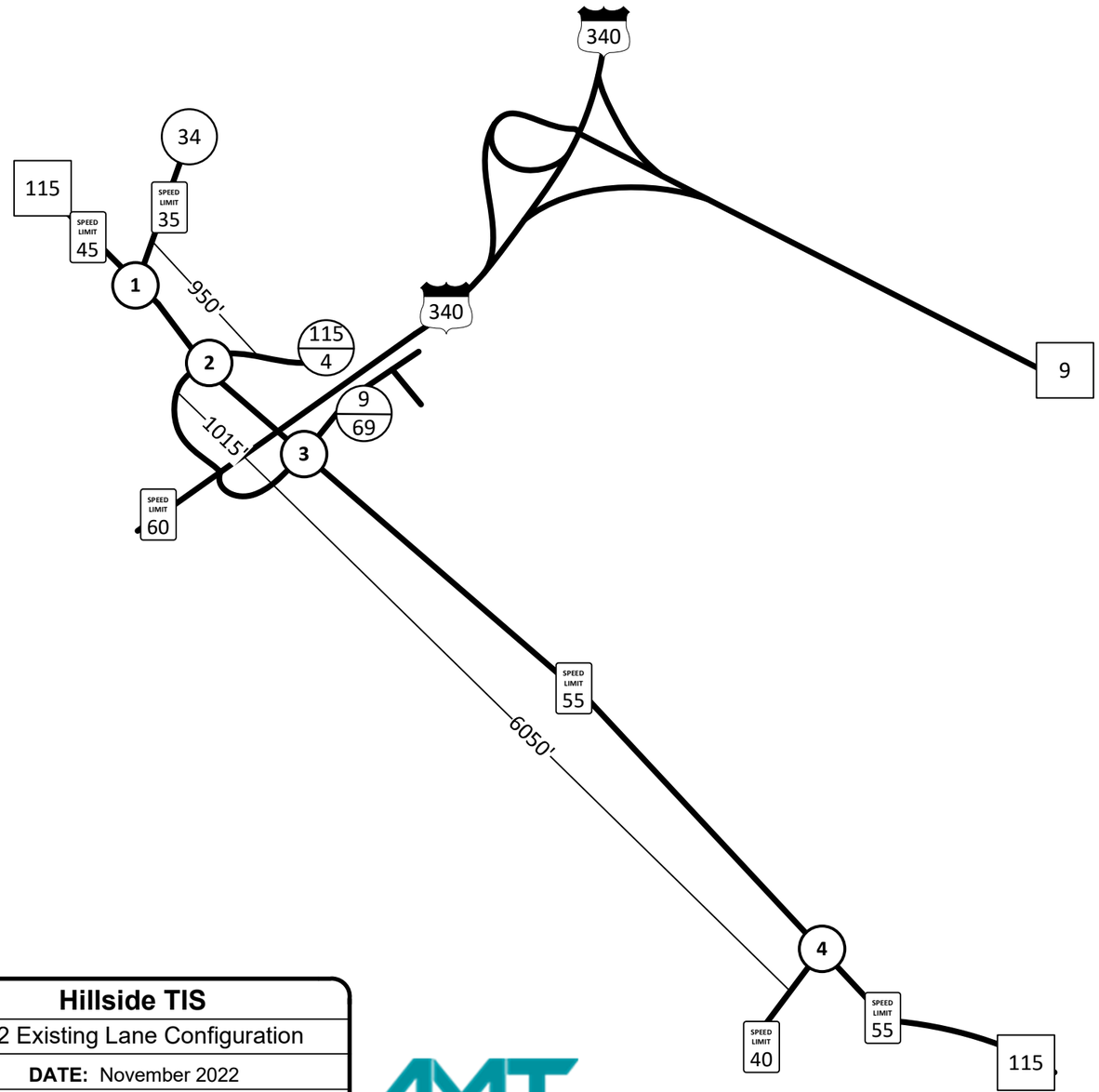
Table 1 provides a detailed description of the existing study area roadway network. In addition, Estimated Build Year AADT is included in the table which contains Existing volume, Hillside trips, approved background trips (Tate Manor, Magnolia Springs, Kings Crossing, and Fairview Farms developments), and

traffic inflation to 2029. The 2022 existing intersection lane configurations and intersections control are shown on **Figure 3.**

Table 1: Roadway Facility Summary

Name	Code	State Functional Classification	Area	Direction	Speed Limit	Typical Roadway Paved Width (ft)	AADT (Year)	**Estimated Build AADT (2029)**	Description
Berryville Pike	US 340	Trunkline	Jefferson County	N-S	60	72	16,115 (2017)	18,590	N-S Trunkline that forms and interchange with WV 115 west of the proposed development
Veterans Memorial Highway	WV 9	Expressway	Jefferson County	E-W	60	72	26,776 (2017)	30,889	E-W Expressway that runs parallel with CR 17 through study area and connects with US 340
Charles Town Road	WV 115	Trunkline	Jefferson County	N-S	45/55	38	4,542 (2017)	15,657	E-W Trunkline that runs perpendicular with US 340 through study area & is main access to development
Jefferson Avenue	CR 34	Essential Arterial	Jefferson County	N-S	35	28	4,373 (2017)	4,380	N-S SLS Route that intersect with WV 115
Kabletown Road	CR 25	Collector (SLS)	Jefferson County	N-S	40	22	1,630 (2017)	1,800	N-S SLS Route that intersects with WV 115
Citizens Way	CR 115/4	Collector (SLS)	Jefferson County	N-S	35	24	1,990 (2022)	5,090	N-S SLS Route that intersects with WV 115 directly opposite US 340 SB Ramps
Hillside Drive	CR 9/69	Collector (SLS)	Jefferson County	N-S	35	30	150 (2022)	920	N-S SLS Route that intersects with WV 115 directly opposite US 340 NB Ramps





LEGEND

- Existing Traffic Control
- Existing Roadway / Existing Lane Configuration
- XXX' Storage Bay Length
- Existing Posted Speed

N

NOT TO SCALE

Hillside TIS

2022 Existing Lane Configuration

DATE: November 2022

FIGURE 3

AMT

EXISTING & NO-BUILD PROJECT TRAFFIC VOLUMES

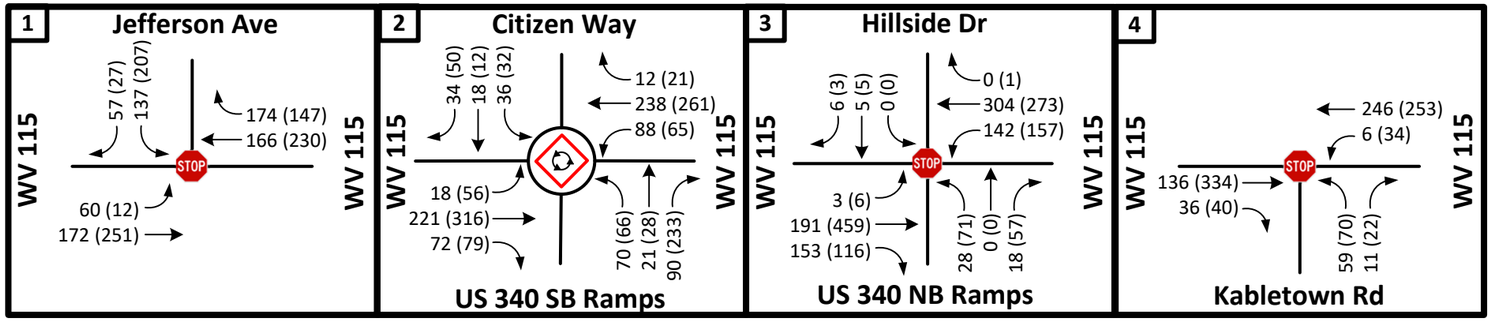
2022 Existing Conditions

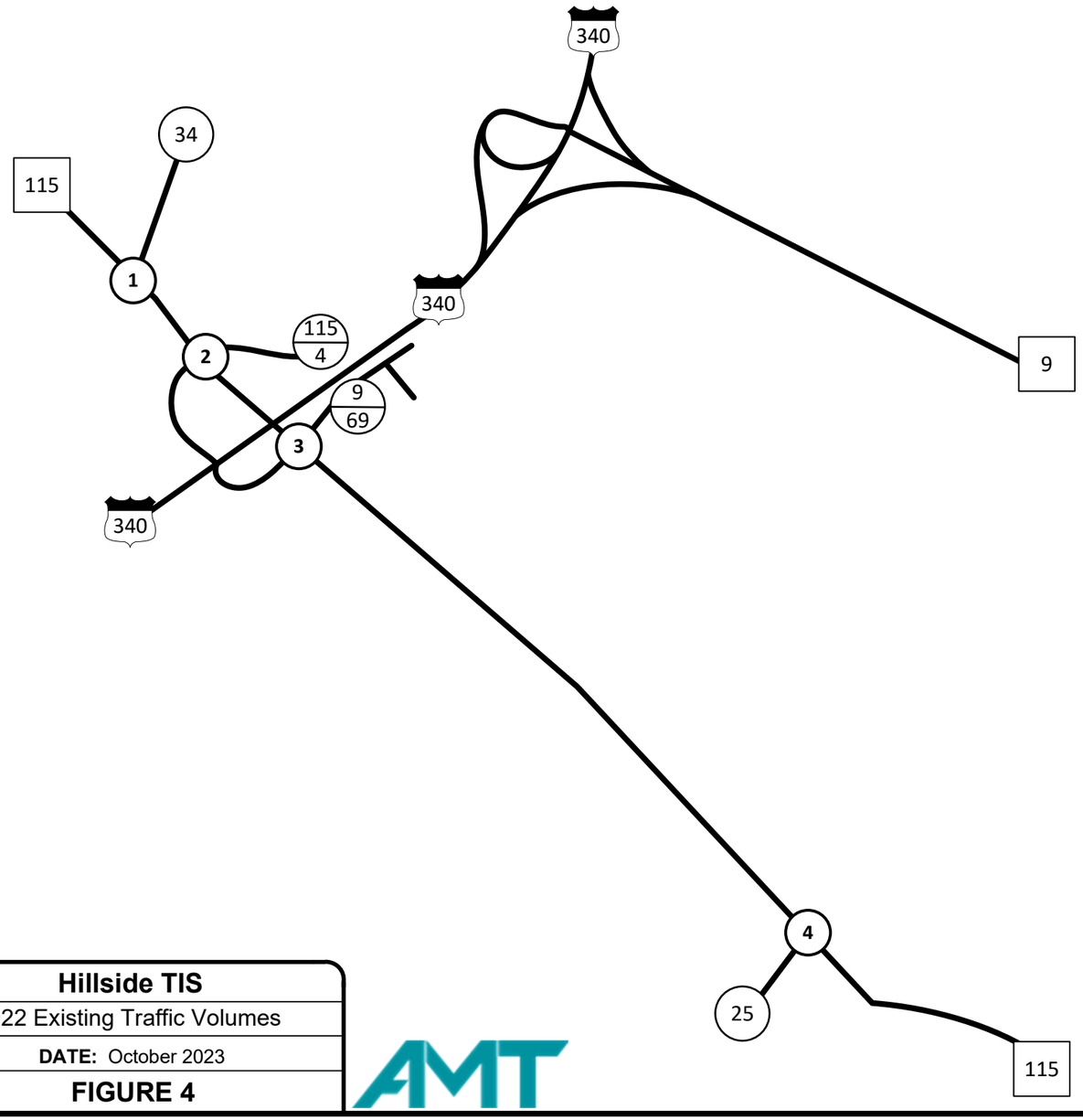
Peak hour turning movement counts were collected for the four existing intersections within the study area by AMT on Friday April 23, 2022 between the hours of 7-9 AM and 3-6 PM. These counts were collected as part of the pending Fairview Farms TIS. On this date, Jefferson County Schools were fully operational with in-classroom instruction for all students. The traffic count data is located in **Appendix B** and the 2022 Existing Traffic Volumes for the weekday AM and PM peak hour volumes are shown on **Figure 4**.

2029 No-Build Conditions

The proposed development is expected to be complete by the year 2029. The 2029 No-Build peak hour traffic volumes include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, the anticipated traffic generated by partial build-out of the Fairview Farms development, and annual traffic growth prior to the year 2029. The growth rate of 1.20% was applied to the existing peak hour traffic counts in order to develop 2029 No-Build conditions without the site development in place.

The total background development trips for the weekday AM and PM peak hours are shown on **Figure 5** to illustrate the increase in traffic volume resulting from adjacent projects included within this study. The 2029 No-Build peak hour volumes for the weekday AM and PM peak hour volumes are shown on **Figure 6**.





LEGEND

- Existing Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XX AM Peak Hour Volume
- (XX) PM Peak Hour Volume

N

NOT TO SCALE

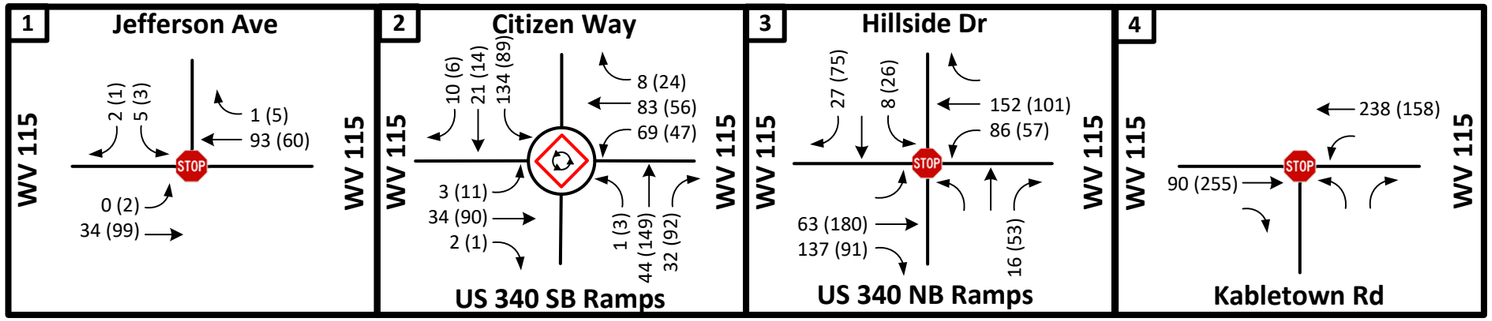
Hillside TIS

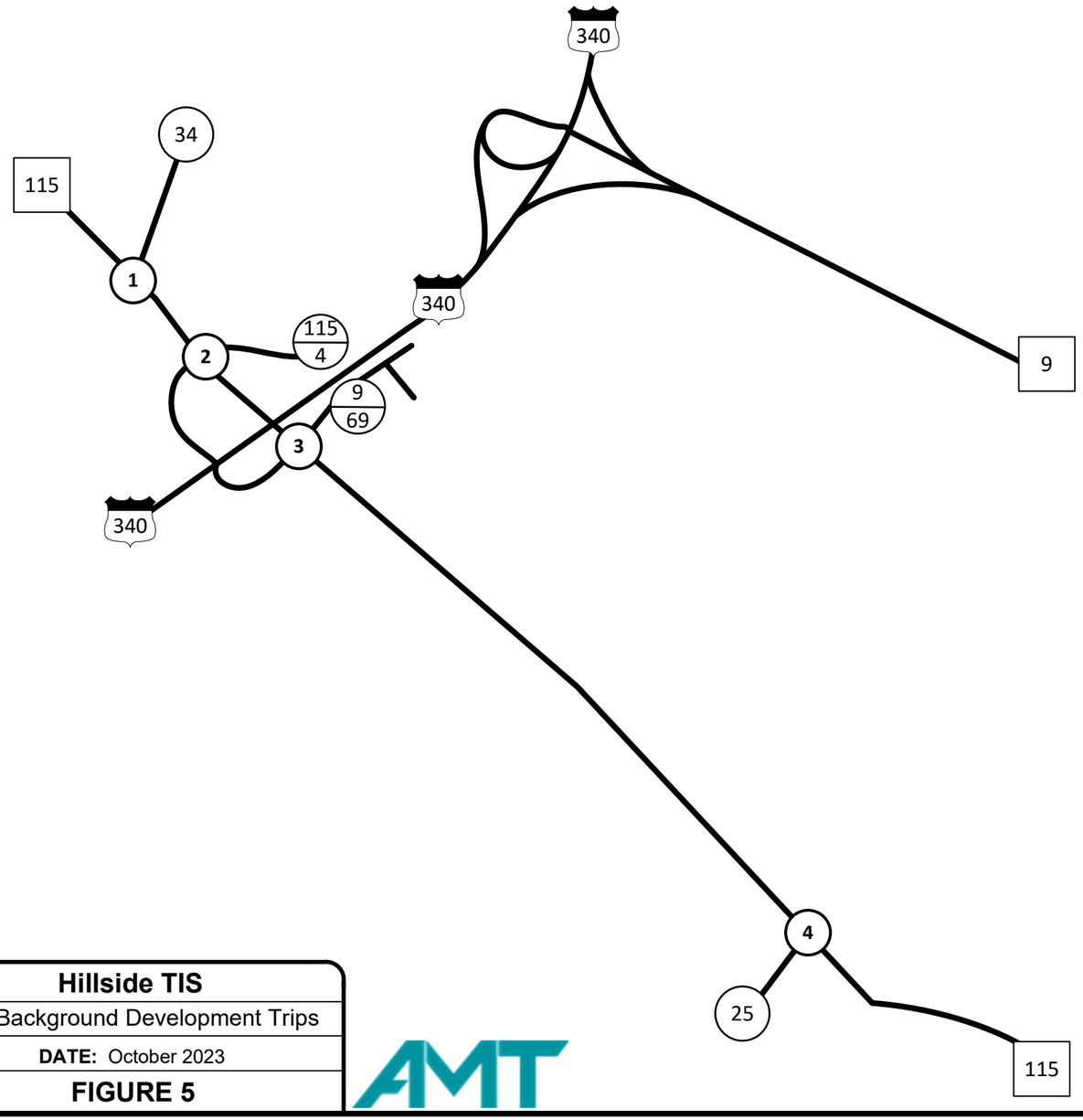
2022 Existing Traffic Volumes

DATE: October 2023

FIGURE 4

AMT





LEGEND

- Existing Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XX AM Peak Hour Volume
- (XX) PM Peak Hour Volume

N

NOT TO SCALE

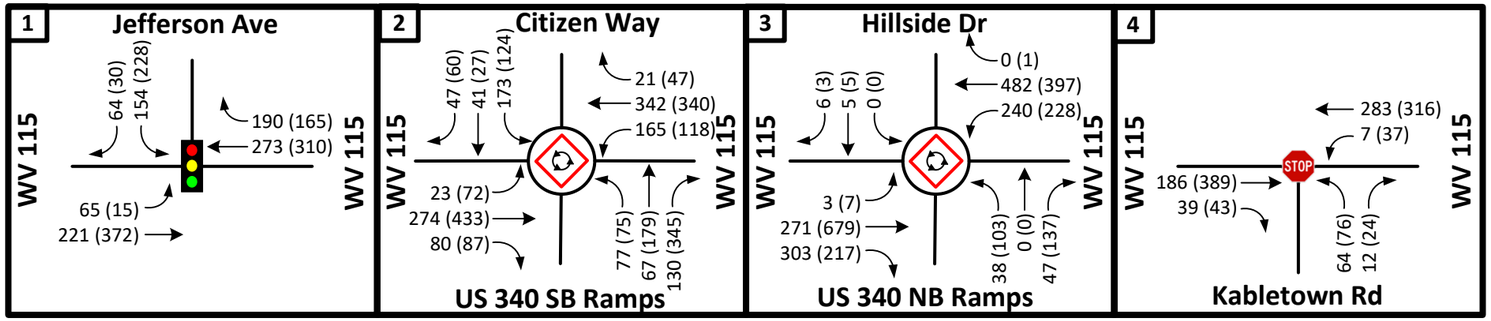
Hillside TIS

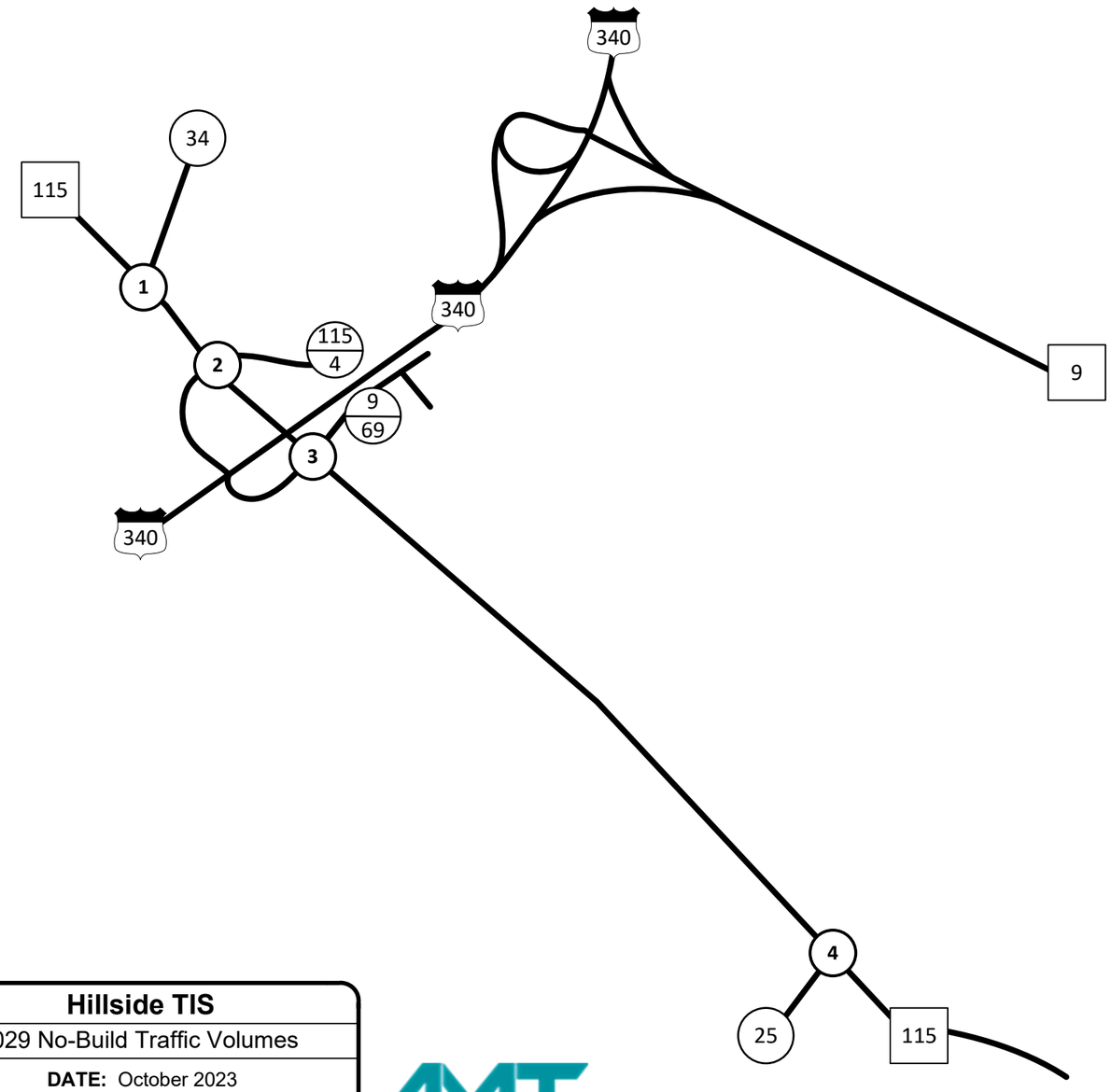
Total Background Development Trips

DATE: October 2023

FIGURE 5

649





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XX AM Peak Hour Volume
- (XX) PM Peak Hour Volume

N

NOT TO SCALE

Hillside TIS

2029 No-Build Traffic Volumes

DATE: October 2023

FIGURE 6

650

TRIP GENERATION

The proposed Hillside Residential development includes 128 townhome lots. Trip generation "Peak Hour of Adjacent Street Traffic" rates from ITE Trip Generation Manual, 11th Edition, were utilized for Multifamily Housing (LUC 220). As shown in **Table 2** below, the proposed development will generate a total of 896 new daily trips including 63 AM peak hour trips and 76 PM peak hour trips.

Table 2: Trip Generation Summary

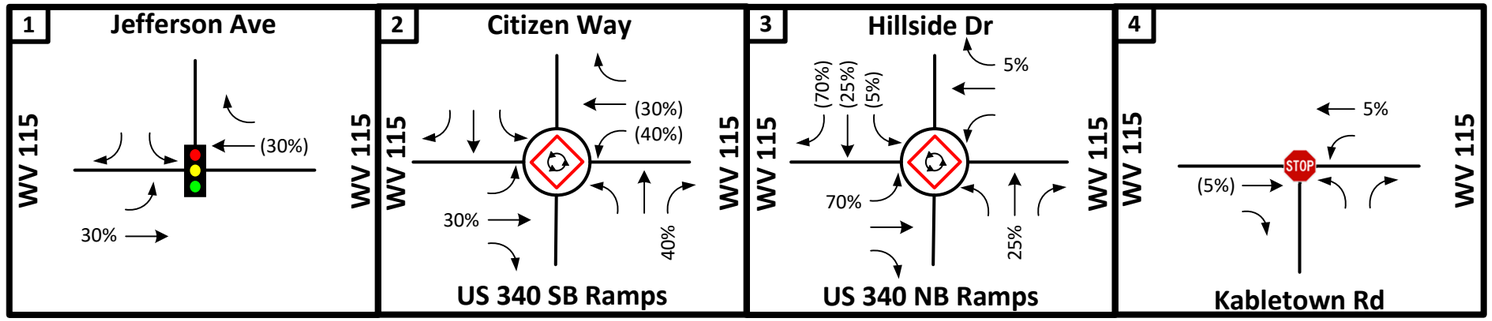
Description	LUC	Density	Avg. Daily Trips	AM Peak			PM Peak		
				Enter	Exit	Total	Enter	Exit	Total
Townhomes	220	128 Units	896	15	48	63	48	28	76
Net New External Trips			**896**	**15**	**48**	**63**	**48**	**28**	**76**

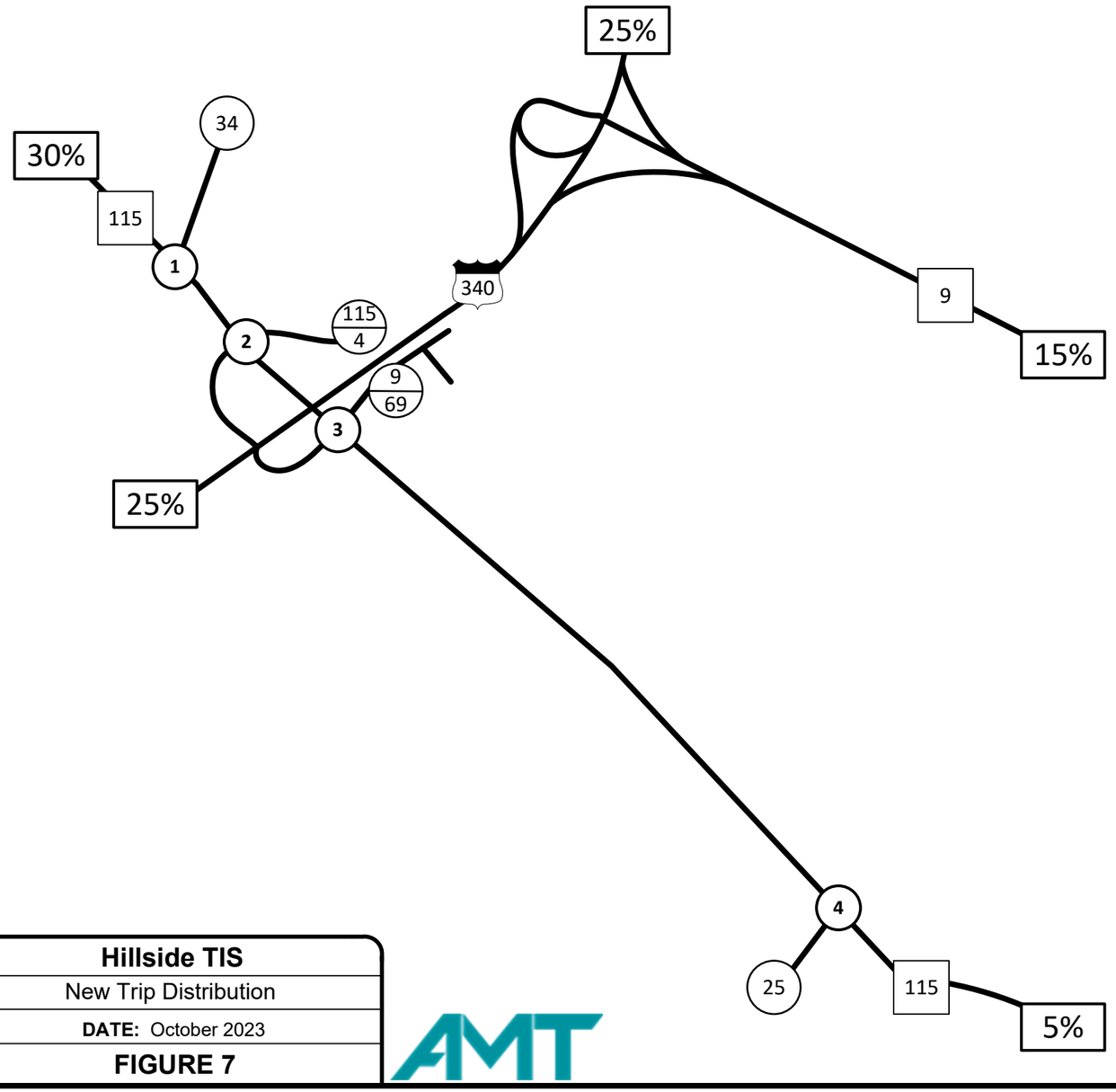
TRIP DISTRIBUTION

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 40% to/from the north on US 340
  - 25% to/from the north on US 340
  - 15% to/from the east on WV 9
- 25% to/from the south on US 340
- 30% to/from the west on WV 115
- 5% to/from the east on WV 115

The external trip distribution percentages are shown on **Figure 7** and the AM and PM peak hour new site trip assignments are shown on **Figure 8**.





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XX% Entering Trip Percentage
- (X%) Exiting Trip Percentage

N

NOT TO SCALE

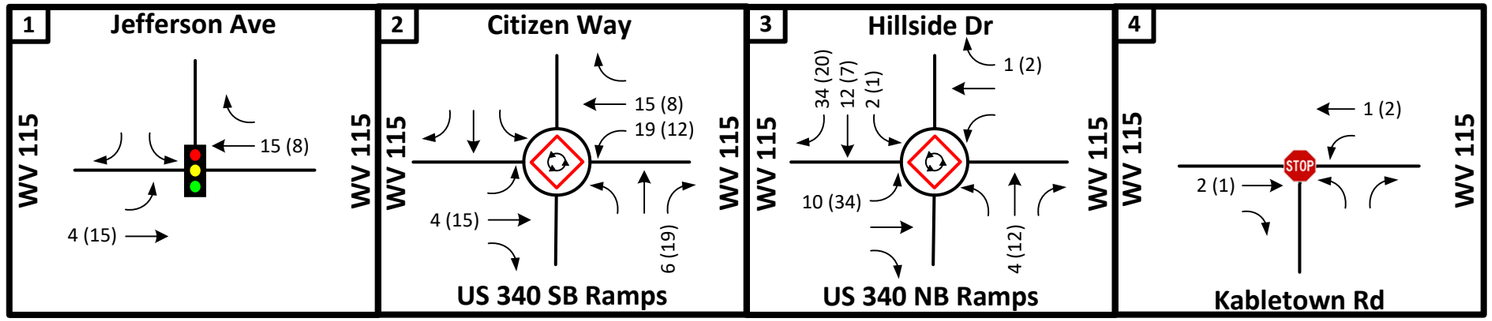
Hillside TIS

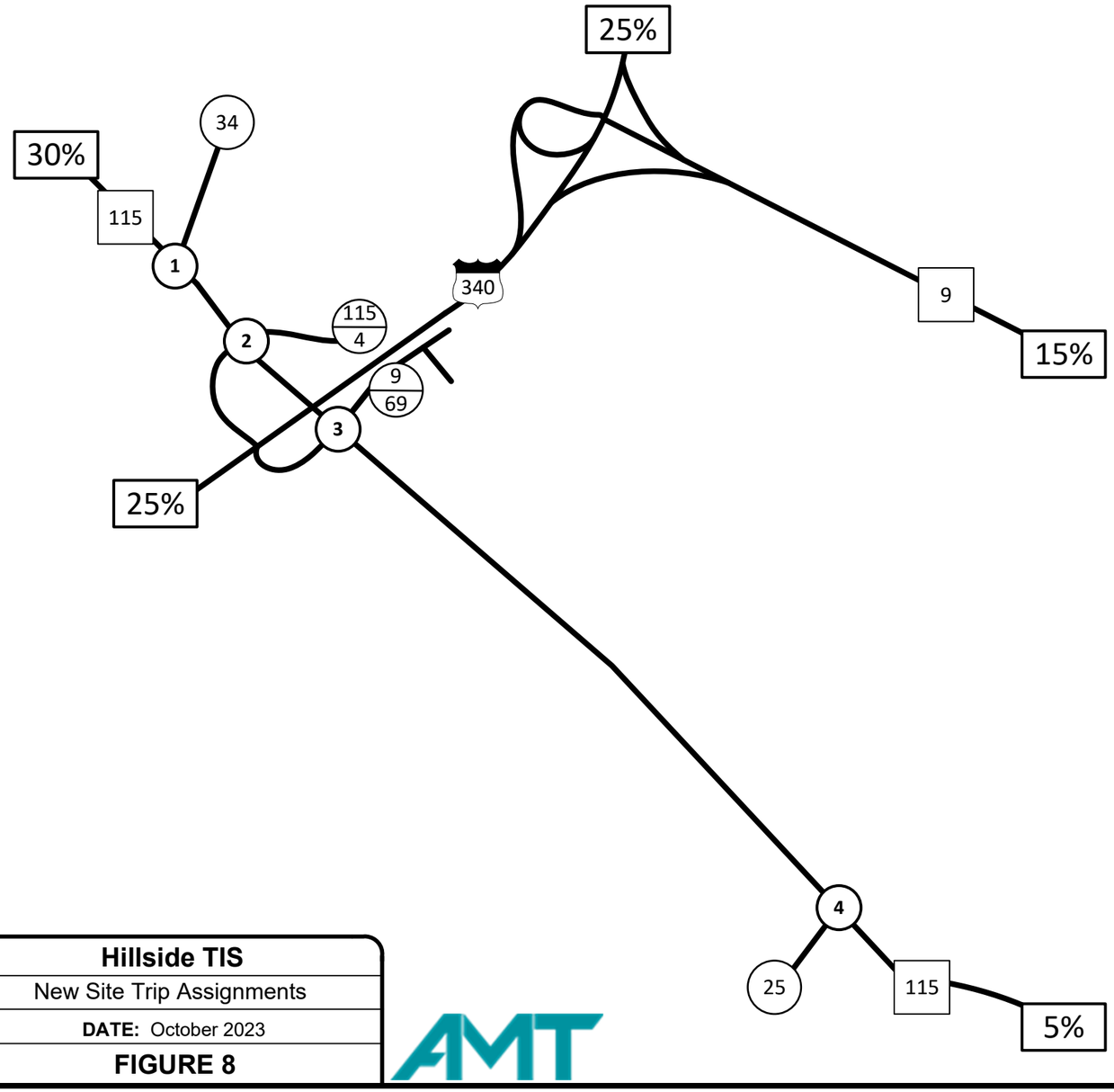
New Trip Distribution

DATE: October 2023

FIGURE 7

AMT





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XX AM Peak Hour Trips
- (XX) PM Peak Hour Trips

N

NOT TO SCALE

Hillside TIS

New Site Trip Assignments

DATE: October 2023

FIGURE 8

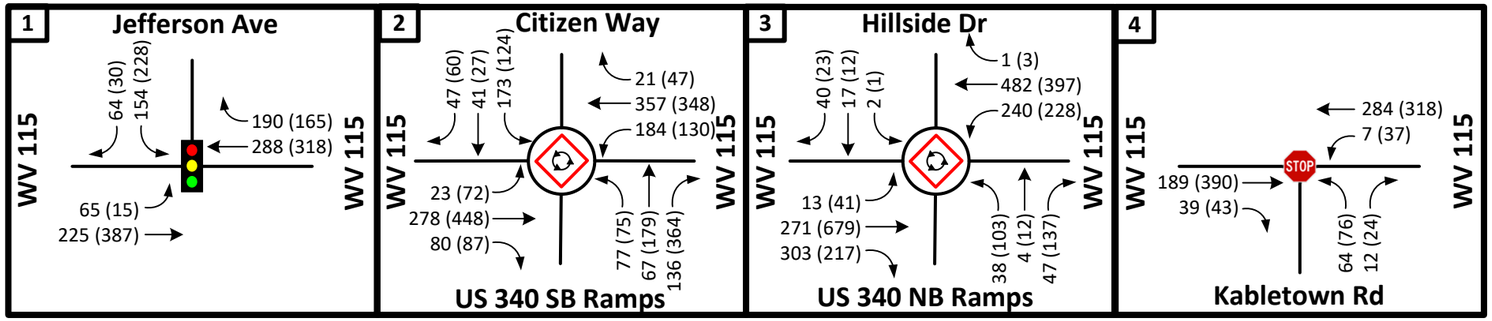
AMT

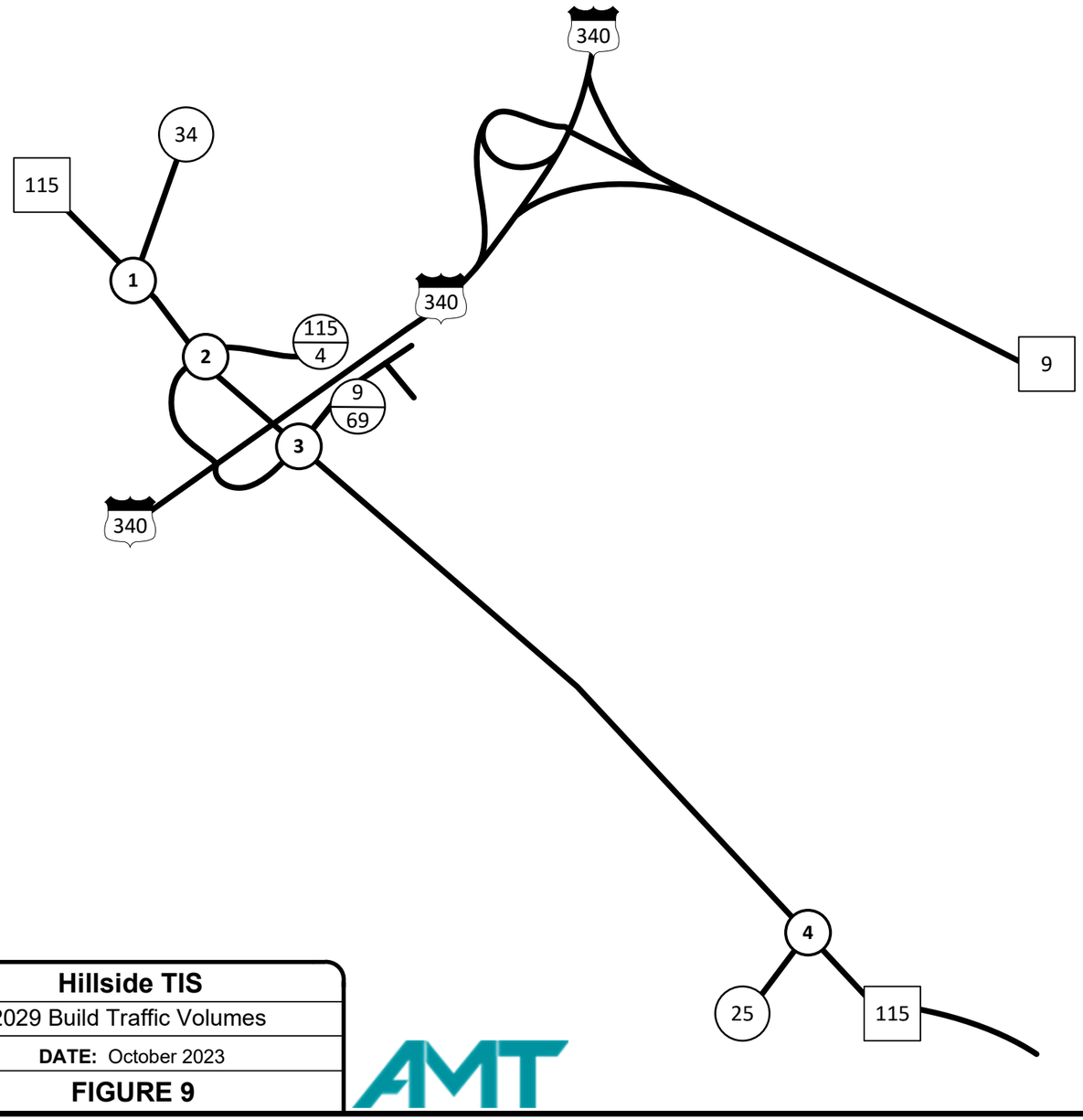
BUILD PROJECT TRAFFIC VOLUMES

2029 Build Conditions

The 2029 Build peak hour traffic volumes include existing 2022 traffic volumes, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, anticipated traffic generated by the Kings Crossing development, the anticipated traffic generated by partial build-out of the Fairview Farms development, annual traffic growth prior to the year 2029, and traffic generated by build-out of the Hillside development. Site generated traffic was distributed onto the transportation network based upon existing traffic patterns and anticipated origin and destination of the newly generated site trips (see **Figure 7** and **8**). The 2029 Build Traffic Volumes for the weekday AM and PM peak hour are shown on **Figure 9**.

The peak hour traffic forecast calculations spreadsheet is included in **Appendix B**.





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XX AM Peak Hour Volume
- (XX) PM Peak Hour Volume

N

NOT TO SCALE

Hillside TIS

2029 Build Traffic Volumes

DATE: October 2023

FIGURE 9

AMT

CAPACITY ANALYSIS

The Highway Capacity Manual defines capacity as the maximum suitable flow rate at which vehicles reasonably can be expected to traverse a point during a specified time period. Capacity uses the measure of efficiency, Level-of-Service (LOS), to describe the traffic performance at intersections. LOS is defined for the overall intersection delay for signalized intersections. An acceptable LOS for a signalized intersection is considered to be LOS D or better (i.e. A, B, C or D).

At unsignalized intersections, the LOS is defined by the control delay for the movement that must yield right-of-way. It may be typical for stop-controlled minor streets to experience long delays during peak periods, while the majority of the traffic flows through the intersection on the major street travel unimpeded.

The procedures outlined in the Highway Capacity Manual; 6th Edition were used as guidelines for the analysis of the study area intersections. This manual provides procedures for the analysis of both signalized and unsignalized intersections. LOS categories range from LOS "A" (best) to "F" (worst) as shown in **Table 3**.

Table 3: Level of Service Criteria

Level of Service	SIGNALIZED Intersection Control Delay (sec/veh)	UNSIGNALIZED Intersection Control Delay (sec/veh)	Intersection LOS Description
A	≤ 10.0	≤ 10.0	Free flow, insignificant delays.
B	10.1-20.0	10.1-15.0	Stable operation, minimal delays.
C	20.1-35.0	15.1-25.0	Stable operation, acceptable delays.
D	35.1-55.0	25.1-35.0	Restricted flow, common delays.
E	55.1-80.0	35.1-50.0	Maximum capacity, extended delays. Volumes at or near capacity. Long queues form upstream from intersection.
F	> 80.0	> 50.0	Forced flow, excessive delays. Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

LOS analysis was completed through the use of Synchro, version 11.1 and Sidra, version 9.0. The software package categorizes the LOS based on HCM methodology and criteria. According to industry standards, any signalized intersection or any approach of an unsignalized intersection is considered acceptable if the average delay is at LOS D or better with LOS A representing little or no delay. Any signalized intersection or approach with a LOS of E or F is considered substandard and may need solutions to improve the operational performance. Copies of the Synchro analyses outputs for each analysis year/scenario are shown in **Appendix C**. Copies of the Sidra analyses outputs for each analysis year/scenario are shown in **Appendix E.**

2022 Existing Conditions Analysis

Since WV 115 and US 340 are both designated as N-S routes, establishment of approach directions utilized throughout the capacity analysis are based on WVDOH cardinal route direction of US 340. While maintaining US 340 as the north-south route through the study area, WV 115 was established as east-west. The bearing direction for WV 115 is east-west through the project area with WV 115 Northbound running west and WV 115 southbound running east.

WV 115 with Jefferson Avenue

Capacity analysis indicates the WV 115 eastbound left-turn movement to Jefferson Avenue currently operates at LOS A during both the AM and PM peak hours. The WV 115 westbound approach to Jefferson Avenue currently operates as free flow traveling unimpeded through the intersection. The Jefferson Avenue southbound approach operates at LOS C during both the AM and PM peak hours under stop control.

WV 115 with US 340 Southbound and Citizens Way

Analysis indicates that the WV 115 eastbound approach to US 340 Southbound/Citizen Way currently operates at LOS A during both the AM and PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Southbound/Citizen Way currently operates at LOS A during both the AM and PM peak hours. The US 340 Southbound Ramp northbound approach to WV 115 currently operates at LOS A during both the AM and PM peak hours. The Citizens Way southbound approach to WV 115 currently operates at LOS A during both AM and PM peak hours. The overall roundabout intersection currently operates at LOS A during both the AM and PM peak hours.

WV 115 with US 340 Northbound and Hillside Drive

Analysis indicates the WV 115 eastbound left-turn movement to Hillside Drive currently operates at LOS A both the AM and PM peak hours, while the thru/right movement currently operates as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to US 340 Northbound currently operates at LOS A during both the AM and PM peak hours, while the thru/right movement operates as free flow moving unimpeded through the intersection. The US 340 Northbound Ramp shared left/thru movement to WV 115 currently operates at LOS D during the AM peak hour and LOS F during the PM peak hour, while the right-turn movement currently operates at LOS B during both the AM and PM peak hours under stop control. The Hillside Drive southbound approach to WV 115 currently operates at LOS C during both the AM and PM peak hours under stop control.

WV 115 with Kabletown Road

Analysis indicates the WV 115 eastbound approach to Kabletown Road currently operates as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to Kabletown Road currently operates at LOS A during both the AM and PM peak hours. The Kabletown Road northbound approach to WV 115 currently operates at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

Figure 10 shows the LOS during the weekday AM and PM peak hours for the 2022 Existing Conditions for each lane group movement at each study intersection.

2029 No-Build Conditions Analysis

The 2029 No-Build peak hour traffic volumes include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, the anticipated traffic generated by the Fairview Farms development, and an annual traffic growth prior to the year 2029.

Improvements included in the 2029 No-Build Conditions comprise installation of a traffic signal at WV 115 with Jefferson Avenue and construction of an exclusive left turn lane on WV 115 eastbound at Jefferson Avenue. These improvements were included in the Tate Manor TIS and expected to be implemented by 2029. In addition, construction of a single-lane roundabout at the WV 115 with US 340 NB Ramp/Hillside Drive is included in the 2029 No-Build conditions. This improvement is currently a planned project by WVDOH and requested to be included beginning in this scenario.

WV 115 with Jefferson Avenue

Following installation of a traffic signal, capacity analysis indicates the WV 115 eastbound approach is expected to operate at LOS A during both the AM and PM peak hours under signal control. The WV 115 westbound approach to Jefferson Avenue is expected to operate at LOS A during both the AM and PM peak hours. The Jefferson Avenue southbound approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The overall signalized intersection is expected to operate at LOS A during both AM and PM peak hours.

WV 115 with US 340 Southbound and Citizens Way

Analysis indicates that the WV 115 eastbound approach to US 340 Southbound/Citizen Way is expected to operate at a LOS B during both the AM and PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Southbound/Citizen Way is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The US 340 Southbound Ramp northbound approach to WV 115 is expected to operate at LOS B during the AM peak hour and LOS E during the PM peak hour. The Citizens Way southbound approach to WV 115 is expected to operate at LOS B during the AM peak hour and LOS A during the PM peak hour. The overall roundabout intersection is expected to operate at LOS B during the AM peak hour and LOS C during the PM peak hour.

WV 115 with US 340 Northbound and Hillside Drive

Following construction of a single-lane roundabout, analysis indicates the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS B during the AM peak hour and LOS D during the PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS A during both the AM and PM peak hours. The US 340 Northbound Ramp approach to WV 115 is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The Hillside Drive southbound approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The overall roundabout intersection is expected to operate at LOS B during the AM peak hour and LOS C during the PM peak hour.

WV 115 with Kabletown Road

Analysis indicates the WV 115 eastbound approach to Kabletown Road will continue to operate as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to Kabletown Road will continue to operate at LOS A during both the AM and PM peak hours. The Kabletown Road northbound approach to WV 115 will continue to operate at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

Figure 11 shows the LOS during the weekday AM and PM peak hours for the 2029 No-Build Conditions for each lane group movement at each study intersection.

2029 Build Conditions Analysis

The 2029 Build Conditions include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, the anticipated traffic generated by the Fairview Farms development, an annual traffic growth prior to the year 2029, and the traffic generated by build-out of the Hillside development.

WV 115 with Jefferson Avenue

Capacity analysis indicates the WV 115 eastbound approach to Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours under signal control. The WV 115 westbound approach to Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The Jefferson Avenue southbound approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours. The overall signalized intersection will continue to operate at LOS A during both AM and PM peak hours.

WV 115 with US 340 Southbound and Citizens Way

Analysis indicates that the WV 115 eastbound approach to US 340 Southbound/Citizen Way is expected to operate at LOS B during both the AM and PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Southbound/Citizen Way approach is expected to operate at LOS B during both the AM and PM peak hours. The US 340 Southbound Ramp northbound approach to WV 115 is expected to operate at LOS B during the AM peak hour and LOS E during the PM peak hour. The Citizens Way southbound approach to WV 115 is expected to operate at LOS B during the AM peak hour and LOS A during the PM peak hour. The overall roundabout intersection is expected to operate at LOS B during the AM peak hour and LOS C during the PM peak hour.

WV 115 with US 340 Northbound and Hillside Drive

Analysis indicates the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS B during the AM peak hour and LOS E during the PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The US 340 Northbound Ramp approach to WV 115 is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The Hillside Drive southbound approach to WV 115 will continue to operate

at LOS A during both the AM and PM peak hours. The overall roundabout intersection is expected to operate at LOS B during the AM peak hour and LOS D during the PM peak hour.

WV 115 with Kabletown Road

Analysis indicates the WV 115 eastbound approach to Kabletown Road will continue to operate as free-flow traveling unimpeded through the intersection. The WV 115 westbound left-turn movement to Kabletown Road will continue to operate at LOS A during both the AM and PM peak hours. The Kabletown Road northbound approach to WV 115 will continue to operate at LOS B during the AM peak hour and LOS C during the PM peak hour under stop control.

Figure 12 shows the LOS during the weekday AM and PM peak hours for the 2029 Build Conditions for each lane group movement at each study intersection.

2029 Build Improved Conditions Analysis

Improvements included in the 2029 Build Improved Conditions comprise construction of a right-turn slip lane on the US 340 Southbound Ramp to WV 115 and construction of a right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramp/Hillside Drive.

Additional analysis is provided for the intersections with proposed improvements implemented. Remaining intersections will operate as described in 2029 Build Conditions and do not necessitate physical improvements.

WV 115 with US 340 Southbound and Citizens Way

Following construction of a northbound exclusive right-turn lane, capacity analysis indicates that the WV 115 eastbound approach to US 340 Southbound/Citizen Way will continue to operate at LOS B during both the AM and PM peak hours under roundabout yield control. The WV 115 westbound approach to US 340 Southbound/Citizens Way will continue to operate at LOS B during both the AM and PM peak hours. The US 340 Southbound Exit Ramp approach to WV 115 is expected to operate at LOS A during the both AM and PM peak hours. The Citizens Way southbound approach to WV 115 will continue to operate at LOS B during the AM peak hour and LOS A during the PM peak hour. The overall roundabout intersection is expected to operate at LOS B during both the AM and PM peak hours.

WV 115 with US 340 Northbound and Hillside Drive

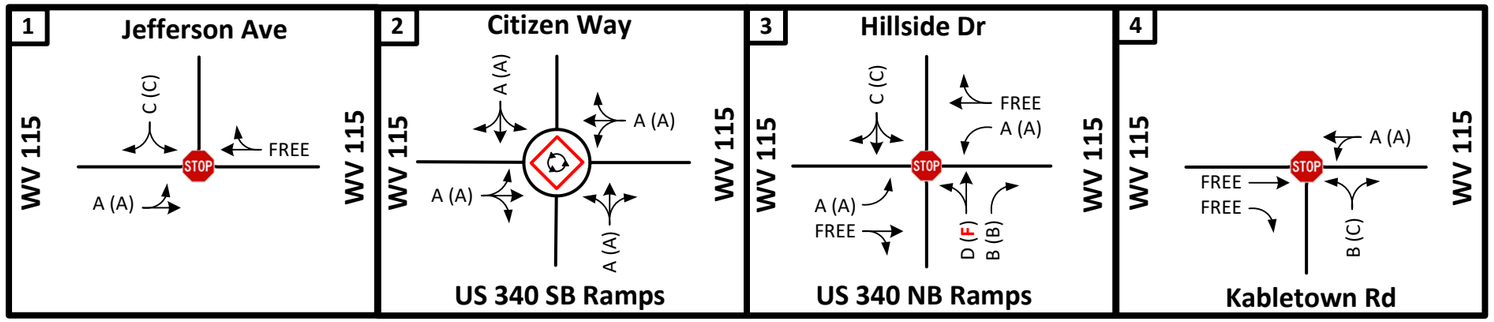
Following construction of an exclusive right-turn lane on the WV 115 eastbound approach, analysis indicates the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour under roundabout yield control. The WV 115 westbound approach to US 340 Northbound Ramps/Hillside Drive will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The US 340 Northbound Exit Ramp approach to WV 115 will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The Hillside Drive southbound approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours. The overall roundabout intersection is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour.

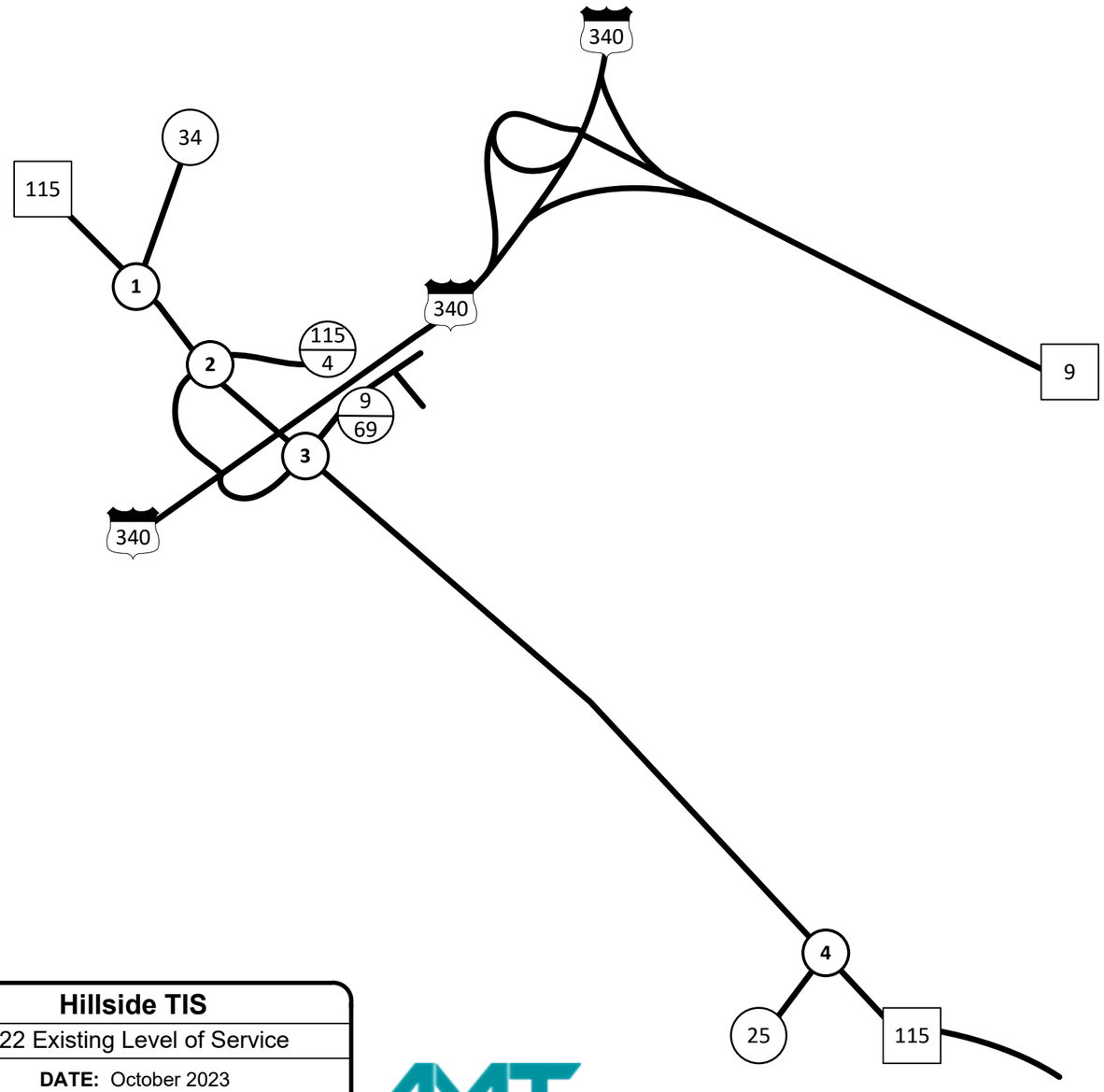
Figure 13 shows the LOS during the weekday AM and PM peak hours for the 2029 Build Improved Conditions for each lane group movement at each study intersection.

Table 4 shows the LOS results for the intersections within the study area during the weekday AM and PM peak hours for the 2022 Existing Conditions, 2029 No-Build Conditions, 2029 Build Conditions, and 2029 Build Improved Conditions.

Table 4: Level of Service Analysis Summary

Intersection	Movement	2022 Existing Conditions				2029 No-Build Conditions				2029 Build Conditions				2029 Build Improved Conditions			
		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Intersection 1 - WV 115 (Charles Town Road) with Jefferson Avenue	EB Left-Turn	A	8.3	A	8.1	A	8.4	A	7.3	A	8.5	A	7.3	A	8.5	A	7.3
	EB Thru	N/A	N/A	N/A	N/A	A	4.1	A	5.0	A	4.1	A	5.0	A	4.1	A	5.0
	EB Approach	N/A	2.2	N/A	0.4	A	5.1	A	5.0	A	5.1	A	5.1	A	5.1	A	5.1
	WB Thru/Right	N/A	FREE	N/A	FREE	A	6.1	A	6.0	A	6.1	A	6.0	A	6.1	A	6.0
Proposed Three-Leg Signalized Intersection	WB Approach	N/A	0.0	N/A	0.0	A	6.1	A	6.0	A	6.1	A	6.0	A	6.1	A	6.0
	SB Left/Right	C	20.6	C	19.5	A	9.0	A	7.5	A	9.3	A	7.6	A	9.3	A	7.6
	SB Approach	C	20.6	C	19.5	A	9.0	A	7.5	A	9.3	A	7.6	A	9.3	A	7.6
Existing Three-Leg Unsignalized Intersection (TWSC)	Overall	N/A	N/A	N/A	N/A	A	6.4	A	6.0	A	6.5	A	6.0	A	6.5	A	6.0
Intersection 2 - WV 115 (Charles Town Road) with US 340 Southbound/Citizens Way	EB Left/Thru/Right	A	6.1	A	6.6	B	11.1	B	11.4	B	11.8	B	12.1	B	11.8	B	12.1
	EB Approach	A	6.1	A	6.6	B	11.1	B	11.4	B	11.8	B	12.1	B	11.8	B	12.1
	WB Left/Thru/Right	A	6.1	A	6.0	A	9.9	B	10.7	B	10.6	B	11.2	B	10.6	B	11.2
	WB Approach	A	6.1	A	6.0	A	9.9	B	10.7	B	10.6	B	11.2	B	10.6	B	11.2
	NB Left/Thru/Right	A	5.8	A	8.5	B	10.2	**E**	**36.4**	B	10.4	**E**	**43.8**	N/A	N/A	N/A	N/A
	NB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	6.5	A	9.1
	NB Right-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	6.8	B	12.4
	NB Approach	A	5.8	A	8.5	B	10.2	**E**	**36.4**	B	10.4	**E**	**43.8**	A	6.6	A	11.1
	SB Left/Thru/Right	A	5.5	A	5.1	B	12.3	A	8.0	B	13.2	A	8.2	B	13.2	A	8.2
	SB Approach	A	5.5	A	5.1	B	12.3	A	8.0	B	13.2	A	8.2	B	13.2	A	8.2
Existing Four-Leg Roundabout Intersection	Overall	A	6.0	A	6.8	B	10.7	C	18.7	B	11.3	C	21.4	B	10.6	B	11.1
Intersection 3 - WV 115 (Charles Town Road) with US 340 Northbound/Hillside Drive	EB Left-Turn	A	7.9	A	7.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Thru/Right	N/A	FREE	N/A	FREE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Left/Thru/Right	N/A	N/A	N/A	N/A	B	12.1	D	34.5	B	12.8	**E**	**43.2**	N/A	N/A	N/A	N/A
	EB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	6.2	B	14.6
	EB Right-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	7.0	A	5.7
	EB Approach	N/A	0.1	N/A	0.1	B	12.1	D	34.5	B	12.8	**E**	**43.2**	A	6.6	B	12.5
	WB Left-Turn	A	8.5	A	9.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	WB Thru/Right	N/A	FREE	N/A	FREE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	WB Left/Thru/Right	N/A	N/A	N/A	N/A	A	9.2	A	9.5	A	9.7	B	10.6	A	9.7	B	10.6
	WB Approach	N/A	2.7	N/A	3.5	A	9.2	A	9.5	A	9.7	B	10.6	A	9.7	B	10.6
	NB Left/Thru	D	25.3	**F**	**66.8**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	NB Right-Turn	B	10.0	B	12.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Proposed Four-Leg Roundabout Intersection in 2029 No-Build Conditions	NB Left/Thru/Right	N/A	N/A	N/A	N/A	A	4.5	B	12.3	A	4.6	B	13.6	A	4.6	B	13.6
	NB Approach	C	19.3	**E**	**42.8**	A	4.5	B	12.3	A	4.6	B	13.6	A	4.6	B	13.6
	SB Left/Thru/Right	C	16.3	C	24.3	A	6.7	A	6.4	A	7.9	A	6.9	A	7.9	A	6.9
	SB Approach	C	16.3	C	24.3	A	6.7	A	6.4	A	7.9	A	6.9	A	7.9	A	6.9
Existing Four-Leg Unsignalized Intersection (TWSC)	Overall	N/A	N/A	N/A	N/A	B	10.1	C	22.5	B	10.6	D	27.4	A	8.1	B	11.9
Intersection 4 - WV 115 (Charles Town Road) with Kabletown Road (CR 25)	EB Thru	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	EB Right-Turn	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE	N/A	FREE
	EB Approach	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0	N/A	0.0
	WB Left-Turn	A	7.6	A	8.2	A	7.8	A	8.4	A	7.8	A	8.4	A	7.8	A	8.4
	WB Approach	N/A	0.2	N/A	1.0	N/A	0.2	N/A	0.9	N/A	0.2	N/A	0.9	N/A	0.2	N/A	0.9
	NB Left/Right	B	11.8	C	15.6	B	13.0	C	18.7	B	13.1	C	18.7	B	13.1	C	18.7
Existing Three-Leg Unsignalized Intersection (TWSC)	NB Approach	B	11.8	C	15.6	B	13.0	C	18.7	B	13.1	C	18.7	B	13.1	C	18.7





LEGEND

- Existing Traffic Control
- Existing Roadway
- Existing Lane Configuration
- A AM Level of Service
- (A) PM Level of Service

N

NOT TO SCALE

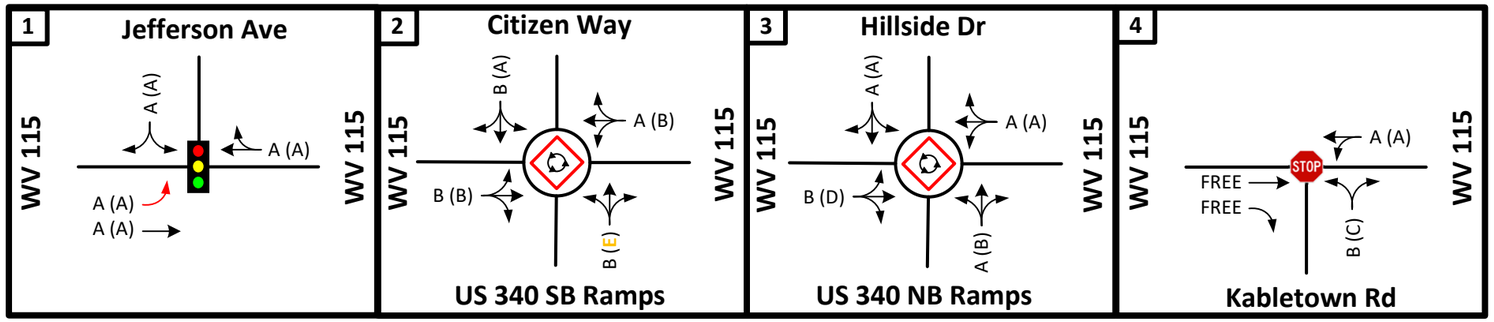
Hillside TIS

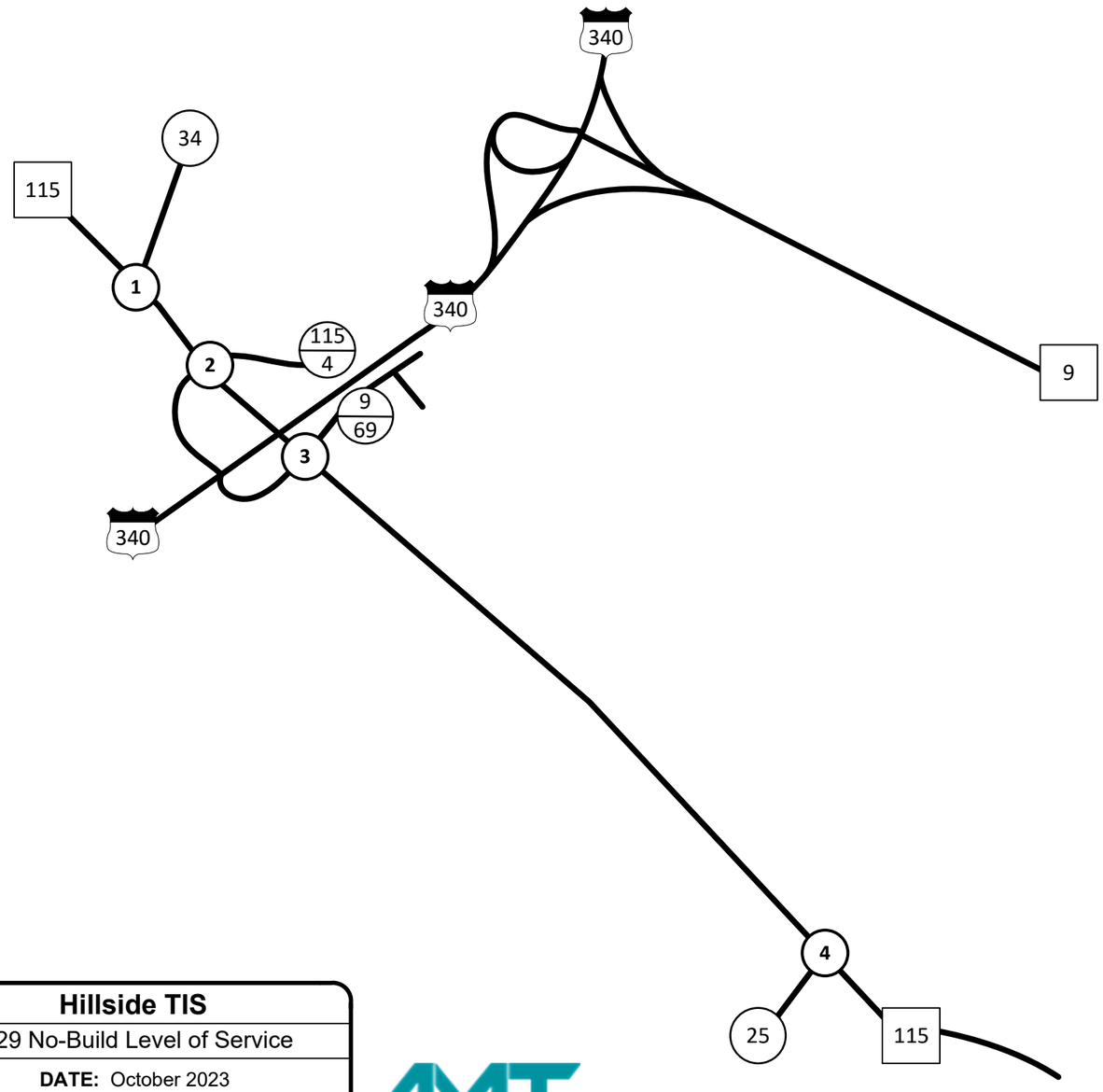
2022 Existing Level of Service

DATE: October 2023

FIGURE 10

AMT





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Lane Configuration
- X AM Level of Service
- (X) PM Level of Service

N

NOT TO SCALE

Hillside TIS

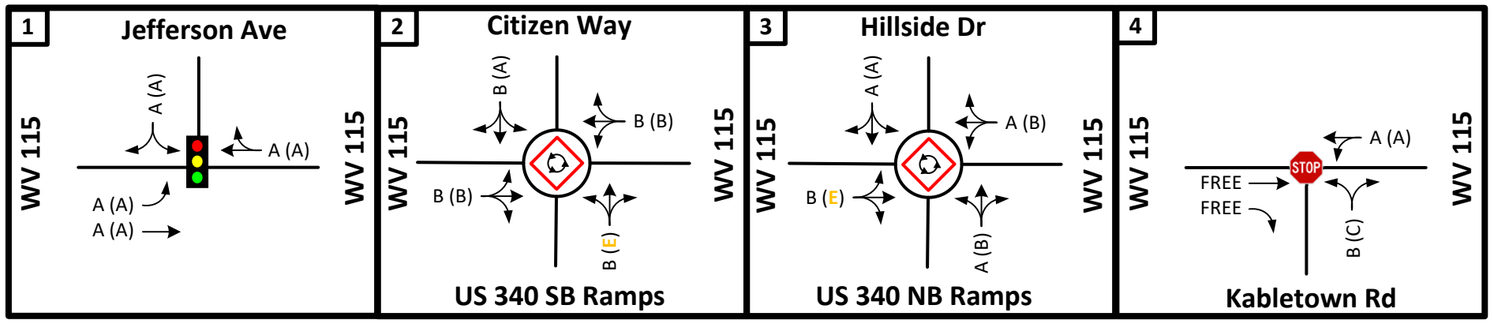
2029 No-Build Level of Service

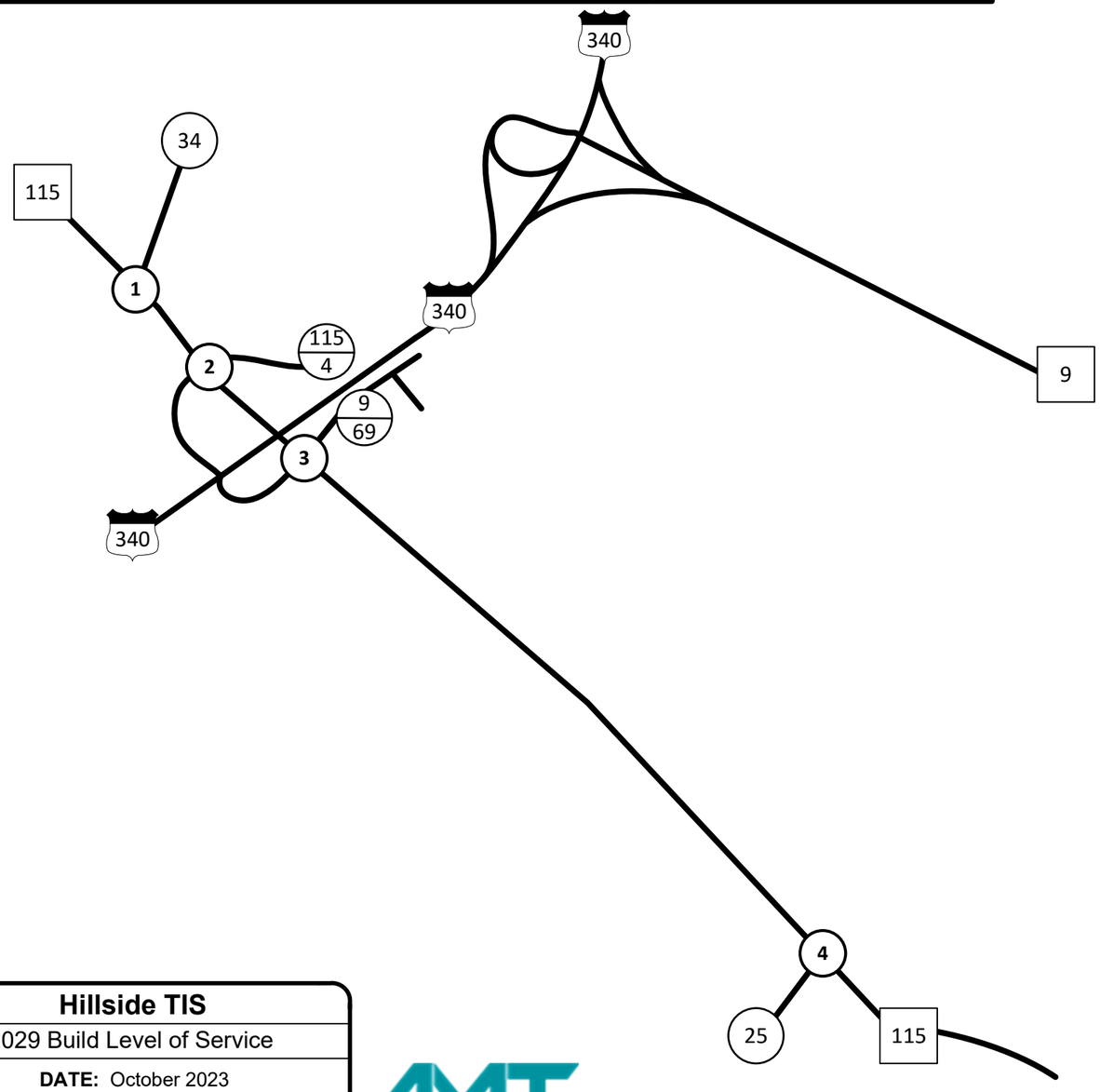
DATE: October 2023

FIGURE 11

AMT

664





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Lane Configuration
- X AM Level of Service
- (X) PM Level of Service

N

NOT TO SCALE

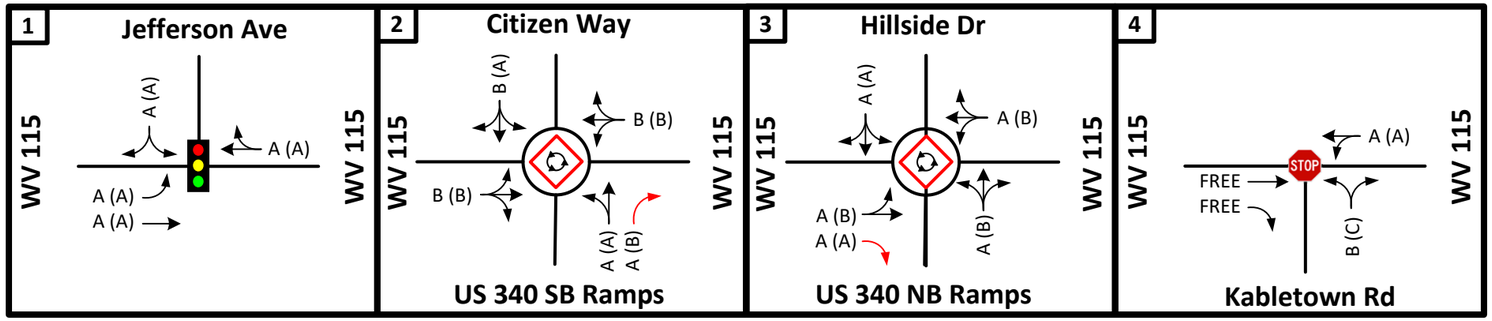
Hillside TIS

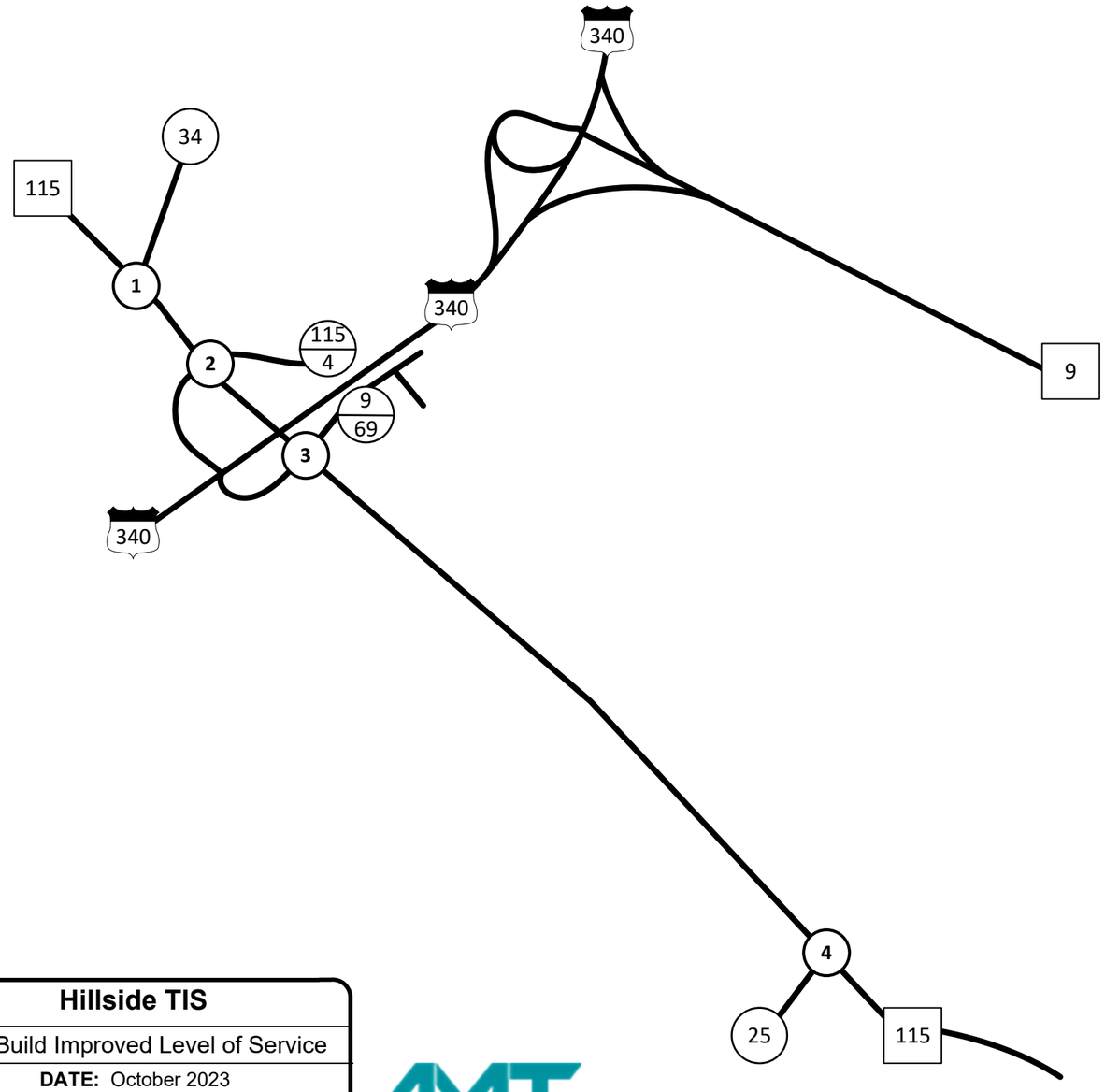
2029 Build Level of Service

DATE: October 2023

FIGURE 12

AMT





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Lane Configuration
- X AM Level of Service
- (X) PM Level of Service

N

NOT TO SCALE

Hillside TIS

2029 Build Improved Level of Service

DATE: October 2023

FIGURE 13

AMT

QUEUING ANALYSIS

2022 Existing Conditions Analysis

Queuing analysis was performed for all study intersections during the weekday AM and PM peak hours using the SimTraffic micro-simulation model, which is a simulation complement to the Synchro traffic analysis models utilized for the capacity analysis. The queuing calculations produced by SimTraffic are acknowledged within the industry to be a realistic replication of actual conditions. Each simulation model was seeded for 10 minutes and recorded for 60 minutes. The simulation was run five times and then averaged to estimate the 95th percentile queuing for all scenarios. The queuing analysis for roundabout intersections were performed using Sidra, version 9.0.

The queuing analysis indicates that there are no existing turning movements currently exceeding storage length during the peak periods analyzed.

Figure 14 shows the 2022 Existing Conditions Queuing Analysis for the weekday AM and PM peak hours.

2029 No-Build Conditions Analysis

Queuing analysis indicates that all conditions described in the 2022 Existing Conditions are expected to continue with similar queues with the increase in traffic due to regional growth in the study area. No additional turning movements are expected to exceed storage length during the peak periods analyzed. However, an excessive queue length is expected on the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive following construction of a single-lane roundabout.

Figure 15 shows the 2029 No-Build Queuing Analysis for the weekday AM and PM peak hours.

2029 Build Conditions Analysis

Queuing analysis indicates that all conditions described in the 2029 No-Build Conditions are expected to continue with similar queueing following build-out of the Hillside development. Analysis indicates that no additional lane groups are expected to exceed storage length during peak periods analyzed.

Figure 16 shows the 2029 Build Queuing Analysis for the weekday AM and PM peak hours.

2029 Build Improved Conditions Analysis

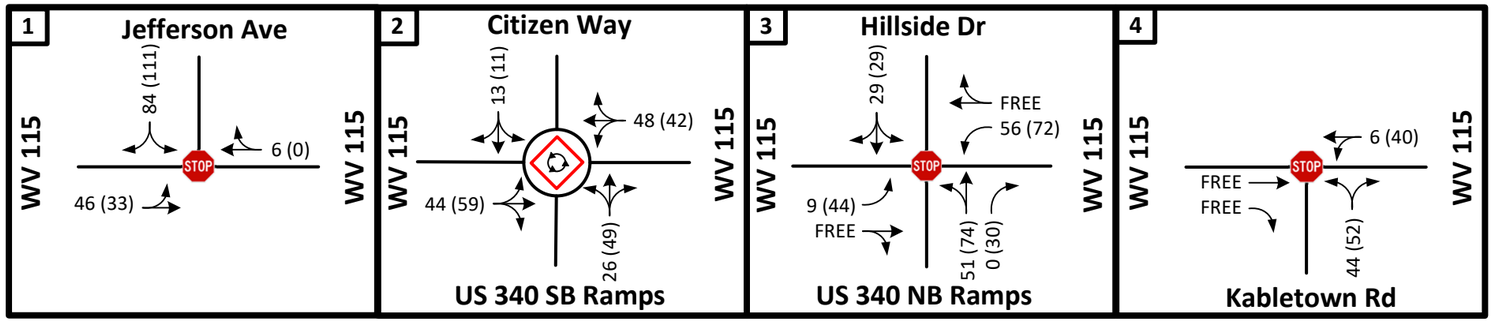
Queuing analysis indicates that all conditions described in the 2029 Build Conditions are expected to be mitigated following implementation of proposed improvements. Analysis indicates that no additional movements are expected to exceed storage length.

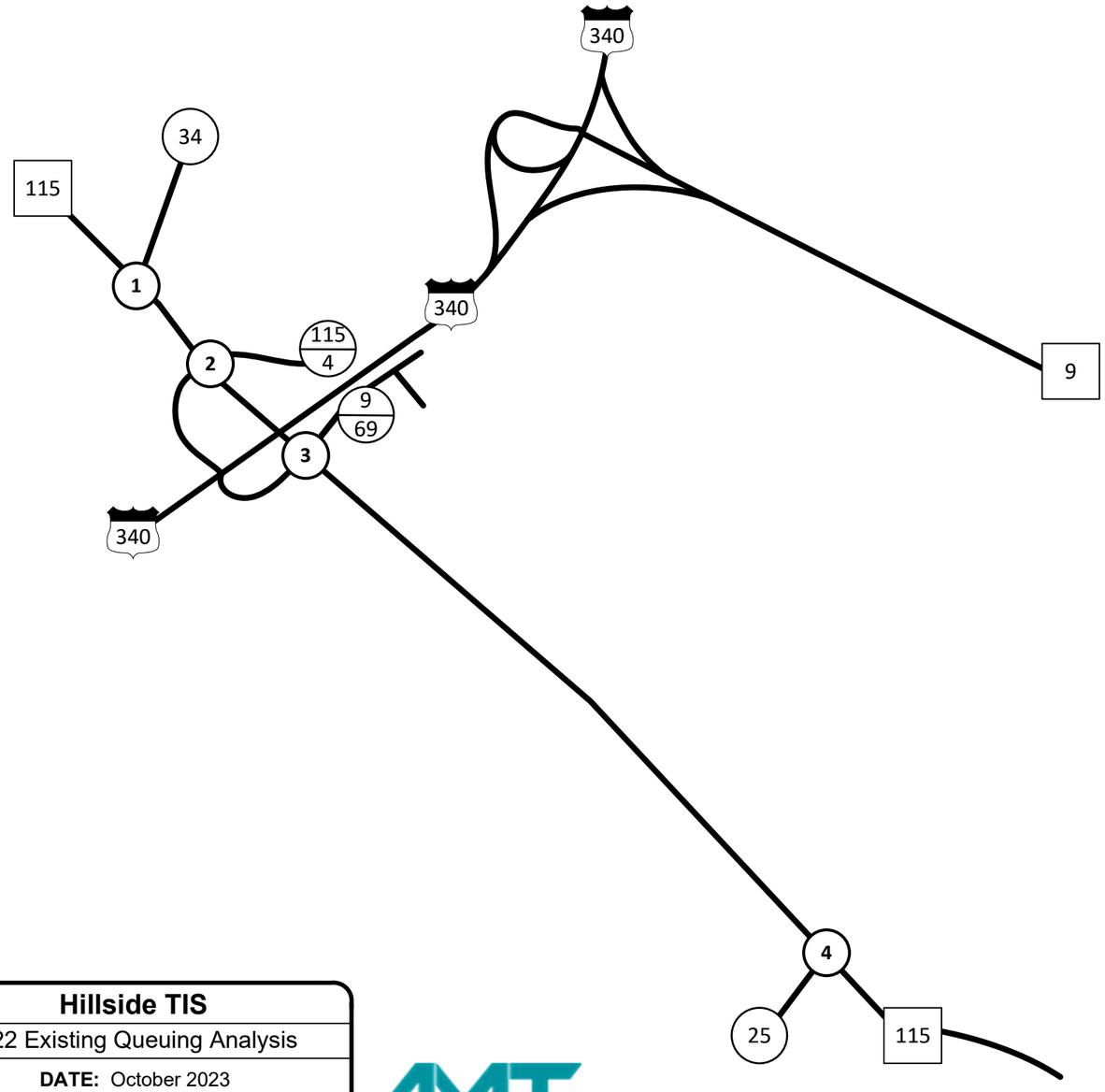
Figure 17 shows the 2029 Build Improved Queuing Analysis for the weekday AM and PM peak hours.

Table 5 presents the 95% queuing results for the intersections within the study during the AM and PM peak hours for the 2022 Existing Conditions, 2029 No-Build Conditions, 2029 Build Conditions, and 2029 Build Improved Conditions. Copies of the SimTraffic analyses outputs are included in **Appendix D**.

Table 5: Queueing Analysis Summary

Intersection	Movement	Existing Storage Length (ft)	2022 Existing		Proposed Storage Length (ft)	2029 No-Build		2029 Build		Proposed Storage Length (ft)	2029 Build Improved	
			AM	PM		AM	PM	AM	PM		AM	PM
Intersection 1 - WV 115 (Charles Town Road) with Jefferson Avenue	EB Left/Thru	--	46	33	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Left-Turn	N/A	N/A	N/A	125	67	33	64	32	125	64	32
	EB Thru	N/A	N/A	N/A	--	76	104	84	107	--	84	107
	WB Thru/Right	--	6	0	--	112	127	115	103	--	115	103
	SB Left/Right	--	84	111	--	108	151	121	133	--	121	133
Intersection 2 - WV 115 (Charles Town Road) with US 340 Southbound/Citizens Way	EB Left/Thru/Right	--	44	59	--	98	154	105	175	--	105	175
	WB Left/Thru/Right	--	48	42	--	103	114	116	127	--	116	128
	NB Left/Thru/Right	--	26	49	--	60	371	63	449	N/A	N/A	N/A
	NB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	21	40
	NB Right-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	22	86
	SB Left/Thru/Right	--	13	11	--	67	32	71	33	--	71	33
Intersection 3 - WV 115 (Charles Town Road) with US 340 Northbound/Hillside Drive	EB Left-Turn	150	9	44	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Thru/Right	--	FREE	FREE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	EB Left/Thru/Right	N/A	N/A	N/A	--	179	1011	199	1240	N/A	N/A	N/A
	EB Left/Thru	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	--	35	299
	EB Right-Turn	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	100	44	28
	WB Left-Turn	175	56	72	--	N/A	N/A	N/A	N/A	--	N/A	N/A
	WB Thru/Right	--	FREE	FREE	--	N/A	N/A	N/A	N/A	--	N/A	N/A
	WB Left/Thru/Right	--	N/A	N/A	--	155	118	157	124	--	157	124
	NB Left/Thru	--	51	74	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	NB Right-Turn	115	0	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	NB Left/Thru/Right	N/A	N/A	N/A	--	10	56	11	63	--	11	63
	SB Left/Thru/Right	--	29	29	--	2	2	11	6	--	11	6
Intersection 4 - WV 115 (Charles Town Road) with Kabletown Road (CR 25)	EB Thru	--	FREE	FREE	--	FREE	FREE	FREE	FREE	--	FREE	FREE
	EB Right-Turn	100	FREE	FREE	100	FREE	FREE	FREE	FREE	100	FREE	FREE
	WB Left/Thru	--	6	40	--	8	46	10	53	--	10	53
	NB Left/Right	--	44	52	--	43	74	47	69	--	47	69





LEGEND

- Existing Traffic Control
- Existing Roadway
- Existing Lane Configuration
- XX AM Queue (FT)
- (XX) PM Queue (FT)

N

NOT TO SCALE

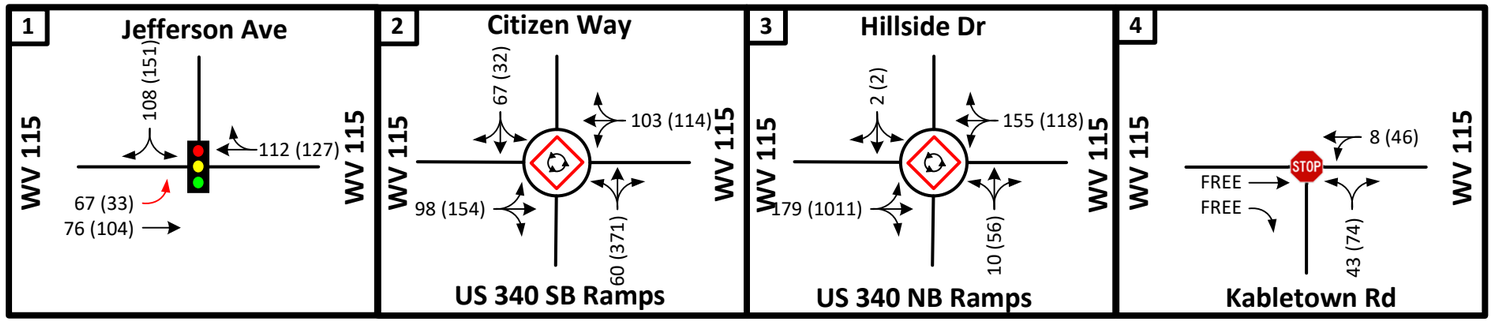
Hillside TIS

2022 Existing Queuing Analysis

DATE: October 2023

FIGURE 14

AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Lane Configuration
- XX AM Queue (FT)
- (XX) PM Queue (FT)

N

NOT TO SCALE

Hillside TIS

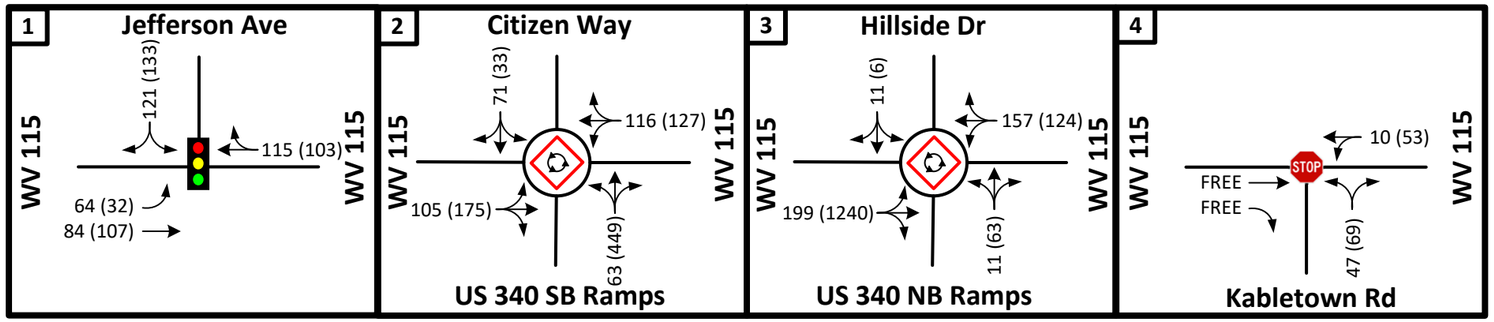
2029 No-Build Queuing Analysis

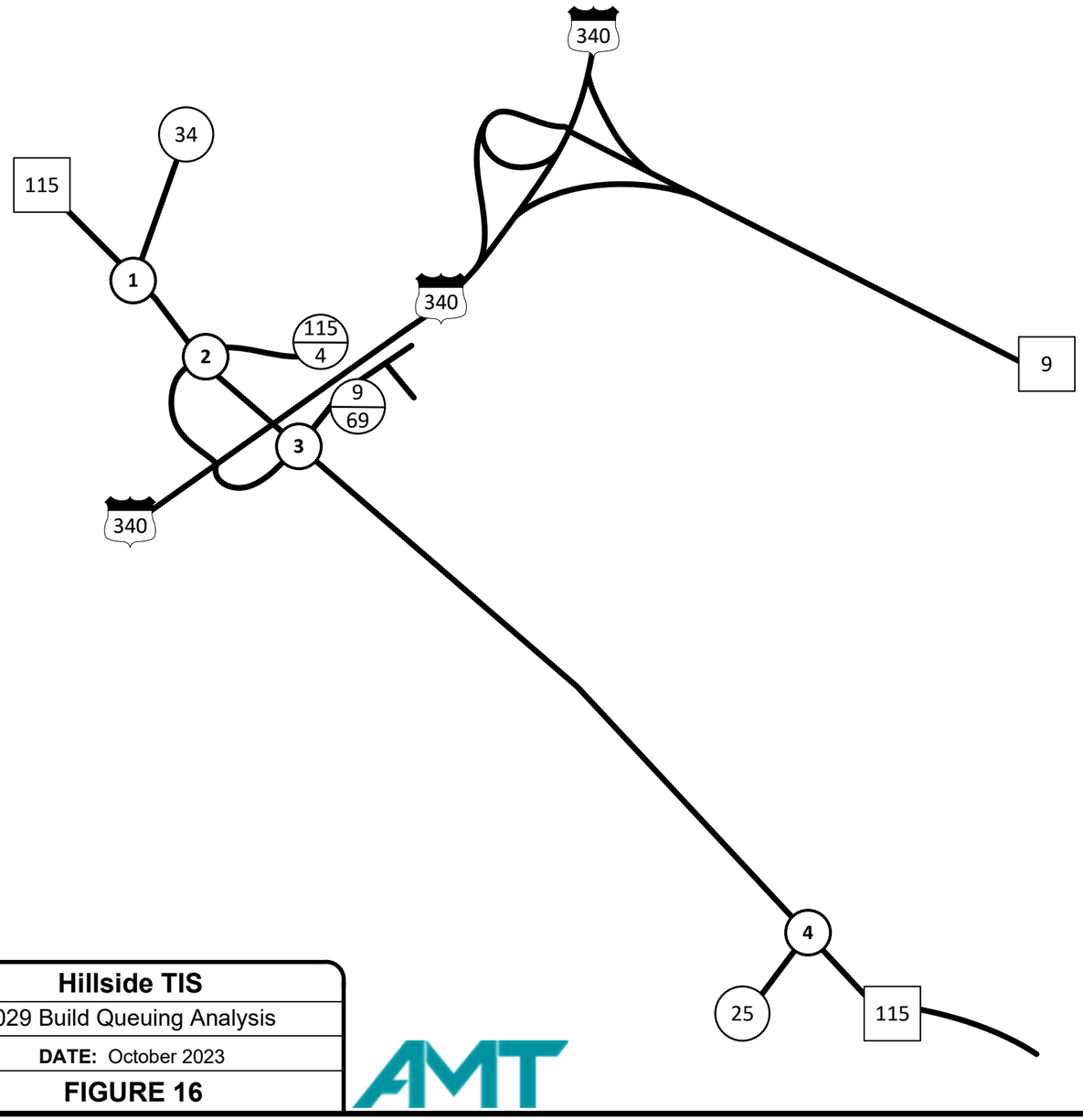
DATE: October 2023

FIGURE 15

AMT

670





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Lane Configuration
- XX AM Queue (FT)
- (XX) PM Queue (FT)

N

NOT TO SCALE

Hillside TIS

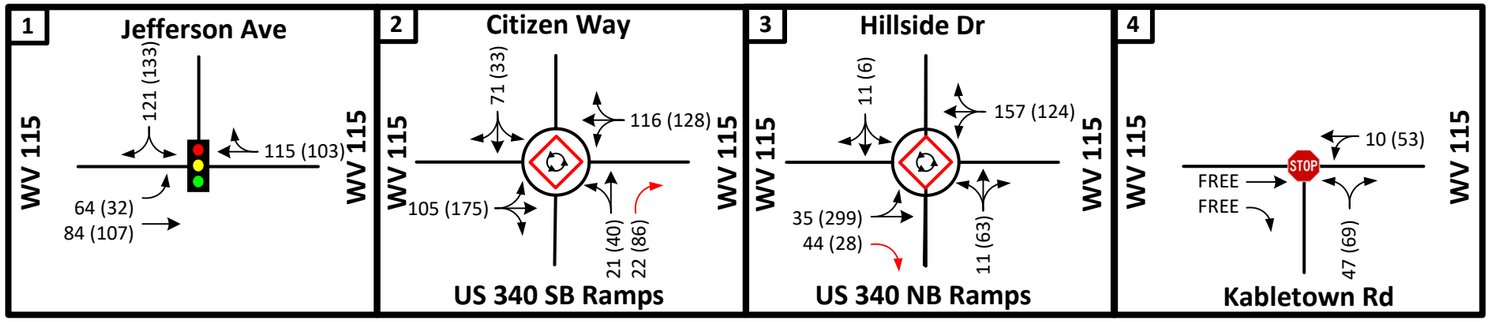
2029 Build Queuing Analysis

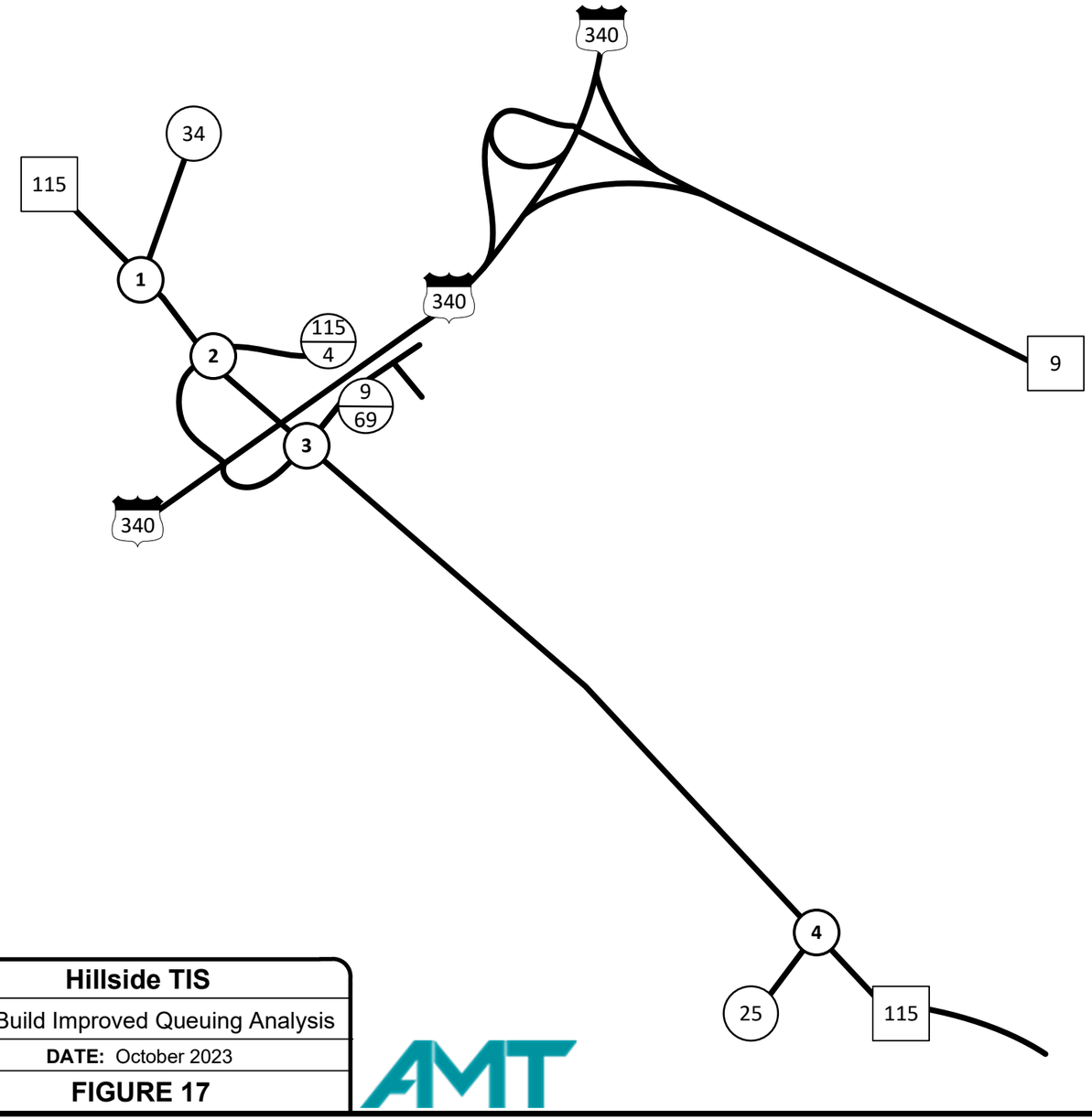
DATE: October 2023

FIGURE 16

AMT

671





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Lane Configuration
- XX AM Queue (FT)
- (XX) PM Queue (FT)

N

NOT TO SCALE

Hillside TIS

2029 Build Improved Queuing Analysis

DATE: October 2023

FIGURE 17

672

CONCLUSIONS/RECOMMENDATIONS

This report summarizes existing and future traffic analyses conducted in support of the proposed Hillside residential development. The proposed development is to be located north of WV 115 and east of US 340 in Charles Town, Jefferson County. The proposed site plan includes 128 townhome lots. Hillside is expected to be built and completed by the year 2029.

The proposed residential development is anticipated to be served by two site driveways; one connecting with Hillside Drive from the north and one site driveway intersecting with Sternway Drive from the north just east of Hillside Drive. Site Drive #1 is proposed to be located approximately 1,650 feet north of WV 115 approaching from the north and will operate as a full movement approach operating as free-flow. Site Drive #2 is proposed to be located approximately 275 feet east of Hillside Drive and will operate as a full movement approach utilizing TWSC.

Based on the findings of the Tate Manor TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Tate Manor residential development in order to maintain operation of the existing transportation network:

WV 115 with Jefferson Avenue

- As part of the Tate Manor TIS, it was recommended that a traffic signal be installed at the intersection of WV 115 and Jefferson Avenue. Intersection conditions previously met the MUTCD warranting criteria. Additionally, the 2022 Existing Conditions and 2029 No-Build analysis indicates that the intersection LOS will currently operates at LOS E during the PM peak hour under TWSC.

- In conjunction with installation of a traffic signal identified in previous studies, widening WV 115 to construct an exclusive left-turn lane on the eastbound approach is recommended. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with an appropriate taper.

Based on the findings of the Kings Crossing TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Kings Crossing residential development in order to maintain operation of the existing transportation network:

WV 115 with Citizen Way/US 340 Southbound Ramps

- Construct a low angle right-turn slip lane on for the US 340 northbound ramp approach to WV 115 eastbound. The 2029 Build analysis indicates that the ramp approach will deteriorate to LOS E during the PM peak hour with the overall intersection operating LOS C. The addition of the right-turn slip lane improves the ramp to LOS A during the PM peak hour and the overall intersection to LOS B. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3 of the Kings Crossing development.

Based on the findings of the Magnolia Springs TIS, the following infrastructure improvements are recommended to address existing capacity issues in order to maintain operation of the existing transportation network:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Proceed with the WVDOH planned conversion of the intersection to a single lane roundabout. This project is currently programmed by WVDOH and is expected to be constructed in 2025. For the purpose of this study, the installation of a single lane roundabout is included beginning in 2029 No-Build conditions.

Based on the findings of the Fairview Farms TIS, the following infrastructure improvements are recommended to address existing capacity issues in order to maintain operation of the existing transportation network:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Construct an exclusive right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive. The WV 115 eastbound approach is anticipated to experience lengthy queues beginning in the 2029 No-Build conditions. This improvement increases capacity and reduces queue lengths on the approach.

Based on the finding of this study, the following geometric improvements are recommended to mitigate the impacts of the Hillside development and maintain acceptable traffic operations along the existing transportation network in 2029:

Hillside Drive with Site Drive #1

- Construct Site Drive #1 as a full movement approach connecting with Hillside Drive approximately 1,650 feet north of WV 115 approaching from the north connecting at the existing cul de sac. The site driveway is recommended to include one ingress and one egress lane. Site Drive #1 will operate as free-flow traveling uninhibited through the intersection.

Sternway Drive with Site Drive #2

- Construct Site Drive #2 as a full movement approach intersecting with Sternway Drive creating a "T" type intersection approximately 275 feet east of Hillside Drive. The site driveway is recommended to include one ingress and one egress lane. Site Drive #2 will operate under TWSC with traffic on Sternway Drive traveling uninhibited through the intersection.

APPENDIX A: STUDY AREA PHOTOS



WV 115 Eastbound Approach to Jefferson Avenue



WV 115 Westbound Approach to Jefferson Avenue



Jefferson Avenue Southbound Approach to WV 115



WV 115 Eastbound Approach to US 340 SB Ramps/Citizen Way



WV 115 Westbound Approach to US 340 SB Ramps/Citizen Way



US 340 SB Off Ramp Northbound Approach to WV 115



Citizen Way Southbound Approach to WV 115



WV 115 Eastbound Approach to US 340 NB Ramp/Hillside Dr



WV 115 Westbound Approach to US 340 NB Ramp/Hillside Dr



US 340 NB Off Ramp Northbound Approach to WV 115



Hillside Dr Southbound Approach to WV 115



WV 115 Eastbound Approach to Kabletown Rd



WV 115 Westbound Approach to Kabletown Rd



Kabletown Rd Northbound Approach to WV 115

APPENDIX B: TRAFFIC VOLUMES & CALCULATIONS

APPENDIX B-1: VOLUME CALCULATIONS

23-0501.001 - Hillside Residential Development TIS - Traffic Volume Calculations

	Balanced Existing Traffic (2022)		Future w/o Adj Devs (2029)		Historical Growth (2022-2029)		Magnolia Springs Site Trips (2024)		Tate Manor Site Trips (2024)		Kings Crossing Site Trips (2025)		Fairview Farms Site Trips (2029, 90% Built)		No Build Volumes (2029)		Site Trip Distribution		Site Trip Assignment		Build Volumes (2029)		Site Impact	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	Enter	Exit	AM	PM	AM	PM	AM	PM
Intersection 1 - WV 115 (Charlestown Road) with Jefferson Avenue (CR 34)																								
EBL	60	12	65	13	5	1			0	2					65	15			0	0	65	15		
EBT	172	251	187	273	15	22	3	11			6	18	25	70	221	372	30%		4	15	225	387	1.4%	3.7%
EBR	0	0	0	0	0	0									0	0			0	0	0	0		
WBL	0	0	0	0	0	0									0	0			0	0	0	0		
WBT	166	230	180	250	14	20	10	6			18	11	65	43	273	310		30%	15	8	288	318	3.1%	1.7%
WBR	174	147	189	160	15	13			1	5					190	165			0	0	190	165		
NBL	0	0	0	0	0	0									0	0			0	0	0	0		
NBT	0	0	0	0	0	0									0	0			0	0	0	0	0.0%	0.0%
NBR	0	0	0	0	0	0									0	0			0	0	0	0		
SBL	137	207	149	225	12	18			5	3					154	228			0	0	154	228		
SBT	0	0	0	0	0	0									0	0			0	0	0	0	0.0%	0.0%
SBR	57	27	62	29	5	2			2	1					64	30			0	0	64	30		
Intersection 2 - WV 115 (Charles Town Road) with US 340 Southbound/Citizens Way (CR 115/4)																								
EBL	18	56	20	61	2	5	3	11							23	72			0	0	23	72		
EBT	221	316	240	343	19	27			3	2	6	18	25	70	274	433	30%		4	15	278	448	1.0%	2.5%
EBR	72	79	78	86	6	7			2	1					80	87			0	0	80	87		
WBL	88	65	96	71	8	6					15	10	54	37	165	118		40%	19	12	184	130		
WBT	238	261	259	284	21	23			0	2	18	11	65	43	342	340		30%	15	8	357	348	6.1%	3.8%
WBR	12	21	13	23	1	2	7	22	1	2					21	47			0	0	21	47		
NBL	70	66	76	72	6	6			1	3					77	75			0	0	77	75		
NBT	21	28	23	30	2	2	42	141	2	8					67	179			0	0	67	179	2.1%	3.1%
NBR	90	233	98	253	8	20					7	22	25	70	130	345	40%		6	19	136	364		
SBL	36	32	39	35	3	3	126	84	8	5					173	124			0	0	173	124		
SBT	18	12	20	13	2	1	19	13	2	1					41	27			0	0	41	27	0.0%	0.0%
SBR	34	50	37	54	3	4	10	6							47	60			0	0	47	60		
Intersection 3 - WV 115 (Charles Town Road) with US 340 Northbound/Hillside Drive (CR 9/69)																								
EBL	3	6	3	7	0	1									3	7	70%		10	34	13	41		
EBT	191	459	208	499	81	92					13	40	50	140	271	679			0	0	271	679	1.7%	3.6%
EBR	153	116	166	126	13	10	126	84	11	7					303	217			0	0	303	217		
WBL	142	157	154	171	12	14					21	14	65	43	240	228			0	0	240	228		
WBT	304	273	330	296	140	54					33	21	119	80	482	397			0	0	482	397	0.1%	0.3%
WBR	0	1	0	1	0	0									0	1	5%		1	2	1	3		
NBL	28	71	30	77	2	6	7	22	1	4					38	103			0	0	38	103		
NBT	0	0	0	0	0	0									0	0	25%		4	12	4	12	4.5%	4.8%
NBR	18	57	20	62	2	5					5	16	22	59	47	137			0	0	47	137		
SBL	0	0	0	0	0	0									0	0		5%	2	1	2	1		
SBT	5	5	5	5	0	0									5	5		25%	12	7	17	12	81.4%	77.8%
SBR	6	3	6	3	0	0									6	3		70%	34	20	40	23		
Intersection 4 - WV 115 (Charles Town Road) with Kabletown Road (CR 25)																								
EBL	0	0	0	0	0	0									0	0			0	0	0	0		
EBT	136	334	148	363	12	29					5	4	33	22	186	389		5%	3	1	189	390	1.3%	0.2%
EBR	36	40	39	43	3	3									39	43			0	0	39	43		
WBL	6	34	7	37	1	3									7	37			0	0	7	37		
WBT	246	253	267	275	21	22					3	6	13	35	283	316	5%		1	2	284	318	0.3%	0.6%
WBR	0	0	0	0	0	0									0	0			0	0	0	0		
NBL	59	70	64	76	5	6									64	76			0	0	64	76		
NBT	0	0	0	0	0	0									0	0			0	0	0	0	0.0%	0.0%
NBR	11	22	12	24	1	2									12	24			0	0	12	24		
SBL	0	0	0	0	0	0									0	0			0	0	0	0		
SBT	0	0	0	0	0	0									0	0			0	0	0	0	0.0%	0.0%
SBR	0	0	0	0	0	0									0	0			0	0	0	0		

Annual Growth Rate 1.20%

Existing Year 2022

Build Year 2029

	AM		PM	
	Enter	Exit	Enter	Exit
Net New Trips	15	48	48	28
Pass-By Trips	0	0	0	0

APPENDIX B-2: TURNING MOVEMENT COUNTS

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 1: WV 115 @ Jefferson Avenue
COUNT BY	AMT

Friday

STREET	Jefferson Ave								WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	12	0	4	16	0	0	0	0	0	29	25	54	5	27	0	32	16	86	102	102
0715 - 0730	**17**	**0**	**9**	**26**	**0**	**0**	**0**	**0**	**0**	**39**	**44**	**83**	**12**	**47**	**0**	**59**	**26**	**142**	**168**	270
0730 - 0745	**41**	**0**	**17**	**58**	**0**	**0**	**0**	**0**	**0**	**39**	**62**	**101**	**25**	**46**	**0**	**71**	**58**	**172**	**230**	500
0745 - 0800	**55**	**0**	**24**	**79**	**0**	**0**	**0**	**0**	**0**	**46**	**44**	**90**	**13**	**38**	**0**	**51**	**79**	**141**	**220**	720
0800 - 0815	**24**	**0**	**7**	**31**	**0**	**0**	**0**	**0**	**0**	**42**	**24**	**66**	**10**	**41**	**0**	**51**	**31**	**117**	**148**	***766***
0815 - 0830	23	0	5	28	0	0	0	0	0	34	23	57	4	42	0	46	28	103	131	729
0830 - 0845	15	0	8	23	0	0	0	0	0	64	32	96	5	52	0	57	23	153	176	675
0845 - 0900	21	0	8	29	0	0	0	0	0	67	27	94	6	51	0	57	29	151	180	635
1500 - 1515	59	0	19	78	0	0	0	0	0	68	38	106	12	58	0	70	78	176	254	254
1515 - 1530	54	0	16	70	0	0	0	0	0	71	23	94	11	58	0	69	70	163	233	487
1530 - 1545	42	0	5	47	0	0	0	0	0	69	32	101	12	64	0	76	47	177	224	711
1545 - 1600	37	0	8	45	0	0	0	0	0	78	40	118	6	71	0	77	45	195	240	951
1600 - 1615	38	0	11	49	0	0	0	0	0	63	36	99	4	55	0	59	49	158	207	904
1615 - 1630	53	0	9	62	0	0	0	0	0	71	38	109	3	69	0	72	62	181	243	914
1630 - 1645	40	0	10	50	0	0	0	0	0	62	46	108	8	65	0	73	50	181	231	921
1645 - 1700	49	0	14	63	0	0	0	0	0	59	38	97	4	71	0	75	63	172	235	916
1700 - 1715	**49**	**0**	**7**	**56**	**0**	**0**	**0**	**0**	**0**	**61**	**32**	**93**	**2**	**69**	**0**	**71**	**56**	**164**	**220**	929
1715 - 1730	**56**	**0**	**7**	**63**	**0**	**0**	**0**	**0**	**0**	**54**	**38**	**92**	**3**	**65**	**0**	**68**	**63**	**160**	**223**	909
1730 - 1745	**45**	**0**	**7**	**52**	**0**	**0**	**0**	**0**	**0**	**66**	**38**	**104**	**4**	**59**	**0**	**63**	**52**	**167**	**219**	897
1745 - 1800	**57**	**0**	**6**	**63**	**0**	**0**	**0**	**0**	**0**	**49**	**39**	**88**	**3**	**58**	**0**	**61**	**63**	**149**	**212**	***874***
Peak HR AM																				
0715 - 0815	***137***	***0***	***57***	***194***	***0***	***0***	***0***	***0***	***0***	***166***	***174***	***340***	***60***	***172***	***0***	***232***	***194***	***572***	***766***	
Peak HR PM																				
1700 - 1800	***207***	***0***	***27***	***234***	***0***	***0***	***0***	***0***	***0***	***230***	***147***	***377***	***12***	***251***	***0***	***263***	***234***	***640***	***874***	
AM PHF	**0.614**				**0.000**				**0.842**				**0.817**				**0.833**			
PM PHF	**0.929**				**0.000**				**0.906**				**0.926**				**0.980**			

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 2: WV 115 @ US 340 Southbound Ramps/Citizens Way
COUNT BY	AMT

Friday

STREET	Citizens Way				US 340 SB Ramps				WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	14	3	8	25	8	2	14	24	9	31	2	42	4	30	6	40	49	82	131	131
0715 - 0730	**15**	**5**	**10**	**30**	**16**	**6**	**26**	**48**	**28**	**58**	**4**	**90**	**3**	**46**	**17**	**66**	**78**	**156**	**234**	365
0730 - 0745	**8**	**6**	**9**	**23**	**24**	**8**	**17**	**49**	**33**	**74**	**1**	**108**	**7**	**56**	**25**	**88**	**72**	**196**	**268**	633
0745 - 0800	**7**	**3**	**9**	**19**	**15**	**5**	**28**	**48**	**16**	**63**	**4**	**83**	**7**	**66**	**21**	**94**	**67**	**177**	**244**	877
0800 - 0815	**6**	**4**	**6**	**16**	**15**	**2**	**19**	**36**	**11**	**43**	**3**	**57**	**1**	**53**	**9**	**63**	**52**	**120**	**172**	***918***
0815 - 0830	7	2	8	17	10	4	26	40	11	45	3	59	6	53	6	65	57	124	181	865
0830 - 0845	5	4	6	15	10	2	21	33	13	78	1	92	3	55	9	67	48	159	207	804
0845 - 0900	9	2	13	24	12	4	22	38	9	78	2	89	5	55	9	69	62	158	220	780
1500 - 1515	14	2	17	33	29	7	36	72	12	63	11	86	18	82	21	121	105	207	312	312
1515 - 1530	6	2	7	15	24	6	40	70	9	58	4	71	16	84	13	113	85	184	269	581
1530 - 1545	7	2	7	16	28	8	39	75	8	64	6	78	6	87	17	110	91	188	279	860
1545 - 1600	12	0	11	23	30	10	49	89	10	76	4	90	11	82	15	108	112	198	310	1170
1600 - 1615	6	1	9	16	18	6	40	64	12	71	4	87	8	73	12	93	80	180	260	1118
1615 - 1630	7	1	12	20	32	7	58	97	5	65	4	74	10	90	24	124	117	198	315	1164
1630 - 1645	8	2	14	24	20	14	43	77	10	74	5	89	11	82	12	105	101	194	295	1180
1645 - 1700	2	2	9	13	13	10	46	69	7	74	3	84	11	95	15	121	82	205	287	1157
1700 - 1715	**11**	**2**	**11**	**24**	**20**	**8**	**52**	**80**	**19**	**64**	**6**	**89**	**15**	**86**	**16**	**117**	**104**	**206**	**310**	1207
1715 - 1730	**6**	**4**	**18**	**28**	**14**	**5**	**54**	**73**	**8**	**61**	**5**	**74**	**18**	**78**	**26**	**122**	**101**	**196**	**297**	1189
1730 - 1745	**5**	**2**	**16**	**23**	**18**	**11**	**61**	**90**	**19**	**66**	**5**	**90**	**11**	**71**	**21**	**103**	**113**	**193**	**306**	1200
1745 - 1800	**10**	**4**	**5**	**19**	**14**	**4**	**66**	**84**	**19**	**70**	**5**	**94**	**12**	**81**	**16**	**109**	**103**	**203**	**306**	***1219***
Peak HR AM																				
0715 - 0815	***36***	***18***	***34***	***88***	***70***	***21***	***90***	***181***	***88***	***238***	***12***	***338***	***18***	***221***	***72***	***311***	***269***	***649***	***918***	
Peak HR PM																				
1700 - 1800	***32***	***12***	***50***	***94***	***66***	***28***	***233***	***327***	***65***	***261***	***21***	***347***	***56***	***316***	***79***	***451***	***421***	***798***	***1219***	

AM PHF	**0.733**	**0.923**	**0.782**	**0.827**	**0.856**
PM PHF	**0.839**	**0.908**	**0.923**	**0.924**	**0.983**

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 3: WV 115 @ US 340 Northbound Ramps/Hillside Drive
COUNT BY	AMT

Friday

STREET	Hillside Dr				US 340 NB Ramps				WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	0	3	0	3	3	0	2	5	28	31	0	59	1	35	39	75	8	134	142	142
0715 - 0730	**0**	**2**	**0**	**2**	**10**	**0**	**3**	**13**	**28**	**41**	**0**	**69**	**1**	**15**	**48**	**64**	**15**	**133**	**148**	290
0730 - 0745	**0**	**0**	**3**	**3**	**4**	**0**	**4**	**8**	**37**	**40**	**0**	**77**	**1**	**43**	**41**	**85**	**11**	**162**	**173**	463
0745 - 0800	**0**	**1**	**2**	**3**	**7**	**0**	**5**	**12**	**42**	**63**	**0**	**105**	**1**	**32**	**32**	**65**	**15**	**170**	**185**	648
0800 - 0815	**0**	**2**	**1**	**3**	**7**	**0**	**6**	**13**	**35**	**46**	**0**	**81**	**0**	**37**	**32**	**69**	**16**	**150**	**166**	***672***
0815 - 0830	0	1	1	2	8	0	5	13	27	46	0	73	1	53	42	96	15	169	184	708
0830 - 0845	0	0	0	0	7	0	4	11	35	49	0	84	1	52	32	85	11	169	180	715
0845 - 0900	0	1	0	1	8	0	4	12	33	54	0	87	0	48	34	82	13	169	182	712
1500 - 1515	0	0	0	0	11	0	7	18	32	60	0	92	0	82	27	109	18	201	219	219
1515 - 1530	0	1	0	1	14	0	21	35	37	53	0	90	2	74	24	100	36	190	226	445
1530 - 1545	0	1	1	2	19	1	17	37	31	44	0	75	0	98	29	127	39	202	241	686
1545 - 1600	0	1	2	3	20	1	12	33	31	44	0	75	4	104	31	139	36	214	250	936
1600 - 1615	0	0	1	1	11	0	14	25	25	50	0	75	2	118	30	150	26	225	251	968
1615 - 1630	0	0	0	0	21	0	8	29	33	54	0	87	3	95	22	120	29	207	236	978
1630 - 1645	0	1	0	1	23	0	13	36	33	70	0	103	1	97	29	127	37	230	267	1004
1645 - 1700	0	1	1	2	18	0	10	28	33	43	1	77	3	98	25	126	30	203	233	987
1700 - 1715	**0**	**1**	**1**	**2**	**20**	**0**	**14**	**34**	**32**	**63**	**0**	**95**	**5**	**95**	**34**	**134**	**36**	**229**	**265**	1001
1715 - 1730	**0**	**0**	**1**	**1**	**15**	**0**	**14**	**29**	**37**	**50**	**0**	**87**	**1**	**104**	**40**	**145**	**30**	**232**	**262**	1027
1730 - 1745	**0**	**2**	**0**	**2**	**17**	**0**	**12**	**29**	**38**	**73**	**0**	**111**	**0**	**88**	**18**	**106**	**31**	**217**	**248**	1008
1745 - 1800	**0**	**2**	**1**	**3**	**19**	**0**	**17**	**36**	**50**	**56**	**1**	**107**	**0**	**120**	**24**	**144**	**39**	**251**	**290**	***1065***
Peak HR AM																				
0715 - 0815	***0***	***5***	***6***	***11***	***28***	***0***	***18***	***46***	***142***	***190***	***0***	***332***	***3***	***127***	***153***	***283***	***57***	***615***	***672***	
Peak HR PM																				
1700 - 1800	***0***	***5***	***3***	***8***	***71***	***0***	***57***	***128***	***157***	***242***	***1***	***400***	***6***	***407***	***116***	***529***	***136***	***929***	***1065***	
AM PHF	**0.917**				**0.885**				**0.790**				**0.832**				**0.908**			
PM PHF	**0.667**				**0.889**				**0.901**				**0.912**				**0.918**			

VEHICLE AND PEDESTRIAN VOLUME SUMMARY

COUNT LOCATION	
CITY	Charles Town
STATE	WV
DATE	5/13/2022
INTERSECTION	Int 4: WV 115 @ Kabletown Road
COUNT BY	AMT

Friday

STREET					Kabletown Rd				WV 115				WV 115				Total			PEAK HR
	From North				From South				From East				From West							
TIME	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	L	T	R	TOT	N-S	E-W	ALL	
0700 - 0715	0	0	0	0	7	0	7	14	2	55	0	57	0	13	3	16	14	73	87	87
0715 - 0730	**0**	**0**	**0**	**0**	**13**	**0**	**5**	**18**	**0**	**76**	**0**	**76**	**0**	**38**	**6**	**44**	**18**	**120**	**138**	225
0730 - 0745	**0**	**0**	**0**	**0**	**17**	**0**	**1**	**18**	**4**	**64**	**0**	**68**	**0**	**36**	**5**	**41**	**18**	**109**	**127**	352
0745 - 0800	**0**	**0**	**0**	**0**	**13**	**0**	**2**	**15**	**0**	**56**	**0**	**56**	**0**	**26**	**17**	**43**	**15**	**99**	**114**	466
0800 - 0815	**0**	**0**	**0**	**0**	**16**	**0**	**3**	**19**	**2**	**50**	**0**	**52**	**0**	**36**	**8**	**44**	**19**	**96**	**115**	***494***
0815 - 0830	0	0	0	0	6	0	8	14	3	56	0	59	0	43	11	54	14	113	127	483
0830 - 0845	0	0	0	0	19	0	6	25	5	85	0	90	0	39	5	44	25	134	159	515
0845 - 0900	0	0	0	0	11	0	6	17	1	73	0	74	0	36	14	50	17	124	141	542
1500 - 1515	0	0	0	0	4	0	4	8	2	56	0	58	0	66	14	80	8	138	146	146
1515 - 1530	0	0	0	0	11	0	3	14	7	57	0	64	0	74	17	91	14	155	169	315
1530 - 1545	0	0	0	0	8	0	4	12	4	67	0	71	0	66	17	83	12	154	166	481
1545 - 1600	0	0	0	0	16	0	3	19	5	74	0	79	0	59	16	75	19	154	173	654
1600 - 1615	0	0	0	0	16	0	4	20	11	82	0	93	0	71	9	80	20	173	193	701
1615 - 1630	0	0	0	0	14	0	1	15	7	65	0	72	0	88	19	107	15	179	194	726
1630 - 1645	0	0	0	0	19	0	5	24	16	72	0	88	0	86	9	95	24	183	207	767
1645 - 1700	0	0	0	0	12	0	5	17	4	63	0	67	0	77	22	99	17	166	183	777
1700 - 1715	**0**	**0**	**0**	**0**	**15**	**0**	**9**	**24**	**7**	**52**	**0**	**59**	**0**	**78**	**10**	**88**	**24**	**147**	**171**	755
1715 - 1730	**0**	**0**	**0**	**0**	**13**	**0**	**6**	**19**	**11**	**69**	**0**	**80**	**0**	**90**	**11**	**101**	**19**	**181**	**200**	761
1730 - 1745	**0**	**0**	**0**	**0**	**21**	**0**	**6**	**27**	**9**	**63**	**0**	**72**	**0**	**89**	**7**	**96**	**27**	**168**	**195**	749
1745 - 1800	**0**	**0**	**0**	**0**	**21**	**0**	**1**	**22**	**7**	**69**	**0**	**76**	**0**	**77**	**12**	**89**	**22**	**165**	**187**	***753***
Peak HR AM																				
0715 - 0815	***0***	***0***	***0***	***0***	***59***	***0***	***11***	***70***	***6***	***246***	***0***	***252***	***0***	***136***	***36***	***172***	***70***	***424***	***494***	
Peak HR PM																				
1700 - 1800	***0***	***0***	***0***	***0***	***70***	***0***	***22***	***92***	***34***	***253***	***0***	***287***	***0***	***334***	***40***	***374***	***92***	***661***	***753***	
AM PHF	**0.000**				**0.921**				**0.829**				**0.977**				**0.895**			
PM PHF	**0.000**				**0.852**				**0.897**				**0.926**				**0.941**			

APPENDIX C: SYNCHRO OUTPUTS

APPENDIX C-1: 2022 EXISTING AM PEAK HOUR

Intersection	
Int Delay, s/veh	5.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	60	172	166	174	137	57
Future Vol, veh/h	60	172	166	174	137	57
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	83	83	83	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	72	207	200	210	165	69

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	410	0	-	0	656	305
Stage 1	-	-	-	-	305	-
Stage 2	-	-	-	-	351	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1149	-	-	-	430	735
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	713	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1149	-	-	-	399	735
Mov Cap-2 Maneuver	-	-	-	-	399	-
Stage 1	-	-	-	-	695	-
Stage 2	-	-	-	-	713	-

Approach	EB	WB	SB
HCM Control Delay, s	2.2	0	20.6
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1149	-	-	-	461
HCM Lane V/C Ratio	0.063	-	-	-	0.507
HCM Control Delay (s)	8.3	0	-	-	20.6
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.2	-	-	-	2.8

Intersection	
Int Delay, s/veh	2.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	191	153	142	304	0	28	0	18	0	5	6
Future Vol, veh/h	3	191	153	142	304	0	28	0	18	0	5	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Stop	-	-	None
Storage Length	150	-	-	175	-	-	-	-	125	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	91	91	91	91	91	91	91	91	91	91	91	91
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	3	210	168	156	334	0	31	0	20	0	5	7

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	334	0	0	378	0	0	952	946	294	946	1030	334
Stage 1	-	-	-	-	-	-	300	300	-	646	646	-
Stage 2	-	-	-	-	-	-	652	646	-	300	384	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1225	-	-	1180	-	-	239	262	745	241	233	708
Stage 1	-	-	-	-	-	-	709	666	-	460	467	-
Stage 2	-	-	-	-	-	-	457	467	-	709	611	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1225	-	-	1180	-	-	208	227	745	210	202	708
Mov Cap-2 Maneuver	-	-	-	-	-	-	208	227	-	210	202	-
Stage 1	-	-	-	-	-	-	708	665	-	459	405	-
Stage 2	-	-	-	-	-	-	388	405	-	688	610	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	2.7	19.3	16.3
HCM LOS			C	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	208	745	1225	-	-	1180	-	-	331
HCM Lane V/C Ratio	0.148	0.027	0.003	-	-	0.132	-	-	0.037
HCM Control Delay (s)	25.3	10	7.9	-	-	8.5	-	-	16.3
HCM Lane LOS	D	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.5	0.1	0	-	-	0.5	-	-	0.1

Intersection	
Int Delay, s/veh	1.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	136	36	6	246	59	11
Future Vol, veh/h	136	36	6	246	59	11
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	151	40	7	273	66	12

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	191	0	438	151
Stage 1	-	-	-	-	151	-
Stage 2	-	-	-	-	287	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1383	-	576	895
Stage 1	-	-	-	-	877	-
Stage 2	-	-	-	-	762	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1383	-	573	895
Mov Cap-2 Maneuver	-	-	-	-	573	-
Stage 1	-	-	-	-	877	-
Stage 2	-	-	-	-	757	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	11.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	607	-	-	1383	-
HCM Lane V/C Ratio	0.128	-	-	0.005	-
HCM Control Delay (s)	11.8	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0	-

APPENDIX C-2: 2022 EXISTING PM PEAK HOUR

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	12	251	230	147	207	27
Future Vol, veh/h	12	251	230	147	207	27
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	256	235	150	211	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	385	0	-	0	590	310
Stage 1	-	-	-	-	310	-
Stage 2	-	-	-	-	280	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1173	-	-	-	470	730
Stage 1	-	-	-	-	744	-
Stage 2	-	-	-	-	767	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1173	-	-	-	464	730
Mov Cap-2 Maneuver	-	-	-	-	464	-
Stage 1	-	-	-	-	735	-
Stage 2	-	-	-	-	767	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	19.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1173	-	-	-	484
HCM Lane V/C Ratio	0.01	-	-	-	0.493
HCM Control Delay (s)	8.1	0	-	-	19.5
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0	-	-	-	2.7

Intersection	
Int Delay, s/veh	6.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	459	116	157	273	1	71	0	57	0	5	3
Future Vol, veh/h	6	459	116	157	273	1	71	0	57	0	5	3
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	Stop	-	-	None
Storage Length	150	-	-	175	-	-	-	-	125	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	7	499	126	171	297	1	77	0	62	0	5	3

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	298	0	0	625	0	0	1220	1216	562	1216	1279	298
Stage 1	-	-	-	-	-	-	576	576	-	640	640	-
Stage 2	-	-	-	-	-	-	644	640	-	576	639	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1263	-	-	956	-	-	157	181	526	158	166	741
Stage 1	-	-	-	-	-	-	503	502	-	464	470	-
Stage 2	-	-	-	-	-	-	461	470	-	503	470	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1263	-	-	956	-	-	130	148	526	120	135	741
Mov Cap-2 Maneuver	-	-	-	-	-	-	130	148	-	120	135	-
Stage 1	-	-	-	-	-	-	500	499	-	461	386	-
Stage 2	-	-	-	-	-	-	372	386	-	441	467	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	3.5	42.8	24.3
HCM LOS			E	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	130	526	1263	-	-	956	-	-	195
HCM Lane V/C Ratio	0.594	0.118	0.005	-	-	0.179	-	-	0.045
HCM Control Delay (s)	66.8	12.8	7.9	-	-	9.6	-	-	24.3
HCM Lane LOS	F	B	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	3	0.4	0	-	-	0.6	-	-	0.1

Intersection	
Int Delay, s/veh	2.3

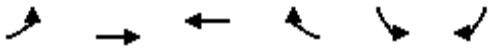
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	334	40	34	253	70	22
Future Vol, veh/h	334	40	34	253	70	22
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	355	43	36	269	74	23

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	398	0	696	355
Stage 1	-	-	-	-	355	-
Stage 2	-	-	-	-	341	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1161	-	408	689
Stage 1	-	-	-	-	710	-
Stage 2	-	-	-	-	720	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1161	-	393	689
Mov Cap-2 Maneuver	-	-	-	-	393	-
Stage 1	-	-	-	-	710	-
Stage 2	-	-	-	-	694	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1	15.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	438	-	-	1161	-
HCM Lane V/C Ratio	0.223	-	-	0.031	-
HCM Control Delay (s)	15.6	-	-	8.2	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.8	-	-	0.1	-

APPENDIX C-3: 2029 NO-BUILD AM PEAK HOUR



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	65	221	273	190	154	64
Future Volume (veh/h)	65	221	273	190	154	64
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	78	266	329	229	186	77
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	487	963	529	368	378	156
Arrive On Green	0.52	0.52	0.52	0.45	0.31	0.24
Sat Flow, veh/h	851	1870	1027	715	1211	502
Grp Volume(v), veh/h	78	266	0	558	264	0
Grp Sat Flow(s),veh/h/ln	851	1870	0	1742	1720	0
Q Serve(g_s), s	2.1	2.3	0.0	6.8	3.7	0.0
Cycle Q Clear(g_c), s	8.9	2.3	0.0	6.8	3.7	0.0
Prop In Lane	1.00			0.41	0.70	0.29
Lane Grp Cap(c), veh/h	487	963	0	897	536	0
V/C Ratio(X)	0.16	0.28	0.00	0.62	0.49	0.00
Avail Cap(c_a), veh/h	1626	3466	0	3227	1876	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	8.3	4.0	0.0	5.3	8.3	0.0
Incr Delay (d2), s/veh	0.2	0.2	0.0	0.7	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.1	0.0	0.5	0.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.4	4.1	0.0	6.1	9.0	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		344	558		264	
Approach Delay, s/veh		5.1	6.1		9.0	
Approach LOS		A	A		A	

Timer - Assigned Phs		4		6	8
Phs Duration (G+Y+Rc), s		17.4		11.5	17.4
Change Period (Y+Rc), s		4.5		4.5	4.5
Max Green Setting (Gmax), s		51.5		29.5	51.5
Max Q Clear Time (g_c+I1), s		10.9		5.7	8.8
Green Ext Time (p_c), s		2.0		0.8	3.9

Intersection Summary	
HCM 6th Ctrl Delay	6.4
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	1.8

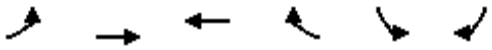
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	186	39	7	283	64	12
Future Vol, veh/h	186	39	7	283	64	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	207	43	8	314	71	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	250	0	537	207
Stage 1	-	-	-	-	207	-
Stage 2	-	-	-	-	330	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1316	-	505	833
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	728	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1316	-	501	833
Mov Cap-2 Maneuver	-	-	-	-	501	-
Stage 1	-	-	-	-	828	-
Stage 2	-	-	-	-	723	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	13
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	535	-	-	1316	-
HCM Lane V/C Ratio	0.158	-	-	0.006	-
HCM Control Delay (s)	13	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0	-

APPENDIX C-4: 2029 NO-BUILD PM PEAK HOUR



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	372	310	165	228	30
Future Volume (veh/h)	15	372	310	165	228	30
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	380	316	168	233	31
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	516	886	545	290	522	69
Arrive On Green	0.47	0.47	0.47	0.40	0.34	0.26
Sat Flow, veh/h	911	1870	1149	611	1544	205
Grp Volume(v), veh/h	15	380	0	484	265	0
Grp Sat Flow(s),veh/h/ln	911	1870	0	1760	1756	0
Q Serve(g_s), s	0.3	3.6	0.0	5.5	3.2	0.0
Cycle Q Clear(g_c), s	5.8	3.6	0.0	5.5	3.2	0.0
Prop In Lane	1.00			0.35	0.88	0.12
Lane Grp Cap(c), veh/h	516	886	0	834	594	0
V/C Ratio(X)	0.03	0.43	0.00	0.58	0.45	0.00
Avail Cap(c_a), veh/h	1848	3620	0	3407	2211	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	7.2	4.6	0.0	5.4	7.0	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.6	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.4	0.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.3	5.0	0.0	6.0	7.5	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		395	484		265	
Approach Delay, s/veh		5.0	6.0		7.5	
Approach LOS		A	A		A	

Timer - Assigned Phs		4		6	8
Phs Duration (G+Y+Rc), s		15.1		11.5	15.1
Change Period (Y+Rc), s		4.5		4.5	4.5
Max Green Setting (Gmax), s		49.5		31.5	49.5
Max Q Clear Time (g_c+I1), s		7.8		5.2	7.5
Green Ext Time (p_c), s		2.3		0.8	3.2

Intersection Summary	
HCM 6th Ctrl Delay	6.0
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	2.5

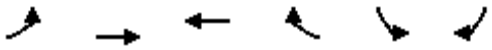
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	389	43	37	316	76	24
Future Vol, veh/h	389	43	37	316	76	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	414	46	39	336	81	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	460	0	828	414
Stage 1	-	-	-	-	414	-
Stage 2	-	-	-	-	414	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1101	-	341	638
Stage 1	-	-	-	-	667	-
Stage 2	-	-	-	-	667	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1101	-	326	638
Mov Cap-2 Maneuver	-	-	-	-	326	-
Stage 1	-	-	-	-	667	-
Stage 2	-	-	-	-	638	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	18.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	369	-	-	1101	-
HCM Lane V/C Ratio	0.288	-	-	0.036	-
HCM Control Delay (s)	18.7	-	-	8.4	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.2	-	-	0.1	-

APPENDIX C-5: 2029 BUILD AM PEAK HOUR



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	65	225	288	190	154	64
Future Volume (veh/h)	65	225	288	190	154	64
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	78	271	347	229	186	77
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	480	976	549	362	372	154
Arrive On Green	0.52	0.52	0.52	0.45	0.31	0.24
Sat Flow, veh/h	837	1870	1052	694	1211	502
Grp Volume(v), veh/h	78	271	0	576	264	0
Grp Sat Flow(s),veh/h/ln	837	1870	0	1745	1720	0
Q Serve(g_s), s	2.2	2.4	0.0	7.1	3.7	0.0
Cycle Q Clear(g_c), s	9.3	2.4	0.0	7.1	3.7	0.0
Prop In Lane	1.00			0.40	0.70	0.29
Lane Grp Cap(c), veh/h	480	976	0	911	528	0
V/C Ratio(X)	0.16	0.28	0.00	0.63	0.50	0.00
Avail Cap(c_a), veh/h	1572	3417	0	3189	1850	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	8.4	3.9	0.0	5.3	8.6	0.0
Incr Delay (d2), s/veh	0.2	0.2	0.0	0.7	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.1	0.0	0.5	0.9	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	8.5	4.1	0.0	6.1	9.3	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		349	576		264	
Approach Delay, s/veh		5.1	6.1		9.3	
Approach LOS		A	A		A	

Timer - Assigned Phs		4		6	8
Phs Duration (G+Y+Rc), s		17.8		11.5	17.8
Change Period (Y+Rc), s		4.5		4.5	4.5
Max Green Setting (Gmax), s		51.5		29.5	51.5
Max Q Clear Time (g_c+I1), s		11.3		5.7	9.1
Green Ext Time (p_c), s		2.0		0.8	4.0

Intersection Summary	
HCM 6th Ctrl Delay	6.5
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	1.8

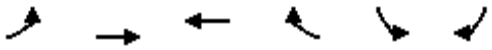
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	189	39	7	284	64	12
Future Vol, veh/h	189	39	7	284	64	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	210	43	8	316	71	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	253	0	542	210
Stage 1	-	-	-	-	210	-
Stage 2	-	-	-	-	332	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1312	-	501	830
Stage 1	-	-	-	-	825	-
Stage 2	-	-	-	-	727	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1312	-	497	830
Mov Cap-2 Maneuver	-	-	-	-	497	-
Stage 1	-	-	-	-	825	-
Stage 2	-	-	-	-	722	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	13.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	531	-	-	1312	-
HCM Lane V/C Ratio	0.159	-	-	0.006	-
HCM Control Delay (s)	13.1	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.6	-	-	0	-

APPENDIX C-6: 2029 BUILD PM PEAK HOUR



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	15	387	318	165	228	30
Future Volume (veh/h)	15	387	318	165	228	30
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	15	395	324	168	233	31
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	513	893	554	287	519	69
Arrive On Green	0.48	0.48	0.48	0.40	0.34	0.26
Sat Flow, veh/h	905	1870	1160	602	1544	205
Grp Volume(v), veh/h	15	395	0	492	265	0
Grp Sat Flow(s),veh/h/ln	905	1870	0	1762	1756	0
Q Serve(g_s), s	0.3	3.7	0.0	5.6	3.2	0.0
Cycle Q Clear(g_c), s	5.9	3.7	0.0	5.6	3.2	0.0
Prop In Lane	1.00			0.34	0.88	0.12
Lane Grp Cap(c), veh/h	513	893	0	841	590	0
V/C Ratio(X)	0.03	0.44	0.00	0.58	0.45	0.00
Avail Cap(c_a), veh/h	1820	3595	0	3387	2196	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	7.3	4.6	0.0	5.4	7.1	0.0
Incr Delay (d2), s/veh	0.0	0.3	0.0	0.6	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.2	0.0	0.4	0.7	0.0
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.3	5.0	0.0	6.0	7.6	0.0
LnGrp LOS	A	A	A	A	A	A
Approach Vol, veh/h		410	492		265	
Approach Delay, s/veh		5.1	6.0		7.6	
Approach LOS		A	A		A	

Timer - Assigned Phs		4		6	8
Phs Duration (G+Y+Rc), s		15.3		11.5	15.3
Change Period (Y+Rc), s		4.5		4.5	4.5
Max Green Setting (Gmax), s		49.5		31.5	49.5
Max Q Clear Time (g_c+I1), s		7.9		5.2	7.6
Green Ext Time (p_c), s		2.4		0.8	3.2

Intersection Summary	
HCM 6th Ctrl Delay	6.0
HCM 6th LOS	A

Intersection	
Int Delay, s/veh	2.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	390	43	37	318	76	24
Future Vol, veh/h	390	43	37	318	76	24
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	100	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	415	46	39	338	81	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	461	0	831	415
Stage 1	-	-	-	-	415	-
Stage 2	-	-	-	-	416	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1100	-	340	637
Stage 1	-	-	-	-	666	-
Stage 2	-	-	-	-	666	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1100	-	325	637
Mov Cap-2 Maneuver	-	-	-	-	325	-
Stage 1	-	-	-	-	666	-
Stage 2	-	-	-	-	637	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.9	18.7
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	368	-	-	1100	-
HCM Lane V/C Ratio	0.289	-	-	0.036	-
HCM Control Delay (s)	18.7	-	-	8.4	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1.2	-	-	0.1	-

APPENDIX D: SIMTRAFFIC OUTPUTS

APPENDIX D-1: 2022 EXISTING AM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	WB	SB
Directions Served	LT	TR	LR
Maximum Queue (ft)	68	9	98
Average Queue (ft)	16	0	52
95th Queue (ft)	46	6	84
Link Distance (ft)	1662	891	2162
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 3: US 340 NB Ramps/Hillside Dr & WV 115

Movement	EB	EB	WB	NB	SB
Directions Served	L	TR	L	LT	LTR
Maximum Queue (ft)	21	19	68	64	40
Average Queue (ft)	1	1	27	19	7
95th Queue (ft)	9	9	56	51	29
Link Distance (ft)		923		1075	1179
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150		175		
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 4: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	16	48
Average Queue (ft)	1	24
95th Queue (ft)	7	40
Link Distance (ft)	627	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

APPENDIX D-2: 2022 EXISTING PM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	52	136
Average Queue (ft)	8	66
95th Queue (ft)	33	111
Link Distance (ft)	1662	2162
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: US 340 NB Ramps/Hillside Dr & WV 115

Movement	EB	EB	WB	NB	NB	SB
Directions Served	L	TR	L	LT	R	LTR
Maximum Queue (ft)	22	36	81	84	53	35
Average Queue (ft)	1	3	39	40	5	7
95th Queue (ft)	11	20	72	74	30	29
Link Distance (ft)		923		1075		1179
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		175		125	
Storage Blk Time (%)				0		
Queuing Penalty (veh)				0		

Intersection: 4: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	46	65
Average Queue (ft)	8	31
95th Queue (ft)	30	54
Link Distance (ft)	627	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

APPENDIX D-3: 2029 NO-BUILD AM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	79	96	137	134
Average Queue (ft)	36	37	66	64
95th Queue (ft)	67	76	112	108
Link Distance (ft)		1662	890	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 4: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	20	69
Average Queue (ft)	1	28
95th Queue (ft)	10	50
Link Distance (ft)	660	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

APPENDIX D-4: 2029 NO-BUILD PM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	36	117	160	192
Average Queue (ft)	10	60	73	84
95th Queue (ft)	33	104	127	151
Link Distance (ft)		1662	890	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 4: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	52	91
Average Queue (ft)	12	34
95th Queue (ft)	39	66
Link Distance (ft)	660	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

APPENDIX D-5: 2029 BUILD AM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	73	99	130	142
Average Queue (ft)	33	43	69	69
95th Queue (ft)	64	84	115	121
Link Distance (ft)		1662	890	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 4: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	16	64
Average Queue (ft)	1	25
95th Queue (ft)	10	46
Link Distance (ft)	311	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

APPENDIX D-6: 2029 BUILD PM PEAK HOUR

Intersection: 1: WV 115 & Jefferson Ave

Movement	EB	EB	WB	SB
Directions Served	L	T	TR	LR
Maximum Queue (ft)	40	136	124	154
Average Queue (ft)	9	60	62	79
95th Queue (ft)	32	107	103	133
Link Distance (ft)		1662	890	2156
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	125			
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 4: Kabletown Rd & WV 115

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	82	78
Average Queue (ft)	18	36
95th Queue (ft)	60	64
Link Distance (ft)	311	1818
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

APPENDIX E: SIDRA OUTPUTS

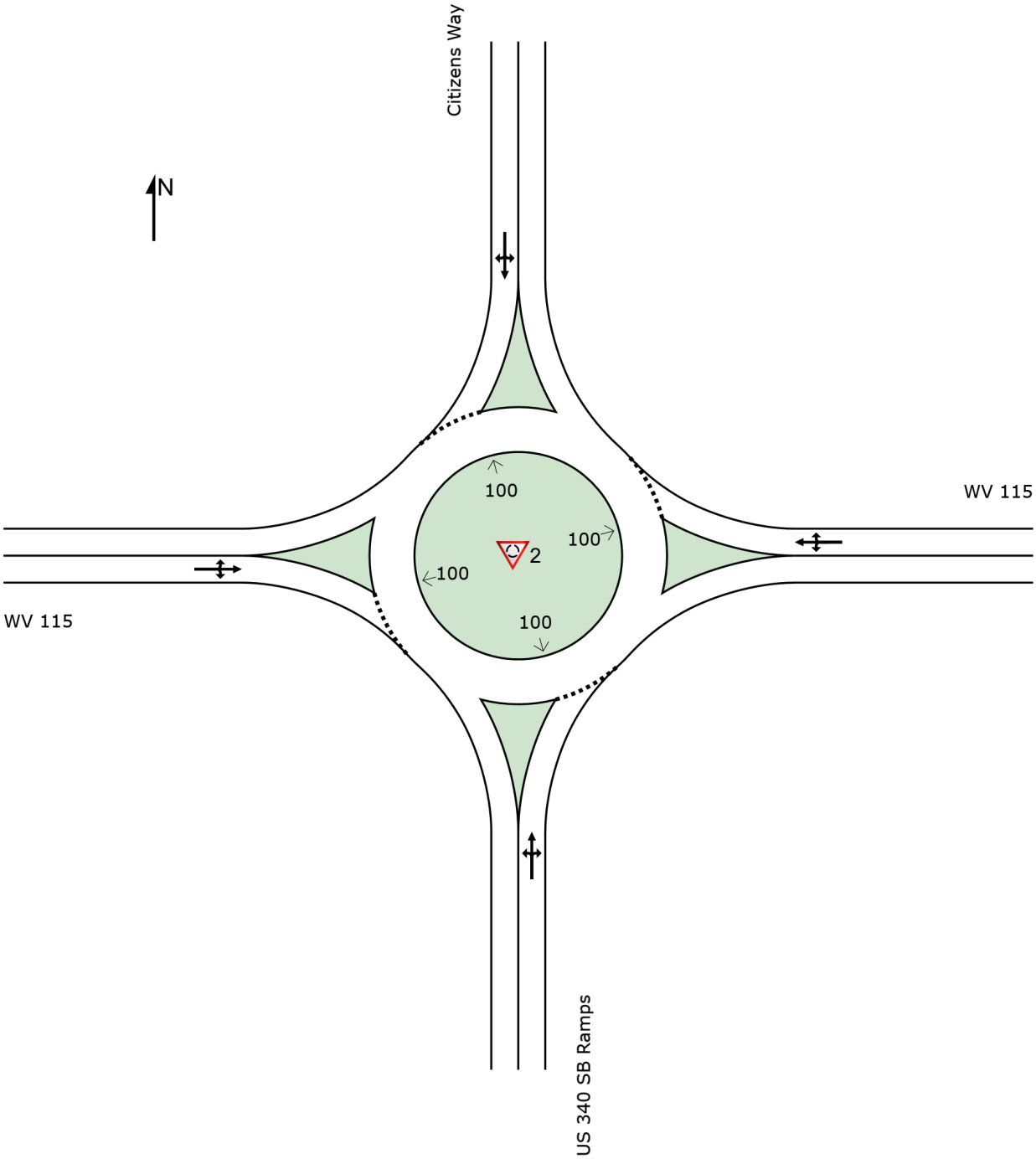
APPENDIX E-1: 2022 EXISTING AM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

2022 Existing AM Peak
Site Category: Existing Design
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2022 Existing AM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	31.7	31.7	mph
Travel Distance (Total)	veh-mi/h	584.3	701.1	pers-mi/h
Travel Time (Total)	veh-h/h	18.4	22.1	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.79		
Travel Time Index		7.70		
Congestion Coefficient		1.26		
Demand Flows (Total)	veh/h	1067	1281	pers/h
Arrival Flows (Total)	veh/h	1067		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.332		
Practical Spare Capacity	%	156.2		
Effective Intersection Capacity	veh/h	3218		
Control Delay (Total)	veh-h/h	1.78	2.14	pers-h/h
Control Delay (Average)	sec	6.0	6.0	sec
Control Delay (Worst Lane by MC)	sec	6.1		
Control Delay (Worst Movement by MC)	sec	12.3	12.3	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	6.0		
Idling Time (Average)	sec	3.9		
Intersection Level of Service (LOS)		LOS A		
95% Back of Queue - Veh (Worst Lane)	veh	1.9		
95% Back of Queue - Dist (Worst Lane)	ft	47.9		
Ave. Que Storage Ratio (Worst Lane)		0.02		
Effective Stops (Total)	veh/h	259	311	pers/h
Effective Stop Rate		0.24	0.24	
Proportion Queued		0.41	0.41	
Performance Index		30.2	30.2	
Cost (Total)	$/h	381.64	381.64	$/h
Fuel Consumption (Total)	gal/h	23.9		
Carbon Dioxide (Total)	kg/h	213.3		
Hydrocarbons (Total)	kg/h	0.019		
Carbon Monoxide (Total)	kg/h	0.26		
NOx (Total)	kg/h	0.256		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	512,372	614,847	pers/y
Delay (Total)	veh-h/y	855	1,026	pers-h/y
Effective Stops (Total)	veh/y	124,406	149,287	pers/y
Travel Distance (Total)	veh-mi/y	280,450	336,540	pers-mi/y
Travel Time (Total)	veh-h/y	8,840	10,608	pers-h/y
Cost (Total)	$/y	183,185	183,185	$/y
Fuel Consumption (Total)	gal/y	11,454		
Carbon Dioxide (Total)	kg/y	102,408		
Hydrocarbons (Total)	kg/y	9		
Carbon Monoxide (Total)	kg/y	127		
NOx (Total)	kg/y	123		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2022 Existing AM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps															
Lane 1[d]	210	2.0	210	2.0	965	0.218	100	5.8	LOS A	1.0	25.6	Full	1600	0.0	0.0
Approach	210	2.0	210	2.0		0.218		5.8	LOS A	1.0	25.6				
East: WV 115															
Lane 1[d]	393	2.0	393	2.0	1185	0.332	100	6.1	LOS A	1.9	47.9	Full	1000	0.0	0.0
Approach	393	2.0	393	2.0		0.332		6.1	LOS A	1.9	47.9				
North: Citizens Way															
Lane 1[d]	102	2.0	102	2.0	831	0.123	100	5.5	LOS A	0.5	12.8	Full	1600	0.0	0.0
Approach	102	2.0	102	2.0		0.123		5.5	LOS A	0.5	12.8				
West: WV 115															
Lane 1[d]	362	2.0	362	2.0	1137	0.318	100	6.1	LOS A	1.7	44.2	Full	1600	0.0	0.0
Approach	362	2.0	362	2.0		0.318		6.1	LOS A	1.7	44.2				
All Vehicles	1067	2.0	1067	2.0		0.332		6.0	LOS A	1.9	47.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	81	24	105	210	2.0	965	0.218	100	NA	NA
Approach	81	24	105	210	2.0		0.218			

East: WV 115

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	102	277	14	393	2.0	1185	0.332	100	NA	NA
Approach	102	277	14	393	2.0		0.332			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	42	21	40	102	2.0	831	0.123	100	NA	NA
Approach	42	21	40	102	2.0		0.123			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	21	257	84	362	2.0	1137	0.318	100	NA	NA
Approach	21	257	84	362	2.0		0.318			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1067	2.0	0.332

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 SB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Citizens Way				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

APPENDIX E-2: 2022 EXISTING PM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

2022 Existing PM Peak
Site Category: Existing Design
Roundabout

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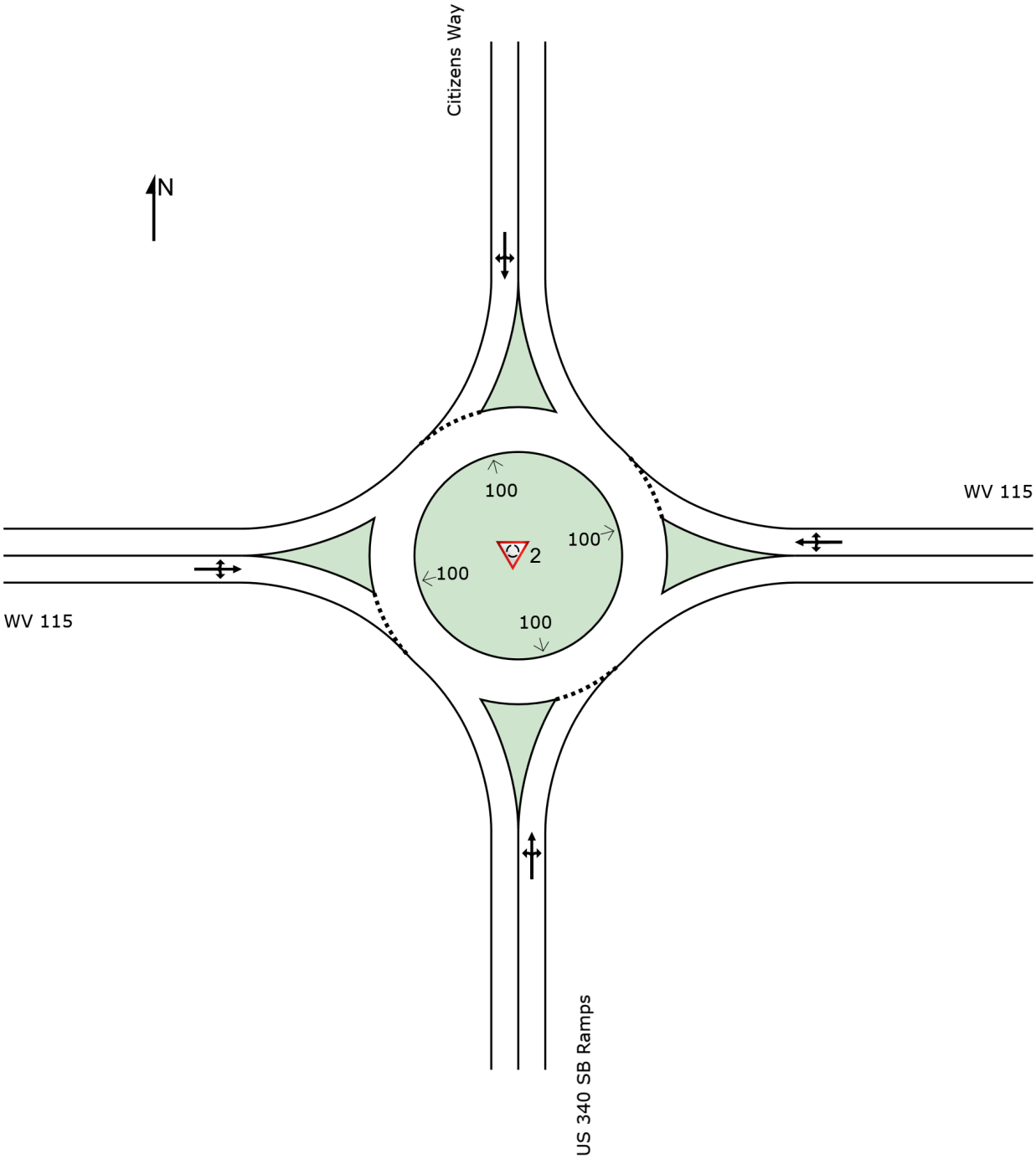

INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2022 Existing PM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	31.4	31.4	mph
Travel Distance (Total)	veh-mi/h	675.9	811.1	pers-mi/h
Travel Time (Total)	veh-h/h	21.5	25.8	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.79		
Travel Time Index		7.62		
Congestion Coefficient		1.27		
Demand Flows (Total)	veh/h	1244	1493	pers/h
Arrival Flows (Total)	veh/h	1244		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.382		
Practical Spare Capacity	%	122.5		
Effective Intersection Capacity	veh/h	3255		
Control Delay (Total)	veh-h/h	2.35	2.82	pers-h/h
Control Delay (Average)	sec	6.8	6.8	sec
Control Delay (Worst Lane by MC)	sec	8.5		
Control Delay (Worst Movement by MC)	sec	16.4	16.4	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	6.8		
Idling Time (Average)	sec	4.6		
Intersection Level of Service (LOS)		LOS A		
95% Back of Queue - Veh (Worst Lane)	veh	2.3		
95% Back of Queue - Dist (Worst Lane)	ft	59.5		
Ave. Que Storage Ratio (Worst Lane)		0.02		
Effective Stops (Total)	veh/h	337	404	pers/h
Effective Stop Rate		0.27	0.27	
Proportion Queued		0.44	0.44	
Performance Index		36.6	36.6	
Cost (Total)	$/h	444.85	444.85	$/h
Fuel Consumption (Total)	gal/h	27.7		
Carbon Dioxide (Total)	kg/h	247.7		
Hydrocarbons (Total)	kg/h	0.022		
Carbon Monoxide (Total)	kg/h	0.31		
NOx (Total)	kg/h	0.297		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	597,061	716,474	pers/y
Delay (Total)	veh-h/y	1,128	1,354	pers-h/y
Effective Stops (Total)	veh/y	161,704	194,045	pers/y
Travel Distance (Total)	veh-mi/y	324,443	389,332	pers-mi/y
Travel Time (Total)	veh-h/y	10,324	12,389	pers-h/y
Cost (Total)	$/y	213,527	213,527	$/y
Fuel Consumption (Total)	gal/y	13,299		
Carbon Dioxide (Total)	kg/y	118,889		
Hydrocarbons (Total)	kg/y	11		
Carbon Monoxide (Total)	kg/y	148		
NOx (Total)	kg/y	143		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2022 Existing Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2022 Existing PM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps															
Lane 1[d]	334	2.0	334	2.0	875	0.381	100	8.5	LOS A	1.9	49.4	Full	1600	0.0	0.0
Approach	334	2.0	334	2.0		0.381		8.5	LOS A	1.9	49.4				
East: WV 115															
Lane 1[d]	354	2.0	354	2.0	1152	0.307	100	6.0	LOS A	1.7	42.5	Full	1000	0.0	0.0
Approach	354	2.0	354	2.0		0.307		6.0	LOS A	1.7	42.5				
North: Citizens Way															
Lane 1[d]	96	2.0	96	2.0	886	0.108	100	5.1	LOS A	0.4	11.4	Full	1600	0.0	0.0
Approach	96	2.0	96	2.0		0.108		5.1	LOS A	0.4	11.4				
West: WV 115															
Lane 1[d]	460	2.0	460	2.0	1204	0.382	100	6.6	LOS A	2.3	59.5	Full	1600	0.0	0.0
Approach	460	2.0	460	2.0		0.382		6.6	LOS A	2.3	59.5				
All Vehicles	1244	2.0	1244	2.0		0.382		6.8	LOS A	2.3	59.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	67	29	238	334	2.0	875	0.381	100	NA	NA
Approach	67	29	238	334	2.0		0.381			

East: WV 115

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	66	266	21	354	2.0	1152	0.307	100	NA	NA
Approach	66	266	21	354	2.0		0.307			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	33	12	51	96	2.0	886	0.108	100	NA	NA
Approach	33	12	51	96	2.0		0.108			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	57	322	81	460	2.0	1204	0.382	100	NA	NA
Approach	57	322	81	460	2.0		0.382			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1244	2.0	0.382

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 SB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Citizens Way				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

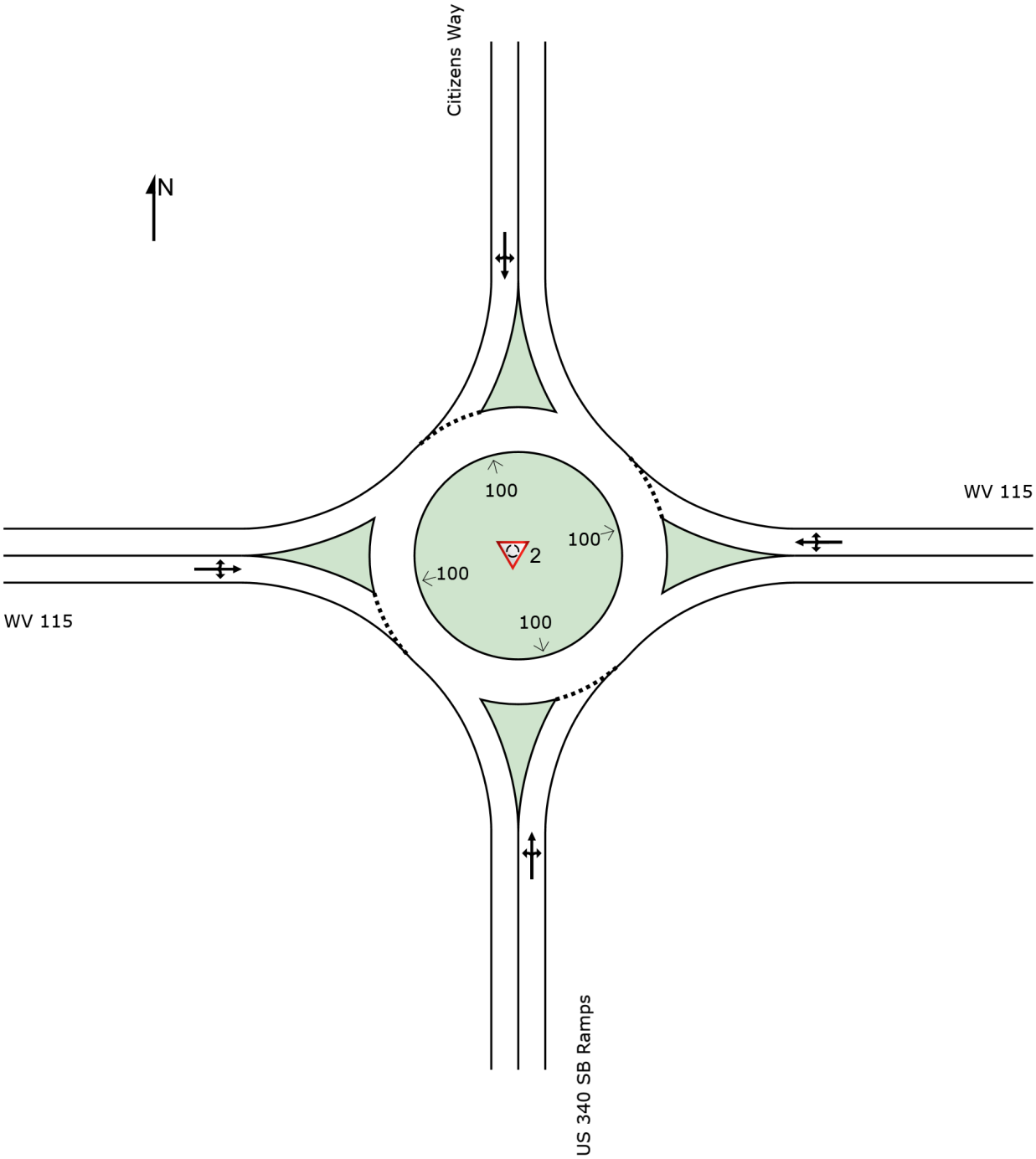
APPENDIX E-3: 2029 NO-BUILD AM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 No-Build Conditions)]

2029 No-Build AM Peak
Site Category: Existing Design
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 No-Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 No-Build AM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values			
Performance Measure	**Vehicles:**	**All MCs**	**Persons**
Travel Speed (Average)	mph	29.3	29.3 mph
Travel Distance (Total)	veh-mi/h	915.5	1098.6 pers-mi/h
Travel Time (Total)	veh-h/h	31.3	37.5 pers-h/h
Desired Speed	mph	40.0	
Speed Efficiency		0.73	
Travel Time Index		7.02	
Congestion Coefficient		1.37	
Demand Flows (Total)	veh/h	1674	2009 pers/h
Arrival Flows (Total)	veh/h	1674	
Percent Heavy Vehicles (Demand)	%	2.0	
Percent Heavy Vehicles (Arrivals)	%	2.0	
Degree of Saturation		0.557	
Practical Spare Capacity	%	52.7	
Effective Intersection Capacity	veh/h	3008	
Control Delay (Total)	veh-h/h	4.97	5.97 pers-h/h
Control Delay (Average)	sec	10.7	10.7 sec
Control Delay (Worst Lane by MC)	sec	12.3	
Control Delay (Worst Movement by MC)	sec	25.0	25.0 sec
Geometric Delay (Average)	sec	0.0	
Stop-Line Delay (Average)	sec	10.7	
Idling Time (Average)	sec	6.5	
Intersection Level of Service (LOS)		LOS B	
95% Back of Queue - Veh (Worst Lane)	veh	4.1	
95% Back of Queue - Dist (Worst Lane)	ft	103.4	
Ave. Que Storage Ratio (Worst Lane)		0.04	
Effective Stops (Total)	veh/h	908	1090 pers/h
Effective Stop Rate		0.54	0.54
Proportion Queued		0.66	0.66
Performance Index		64.2	64.2
Cost (Total)	$/h	644.95	644.95 $/h
Fuel Consumption (Total)	gal/h	39.9	
Carbon Dioxide (Total)	kg/h	356.6	
Hydrocarbons (Total)	kg/h	0.032	
Carbon Monoxide (Total)	kg/h	0.43	
NOx (Total)	kg/h	0.428	

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	803,721	964,465	pers/y
Delay (Total)	veh-h/y	2,387	2,864	pers-h/y
Effective Stops (Total)	veh/y	435,896	523,076	pers/y
Travel Distance (Total)	veh-mi/y	439,439	527,326	pers-mi/y
Travel Time (Total)	veh-h/y	15,017	18,021	pers-h/y
Cost (Total)	$/y	309,575	309,575	$/y
Fuel Consumption (Total)	gal/y	19,149		
Carbon Dioxide (Total)	kg/y	171,180		
Hydrocarbons (Total)	kg/y	16		
Carbon Monoxide (Total)	kg/y	209		
NOx (Total)	kg/y	205		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 No-Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 No-Build AM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps															
Lane 1[d]	319	2.0	319	2.0	758	0.420	100	10.2	LOS B	2.4	60.2	Full	1600	0.0	0.0
Approach	319	2.0	319	2.0		0.420		10.2	LOS B	2.4	60.2				
East: WV 115															
Lane 1[d]	614	2.0	614	2.0	1103	0.557	100	9.9	LOS A	4.1	103.4	Full	1000	0.0	0.0
Approach	614	2.0	614	2.0		0.557		9.9	LOS A	4.1	103.4				
North: Citizens Way															
Lane 1[d]	303	2.0	303	2.0	658	0.461	100	12.3	LOS B	2.6	67.2	Full	1600	0.0	0.0
Approach	303	2.0	303	2.0		0.461		12.3	LOS B	2.6	67.2				
West: WV 115															
Lane 1[d]	438	2.0	438	2.0	849	0.517	100	11.1	LOS B	3.9	98.2	Full	1600	0.0	0.0
Approach	438	2.0	438	2.0		0.517		11.1	LOS B	3.9	98.2				
All Vehicles	1674	2.0	1674	2.0		0.557		10.7	LOS B	4.1	103.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	90	78	151	319	2.0	758	0.420	100	NA	NA
Approach	90	78	151	319	2.0		0.420			
East: WV 115										
Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	192	398	24	614	2.0	1103	0.557	100	NA	NA
Approach	192	398	24	614	2.0		0.557			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	48	55	303	2.0	658	0.461	100	NA	NA
Approach	201	48	55	303	2.0		0.461			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	319	93	438	2.0	849	0.517	100	NA	NA
Approach	27	319	93	438	2.0		0.517			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1674	2.0	0.557

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

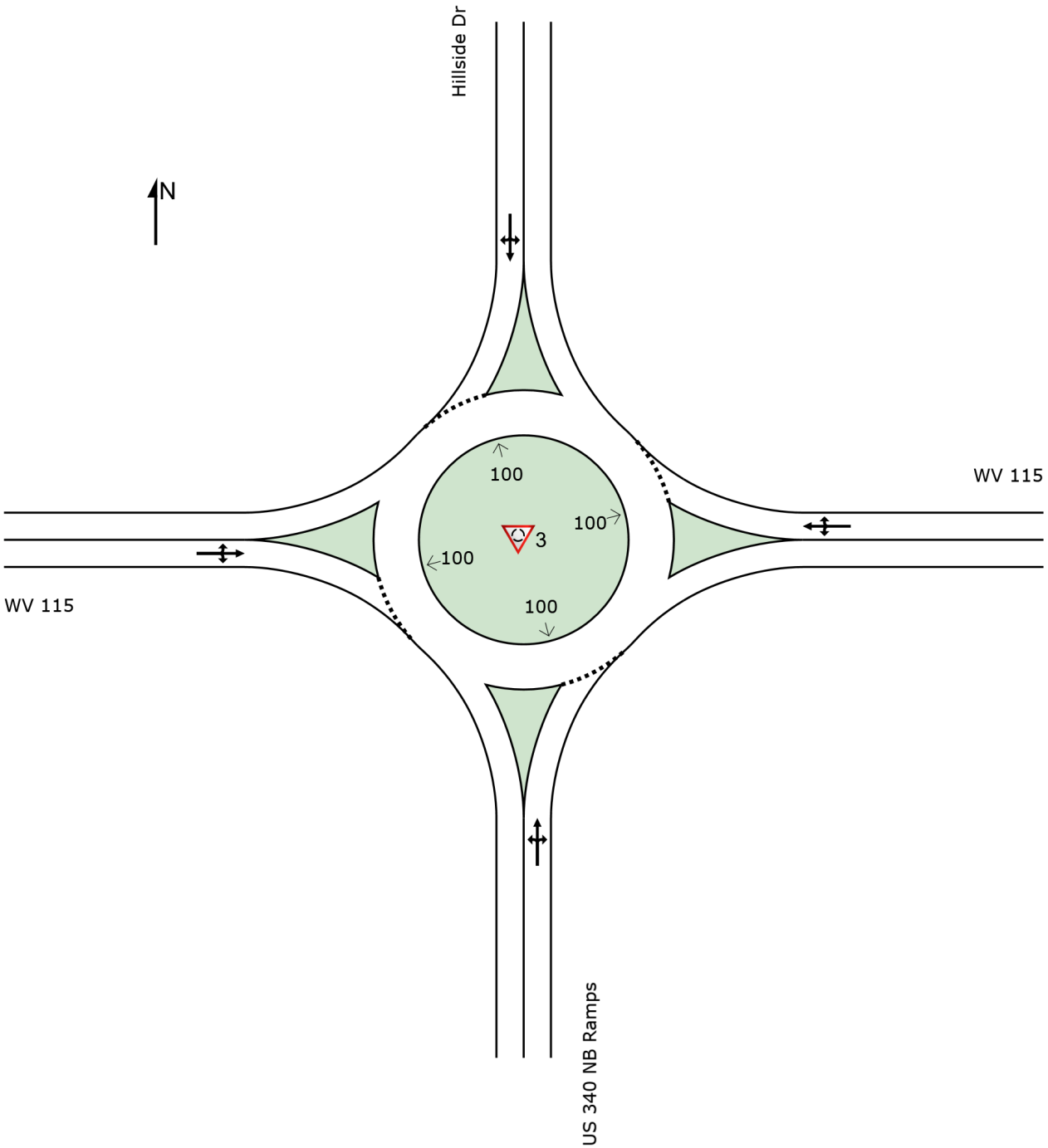
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 SB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Citizens Way				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 No-Build Conditions)]

2029 No-Build AM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 No-Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 No-Build AM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	29.9	29.9	mph
Travel Distance (Total)	veh-mi/h	839.6	1007.5	pers-mi/h
Travel Time (Total)	veh-h/h	28.1	33.7	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.75		
Travel Time Index		7.19		
Congestion Coefficient		1.34		
Demand Flows (Total)	veh/h	1536	1844	pers/h
Arrival Flows (Total)	veh/h	1536		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.623		
Practical Spare Capacity	%	36.4		
Effective Intersection Capacity	veh/h	2464		
Control Delay (Total)	veh-h/h	4.30	5.16	pers-h/h
Control Delay (Average)	sec	10.1	10.1	sec
Control Delay (Worst Lane by MC)	sec	12.1		
Control Delay (Worst Movement by MC)	sec	19.7	19.7	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	10.1		
Idling Time (Average)	sec	6.7		
Intersection Level of Service (LOS)		LOS B		
95% Back of Queue - Veh (Worst Lane)	veh	7.0		
95% Back of Queue - Dist (Worst Lane)	ft	178.5		
Ave. Que Storage Ratio (Worst Lane)		0.06		
Effective Stops (Total)	veh/h	495	594	pers/h
Effective Stop Rate		0.32	0.32	
Proportion Queued		0.50	0.50	
Performance Index		60.9	60.9	
Cost (Total)	$/h	576.36	576.36	$/h
Fuel Consumption (Total)	gal/h	35.2		
Carbon Dioxide (Total)	kg/h	315.2		
Hydrocarbons (Total)	kg/h	0.028		
Carbon Monoxide (Total)	kg/h	0.39		
NOx (Total)	kg/h	0.379		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	737,407	884,888	pers/y
Delay (Total)	veh-h/y	2,065	2,478	pers-h/y
Effective Stops (Total)	veh/y	237,541	285,049	pers/y
Travel Distance (Total)	veh-mi/y	402,990	483,588	pers-mi/y
Travel Time (Total)	veh-h/y	13,493	16,192	pers-h/y
Cost (Total)	$/y	276,652	276,652	$/y
Fuel Consumption (Total)	gal/y	16,920		
Carbon Dioxide (Total)	kg/y	151,292		
Hydrocarbons (Total)	kg/y	14		
Carbon Monoxide (Total)	kg/y	186		
NOx (Total)	kg/y	182		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 No-Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 No-Build AM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps															
Lane 1[d]	95	2.0	95	2.0	983	0.096	100	4.5	LOS A	0.4	10.3	Full	1600	0.0	0.0
Approach	95	2.0	95	2.0		0.096		4.5	LOS A	0.4	10.3				
East: WV 115															
Lane 1[d]	795	2.0	795	2.0	1290	0.616	100	9.2	LOS A	6.1	154.8	Full	1000	0.0	0.0
Approach	795	2.0	795	2.0		0.616		9.2	LOS A	6.1	154.8				
North: Hillside Dr															
Lane 1[d]	13	2.0	13	2.0	557	0.024	100	6.7	LOS A	0.1	2.1	Full	1600	0.0	0.0
Approach	13	2.0	13	2.0		0.024		6.7	LOS A	0.1	2.1				
West: WV 115															
Lane 1[d]	634	2.0	634	2.0	1017	0.623	100	12.1	LOS B	7.0	178.5	Full	1600	0.0	0.0
Approach	634	2.0	634	2.0		0.623		12.1	LOS B	7.0	178.5				
All Vehicles	1536	2.0	1536	2.0		0.623		10.1	LOS B	7.0	178.5				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	42	1	52	95	2.0	983	0.096	100	NA	NA
Approach	42	1	52	95	2.0		0.096			

East: WV 115

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	264	530	1	795	2.0	1290	0.616	100	NA	NA
Approach	264	530	1	795	2.0		0.616			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	5	7	13	2.0	557	0.024	100	NA	NA
Approach	1	5	7	13	2.0		0.024			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	3	298	333	634	2.0	1017	0.623	100	NA	NA
Approach	3	298	333	634	2.0		0.623			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1536	2.0	0.623

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 NB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Hillside Dr				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

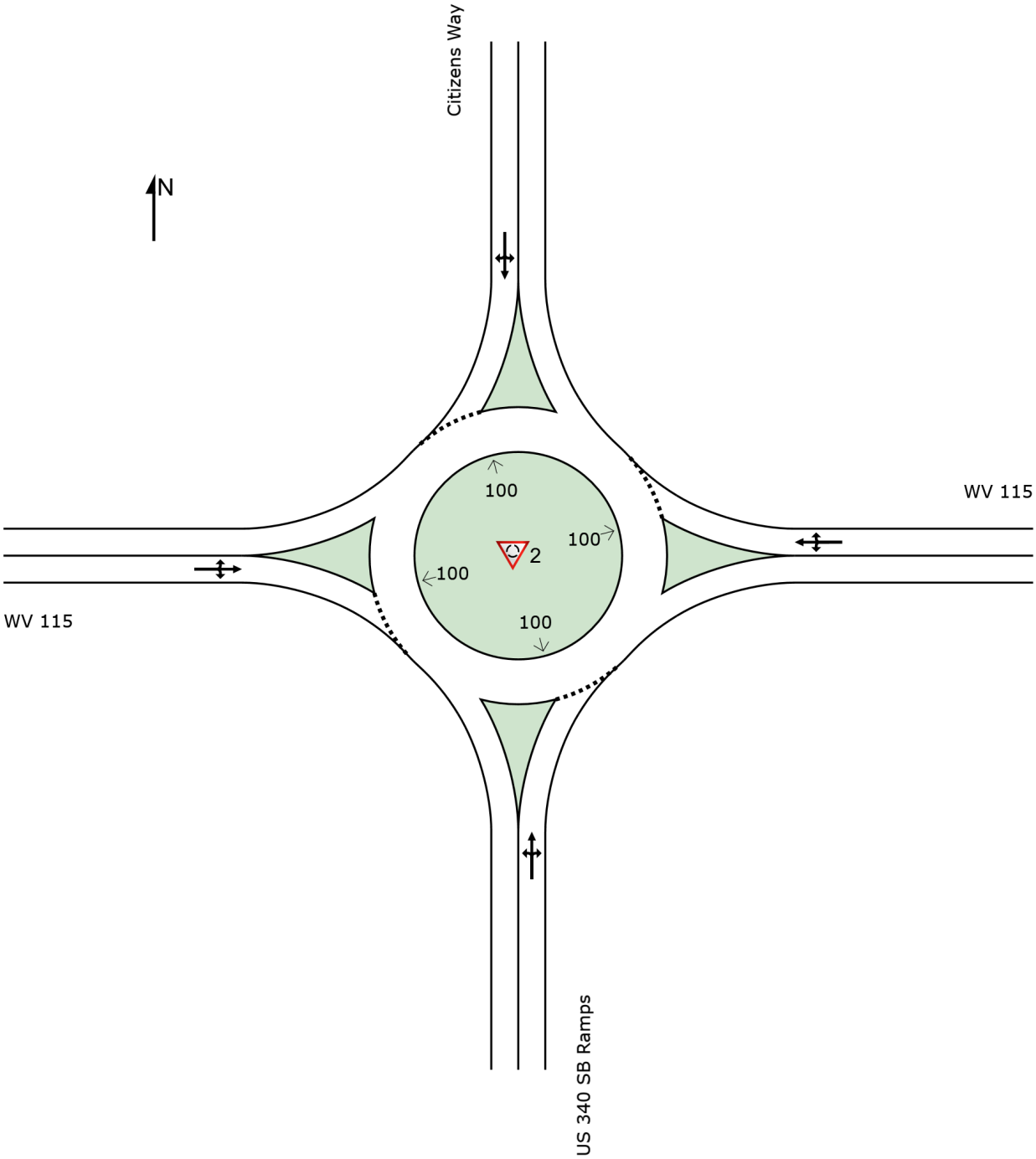
APPENDIX E-4: 2029 NO-BUILD PM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 No-Build Conditions)]

2029 No-Build PM Peak
Site Category: Existing Design
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 No-Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 No-Build PM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	26.4	26.4	mph
Travel Distance (Total)	veh-mi/h	1064.4	1277.3	pers-mi/h
Travel Time (Total)	veh-h/h	40.3	48.4	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.66		
Travel Time Index		6.22		
Congestion Coefficient		1.52		
Demand Flows (Total)	veh/h	1946	2335	pers/h
Arrival Flows (Total)	veh/h	1946		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.893		
Practical Spare Capacity	%	-4.8		
Effective Intersection Capacity	veh/h	2180		
Control Delay (Total)	veh-h/h	10.10	12.12	pers-h/h
Control Delay (Average)	sec	18.7	18.7	sec
Control Delay (Worst Lane by MC)	sec	36.4		
Control Delay (Worst Movement by MC)	sec	51.8	51.8	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	18.7		
Idling Time (Average)	sec	10.8		
Intersection Level of Service (LOS)		LOS C		
95% Back of Queue - Veh (Worst Lane)	veh	14.6		
95% Back of Queue - Dist (Worst Lane)	ft	371.4		
Ave. Que Storage Ratio (Worst Lane)		0.09		
Effective Stops (Total)	veh/h	1614	1937	pers/h
Effective Stop Rate		0.83	0.83	
Proportion Queued		0.78	0.78	
Performance Index		109.4	109.4	
Cost (Total)	$/h	814.23	814.23	$/h
Fuel Consumption (Total)	gal/h	48.1		
Carbon Dioxide (Total)	kg/h	430.3		
Hydrocarbons (Total)	kg/h	0.040		
Carbon Monoxide (Total)	kg/h	0.52		
NOx (Total)	kg/h	0.515		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	934,041	1,120,849	pers/y
Delay (Total)	veh-h/y	4,849	5,819	pers-h/y
Effective Stops (Total)	veh/y	774,760	929,712	pers/y
Travel Distance (Total)	veh-mi/y	510,900	613,080	pers-mi/y
Travel Time (Total)	veh-h/y	19,360	23,232	pers-h/y
Cost (Total)	$/y	390,829	390,829	$/y
Fuel Consumption (Total)	gal/y	23,111		
Carbon Dioxide (Total)	kg/y	206,563		
Hydrocarbons (Total)	kg/y	19		
Carbon Monoxide (Total)	kg/y	248		
NOx (Total)	kg/y	247		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 No-Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 No-Build PM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps															
Lane 1[d]	611	2.0	611	2.0	685	0.893	100	36.4	LOS E	14.6	371.4	Full	1600	0.0	0.0
Approach	611	2.0	611	2.0		0.893		36.4	LOS E	14.6	371.4				
East: WV 115															
Lane 1[d]	515	2.0	515	2.0	952	0.541	100	10.7	LOS B	4.5	113.8	Full	1000	0.0	0.0
Approach	515	2.0	515	2.0		0.541		10.7	LOS B	4.5	113.8				
North: Citizens Way															
Lane 1[d]	215	2.0	215	2.0	760	0.283	100	8.0	LOS A	1.3	32.0	Full	1600	0.0	0.0
Approach	215	2.0	215	2.0		0.283		8.0	LOS A	1.3	32.0				
West: WV 115															
Lane 1[d]	604	2.0	604	2.0	1013	0.597	100	11.4	LOS B	6.0	153.5	Full	1600	0.0	0.0
Approach	604	2.0	604	2.0		0.597		11.4	LOS B	6.0	153.5				
All Vehicles	1946	2.0	1946	2.0		0.893		18.7	LOS C	14.6	371.4				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	77	183	352	611	2.0	685	0.893	100	NA	NA
Approach	77	183	352	611	2.0		0.893			

East: WV 115

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	120	347	48	515	2.0	952	0.541	100	NA	NA
Approach	120	347	48	515	2.0		0.541			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	28	61	215	2.0	760	0.283	100	NA	NA
Approach	127	28	61	215	2.0		0.283			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	73	442	89	604	2.0	1013	0.597	100	NA	NA
Approach	73	442	89	604	2.0		0.597			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1946	2.0	0.893

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

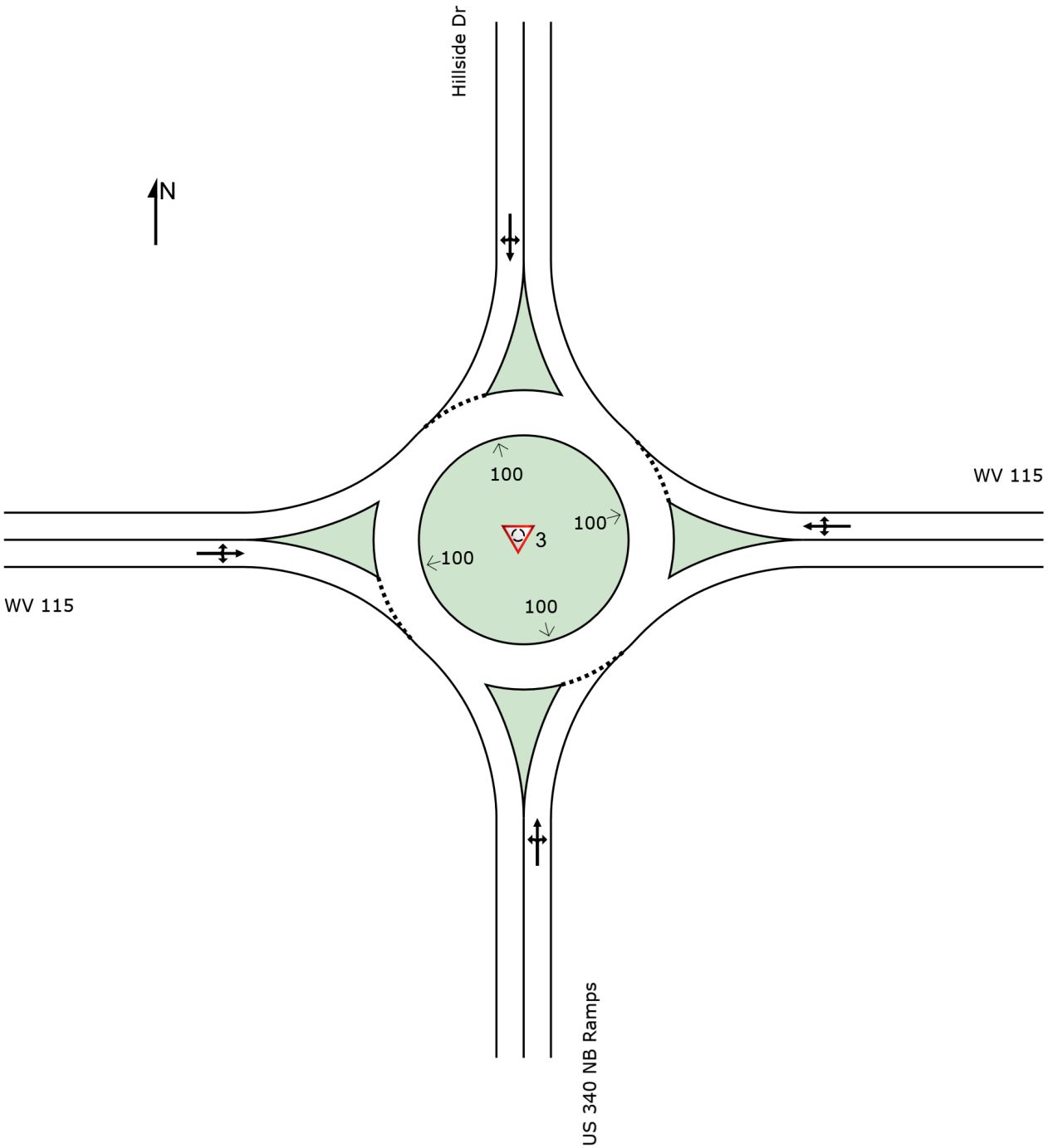
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 SB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Citizens Way				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 No-Build Conditions)]

2029 No-Build PM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 No-Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 No-Build PM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	25.0	25.0	mph
Travel Distance (Total)	veh-mi/h	1043.5	1252.2	pers-mi/h
Travel Time (Total)	veh-h/h	41.7	50.0	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.63		
Travel Time Index		5.84		
Congestion Coefficient		1.60		
Demand Flows (Total)	veh/h	1934	2320	pers/h
Arrival Flows (Total)	veh/h	1934		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.949		
Practical Spare Capacity	%	-10.4		
Effective Intersection Capacity	veh/h	2038		
Control Delay (Total)	veh-h/h	12.09	14.51	pers-h/h
Control Delay (Average)	sec	22.5	22.5	sec
Control Delay (Worst Lane by MC)	sec	34.5		
Control Delay (Worst Movement by MC)	sec	43.8	43.8	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	22.5		
Idling Time (Average)	sec	11.7		
Intersection Level of Service (LOS)		LOS C		
95% Back of Queue - Veh (Worst Lane)	veh	39.8		
95% Back of Queue - Dist (Worst Lane)	ft	1011.1		
Ave. Que Storage Ratio (Worst Lane)		0.25		
Effective Stops (Total)	veh/h	1967	2360	pers/h
Effective Stop Rate		1.02	1.02	
Proportion Queued		0.78	0.78	
Performance Index		161.9	161.9	
Cost (Total)	$/h	837.08	837.08	$/h
Fuel Consumption (Total)	gal/h	48.9		
Carbon Dioxide (Total)	kg/h	436.8		
Hydrocarbons (Total)	kg/h	0.041		
Carbon Monoxide (Total)	kg/h	0.51		
NOx (Total)	kg/h	0.533		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	928,174	1,113,809	pers/y
Delay (Total)	veh-h/y	5,805	6,966	pers-h/y
Effective Stops (Total)	veh/y	944,175	1,133,011	pers/y
Travel Distance (Total)	veh-mi/y	500,887	601,065	pers-mi/y
Travel Time (Total)	veh-h/y	20,016	24,019	pers-h/y
Cost (Total)	$/y	401,796	401,796	$/y
Fuel Consumption (Total)	gal/y	23,462		
Carbon Dioxide (Total)	kg/y	209,687		
Hydrocarbons (Total)	kg/y	20		
Carbon Monoxide (Total)	kg/y	247		
NOx (Total)	kg/y	256		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 No-Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 No-Build PM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps															
Lane 1[d]	262	2.0	262	2.0	612	0.428	100	12.3	LOS B	2.2	55.7	Full	1600	0.0	0.0
Approach	262	2.0	262	2.0		0.428		12.3	LOS B	2.2	55.7				
East: WV 115															
Lane 1[d]	680	2.0	680	2.0	1192	0.571	100	9.5	LOS A	4.6	117.8	Full	1000	0.0	0.0
Approach	680	2.0	680	2.0		0.571		9.5	LOS A	4.6	117.8				
North: Hillside Dr															
Lane 1[d]	10	2.0	10	2.0	584	0.017	100	6.4	LOS A	0.1	1.5	Full	1600	0.0	0.0
Approach	10	2.0	10	2.0		0.017		6.4	LOS A	0.1	1.5				
West: WV 115															
Lane 1[d]	982	2.0	982	2.0	1035	0.949	100	34.5	LOS D	39.8	1011.1	Full	1600	0.0	0.0
Approach	982	2.0	982	2.0		0.949		34.5	LOS D	39.8	1011.1				
All Vehicles	1934	2.0	1934	2.0		0.949		22.5	LOS C	39.8	1011.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	112	1	149	262	2.0	612	0.428	100	NA	NA
Approach	112	1	149	262	2.0		0.428			

East: WV 115

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	248	432	1	680	2.0	1192	0.571	100	NA	NA
Approach	248	432	1	680	2.0		0.571			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	5	3	10	2.0	584	0.017	100	NA	NA
Approach	1	5	3	10	2.0		0.017			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	8	738	236	982	2.0	1035	0.949	100	NA	NA
Approach	8	738	236	982	2.0		0.949			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1934	2.0	0.949

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 NB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Hillside Dr				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

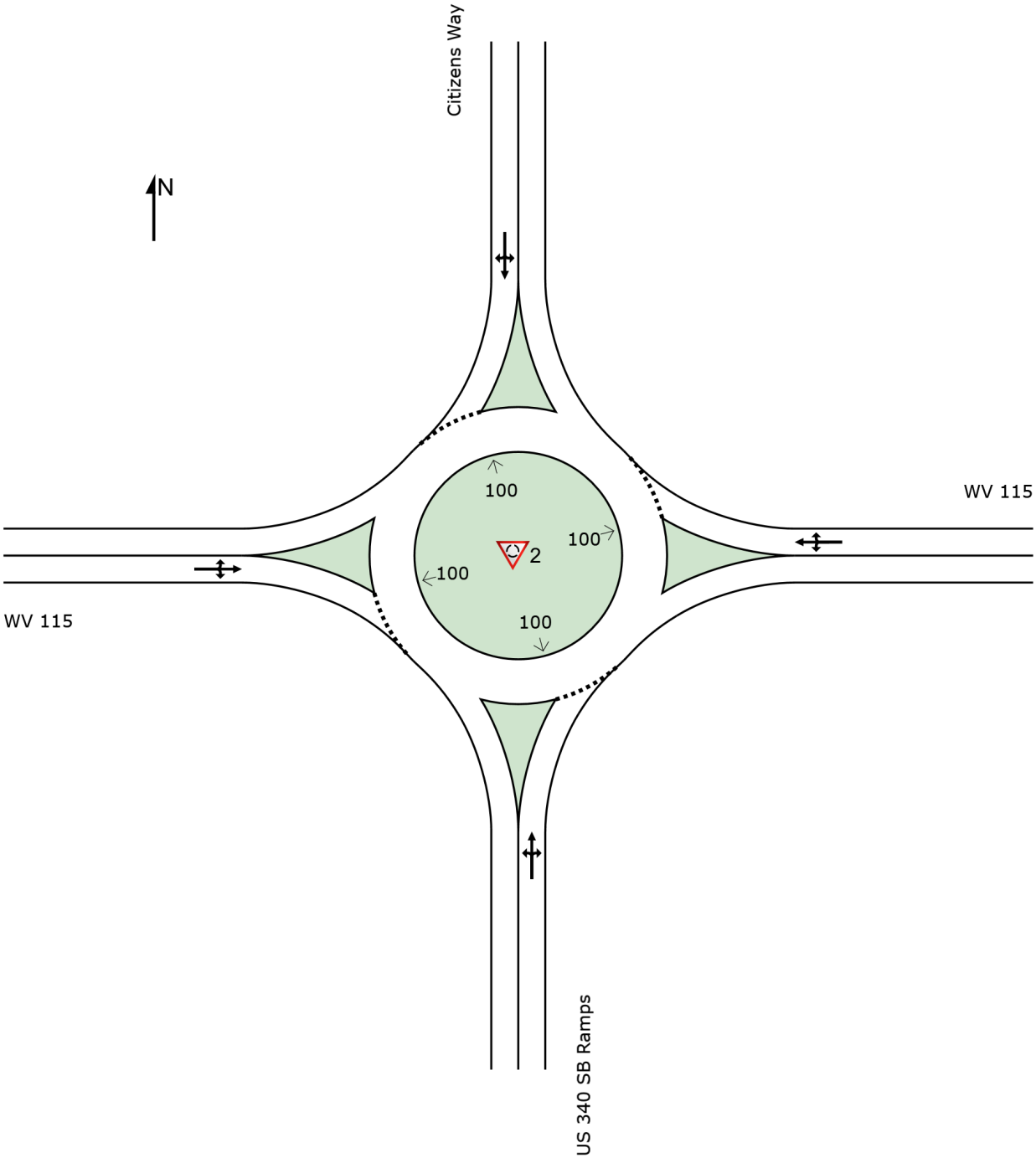
APPENDIX E-5: 2029 BUILD AM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Conditions)]

2029 Build AM Peak
Site Category: Existing Design
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build AM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	29.0	29.0	mph
Travel Distance (Total)	veh-mi/h	942.3	1130.7	pers-mi/h
Travel Time (Total)	veh-h/h	32.5	39.0	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.72		
Travel Time Index		6.94		
Congestion Coefficient		1.38		
Demand Flows (Total)	veh/h	1726	2071	pers/h
Arrival Flows (Total)	veh/h	1726		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.593		
Practical Spare Capacity	%	43.5		
Effective Intersection Capacity	veh/h	2912		
Control Delay (Total)	veh-h/h	5.42	6.51	pers-h/h
Control Delay (Average)	sec	11.3	11.3	sec
Control Delay (Worst Lane by MC)	sec	13.2		
Control Delay (Worst Movement by MC)	sec	26.8	26.8	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	11.3		
Idling Time (Average)	sec	6.9		
Intersection Level of Service (LOS)		LOS B		
95% Back of Queue - Veh (Worst Lane)	veh	4.6		
95% Back of Queue - Dist (Worst Lane)	ft	116.3		
Ave. Que Storage Ratio (Worst Lane)		0.05		
Effective Stops (Total)	veh/h	975	1170	pers/h
Effective Stop Rate		0.56	0.56	
Proportion Queued		0.68	0.68	
Performance Index		68.2	68.2	
Cost (Total)	$/h	669.68	669.68	$/h
Fuel Consumption (Total)	gal/h	41.3		
Carbon Dioxide (Total)	kg/h	369.4		
Hydrocarbons (Total)	kg/h	0.034		
Carbon Monoxide (Total)	kg/h	0.45		
NOx (Total)	kg/h	0.443		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	828,279	993,935	pers/y
Delay (Total)	veh-h/y	2,604	3,125	pers-h/y
Effective Stops (Total)	veh/y	467,875	561,450	pers/y
Travel Distance (Total)	veh-mi/y	452,293	542,752	pers-mi/y
Travel Time (Total)	veh-h/y	15,612	18,734	pers-h/y
Cost (Total)	$/y	321,445	321,445	$/y
Fuel Consumption (Total)	gal/y	19,834		
Carbon Dioxide (Total)	kg/y	177,299		
Hydrocarbons (Total)	kg/y	16		
Carbon Monoxide (Total)	kg/y	216		
NOx (Total)	kg/y	213		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build AM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps															
Lane 1[d]	326	2.0	326	2.0	754	0.432	100	10.4	LOS B	2.5	63.3	Full	1600	0.0	0.0
Approach	326	2.0	326	2.0		0.432		10.4	LOS B	2.5	63.3				
East: WV 115															
Lane 1[d]	653	2.0	653	2.0	1103	0.593	100	10.6	LOS B	4.6	116.3	Full	1000	0.0	0.0
Approach	653	2.0	653	2.0		0.593		10.6	LOS B	4.6	116.3				
North: Citizens Way															
Lane 1[d]	303	2.0	303	2.0	631	0.481	100	13.2	LOS B	2.8	70.7	Full	1600	0.0	0.0
Approach	303	2.0	303	2.0		0.481		13.2	LOS B	2.8	70.7				
West: WV 115															
Lane 1[d]	443	2.0	443	2.0	829	0.535	100	11.8	LOS B	4.1	105.1	Full	1600	0.0	0.0
Approach	443	2.0	443	2.0		0.535		11.8	LOS B	4.1	105.1				
All Vehicles	1726	2.0	1726	2.0		0.593		11.3	LOS B	4.6	116.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	90	78	158	326	2.0	754	0.432	100	NA	NA
Approach	90	78	158	326	2.0		0.432			

East: WV 115

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	214	415	24	653	2.0	1103	0.593	100	NA	NA
Approach	214	415	24	653	2.0		0.593			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	48	55	303	2.0	631	0.481	100	NA	NA
Approach	201	48	55	303	2.0		0.481			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	323	93	443	2.0	829	0.535	100	NA	NA
Approach	27	323	93	443	2.0		0.535			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1726	2.0	0.593

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

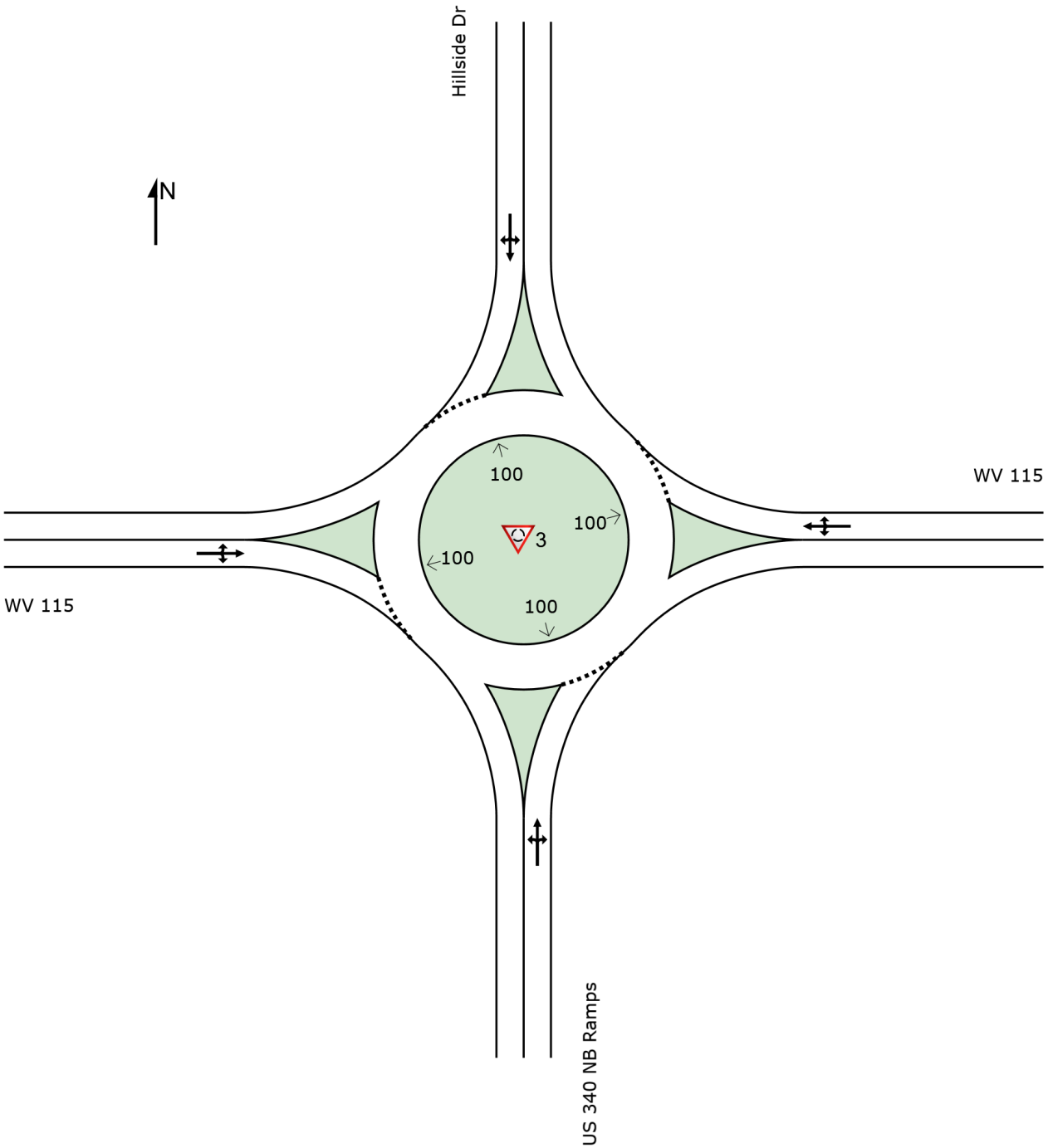
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 SB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Citizens Way				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Conditions)]

2029 Build AM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build AM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	29.7	29.7	mph
Travel Distance (Total)	veh-mi/h	880.7	1056.9	pers-mi/h
Travel Time (Total)	veh-h/h	29.7	35.6	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.74		
Travel Time Index		7.14		
Congestion Coefficient		1.35		
Demand Flows (Total)	veh/h	1602	1923	pers/h
Arrival Flows (Total)	veh/h	1602		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.644		
Practical Spare Capacity	%	32.0		
Effective Intersection Capacity	veh/h	2488		
Control Delay (Total)	veh-h/h	4.70	5.64	pers-h/h
Control Delay (Average)	sec	10.6	10.6	sec
Control Delay (Worst Lane by MC)	sec	12.8		
Control Delay (Worst Movement by MC)	sec	20.9	20.9	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	10.6		
Idling Time (Average)	sec	6.7		
Intersection Level of Service (LOS)		LOS B		
95% Back of Queue - Veh (Worst Lane)	veh	7.8		
95% Back of Queue - Dist (Worst Lane)	ft	199.1		
Ave. Que Storage Ratio (Worst Lane)		0.06		
Effective Stops (Total)	veh/h	601	721	pers/h
Effective Stop Rate		0.37	0.37	
Proportion Queued		0.55	0.55	
Performance Index		66.0	66.0	
Cost (Total)	$/h	608.36	608.36	$/h
Fuel Consumption (Total)	gal/h	37.2		
Carbon Dioxide (Total)	kg/h	332.9		
Hydrocarbons (Total)	kg/h	0.030		
Carbon Monoxide (Total)	kg/h	0.41		
NOx (Total)	kg/h	0.401		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	769,055	922,866	pers/y
Delay (Total)	veh-h/y	2,257	2,709	pers-h/y
Effective Stops (Total)	veh/y	288,295	345,954	pers/y
Travel Distance (Total)	veh-mi/y	422,746	507,295	pers-mi/y
Travel Time (Total)	veh-h/y	14,238	17,085	pers-h/y
Cost (Total)	$/y	292,014	292,014	$/y
Fuel Consumption (Total)	gal/y	17,872		
Carbon Dioxide (Total)	kg/y	159,801		
Hydrocarbons (Total)	kg/y	14		
Carbon Monoxide (Total)	kg/y	196		
NOx (Total)	kg/y	192		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build AM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps															
Lane 1[d]	98	2.0	98	2.0	971	0.101	100	4.6	LOS A	0.4	10.8	Full	1600	0.0	0.0
Approach	98	2.0	98	2.0		0.101		4.6	LOS A	0.4	10.8				
East: WV 115															
Lane 1[d]	795	2.0	795	2.0	1271	0.625	100	9.7	LOS A	6.2	156.8	Full	1000	0.0	0.0
Approach	795	2.0	795	2.0		0.625		9.7	LOS A	6.2	156.8				
North: Hillside Dr															
Lane 1[d]	65	2.0	65	2.0	557	0.116	100	7.9	LOS A	0.4	11.0	Full	1600	0.0	0.0
Approach	65	2.0	65	2.0		0.116		7.9	LOS A	0.4	11.0				
West: WV 115															
Lane 1[d]	645	2.0	645	2.0	1002	0.644	100	12.8	LOS B	7.8	199.1	Full	1600	0.0	0.0
Approach	645	2.0	645	2.0		0.644		12.8	LOS B	7.8	199.1				
All Vehicles	1602	2.0	1602	2.0		0.644		10.6	LOS B	7.8	199.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	42	4	52	98	2.0	971	0.101	100	NA	NA
Approach	42	4	52	98	2.0		0.101			

East: WV 115

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	264	530	1	795	2.0	1271	0.625	100	NA	NA
Approach	264	530	1	795	2.0		0.625			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	2	19	44	65	2.0	557	0.116	100	NA	NA
Approach	2	19	44	65	2.0		0.116			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	298	333	645	2.0	1002	0.644	100	NA	NA
Approach	14	298	333	645	2.0		0.644			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1602	2.0	0.644

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 NB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Hillside Dr				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

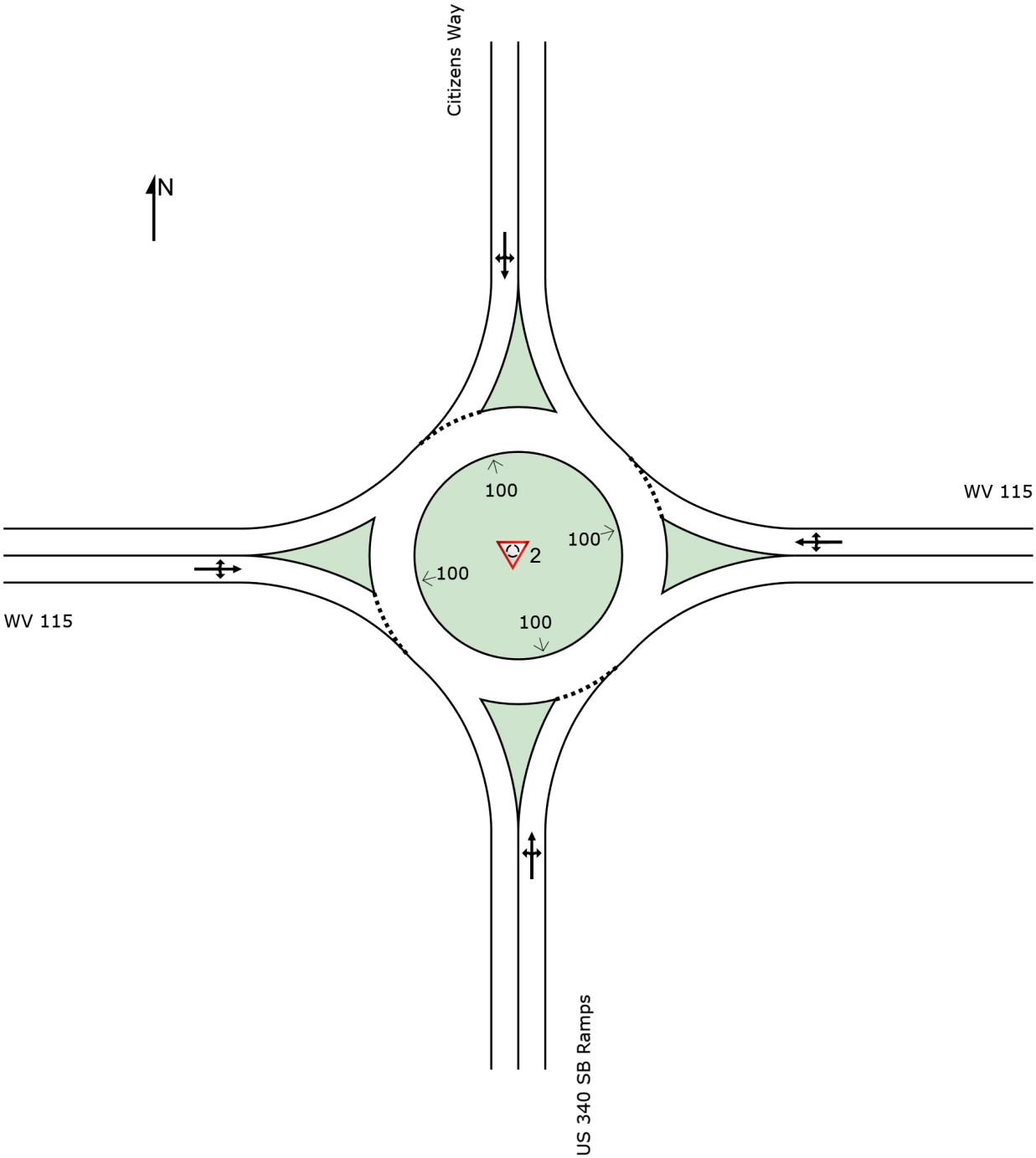
APPENDIX E-6: 2029 BUILD PM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Conditions)]

2029 Build PM Peak
Site Category: Existing Design
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build PM Peak
Site Category: Existing Design
Roundabout

Intersection Performance - Hourly Values			
Performance Measure	**Vehicles:**	**All MCs**	**Persons**
Travel Speed (Average)	mph	25.4	25.4 mph
Travel Distance (Total)	veh-mi/h	1092.8	1311.4 pers-mi/h
Travel Time (Total)	veh-h/h	43.0	51.6 pers-h/h
Desired Speed	mph	40.0	
Speed Efficiency		0.64	
Travel Time Index		5.95	
Congestion Coefficient		1.57	
Demand Flows (Total)	veh/h	2001	2401 pers/h
Arrival Flows (Total)	veh/h	2001	
Percent Heavy Vehicles (Demand)	%	2.0	
Percent Heavy Vehicles (Arrivals)	%	2.0	
Degree of Saturation		0.936	
Practical Spare Capacity	%	-9.2	
Effective Intersection Capacity	veh/h	2138	
Control Delay (Total)	veh-h/h	11.91	14.30 pers-h/h
Control Delay (Average)	sec	21.4	21.4 sec
Control Delay (Worst Lane by MC)	sec	43.8	
Control Delay (Worst Movement by MC)	sec	59.9	59.9 sec
Geometric Delay (Average)	sec	0.0	
Stop-Line Delay (Average)	sec	21.4	
Idling Time (Average)	sec	12.4	
Intersection Level of Service (LOS)		LOS C	
95% Back of Queue - Veh (Worst Lane)	veh	17.7	
95% Back of Queue - Dist (Worst Lane)	ft	449.1	
Ave. Que Storage Ratio (Worst Lane)		0.11	
Effective Stops (Total)	veh/h	1826	2191 pers/h
Effective Stop Rate		0.91	0.91
Proportion Queued		0.79	0.79
Performance Index		123.9	123.9
Cost (Total)	$/h	861.65	861.65 $/h
Fuel Consumption (Total)	gal/h	50.2	
Carbon Dioxide (Total)	kg/h	448.8	
Hydrocarbons (Total)	kg/h	0.042	
Carbon Monoxide (Total)	kg/h	0.54	
NOx (Total)	kg/h	0.536	

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	960,490	1,152,588	pers/y
Delay (Total)	veh-h/y	5,719	6,862	pers-h/y
Effective Stops (Total)	veh/y	876,510	1,051,812	pers/y
Travel Distance (Total)	veh-mi/y	524,560	629,472	pers-mi/y
Travel Time (Total)	veh-h/y	20,622	24,746	pers-h/y
Cost (Total)	$/y	413,590	413,590	$/y
Fuel Consumption (Total)	gal/y	24,102		
Carbon Dioxide (Total)	kg/y	215,409		
Hydrocarbons (Total)	kg/y	20		
Carbon Monoxide (Total)	kg/y	257		
NOx (Total)	kg/y	257		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build PM Peak
Site Category: Existing Design
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps															
Lane 1[d]	631	2.0	631	2.0	674	0.936	100	43.8	LOS E	17.7	449.1	Full	1600	0.0	0.0
Approach	631	2.0	631	2.0		0.936		43.8	LOS E	17.7	449.1				
East: WV 115															
Lane 1[d]	536	2.0	536	2.0	952	0.563	100	11.2	LOS B	5.0	127.2	Full	1000	0.0	0.0
Approach	536	2.0	536	2.0		0.563		11.2	LOS B	5.0	127.2				
North: Citizens Way															
Lane 1[d]	215	2.0	215	2.0	744	0.289	100	8.2	LOS A	1.3	32.6	Full	1600	0.0	0.0
Approach	215	2.0	215	2.0		0.289		8.2	LOS A	1.3	32.6				
West: WV 115															
Lane 1[d]	619	2.0	619	2.0	1000	0.620	100	12.1	LOS B	6.9	175.0	Full	1600	0.0	0.0
Approach	619	2.0	619	2.0		0.620		12.1	LOS B	6.9	175.0				
All Vehicles	2001	2.0	2001	2.0		0.936		21.4	LOS C	17.7	449.1				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	77	183	371	631	2.0	674	0.936	100	NA	NA
Approach	77	183	371	631	2.0		0.936			

East: WV 115

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	133	355	48	536	2.0	952	0.563	100	NA	NA
Approach	133	355	48	536	2.0		0.563			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	28	61	215	2.0	744	0.289	100	NA	NA
Approach	127	28	61	215	2.0		0.289			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	73	457	89	619	2.0	1000	0.620	100	NA	NA
Approach	73	457	89	619	2.0		0.620			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	2001	2.0	0.936

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

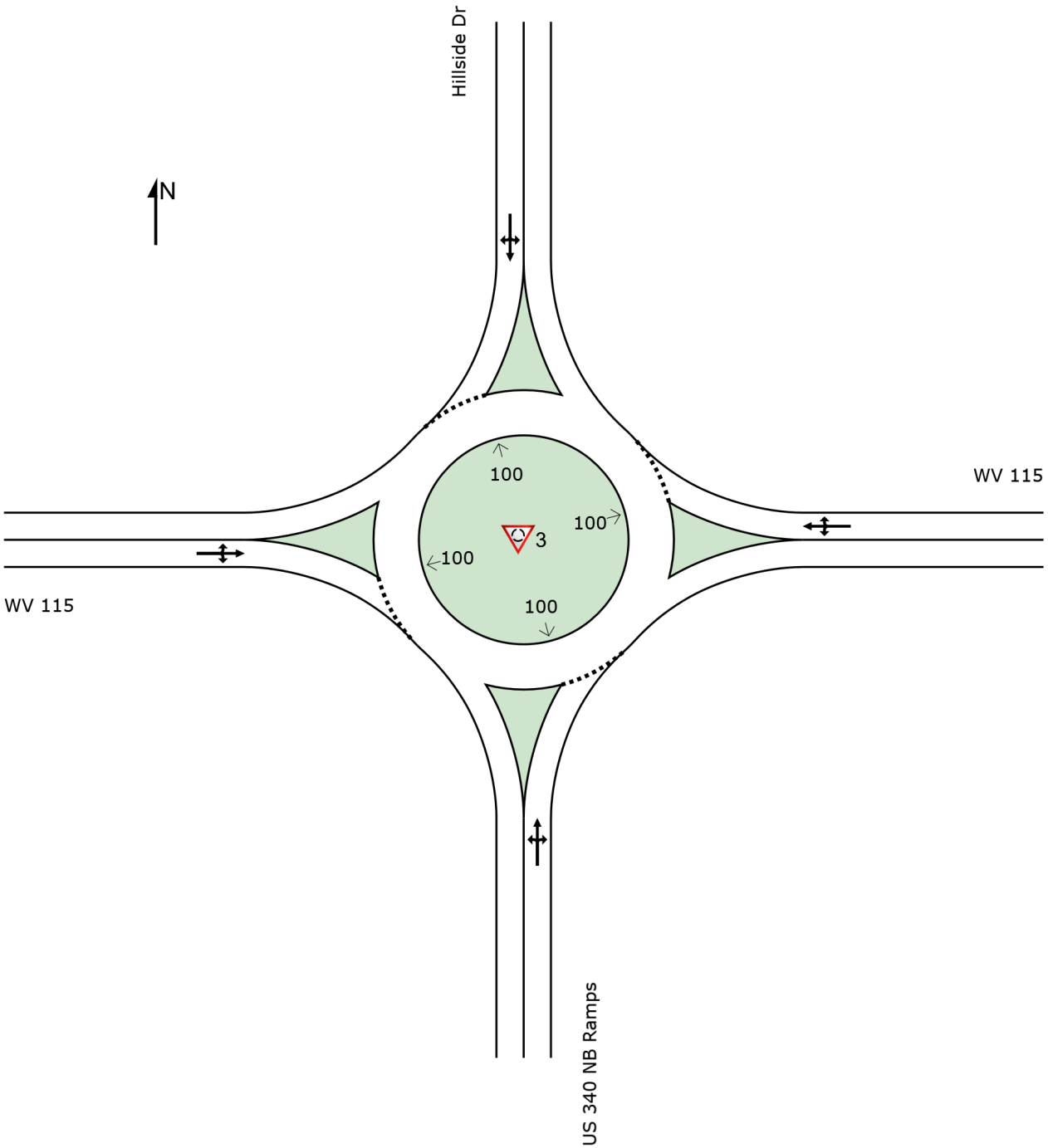
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 SB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Citizens Way				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Conditions)]

2029 Build PM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build PM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	23.6	23.6	mph
Travel Distance (Total)	veh-mi/h	1094.4	1313.2	pers-mi/h
Travel Time (Total)	veh-h/h	46.4	55.7	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.59		
Travel Time Index		5.44		
Congestion Coefficient		1.70		
Demand Flows (Total)	veh/h	2014	2417	pers/h
Arrival Flows (Total)	veh/h	2014		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.992		
Practical Spare Capacity	%	-14.4		
Effective Intersection Capacity	veh/h	2030		
Control Delay (Total)	veh-h/h	15.34	18.41	pers-h/h
Control Delay (Average)	sec	27.4	27.4	sec
Control Delay (Worst Lane by MC)	sec	43.2		
Control Delay (Worst Movement by MC)	sec	52.9	52.9	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	27.4		
Idling Time (Average)	sec	14.8		
Intersection Level of Service (LOS)		LOS D		
95% Back of Queue - Veh (Worst Lane)	veh	48.8		
95% Back of Queue - Dist (Worst Lane)	ft	1239.9		
Ave. Que Storage Ratio (Worst Lane)		0.31		
Effective Stops (Total)	veh/h	2455	2946	pers/h
Effective Stop Rate		1.22	1.22	
Proportion Queued		0.82	0.82	
Performance Index		192.5	192.5	
Cost (Total)	$/h	922.69	922.69	$/h
Fuel Consumption (Total)	gal/h	52.7		
Carbon Dioxide (Total)	kg/h	471.1		
Hydrocarbons (Total)	kg/h	0.045		
Carbon Monoxide (Total)	kg/h	0.55		
NOx (Total)	kg/h	0.572		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	966,783	1,160,139	pers/y
Delay (Total)	veh-h/y	7,362	8,835	pers-h/y
Effective Stops (Total)	veh/y	1,178,383	1,414,060	pers/y
Travel Distance (Total)	veh-mi/y	525,290	630,348	pers-mi/y
Travel Time (Total)	veh-h/y	22,274	26,729	pers-h/y
Cost (Total)	$/y	442,890	442,890	$/y
Fuel Consumption (Total)	gal/y	25,301		
Carbon Dioxide (Total)	kg/y	226,116		
Hydrocarbons (Total)	kg/y	21		
Carbon Monoxide (Total)	kg/y	263		
NOx (Total)	kg/y	275		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build PM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps															
Lane 1[d]	274	2.0	274	2.0	589	0.465	100	13.6	LOS B	2.5	62.5	Full	1600	0.0	0.0
Approach	274	2.0	274	2.0		0.465		13.6	LOS B	2.5	62.5				
East: WV 115															
Lane 1[d]	683	2.0	683	2.0	1132	0.603	100	10.6	LOS B	4.9	123.9	Full	1000	0.0	0.0
Approach	683	2.0	683	2.0		0.603		10.6	LOS B	4.9	123.9				
North: Hillside Dr															
Lane 1[d]	39	2.0	39	2.0	584	0.067	100	6.9	LOS A	0.2	6.2	Full	1600	0.0	0.0
Approach	39	2.0	39	2.0		0.067		6.9	LOS A	0.2	6.2				
West: WV 115															
Lane 1[d]	1018	2.0	1018	2.0	1026	0.992	100	43.2	LOS E	48.8	1239.9	Full	1600	0.0	0.0
Approach	1018	2.0	1018	2.0		0.992		43.2	LOS E	48.8	1239.9				
All Vehicles	2014	2.0	2014	2.0		0.992		27.4	LOS D	48.8	1239.9				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	112	13	149	274	2.0	589	0.465	100	NA	NA
Approach	112	13	149	274	2.0		0.465			

East: WV 115

Mov. From E	L2	T1	R2	Total	%HV	Cap.	Deg. Satn	Lane Util.	Prob. SL Ov.	Ov. Lane

To Exit:	S	W	N			veh/h	v/c	%	%	No.
Lane 1	248	432	3	683	2.0	1132	0.603	100	NA	NA
Approach	248	432	3	683	2.0		0.603			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	13	25	39	2.0	584	0.067	100	NA	NA
Approach	1	13	25	39	2.0		0.067			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	45	738	236	1018	2.0	1026	0.992	100	NA	NA
Approach	45	738	236	1018	2.0		0.992			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	2014	2.0	0.992

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 NB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Hillside Dr				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

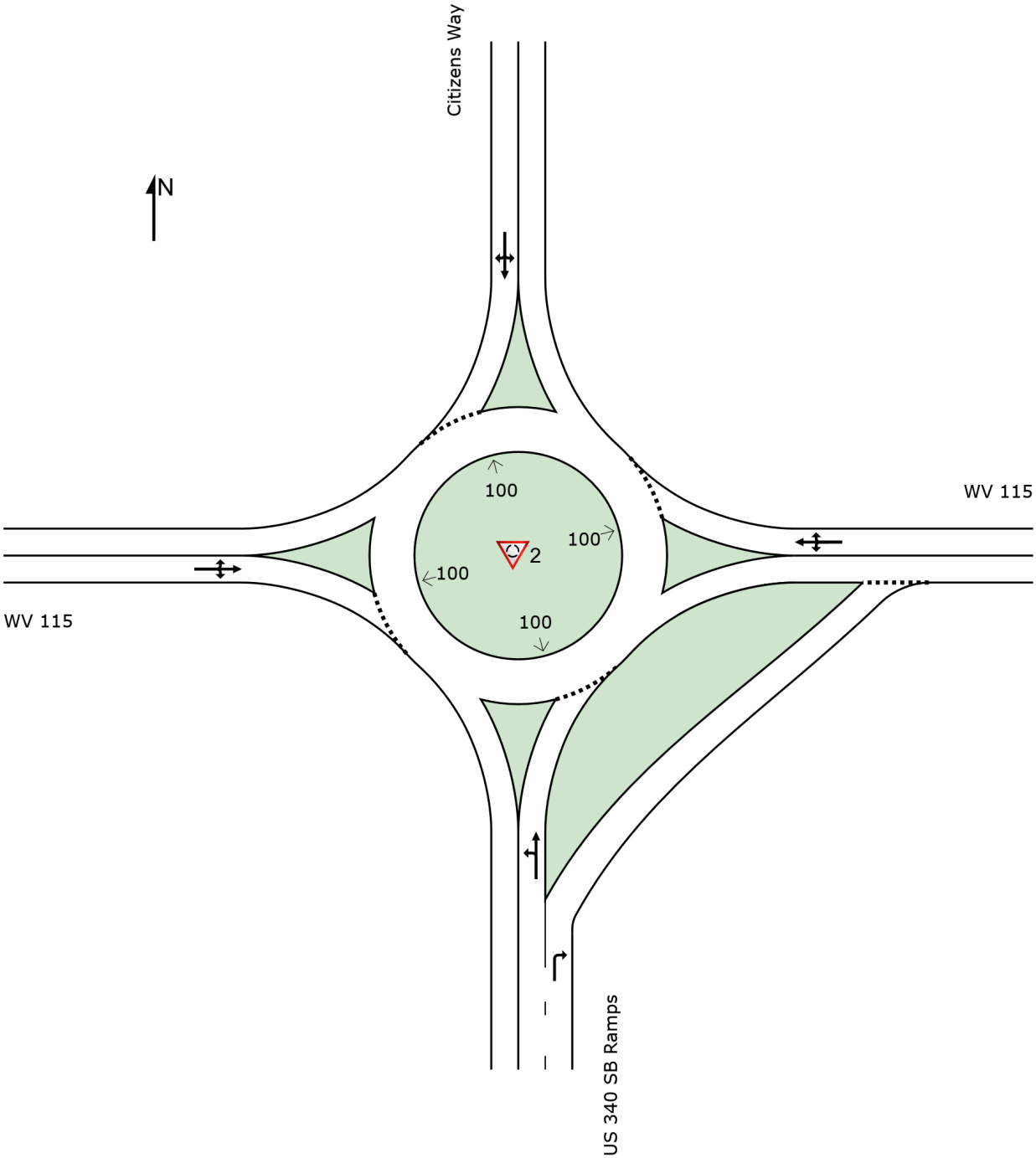
APPENDIX E-7: 2029 BUILD IMPROVED AM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Improved Conditions)]

2029 Build Improved AM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Improved Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build Improved AM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	29.3	29.3	mph
Travel Distance (Total)	veh-mi/h	942.3	1130.7	pers-mi/h
Travel Time (Total)	veh-h/h	32.2	38.6	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.73		
Travel Time Index		7.02		
Congestion Coefficient		1.37		
Demand Flows (Total)	veh/h	1726	2071	pers/h
Arrival Flows (Total)	veh/h	1726		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.593		
Practical Spare Capacity	%	43.5		
Effective Intersection Capacity	veh/h	2912		
Control Delay (Total)	veh-h/h	5.08	6.10	pers-h/h
Control Delay (Average)	sec	10.6	10.6	sec
Control Delay (Worst Lane by MC)	sec	13.2		
Control Delay (Worst Movement by MC)	sec	26.8	26.8	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	10.6		
Idling Time (Average)	sec	6.5		
Intersection Level of Service (LOS)		LOS B		
95% Back of Queue - Veh (Worst Lane)	veh	4.6		
95% Back of Queue - Dist (Worst Lane)	ft	116.3		
Ave. Que Storage Ratio (Worst Lane)		0.05		
Effective Stops (Total)	veh/h	920	1104	pers/h
Effective Stop Rate		0.53	0.53	
Proportion Queued		0.66	0.66	
Performance Index		63.5	63.5	
Cost (Total)	$/h	663.55	663.55	$/h
Fuel Consumption (Total)	gal/h	41.1		
Carbon Dioxide (Total)	kg/h	367.1		
Hydrocarbons (Total)	kg/h	0.033		
Carbon Monoxide (Total)	kg/h	0.45		
NOx (Total)	kg/h	0.440		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	828,279	993,935	pers/y
Delay (Total)	veh-h/y	2,440	2,928	pers-h/y
Effective Stops (Total)	veh/y	441,620	529,944	pers/y
Travel Distance (Total)	veh-mi/y	452,293	542,752	pers-mi/y
Travel Time (Total)	veh-h/y	15,446	18,535	pers-h/y
Cost (Total)	$/y	318,506	318,506	$/y
Fuel Consumption (Total)	gal/y	19,714		
Carbon Dioxide (Total)	kg/y	176,225		
Hydrocarbons (Total)	kg/y	16		
Carbon Monoxide (Total)	kg/y	215		
NOx (Total)	kg/y	211		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Improved Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build Improved AM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps															
Lane 1[d]	167	2.0	167	2.0	822	0.204	100	6.5	LOS A	0.8	20.6	Full	1600	0.0	0.0
Lane 2	158	2.0	158	2.0	776	0.204	100	6.8	LOS A	0.9	22.0	Full	1600	0.0	0.0
Approach	326	2.0	326	2.0		0.204		6.6	LOS A	0.9	22.0				
East: WV 115															
Lane 1[d]	653	2.0	653	2.0	1103	0.593	100	10.6	LOS B	4.6	116.3	Full	1000	0.0	0.0
Approach	653	2.0	653	2.0		0.593		10.6	LOS B	4.6	116.3				
North: Citizens Way															
Lane 1[d]	303	2.0	303	2.0	631	0.481	100	13.2	LOS B	2.8	70.7	Full	1600	0.0	0.0
Approach	303	2.0	303	2.0		0.481		13.2	LOS B	2.8	70.7				
West: WV 115															
Lane 1[d]	443	2.0	443	2.0	829	0.535	100	11.8	LOS B	4.1	105.1	Full	1600	0.0	0.0
Approach	443	2.0	443	2.0		0.535		11.8	LOS B	4.1	105.1				
All Vehicles	1726	2.0	1726	2.0		0.593		10.6	LOS B	4.6	116.3				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	90	78	-	167	2.0	822	0.204	100	NA	NA
Lane 2	-	-	158	158	2.0	776	0.204	100	NA	NA
Approach	90	78	158	326	2.0		0.204			
East: WV 115										

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	214	415	24	653	2.0	1103	0.593	100	NA	NA
Approach	214	415	24	653	2.0		0.593			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	201	48	55	303	2.0	631	0.481	100	NA	NA
Approach	201	48	55	303	2.0		0.481			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	27	323	93	443	2.0	829	0.535	100	NA	NA
Approach	27	323	93	443	2.0		0.535			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1726	2.0	0.593

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

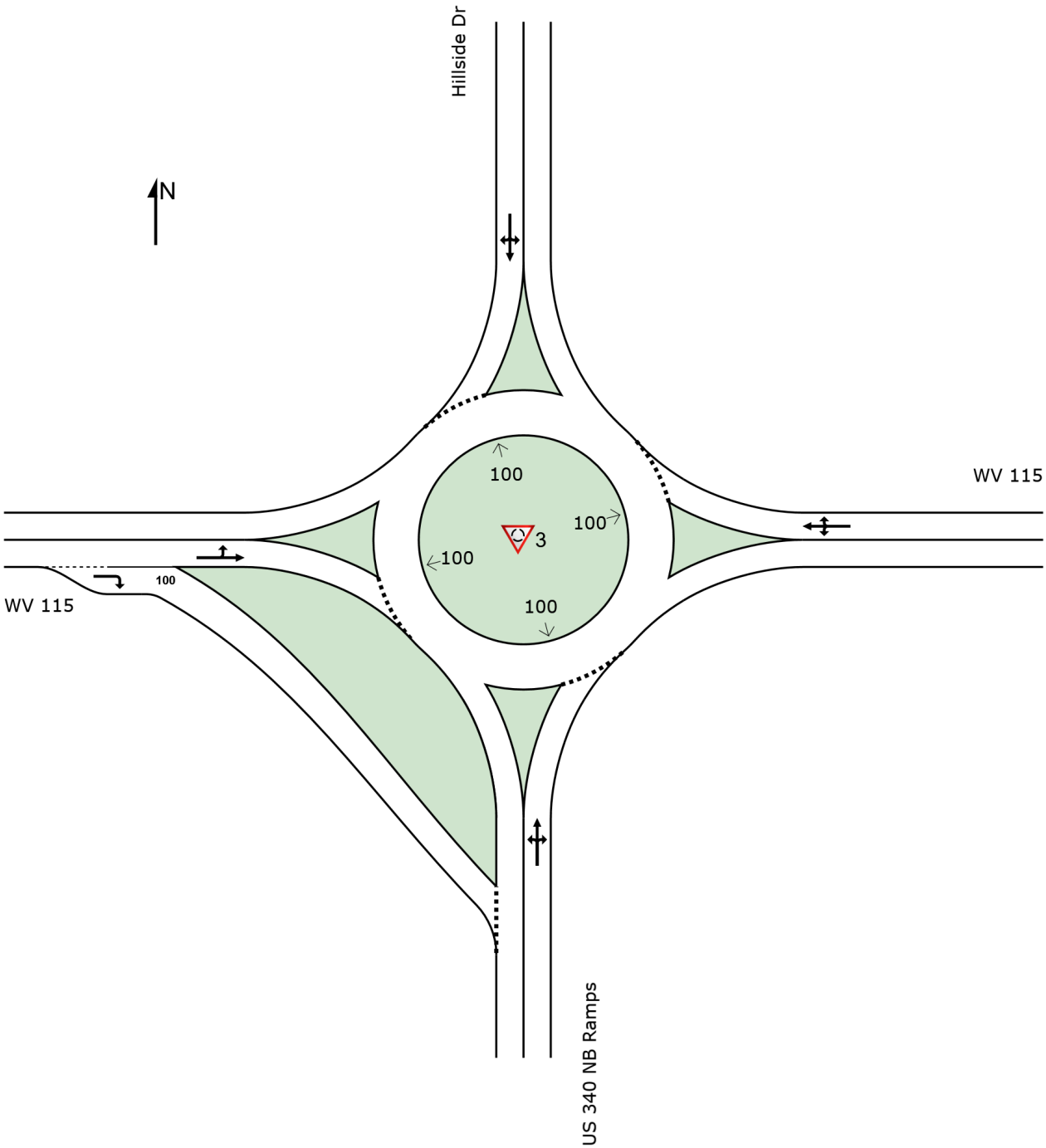
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 SB Ramps				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Citizens Way				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Improved Conditions)]

2029 Build Improved AM Peak
Site Category: Proposed Design 2
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Improved Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build Improved AM Peak
Site Category: Proposed Design 2
Roundabout

Intersection Performance - Hourly Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Travel Speed (Average)	mph	30.9	30.9	mph
Travel Distance (Total)	veh-mi/h	880.7	1056.9	pers-mi/h
Travel Time (Total)	veh-h/h	28.5	34.3	pers-h/h
Desired Speed	mph	40.0		
Speed Efficiency		0.77		
Travel Time Index		7.46		
Congestion Coefficient		1.30		
Demand Flows (Total)	veh/h	1602	1923	pers/h
Arrival Flows (Total)	veh/h	1602		
Percent Heavy Vehicles (Demand)	%	2.0		
Percent Heavy Vehicles (Arrivals)	%	2.0		
Degree of Saturation		0.625		
Practical Spare Capacity	%	36.0		
Effective Intersection Capacity	veh/h	2563		
Control Delay (Total)	veh-h/h	3.59	4.31	pers-h/h
Control Delay (Average)	sec	8.1	8.1	sec
Control Delay (Worst Lane by MC)	sec	9.7		
Control Delay (Worst Movement by MC)	sec	20.9	20.9	sec
Geometric Delay (Average)	sec	0.0		
Stop-Line Delay (Average)	sec	8.1		
Idling Time (Average)	sec	5.8		
Intersection Level of Service (LOS)		LOS A		
95% Back of Queue - Veh (Worst Lane)	veh	6.2		
95% Back of Queue - Dist (Worst Lane)	ft	156.8		
Ave. Que Storage Ratio (Worst Lane)		0.06		
Effective Stops (Total)	veh/h	392	471	pers/h
Effective Stop Rate		0.24	0.24	
Proportion Queued		0.45	0.45	
Performance Index		48.4	48.4	
Cost (Total)	$/h	587.58	587.58	$/h
Fuel Consumption (Total)	gal/h	36.2		
Carbon Dioxide (Total)	kg/h	324.0		
Hydrocarbons (Total)	kg/h	0.029		
Carbon Monoxide (Total)	kg/h	0.40		
NOx (Total)	kg/h	0.389		

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	769,055	922,866	pers/y
Delay (Total)	veh-h/y	1,725	2,070	pers-h/y
Effective Stops (Total)	veh/y	188,358	226,030	pers/y
Travel Distance (Total)	veh-mi/y	422,745	507,294	pers-mi/y
Travel Time (Total)	veh-h/y	13,701	16,442	pers-h/y
Cost (Total)	$/y	282,040	282,040	$/y
Fuel Consumption (Total)	gal/y	17,394		
Carbon Dioxide (Total)	kg/y	155,541		
Hydrocarbons (Total)	kg/y	14		
Carbon Monoxide (Total)	kg/y	193		
NOx (Total)	kg/y	187		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Improved Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build Improved AM Peak
Site Category: Proposed Design 2
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps															
Lane 1[d]	98	2.0	98	2.0	971	0.101	100	4.6	LOS A	0.4	10.8	Full	1600	0.0	0.0
Approach	98	2.0	98	2.0		0.101		4.6	LOS A	0.4	10.8				
East: WV 115															
Lane 1[d]	795	2.0	795	2.0	1271	0.625	100	9.7	LOS A	6.2	156.8	Full	1000	0.0	0.0
Approach	795	2.0	795	2.0		0.625		9.7	LOS A	6.2	156.8				
North: Hillside Dr															
Lane 1[d]	65	2.0	65	2.0	557	0.116	100	7.9	LOS A	0.4	11.0	Full	1600	0.0	0.0
Approach	65	2.0	65	2.0		0.116		7.9	LOS A	0.4	11.0				
West: WV 115															
Lane 1[d]	312	2.0	312	2.0	1061	0.294	100	6.2	LOS A	1.4	35.1	Full	1600	0.0	0.0
Lane 2	333	2.0	333	2.0	1004	0.332	100	7.0	LOS A	1.7	43.9	Short	100	0.0	NA
Approach	645	2.0	645	2.0		0.332		6.6	LOS A	1.7	43.9				
All Vehicles	1602	2.0	1602	2.0		0.625		8.1	LOS A	6.2	156.8				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	42	4	52	98	2.0	971	0.101	100	NA	NA
Approach	42	4	52	98	2.0		0.101			

East: WV 115

Mov.	L2	T1	R2	Total	%HV		Deg.	Lane	Prob.	Ov.

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	264	530	1	795	2.0	1271	0.625	100	NA	NA
Approach	264	530	1	795	2.0		0.625			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	2	19	44	65	2.0	557	0.116	100	NA	NA
Approach	2	19	44	65	2.0		0.116			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	14	298	-	312	2.0	1061	0.294	100	NA	NA
Lane 2	-	-	333	333	2.0	1004	0.332	100	0.0	1
Approach	14	298	333	645	2.0		0.332			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	1602	2.0	0.625

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 NB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Hillside Dr				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0

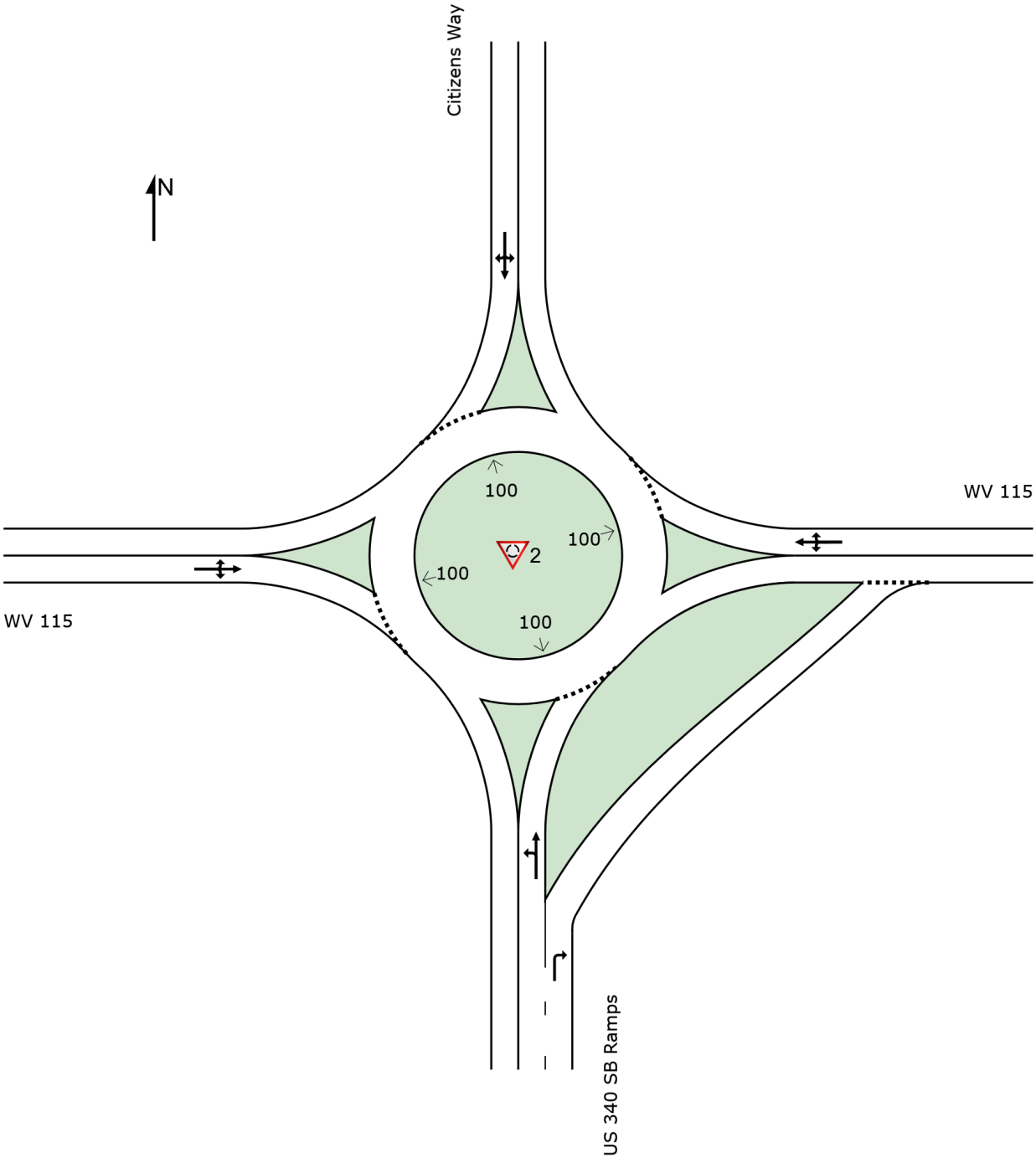
APPENDIX E-8: 2029 BUILD IMPROVED PM PEAK HOUR

SITE LAYOUT

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Improved Conditions)]

2029 Build Improved PM Peak
Site Category: Proposed Design 1
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Improved Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build Improved PM Peak
Site Category: Proposed Design 1
Roundabout

Intersection Performance - Hourly Values			
Performance Measure	**Vehicles:**	**All MCs**	**Persons**
Travel Speed (Average)	mph	29.4	29.4 mph
Travel Distance (Total)	veh-mi/h	1092.8	1311.4 pers-mi/h
Travel Time (Total)	veh-h/h	37.2	44.7 pers-h/h
Desired Speed	mph	40.0	
Speed Efficiency		0.73	
Travel Time Index		7.04	
Congestion Coefficient		1.36	
Demand Flows (Total)	veh/h	2001	2401 pers/h
Arrival Flows (Total)	veh/h	2001	
Percent Heavy Vehicles (Demand)	%	2.0	
Percent Heavy Vehicles (Arrivals)	%	2.0	
Degree of Saturation		0.620	
Practical Spare Capacity	%	37.2	
Effective Intersection Capacity	veh/h	3229	
Control Delay (Total)	veh-h/h	6.18	7.42 pers-h/h
Control Delay (Average)	sec	11.1	11.1 sec
Control Delay (Worst Lane by MC)	sec	12.4	
Control Delay (Worst Movement by MC)	sec	23.7	23.7 sec
Geometric Delay (Average)	sec	0.0	
Stop-Line Delay (Average)	sec	11.1	
Idling Time (Average)	sec	6.1	
Intersection Level of Service (LOS)		LOS B	
95% Back of Queue - Veh (Worst Lane)	veh	6.9	
95% Back of Queue - Dist (Worst Lane)	ft	175.0	
Ave. Que Storage Ratio (Worst Lane)		0.05	
Effective Stops (Total)	veh/h	1225	1470 pers/h
Effective Stop Rate		0.61	0.61
Proportion Queued		0.70	0.70
Performance Index		77.5	77.5
Cost (Total)	$/h	766.45	766.45 $/h
Fuel Consumption (Total)	gal/h	47.3	
Carbon Dioxide (Total)	kg/h	422.8	
Hydrocarbons (Total)	kg/h	0.039	
Carbon Monoxide (Total)	kg/h	0.52	
NOx (Total)	kg/h	0.511	

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	960,490	1,152,588	pers/y
Delay (Total)	veh-h/y	2,967	3,560	pers-h/y
Effective Stops (Total)	veh/y	588,095	705,714	pers/y
Travel Distance (Total)	veh-mi/y	524,559	629,470	pers-mi/y
Travel Time (Total)	veh-h/y	17,866	21,439	pers-h/y
Cost (Total)	$/y	367,894	367,894	$/y
Fuel Consumption (Total)	gal/y	22,706		
Carbon Dioxide (Total)	kg/y	202,961		
Hydrocarbons (Total)	kg/y	18		
Carbon Monoxide (Total)	kg/y	248		
NOx (Total)	kg/y	245		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 2 [WV 115 w US 340 SB/Citizens Way (Site Folder: 2029 Build Improved Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build Improved PM Peak
Site Category: Proposed Design 1
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 SB Ramps															
Lane 1[d]	259	2.0	259	2.0	742	0.349	100	9.1	LOS A	1.6	39.8	Full	1600	0.0	0.0
Lane 2	371	2.0	371	2.0	729	0.510	100	12.4	LOS B	3.4	86.4	Full	1600	0.0	0.0
Approach	631	2.0	631	2.0		0.510		11.1	LOS B	3.4	86.4				
East: WV 115															
Lane 1[d]	536	2.0	536	2.0	952	0.563	100	11.2	LOS B	5.0	128.1	Full	1000	0.0	0.0
Approach	536	2.0	536	2.0		0.563		11.2	LOS B	5.0	128.1				
North: Citizens Way															
Lane 1[d]	215	2.0	215	2.0	744	0.289	100	8.2	LOS A	1.3	32.6	Full	1600	0.0	0.0
Approach	215	2.0	215	2.0		0.289		8.2	LOS A	1.3	32.6				
West: WV 115															
Lane 1[d]	619	2.0	619	2.0	1000	0.620	100	12.1	LOS B	6.9	175.0	Full	1600	0.0	0.0
Approach	619	2.0	619	2.0		0.620		12.1	LOS B	6.9	175.0				
All Vehicles	2001	2.0	2001	2.0		0.620		11.1	LOS B	6.9	175.0				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 SB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	77	183	-	259	2.0	742	0.349	100	NA	NA
Lane 2	-	-	371	371	2.0	729	0.510	100	NA	NA
Approach	77	183	371	631	2.0		0.510			
East: WV 115										

Mov. From E To Exit:	L2 S	T1 W	R2 N	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	133	355	48	536	2.0	952	0.563	100	NA	NA
Approach	133	355	48	536	2.0		0.563			
North: Citizens Way										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	127	28	61	215	2.0	744	0.289	100	NA	NA
Approach	127	28	61	215	2.0		0.289			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	73	457	89	619	2.0	1000	0.620	100	NA	NA
Approach	73	457	89	619	2.0		0.620			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	2001	2.0	0.620

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	Opposing Flow Rate pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

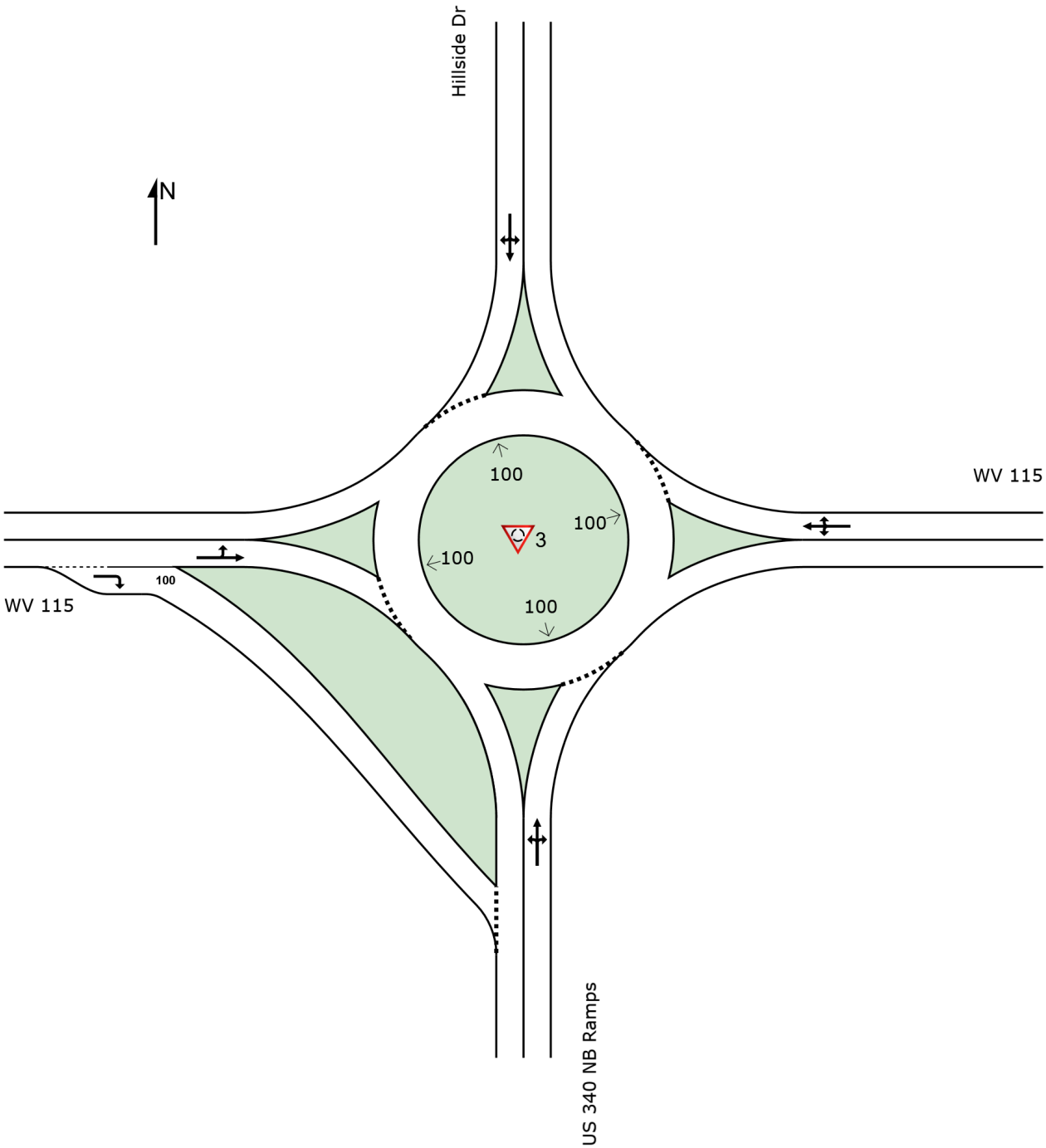
	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 SB Ramps				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Citizens Way				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0

SITE LAYOUT

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Improved Conditions)]

2029 Build Improved PM Peak
Site Category: Proposed Design 2
Roundabout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



INTERSECTION SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Improved Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build Improved PM Peak
Site Category: Proposed Design 2
Roundabout

Intersection Performance - Hourly Values			
Performance Measure	**Vehicles:**	**All MCs**	**Persons**
Travel Speed (Average)	mph	29.0	29.0 mph
Travel Distance (Total)	veh-mi/h	1094.4	1313.2 pers-mi/h
Travel Time (Total)	veh-h/h	37.7	45.3 pers-h/h
Desired Speed	mph	40.0	
Speed Efficiency		0.73	
Travel Time Index		6.95	
Congestion Coefficient		1.38	
Demand Flows (Total)	veh/h	2014	2417 pers/h
Arrival Flows (Total)	veh/h	2014	
Percent Heavy Vehicles (Demand)	%	2.0	
Percent Heavy Vehicles (Arrivals)	%	2.0	
Degree of Saturation		0.721	
Practical Spare Capacity	%	17.8	
Effective Intersection Capacity	veh/h	2792	
Control Delay (Total)	veh-h/h	6.66	7.99 pers-h/h
Control Delay (Average)	sec	11.9	11.9 sec
Control Delay (Worst Lane by MC)	sec	14.6	
Control Delay (Worst Movement by MC)	sec	28.5	28.5 sec
Geometric Delay (Average)	sec	0.0	
Stop-Line Delay (Average)	sec	11.9	
Idling Time (Average)	sec	6.7	
Intersection Level of Service (LOS)		LOS B	
95% Back of Queue - Veh (Worst Lane)	veh	11.8	
95% Back of Queue - Dist (Worst Lane)	ft	298.6	
Ave. Que Storage Ratio (Worst Lane)		0.08	
Effective Stops (Total)	veh/h	1092	1310 pers/h
Effective Stop Rate		0.54	0.54
Proportion Queued		0.68	0.68
Performance Index		78.3	78.3
Cost (Total)	$/h	774.31	774.31 $/h
Fuel Consumption (Total)	gal/h	47.5	
Carbon Dioxide (Total)	kg/h	424.4	
Hydrocarbons (Total)	kg/h	0.039	
Carbon Monoxide (Total)	kg/h	0.52	
NOx (Total)	kg/h	0.514	

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Intersection LOS value for Vehicles is based on average delay for all vehicle movements.
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand effects.
In Network analysis, Arrival Flows will be reduced if Upstream Capacity Constraint exists.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
Site Model Variability Index (Average value of largest changes in Lane Degrees of Saturation from the third to the last Main (Timing-Capacity) Iterations): 0.0 %
Number of Iterations: 3 (Maximum: 10)
Largest change in Lane Degrees of Saturation for the last three Flow-Capacity Iterations: 100.0% 0.0% 0.0%

Intersection Performance - Annual Values				
Performance Measure	**Vehicles:**	**All MCs**	**Persons**	
Demand Flows (Total)	veh/y	966,783	1,160,139	pers/y
Delay (Total)	veh-h/y	3,196	3,836	pers-h/y
Effective Stops (Total)	veh/y	524,104	628,924	pers/y
Travel Distance (Total)	veh-mi/y	525,289	630,347	pers-mi/y
Travel Time (Total)	veh-h/y	18,106	21,727	pers-h/y
Cost (Total)	$/y	371,669	371,669	$/y
Fuel Consumption (Total)	gal/y	22,788		
Carbon Dioxide (Total)	kg/y	203,706		
Hydrocarbons (Total)	kg/y	19		
Carbon Monoxide (Total)	kg/y	248		
NOx (Total)	kg/y	247		

1 Hours per Year: 480 (Site)

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LANE SUMMARY

Site: 3 [WV 115 w US 340 NB/Hillside Drive (Site Folder: 2029 Build Improved Conditions)]

Output produced by SIDRA INTERSECTION Version: 9.1.3.210

2029 Build Improved PM Peak
Site Category: Proposed Design 2
Roundabout

Lane Use and Performance

	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh	Dist] ft	Lane Config	Lane Length ft	Cap. Adj. %	Prob. Block. %
South: US 340 NB Ramps															
Lane 1[d]	274	2.0	274	2.0	589	0.465	100	13.6	LOS B	2.5	63.3	Full	1600	0.0	0.0
Approach	274	2.0	274	2.0		0.465		13.6	LOS B	2.5	63.3				
East: WV 115															
Lane 1[d]	683	2.0	683	2.0	1132	0.603	100	10.6	LOS B	4.9	123.9	Full	1000	0.0	0.0
Approach	683	2.0	683	2.0		0.603		10.6	LOS B	4.9	123.9				
North: Hillside Dr															
Lane 1[d]	39	2.0	39	2.0	584	0.067	100	6.9	LOS A	0.2	6.2	Full	1600	0.0	0.0
Approach	39	2.0	39	2.0		0.067		6.9	LOS A	0.2	6.2				
West: WV 115															
Lane 1[d]	783	2.0	783	2.0	1085	0.721	100	14.6	LOS B	11.8	298.6	Full	1600	0.0	0.0
Lane 2	236	2.0	236	2.0	1027	0.230	100	5.7	LOS A	1.1	27.8	Short	100	0.0	NA
Approach	1018	2.0	1018	2.0		0.721		12.5	LOS B	11.8	298.6				
All Vehicles	2014	2.0	2014	2.0		0.721		11.9	LOS B	11.8	298.6				

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Roundabout LOS Method: Same as Sign Control.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > 1 irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
Delay Model: HCM Delay Formula (Stopline Delay: Geometric Delay is not included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Gap.
Gap-Acceptance Capacity Formula: Siegloch M1 implied by US HCM 6 Roundabout Capacity Model.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

d Dominant lane on roundabout approach

Approach Lane Flows (veh/h)

South: US 340 NB Ramps

Mov. From S To Exit:	L2 W	T1 N	R2 E	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	112	13	149	274	2.0	589	0.465	100	NA	NA
Approach	112	13	149	274	2.0		0.465			

East: WV 115

Mov.	L2	T1	R2	Total	%HV	Deg.	Lane	Prob.	Ov.

From E To Exit:	S	W	N			Cap. veh/h	Satn v/c	Util. %	SL Ov. %	Lane No.
Lane 1	248	432	3	683	2.0	1132	0.603	100	NA	NA
Approach	248	432	3	683	2.0		0.603			
North: Hillside Dr										
Mov. From N To Exit:	L2 E	T1 S	R2 W	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	1	13	25	39	2.0	584	0.067	100	NA	NA
Approach	1	13	25	39	2.0		0.067			
West: WV 115										
Mov. From W To Exit:	L2 N	T1 E	R2 S	Total	%HV	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Prob. SL Ov. %	Ov. Lane No.
Lane 1	45	738	-	783	2.0	1085	0.721	100	NA	NA
Lane 2	-	-	236	236	2.0	1027	0.230	100	0.0	1
Approach	45	738	236	1018	2.0		0.721			

	Total	%HV	Deg.Satn (v/c)
All Vehicles	2014	2.0	0.721

Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

Merge Analysis

	Exit Lane Number	Short Lane Length ft	Percent Opng in Lane %	Opposing Flow Rate veh/h	 pcu/h	Critical Gap sec	Follow-up Headway sec	Lane Flow Rate veh/h	Capacity veh/h	Deg. Satn v/c	Min. Delay sec	Merge Delay sec
There are no Exit Short Lanes for Merge Analysis at this Site.												

Variable Demand Analysis

	Initial Queued Demand veh	Residual Queued Demand veh	Time for Residual Demand to Clear sec	Duration of Oversatn sec
South: US 340 NB Ramps				
Lane 1	0.0	0.0	0.0	0.0
East: WV 115				
Lane 1	0.0	0.0	0.0	0.0
North: Hillside Dr				
Lane 1	0.0	0.0	0.0	0.0
West: WV 115				
Lane 1	0.0	0.0	0.0	0.0
Lane 2	0.0	0.0	0.0	0.0

APPENDIX F: ADJACENT DEVELOPMENTS

APPENDIX F-1: TATE MANOR TIS

Tate Manor Traffic Impact Study
Jefferson County, WV

AMT Project File 19-0073.001 | December 19, 2019 **REVISED**

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EXECUTIVE SUMMARY

This report summarizes the existing and future traffic analyses conducted in support of the proposed Tate Manor residential development. The proposed residential development will be located along the east side of Jefferson Avenue (CR 34) and north of Crescent Drive/High Street in Charles Town, Jefferson County. Site access is proposed to Jefferson Avenue, Belvedere Farm Lane, and an extension of Belvedere Drive from Crescent Drive. The proposed site includes 80 townhomes and is expected to be completed by 2024.

The site is proposed to be served by three site driveways – one full-movement connection to Jefferson Avenue, one full-movement connection to Belvedere Farm Lane, and one full-movement connection via extension of Belvedere Drive via Crescent Drive. The proposed site driveways are assumed to operate under stop-control.

The traffic analysis will consider future conditions at the anticipated build-out year of 2024. This report summarizes the analyses of 2019 Existing conditions, 2024 No-Build conditions (without the proposed development in place), and 2024 Build conditions (with the proposed development in place) during the weekday AM and PM peak hours. Traffic generated by the pending Magnolia Springs development is included in the No Build and Build Conditions analysis. The annual growth rate was provided by WVDOH at a compounded rate of 1.31% per year.

AMT (A. Morton Thomas and Associates, Inc.) was retained to determine the potential traffic impacts of the proposed residential development in accordance with the guidelines set forth by the WVDOH (Division of Highways) in Traffic Engineering Directive (TED) 106-2. The intention of the study is to fully examine the impacts of the traffic generated by the residential development on the existing transportation system and identify potential mitigation measures. This report presents trip generation, trip distribution, intersection capacity analysis, queuing analysis, auxiliary lane analysis, signal warrant analysis, and recommendations for transportation improvements required to meet anticipated traffic demands.

Based upon a review of the site plan and adjacent transportation network, the following seven (7) existing and one (1) proposed site driveway intersections are included within the scope of the Traffic Impact Study (TIS) for the proposed Tate Manor residential development:

1) Jefferson Avenue (CR 34) with Euclid Avenue *(Two-way Stop-Control Three-legged intersection)*
2) Euclid Avenue with Belvedere Farm Lane *(Two-way Stop-Control Three-legged intersection)*
3) Jefferson Avenue (CR 34) with High Street *(Two-way Stop-Control Three-legged intersection)*
4) Crescent Drive with Belvedere Drive *(Two-way Stop-Control Three-legged intersection)*
5) WV 115 with Jefferson Avenue (CR 34) *(Two-way Stop-Control Three-legged intersection)*
6) WV 115 with Citizens Way/US 340 *(Single-lane Roundabout Four-legged intersection)*
7) WV 115 with Hillside Drive/US 340 *(Two-way Stop-Control Four-legged intersection)*
8) Jefferson Avenue (CR 34) with Site Driveway #1 *(Proposed Two-way Stop-Control Three-legged intersection)*

The existing Two-way Stop-Control Three-legged intersection of Belvedere Drive with Crescent Drive will be the location of one of the three proposed site driveways. This site driveway will be located in line with Belvedere Drive on the north side of Crescent Drive and will create a fourth leg to the intersection. The

site driveway will be an extension of Belvedere Drive and will operate under stop control. Additional site access will be provided via direct access to Jefferson Avenue and extension of Belvedere Farm Lane, which connects to Euclid Avenue.

Hale Road currently dead ends prior to connection with Crescent Drive just west of Belvedere Drive, and there are no plans to connect these two streets. No traffic from Tate Manor will enter Jefferson Avenue via Hale Road and High Street, which avoids conflict with traffic from Charles Town Middle School.

Site Trip Generation and Distribution

The proposed Tate Manor residential development will include 80 townhomes. The trip generation "Peak Hour of Generator" rates from the ITE Trip Generation Manual, 10th Edition, were utilized for Multifamily Housing (LUC 220). The trip generation analysis indicates that a total of 564 new daily trips will be generated, which includes 39 new AM peak hour trips, and 48 new PM peak hour trips.

The AM and PM peak hour site generated trips to/from the proposed site were distributed based upon interpolation from current traffic patterns. The distribution of the new external trips are as follows:

- 35% to/from the north on US 340
- 10% to/from the south on US 340
- 5% to/from the west on WV 115
- 35% to/from the north on Jefferson Avenue (CR 34)
- 15% to/from the north on Euclid Avenue

2019 Existing Conditions Analysis

The capacity analysis indicates the westbound approach of Euclid Avenue to Jefferson Avenue (CR 34) currently operates at Level of Service (LOS) B during both the AM and PM peak hours with stop control. The southbound approach of Jefferson Avenue currently operates at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue operates as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Farm Lane approach to Euclid Avenue currently operates at LOS A during both the AM and PM peak hour with stop control. The westbound Euclid Avenue approach to Belvedere Farm Lane currently operates at LOS A during both the AM and PM peak hours. The eastbound approach of Euclid Avenue operates as free-flow traveling unimpeded through the intersection.

Analysis indicates that the westbound approach of High Street to Jefferson Avenue currently operates at LOS C during the AM peak hour and LOS B during the PM peak hour with stop control. The southbound approach of Jefferson Avenue currently operates at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue operates as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Drive approach to Crescent Drive currently operates at LOS A during both the AM and PM peak hours with stop control. The westbound Crescent Drive approach to Belvedere Drive currently operates at LOS A during both the AM and PM peak hours. The eastbound approach of Crescent Drive operates as free-flow traveling unimpeded through the

intersection. Hale Road currently dead ends prior to connection with Crescent Drive just west of Belvedere Drive, and there are no plans to connect these two streets.

Additional analysis indicates that the southbound Jefferson Avenue approach to WV 115 currently operates at LOS C during the AM peak hour and LOS E during the PM peak hour with stop control. The eastbound WV 115 approach to Jefferson Avenue currently operates at LOS A during both the AM and PM peak hours. The westbound approach of WV 115 operates as free-flow traveling unimpeded through the intersection.

The intersection of WV 115 with Citizens Way and the US 340 Southbound Ramps was recently modified to a four-legged roundabout. Analysis indicates that the eastbound WV 115 approach to Citizens Way currently operates at LOS A during both the AM and PM peak hours. The westbound WV 115 approach to Citizens Way currently operates at LOS A during both the AM and PM peak hours. The northbound US 340 ramps approach to WV 115 currently operates at LOS A during the AM peak hour and LOS B during the PM peak hour. The southbound Citizens Way approach to WV 115 currently operates at LOS A during both the AM and PM peak hours.

Further analysis indicates that the left turn movement on the eastbound WV 115 approach to Hillside Drive and the US 340 Northbound ramps currently operates at LOS A during both the AM and PM peak hours. The eastbound through movement travels uninhibited through the intersection. The left turn movement on the westbound WV 115 approach to Hillside Drive and the US 340 Northbound ramps currently operates at LOS A during both the AM and PM peak hours. The westbound through movement travels uninhibited through the intersection. The US 340 Northbound Ramps approach currently operates at LOS D during the AM peak hour and LOS F during the PM peak hour. The southbound Hillside Drive approach currently operates at LOS C during the AM peak hour and LOS D during the PM peak hour.

2024 No-Build Conditions Analysis

The 2024 No Build Conditions include the existing 2019 traffic volume, anticipated annual traffic growth to 2024, and the traffic anticipated to be generated by the Magnolia Springs development.

The capacity analysis indicates the westbound approach of Euclid Avenue to Jefferson Avenue (CR 34) will continue to operate at LOS B during both the AM and PM peak hours with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Farm Lane approach to Euclid Avenue will continue to operate at LOS A during both the AM and PM peak hour with stop control. The westbound Euclid Avenue approach to Belvedere Farm Lane will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Euclid Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Analysis indicates that the westbound approach of High Street to Jefferson Avenue is expected to operate at LOS D during the AM peak hour and LOS B during the PM peak hour with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Drive approach to Crescent Drive will continue to operate at LOS A during both the AM and PM peak hours with stop control. The westbound Crescent Drive approach to Belvedere Drive will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Crescent Drive will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the southbound Jefferson Avenue approach to WV 115 is expected to operate at LOS C during the AM peak hour and LOS F during the PM peak hour with stop control in the No Build Condition. The eastbound WV 115 approach to Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The westbound approach of WV 115 will continue to operate as free-flow traveling unimpeded through the intersection. The intersection can be improved to LOS A during the AM and PM peak hours considering No Build conditions if a traffic signal is installed prior to 2024.

The intersection of WV 115 with Citizens Way and the US 340 Southbound Ramps was recently modified to a four-legged single lane roundabout. Analysis indicates that the eastbound WV 115 approach to Citizens Way is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Citizens Way is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during the AM peak hour and LOS D during the PM peak hour. The southbound Citizens Way approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours. The LOS of the US 340 southbound ramp approach can be improved to LOS B in the PM peak hour considering Build conditions if a right turn slip is constructed.

The intersection of WV 115 with Hillside Drive and the US 340 Northbound Ramps is anticipated to be modified to a four-legged single lane roundabout to mirror the newly constructed roundabout at WV 115 with Citizens Drive by 2024. For this traffic study, it was assumed the roundabout would be constructed by 2024 and thus included in the No-Build and Build Conditions. Analysis indicates that the eastbound WV 115 approach to Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Hillside Drive is expected to operate at LOS A during both the AM and PM peak hours. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The southbound Hillside Drive approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours.

2024 Build Conditions Analysis

The 2024 Build Conditions include the existing 2019 traffic volume, anticipated annual traffic growth to 2024, traffic anticipated to be generated by the Magnolia Springs development, and the traffic generated by the Tate Manor development.

The capacity analysis indicates the westbound approach of Euclid Avenue to Jefferson Avenue will continue to operate at LOS B during both the AM and PM peak hours with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Farm Lane approach to Euclid Avenue will continue to operate at LOS A during both the AM and PM peak hour with stop control. The westbound

Euclid Avenue approach to Belvedere Farm Lane will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Euclid Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Analysis indicates that the westbound approach of High Street to Jefferson Avenue will continue to operate at LOS D during the AM peak hour and LOS B during the PM peak hour with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection. Hale Road currently dead ends prior to connection with Crescent Drive just west of Belvedere Drive, and there are no plans to connect these two streets. No traffic from Tate Manor will enter Jefferson Avenue via Hale Road and High Street, which avoids conflict with traffic from Charles Town Middle School.

Additional analysis indicates that the northbound Belvedere Drive approach to Crescent Drive will continue to operate at LOS A during both the AM and PM peak hours with stop control. The proposed southbound Belvedere Drive approach to Crescent Drive is expected to operate at LOS A during both the AM and PM peak hours with stop control. The westbound Crescent Drive approach to Belvedere Drive will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Crescent Drive will continue to operate as free-flow traveling unimpeded through the intersection. Crescent Drive dead ends immediately west of Belvedere Drive.

Additional analysis indicates that the southbound Jefferson Avenue approach to WV 115 is expected to operate at LOS D during the AM peak hour and LOS F during the PM peak hour with stop control. The eastbound WV 115 approach to Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The westbound approach of WV 115 will continue to operate as free-flow traveling unimpeded through the intersection. The intersection can be improved to LOS A during the AM and PM peak hours considering Build conditions if a traffic signal is installed prior to 2024.

The intersection of WV 115 with Citizens Way and the US 340 Southbound Ramps was recently modified to a four-legged single lane roundabout. Analysis indicates that the eastbound WV 115 approach to Citizens Way will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Citizens Way will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The northbound US 340 ramps approach to WV 115 will continue to operate at LOS A during the AM peak hour and LOS D during the PM peak hour. The southbound Citizens Way approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours. The LOS of the US 340 southbound ramp approach can be improved to LOS B in the PM peak hour considering No Build conditions if a right turn slip lane is constructed.

The intersection of WV 115 with Hillside Drive and the US 340 Northbound Ramps is anticipated to be modified to a four-legged single lane roundabout to mirror the newly constructed roundabout at WV 115 with Citizens Drive. For this traffic study, it was assumed the roundabout would be constructed by 2024 and thus included in the No-Build and Build Conditions. Analysis indicates that the eastbound WV 115 approach to Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Hillside Drive is expected to operate at LOS A during both the AM and PM peak hours. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The southbound Hillside Drive approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours.

Further analysis indicates that the westbound Site Drive #1 approach is expected to operate at LOS B during both the AM and PM peak hours with stop control. The southbound Jefferson Avenue approach is expected to operate at LOS A during both the AM and PM peak hours. The northbound Jefferson Avenue approach is expected to operate as free-flow traveling unimpeded through the intersection.

2024 Build Conditions Analysis

The 2024 Build Conditions include the existing 2019 traffic volume, anticipated annual traffic growth to 2024, traffic anticipated to be generated by the Magnolia Springs development, and the traffic generated by the Tate Manor development.

The 2024 Build Improved Conditions also includes a number of proposed roadway improvements that are to mitigate capacity issues along the existing transportation network. These are proposed to mitigate existing issues and not as a result of the proposed Tate Manor residential development. These improvements include, installing a traffic signal at the WV 115 with Jefferson Avenue intersection, constructing an exclusive left-turn lane on the eastbound WV 115 approach to Jefferson Avenue, and constructing an exclusive right-turn slip lane on the US 340 southbound exit ramp approach to WV 115.

The capacity analysis indicates the westbound approach of Euclid Avenue to Jefferson Avenue will continue to operate at LOS B during both the AM and PM peak hours with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection.

Additional analysis indicates that the northbound Belvedere Farm Lane approach to Euclid Avenue will continue to operate at LOS A during both the AM and PM peak hour with stop control. The westbound Euclid Avenue approach to Belvedere Farm Lane will continue to operate at LOS A during both the AM and PM peak hours with stop control. The eastbound approach of Euclid Avenue will continue to operate at LOS A during both the AM and PM peak hours with stop control. This intersection is proposed to be modified to an All-Way Stop-Control intersection with the completion of the proposed Magnolia Springs development.

Analysis indicates that the westbound approach of High Street to Jefferson Avenue will continue to operate at LOS D during the AM peak hour and LOS B during the PM peak hour with stop control. The southbound approach of Jefferson Avenue will continue to operate at LOS A during both the AM and PM peak hours. The northbound approach of Jefferson Avenue will continue to operate as free-flow traveling unimpeded through the intersection. Hale Road currently dead ends prior to connection with Crescent Drive just west of Belvedere Drive, and there are no plans to connect these two streets. No traffic from Tate Manor will enter Jefferson Avenue via Hale Road and High Street, which avoids conflict with traffic from Charles Town Middle School.

Additional analysis indicates that the northbound Belvedere Drive approach to Crescent Drive will continue to operate at LOS A during both the AM and PM peak hours with stop control. The proposed southbound Belvedere Drive approach to Crescent Drive is expected to operate at LOS A during both the AM and PM peak hours with stop control. The westbound Crescent Drive approach to Belvedere Drive will continue to operate at LOS A during both the AM and PM peak hours. The eastbound approach of Crescent Drive will continue to operate as free-flow traveling unimpeded through the intersection. Crescent Drive dead ends immediately west of Belvedere Drive.

The intersection is proposed to be modified to a signalized intersection with the addition of an exclusive left-turn lane on the eastbound WV 115 approach. Analysis indicates that the southbound Jefferson Avenue approach to WV 115 is expected to operate at LOS B during both the AM and PM peak hours with traffic-signal control. The eastbound WV 115 approach to Jefferson Avenue is expected to operate at LOS A during both the AM and PM peak hours with traffic-signal control. The westbound approach of WV 115 is expected to operate at LOS A during both the AM and PM peak hours with traffic-signal control. The overall intersection is expected to operate at LOS A during both the AM and PM peak hours.

The intersection of WV 115 with Citizens Way and the US 340 Southbound Ramps was recently modified to a four-legged single lane roundabout. Analysis indicates that the eastbound WV 115 approach to Citizens Way will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Citizens Way will continue to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours with the addition of a right-turn slip lane. The southbound Citizens Way approach to WV 115 will continue to operate at LOS A during both the AM and PM peak hours.

The intersection of WV 115 with Hillside Drive and the US 340 Northbound Ramps is anticipated to be modified to a four-legged single lane roundabout to mirror the newly constructed roundabout at WV 115 with Citizens Drive. For this traffic study, it was assumed the roundabout would be constructed by 2024 and thus included in the No-Build and Build Conditions. Analysis indicates that the eastbound WV 115 approach to Hillside Drive is expected to operate at LOS A during the AM peak hour and LOS B during the PM peak hour. The westbound WV 115 approach to Hillside Drive is expected to operate at LOS A during both the AM and PM peak hours. The northbound US 340 ramps approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours. The southbound Hillside Drive approach to WV 115 is expected to operate at LOS A during both the AM and PM peak hours.

Further analysis indicates that the westbound Site Drive #1 approach is expected to operate at LOS B during both the AM and PM peak hours with stop control. The southbound Jefferson Avenue approach is expected to operate at LOS A during both the AM and PM peak hours. The northbound Jefferson Avenue approach is expected to operate as free-flow traveling unimpeded through the intersection.

Conclusions/Recommendations

The proposed Tate Manor residential development will be located along the east side of Jefferson Avenue and north of Crescent Drive/High Street in Charles Town, Jefferson County, West Virginia. Site access is proposed to Jefferson Avenue, Belvedere Farm Lane, and an extension of Belvedere Drive from Crescent Drive. The proposed site includes 80 townhomes. The residential development is expected to be completed by 2024.

The site is proposed to be served by three site driveways – one full-movement connection to Jefferson Avenue, one full-movement connection to Belvedere Farm Lane, and one full-movement connection via extension of Belvedere Drive via Crescent Drive. The proposed site driveways are assumed to operate under stop-control.

The results of the capacity analyses and the queueing analyses indicate that the trips generated by the proposed site can be accommodated within the existing transportation network.

Based on the findings of this study, the following infrastructure improvements are recommended from evaluation of the Tate Manor Residential Traffic Impact Study maintain adequate operation of the existing transportation network:

Jefferson Avenue with Proposed Site Driveway #1

- Construct Site Driveway #1 as a full movement approach located approximately 250 feet north of the Jefferson Avenue and High Street intersection. The driveway should be constructed to provide one ingress lane and two egress lanes. The proposed driveway will operate under stop-control while Jefferson Avenue operates as free-flow.

Crescent Drive with Belvedere Drive (Proposed Site Driveway #2)

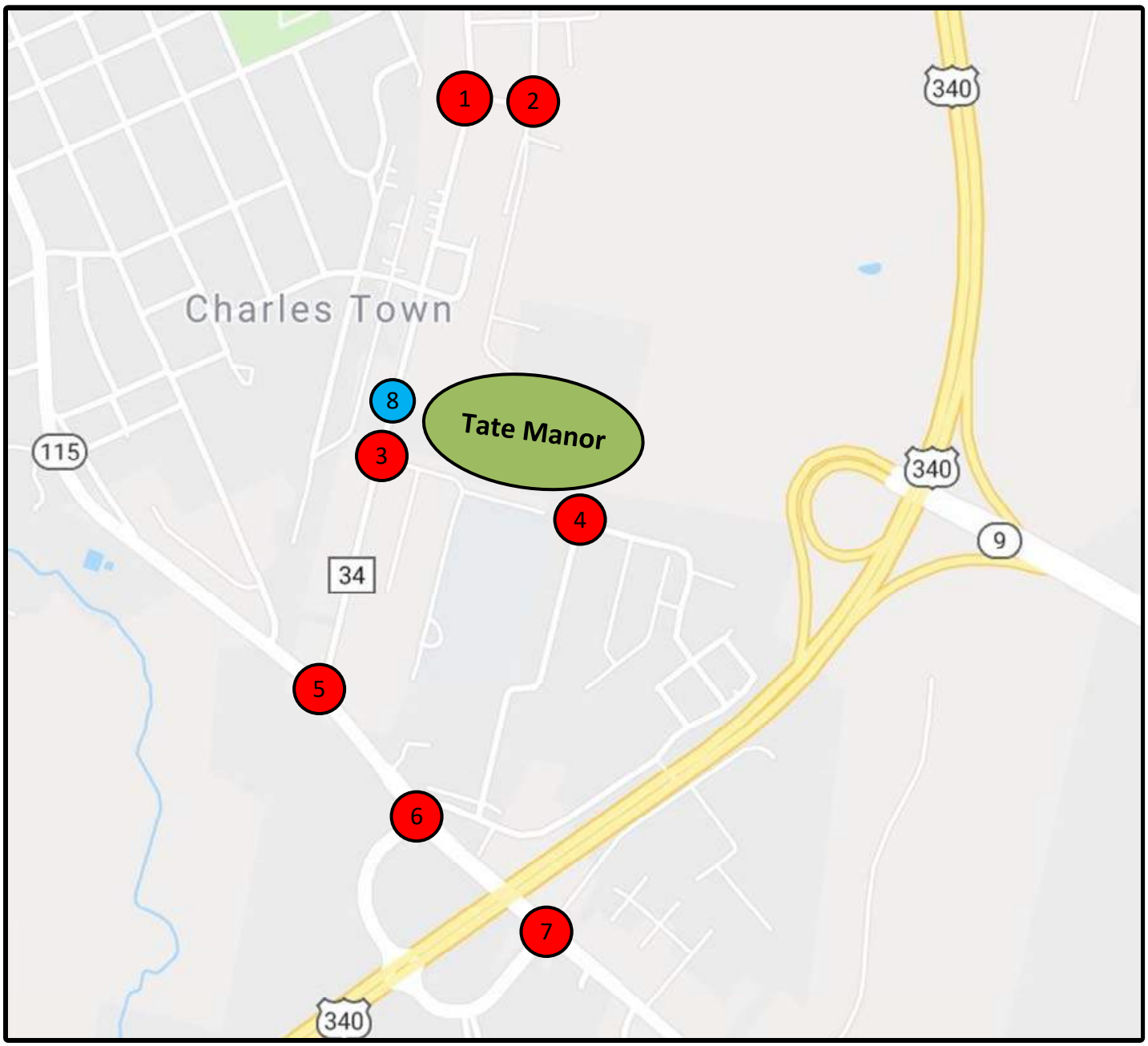
- Construct Site Driveway #2 as a full movement approach as an extension of Belvedere Drive, which will intersect with Crescent Drive opposite existing Belvedere Drive creating a plus type intersection. The driveway should be constructed to provide one ingress lane and one egress lanes. The proposed driveway will operate under stop-control while Crescent Drive operates as free-flow.

WV 115 with Jefferson Avenue

- It is recommended that the WVDOH further evaluate the need for a traffic signal at the intersection of WV 115 with Jefferson Avenue. Evaluation of existing peak hour conditions indicate that the MUTCD Peak Hour Warrant is met for the intersection. In addition, the No Build analysis indicates that LOS will deteriorate to LOS F during the PM peak hour by 2024 with Two Way Stop Control.

WV 115 with Citizens Way and the US 340 Southbound Ramps

- Ideally, consideration should be given to add a right turn slip lane on the US 340 southbound ramp approach to WV 115. The No Build analysis indicates that LOS will deteriorate to LOS D for the ramp approach during the PM peak hour by 2024 with the current configuration. Creating the right turn slip lane improves the ramp approach to LOS B.



LEGEND

= Proposed Site

= Existing Intersection

= Proposed Intersection

N

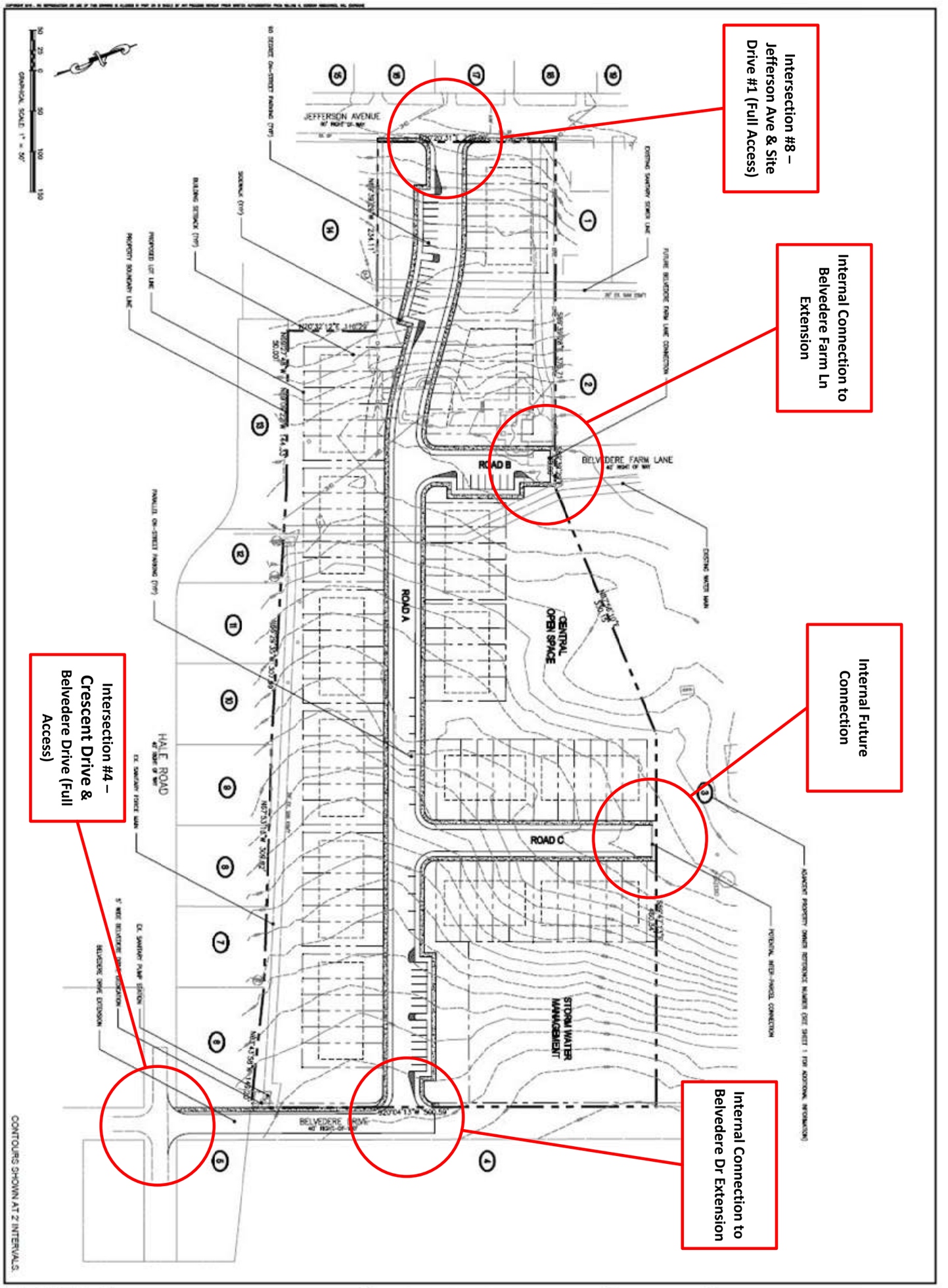
NOT TO SCALE

Tate Manor
Residential Development TIS

Site Location Map

DATE: December 2019

FIGURE 1



CONCEPTUAL PLAN

JEFFERSON HEIGHTS SOUTH SKETCH PLAN

City of CHARLES TOWN, WEST VIRGINIA

2019-02-12: REVISED PURSUANT TO CITY COMMENTS

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CHECK: 2280 Sketch Plan.DWG

Tate Manor
Residential Development TIS

Site Plan

DATE: December 2019

NOT TO SCALE

FIGURE 2

AMT

TRIP GENERATION

The proposed residential development will be located along the east side of Jefferson Avenue and north of Crescent Drive/High Street in Charles Town, Jefferson County. Site access is proposed to Jefferson Avenue, Belvedere Farm Lane, and an extension of Belvedere Drive from Crescent Drive. The proposed site includes 80 townhomes and is expected to be completed by 2024. The trip generation "Peak Hour of Generator" rates from the ITE Trip Generation Manual, 10th Edition, were utilized for Multifamily Housing (LUC 220).

As shown in **Table 2** below, the proposed residential development will generate a total of 564 new daily trips, including 39 new AM peak hour, and 48 new PM peak hour trips.

Table 2: Trip Generation Summary

Description	LUC	Density		Daily Trips	AM Peak			PM Peak		
					Enter	Exit	Total	Enter	Exit	Total
Multifamily Housing	220	80	Units	564	9	30	39	30	18	48
Total				**564**	**9**	**30**	**39**	**30**	**18**	**48**

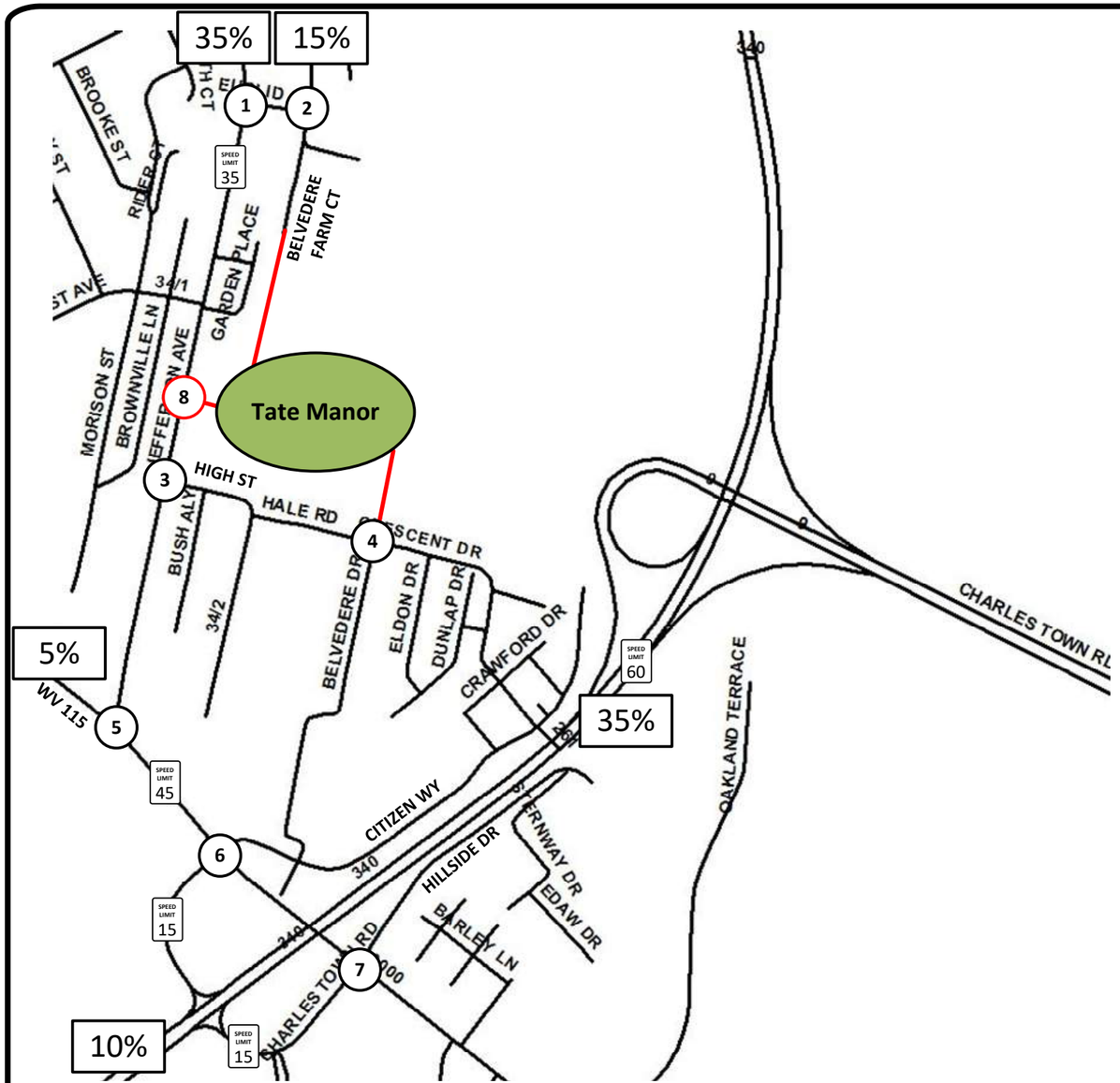
TRIP DISTRIBUTION

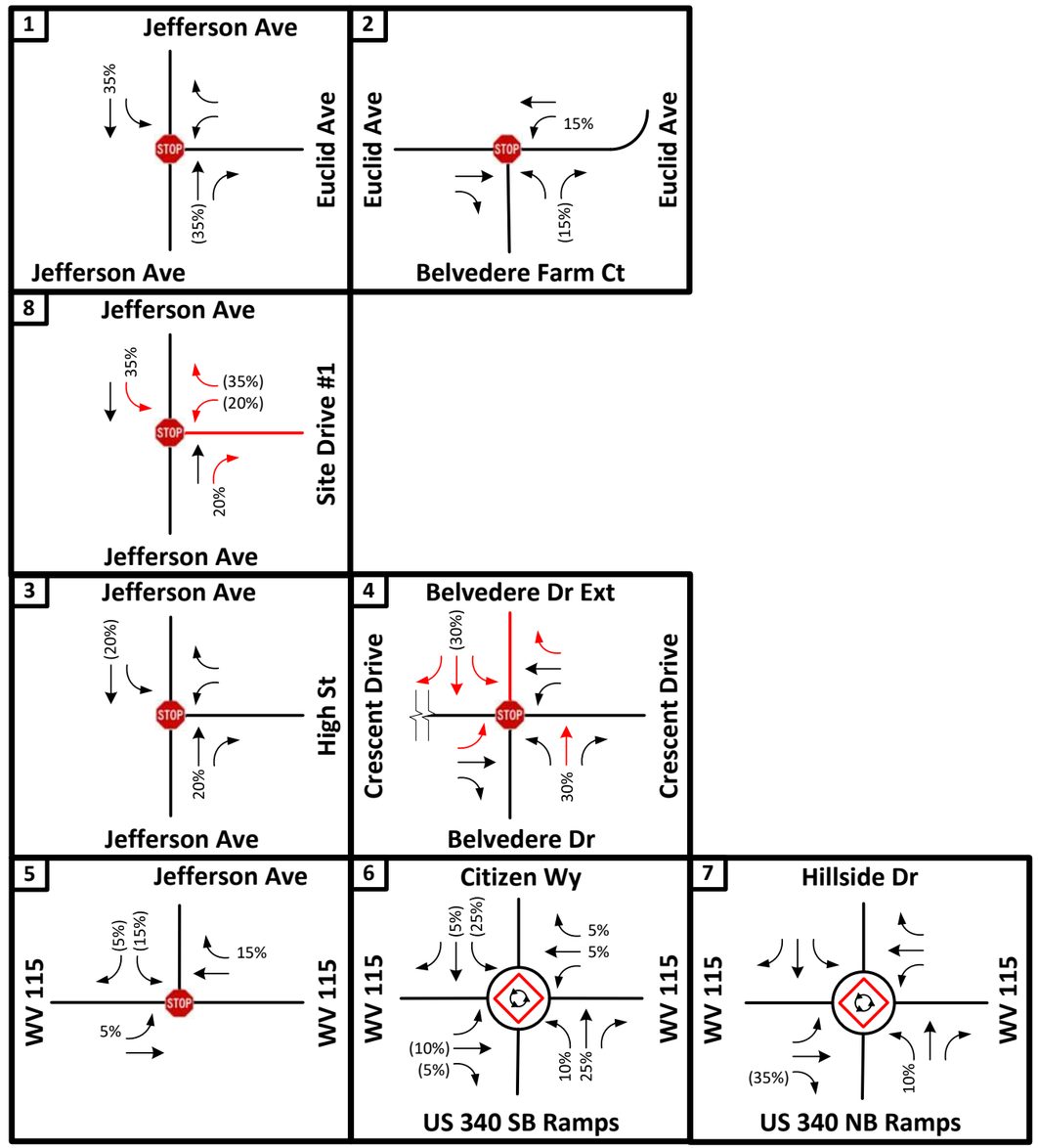
The new AM and PM peak hour site generated trips to/from the proposed site were distributed based upon interpolation from current traffic patterns. The distribution of the new external trips are as follows:

- 35% to/from the north on US 340
- 10% to/from the south on US 340
- 5% to/from the west on WV 115
- 35% to/from the north on Jefferson Avenue
- 15% to/from the north on Euclid Avenue

Traffic generated by the impending Magnolia Springs development located north of the Tate Manor residential development is included as a pending development accounted for in No Build and Build conditions. Magnolia Springs is proposed to have site driveways which intersect with Euclid Avenue and with Citizens Way. An approved Traffic Impact Study by Kittelson & Associates was obtained for this project and future traffic volumes were accounted for in the No Build and Build volume calculations, as directed by the WVDOH.

The external trip distribution percentages are shown in **Figure 4**, and the AM and PM peak hour new site trip assignments are shown on **Figure 5**.





LEGEND

- Existing Traffic Control
- Roundabout
- Existing Roadway
- Proposed Roadway
- XX% Entering Trip Percentage
- (XX%) Exiting Trip Percentage

N

NOT TO SCALE

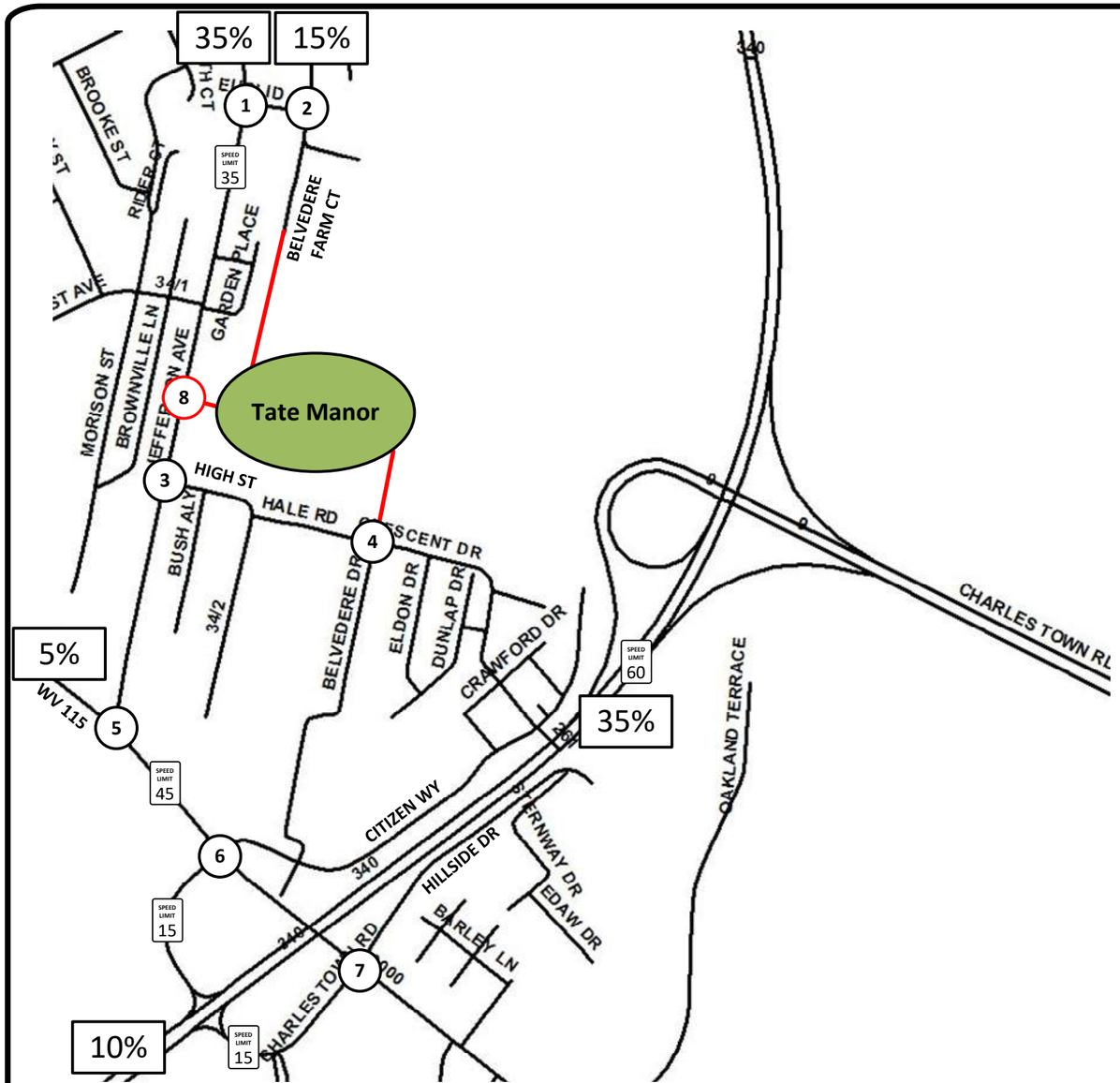
Tate Manor Residential Development TIS

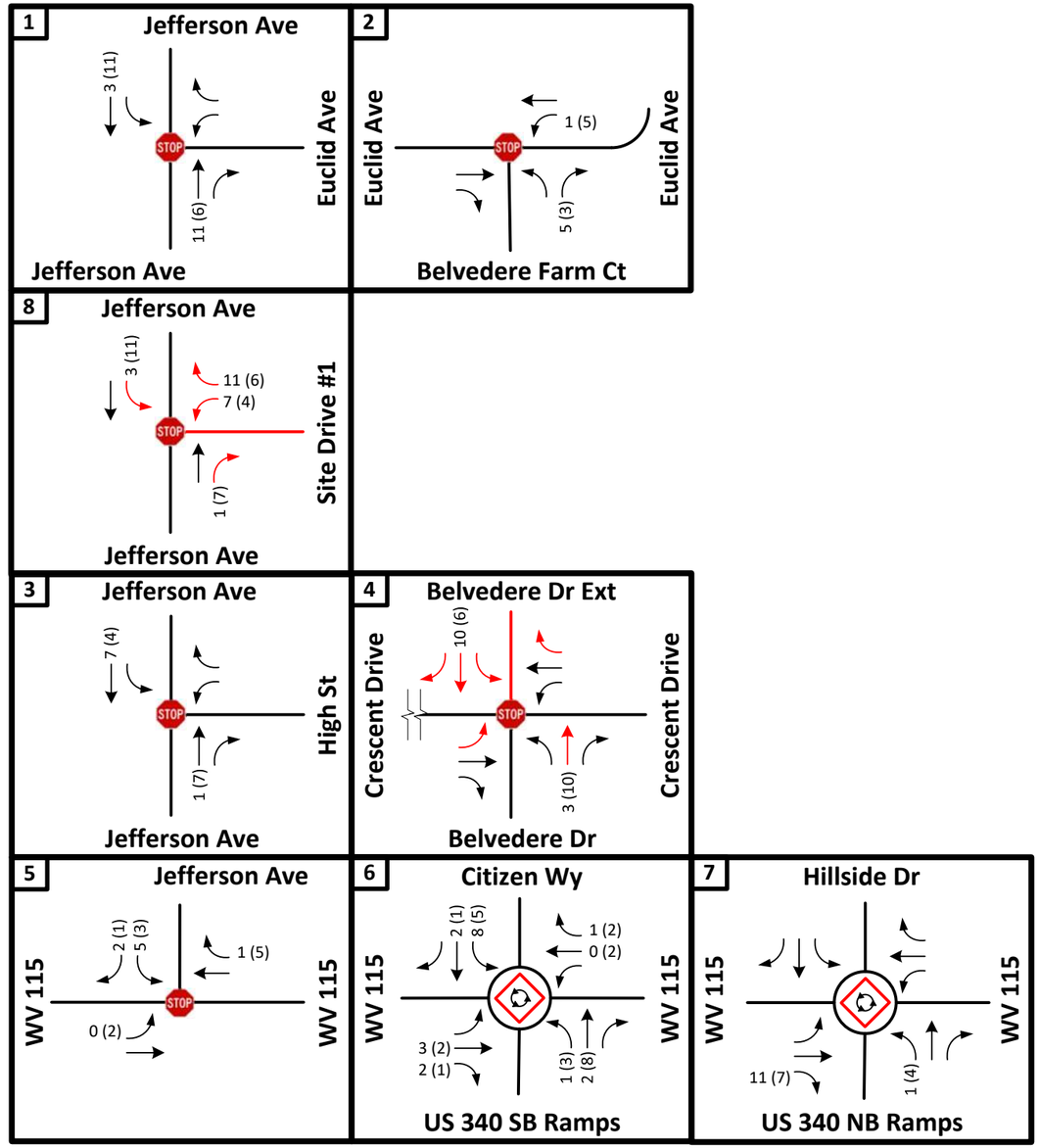
Site Trip Distribution

DATE: December 2019

FIGURE 4

826





LEGEND

- Existing Traffic Control
- Roundabout
- Existing Roadway
- Proposed Roadway
- XX AM Peak Hour Volume
- (XX) PM Peak Hour Volume

N

NOT TO SCALE

Tate Manor
Residential Development TIS

Site Trip Assignment

DATE: December 2019

FIGURE 5

827

APPENDIX F-2: MAGNOLIA SPRINGS TIS

Transportation Impact Study

Magnolia Springs

Jefferson County, West Virginia

June 2018
(Revised September 2018)

Transportation Impact Study

Magnolia Springs

Jefferson County, West Virginia

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Project No. 22481

September 2018



Section 1
Executive Summary

EXECUTIVE SUMMARY

Chandlers Glen, LLC proposes to develop the Magnolia Springs development, located west of US-340 near Charles Town in Jefferson County, West Virginia.

A traffic operations analysis has been conducted to confirm that the transportation system can adequately support the proposed Magnolia Springs, in fulfillment of West Virginia Division of Highways (WVDOH) requirements. The scope of the project analysis was developed through collaboration with WVDOH staff in accordance with WVDOH's Traffic Engineering Directive (TED) 106-2.

Specifically, this analysis includes:

- Year 2018 existing land use and transportation system conditions within the site vicinity;
- Planned development improvements in the study area;
- Forecast year 2022 background traffic conditions during the Friday a.m. and Friday p.m. peak periods, including regional growth;
- Trip generation and distribution estimates for the proposed development;
- Forecast year 2022 total traffic conditions with full build-out of the site during the Friday a.m. and Friday p.m. peak periods;
- Conclusions and recommendations.

TRANSPORTATION IMPACT ANALYSIS FINDINGS

The results of the traffic impact analysis indicate that the proposed development can be constructed while not impacting operations on the surrounding transportation system assuming provision of mitigations specified in this report. The findings of this analysis and our recommendations are discussed below.

Existing Conditions

- The study intersections operate at acceptable levels of service during the Friday a.m. and Friday p.m. peak hours, with the exception of the Route 115 & Hillside Drive & US-340 NB Ramps intersection.
    - During the Friday a.m. peak hour, the northbound approach operates at LOS E.
    - During the Friday p.m. peak hour, the northbound approach operates at LOS F.

Year 2022 Background Traffic Conditions

- A 0.625 percent growth rate (compounded annually) was used to account for regional growth in development of year 2022 background traffic volumes.
- In-process traffic from the Jefferson Heights North development was added to background traffic to project year 2022 background traffic volumes.

- The Euclid Avenue & Belvedere Farm Court intersection will also be realigned and changed to All-Way Stop Control with the Jefferson Heights North development.
- The study intersections operate at acceptable levels of service during the Friday a.m. and Friday p.m. peak hours, with the exception of the Route 115 & Hillside Drive & US-340 NB Ramps intersection.
    - During both peak hours, the northbound approach is expected to experience an increase in delay but maintain levels of service consistent with existing conditions.
        - To help mitigate increased delay at the intersection, MUTCD traffic signal warrants were evaluated. Only Warrant 3 (Peak Hour) will be met under year 2022 background conditions, which is generally a warrant reserved for special cases.
        - A single-lane roundabout was also evaluated to help mitigate the northbound approach delays. Based on these analyses, the intersection would operate acceptably with a roundabout during the Friday a.m. and p.m. peak hours.
- All forecast queues are anticipated to be accommodated with existing storage lengths.

Proposed Development Plan

- The Magnolia Springs development is anticipated to be fully built-out in year 2022.
- The current development plan consists of up to 350 single-family homes.
- Access to the site is proposed via an extension of Citizens Way to the south and a driveway off Belvedere Farm Court to the north. The following driveway distributions were assumed and confirmed during the scoping process:
    - Citizens Way (south): 80 percent
    - Belvedere Farm Court (north): 20 percent
- The proposed development would be estimated to generate approximately 259 Friday a.m. (65 in; 194 out), and 347 Friday p.m. (218 in; 129 out) net new peak hour trips. These estimates are based on data available from the *Trip Generation Manual, 10th Edition* and the number of dwelling units (Single-family Detached Housing: ITE Land Use Code 210).

Year 2022 Total Traffic Conditions

- All of the study intersections are forecast to operate at the same level-of-service during both the Friday a.m. and Friday p.m. peak periods relative to year 2022 background traffic conditions with the following exceptions:
    - Route 115 & Citizens Way & US-340 SB Ramps: The critical movements are anticipated to operate at LOS "B" during the Friday a.m. peak hour and LOS "D" during the Friday p.m. peak hour with v/c ratios of 0.45 and 0.80, respectively. Under year 2022 background conditions, the critical movements are anticipated to operate at LOS "A" during the Friday a.m. peak hour and LOS "B" during the Friday p.m. peak hour.

- Note the intersection is still forecast to operate acceptably, so adding roadway capacity does not appear warranted as part of the development.

- Route 115 & Hillside Drive & US-340 NB Ramps: The critical northbound movement is anticipated to operate at LOS "F" during the Friday a.m. and p.m. peak hours with a v/c ratio of 0.78 and over 1.0, respectively. Under year 2022 background conditions, this approach is anticipated to operate at LOS "E" during the Friday a.m. peak hour and LOS "F" during the Friday p.m. peak hour.

  - To help mitigate increased delay at the intersection, MUTCD traffic signal warrants were evaluated. Warrant 1 (Eight-Hour Vehicular Volume), Warrant 2 (Four-Hour Vehicular Volume), and Warrant 3 (Peak Hour) are expected to be met under year 2022 total traffic conditions at the 70 and 100 percent volume thresholds.

    - With the installation of a traffic signal, the westbound left-turn 95th percentile queue is anticipated to exceed the available storage capacity during the Friday p.m. peak hour. If this improvement is implemented, the westbound left-turn lane could be extended to 250 feet of storage to accommodate queues.

  - A single-lane roundabout was also evaluated to help mitigate the northbound approach delays. Based on these analyses, the intersection would operate acceptably with a roundabout during the Friday a.m. and p.m. peak hours.

- Increases to queueing is typically less than the assumed length of one vehicle and is anticipated to have only minor impacts operations beyond conditions already noted under year 2022 background conditions. The largest disparity in queuing between year 2022 background and year 2022 total conditions is projected to occur on the northbound approach of the Route 115 & Citizens Way & US-340 SB Ramps intersection (approximately five vehicles); however, this increase can be accommodated by the existing roadway geometry and the level of service is expected to be acceptable.

RECOMMENDATIONS

Both the City of Charles Town and Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO) prefer the installation of a roundabout at the Route 115 & Hillside Drive & US-340 NB ramps intersection, which operates with deficiencies under existing and background conditions. A preliminary cost estimate provided by WVDOH indicates the cost of a roundabout at this location would be approximately $950,000.

Per discussions with WVDOH, the applicant is willing to make a one-time contribution of $50,000 to a future intersection improvement at the Route 115 & Hillside Drive & US-340 NB ramps intersection once a project is formally programmed. No other improvements to the roadway network are recommended with the Magnolia Springs development.

Trip Generation

Trip generation estimates for the proposed development were developed using the standard reference *Trip Generation, 10th Edition* (Reference 4) published by the Institute of Transportation Engineers (ITE). **Table 6** shows the estimated trip generation potential of the site when completed.

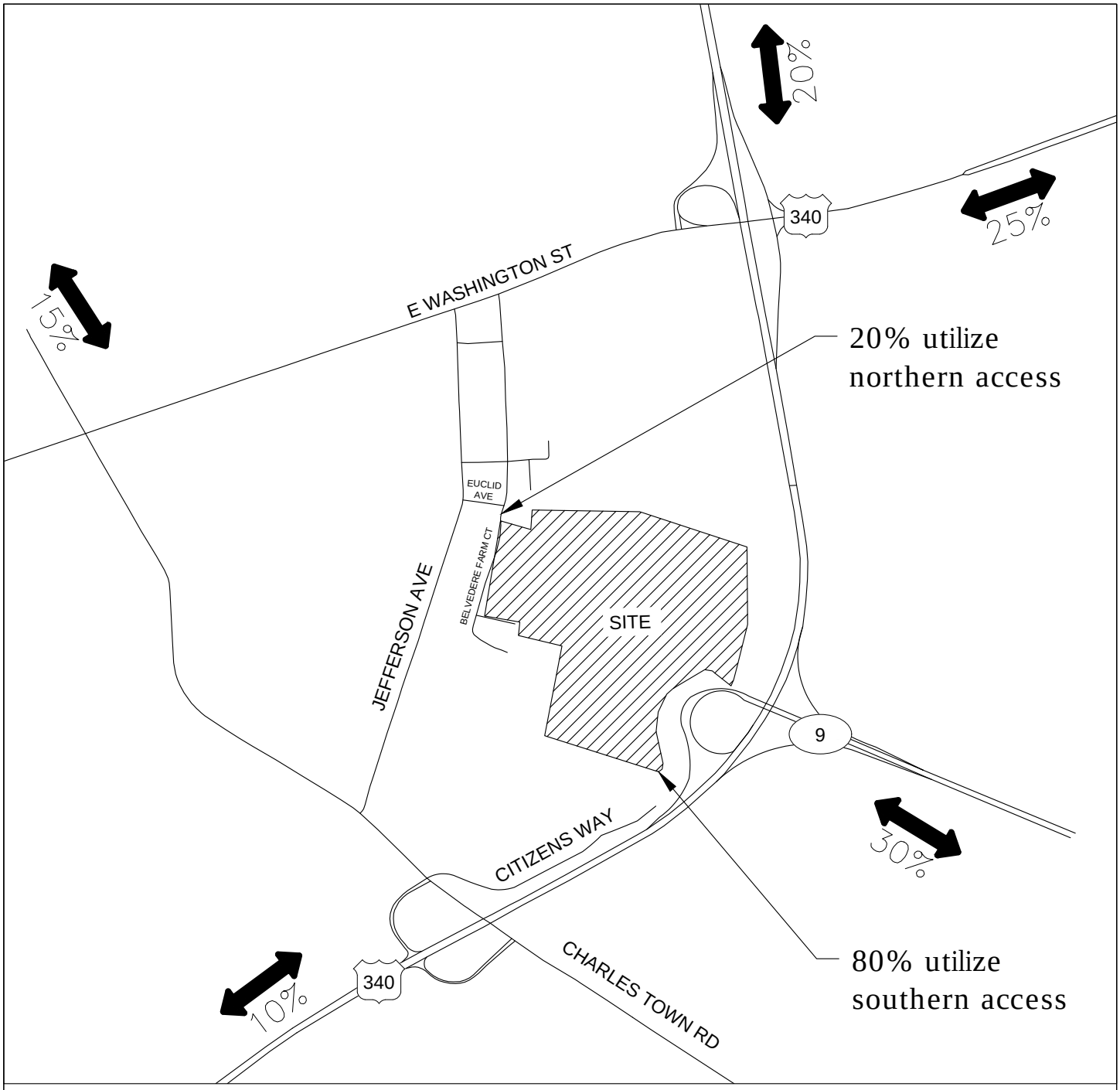
Table 6. Estimated Trip Generation

Land Use	ITE Code	Units		Peak Hour of Adjacent Street						
				Weekday Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
					Total	In	Out	Total	In	Out
Single-family Detached Housing	210	350	Dwelling Units	3,304	259	65	194	347	218	129

As shown in **Table 6**, the proposed development would be estimated to generate approximately 259 Friday a.m. (65 in; 194 out), and 347 Friday p.m. (218 in; 129 out) net new peak hour trips.

Site Trip Distribution/Trip Assignment

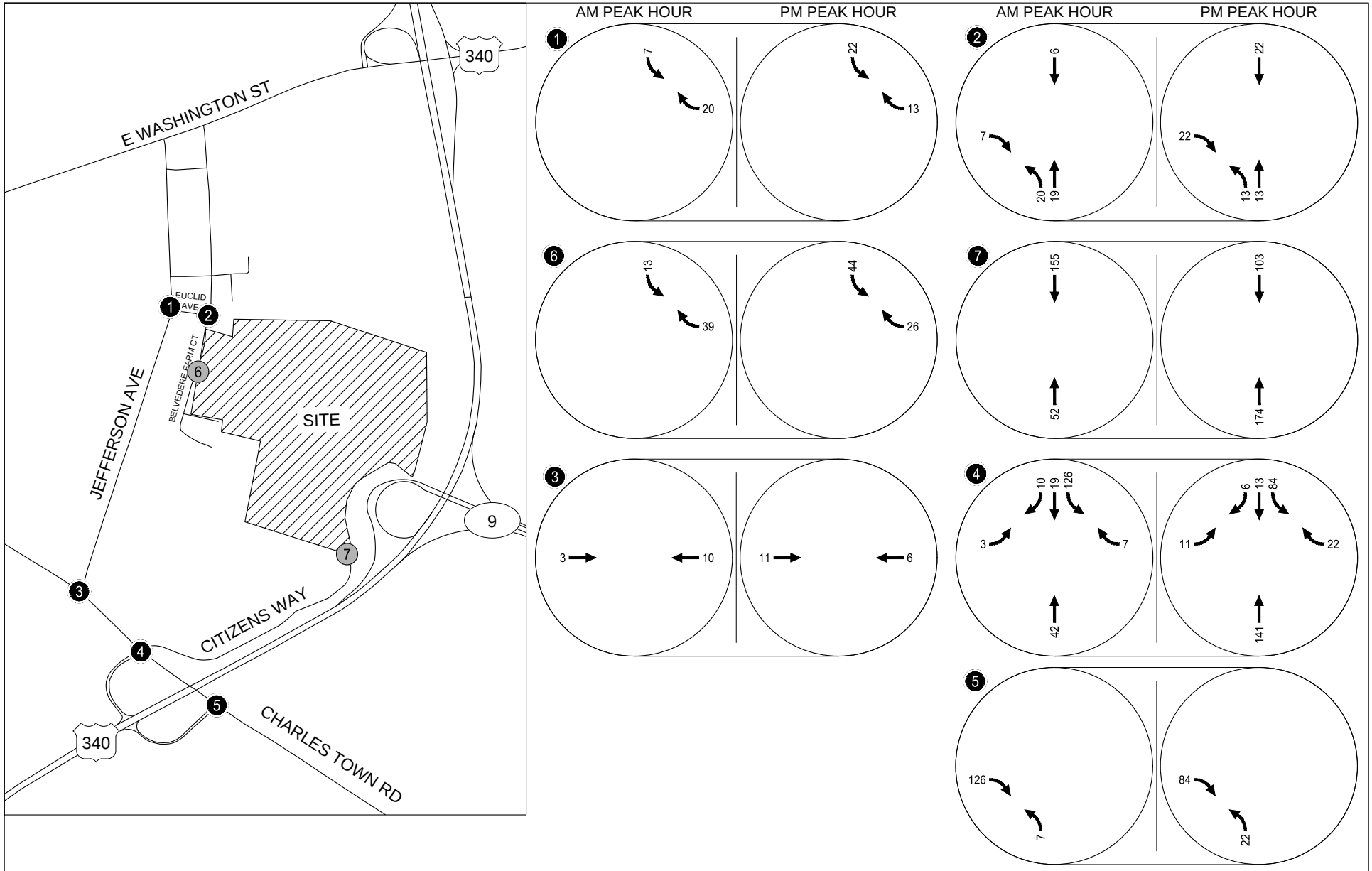
The estimated trip distribution pattern was confirmed by WVDOH through scoping correspondence. **Figure 10** illustrates the estimated trip distribution pattern. **Figure 11** shows the assignment of net new site-generated trips to the roadway network during the Friday a.m. and Friday p.m. peak hours.



XX% Proposed Trip Distribution

Trip Distribution
Jefferson County, West Virginia

Figure
10



Site-Generated Trips
Friday AM and PM Peak Hours
Jefferson County, West Virginia

Figure
11

KITTELSON & ASSOCIATES

Section 5
Conclusions and Recommendations

CONCLUSIONS AND RECOMMENDATIONS

The results of the traffic impact analysis indicate that the proposed development can be constructed while not impacting operations on the surrounding transportation system assuming provision of mitigations specified in this report. The findings of this analysis and our recommendations are discussed below.

FINDINGS

Existing Conditions

- The study intersections operate at acceptable levels of service during the Friday a.m. and Friday p.m. peak hours, with the exception of the Route 115 & Hillside Drive & US-340 NB Ramps intersection.
    - During the Friday a.m. peak hour, the northbound approach operates at LOS E.
    - During the Friday p.m. peak hour, the northbound approach operates at LOS F.

Year 2022 Background Traffic Conditions

- A 0.625 percent growth rate (compounded annually) was used to account for regional growth in development of year 2022 background traffic volumes.
- In-process traffic from the Jefferson Heights North development was added to background traffic to project year 2022 background traffic volumes.
- The Euclid Avenue & Belvedere Farm Court intersection will also be realigned and changed to All-Way Stop Control with the Jefferson Heights North development.
- The study intersections operate at acceptable levels of service during the Friday a.m. and Friday p.m. peak hours, with the exception of the Route 115 & Hillside Drive & US-340 NB Ramps intersection.
    - During both peak hours, the northbound approach is expected to experience an increase in delay but maintain levels of service consistent with existing conditions.
        - To help mitigate increased delay at the intersection, MUTCD traffic signal warrants were evaluated. Only Warrant 3 (Peak Hour) will be met under year 2022 background conditions, which is generally a warrant reserved for special cases.
        - A single-lane roundabout was also evaluated to help mitigate the northbound approach delays. Based on these analyses, the intersection would operate acceptably with a roundabout during the Friday a.m. and p.m. peak hours.
- All forecast queues are anticipated to be accommodated with existing storage lengths.

Proposed Development Plan

- The Magnolia Springs development is anticipated to be fully built-out in year 2022.
- The current development plan consists of up to 350 single-family homes.
- Access to the site is proposed via an extension of Citizens Way to the south and a driveway off Belvedere Farm Court to the north. The following driveway distributions were assumed and confirmed during the scoping process:
    - Citizens Way (south): 80 percent
    - Belvedere Farm Court (north): 20 percent
- The proposed development would be estimated to generate approximately 259 Friday a.m. (65 in; 194 out), and 347 Friday p.m. (218 in; 129 out) net new peak hour trips. These estimates are based on data available from the *Trip Generation Manual, 10th Edition* and the number of dwelling units (Single-family Detached Housing: ITE Land Use Code 210).

Year 2022 Total Traffic Conditions

- All of the study intersections are forecast to operate at the same level-of-service during both the Friday a.m. and Friday p.m. peak periods relative to year 2022 background traffic conditions with the following exceptions:
    - Route 115 & Citizens Way & US-340 SB Ramps: The critical movements are anticipated to operate at LOS "B" during the Friday a.m. peak hour and LOS "D" during the Friday p.m. peak hour with v/c ratios of 0.45 and 0.80, respectively. Under year 2022 background conditions, the critical movements are anticipated to operate at LOS "A" during the Friday a.m. peak hour and LOS "B" during the Friday p.m. peak hour.
        - Note the intersection is still forecast to operate acceptably, so adding roadway capacity does not appear warranted as part of the development.
    - Route 115 & Hillside Drive & US-340 NB Ramps: The critical northbound movement is anticipated to operate at LOS "F" during the Friday a.m. and p.m. peak hours with a v/c ratio of 0.78 and over 1.0, respectively. Under year 2022 background conditions, this approach is anticipated to operate at LOS "E" during the Friday a.m. peak hour and LOS "F" during the Friday p.m. peak hour.
        - To help mitigate increased delay at the intersection, MUTCD traffic signal warrants were evaluated. Warrant 1 (Eight-Hour Vehicular Volume), Warrant 2 (Four-Hour Vehicular Volume), and Warrant 3 (Peak Hour) are expected to be met under year 2022 total traffic conditions at the 70 and 100 percent volume thresholds.
            - With the installation of a traffic signal, the westbound left-turn 95th percentile queue is anticipated to exceed the available storage capacity during the Friday p.m. peak hour. If this improvement is implemented, the westbound left-turn lane could be extended to 250 feet of storage to accommodate queues.

- A single-lane roundabout was also evaluated to help mitigate the northbound approach delays. Based on these analyses, the intersection would operate acceptably with a roundabout during the Friday a.m. and p.m. peak hours.

- Increases to queueing is typically less than the assumed length of one vehicle and is anticipated to have only minor impacts operations beyond conditions already noted under year 2022 background conditions. The largest disparity in queuing between year 2022 background and year 2022 total conditions is projected to occur on the northbound approach of the Route 115 & Citizens Way & US-340 SB Ramps intersection (approximately five vehicles); however, this increase can be accommodated by the existing roadway geometry and the level of service is expected to be acceptable.

RECOMMENDATIONS

Both the City of Charles Town and Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO) prefer the installation of a roundabout at the Route 115 & Hillside Drive & US-340 NB ramps intersection, which operates with deficiencies under existing and background conditions. A preliminary cost estimate provided by WVDOH indicates the cost of a roundabout at this location would be approximately $950,000.

Per discussions with WVDOH, the applicant is willing to make a one-time contribution of $50,000 to a future intersection improvement at the Route 115 & Hillside Drive & US-340 NB ramps intersection once a project is formally programmed. No other improvements to the roadway network are recommended with the Magnolia Springs development.

APPENDIX F-3: KINGS CROSSING TIS

Kings Crossing Residential Traffic Impact Study
Charles Town, Jefferson County, WV

AMT Project File 21-0261.001 | May 4, 2022 **REVISED**

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EXECUTIVE SUMMARY

This report summarizes existing and future traffic analyses conducted in support of the proposed Kings Crossing Residential Development. The proposed residential development is to be located south of WV 115 (Charles Town Road) and east of US 340 (Berryville Pike) near Charles Town, Jefferson County, West Virginia. The proposed site plan includes 177 single-family homes and 227 townhomes and is expected to be built and completed by the year 2025. The development will be constructed in three phases. Phase 1 will include 43 single-family homes and 72 townhomes and is planned to be completed in 2022. Phase 2 includes an additional 81 single-family homes and 83 townhomes and is planned to be completed in 2024. Phase 3 includes an additional 53 single-family homes and 72 townhomes and is planned to be completed in 2025.

The proposed residential development is anticipated to be served by two site driveways intersecting directly with WV 115. Site Drive #1 and Site Drive #2 intersect with WV 115. Site Drive #1 (addressed as Road 1 on the site plan) is proposed to be located approximately 2,000 feet east of Crosswinds Drive approaching WV 115 from the south and will operate as a full movement approach utilizing two-way stop-control (TWSC). Site Drive #2 (addressed as Road 12 on the site plan) will approach WV 115 from the south approximately 2,600 feet east of Crosswinds Drive and will operate as a full movement approach utilizing TWSC.

Traffic analyses will consider future conditions at the anticipated milestone years of 2022, 2024, and 2025. This report summarizes the analyses of 2021 Existing conditions, 2022 No-Build conditions (without proposed development in place), 2022 Phase 1 Build conditions (with phase 1 of proposed development in place), 2024 Partial Build, 2024 Phase 2 Build (with phase 1 and 2 of the proposed development in place), 2025 Partial Build, 2025 Full Build (with complete development in place), and 2025 Build Improved conditions (with the proposed development and proposed improvements in place) during weekday AM and PM peak hours. An annual growth rate of 1.20% was obtained from the WVDOH.

Two approved traffic impact studies have been included in the future peak hour forecasts as pending developments that will be complete by the Full Build Year of 2025. These developments are the Tate Manor and Magnolia Springs residential developments. Both developments are located north of Crescent Drive/High Street and east of Jefferson Avenue in Charles Town and are anticipated to be completed by the year 2024. Estimated traffic generated by the two developments are included in the background traffic volumes beginning in the 2024 Partial Build conditions. Information regarding both developments is located in **Appendix F**.

AMT (A. Morton Thomas and Associates, Inc.) was retained to determine the projected traffic impacts of the proposed development in accordance with the guidelines set forth by WVDOH in Traffic Engineering Directive (TED) 106-2. The intent of the study is to fully examine the impacts of the traffic generated by the development on the existing transportation system and identify potential mitigation measures. This report presents trip generation, trip distribution, intersection on capacity analysis, queuing analysis, signal warrant analysis, auxiliary lane analysis, and recommendations for transportation improvements necessary to meet the anticipated traffic demands.

Based upon a review of the site plan and adjacent transportation network and following scope of work coordination with WVDOH, the following seven (7) existing and two (2) proposed intersections are

included within the scope of the Traffic Impact Study (TIS) for the proposed Kings Crossing residential development:

1) US 340 (Berryville Pike) with Candlewood Drive *(TWSC "T" type intersection)*
2) WV 115 (S. George Street) with Jefferson Avenue (CR 34) (*TWSC "T" type intersection)*
3) WV 115 with Citizens Way (CR 115/4)/US 340 SB (*Single-lane Roundabout Plus intersection)*
4) WV 115 with Hillside Drive (CR 9/69)/US 340 NB (*TWSC Plus type intersection)*
5) WV 115 with Fairleigh Drive/Bailey Brooks Way *(TWSC Plus type intersection)*
6) WV 115 with Crosswinds Drive *(TWSC "T" type intersection)*
7) WV 115 with Kabletown Road (CR 25) *(TWSC "T" type intersection)*
8) WV 115 with Site Drive #1 *(Proposed TWSC "T" type intersection)*
9) WV 115 with Site Drive #2 *(Proposed TWSC "T" type intersection)*

Peak Hour Traffic Volumes

Peak hour turning movement counts were collected for six (6) of the seven (7) existing intersections within the study area by AMT on Friday April 23, 2021 between the hours of 7-9 AM and 3-6 PM. Following submission of the Scope of Work document, WVDOH requested that the intersection of WV 115 with Jefferson Avenue intersection be included as part of the study area. Peak hour turning movement counts were collected for the additional intersection on May 4, 2018 by Quality Counts, in support of the Magnolia Springs TIS prepared by Kittelson & Associates Inc. The peak hour turning movement counts conducted by Quality Counts were balanced into the existing system. It was assumed that the additional trips produced from balancing the counts would proceed to enter and exit the system via US 340. On both May 4, 2018 and April 23, 2021, Jefferson County Schools were fully operational with in-classroom instruction for all students. The turning movement counts were compared with existing AADT and determined to be reasonable as a check and calibration for COVID-19 impacts.

The first phase of the proposed development is expected to be complete by the year 2022. The 2022 No-Build peak hour traffic volumes include: existing 2021 peak hour traffic and an annual traffic growth prior to the year 2022. The growth rate of 1.20% was applied to the existing peak hour traffic counts and compounded annually.

The 2022 Phase 1 Build traffic volumes include: the existing peak hour traffic volume, annual traffic growth until 2022, and new trips generated by phase 1 of the proposed development.

The 2024 Partial Build volumes include: the existing peak hour traffic volumes, annual traffic growth until 2024, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, and new trips generated by phase 1 of the proposed development.

The 2024 Phase 2 Build Volumes include: the existing peak hour traffic volumes, annual traffic growth until 2024, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, and new trips generated by phase 1 and phase 2 of the proposed development.

The 2025 Partial Build Volumes include: the existing peak hour traffic volumes, annual traffic growth until 2025, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, and new trips generated by phase 1 and phase 2 of the proposed development.

The 2025 Full Build Conditions include: existing 2021 peak hour traffic volume, anticipated traffic generated by the Tate Manor development, anticipated traffic generated by the Magnolia Springs development, an annual traffic growth prior to the year 2025, and the new peak hour trips to be generated by the full build out of Kings Crossing development. Site generated traffic was distributed onto the transportation network based upon existing traffic patterns and anticipated origin and destination of the newly generated site trips.

Site Trip Generation and Distribution

The proposed Kings Crossing residential development includes 177 single-family homes and 227 townhomes. The development will be constructed in three phases. Trip generation "Peak Hour of Generator" rates from ITE Trip Generation Manual, 10th Edition, were utilized for Single-Family Detached Housing (LUC 210) and Multifamily Housing (LUC 220). Phase 1 will include 43 single-family homes and 72 townhomes. Trip generation analysis indicates that Phase 1 will generate a total of 933 trips which includes 73 AM peak hour trips and 91 PM peak hour trips. Phase 2 includes an additional 81 single-family homes and 83 townhomes. Phase 2 will generate a total of 1,373 additional trips which includes 108 AM peak hour trips and 137 PM peak hour trips. Phase 3 will include 53 single-family homes and 72 townhomes. Phase 3 will generate a total of 1,027 additional trips which includes 80 AM peak hour trips and 101 PM peak hour trips. Trip generation analysis indicates that a total of 3,333 new daily trips will be generated including 261 AM peak hour trips and 329 PM peak hour trips at full build out in 2025.

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 35% to/from the north on US 340
- 25% to/from the south on US 340
- 30% to/from the west on WV 115
- 10% to/from the east on WV 115

2021 Existing Conditions Analysis

The results of the 2021 existing conditions capacity analyses indicate that three (3) traffic movements currently operate worse than LOS D, which is considered the minimum tolerable level. Traffic movements that are expected to operate worse than LOS D include the following:

- ***Candlewood Drive westbound shared left-turn to US 340 LOS E during the PM peak hour***
- ***Jefferson Avenue southbound shared left/right lane to WV 115 LOS E during the PM peak hour***
- ***US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during the PM peak hour***

2022 No-Build Conditions Analysis

The results of the 2028 No-Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2021 Existing Conditions are anticipated to continue. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during the PM peak hour*

- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during the PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*

2022 Phase 1 Build Conditions Analysis

Geometric improvements included in the Phase 1 2022 Build Conditions include the construction of Site Drive #1 and Site Drive #2. Site Drive #1 is a full movement approach connecting to WV 115 creating a "T" type intersection approximately 2,000 feet east of Crosswinds Drive and will operate under stop control. Site Drive #2 is a full movement approach connecting to WV 115 creating a "T" type intersection approximately 2,600 feet east of Crosswinds Drive and will operate under stop control.

The results of the Phase 1 2022 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2022 No-Build Conditions are anticipated to continue with no additional movements expected to operate worse than LOS D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS E during the AM peak hour and LOS F during the PM peak hour*

2024 Partial Build Conditions Analysis

The results of the 2022 Phase 1 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2021 Existing Conditions are anticipated to continue with no additional traffic movements operating worse than LOS D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during the PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during the PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*

2024 Phase 2 Build Conditions Analysis

The results of the Phase 2 2024 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2024 Partial Build Conditions are anticipated to continue with no additional movements expected to operate worse than LOS D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*

2025 Partial Build Conditions Analysis

The results of the 2024 Phase 2 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2021 Existing Conditions are anticipated to continue with no additional movements operating at LOS worse than D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during the PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during the PM peak hour*
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*

2025 Full Build Conditions Analysis

The results of the Phase 3 2025 Full Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2025 Partial Build Conditions are anticipated to continue with two additional movements expected to operate worse than LOS D. Traffic movements that are expected to operate worse than LOS D include the following:

- *Candlewood Drive westbound shared left/through lane to US 340 LOS E during PM peak hour*
- *Jefferson Avenue southbound shared left/right lane to WV 115 LOS F during PM peak hour*
- ***US 340 SB Ramp northbound shared left/through/right lane to WV 115 LOS E during the PM peak hour***
- *US 340 NB Ramp northbound shared left/through lane to WV 115 LOS F during both the AM and PM peak hours*
- ***Hillside Drive southbound shared left/through/right lane to WV 115 LOS E during the PM peak hour***

2025 Full Build Improved Conditions Analysis

Geometric improvements included in the Phase 3 2028 Build Improved Conditions include:

1. Construction of an exclusive left-turn lane on WV 115 westbound approach to Site Drive #1.
2. Construction of a roundabout at the WV 115 with US 340 Northbound Ramp/Hillside Drive intersection.
3. Construction of a right turn slip lane at WV 115 with US 340 Southbound Ramp/Citizen Way.
4. Installation of a traffic signal at WV 115 with Jefferson Avenue.
5. Construction of an exclusive left turn lane on WV 115 eastbound at Jefferson Avenue identified in the Tate Manor TIS.

The results of the Phase 3 2025 Full Build Improved Conditions capacity analyses indicate that no traffic movements will operate worse than LOS D, which is considered the minimum tolerable level, except for Candlewood Drive to US 340 and US 340 SB Ramp to WV 115.

- *Candlewood Drive westbound shared left-turn movement to US 340 LOS E during the PM peak hour.*

Conclusions/Recommendations

Based on the findings of this study, the following infrastructure improvements are recommended to address existing capacity issues and maintain operation of the existing transportation network:

US 340 with Candlewood Drive

- Install pavement markings on the Candlewood Drive approach to US 340. Previous pavement markings are no longer visible and need to be reinstalled to delineate separate left and right turn lanes.

WV 115 with Jefferson Avenue

- As part of the Tate Manor TIS, it was recommended that a traffic signal be installed at the intersection of WV 115 and Jefferson Avenue. Intersection conditions previously met the MUTCD warranting criteria. Additionally, the 2021 Existing Conditions and 2022 No-Build analysis indicates that the intersection LOS will currently operates at LOS E during the PM peak hour under Two Way Stop Control. The previously completed signal warrant is located in **Appendix G**.

- In conjunction with installation of a traffic signal identified in previous studies, widening WV 115 to construct an exclusive left-turn lane on the eastbound approach is recommended. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with an appropriate taper.

WV 115 with Hillside Drive/ US 340 Northbound Ramps

- Proceed with the DOH planned conversion of the intersection to a single lane roundabout. The 2021 Existing Conditions analysis indicates that the northbound movement currently operates at LOS E during the PM peak hour. Under roundabout yield control, this intersection would operate at an overall LOS C during the PM peak hour for 2025 Full Build Conditions, with the northbound movement operating at LOS A.

Based on the finding of this study, the following improvements are recommended for Phase 1 of the Kings Crossing Residential Development:

WV 115 with Site Drive #1

- Construct Site Drive #1 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 2,000 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and two egress lanes to provide separate left and right turn lanes exiting the development. Site Drive #1 will operate under stop-control, while WV 115 operates as free-flow.

WV 115 with Site Drive #2

- Construct Site Drive #2 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 2,600 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and two egress lanes to provide separate left and right turn

lanes exiting the development. Site Drive #2 will operate under stop-control, while WV 115 operates as free-flow.

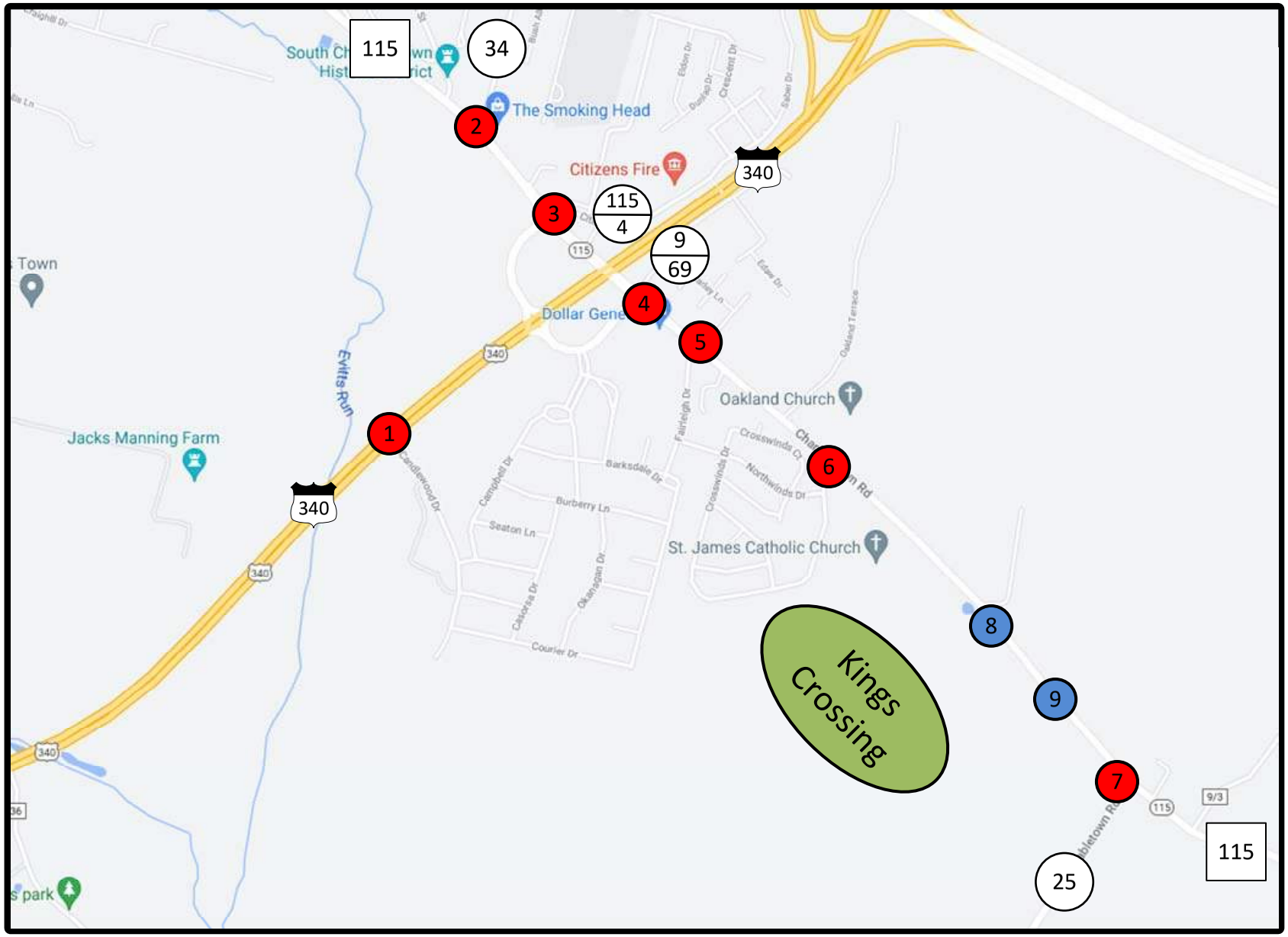
Based on the finding of this study, the following geometric improvements are recommended to mitigate the impacts of the Kings Crossing residential development and maintain acceptable traffic operations along the existing transportation network after the full build out of Kings Crossing Residential development in 2025:

WV 115 with Citizen Way/US 340 Southbound Ramps

- Construct a low angle right turn slip lane on for the US 340 northbound ramp approach to WV 115 eastbound. The 2025 Partial Build analysis indicates that the ramp approach will deteriorate to LOS C during the PM peak hour with the overall intersection operating LOS B. The 2025 Build analysis indicates that the US 340 southbound ramp approach will deteriorate to LOS E during the PM peak hour with the overall intersection operating at LOS C. The addition of the right turn slip lane improves the ramp to LOS B during the PM peak hour and the overall intersection to LOS B. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.

WV 115 with Site Drive #1

- Construct an exclusive left-turn lane on the WV 115 westbound approach to Site Drive #2. Peak hour volumes are projected to meet the AASHTO guidelines following 2025 Build Conditions PM peak hour. The left-turn should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.



LEGEND

- = Development
- = Existing Intersection
- = Proposed Intersection

AMT

N

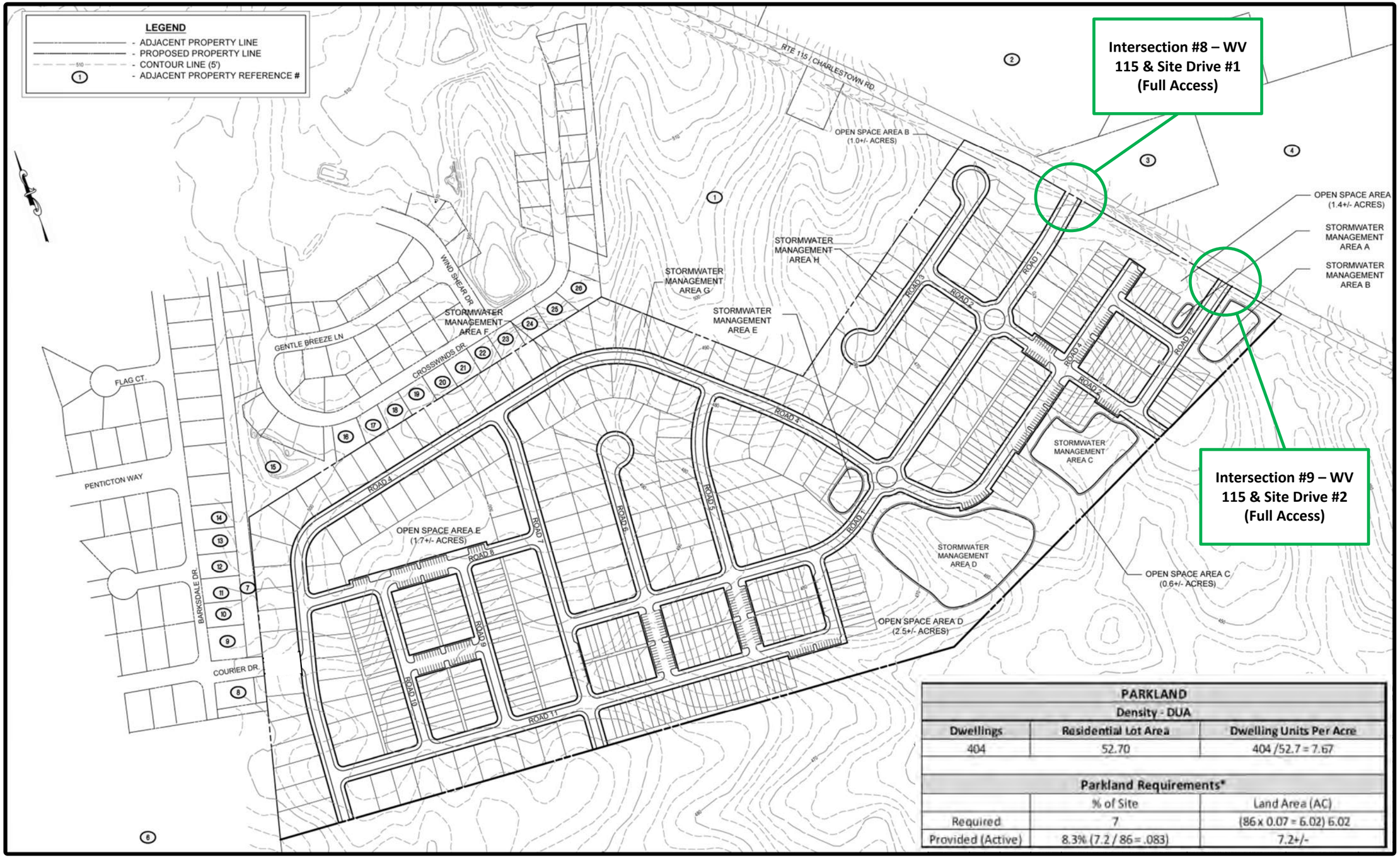
NOT TO SCALE

Kings Crossing Residential TIS

Site Location Map

DATE: May 2022

FIGURE 1



PARKLAND		
Density - DUA		
Dwellings	Residential Lot Area	Dwelling Units Per Acre
404	52.70	404 /52.7 = 7.67
Parkland Requirements*		
	% of Site	Land Area (AC)
Required	7	(86 x 0.07 = 6.02) 6.02
Provided (Active)	8.3% (7.2 / 86 = .083)	7.2+/-

Kings Crossing Residential TIS

Site Plan

DATE: May 2022

NOT TO SCALE

FIGURE 2

TRIP GENERATION

The proposed Kings Crossing residential development includes 177 single-family homes and 227 townhomes. The development will be constructed in three phases. Trip generation "Peak Hour of Generator" rates from ITE Trip Generation Manual, 10th Edition, were utilized for Single-Family Detached Housing (LUC 210) and Multifamily Housing (LUC 220). Phase 1 will include 43 single-family homes and 72 townhomes. Trip generation analysis indicates that Phase 1 will generate a total of 933 trips which includes 73 AM peak hour trips and 91 PM peak hour trips. Phase 2 includes an additional 81 single-family homes and 83 townhomes. Phase 2 will generate a total of 1,373 additional trips which includes 108 AM peak hour trips and 137 PM peak hour trips. Phase 3 will include 53 single-family homes and 72 townhomes. Phase 3 will generate a total of 1,027 additional trips which includes 80 AM peak hour trips and 101 PM peak hour trips. Trip generation analysis indicates that a total of 3,333 new daily trips will be generated including 261 AM peak hour trips and 329 PM peak hour trips at full build out in 2025.

Table 2 shows the summary of the Trip Generation for all three phases of Kings Crossing.

Table 2: Trip Generation Summary

Phase 1

Description	LUC	Density	Daily Trips	AM Peak			PM Peak		
				Enter	Exit	Total	Enter	Exit	Total
Single-Family Homes	210	43 Units	406	9	24	33	28	15	43
Townhomes	220	72 Units	527	11	29	40	28	20	48
Total Net New External Trips			**933**	**20**	**53**	**73**	**56**	**35**	**91**

Phase 2

Description	LUC	Density	Daily Trips	AM Peak			PM Peak		
				Enter	Exit	Total	Enter	Exit	Total
Single-Family Homes	210	81 Units	765	16	46	62	52	29	81
Townhomes	220	83 Units	608	13	33	46	33	23	56
Total Net New External Trips			**1,373**	**29**	**79**	**108**	**85**	**52**	**137**

Phase 3

Description	LUC	Density	Daily Trips	AM Peak			PM Peak		
				Enter	Exit	Total	Enter	Exit	Total
Single-Family Homes	210	53 Units	500	10	30	40	34	19	53
Townhomes	220	72 Units	527	11	29	40	28	20	48
Total Net New External Trips			**1,027**	**21**	**59**	**80**	**62**	**39**	**101**

Full Build (Summary)

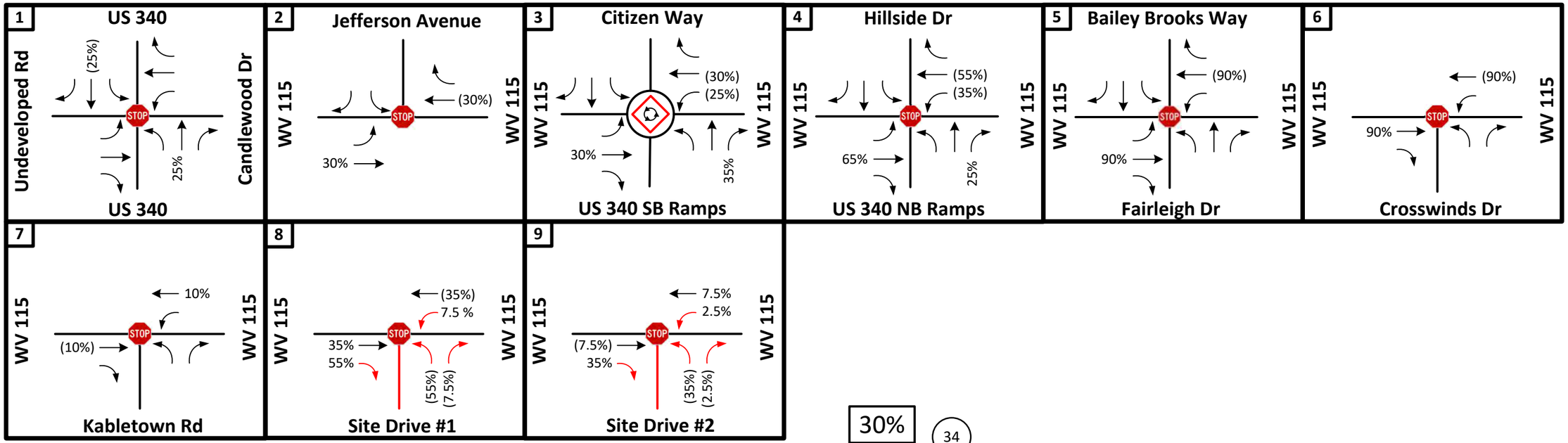
Description	LUC	Density	Daily Trips	AM Peak			PM Peak		
				Enter	Exit	Total	Enter	Exit	Total
Single-Family Homes	210	177 Units	1,671	35	100	135	114	63	177
Townhomes	220	227 Units	1,662	35	91	126	89	63	152
Total Net New External Trips			**3,333**	**70**	**191**	**261**	**203**	**126**	**329**

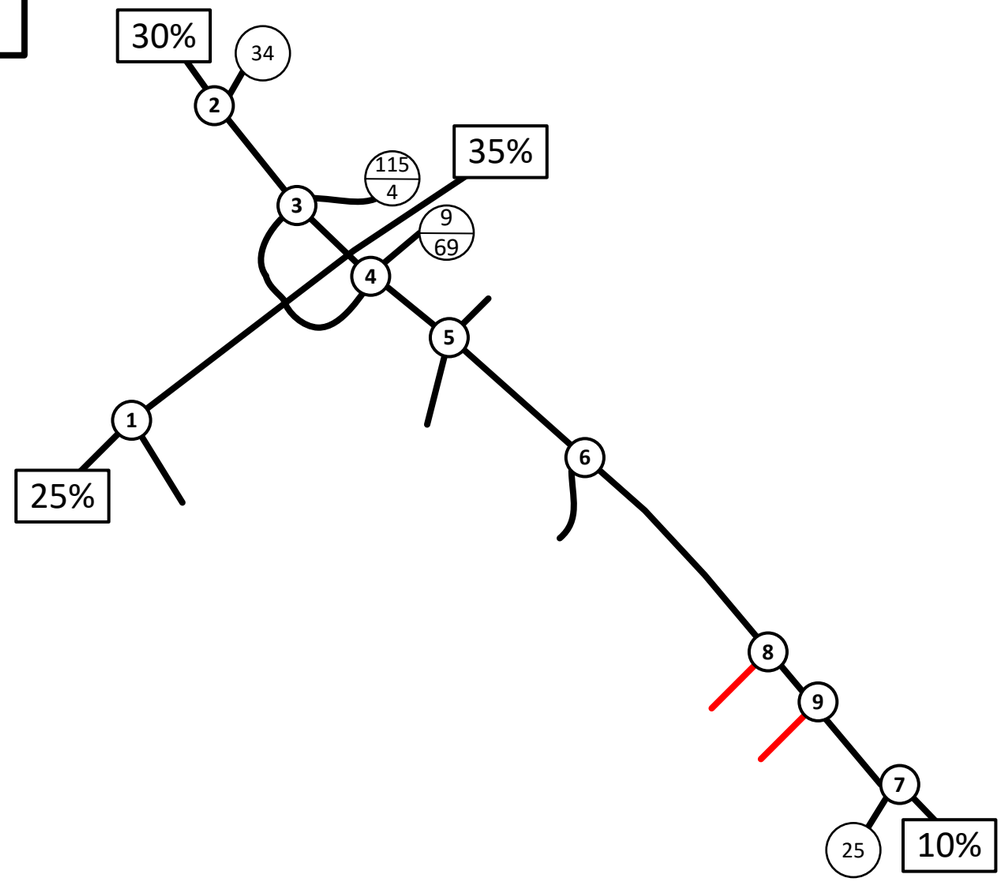
TRIP DISTRIBUTION

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 35% to/from the north on US 340
- 25% to/from the south on US 340
- 30% to/from the west on WV 115
- 10% to/from the east on WV 115

The external trip distribution percentages are shown on **Figure 6** and the AM and PM peak hour new site trip assignments are shown on **Figure 7** through **9**.





LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX% Entering Trip Percentage
- (X%) Exiting Trip Percentage

N

NOT TO SCALE

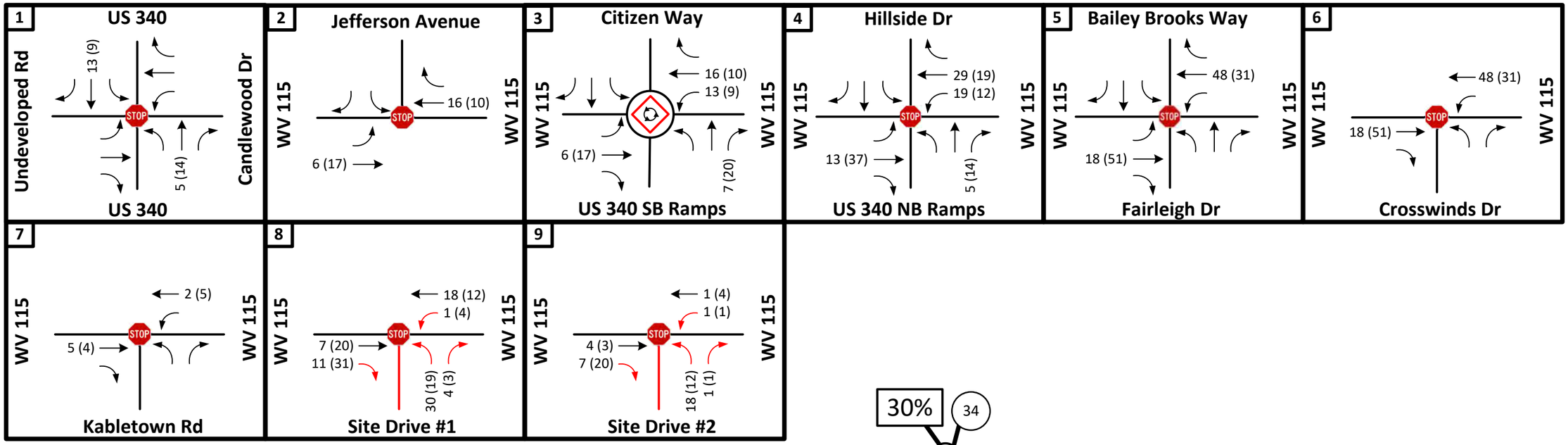
Kings Crossing Residential TIS

New Trip Distribution

DATE: May 2022

FIGURE 6

AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX AM Peak Hour Trips
- (XX) PM Peak Hour Trips

N

NOT TO SCALE

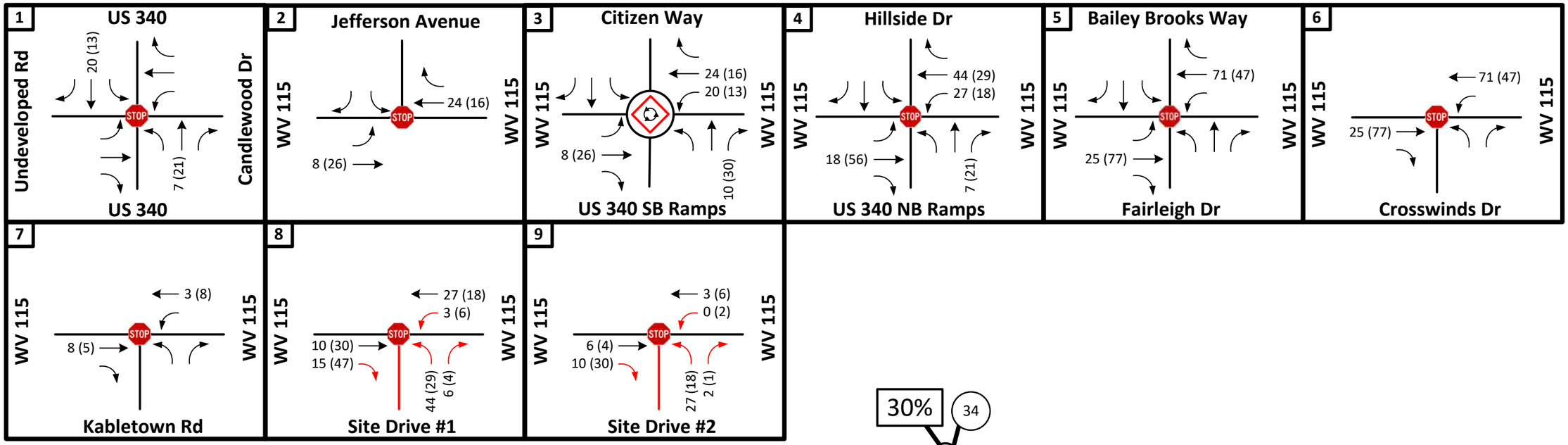
Kings Crossing Residential TIS

Phase 1 Site Trip Assignments

DATE: May 2022

FIGURE 7

AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX AM Peak Hour Trips
- (XX) PM Peak Hour Trips

N

NOT TO SCALE

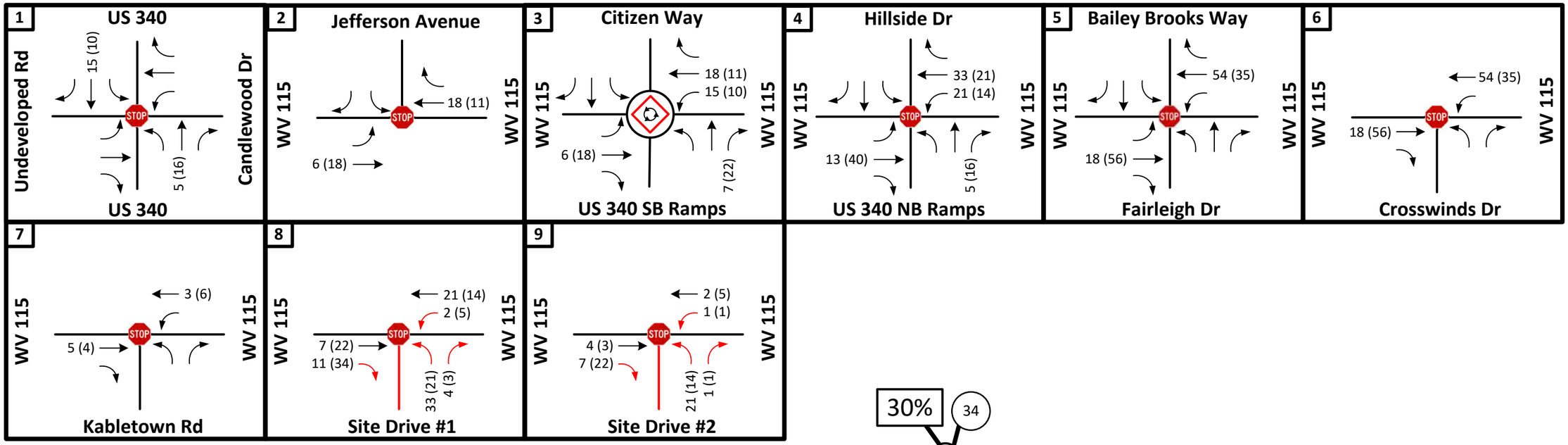
Kings Crossing Residential TIS

Phase 2 Site Trip Assignments

DATE: May 2022

FIGURE 8

AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX AM Peak Hour Trips
- (XX) PM Peak Hour Trips

N

NOT TO SCALE

Kings Crossing Residential TIS

Phase 3 Site Trip Assignments

DATE: May 2022

FIGURE 9

AMT

CONCLUSIONS/RECOMMENDATIONS

This report summarizes existing and future traffic analyses conducted in support of the proposed Kings Crossing Residential Development. The proposed residential development is to be located south of WV 115 (Charles Town Road) and east of US 340 (Berryville Pike) near Charles Town, Jefferson County, West Virginia. The proposed site plan includes 177 single-family homes and 227 townhomes and is expected to be built and completed by the year 2025. The development will be constructed in three phases. Phase 1 will include 43 single-family homes and 72 townhomes and is planned to be completed in 2022. Phase 2 includes an additional 81 single-family homes and 83 townhomes and is planned to be completed in 2024. Phase 3 includes an additional 53 single-family homes and 72 townhomes and is planned to be completed in 2025.

The proposed residential development is anticipated to be served by two site driveways intersecting directly with WV 115. Site Drive #1 and Site Drive #2 intersect with WV 115. Site Drive #1 (addressed as Road 1 on the site plan) is proposed to be located approximately 2,000 feet east of Crosswinds Drive approaching WV 115 from the south and will operate as a full movement approach utilizing two-way stop-control (TWSC). Site Drive #2 (addressed as Road 12 on the site plan) will approach WV 115 from the south approximately 2,600 feet east of Crosswinds Drive and will operate as a full movement approach utilizing TWSC.

Based on the findings of this study, the following infrastructure improvements are recommended to address existing capacity issues and maintain operation of the existing transportation network:

US 340 with Candlewood Drive

- Install pavement markings on the Candlewood Drive approach to US 340. Previous pavement markings are no longer visible and need to be reinstalled to delineate separate left and right turn lanes.

WV 115 with Jefferson Avenue

- As part of the Tate Manor TIS, it was recommended that a traffic signal be installed at the intersection of WV 115 and Jefferson Avenue. Intersection conditions previously met the MUTCD warranting criteria. Additionally, the 2021 Existing Conditions and 2022 No-Build analysis indicates that the intersection LOS will currently operates at LOS E during the PM peak hour under Two Way Stop Control. The previously completed signal warrant is located in **Appendix G**.

- In conjunction with installation of a traffic signal identified in previous studies, widening WV 115 to construct an exclusive left-turn lane on the eastbound approach is recommended. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with an appropriate taper.

WV 115 with Hillside Drive/ US 340 Northbound Ramps

- Proceed with the DOH planned conversion of the intersection to a single lane roundabout. The 2021 Existing Conditions analysis indicates that the northbound movement currently operates at LOS E during the PM peak hour. Under roundabout yield control, this intersection would operate at an overall LOS C during the PM peak hour for 2025 Full Build Conditions, with the northbound movement operating at LOS A.

Based on the finding of this study, the following improvements are recommended for Phase 1 of the Kings Crossing Residential Development:

WV 115 with Site Drive #1

- Construct Site Drive #1 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 2,000 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and two egress lanes to provide separate left and right turn lanes exiting the development. Site Drive #1 will operate under stop-control, while WV 115 operates as free-flow.

WV 115 with Site Drive #2

- Construct Site Drive #2 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 2,600 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and two egress lanes to provide separate left and right turn lanes exiting the development. Site Drive #2 will operate under stop-control, while WV 115 operates as free-flow.

Based on the finding of this study, the following geometric improvements are recommended to mitigate the impacts of the Kings Crossing residential development and maintain acceptable traffic operations along the existing transportation network after the full build out of Kings Crossing Residential development in 2025:

WV 115 with Citizen Way/US 340 Southbound Ramps

- Construct a low angle right turn slip lane on for the US 340 northbound ramp approach to WV 115 eastbound. The 2025 Partial Build analysis indicates that the ramp approach will deteriorate to LOS C during the PM peak hour with the overall intersection operating LOS B. The 2025 Build analysis indicates that the US 340 southbound ramp approach will deteriorate to LOS E during the PM peak hour with the overall intersection operating at LOS C. The addition of the right turn slip lane improves the ramp to LOS B during the PM peak hour and the overall intersection to LOS B. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.

WV 115 with Site Drive #1

- Construct an exclusive left-turn lane on the WV 115 westbound approach to Site Drive #2. Peak hour volumes are projected to meet the AASHTO guidelines following 2025 Build Conditions PM peak hour. The left-turn should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.

APPENDIX F-4: PENDING FAIRVIEW FARMS TIS

Fairview Farms Traffic Impact Study - REVISION
Charles Town, Jefferson County, WV

AMT Project File 22-0255.001 | August 4, 2023

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Signature: Date: 08/04/2023

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EXECUTIVE SUMMARY

This report summarizes existing and future traffic analyses conducted in support of the proposed Fairview Farms Mixed-Use Development. The proposed development is to be located north of WV 115 (Charles Town Road) and east of US 340 (Berryville Pike) in Charles Town, Jefferson County. The proposed site plan includes 267 single-family homes, 200 townhomes, and 99,000 square feet (sf) of self-storage. Fairview Farms is expected to be built and completed by the year 2030.

The proposed mixed-use development is anticipated to be served by two site driveways intersecting directly with WV 115. Site Drive #1 is proposed to be located approximately 630 feet east of Crosswinds Drive approaching WV 115 from the north and will operate as a full movement approach utilizing two-way stop-control (TWSC). Site Drive #2 will approach WV 115 from the north approximately 1,270 feet east of Crosswinds Drive and will operate as a full movement approach utilizing TWSC.

Traffic analyses will consider future conditions at the anticipated build-out year of 2030. This report summarizes the analyses of 2022 Existing conditions, 2030 No-Build conditions (without proposed development in place), 2030 Build conditions (with the proposed development in place), and 2030 Build Improved conditions (with the proposed development and improvements in place) during weekday AM and PM peak hours. An annual growth rate of 1.20% was obtained from the WVDOH Performance Management Division.

Three approved traffic impact studies have been included in the future peak hour forecasts as pending developments that will be complete by the Build Year of 2030. These developments are the Tate Manor, Magnolia Springs, and Kings Crossing residential developments. The Tate Manor and Magnolia Springs developments are located north of Crescent Drive/High Street and east of Jefferson Avenue in Charles Town and are anticipated to be completed by the year 2024. The Kings Crossing development is located along the south side of WV 115 opposite the proposed development and is anticipated to be complete by 2025. Estimated traffic generated by the three developments are included in the background traffic volumes beginning in the 2030 No-Build conditions.

AMT (A. Morton Thomas and Associates, Inc.) was retained to determine the projected traffic impacts of the proposed development in accordance with the guidelines set forth by WVDOH in Traffic Engineering Directive (TED) 106-2. The intent of the study is to fully examine the impacts of the traffic generated by the development on the existing transportation system and identify potential mitigation measures. This report presents trip generation, trip distribution, intersection on capacity analysis, queuing analysis, auxiliary lane analysis, and recommendations for transportation improvements necessary to meet the anticipated traffic demands.

Based upon a review of the site plan and adjacent transportation network and following scope of work coordination with WVDOH, the following eight existing and two proposed intersections are included within the scope of the Traffic Impact Study (TIS) for the proposed Fairview Farms residential development:

1) WV 115 (Charles Town Road) with Jefferson Avenue (CR 34) (*TWSC "T" type intersection)*
2) WV 115 with Citizens Way (CR 115/4)/US 340 SB (*Single-lane Roundabout Plus intersection)*
3) WV 115 with Hillside Drive (CR 9/69)/US 340 NB (*TWSC Plus type intersection)*
4) WV 115 with Fairleigh Drive/Bailey Brooks Way *(TWSC Plus type intersection)*

5) WV 115 with Crosswinds Drive *(TWSC "T" type intersection)*
6) WV 115 with Kabletown Road (CR 25) *(TWSC "T" type intersection)*
7) WV 115 with Cattail Run Road (CR 9/3) *(TWSC "T" type intersection)*
8) WV 9 (Veterans Memorial Highway) with Cattail Run Road *(TWSC Plus type intersection)*
9) WV 115 with Site Drive #1 *(Proposed TWSC "T" type intersection)*
10) WV 115 with Site Drive #2 *(Proposed TWSC "T" type intersection)*

Peak Hour Traffic Volumes

Peak hour turning movement counts were collected for the eight existing intersections within the study area by AMT on Friday April 23, 2022 between the hours of 7-9 AM and 3-6 PM. On this date, Jefferson County Schools were fully operational with in-classroom instruction for all students.

The proposed development is expected to be complete by the year 2030. The 2030 No-Build peak hour traffic volumes include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, and an annual traffic growth prior to the year 2030. The growth rate of 1.20% was applied to the existing peak hour traffic counts and compounded annually.

The 2030 Build Conditions include the existing 2022 traffic volume, the anticipated traffic generated by the pending Tate Manor development, the anticipated traffic generated by the Magnolia Springs development, the anticipated traffic generated by the Kings Crossing development, an annual traffic growth prior to the year 2030, and the traffic generated by build-out of the Fairview Farms development. Site generated traffic was distributed onto the transportation network based upon existing traffic patterns and anticipated origin and destination of the newly generated site trips.

Site Trip Generation and Distribution

The proposed Fairview Farms mixed-use development includes 267 single-family homes, 200 townhomes, and 99,000 sf of self-storage. Trip generation "Peak Hour of Generator" rates from ITE Trip Generation Manual, 11th Edition, were utilized for Self-Storage (LUC 151), Single-Family Detached Housing (LUC 210), and Multifamily Housing (LUC 220). Trip generation analysis indicates that a total of 4,133 new daily trips will be generated including 335 AM peak hour trips and 421 PM peak hour trips.

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 25% to/from the north on US 340
- 25% to/from the south on US 340
- 15% to/from the east on WV 9
    - 10% to/from north via Cattail Run Road
    - 5% to/from north via US 340
- 30% to/from the west on WV 115
- 5% to/from the east on WV 115

2022 Existing Conditions Analysis

The results of the 2022 Existing Conditions capacity analyses indicate that one traffic movement currently operates worse than LOS D, which is considered the minimum tolerable level. Traffic movements that are expected to operate worse than LOS D include the following (movements shown in bold type indicate they first appear in the milestone analysis being discussed):

- ***US 340 NB Ramp northbound shared left/thru lane to WV 115 LOS F during PM peak hour***

2030 No-Build Conditions Analysis

Improvements included in the 2030 No-Build Conditions include installation of a traffic signal at WV 115 with Jefferson Avenue and construction of an exclusive left-turn lane on WV 115 eastbound at Jefferson Avenue. These improvements were included in the Tate Manor TIS. In addition, construction of a single-lane roundabout at the WV 115 with US 340 NB Ramp/Hillside Drive is included in the 2030 No-Build conditions. This improvement is currently a planned project by WVDOH and requested to be included beginning in this scenario.

The results of the 2030 No-Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2022 Existing Conditions are anticipated to be mitigated following implementation of proposed improvements. One additional movement is anticipated to operate worse than LOS D during the 2030 No-Build conditions (shown in bold). Traffic movements that are expected to operate worse than LOS D include the following:

- ***Farleigh Drive northbound approach to WV 115 LOS E during PM peak hour***

2030 Build Conditions Analysis

Improvements included in the 2030 Build Conditions include construction of the two site driveways intersecting with WV 115.

The results of the 2030 Build Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2030 No-Build Conditions are anticipated to continue. Three additional movements are anticipated to operate worse than LOS D during the 2030 Build conditions (shown in bold). Traffic movements that are expected to operate worse than LOS D include the following:

- ***US 340 SB Ramp northbound shared left/thru/right lane to WV 115 LOS E during PM peak hour***
- ***WV 115 eastbound approach to US 340 NB Ramp/Hillside Drive LOS E during PM peak hour***
- *Farleigh Drive northbound approach to WV 115 LOS F during PM peak hour*
- ***Crosswinds Drive northbound left-turn movement to WV 115 LOS E during PM peak hour***

2030 Build Improved Conditions Analysis

Improvements included in the 2030 Build Improved Conditions comprise construction of a right-turn slip lane on the US 340 Southbound Ramp to WV 115, construction of a right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramp/Hillside Drive, construction of an exclusive left-turn lane on WV 115 eastbound approach to Site Drive #1, and construction of an exclusive left-turn lane on WV 115 eastbound approach to Site Drive #2.

The results of the 2030 Build Improved Conditions capacity analyses indicate that traffic movements that operate worse than LOS D during 2030 Build Conditions will be mostly mitigated following implementation of proposed improvements. Traffic movements that are expected to operate worse than LOS D include the following:

- *Farleigh Drive northbound approach to WV 115 LOS F during the PM peak hour*
- *Crosswinds Drive northbound left-turn movement to WV 115 LOS E during PM peak hour*

Conclusions/Recommendations

Based on the findings of the Tate Manor TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Tate Manor residential development in order to maintain operation of the existing transportation network:

WV 115 with Jefferson Avenue

- As part of the Tate Manor TIS, it was recommended that a traffic signal be installed at the intersection of WV 115 and Jefferson Avenue. Intersection conditions previously met the MUTCD warranting criteria. Additionally, the 2022 Existing Conditions and 2030 No-Build analysis indicates that the intersection LOS will currently operates at LOS E during the PM peak hour under TWSC.

- In conjunction with installation of a traffic signal identified in previous studies, widening WV 115 to construct an exclusive left-turn lane on the eastbound approach is recommended. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with an appropriate taper.

Based on the findings of the Kings Crossing TIS, the following infrastructure improvements are recommended to address existing capacity issues and accommodate the Kings Crossing residential development in order to maintain operation of the existing transportation network:

WV 115 with Citizen Way/US 340 Southbound Ramps

- Construct a low angle right-turn slip lane on for the US 340 northbound ramp approach to WV 115 eastbound. The 2030 Build analysis indicates that the ramp approach will deteriorate to LOS E during the PM peak hour with the overall intersection operating LOS C. The addition of the right-turn slip lane improves the ramp to LOS A during the PM peak hour and the overall intersection to LOS B. This measure is needed at the conclusion of Phase 2 and prior to beginning Phase 3.

Based on the findings of the Magnolia Springs TIS, the following infrastructure improvements are recommended to address existing capacity issues in order to maintain operation of the existing transportation network:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Proceed with the WVDOH planned conversion of the intersection to a single lane roundabout. This project is currently programmed by WVDOH and is expected to be constructed in 2025. For the purpose of this study, the installation of a single lane roundabout is included beginning in 2030 No-Build conditions.

Based on the findings of this study, the following capacity infrastructure improvements are recommended to mitigate future transportation issues prior to construction of the Fairview Farms Development:

WV 115 with Hillside Drive/US 340 Northbound Ramps

- Construct an exclusive right-turn slip lane on the WV 115 eastbound approach to US 340 Northbound Ramps/Hillside Drive. The WV 115 eastbound approach is anticipated to experience lengthy queues beginning in the 2030 No-Build conditions. This improvement increases capacity and reduces queue lengths on the approach.

Based on the finding of this study, the following geometric improvements are recommended to mitigate the impacts of the Fairview Farms development and maintain acceptable traffic operations along the existing transportation network in 2030:

WV 115 with Site Drive #1

- Construct Site Drive #1 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 630 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and one egress lane. Site Drive #1 will operate under stop-control, while WV 115 operates as free-flow.

- Construct an exclusive left-turn lane on the WV 115 eastbound approach to Site Drive #1. Peak hour volumes are projected to meet the AASHTO guidelines during 2030 Build Conditions AM and PM peak hours. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper.

WV 115 with Site Drive #2

- Construct Site Drive #2 as a full movement approach intersecting with WV 115 creating a "T" type intersection approximately 1,270 feet east of Crosswinds Drive. The site driveway is recommended to include one ingress and one egress lane. Site Drive #2 will operate under stop-control, while WV 115 operates as free-flow.

- Construct an exclusive left-turn lane on the WV 115 eastbound approach to Site Drive #2. Peak hour volumes are projected to meet the AASHTO guidelines during 2030 Build Conditions PM peak hour. The left-turn lane should be constructed to provide a minimum of 125 feet of full-width storage with appropriate taper.

267 SINGLE FAMILY LOTS

200 TOWNHOUSE LOTS

Neighborhood Residential Land Use Mix Requirements				
	Requirement*		Provided	
Use	%	Acres	%	Acres
Residential	50	58.08	0.50	58.09
Commercial	10	11.62	0.10	11.62
Open Space*	10	7.75	0.13	10.17

*Per Ordinance, 10% of "usable land (Net Builldabal Land Area)" required for open space.

150 75 0 150 300 450

GRAPHICAL SCALE: 1" = 150'

NORTH

COMPREHENSIVE PLAN ROAD
LIMITED ACCESS
(80' RIGHT-OF-WAY)

SWM

SWM

SWM

CENTRAL
OPEN SPACE
(3.42 ACRES)

SWM

Intersection #5 – WV 115 & Crosswinds Dr (Full Access)

Intersection #9 – WV 115 & Site Drive #1 (Full Access)

COMMERCIAL LOT #1
(3.76 ACRES)

15' WIDE ROAD RIGHT-OF-WAY
RESERVATION (ROUTE 115)

COMMERCIAL LOT #2
(5.44 ACRES)

Intersection #10 – WV 115 & Site Drive #2 (Full Access)

WATER PLANT DEDICATION
(2.42 ACRES)

SWM

SINGLE FAMILY LOT (110' DEPTH)

TOWNHOUSE LOT (100' DEPTH)

COMMON OPEN SPACE

STORMWATER MANAGEMENT

COMMERCIAL LOT

Fairview Farms TIS

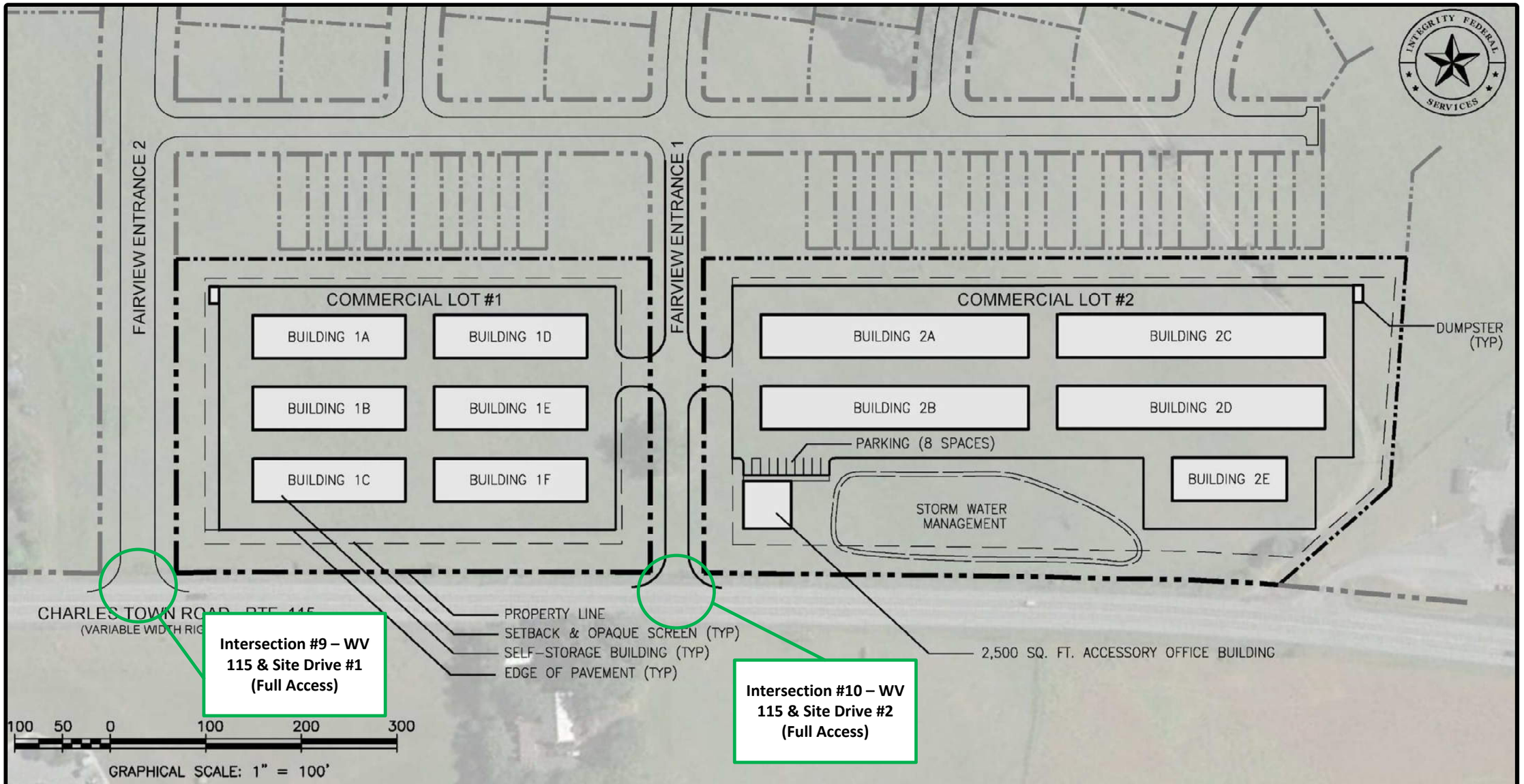
Site Plan - Overview

DATE: August 2023

FIGURE 2

N

NOT TO SCALE



COMMERCIAL LOT #1	
BUILDING	AREA (SQ. FT.)
1A	7,200
1B	7,200
1C	7,200
1D	7,200
1E	7,200
1F	7,200
TOTAL	43,200

COMMERCIAL LOT #2	
BUILDING	AREA (SQ. FT.)
2A	12,600
2B	12,600
2C	12,600
2D	12,600
2E	5,400
TOTAL	55,800

TOTAL FLOOR AREA	
USE	AREA (SQ. FT.)
SELF-STORAGE	99,000
ACCESSORY OFFICE	2,500

SELF-STORAGE CONCEPT A

FAIRVIEW FARMS COMMERCIAL

TAX MAP 10, PARCEL 218.1
CITY OF CHARLES TOWN
JEFFERSON COUNTY, WEST VIRGINIA

Fairview Farms TIS

Site Plan – Commercial Lots

DATE: August 2023

FIGURE 3

NOT TO SCALE

TRIP GENERATION

The proposed Fairview Farms mixed-use development includes 267 single-family homes, 200 townhomes, and 99,000 sf of self-storage. Trip generation "Peak Hour of Generator" rates from ITE Trip Generation Manual, 11th Edition, were utilized for Self-Storage (LUC 151), Single-Family Detached Housing (LUC 210), and Multifamily Housing (LUC 220). As shown in **Table 2** below, the proposed development will generate a total of 4,133 new daily trips including 335 AM peak hour trips and 421 PM peak hour trips.

Table 2: Trip Generation Summary

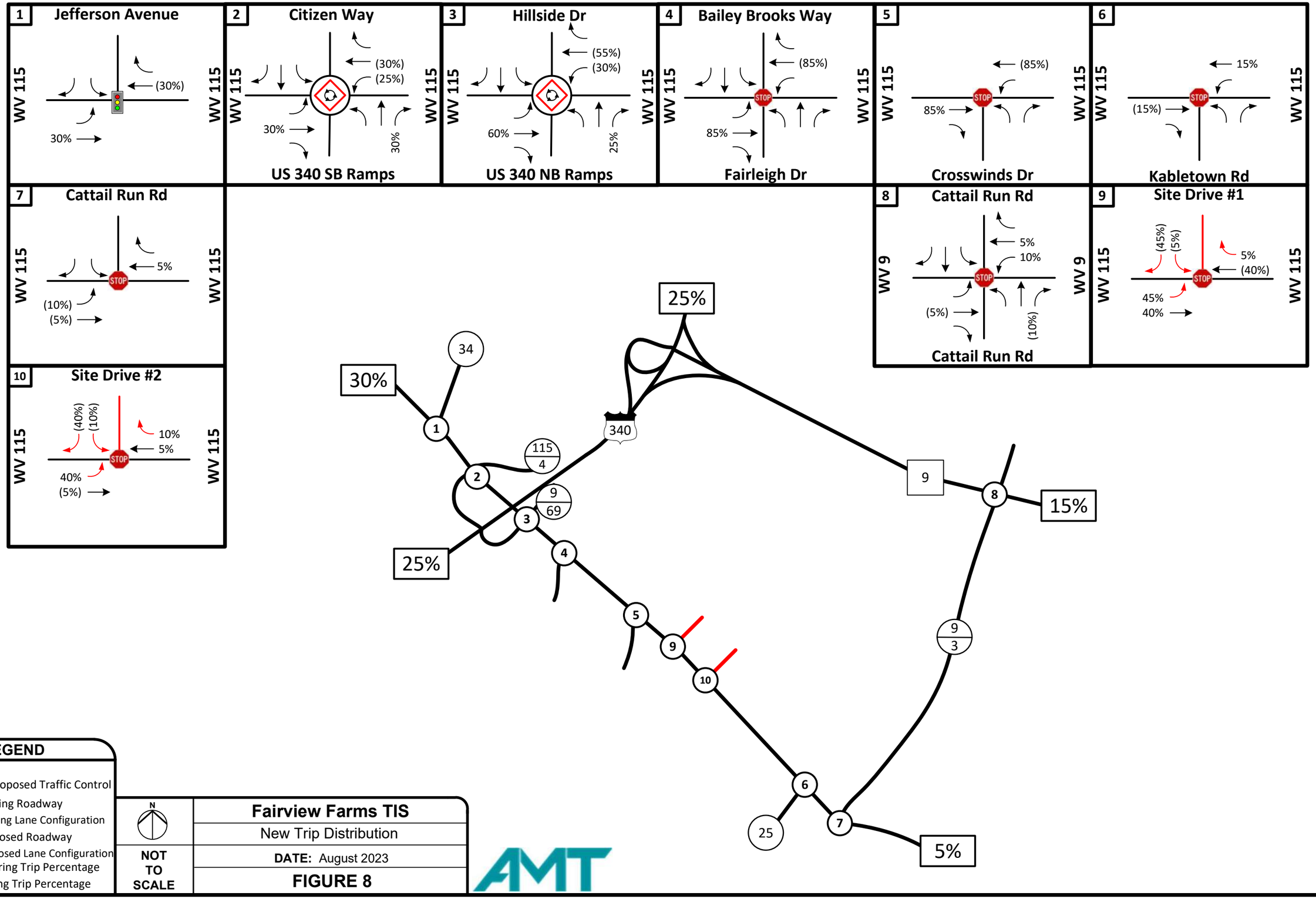
Description	LUC	Density		Daily Trips	AM Peak			PM Peak		
					Enter	Exit	Total	Enter	Exit	Total
Self Storage Facility	151	99,000	S.F.	149	10	10	20	10	10	20
Single-Family Homes	210	267	Units	2,520	53	150	203	171	96	267
Townhomes	220	200	Units	1,464	31	81	112	79	55	134
Net New External Trips				**4,133**	**94**	**241**	**335**	**260**	**161**	**421**

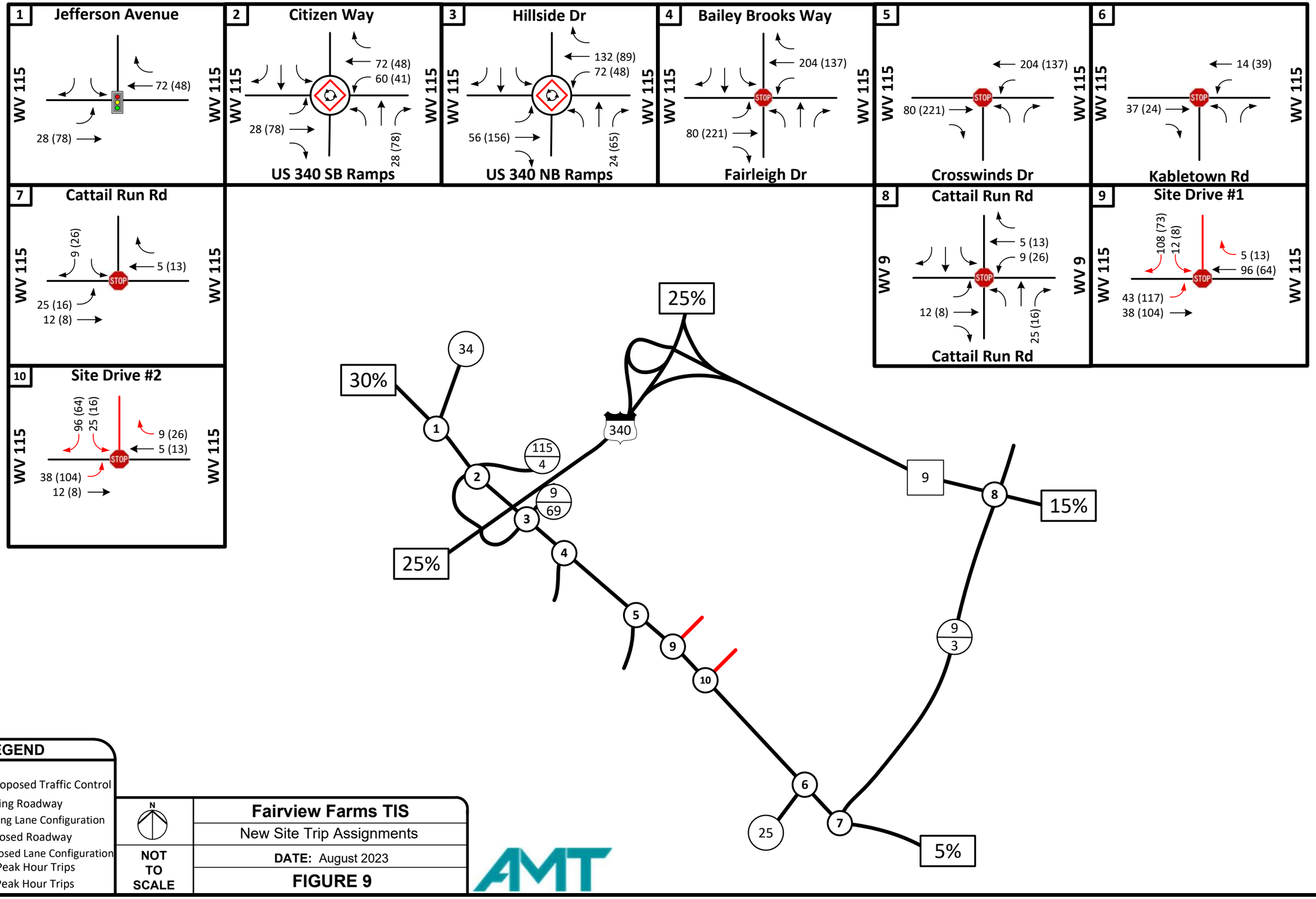
TRIP DISTRIBUTION

The AM and PM peak hour trips to/from the proposed site were distributed based upon interpolation from current traffic patterns with all trips entering the development via WV 115. Distribution of the new external trips are as follows:

- 25% to/from the north on US 340
- 25% to/from the south on US 340
- 15% to/from the east on WV 9
  - 10% to/from north via Cattail Run Road
  - 5% to/from north via US 340
- 30% to/from the west on WV 115
- 5% to/from the east on WV 115

The external trip distribution percentages are shown on **Figure 8** and the AM and PM peak hour new site trip assignments are shown on **Figure 9**.


1
Jefferson Avenue
WV 115
WV 115
(30%)
30%
2
Citizen Way
(30%)
(25%)
30%
30%
US 340 SB Ramps
3
Hillside Dr
(55%)
(30%)
60%
25%
US 340 NB Ramps
4
Bailey Brooks Way
(85%)
STOP
85%
Fairleigh Dr
5
(85%)
STOP
85%
Crosswinds Dr
6
15%
STOP
(15%)
Kabletown Rd
7
Cattail Run Rd
5%
STOP
(10%)
(5%)
8
Cattail Run Rd
WV 9
WV 9
5%
10%
STOP
(5%)
(10%)
Cattail Run Rd
9
Site Drive #1
(45%)
(5%)
5%
(40%)
STOP
45%
40%
10
Site Drive #2
(40%)
(10%)
10%
5%
STOP
40%
(5%)
25%
34
30%
1
340
115
4
2
9
69
3
4
25%
5
9
10
9
3
9
8
15%
6
25
7
5%
LEGEND
Proposed Traffic Control
Existing Roadway
Existing Lane Configuration
Proposed Roadway
Proposed Lane Configuration
XX% Entering Trip Percentage
(X%) Exiting Trip Percentage
N
NOT TO SCALE
Fairview Farms TIS
New Trip Distribution
DATE: August 2023
FIGURE 8
AMT



LEGEND

- Proposed Traffic Control
- Existing Roadway
- Existing Lane Configuration
- Proposed Roadway
- Proposed Lane Configuration
- XX AM Peak Hour Trips
- (XX) PM Peak Hour Trips

N

NOT TO SCALE

Fairview Farms TIS

New Site Trip Assignments

DATE: August 2023

FIGURE 9

AMT

APPENDIX G: PROJECT CORRESPONDENCE

APPENDIX G-1: SCOPE OF WORK

Proposed TIS Scope of Work (SOW)

Hillside Residential Development TIS

Charles Town, Jefferson County

Purpose

The purpose of this SOW document is to delineate the assumptions of the Traffic Impact Study (TIS) for the proposed development project. Confirming assumptions at the beginning of the project helps to assure that the TIS will be completed only once and in a timely matter. This memorandum aims to create a communicative line between the WVDOH, the client, and the traffic engineer to discuss all of the issues involved with completing the TIS. This document will cover the following topics:

- Client Information
- Study Methodology
- Intersections to be studied
- Existing Traffic Data Collection
- Trip Generation
- Trip Distribution
- Site Access
- Approved Developments
- Additional Data Needs
- Local Government Coordination

Client Information

AMT is preparing this study on behalf of *Hillside Investment LLC.* Our Point of Contact is *John Thomas*.

175 John J Thomas Way
Charles Town, WV 25414
johnthomas1602@comcast.net

Study Methodology

The site is located north of WV 115 (Charles Town Road) east of US 340 in Charles Town, Jefferson County. Site access is proposed via one site driveway connecting with Hillside Drive (CR 9/69) from the north and one site driveway intersecting with Sternway Drive from the north just east of Hillside Drive. Both the weekday AM (7-9 AM) and PM (3-6 PM) peak hours will be studied.

The analysis will follow the TED 106-2 along with applicable ITE and Highway Capacity methodologies which include four milestones:

- 2022 Existing Conditions
- 2029 Future No-Build Conditions (without proposed development and with any approved adjacent development in place)
- 2029 Future Build Conditions (with the proposed development in place)

- 2029 Future Build Improved Conditions (with the proposed development and recommended improvements in place)

Traffic analysis will consider Future Build conditions at the build-out year. Based upon current information, the development is assumed to fully built by 2029. A growth rate provided by WVDOH Performance Management Division for the pending *Fairview Farms TIS* will be utilized to determine future traffic volumes.

The analyses will be performed using the SYNCHRO 11.1 and SIDRA 9.0 (as applicable) software packages. The use of the software helps to ensure that the intersections will be analyzed in real life situations with intersections in coordination in all conditions.

Number of Intersections to be Studied

The following eight (8) existing intersections will be included in the study for capacity analysis:

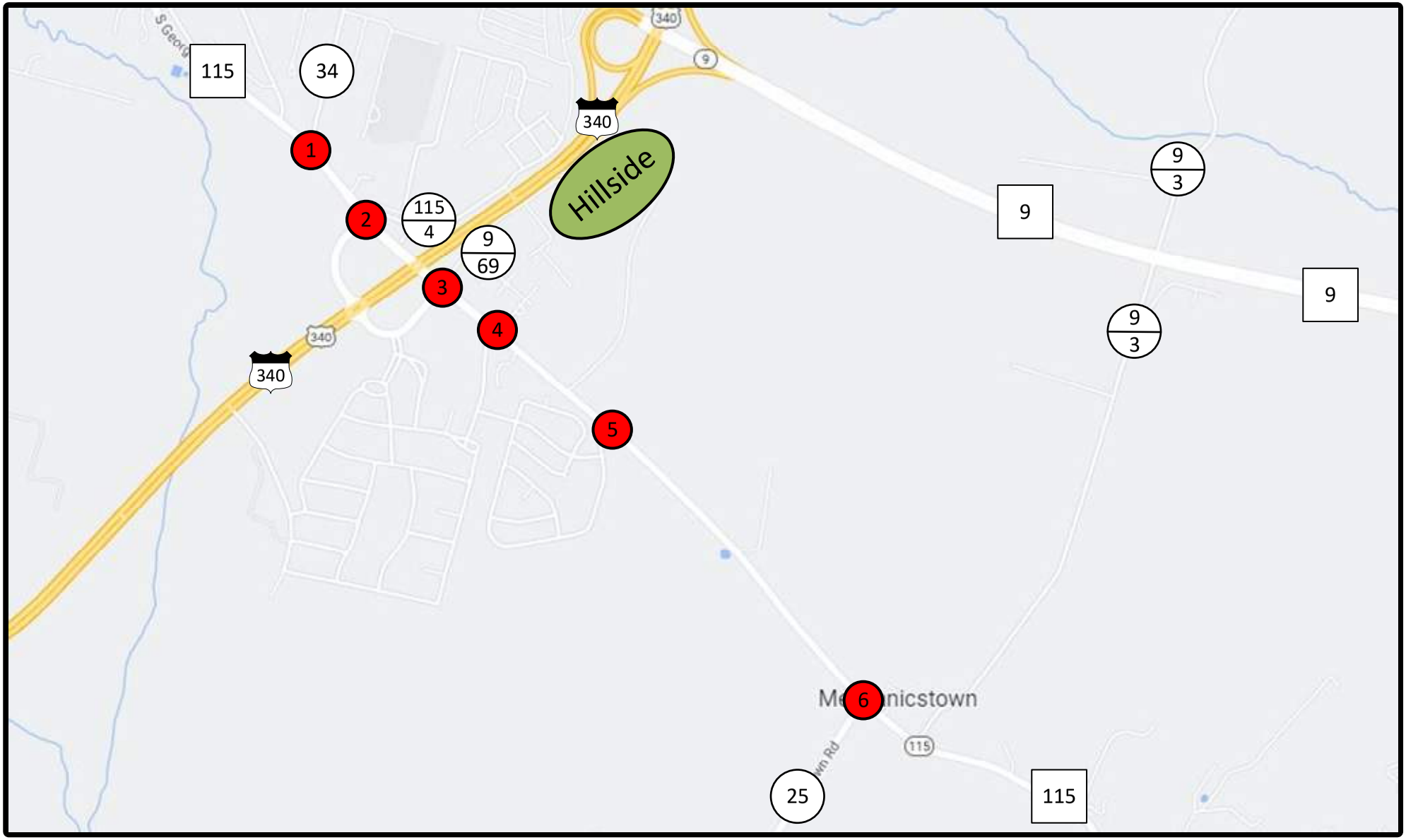
1. WV 115 with Jefferson Avenue (CR 34)
    - Existing: Stop Controlled "T" Intersection
2. WV 115 with Citizens Way (CR 115/4)/US 340 SB Ramps
    - Existing: Roundabout Plus Intersection
3. WV 115 with Hillside Drive (CR 9/69)/US 340 NB Ramps
    - Existing: Stop Controlled Plus Intersection
    - Proposed: Roundabout Plus Intersection (Planned WVDOH Project)
4. WV 115 with Fairleigh Drive
    - Existing: Stop Controlled "T" Intersection
5. WV 115 with Crosswinds Drive
    - Existing: Stop Controlled "T" Intersection
6. WV 115 with Kabletown Road (CR 25)
    - Existing: Stop Controlled "T" Intersection

Site access will be provided by the following connections:

- Site Access #1 is a connection to the current dead end of Hillside Drive – Hillside Drive intersects with WV 115 opposite US 340 NB Ramps
- Site Access #2 is a connection to Sternway Drive from the north creating a "T" Intersection. Sternway Drive intersects with Hillside Drive to the west of the proposed site access #2

The proposed site access roadways appear to be simple connections and do not merit analysis. All site connections will be within the City of Charles Town.

Figure 1 shows the study area and key intersections. Figure 2 shows the current conceptual site plan with proposed access.



LEGEND

- = Development
- = Existing Intersection
- = Proposed Intersection

AMT

N

NOT TO SCALE

Hillside TIS

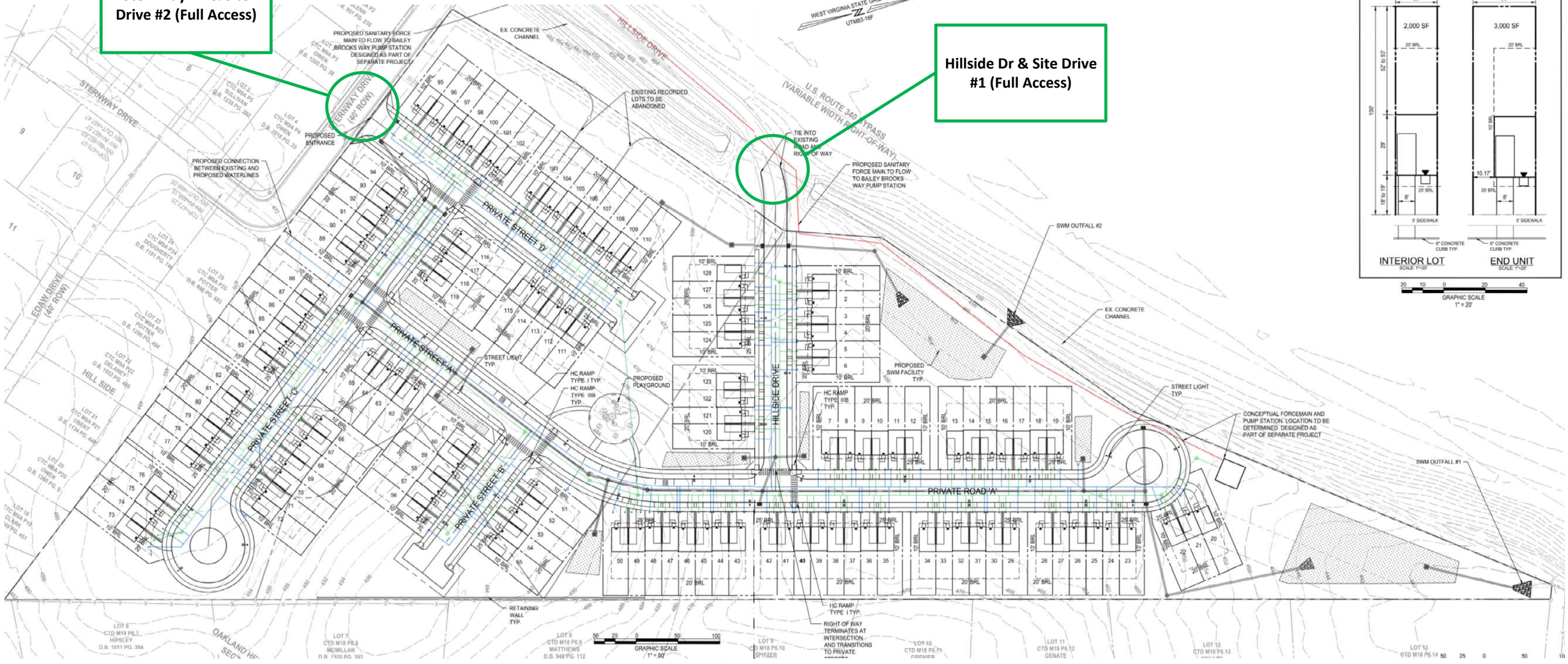
Site Location Map

DATE: August 2023

FIGURE 1

Sternway Dr & Site Drive #2 (Full Access)

Hillside Dr & Site Drive #1 (Full Access)



Hillside TIS

Site Plan

DATE: August 2023

FIGURE 2

NOT TO SCALE

Existing Traffic Data Collection

The existing intersections were collected as part of the pending *Fairview Farms TIS* project. Peak hour turning movement counts at each existing intersection were collected on Friday May 13, 2022, while Jefferson County Schools were in session between the hours of 7AM to 9AM and 3PM to 6PM. Turning Movement counts were collected at the following locations:

- WV 115 with Jefferson Avenue (CR 34)
- WV 115 with Citizens Way (CR 115/4)/US 340 SB Ramps
- WV 115 with Hillside Drive (CR 9/69)/US 340 NB Ramps
- WV 115 with Fairleigh Drive
- WV 115 with Crosswinds Drive
- WV 115 with Kabletown Road (CR 25)

Trip Generation

The proposed site will be 128 townhome units (See Figure 2). Peak hour trip generation will be determined using trip rate data from the latest version of the ITE Trip Generation Manual using Land Use Codes (LUC) 220 (Multi-Family Housing).

Trip Distribution

The site-generated trips to and from the proposed residential development will be distributed in accordance with the existing traffic patterns and land uses in the vicinity of the study area. Proposed trip distribution based upon current conditions is as follows:

- 40% to/from the north on US 340
    - 25% to/from the north on US 340
    - 15% to/from the east on WV 9
- 25% to/from the south on US 340
- 30% to/from the west on WV 115
- 5% to/from the east on WV 115

This proposed distribution results in an 5/95 east/west split for traffic entering the site from WV 115. Trip distribution will be confirmed once turning movement data is collected and discussed with WVDOH prior to submission of the preliminary TIS document.

Site Access

Access to the site is proposed to be provided by two site access points. Each of these are detailed below:

- Site Access #1 is a connection to the current dead end of Hillside Drive – Hillside Drive intersects with WV 115 opposite US 340 NB Ramps
- Site Access #2 is a connection to Sternway Drive from the north creating a "T" Intersection. Sternway Drive intersects with Hillside Drive to the west of the proposed site access #2

Approved Developments

The TIS will potentially include any applicable approved or pending TIS documents for projects in the vicinity of this proposed development, as determined by WVDOH. Preliminary adjacent pending developments will include the following:

- Magnolia Springs TIS (parcel north of WV 115 and east of US 340)
- Jefferson Heights South TIS (parcel east of CR 34 near Belvedere Farms Lane)

- Kings Crossing TIS (parcel on south side WV 115 east of proposed development)
- *Pending* Fairview Farms TIS (parcel on north side of WV 115 east of proposed development)

Additional Data Needs

The following information is requested in order to complete the analysis for this project:

- Any potential DOH improvement projects planned in this area

Local Government Coordination

The TIS will be provided to the following entities, plus any added through the coordination process:

- City of Charles Town
- Jefferson County Commission
- Hagerstown Eastern Panhandle MPO (HEPMPO)

Glaser, Caleb

From: Meadows, Donald R <donald.r.meadows@wv.gov>
Sent: Monday, August 21, 2023 4:28 PM
To: Glaser, Caleb
Cc: Ken Clohan
Subject: Re: Potential Hillside TIS - Charles Town, Jefferson County

Caleb,
After reviewing the proposed SOW for the Hillside Dr Residential Development, based on the size and location of the development combined with the anticipated Trip Distribution, we see no reason to include the WV 115 intersections with Fairleigh Dr and Crosswinds Dr. Otherwise, remainder of scope looks good and you can proceed with preparation of the study document. As this TIS technically is not being prepared as a requirement of the DOH, when ready to submit, you can provide directly to Ken and myself for a "courtesy" review and no developer agreement will be required. Let us know if you have any questions or if you need any additional information. THANKS>DON

Donald R. Meadows
West Virginia Division of Highways
Traffic Engineering - Operations
1900 Kanawha Blvd. E.
Charleston, WV 25305
Office Ph: 304-414-7354
Cell Ph: 304-382-3160

On Thu, Aug 10, 2023 at 11:18 AM Glaser, Caleb <cglaser@amtengineering.com> wrote:

> Good Morning Don & Ken,
>
> Attached is our proposed Scope of Work (SOW) for a residential development located in Charles Town, Jefferson County. The site is proposed to include 128 Townhome lots and to be served by two site driveways (one directly connecting with Hillside Drive and one intersecting with Sternway Drive). I have been told you are both aware of the project and do not require a TIS but the City of Charles Town is requesting the developer complete a TIS. I wanted to provide you both with the proposed SOW (and TIS report once complete) to keep you both in the loop on the project.
>
> Best Regards,

Caleb Glaser, PE, PTOE
Project Engineer

Direct 304-903-7010 **Cell** 216-640-5970 **Corporate** 800-881-2545
amtengineering.com LinkedIn Title VI Statement

APPENDIX G-2: GROWTH RATE

Glaser, Caleb

From: Skeen, Jeremy P <jeremy.p.skeen@wv.gov>
Sent: Tuesday, May 17, 2022 2:18 PM
To: Glaser, Caleb
Subject: Re: [External] WV 115 Growth Rate - Jefferson County

Caleb,

The same growth rate can be used from the previous year.

Thank you,
Jeremy

On Tue, May 17, 2022 at 9:47 AM Glaser, Caleb <cglaser@amtengineering.com> wrote:

> Good Morning Jeremy,
>
> We have a new TIS starting across from this previous project on WV 115. This is another residential development for a private client and was wondering if we would be able to utilize the same growth rate you provided about a year ago? The site driveways will intersect with WV 115 between Candlewood Drive & Kabletown Road intersections.
>
> Please let me know if this is possible or if the growth rate would've changed in the past year. As always I appreciate your assistance.
>
> Best Regards,
>
> **Caleb Glaser** P.E.
>
> Engineer
>
> **P** 304-400-4952 **| D** 304-903-7010 **| C** 216-640-5970
> **W** www.amtengineering.com
>
> **From:** Skeen, Jeremy P <Jeremy.P.Skeen@wv.gov>
> **Sent:** Wednesday, May 5, 2021 7:36 AM
> **To:** Glaser, Caleb <cglaser@amtengineering.com>

Cc: Johnson, Leland W <Leland.W.Johnson@wv.gov>
Subject: RE: [External] WV 115 Growth Rate - Jefferson County

Caleb,

According to the MPO Model of Jefferson County, the growth rate of WV 115 just East of the US 340 interchange is: 1.1978%

Thanks,

Jeremy

From: Johnson, Leland W <Leland.W.Johnson@wv.gov>
Sent: Friday, April 30, 2021 1:18 PM
To: Skeen, Jeremy P <Jeremy.P.Skeen@wv.gov>
Cc: cglaser@amtengineering.com
Subject: FW: [External] WV 115 Growth Rate - Jefferson County

Jeremy,

Please handle this request.

Leland

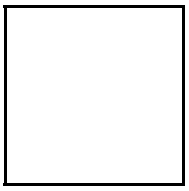
From: Glaser, Caleb <cglaser@amtengineering.com>
Sent: Friday, April 30, 2021 1:16 PM
To: Johnson, Leland W <Leland.W.Johnson@wv.gov>
Cc: Elsayed, Gehan M <Gehan.M.Elsayed@wv.gov>
Subject: [External] WV 115 Growth Rate - Jefferson County

CAUTION: External email. Do not click links or open attachments unless you verify sender.

Good Afternoon Leland,

Could you provide the anticipated annual traffic growth rate for WV 115 in Jefferson County at the US 340 interchange? We are preparing a TIS for a residential development just east of the interchange. In June 2019 you provided us with a growth rate in this area at 1.31% and was unsure if it would've changed.

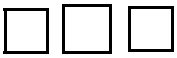
Thank you,



Caleb Glaser EIT

Engineer

P 304-400-4952 **| D** 304-903-7010 **| C** 216-640-5970
W www.amtengineering.com



Kimley»Horn

Memorandum

To: Sylke Knuppel
IMEG
4601 Forbes Boulevard #140
Lanham, MD 20706

From: Mark Phillips, P.E.

Through: James Newman
City of Charles Town
101 E Washington Street
Charles Town, WV 25414

Date: February 22, 2024

Subject: Hillside Preliminary Subdivision/Land Development Plat Review

This memorandum summarizes our review of the Preliminary Subdivision/Land Development Plat for the Hillside Development (dated October 13, 2023, prepared by IMEG) for a proposed 124 Townhouses on approximately 14.24 acres. The site is currently zoned Residential Medium-High (R-15) per the City of Charles Town Subdivision and Land Development Ordinance dated June 23, 2012 (Rev. June 21, 2023). This application proposes a by-right development of approximately 14.47 acres of property.

The site abuts the eastern side of Route 340 and will connect to Hillside Drive. There is one access point proposed at the current terminus of Hillside Drive. The site is proposed to consist of 124 townhouse units.

Kimley-Horn's review of this application is limited to the Preliminary Subdivision/Land Development Plat and Application provided. Based upon our review, we have the following comments on the materials provided:

1. This Application generally complies with the Preliminary Subdivision/Land Development Plat requirements per the City of Charles Town Subdivision and Land Development Ordinance.
2. We request the Applicant provide cross sections of the public streets at 50' intervals per the City of Charles Town Subdivision and Land Development Ordinance 1332.05.C.3.
3. We request the Applicant provide grading details for all the proposed curb ramps to ensure they meet ADA standards.
4. We request the Applicant reevaluate inlets 118, 132, 146, and 148 to ensure they are within the allowable spread limits per the WV DOH Drainage Manual.
5. We request the Applicant label the curb ramps, curb, and gutter as they are labeled in the City of Charles Town details and not VDOT (CG-6 and CG-12) labels.
6. We request the Applicant provide dimensions on the buffer distance between the sidewalk and the back of the curb to ensure it meets the City of Charles Town standards.
7. We request the Applicant provide the photometric information on the photometric plan, sheet C802.
8. We request the Applicant provide labels on the landscaping plans to verify there is a 10'-20' buffer.

9. We request the Applicant provide dimensions to verify that there is at least a 13.5' front setback from the property to the curb.

Kimley-Horn recommends that the Applicant address Comments 2- 9 above.

Thank you for the opportunity to review this Preliminary Subdivision/Land Development Plat. Please feel free to contact us at 703-870-3631 should you have any questions.

KIMLEY-HORN & ASSOCIATES, INC.



Mark Phillips, P.E.
Project Manager, Associate

Planning Commission
101 East Washington Street
Charles Town, WV 25414

SCHEDULED

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

AGENDA ITEM (ID #)

Commission Review: SLD2022-06 - Norborne Glebe Phases 10B, 11, 12, 13 preliminary plan

ATTACHMENTS:

- 1. Staff Report.pdf
- 2. Application.pdf
- 3. Plans revised.pdf
- 4. KH Review.pdf

Preliminary Plan Report

SLD2022-06

Date: For the February 26, 2024 Planning Commission meeting

Applicant: Greenway Engineering

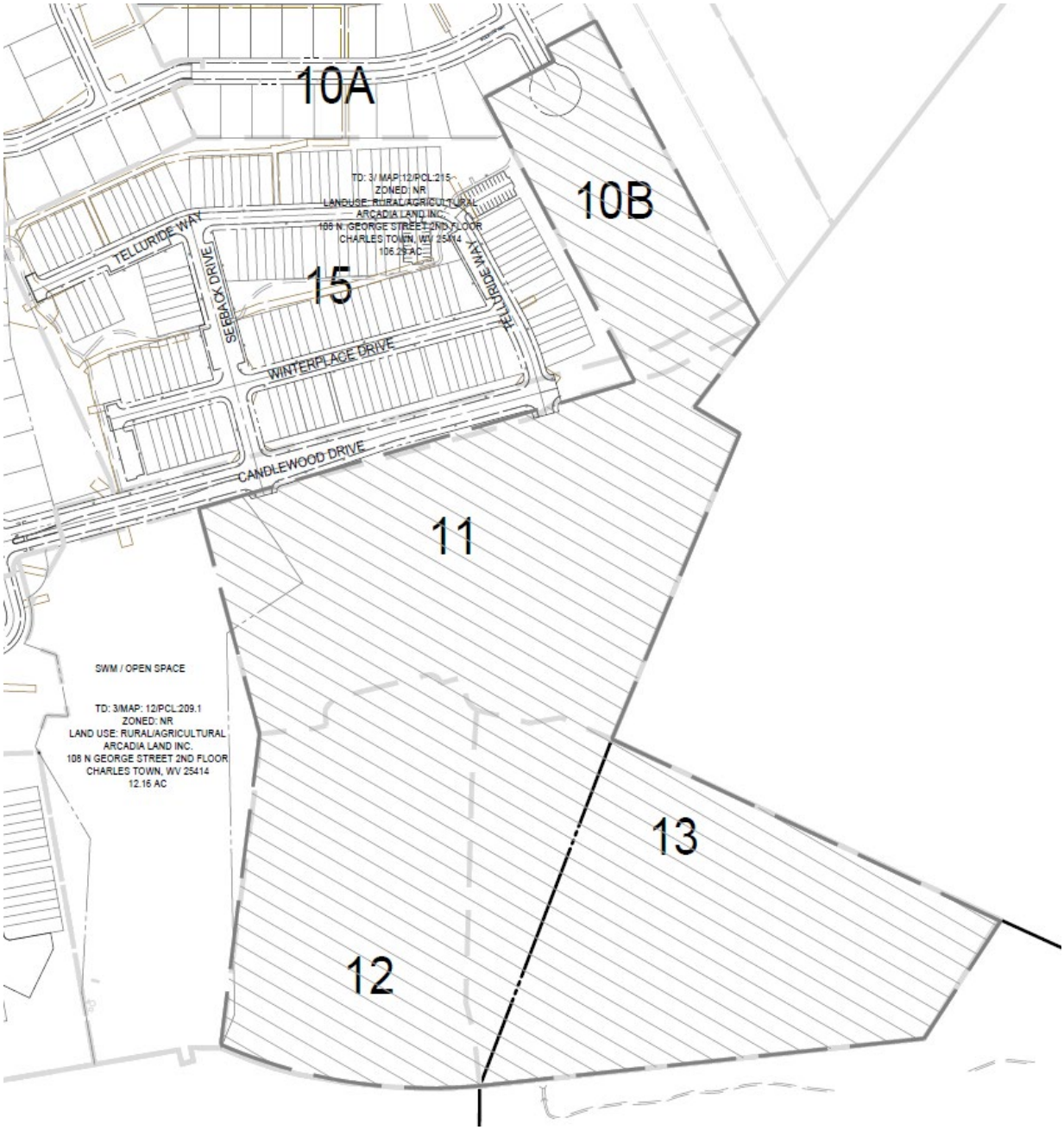
Property Owner: Arcadia Land Inc.

Report by: James Newman, City Planner, Zoning/Subdivision Administrator.

Proposal: Major Subdivision and Land Development.

Property Location: Located on Candlewood Drive in areas outlined and crosshatched below.

Current Zoning: Neighborhood Residential



PROJECT OVERVIEW

The development of 43.52 acres for phases 10B, 11, 12, and 13. Proposed uses are single family detached units (78 units), and townhomes (150 units).

SKETCH PLAN

The sketch plan was approved by the Planning Commission on April 24, 2023. The preliminary plan is **generally in conformance** with the sketch plan.

ZONING REVIEW

The property is zoned Neighborhood Residential (NR).

Setbacks

Front : 30 ft.
Sides: 10 ft. Zero feet for townhomes with shared walls.
Rear: 20 ft.

Lot Coverage and Open Space

In the NR zoning district, up to 70% of a lot may be developed. A minimum 10% of open space is required; 30% open space is required for townhome areas of the development. Provided open space is:

Phase 10B - 2.3 acres out of 5.1 acres (45%)
Phase 11 – 9.7 acres out of 14.5 acres (67%)
Phase 12 – 3.9 acres out of 9.4 acres (42%)
Phase 13 – 8.4 acres out of 14.3 acres (59%)
Overall – 24.4 acres out of 43.5 acres (56%)

Open space is shown adjacent to and behind the townhomes and behind some of the single family homes (see sheet plan page 16 of 97).

Traffic

Traffic impact is detailed in this table crafted by the applicant:

TRIP GENERATION DATA				
SINGLE FAMILY (DETACHED) (210)				
UNITS	**ADT RATE**	**ADT**	**PEAK HOUR RATE**	**PEAK HOUR TRIPS**
78	**7.20**	561.6	**0.74**	57.72
SINGLE FAMILY (ATTACHED) (210)				
UNITS	**ADT RATE**	**ADT**	**PEAK HOUR RATE**	**PEAK HOUR TRIPS**
146	**7.20**	1051.2	**0.74**	108.04

Parking

Both the detached and attached homes have driveways. Total required parking is 411 spaces, 57 spaces are provided. There are two dedicated off-street parking lots for townhome parking, one with 20 spaces and the other with 28 spaces. There is additional on-street parking.

Landscaping

In parking lots with over 25 spaces, there must be one tree shade tree planted per every 10 parking spaces. Additionally, at least 5% of the parking lot with over 25 spaces must be devoted to interior landscaping. This plan does not meet these requirements.

A row of shrubbery (with a minimum planting height of 18 inches) is required between the parking lot and the street. Trees have been provided at the entrance and rear of the parking lots; additional shrubbery is required.

Lighting

Applicant is proposing lighting in conformance with the City's lighting standards. There are 95 light poles spread throughout the four phases. The poles are less than 33 feet in height (15 ft. maximum proposed), with a mix of acorn and colonial post tops.

The lighting must not exceed an average of 0.8 footcandles at the property line; the lighting plan conforms to this requirement. The maximum average lighting must not exceed 3-foot candles; the lighting plan conforms to this requirement.

Sidewalks/Trails

Sidewalks are provided on both sides of most roads. Seeback Drive and Candlewood Drive have sidewalks shown on one side each in certain areas not adjacent to residences..

Stormwater

Stormwater plans are reviewed by the City's engineering firm Kimley-Horn. The applicant has addressed their comments and Kimley-Horn has reviewed the revised plans, and has no further concerns or comments.

RECOMMENDATION

Applicant is four additional phases of residential development, split between townhomes and single-family homes.

Due to general conformance with the sketch plan and zoning and subdivision regulations, the Planning Commission should vote to **approve** the preliminary plan subject to a condition:

1. Required interior and exterior parking lot landscaping shall be provided.

S/LD Application No._____

SUBDIVISION AND LAND DEVELOPMENT APPLICATION

SUBDIVISION AND LAND DEVELOPMENT ORDINANCE
ARTICLE 1332, SUBDIVISION AND LAND DEVELOPMENT APPLICATION & APPROVAL REQUIREMENTS

To assist the Subdivision Administrator in the review of a Subdivision and Land Development (S/LD) Application, the Applicant must utilize this form to supply the City with the information prescribed under Section 1332.03 of the Charles Town Subdivision Ordinance. The submission of this form, along with the prescribed information and required fees, shall serve as the Applicant's S/LD Application as required by Ordinance Section 1332.03.

1. DATE November 07, 2023

2. APPLICATION TYPE

☐ Minor Subdivision | Final S/LD Plan

☐ Major Subdivision Development*
- Preliminary S/LD Plan and Final Plat

☐ Major Land Development**
- Preliminary S/LD Plan

☑ Major Subdivision and Land Development***
- Preliminary S/LD Plan and Final Plat

*Conventional Subdivision – A Preliminary Plan and Plat Approval and a Final Plan and Plat Approval is required.

**No Division/Merger of Land – A Preliminary Plan and Plat Approval is required for the submission of a building or multiple buildings on one lot where there is no subdivision of land (commonly referred to as a site plan).

***A Preliminary Plan and Plat Approval and a Final Plan and Plat Approval is required for the submission of a building or multiple buildings that will require the merger, adjustment or subdivision of land.

3. APPLICANT'S NAME* Arcadia Land, Inc

Address: 108 N. George St. 2nd Floor Charles Town WV 25414

Telephone Number ( ) Fax Number ( )

Email Address gendler@arcadiacompanies.com

4. PROPERTY OWNER'S NAME Same As Above

Address:

Telephone Number ( ) Fax Number ( )

Email Address

5. LEGAL DESCRIPTION OF THE SUBJECT PROPERTY (list all parcels that apply)

Property Address:

Tax Map # and Parcel: 03120215000000000

Deed Book and Page #: 1173/85

Property Area in Square Feet or Acres: 106.29 AC

6. DESCRIPTION OF PROJECT AND PROPOSED USE(S) OF THE PROPERTY:

This project proposes 148 total townhouses and 78 single family homes.

7. DESCRIPTION OF THE EXISTING (OR FORMER) USE(S) OF THE PROPERTY AND CURRENT ZONING:

Existing use is an undeveloped property within a larger subdivision. The current zoning is residential.

*Applicants include: Property owner(s), Engineer(s), Surveyor(s), or Consultant(s)

8. ARE THERE ANY ANTICIPATED WAIVERS OR VARIANCES? IF YES, PROVIDE DETAILS.

9. PARCEL HISTORY (List all pending or previously approved applications on the subject parcels inventoried above, including previous site plan applications if this application is a site plan amendment)

Application No.	Project Name and Phase	Status	Approval Date
SLD-2013-04	Norborne Glebe Phase 5		Subdivision Plan Approved 1/14/2014
SLD-2017-05	Norborne Glebe Phase 7-8		Subdivision Plan Approved 9/25/2018
SLD-2016-01	Norborne Glebe Phase 6		Subdivision Plan Approved 09/25/2018
SLD-2017-14	Norborne Glebe Phase 14A		Subdivision Plan Approved 09-25-2018
SLD-2021-02	Norborne Glebe Phase 14B		Subdivision Plan Approved 02/28/2022
SLD-2021-05	Norborne Glebe Phase 9&10		Subdivision Plan Approved10/13/2022
SLD-2022-03	Norborne Glebe Phase 15		Subdivsion Plan Approved 03/27/2023

10. HAS THE PROPERTY BEEN THE SUBJECT OF ANY COURT ACTION?

☐ Yes (Please specify nature of all proceedings and current status and attach any documents showing court decisions, etc.)

☐ No

11. PLAN/PLAT SUBMISSION TO OTHER AGENCIES (Documentation of all required approvals must be attached to this Application or submitted prior to Preliminary S/LD Application approval)

Agency (Specify others as applicable)	Submittal Date	Approval/Permit Issued	Date of Approval/Issuance
City of Charles Town			
City of Charles Town Utility Board			
Jefferson County Planning and Zoning Department			
Jefferson County Addressing Office			
Jefferson County Board of Education			
WV Department of Environmental Protection			
WV Department of Transportation, Division of Highways			
WV State Historic Preservation Office			
WV Office of Environmental Health Services			
U.S. Army Corps of Engineers			

12. FEE CALCULATION (Per Fee Schedule) $200 Filing Fee

$11,300 (226 Lots x $50 per)

AMOUNT PAID $ 11,500 (paid with final plat)

APPLICANT CERTIFICATION

I certify that, to the best of my knowledge, the submitted information and statements are true and correct. I also certify that I have received and read Section 1332.03 of the Charles Town S/LD Ordinance and relevant provisions of the Charles Town City Code.

Signature of Applicant _____ Date 11/7/2023

Asst. Treasurer

Signature of Property Owner (If different than Applicant)

_____ Date _____

Please submit an original completed Application and specified number of Plan/Plat (Three (3) copies at 24" x 36", Adobe PDF format, and Five (5) copies at 11" x 17") copies to the following:

Subdivision Administrator
City of Charles Town
101 E. Washington Street
Charles Town, WV 25414

FOR CITY USE ONLY

Application Number:_____ Date Application Received:_____

Fee: $_____ Paid:$_____ Check No._____

Receipt No._____

Subdivision Administrator Approval:_____ Date:_____

Planning Commission Approval:_____ Date:_____

Comments/Conditions:_____

_____

_____

_____

_____

_____

NORBORNE GLEBE

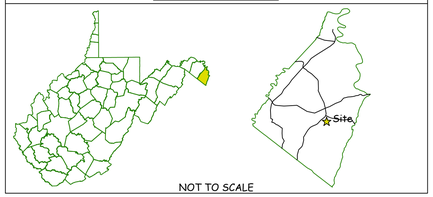
PHASE 10B, 11, 12, & 13

MAJOR SLD 2022-06

PRELIMINARY SUBDIVISION/LAND DEVELOPMENT PLAT

CHARLES TOWN CORP. DISTRICT (3) - MAP 12 - PARCEL 215
DEED BOOK 1173 - PAGE 85
CITY OF CHARLES TOWN
JEFFERSON COUNTY, WEST VIRGINIA
ZONED NEIGHBORHOOD RESIDENTIAL (NR)

GENERAL LOCATION



Plan Revisions

Revision	Date	Comment
1	02/06/2024	PER CITY, CTUB, & DEP COMMENTS
2	02/15/2024	PER CITY COMMENTS

STATE & LOCAL PERMITS

AGENCY	PERMIT #/APPROVAL DATE
WVDEP	WVR1101047 / 03/28/2022
WVDOH	05-02-0050 /01-23-2021

CALL "MISS UTILITY"

MISS UTILITY OF WEST VIRGINIA (MUWV) AT 811 OR 1-800-245-4848, 48 HOURS PRIOR TO THE START OF WORK. EXCAVATORS MUST NOTIFY ALL PUBLIC UTILITY OPERATORS WHO MAINTAIN UNDERGROUND UTILITY LINES IN THE AREA OF PROPOSED EXCAVATING OR BLASTING AND HAVE THOSE FACILITIES LOCATED BY THE UTILITY COMPANIES PRIOR TO COMMENCING EXCAVATION. THE EXCAVATOR IS RESPONSIBLE FOR COMPLIANCE WITH ALL COUNTY REQUIREMENTS, WEST VIRGINIA CODE AND REGULATIONS.

UTILITY NOTICE (AS NEEDED)

Contractors shall notify all public utility operators who maintain underground utility lines in the area of proposed excavating or blasting at least two (2) working days, but not more than ten (10) working days, prior to commencement of excavation or demolition. Names and telephone numbers of the operators of underground utility lines appear below. These numbers shall also be used to serve in an emergency condition.

Water: Charles Town Utility Board
832 S. George Street
Charles Town, WV 25414
(304) 725-2316

Sewer: Charles Town Utility Board
832 S. George Street
Charles Town, WV 25414
(304) 725-2316

Power: Potomac Edison
P.O.Box 3615
Akron, OH 44309
(800) 686-0011

Phone: Frontier Communications
1108 N. Mildred Street
Ranson, WV 25438
(304) 728-8500

Soil Conservation: Eastern Panhandle Conservation District
151 Aikens Center, Suite 2
Martinsburg, WV 25404
(304) 263-4376

STATEMENT OF ACCURACY

"The Engineer and/or Surveyor, in signing this plat/plan, attests to the best of his or her knowledge, is plan is complete and accurate."

RANDY L. KEPLER, P.E. Date
GREENWAY ENGINEERING INC.

PRELIMINARY PLAN AND PLAT APPROVAL

"This Preliminary Plan was approved by the City of Charles Town, on the _____ day of _____ , 20_____ , subject to any conditions specified hereon.

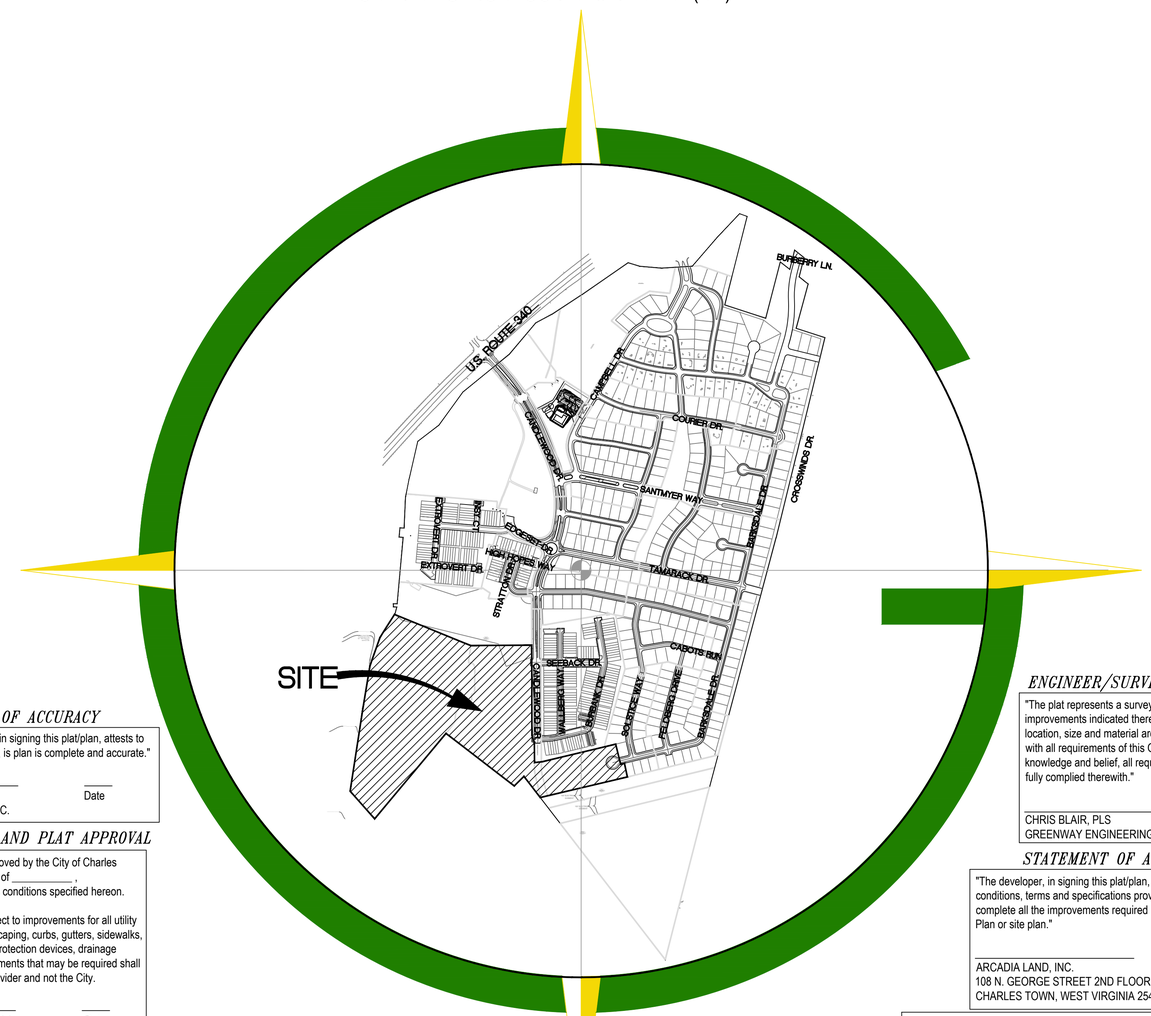
All expenses incurred with respect to improvements for all utility services, paving, grading, landscaping, curbs, gutters, sidewalks, road lighting, road signs, flood protection devices, drainage structures and all other improvements that may be required shall be the responsibility of the subdivider and not the City.

Secretary of the Planning Commision Date

Charles Town - Complete List of Waivers/Variances

Ordinance	Section of Ordinance	Description of Waiver or Variance	Date Granted
SLDO-CTWV	1333.20	Waiver to allow Electric Meters in the front yard of all Townhomes in the Norborne Glebe subdivision	June 27, 2022
SLDO-CTWV	**1333.07**	**Waiver to allow driveways to be constructed closer than 40' to intersections across from a "T" intersection.**	**March 27, 2023**

"This property is in an area designated as a special flood area, as shown on Community Map/panel Number 54037C0138E, Effective date 12/18/2009."



VICINITY MAP

SCALE: 1" = 600'

OWNER/DEVELOPER
ARCADIA LAND, INC
108 N GEORGE ST 2ND FLOOR
CHARLES TOWN, WV 25414
443-286-2786

ENGINEER/SURVEYOR'S CERTIFICATION

"The plat represents a survey made by him/her; all Monuments and improvements indicated thereon actually exist, and that their location, size and material are correctly shown; he/she is familiar with all requirements of this Ordinance; and, to his/her best knowledge and belief, all requirements of this Ordinance have been fully complied therewith."

CHRIS BLAIR, PLS Date
GREENWAY ENGINEERING, INC.

STATEMENT OF ACCEPTANCE

"The developer, in signing this plat/plan, agrees to abide by all conditions, terms and specifications provided heron; and to complete all the improvements required by the Preliminary Plat and Plan or site plan."

ARCADIA LAND, INC. Date
108 N. GEORGE STREET 2ND FLOOR
CHARLES TOWN, WEST VIRGINIA 25414

APPROVALS

PRELIMINARY PLAT APPROVAL DATE

PLANNING COMMISSION DATE

ZONING ADMINISTRATOR DATE

THESE PLANS ARE IN CONFORMANCE WITH CITY OF CHARLES TOWN STANDARDS AND ORDINANCES. ANY DEVIATION OR CHANGE IN THESE PLANS SHALL BE APPROVED BY THE ZONING ADMINISTRATOR PRIOR TO CONSTRUCTION

Sheet List Table

Sheet Number	Sheet Title
1	COVER SHEET
2	GENERAL NOTES & LEGEND
3	ADJOINING OWNER INFORMATION & PHASING KEY
4	EXISITING CONDITIONS
5	OVERALL E&S PHASE I
6	E&S PHASE I
7	E&S PHASE I
8	E&S PHASE I
9	E&S PHASE II
10	E&S PHASE II
11	E&S PHASE II
12	E&S NARRATIVE
13	E&S DETAILS
14	SEDIMENT BASIN DETAILS
15	SEDIMENT BASIN DETAILS
16	OVERALL PLAN
17	LAYOUT & UTILITY PLAN
18	LAYOUT & UTILITY PLAN
19	LAYOUT & UTILITY PLAN
20	LAYOUT & UTILITY PLAN
21	LAYOUT & UTILITY PLAN
22	LAYOUT & UTILITY PLAN
23	GRADING PLAN
24	GRADING PLAN
25	GRADING PLAN
26	GRADING PLAN
27	GRADING PLAN
28	GRADING PLAN
29	CURB RAMP DETAIL PLAN
30	CURB RAMP DETAIL PLAN
31	PRELIMINARY PLAN
32	PRELIMINARY PLAN
33	PRELIMINARY PLAN
34	PRELIMINARY PLAN
35	PRELIMINARY PLAN
36	PRELIMINARY PLAN
37	ROAD TYPICAL SECTIONS
38	CANDLEWOOD DRIVE ROAD PROFILES
39	CANDLEWOOD DRIVE ROAD CROSS SECTIONS
40	CANDLEWOOD DRIVE ROAD CROSS SECTIONS
41	BARKSDALE DRIVE ROAD PROFILES
42	BARKSDALE DRIVE ROAD CROSS SECTIONS
43	BARKSDALE DRIVE ROAD CROSS SECTIONS
44	ALPINE DRIVE ROAD PROFILES
45	ALPINE DRIVE ROAD CROSS SECTIONS
46	GERSBACK WAY ROAD PROFILES
47	GERSBACK WAY ROAD CROSS SECTIONS
48	GERSBACK WAY ROAD CROSS SECTIONS
49	SEEBACK DRIVE ROAD PROFILES
50	SEEBACK DRIVE ROAD PROFILES
51	SEEBACK DRIVE ROAD PROFILES
52	SEEBACK DRIVE ROAD PROFILES
53	SEEBACK DRIVE ROAD CROSS SECTIONS
54	SEEBACK DRIVE ROAD CROSS SECTIONS
55	SEBACK DRIVE ROAD CROSS SECTIONS
56	SEEBACK DRIVE ROAD CROSS SECTIONS
57	SEEBACK DRIVE ROAD CROSS SECTION
58	SEEBACK DRIVE ROAD CROSS SECTIONS
59	SEEBACK DRIVE ROAD CROSS SECTIONS
60	SEEBACK DRIVE ROAD CROSS SECTIONS
61	GRUNTER WAY PROFILES
62	GRUNTER WAY ROAD CROSS SECTIONS
63	GRUNTER WAY ROAD CROSS SECTIONS
64	BRAUNECK WAY PROFILES
65	BRAUNECK WAY ROAD CROSS SECTIONS
66	HOFICK CT ROAD PROFILES
67	HOFICK COURT ROAD CROSS SECTIONS
68	HOFICK CT ROAD CROSS SECTIONS
69	SANITARY SEWER PROFILES
70	SANITARY SEWER PROFILES
71	SANITARY SEWER PROFILES
72	SANITARY SEWER PROFILES
73	SANITARY SEWER PROFILES
74	STORM SEWER PROFILES
75	STORM SEWER PROFILES
76	STORM SEWER PROFILES
77	STORM SEWER PROFILES
78	STORM SEWER PROFILES
79	STORM SEWER COMPUTATIONS
80	STORM SEWER DETAILS
81	STORM SEWER DETAILS
82	STORM SEWER DETAILS
83	STORM SEWER DETAILS
84	LANDSCAPE PLAN
85	LANDSCAPE PLAN
86	LANDSCAPE PLAN
87	LIGHTING PLAN
87A	LIGHTING PLAN
87B	LIGHTING PLAN
87C	LIGHTING PLAN
87D	LIGHTING PLAN
87E	LIGHTING PLAN
88	SITE DETAILS
89	CITY OF CHARLES TOWN DETAILS
90	CTUB DETAILS
91	CTUB DETAILS
92	SWM PLAN
93	SWM COMPS
94	SWM DETAILS
95	BMP PLAN
96	BMP DETAIL & SECTIONS
97	BMP COMPUTATIONS & DETAILS

704 Foxcroft Avenue
Martinsburg, West Virginia 25401
Telephone: (304) 433-3011
Fax: (540) 722-8528
www.greenwayeng.com

GREENWAY ENGINEERING
PROUDLY SERVING VIRGINIA & WEST VIRGINIA
OFFICES IN: WINCHESTER, VA & MARTINSBURG, WV

COVER SHEET
NORBORNE GLEBE
PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

DATE: 11/06/2023
SCALE: N/A
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 1 OF 97
SLD2022-06

GENERAL NOTES

1. **Methods and materials used in the construction of the improvements herein shall conform to current Jefferson County Construction Standards and Specifications and/or current WVDOT Standards and Specifications.**

2. **The Engineer shall not have control over or charge of and shall not be responsible for construction means, methods, techniques, sequences or procedures nor for safety precautions and programs in connection with work shown on these plans. The Engineer is not responsible for the contractor's schedules or failure to carry out the work. The Engineer is not responsible for acts or omissions of the contractor, subcontractor, or their agents or employees, or any other person performing portions of the work.**

3. **The Contractor, Owner or Developer shall be responsible for securing any third party inspection/testing service to insure construction compliance with these plans and specifications. It is Greenway Engineering's recommendation that a third party inspection/testing service be employed to ensure that project is completed and materials installed meet the details and specifications in these plans.**

4. **The location of existing utilities shown in these plans are taken from existing records and available asbuilt data. It shall be the contractors responsibility to verify the exact horizontal and vertical location of all existing utilities as needed prior to construction. The contractor shall be responsible for the digging of all test holes that may be required, whether recommended or not by these plans, to determine the exact location and elevation of existing utilities. If any conflicts arising from this existing utility verification or if during the course of construction, any object of an unusual nature is encountered, the contractor shall cease work in that area and immediately notify Greenway Engineering at (540) 662-4185 and/or the proper authority. Greenway Engineering or any engineer associated with these plans shall not be responsible or liable for any construction cost that may be associated with the installation or reinstallation any utility or other improvements if not notified of any discrepancies between actual field conditions and the approved plan.**

5. **The approval of these plans in no way relieve the developer, the contractor, or their agents of any legal responsibility which may be required by the code of West Virginia or any other ordinance enacted by the County nor does it guarantee the issuance of any required permit by the County, WVDOT or any other Agency.**

6. **An approved set of plans and all applicable permits must be available at the construction site at all times during construction. A representative of the developer must be available at all times.**

7. **The contractor shall provide adequate means of cleaning mud from trucks and/or other equipment prior to entering public streets, and it is the contractors responsibility to clean streets, allay dust, and to take whatever measures are necessary to insure that public streets are maintained in a clean, mud and dust free condition at all times.**

8. **The developer will be responsible for any damage to the existing streets and utilities which occurs as a result of his construction project within or contiguous to the existing right-of-way.**

9. **Warning signs, markers, barricades or flagmen should be in accordance with the State and Federal Manual on Uniform Traffic Control Devices (MUTCD).**

10. **All unsuitable material shall be removed from the construction limits of the site plan before placing embankment.**

11. **All pavement sections shown on these approved plans are based on a minimum CBR value of 6 and are for preliminary design only. Final pavement design shall be based upon actual field tested CBR values. The Contractor or Developer shall be responsible for field tests per WVDOT standards to obtain actual CBR values for final design. Final pavement designs will be approved by WVDOT and/or the Owner/Developer, which ever applicable, prior to installation.**

12. **All springs shall be capped and piped to the nearest storm sewer manholes or curb inlet. The pipe shall be minimum 6" diameter.**

13. **When grading is proposed within easements of utilities, letters of permission from all involved companies must be provided to the City prior to issuance of grading and/or site development permits.**

14. **a. Notification shall be given to the Jefferson County Public Sewer District two weeks prior to construction so they can arrange to have a project representative during construction. The District would like to be in the pre-construction project meetings with the contractor.**

    b. Notification shall be given to the City of Charles Town Utility Board prior to construction of water lines. Information should also be obtained from the appropriate authority concerning permits, cut sheets, and connections to existing lines.

15. **The Developer and/or Contractor shall be responsible to supply all utility companies with copies of the approved plans and advise them that all grading shall conform to the approved plans, and further that the utility companies shall be responsible for honoring these plans and the finished grades in the installation of their utility lines.**

16. **All utilities to be located underground.**

17. **Contractors shall notify operators who maintain underground utility lines in the area of proposed excavating or blasting at least two (2) working days, but not more than ten (10) working days, prior to commencement of excavation or demolition.**

18. **The developer will be responsible for the relocation of any utilities which is required as a result of his project. The relocation should be done prior to construction.**

19. **All parking lot/street light and dry utility design shall be performed and provided separately by others. All dry utility and or lighting information shown hereon is as specified by others and is included for informational purposes only, as directed by the Owner, Developer and/or public agency requirements. Greenway Engineering has not performed the lighting and/or dry utility design and does not warrant and is not responsible for the degree and/or adequacy of illumination on this project or the adequacy of the dry utility to service the site.**

20. **All sanitary sewers, water mains and appurtenances shall be constructed in accordance with the current standards and specifications of Jefferson County.**

21. **All stormwater piping and structures shown on these plans are only accurate to the inlet or manhole locations as shown hereon. Detail design of stormwater structures were not provided to Greenway Engineering. Actual pipe alignments will be based upon developed structural shop drawings as provided by the manufacturer. Contractor shall make adjustments to pipe alignments base on provided shop drawings. Greenway Engineering will not be held responsible or liable for any discrepancies or changes caused by the structural design. Contractor may submit shop drawings to Greenway Engineering for review and approval at contractor's expense. Shop drawings will be reviewed for compliance with design plans. The Owner or Developer will be responsible for any redesign as a result of structural shop drawing design.**

22. **Controlled fills shall be compacted to 95% of maximum density as determined by method "A" per standard proctor AASHTO-T99, ASTM-D698, or VTM-1 as applicable. Density shall be certified by a registered professional engineer and results submitted to Jefferson County, prior to pavement construction. If a geotechnical report has been prepared, it should supersede the requirements in this note.**

23. **Refer to Geotechnical Engineer for methods, materials and details for construction of all earthwork activities.**

24. **Any retaining wall 2 ft. or greater in height shall require the issuance of a separate building permit.**

25. **Construction debris shall be containerized. No less than one litter receptacle shall be provided at the construction site.**

26. **Greenway Engineering, Inc. (GE) issued this plan set based on project criteria dictated by the client and municipal codes. This plan set is not considered complete or appropriate for construction until ALL necessary agencies have given approval AND this plan set is signed and sealed by a licensed professional. Any work, planning, scheduling, material purchases and/or construction prior to approvals and licensed/professional sealing will be performed at the risk of the personnel authorizing work. GE shall be held harmless from any costs, time delay and/or material changes incurred on work started before this plan set receives approvals and seals.**

WATER AND SEWER NOTES

1. Easements shall be given to the Charles Town Utility Board for the construction and maintenance of sewer facilities, as depicted herein.

2. Installation and maintenance of water and sewer lines shall be in accordance with the WV Department of Health, , the City of Charles Town, and the Charles Town Utility Board requirements.

3. Complete water lateral prior to final paving.

4. Water lines to have a minimum of forty-two inches (42") of cover to crown of pipe. Water lines to have seal of the National Sanitation Foundation. Mechanical joints or slip-on joints with rubber gaskets are preferred by the Health Department.

5. Provide concrete thrust blocking at all water line intersections and direction changes.

6. All water mains must be AWWA C900, CL235 PVC. All sanitary sewer to be PVC ASTM 3034 SDR-35 unless otherwise specified.

7. Water easements are to be dedicated to the Charles Town Utility Board.

8. Storm drain easements are to be dedicated to the City of Charles Town.

9. Sanitary sewer and force main easements are to be dedicated to the Charles Town Utility Board.

10. A horizontal separation of at least 10 foot must be maintained between sanitary sewer and potable water lines except when they are crossing. When water and sewer lines cross, the water line shall be at least 18 inches above the sewer line.

Summary of Water Requirements - Charles Town Utility Board, Charles Town, WV

1. All water mains must be AWWA C900, CL235 PVC. Line extensions must have permitted approval prior to installation.
2. All service lines to be minimum 200 PSI PVC or copper. Final Line size will depend on the type of service. The City will not allow any galvanized lines or fittings. A standard shut off valve must be installed on the property side of the meter for the owner's use; the meter valve is for the city use only.
3. All meters, vaults, and crooks will be set at the property line; the CTUB will install the meters.
4. All service lines will be no deeper than 36" at the meter location to allow access to the setter by the meter installers. Deeper service lines may be acceptable if a crossing conflict is encountered or site conditions dictate.
5. The CTUB will supply the meters, setter and boxes. All non-metallic lines will be installed with tracer ribbon. (Located 6" above the newly installed service line with 3" wide detectable tape.)
6. All multi-meter installations, such as a business or apartment complex are to be set in an outside vault, or an accessible mechanical room, and are to be supplied by the owner. These areas are to be inspected prior to the availability of water service.
7. Fire Hydrants must be American Darling Mark B62B 5-1/4" valve opening with 6" base or equal.
8. Valves are to be AWWA C515 gate valves resilient seated opening left. Valve boxes must be screw type Tyler #562S or equal. All valve riser sleeves are to be cast iron with cap. PVC risers to be approved on a use basis by the CTUB Water Representatives.
9. All valves, bends (45's, 22's and 90's), tees and elbows shall have mechanical restraints (such as mega lugs) and thrust blocks.
10. The CTUB must inspect all work. The contractor must give 24-hour notice to the CTUB for an inspection request. The CTUB may request as-built sketches, photos etc. (as back up)
11. All West Virginia Public Service Commission and WV Health Department, rules and regulations, applying to water and sewer must be followed, and all local state and federal permits and approvals must be obtained prior to performing any water or sewer extensions or upgraded work.

Submittals

1. Prior to the installation of any material or equipment on the project supplied by the Contractor, the Contractor shall submit to the City, three (3) copies of all shop drawings, laying schedules, manufacturer specifications, certification and drawings in accordance with the General Conditions. (Water/Sewer) One copy is for the application file. One copy is for the final inspection compliance. One copy is for inspection review or comments to be completed prior to beginning work. A copy of a current WV Contractors License and proof of Liability Insurance must accompany the submittal.

2. City will require as-built drawings and a copy of submittals for all pipe and and appurtenances used on the project. As-builts shall be furnished in both PDF and AutoCAD formats. An O&M Manual containing, at a minimum, all submittals is to be furnished.

Field Copies of Construction Information

The Contractor shall keep a minimum of one (1) complete copy of the Contract construction plans and specifications (including all revisions and addendums), and all shop drawings issued at the project site. All information shall be kept in a neat and good order and shall be made available for the City's Representative to use at his request.

Open Excavation

1. The depth of trenches shall be such that the location of the proposed pipes will conform with the lines and grades shown on the plans. The shape of all trenches above and within the pipe zone, the construction methods employed, the general protections requirements, the general excavation requirements, the general trenching requirements, and the minimum regulations for trench shoring, shall conform with the regulations set forth under OSHA Regulations 29CFR part 1926 650, 651 & 652. No trenching excavation work shall be performed which is not in accordance with those regulations.
2. The shape of the trenches in the "pipe zone" (which shall be construed to be that portion of the trench between the trench bottom and an elevation 1 foot above the top of the pipe) shall conform to the configuration identified as "Typical Bedding" on Pipe Bedding Drawing #1. The contractor is herein advised that if trench widths in the pipe zone exceed the outside diameter of the pipe plus two feet, and if the City determines that such excessive widths will result in a structural loading for which the pipe is not designed, he shall be required to bed the pipe on a concrete cradle at no additional cost.
3. The Contractor shall shape trenches which are located adjacent to existing above ground or underground structures and/or facilities or in other confined areas, so that such structures and facilities are properly protected against damage or disturbance from settlement or displacement. Adequate sheeting, shoring and/or bracing shall be installed and maintained to provide such protection and the Contractor shall be responsible for all damages resulting to such proposed and existing structures, pipelines, and/or facilities as the result of his failure to use and maintain adequate trench wall support, as well as a result of any other construction activities. The bottoms of all trenches shall be excavated to a depth of 6 inches below the bottom of the proposed lines to accommodate the bedding hereinafter specified.

Pipe Installation

1. Before any pipe is installed in trenches, it shall be inspected for damage and the inside of the pipe shall be swabbed to remove loose dirt and foreign objects, No damaged pipe will be permitted to be installed.
2. All pipes shall be installed to the lines and grades shown on the drawings. No pipes shall be constructed in trenches in which water flows or is pooled and, all pipes shall be carefully handled in the ditch to keep the jointing ends and materials free from dirt during installation. During shut down periods and at the end of each day, all open ends of pipe shall be suitably plugged to prevent the inflow of water, dirt, foreign objects, etc.

Pipe Bedding and Pipe Zone Backfill Material

All proposed pipelines shall be supported on stone dust or #10's small diameter stone. The material shall be placed to a minimum depth of 6 inches below the bottom of the pipe and 6 inches above of the top of the pipe. The material shall be placed in the pipe zone in such a manner as to not disturb, displace, or otherwise misalign the installed pipelines.

Backfill Material Above the Pipe Zone

The material used above the pipe zone shall be such that a satisfactory compaction can be made. At no time shall material bigger than 2 inches in diameter be used. But any material used must be approved by the City before hand. After approval, the entire depth within the backfilled area shall be compacted to provide the minimum percentage of density specified for each area of classification.

Special Backfill Material Below the Pipe Zone

Where muck, quicksand, soft clay, swampy or other material is encountered in the trench bottom, which in the opinion of the City is unsuitable for pipe foundation subgrade or backfill, such material shall be removed to a depth satisfactory to the City. The trench shall then be backfilled to grade with acceptable City approved material, mechanically compacted in successive layers.

Ductile Iron Pipe and Fittings

Ductile iron pipe and fittings under this Contract shall be furnished by the Contractor. All pipes will be slip type joint unless otherwise noted and all fittings will be mechanical joint.

PVC Pipe and Fittings

No glue joints are to be used within the CTUB water or JCPSD right of way. Onsite sewer laterals are to be schedule 40 PVC Pipe or equivalent.

Fire Hydrants

Hydrants shall be furnished and installed complete where shown on the drawings and as approved by the CTUB. This installation shall be adapted to the location of the hydrant so as to make the best installation possible. (note: hydrants no-more than 500 ft apart)

Service Connections for Water Lines

1. Service connections shall be made as indicated on the Contract Drawings.
2. The Contractor shall furnish all fittings required to make the necessary connections. All service line connections shall be made in the presence of the CTUB representative.

Valves and Boxes

Each valve installed underground shall be equipped with a valve box furnished by the Contractor and installed by the Contractor.

Anchoring and Blocking

1. All bends in excess of 10 deg, plugs, caps, tees, and wyes branches along pipelines shall be adequately blocked or anchored to prevent the lines from pulling apart under pressure (see typical concrete blocking).
2. Lugged fitting and tie rods, clamps collars, restrained joints, and anchoring fittings may be substituted in lieu of blocking after having received the approval of the CTUB. Concrete used for blocking and anchoring pipelines in trenches shall consist of concrete as specified elsewhere in these specifications.

Pressure and Leakage Tests

All pipeline shall be tested by the Contractor according with AWWA and witnessed by the CTUB Representative. The Contractor shall furnish all equipment, apparatus, temporary blocking, pumps, taps and gauges to conduct the tests.

Blow Off

Blow off valves shall not be installed.

WATER AND SEWER NOTES (CONT.)

Minimum Pipe Size and System Design

1. The minimum size of water pipe shall be six-inch diameter. This may be increased at the discretion of the City if hydraulic modeling indicates that a larger size is needed to provide pressure and/or fireflow in the area.
2. Dead ends shall be minimized by looping of all mains.
3. Where dead-end mains occur they should be provided with a fire hydrant, for flushing purposes.
4. No flushing device shall be directly connected to any sewer.

Separation of Water Services & Mains from Other Utilities

5 foot horizontal separation from all non-sewer utility lines - electric, phone etc.

Parallel Installation

1. Normal conditions - Water mains shall be laid at least ten feet horizontally from any sanitary sewer, storm sewer or sewer manhole, whenever possible; the distance shall be measured edge-to-edge.
2. Unusual conditions - When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a storm sewer provided that:
   A. The bottom of the water main is at least 18 inches above the top of the sewer
   B. Where this vertical separation cannot be obtained, the water main will be sleeved and all voids will be filled.

Crossings

1. Normal conditions - Water mains crossing house sewers, storm sewers or sanitary sewer shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer, whenever possible.
2. Unusual conditions - When local conditions prevent a vertical separation as described, the following construction shall be used:
3. Water mains passing under sewer shall be protected by providing:
   A. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.
   B. Adequate structural support for the sewers to prevent excessive deflection of the joints and settling on and breaking the water mains;
   C. That the length of the water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.
   D. Water line shall be sleeved and the void area filled.
4. Sewer manholes - No water pipe shall pass through or come within 5 feet of any part of a sewer manhole.

Private Fire Protection Service

No pipe or fixtures connected with a private fire service served by the CTUB shall be connected with pipes or fixtures supplied with water from any other source.

WVDOH NOTES

WV1. All work, construction methods and materials shall conform with the West Virginia Division of Highways "STANDARD SPECIFICATIONS ROADS AND BRIDGES Adopted January 1, 2000" and Supplemental Specifications dated January 1, 2001.
All work on this project shall also conform with The Soil Conservation Service Erosion and Sediment Control Regulations and any other state, federal, or local regulations applicable. In the event of conflict between any of these standards, specifications, or plans, the most stringent shall govern.

WV2. All construction shall comply with the latest U.S. Department of Labor Occupational Safety & Health Administration.

WV3. When working on WVDOT right-of-way, all traffic control, whether permanent or temporary, shall be in accordance with "Traffic Control for Street and Highway Construction and Maintenance Operations" dated November 1994 as published by WVDOT.

WV4. Design features relating to construction or to regulation, control and safety of traffic may be subject to change as deemed necessary by WVDOT.

WV5. Prior to initiation of work, Contractor shall be responsible for acquiring all necessary WVDOT land use permits for any work on WVDOT right-of-way.

WV6. If required by the local WVDOT Residency Office, a preconstruction conference must be arranged and held by the engineer and/or developer with the attendance of the contractor, various County agencies, utility companies and WVDOT prior to initiation of work.

WV7. Contractor shall notify the local WVDOT Residency Office when work is to begin or cease for any undetermined length of time. WVDOT will also require 48 hours notice for any inspection.

WV8. The Contractor will be responsible for maintaining adequate access to the project from the adjacent public roadway through construction and maintenance of a construction entrance in accordance with the Soil Conservation Service Erosion & Sediment Control Handbook. Furthermore, access to other properties affected by this project shall be maintained through construction.

WV9. Contractor shall ensure adequate drainage is achieved and maintained on the site during and at the end of construction.

WV10. All water and sewer lines within existing or proposed WVDOT right-of-way are to have minimum 36" cover and, when possible, to be installed under roadway drainage facilities.

WV11. Any unusual subsurface conditions encountered during the course of construction shall be immediately brought to the attention of the engineer and WVDOT. Work shall cease in that vicinity until an adequate design can be determined by the engineer and approved by WVDOT.

WV12. All undercut areas and borrow material shall be inspected and approved by WVDOT Inspector prior to placement of fill.

WV13. All roadway fill, base, subsurface material and backfill of utility/storm sewer trenches shall be compacted in 6" lifts to 98% of theoretical maximum density as determined by AASHTO T-99 Method A, within plus or minus 2% of optimum moisture for the full width of any dedicated street right-of-way. At the direction of WVDOT Inspector density tests performed by a qualified independent agency shall be conducted as required in the WVDOT Road and Bridge Specifications. A copy of all tests shall be submitted to WVDOT prior to final WVDOT approval.

WV14. WVDOT Standard CD and UD underdrains shall be installed where indicated on these plans and further where determined necessary by WVDOT Inspector.

WV15. The installation of any entrances and mailboxes within any dedicated street right-of-way shall meet WVDOT minimum design standards and is the developer's responsibility.

WV16. If required by the local WVDOT Residency Office, copies of all invoices for materials within any dedicated street right-of-way must be provided to the WVDOT Inspector prior to acceptance of work. Unit and total prices may be obscured.

WV17. Prior to acceptance by WVDOT of any streets, any required street signage and/or pavement markings must be installed by the developer.

WV18. WVDOH District 5 Permit #05-05-0130.

TRIP GENERATION DATA

SINGLE FAMILY (DETACHED) (210)

UNITS	ADT RATE	ADT	PEAK HOUR RATE	PEAK HOUR TRIPS
78	**7.20**	561.6	**0.74**	57.72

SINGLE FAMILY (ATTACHED) (210)

UNITS	ADT RATE	ADT	PEAK HOUR RATE	PEAK HOUR TRIPS
146	**7.20**	1051.2	**0.74**	108.04

*** TAKEN FROM ITE TRIP GENERATION 9TH EDITION**

LEGEND

EXISTING INTERMEDIATE CONTOUR — 330
EXISTING INDEX CONTOUR — 330
PROPOSED CONTOUR — 400
EXISTING EDGE OF PAVEMENT
PROPOSED EDGE OF PAVEMENT
EXISTING CURB AND GUTTER
PROPOSED CURB AND GUTTER
TRANSITION TO REVERSE CURB
EXISTING TELEPHONE LINE — T
PROPOSED TELEPHONE LINE — T
EXISTING STORM SEWER WITH INLET
PROPOSED STORM SEWER WITH INLET
EXISTING SANITARY SEWER WITH MANHOLE — S
PROPOSED SANITARY SEWER WITH MANHOLE — S
PROPOSED SAN. LAT. CLEANOUT — S
EXISTING ELECTRIC SERVICE — E
PROPOSED ELECTRIC SERVICE — E
EXISTING GAS LINE — G
PROPOSED GAS LINE — G
EXISTING WATERLINE W/ TEE — W
PROPOSED WATERLINE W/ TEE — W
EXISTING FIRE HYDRANT/VALVE/METER
PROPOSED FIRE HYDRANT/VALVE/METER
PROPOSED REDUCER — W
PROPERTY LINE
EXISTING EASEMENT
PROPOSED EASEMENT
PROPOSED CENTERLINE
EXISTING CENTERLINE
EXISTING TREE LINE
FLOW LINE
FENCELINE — X
EXISTING UTILITY POLE/GUIDE WIRE
EXISTING TELEPHONE PEDESTAL
SIGNS
PARKING INDICATOR
INDICATES THE NUMBER OF TYP. PARKING SPACES — 12
HANDICAP PARKING
VEHICLES PER DAY COUNT — 100
PROPOSED BUILDING ENTRANCE
SANITARY MANHOLE IDENTIFIER — 12
STORM DRAIN STRUCTURE IDENTIFIER — 6
EXISTING SPOT ELEVATION — 735.4
PROPOSED SPOT ELEVATION — 35.5
LIGHT POLE

PROJECT NOTES

Zoning and Area Tabulations - Residential

Street Address	Candlewood Drive				
Parcel No: (TD 3 Map 12)	215	215, 209.1	215	215, 216	
Zoned	NR (Neighboorhood Reisdential)				
	PHASE 10B	PHASE 11	PHASE 12	PHASE 13	TOTAL
Total Proposed Lots	27 Lots	65 Lots	85 Lots	51 Lots	228 Lots
Single Family Detached	27 Lots	0 Lots	0 Lots	51 Lots	78 Lots
Townhomes	0 Lots	65 Lots	85 Lots	0 Lots	150 Lots
Total Area	5.101 AC	14.580 AC	9.450 AC	14.390 AC	43.521 AC
Lot Area	3.697 AC	8.050 AC	2.140 AC	10.700 AC	24.587 AC
Sensitive Areas	0.000 AC	0.000 AC	0.000 AC	0.000 AC	0 AC
Right-of-Way	1.404 AC	5.300 AC	2.460 AC	2.510 AC	11.674 AC
Parking Areas	0.000 AC	0.154 AC	0.510 AC	0.000 AC	0.664 AC
SWM Areas	0.000 AC	0.000 AC	0.000 AC	0.000 AC	0 AC
Net Building Area (NBLA)	3.697 AC	9.126 AC	6.480 AC	11.880 AC	31.183 AC
Max Density Allowed ((NBLA/1750)	92 Lots	227 Lots	161 Lots	296 Lots	776 Lots
Proposed Density	27 Lots	65 Lots	85 Lots	51 Lots	228 Lots
Total On-Lot Open Space	2.305 AC	5.380 AC	2.810 AC	6.400 AC	16.895 AC
Total Off-Lot Open Space	0.000 AC	4.410 AC	1.120 AC	2.040 AC	7.57 AC
Total Open Space	2.305 AC	9.790 AC	3.930 AC	8.440 AC	24.465 AC
(Minimum 30%)	45%	67%	42%	59%	56%
Required Parking (1.8 per D.U.)	49 Spaces	117 Spaces	153 Spaces	92 Spaces	411 Spaces
Total Proposed Parking	54 Spaces	179 Spaces	238 Spaces	102 Spaces	573 Spaces
1 per Driveway, 1 per Garage	54 Spaces	130 Spaces	170 Spaces	102 Spaces	456 Spaces
Parking Lot Spaces	0 Spaces	49 Spaces	68 Spaces	0 Spaces	117 Spaces
Minimum Lot Size	6000 SF	2K/6K SF	2000 SF	6000 SF	
Minimum Lot Width	18 FT	18 FT	18 FT	18 FT	
Front Yard Setback	25 FT	25 FT	25 FT	25 FT	
Rear Yard Setback	20 FT	20 FT	20 FT	20 FT	
Side Yard Setback	10 FT	10 FT	10 FT	10 FT	
Maximum Building Height	40 FT	40 FT	40 FT	40 FT	
Maximum Building Stories	3 Stories	3 Stories	3 Stories	3 Stories	
Required Landscape Plantings:					
Street Trees	1 Tree Per 50 L.F. of Road Frontage See Landscape Sheet for Specifics				

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OFFICES IN: WINCHESTER, VA & MARTINSBURG, WV

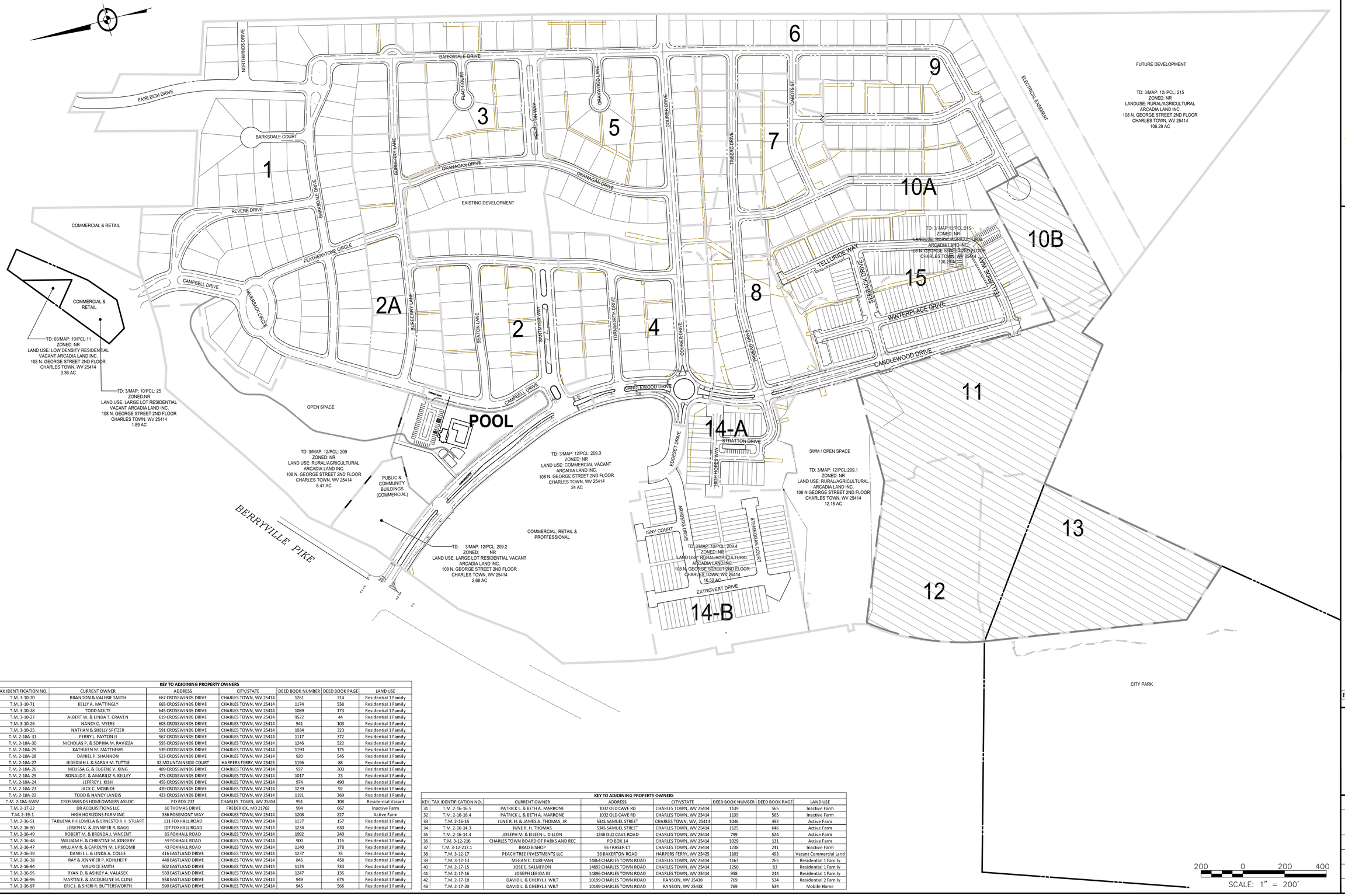
GENERAL NOTES & LEGEND

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: N/A
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 2 OF 97
SLD2022-06



KEY TO ADJOINING PROPERTY OWNERS

KEY	TAX IDENTIFICATION NO.	CURRENT OWNER	ADDRESS	CITY/STATE	DEED BOOK NUMBER	DEED BOOK PAGE	LAND USE
1	T.M. 3-10-70	BRANDON & VALERIE SMITH	667 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1261	714	Residential 1 Family
2	T.M. 3-10-71	KELLY A. MATTINGLY	665 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1174	558	Residential 1 Family
3	T.M. 3-10-28	TODD NOLTE	645 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1089	173	Residential 1 Family
4	T.M. 3-10-27	ALBERT W. & LINDA T. CRAVEN	619 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	9522	44	Residential 1 Family
5	T.M. 3-10-26	NANCY C. MYERS	603 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	941	103	Residential 1 Family
6	T.M. 3-10-25	NATHAN & SHELLY SPITZER	591 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1034	323	Residential 1 Family
7	T.M. 2-18A-31	PERRY L. PAYTON II	567 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1117	372	Residential 1 Family
8	T.M. 2-18A-30	NICHOLAS P. & SOPHIA M. RAVIZZA	555 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1246	522	Residential 1 Family
9	T.M. 2-18A-29	KATHLEEN M. MATTHEWS	539 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1190	175	Residential 1 Family
10	T.M. 2-18A-28	DANIEL P. SHANNON	523 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	920	545	Residential 1 Family
11	T.M. 2-18A-27	JEDEDIAH J. & SARAH M. TUTTLE	32 MOUNTAINSIDE COURT	HARPERS FERRY, WV 25425	1196	88	Residential 1 Family
12	T.M. 2-18A-26	MELISSA G. & EUGENE V. KING	489 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	927	303	Residential 1 Family
13	T.M. 2-18A-25	RONALD E. & AMARILIZ R. KELLEY	473 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1017	23	Residential 1 Family
14	T.M. 2-18A-24	JEFFREY J. KISH	455 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	974	490	Residential 1 Family
15	T.M. 2-18A-23	JACK C. MCBRIDE	439 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1239	92	Residential 1 Family
16	T.M. 2-18A-22	TODD & NANCY LANDIS	423 CROSSWINDS DRIVE	CHARLES TOWN, WV 25414	1191	369	Residential 1 Family
17	T.M. 2-18A-SWM	CROSSWINDS HOMEOWNERS ASSOC.	PO BOX 232	CHARLES TOWN, WV 25414	951	108	Residential Vacant
18	T.M. 2-17-22	DR ACQUISITIONS LLC	60 THOMAS DRIVE	FREDERICK, MD 21702	994	667	Inactive Farm
19	T.M. 2-19-1	HIGH HORIZONS FARM INC	336 ROSEMONT WAY	CHARLES TOWN, WV 25414	1208	227	Active Farm
20	T.M. 2-16-51	TABUENA PHILOMELA & ERNESTO R.H. STUART	111 FOXHALL ROAD	CHARLES TOWN, WV 25414	1137	157	Residential 1 Family
21	T.M. 2-16-50	JOSEPH V. & JENNIFER R. DAGG	107 FOXHALL ROAD	CHARLES TOWN, WV 25414	1234	630	Residential 1 Family
22	T.M. 2-16-49	ROBERT M. & BRENDA J. VINCENT	85 FOXHALL ROAD	CHARLES TOWN, WV 25414	1092	240	Residential 1 Family
23	T.M. 2-16-48	WILLIAM H. & CHRISTINE M. KINGERY	59 FOXHALL ROAD	CHARLES TOWN, WV 25414	900	116	Residential 1 Family
24	T.M. 2-16-47	WILLIAM R. & CAROLYN M. LIPSCOMB	43 FOXHALL ROAD	CHARLES TOWN, WV 25414	1140	378	Residential 1 Family
25	T.M. 2-16-39	DANIEL L. & LINDA A. COLLIE	416 EASTLAND DRIVE	CHARLES TOWN, WV 25414	1237	35	Residential 1 Family
26	T.M. 2-16-38	RAY & JENNIFER P. KOHLHEPP	448 EASTLAND DRIVE	CHARLES TOWN, WV 25414	845	458	Residential 1 Family
27	T.M. 2-16-94	MAURICE SMITH	502 EASTLAND DRIVE	CHARLES TOWN, WV 25414	1174	733	Residential 1 Family
28	T.M. 2-16-95	RYAN D. & ASHLEY A. VALASEK	550 EASTLAND DRIVE	CHARLES TOWN, WV 25414	1247	135	Residential 1 Family
29	T.M. 2-16-96	MARTIN E. & JACQUELINE M. CLINE	558 EASTLAND DRIVE	CHARLES TOWN, WV 25414	949	675	Residential 1 Family
30	T.M. 2-16-97	ERIC J. & SHERI R. BUTTERSWORTH	590 EASTLAND DRIVE	CHARLES TOWN, WV 25414	945	566	Residential 1 Family

KEY TO ADJOINING PROPERTY OWNERS

KEY	TAX IDENTIFICATION NO.	CURRENT OWNER	ADDRESS	CITY/STATE	DEED BOOK NUMBER	DEED BOOK PAGE	LAND USE
31	T.M. 2-16-16.5	PATRICK L. & BETH A. MARRONE	1032 OLD CAVE RD	CHARLES TOWN, WV 25414	1139	565	Inactive Farm
32	T.M. 2-16-16.4	PATRICK L. & BETH A. MARRONE	1032 OLD CAVE RD	CHARLES TOWN, WV 25414	1139	565	Inactive Farm
33	T.M. 2-16-15	JUNE R. H. & JAMES A. THOMAS, JR	5345 SAMUEL STREET	CHARLES TOWN, WV, 25414	1046	492	Active Farm
34	T.M. 2-16-14.3	JUNE R. H. THOMAS	5345 SAMUEL STREET	CHARLES TOWN, WV 25414	1125	646	Active Farm
35	T.M. 2-16-14.4	JOSEPH M. & EILEEN L. DILLON	1248 OLD CAVE ROAD	CHARLES TOWN, WV 25414	799	524	Active Farm
36	T.M. 3-12-216	CHARLES TOWN BOARD OF PARKS AND REC	PO BOX 14	CHARLES TOWN, WV 25414	1029	131	Active Farm
37	T.M. 3-12-217.1	BRAD BISHOP	55 FRASER CT	CHARLES TOWN, WV 25414	1238	241	Inactive Farm
38	T.M. 3-12-17	PEACH TREE INVESTMENTS LLC	36 BAKERTON ROAD	HARPERS FERRY, WV 25425	1103	493	Vacant Commercial Land
39	T.M. 3-12-13	MEGAN C. CURFMAN	14864 CHARLES TOWN ROAD	CHARLES TOWN, WV 25414	1167	265	Residential 1 Family
40	T.M. 2-17-15	JOSE E. SALVERON	14892 CHARLES TOWN ROAD	CHARLES TOWN, WV 25414	1250	83	Residential 1 Family
41	T.M. 2-17-16	JOSEPH LEBIDA III	14896 CHARLES TOWN ROAD	CHARLES TOWN, WV 25414	958	244	Residential 1 Family
42	T.M. 2-17-18	DAVID L. & CHERYL J. WILT	10199 CHARLES TOWN ROAD	RANSON, WV 25438	769	534	Residential 2 Family
43	T.M. 2-17-20	DAVID L. & CHERYL J. WILT	10199 CHARLES TOWN ROAD	RANSON, WV 25438	769	534	Mobile Home

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ADJOINING OWNER INFORMATION & PHASING KEY

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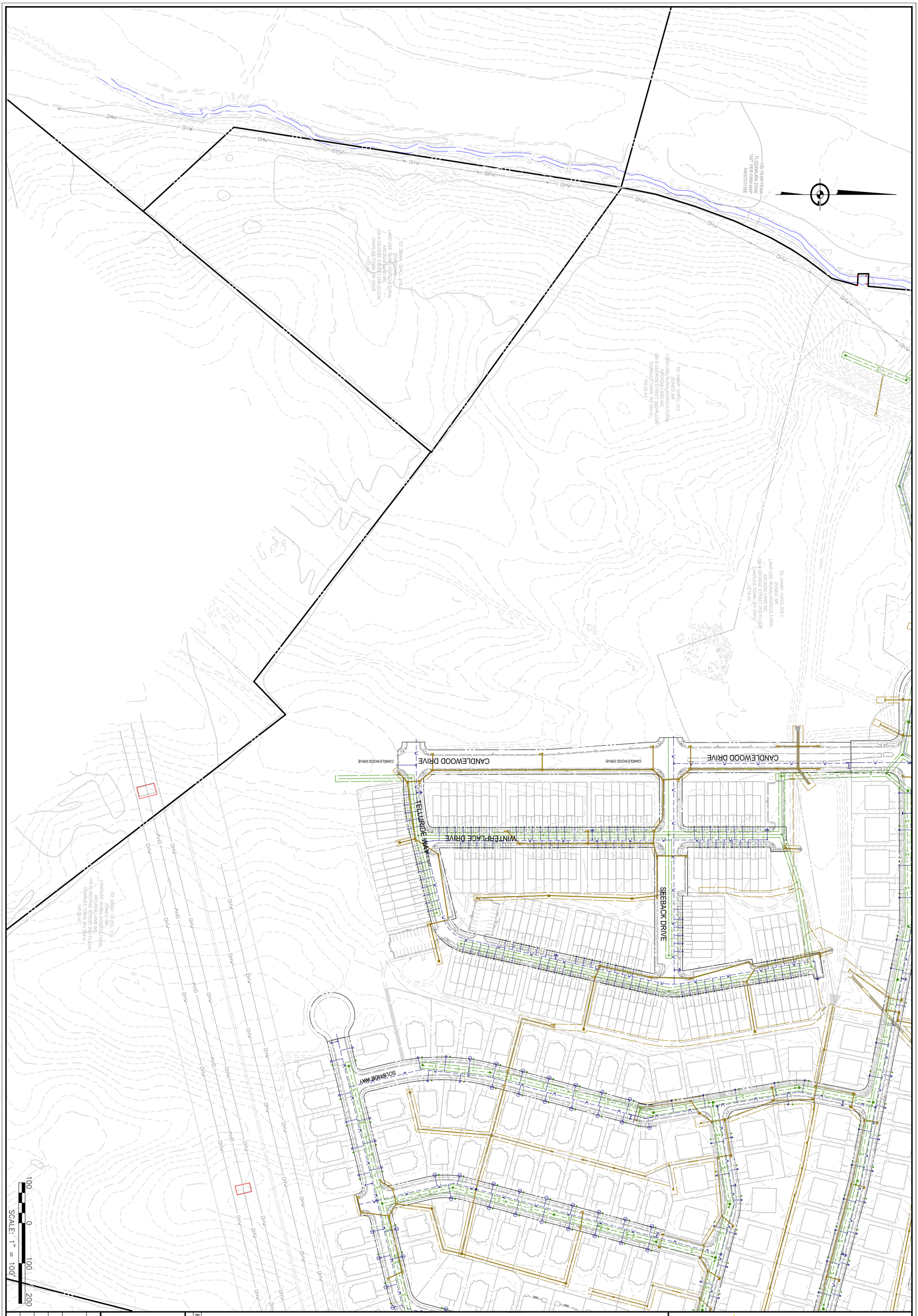
SCALE: 1" = 200'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 3 OF 97

SLD2022-06



EXISITING CONDITIONS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

SLD2022-06
SHEET 4 OF 97
FILE NO. 4542A
DESIGNED BY: CC/CW
SCALE: 1" = 100'
DATE: 11/06/2023

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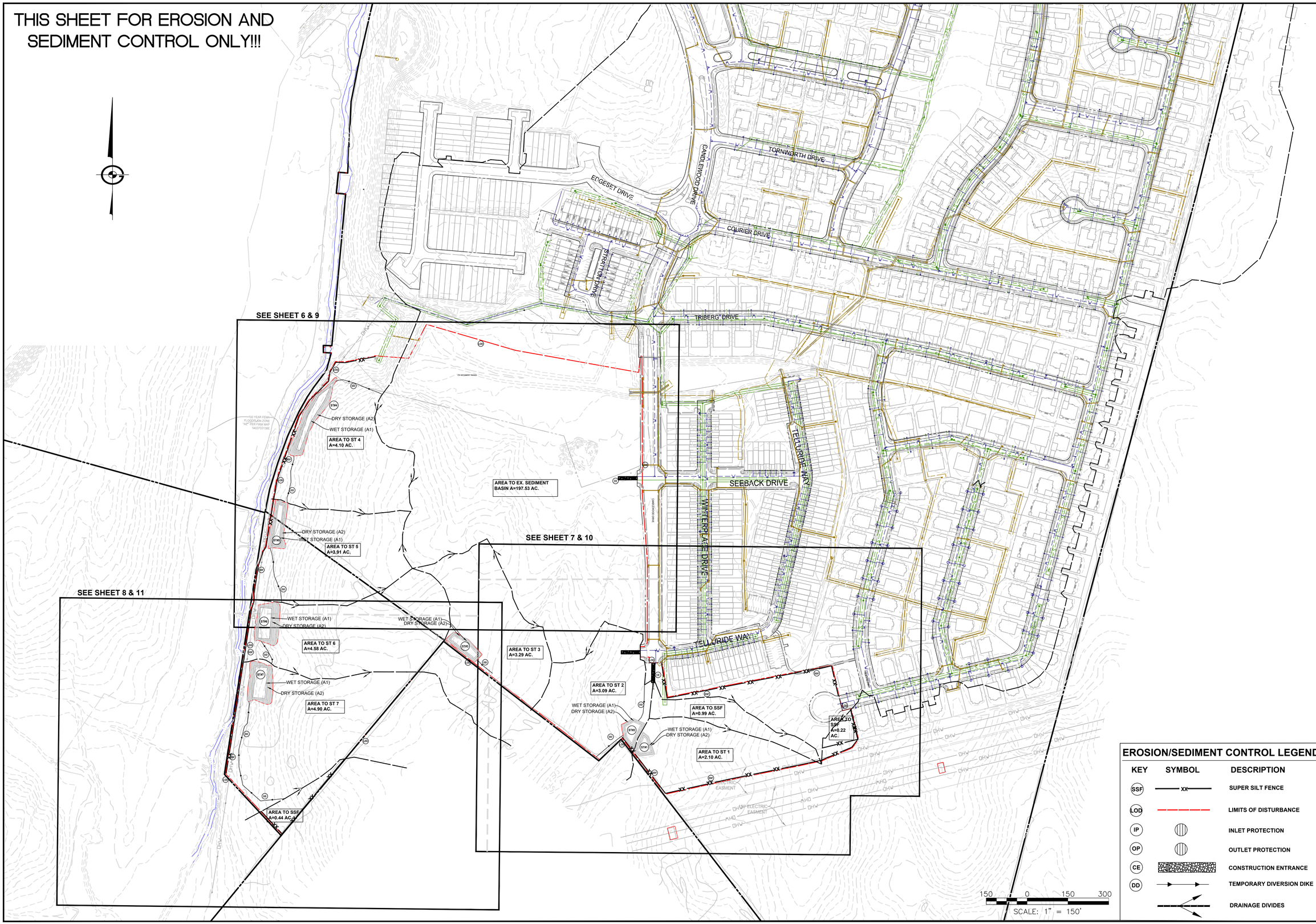

EROSION/SEDIMENT CONTROL LEGEND

KEY	SYMBOL	DESCRIPTION
SSF	—xx—	SUPER SILT FENCE
LOD	— — —	LIMITS OF DISTURBANCE
IP		INLET PROTECTION
OP		OUTLET PROTECTION
CE		CONSTRUCTION ENTRANCE
DD		TEMPORARY DIVERSION DIKE
		DRAINAGE DIVIDES

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OVERALL E&S PHASE I

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PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

SCALE: 1" = 150'

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FILE NO. 4542A

SHEET 5 OF 97

SLD2022-06

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MATCHLINE
SEE SHEET 7

CANDLEWOOD DRIVE

WINTERPLACE DRIVE

TELLURIDE WAY

SOLSTICE WAY

AREA TO ST 3
A=3.29 AC.

AREA TO ST 2
A=3.09 AC.

AREA TO SSF
A=0.99 AC.

AREA TO SSF
A=0.22 AC.

AREA TO ST 1
A=2.10 AC.

WET STORAGE (A1)
DRY STORAGE (A2)

WET STORAGE (A1)
DRY STORAGE (A2)

ST#2

ST#1

CE

LOD

DD

SSF

TAX MAP: 12/ PCL: 215
ZONED: NR
LANDUSE/ RURAL/AGRICULTURAL
ARCADIA LAND INC.
108 N. GEORGE STREET 2ND FLOOR
CHARLES TOWN, WV 25414
106.29 AC

MATCHLINE
SEE SHEET 8

50 25 0 50 100
SCALE: 1" = 50'

EROSION/SEDIMENT CONTROL LEGEND

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SHEET 6 OF 97
SLD2022-06

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100 YEAR FEMA FLOODPLAIN ZONE "AE" PER FIRM MAP 54037C0138E

LOD

DD

ST#4

DRY STORAGE (A2)

WET STORAGE (A1)

AREA TO ST 4
A=4.10 AC.

SSF

EX SEDIMENT BASIN

TD: 3/MAP: 12/PCL:209.1
ZONED: NR
LAND USE: RURAL/AGRICULTURAL
ARCADIA LAND INC.
108 N GEORGE STREET 2ND FLOOR
CHARLES TOWN, WV 25414
12.16 AC

CANDLEWOOD DRIVE

CE

AREA TO EX. SEDIMENT BASIN
A=197.53 AC.

ST#5

AREA TO ST 5
A=3.91 AC.

AREA TO ST 3
A=3.29 AC.

AREA TO ST 6
A=4.58 AC.

MATCHLINE
SEE SHEET 6

MATCHLINE
SEE SHEET 8

ST#6

50 25 0 50 100
SCALE: 1" = 50'

EROSION/SEDIMENT CONTROL LEGEND

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E&S PHASE I

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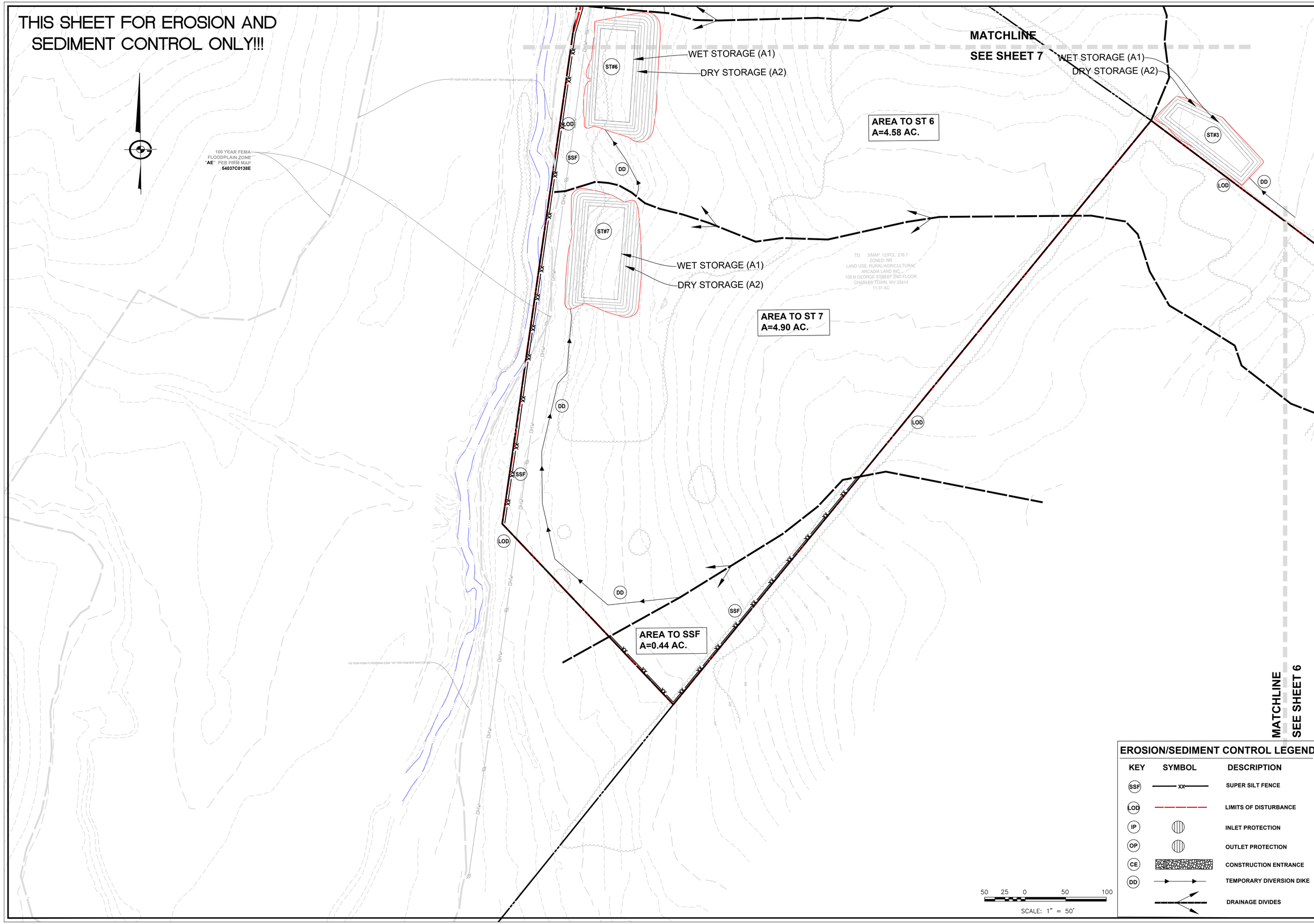
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SCALE: 1" = 50'

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SHEET 8 OF 97

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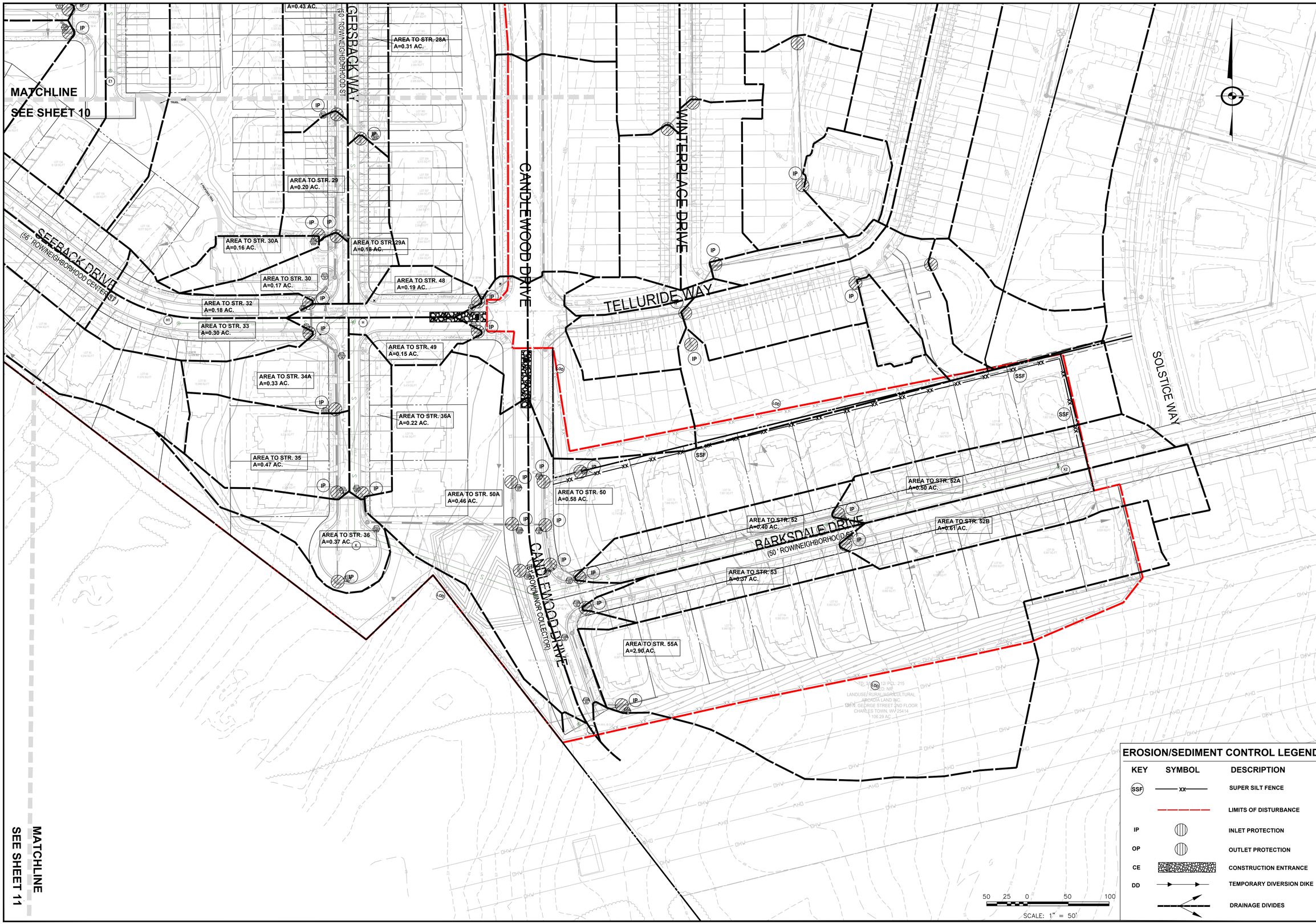

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E&S PHASE II

NORBORNE GLEBE

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CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

DATE: 11/06/2023
SCALE: 1" = 50'
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FILE NO. 4542A
SHEET 9 OF 97
SLD2022-06

EX SEDIMENT BASIN

AREA TO STR. 2
A=0.25 AC.

AREA TO STR. 3
A=0.16 AC.

AREA TO STR. 5
A=0.27 AC.

SEEBACK DRIVE
(56' ROW/NEIGHBORHOOD CENTER ST.)

AREA TO STR. 39
A=0.21 AC.

AREA TO STR. 6A
A=1.09 AC.

AREA TO STR. 40
A=0.38 AC.

AREA TO STR. 8A
A=0.29 AC.

AREA TO STR. 8
A=1.19 AC.

AREA TO STR. 40A
A=1.34 AC.

AREA TO STR. 25
A=0.23 AC.

AREA TO STR. 46
A=0.10 AC.

AREA TO STR. 47
A=0.24 AC.

AREA TO STR. 26
A=0.40 AC.

AREA TO STR. 41
A=0.74 AC.

AREA TO STR. 41A
A=0.64 AC.

AREA TO STR. 27
A=0.26 AC.

AREA TO STR. 27A
A=0.17 AC.

AREA TO STR. 26A
A=1.75 AC.

GRUNTER WAY
(50' ROW/NEIGHBORHOOD ST.)

AREA TO STR. 9B
A=1.03 AC.

AREA TO STR. 43
A=0.41 AC.

ALPINE DRIVE
(50' ROW/NEIGHBORHOOD ST.)

AREA TO STR. 10
A=0.15 AC.

AREA TO STR. 10A
A=0.08 AC.

AREA TO STR. 12
A=0.62 AC.

AREA TO STR. 28
A=0.43 AC.

GERSBACK WAY
(50' ROW/NEIGHBORHOOD ST.)

AREA TO STR. 28A
A=0.31 AC.

AREA TO STR. 44
A=0.95 AC.

SEEBACK DRIVE
(56' ROW/NEIGHBORHOOD CENTER ST.)

AREA TO STR. 23
A=0.28 AC.

AREA TO STR. 22
A=0.36 AC.

AREA TO STR. 12A
A=0.27 AC.

AREA TO STR. 13
A=0.61 AC.

AREA TO STR. 14
A=0.44 AC.

AREA TO STR. 17
A=0.20 AC.

AREA TO STR. 29
A=0.20 AC.

AREA TO STR. 18
A=0.22 AC.

AREA TO STR. 30A
A=0.16 AC.

AREA TO STR. 30
A=0.17 AC.

AREA TO STR. 32
A=0.18 AC.

AREA TO STR. 33
A=0.30 AC.

AREA TO STR. 22A
A=1.54 AC.

BRAUNECK COURT
(50' ROW/NEIGHBORHOOD ST.)

SEEBACK DRIVE
(56' ROW/NEIGHBORHOOD CENTER ST.)

CANDLEWOOD DRIVE

MATCHLINE
SEE SHEET 9

MATCHLINE
SEE SHEET 11

SCALE: 1" = 50

EROSION/SEDIMENT CONTROL LEGEND

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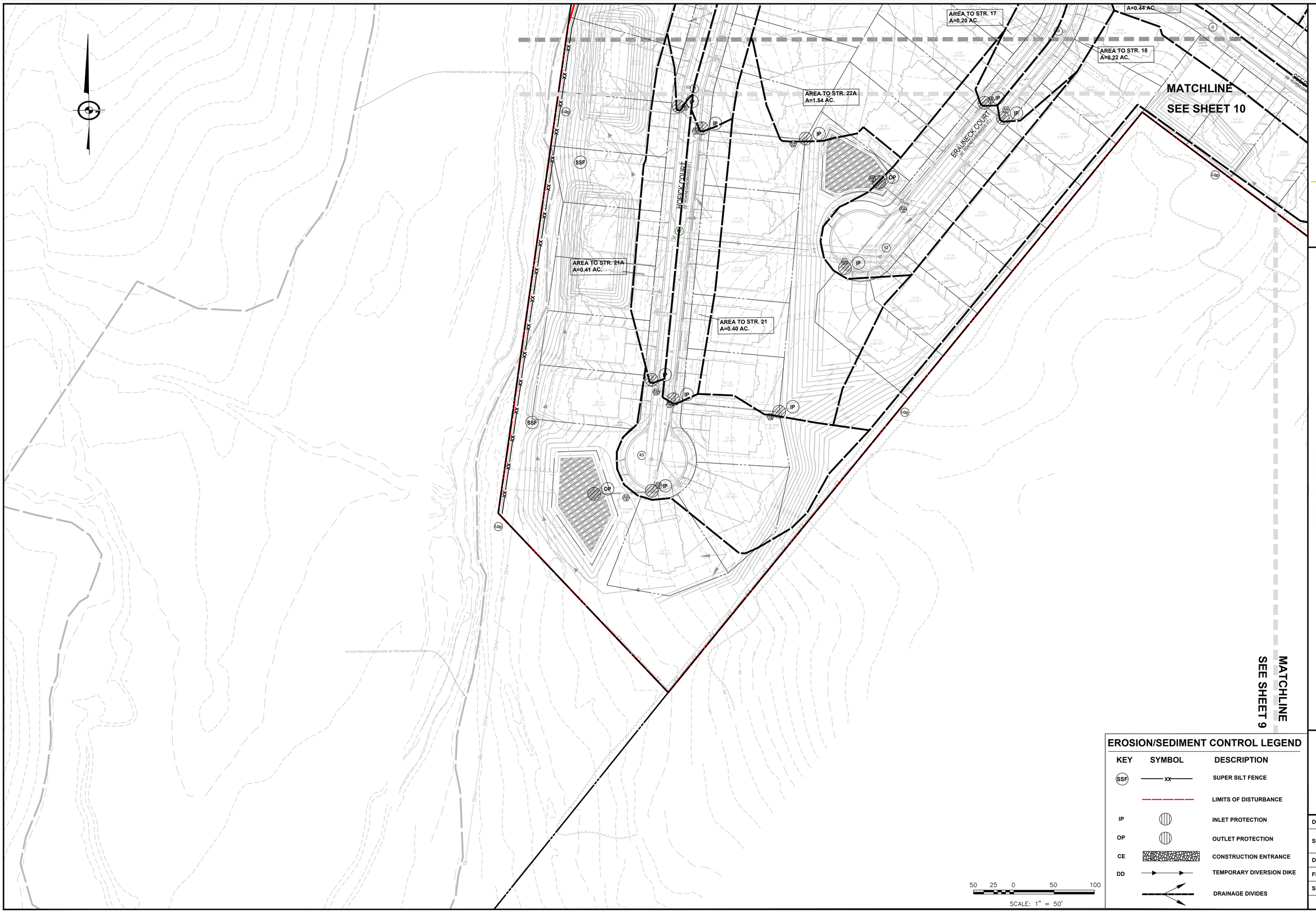

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SHEET	11 OF 97
	SLD2022-06

EROSION AND SEDIMENT CONTROL NARRATIVE

Description: The Project delineated hereon is located in the City of Charles Town, WV. This plan proposes construction of Phase 10B-13 consisting of 146 town homes and 78 Single Family homes and associated roads and utilities. Approximately 50.32 acres will be disturbed for construction.

Date of construction: Construction will begin following plan approval and is estimated to take up to 2 years to complete the project.

Offsite areas: Top soil will be stripped from graded areas and stockpiled for use in final grading and permanent stabilization. Stockpiles will be kept on site and clear of all construction activities. The stockpiles will be be stabilized with temporary seeding and protected with silt fence.

Erosion And Sediment Control Measures: Unless otherwise indicated, all vegetative and structural erosion and sediment control measures shall be constructed and maintained according to the minimum standards and specifications of the West Virginia Erosion and Sediment Control Handbook.

Management Strategies:

Construction shall be sequenced such that grading operations will begin and end as quickly as possible.

The site superintendent shall be responsible for the installation and maintenance of all erosion and sediment control measures. Maintenance of these measures throughout the project is critical to the effectiveness of the program.

After areas above controls have been stabilized, the controls shall be cleaned up and removed.

Electric power, telephone, storm, sanitary, water & gas supply trenches (as applicable) are to be compacted, seeded and mulched within four (4) days after backfilling. No more than 500 feet are to be open at any one time.

All cut and fill slopes are to be seeded and mulched within four (4) days of completion of grading.

Drainage swales shall be stabilized with check dams until vegetation has been well established, at which time the temporary check dams shall be removed.

Devices listed above are considered minimum erosion and sediment controls. Additional control measures may be necessary due to contractor phasing or other unforeseen conditions. It is the contractor's responsibility to provide additional measures to those shown, as needed, in order to control erosion and contain sediment on site. All measures shall be installed according to the standards and specifications in the West Virginia erosion and sediment control handbook.

Maintenance Program:

All control measures shall be inspected daily by the site superintendent or his representative and within 24 hours after any storm event greater than 0.25 inches of rain per 24-hour period. Any damaged structural measures are to be repaired by the end of the day. Seeded areas shall be checked regularly to ensure that a good stand of grass is maintained. All areas shall be fertilized and reseeded as needed until grass is established.

Trapped sediment is to be removed as required to maintain 50% trap efficiency and disposed of by spreading on site.

Inlet protection shall be checked regularly for sediment build-up. If the gravel outlet is clogged by sediment, it shall be removed and cleaned or replaced immediately.

The contractor is responsible for keeping existing public roads in a clean, dust and mud free, condition at all times.

Erosion and sediment control program:

1. Hold pre-construction meeting on site with inspector.
2. Install construction entrance.
3. Clearing and grubbing for sediment control devices only.
4. Placement of sediment control devices.
5. Obtain inspector's approval prior to beginning grading operations.
6. Clear and grub remainder of site.
7. Rough grade site.
8. Install drainage devices with sediment control.
9. Final grading.
10. Restoration and stabilization of disturbed areas.
11. Remove erosion and sediment control measures with the approval of the inspector.

Note: City of Charles Town Public Officials retain the right to add and/or modify these erosion and sediment control measures during the construction process, within reason, to ensure adequate protection to the public and the environment.

Seeding schedule (soil stabilization):

1. All permanent seeding shall be in accordance with the West Virginia Erosion & Sediment Control Manual.
2. Spread topsoil at a minimum depth of four (4) inches.
3. Incorporate pulverized agricultural limestone into the topsoil at a rate of 92 lbs. per 1,000 square feet (2 tons per acre).
4. Fertilize with 10-10-10 fertilizer at a rate of 23 lbs per 1,000 square feet (1,000 lbs per acre).
5. Seed all areas with a seed mix consisting of 67% Kentucky 31 Tall Fescue and 33% Red Top Clover.
6. Mulch all seeded areas with straw mulch applied at a rate of 3,500 lbs per acre anchored with cutback or emulsified asphalt applied at a rate of 200 gallons per acre.

Dust control:

1. Temporary seeding shall be applied to all disturbed areas subject to little or no construction traffic.
2. All haul roads and other heavy traffic routes shall be sprinkled with water until the surface is wet and repeated as needed to control dust.

Stormwater Management Narrative:

The existing Stormwater Management Facility was approved to service the full build out of the development within its drainage area. The existing pond, as designed, meets the 1999 Virginia Stormwater Management Handbook, which is one of the practices allowable by the City of Charles Town Code. Chapter 2 of the VSMH states sites are allowed to use the Technology-based water quality criteria so that for land development, "the post developed stormwater runoff from the impervious cover shall be treated by an appropriate BMP as required by the post-developed condition percent impervious cover as specified in Table 2-3." Table 2-3 allows an Extended Detention facility to be utilized when the impervious cover is from 22-37%. Our conservative calculations have the existing pond and it contributing drainage area (both currently developed and the proposed full build-out of the remaining drainage area) to be 37% impervious and therefore meeting the technology based criteria. No additional measures are anticipated.

MINIMUM CONSTRUCTION STANDARDS

An erosion and sediment control program adopted with this plan must be consistent with the VSECH for 9VAC25-840-40 minimum standards:

1. Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site. Temporary soil stabilization shall be applied within seven days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days. Permanent stabilization shall be applied to areas that are to be left dormant for more than one year.
2. During construction of the project, soil stock piles and borrow areas shall be stabilized or protected with sediment trapping measures. The applicant is responsible for the temporary protection and permanent stabilization of all soil stockpiles on site as well as borrow areas and soil intentionally transported from the project site.
3. A permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is uniform, mature enough to survive and will inhibit erosion.
4. Sediment basins and traps, perimeter dikes, sediment barriers and other measures intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place.
5. Stabilization measures shall be applied to earthen structures such as dams, dikes and diversions immediately after installation.
6. Sediment traps and sediment basins shall be designed and constructed based upon the total drainage area to be served by the trap or basin.
   a. The minimum storage capacity of a sediment trap shall be 134 cubic yards per acre of drainage area and the trap shall only control drainage areas less than three acres.
   b. Surface runoff from disturbed areas that is comprised of flow from drainage areas greater than or equal to three acres shall be controlled by a sediment basin. The minimum storage capacity of a sediment basin shall be 134 cubic yards per acre of drainage area. The outfall system shall, at a minimum, maintain the structural integrity of the basin during a 100-year storm of 24-hour duration. Runoff coefficients used in runoff calculations shall correspond to a bare earth condition or those conditions expected to exist while the sediment basin is utilized.
7. Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Slopes that are found to be eroding excessively within one year of permanent stabilization shall be provided with additional slope stabilizing measures until the problem is corrected.
8. Concentrated runoff shall not flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume or slope drain structure.
9. Whenever water seeps from a slope face, adequate drainage or other protection shall be provided.
10. All storm sewer inlets that are made operable during construction shall be protected so that sediment-laden water cannot enter the conveyance system without first being filtered or otherwise treated to remove sediment.
11. Before newly constructed stormwater conveyance channels or pipes are made operational, adequate outlet protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel and receiving channel.
12. When work in a live watercourse is performed, precautions shall be taken to minimize encroachment, control sediment transport and stabilize the work area to the greatest extent possible during construction. Nonerodible material shall be used for the construction of causeways and cofferdams. Earthen fill may be used for these structures if armored by nonerodible cover materials.
13. When a live watercourse must be crossed by construction vehicles more than twice in any six-month period, a temporary vehicular stream crossing constructed of nonerodible material shall be provided.
14. All applicable federal, state and local requirements pertaining to working in or crossing live watercourses shall be met.
15. The bed and banks of a watercourse shall be stabilized immediately after work in the watercourse is completed.
16. Underground utility lines shall be installed in accordance with the following standards in addition to other applicable criteria:
   a. No more than 500 linear feet of trench may be opened at one time.
   b. Excavated material shall be placed on the uphill side of trenches.
   c. Effluent from dewatering operations shall be filtered or passed through an approved sediment trapping device, or both, and discharged in a manner that does not adversely affect flowing streams or off-site property.
   d. Material used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization.
   e. Restabilization shall be accomplished in accordance with this chapter.
   f. Applicable safety requirements shall be complied with.
17. Where construction vehicle access routes intersect paved or public roads, provisions shall be made to minimize the transport of sediment by vehicular tracking onto the paved surface. Where sediment is transported onto a paved or public road surface, the road surface shall be cleaned thoroughly at the end of each day. Sediment shall be removed from the roads by shoveling or sweeping and transported to a sediment control disposal area. Street washing shall be allowed only after sediment is removed in this manner. This provision shall apply to individual development lots as well as to larger land-disturbing activities.
18. All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed, unless otherwise authorized by the VESCP authority. Trapped sediment and the disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.
19. Properties and waterways downstream from development sites shall be protected from sediment deposition, erosion and damage due to increases in volume, velocity and peak flow rate of stormwater runoff for the stated frequency storm of 24-hour duration in accordance with the following standards and criteria. Stream restoration and relocation projects that incorporate natural channel design concepts are not man-made channels and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels:
   a. Concentrated stormwater runoff leaving a development site shall be discharged directly into an adequate natural or man-made receiving channel, pipe or storm sewer system. For those sites where runoff is discharged into a pipe or pipe system, downstream stability analyses at the outfall of the pipe or pipe system shall be performed.
   b. Adequacy of all channels and pipes shall be verified in the following manner:

   (1) The applicant shall demonstrate that the total drainage area to the point of analysis within the channel is one hundred times greater than the contributing drainage area of the project in question; or

   (2) (a) Natural channels shall be analyzed by the use of a two-year storm to verify that stormwater will not overtop channel banks nor cause erosion of channel bed or banks.

   (b) All previously constructed man-made channels shall be analyzed by the use of a 10-year storm to verify that stormwater will not overtop its banks and by the use of a two-year storm to demonstrate that stormwater will not cause erosion of channel bed or banks; and

   (c) Pipes and storm sewer systems shall be analyzed by the use of a 10-year storm to verify that stormwater will be contained within the pipe or system.

   c. If existing natural receiving channels or previously constructed man-made channels or pipes are not adequate, the applicant shall:

   (1) Improve the channels to a condition where a 10-year storm will not overtop the banks and a two-year storm will not cause erosion to the channel, the bed, or the banks; or

   (2) Improve the pipe or pipe system to a condition where the 10-year storm is contained within the appurtenances;

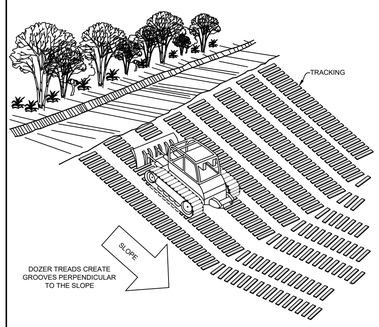
   (3) Develop a site design that will not cause the pre-development peak runoff rate from a two-year storm to increase when runoff outfalls into a natural channel or will not cause the pre-development peak runoff rate from a 10-year storm to increase when runoff outfalls into a man-made channel; or

   (4) Provide a combination of channel improvement, stormwater detention or other measures which is satisfactory to the VESCP authority to prevent downstream erosion.

   d. The applicant shall provide evidence of permission to make the improvements.
   e. All hydrologic analyses shall be based on the existing watershed characteristics and the ultimate development condition of the subject project.
   f. If the applicant chooses an option that includes stormwater detention, he shall obtain approval from the VESCP of a plan for maintenance of the detention facilities. The plan shall set forth the maintenance requirements of the facility and the person responsible for performing the maintenance.
   g. Outfall from a detention facility shall be discharged to a receiving channel, and energy dissipators shall be placed at the outfall of all detention facilities as necessary to provide a stabilized transition from the facility to the receiving channel.
   h. All on-site channels must be verified to be adequate.
   i. Increased volumes of sheet flows that may cause erosion or sedimentation on adjacent property shall be diverted to a stable outlet, adequate channel, pipe or pipe system, or to a detention facility.
   j. In applying these stormwater management criteria, individual lots or parcels in a residential, commercial or industrial development shall not be considered to be separate development projects. Instead, the development, as a whole, shall be considered to be a single development project. Hydrologic parameters that reflect the ultimate development condition shall be used in all engineering calculations.
   k. All measures used to protect properties and waterways shall be employed in a manner which minimizes impacts on the physical, chemical and biological integrity of rivers, streams and other waters of the state.
   l. Any plan approved prior to July 1, 2014, that provides for stormwater management that addresses any flow rate capacity and velocity requirements for natural or man-made channels shall satisfy the flow rate capacity and velocity requirements for natural or man-made channels if the practices are designed to (i) detain the water quality volume and to release it over 48 hours; (ii) detain and release over a 24-hour period the expected rainfall resulting from the one year, 24-hour storm; and (iii) reduce the allowable peak flow rate resulting from the 1.5, 2, and 10-year, 24-hour storms to a level that is less than or equal to the peak flow rate from the site assuming it was in a good forested condition, achieved through multiplication of the forested peak flow rate by a reduction factor that is equal to the runoff volume from the site when it was in a good forested condition divided by the runoff volume from the site in its proposed condition, and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels as defined in any regulations promulgated pursuant to § 62.1-44.15:54 or 62.1-44.15:65 of the Act.
   m. For plans approved on and after July 1, 2014, the flow rate capacity and velocity requirements of § 62.1-44.15:52 A of the Act and this subsection shall be satisfied by compliance with water quantity requirements in the Stormwater Management Act (§ 62.1-44.15:24 et seq. of the Code of Virginia) and attendant regulations, unless such land-disturbing activities are in accordance with 9VAC25-870-48 of the Virginia Stormwater Management Program (VSMP) Regulation or are exempt pursuant to subdivision C 7 of § 62.1-44.15:34 of the Act.
   n. Compliance with the water quantity minimum standards set out in 9VAC25-870-66 of the Virginia Stormwater Management Program (VSMP) Regulation shall be deemed to satisfy the requirements of this subdivision 19.

SLOPE TRACKING

N.T.S.



NOTES:
1. TRACKING SLOPES ARE DONE BY RUNNING TRACKED MACHINERY UP AND DOWN THE SLOPE, LEAVING TREAD MARKS PARALLEL TO THE CONTOUR. IF A BULLDOZER IS USED, THE BLADE SHOULD BE UP.

SEEDING

TABLE 3.31-B
ACCEPTABLE TEMPORARY SEEDING PLANT MATERIALS
"QUICK REFERENCE FOR ALL REGIONS"

Planting Dates	Species	Rate (lbs./acre)
Sept. 1 - Feb. 15	50/50 Mix of Annual Ryegrass (Lolium multi-florum) & Cereal (Winter) Rye (Secal cereale)	50 - 100
Feb. 16 - Apr. 30	Anual Ryegrass (Lolium multi-florum)	60 - 100
May 1 - Aug. 31	German Millet (Setaria italica)	50

TABLE 3.32-C
SITE SPECIFIC PERMANENT SEEDING MIXTURES
FOR APPALACHIAN/MOUNTAIN AREA

	Total Lbs. Per Acre
Minimum Care Lawn	
- Commercial or Residential	200-250 lbs.
- Kentucky 31 or Turf-Type Tall Fescue	90-100%
- Improved Perennial Ryegrass *	0-10%
- Kentucky Bluegrass	0-10%
High-Maintenance Lawn	
Minimum of three (3) up to five (5) varieties of bluegrass from approved list for use in Virginia.	125 lbs.
General Slope (3:1 or less)	
- Kentucky 31 Fescue	128 lbs.
- Red Top Grass	2 lbs.
- Seasonal Nurse Crop**	20 lbs.
	150 lbs
Low-Maintenance Slope (Steeper than 3:1)	
- Kentucky 31 Fescue	108 lbs.
- Red Top Grass	2 lbs.
- Seasonal Nurse Crop**	20 lbs.
- Crownvetch ***	20 lbs.
	150 lbs

* Perennial Ryegrass will germinate faster and at lower soil temperatures than fescue, thereby providing cover and erosion resistance for seedbed.

** Use seasonal nurse crop in accordance with seeding dates as stated below:
March, April through May 15th.....Annual Rye
May 16th through August 15th.....Foxtail Millet
August 16th through Sept.,Oct.....Annual Rye
November through February.....Winter Rye

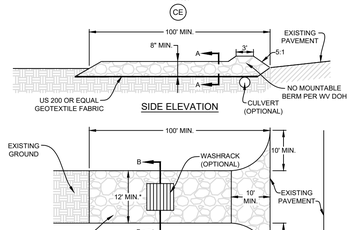
*** If Flatpea is used, increase to 30 lbs./acre. All legume seed must be properly inoculated. Weeping Lovegrass may also be included in any slope or low-maintance mixtures during warmer seeding periods; add 10-20 lbs/acre in mixes.

Seeding
Seed shall be evenly applied with a broadcast seeder, drill, cultipacker seeder or hydroseeder. Small grains shall be planted no more than one inch deep. Grasses and legumes shall be planted with no less than 1/4" soil cover.

ROCK CONSTRUCTION ENTRANCE

N.T.S.

CE

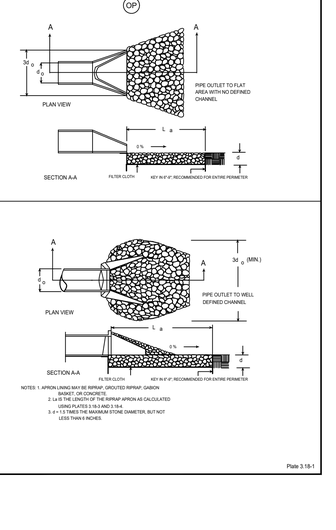


MODIFIED) SOURCE: ADAPTED FROM THE 1983 MARYLAND STANDARDS FOR SOIL EROSION AND SEDIMENT CONTROL AND VA. DSWC

PIPE OUTLET CONDITIONS

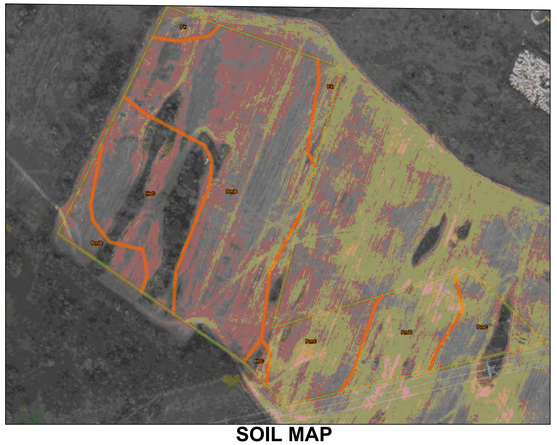
N.T.S.

OP



Source: Va. DSWC Plate 3.18-1

SOIL TABULATION			
MAP UNIT SYMBOL	MAP UNIT NAME	ACRES IN AOI	PERCENT OF AOI
Fk	Funkstown silt loam	1	3.60%
HrC	Hagerston-Rock outcrop complex, 8 to 15 percent slopes	5.3	19.30%
PmB	Poplimento silt loam 3 to 8 percent slopes	16.2	59.40%
PmC	Poplimento silt loam 8 to 15 percent slopes	4.8	17.70%



SOIL MAP
1"=60'

SEDIMENT TRAP COMPUTATIONS

TRAP NO.	DRAINAGE AREA (ACRES)	STORAGE REQUIRED (CU. FT.)	STORAGE PROVIDED (CU. FT.)	WET STORAGE DEPTH D1 (FT.)	AREA A1 (SQ. FT.)	VOLUME REQUIRED (CU. FT.)	VOLUME PROVIDED V1 (CU. FT.)	SURFACE DIMENSION (FT. x FT.)	DRY STORAGE DEPTH D2 (FT.) (Ho)	AREA A2 (SQ. FT.)	VOLUME REQUIRED (CU. FT.)	VOLUME PROVIDED V1 (CU. FT.)	SURFACE DIMENSION (FT. x FT.)	EXCAVATED DEPTH (FT.)	BERM HEIGHT H (FT.)	TOP BERM Min WIDTH W (FT.)	OUTLET HEIGHT Ho (FT.)	CLEANOUT HEIGHT (FT.)	OUTLET TYPE	LENGTH OF GRAVEL WEIR (FT.)
1	2.10	7598	9348	2.0	2280	3799	3876	30 X 76	2.0	3192	3799	5472	38 X 84	2.0	3.0	3.0	2.0	2.0	GRAVEL	7
2	3.09	11180	13488	2.0	3360	5590	5712	40 X 84	2.0	4416	5590	7776	48 X 92	2.0	3.0	3.0	2.0	2.0	GRAVEL	9
3	3.29	11904	14126	2.0	3528	5952	5998	42 X 84	2.0	4600	5952	8128	50 X 92	2.0	3.0	3.0	2.0	2.0	GRAVEL	9
4	4.10	14834	17523	2.0	4416	7417	7507	48 X 92	2.0	5600	7417	10016	56 X 100	2.0	3.0	3.0	2.0	2.0	GRAVEL	11
5	3.91	14147	16676	2.0	4200	7073.5	7140	50 X 84	2.0	5336	7074	9536	58 X 92	2.0	3.0	3.0	2.0	2.0	GRAVEL	10
6	4.58	16571	19614	2.0	4968	8285.5	8446	54 X 92	2.0	6200	8286	11168	62 X 100	2.0	3.0	3.0	2.0	2.0	GRAVEL	12
7	4.90	17729	20741	2.0	5264	8864.5	8949	56 X 94	2.0	6528	8865	11792	64 X 102	2.0	3.0	3.0	2.0	2.0	GRAVEL	12

Notes: 1. The required storage volume is based upon 134 cu. yds. Per acre (or 3618 cu. ft. per acre) = 80% trap efficiency.
2. V1 = 0.85 x D1 x A1
3. V2 = [(A1 + A2)/2] x D2
4. Total drainage area is used to design the outlet structure of the trap.
5. Construction of the sediment trap shall be in accordance with the latest version of the VA Erosion & Sediment Control Handbook.

PUBLIC NOTICE SIGN

N.T.S.

For Info on NPDES Stormwater Permit
To comment on Sediment Control Plan:
Call: 800-654-5227
or
DEP.Plan@wv.gov
DEP 601 57TH Street SE, Charleston WV 25304

Application date: XX/XX/20XX

NORBORNE GLEBE PH 10B,11,12 &13
(XXX) XXX-XXXX

NOTES:
1. THE SIGN WILL BE A MINIMUM 0F 24"X24" WITH 1.6" AND 0.8" LETTERS.

704 Foxcroft Avenue
Martinsburg, West Virginia 25401
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E&S NARRATIVE

NORBORNE GLEBE
PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

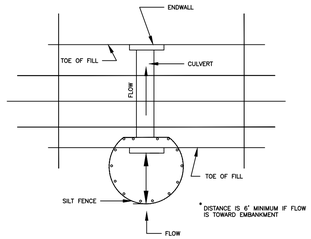
Rev. No.	Date

DATE: 11/06/2023
SCALE: AS SHOWN
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 12 OF 97
SLD2022-06

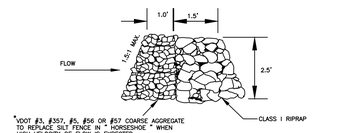
SILT FENCE CULVERT INLET PROTECTION

N.T.S.

IP



*OPTIONAL STONE COMBINATION



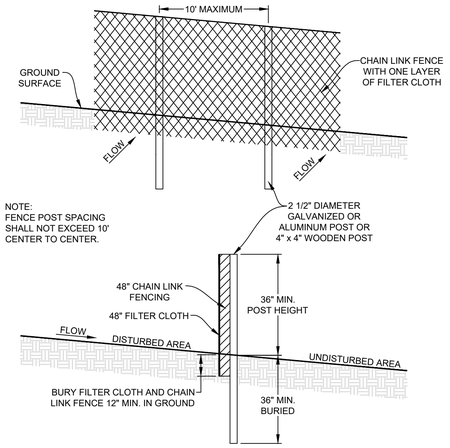
SOURCE: ADAPTED from VDOT Standard Sheets and Va. DSWC

PLATE. 3.08-1

SUPER SILT FENCE

N.T.S.

SSF #1



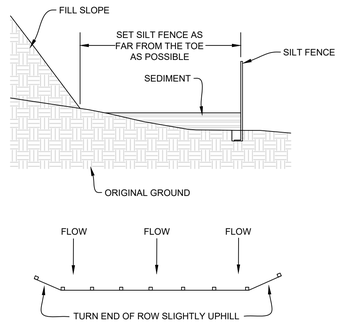
NOTES:
1. SUPER SILT FENCE IS A TEMPORARY BARRIER OF GEOTEXTILE FABRIC OVER CHAIN LINK FENCE.
2. SUPER SILT FENCE SHOULD BE PLACED AS CLOSE TO THE CONTOUR AS POSSIBLE.
3. ENDS SHALL BE EXTENDED UPHILL A MINIMUM OF 2 VERTICAL FEET.
4. CHAIN LINK FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES OR STAPLES. GEOTEXTILE FABRIC SHALL BE FASTENED SECURELY TO THE CHAIN LINK FENCE WITH TIES SPACED EVERY 24" AT THE TOP AND MID-SECTIONS.
5. GEOTEXTILE FABRIC AND CHAIN LINK FENCE SHALL BE EMBEDDED A MINIMUM OF 12" INTO THE GROUND. WHEN 2 SECTIONS OF GEOTEXTILE FABRIC ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6" AND FOLDED.
6. METAL POSTS AS SPECIFIED BY WV DOT CAN BE REPLACED BY PRESSURE-TREATED 4" x 4" POSTS.
7. SUPER SILT FENCE SHOULD BE INSPECTED AT A MINIMUM ONCE EVERY 7 CALENDAR DAYS OR WITHIN 24 HOURS AFTER ANY STORM EVENT GREATER THAN 0.5 INCHES OF RAIN PER 24 HOUR PERIOD. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.

(MODIFIED) SOURCE: WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.

SILT FENCE PLACEMENT

N.T.S.

SF

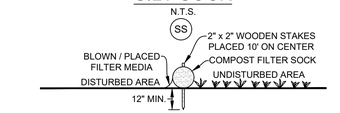


Slope - Percent	Maximum Slope Length (ft) Above Fence		
	Standard (18" High) Silt Fence	Reinforced (30" High) Silt Fence	Super Silt Fence
2 (or less)	150	500	1000
5	100	250	550
10	50	150	325
15	35	100	215
20	25	70	175
25	20	55	135
30	15	45	100
35	15	40	85
40	15	35	75
45	10	30	60
50	10	25	50

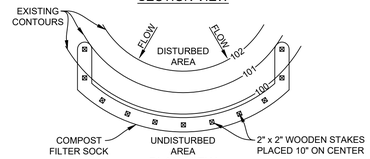
SILT SOCK

N.T.S.

SS



SECTION VIEW



PLAN VIEW

ADAPTED FROM FILTREXX
SOCK FABRIC SHALL MEET STANDARDS OF TABLE 4.1. COMPOST SHALL MEET THE FOLLOWING STANDARDS.

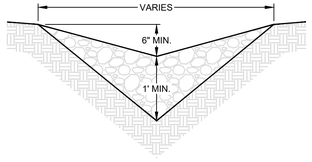
ORGANIC MATTER CONTENT	80%-100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5-8.0
MOISTURE CONTENT	35%-55%
PARTICLE SIZE	98% PASS THROUGH 1" SCREEN
SOLUBLE SALT CONCENTRATION	5.0 dS MAXIMUM

NOTES:
1. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8' UP THE SLOPE OR TO A HEIGHT EQUAL TO THE EFFECTIVE SOCK HEIGHT, WHICHEVER IS GREATER, AT 45° TO THE MAIN SOCK ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY SOCK SHALL NOT EXCEED MANUFACTURER'S MAXIMUM PERMISSIBLE SLOPE LENGTH.
2. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
3. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
4. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
5. BIODEGRADABLE FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
6. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.
7. IN THE EVENT THE GROUND IS FROZEN, #5 REBAR WITH SAFETY CAPS SHALL BE USED INSTEAD OF WOODEN STAKES TO ANCHOR THE FILTER SOCK. ONCE THE GROUND THAWS, THE REBAR ANCHORS SHALL BE REMOVED AND REPLACED WITH 2" x 2" WOODEN STAKES AND INSTALLED AS SHOWN IN THE DETAIL ABOVE.

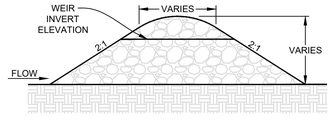
ROCK CHECK DAM

N.T.S.

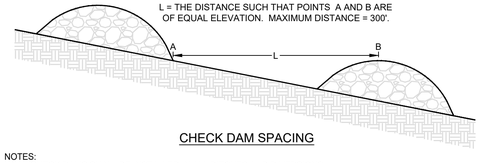
CD



ELEVATION



CROSS-SECTION



CHECK DAM SPACING

NOTES:
1. CHECK DAMS SHALL BE INSTALLED IN ALL DITCHES AND DIVERSIONS.

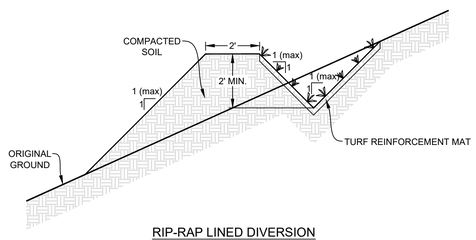
(MODIFIED) SOURCE: WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE MANUAL.

DIVERSION

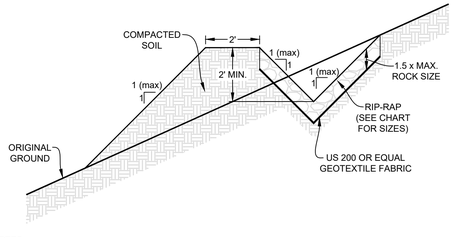
N.T.S.

DD

GRASS OR TURF REINFORCEMENT MAT LINED DIVERSION



RIP-RAP LINED DIVERSION



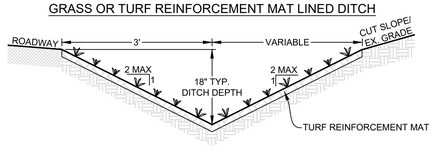
NOTES:
1. DIVERSION DIMENSIONS SHOWN ARE FOR COMPLETED DIVERSION AFTER LINING INSTALLATION. THE DIVERSION MUST BE OVER-EXCAVATED A SUFFICIENT AMOUNT TO ALLOW FOR THE REQUIRED LINING TO BE PLACED WITHIN THE DIVERSION WHILE MAINTAINING THE SPECIFIED FINISHED DIMENSIONS.
2. DIVERSION DIMENSIONS SHALL BE CONSTANTLY MAINTAINED. DIVERSION LINES SHALL BE CLEANED WHENEVER TOTAL DIVERSION DEPTH IS REDUCED BY 25% AT ANY LOCATION. SEDIMENT DEPOSITS SHALL BE REMOVED WITHIN 24 HOURS OF DISCOVERY OR AS SOON AS SOIL CONDITIONS PERMIT ACCESS TO DIVERSION WITHOUT FURTHER DAMAGE.

TYPICAL V-DITCH

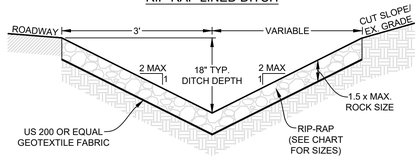
N.T.S.

DL #1

GRASS OR TURF REINFORCEMENT MAT LINED DITCH



RIP-RAP LINED DITCH



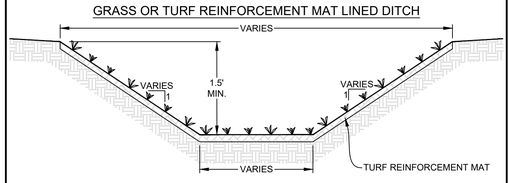
NOTES:
1. ALL DITCH LINE PROTECTION SHALL BE INSTALLED AS RECOMMENDED IN THE WEST VIRGINIA EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE (BMP) MANUAL. DITCH LINE PROTECTION SHALL BE BASED ON THE FOLLOWING GRADES:
   1.1. LESS THAN 3% = GRASS.
   1.2. 3%-9% = TURF REINFORCEMENT MAT OR GRASS WITH ROLLED EROSION CONTROL PRODUCTS (R.E.C.P.).
   1.3. GREATER THAN 9% = RIP-RAP. SEE CHART FOR SIZES.
2. TYPICAL OUTLET PROTECTION SHALL BE INSTALLED AT DOWNSTREAM END OF ALL DITCH LINES. SEE OUTLET PROTECTION DETAIL.
3. DITCH DIMENSIONS SHOWN ARE FOR COMPLETED DITCH AFTER LINING INSTALLATION. THE DITCH MUST BE OVER-EXCAVATED A SUFFICIENT AMOUNT TO ALLOW FOR THE REQUIRED LINING TO BE PLACED WITHIN THE DITCH WHILE MAINTAINING THE SPECIFIED FINISHED DIMENSIONS.
4. DITCH DIMENSIONS SHALL BE CONSTANTLY MAINTAINED. DITCH LINES SHALL BE CLEANED WHENEVER TOTAL DITCH DEPTH IS REDUCED BY 25% AT ANY LOCATION. SEDIMENT DEPOSITS SHALL BE REMOVED WITHIN 24 HOURS OF DISCOVERY OR AS SOON AS SOIL CONDITIONS PERMIT ACCESS TO DITCH WITHOUT FURTHER DAMAGE.
5. DAMAGED LINING SHALL BE REPAIRED OR REPLACED WITHIN 48 HOURS OF DISCOVERY.
6. IF HIGH EROSIVE SOILS ARE ENCOUNTERED DURING CONSTRUCTION, THE ENGINEER SHOULD BE CONTACTED FOR FURTHER EVALUATION.

TYPICAL TRAPEZOIDAL DITCH

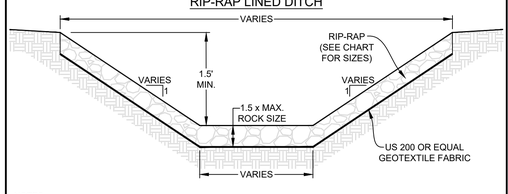
N.T.S.

DL #1

GRASS OR TURF REINFORCEMENT MAT LINED DITCH



RIP-RAP LINED DITCH



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4. DITCH DIMENSIONS SHALL BE CONSTANTLY MAINTAINED. DITCH LINES SHALL BE CLEANED WHENEVER TOTAL DITCH DEPTH IS REDUCED BY 25% AT ANY LOCATION. SEDIMENT DEPOSITS SHALL BE REMOVED WITHIN 24 HOURS OF DISCOVERY OR AS SOON AS SOIL CONDITIONS PERMIT ACCESS TO DITCH WITHOUT FURTHER DAMAGE.
5. DAMAGED LINING SHALL BE REPAIRED OR REPLACED WITHIN 48 HOURS OF DISCOVERY.
6. IF HIGH EROSIVE SOILS ARE ENCOUNTERED DURING CONSTRUCTION, THE ENGINEER SHOULD BE CONTACTED FOR FURTHER EVALUATION.

704 Foxcroft Avenue
Martinsburg, West Virginia 25401
Telephone: (304) 263-8951
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E&S DETAILS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

SCALE: N/A

DESIGNED BY: CC/CW

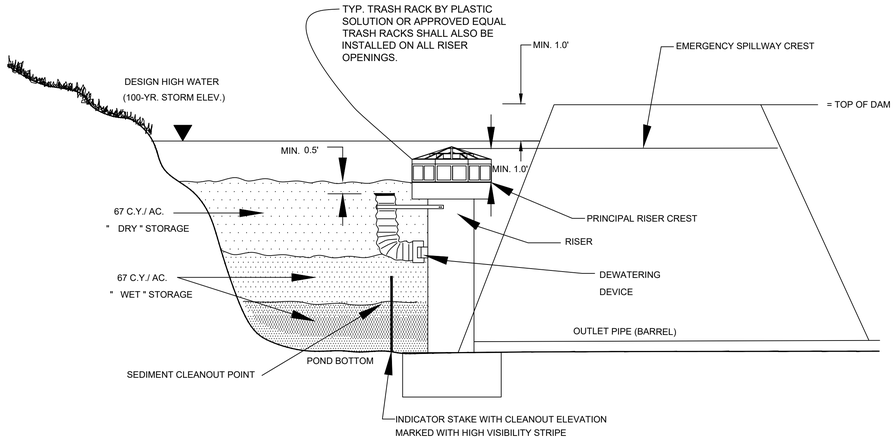
FILE NO. 4542A

SHEET 13 OF 97

SLD2022-06

SEDIMENT BASIN SCHEMATIC

N.T.S.



NOTE: CLEANOUT ELEVATIONS FOR SEDIMENT TRAPS/BASINS SHALL BE VISIBLY MARKED ON THE RISER STRUCTURE. IF NO RISER STRUCTURE IS PRESENT, A STAKE SHALL BE SET AND VISIBLY MARKED ON THE EMBANKMENT INDICATING THE ELEVATION OF THE CLEANOUT IN ITS RESPECTIVE BMP.

SEE TEMPORARY SEDIMENT BASIN DESIGN SPECIFICATIONS WORKSHEET FOR FINAL DESIGN ELEVATIONS

SOURCE: VA. DSWC

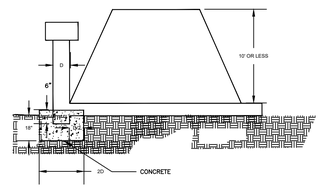
PLATE. 3.14-2

RISER PIPE BASE CONDITIONS

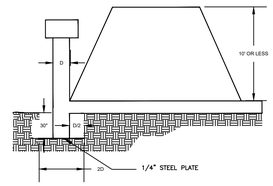
N.T.S.

FOR EMBANKMENTS LESS THAN 10' HIGH

CONCRETE BASE FOR EMBANKMENT 10' OR LESS IN HEIGHT



STEEL BASE FOR EMBANKMENT 10' OR LESS IN HEIGHT

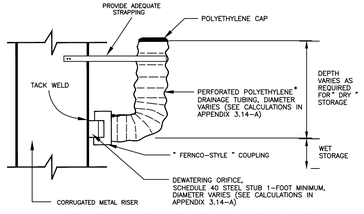


SOURCE: VA. DSWC

PLATE. 3.14-14

DEWATERING SYSTEM FOR SEDIMENT BASINS

N.T.S.



NOTE: WITH CONCRETE RISER, USE PVC SCHEDULE 40 STUB FOR DEWATERING ORIFICE

*DRAINAGE TUBING SHALL COMPLY WITH ASTM F667 AND AASHTO M294

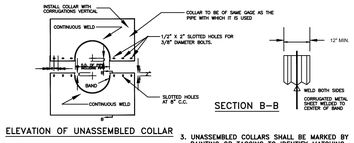
SOURCE: VA. DSWC

PLATE. 3.14-15

SEEP COLLAR

N.T.S.

DETAILS OF CORRUGATED METAL ANTI-SEEP COLLAR



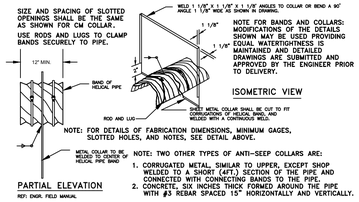
ELEVATION OF UNASSEMBLED COLLAR

SECTION B-B

NOTES FOR COLLARS:

1. ALL MATERIALS TO BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
2. WHEN SPECIFIED ON THE PLANS, COATING OF COLLARS SHALL BE IN ACCORDANCE WITH CONSTRUCTION AND CONSTRUCTION MATERIAL SPECIFICATIONS.
3. UNASSEMBLED COLLARS SHALL BE MARKED BY PAINTING OR TAGGING TO IDENTIFY MATCHING PAIRS.
4. THE LAP BETWEEN THE TWO HALF SECTIONS AND BETWEEN THE PIPE AND CONNECTING BAND SHALL BE CAULKED WITH ASPHALT MASTIC AT TIME OF INSTALLATION.
5. EACH COLLAR SHALL BE FURNISHED WITH TWO 1/2" DIAMETER RODS WITH STANDARD TANK LUGS FOR CONNECTING COLLARS TO PIPE.

DETAIL OF HELICAL PIPE ANTI-SEEP COLLAR



NOTE: FOR BANDS AND COLLARS: MODIFICATIONS OF THE DETAILS SHOWN MAY BE USED PROVIDING EQUAL WATERTIGHTNESS IS MAINTAINED AND DETAILED DRAWINGS ARE SUBMITTED AND APPROVED BY THE ENGINEER PRIOR TO DELIVERY.

ISOMETRIC VIEW

NOTE: FOR DETAILS OF FABRICATION DIMENSIONS, MINIMUM GAGES, SLOTTED HOLES, AND NOTES, SEE DETAIL ABOVE.

PARTIAL ELEVATION

REF: ENGR. FIELD MANUAL

NOTE: TWO OTHER TYPES OF ANTI-SEEP COLLARS ARE:

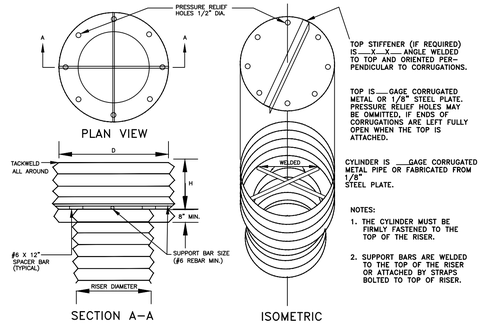
1. CORRUGATED METAL, SIMILAR TO UPPER, EXCEPT SHOP WELDED TO A SHORT (4FT.) SECTION OF THE PIPE AND CONNECTED WITH CONNECTING BANDS TO THE PIPE.
2. CONCRETE, SIX INCHES THICK FORMED AROUND THE PIPE WITH #3 REBAR SPACED 15" HORIZONTALLY AND VERTICALLY.

SOURCE: USDA-SCS

PLATE. 3.14-13

ANTI- VORTEX DEVICE DESIGN

N.T.S.



SOURCE: USDA-SCS

PLATE. 3.14-10

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SEDIMENT BASIN DETAILS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

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SCALE: N/A

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 14 OF 97

SLD2022-06

Temporary Sediment Basin 1 Design Specifications

Project:	4542A
Basin Number:	1
Total Area Draining to Basin:	192.50 AC.

Basin Volume Design

Wet Storage

1. Minimum Required Wet Storage:	12897.5 C.Y.
2. Available Basin Volume at Elevation:	13481.0 C.Y.
	465.6 ft.
3. Required Wet Excavation:	0.0 C.Y.
4. Available Volume Before Cleanout Required:	6352.5 C.Y.
5. Cleanout Elevation:	463.7 ft.
6. Distance from Dewatering Orifice to Cleanout:	1.9 ft.

Dry Storage

7. Minimum Required Dry Storage:	12897.5 C.Y.
8. Total Available Basin Volume at Elevation:	14039.0 C.Y.
	467.7 ft.
9. Diameter of Dewatering Orifice:	10.0 in.
10. Diameter of Flexible Tubing:	12.0 in.

Preliminary Design Elevations

11. Crest of Riser:	471.0 ft.
Top of Dam:	472.0 ft.
Design High Water:	471.5 ft.
Upstream Toe of Dam:	455.9 ft.

Basin Shape

12. Length:Width:	2.0
Baffles Needed?	no

Runoff

13. Q2:	2.90 cfs
14. Q25:	5.67 cfs
Q100:	37.95 cfs

Principal Spillway Design

15. Qp:	2.90 cfs
16. Assumed Available Head (h):	1.0 ft.
17. Riser Diameter/Size:	48x72 in.
Actual Head (h):	0.5 ft.
18. Barrel Length (l):	96.0 ft.
Head on Barrel (H):	16.0 ft.
19. Barrel Diameter:	48 in.
20. Trash Rack/Anti Vortex Diameter/Size:	48x72 in.
Trash Rack/Anti Vortex Height:	24 in.

Emergency Spillway Design

Emergency Spillway Used?	**yes**
21. Qe:	4.9 cfs
22. Bottom Width (b):	20.0 ft.
Slope of Exit Channel (s):	0.010 ft./foot
Minimum Length of Exit Channel (x):	20.0 ft.
Hp	0.50 ft.

Anti-Seep Collar Design

23. Depth of Water at Principle Spillway Crest (Y):	15.5 ft.
Slope of Upstream Face of Embankement (Z):	3.0 ft./foot
Slope of Barrel (Sb):	5.7 %
Length of Barrel in Saturation Zone (Ls):	140.0 ft.
24. Number of Collars Required:	
Size of Collars:	ft.

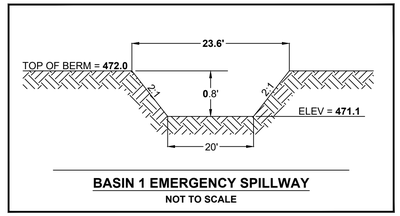
Final Design Elevations

25. Top of Dam:	472.0 ft.
Design High Water:	471.50 ft.
Emergency Spillway Crest:	471.0 ft.
Principle Spillway Crest:	471.0 ft.
Dewatering Orifice Invert:	465.6 ft.
Cleanout Elevation:	463.7 ft.
Upstream Toe of Dam/Bottom of Wet Storage:	455.9 ft.

*Principle Spillway designed to pass 100YR Flow, routed in HydroCAD

SEDIMENT BASIN 1 VOLUMES			
Elevation	C.Y.	C.F.	Acre-Ft
458	98	2,640.6	0.06062
459	315	8,504.8	0.19524
460	714	19,286.9	0.44277
461	1,391	37,559.4	0.86225
462	2,553	68,916.6	1.58211
463	4,397	118,718.2	2.72539
464	6,956	187,813.5	4.31161
465	10,697	288,821.0	6.63042
466	15,561	420,136.3	9.645
467	21,971	593,214.7	13.61833
468	30,182	814,907.6	18.70771
469	40,793	1,101,407.2	25.28483
470	53,725	1,450,562.8	33.30034
471	69,875	1,886,611.1	43.31063
472	89,143	2,406,868.7	55.2541

BASIN 1 ORIFACE SIZING						
Oriface in Inches	10					
	Ao (ft2)	As	h	Cd	T1	T2
Average Oriface Size Between Time Range 10.92	0.545415391	226338	2.1	0.6	48	72
		AT 467.7 ELEV				
	Oriface SQ FT	DIA in Inches				
Size at T1	0.78843	12.02				
Size at T2	0.52562	9.82				
Time of Dewatering (hr)	69.38692					



BASIN 1 EMERGENCY SPILLWAY
NOT TO SCALE

Notes:

- **Area within design high water area to remain at grades shown on E&S Phase I plan until stabilization and transition to E&S Phase II plan
- Contractor to coordinate with Geotechnical Engineer to ensure wet area is stable and can hold water prior to construction

Temporary Sediment Basin 2 Design Specifications

Project:	4542A
Basin Number:	1
Total Area Draining to Basin:	17.27 AC.

Basin Volume Design

Wet Storage

1. Minimum Required Wet Storage:	1157.1 C.Y.
2. Available Basin Volume at Elevation:	1217.0 C.Y.
	464.0 ft.
3. Required Wet Excavation:	0.0 C.Y.
4. Available Volume Before Cleanout Required:	569.9 C.Y.
5. Cleanout Elevation:	462.0 ft.
6. Distance from Dewatering Orifice to Cleanout:	2.0 ft.

Dry Storage

7. Minimum Required Dry Storage:	1157.1 C.Y.
8. Total Available Basin Volume at Elevation:	1340.0 C.Y.
	467.0 ft.
9. Diameter of Dewatering Orifice:	3.0 in.
10. Diameter of Flexible Tubing:	5.0 in.

Preliminary Design Elevations

11. Crest of Riser:	468.5 ft.
Top of Dam:	470.7 ft.
Design High Water:	469.2 ft.
Upstream Toe of Dam:	460.0 ft.

Basin Shape

12. Length:Width:	2.0
Baffles Needed?	no

Runoff

13. Q2:	1.30 cfs
14. Q25:	52.90 cfs
Q100:	52.91 cfs

Principal Spillway Design

15. Qp:	1.30 cfs
16. Assumed Available Head (h):	2.2 ft.
17. Riser Diameter:	120.0 in.
Actual Head (h):	0.7 ft.
18. Barrel Length (l):	80.0 ft.
Head on Barrel (H):	8.5 ft.
19. Barrel Diameter:	36 in.
20. Trash Rack/Anti Vortex Diameter:	120 in.
Trash Rack/Anti Vortex Height:	24 in.

Emergency Spillway Design

Emergency Spillway Used?	**yes**
21. Qe:	25.1 cfs
22. Bottom Width (b):	20.0 ft.
Slope of Exit Channel (s):	0.010 ft./foot
Minimum Length of Exit Channel (x):	40.0 ft.
Hp	0.50 ft.

Anti-Seep Collar Design

23. Depth of Water at Principle Spillway Crest (Y):	8.0 ft.
Slope of Upstream Face of Embankement (Z):	3.0 ft./foot
Slope of Barrel (Sb):	2.5 %
Length of Barrel in Saturation Zone (Ls):	62.2 ft.
24. Number of Collars Required:	
Size of Collars:	ft.

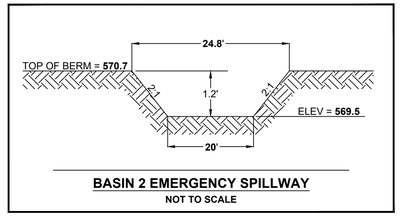
Final Design Elevations

25. Top of Dam:	470.7 ft.
Design High Water:	469.2 ft.
Emergency Spillway Crest:	469.5 ft.
Principle Spillway Crest:	468.5 ft.
Dewatering Orifice Invert:	464.0 ft.
Cleanout Elevation:	462.0 ft.
Upstream Toe of Dam/Bottom of Wet Storage:	460.0 ft.

*Principle Spillway designed to pass 100YR Flow, routed in HydroCAD

SEDIMENT BASIN 2 VOLUMES			
Elevation	C.Y.	C.F.	Acre-Ft
462	510	13,770.9	0.31614
463	846	22,846.2	0.52448
464	1,218	32,878.1	0.75478
465	1,626	43,899.1	1.00778
466	2,072	55,943.2	1.28428
467	2,557	69,045.1	1.58506
468	3,083	83,245.5	1.91105
469	3,651	98,584.8	2.2632
470	4,263	115,093.9	2.64219
470.7	4,718	127,387.6	2.92442

BASIN 2 ORIFACE SIZING						
Oriface in Inches	3					
	Ao (ft2)	As	h	Cd	T1	T2
Average Oriface Size Between Time Range 2.93	0.049087385	13627	3	0.6	48	72
		467				
	Oriface SQ FT	DIA in Inches				
Size at T1	0.05674	3.23				
Size at T2	0.03782	2.63				
Time of Dewatering (hr)	55.47903					



BASIN 2 EMERGENCY SPILLWAY
NOT TO SCALE

Notes:

- **Area within design high water area to remain at grades shown on E&S Phase I plan until stabilization and transition to E&S Phase II plan
- Contractor to coordinate with Geotechnical Engineer to ensure wet area is stable and can hold water prior to construction

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SEDIMENT BASIN DETAILS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

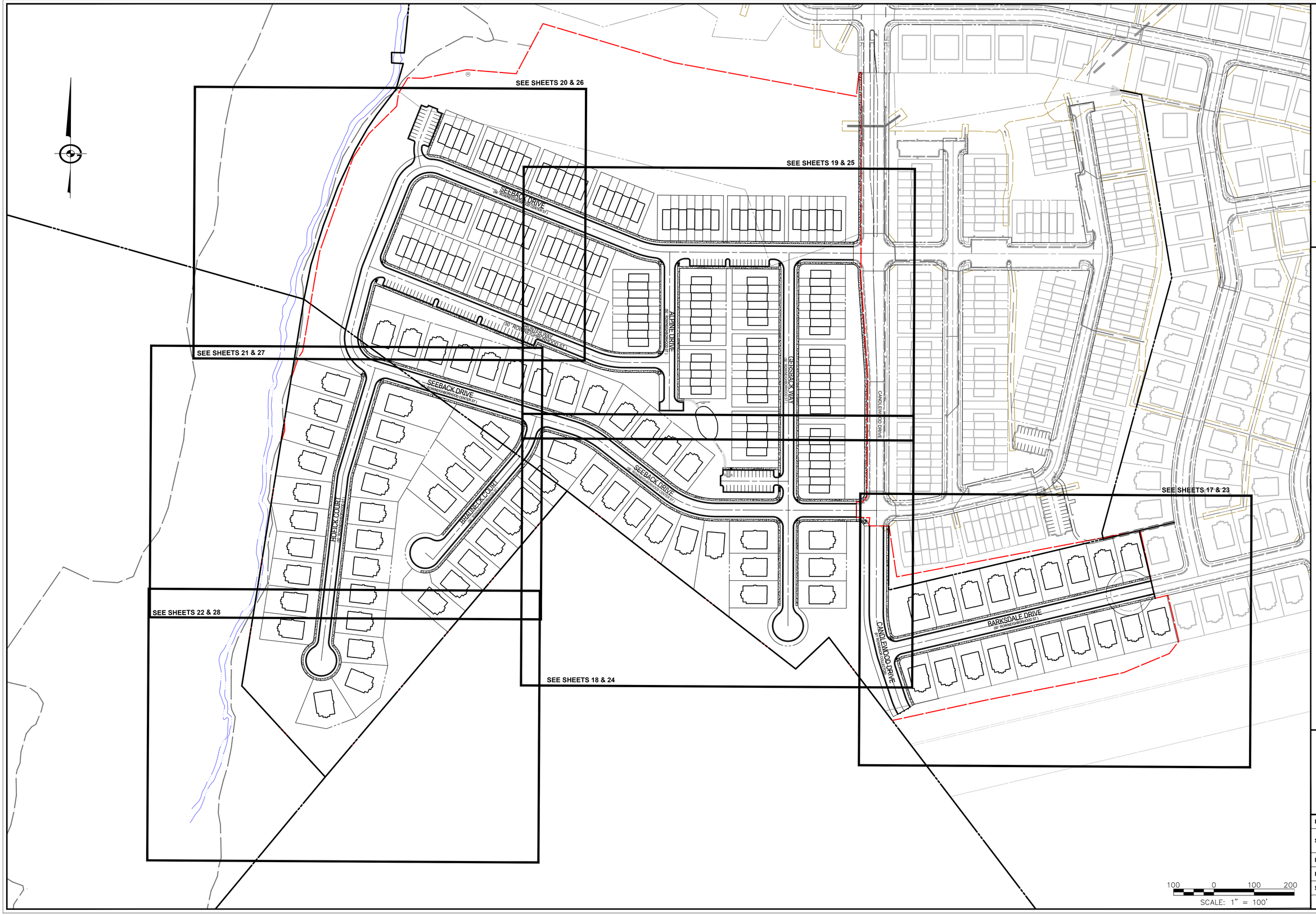
SCALE: N/A

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 15 OF 97

SLD2022-06



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OVERALL PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

DATE: 11/06/2023

SCALE: 1" = 100'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 16 OF 97

SLD2022-06

MATCHLINE SEE SHEET 18

BARKSDALE DRIVE
(56' ROW/NEIGHBORHOOD CENTER ST.)

CANDLEWOOD DRIVE
(67' ROW/MINOR COLLECTOR)

8' TRAIL ESMT.

STREET LIGHT

LOT 58 8,029 SQ.FT
LOT 59 8,057 SQ.FT
LOT 60 8,058 SQ.FT
LOT 61 8,059 SQ.FT
LOT 62 8,062 SQ.FT
LOT 63 8,063 SQ.FT
LOT 64 8,065 SQ.FT
LOT 65 8,066 SQ.FT
LOT 66 8,068 SQ.FT
LOT 67 8,387 SQ.FT
LOT 68 7,857 SQ.FT
LOT 69 7,860 SQ.FT
LOT 70 7,860 SQ.FT
LOT 71 7,858 SQ.FT
LOT 72 7,855 SQ.FT
LOT 73 7,853 SQ.FT
LOT 74 7,851 SQ.FT
LOT 75 7,848 SQ.FT
LOT 76 12,718 SQ.FT

20' BRL
25' BRL
10' BRL
18'

5' SIDEWALK
4" SAN. LAT (TYP.)
8" WATERLINE
8" SAN
15" STM
15' STM ESMT
24" STM
18" STM
12" STM
10" STM
6" STM
STREET LIGHT (TYP.)
STREET SIGN
1-F.H. ASSEMBLY
HC RAMP TYPE II (TYP.)
1-8"x8" TEE
3-8" G.V.
15' SAN. ESMT.
18" SAN. ESMT.
TYPE III TRAFFIC BARRICADE
1-W/L B.O.V.
CG-1
38'
36'
25'
X1
X2
X
Z

TID: 3/MAP: 12/ PCL: 215
ZONED: NR
LANDUSE: RURAL/AGRICULTURAL
ARCADIA LAND INC
108 N. GEORGE STREET - 1ST FLOOR
CHARLESTOWN, WV 25414
106.29 AC

30 15 0 30 60
SCALE: 1" = 30'

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Martinsburg, West Virginia 25401
Telephone: (304) 263-8951
Fax: (540) 722-9528
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LAYOUT & UTILITY PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
1	01/17/2024

DATE: 11/06/2023
SCALE: 1" = 30'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 17 OF 97

SLD2022-06

MATCHLINE
SEE SHEET 19

MATCHLINE
SEE SHEET 21

MATCHLINE
SEE SHEET 17

SEEBACK DRIVE
SIDE-ROW/NEIGHBORHOOD CENTER ST.

CANDLEWOOD DRIVE
(ST ROW/MINOR COLLECTOR)

NOTE: HEAVY TRAFFIC RATED CLEANOUT CAPS TO BE INSTALLED ON ALL SANITARY CLEANOUTS IN DRIVEWAYS

30 15 0 30 60
SCALE: 1" = 30'

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CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
2	02/15/2024

DATE: 11/06/2023

SCALE: 1" = 30'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 18 OF 97

SLD2022-06

NOTE: HEAVY TRAFFIC RATED CLEANOUT CAPS TO BE INSTALLED ON ALL SANITARY CLEANOUTS IN DRIVEWAYS

TD: 3/MAP: 12/PCL:209.1
ZONED: NR
LAND USE: RURAL/AGRICULTURAL
ARCADIA LAND INC.
108 N GEORGE STREET 2ND FLOOR
CHARLES TOWN, WV 25414
12.16 AC

SEEBACK DRIVE
(56' ROW/NEIGHBORHOOD CENTER ST.)

ALPINE DRIVE
(50' ROW/NEIGHBORHOOD ST.)

GRUNTER WAY
(50' ROW/NEIGHBORHOOD ST.)
(N2)

GERSBACK WAY
(50' ROW/NEIGHBORHOOD ST.)

CANDLEWOOD DRIVE

MATCHLINE
SEE SHEET 20

MATCHLINE
SEE SHEET 18

SCALE: 1" = 30'

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SHEET 19 OF 97

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FILE NO. 4542A

SHEET 20 OF 97

SLD2022-06

100 YEAR FEMA FLOODPLAIN ZONE "AE" PER FIRM MAP 54037C0138E

SEEBACK DRIVE
(66' ROW/NEIGHBORHOOD CENTER ST.)

GRUNTER WAY
(50' ROW/NEIGHBORHOOD ST.)

MATCHLINE
SEE SHEET 22

MATCHLINE
SEE SHEET 21

NOTE: HEAVY TRAFFIC RATED CLEANOUT CAPS TO BE INSTALLED ON ALL SANITARY CLEANOUTS IN DRIVEWAYS

SCALE: 1" = 30'

MATCHLINE
SEE SHEET 20

MATCHLINE SEE SHEET 22

MATCHLINE
SEE SHEET 18

100 YEAR FEMA FLOODPLAIN ZONE "AE" PER FIRM MAP 54037C0138E

SEEBACK DRIVE
(56' ROW/NEIGHBORHOOD CENTER ST.)

HOEICK COURT
(50' ROW/NEIGHBORHOOD ST.)

BRAUNECK COURT
(50' ROW/NEIGHBORHOOD ST.)

LOT 123 9,393 SQ.FT
LOT 122 8,262 SQ.FT
LOT 121 8,261 SQ.FT
LOT 120 9,554 SQ.FT
LOT 119 9,696 SQ.FT
LOT 118 9,044 SQ.FT
LOT 117 8,391 SQ.FT
LOT 116 8,589 SQ.FT
LOT 115 8,782 SQ.FT
LOT 124 9,752 SQ.FT
LOT 125 8,126 SQ.FT
LOT 126 8,126 SQ.FT
LOT 127 8,126 SQ.FT
LOT 128 8,126 SQ.FT
LOT 129 8,126 SQ.FT
LOT 100 14,667 SQ.FT
LOT 101 11,146 SQ.FT
LOT 102 10,143 SQ.FT
LOT 103 9,143 SQ.FT
LOT 104 8,121 SQ.FT
LOT 105 8,144 SQ.FT
LOT 106 8,166 SQ.FT
LOT 107 8,167 SQ.FT
LOT 99 12,265 SQ.FT
LOT 98 11,269 SQ.FT
LOT 97 10,687 SQ.FT
LOT 96 10,086 SQ.FT
LOT 95 8,516 SQ.FT
LOT 94 8,126 SQ.FT
LOT 93 8,126 SQ.FT
LOT 92 8,126 SQ.FT
LOT 91 8,126 SQ.FT

22.5° BEND
15" STM ESMT
1-45° BEND
15" STM
1-8"x8" TEE
3-8" G.V.
RC RAMP TYPE II (TYP.)
14'R L=5.44'
25'R
8" WATERLINE
8" SAN
4" SAN LAT (TYP.)
W/M (TYP.)
5' SIDEWALK
15' SAN. ESMT
1-F.H. ASSEMBLY
STREET LIGHT (TYP.)
POND D/W
CG-1
18'
97'R
137'R
16'R

TO BE USED FOR ZONING AND LAND USE APPLICATION ONLY
ARCADIS
GEORGE STREET, SUITE 210
CHARLES TOWN, WV 25414

SCALE: 1" = 30'

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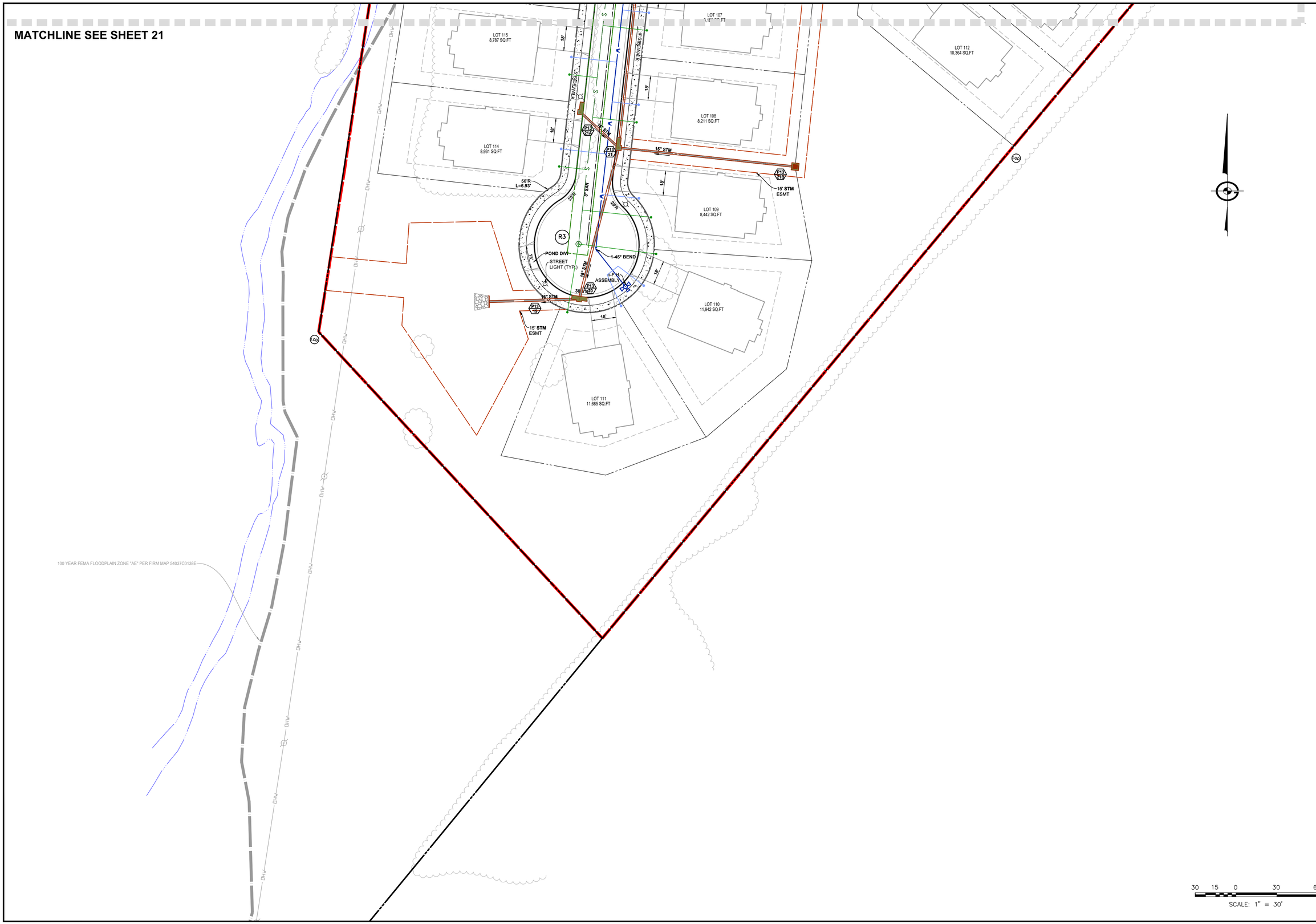
LAYOUT & UTILITY PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: 1" = 30'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 21 OF 97
SLD2022-06



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FILE NO. 4542A

SHEET 22 OF 97

SLD2022-06

MATCHLINE SEE SHEET 24

LOD

CANDLEWOOD DRIVE (67' ROW/MINOR COLLECTOR)

BARKSDALE DRIVE (50' ROW/NEIGHBORHOOD CENTER ST.)

8" WATERLINE

8" SAN

15" STM

24" STM

15' STM ESMT

15' SAN. ESMT

15' SAN ESMT

4" SAN LAT (TYP.)

1-F.H. ASSEMBLY

STREET SIGN

CURB RAMP #2

CURB RAMP #1

HC RAMP TYPE II (TYP.)

"x8" TEE " G.V.

1-W/L B.O.V.

X1 X2 Y Z

LOT 67 8,387 SQ.FT
F.F.= 485.70 G.F.= 483.99 B.F.= 475.69

LOT 66 8,068 SQ.FT
F.F.= 489.50 G.F.= 487.69 B.F.= 479.48

LOT 65 8,066 SQ.FT
F.F.= 493.30 G.F.= 491.49 B.F.= 483.28

LOT 64 8,065 SQ.FT
F.F.= 497.30 G.F.= 495.49 B.F.= 487.28

LOT 63 8,063 SQ.FT
F.F.= 500.30 G.F.= 498.49 B.F.= 490.28

LOT 62 8,062 SQ.FT
F.F.= 503.00 G.F.= 504.19 B.F.= 492.98

LOT 61 8,059 SQ.FT
F.F.= 505.50 G.F.= 503.79 B.F.= 495.58

LOT 60 8,058 SQ.FT
F.F.= 506.90 G.F.= 505.09 B.F.= 496.88

LOT 59 8,057 SQ.FT
F.F.= 507.85 G.F.= 506.04 B.F.= 479.83

LOT 58 8,029 SQ.FT
F.F.= 508.70 G.F.= 506.89 B.F.= 498.68

LOT 68 7,857 SQ.FT
F.F.= 508.30 G.F.= 506.49 B.F.= 498.28

LOT 69 7,860 SQ.FT
F.F.= 507.40 G.F.= 505.59 B.F.= 497.38

LOT 70 7,860 SQ.FT
F.F.= 506.50 G.F.= 504.69 B.F.= 496.48

LOT 71 7,858 SQ.FT
F.F.= 504.40 G.F.= 502.59 B.F.= 494.38

LOT 72 7,855 SQ.FT
F.F.= 501.70 G.F.= 499.89 B.F.= 491.68

LOT 73 7,853 SQ.FT
F.F.= 498.90 G.F.= 497.09 B.F.= 488.88

LOT 74 7,851 SQ.FT
F.F.= 495.45 G.F.= 493.64 B.F.= 485.43

LOT 75 7,848 SQ.FT
F.F.= 491.60 G.F.= 489.79 B.F.= 481.58

LOT 76 12,718 SQ.FT
F.F.= 487.75 G.F.= 485.94 B.F.= 477.73

100' ELECTRIC EASEMENT

150' ELECTRIC EASEMENT

TO: 3/MAP: 12/ PCL: 215
ZONED: NR
LANDUSE: RURAL/AGRICULTURAL
ARCADIA LAND INC.
108 N. GEORGE STREET-2ND FLOOR
CHARLES TOWN, WV 25414
106.29 AC

30 15 0 30 60
SCALE: 1" = 30'

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NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

GRADING PLAN

Rev. No.	Date

DATE: 11/06/2023

SCALE: 1" = 30'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 23 OF 97

SLD2022-06

MATCHLINE
SEE SHEET 25

MATCHLINE
SEE SHEET 27

MATCHLINE
SEE SHEET 23

SEEBACK DRIVE
(55' ROW/NEIGHBORHOOD CENTER ST.)

CANDLEWOOD DRIVE
(67' ROW/MINOR COLLECTOR)

30 15 0 30 60
SCALE: 1" = 30'

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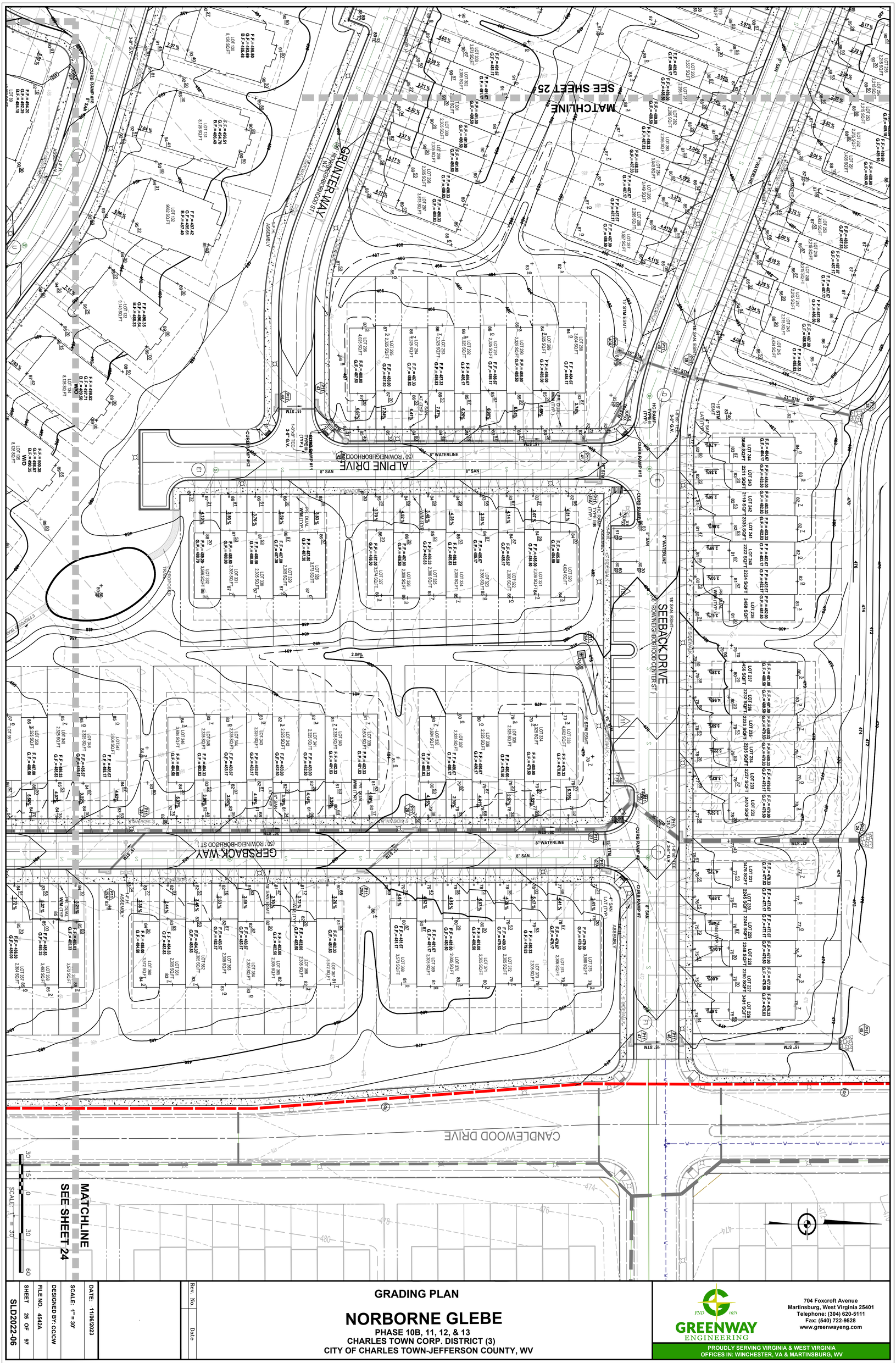
DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 24 OF 97

SLD2022-06



GRADING PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

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FILE NO. 4542A
SHEET 25 OF 97
SLD2022-06

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GRADING PLAN

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PHASE 10B, 11, 12, & 13
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CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

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FILE NO. 4542A
SHEET 26 OF 97
SLD2022-06

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MATCHLINE
SEE SHEET 26

MATCHLINE
SEE SHEET 28

MATCHLINE
SEE SHEET 24

SEEBACK DRIVE
(56' ROW/NEIGHBORHOOD CENTER ST.)

HOEICK COURT
(50' ROW/NEIGHBORHOOD ST.)

BRAUNECK COURT
(50' ROW/NEIGHBORHOOD ST.)

100 YEAR FEMA FLOODPLAIN ZONE "AE" PER FIRM MAP 54037C0136E

SCALE: 1" = 30'

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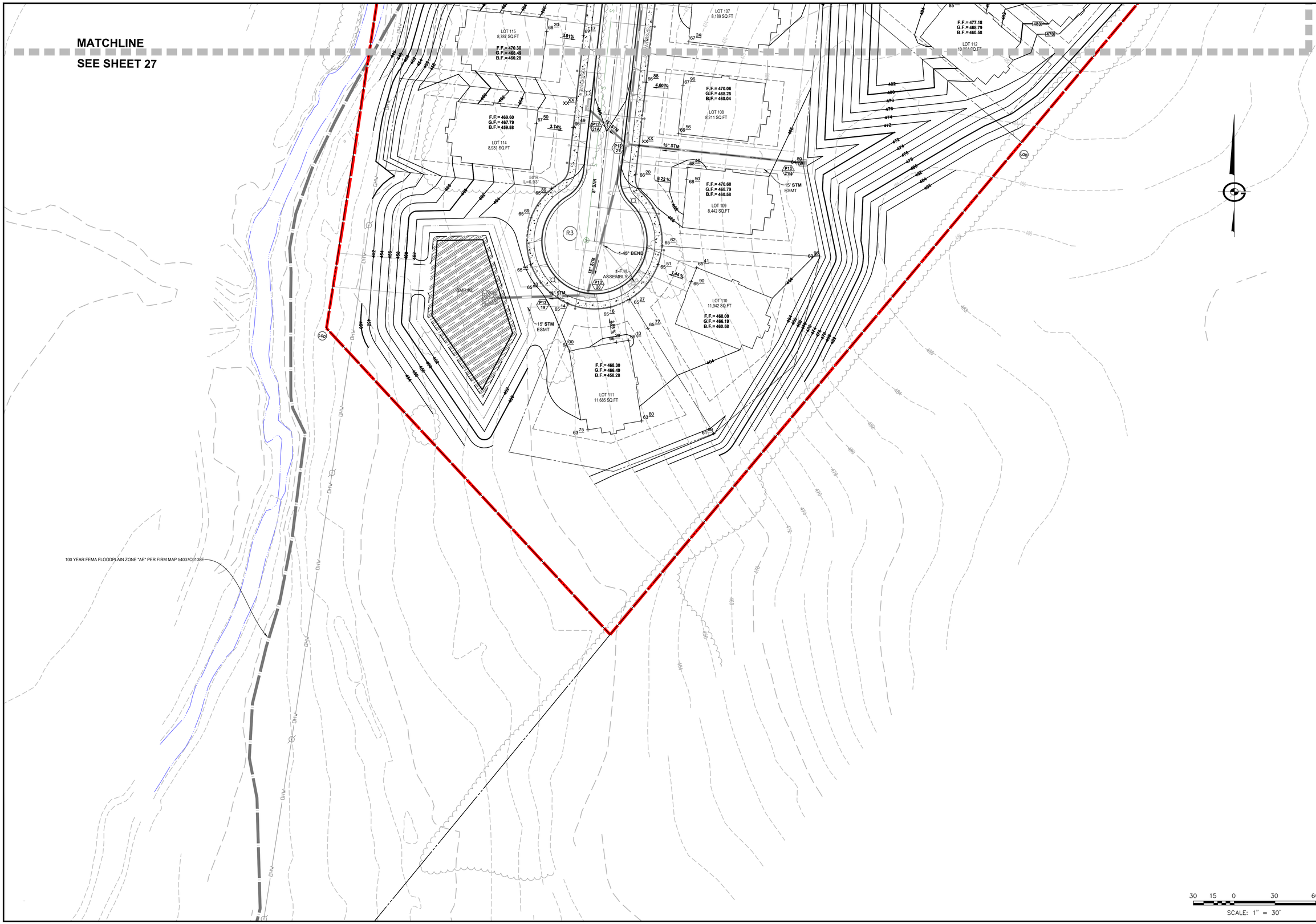
FILE NO. 4542A

SHEET 27 OF 97

SLD2022-06



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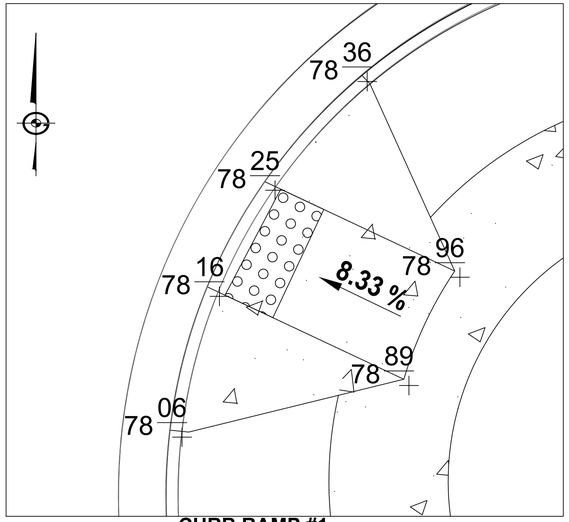
DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 28 OF 97

SLD2022-06



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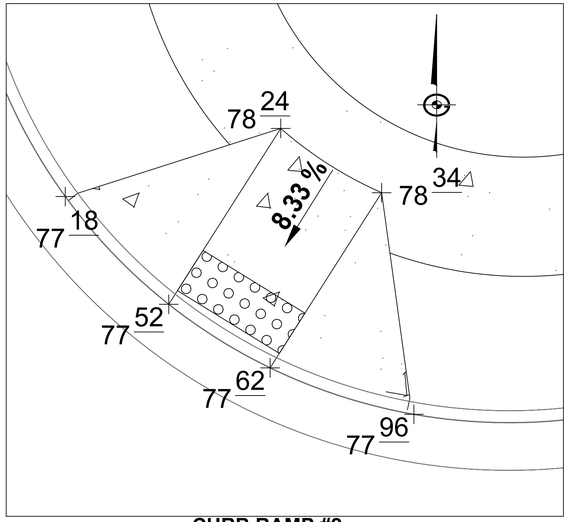

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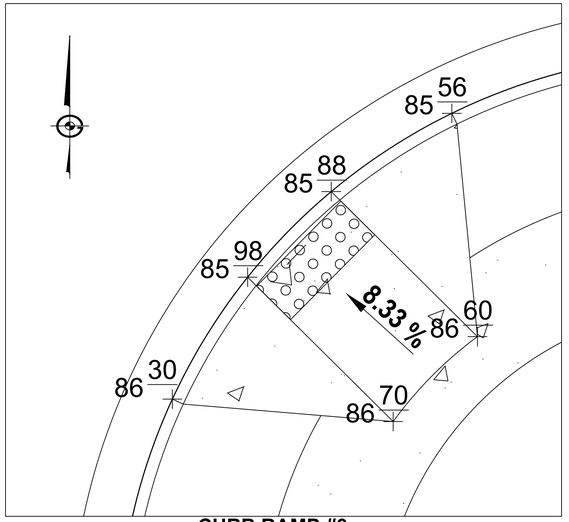

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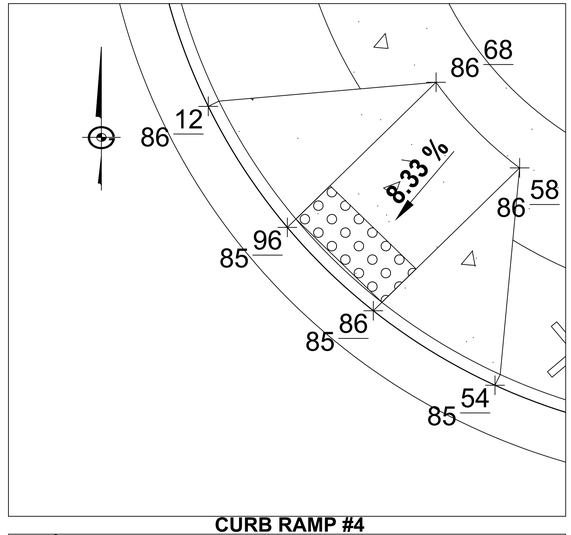

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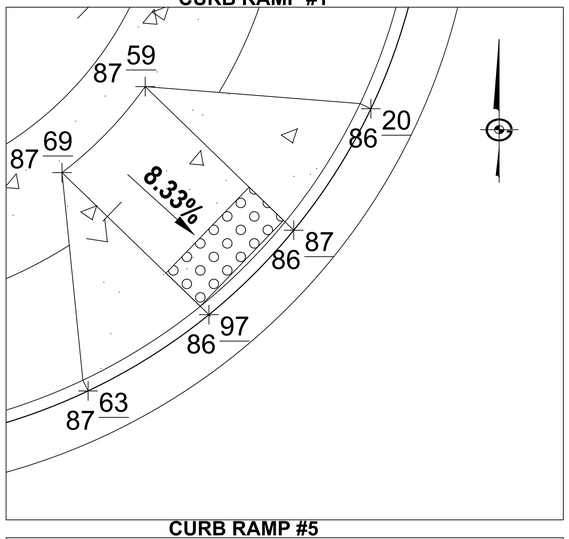

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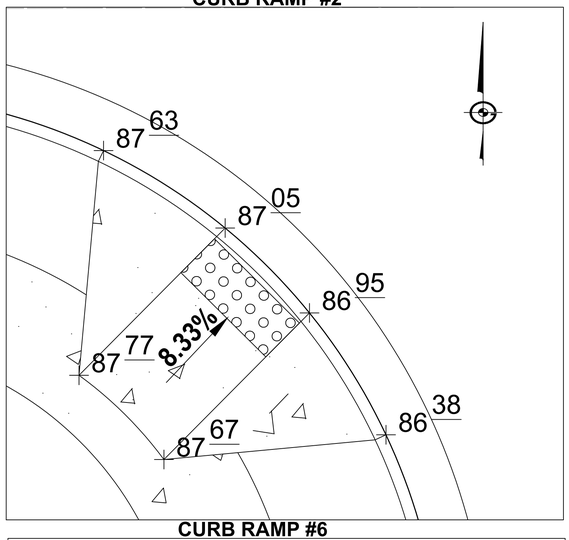

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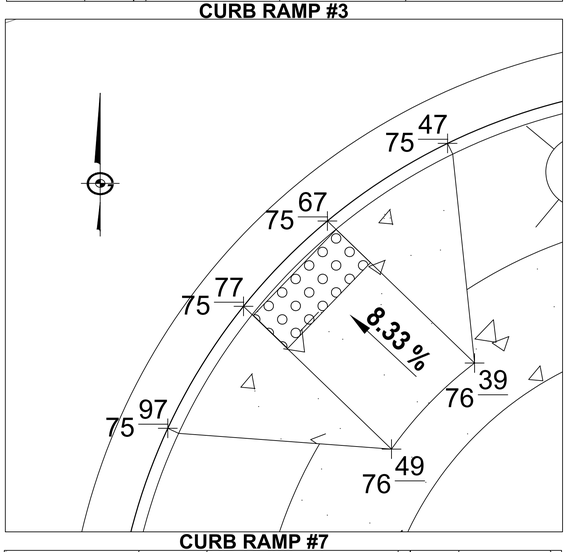

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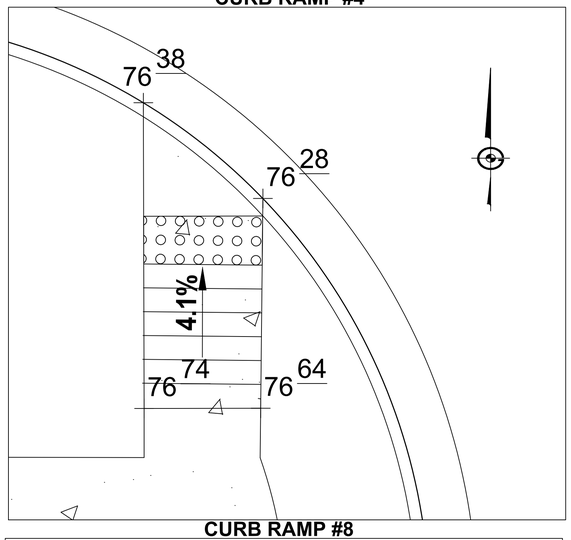

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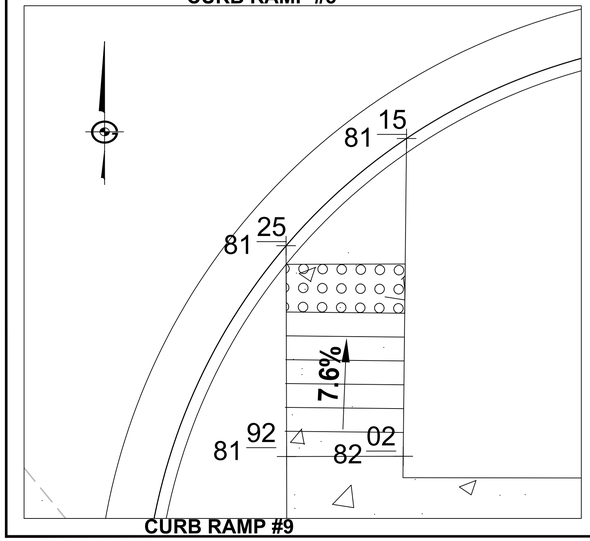

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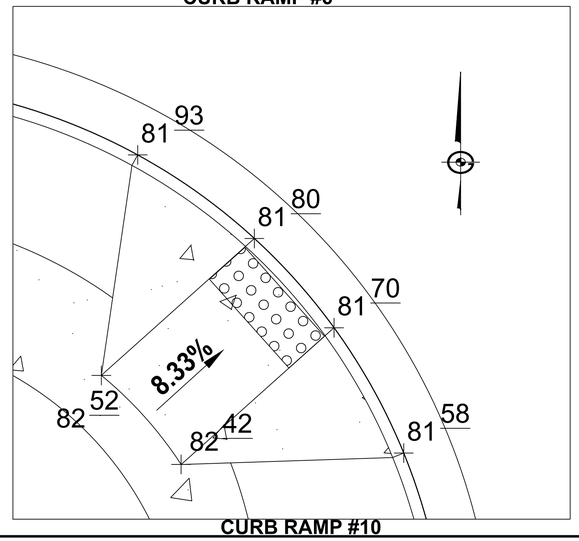

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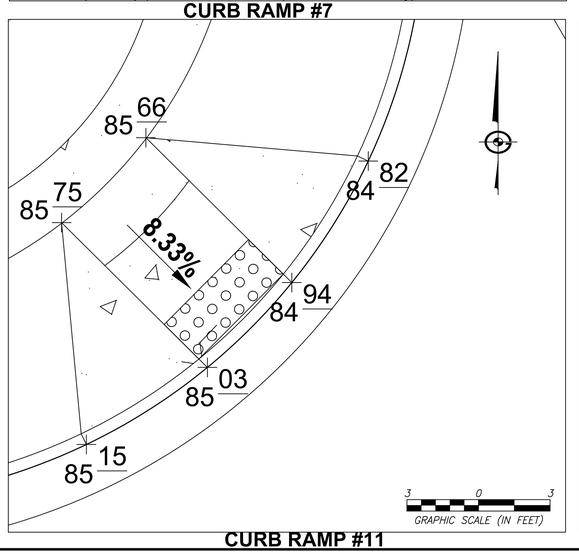

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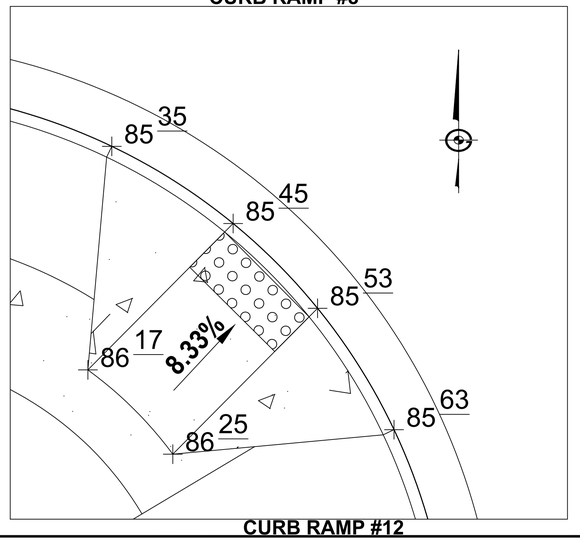

CURB RAMP #12

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CURB RAMP DETAIL PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
2	02/15/2024

DATE: 11/06/2023

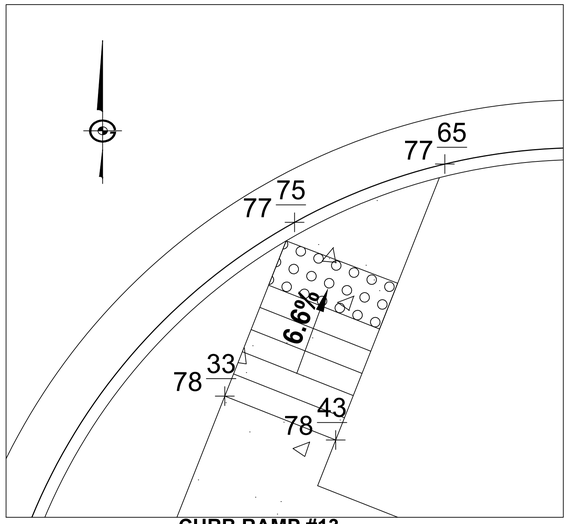
SCALE: 1" = 3'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 29 OF 97

SLD2022-06



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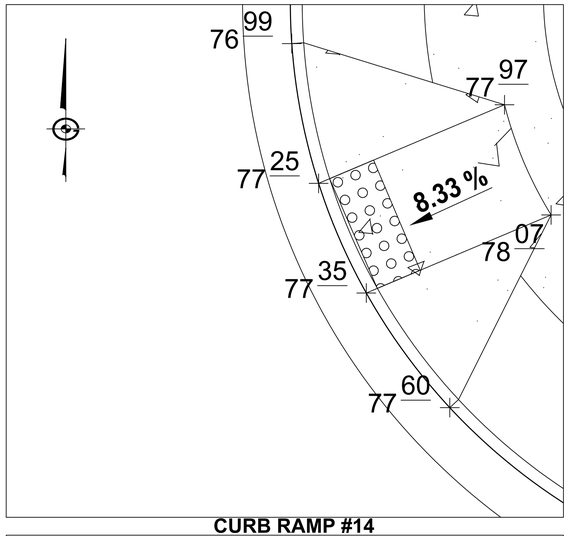

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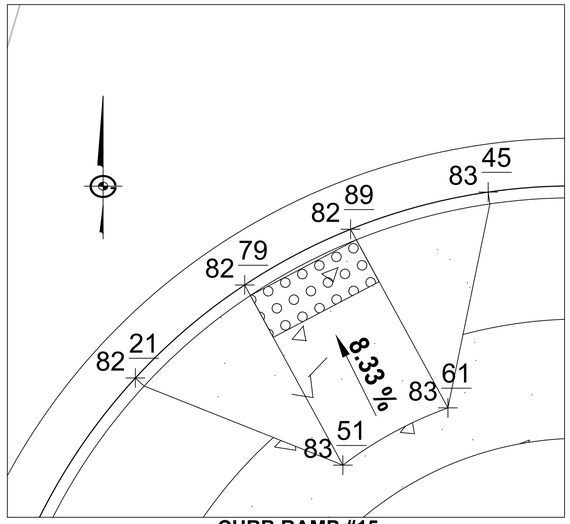

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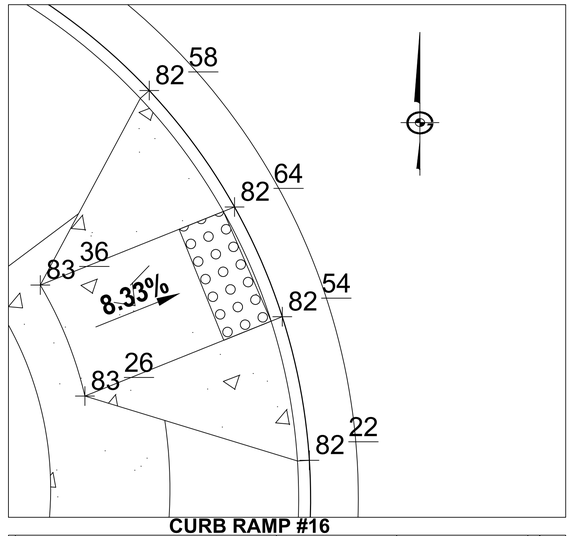

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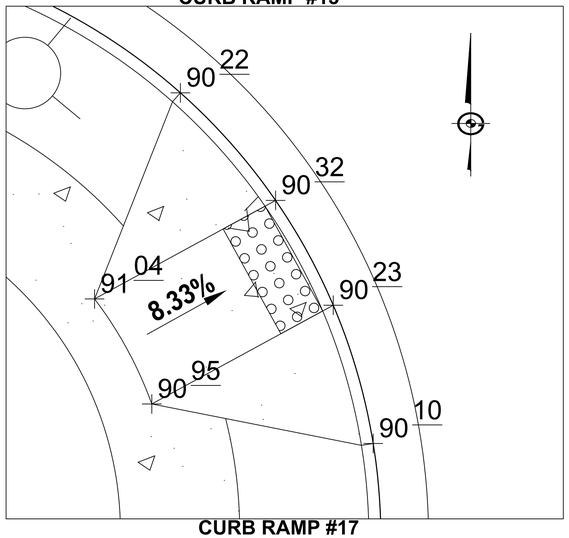

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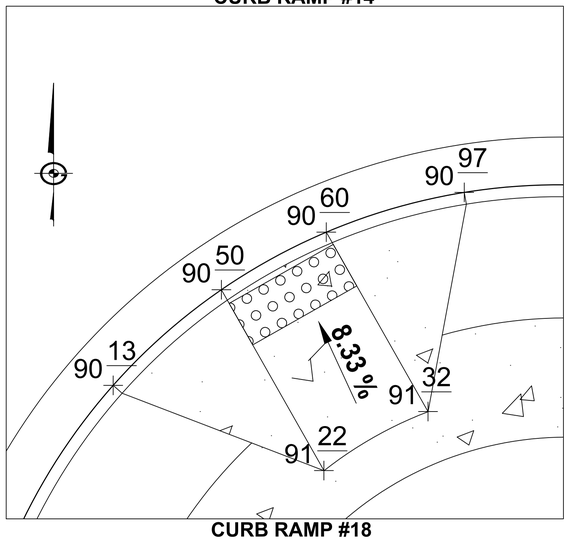

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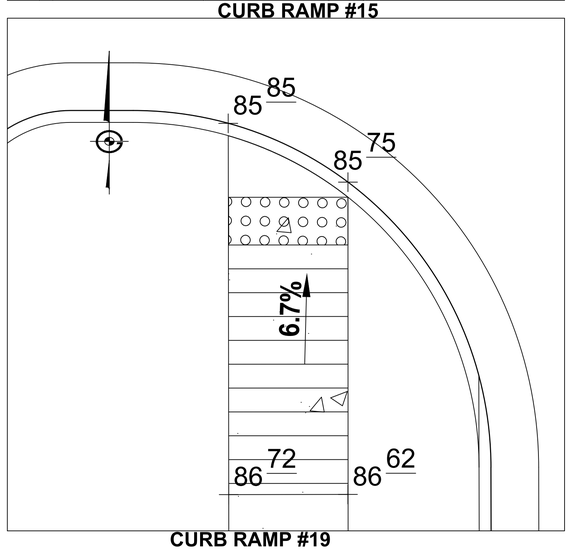

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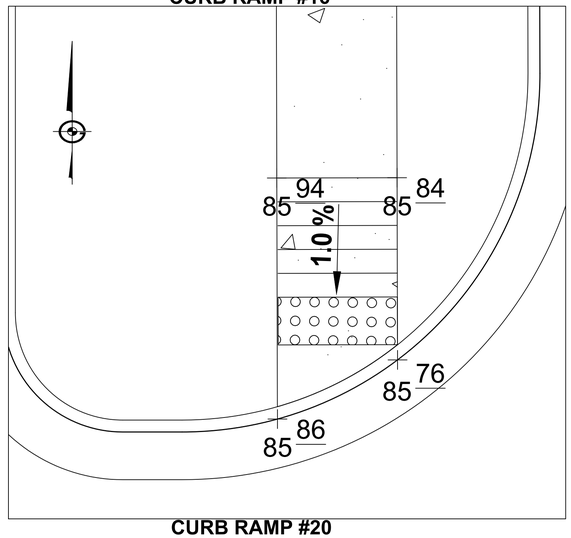

CURB RAMP #20

3 0 3
GRAPHIC SCALE (IN FEET)

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CURB RAMP DETAIL PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
2	02/15/2024

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SCALE: 1" = 3'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 30 OF 97

SLD2022-06

CURVE	RADIUS	ARC LENGTH	CHORD LENGTH	CHORD BEARING	DELTA ANGLE
C1	14.00'	22.05'	19.84'	N 44°58'39" E	90°14'44"
C2	170.00'	64.29'	63.91'	S 79°18'40" E	21°40'07"
C3	103.00'	161.79'	145.66'	N 66°31'24" E	90°00'00"
C4	128.00'	16.06'	16.05'	S 17°55'45" W	7°11'18"
C5	103.00'	129.40'	121.06'	S 21°39'24" E	71°59'00"
C6	13.75'	17.78'	16.57'	N 20°36'08" W	74°05'32"
C7	145.00'	25.51'	25.48'	S 11°24'12" W	10°04'54"
C8	50.00'	249.02'	60.63'	N 83°38'15" W	285°21'19"
C9	13.50'	12.41'	11.98'	S 19°58'35" E	52°40'39"
C10	95.00'	16.72'	16.69'	S 11°24'12" W	10°04'54"
C11	13.75'	21.62'	19.46'	N 61°28'46" E	90°04'15"
C12	13.75'	21.60'	19.45'	N 28°29'07" W	90°00'00"
C13	13.50'	18.31'	16.94'	S 78°45'30" W	77°43'31"
C14	50.00'	224.91'	77.87'	S 11°14'30" E	257°43'31"
C15	175.50'	71.62'	71.12'	S 28°12'19" W	23°22'52"
C16	13.75'	21.60'	19.45'	S 61°30'53" W	90°00'00"
C17	230.00'	151.44'	148.72'	N 71°16'57" W	37°43'32"
C18	13.75'	21.60'	19.45'	N 45°08'43" W	90°00'00"
C19	50.01'	249.07'	60.63'	S 89°51'17" W	285°22'00"
C20	13.50'	12.41'	11.98'	N 26°29'13" W	52°41'00"
C21	13.75'	21.60'	19.45'	N 44°51'17" E	90°00'00"
C22	14.00'	21.99'	19.80'	S 45°08'43" E	90°00'00"
C23	14.00'	21.96'	19.77'	S 44°55'38" W	89°51'17"
C24	174.00'	114.57'	112.51'	N 71°16'57" W	37°43'32"
C25	276.00'	101.48'	100.90'	S 62°57'09" E	21°03'56"
C26	47.00'	72.04'	65.19'	S 29°34'30" E	87°49'13"
C27	224.50'	84.90'	84.40'	S 79°18'40" E	21°40'07"
C28	13.50'	21.21'	19.09'	N 45°08'43" W	90°00'00"
C29	13.50'	21.21'	19.09'	N 44°51'17" E	90°00'00"
C30	174.50'	65.99'	65.60'	N 79°18'40" W	21°40'07"
C31	14.00'	21.99'	19.80'	S 23°28'36" E	90°00'00"
C32	47.00'	73.83'	66.47'	N 66°31'24" E	90°00'00"
C33	224.98'	58.41'	58.25'	S 75°52'50" E	14°52'30"
C34	13.75'	19.95'	18.25'	N 41°42'54" W	83°08'21"
C35	230.50'	54.27'	54.14'	S 06°53'24" E	13°29'21"
C36	12.50'	19.63'	17.68'	S 58°38'04" E	90°00'00"
C37	12.50'	20.72'	18.43'	S 28°53'10" W	94°57'31"

MATCHLINE
SEE SHEET 32

CANDLEWOOD DRIVE
(61' ROW/MINOR COLLECTOR)

BARKSDALE DRIVE
(56 ' ROW/NEIGHBORHOOD CENTER ST)

N 76°20'30" E
68.00'

S 76°20'30" W
68.00'

LOT 76
12,718 SQ.FT

LOT 75
7,848 SQ.FT

LOT 74
7,851 SQ.FT

LOT 73
7,853 SQ.FT

LOT 72
7,855 SQ.FT

LOT 71
7,858 SQ.FT

LOT 70
7,860 SQ.FT

LOT 69
7,860 SQ.FT

LOT 68
7,857 SQ.FT

LOT 67
8,387 SQ.FT

LOT 66
8,068 SQ.FT

LOT 65
8,066 SQ.FT

LOT 64
8,065 SQ.FT

LOT 63
8,063 SQ.FT

LOT 62
8,062 SQ.FT

LOT 61
8,059 SQ.FT

LOT 60
8,058 SQ.FT

LOT 59
8,057 SQ.FT

LOT 58
8,029 SQ.FT

S 15°25'25" E
81.02'06"

S 13°39'30" E
117.50'00"

N 13°39'30" W
117.50'00"

N 13°40'20" W
117.60'00"

TD: 3/MAP: 12/ PCL: 215
ZONED: NR
LANDUSE: RURAL/AGRICULTURAL
ARCADIA LAND INC.
108 N. GEORGE STREET 2ND FLOOR
CHARLES TOWN, WV 25414
106.29 AC

NOTES:

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CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

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DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 31 OF 97

SLD2022-06

MATCHLINE SEE SHEET 33

MATCHLINE SEE SHEET 35

MATCHLINE SEE SHEET 31

CANDLEWOOD DRIVE

LOT 133 9,149 SQ.FT
LOT 134 8,126 SQ.FT
LOT 135 8,126 SQ.FT
LOT 136 8,077 SQ.FT
LOT 89 10,062 SQ.FT
LOT 90 9,590 SQ.FT
LOT 88 8,133 SQ.FT
LOT 87 8,194 SQ.FT
LOT 91 8,126 SQ.F
LOT 86 8,194 SQ.FT
LOT 85 9,204 SQ.FT
LOT 84 11,679 SQ.FT
LOT 83 15,898 SQ.FT
LOT 82 9,559 SQ.FT
LOT 81 8,228 SQ.FT
LOT 80 8,225 SQ.FT
LOT 77 9,474 SQ.FT
LOT 78 8,166 SQ.FT
LOT 79 9,157SQ.FT
LOT347 3,604 SQ.FT
LOT 348 2,325 SQ.FT
LOT 349 2,325 SQ.FT
LOT 350 2,325 SQ.FT
LOT 351 3,604 SQ.FT
LOT 359 3,572 SQ.FT
LOT 358 3,493 SQ.FT
LOT 357 2,304 SQ.FT
LOT 356 2,304 SQ.FT
LOT 355 2,304 SQ.FT
LOT 354 2,304 SQ.FT
LOT 353 2,304 SQ.FT
LOT 352 3,989 SQ.FT

LOT LINE & CURVE TABLE

CURVE	RADIUS	ARC LENGTH	CHORD LENGTH	CHORD BEARING	DELTA ANGLE
C1	14.00'	22.05'	19.84'	N 44°58'39" E	90°14'44"
C2	170.00'	64.29'	63.91'	S 79°18'40" E	21°40'07"
C3	103.00'	161.79'	145.66'	N 66°31'24" E	90°00'00"
C4	128.00'	16.06'	16.05'	S 17°55'45" W	7°11'18"
C5	103.00'	129.40'	121.06'	S 21°39'24" E	71°59'00"
C6	13.75'	17.78'	16.57'	N 20°36'08" W	74°05'32"
C7	145.00'	25.51'	25.48'	S 11°24'12" W	10°04'54"
C8	50.00'	249.02'	60.63'	N 83°38'15" W	285°21'19"
C9	13.50'	12.41'	11.98'	S 19°58'35" E	52°40'39"
C10	95.00'	16.72'	16.69'	S 11°24'12" W	10°04'54"
C11	13.75'	21.62'	19.46'	N 61°28'46" E	90°04'15"
C12	13.75'	21.60'	19.45'	N 28°29'07" W	90°00'00"
C13	13.50'	18.31'	16.94'	S 78°45'30" W	77°43'31"
C14	50.00'	224.91'	77.87'	S 11°14'30" E	257°43'31"
C15	175.50'	71.62'	71.12'	S 28°12'19" W	23°22'52"
C16	13.75'	21.60'	19.45'	S 61°30'53" W	90°00'00"
C17	230.00'	151.44'	148.72'	N 71°16'57" W	37°43'32"
C18	13.75'	21.60'	19.45'	N 45°08'43" W	90°00'00"
C19	50.01'	249.07'	60.63'	S 89°51'17" W	285°22'00"
C20	13.50'	12.41'	11.98'	N 26°29'13" W	52°41'00"
C21	13.75'	21.60'	19.45'	N 44°51'17" E	90°00'00"
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C33	224.98'	58.41'	58.25'	S 75°52'50" E	14°52'30"
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C35	230.50'	54.27'	54.14'	S 06°53'24" E	13°29'21"
C36	12.50'	19.63'	17.68'	S 58°38'04" E	90°00'00"
C37	12.50'	20.72'	18.43'	S 28°53'10" W	94°57'31"

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FND 1971
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PRELIMINARY PLAN

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Rev. No.	Date

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SCALE: 1" = 30'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 32 OF 97
SLD2022-06

LOT LINE & CURVE TABLE

CURVE	RADIUS	ARC LENGTH	CHORD LENGTH	CHORD BEARING	DELTA ANGLE
C1	14.00'	22.05'	19.84'	N 44°58'39" E	90°14'44"
C2	170.00'	64.29'	63.91'	S 79°18'40" E	21°40'07"
C3	103.00'	161.79'	145.66'	N 66°31'24" E	90°00'00"
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C8	50.00'	249.02'	60.63'	N 83°38'15" W	285°21'19"
C9	13.50'	12.41'	11.98'	S 19°58'35" E	52°40'39"
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C11	13.75'	21.62'	19.46'	N 61°28'46" E	90°04'15"
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C31	14.00'	21.99'	19.80'	S 23°28'36" E	90°00'00"
C32	47.00'	73.83'	66.47'	N 66°31'24" E	90°00'00"
C33	224.98'	58.41'	58.25'	S 75°52'50" E	14°52'30"
C34	13.75'	19.95'	18.25'	N 41°42'54" W	83°08'21"
C35	230.50'	54.27'	54.14'	S 06°53'24" E	13°29'21"
C36	12.50'	19.63'	17.68'	S 58°38'04" E	90°00'00"
C37	12.50'	20.72'	18.43'	S 28°53'10" W	94°57'31"

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NORBORNE GLEBE

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CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

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DESIGNED BY:	CC/CW
FILE NO.	4542A
SHEET	33 OF 97
	SLD2022-06

LOT LINE & CURVE TABLE

CURVE	RADIUS	ARC LENGTH	CHORD LENGTH	CHORD BEARING	DELTA ANGLE
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C3	103.00'	161.79'	145.66'	N 66°31'24" E	90°00'00"
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C5	103.00'	129.40'	121.06'	S 21°39'24" E	71°59'00"
C6	13.75'	17.78'	16.57'	N 26°38'08" W	74°05'32"
C7	145.00'	25.51'	25.48'	S 11°24'12" W	10°04'54"
C8	50.00'	249.02'	60.63'	N 83°38'15" W	285°21'19"
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MATCHLINE
SEE SHEET 35

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FILE NO. 4542A
SHEET 34 OF 97
SLD2022-06

MATCHLINE

SEE SHEET 34

SEEBACK DRIVE
(56' ROW/NEIGHBORHOOD CENTER ST)

HOFICK COURT
(50' ROW/NEIGHBORHOOD ST)

BRAUNECK COURT
(50' ROW/NEIGHBORHOOD ST)

100 YEAR FEMA FLOODPLAIN ZONE "AE" PER FIRM MAP 54037C0138E

LOT 123 9,393 SQ.FT
LOT 122 8,262 SQ.FT
LOT 121 8,261 SQ.FT
LOT 120 9,554 SQ.FT
LOT 119 9,696 SQ.FT
LOT 118 9,044 SQ.FT
LOT 117 8,391 SQ.FT
LOT 116 8,589 SQ.FT
LOT 115 8,787 SQ.FT
LOT 100 14,667 SQ.FT
LOT 101 11,146 SQ.FT
LOT 102 10,143 SQ.FT
LOT 103 9,148 SQ.FT
LOT 104 8,121 SQ.FT
LOT 105 8,144 SQ.FT
LOT 106 8,166 SQ.FT
LOT 107 8,189 SQ.FT
LOT 127 8,126 SQ.FT
LOT 128 8,126 SQ.FT
LOT 129 8,126 SQ.FT
LOT 98 11,269 SQ.FT
LOT 97 10,687 SQ.FT
LOT 96 10,086 SQ.FT
LOT 95 8,516 SQ.FT
LOT 94 8,126 SQ.FT
LOT 93 8,126 SQ.FT
LOT 92 8,126 SQ.FT
LOT 91 8,126 SQ.FT

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C26	47.00'	72.04'	65.19'	S 29°34'30" E	87°49'13"
C27	224.50'	84.90'	84.40'	S 79°18'40" E	21°40'07"
C28	13.50'	21.21'	19.09'	N 45°08'43" W	90°00'00"
C29	13.50'	21.21'	19.09'	S 44°51'17" W	90°00'00"
C30	174.50'	65.99'	65.60'	N 79°18'40" W	21°40'07"
C31	14.00'	21.99'	19.80'	S 23°28'36" E	90°00'00"
C32	47.00'	73.83'	66.47'	N 66°31'24" E	90°00'00"
C33	224.98'	58.41'	58.25'	S 75°52'50" E	14°52'30"
C34	13.75'	19.95'	18.23'	N 41°42'54" W	83°08'21"
C35	230.50'	54.27'	54.14'	S 06°53'24" E	13°29'21"
C36	12.50'	19.63'	17.68'	S 58°38'04" E	90°00'00"
C37	12.50'	20.72'	18.43'	S 28°53'10" W	94°57'31"

MATCHLINE

SEE SHEET 36

MATCHLINE

SEE SHEET 31

NOTES:

1. ALL OPEN SPACE THAT IS NOT PART OF A LOT IS PUBLIC USE.
2. ALL CORNERS FOR THIS SUBDIVISION ARE "TO BE SET". THE APPROPRIATE CORNER NOTES WILL BE ADDED TO THE FINAL PLAT FOR RECORDATION AND WILL BE SET PER WV CODE AT TIME OF RECORDATION.

30 15 0 30 60
SCALE: 1" = 30'

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OFFICES IN: WINCHESTER, VA & MARTINSBURG, WV

PRELIMINARY PLAN

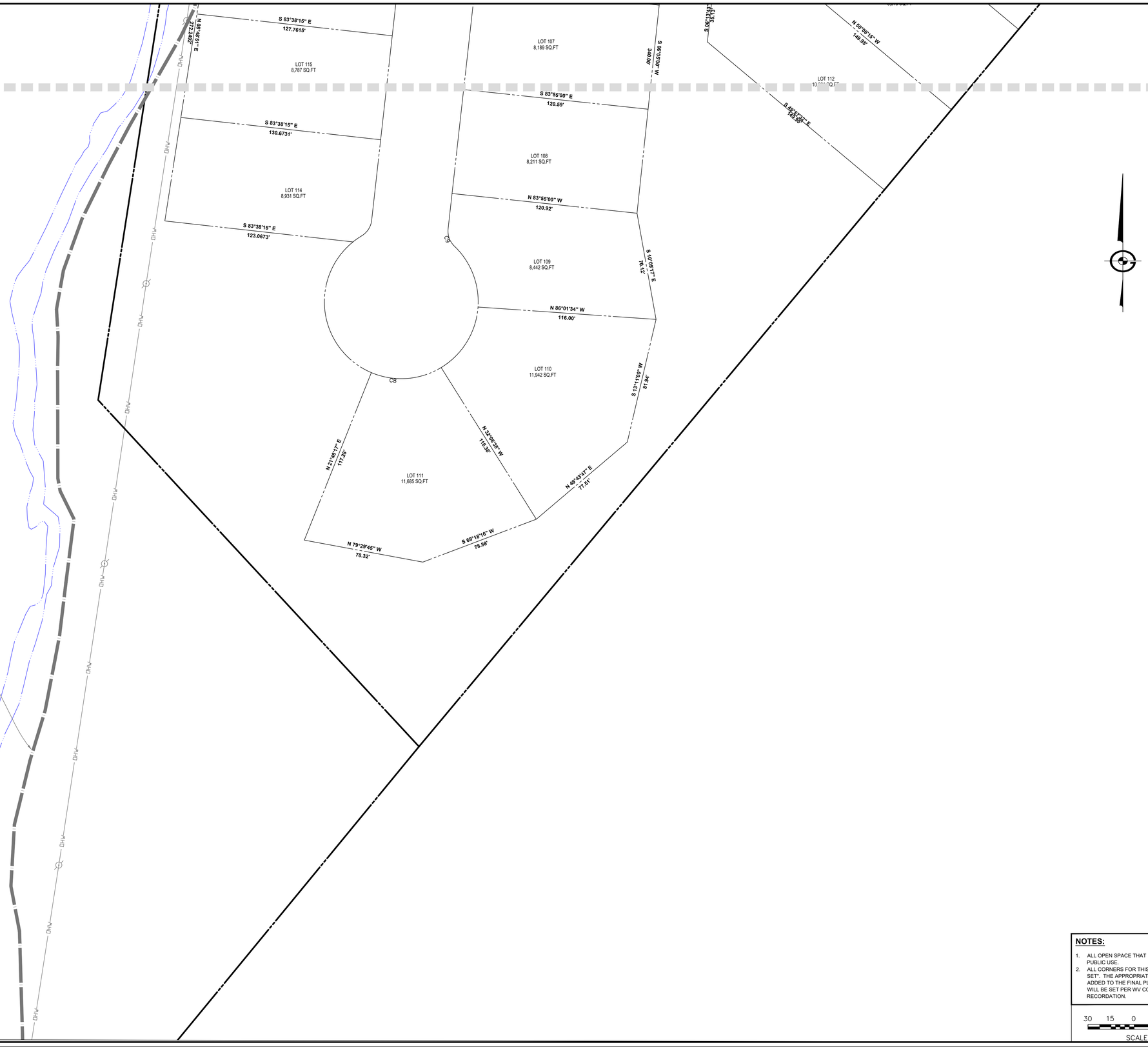
NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: 1" = 30'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 35 OF 97
SLD2022-06

MATCHLINE
SEE SHEET 35



LOT LINE & CURVE TABLE

CURVE	RADIUS	ARC LENGTH	CHORD LENGTH	CHORD BEARING	DELTA ANGLE
C1	14.00'	22.05'	19.84'	N 44°58'39" E	90°14'44"
C2	170.00'	64.29'	63.91'	S 79°18'40" E	21°40'07"
C3	103.00'	161.79'	145.66'	N 66°31'24" E	90°00'00"
C4	128.00'	16.06'	16.05'	S 17°56'45" W	7°11'18"
C5	103.00'	129.40'	121.06'	S 21°39'24" E	71°59'00"
C6	13.75'	17.78'	16.57'	N 20°36'08" W	74°05'32"
C7	145.00'	25.51'	25.48'	S 11°24'12" W	10°04'54"
C8	50.00'	249.02'	60.63'	N 83°38'15" W	285°21'19"
C9	13.50'	12.41'	11.98'	S 19°58'35" E	52°40'39"
C10	95.00'	16.72'	16.69'	S 11°24'12" W	10°04'54"
C11	13.75'	21.62'	19.46'	N 61°28'46" E	90°04'15"
C12	13.75'	21.60'	19.45'	N 28°29'07" W	90°00'00"
C13	13.50'	18.31'	16.94'	S 78°45'30" W	77°43'31"
C14	50.00'	224.91'	77.87'	S 11°14'30" E	257°43'31"
C15	175.50'	71.62'	71.12'	S 28°12'19" W	23°22'52"
C16	13.75'	21.60'	19.45'	S 61°30'53" W	90°00'00"
C17	230.00'	151.44'	148.72'	N 71°16'57" W	37°43'32"
C18	13.75'	21.60'	19.45'	N 45°08'43" W	90°00'00"
C19	50.01'	249.07'	60.63'	S 89°51'17" W	285°22'00"
C20	13.50'	12.41'	11.98'	N 26°29'13" W	52°41'00"
C21	13.75'	21.60'	19.45'	N 44°51'17" E	90°00'00"
C22	14.00'	21.99'	19.80'	S 45°08'43" E	90°00'00"
C23	14.00'	21.96'	19.77'	S 44°55'38" W	89°51'17"
C24	174.00'	114.57'	112.51'	N 71°16'57" W	37°43'32"
C25	276.00'	101.48'	100.90'	S 62°57'09" E	21°03'56"
C26	47.00'	72.04'	65.19'	S 29°34'30" E	87°49'13"
C27	224.50'	84.90'	84.40'	S 79°18'40" E	21°40'07"
C28	13.50'	21.21'	19.09'	N 45°08'43" W	90°00'00"
C29	13.50'	21.21'	19.09'	S 44°51'17" W	90°00'00"
C30	174.50'	65.99'	65.60'	N 79°18'40" W	21°40'07"
C31	14.00'	21.99'	19.80'	S 2°28'36" E	90°00'00"
C32	47.00'	73.83'	66.47'	N 66°31'24" E	90°00'00"
C33	224.98'	58.41'	58.25'	S 75°52'50" E	14°52'30"
C34	13.75'	19.95'	18.25'	N 41°42'54" W	83°08'21"
C35	230.50'	54.27'	54.14'	S 06°53'24" E	13°29'21"
C36	12.50'	19.63'	17.68'	S 58°38'04" E	90°00'00"
C37	12.50'	20.72'	18.43'	S 28°53'10" W	94°57'31"

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PRELIMINARY PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

NOTES:

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2. ALL CORNERS FOR THIS SUBDIVISION ARE "TO BE SET". THE APPROPRIATE CORNER NOTES WILL BE ADDED TO THE FINAL PLAT FOR RECORDATION AND WILL BE SET PER WV CODE AT TIME OF RECORDATION.

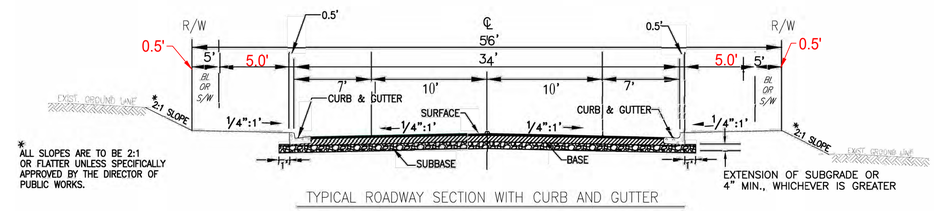
30 15 0 30 60
SCALE: 1" = 30'

DATE: 11/06/2023
SCALE: 1" = 30'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 36 OF 97
SLD2022-06

Note: Pavement design is preliminary and shall be adjusted upon establishing actual CBR values.

PRELIMINARY PAVEMENT DESIGN

SURFACE: 1.5" SM-9.5A
INTERMEDIATE: 3" IM-19.0
BASE: 8" 21-B Aggregate
SUBBASE: Compacted Subgrade



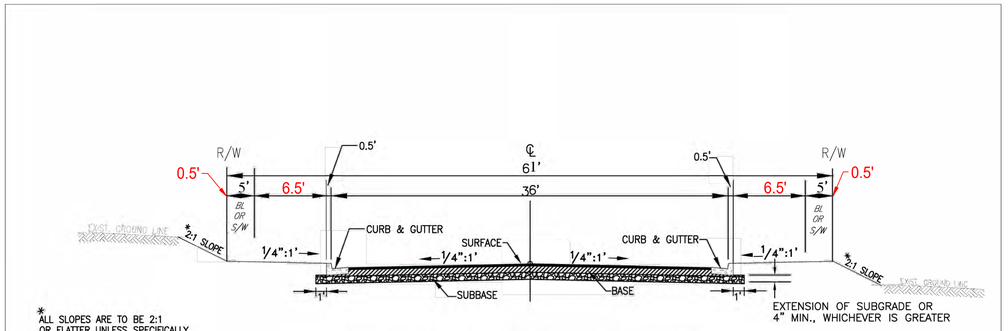
TYPICAL ROADWAY SECTION WITH CURB AND GUTTER

* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

SEEBACK DRIVE

TYPICAL SECTION - NEIGHBORHOOD CENTER STREET
(501-1000 VPD)

City of Charles Town



TYPICAL ROADWAY SECTION WITH CURB AND GUTTER

* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

CANDLEWOOD DRIVE STA 41+33.13 TO 46+64.99

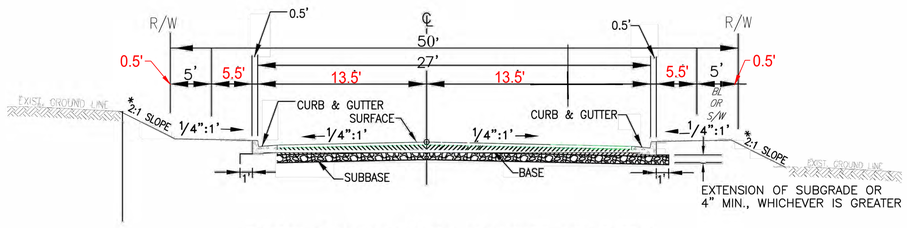
TYPICAL SECTION - MINOR COLLECTOR
(1000-2001 VPD)

City of Charles Town

Note: Pavement design is preliminary and shall be adjusted upon establishing actual CBR values.

PRELIMINARY PAVEMENT DESIGN

SURFACE: 1.5" SM-9.5A
INTERMEDIATE: 3" IM-19.0
BASE: 8" 21-B Aggregate
SUBBASE: Compacted Subgrade



TYPICAL ROADWAY SECTION WITH CURB AND GUTTER

* ALL SLOPES ARE TO BE 2:1 OR FLATTER UNLESS SPECIFICALLY APPROVED BY THE DIRECTOR OF PUBLIC WORKS.

BARKSDALE DRIVE, GERSBACK WAY, ALPINE DRIVE, GRUNTER WAY, HOFICK COURT, AND BRAUNECK COURT

TYPICAL SECTION - NEIGHBORHOOD STREET
(0-500 VPD)

City of Charles Town

Note: Pavement design is preliminary and shall be adjusted upon establishing actual CBR values.

PRELIMINARY PAVEMENT DESIGN

SURFACE: 1.5" SM-9.5A
INTERMEDIATE: 3" IM-19.0
BASE: 8" 21-B Aggregate
SUBBASE: Compacted Subgrade

NOTE:
ALL REVISIONS IN RED MADE FOR CONSTRUCTABILITY.

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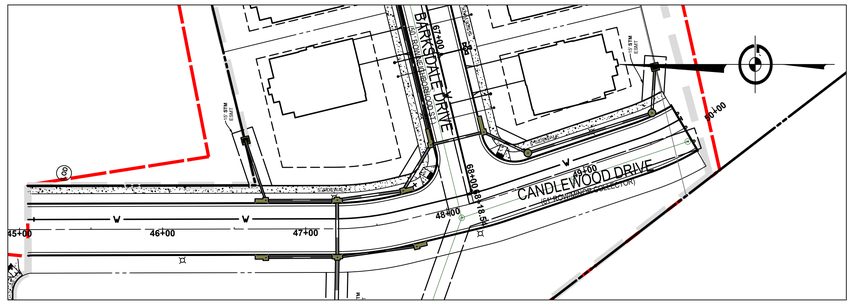
ROAD TYPICAL SECTIONS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

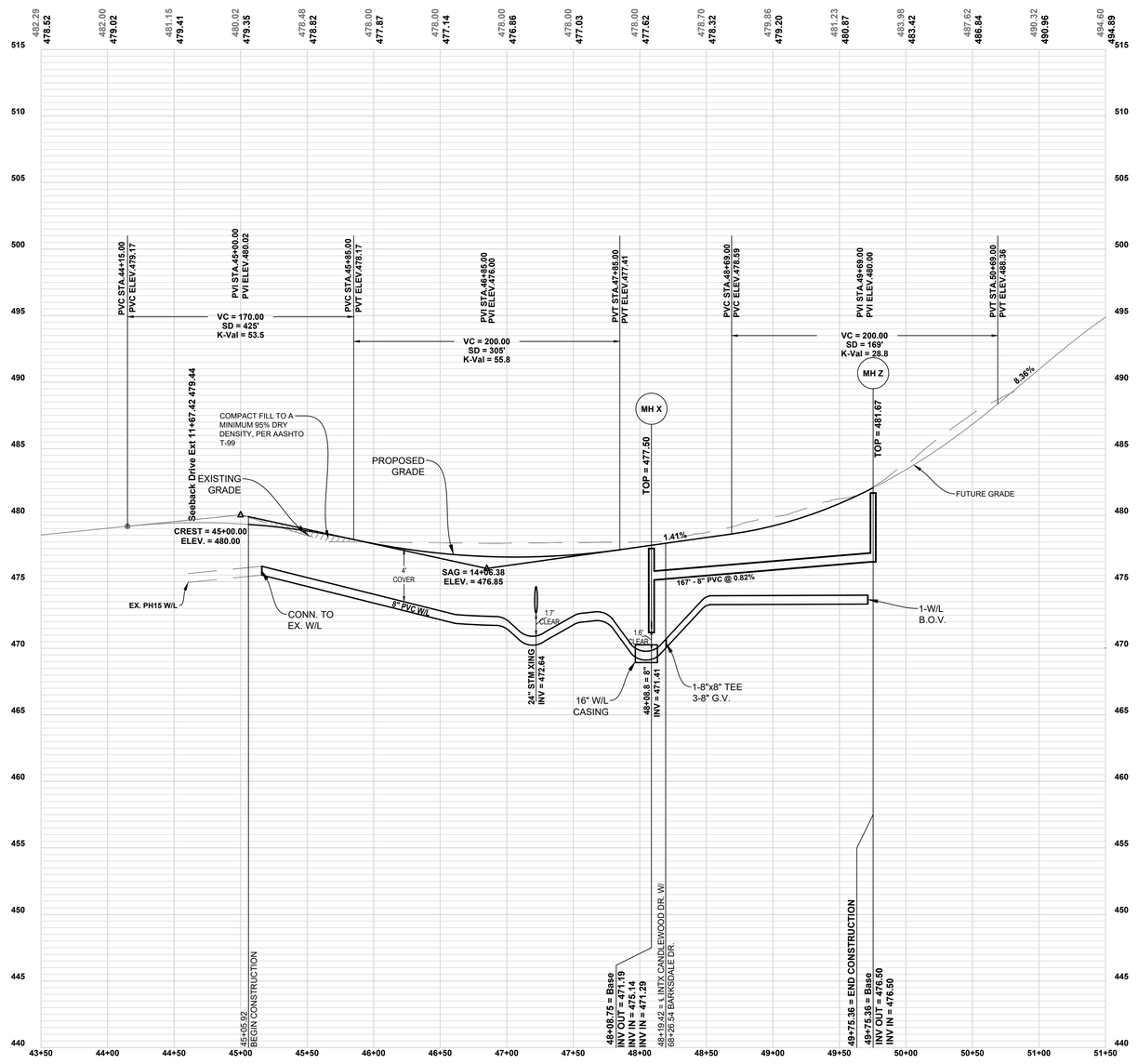
Rev. No.	Date

DATE: 11/06/2023
SCALE: N/A
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 37 OF 97
SLD2022-06



50 25 0 50 100

SCALE: 1" = 50'



CANDLEWOOD DRIVE EXT.

61' R.O.W., **36' FC TO FC**
POSTED SPEED 25 MPH

50 25 0 50 100

SCALE: 1" = 50'

10 5 0 2.5 5

SCALE: 1" = 5'

NOTES:
1. EXISTING UTILITIES SHOWN PER PREVIOUS DESIGN DATA. CONTRACTOR TO FIELD VERIFY FIELD CONDITIONS.
2. ALL PROPOSED UTILITIES SHALL BE LOCATED UNDERGROUND

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CANDLEWOOD DRIVE ROAD PROFILES

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

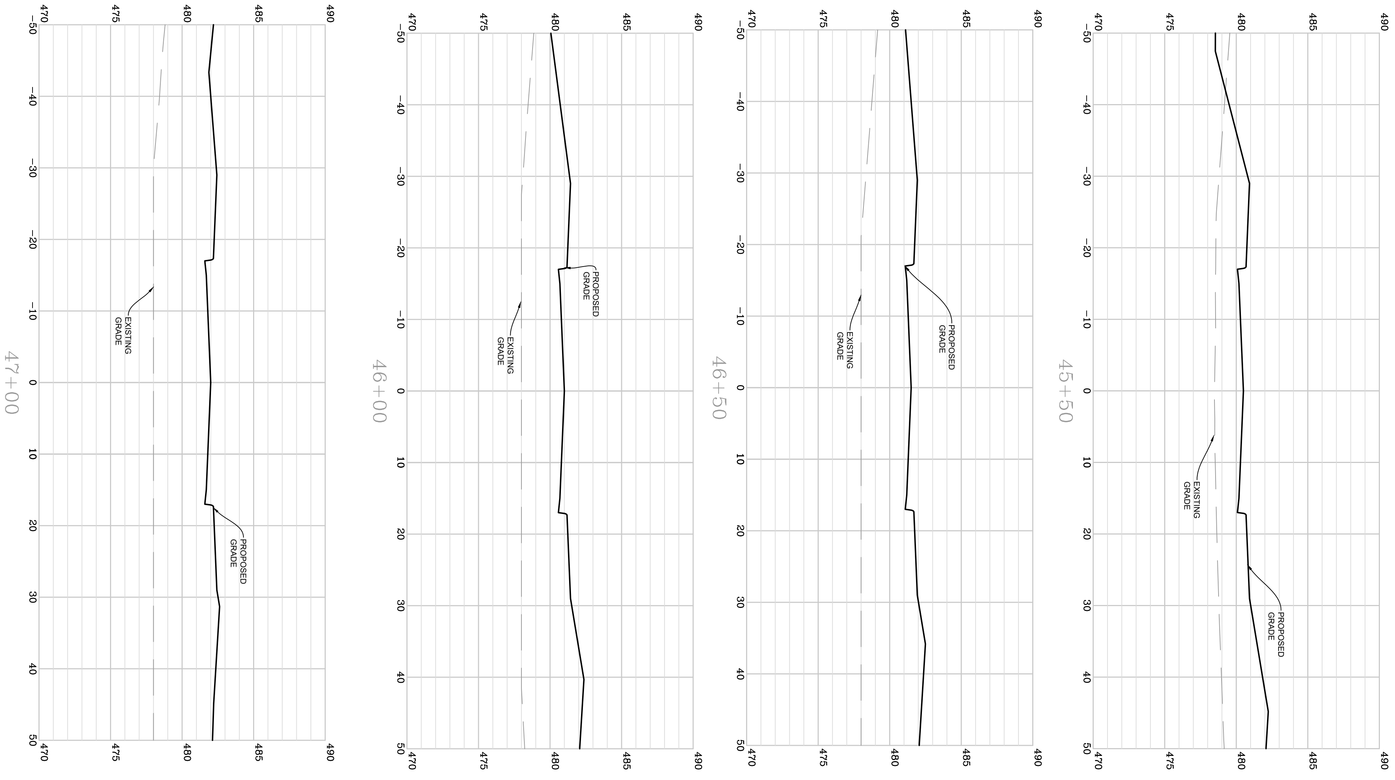
SCALE: H:1"=50 V:1"=5"

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 38 OF 97

SLD2022-06



SCALE: 1" = 5'

SCALE: 1" = 10'

CANDLEWOOD DRIVE ROAD CROSS SECTIONS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: H:1"=10' V:1"=5'
DESIGNED BY: CG;CW
FILE NO. 4542A
SHEET 39 OF 97
SLD2022-06

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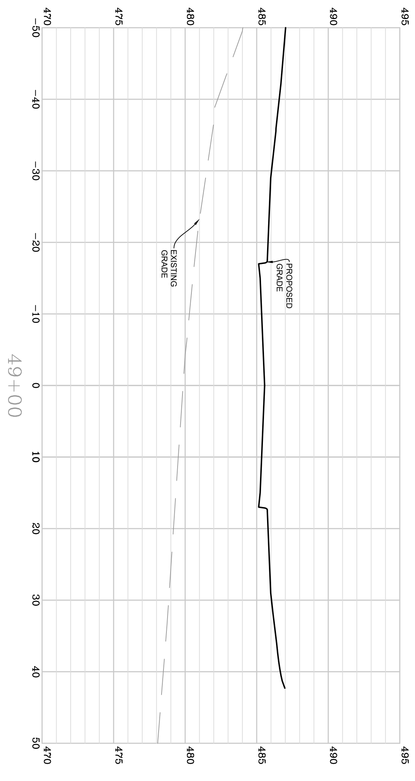
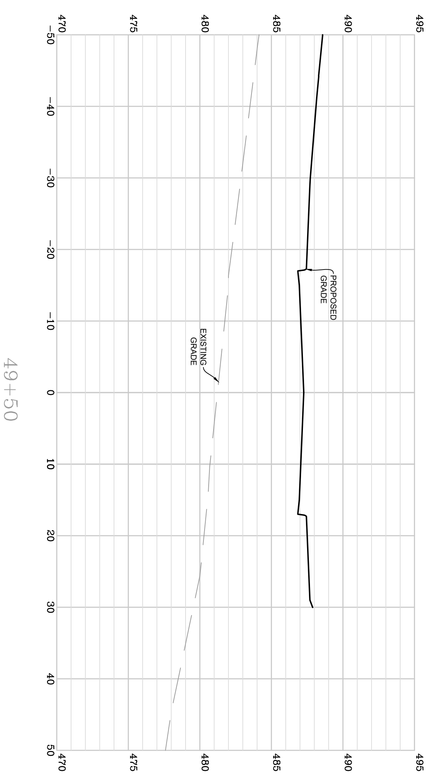
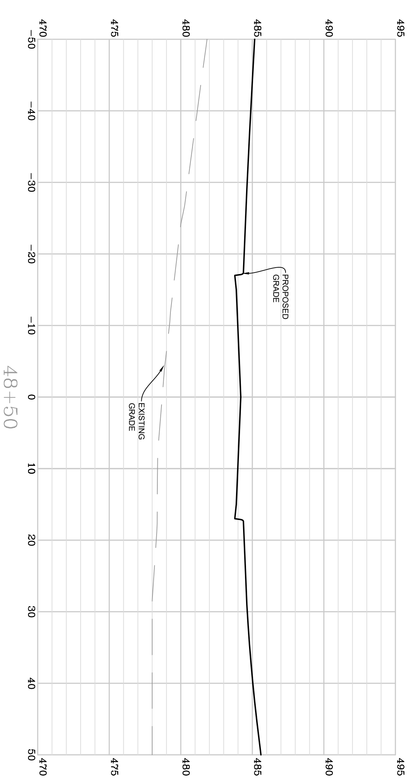
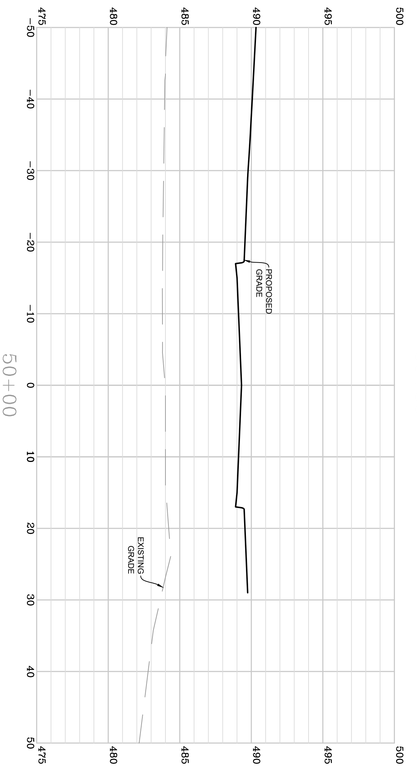
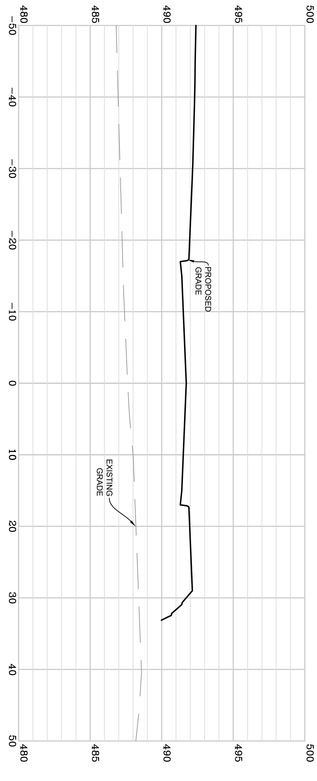
OFFICES IN: WINCHESTER, VA & MARTINSBURG, WV

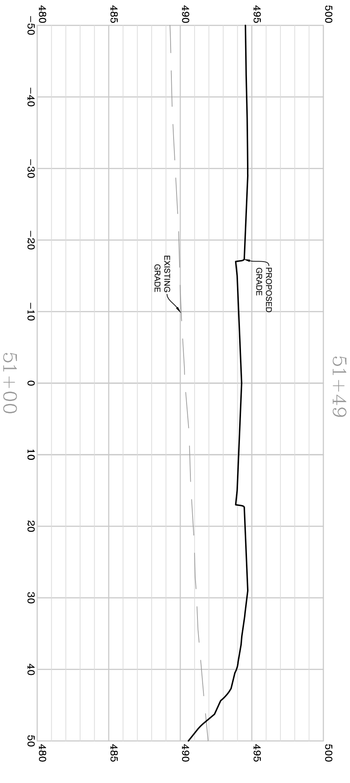


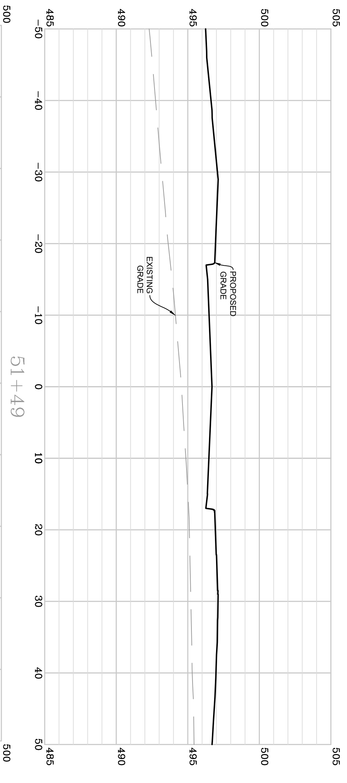


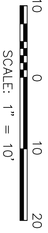


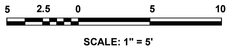












CANDLEWOOD DRIVE ROAD CROSS SECTIONS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: H:1"=10' V:1"=5'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 40 OF 97
SLD2022-06

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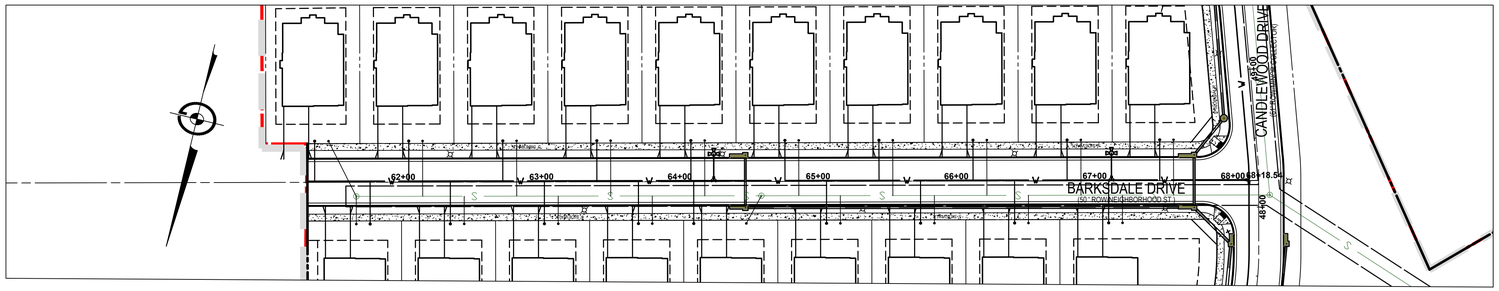

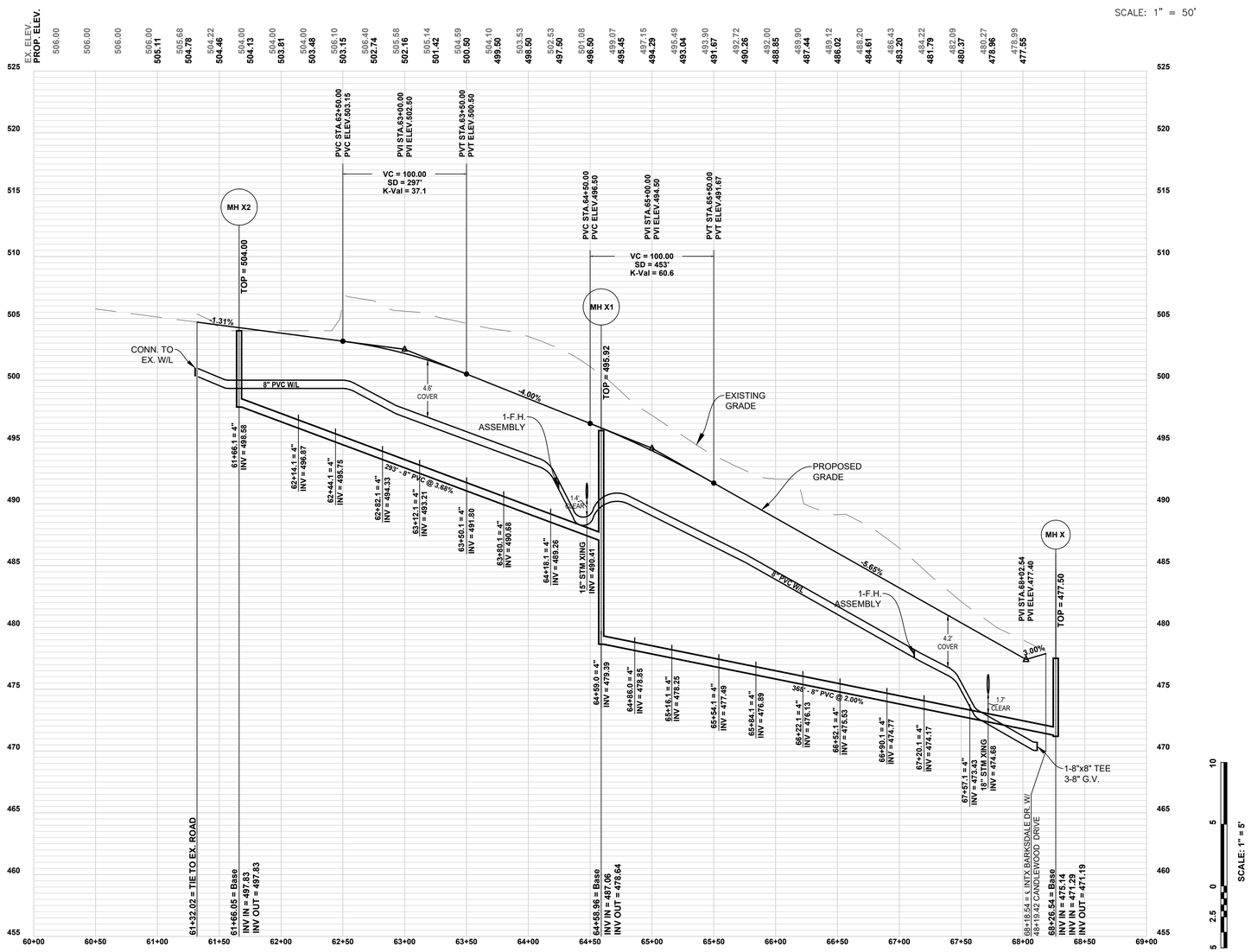

BARKSDALE DRIVE EXT.
56' R.O.W., **34' FC TO FC**
POSTED SPEED 25 MPH

50 25 0 50 100
SCALE: 1" = 50'

Barksdale Drive

Lot Number	Lateral Station	Lateral Invert (ft)	Main Invert (ft)	Lateral Length (ft)	Lateral Slope (%)	Riser Height (ft)	Station @ Riser End	Invert @ Lateral Cleanout (ft)	Finish Grade @ Cleanout (ft)	Basement Floor Elev (ft)	Comments
MH X (Inv In = 471.29) to MH X1 (Inv Out = 478.64) - 367.6' @ 2.00%											
L63	3+40.49	478.88	481.95	40.01	5.95	0.00	0+00.00	481.26	495.08	0.00	
L73	3+10.47	478.28	481.35	20.00	7.10	0.00	0+00.00	479.70	493.91	0.00	
L64	2+72.49	477.51	480.59	40.01	2.00	0.00	0+00.00	478.31	491.89	0.00	
L74	2+42.47	476.90	479.99	20.00	2.00	0.00	0+00.00	477.30	490.20	0.00	
L65	2+04.49	476.13	479.23	40.01	2.00	0.00	0+00.00	476.93	488.05	0.00	
L75	1+74.47	475.53	478.63	20.00	2.00	0.00	0+00.00	475.93	486.35	0.00	
L66	1+36.49	474.76	477.87	40.01	2.00	0.00	0+00.00	475.56	484.21	0.00	
L76	1+06.47	474.15	477.27	20.00	2.00	0.00	0+00.00	474.55	482.51	0.00	
L67	0+69.49	473.40	476.53	40.01	2.00	0.00	0+00.00	474.20	480.42	0.00	
MH X1 (Inv In = 487.06) to MH X2 (Inv Out = 497.83) - 292.9' @ 3.68%											
L59	2+44.91	496.87	487.49	40.01	11.80	0.00	0+00.00	501.59	504.00	0.00	
L69	2+14.89	495.75	486.89	20.00	23.30	0.00	0+00.00	500.41	503.44	0.00	
L60	1+76.91	494.33	486.13	40.01	12.95	0.00	0+00.00	499.51	502.61	0.00	
L70	1+46.89	493.21	485.53	20.00	24.80	0.00	0+00.00	498.17	502.19	0.00	
L61	1+08.91	491.80	484.77	40.01	12.30	0.00	0+00.00	496.72	500.58	0.00	
L71	0+78.89	490.68	484.17	20.00	20.85	0.00	0+00.00	494.85	499.62	0.00	
L62	0+40.91	489.26	483.41	40.01	9.12	0.00	0+00.00	492.91	498.19	0.00	
L72	0+00.00	479.39	482.49	18.78	31.15	0.00	0+00.00	485.24	496.63	0.00	
MH X2											
L58	0+00.00	498.58	488.45	40.73	11.44	0.00	0+00.00	503.24	504.20	0.00	
L68	0+00.00	498.58	488.45	16.00	24.94	0.00	0+00.00	502.57	504.00	0.00	

NOTES:
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BARKSDALE DRIVE ROAD PROFILES

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
2	02/15/2024

DATE: 11/06/2023

SCALE: H:1"=50 V:1"=5"

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 41 OF 97

SLD2022-06

2+00

1+50

1+00

0+50

0+00

4+50

4+00

3+50

3+00

2+50

10 0 10 20
SCALE: 1" = 10'

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FND 1971

PROUDLY SERVING VIRGINIA & WEST VIRGINIA
OFFICES IN: WINCHESTER, VA & MARTINSBURG, WV

BARKSDALE DRIVE ROAD CROSS SECTIONS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

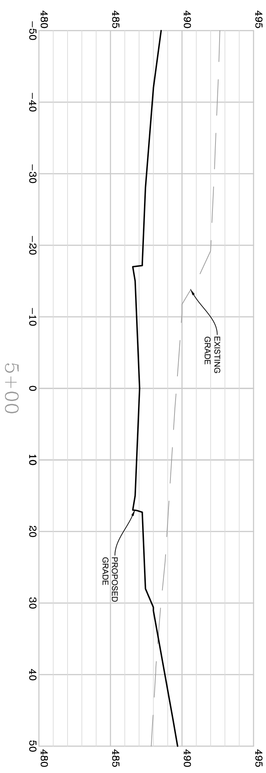
SCALE: H:1"=10' V:1"=5'

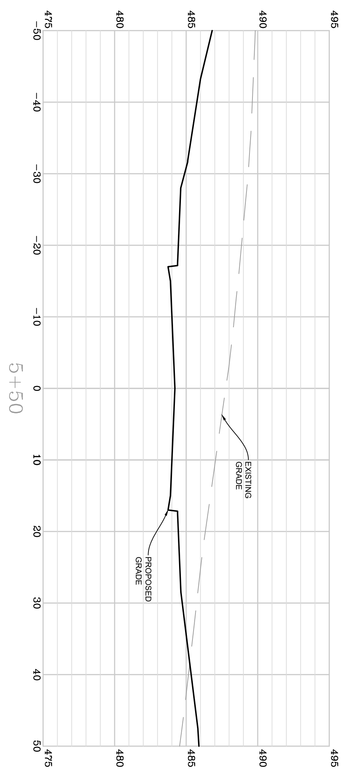
DESIGNED BY: CC/CW

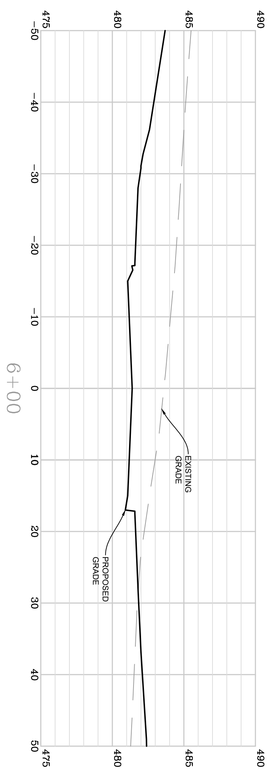
FILE NO. 4542A

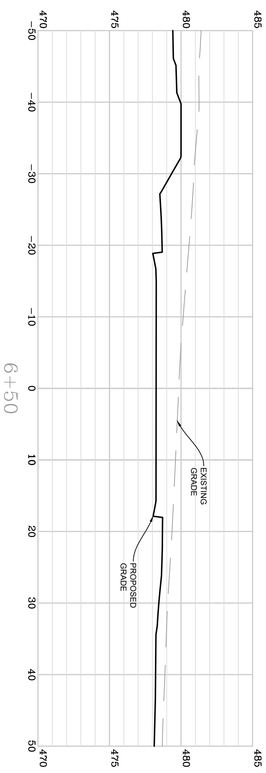
SHEET 42 OF 97

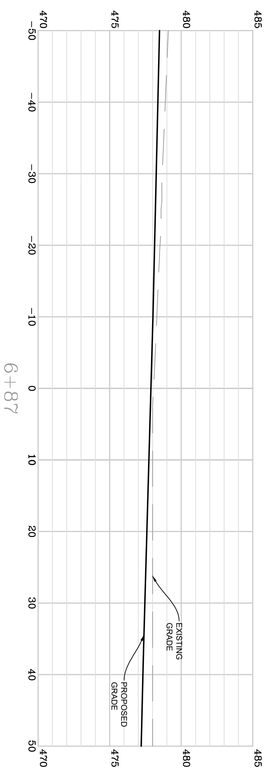
SLD2022-06

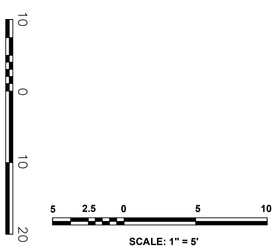












BARKSDALE DRIVE ROAD CROSS SECTIONS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

SLD2022-06
SHEET 43 OF 97
FILE NO. 4542A
DESIGNED BY: CC/CW
SCALE: H:1"=10' V:1"=5'
DATE: 11/06/2023

704 Foxcroft Avenue
Martinsburg, West Virginia 25401
Telephone: (304) 620-5111
Fax: (540) 722-9528
www.greenwayeng.com

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FND 1971

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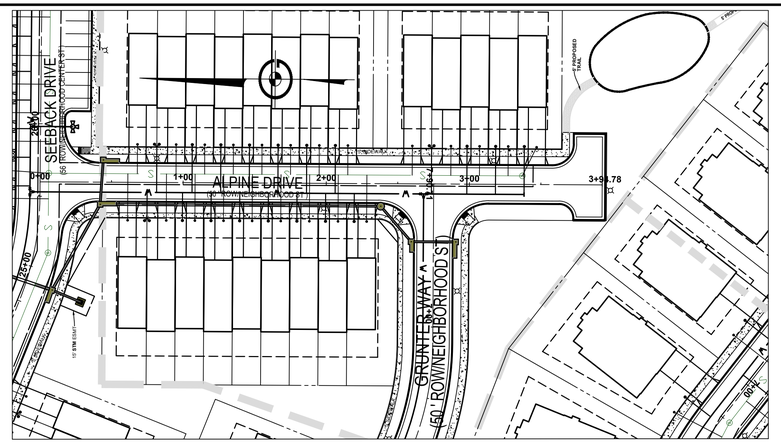

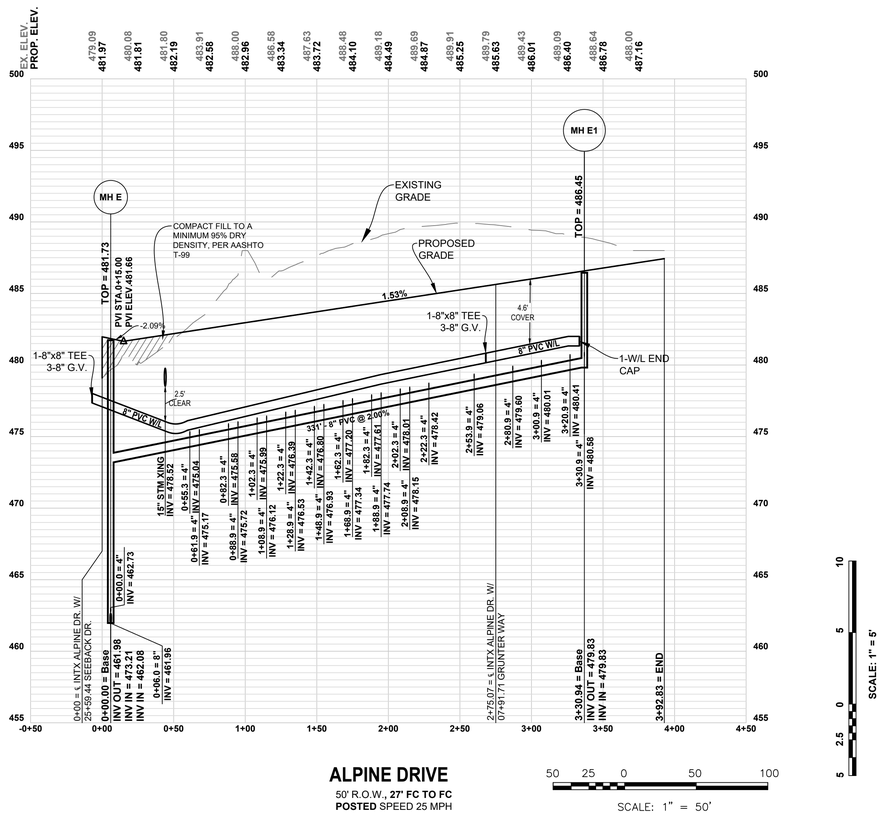

ALPINE DRIVE
50' R.O.W., **27' FC TO FC**
POSTED SPEED 25 MPH

50 25 0 50 100
SCALE: 1" = 50'

Alpine Drive											
MH E (Inv In = 473.21) to MH E1 (Inv Out = 479.83) - 330.9' @ 2.00%											
Lot Number	Lateral Station	Lateral Invert (ft)	Main Invert (ft)	Lateral Length (ft)	Lateral Slope (%)	Riser Height (ft)	Station @ Riser End	Invert @ Lateral Cleanout (ft)	Finish Grade @ Cleanout (ft)	Basement Floor Elev (ft)	Comments
L331	3+20.94	480.41	474.40	20.50	10.83	0.00	0+00.00	482.63	486.69	0.00	
L330	3+00.94	480.01	473.97	20.50	12.78	0.00	0+00.00	482.63	486.67	0.00	
L329	2+80.94	479.60	473.54	20.50	11.31	0.00	0+00.00	481.92	486.46	0.00	
L328	2+53.94	479.06	472.96	20.50	13.95	0.00	0+00.00	481.92	485.94	0.00	
L296	2+22.31	478.42	472.28	30.50	11.44	0.00	0+00.00	481.91	485.29	0.00	
L327	2+08.94	478.15	471.99	20.52	14.43	0.00	0+00.00	481.11	485.06	0.00	
L295	2+02.31	478.01	471.85	32.50	9.82	0.00	0+00.00	481.20	484.83	0.00	
L326	1+88.94	477.74	471.56	20.52	16.37	0.00	0+00.00	481.10	484.68	0.00	
L294	1+82.31	477.61	471.42	32.50	8.89	0.00	0+00.00	480.50	484.67	0.00	
L325	1+68.94	477.34	471.13	20.52	14.91	0.00	0+00.00	480.40	484.66	0.00	
L293	1+62.31	477.20	470.99	32.50	10.12	0.00	0+00.00	480.49	484.60	0.00	
L324	1+48.94	476.93	470.70	20.53	16.86	0.00	0+00.00	480.39	484.43	0.00	
L292	1+42.31	476.80	470.56	32.50	9.20	0.00	0+00.00	479.79	484.25	0.00	
L323	1+28.94	476.53	470.27	20.53	15.40	0.00	0+00.00	479.69	484.02	0.00	
L291	1+22.31	476.39	470.13	32.50	10.43	0.00	0+00.00	479.78	483.90	0.00	
L322	1+08.94	476.12	469.84	20.53	17.34	0.00	0+00.00	479.68	484.00	0.00	
L290	1+02.31	475.99	469.70	32.50	9.51	0.00	0+00.00	479.08	483.48	0.00	
L321	0+88.94	475.72	469.41	20.53	15.88	0.00	0+00.00	478.98	483.64	0.00	
L289	0+82.31	475.58	469.27	32.50	10.74	0.00	0+00.00	479.07	483.05	0.00	
L320	0+61.94	475.17	468.83	20.54	18.50	0.00	0+00.00	478.97	482.73	0.00	
L288	0+55.31	475.04	468.69	32.50	10.25	0.00	0+00.00	478.37	482.68	0.00	
L243	0+00.00	462.73	467.40	33.57	51.15	0.00	0+00.00	479.90	482.00	0.00	
MH E1											
L332	0+00.00	480.58	474.61	20.29	13.40	0.00	0+00.00	483.30	487.05	0.00	

NOTES:
1. EXISTING UTILITIES SHOWN PER PREVIOUS DESIGN DATA. CONTRACTOR TO FIELD VERIFY FIELD CONDITIONS.
2. ALL PROPOSED UTILITIES SHALL BE LOCATED UNDERGROUND

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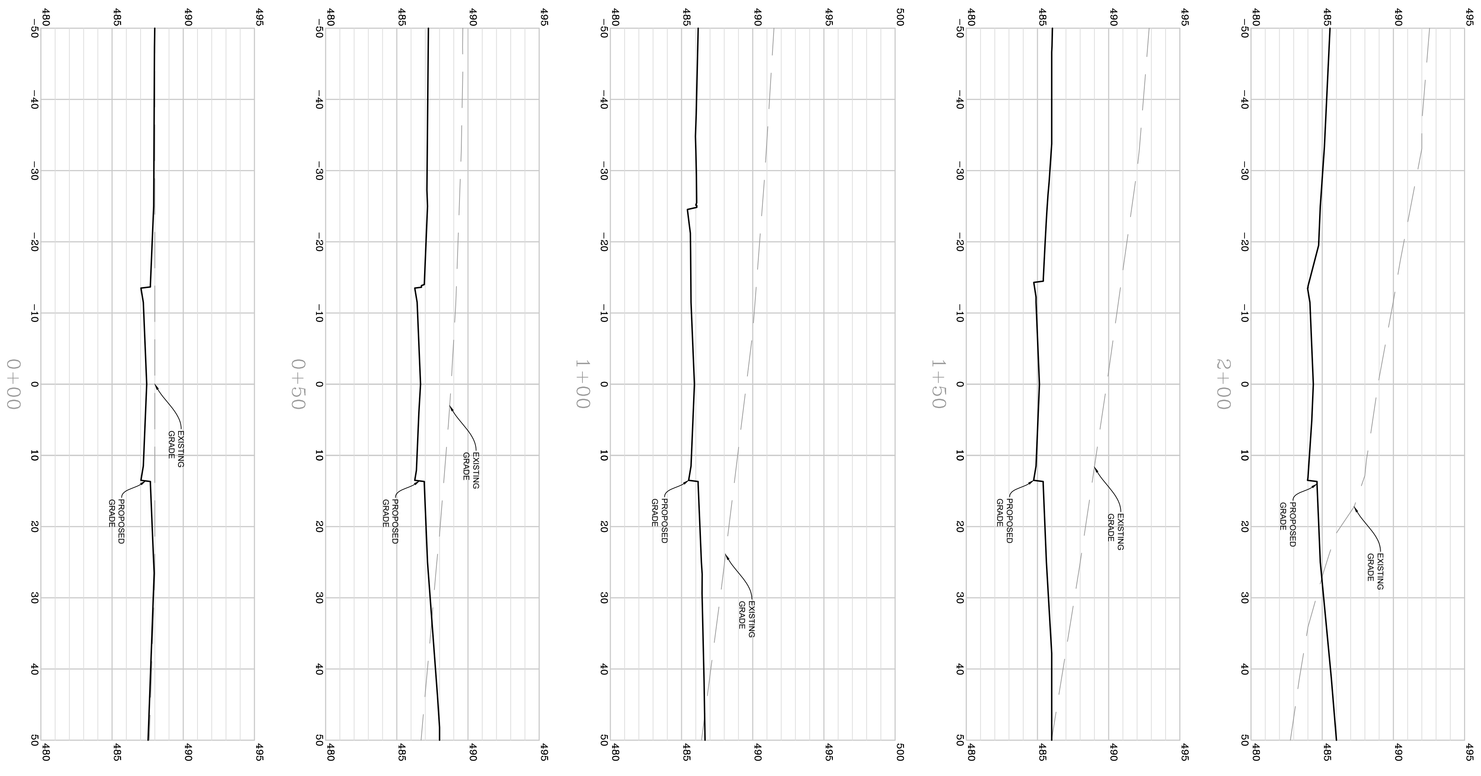
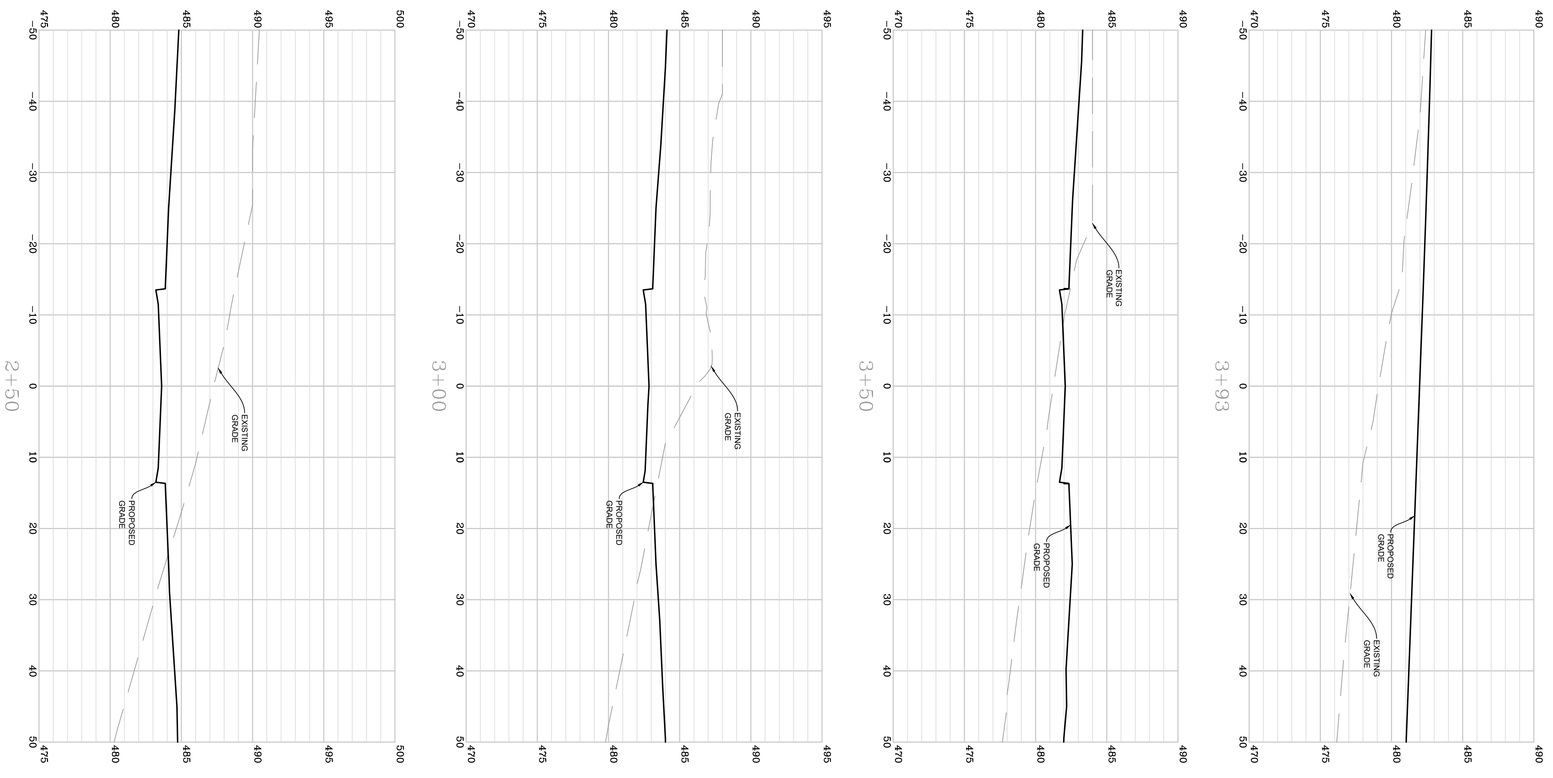
ALPINE DRIVE ROAD PROFILES
NORBORNE GLEBE
PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
2	02/15/2024

DATE: 11/06/2023
SCALE: H:1"=50 V:1"=5"
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 44 OF 97
SLD2022-06





SCALE: 1" = 10'

SCALE: 1" = 5'

ALPINE DRIVE ROAD CROSS SECTIONS

NORBORNE GLEBE

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CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

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SHEET 45 OF 97
SLD2022-06

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GERSBACK WAY
50' R.O.W., **27' FC TO FC**
POSTED SPEED 25 MPH

Gersbeck Way

MH F (Inv In = 463.66) to MH G (Inv Out = 466.10) - 319.8' @ 0.76%

Lot Number	Lateral Station	Lateral Invert (ft)	Main Invert (ft)	Lateral Length (ft)	Lateral Slope (%)	Riser Height (ft)	Station @ Riser End	Invert @ Lateral Cleanout (ft)	Finish Grade @ Cleanout (ft)	Basement Floor Elev (ft)	Comments
L364	3+07.20	466.76	466.01	20.50	62.98	0.00	0+00.00	479.67	481.86	0.00	
L343	3+00.23	466.72	470.59	32.50	40.00	0.00	0+00.00	479.72	481.69	0.00	
L365	2+85.27	466.59	465.84	20.50	60.54	0.00	0+00.00	479.00	481.55	0.00	
L342	2+80.23	466.56	470.49	32.50	38.31	0.00	0+00.00	479.01	481.25	0.00	
L366	2+65.27	466.44	465.69	20.50	61.27	0.00	0+00.00	479.00	481.20	0.00	
L341	2+60.23	466.41	470.39	32.50	38.77	0.00	0+00.00	479.01	480.80	0.00	
L367	2+45.27	466.28	465.53	20.50	22.30	0.00	0+00.00	470.86	480.82	0.00	
L340	2+40.23	466.25	470.29	32.50	37.08	0.00	0+00.00	478.30	480.67	0.00	
L339	2+13.23	466.04	470.15	32.50	37.72	0.00	0+00.00	478.30	480.28	0.00	
L368	1+90.73	465.87	465.12	20.50	57.56	0.00	0+00.00	477.67	479.87	0.00	
L369	1+73.22	465.73	464.98	20.50	58.24	0.00	0+00.00	477.67	479.51	0.00	
L338	1+68.22	465.70	469.93	32.50	36.62	0.00	0+00.00	477.60	479.30	0.00	
L370	1+53.48	465.58	464.83	20.50	55.71	0.00	0+00.00	477.00	479.22	0.00	
L337	1+48.22	465.54	469.83	32.50	34.95	0.00	0+00.00	476.90	478.85	0.00	
L371	1+33.48	465.43	464.68	20.50	56.44	0.00	0+00.00	477.00	478.86	0.00	
L336	1+28.22	465.39	469.73	32.50	33.26	0.00	0+00.00	476.20	478.67	0.00	
L372	1+13.48	465.28	464.53	20.50	53.90	0.00	0+00.00	476.33	478.51	0.00	
L335	1+08.22	465.23	469.63	32.50	33.72	0.00	0+00.00	476.19	478.50	0.00	
L373	0+93.48	465.12	464.37	20.50	54.68	0.00	0+00.00	476.33	478.14	0.00	
L334	0+88.22	465.08	469.53	32.50	32.06	0.00	0+00.00	475.50	478.00	0.00	
L374	0+70.72	464.95	464.20	20.50	52.29	0.00	0+00.00	475.67	477.76	0.00	
L333	0+61.22	464.87	469.39	32.50	32.68	0.00	0+00.00	475.49	477.74	0.00	
L375	0+43.72	464.74	463.99	20.50	50.05	0.00	0+00.00	475.00	477.26	0.00	
			MH G (Inv In = 466.20) to MH H (Inv Out = 467.80) - 319.8' @ 0.50%								
L352	2+64.39	468.28	472.11	20.50	76.68	0.00	0+00.00	484.00	486.00	0.00	
L353	2+44.39	468.18	472.01	20.50	77.17	0.00	0+00.00	484.00	486.00	0.00	
L354	2+24.38	468.08	471.91	20.50	77.66	0.00	0+00.00	484.00	486.00	0.00	
L355	2+04.39	467.98	471.81	20.50	74.73	0.00	0+00.00	483.30	485.47	0.00	
L356	1+84.39	467.88	471.71	20.50	71.80	0.00	0+00.00	482.60	484.95	0.00	
L351	1+72.43	467.82	471.65	32.50	48.86	0.00	0+00.00	483.70	484.87	0.00	
L357	1+64.42	467.78	467.03	20.50	71.80	0.00	0+00.00	482.50	484.95	0.00	
L350	1+52.43	467.72	471.55	32.50	47.02	0.00	0+00.00	483.00	484.67	0.00	
L358	1+44.34	467.68	466.93	20.50	69.02	0.00	0+00.00	481.83	484.60	0.00	
L349	1+32.43	467.62	471.45	32.50	45.17	0.00	0+00.00	482.30	484.53	0.00	
L359	1+17.74	467.54	466.79	20.50	69.71	0.00	0+00.00	481.83	484.12	0.00	
L348	1+12.43	467.51	471.35	32.50	43.32	0.00	0+00.00	481.59	484.03	0.00	
L347	0+85.43	467.38	471.21	32.50	43.75	0.00	0+00.00	481.60	483.48	0.00	
L360	0+67.38	467.29	466.54	20.50	66.88	0.00	0+00.00	481.00	483.25	0.00	
L361	0+47.38	467.19	466.44	20.50	63.38	0.00	0+00.00	480.18	482.90	0.00	
L346	0+40.44	467.15	470.99	32.50	40.74	0.00	0+00.00	480.39	482.67	0.00	
L362	0+27.39	467.09	466.34	20.50	64.59	0.00	0+00.00	480.33	482.55	0.00	
L345	0+20.44	467.05	470.89	32.50	41.05	0.00	0+00.00	480.39	482.58	0.00	
L363	0+07.39	466.99	466.24	20.50	61.85	0.00	0+00.00	479.67	482.21	0.00	
L344	0+00.00	466.85	470.68	30.50	42.13	0.00	0+00.00	479.70	482.11	0.00	
			MH H (Inv In = 467.90) to MH K (Inv Out = 469.19) - 257.2' @ 0.50%								
L80	2+23.15	469.77	469.02	32.50	51.18	0.00	0+00.00	486.41	486.36	0.00	
L79	2+18.15	469.75	473.57	20.50	30.73	0.00	0+00.00	476.05	486.00	0.00	
L78	1+55.15	469.43	468.68	20.50	33.03	0.00	0+00.00	476.20	486.58	0.00	
L81	1+50.15	469.41	473.23	32.50	26.40	0.00	0+00.00	477.99	486.61	0.00	
L77	0+79.82	469.05	468.30	20.50	35.31	0.00	0+00.00	476.29	486.95	0.00	
L82	0+74.82	469.02	472.86	32.50	28.58	0.00	0+00.00	478.31	486.65	0.00	

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Rev. No.	Date

DATE: 11/06/2023
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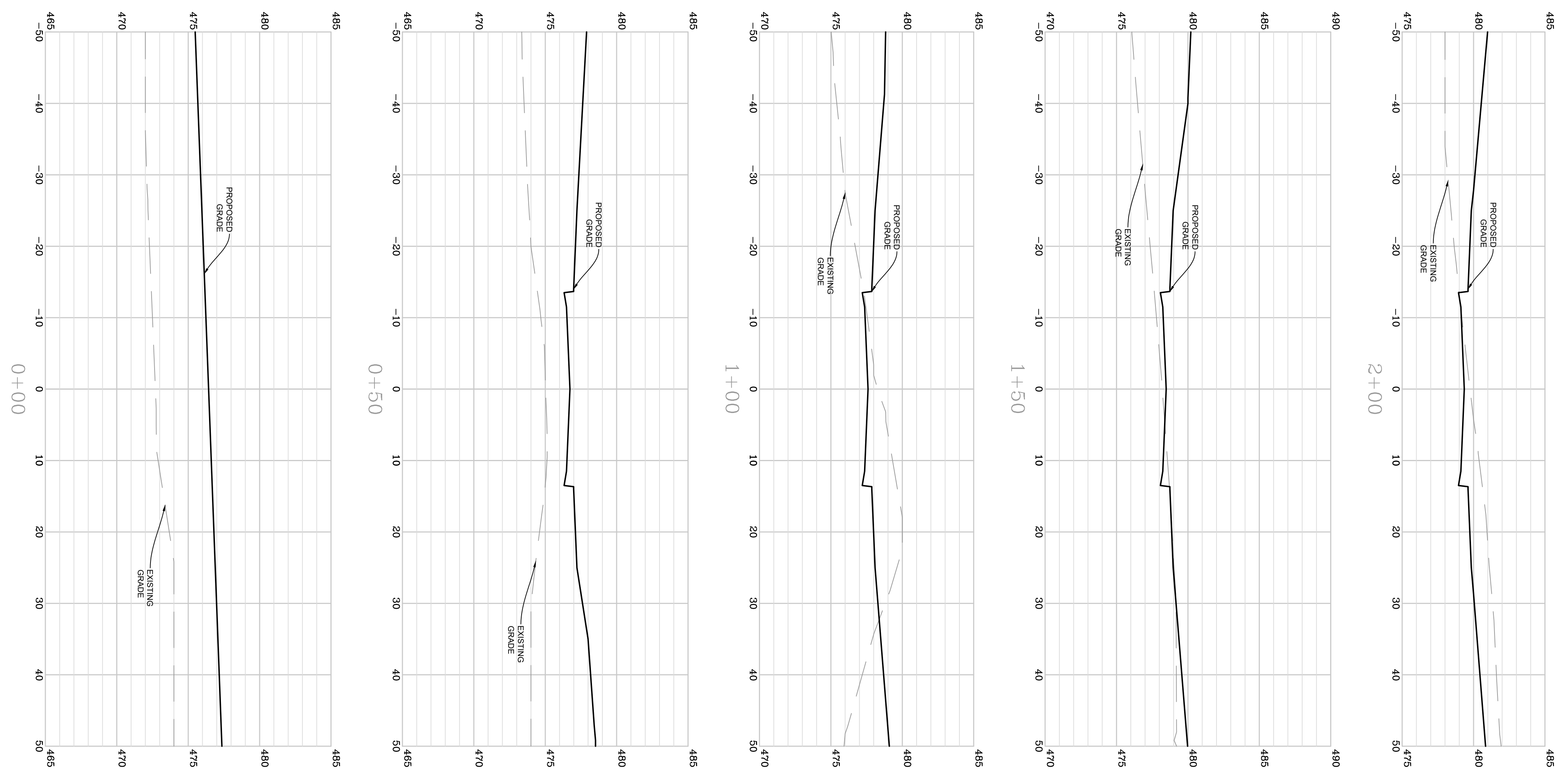
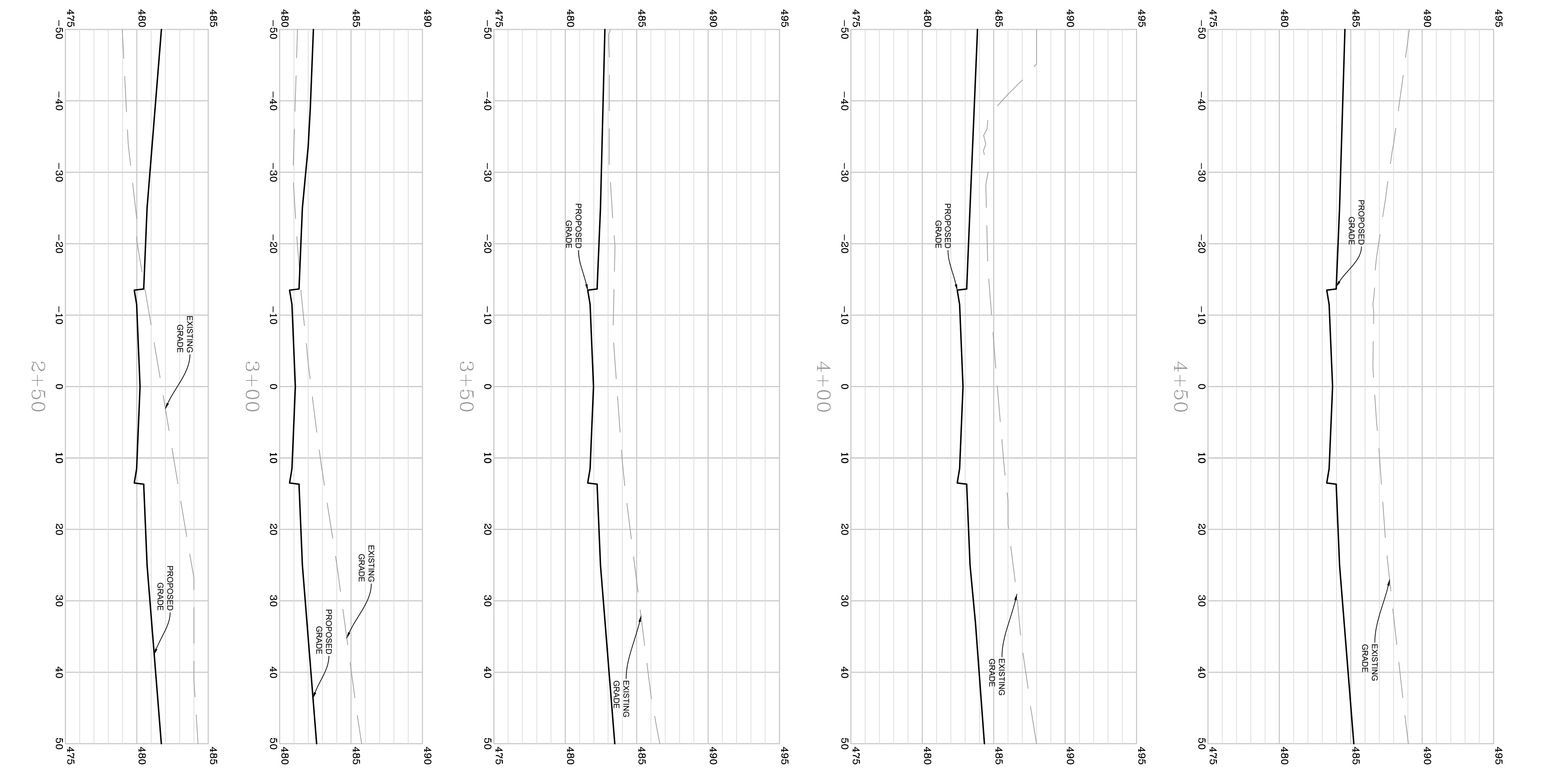
SHEET 46 OF 97
SLD2022-06





SCALE: 1" = 10'

SCALE: 1" = 5'

GERSBACK WAY ROAD CROSS SECTIONS

NORBORNE GLEBE

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CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

SLD2022-06

SHEET 47 OF 97

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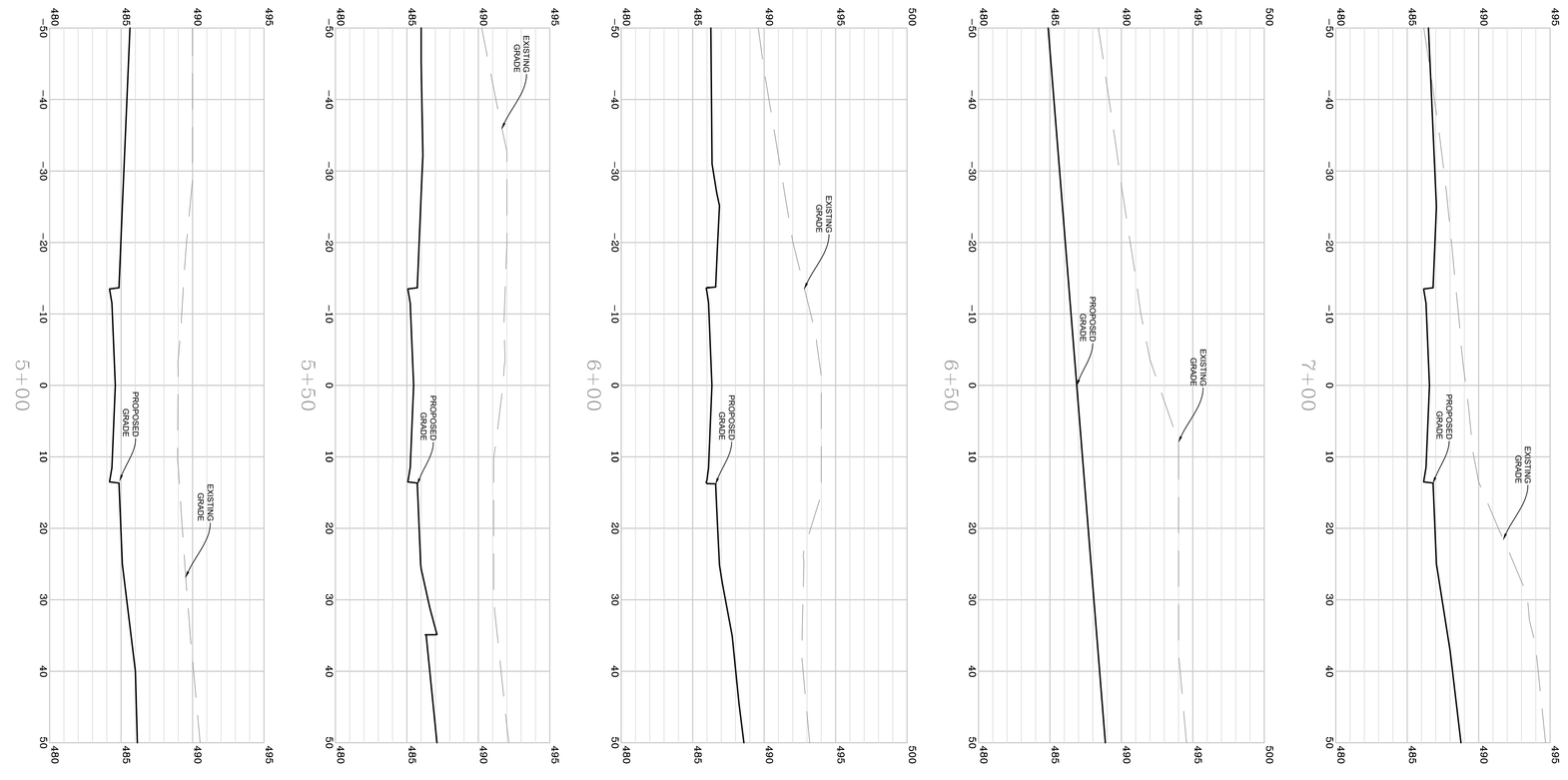

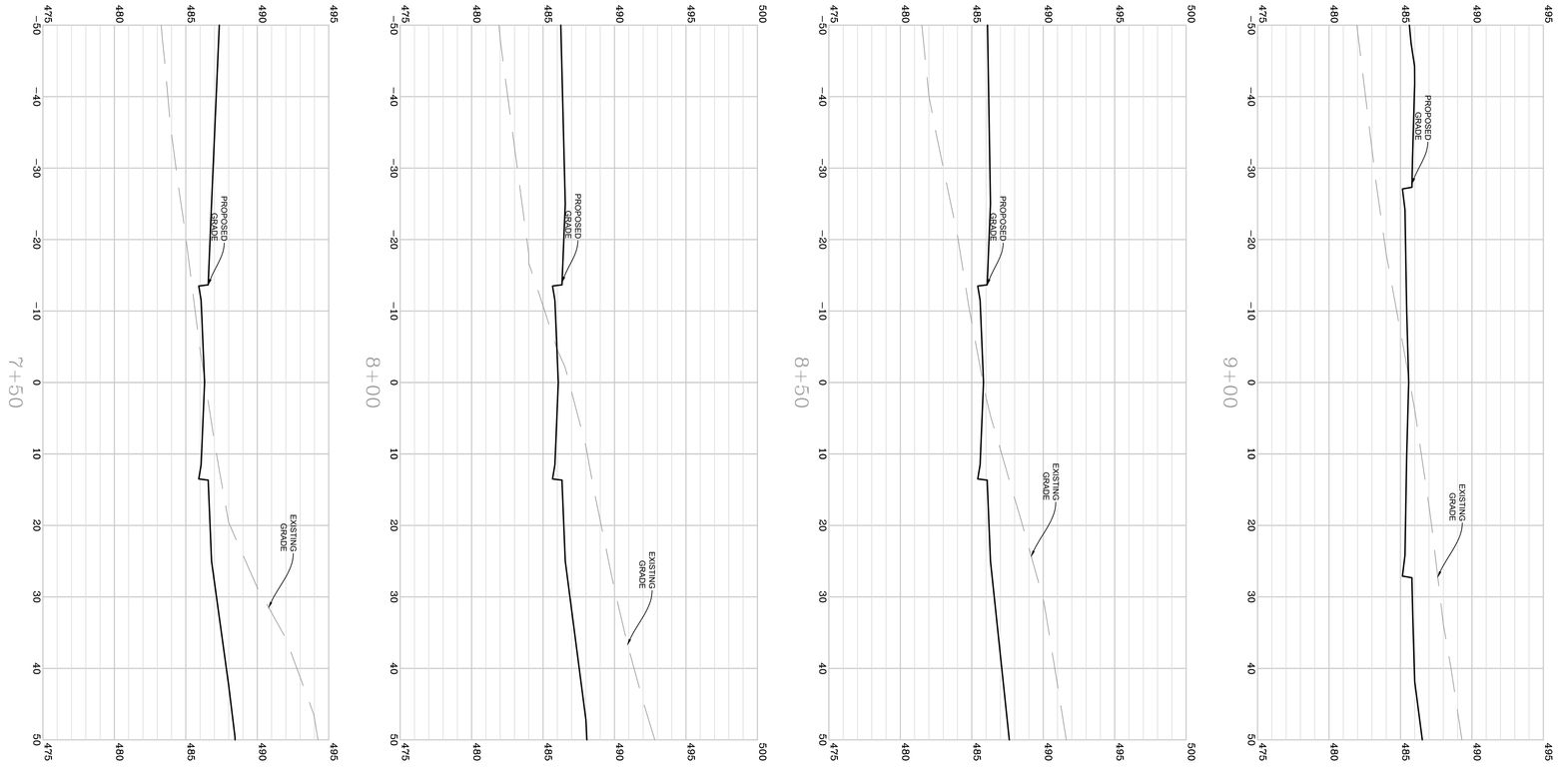

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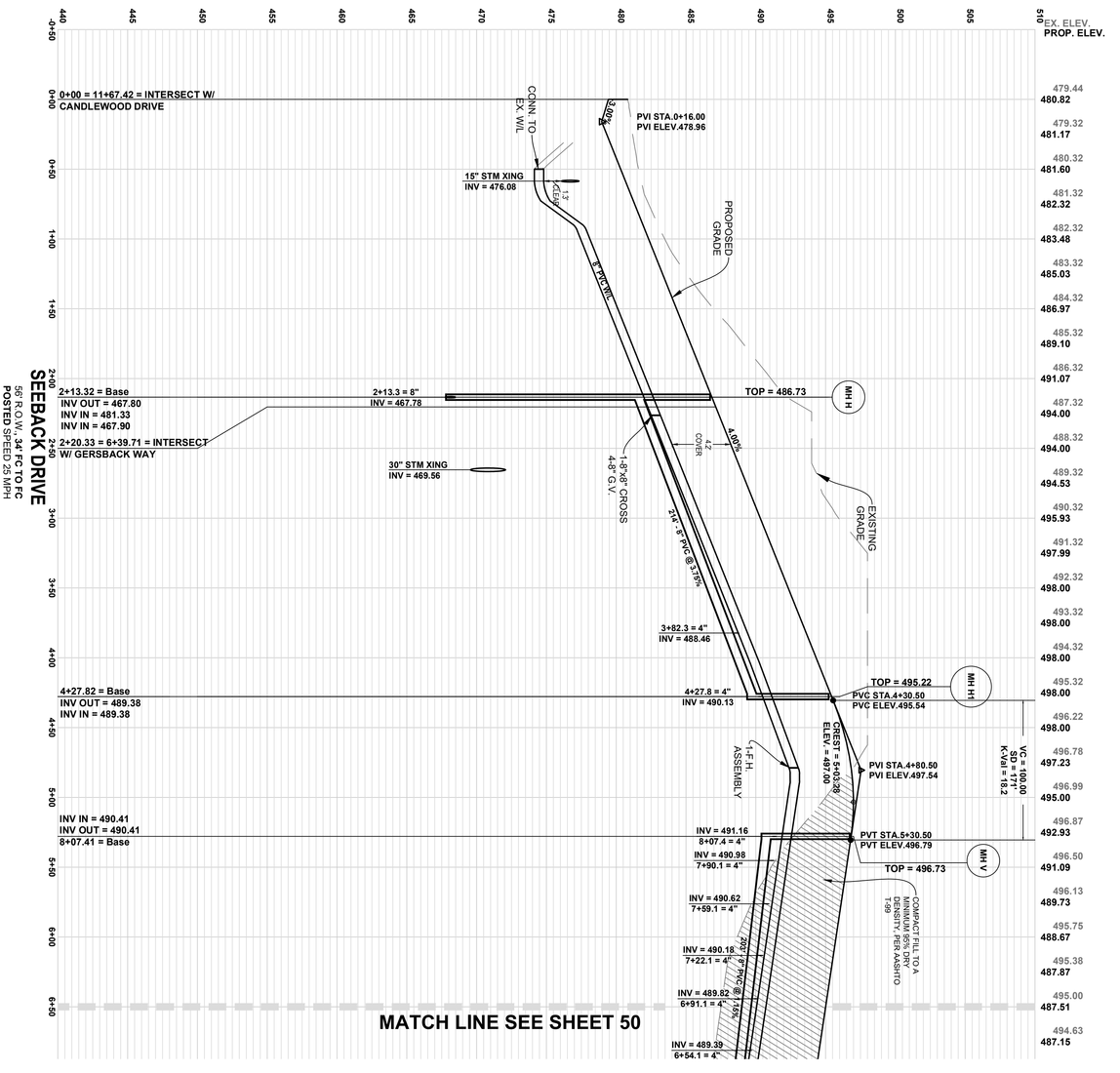
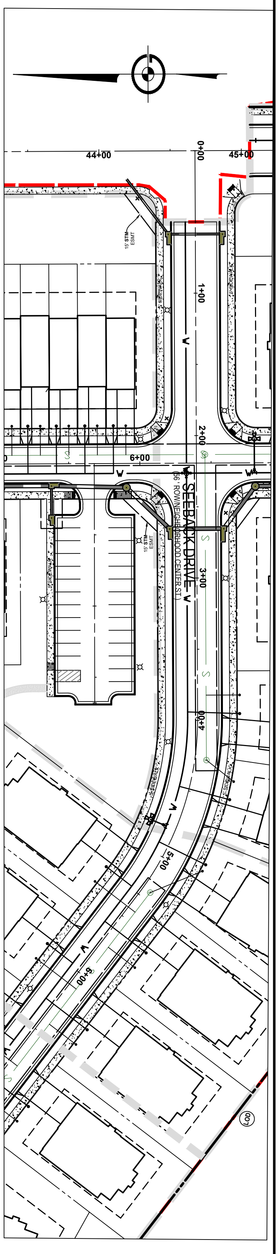


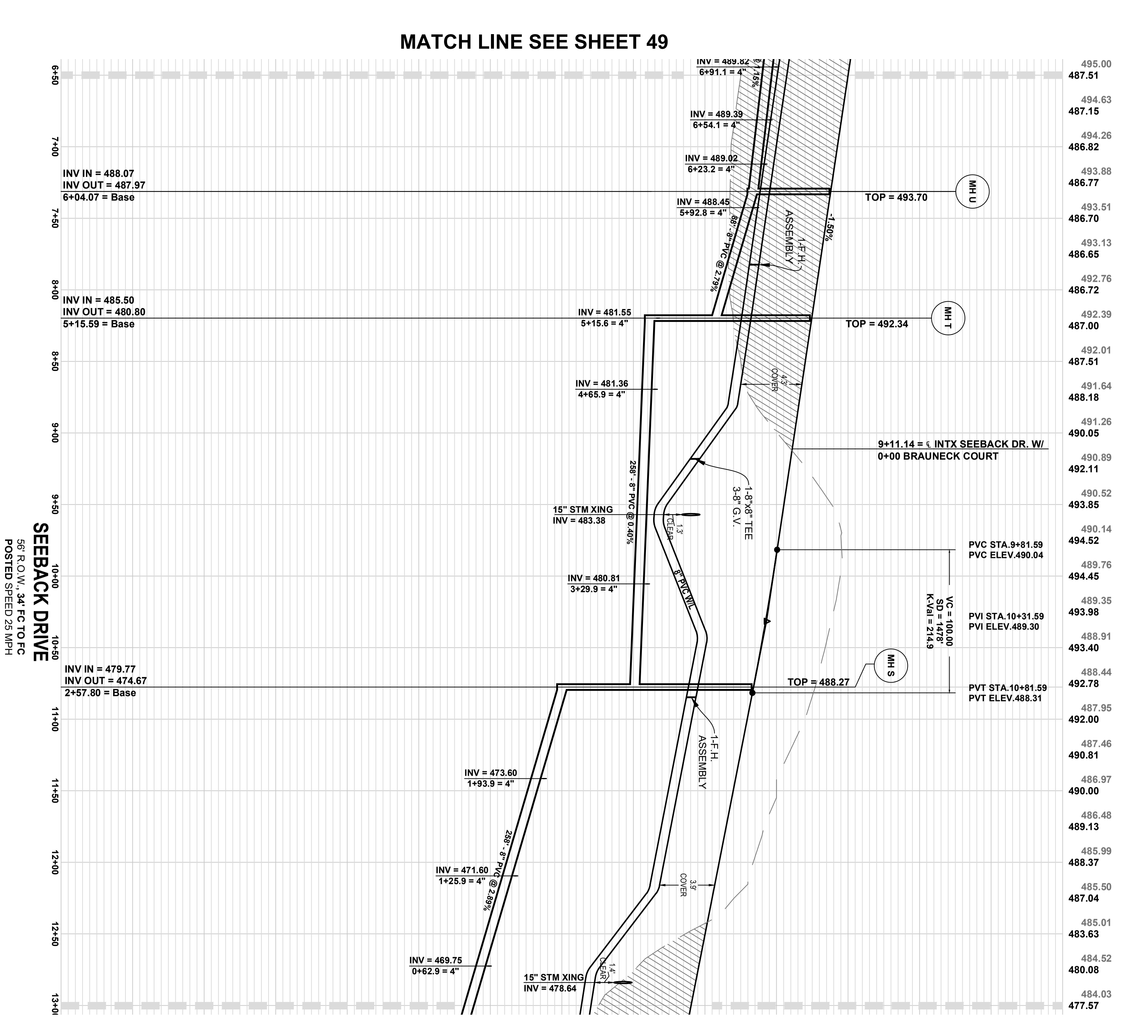


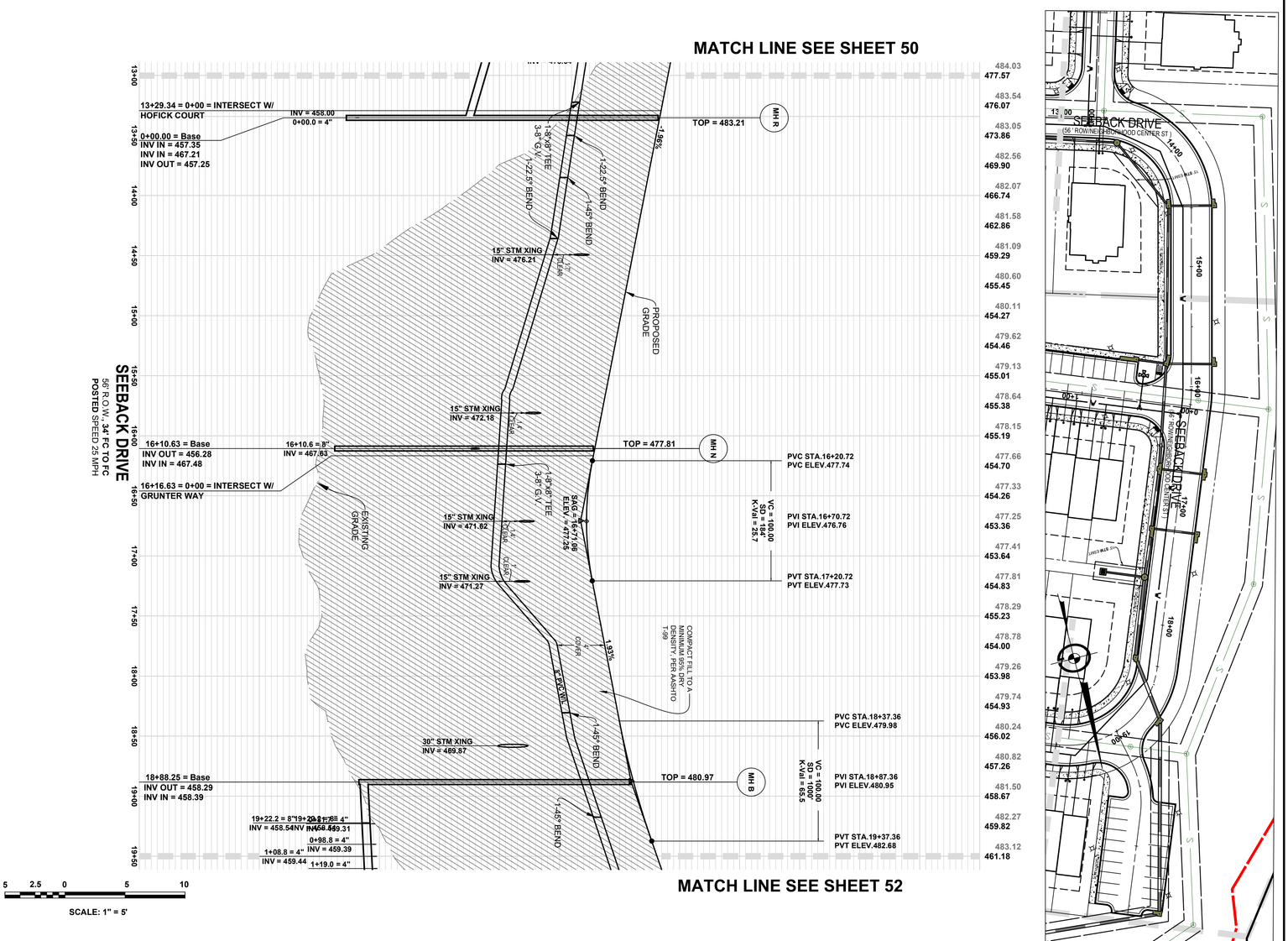
SCALE: 1" = 50'

SCALE: 1" = 5'

SCALE: 1" = 50'

| | Seeback Drive | | |


MATCH LINE SEE SHEET 49
SEEBACK DRIVE
56' R.O.W., 34' FC TO FC
POSTED SPEED 25 MPH
INV IN = 488.07
INV OUT = 487.97
6+04.07 = Base
INV IN = 485.50
INV OUT = 480.80
5+15.59 = Base
INV IN = 479.77
INV OUT = 474.67
2+57.80 = Base
INV = 489.82
6+91.1 = 4"
INV = 489.39
6+54.1 = 4"
INV = 489.02
6+23.2 = 4"
INV = 488.45
5+92.8 = 4"
INV = 481.55
5+15.6 = 4"
INV = 481.36
4+65.9 = 4"
INV = 480.81
3+29.9 = 4"
INV = 473.60
1+93.9 = 4"
INV = 471.60
1+25.9 = 4"
INV = 469.75
0+62.9 = 4"
15" STM XING
INV = 483.38
15" STM XING
INV = 478.64
MH U
TOP = 493.70
MH T
TOP = 492.34
MH S
TOP = 488.27
9+11.14 = ℄ INTX SEEBACK DR. W/
0+00 BRAUNECK COURT
PVC STA.9+81.59
PVC ELEV.490.04
PVI STA.10+31.59
PVI ELEV.489.30
PVT STA.10+81.59
PVT ELEV.488.31
VC = 100.00
SD = 1.42%
K Val = 214.9
1-15"x8" TEE
3.6' C.V.
1-15"x8" TEE
3.3' C.V.
1-15"x8" TEE
3.9' C.V.
1-15"x8" TEE
3.9' C.V.
1-15"x8" TEE
3.7' C.V.
1-15" H.E. ASSEMBLY
1-15" H.E. ASSEMBLY
1-15" H.E. ASSEMBLY
1-15" H.E. ASSEMBLY
1-15" H.E. ASSEMBLY
1.5' COVER
1.3' COVER
3.9' COVER
1.5' COVER
1.5' COVER
1.95%
1.45%
1.40%
1.40%
1.40



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SEEBACK DRIVE ROAD PROFILES

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
2	06/15/2024

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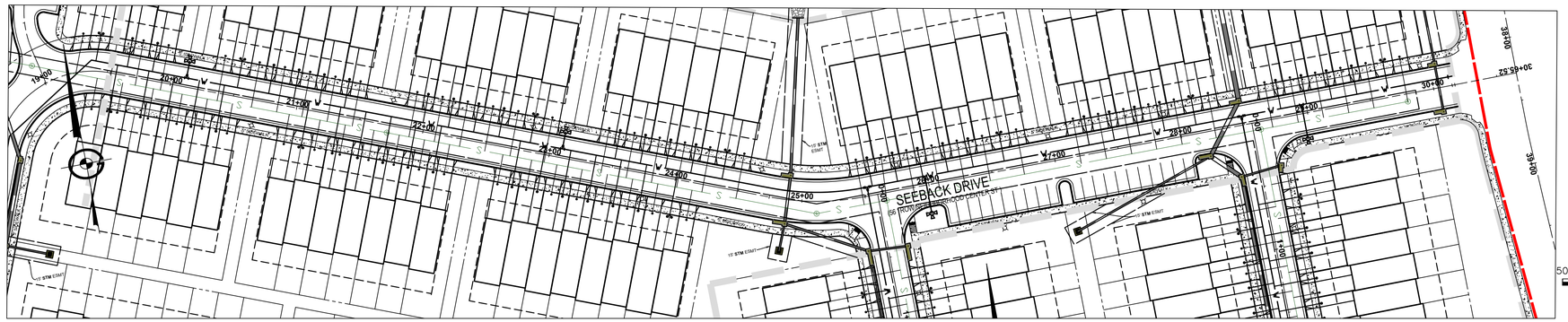
OFFICES IN: WINCHESTER, VA & MARTINSBURG, WV

DATE:	11/06/2023
SCALE:	H:1"=50' V:1"=5'
DESIGNED BY:	CC/CW
FILE NO.	4542A
SHEET	51 OF 97
	SLD2022-06



Seeback Drive

Lot Number	Lateral Station	Lateral Invert (ft)	Main Invert (ft)	Lateral length (ft)	Lateral Slope (%)	Riser Height (ft)	Station @ Riser End	Invert @ Lateral Cleanout (ft)	Finish Grade @ Cleanout (ft)	Basement Floor Elev (ft)	Comments
MH B (Inv In = 458.39) to MH C (Inv Out = 459.80) - 281.1' @ 0.50%											
L276	2+71.04	460.51	465.17	23.50	114.04	0.00	0+00.00	487.31	489.40	0.00	
L257	2+53.70	460.42	465.08	35.50	76.03	0.00	0+00.00	487.41	488.00	0.00	
L275	2+48.29	460.38	459.63	23.50	113.69	0.00	0+00.00	487.10	489.51	0.00	
L258	2+33.80	460.32	464.98	35.50	74.34	0.00	0+00.00	486.71	488.00	0.00	
L274	2+28.29	460.28	459.53	23.50	111.16	0.00	0+00.00	486.40	489.21	0.00	
L259	2+13.80	460.22	464.88	35.50	74.62	0.00	0+00.00	486.71	488.00	0.00	
L273	2+03.94	460.17	464.84	23.50	112.51	0.00	0+00.00	486.61	488.32	0.00	
L260	1+93.80	460.11	464.78	35.50	72.93	0.00	0+00.00	486.00	488.00	0.00	
L261	1+73.80	460.01	464.68	35.50	71.24	0.00	0+00.00	485.30	487.50	0.00	
L272	1+58.94	459.94	464.61	23.50	84.51	0.00	0+00.00	479.80	486.62	0.00	
L262	1+46.70	459.88	464.55	35.50	69.66	0.00	0+00.00	484.61	486.57	0.00	
L271	1+39.04	459.84	464.51	23.50	103.23	0.00	0+00.00	484.10	486.24	0.00	
L270	1+19.04	459.74	464.41	23.50	100.68	0.00	0+00.00	483.40	485.47	0.00	
L263	1+01.70	459.65	464.32	35.50	64.08	0.00	0+00.00	482.40	485.01	0.00	
L269	0+96.29	459.62	458.87	23.50	97.46	0.00	0+00.00	482.53	484.88	0.00	
L264	0+81.80	459.55	464.22	35.50	62.39	0.00	0+00.00	481.70	484.32	0.00	
L268	0+71.94	459.50	464.18	23.50	95.74	0.00	0+00.00	482.00	484.02	0.00	
L265	0+61.80	459.44	464.12	35.50	60.70	0.00	0+00.00	480.99	483.26	0.00	
L267	0+51.78	459.39	464.07	24.45	89.56	0.00	0+00.00	481.29	482.82	0.00	
L266	0+34.69	459.31	463.99	32.12	67.52	0.00	0+00.00	481.00	481.56	0.00	
MH C (Inv In = 459.90) to MH D (Inv Out = 461.60) - 340.5' @ 0.50%											
L245	2+76.61	462.04	466.70	35.50	55.69	0.00	0+00.00	481.81	484.00	0.00	
L246	2+49.61	461.90	466.57	35.50	58.03	0.00	0+00.00	482.50	484.08	0.00	
L287	2+41.83	461.86	466.53	23.50	88.26	0.00	0+00.00	482.60	484.68	0.00	
L247	2+29.61	461.80	466.47	35.50	60.28	0.00	0+00.00	483.20	484.76	0.00	
L286	2+14.83	461.72	466.40	23.50	91.83	0.00	0+00.00	483.30	485.44	0.00	
L248	2+09.61	461.70	466.37	35.50	60.56	0.00	0+00.00	483.20	485.44	0.00	
L285	1+94.83	461.62	466.30	23.50	95.23	0.00	0+00.00	484.00	486.00	0.00	
L249	1+89.61	461.60	466.27	35.50	63.38	0.00	0+00.00	484.10	486.00	0.00	
L284	1+74.83	461.52	466.20	23.50	95.66	0.00	0+00.00	484.00	486.00	0.00	
L250	1+69.61	461.50	466.17	35.50	63.66	0.00	0+00.00	484.10	486.00	0.00	
L283	1+54.83	461.42	466.10	23.50	99.06	0.00	0+00.00	484.70	486.00	0.00	
L282	1+34.83	461.32	466.00	23.50	99.49	0.00	0+00.00	484.70	486.68	0.00	
L251	1+24.59	461.27	465.94	35.50	66.56	0.00	0+00.00	484.90	486.70	0.00	
L281	1+14.83	461.22	465.90	23.50	102.89	0.00	0+00.00	485.40	487.25	0.00	
L252	0+97.58	461.13	465.81	35.50	68.93	0.00	0+00.00	485.60	487.61	0.00	
L280	0+92.08	461.11	460.36	23.50	105.58	0.00	0+00.00	485.92	488.00	0.00	
L253	0+77.59	461.03	465.71	35.50	69.21	0.00	0+00.00	485.60	488.00	0.00	
L254	0+57.58	460.93	465.61	35.50	71.46	0.00	0+00.00	486.30	488.00	0.00	
L279	0+49.83	460.89	465.57	23.50	109.36	0.00	0+00.00	486.59	488.00	0.00	
L255	0+37.59	460.83	465.51	35.50	71.75	0.00	0+00.00	486.30	488.00	0.00	
L278	0+29.93	460.79	465.47	23.50	109.79	0.00	0+00.00	486.59	488.56	0.00	
L256	0+17.58	460.73	465.41	35.50	74.00	0.00	0+00.00	487.00	488.00	0.00	
L277	0+09.93	460.69	465.37	23.50	113.19	0.00	0+00.00	487.29	489.07	0.00	
MH D (Inv In = 461.70) to MH E (Inv Out = 461.98) - 55.6' @ 0.50%											
L244	0+37.75	462.64	467.31	35.57	50.50	0.00	0+00.00	480.60	482.00	0.00	
MH E (Inv In = 462.08) to MH F (Inv Out = 463.56) - 296.5' @ 0.50%											
L233	2+61.18	464.14	468.81	35.50	30.06	0.00	0+00.00	474.81	476.88	0.00	
L233	2+34.18	464.00	468.67	35.50	32.39	0.00	0+00.00	475.50	477.92	0.00	
L234	2+13.99	463.90	468.57	35.50	34.65	0.00	0+00.00	476.20	478.00	0.00	
L235	1+94.18	463.80	468.47	35.50	34.93	0.00	0+00.00	476.20	478.00	0.00	
L236	1+74.18	463.70	468.37	35.50	37.18	0.00	0+00.00	476.90	478.20	0.00	
L237	1+54.18	463.60	468.27	35.50	37.46	0.00	0+00.00	476.90	478.88	0.00	
L238	1+09.18	463.37	468.05	35.50	40.65	0.00	0+00.00	477.80	480.00	0.00	
L239	0+82.18	463.23	467.91	35.50	42.99	0.00	0+00.00	478.49	480.00	0.00	
L240	0+62.18	463.13	467.81	35.50	43.27	0.00	0+00.00	478.49	480.37	0.00	
L241	0+42.18	463.03	467.71	35.50	45.52	0.00	0+00.00	479.19	481.05	0.00	
L242	0+22.17	462.93	467.61	35.50	45.80	0.00	0+00.00	479.19	481.73	0.00	
L243	0+00.00	462.73	467.40	33.57	51.15	0.00	0+00.00	479.90	482.00	0.00	
MH F (Inv In = 463.66) to MH F1 (Inv Out = 469.55) - 116.5' @ 5.06%											
L227	0+89.69	469.00	469.44	33.50	10.90	0.00	0+00.00	472.65	474.27	0.00	
L228	0+69.68	467.95	469.36	33.50	16.03	0.00	0+00.00	473.32	474.94	0.00	
L229	0+49.69	466.91	469.28	33.50	19.04	0.00	0+00.00	473.29	475.62	0.00	
L230	0+29.68	465.86	469.20	33.50	24.15	0.00	0+00.00	473.95	476.00	0.00	
L231	0+09.49	464.80	469.12	33.50	29.28	0.00	0+00.00	474.61	476.00	0.00	
MH F1											
L226	0+00.00	470.30	469.55	31.50	5.08	0.00	0+00.00	471.90	474.00	0.00	

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SEEBACK DRIVE ROAD PROFILES

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
2	02/15/2024

DATE: 11/06/2023
SCALE: H:1"=50 V:1"=5"
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 52 OF 97
SLD2022-06

1+50

1+00

0+50

0+00

3+50

3+00

2+50

2+00

10 0 10 20
SCALE: 1" = 10'

SCALE: 1" = 5'
10 5 0 2.5 5

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SEEBACK DRIVE ROAD CROSS SECTIONS

NORBORNE GLEBE

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Rev. No.	Date

DATE: 11/06/2023

SCALE: H:1"=10' V:1"=5'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 53 OF 97

SLD2022-06

5+50

5+00

4+50

4+00

7+00

6+50

6+00

10 0 10 20
SCALE: 1" = 10'

SCALE: 1" = 5'
10 5 0 2.5 5

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DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 54 OF 97

SLD2022-06

9+00

8+50

8+00

7+50

11+00

10+50

10+00

9+50

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SEBACK DRIVE ROAD CROSS SECTIONS

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Rev. No.	Date

DATE: 11/06/2023

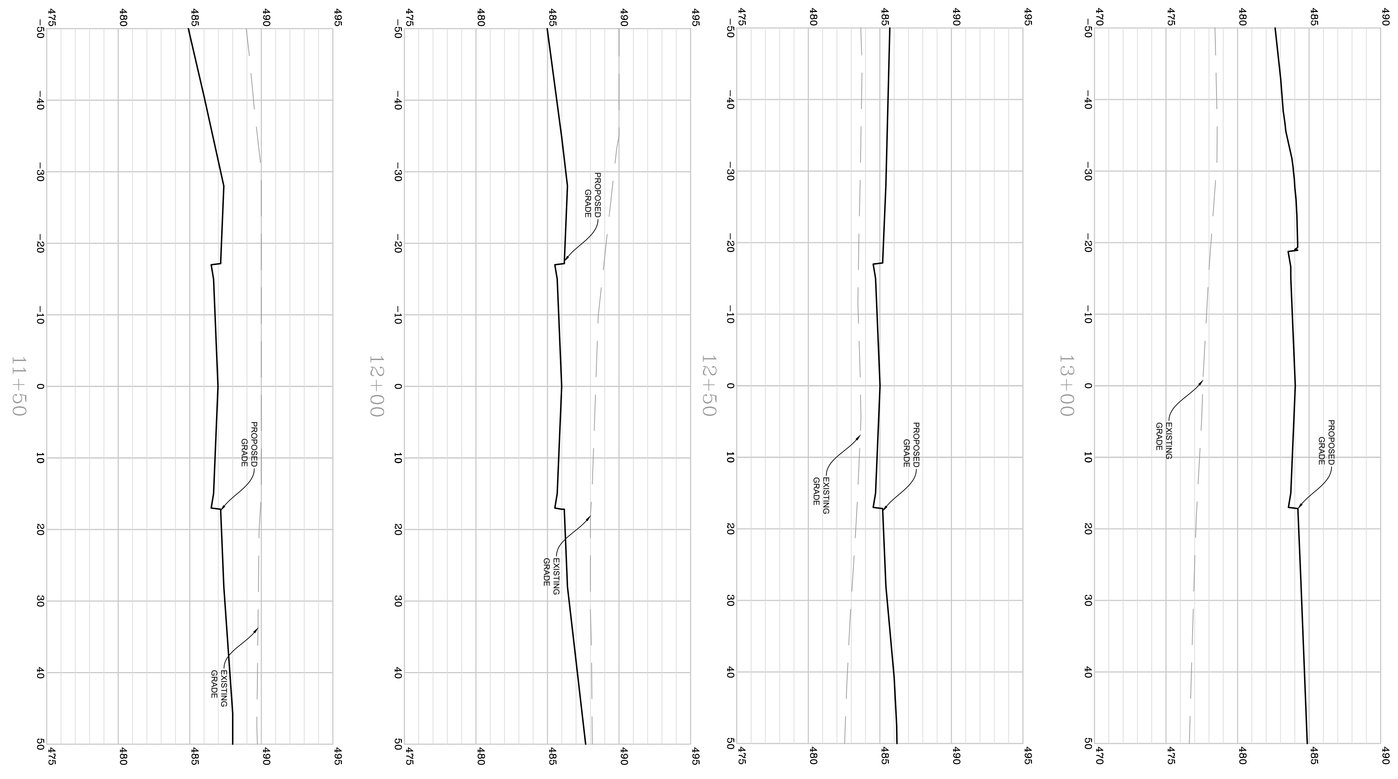
SCALE: H:1"=10' V:1"=5'

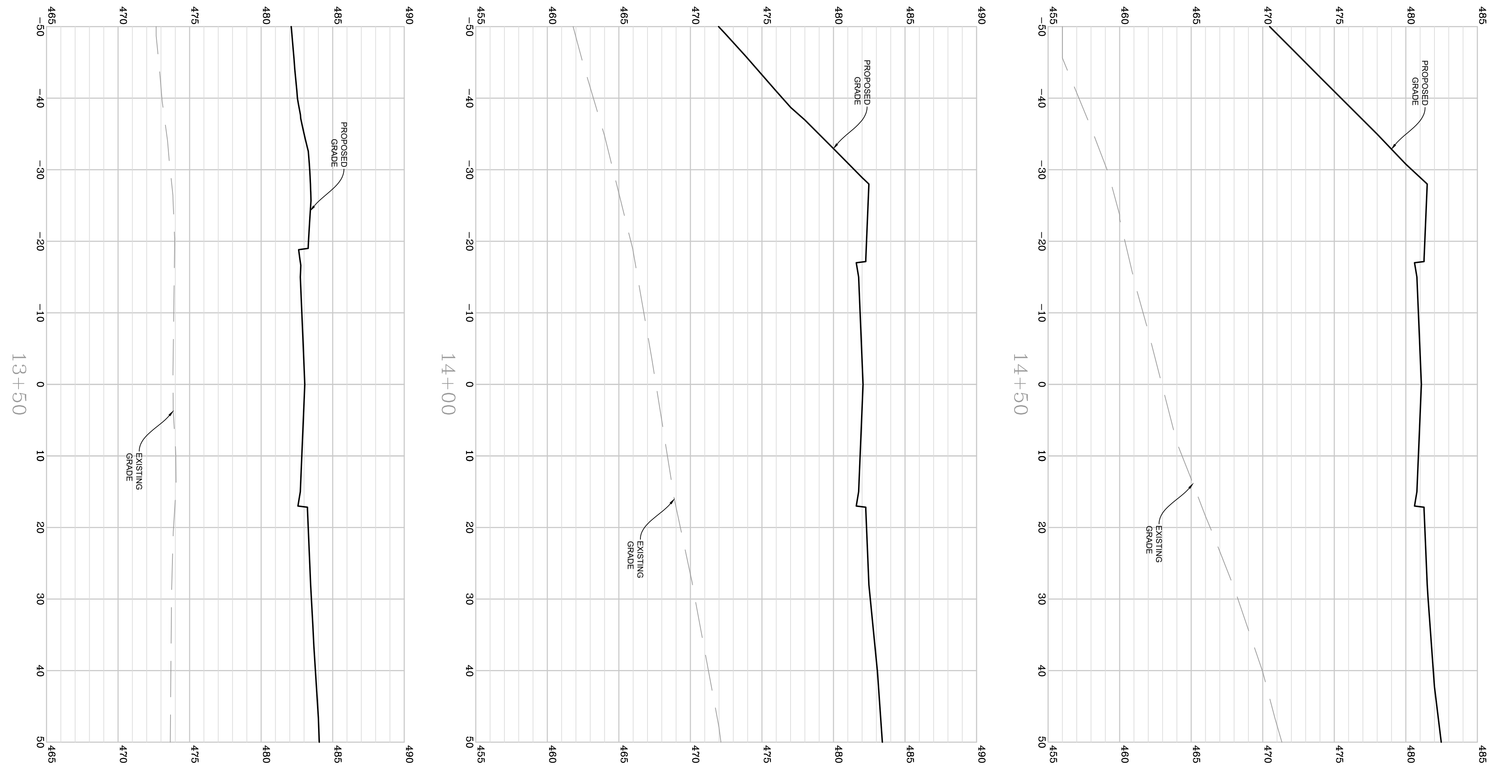
DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 55 OF 97

SLD2022-06





SCALE: 1" = 50'

SCALE: 1" = 5'

SEEBACK DRIVE ROAD CROSS SECTIONS

NORBORNE GLEBE

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CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

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SCALE: H:1"=50' V:1"=5'
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SHEET 56 OF 97
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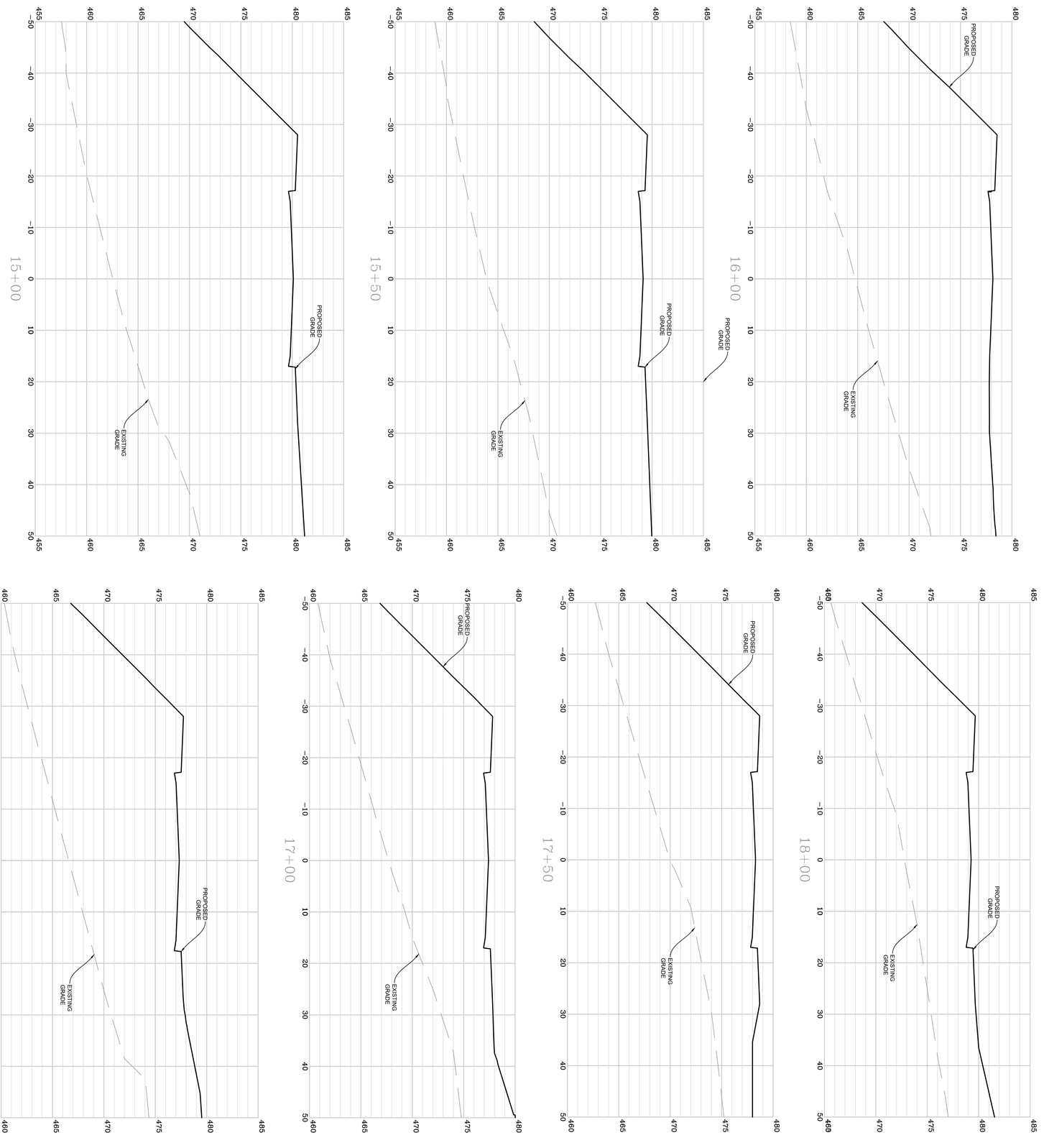

SCALE: 1" = 10'

SCALE: 1" = 5'

SEEBACK DRIVE ROAD CROSS SECTION

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
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SCALE:	H:1"=10' V:1"=5'
DESIGNED BY:	CC/CW
FILE NO.	4542A
SHEET	57 OF 97
SLD2022-06	

50 25 0 50 100

SCALE: 1" = 50'

SCALE: 1" = 5'

10 5 0 2.5 5

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SEEBACK DRIVE ROAD CROSS SECTIONS

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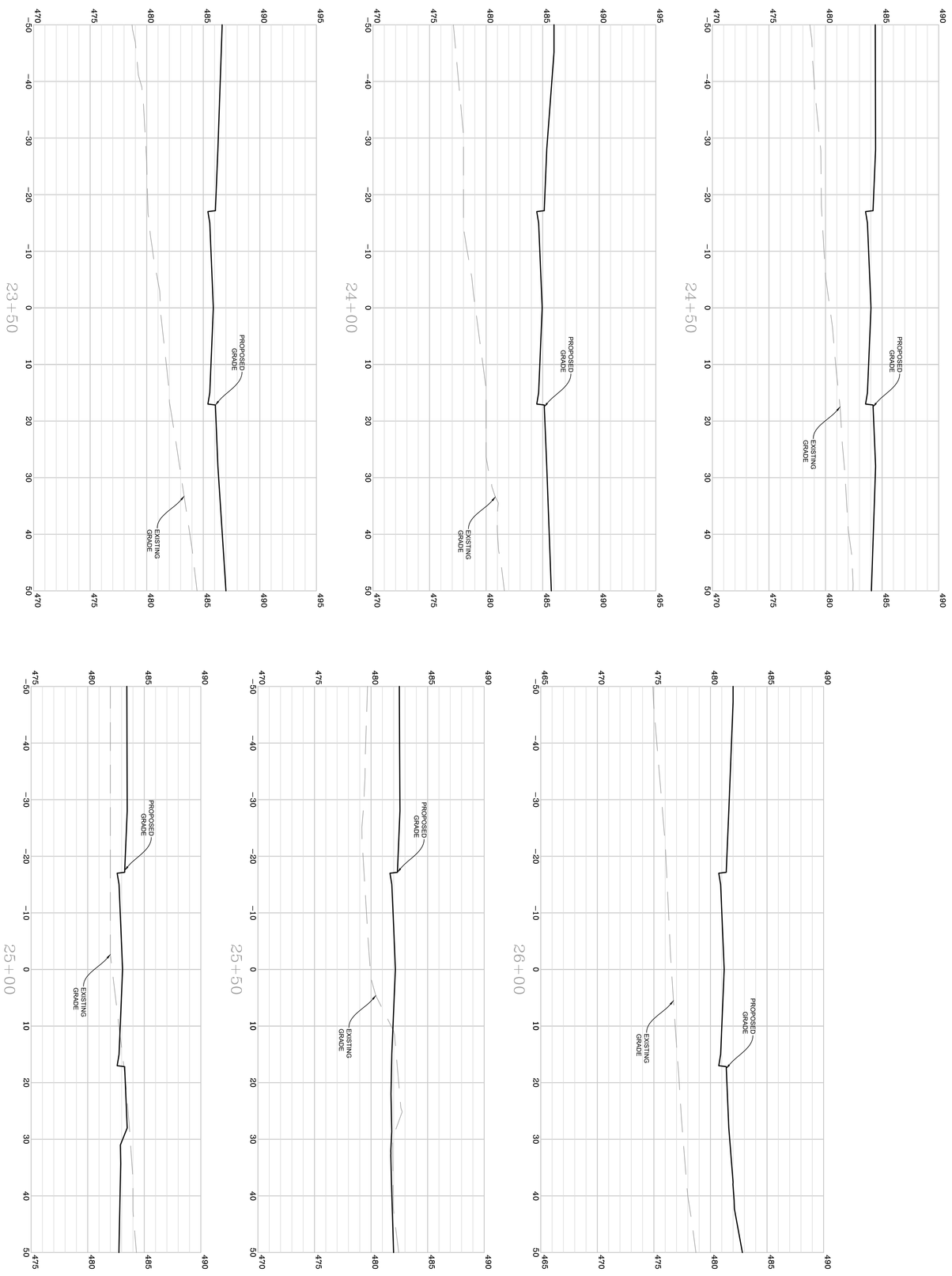
SCALE: H:1"=50 V:1"=5"

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 58 OF 97

SLD2022-06



SCALE: 1" = 10'

SCALE: 1" = 5'

SEEBACK DRIVE ROAD CROSS SECTIONS

NORBORNE GLEBE

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CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: H:1"=50' V:1"=5'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 59 OF 97
SLD2022-06

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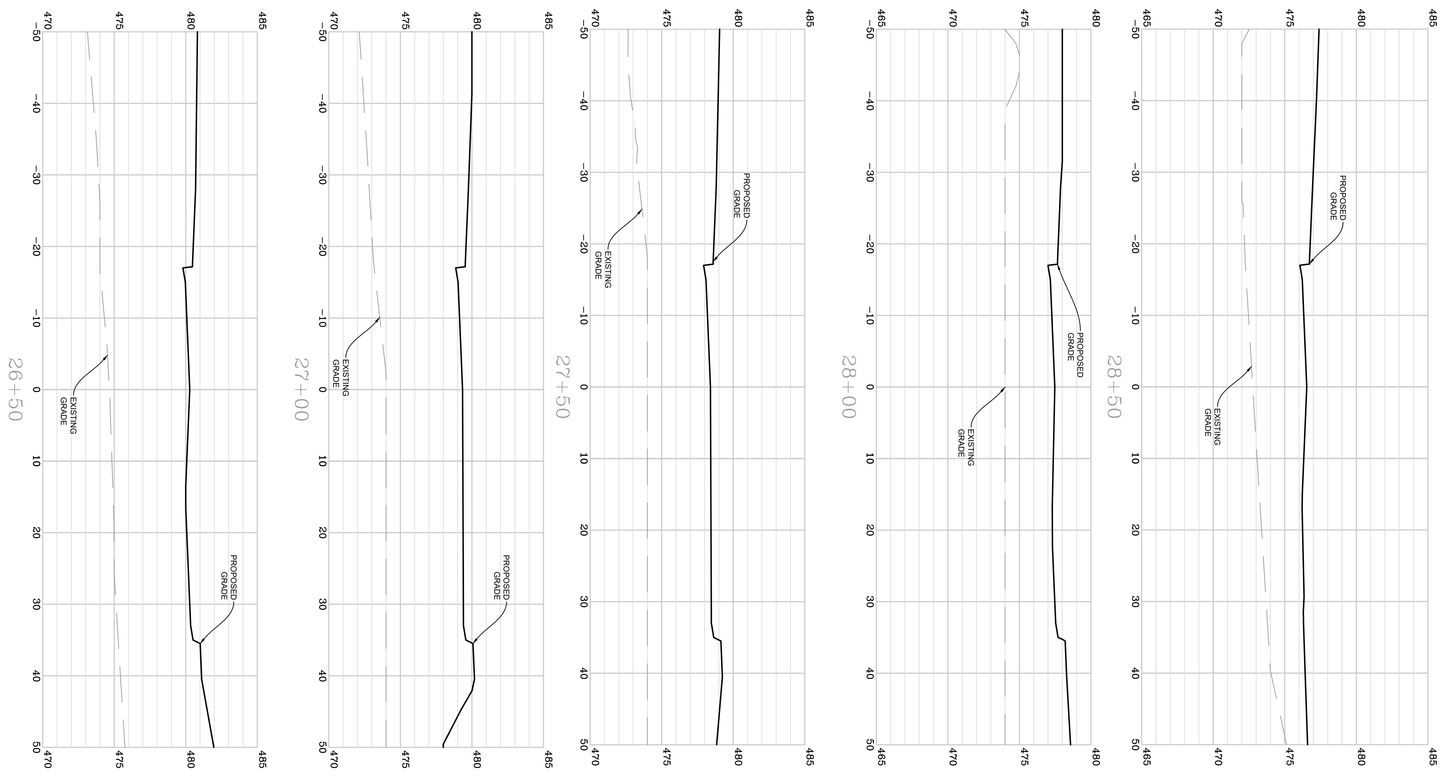

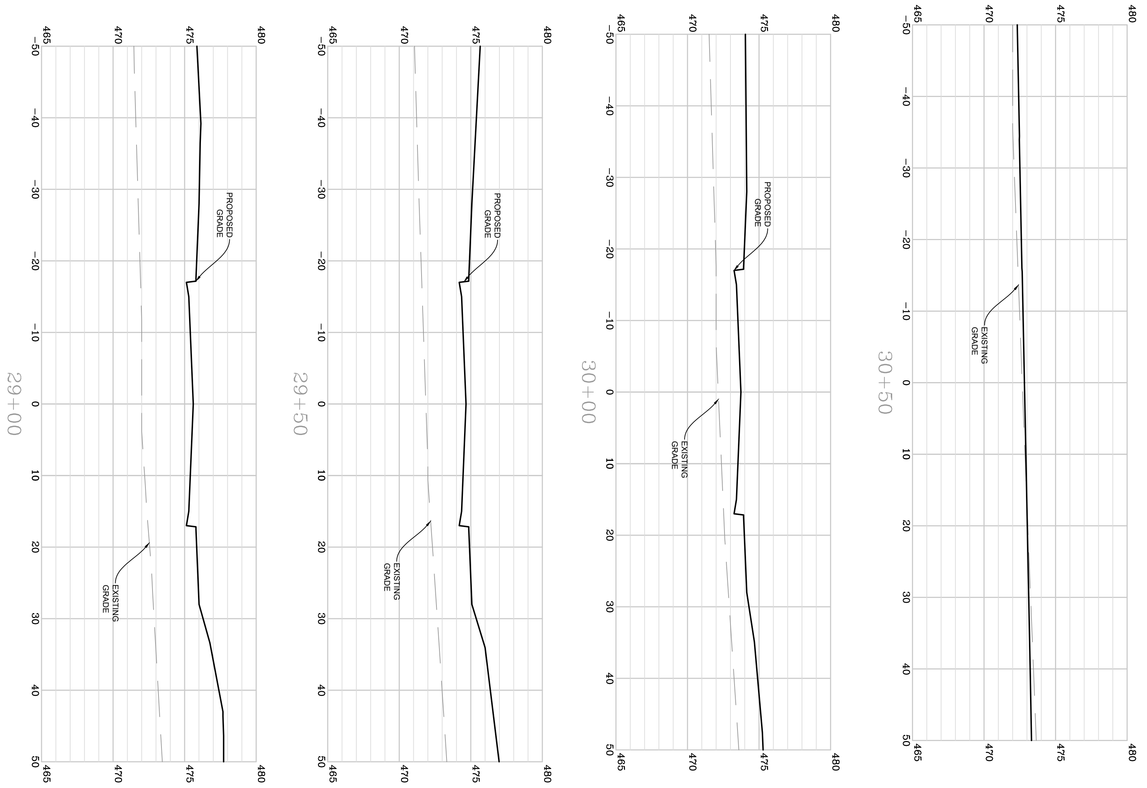

SCALE: 1" = 10'

SCALE: 1" = 5'

SEEBACK DRIVE ROAD CROSS SECTIONS

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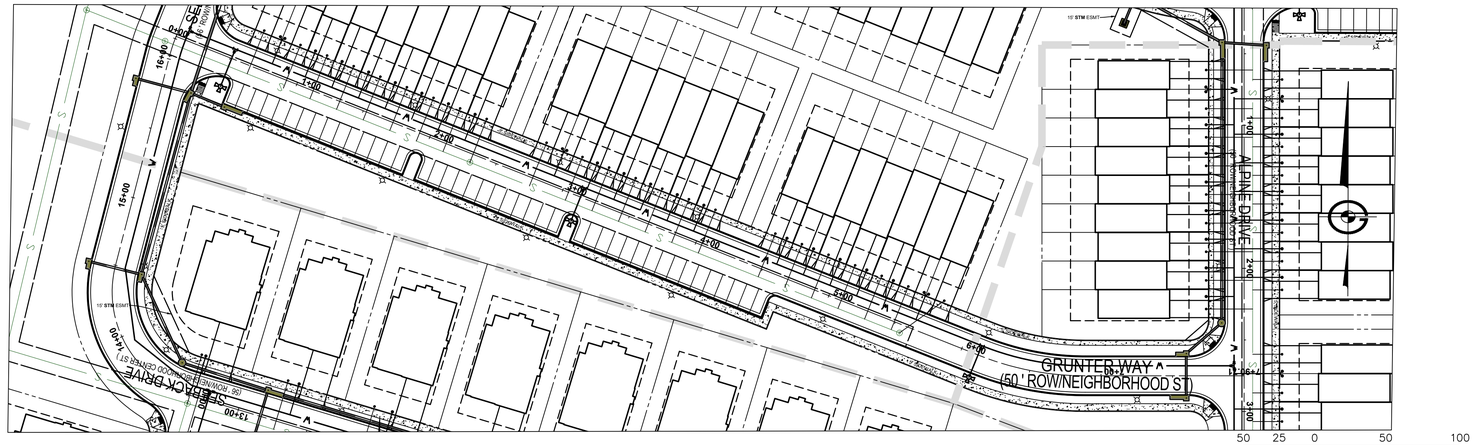

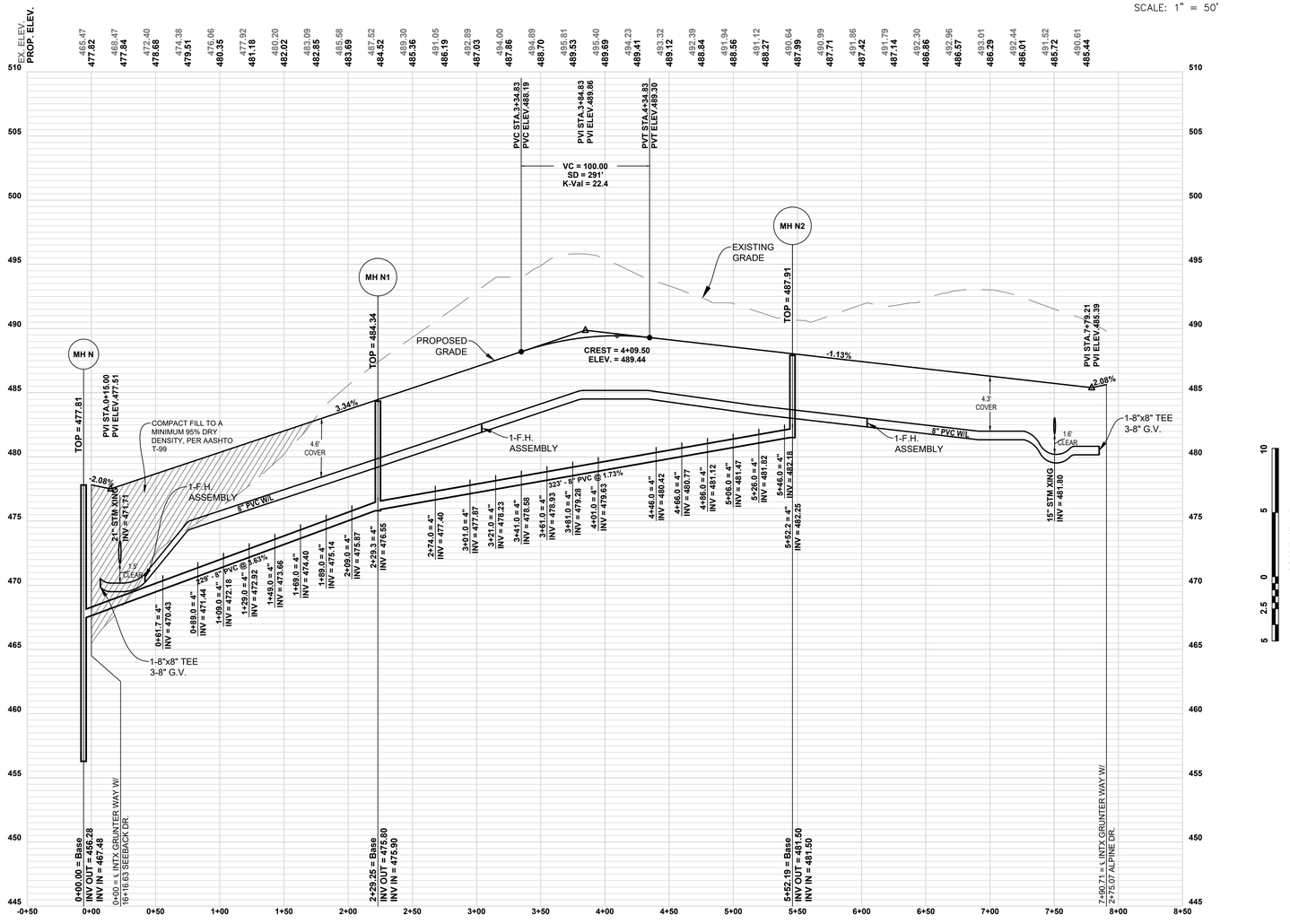

Grunter Way

Lot Number	Lateral Station	Lateral Invert (ft)	Main Invert (ft)	Lateral Length (ft)	Lateral Slope (%)	Riser Height (ft)	Station @ Riser End	Invert @ Lateral Cleanout (ft)	Finish Grade @ Cleanout (ft)	Basement Floor Elev (ft)	Comments
MH N (Inv In = 467.48) to MH N1 (Inv Out = 475.80) - 229.3' @ 3.63%											
L312	2+08.98	475.87	467.38	32.50	19.97	0.00	0+00.00	482.36	484.26	0.00	
L313	1+88.99	475.14	466.58	32.50	20.03	0.00	0+00.00	481.65	483.58	0.00	
L314	1+68.99	474.40	465.78	32.50	20.12	0.00	0+00.00	480.94	482.72	0.00	
L315	1+48.99	473.66	464.98	32.50	20.19	0.00	0+00.00	480.22	482.26	0.00	
L316	1+28.99	472.92	464.18	32.50	20.28	0.00	0+00.00	479.51	481.57	0.00	
L317	1+08.99	472.18	463.38	32.50	20.37	0.00	0+00.00	478.80	480.72	0.00	
L318	0+88.99	471.44	462.58	32.50	20.43	0.00	0+00.00	478.08	480.26	0.00	
L319	0+61.74	470.43	461.49	32.50	23.48	0.00	0+00.00	478.06	479.07	0.00	
MH N1 (Inv In = 475.90) to MH N2 (Inv Out = 481.50) - 322.9' @ 1.73%											
L298	3+16.73	482.18	480.96	30.50	8.03	0.00	0+00.00	484.63	488.66	0.00	
L299	2+96.73	481.82	480.16	30.50	9.54	0.00	0+00.00	484.73	488.67	0.00	
L300	2+76.73	481.47	479.36	30.50	13.31	0.00	0+00.00	485.53	488.86	0.00	
L301	2+56.73	481.12	478.56	30.50	14.79	0.00	0+00.00	485.63	489.15	0.00	
L302	2+36.73	480.77	477.76	30.50	16.30	0.00	0+00.00	485.74	489.44	0.00	
L303	2+16.73	480.42	476.96	32.50	18.83	0.00	0+00.00	486.54	489.73	0.00	
L304	1+71.73	479.63	478.16	32.50	23.54	0.00	0+00.00	487.28	490.00	0.00	
L305	1+51.73	479.28	474.36	32.50	22.77	0.00	0+00.00	486.68	490.00	0.00	
L306	1+31.73	478.93	473.56	32.50	22.03	0.00	0+00.00	486.09	489.25	0.00	
L307	1+11.73	478.58	472.76	32.50	23.42	0.00	0+00.00	486.19	488.53	0.00	
L308	0+91.73	478.23	471.96	32.50	22.68	0.00	0+00.00	485.60	488.08	0.00	
L309	0+71.73	477.87	471.16	32.50	21.91	0.00	0+00.00	484.99	487.25	0.00	
L310	0+44.73	477.40	470.08	32.50	21.63	0.00	0+00.00	484.43	486.37	0.00	
L311	0+00.00	476.55	468.19	30.50	21.15	0.00	0+00.00	483.00	484.73	0.00	
MH N2											
L297	0+00.00	482.25	481.21	34.58	6.68	0.00	0+00.00	484.56	488.29	0.00	

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GRUNTER WAY PROFILES

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
2	02/15/2024

DATE: 11/06/2023
SCALE: H:1"=50 V:1"=5"
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 61 OF 97
SLD2022-06

2+50

2+00

1+50

1+00

0+50

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3+50

3+00

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SCALE: 1" = 10'

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10 0 10 20
SCALE: 1" = 10'

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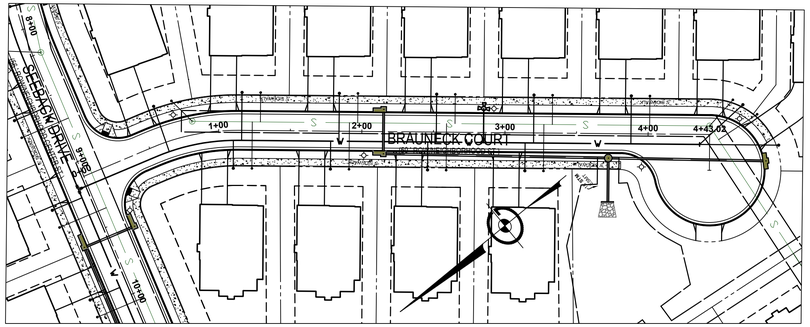

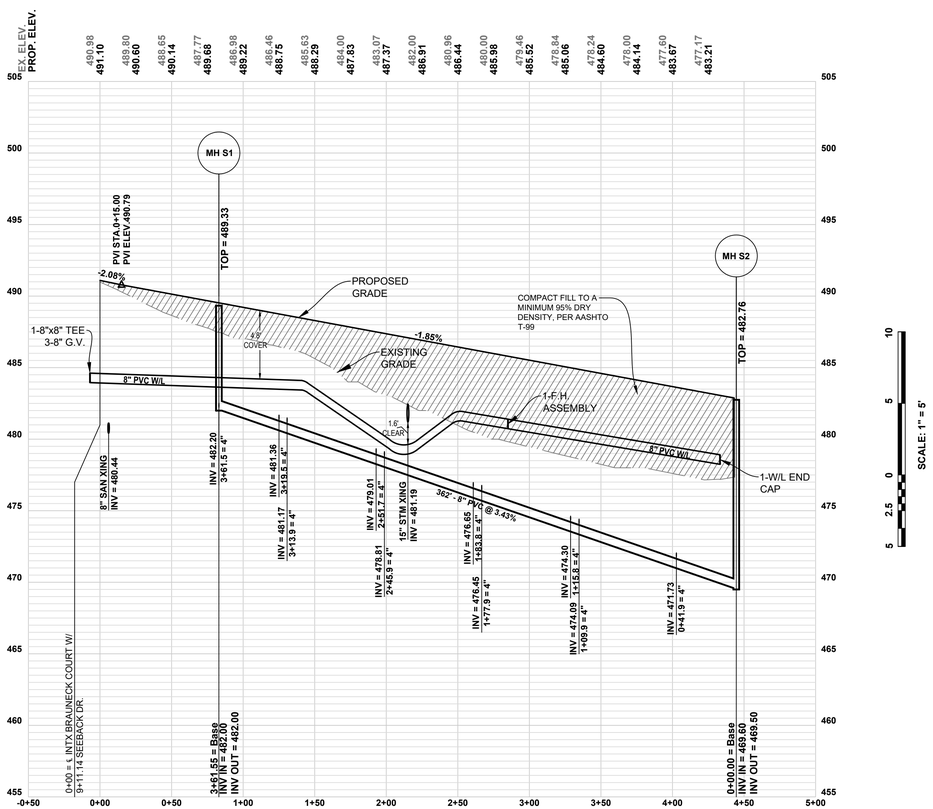

BRAUNECK COURT

50' R.O.W., **27' FC TO FC**
POSTED SPEED 25 MPH

50 25 0 50 100
SCALE: 1" = 50'

Brauneck Court										
MH R2 (Inv In = 459.81) to MH S2 (Inv Out = 469.50) - 257.6' @ 3.41%										
Lot Number	Lateral Station	Lateral Invert (ft)	Main Invert (ft)	Lateral Length (ft)	Lateral Slope (%)	Riser Height (ft)	Station @ Riser End	Invert @ Lateral Cleanout (ft)	Finish Grade @ Cleanout (ft)	Basement Floor Elev (ft)	Comments
L112	2+46.18	469.92	469.11	30.23	2.12	0.00	0+00.00	470.56	482.96	0.00	Hung Sewer
MH S1											
L89	0+00.00	482.20	475.02	18.35	23.21	0.00	0+00.00	486.46	490.51	0.00	
MH S2 (Inv In = 469.60) to MH S1 (Inv Out = 482.00) - 361.5' @ 3.43%											
L99	3+19.54	481.36	474.39	32.50	10.43	0.00	0+00.00	484.75	489.09	0.00	
L90	3+13.88	481.17	474.31	20.50	16.68	0.00	0+00.00	484.59	488.78	0.00	
L98	2+51.67	479.01	473.38	32.50	9.17	0.00	0+00.00	481.99	488.02	0.00	
L91	2+45.88	478.81	473.29	20.50	15.67	0.00	0+00.00	482.02	487.91	0.00	
L97	1+83.80	476.65	472.36	32.50	8.46	0.00	0+00.00	479.40	486.67	0.00	
L92	1+77.88	476.45	472.27	20.50	14.55	0.00	0+00.00	479.43	486.00	0.00	
L96	1+15.80	474.30	471.34	32.50	8.52	0.00	0+00.00	477.07	485.39	0.00	
L93	1+09.88	474.09	471.25	20.50	13.37	0.00	0+00.00	476.83	485.15	0.00	
L94	0+41.88	471.73	470.23	20.50	12.30	0.00	0+00.00	474.25	484.00	0.00	
L95	0+00.00	470.25	469.50	20.43	9.74	0.00	0+00.00	472.24	482.88	0.00	

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BRAUNECK WAY PROFILES

NORBORNE GLEBE

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CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

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SHEET 64 OF 97

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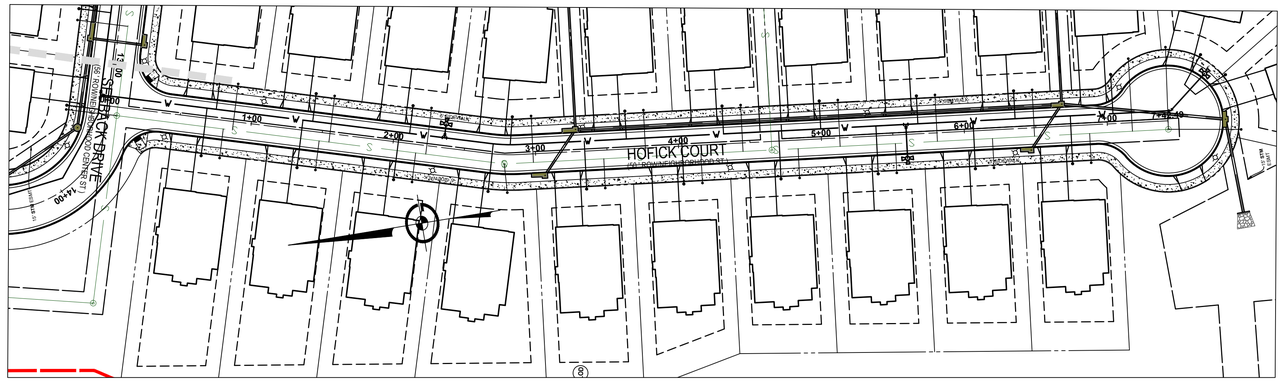

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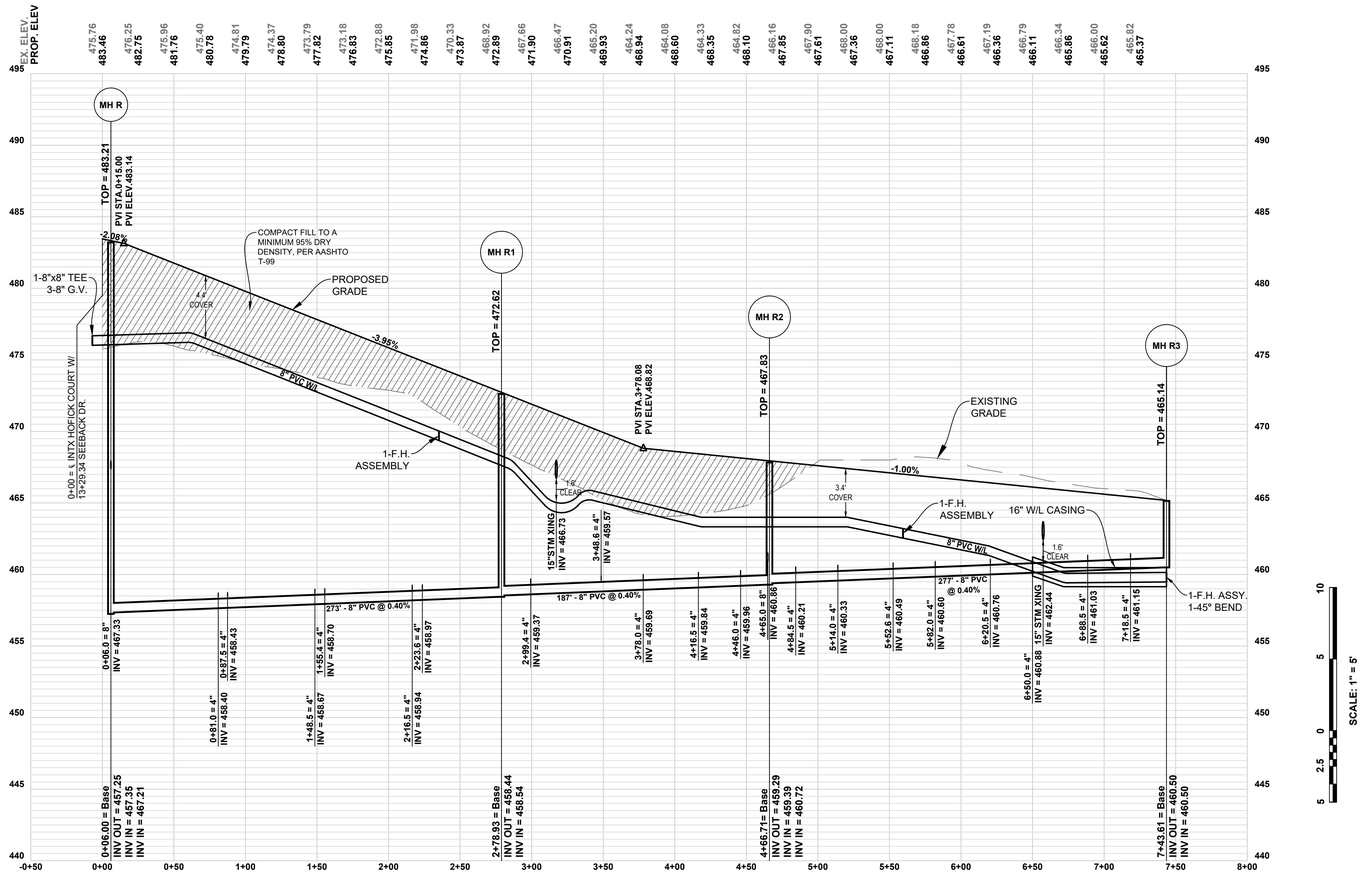
SCALE: 1" = 50'



HOFICK COURT

50' R.O.W., **27' FC TO FC**
POSTED SPEED 25 MPH

50 25 0 50 100

SCALE: 1" = 50'

Hofick Court

Lot Number	Lateral Station	Lateral Invert (ft)	Main Invert (ft)	Lateral Length (ft)	Lateral Slope (%)	Riser Height (ft)	Station @ Riser End	Invert @ Lateral Cleanout (ft)	Finish Grade @ Cleanout (ft)	Basement Floor Elev (ft)	Comments
MH R (Inv In = 457.35) to MH R1 (Inv Out = 458.44) - 272.9' @ 0.40%											
L102	2+17.63	458.97	458.22	32.50	19.66	0.00	0+00.00	465.36	475.50	0.00	
L121	2+10.54	458.95	458.19	20.50	30.93	0.00	0+00.00	465.29	475.58	0.00	
L101	1+49.44	458.70	457.95	32.50	28.65	0.00	0+00.00	468.01	478.18	0.00	
L122	1+42.54	458.67	457.92	20.50	46.88	0.00	0+00.00	468.28	478.28	0.00	
L100	0+81.51	458.42	457.68	32.50	38.00	0.00	0+00.00	470.77	481.27	0.00	
L123	0+75.02	458.40	457.65	20.50	61.12	0.00	0+00.00	470.93	480.71	0.00	
L124	0+00.00	458.00	457.25	31.50	44.00	0.00	0+00.00	471.86	483.52	0.00	
MH R1 (Inv In = 458.54) to MH R2 (Inv Out = 459.29) - 187.2' @ 0.40%											
L105	1+67.07	459.97	459.21	32.50	2.00	0.00	0+00.00	460.62	468.78	0.00	Hung Sewer
L118	1+37.60	459.85	459.09	20.50	2.00	0.00	0+00.00	460.26	468.00	0.00	Hung Sewer
L104	0+99.03	459.69	458.94	32.50	2.00	0.00	0+00.00	460.34	469.93	0.00	Hung Sewer
L119	0+69.64	459.57	458.82	20.50	2.00	0.00	0+00.00	459.98	470.36	0.00	Hung Sewer
L103	0+20.42	459.37	458.62	32.50	9.94	0.00	0+00.00	462.60	472.55	0.00	
L120	0+00.00	459.19	458.44	16.18	22.18	0.00	0+00.00	462.78	472.51	0.00	
MH R2 (Inv In = 459.39) to MH R3 (Inv Out = 460.50) - 277.4' @ 0.40%											
L109	2+52.31	461.16	460.40	50.79	2.01	0.00	0+00.00	462.18	466.00	0.00	Hung Sewer
L114	2+22.36	461.03	460.28	20.50	2.00	0.00	0+00.00	461.44	466.20	0.00	Hung Sewer
L108	1+83.79	460.88	460.13	32.50	2.00	0.00	0+00.00	461.53	466.73	0.00	Hung Sewer
L115	1+54.36	460.76	460.01	20.50	2.00	0.00	0+00.00	461.17	466.91	0.00	Hung Sewer
L107	1+15.83	460.60	459.85	32.50	2.00	0.00	0+00.00	461.25	467.34	0.00	Hung Sewer
L116	0+86.40	460.49	459.74	20.50	2.00	0.00	0+00.00	460.90	467.57	0.00	Hung Sewer
L106	0+47.79	460.33	459.58	30.50	2.13	0.00	0+00.00	460.98	468.09	0.00	Hung Sewer
L117	0+18.36	460.21	459.46	20.50	2.00	0.00	0+00.00	460.62	468.00	0.00	Hung Sewer
MH R3											
L110	0+00.00	460.50	460.50	55.50	2.07	0.00	0+00.00	461.65	465.72	0.00	Hung Sewer
L111	0+00.00	460.50	460.50	46.84	2.18	0.00	0+00.00	461.52	465.15	0.00	Hung Sewer

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HOFICK CT ROAD PROFILES

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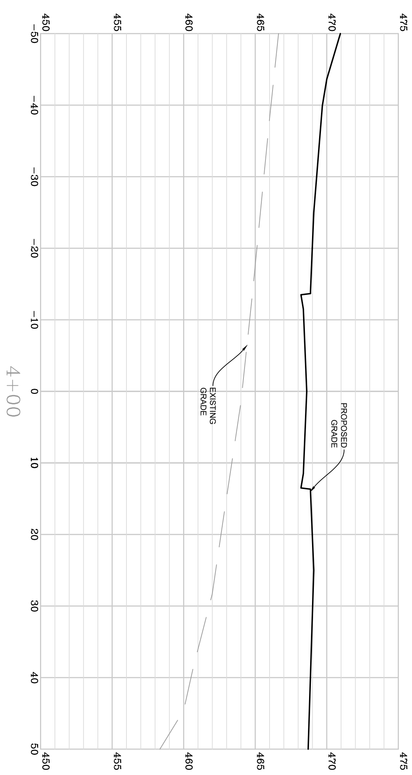

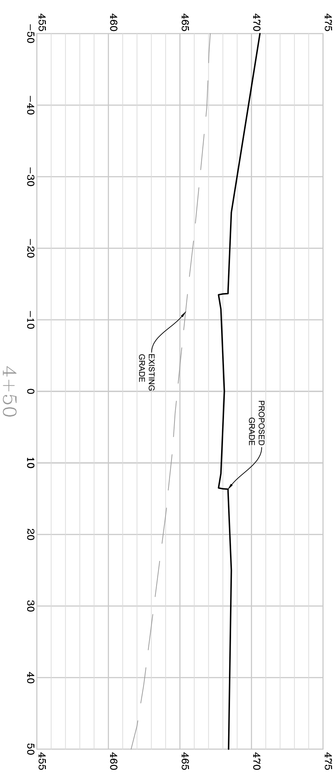

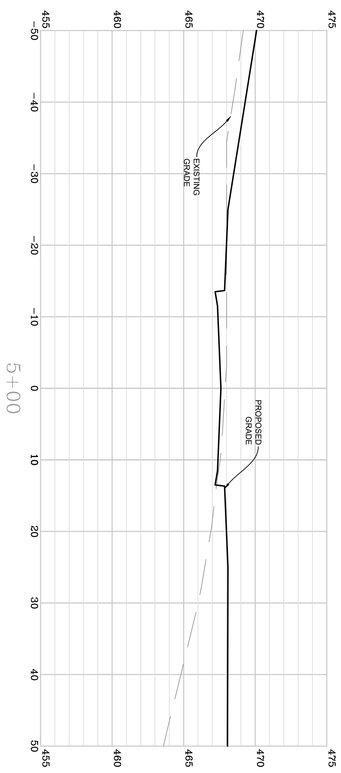

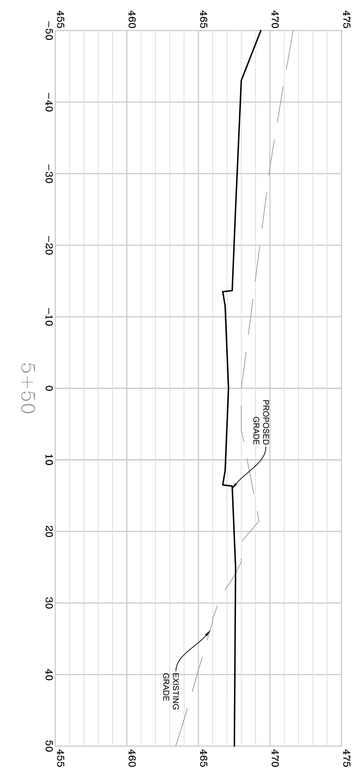

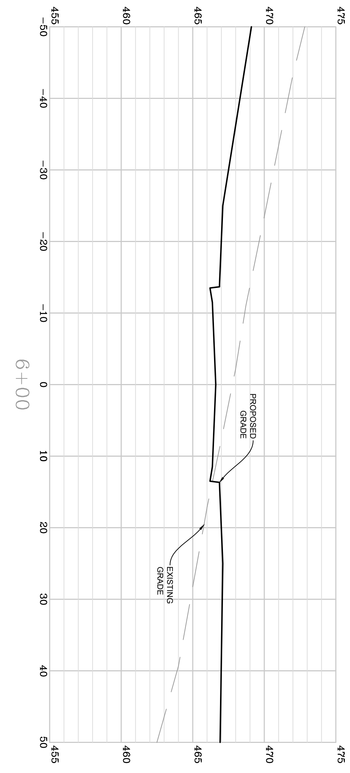

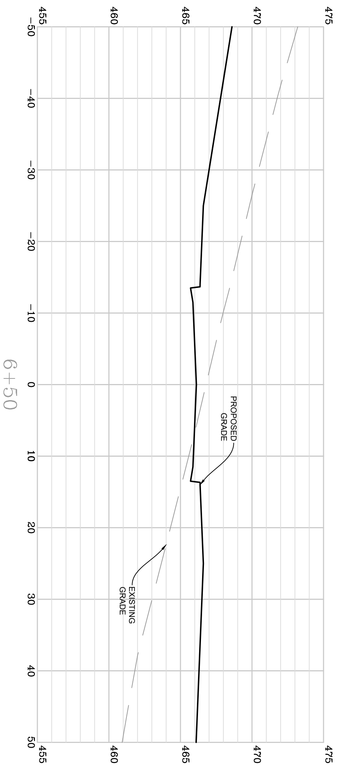

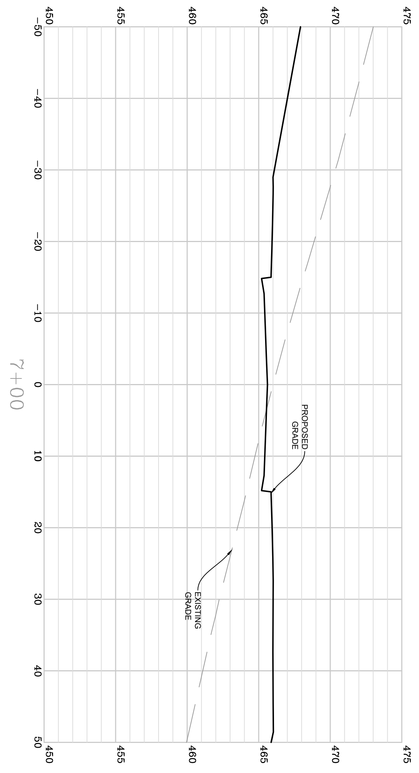

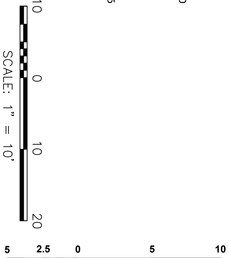

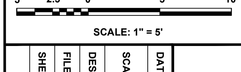

HOFICK CT ROAD CROSS SECTIONS

NORBORNE GLEBE

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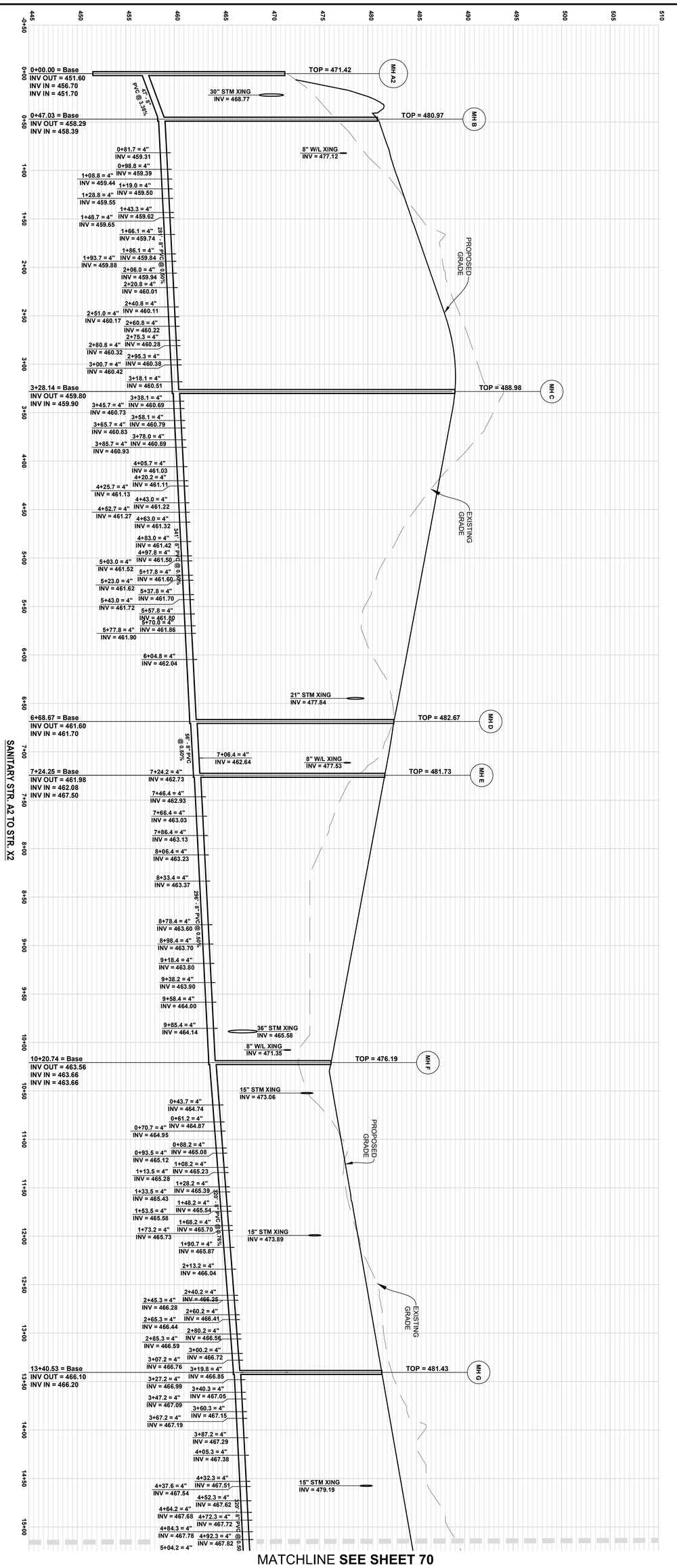

MATCHLINE **SEE SHEET 70**

SANITARY SEWER PROFILES

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FILE NO. 4542A
DESIGNED BY: CC/CW
SCALE: H=1"=50' V=1"=5'
DATE: 11/06/2023

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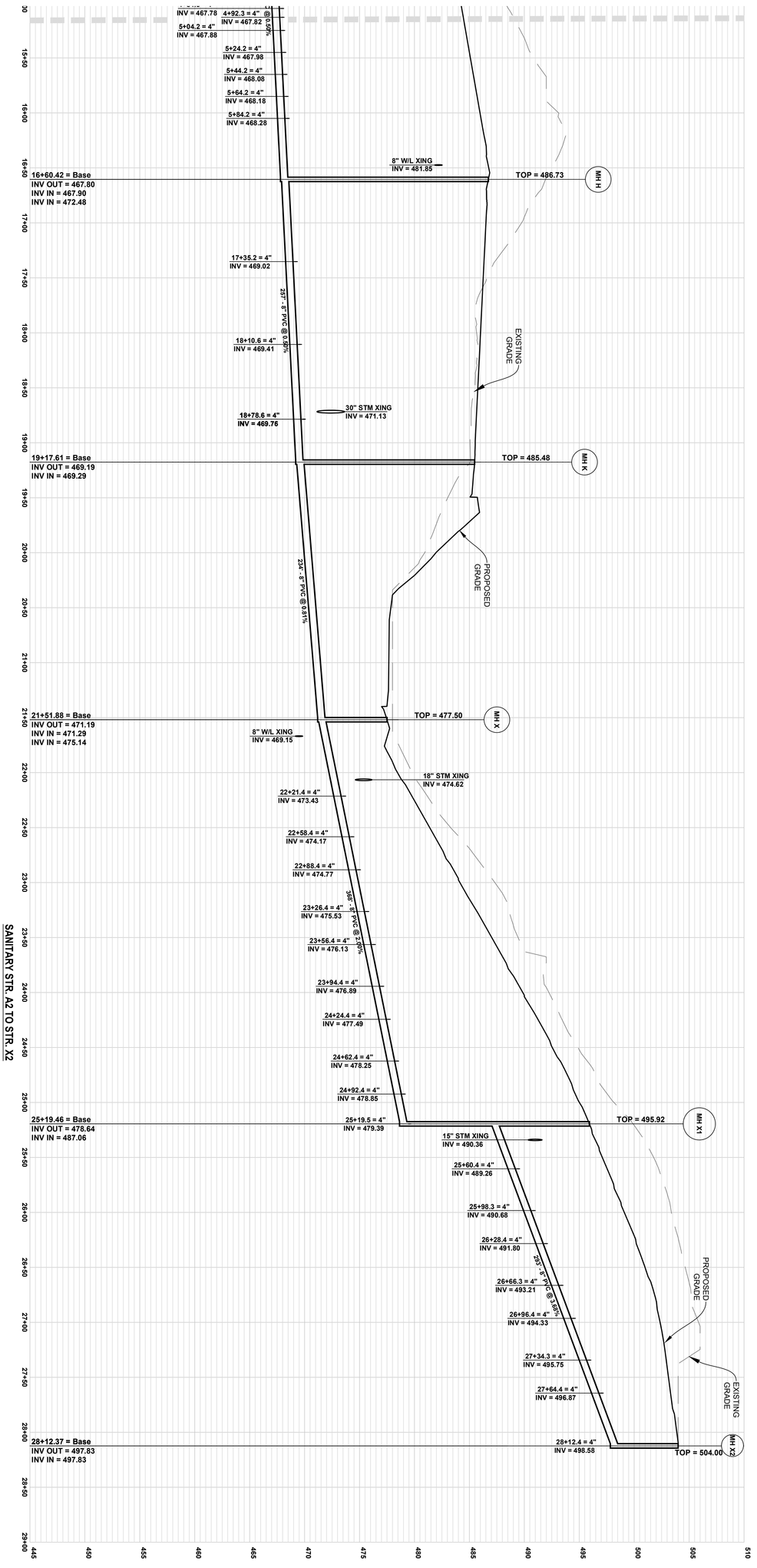
MATCHLINE **SEE SHEET 69**



SCALE: 1" = 50'

50 25 0 50 100

SCALE: 1" = 5'

10 5 0 5

SANITARY SEWER PROFILES

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: H=1"=50' V=1"=5'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 70 OF 97
SLD2022-06

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SANITARY SEWER PROFILES

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CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

SCALE: H=1"=50'
V=1"=5'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 71 OF 97

SLD2022-06

SANITARY EX. PUMP STA. TO STR. R3

SANITARY EX. PUMP STA. TO STR. R3

SCALE: 1" = 5'

SCALE: 1" = 50'

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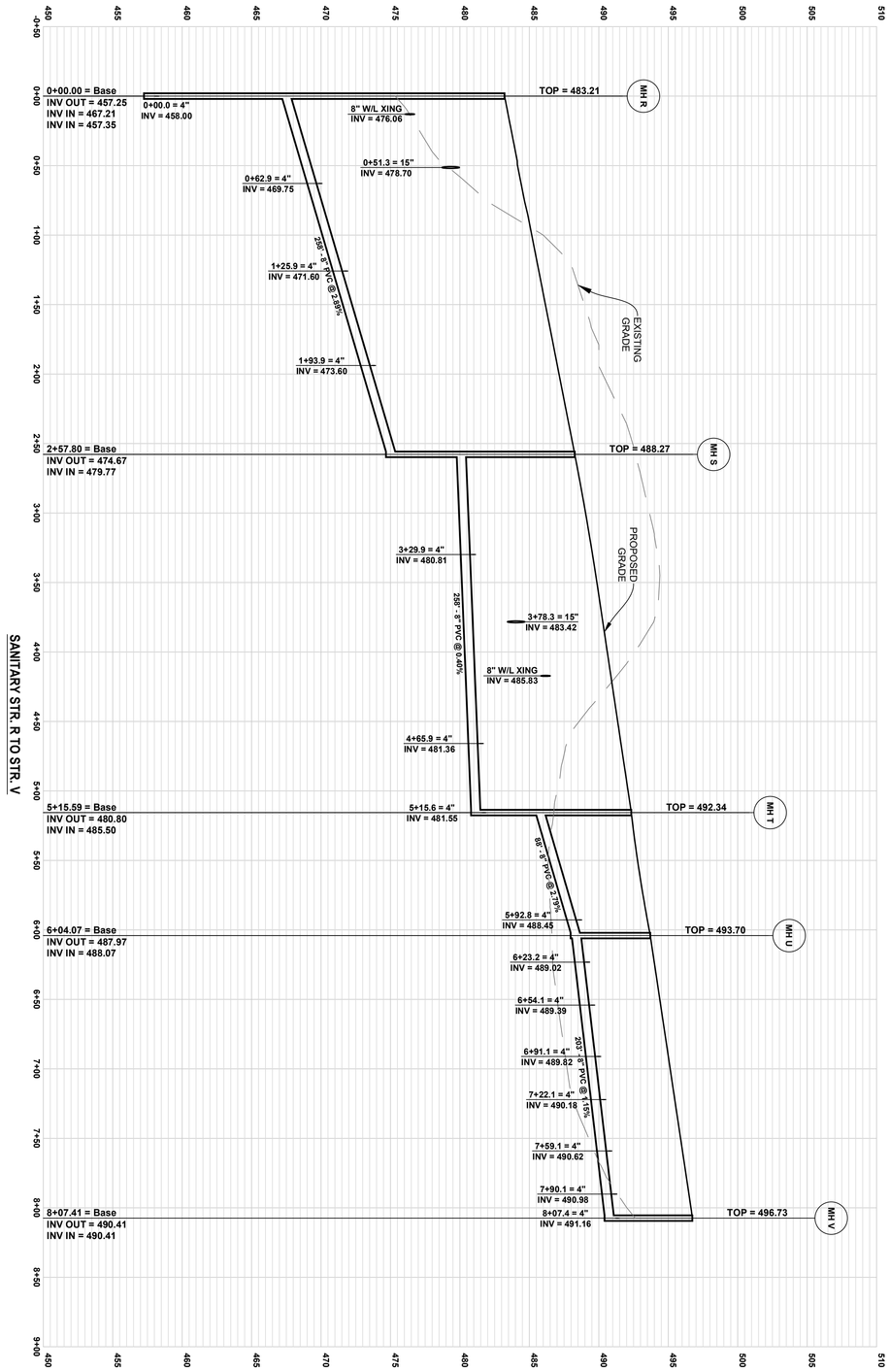
SCALE: H=1"=50'
V=1"=5'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 72 OF 97

SLD2022-06



SCALE: 1" = 50'

50 25 0 50 100

SCALE: 1" = 5'

10 5 0 5

SANITARY SEWER PROFILES

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

SLD2022-06
SHEET 73 OF 97
FILE NO. 4542A
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STORM STR. 1 TO STR. 14

10 5 0 2.5 5

SCALE: 1" = 5'

NOTE:
EXISTING UTILITIES SHOWN PER PREVIOUS DESIGN DATA.
CONTRACTOR TO FIELD VERIFY FIELD CONDITIONS.

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CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
1	01/17/2024

DATE: 11/06/2023

SCALE: H:1"=50'
V:1"=5"

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 74 OF 97

SLD2022-06

STORM STR. 6 TO STR. 6A

STORM STR. 7 TO STR. 7A

STORM STR. 8 TO STR. 8A

STORM STR. 9 TO STR. 9A

STORM STR. 9 TO STR. 9B

STORM STR. 10 TO STR. 10A

STORM STR. 12 TO STR. 12A

STORM STR. 26 TO STR. 26A

STORM STR. 27 TO STR. 27A

STORM STR. 28 TO STR. 28A

STORM STR. 29 TO STR. 29A

STORM STR. 30 TO STR. 30A

STORM STR. 35 TO STR. 36

SCALE: 1" = 5'

SCALE: 1" = 50'

NOTE:
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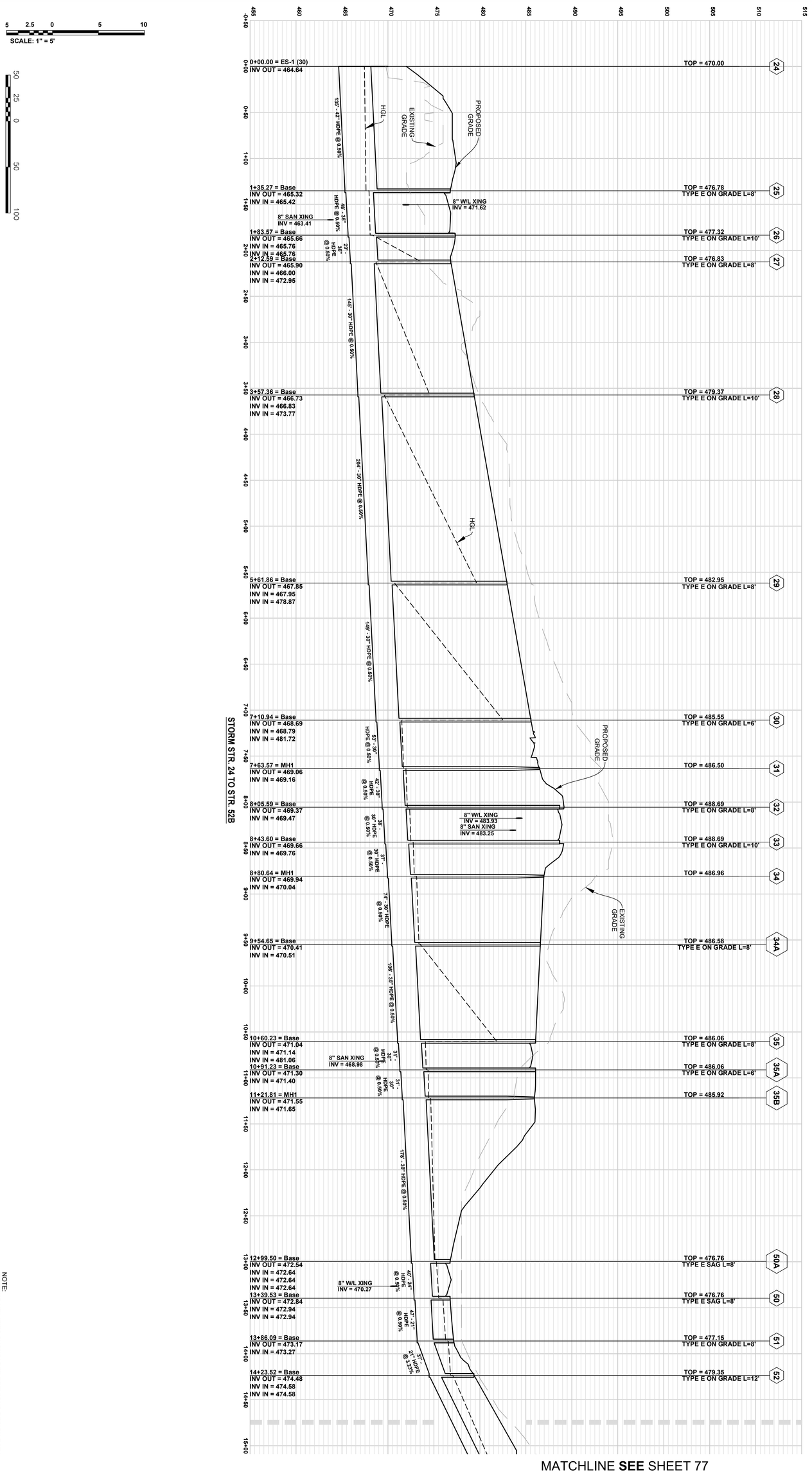
SCALE: H:1"=50'
V:1"=5"

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 75 OF 97

SLD2022-06



MATCHLINE **SEE** SHEET 77

NOTE:
EXISTING UTILITIES SHOWN PER PREVIOUS DESIGN DATA.
CONTRACTOR TO FIELD VERIFY FIELD CONDITIONS.

STORM SEWER PROFILES

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PHASE 10B, 11, 12, & 13
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DATE: 11/06/2023
SCALE: H:1"=50' V:1"=5'
DESIGNED BY: CG/CW
FILE NO. 4542A
SHEET 76 OF 97
SLD2022-06

NOTE:
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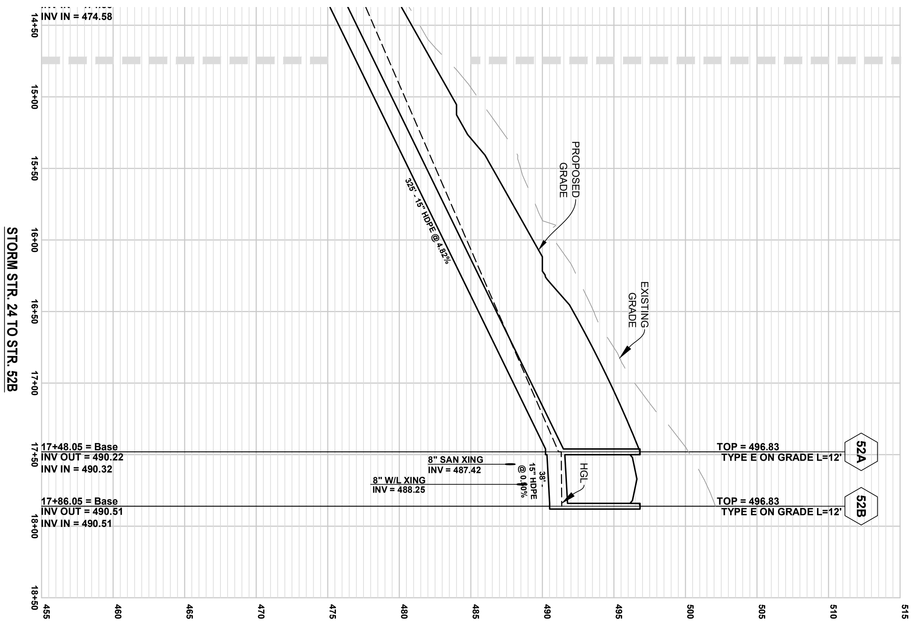
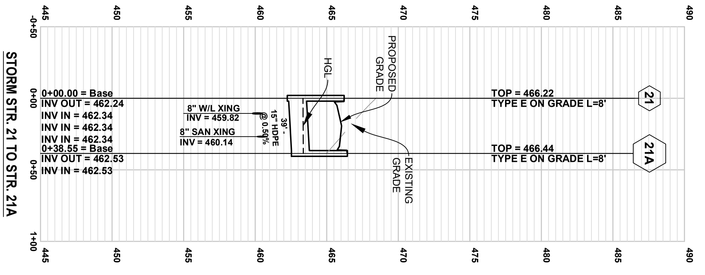
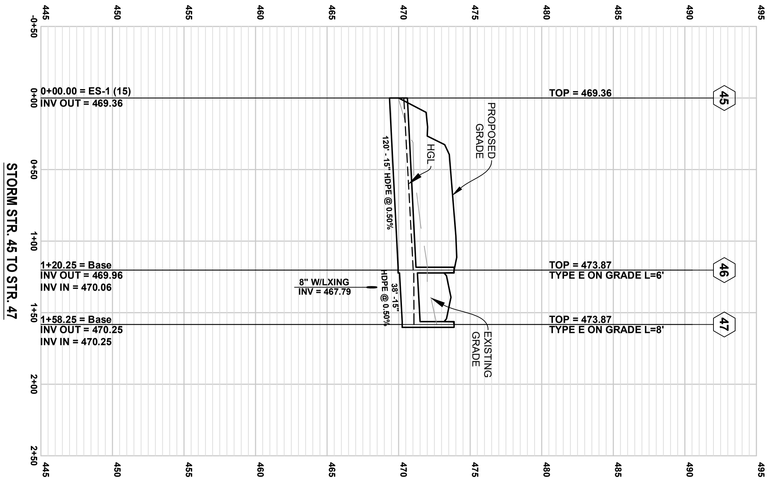
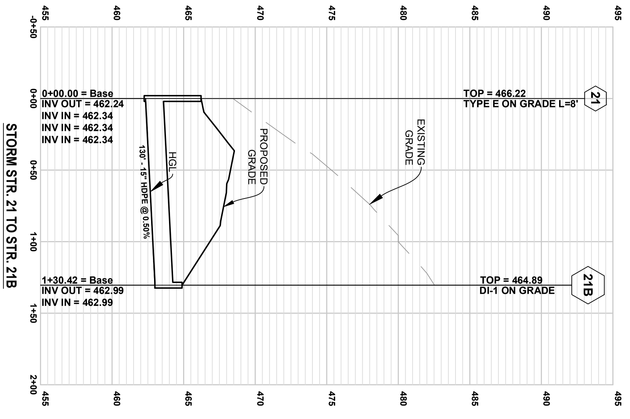
CONTRACTOR TO FIELD VERIFY FIELD CONDITIONS.

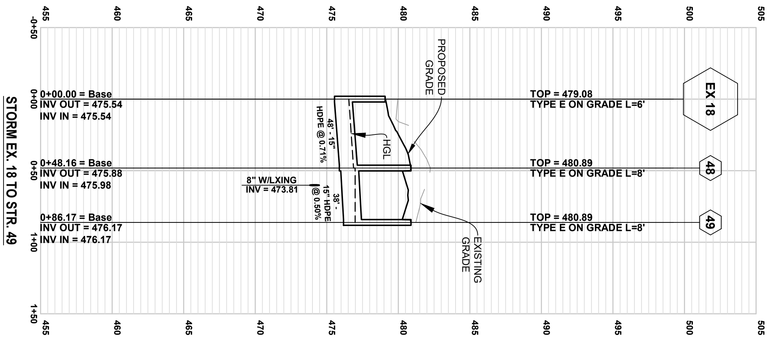
MATCHLINE **SEE** SHEET 76

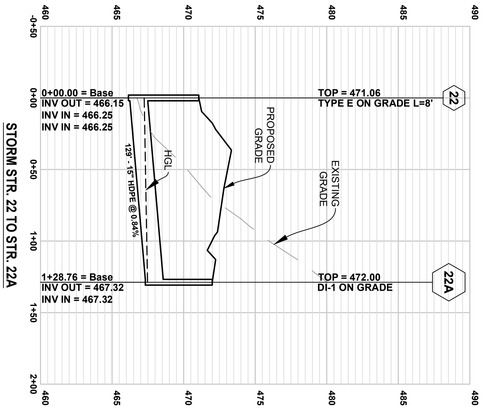












SCALE: 1" = 50'

SCALE: 1" = 5'

STORM SEWER PROFILES

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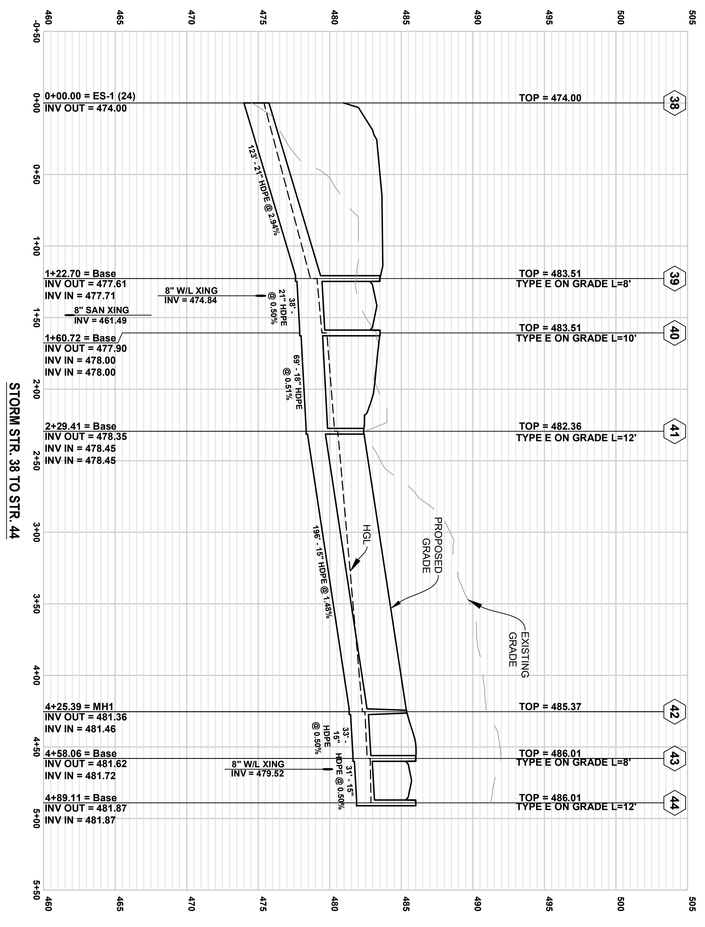
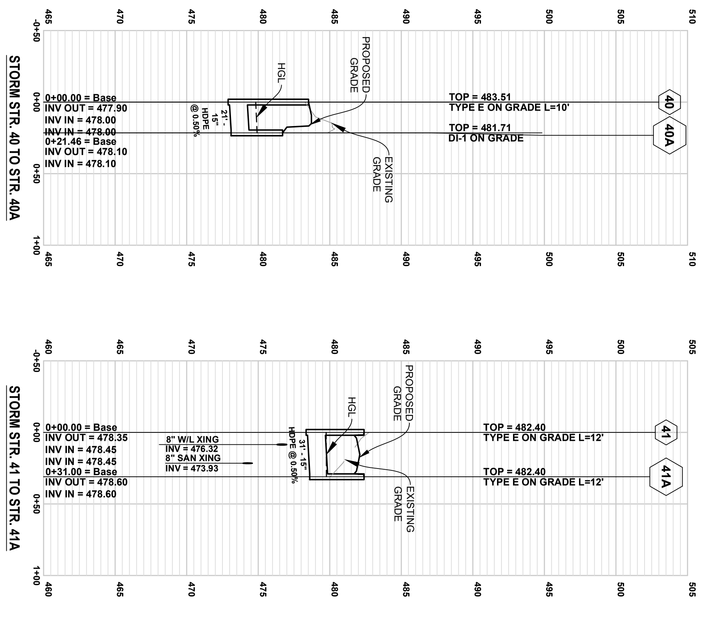
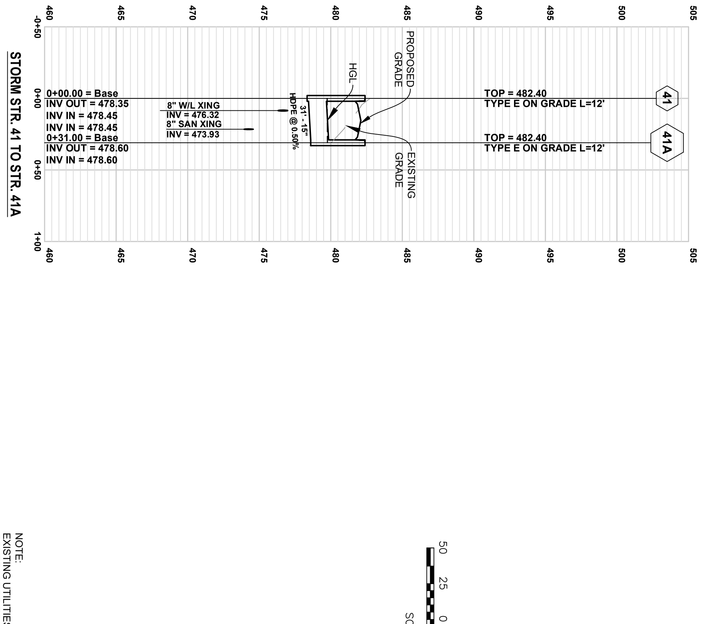
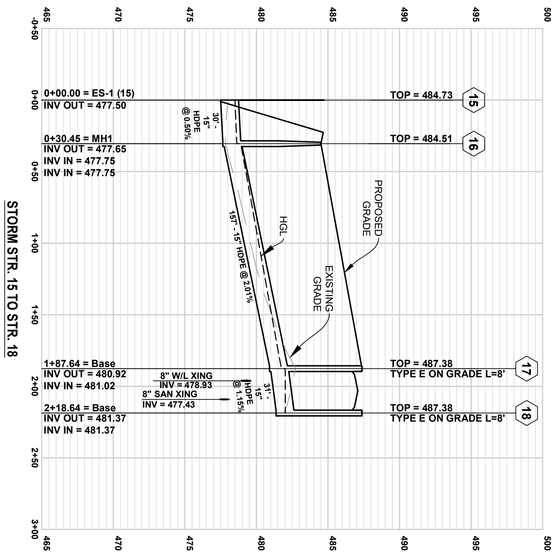
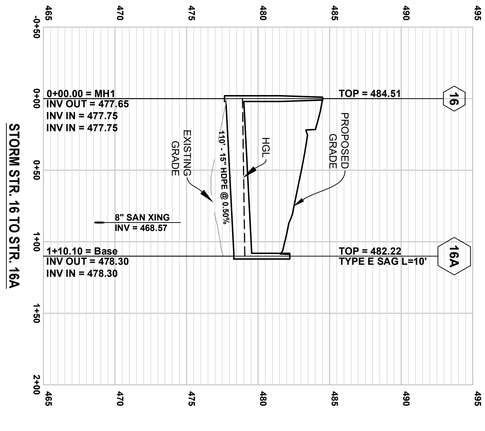
FILE NO.	4542A
SHEET	77 OF 97
	SLD2022-06

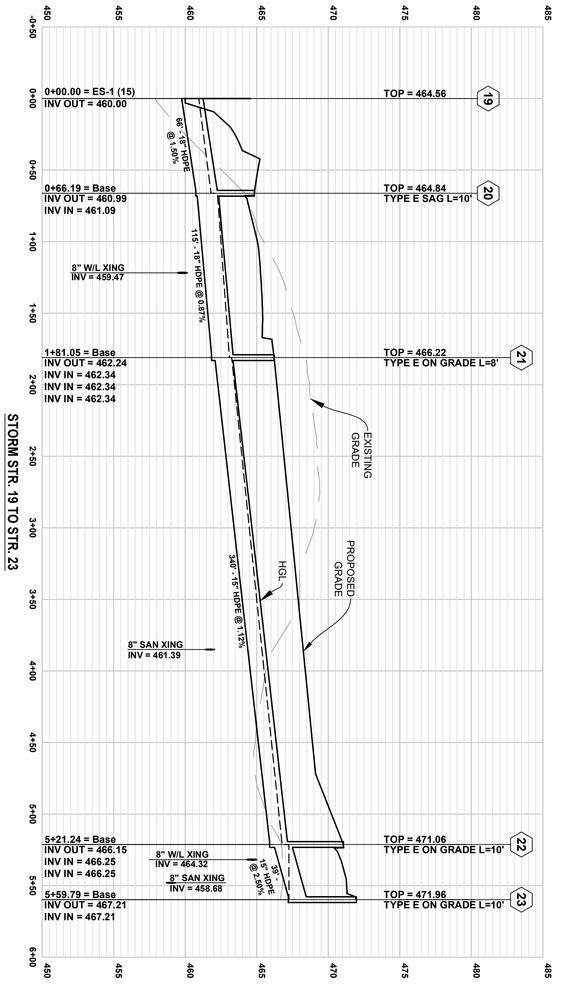












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STORM SEWER PROFILES

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SHEET 78 OF 97
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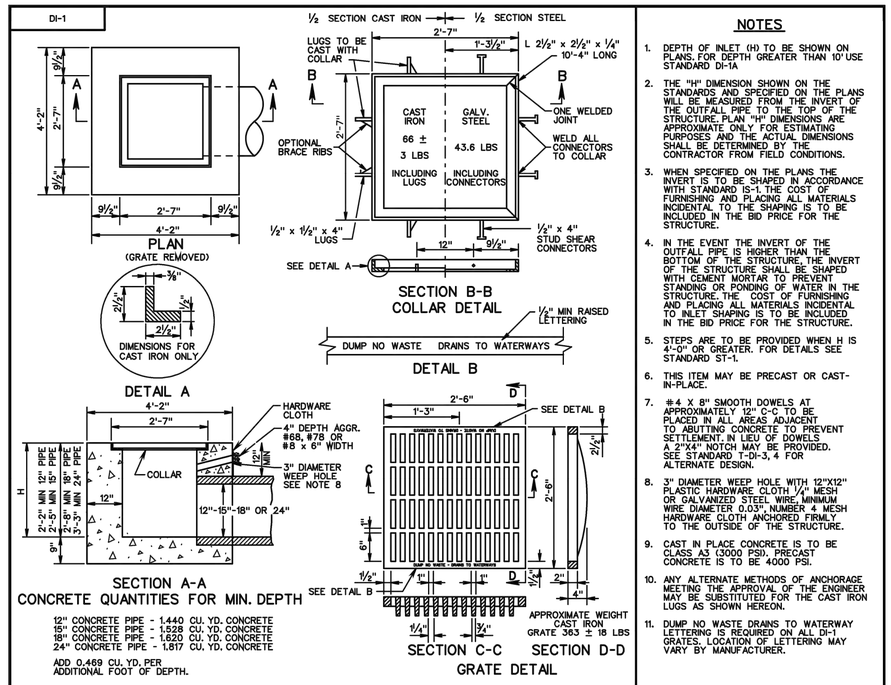
STORM INLET CALCULATIONS

Structure Name	Inlet ID	Length (ft)	DA (AC.)	C	CA	I (in/hr)	Q (cfs)	Qb (cfs)	Qt (cfs)	S (ft/ft)	Sx (ft/ft)	T (ft)	W (ft)	W/T	Sw (ft/ft)	Sw/Sx	Eo	a	Sw = a/(12W)	Se=Sx+Sw(Eo) (ft/ft)	Lt (ft)	L, Spec Length	L/Lt	E (%)	Qi (cfs)	Qb, Co (cfs)	Sag Inlets Only: Ponding Depth (ft)	Curb Opening Height (ft)	d/h	T @ Sag
6A	DI-1	2.16	1.09	0.55	0.60	4.75	2.85	0.00	2.85	Assume 50% Clogging												N/A	N/A	1.00	2.85	0.00	0.20	-	-	-
14	DI-3B - 10'	10.00	0.44	0.61	0.27	4.75	1.27	0.00	1.27	0.02	0.02	4.76	2.00	0.42	0.08	4.00	0.90	3.52	0.15	0.15	8.484	10.000	1.179	1.00	1.27	0.00	0.23	-	-	-
13	DI-3B - 10'	10.00	0.61	0.58	0.35	4.75	1.68	0.00	1.68	0.02	0.02	5.73	2.00	0.35	0.08	4.00	0.94	3.52	0.15	0.14	9.972	10.000	1.003	1.00	1.68	0.00	0.24	-	-	-
12A	DI-3B - 8'	8.00	0.27	0.68	0.18	4.75	0.87	0.00	0.87	0.02	0.02	3.13	2.00	0.64	0.08	4.00	0.98	3.52	0.15	0.17	7.544	8.000	1.060	1.00	0.87	0.00	0.19	-	-	-
12	DI-3B -12'	12.00	0.62	0.73	0.45	4.75	2.15	0.00	2.15	0.02	0.02	6.10	2.00	0.33	0.08	4.00	0.81	3.52	0.15	0.14	12.087	12.000	0.993	1.00	2.15	0.00	0.25	-	-	-
10A	DI-3B - 6'	6.00	0.08	0.82	0.07	4.75	0.31	0.00	0.31	0.02	0.02	1.55	2.00	1.29	0.08	4.00	1.00	3.52	0.15	0.17	4.832	6.000	1.242	1.00	0.31	0.00	0.16	-	-	-
10	DI-3B - 6'	6.00	0.15	0.66	0.10	4.75	0.47	0.00	0.47	0.02	0.02	1.81	2.00	1.11	0.08	4.00	1.00	3.52	0.15	0.17	5.741	6.000	1.045	1.00	0.47	0.00	0.16	-	-	-
9B	DI-3B - 14'	14.00	1.03	0.54	0.56	4.75	2.64	0.00	2.64	0.03	0.02	5.89	2.00	0.34	0.08	4.00	0.82	3.52	0.15	0.14	15.327	14.000	0.913	0.99	2.61	0.03	0.25	-	-	-
9A	DI-3B - 8'	8.00	0.00	0.00	0.00	4.75	0.00	0.00	0.00	0.01	0.02	0.00	2.00	0.00	0.08	4.17	0.00	3.52	0.15	0.02	0.000	8.000	1.000	0.00	0.00	0.00	0.00	-	-	-
9	DI-3B - 8'	8.00	0.00	0.50	0.00	4.75	0.00	0.00	0.00	0.01	0.02	0.00	2.00	0.00	0.08	4.17	0.00	3.52	0.15	0.02	0.000	8.000	1.000	0.00	0.00	0.00	0.00	-	-	-
8A	DI-3C - 8'	8.00	0.29	0.78	0.23	4.75	1.07	0.02	1.09	0.01	0.02	5.00	2.00	0.40	0.08	4.17	0.00	3.52	0.15	0.02	8.000	8.000	1.000	1.00	1.11	0.00	0.23	0.458	0.494	1.41
8	DI-3C - 8'	8.00	1.19	0.73	0.87	4.75	4.13	0.00	4.13	0.02	0.02	8.63	2.00	0.23	0.08	4.00	0.00	3.52	0.15	0.02	8.000	8.000	1.000	1.00	4.13	0.00	0.30	0.458	0.664	7.84
7A	DI-3B - 8'	8.00	0.00	0.00	0.00	4.75	0.00	0.00	0.00	0.01	0.02	0.00	2.00	0.00	0.08	4.17	0.00	3.52	0.15	0.02	0.000	8.000	1.000	0.00	0.00	0.00	0.00	-	-	-
7	DI-3B - 8'	8.00	0.00	0.00	0.00	4.75	0.00	0.00	0.00	0.01	0.02	0.00	2.00	0.00	0.08	4.17	0.00	3.52	0.15	0.02	0.000	8.000	1.000	0.00	0.00	0.00	0.00	-	-	-
5	DI-3B - 4'	4.00	0.08	0.67	0.05	4.75	0.25	0.00	0.25	0.01	0.02	1.64	2.00	1.22	0.08	4.17	1.00	3.52	0.15	0.17	3.638	4.000	1.100	1.00	0.25	0.00	0.16	-	-	-
3	DI-3B - 6'	6.00	0.16	0.67	0.11	4.75	0.51	0.00	0.51	0.03	0.02	1.68	2.00	1.19	0.08	4.00	1.00	3.52	0.15	0.17	7.085	6.000	0.847	0.97	0.49	0.02	0.16	-	-	-
2	DI-3B - 6'	6.00	0.25	0.73	0.18	4.75	0.87	0.00	0.87	0.01	0.02	4.27	2.00	0.47	0.08	4.17	0.94	3.52	0.15	0.16	6.296	6.000	0.953	1.00	0.86	0.00	0.21	-	-	-
16A	DI-3C - 10'	10.00	0.69	0.65	0.45	4.75	2.13	0.00	2.13	0.01	0.02	7.50	2.00	0.27	0.08	4.17	0.00	3.52	0.15	0.02	10.000	10.000	1.000	1.00	2.13	0.00	0.28	0.458	0.603	2.01
18	DI-3B - 8'	8.00	0.22	0.60	0.13	4.75	0.63	0.00	0.63	0.02	0.02	2.19	2.00	0.91	0.08	4.00	1.00	3.52	0.15	0.17	6.406	8.000	1.249	1.00	0.63	0.00	0.17	-	-	-
17	DI-3B - 8'	8.00	0.20	0.63	0.13	4.75	0.60	0.00	0.60	0.02	0.02	2.11	2.00	0.95	0.08	4.00	1.00	3.52	0.15	0.17	6.281	8.000	1.274	1.00	0.60	0.00	0.17	-	-	-
21A	DI-3B - 8'	8.00	0.41	0.64	0.26	4.75	1.25	0.00	1.25	0.01	0.02	5.40	2.00	0.37	0.08	4.00	0.86	3.52	0.15	0.15	7.682	8.000	1.041	1.00	1.25	0.00	0.24	-	-	-
23	DI-3B - 10'	10.00	0.28	0.64	0.18	4.75	0.85	0.00	0.85	0.04	0.02	1.98	2.00	1.01	0.08	4.00	1.00	3.52	0.15	0.17	9.084	10.000	1.101	1.00	0.85	0.00	0.17	-	-	-
22A	DI-1	2.16	1.54	0.47	0.72	4.75	3.44	0.00	3.44	Assume 50% Clogging												N/A	N/A	1.00	3.44	0.00	0.21	-	-	16.83
21B	DI-1	2.16	0.00	0.50	0.00	4.75	0.00	0.00	0.00	Assume 50% Clogging												N/A	N/A	0.00	0.00	0.00	0.00	-	-	0.00
21	DI-3B - 8'	8.00	0.40	0.63	0.25	4.75	1.20	0.00	1.20	0.01	0.02	5.26	2.00	0.38	0.08	4.00	0.87	3.52	0.15	0.15	7.510	8.000	1.065	1.00	1.20	0.00	0.23	-	-	-
20	DI-3C - 10'	10.00	0.86	0.48	0.41	4.75	1.96	0.00	1.96	0.01	0.02	7.18	2.00	0.28	0.08	4.17	0.00	3.52	0.15	0.02	10.000	10.000	1.000	1.00	1.96	0.00	0.27	0.458	0.590	1.56
26A	DI-1	2.16	1.75	0.44	0.77	4.75	3.66	0.00	3.66	Assume 50% Clogging												N/A	N/A	1.00	3.66	0.00	0.22	-	-	17.50
36	DI-3C - 8'	8.00	0.37	0.61	0.23	4.75	1.07	0.00	1.07	0.01	0.02	4.99	2.00	0.40	0.08	4.17	0.00	3.52	0.15	0.02	8.000	8.000	1.000	1.00	1.07	0.00	0.23	0.458	0.494	1.41
59	DI-3B - 8'	8.00	0.00	0.00	0.00	4.75	0.00	0.00	0.00	0.01	0.02	0.00	2.00	0.00	0.08	4.17	0.00	3.52	0.15	0.02	0.000	8.000	1.000	0.00	0.00	0.00	0.00	-	-	-
57	DI-3B - 8'	8.00	0.00	0.50	0.00	4.75	0.00	0.00	0.00	0.01	0.02	0.00	2.00	0.00	0.08	4.17	0.00	3.52	0.15	0.02	0.000	8.000	1.000	0.00	0.00	0.00	0.00	-	-	-
58A	DI-1	2.16	0.00	0.50	0.00	4.75	0.00	0.00	0.00	Assume 50% Clogging												N/A	N/A	0.00	0.00	0.00	0.00	-	-	0.00
58	DI-3B - 8'	8.00	0.00	0.50	0.00	4.75	0.00	0.00	0.00	0.01	0.02	0.00	2.00	0.00	0.08	4.17	0.00	3.52	0.15	0.02	0.000	8.000	1.000	0.00	0.00	0.00	0.00	-	-	-
55A	DI-1	2.16	2.90	0.43	1.25	4.75	5.92	0.00	5.92	Assume 50% Clogging												N/A	N/A	1.00	5.92	0.00	0.26	-	-	23.72
53	DI-3B -12'	12.00	0.37	0.66	0.24	4.75	1.16	0.00	1.16	0.06	0.02	2.32	2.00	0.86	0.08	4.00	1.00	3.52	0.15	0.17	11.524	12.000	1.041	1.00	1.16	0.00	0.17	-	-	-
52B	DI-3B -12'	12.00	0.61	0.55	0.34	4.75	1.59	0.00	1.59	0.04	0.02	3.88	2.00	0.52	0.08	4.00	0.95	3.52	0.15	0.16	12.155	12.000	0.987	1.00	1.59	0.00	0.21	-	-	-
52A	DI-3B -12'	12.00	0.50	0.56	0.28	4.75	1.33	0.00	1.33	0.04	0.02	3.30	2.00	0.61	0.08	4.00	0.98	3.52	0.15	0.16	11.116	12.000	1.080	1.00	1.33	0.00	0.20	-	-	-
52	DI-3B -12'	12.00	0.40	0.68	0.27	4.75	1.29	0.00	1.29	0.06	0.02	2.66	2.00	0.75	0.08	4.00	1.00	3.52	0.15	0.17	12.077	12.000	0.994	1.00	1.29	0.00	0.18	-	-	-
51	DI-3B - 8'	8.00	0.00	0.00	0.00	4.75	0.00	0.00	0.00	0.01	0.02	0.00	2.00	0.00	0.08	4.17	0.00	3.52	0.15	0.02	0.000	8.000	1.000	0.00	0.00	0.00	0.00	-	-	-
50	DI-3C - 8'	8.00	1.74	0.58	1.01	4.75	4.79	0.00	4.79	0.01	0.03	9.21	2.00	0.22	0.08	2.78	0.00	3.52	0.15	0.03	8.000	8.000	1.000	1.00	4.79	0.00	0.38	0.458	0.835	7.06
50A	DI-3C - 8'	8.00	1.22	0.46	0.56	4.75	2.67	0.00	2.67	0.01	0.03	7.10	2.00	0.28	0.08	2.78	0.00	3.52	0.15	0.03	8.000	8.000	1.000	1.00	2.67	0.00	0.32	0.458	0.697	3.62
35A	DI-3B - 6'	6.00	0.22	0.65	0.14	4.75	0.68	0.00	0.68	0.01	0.02	4.50	2.00	0.44	0.08	4.00	0.92	3.52	0.15	0.16	4.641	6.000	1.293	1.00	0.68	0.00	0.22	-	-	-
35	DI-3B - 8'	8.00	0.47	0.58	0.27	4.75	1.29	0.00	1.29	0.01	0.02	6.77	2.00	0.30	0.08	4.00	0.76	3.52	0.15	0.13	6.726	8.000	1.189	1.00	1.29	0.00	0.27	-	-	-
34A	DI-3B - 8'	8.00	0.33	0.57	0.19	4.75	0.89	0.00	0.89	0.01	0.02	5.42	2.00	0.37	0.08	4.00	0.86	3.52	0.15	0.15	5.392	8.000	1.484	1.00	0.89	0.00	0.24	-	-	-
33	DI-3B - 10'	10.00	0.30	0.62	0.19	4.75	0.88	0.00	0.88	0.04	0.02	2.11	2.00	0.95	0.08	4.00	1.00	3.52	0.15	0.17	9.262	10.000	1.080	1.00	0.88	0.00	0.17	-	-	-
32	DI-3B - 8'	8.00	0.18	0.73	0.13	4.75	0.62	0.00	0.62	0.04	0.02	1.77	2.00	1.13	0.08	4.00	1.00	3.52	0.15	0.17	8.058	8.000	0.993	1.00	0.62	0.00	0.16	-	-	-
30A	DI-3B - 6'	6.00	0.16	0.71	0.11	4.75	0.54	0.00	0.54	0.01	0.02	2.70	2.00	0.74	0.08	4.17	1.00	3.52	0.15	0.17	4.996	6.000	1.201	1.00	0.54	0.00	0.18	-	-	-
30	DI-3B - 6'	6.00	0.17	0.65	0.11	4.75	0.52	0.00	0.52	0.02	0.02	1.93	2.00	1.03	0.08	4.00	1.00	3.52	0.15	0.17	5.846	6.000	1.026	1.00	0.52	0.00	0.17	-	-	-
29A	DI-3B - 8'	8.00	0.18	0.77	0.14	4.75	0.66	0.00	0.66	0.02	0.02	2.42	2.00	0.83	0.08	4.00	1.00	3.52	0.15	0.17	6.434	8.000	1.243	1.00	0.66	0.00	0.18	-	-	-
29	DI-3B - 8'	8.00	0.20	0.69	0.14	4.75	0.66	0.00	0.66	0.02	0.02	2.41	2.00	0.83	0.08	4.00	1.00	3.52	0.15	0.17	6.422	8.000	1.246	1.00	0.66	0.00	0.18	-	-	-
28A	DI-3B - 8'	8.00	0.31	0.71	0.22	4.75	1.05	0.00	1.05	0.02	0.02	3.86	2.00	0.52	0.08	4.00	0.96	3.52	0.15	0.16	7.942	8.000	1.007	1.00	1.05	0.00	0.21	-	-	-
28	DI-3B - 10'	10.00	0.43	0.72	0.31	4.75	1.47	0.00	1.47	0.02	0.02	4.99	2.00	0.40	0.08	4.00	0.89	3.52	0.15	0.17	9.516	10.000	1.051	1.00	1.47	0.00	0.23	-	-	-
27A	DI-3B - 6'	6.00	0.17	0.72	0.12	4.75	0.58	0.00	0.58	0.02	0.02	2.11	2.00	0.95	0.08	4.00	1.00	3.52	0.15	0.17	6.103	6.000	0.983	1.00	0.58	0.00	0.17	-	-	-
27	DI-3B - 8'	8.00	0.26	0.74	0.19	4.75	0.91	0.00	0.91	0.02	0.02	3.46	2.00	0.58	0.08	4.00	0.97	3.52	0.15	0.16	7.483	8.000	1.069	1.00	0.91	0.00	0.20	-	-	-
26	DI-3B - 10'	10.00	0.40	0.72	0.29	4.75	1.37	0.00	1.37	0.02	0.02	4.63	2.00	0.43	0.08	4.00	0.91	3.52	0.15	0.15	9.292	10.000	1.076	1.00	1.37	0.00	0.22	-	-	-
25	DI-3B - 8'	8.00	0.23	0.72	0.17	4.75	0.79	0.00	0.79	0.02	0.02	2.84	2.00	0.70	0.08	4.00	0.99	3.52	0.15	0.17	7.049	8.000	1.135	1.00	0.79	0.00	0.19	-	-	-
40A	DI-1	2.16	1.34	0.53	0.71	4.75	3.37	0.00	3.37	Assume 50% Clogging												N/A	N/A	1.00	3.37	0.00	0.21	-	-	16.64
44	DI-3B -12'	12.00	0.95	0.53	0.50	4.75	2.39	0.00	2.39	0.01	0.02	7.54	2.00	0.27	0.08	4.00	0.71	3.52	0.15	0.13	11.499	12.000	1.044	1.00	2.39	0.00	0.26	-	-	-
43	DI-3B - 8'	8.00	0.41	0.62	0.25	4.75	1.21	0.00	1.21	0.01	0.02	5.06	2.00	0.40	0.08	4.00	0.88	3.52	0.15	0.15	7.703	8.000	1.039	1.00	1.21	0.00	0.23	-	-	-
41A	DI-3B -12'	12.00	0.84	0.54	0.45	4.75	2.15	0.00	2.15	0.02	0.02	6.56	2.00	0.30	0.08	4.00	0.78	3.52	0.15	0.13	11.460	12.000	1.047	1.00	2.15	0.00	0.26	-	-	-
41	DI-3B -12'	12.00	0.74	0.65	0.48	4.75	2.28	0.00	2.28	0.02	0.02	6.78	2.00	0.29	0.08	4.00	0.76	3.52	0.15	0.13	11.860	12.000	1.012	1.00	2.28	0.00	0.27	-	-	-
40	DI-3B - 10'	10.00	0.38	0.69	0.26	4.75	1.25	0.00	1.25	0.02	0.02	4.35	2.00	0.46	0.08	4.00	0.93	3.52	0.15	0.16	8.909	10.000	1.122	1.00	1.25	0.00	0.22	-	-	-
39	DI-3B - 8'	8.00	0.21	0.81	0.17	4.75	0.81	0.00	0.81	0.02	0.02	2.92	2.00	0.68	0.08	4.00	0.99	3.52	0.15	0.17	7.135	8.000	1.121	1.00	0.81	0.00	0.19	-	-	-
47	DI-3B - 8'	8.00	0.24	0.73	0.18	4.75	0.83	0.00	0.83	0.02	0.02	3.06	2.00	0.65	0.08	4.00	0.99	3.52	0.15	0.17	7.287	8.000	1.098	1.00	0.83	0.00	0.19	-	-	-
46	DI-3B - 6'	6.00	0.10	0.84	0.08	4.75	0.40	0.00	0.40	0.02	0.02	1.72	2.00	1.16	0.08	4.00	1.00	3.52	0.15	0.17	5.316	6.000	1.129	1.00	0.40	0.00	0.16	-	-	-
49	DI-3B - 8'	8.00	0.15	0.66	0.10	4.75	0.47	0.00	0.47	0.04	0.02	1.59	2.00	1.26	0.08	4.00	1.00	3.52	0.15	0.17	7.160	8.000	1.117	1.00	0.47	0.00	0.16	-	-	-
48	DI-3B - 8'	8.00	0.19	0.68	0.13	4.75	0.61	0.00	0.61	0.04	0.02	1.76	2.00	1.14	0.08	4.00	1.00	3.52	0.15	0.17	8.003	8.000	1.000	1.00	0.61	0.00	0.16	-	-	-

STORM SEWER PIPE CALCULATIONS

From	To	DA (Acres)	Runoff Coef. C	CA (Increm.)	CA (Accum.)	Tc (min)	Rainfall (in/hr)	Runoff Q_t (cfs)	Invert Up (ft)	Invert Down (ft)	Length (ft)	Slope (%)	Diameter (in)	Capacity (cfs)	Velocity (fps)	Increm Flow Time (min)	Flow Time (min)	Pipe Material
6A	6	1.09	0.55	0.60	0.60	5.00	6.54	3.92	471.11	470.76	34.86	1.00	15.00	7.53	3.19	0.10	0.18	HDPE
6	5	0.00	0.00	0.00	3.67	0.00	0.00	21.32	470.66	470.31	67.27	0.51	30.00	34.25	6.97	0.16	0.16	HDPE
5	3	0.08	0.67	0.05	3.73	5.00	6.54	21.45	470.21	469.61	56.22	1.07	30.00	49.37	9.22	0.10	0.10	HDPE
3	2	0.16	0.67	0.11	3.83	5.00	6.54	21.83	469.51	464.46	161.02	3.14	30.00	84.69	4.50	0.19	0.60	HDPE
2	1A	0.25	0.73	0.18	4.02	5.00	6.54	22.14	464.36	463.61	150.32	0.50	30.00	33.80	4.65	0.36	0.54	HDPE
1A	1	0.00	0.00	0.00	4.02	0.00	0.00	21.71	463.61	463.15	91.44	0.50	30.00	33.84	6.97	0.22	0.22	HDPE
7A	7	0.00	0.00	0.00	0.00	5.00	6.54	0.00	471.46	471.08	38.05	1.00	15.00	7.53	0.00	0.00	0.00	HDPE
7	6	0.00	0.00	0.00	3.07	5.00	6.54	17.96	470.98	470.76	41.01	0.54	24.00	19.43	5.72	0.12	0.12	HDPE
8A	8	0.29	0.78	0.23	0.23	5.00	6.54	1.54	471.81	471.43	37.99	1.00	15.00	7.53	1.26	0.14	0.50	HDPE
8	7	1.19	0.73	0.87	3.07	5.00	6.54	18.09	471.33	471.08	50.00	0.50	24.00	18.64	5.76	0.14	0.14	HDPE
9A	9	0.00	0.00	0.00	0.00	5.00	6.54	0.00	472.37	471.97	39.87	1.00	15.00	7.53	0.00	0.00	0.00	HDPE
9	8	0.00	0.50	0.00	1.98	5.00	6.54	11.72	471.87	471.43	87.66	0.50	21.00	13.06	4.87	0.25	0.30	HDPE
9B	9	1.03	0.54	0.56	0.56	5.00	6.54	3.36	472.22	471.97	25.27	1.00	15.00	7.51	2.74	0.07	0.15	HDPE
10A	10	0.08	0.82	0.07	0.07	5.00	6.54	0.45	476.39	476.01	38.06	1.00	15.00	7.53	3.20	0.00	0.20	HDPE
10	9	0.15	0.66	0.10	1.42	5.00	6.54	8.55	475.91	471.97	131.45	3.00	15.00	13.04	6.97	0.20	0.31	HDPE
12A	12	0.27	0.68	0.18	0.18	5.00	6.54	1.18	478.83	478.45	38.00	1.00	15.00	7.53	4.24	0.15	0.15	HDPE
12	11	0.62	0.73	0.45	1.26	5.00	6.54	7.58	478.35	476.45	63.12	3.00	15.00	13.04	6.18	0.10	0.17	HDPE
11	10	0.00	0.00	0.00	1.26	0.00	0.00	7.51	476.35	476.01	67.85	0.50	15.00	5.32	6.12	0.18	0.18	HDPE
14	13	0.44	0.61	0.27	0.27	5.00	6.54	1.75	483.48	483.29	38.00	0.50	15.00	5.32	3.69	0.17	0.17	HDPE
13	12	0.61	0.58	0.35	0.62	5.00	6.54	3.94	483.19	478.45	326.96	1.45	15.00	9.06	6.75	0.81	0.81	HDPE
16A	16	0.69	0.65	0.45	0.45	5.00	6.54	2.93	478.30	477.75	110.10	0.50	15.00	5.32	4.20	0.44	0.44	HDPE
16	15	0.00	0.00	0.00	0.71	0.00	0.00	4.47	477.65	477.50	30.45	0.50	15.00	5.32	3.65	0.11	0.14	HDPE
18	17	0.22	0.60	0.13	0.13	5.00	6.54	0.86	481.37	481.02	31.00	1.15	15.00	8.07	4.07	0.13	0.13	HDPE
17	16	0.20	0.63	0.13	0.26	5.00	6.54	1.68	480.92	477.75	157.18	2.01	15.00	10.68	6.02	0.44	0.44	HDPE
21A	21	0.41	0.64	0.26	0.26	5.00	6.54	1.67	462.53	462.34	38.55	0.50	15.00	5.32	3.64	0.18	0.18	HDPE
21	20	0.40	0.63	0.25	1.64	5.00	6.54	9.95	461.84	460.84	114.86	0.87	18.00	11.41	5.63	0.28	0.34	HDPE
20	19	0.86	0.48	0.41	2.06	5.00	6.54	12.33	460.74	459.75	66.19	1.50	18.00	15.00	7.00	0.12	0.16	HDPE
21B	21	0.00	0.50	0.00	0.00	5.00	6.54	0.00	462.99	462.34	130.42	0.50	15.00	5.32	0.00	0.00	0.00	HDPE
22A	22	1.54	0.47	0.72	0.72	5.00	6.54	4.73	467.32	466.25	128.76	0.84	15.00	6.89	5.71	0.38	0.38	HDPE
22	21	0.36	0.63	0.23	1.13	5.00	6.54	7.19	465.90	462.09	340.19	1.12	15.00	7.96	6.87	0.83	0.83	HDPE
23	22	0.28	0.64	0.18	0.18	5.00	6.54	1.17	467.21	466.25	38.55	2.50	15.00	11.90	5.86	0.11	0.11	HDPE
26A	26	1.75	0.44	0.77	0.77	5.00	6.54	5.04	471.70	465.76	118.77	5.00	15.00	16.83	4.10	0.17	0.48	HDPE
26	25	0.40	0.72	0.29	7.51	5.00	6.54	37.77	465.66	465.42	48.30	0.50	36.00	54.96	5.75	0.10	0.14	HDPE
25	24	0.23	0.72	0.17	7.68	5.00	6.54	38.35	465.32	464.64	135.27	0.50	42.00	82.91	8.15	0.28	0.28	HDPE
27	27	0.17	0.72	0.12	0.12	5.00	6.54	0.81	473.11	472.95	32.32	0.50	15.00	5.32	2.98	0.18	0.18	HDPE
27	26	0.26	0.74	0.19	6.45	5.00	6.54	32.46	465.90	465.76	29.02	0.50	36.00	54.96	4.93	0.06	0.10	HD

DI-1



CONCRETE QUANTITIES FOR MIN. DEPTH

12" CONCRETE PIPE - 1.440 CU. YD. CONCRETE
15" CONCRETE PIPE - 1.528 CU. YD. CONCRETE
18" CONCRETE PIPE - 1.620 CU. YD. CONCRETE
24" CONCRETE PIPE - 1.817 CU. YD. CONCRETE

ADD 0.469 CU. YD. PER ADDITIONAL FOOT OF DEPTH.

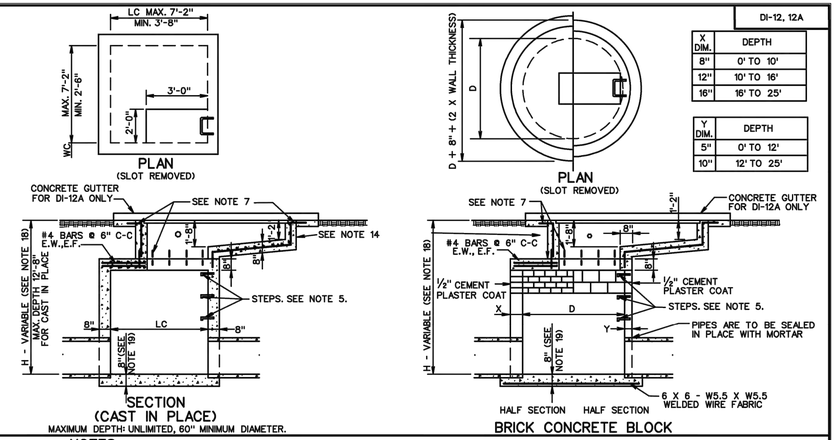
NOTES

1. DEPTH OF INLET (H) TO BE SHOWN ON PLANS. FOR DEPTH GREATER THAN 10' USE STANDARD DI-1A
2. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE. PLAN "H" DIMENSIONS ARE APPROXIMATE ONLY FOR ESTIMATING PURPOSES AND THE ACTUAL DIMENSIONS SHALL BE DETERMINED BY THE CONTRACTOR FROM FIELD CONDITIONS.
3. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
4. IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO INLET SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
5. STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
6. THIS ITEM MAY BE PRECAST OR CAST-IN-PLACE.
7. #4 X 8" SMOOTH DOWELS AT APPROXIMATELY 12" C-C TO BE PLACED IN ALL AREAS ADJACENT TO ABUTTING CONCRETE TO PREVENT SETTLEMENT. IN LIEU OF DOWELS A 2"X4" NOTCH MAY BE PROVIDED. SEE STANDARD T-DI-3, 4 FOR ALTERNATE DESIGN.
8. 3" DIAMETER WEEP HOLE WITH 12"X12" PLASTIC HARDWARE CLOTH ¼" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO THE OUTSIDE OF THE STRUCTURE.
9. CAST IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
10. ANY ALTERNATE METHODS OF ANCHORAGE MEETING THE APPROVAL OF THE ENGINEER MAY BE SUBSTITUTED FOR THE CAST IRON LUGS AS SHOWN HEREON.
11. DUMP NO WASTE DRAINS TO WATERWAY LETTERING IS REQUIRED ON ALL DI-1 GRATES. LOCATION OF LETTERING MAY VARY BY MANUFACTURER.

VDOT ROAD AND BRIDGE STANDARDS		SPECIFICATION REFERENCE
SHEET 1 OF 1	REVISION DATE	
104.01		233 302

STANDARD DROP INLET
12" - 24" PIPE: MAXIMUM DEPTH (H) = 10'
VIRGINIA DEPARTMENT OF TRANSPORTATION

DI-12, 12A



X DIM.	DEPTH
8"	0' TO 10'
12"	10' TO 16'
16"	16' TO 25'

Y DIM.	DEPTH
5"	0' TO 12'
10"	12' TO 25'

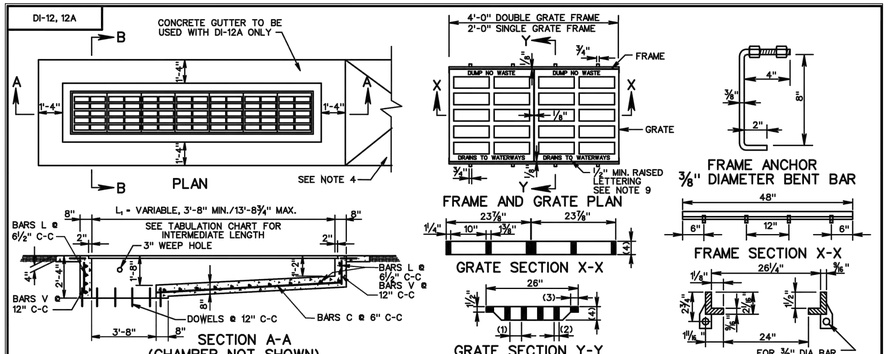
NOTES

1. USE OF INLET RESTRICTED TO NON-VEHICULAR LOCATIONS.
2. DEPTH OF INLET (H) AND LENGTH (L) TO BE SHOWN ON PLANS.
3. THE "H" DIMENSION SHOWN ON THE STANDARDS AND SPECIFIED ON THE PLANS WILL BE MEASURED FROM THE INVERT OF THE OUTFALL PIPE TO THE TOP OF THE STRUCTURE.
4. WHEN SPECIFIED ON THE PLANS THE INVERT IS TO BE SHAPED IN ACCORDANCE WITH STANDARD IS-1, THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
5. IN THE EVENT THE INVERT OF THE OUTFALL PIPE IS HIGHER THAN THE BOTTOM OF THE STRUCTURE, THE INVERT OF THE STRUCTURE SHALL BE SHAPED WITH CEMENT MORTAR TO PREVENT STANDING OR PONDING OF WATER IN THE STRUCTURE. THE COST OF FURNISHING AND PLACING ALL MATERIALS INCIDENTAL TO THE SHAPING IS TO BE INCLUDED IN THE BID PRICE FOR THE STRUCTURE.
6. STEPS ARE TO BE PROVIDED WHEN H IS 4'-0" OR GREATER. FOR DETAILS SEE STANDARD ST-1.
7. CHAMBER MAY BE PRECAST. SEE STANDARD 103.10 FOR DETAILS.
8. #4 DOWELS 12" LONG SPACED AT 12" C-C ALL SIDES.
9. FOOTING MAY BE ROUND OR SQUARE IN SHAPE. KEY IS TO BE 1" DEEP X WALL THICKNESS + 1".
10. ALL REINFORCING STEEL SHALL HAVE A MIN. COVER OF 2".
11. ALL REINFORCING STEEL TO BE CUT CLEAR OF ALL OPENINGS BY 2".
12. CAST-IN PLACE CONCRETE IS TO BE CLASS A3 (3000 PSI). PRECAST CONCRETE IS TO BE 4000 PSI.
13. ALL REINFORCING BARS TO BE #4.
14. GRATE BARS TO BE INSTALLED SO THEY WILL BE ALIGNED PARALLEL TO DITCH FLOW.
15. FOR DETAILS OF CONCRETE SLOT, COLLAR AND GRATE, AND METHOD OF PLACING APPROACH GUTTER SEE SHEET 2 OF 3.
16. PAVED DITCHES ARE TO BE TRANSITIONED TO MEET INLET GUTTER AS SHOWN IN ST'D. PG-2A.
17. QUANTITIES SHOWN ARE FOR INLETS WITHOUT PIPES. PIPE DISPLACEMENTS MUST BE DEDUCTED TO OBTAIN TRUE QUANTITIES. SEE SHEET 3 OF 3 FOR QUANTITIES.
18. PROVIDE SAFETY SLABS WHEN SPECIFIED ON THE PLANS.
19. SEE TABULATION CHART ON SHEET 3 OF 3 FOR FOR MINIMUM DEPTH (H).
20. 10" THICK SLAB FOR PIPE SIZES 60" TO 72" IN DIAMETER.
21. THE TYPE OF INLET DETAILED HEREON TO BE CONSTRUCTED WILL BE AT THE OPTION OF THE CONTRACTOR.
22. DI-12 NO GUTTER.
    DI-12A PERIPHERAL GUTTER.

SPECIFICATION REFERENCE	VDOT ROAD AND BRIDGE STANDARDS	
233 302	REVISION DATE	SHEET 1 OF 3
		104.30

MULTIGRATE DROP INLET
FOR PIPE SIZES 12" TO 72"
VIRGINIA DEPARTMENT OF TRANSPORTATION

DI-12, 12A



GRATE DIMENSIONS				
GRATE TYPE	OPENING WIDTH (1)	BAR THICKNESS (2)	END SECTION WIDTH (3)	GRATE THICKNESS (4)
TYPE I	3/4" 5 OPENINGS	1½" 4 BARS	2⅛"	3¾"
TYPE II	1⅛" 8 OPENINGS	1⅜" 7 BARS	2⅜"	3¾"

NOTES:

1. TYPE I GRATE: LIMITED ACCESS AND RURAL UNLIMITED ACCESS: PEDESTRIAN ACCESS UNLIKELY
2. TYPE II GRATE: URBAN AREAS: PEDESTRIAN ACCESSIBLE AREAS.
3. SEE GRATE DIMENSION TABLE FOR SIZE AND NUMBER OF GRATE OPENINGS REQUIRED FOR TYPE I AND TYPE II GRATE.
4. PAVED DITCHES ARE TO BE TRANSITIONED TO MEET INLET GUTTER AS SHOWN IN STANDARD PG-2A.
5. 3" DIAMETER WEEP HOLE WITH 12" X 12" PLASTIC HARDWARE CLOTH ¼" MESH OR GALVANIZED STEEL WIRE, MINIMUM WIRE DIAMETER 0.03", NUMBER 4 MESH HARDWARE CLOTH ANCHORED FIRMLY TO OUTSIDE OF STRUCTURE.
6. IF NORMAL DITCH GRADE IS TOO FLAT TO ALLOW FOR ADJUSTED GRADE TO INLET, A SPECIAL GUTTER DETAIL WILL BE REQUIRED ON PLANS.
7. GRATE BARS TO BE PARALLEL TO DITCH FLOW.
8. DI-12 AND DI-12A ARE NOT TO BE UTILIZED IN LOCATIONS NORMALLY SUBJECT TO TRAFFIC.
9. DUMP NO WASTE DRAINS TO WATERWAYS LETTERING IS REQUIRED ON ALL DI-12 GRATES. LOCATION OF LETTERING MAY VARY BY MANUFACTURER.

VDOT ROAD AND BRIDGE STANDARDS		SPECIFICATION REFERENCE
SHEET 2 OF 3	REVISION DATE	
104.31		233 302

MULTIGRATE DROP INLET
FOR PIPE SIZES 12" TO 72"
VIRGINIA DEPARTMENT OF TRANSPORTATION

DI-12, 12A

TABULATION CHARTS

APPROXIMATE QUANTITIES (SEE NOTE 2) CAST IN PLACE CHAMBER						
PIPE SIZES	MINIMUM DEPTH H (SEE NOTE 3)	REINFORCING STEEL LBS.	CONCRETE CU. YDS.	CHAMBER DIMENSIONS W_C	CHAMBER DIMENSIONS L_C	CONCRETE CHAMBER INCREMENTS PER FOOT (SEE NOTE 1) CU. YDS.
12" TO 24"	4'-2"	20.5	1.20	2'-6"	3'-8"	.37
27" TO 36"	5'-6 1/4 "	30.33	2.14	3'-8"	3'-8"	.43
42" TO 54"	6'-10 1/2 "	129.80	4.39	5'-5"	5'-5"	.53
60" TO 72"	8'-6"	277.32	7.65	7'-2"	7'-2"	.69

NOTES

1. FOR EACH ADDITIONAL FOOT IN DEPTH THE INCREMENT SHOWN MUST BE MULTIPLIED BY THE ADDITIONAL DEPTH IN FEET AND ADDED TO THE CONCRETE TOTAL.
2. APPROXIMATE QUANTITIES ARE SHOWN FOR BIDDING PURPOSES ONLY: ITEMS ARE NOT TO BE BID SEPARATELY. TO OBTAIN THE TOTAL APPROXIMATE CONCRETE QUANTITIES FOR EACH INLET, THE CHAMBER, SLOT AND GUTTER (GUTTER TO BE USED WITH DI-12A ONLY) QUANTITIES MUST BE ADDED TOGETHER.
3. MINIMUM DEPTHS SHOWN ARE FOR THE SMALLEST PIPE SIZE IN EACH SERIES. MINIMUM DEPTH H = PIPE DIAMETER + PIPE WALL THICKNESS + 3'.
4. FOR APPROXIMATE QUANTITIES FOR DI-12A ADD 0.36 CU. YDS. OF CLASS A3 CONCRETE TO DI-12 QUANTITIES FOR CONCRETE GUTTER. QUANTITY SHOWN IS FOR A MINIMUM SLOT LENGTH OF 3'-8". FOR OTHER CONCRETE LENGTHS SEE CONCRETE GUTTER INCREMENTS IN THIS TABLE.
5. DI-12A CONCRETE GUTTER INCREMENT: ADD 0.07 CU. YDS. CLASS A3 CONCRETE FOR EACH ADDITIONAL FOOT OF SLOT LENGTH GREATER THAN MINIMUM 3'-8".
6. DOWELS ARE TO BE PROVIDED FOR THE JOINT BETWEEN THE CONCRETE GUTTER AND SLOT. THE COST OF DOWELS ARE TO BE INCLUDED IN THE CUBIC YARD COST FOR CONCRETE.
7. SLOT MAY BE PRECAST OR CAST IN PLACE.
8. L = LENGTH ROUNDED FOR PLAN USE.

APPROXIMATE QUANTITIES BRICK AND BLOCK CHAMBER						
PIPE SIZES	CHAMBER DIMENSIONS "D"	REINFORCING STEEL LBS.	CONCRETE CU. YDS.	BRICK MIN. DEPTH H	BRICK NO.	BLOCK NO.
12" TO 24"	4'-0"	102.68	1.25	4'-2"	688	42
27" TO 36"	4'-0"	102.68	1.25	5'-6¼"	911	55
42" TO 54"	5'-6"	200.81	2.01	7'-10½"	1300	111
60" TO 72"	8'-0"	404.74	3.65	9'-6"	1568	190

BRICK CHAMBER INCREMENTS PER FT.				
X DIM.	DEPTH	4' DIAMETER APPROX. NO. BRICKS/FT.	5'-6" DIAMETER APPROX. NO. BRICKS/FT.	8'-0" DIAMETER APPROX. NO. BRICKS/FT.
8"	0' - 10'	165	227	330
12"	10' - 16'	250	341	495
16"	16' - 25'	330	454	660

BLOCK CHAMBER INCREMENTS PER FT.				
Y DIM.	DEPTH	4' DIAMETER APPROX. NO. BRICKS/FT.	5'-6" DIAMETER APPROX. NO. BRICKS/FT.	8'-0" DIAMETER APPROX. NO. BRICKS/FT.
5"	0' - 12'	10	14	20
10"	12' - 25'	20	28	40

APPROXIMATE QUANTITIES - DI- 12 ONLY (SEE NOTE 4) SLOT 4' TO 14' (SEE NOTE 8)				
L (SEE NOTE 8)	L_1	CONCRETE CU. YDS.	REINFORCING STEEL LBS.	GRATES NO.
4	3'-8"	0.81	81.27	2
6	5'-8¾"	1.10	122.81	3
8	7'-8"	1.30	161.90	4
10	9'-8¾"	1.61	203.37	5
12	11'-8"	1.91	242.45	6
14	13'-8¾"	2.22	283.93	7

SPECIFICATION REFERENCE	VDOT ROAD AND BRIDGE STANDARDS	
233 302	REVISION DATE	SHEET 3 OF 3
		104.32

MULTIGRATE DROP INLET
FOR PIPE SIZES 12" TO 72"
VIRGINIA DEPARTMENT OF TRANSPORTATION

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STORM SEWER DETAILS

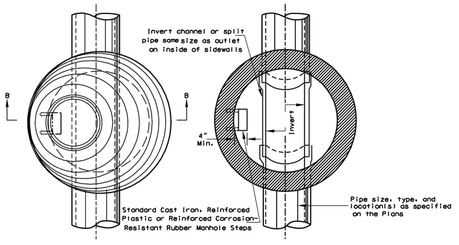
NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

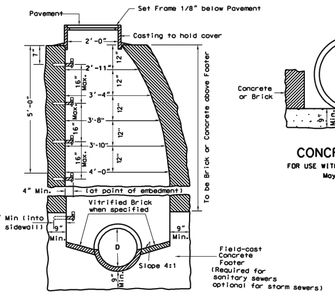
Rev. No.	Date

DATE: 11/06/2023
SCALE: N/A
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 80 OF 97

SLD2022-06



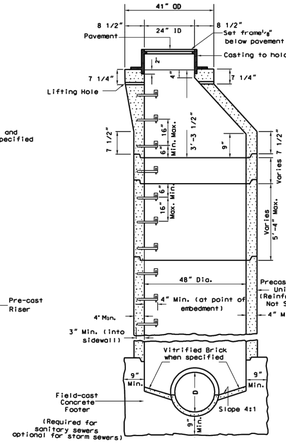
PLAN VIEWS



CAST-IN-PLACE OPTION

CONCRETE BASE

FOR USE WITH STORM SEWERS ONLY
May Be Precast



PRE-CAST

NOTES

Type A Manholes, when specified on the Plans, may be constructed in either method (cast-in-place or pre-cast option) as shown herein.

Steps, frames, and covers shall be as shown on Standard Sheet DR7-X.

"Keyed" or "doweled" type construction joints, acceptable to the Engineer, may be used in the construction of concrete manholes.

If the cast-in-place manhole is over twelve feet (12') in depth, the sidewalls below that depth will be double thickness.

Pipe at elevations other than shown may be joined to the manhole by cutting a hole the size of the connecting pipe in the manhole. Inserting the pipe the thickness of the manhole shell and closing all openings around the connecting pipe with joint mortar.

Drawing shows pipe entering and leaving manhole in a straight line. However, the pipes may enter or leave at an angle or place as called for or shown on the Plans.

Minimum height of bench wall above flowline of pipe is 25% of the diameter of the pipes.

The use of brick for manhole construction will not be allowed when a manhole is located in the roadway.

The following additional notes are applicable for pre-cast manholes:

Manhole steps shall be placed into plastic concrete wall during manufacture or mortared into holes after the concrete has set.

Sidewall sections may be used in any combination to produce a manhole of desired depth, except the tapered top section shall be retained as shown.

The tapered top section shall be manufactured and meet the same requirements as the manhole's sidewalls, but shall conform to the dimensions detailed herein.

Lifting holes in the tapered top section and the circumferential notches in the manhole cover are for handling purposes only.

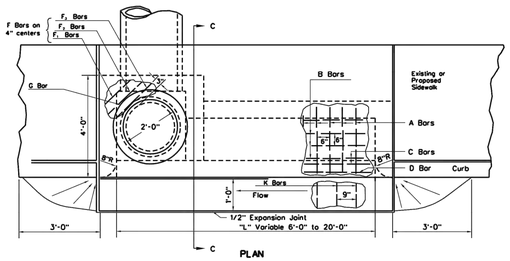
The pre-cast sidewall units shall be set in joint mortar or sealed with O-ring gaskets.

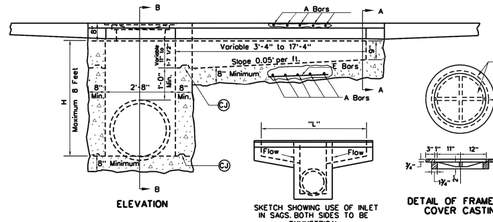
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

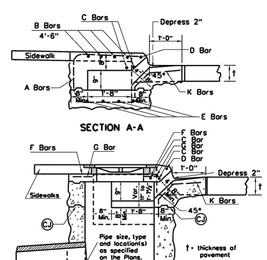
PREPARED 7-1-98
REVISION DATE

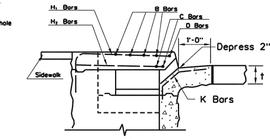
TYPE A MANHOLE

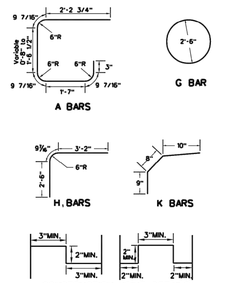
STANDARD SHEET DR7-A











NOTES

Type E inlet detailed herein is for use on a grade. If it is to be used in a sag (see sketch herein) it should be built symmetrically about centerline of pipe and length of opening specified.

The covering for reinforcing steel shall be two inches, measured from the surface of the concrete to the face of the bar, unless otherwise shown. All reinforcing steel shall be epoxy-coated and meet the requirements of Section 602 of the Specifications.

Optional construction joints labeled "CJ" may be keyed or doweled as per the typical details shown herein or as approved by the Engineer.

If Type E inlet is to be constructed along with a sidewalk, the sidewalk shall be constructed monolithic with the top slab on the inlet. The sidewalk shall be reinforced with Type B Fabric placed 2" from bottom of sidewalk and extended into the top slab of the inlet a minimum distance of 8". Cost of Type B Fabric shall be included in the unit price bid for Concrete Sidewalk.

This inlet shall not be placed in a pedestrian cross walk.

CONCRETE AND REINFORCING STEEL QUANTITIES

"L" Feet	Concrete C.Y.	Reinforcing Steel lbs.	A Bars (Bent) No.	Size	Length	B Bars (Straight) No.	Size	Length	C Bars (Straight) No.	Size	Length	D Bars (Straight) No.	Size	Length	E Bars (Straight) No.	Size	Length	F, Bars (Straight) No.	Size	Length	F, Bars (Straight) No.	Size	Length	G Bar (Bent) No.	Size	Length	H,Bars (Straight) No.	Size	Length	H, Bars (Straight) No.	Size	Length	K Bars (Bent) No.	Size	Length
6	2.59	189	5	*5	7'-1" to 7'-3"	4	*5	3'-9"	2	*5	7'-1"	1	*5	7'-1"	4	*5	3'-6"	4	*5	2'-0"	4	*5	2'-6"	4	*5	3'-0"	1	*5	8'-0"	2	*7	6'-5"	2	*6	3'-4"	10	*5	2'-3"
8	3.07	250	9	*5	7'-3" to 7'-4"	4	*5	5'-9"	2	*5	9'-1"	1	*5	9'-1"	4	*5	5'-6"	4	*5	2'-0"	4	*5	2'-6"	4	*5	3'-0"	1	*5	8'-0"	2	*7	6'-5"	2	*6	3'-4"	13	*5	2'-3"
10	3.57	308	13	*5	7'-1" to 7'-5"	4	*5	7'-9"	2	*5	11'-1"	1	*5	11'-1"	4	*5	7'-6"	4	*5	2'-0"	4	*5	2'-6"	4	*5	3'-0"	1	*5	8'-0"	2	*7	6'-5"	2	*6	3'-4"	15	*5	2'-3"
12	4.09	369	17	*5	7'-3" to 7'-6"	4	*5	9'-9"	2	*5	13'-1"	1	*5	13'-1"	4	*5	9'-6"	4	*5	2'-0"	4	*5	2'-6"	4	*5	3'-0"	1	*5	8'-0"	2	*7	6'-5"	2	*6	3'-4"	18	*5	2'-3"
14	4.62	444	21	*5	7'-1" to 7'-7"	4	*5	11'-9"	2	*6	15'-1"	1	*5	15'-1"	4	*5	11'-6"	4	*5	2'-0"	4	*5	2'-6"	4	*5	3'-0"	1	*5	8'-0"	2	*7	6'-5"	2	*6	3'-4"	21	*5	2'-3"
16	5.17	506	25	*5	7'-1" to 7'-9"	4	*5	13'-9"	2	*6	17'-1"	1	*5	17'-1"	4	*5	13'-6"	4	*5	2'-0"	4	*5	2'-6"	4	*5	3'-0"	1	*5	8'-0"	2	*7	6'-5"	2	*6	3'-4"	23	*5	2'-3"
18	5.74	570	29	*5	7'-1" to 7'-10"	4	*5	15'-9"	2	*6	19'-1"	1	*5	19'-1"	4	*5	15'-6"	4	*5	2'-0"	4	*5	2'-6"	4	*5	3'-0"	1	*5	8'-0"	2	*7	6'-5"	2	*6	3'-4"	26	*5	2'-3"
20	6.19	636	33	*5	7'-1" to 8'-0"	4	*5	17'-9"	2	*6	21'-1"	1	*5	21'-1"	4	*5	17'-6"	4	*5	2'-0"	4	*5	2'-6"	4	*5	3'-0"	1	*5	8'-0"	2	*7	6'-5"	2	*6	3'-4"	29	*5	2'-3"

* The quantities shown above are for an H of five feet. If deeper inlets are required the quantities must be adjusted accordingly.

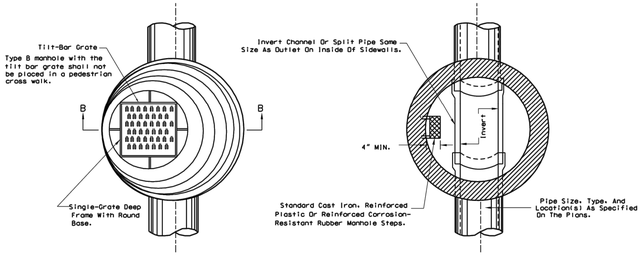
The above table to be used for estimating purposes only.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

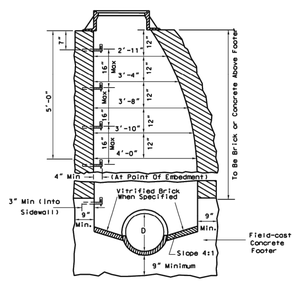
PREPARED 7-1-98
REVISION DATE

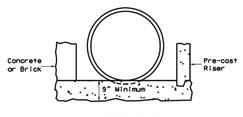
TYPE E INLET

STANDARD SHEET DR6-E



PLAN VIEWS





NOTES

"Keyed" Or "Doweled" Type Construction Joints, Acceptable To The Engineer, May Be Used In The Construction Of Concrete Manholes.

If Cast-In-Place Manhole Is Over Twelve Feet (12') In Depth, The Sidewalls Below That Depth Will Be Double Thickness.

Pipe At Elevations Other Than Shown May Be Joined To The Manhole By Cutting A Hole The Size Of The Connecting Pipe In The Manhole, Inserting The Pipe The Thickness Of The Manhole Shell And Closing All Openings Around The Connecting Pipe With Joint Mortar.

Either This Manhole Or The Precast Manhole On Standard Sheet DR7-A May Be Furnished When Type B Manhole Is Called For In The Contract. The Frame And Grate Shall Be As Shown On Standard Sheet DR6-X INLET CASTINGS. Steps Shall Be As Shown On Standard Sheet DR7-X.

Minimum Height Of Bench Wall Above Flowline Of Pipe Is 25% Of The Diameter Of The Pipes.

The use of brick for manhole construction will not be allowed when a manhole is located in the roadway.

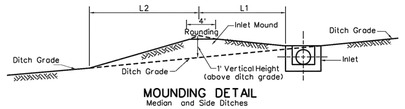
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

TYPE B MANHOLE

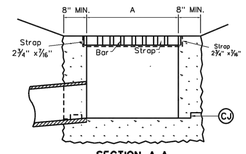
STANDARD SHEET DR7-B

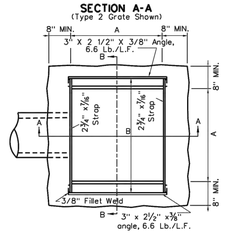
INLET MOUNDING TABLE			
DITCH GRADE (%) FROM	TO	L1, HORIZONTAL LENGTH (FT.)	L2, HORIZONTAL LENGTH (FT.)
0	3	10	15
3	5	9	20
5	7.5	8	40
7.5	UP	SPECIAL DESIGN	SPECIAL DESIGN

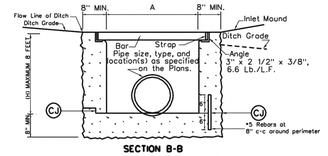


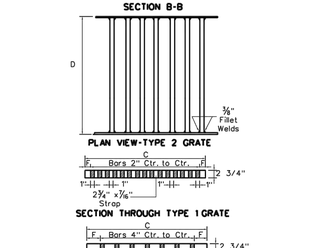
MOUNDING DETAIL

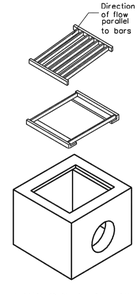
Median and Side Ditches











NOTES

The final installed top surface of inlet and grate shall be flush with adjacent finished surfaces such as pavement, gutters, curbs, and sidewalks. Top of grate elevation, if shown on the plans, is for information only.

Construction may be cast-in place, precast in one or multiple sections, or any combination of cast-in-place and precast.

Type 2 Grate shall be used at all locations unless otherwise specified on the Plans. Type 1 Urban Grates shall be used only at specially designated locations as shown on the plans.

The Contractor, at his option, may omit use of the frame by forming a ledge in the concrete.

Special care shall be execised in forming the 2" wide concrete ledge to provide a smooth, even surface for supporting the grates if the shallow frame is not used, no projections shall exist on the bearing surfaces of the ledge or the grates, and the grates shall seat on the ledge without rocking.

The Mounding Detail as shown is not required when an inlet is placed in a sag.

Optional construction joints labeled "CJ" may be roughened concrete, keyed or doweled as per the typical details shown herein or as approved by the Engineer. Non shrink grout meeting the requirements of subsection 715.5 of the specifications may be used to a depth of ½" for leveling between precast sections. Thicker depths will be allowed as per the manufacturer's recommendations.

This inlet is to be installed in roadside or median ditches only. It is not to be placed adjacent to pavement or in the gutter pan of combination curb and gutter.

The minimum distance from the top of any pipe opening to any construction joint above the opening shall be four (4) inches.

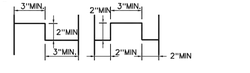
The number and location of pipe openings shall be as shown in the plans. The contractor at no additional cost, shall be responsible for any temporary bracing required to transport precast inlet sections due to multiple openings.

DIMENSIONS					TYPE 2 GRATE		FRAME	TYPE 1 GRATE		
Pipe Size	A	B	C	D	H(Min)	F	Bars	WT.	WT.	F	Bars	WT.
18"	2'-8"	3'-2"	2'-7 3/4"	3'-1 3/4"	2'-0"	3 3/8"	7	223	62	1 3/8"	15	453
21"	2'-8"	3'-2"	2'-7 3/4"	3'-1 3/4"	2'-3"	3 3/8"	7	223	62	1 3/8"	15	453
24"	2'-8"	3'-2"	2'-7 3/4"	3'-1 3/4"	2'-6"	3 3/8"	7	223	62	1 3/8"	15	453
27"	3'-0"	3'-6"	2'-11 3/4"	3'-5 3/4"	2'-9"	3 3/8"	8	279	69	1 3/8"	17	566
30"	3'-6"	4'-0"	3'-5 3/4"	3'-11 3/4"	3'-0"	3 3/8"	9	357	80	1 3/8"	21	797
33"	3'-9"	4'-3"	3'-8 3/4"	4'-2 3/4"	3'-3"	3 3/8"	10	419	85	1 7/8"	21	847
36"	4'-0"	4'-6"	3'-11 3/4"	4'-5 3/4"	3'-6"	3 3/8"	11	486	90	1 3/8"	23	981
42"	4'-6"	5'-0"	4'-5 3/4"	4'-11 3/4"	4'-0"	3 3/8"	12	587	101	1 3/8"	27	1277
48"	5'-0"	5'-6"	4'-11 3/4"	5'-5 3/4"	4'-6"	3 3/8"	14	748	112	1 3/8"	29	1507

Table Note: Grate and frame weights are for information only and will increase if larger straps and bars are used.

The following substitutions in dimensions are acceptable for fabricating the grate and frame:

Strap Thickness: 1/2" Strap Depth: 3" Bar Depth: 3"



WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

TYPE G INLET

STANDARD SHEET DR6-G

704 Foxcroft Avenue
Martinsburg, West Virginia 25401
Telephone: (304) 262-5411
Fax: (540) 722-9528
www.greenwayeng.com

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STORM SEWER DETAILS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

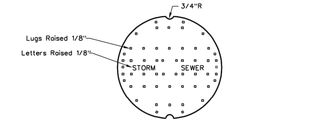
SCALE: N/A

DESIGNED BY: CC/CW

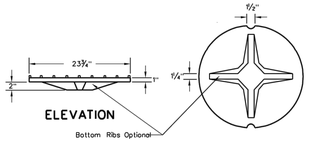
FILE NO. 4542A

SHEET 81 OF 97

SLD2022-06

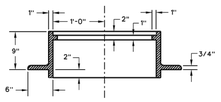


PLAN



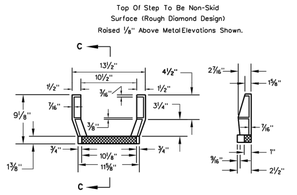
INVERTED PLAN

MANHOLE COVER



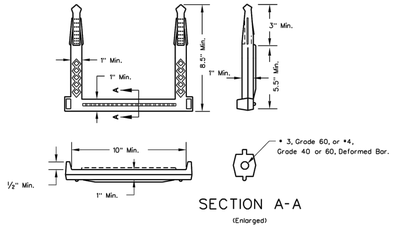
SECTION

MANHOLE FRAME



PLAN SECTION C-C

GRAY IRON STEP



SECTION A-A

(Enlarged)

REINFORCED PLASTIC AND REINFORCED CORROSION - RESISTANT RUBBER MANHOLE STEPS

NOTES

Lettering on covers shall denote STORM SEWER or SANITARY SEWER as applicable.
Bottom ribs may be deleted from manhole cover castings.
The ⅛" raised lugs are a skid resistant measure. Alternative measures will require approval by the Engineer.
Shop Drawings shall be submitted if details and dimensions vary.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
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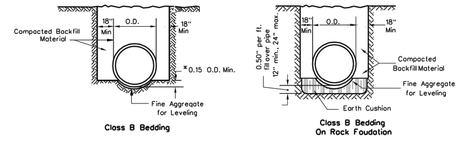
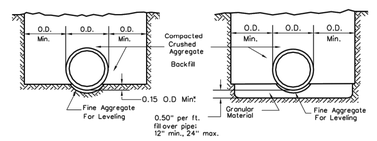
MANHOLE CASTINGS

STANDARD SHEET DR7-X

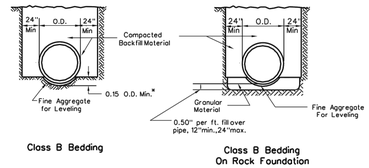
* Except for structural plate pipe where length of bedding arc need not exceed width of bottom plate However, if structural plate pipe is first assembled and then placed in the trench, the 0.15 O.D. minimum value will apply.



(Trench shown is for 18" thru 54" Pipe)

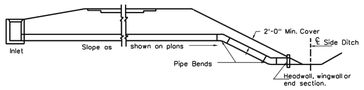


(Trench shown is for 60" thru 108" flexible pipe in soil cut fill sections)



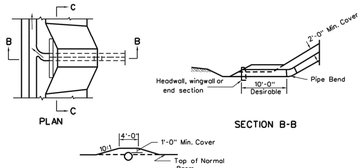
(Trench shown is for 60" thru 108" rigid pipe in cut sections)

TYPICAL PIPE BEDDING



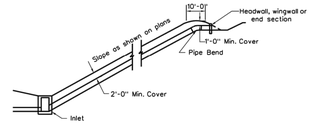
MEDIAN OUTLET IN HIGH FILL

To be used where called for on the plans or as shown on the cross sections.



OUTLET THROUGH BERM

To be used where called for on the plans or as shown on the cross sections.



PIPE FLUME
Earth Cut or Shallow Rock Cuts

NOTES

For pipe without corrugations, a one inch layer of fine aggregate for leveling will normally be adequate to achieve a uniform bearing surface. For corrugated pipe, layers shall be 1" minimum for 1/2" depth corrugations, 2" minimum for 1" depth corrugations, and 3" minimum for 2" or 2-1/2" depth corrugations.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

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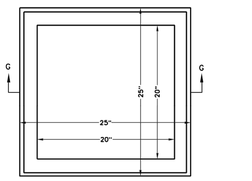
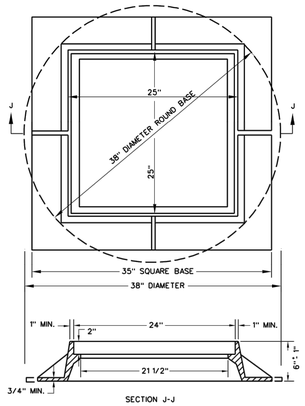
MISCELLANEOUS DRAINAGE (sheet 1 of 4)

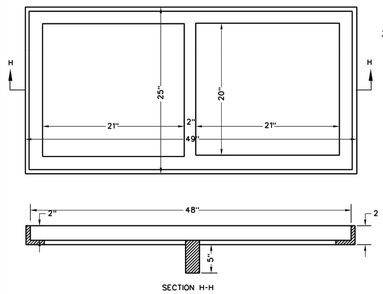
STANDARD SHEET DR8



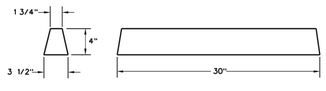
SINGLE-GRATE SHALLOW FRAME



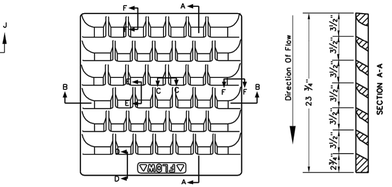
SINGLE- GRATE DEEP FRAME (ROUND OR SQUARE BASE)

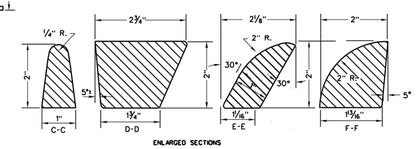


DOUBLE-GRATE SHALLOW FRAME



GRATE SUPPORT BAR





TILT-BAR GRATE

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

INLET CASTINGS

STANDARD SHEET DR6-X

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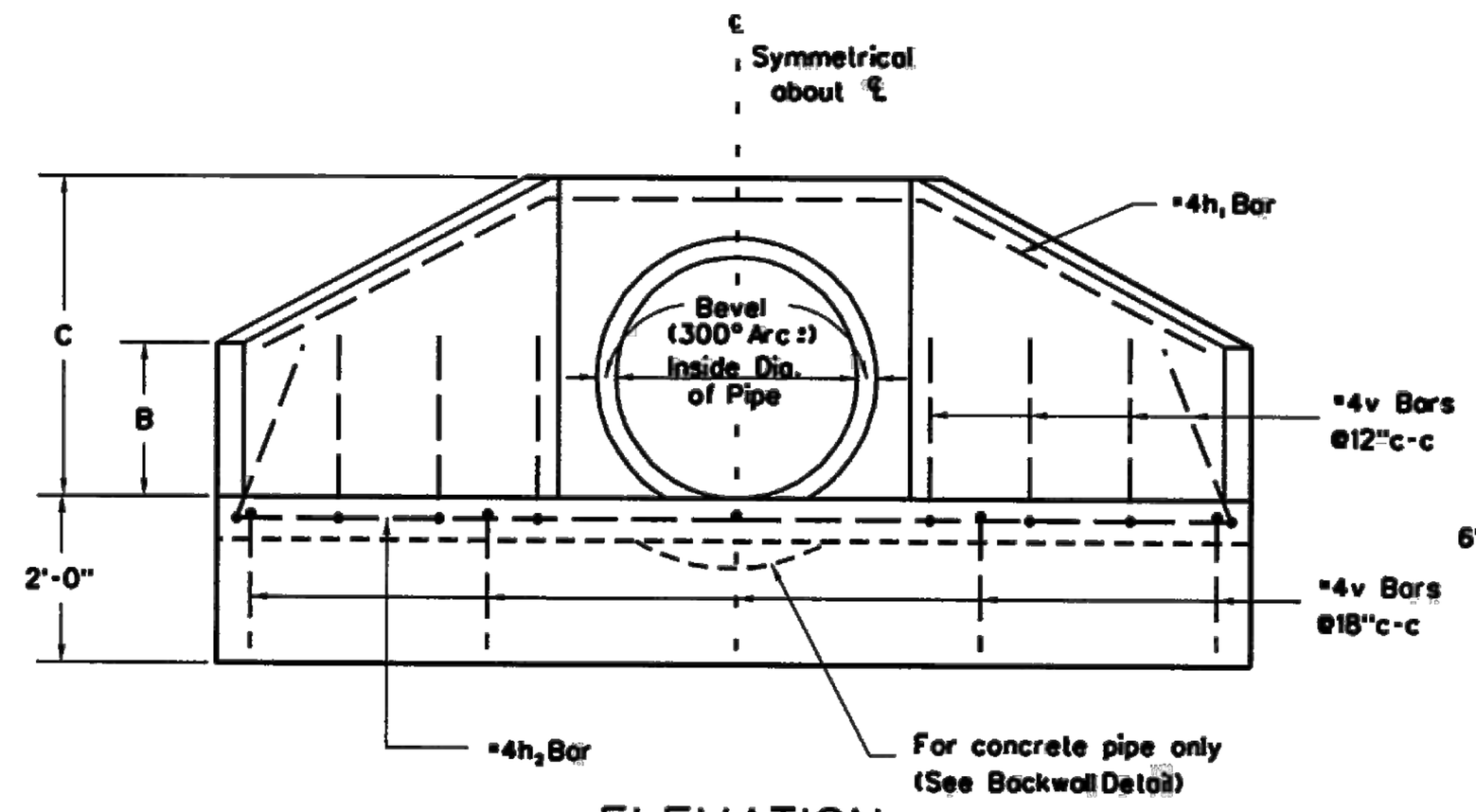
STORM SEWER DETAILS

NORBORNE GLEBE

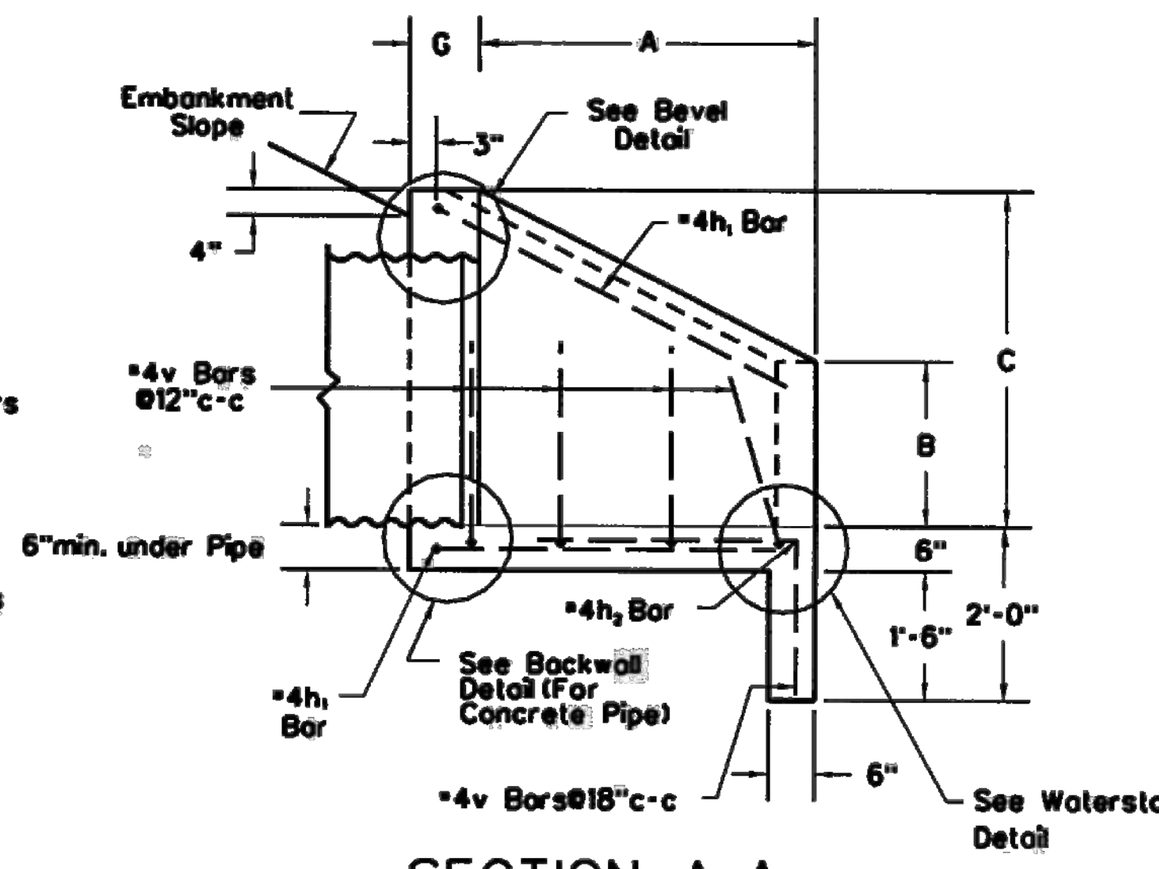
PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

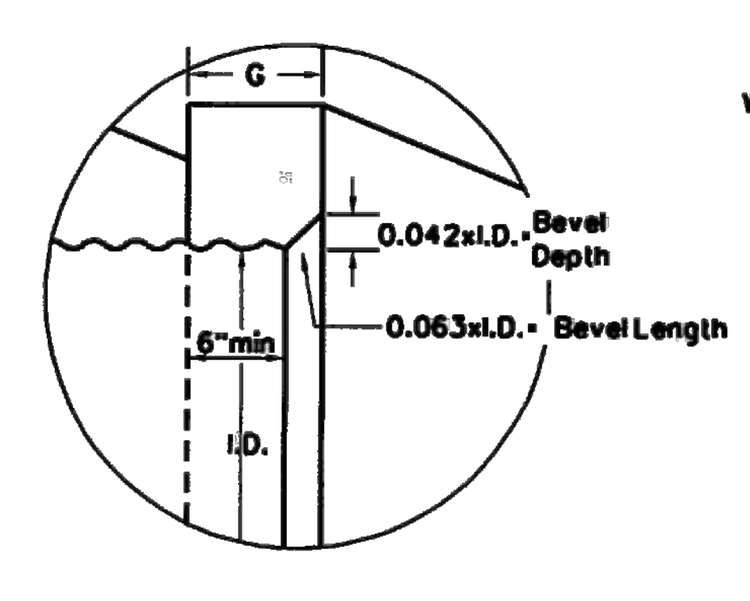
DATE: 11/06/2023
SCALE: N/A
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 82 OF 97
SLD2022-06



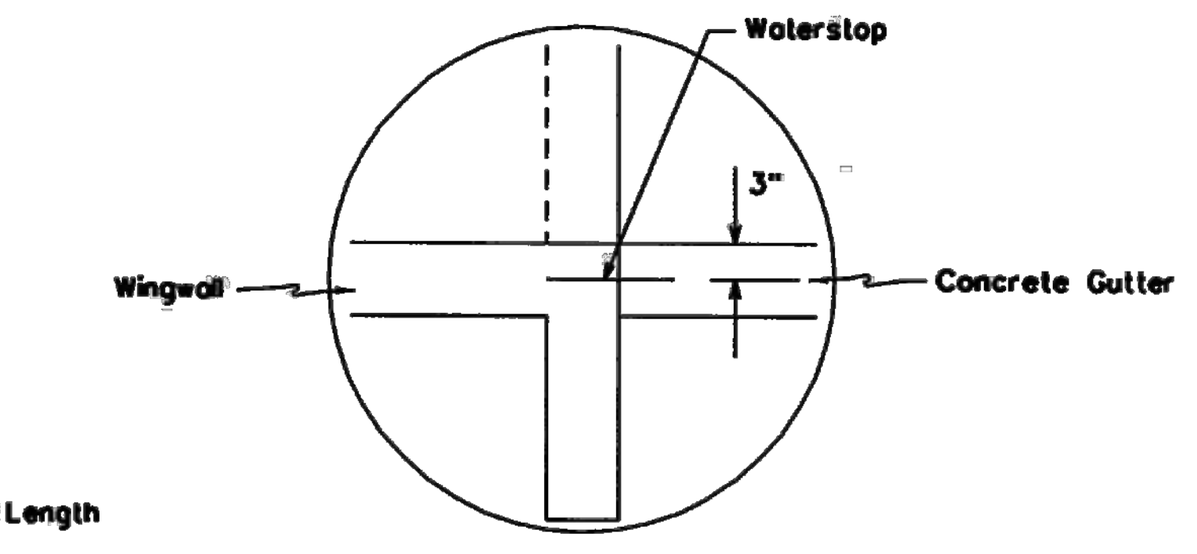
ELEVATION



SECTION A-A



BEVEL DETAIL



WATERSTOP DETAIL

NOTES

All concrete shall be Class B Concrete.

Reinforcing steel shall be new billet steel and shall conform to the requirements of 709.1 of the Specifications.

The covering for Reinforcing Steel shall be 2" measured from the surface of the concrete to the face of the bar, unless otherwise noted on the Plans. Reinforcement in members where concrete is deposited on the ground shall have 3" of concrete from the face of the bar to the ground contact surface.

All exposed edges shall have a 3/4" x 45° chamfer. Chamfer on vertical edges shall be continued a minimum of one foot below finished ground line.

When wingwalls are placed on the inlet end of corrugated metal or structural plate pipe, a bevel shall be used at the inlet opening. The end of the pipe shall be set in from the face of the wall as shown on the "Bevel Detail", and the bevel constructed from the end of the pipe to the face of the wall.

When wingwalls are placed on the inlet end of concrete pipe, the "bell" or "groove" of the pipe shall be placed in the wall, and the inside of the "bell" or "groove" shall be filled with concrete up to the flow line.

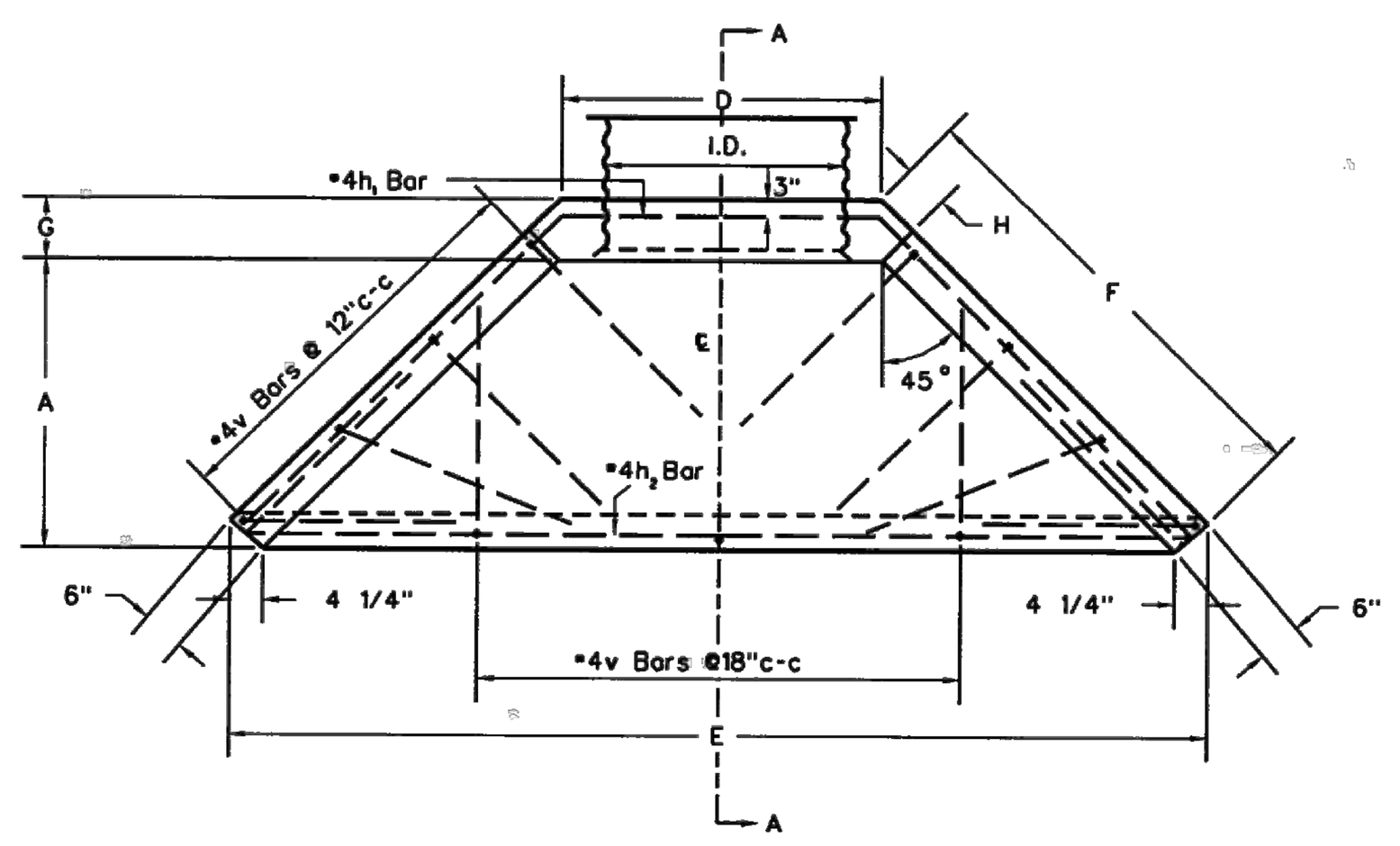
Bevels are not required on outlet wingwalls or on inlet wingwalls for concrete pipe.

Keyed or doweled type construction joints, acceptable to the Engineer, may be used during construction.

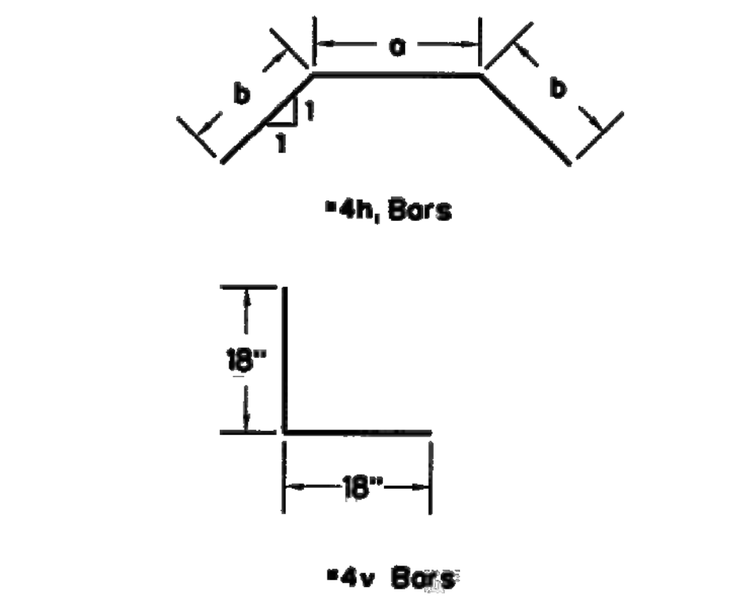
If embankment slope above wingwalls is flatter than 2:1, provide wings for 2:1 slope and warp embankment to 2:1 slope at wingwall.

The pay quantity for wingwalls, constructed in accordance with the details herein, will be the cubic yards of Class B Concrete specified on this sheet. Cost of all reinforcing steel shall be included in the unit price bid for Class B Concrete.

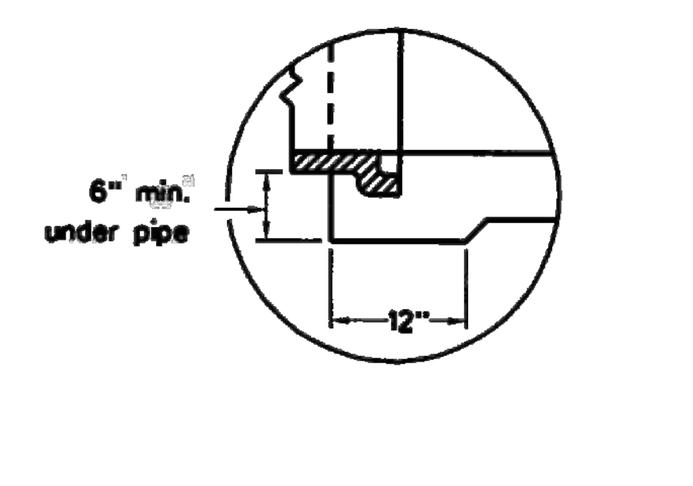
Waterstop meeting the requirements of 708.10 shall be placed as shown when concrete gutter is to abut the wingwall.



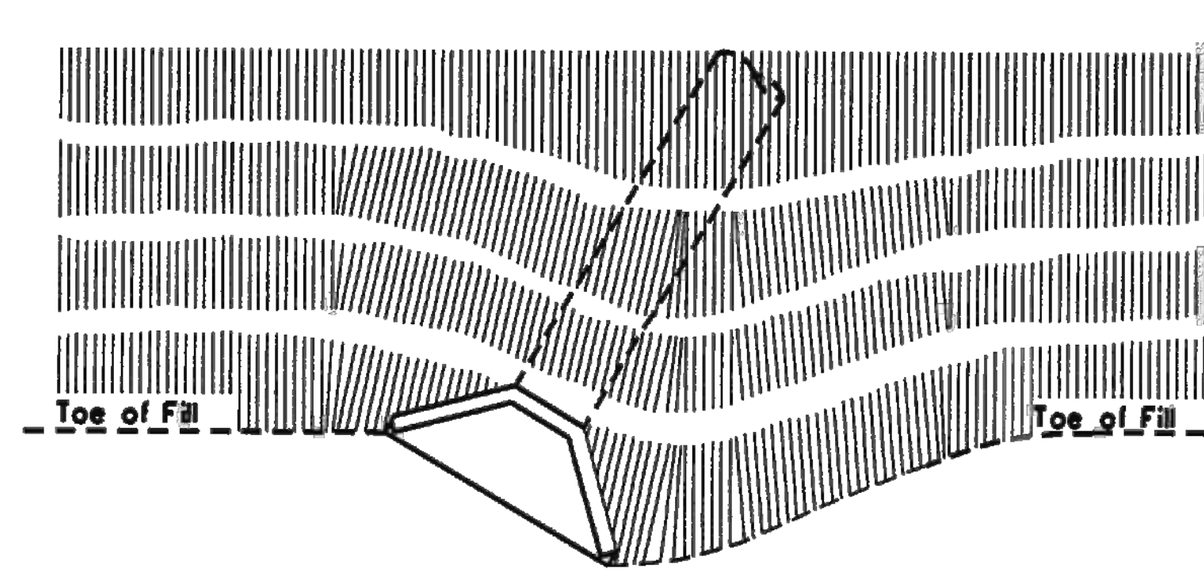
PLAN VIEW



DETAIL OF BENT BARS



BACKWALL DETAIL
(For Concrete Pipe)



CONSTRUCTION DETAIL - SKEWED PIPE

Inside Dia. of Pipe	Slope of Fill	A	B	C	D	E	F	G	H	Mark	Size	No. of Bars	a	b	Total	Type	CONC. (R.C.P.) C.Y.	CONC. (C.M.P.) C.Y.	STEEL LBS.
		DIMENSIONS								REINFORCEMENT			LENGTH				QUANTITIES		
15"	2:1	*2'-0"	0'-10"	1'-11"	2'-0"	6'-7 1/2"	3'-3 1/4"	*0'-8"	*0'-5 3/8"	h1	#4	2	1'-10"	3'-2 1/2"	8'-3"	BENT	0.61	0.62	41.2
		†2'-2"						†0'-6"	†0'-2 1/2"	h2	#4	1			6'-1"	ST.			
		BEVEL:DEPTH=3/4" LENGTH=1"								v	#4	13			3'-0"	BENT			
18"	2:1	*2'-0"	1'-1"	2'-2"	2'-3"	6'-10 1/2"	3'-3 1/4"	*0'-8"	*0'-5 3/8"	h1	#4	2	2'-1"	3'-2 1/2"	8'-6"	BENT	0.67	0.68	41.8
		†2'-2"						†0'-6"	†0'-2 1/2"	h2	#4	1			6'-4"	ST.			
		BEVEL:DEPTH=3/4" LENGTH=1 1/4"								v	#4	13			3'-0"	BENT			
24"	2:1	*2'-8"	1'-4"	2'-9"	2'-11"	8'-10 1/2"	4'-2 1/2"	*0'-8"	*0'-5 3/8"	h1	#4	2	2'-9"	4'-1 1/2"	11'-0"	BENT	1.01	1.02	52.4
		†2'-10"						†0'-6"	†0'-2 1/2"	h2	#4	1			8'-4"	ST.			
		BEVEL:DEPTH=1" LENGTH=1 1/2"								v	#4	16			3'-0"	BENT			
30"	2:1	*3'-1"	1'-7"	3'-3"	3'-5"	10'-4 1/2"	4'-11"	*0'-9"	*0'-6 3/4"	h1	#4	2	3'-3"	4'-10 1/2"	13'-0"	BENT	1.32	1.37	58.1
		†3'-4"						†0'-6"	†0'-2 1/2"	h2	#4	1			9'-10"	ST.			
		BEVEL:DEPTH=1 1/4" LENGTH=2"								v	#4	17			3'-0"	BENT			
36"	2:1	*3'-9"	1'-10"	3'-10"	4'-1"	12'-4 1/2"	5'-10 1/2"	*0'-9"	*0'-6 3/4"	h1	#4	2	3'-11"	5'-9 1/2"	15'-6"	BENT	1.79	1.86	70.8
		†4'-0"						†0'-6"	†0'-2 1/2"	h2	#4	1			11'-10"	ST.			
		BEVEL:DEPTH=1 1/2" LENGTH=2 1/4"								v	#4	21			3'-0"	BENT			

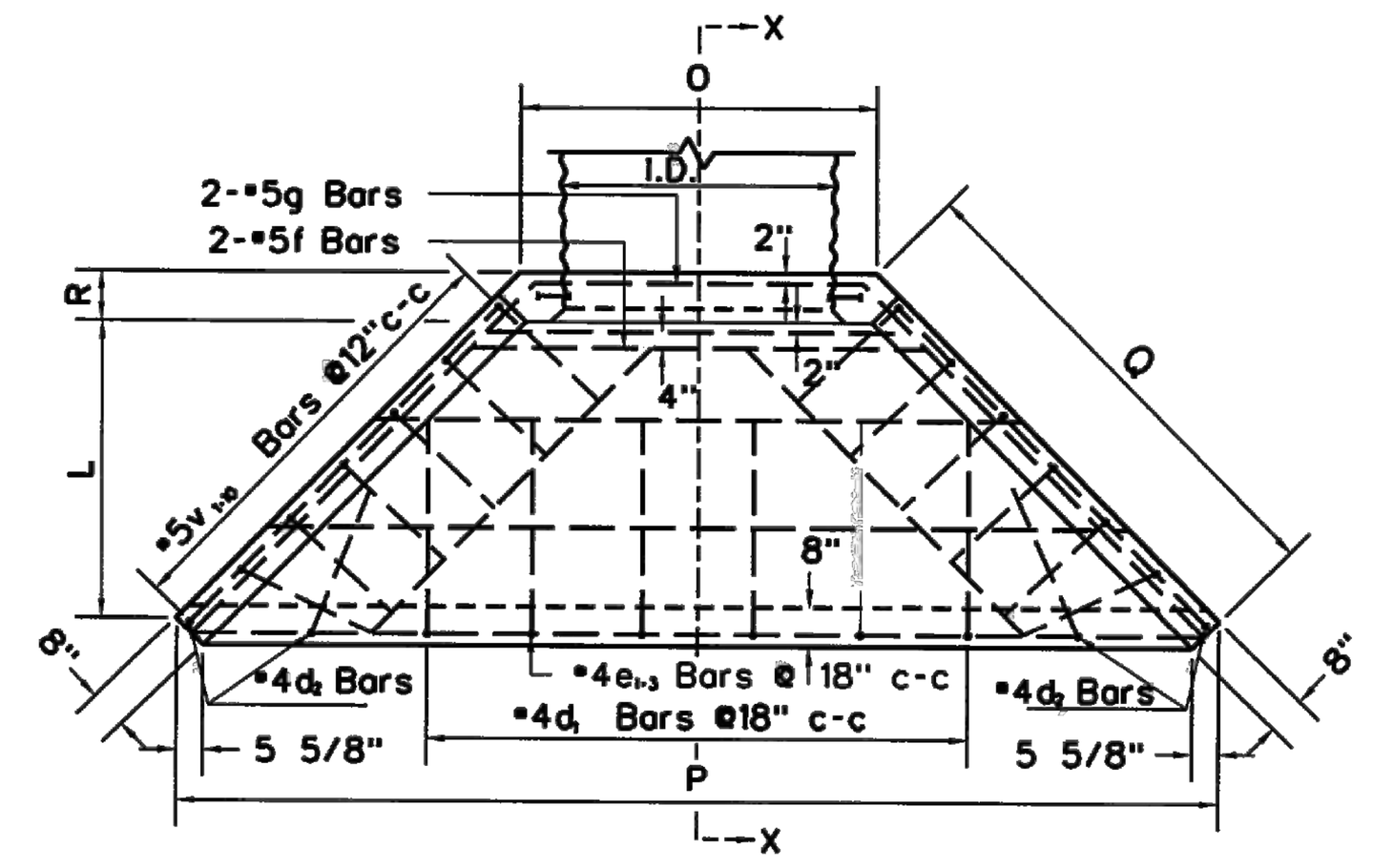
* DIMENSIONS FOR INLET WINGWALLS ON CORRUGATED METAL PIPE (TO ACCOMMODATE THE BEVEL).
† DIMENSIONS FOR INLET WINGWALLS ON CONCRETE PIPE AND ALL OUTLET WINGWALLS.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

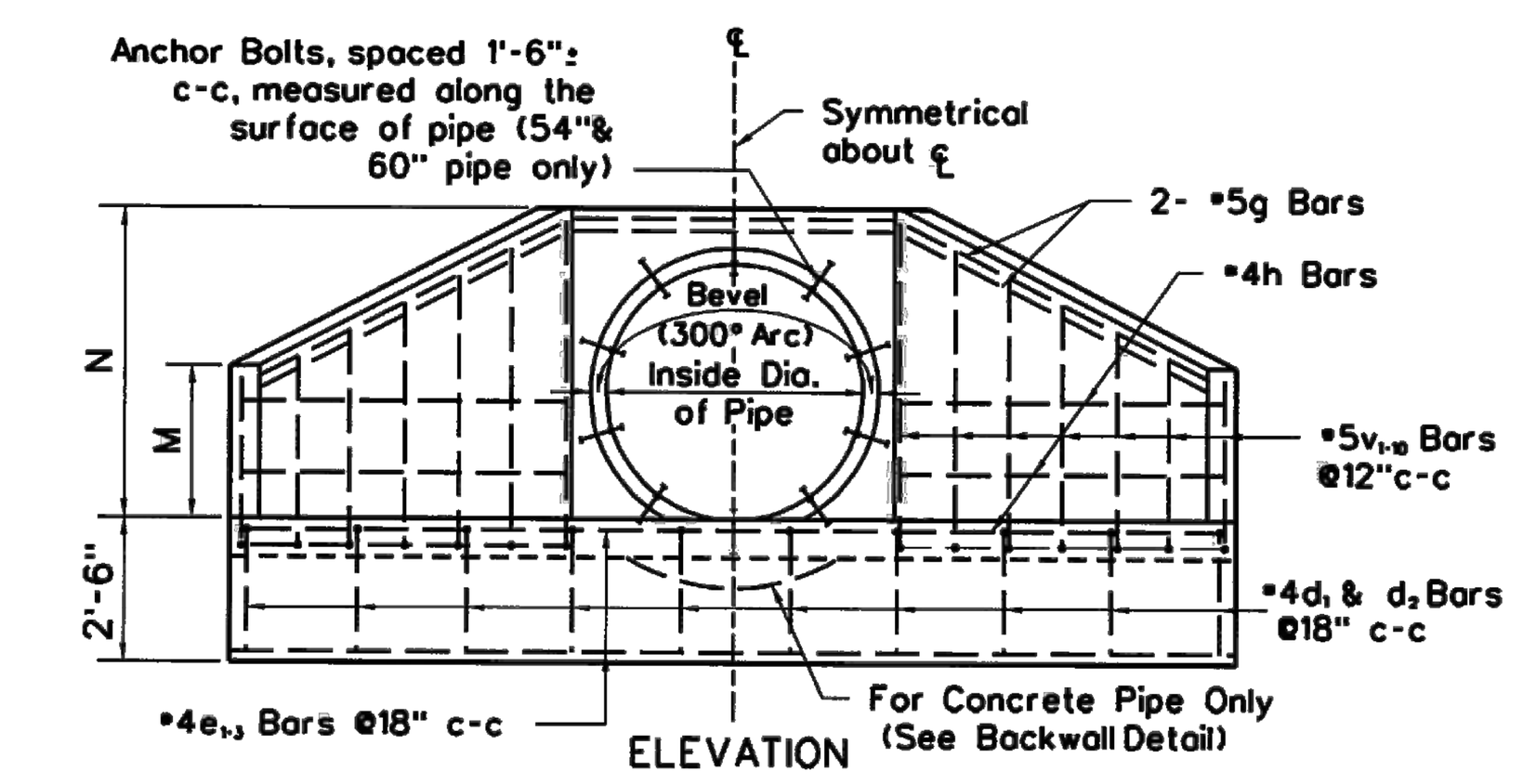
PREPARED 7-1-99
REVISION DATE

PIPE CULVERT WINGWALLS (SHEET 1 OF 4)

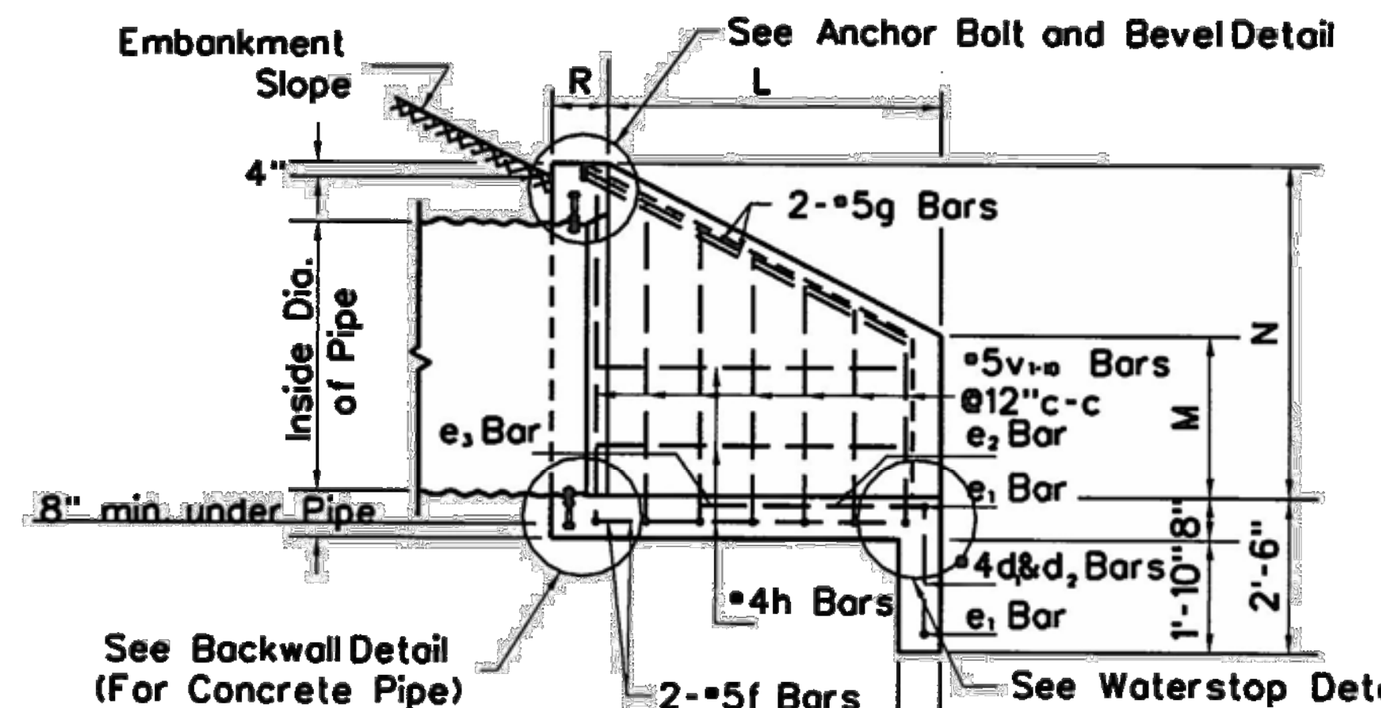
STANDARD SHEET DR2



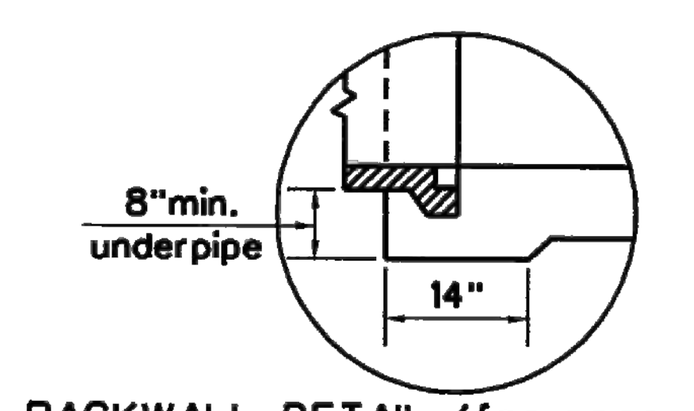
PLAN VIEW



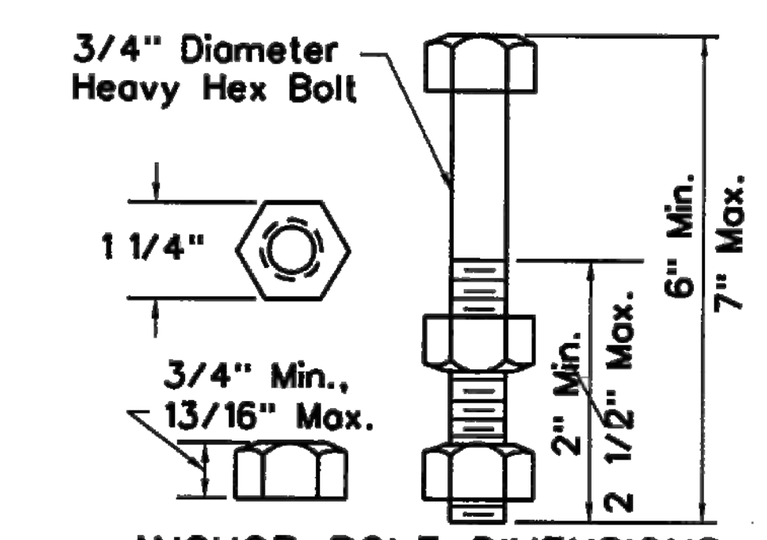
ELEVATION



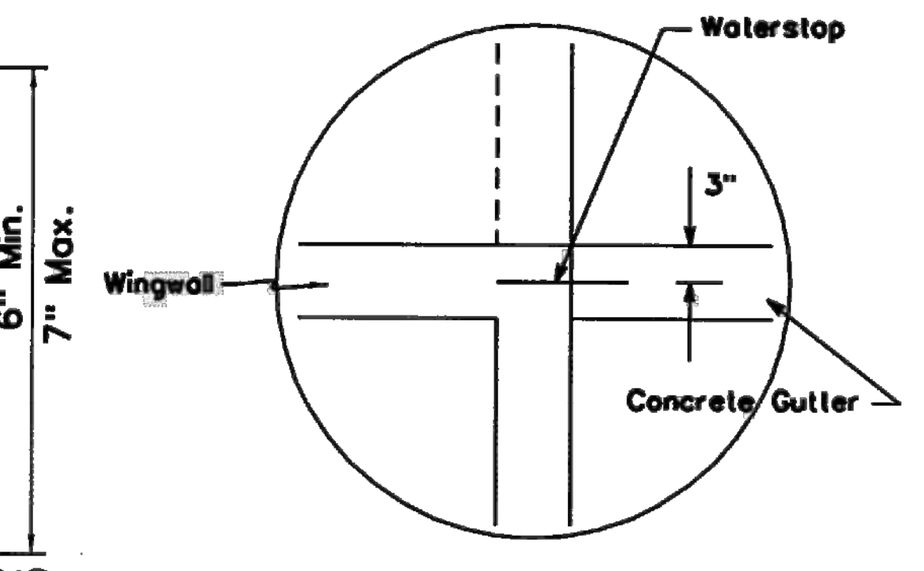
SECTION X-X



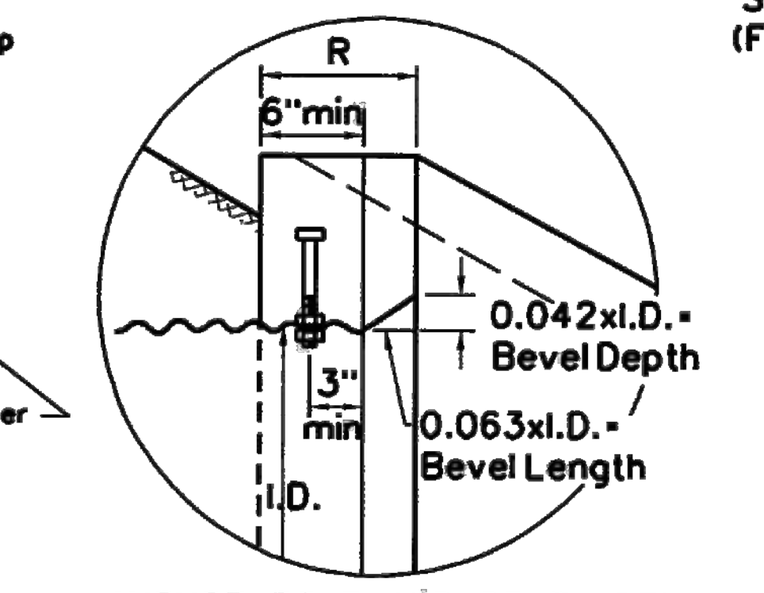
BACKWALL DETAIL (for concrete pipe)



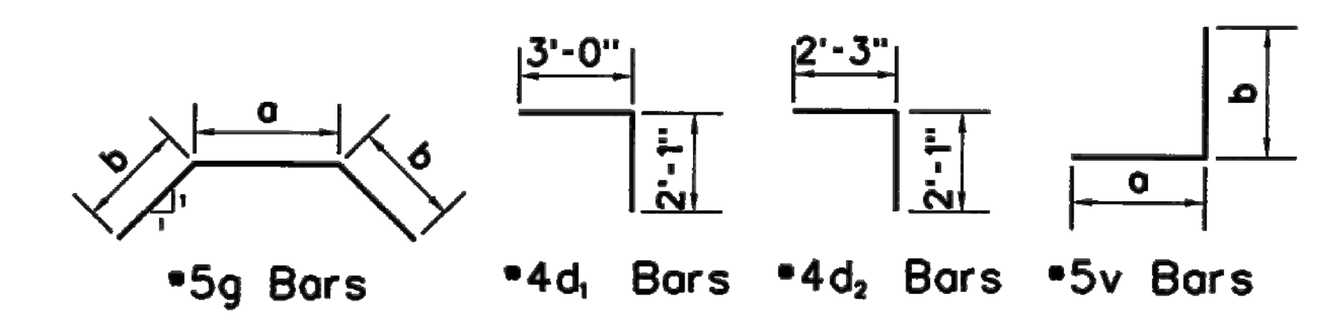
ANCHOR BOLT DIMENSIONS



WATERSTOP DETAIL



ANCHOR BOLT AND BEVEL DETAIL



DETAIL OF BENT BARS

Inside Dia. of Pipe	Slope of Fill	L	M	N	O	P	Q	R	S	Mark	Size	No. of Bars	a	b	Total	Type	Conc. (RCP) C.Y.	Conc. (C.M.P. or S.P.P.) C.Y.	Steel Lbs.
		DIMENSIONS								REINFORCEMENT			LENGTH				QUANTITIES		
42"	2:1	*4'-3"	2'-2"	4'-4 1/2"	4'-10"	14'-1/2"	6'-6 1/2"	*0'-10"	*0'-6 1/2"	d1	#4	6			5'-1"	Bent	3.17	3.23	225.0
		+4'-5"						+0'-8"	+0'-3 1/4"	d2	#4	4			4'-4"	Bent			
										e1	#4	2			13'-6"	St.			
		Bevel: Depth = 1 3/4"								e2	#4	1			11'-0"	St.			
		Length= 2 3/4"								e3	#4	1			8'-0"	St.			
										f	#5	2			5'-10"	St.			
										g	#5	2	4'-4"	6'-9"	17'-10"	Bent			
										h	#4	8			6'-0"	St.			
										v1	#5	2	2'-0"	2'-6"	4'-6"	Bent			
										v2	#5	2	2'-0"	2'-10"	4'-10"	Bent			
										v3	#5	2	2'-0"	3'-2"	5'-2"	Bent			
										v4	#5	2	2'-0"	3'-7"	5'-7"	Bent			
										v5	#5	2	2'-0"	3'-11"	5'-11"	Bent			
										v6	#5	2	2'-0"	4'-2"	6'-2"	Bent			
										v7	#5	2	2'-0"	4'-6"	6'-6"	Bent			
48"	2:1	*4'-10"	2'-5"	4'-11"	5'-5"	15'-9 1/2"	7'-4 1/2"	*0'-10"	*0'-6 1/2"	d1	#4	7			5'-1"	Bent	3.89	3.97	262.0
		+5'-0"						+0'-8"	+0'-3 1/4"	d2	#4	4			4'-4"	Bent			
										e1	#4	2			15'-3"	St.			
		Bevel: Depth= 2"								e2	#4	1			12'-9"	St.			
		Length= 3"								e3	#4	1			9'-9"	St.			
										f	#5	2			6'-5"	St.			
										g	#5	2	4'-11"	7'-8"	20'-3"	Bent			
										h	#4	8			6'-9"	St.			
										v1	#5	2	2'-0"	2'-9"	4'-9"	Bent			
										v2	#5	2	2'-0"	3'-1"	5'-1"	Bent			
										v3	#5	2	2'-0"	3'-5"	5'-5"	Bent			
										v4	#5	2	2'-0"	3'-9"	5'-9"	Bent			
										v5	#5	2	2'-0"	4'-2"	6'-2"	Bent			
										v6	#5	2	2'-0"	4'-6"	6'-6"	Bent			
										v7	#5	2	2'-0"	4'-10"	6'-10"	Bent			
										v8	#5	2	2'-0"	5'-2"	7'-2"	Bent			
54"	2:1	*5'-5"	2'-8"	5'-5 1/2"	6'-0"	17'-6 1/2"	8'-2"	*0'-10"	*0'-6 1/2"	d1	#4	8			5'-1"	Bent	4.64	4.74	300.0
		+5'-7"						+0'-8"	+0'-3 1/4"	d2	#4	4			4'-4"	Bent			
										e1	#4	2			17'-0"	St.			
		Bevel: Depth = 2 1/4"								e2	#4	1			14'-6"	St.			
		Length= 3 1/2"								e3	#4	1			11'-6"	St.			
										f	#5	2			7'-0"	St.			
										g	#5	2	5'-6"	8'-7"	22'-8"	Bent			
										h	#4	8			7'-8"	St.			
										v1	#5	2	2'-0"	3'-0"	5'-0"	Bent			
										v2	#5	2	2'-0"	3'-4"	5'-4"	Bent			
										v3	#5	2	2'-0"	3'-8"	5'-8"	Bent			
										v4	#5	2	2'-0"	4'-0"	6'-0"	Bent			
										v5	#5	2	2'-0"	4'-4"	6'-4"	Bent			
										v6	#5	2	2'-0"	4'-8"	6'-8"	Bent			
										v7	#5	2	2'-0"	5'-0"	7'-0"	Bent			
										v8	#5	2	2'-0"	5'-4"	7'-4"	Bent			
										v9	#5	2	2'-0"	5'-8"	7'-8"	Bent			
60"	2:1	*6'-0"	2'-11"	6'-0"	6'-7"	19'-3 1/2"	9'-0"	*0'-10"	*0'-6 1/2"	d1	#4	9			5'-1"	Bent	5.54	5.66	341.0
		+6'-2"						+0'-8"	+0'-3 1/4"	d2	#4	4			4'-4"	Bent			
										e1	#4	2			18'-9"	St.			
		Bevel: Depth = 2 1/2"								e2	#4	1			16'-3"	St.			
		Length= 3 3/4"								e3	#4	1			13'-3"	St.			
										f	#5	2			7'-7"	St.			
										g	#5	2	6'-1"	9'-5"	24'-11"	Bent			
										h	#4	8			8'-6"	St.			
										v1	#5	2	2'-0"	3'-3"	5'-3"	Bent			
										v2	#5	2	2'-0"	3'-7"	5'-7"	Bent			
										v3	#5	2	2'-0"	3'-11"	5'-11"	Bent			
										v4	#5	2	2'-0"	4'-3"	6'-3"	Bent			
										v5	#5	2	2'-0"	4'-8"	6'-8"	Bent			
										v6	#5	2	2'-0"	5'-0"	7'-0"	Bent			
										v7	#5	2	2'-0"	5'-4"	7'-4"	Bent			
										v8	#5	2	2'-0"	5'-8"	7'-8"	Bent			
										v9	#5	2	2'-0"	6'-0"	8'-0"	Bent			
										v10	#5	2	2'-0"	6'-3"	8'-3"	Bent			

* Dimensions for inlet wingwalls on corrugated metal or structural plate pipe (to accommodate bevel).

NOTES

The "Notes" and the "Construction Detail-Skewed Pipe" on Standard Sheet DR2 (Sheet 1 of 2) shall apply to this sheet.

Anchor bolts shall be used on wingwalls for corrugated metal and structural plate pipe greater than 48" in diameter. Anchor bolts are not required for concrete pipe.

Anchor bolts and nuts shall conform to the requirements for "Headwall Anchorage" hardware as stipulated in AASHTO Specification M-167. Anchor bolts and nuts shall be cleaned after galvanizing to provide a free running fit.

Cost of the anchor bolts and nuts shall be included in the unit price bid for the pipe.

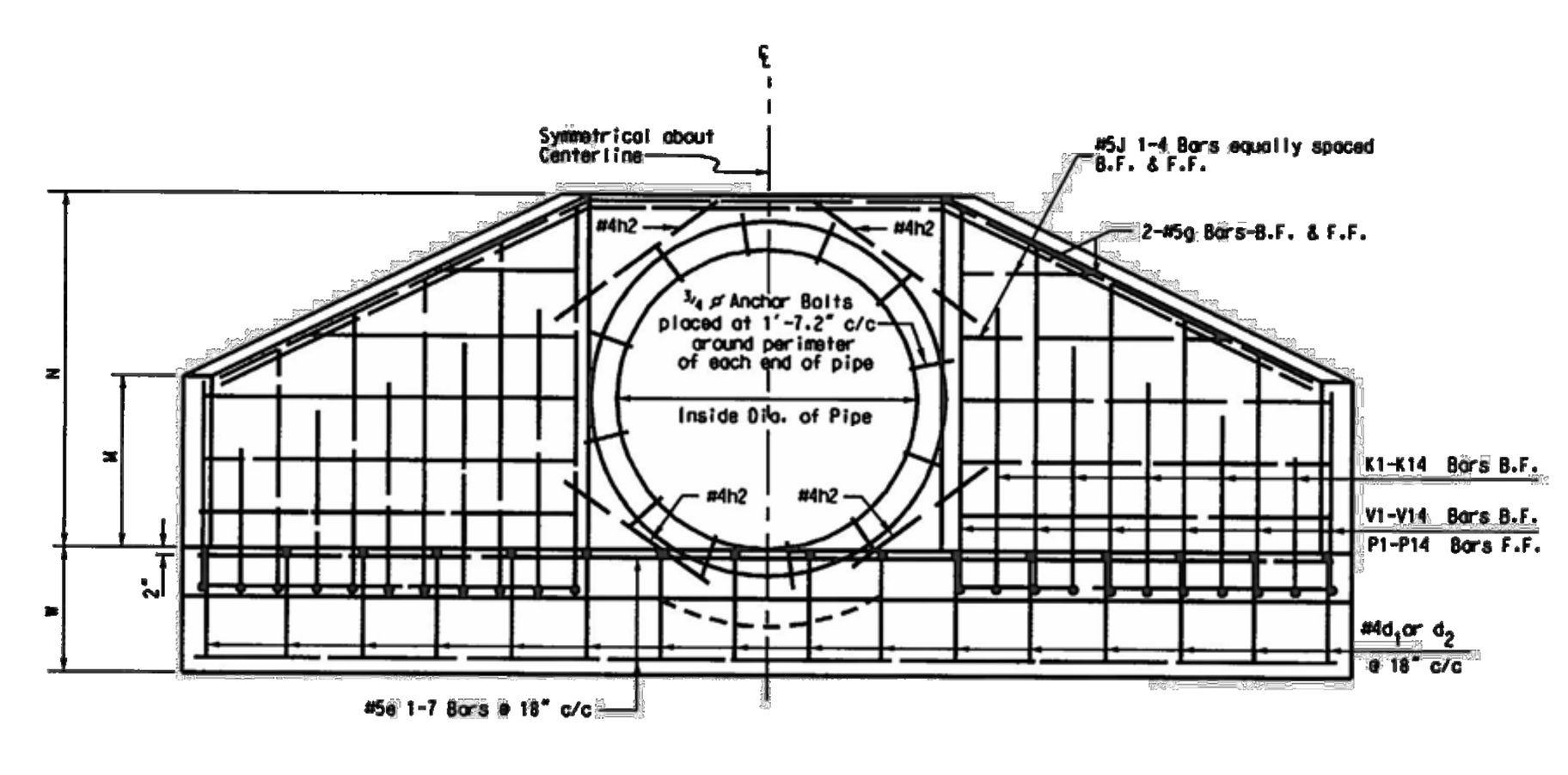
Right-of-way fence hardware inserts shall be installed in the sidewalls during the construction of wingwalls for pipes over 48" in diameter. Dimensions and location of inserts shall conform to the "Drainage Structure Terminal Installation" detail of the applicable right-of-way fence standard.

Waterstop meeting the requirements of 708.10 shall be placed as shown when concrete gutter is to abut the wingwall.

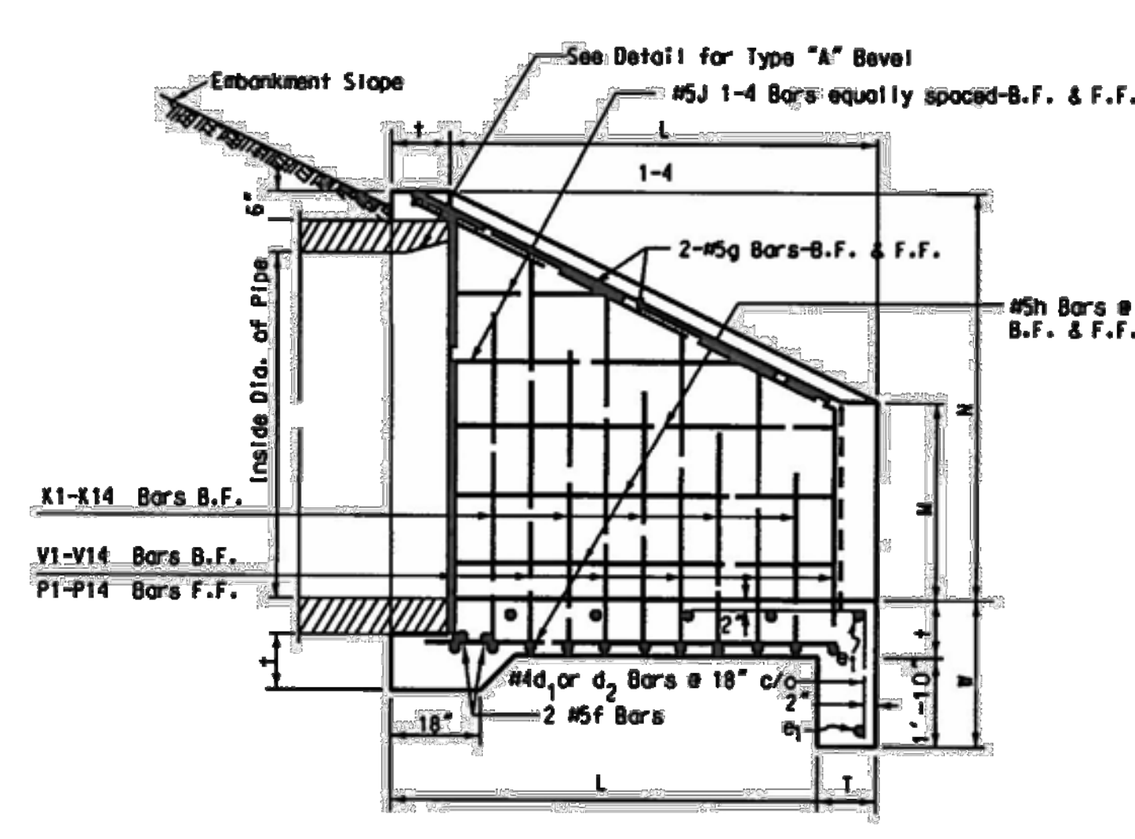
WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7-1-99
REVISION DATE

PIPE CULVERT WINGWALLS (SHEET 2 OF 4)



END VIEW

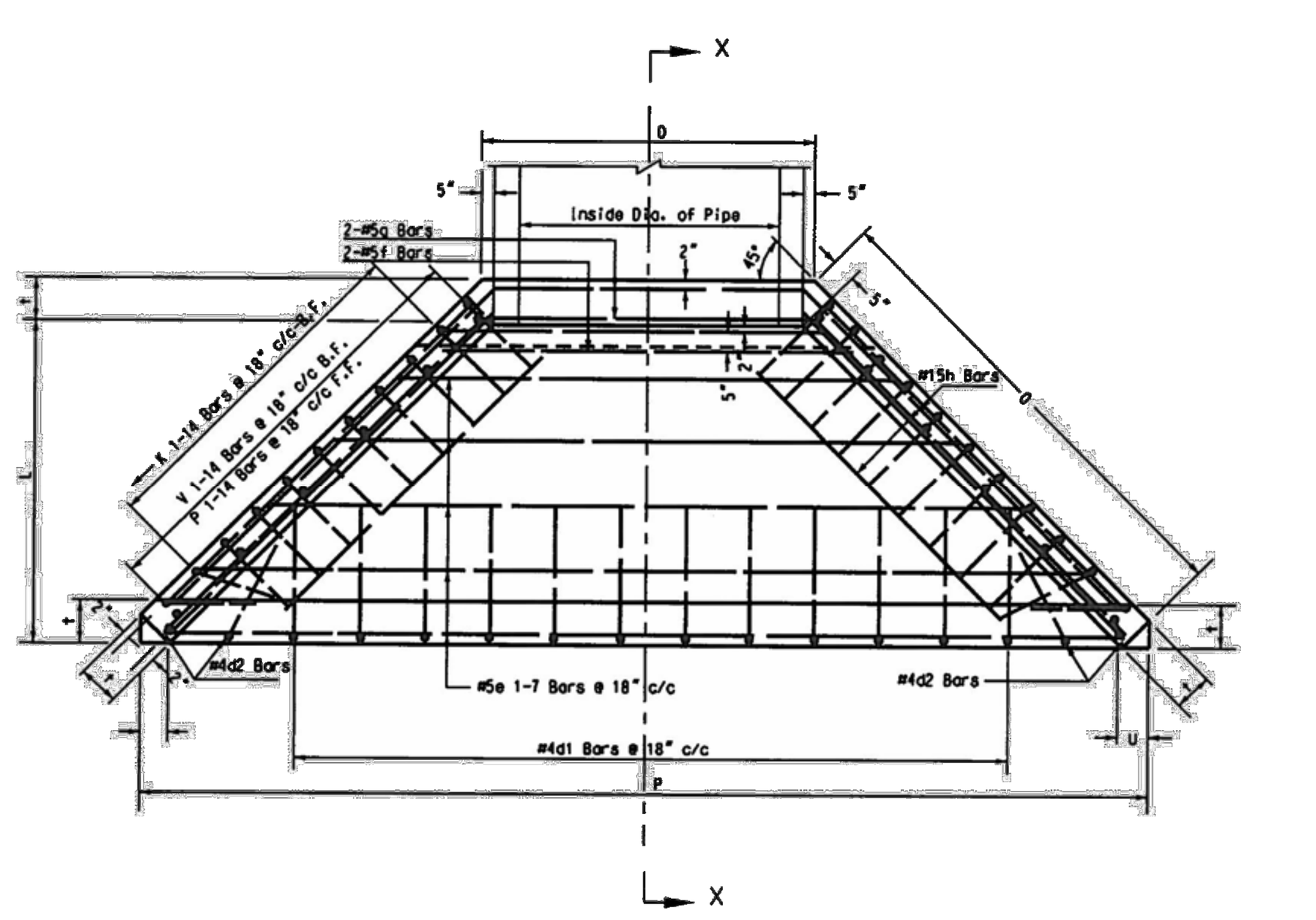


SECTION X-X

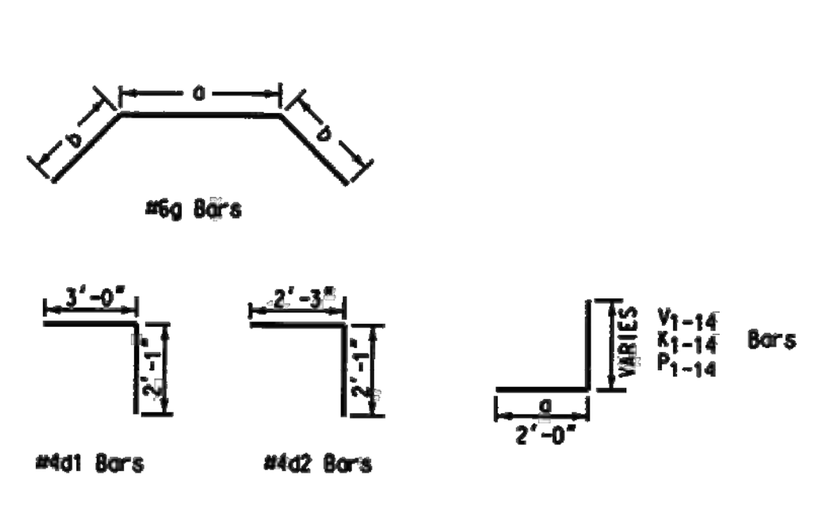
NOTES

REINFORCING BAR DETAILS AND QUANTITIES ARE SHOWN ON SHEET 4 OF 4
B.F. DENOTES BACK FACE
F.F. DENOTES FRONT FACE

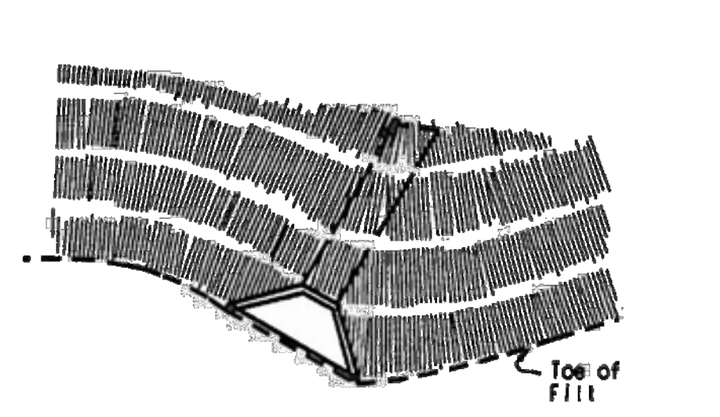
INSIDE DIA OF PIPE	SLOPE OF FILL	L	M	N	O	P	Q	t	u	w
		DIMENSIONS								
72"	2:1	7'-4"	3'-6"	7'-1"	8'-0"	23'-3"	10'-9"	12"	8 1/2"	2'-10"
84"	2:1	8'-6"	4'-0"	8'-2"	9'-2"	26'-9"	12'-5"	12"	8 1/2"	2'-10"
96"	2:1	9'-8"	4'-6"	9'-3"	10'-4"	30'-3"	14'-1"	12"	8 1/2"	2'-10"
108"	2:1	10'-10"	5'-0"	10'-4"	11'-6"	33'-9"	15'-9"	12"	8 1/2"	2'-10"
120"	2:1	12'-0"	5'-6"	11'-5"	12'-8"	37'-4"	17'-5"	14"	9 5/8"	3'-0"
144"	2:1	14'-4"	6'-6"	13'-6"	14'-10"	44'-3"	20'-9"	16"	11 3/8"	3'-2"



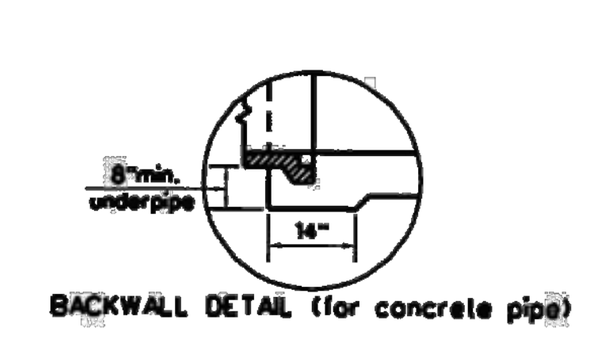
PLAN



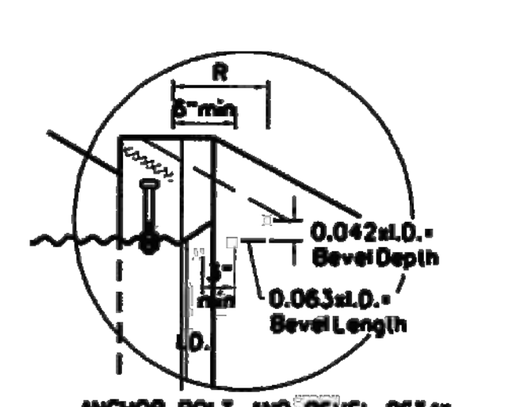
DETAIL OF BENT BARS



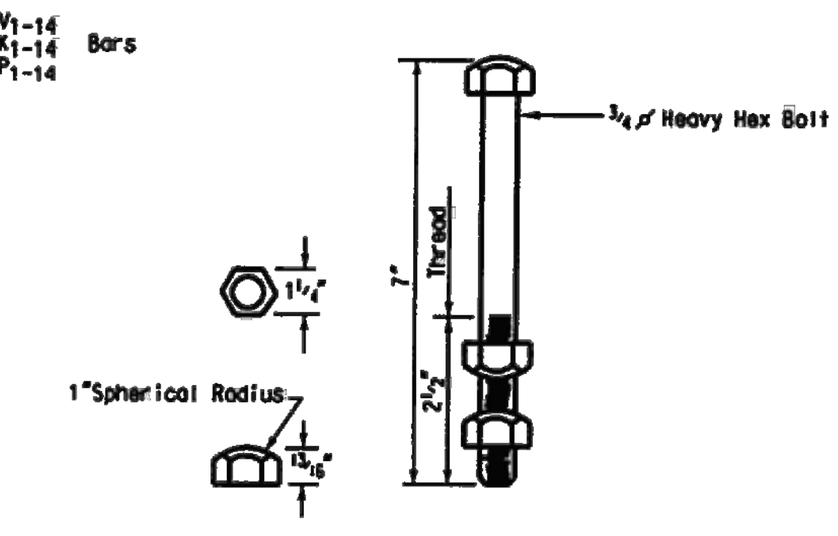
SKEWED PIPE CONSTRUCTION DETAIL



BACKWALL DETAIL (for concrete pipe)



ANCHOR BOLT AND BEVEL DETAIL



ANCHOR BOLT DETAIL

NOTES

NOTES ON THE STANDARD DETAIL DR2 (SHEETS 1 OF 2 AND 2 OF 2) SHALL APPLY TO THIS SHEET.

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7/1/99
REVISION DATE

PIPE CULVERT WINGWALLS (SHEET 3 OF 4)

STANDARD SHEET DR2

I.D. PIPE	FILL SLOPE	L	M	N	O	P	Q	T	MK	SIZE	NO.	a	b	TOTAL	SPAC.	TYPE	CONC. (C.Y.)	STEEL (Lbs)
		DIMENSIONS							REINFORCEMENT								QUANTITY	
72"	2:1	7'-4"	3'-6"	7'-1"	8'-0"	23'-3"	10'-9"	12"	D1	4	12			5'-1"	18" cc	BENT	11.22	972
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			22'-9"	18" cc	STR.		
									E2	5	1			20'-8"	18" cc	STR.		
									E3	5	1			17'-8"	18" cc	STR.		
									E4	5	1			14'-8"	18" cc	STR.		
									F	5	2			9'-11"	5" cc	STR.		
									G	5	4	7'-7"	11'-9"	31'-1"		BENT		
									H	5	18			10'-1"		STR.		
									V1	5	2	2'-0"	4'-2"	6'-2"	18" cc	BENT		
									THRU		6" INCREMENTS							
									V6	5	2	2'-0"	6'-8"	8'-8"	18" cc	BENT		
									V7	6	2	2'-0"	7'-2"	9'-2"	18" cc	BENT		
									H2	4	8			5'-0"		STR.		
									K1	5	2	2'-0"	2'-7"	4'-7"	18" cc	BENT		
									THRU		6" INCREMENTS							
									K6	5	2	2'-0"	5'-1"	7'-1"	18" cc	BENT		
									K7	6	2	2'-0"	5'-7"	7'-7"	18" cc	BENT		
									P1	5	2	2'-0"	4'-2"	6'-2"	18" cc	BENT		
									THRU		6" INCREMENTS							
									P7	5	2	2'-0"	7'-2"	9'-2"	18" cc	BENT		
									J1	5	4			1'-3"	18" cc	STR.		
									J2	5	4			2'-6"	18" cc	STR.		
84"	2:1	8'-6"	4'-0"	8'-2"	9'-2"	26'-9"	12'-5"	12"	D1	4	14			5'-1"	18" cc	BENT	14.25	1095
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			26'-3"	18" cc	STR.		
									E2	5	1			24'-2"	18" cc	STR.		
									E3	5	1			21'-2"	18" cc	STR.		
									E4	5	1			18'-2"	18" cc	STR.		
									F	5	2			11'-1"	5" cc	STR.		
									G	5	4	8'-9"	13'-8"	36'-1"		BENT		
									H	5	18			11'-9"		STR.		
									V1	5	2	2'-0"	4'-8"	6'-8"	18" cc	BENT		
									THRU		6" INCREMENTS							
									V5	5	2	2'-0"	6'-8"	8'-8"	18" cc	BENT		
									V6	6	2	2'-0"	7'-2"	9'-2"	18" cc	BENT		
									V7	6	2	2'-0"	7'-8"	9'-8"	18" cc	BENT		
									V8	7	2	2'-0"	8'-3"	10'-3"	18" cc	BENT		
									K1	5	2	2'-0"	2'-10"	4'-10"	18" cc	BENT		
									THRU		6" INCREMENTS							
									K5	5	2	2'-0"	4'-10"	6'-10"	18" cc	BENT		
									K6	6	2	2'-0"	5'-4"	7'-4"	18" cc	BENT		
									K7	6	2	2'-0"	5'-10"	7'-10"	18" cc	BENT		
									K8	7	2	2'-0"	6'-4"	8'-4"	18" cc	BENT		
									P1	5	2	2'-0"	4'-8"	6'-8"	18" cc	BENT		
									THRU		6" INCREMENTS							
									P8	5	2	2'-0"	8'-2"	10'-2"	18" cc	BENT		
									J1	5	4			1'-3"	18" cc	STR.		
									J2	5	4			2'-10"	18" cc	STR.		
									H2	4	8			6'-6"		STR.		
96"	2:1	9'-8"	4'-6"	9'-3"	10'-4"	30'-3"	14'-1"	12"	D1	4	15			5'-1"	18" cc	BENT	18.30	1485
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			29'-9"	18" cc	STR.		
									E2	5	1			27'-8"	18" cc	STR.		
									E3	5	1			24'-8"	18" cc	STR.		
									E4	5	1			21'-8"	18" cc	STR.		
									E5	5	1			18'-8"	18" cc	STR.		
									F	5	2			12'-3"	5" cc	STR.		
									G	5	4	9'-11"	15'-5"	40'-9"		BENT		
									H	5	18			13'-5"		STR.		
									V1	5	2	2'-0"	5'-2"	7'-2"	18" cc	BENT		
									THRU		6" INCREMENTS							
									V4	5	2	2'-0"	6'-8"	8'-8"	18" cc	BENT		
									V5	6	2	2'-0"	7'-3"	9'-3"	18" cc	BENT		
									V6	6	2	2'-0"	7'-9"	9'-9"	18" cc	BENT		
									V7	7	2	2'-0"	8'-3"	10'-3"	18" cc	BENT		
									V8	7	2	2'-0"	8'-10"	10'-10"	18" cc	BENT		
									V9	8	2	2'-0"	9'-4"	11'-4"	18" cc	BENT		
									V0	8	2	2'-0"	9'-10"	11'-10"	18" cc	BENT		
									K1	5	2	2'-0"	3'-1"	5'-1"	18" cc	BENT		
									THRU		6" INCREMENTS							
									K4	5	2	2'-0"	4'-7"	6'-7"	18" cc	BENT		
									K5	6	2	2'-0"	5'-1"	7'-1"	18" cc	BENT		
									K6	6	2	2'-0"	5'-7"	7'-7"	18" cc	BENT		
									H2	4	8			8'-0"		STR.		
									K7	7	2	2'-0"	6'-1"	8'-1"	18" cc	BENT		
									K8	7	2	2'-0"	6'-7"	8'-7"	18" cc	BENT		
									K9	8	2	2'-0"	7'-1"	9'-1"	18" cc	BENT		
									P1	5	2	2'-0"	5'-2"	7'-2"	18" cc	BENT		
									THRU		6" INCREMENTS							
									P10	5	2	2'-0"	9'-8"	11'-8"	18" cc	BENT		
									J1	5	4			1'-7"	18" cc	STR.		
									J2	5	4			3'-2"	18" cc	STR.		
108"	2:1	10'-10"	5'-0"	10'-4"	11'-6"	33'-9"	15'-9"	12"	D1	4	19			5'-1"	18" cc	BENT	22.48	1927
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			33'-3"	18" cc	STR.		
									E2	5	1			31'-2"	18" cc	STR.		
									E3	5	1			28'-2"	18" cc	STR.		
									E4	5	1			25'-2"	18" cc	STR.		
									E5	5	1			22'-2"	18" cc	STR.		
									F	5	2			13'-5"	5" cc	STR.		
									G	5	4	11'-1"	17'-4"	45'-9"		BENT		
									H	5	22			15'-1"		STR.		
									V1	5	2	2'-0"	5'-8"	7'-8"	18" cc	BENT		
									THRU		6" INCREMENTS							
									V4	5	2	2'-0"	7'-2"	9'-2"	18" cc	BENT		
									V5	6	2	2'-0"	7'-8"	9'-8"	18" cc	BENT		
									V6	6	2	2'-0"	8'-2"	10'-2"	18" cc	BENT		
									V7	7	2	2'-0"	8'-9"	10'-9"	18" cc	BENT		
									V8	8	2	2'-0"	9'-3"	11'-3"	18" cc	BENT		
									V9	8	2	2'-0"	9'-9"	11'-9"	18" cc	BENT		
									V10	9	2	2'-0"	10'-4"	12'-4"	18" cc	BENT		
									V11	9	2	2'-0"	10'-10"	12'-10"	18" cc	BENT		
									H2	4	8			9'-0"		STR.		
									K1	5	2	2'-0"	3'-4"	5'-4"	18" cc	BENT		
									THRU		6" INCREMENTS							
									K3	5	2	2'-0"	4'-4"	6'-4"	18" cc	BENT		
									K4	6	2	2'-0"	4'-10"	6'-10"	18" cc	BENT		
									K5	6	2	2'-0"	5'-4"	7'-4"	18" cc	BENT		
									K6	7	2	2'-0"	5'-10"	7'-10"	18" cc	BENT		
									K7	7	2	2'-0"	6'-4"	8'-4"	18" cc	BENT		
									K8	8	2	2'-0"	6'-10"	8'-10"	18" cc	BENT		
									K9	8	2	2'-0"	7'-4"	9'-4"	18" cc	BENT		
									K10	9	2	2'-0"	7'-10"	9'-10"	18" cc	BENT		
									P1	5	2	2'-0"	5'-8"	7'-8"	18" cc	BENT		
									THRU		6" INCREMENTS							
									P11	5	2	2'-0"	10'-8"	12'-8"	18" cc	BENT		
									J1	5	4			1'-4"	18" cc	STR.		
									J2	5	4			2'-9"	18" cc	STR.		
									J3	5	4			4'-1"	18" cc	STR.		
120"	2:1	12'-0"	5'-6"	11'-5"	12'-8"	37'-4"	17'-5"	14"	D1	4	21			5'-1"	18" cc	BENT	31.78	2492
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			36'-10"	18" cc	STR.		
									E2	5	1			35'-0"	18" cc	STR.		
									E3	5	1			32'-0"	18" cc	STR.		
									E4	5	1			29'-0"	18" cc	STR.		
									E5	5	1			26'-0"	18" cc	STR.		
									E6	5	1			23'-0"	18" cc	STR.		
									F	5	2			14'-7"	5" cc	STR.		
									G	5	4	12'-3"	19'-2"	50'-7"		BENT		
									H	5	22			16'-9"	18" cc	STR.		
									V1	5	2	2'-0"	6'-4"	8'-4"	18" cc	BENT		
									V2	5	2	2'-0"	6'-10"	8'-10"	18" cc	BENT		
									V3	6	2	2'-0"	7'-4"	9'-4"	18" cc	BENT		
									V4	6	2	2'-0"	7'-10"	9'-10"	18" cc	BENT		
									V5	7	2	2'-0"	8'-5"	10'-5"	18" cc	BENT		
									V6	7	2	2'-0"	8'-11"	10'-11"	18" cc	BENT		
									V7	8	2	2'-0"	9'-5"	11'-5"	18" cc	BENT		
									V8	8	2	2'-0"	9'-11"	11'-11"	18" cc	BENT		
									V9	9	2	2'-0"	10'-6"	12'-6"	18" cc	BENT		
									V10	9	2	2'-0"	11'-0"	13'-0"	18" cc	BENT		
									V11	10	2	2'-0"	11'-6"	13'-6"	18" cc	BENT		
									V12	10	2	2'-0"	12'-0"	14'-0"	18" cc	BENT		
									K1	5	2	2'-0"	3'-9"	5'-9"	18" cc	BENT		
									K2	5	2	2'-0"	4'-3"	6'-3"	18" cc	BENT		
									K3	6	2	2'-0"	4'-9"	6'-9"	18" cc	BENT		
									K4	6	2	2'-0"	5'-3"	7'-3"	18" cc	BENT		
									K5	7	2	2'-0"	5'-9"	7'-9"	18" cc	BENT		
									K6	7	2	2'-0"	6'-3"	8'-3"	18" cc	BENT		
									K7	8	2	2'-0"	6'-9"	8'-9"	18" cc	BENT		
									K8	8	2	2'-0"	7'-3"	9'-3"	18" cc	BENT		
									K9	9	2	2'-0"	7'-9"	9'-9"	18" cc	BENT		
									K10	9	2	2'-0"	8'-3"	10'-3"	18" cc	BENT		
									K11	10	2	2'-0"	8'-9"	10'-9"	18" cc	BENT		
									H2	4	8			10'-0"		STR.		
									P1	5	2	2'-0"	6'-4"	8'-4"	18" cc	BENT		
									THRU		6" INCREMENTS							
									P12	5	2	2'-0"	11'-10"	13'-10"	18" cc	BENT		
									J1	5	4			1'-6"	18" cc	STR.		
									J2	5	4			3'-0"	18" cc	STR.		
									J3	5	4			4'-6"	18" cc	STR.		
144"	2:1	14'-4"	6'-6"	13'-6"	14'-10"	44'-3"	20'-9"	16"	D1	4	26			5'-1"	18" cc	BENT	49.71	3958
									D2	4	4			4'-4"	18" cc	BENT		
									E1	5	2			43'-9"	18" cc	STR.		
									E2	5	1			41'-11"	18" cc	STR.		
									E3	5	1			38'-11"	18" cc	STR.		
									E4	5	1			36'-11"	18" cc	STR.		
									E5	5	1			33'-11"	18" cc	STR.		
									E6	5	1			30'-11"	18" cc	STR.		
									E7	5	1			27'-1"	18" cc	STR.		
									F	5	2			16'-9"	5" cc	STR.		
									G	5	4	14'-5"	22'-11"	60'-3"		BENT		
									H	5	26			20'-1"		STR.		
									H2	4	8			13'-6"		STR.		
									V1	6	2	2'-0"	7'-6"	9'-6"	18" cc	BENT		
									V2	6	2	2'-0"	8'-0"	10'-0"	18" cc	BENT		
									V3	6	2	2'-0"	8'-6"	10'-6"	18" cc	BENT		
									V4	7	2	2'-0"	9'-0"	11'-0"	18" cc	BENT		
									V5	7	2	2'-0"	9'-6"	11'-6"	18" cc	BENT		
									V6	8	2	2'-0"	10'-0"	12'-0"	18" cc	BENT		
									V7	8	2	2'-0"	10'-6"	12'-6"	18" cc	BENT		
									V8	9	2	2'-0"	11'-0"	13'-0"	18" cc	BENT		
									V9	9	2	2'-0"	11'-6"	13'-6"	18" cc	BENT		
									V10	10	2	2'-0"	12'-0"	14'-0"	18" cc	BENT		
									V11	10	2	2'-0"	12'-6"	14'-6"	18" cc	BENT		
									V12	11	2	2'-0"	13'-0"	15'-0"	18" cc	BENT		
									V13	11	2	2'-0"	13'-6"	15'-6"	18" cc	BENT		
									V14	11	2	2'-0"	14'-0"	16'-0"	18" cc	BENT		
									K1	6	2	2'-0"	4'-5"	6'-5"	18" cc	BENT		
									K2	6	2	2'-0"	4'-11"	6'-11"	18" cc	BENT		
									K3	7	2	2'-0"	5'-5"	7'-5"	18" cc	BENT		
									K4	7	2	2'-0"	5'-11"	7'-11"	18" cc	BENT		
									K5	7	2	2'-0"	6'-5"	8'-5"	18" cc	BENT		
									K6	8	2	2'-0"	6'-11"	8'-11"	18" cc	BENT		
									K7	8	2	2'-0"	7'-5"	9'-5"	18" cc	BENT		
									K8	9	2	2'-0"	7'-11"	9'-11"	18" cc	BENT		
									K9	9	2	2'-0"	8'-5"	10'-5"	18" cc	BENT		
									K10	10	2	2'-0"	8'-11"	10'-11"	18" cc	BENT		
									K11	10	2	2'-0"	9'-5"	11'-5"	18" cc	BENT		
									K12	11	2	2'-0"	9'-11"	11'-11"	18" cc	BENT		
									K13	11	2	2'-0"	10'-5"	12'-5"	18" cc	BENT		
									K14	11	2	2'-0"	10'-5"	12'-11"	18" cc	BENT		
									P1	5	2	2'-0"	10'-11"	9'-6"	18" cc	BENT		
									THRU		6" INCREMENTS							
									P14	5	2	2'-0"	14'-0"	16'-0"	18" cc	BENT		
									J1	5	4			1'-5"	18" cc	STR.		
									J2	5	4			2'-10"	18" cc	STR.		
									J3	5	4			4'-3"	18" cc	STR.		
									J4	5	4			5'-9"	18" cc	STR.		

WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
STANDARD DETAIL

PREPARED 7/1/99
REVISION DATE

PIPE CULVERT WINGWALLS (SHEET 4 OF 4)

STANDARD SHEET DR2

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STORM SEWER DETAILS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

SCALE: N/A

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 83 OF 97

SLD2022-06

GENERAL CONDITIONS - CODE COMPLIANT LANDSCAPE PLAN

SCOPE OF WORK
THE LANDSCAPE CONTRACTOR SHALL PROVIDE ALL MATERIALS, LABOR AND EQUIPMENT TO COMPLETE ALL LANDSCAPE WORK AS SHOWN ON THE PLANS AND SPECIFICATIONS.

NOTE: IF CONTRACTOR BIDS ACCORDING TO THE PLANT LIST, HE/SHE SHOULD THOROUGHLY CHECK THE PLANT LIST QUANTITIES WITH THE SYMBOLS DRAWN ON THE PLAN, TO BE SURE THERE ARE NO DISCREPANCIES. IF THERE IS A DISCREPANCY BETWEEN THE DRAWING AND THE LIST ON THE PLANS, THE DRAWING TAKES PRECEDENCE.

STANDARDS
ALL PLANT MATERIAL WILL CONFORM TO THE CURRENT ISSUE OF THE AMERICAN STANDARD FOR NURSERY STOCK PUBLISHED BY THE AMERICAN NURSERY & LANDSCAPE ASSOCIATION (ANLA).PLANT MATERIAL MUST BE SELECTED FROM NURSERIES THAT HAVE BEEN INSPECTED AND CERTIFIED BY STATE PLANT INSPECTORS.COLLECTED MATERIAL MAY BE USED ONLY WHEN APPROVED BY OWNER'S REPRESENTATIVE.NOMENCLATURE WILL BE IN ACCORDANCE WITH HORTUS III BY L.H. BAILEY.

SUBSTITUTIONS: PRE-BID
IT IS THE LANDSCAPE CONTRACTOR'S RESPONSIBILITY TO MAKE EVERY REASONABLE EFFORT TO FIND THE PLANTS SPECIFIED BY THE LANDSCAPE ARCHITECT. THE LANDSCAPE CONTRACTOR MAY OFFER SUBSTITUTIONS TO THE LANDSCAPE ARCHITECT FOR HIS/HER CONSIDERATION. THE LANDSCAPE CONTRACTOR WILL NOTIFY THE LANDSCAPE ARCHITECT IF THERE ARE KNOWN
DISEASES OR INSECT RESISTANT SPECIES THAT CAN BE SUBSTITUTED FOR A SELECTED PEST-PRONE PLANT. THE CONTRACTOR SHALL SUBMIT A BASE BID AS PER PLAN PLUS PRICE CLARIFICATIONS FOR ALL RECOMMENDED SUBSTITUTIONS.

SUBSTITUTIONS: POST-BID
IT IS THE INTENT TO ELIMINATE POST-BID SUBSTITUTIONS. HOWEVER, IN THE EVENT THAT THE CONTRACT MATERIAL HAS BECOME UNAVAILABLE, AN APPROPRIATE SUBSTITUTION MUST BE APPROVED BY THE OWNER'S REPRESENTATIVE.

UTILITIES AND UNDERGROUND FEATURES
THE LANDSCAPE CONTRACTOR SHALL NOTIFY UTILITY COMPANIES AND/OR THE GENERAL CONTRACTOR IN ADVANCE OF CONSTRUCTION TO LOCATE UTILITIES.

TREES AND/OR SHRUBS SHALL NOT BE PLACED WITHIN WATER AND SEWER EASEMENTS

IF THERE IS A CONFLICT WITH UTILITIES AND THE PLANTING, THE LANDSCAPE ARCHITECT SHALL BE RESPONSIBLE FOR RELOCATING PLANTS PRIOR TO THE PLANTING PROCESS. ANY COST DUE TO RELOCATING AFTER PLANTING SHALL BE BORNE BY THE OWNER. IF PLANTS ARE TO BE INSTALLED IN AREAS THAT SHOW OBVIOUS POOR DRAINAGE, AND THE PLANTS ARE INAPPROPRIATE FOR THAT CONDITION, THE LANDSCAPE CONTRACTOR SHALL NOTIFY THE LANDSCAPE ARCHITECT AND OWNER. IF THEY DEEM NECESSARY, THE PLANTS SHALL BE RELOCATED, THE CONTRACT SHALL BE ADJUSTED TO ALLOW FOR DRAINAGE CORRECTION AT A NEGOTIATED COST, OR THE PLANT SELECTION MODIFIED BY THE LANDSCAPE ARCHITECT TO ACCOMMODATE THE POOR DRAINAGE.

WARRANTY
THE STANDARD WARRANTY IS FOR ONE (1) YEAR PERIOD, EXCLUDING BULBS, SOD AND ANNUALS, COMMENCING ON THE DATE OF INITIAL ACCEPTANCE. ALL PLANTS SHALL BE ALIVE AND IN SATISFACTORY GROWTH AT THE END OF THE GUARANTEE PERIOD. ANY MATERIAL THAT IS 25% DEAD OR MORE SHALL BE CONSIDERED DEAD AND MUST BE REPLACED AT NO CHARGE. A TREE SHALL BE CONSIDERED DEAD WHEN THE MAIN LEADER HAS DIED BACK, OR 25% OF THE CROWN IS DEAD. REPLACEMENTS SHALL BE MADE DURING THE NEXT PLANTING PERIOD.
REPLACEMENTS SHALL BE OF THE SAME TYPE, SIZE AND QUALITY AS ORIGINAL SPECIES UNLESS OTHERWISE NEGOTIATED.

CONTAINER - GROWN STOCK
1. THE SIZE OF CONTAINER-GROWN SHRUBS IS MEASURED BY HEIGHT AND WIDTH OF THE PLANT.
CONTAINER-GROWN TREES
ARE MEASURED BY THE SAME STANDARDS LISTED IN B.3. ABOVE. THE ROOT SYSTEM OF CONTAINER-GROWN PLANTS SHALL
BE WELL DEVELOPED AND WELL DISTRIBUTED THROUGH OUT THE CONTAINER.

2. ALL CONTAINER-GROWN TREES AND SHRUBS THAT HAVE CIRCLING (GIRDLING) AND MATTED ROOTS SHALL BE TREATED IN
THE FOLLOWING MANNER PRIOR TO PLANTING: SEPARATE THE ROOTS BY HAND, UNTANGLING SO CIRCLING ROOTS WILL NOT
DAMAGE FUTURE OF THE PLANT. SEE PLANTING PROCEDURES FOR ALL CONTAINER-GROWN TREES & SHRUBS IN THIS SECTION.

3. ALL CONTAINER-GROWN PLANTS SHOULD BE GROUPED AND WATERED DAILY UNTIL THEY ARE PLANTED IN THE

LANDSCAPE, THE SOIL SHALL BE KEPT MOIST WITH THE EQUIVALENT OF ONE-INCH OF RAINFALL PER WEEK.

4. PRUNING SHALL BE DONE BEFORE PLANTING OR DURING THE PLANTING OPERATION. PRUNING DETAIL FOR TREES IN THIS SECTION.

5. ALL PLANT MATERIAL IN TRANSIT SHALL BE COVERED TO KEEP MATERIAL FROM DRYING OUT. THE COVERING SHALL COMPLY WITH THE STATE AND LOCAL LAWS PERTAINING TO THE TRANSPORT OF MATERIALS.

6. TREES SHALL BE PLACED IN AN UPRIGHT POSITION WITH THE ROOTBALL COVERED BY MULCH AND KEPT MOIST. TREES AND SHRUBS SHOULD NOT BE LEFT ON SITE UNPLANTED FOR MORE THAN 24-HOURS WITHOUT ADEQUATE WATER TO INSURE ROOT SURVIVAL.

INSPECTION
A. PLANTS MAY BE SUBJECT TO INSPECTION AND APPROVAL BY THE OWNER OR OWNER'S REPRESENTATIVE AT THE PLACE OF GROWTH OR HOLDING YARD FOR CONFORMITY TO SPECIFICATION REQUIREMENTS AS TO QUALITY, SIZE AND VARIETY.

B. PLANTS DAMAGED IN HANDLING OR TRANSPORTATION CAN BE REJECTED BY THE OWNER OR OWNER'S REPRESENTATIVE.

C. STATE NURSERY INSPECTION CERTIFICATES SHALL BE FURNISHED TO THE LANDSCAPE ARCHITECT UPON REQUEST.

STANDARDS
A. PLANTS WILL BE IN ACCORDANCE WITH THE CURRENT ANLA'S STANDARDS AND CONFORM IN GENERAL TO REPRESENTATIVE SPECIES.

B. BALLED AND BURLAPPED (B&B)
1. BALLED AND BURLAPPED PLANTS SHALL BE DUG WITH FIRM ROOT BALLS FREE OF NOXIOUS WEEDS. THERE SHOULD BE NO EXCESS SOIL ON TOP OF THE ROOTBALL OR AROUND THE TRUNK
2. BALL SIZES SHALL BE IN ACCORDANCE WITH ANLA STANDARDS.
3. CALIPER AND HEIGHT MEASUREMENT: IN SIZE GRADING B&B SINGLE TRUNK TREES, CALIPER SHALL TAKE PRECEDENCE OVER HEIGHT. CALIPER OF THE TRUNK SHALL BE TAKEN 6" ABOVE GROUND LEVEL (UP TO AND INCLUDING 4" CALIPER SIZE) AND 12" ABOVE THE GROUND LEVEL FOR LARGER TREES. FOR MULTIPLE-TRUNK TREES, HEIGHT MEASUREMENT SHALL TAKE PRECEDENCE OVER CALIPER.

NOTES:

1) ALL PLANTING SHALL CONFORM WITH SECTION 1333.15, BUFFER AND SCREENING STANDARDS,AND/OR SECTION 1333.16, LANDSCAPING STANDARDS OF THE CHARLESTOWN SUBDIVISION AND LAND DEVELOPMENT ORDINANCE

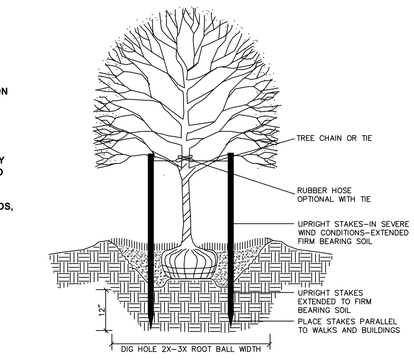
2) ANY PLANT SUBSTITUTIONS MUST BE APPROVED IN WRITING BY THE CHARLESTOWN DEPARTMENT OF COMMUNITY DEVELOPMENT ZONING AND PLANNING DIVISION.

3) ANY TREES LOCATED ON AN INDIVIDUAL LOT WILL BE INSTALLED PRIOR TO THE REQUEST FOR AN OCCUPANCY PERMIT FOR THAT SPECIFIC LOT. ALL OTHER LANDSCAPING SHOWN ON THIS PLAN WILL BE INSTALLED PRIOR TO BOND RELEASE.

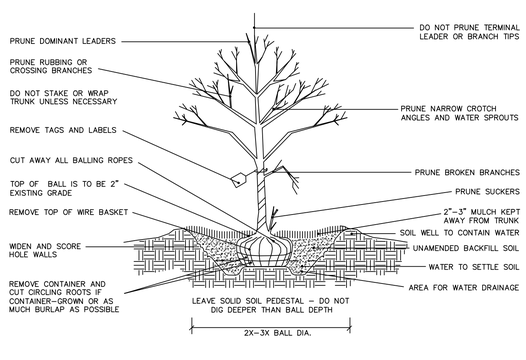
4.) ALL GRADED/DISTURBED AREAS WITHIN THE PROJECT LIMITS EXCEPT FOR BUT NOT LIMITED TO WALKS, ROADS, DRIVES, TEMPORARY EASEMENTS UNDER CULTIVATION, AND AREAS DESIGNATED AS PLANTING BEDS SHALL BE SODDED OR SEEDED

THIS VIEW FOR LANDSCAPING ONLY





TREE PLANTING – VERTICAL STAKES
TREES <4" CAL. SCALE: NOT TO SCALE



TREE PLANTING DETAIL
TREES <4" CAL. SCALE: NOT TO SCALE

PLANT SCHEDULE

ABB	BOTANIC NAME	COMMON NAME	QUANTITY	SIZE
PROPOSED TREE PLANTINGS				
Ar*	Acer Rubrum 'Franksred'	Red Sunset Red Maple	154	2" cal, B&B
Tc*	Tilia chordata 'Greenspire'	Greenspire Littleleaf Linden	28	2" cal, B&B
Js	Juniperus scopulorum 'Skyrocket'	Skyrocket juniper	171	2" cal, B&B
Zs*	Zelkova serrata 'Green Vase'	Green Vase Japanese Zelkova	116	2" cal, B&B

469 total trees
*287 total street trees

STREET TREE PLANTING:
1 TREE **EVERY 50' OF STREET FRONTAGE. UP TO 10% OF THE TOTAL NUMBER FOR STREET TREES REQUIRED MAY BE PLANTED IN DESIGNATED OPEN SPACE AREAS.**

PHASE 10B-13 TREE FRONTAGE:
14,370.52 LF STREET FRONTAGE, 14,370.52/50 = 287 TREES REQ
287 TOTAL TREES PROVIDED

PHASE 11 PARKING LOT LANDSCAPING:
1 TREE SHALL BE PROVIDED FOR EVERY 2,000 SQUARE FEET OF IMPERVIOUS AREA FOR THE FIRST 100,000 SQUARE FEET OF THE TOTAL SITE.
21,165.11 SQFT PARKING LOT AREA: 21,265.11/2000 SQFT= 10 TREES REQ
11 TOTAL TREES PROVIDED

ROAD BUFFER CANDLEWOOD DRIVE: ONE CONTINUOUS ROW OF CONIFEROUS TREES SPACED 12 FEET ON CENTER AND TWO STAGGERED ROW SPACED 8 FEET APART.

LEGEND

- Deciduous Trees (Street Trees/Parking Lot Landscaping)
- Deciduous Trees (Street Trees/Parking Lot Landscaping)
- Deciduous Trees (Street Trees/Parking Lot Landscaping)
- Evergreen Trees (Buffer Plantings)

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LANDSCAPE PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: 1" = 50'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 84 OF 97
SLD2022-06

THIS VIEW FOR LANDSCAPING ONLY

MATCHLINE
SEE SHEET 84

MATCHLINE
SEE SHEET 86

CANDLEWOOD DRIVE
(61' ROW/MINOR COLLECTOR)

GERSBACK WAY
(50' ROW/NEIGHBORHOOD ST.)

ALPINE DRIVE
(50' ROW/NEIGHBORHOOD ST.)

SEEBACK DRIVE
(50' ROW/NEIGHBORHOOD ST.)

SEEBACK DRIVE
(50' ROW/NEIGHBORHOOD CENTER ST.)

GRUNTER WAY
(50' ROW/NEIGHBORHOOD ST.)

JS 72 | JS 16 | JS 15 | JS 12 | JS 56

AR 1 | AR 2 | AR 3 | AR 4 | AR 5 | AR 12

ZS 1 | ZS 2 | ZS 3 | ZS 4 | ZS 7 | ZS 15 | ZS 16

TC 1 | TC 2 | TC 3

50 25 0 50 100
SCALE: 1" = 50'

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SHEET 85 OF 97
SLD2022-06

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MATCHLINE
SEE SHEET 85

100 YEAR FEMA
FLOODPLAIN ZONE
"AE" PER FIRM MAP
54037C0138E

50 25 0 50 100
SCALE: 1" = 50'

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1	01/17/2024

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SHEET 86 OF 97

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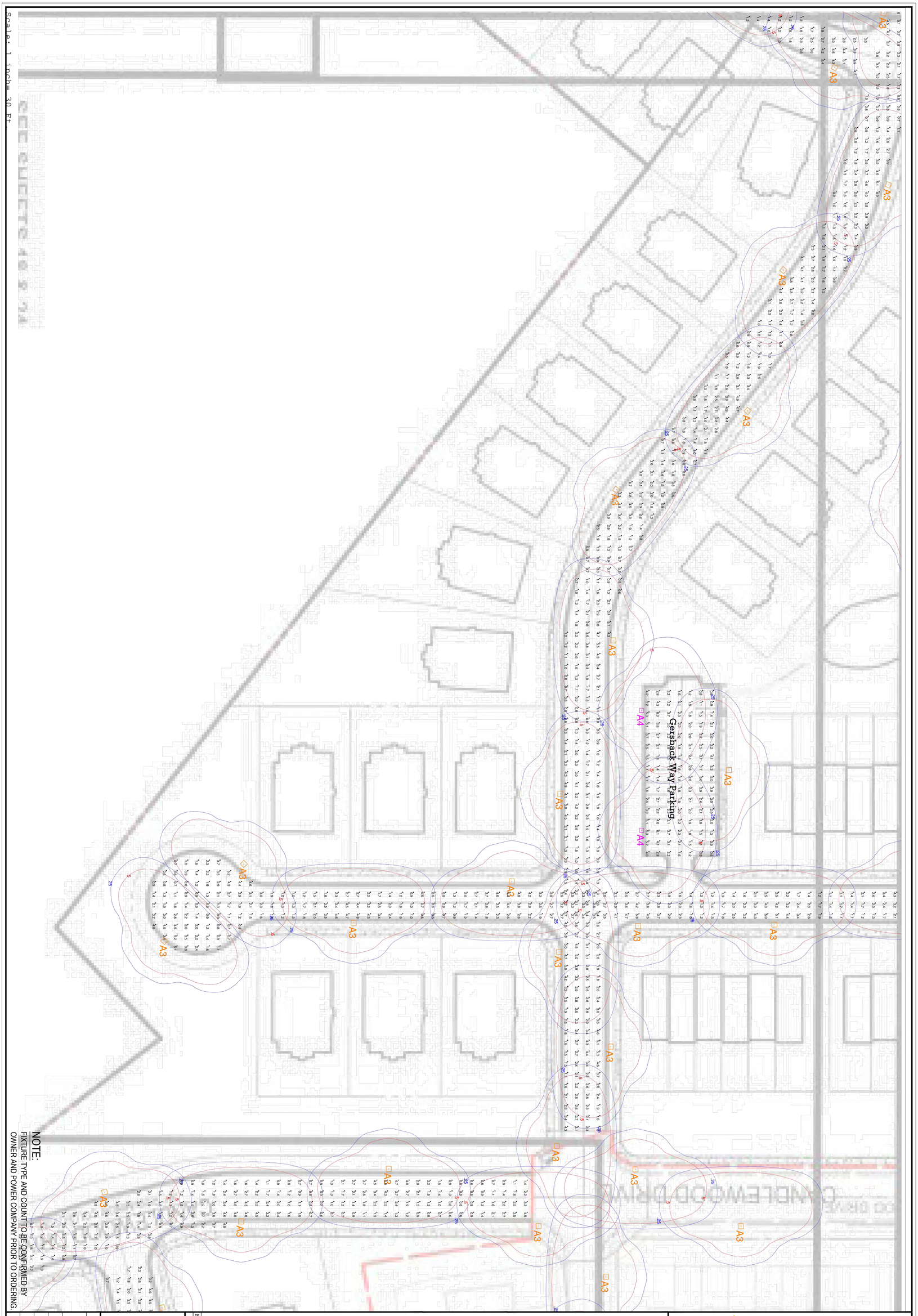
A3
A3
A3



NOTE:
FIXTURE TYPE AND COUNT TO BE CONFIRMED BY OWNER AND POWER COMPANY PRIOR TO ORDERING.

LIGHTING PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date
1	01/10/2024

DATE: 11/06/2023
SCALE: 1"=30'
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 87A OF 97
SLD2022-06

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Telephone: (304) 620-5111
Fax: (540) 722-9528
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SHEET 87C OF 97

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SHEET 87E OF 97

SLD2022-06

HADCO by Signify

Urban

Refractive globe with Lumilock LED engine GX4

RL34/RL54 Post top



Project:
Location:
Cat.No:
Type:
Lamps: Qty:
Notes:

Whether you are looking to beautify or add a sense of security and well-being to your outdoor space, the highly configurable Hadco LED refractive post tops paired with the latest LumiLock light engine GX4 will definitely help you achieve your goals. A multitude of exterior luminaire styles allow you to create promenades and areas exuding timeless, historical charm both day and night. The configurable LED light engine GX4 is an ideal alternative to HID sources, providing you with significant energy savings, and more choices for light levels, optics and controls. Includes Service Tag. Hadco's innovative way to provide assistance throughout the life of the product.

Ordering guide

example: RL34 A A B A 1 A S N R7 W A 3 N N N N SP1

Series	Pod	Roof	Cage	Finial	Fastener	Finish	Optic	Pod Photo Control (Number inside of pod)
RL34 Wide Body Type 3	A Octagonal style	A Victorian	B[1] Cage for wide body globe	A	1 Hex head	A Black	S Short	E 120 VAC Button Eye
RL54 Wide Body Type 5	B Round fitter with scalloped petals	B Acorn	E Band for wide body globe	B	2 Allen head	B White	W Wide	H 208/240/277 Button Eye
	H Round contemporary	C Tall	F Band for wide body globe	C[2]		G Verde		R[3] 3 Pin Receptacle
	L Round fluted long	D[4] Short	G[2] Cage for wide body globe	D[2]		M Bronze		N None
	T Decorative Leaf w/ Scalloped Petals	G Adams	J Cage for wide body globe	E[2]		J Green		
			N None	F				
				G				
				H				
				N None				

Optional programs

Future Proof Photo Control	Color Temp	Voltage	Drive Current	Integral Control Options	Option 1	Option 2	Option 3	Surge Protection
RS[5,6] 5 pin receptacle on the engine	W 3000K	A 120-277 VAC	2[7] 200mA	Dynodimmer[3,8]	AST[9] Adjustable start up time	CLO[9] Constant light output	OTL[9] Over the life	SP1 10kV/10kA Surge Protector
RT[5,6] 7 pin receptacle on the engine	N 4000K	B 347-480 VAC	3 350mA	DA 4 Hrs 25% Reduction	N None	N None	N None	SP2[9] 20kV/20kA Surge Protector
N None			4 450mA	DB 4 Hrs 50% Reduction				
			5[7] 530mA	DC 4 Hrs 75% Reduction				
				DD 6 Hrs 25% Reduction				
				DE 6 Hrs 50% Reduction				
				DF 6 Hrs 75% Reduction				
				DG 8 Hrs 25% Reduction				
				DH 8 Hrs 50% Reduction				
				DJ 8 Hrs 75% Reduction				
				DL[9] DALI				
				S[9] FAWS Switch				
				N None				

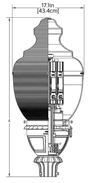
1 Not available with A pod.
2 Not available with B Roof.
3 Use of photoelectric cell (pod photo control (R) only) or shorting cap is required to ensure proper illumination. When R, R5, R7 options are selected, product will ship with shorting cap(s) installed.
4 Only available with A & B clear roof options. Not available with drive currents 4 or 5.
RL 34 or 54 with S optic only available with A roof.
5 Optional Dynadimmer dimming schedules, DALI, AST, CLO, and OTL not available with 347-480 VAC.
6 When SP2 option is selected, luminaire will be fitted with SP1 instead of SP1.
7 Not available with B 347-480 voltage.
8 Not available with R5 or R7.
9 FAWS not available with CLO.

RL34/RL54 Refractive globe with Lumilock LED engine GX4

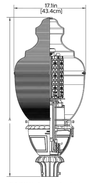
Post top

Dimensions

RL34 - Type 3

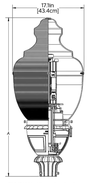


RL34BANNxxW configuration shown

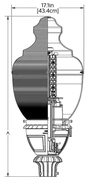


RL34BANNxxS configuration shown

RL54 - Type 5



RL54BANNxxW configuration shown



RL54BANNxxS configuration shown

Roof	Dimension 'H' (in)	Dimension 'H' (cm)
A Victorian	39.5	100.3
B Acorn	34.4	87.3
C Tall	45.1	114.5
D Short	32.5	82.5
G Adams	35.7	90.7

EPA: 2.08 sq. ft. (Varies depending on options selected)
Weight: 55lbs (maximum)

Dimensions will vary when other pod, cage and brim options are specified.
See specification text on pages 5 and 6 for option dimensions.

Housing Options

Fitter/Pod Options



A Octagonal
B Round with Scalloped Petals
H Round Contemporary
L Round Fluted Long
T Decorative Leaf w/ Scalloped Petals

Roof Options



A Victorian
B Acorn
C Tall
D Short
G Adams

Cage/Band Options



B Cage for Wide Body Globe
E Band for Wide Body Globe
F Band for Wide Body Globe
G Cage for Wide Body Globe
I Cage for Wide Body Globe
J Cage for Wide Body Globe

Finial Options



A B C D E F G H

RL34/RL54 Refractive globe with Lumilock LED engine GX4

Post top

LED Wattage and Lumen Values: 4000K

Ordering Code	Total LEDs	LED current (mA)	Average system watts[1] (W)	Short: Delivered lumens[2]	Short: Efficacy (LPW)	Short: BUG rating	Wide: Delivered lumens[2]	Wide: Efficacy (LPW)	Wide: BUG rating
RL34, Acrylic Roof									
RL34xAxxxxxxxWx2xxxxx	64	200	39	5193	132.1	B1-U5-G3	5136	130.7	B1-U5-G3
RL34xAxxxxxxxWx3xxxxx	64	350	69	8767	127.1	B2-U5-G4	8670	125.7	B2-U5-G4
RL34xAxxxxxxxWx4xxxxx	64	450	88	10770	122.3	B2-U5-G4	10591	120.9	B2-U5-G4
RL34xAxxxxxxxWx5xxxxx	64	530	104	12454	119.4	B3-U5-G5	12316	118.1	B3-U5-G4
RL34, Metal Roof									
RL34xDxxxxxxxWx2xxxxx	64	200	39	3528	89.8	B1-U3-G3	3457	88.2	B1-U3-G3
RL34xDxxxxxxxWx3xxxxx	64	350	69	5957	86.3	B2-U4-G3	5853	84.8	B2-U3-G3
RL34xDxxxxxxxWx4xxxxx	64	450	88	7277	83.2	B2-U4-G4	7150	81.7	B2-U3-G3
RL34xDxxxxxxxWx5xxxxx	64	530	104	8461	81.2	B2-U4-G4	8314	79.8	B3-U4-G4
RL54, Acrylic Roof									
RL54xAxxxxxxxWx2xxxxx	64	200	39	5143	131.9	B2-U5-G3	4985	127.8	B3-U5-G2
RL54xAxxxxxxxWx3xxxxx	64	350	69	8541	126.1	B3-U5-G3	8507	124.2	B3-U5-G3
RL54xAxxxxxxxWx4xxxxx	64	450	87	10467	120.3	B3-U5-G4	10368	119.5	B3-U5-G3
RL54xAxxxxxxxWx5xxxxx	64	530	104	12134	117.4	B3-U5-G4	12098	116.7	B4-U5-G3
RL54, Metal Roof									
RL54xDxxxxxxxWx2xxxxx	64	200	39	3513	89.8	B2-U3-G2	3413	87.3	B3-U3-G2
RL54xDxxxxxxxWx3xxxxx	64	350	69	5931	86.5	B3-U4-G3	5762	84.0	B3-U3-G3
RL54xDxxxxxxxWx4xxxxx	64	450	87	7245	83.2	B3-U4-G3	7039	80.8	B3-U3-G3
RL54xDxxxxxxxWx5xxxxx	64	530	104	8425	81.2	B3-U4-G3	8185	78.9	B4-U3-G3

LED Wattage and Lumen Values: 3000K

Ordering Code	Total LEDs	LED current (mA)	Average system watts[1] (W)	Short: Delivered lumens[2]	Short: Efficacy (LPW)	Short: BUG rating	Wide: Delivered lumens[2]	Wide: Efficacy (LPW)	Wide: BUG rating
RL34, Acrylic Roof									
RL34xAxxxxxxxWx2xxxxx	64	200	39	4583	116.6	B1-U5-G3	4532	115.3	B1-U5-G3
RL34xAxxxxxxxWx3xxxxx	64	350	69	7734	112.1	B2-U5-G4	7648	110.8	B2-U5-G3
RL34xAxxxxxxxWx4xxxxx	64	450	88	9412	107.9	B2-U5-G4	9348	106.7	B2-U5-G4
RL34xAxxxxxxxWx5xxxxx	64	530	104	10984	105.3	B3-U5-G4	10862	104.1	B2-U5-G4
RL34, Metal Roof									
RL34xDxxxxxxxWx2xxxxx	64	200	39	3114	79.2	B1-U3-G2	3046	77.5	B1-U3-G2
RL34xDxxxxxxxWx3xxxxx	64	350	69	5254	76.1	B2-U4-G3	5143	74.5	B2-U3-G3
RL34xDxxxxxxxWx4xxxxx	64	450	88	6422	73.4	B2-U4-G3	6283	71.8	B2-U3-G3
RL34xDxxxxxxxWx5xxxxx	64	530	104	7463	71.8	B2-U4-G4	7306	70.1	B2-U3-G4
RL54, Acrylic Roof									
RL54xAxxxxxxxWx2xxxxx	64	200	39	4536	116.3	B2-U5-G2	4397	112.7	B2-U5-G2
RL54xAxxxxxxxWx3xxxxx	64	350	69	7621	111.3	B3-U5-G3	7503	109.5	B3-U5-G3
RL54xAxxxxxxxWx4xxxxx	64	450	87	9232	106.1	B3-U5-G3	9171	105.4	B3-U5-G3
RL54xAxxxxxxxWx5xxxxx	64	530	104	10717	103.5	B3-U5-G4	10671	102.9	B3-U5-G3
RL54, Metal Roof									
RL54xDxxxxxxxWx2xxxxx	64	200	39	3100	79.3	B2-U3-G2	3024	77.3	B2-U3-G2
RL54xDxxxxxxxWx3xxxxx	64	350	69	5232	76.3	B3-U4-G3	5105	74.4	B3-U3-G2
RL54xDxxxxxxxWx4xxxxx	64	450	87	6394	73.4	B3-U4-G3	6236	71.6	B3-U3-G3
RL54xDxxxxxxxWx5xxxxx	64	530	104	7431	71.7	B3-U4-G3	7251	69.9	B3-U3-G3

Due to rapid and continuous advances in LED technology, LED luminaire data is subject to change without notice and at the discretion of Philips.
Lumen output by optic type will vary slightly. See IES files and specification sheets when available. All technical data is subject to change.
Lumen values based on photometric tests performed in compliance with IESNA LM-79.
Note: Some data may be scaled based on tests of similar, but not identical, luminaires.

RL34/RL54 Refractive globe with Lumilock LED engine GX4

Post top

Predicted Lumen Depreciation Data

Predicted performance derived from LED manufacturer's data and engineering design estimates, based on IESNA LM-80 methodology. Actual experience may vary due to field application conditions. L_{70} is the predicted time when LED performance depreciates to 70% of initial lumen output. Calculated per IESNA TM21-11. Published L_{70} hours limited to 6 times actual LED test hours.

Driver mA	Optic	Ambient Temperature °C	Calculated L_{00} Hours	L_{00} per TM-21 (Hours)	Lumen Maintenance % at 60,000 hrs
530	Wide	25	>85,000	>60,000 hours	>88%
530	Short	25	>100,000	>54,000 hours	>98%
450	Wide	25	>100,000	>60,000 hours	>93%
450	Short	25	>100,000	>54,000 hours	>98%
350	Wide	25	>100,000	>60,000 hours	>94%
350	Short	25	>100,000	>54,000 hours	>98%
200	Wide	25	>100,000	>60,000 hours	>94%
200	Short	25	>100,000	>54,000 hours	>98%

Field Adjustable Wattage (FAWS) Multiplier Chart

All 350, 450, and 530 mA Configurations

FAWS Position	Typical Delivered Lumens Multiplier	Typical System wattage and typical current
1	0.30	0.28
2	0.53	0.48
3	0.62	0.56
4	0.73	0.67
5	0.78	0.73
6	0.83	0.78
7	0.87	0.85
8	0.91	0.89
9	0.95	0.93
10	1.00	1.00

All 200mA Configurations

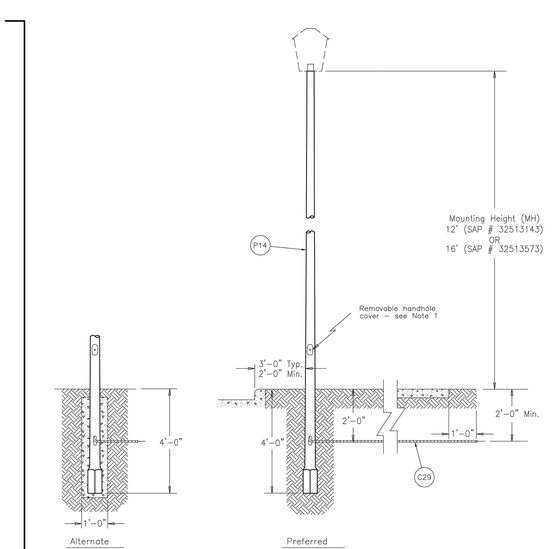
FAWS Position	Typical Delivered Lumens Multiplier	Typical System wattage and typical current
1	0.30	0.35
2	0.50	0.55
3	0.59	0.62
4	0.69	0.72
5	0.77	0.80
6	0.83	0.85
7	0.88	0.90
8	0.93	0.92
9	0.96	0.97
10	1.00	1.00

Potomac Edison, WV EMU

Picture	Description	Wattage	Type	Lumens
	Open Luminaire (note 5)	100	HPS	9500
	Open Luminaire	100	HPS	9500
	Cobra Head	~~175~~	MV	~~8150~~
		100	HPS	9500
		200	HPS	22000
		400	HPS	50000
		400	MH	36000
		1000	MH	90000
	Shoebox	100	HPS	9500
		200	HPS	22000
		400	HPS	50000
		100	HPS	9500
		200	HPS	22000
		400	HPS	50000
		100	HPS	9500
		200	HPS	22000
		400	HPS	50000
		400	MH	36000
		400	MH	36000
		400	MH	36000
		1000	MH	90000
		1000	MH	90000
	Floodlight	200	HPS	22000
		400	HPS	50000
		400	MH	36000
		1000	MH	90000
	Colonial Post Top	100	HPS	9500
		175	MH	11600

Notes:
1. Use specified Lighting or an approved equal.
2. Light pole base detail to be provided by the lighting designer/contractor.

SECTION 1333.14, LIGHTING STANDARDS
(A) Public Street Lighting. Street lights are required for all new Public Streets in accordance with the following standards:
1. Lights shall be provided along all City Streets and shall conform to Article 926, Underground Utilities, of the Charles Town Codified Ordinance.
2. Lights shall be provided at all entrances, intersections, and Cul-de-sacs.
3. Lights shall be spaced no more than two hundred (200) feet apart in residential areas, and no more than three hundred (300) feet apart in non-residential areas.
4. Lights shall use a white metal halide lighting system.
5. Lights shall conform to the power provider's requirements pertaining to watts, lumens, downlight reflectors and residential shields.
6. Lights shall be mounted on flat black poles with acorn style tops, unless otherwise specified by the Planning Commission.
7. Lights proposed within Land Developments and Subdivisions shall be provided without any installation or equipment costs incurred by the City of Charles Town.



Notes:
1. Future page to be added for connection and fusing details.
2. Luminaires should be grounded to neutral terminal if not grounded by manufacturer.
3. Install concrete foundation in poor soil conditions such as soft clay, heavy silt, or areas where standing water is common. Round fiber forms should be used for concrete foundation.
4. For field identification of high intensity discharge (HID) lamps, see Standard 16-020.

APPROVED BY: JAM/JWB

Embedded Fiberglass Post For Post Top Luminaires

FirstEnergy
Construction Std. 16-210
REV. 1
DATE 8/16

704 Foxcroft Avenue
Martinsburg, West Virginia 25401
Telephone: (304) 263-8951
Fax: (540) 722-4528
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SITE DETAILS

NORBORNE GLEBE
PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

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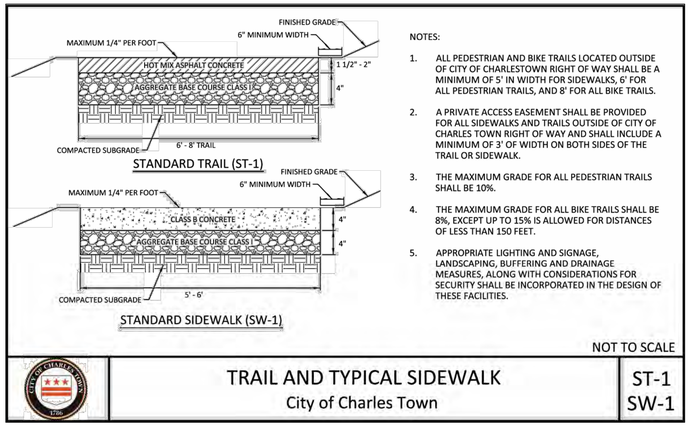


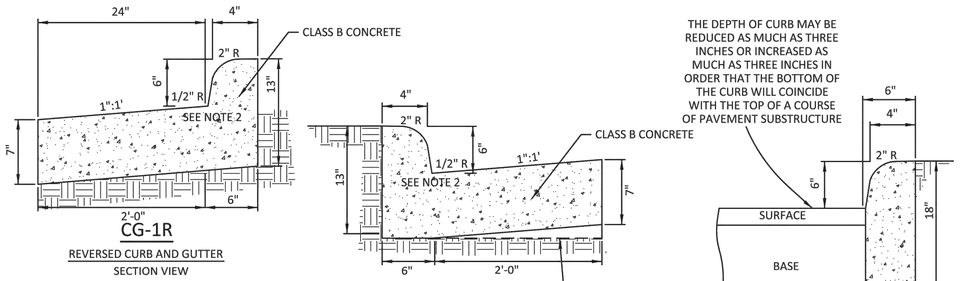
NOTES:

1. ALL PEDESTRIAN AND BIKE TRAILS LOCATED OUTSIDE OF CITY OF CHARLESTOWN RIGHT OF WAY SHALL BE A MINIMUM OF 5' IN WIDTH FOR SIDEWALKS, 6' FOR ALL PEDESTRIAN TRAILS, AND 8' FOR ALL BIKE TRAILS.
2. A PRIVATE ACCESS EASEMENT SHALL BE PROVIDED FOR ALL SIDEWALKS AND TRAILS OUTSIDE OF CITY OF CHARLES TOWN RIGHT OF WAY AND SHALL INCLUDE A MINIMUM OF 3' OF WIDTH ON BOTH SIDES OF THE TRAIL OR SIDEWALK.
3. THE MAXIMUM GRADE FOR ALL PEDESTRIAN TRAILS SHALL BE 10%.
4. THE MAXIMUM GRADE FOR ALL BIKE TRAILS SHALL BE 8%, EXCEPT UP TO 15% IS ALLOWED FOR DISTANCES OF LESS THAN 150 FEET.
5. APPROPRIATE LIGHTING AND SIGNAGE, LANDSCAPING, BUFFERING AND DRAINAGE MEASURES, ALONG WITH CONSIDERATIONS FOR SECURITY SHALL BE INCORPORATED IN THE DESIGN OF THESE FACILITIES.

NOT TO SCALE

	TRAIL AND TYPICAL SIDEWALK City of Charles Town	ST-1 SW-1

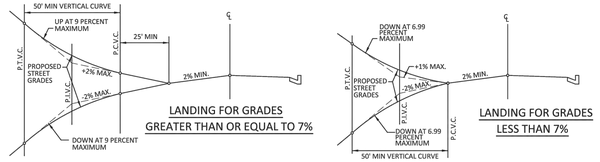
TYPICAL COMBINATION CURB AND GUTTER
N.T.S.



NOTES:

1. THE USE OF CG-1R SHALL NOT BE UTILIZED WITHIN THE LIMITS OF PUBLIC RIGHT OF WAY.
2. A MAXIMUM OF A 2" RADIUS IS ACCEPTABLE WITH CURB AND GUTTER.
3. SUBGRADE FOR ALL CURB AND GUTTER SHALL BE COMPACTED TO 95 PERCENT DENSITY AT OPTIMUM MOISTURE TO THE FULL WIDTH OF RIGHT OF WAY IN ACCORDANCE WITH AASHTO, T99.

(MODIFIED) SOURCE: CITY OF CHARLES TOWN DETAIL CG-1, CG-1R, AND CG-2)

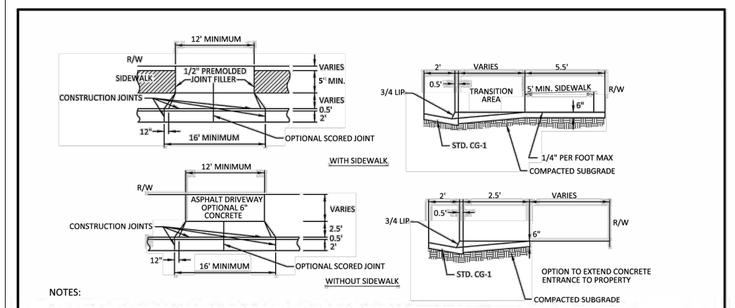


NOTES:

1. THE P.C.V.C. AS SHOWN ON THE DETAIL FOR LANDINGS WITH GRADES LESS THAN 7% SHALL BEGIN AT THE FACE OF CURB ON A CURB AND GUTTER SECTION OR AT THE EDGE OF PAVEMENT ON A SECTION WITHOUT CURB AND GUTTER.
2. THE 25' MINIMUM VERTICAL CURVE AS SHOWN ON THE DETAIL FOR LANDINGS WITH GRADES EQUAL TO OR GREATER THAN 7% SHALL BEGIN AT THE FACE OF CURB ON A CURB AND GUTTER SECTION OR AT THE EDGE OF PAVEMENT ON A SECTION WITHOUT CURB AND GUTTER.

NOT TO SCALE

	INTERSECTION LANDING REQUIREMENTS City of Charles Town	

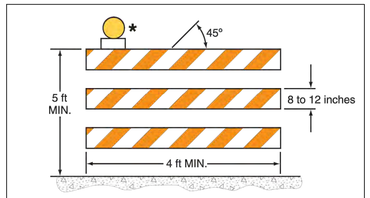


NOTES:

1. GRADING PLANS MUST PROVIDE FOR ADEQUATE VEHICULAR CLEARANCE FOR DRIVEWAY APPROACH, DEPARTURE, AND BREAKOVER TRANSITIONS.

NOT TO SCALE

	DRIVEWAY ENTRACE WITH CURB AND GUTTER City of Charles Town	DE-2



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CITY OF CHARLES TOWN DETAILS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
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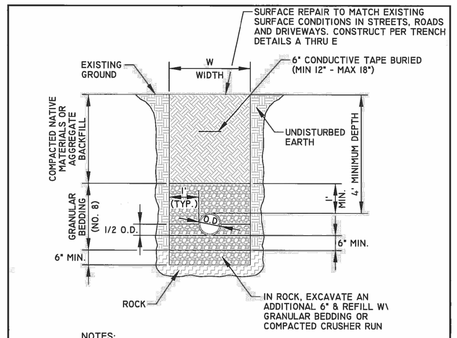
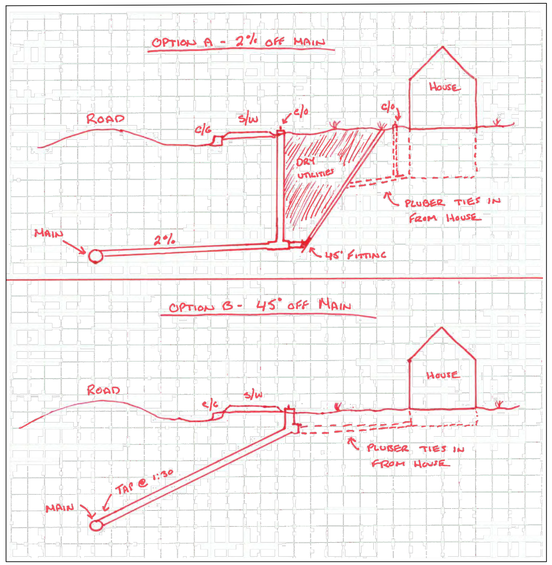
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 89 OF 97
SLD2022-06



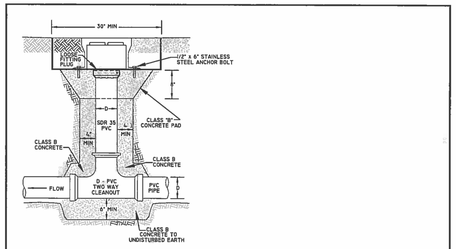
NOTES:

1. W = MAXIMUM PERMISSIBLE TRENCH WIDTH, BASED UPON, W = O.D. + 24", UNLESS APPROVED BY THE ENGINEER.
2. TRENCHES TO BE SHEETED AND BRACED AS REQUIRED.
3. PROVIDE BEARING FOR FULL LENGTH OF BARREL, DIG HOLES FOR THE BELL.
4. BACKFILL ON SIDES TO 1/2 O.D. OF PIPE TO HOLD PIPE IN PLACE PRIOR TO PLACING ADDITIONAL BEDDING.
5. BACKFILL TO BE COMPACTED IN 6" LAYERS TO 95% OF MAXIMUM DENSITY AT OPTIMUM MOISTURE (+2%) IN ROADS AND STREETS. COMPACT TO MATCH EXISTING GROUND IN OTHER AREAS.
6. MAINTAIN MINIMUM OF 4' OF COVER TO THE TOP OF PIPE.
7. A CASING PIPE SHALL BE REQUIRED IN ROAD CROSSINGS WHERE SHOWN ON PLANS
8. ALL WATER LINES REQUIRE PERMIT FROM APPLICABLE REGULATORY ENTITIES. PERMIT REQUIREMENTS SUPERCEDE WHAT IS SHOWN ON THIS DETAIL.

Charles Town Utility Board	SEWER LINE TRENCH DETAIL	Standard Detail No. S-1
832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 •Fax: (304) 725-4313		NOT TO SCALE
		SEPTEMBER 2015



SINGLE SERVICE LATERAL W/ 2 OPTIONS DETAIL

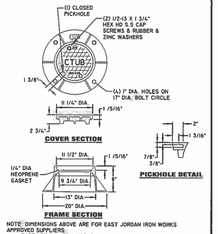


MAIN LINE CLEANOUT

(FOR D ≤ 8")

NOTES:

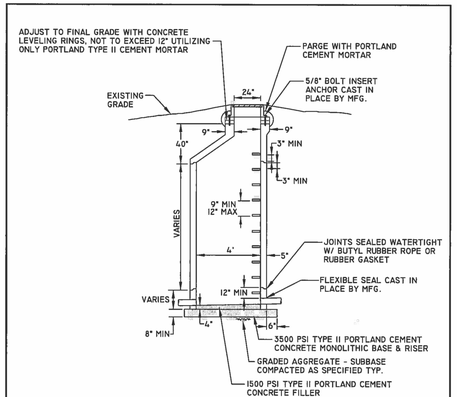
1. CLEANOUT FRAME AND COVER SHALL BE INSTALLED SUCH THAT IT IS LEVEL TO 2" BELOW SURROUNDING SURFACE. CLEANOUTS PROJECTING ABOVE SURFACE ARE UNACCEPTABLE.
2. FOR CLEANOUTS SUBJECT TO VEHICULAR TRAVEL, CONSTRUCT 30"x30"x6" CLASS B CONCRETE PAD. REINFORCE WITH 6x6 W4.0/4.0 WIRE MESH OR #3 REBAR @ 12" C-C EACH DIRECTION.
3. FOR NON-VEHICULAR TRAFFIC AREAS CONCRETE PAD CAN BE ELIMINATED AT DIRECTION OF ENGINEER. BACKFILL TO MATCH SURROUNDING AREA.
4. USE TEE AND PLUG FOR CLEANOUT AT END OF LINE.
5. FOR MAINLINE DIAMETER OF 8" OR GREATER, USE STRAIGHT TEE.



NOTE: DIMENSIONS ABOVE ARE FOR EAST JORDAN IRON WORKS APPROVED SUBSTITUTE: EAST JORDAN IRON WORKS FRAME & COVER 157807, UNDIPPED

MAIN LINE CLEANOUT FRAME & COVER

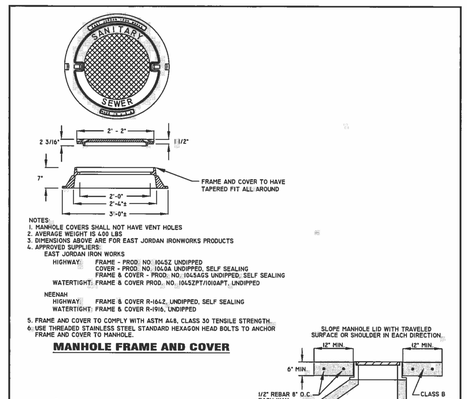
Charles Town Utility Board	MAINLINE CLEANOUT & FRAME & COVER DETAIL	Standard Detail No. S-12
832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 •Fax: (304) 725-4313		NOT TO SCALE
		SEPTEMBER 2015



NOTES:

1. PRECAST MANHOLE SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM C 478 UTILIZING TYPE II PORTLAND CEMENT. 3500 PSI MIX MINIMUM.
2. 0.1' FALL TYPICAL INVERT IN TO INVERT OUT OR MATCH CROWNS FOR DIFFERING PIPE DIAMETERS.
3. COMPLETE MANHOLE SHALL PASS VACUUM TEST PRIOR TO ACCEPTANCE.

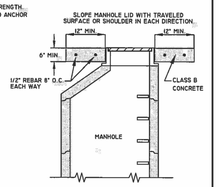
Charles Town Utility Board	PRECAST MANHOLE W/ ECCENTRIC TOP DETAIL	Standard Detail No. S-6
832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 •Fax: (304) 725-4313		NOT TO SCALE
		SEPTEMBER 2015



NOTES:

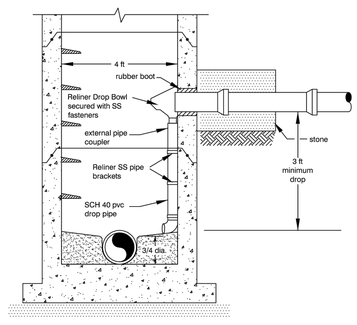
1. MANHOLE COVERS SHALL NOT HAVE VENT HOLES
2. AVERAGE WEIGHT IS 400 LBS
3. DIMENSIONS ABOVE ARE FOR EAST JORDAN IRONWORKS PRODUCTS
4. APPROVED SUPPLIERS:
   EAST JORDAN IRON WORKS
   HIGHWAY: FRAME - PROD. NO. 1045Z UNDIPPED
   COVER - PROD. NO. 1045A UNDIPPED, SELF SEALING
   FRAME & COVER - PROD. NO. 1045AGS UNDIPPED, SELF SEALING
   WATERTIGHT: FRAME & COVER PROD. NO. 1045ZPT/1018APT, UNDIPPED
   NEENAH
   HIGHWAY: FRAME & COVER R-1642, UNDIPPED, SELF SEALING
   WATERTIGHT: FRAME & COVER R-1916, UNDIPPED
5. FRAME AND COVER TO COMPLY WITH ASTM A48, CLASS 30 TENSILE STRENGTH.
6. USE THREADED STAINLESS STEEL STANDARD HEXAGON HEAD BOLTS TO ANCHOR FRAME AND COVER TO MANHOLE.

MANHOLE FRAME AND COVER



ANCHOR DETAIL FOR FRAME & COVER IN PAVED ROAD SURFACE AREAS AND SHOULDERS OF ROAD

Charles Town Utility Board	MANHOLE FRAME & COVER ANCHOR FOR FRAME & COVER DETAIL	Standard Detail No. S-7
832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 •Fax: (304) 725-4313		NOT TO SCALE
		SEPTEMBER 2015

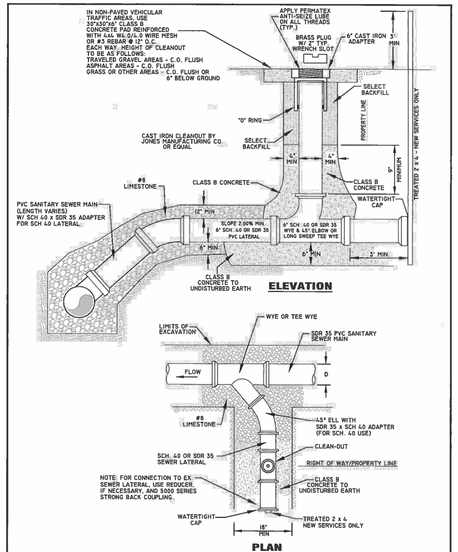


Inside drop system to be Reliner Drop Bowl, manufactured by Duran, Inc.

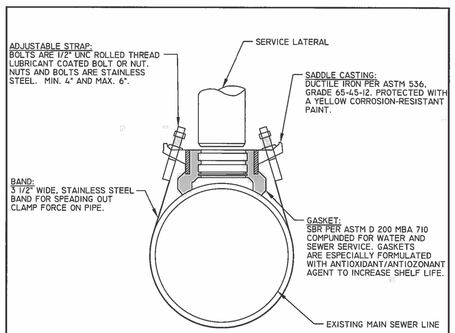
DROP MANHOLE

-16-

MAR 18



Charles Town Utility Board	NEW LATERAL CONNECTION DETAIL	Standard Detail No. S-13
832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 •Fax: (304) 725-4313		NOT TO SCALE
		SEPTEMBER 2015



NOTES:

1. SADDLE SHALL BE CAPABLE OF ATTACHING TO VARIOUS SIZES AND MATERIALS OF GRAVITY SEWER MAIN LINES. SADDLE SHALL BE INSTALLED SO SEWER LATERAL IS AT 45° FROM VERTICAL AT MAINLINE.
2. ROMAC ORIGINAL, STYLE "CB" SEWER SADDLE.
3. PIPE STOP CAPABLE OF WITHSTANDING 1000 POUNDS OF OF THRUST IS MOLDED INTO THE CB SADDLE GASKET. CARE MUST BE TAKEN DURING SYSTEM DESIGN & INSTALLATION TO ASSURE THAT THIS THRUST LIMIT IS NOT EXCEEDED.
4. NEW LATERAL CONNECTIONS USE 4" SADDLE OR SIZE OF LATERAL IF LARGER.
5. FOR SEWER LATERAL REPLACEMENTS USE 6" SADDLE AND USE PIPE REDUCER TO CONNECT TO LATERAL.
6. A PVC REDUCER IS REQUIRED FOR LOW PRESSURE SEWER MAINS.

Charles Town Utility Board	SEWER SADDLE DETAIL	Standard Detail No. S-15
832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 •Fax: (304) 725-4313		NOT TO SCALE
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SHEET 90 OF 97

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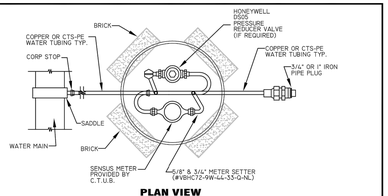
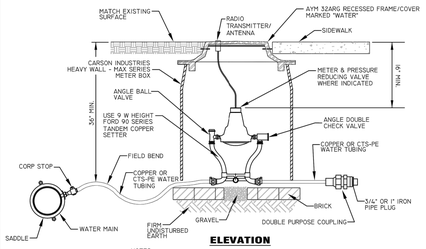


PLAN VIEW

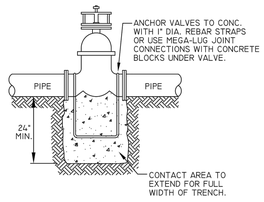


ELEVATION

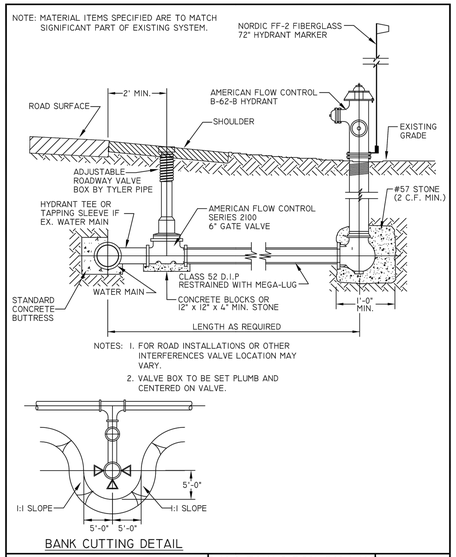
NOTES:

1. ALL BOLTS TO BE STAINLESS STEEL.
2. CONNECT NEW METER SETTER TO EXISTING SERVICE LINES FOR LOCATIONS REQUIRING ONLY METER REPLACEMENT
3. PRESSURE REDUCING VALVE REQUIRED IF STATIC SYSTEM PRESSURES EXCEED 100 PSI
4. ALL METERS TO BE SENSUS RADIO READ PLACED AT PROPERTY LINE.

Charles Town Utility Board 832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 • Fax: (304) 725-4313	METERED CONNECTION DETAIL	Standard Detail No. W-1 NOT TO SCALE APRIL 2015

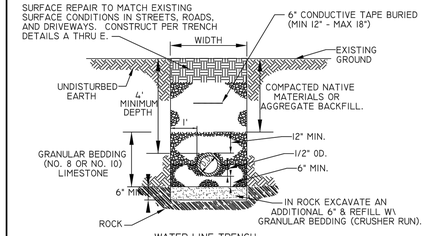


Charles Town Utility Board 832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 • Fax: (304) 725-4313	WATER VALVES DETAIL	Standard Detail No. W-3 NOT TO SCALE APRIL 2015



BANK CUTTING DETAIL

Charles Town Utility Board 832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 • Fax: (304) 725-4313	FIRE HYDRANT WITH TAPPING SLEEVE AND VALVE DETAIL	Standard Detail No. W-5 NOT TO SCALE APRIL 2015



WATER LINE TRENCH

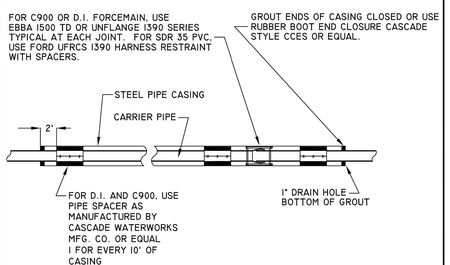
NOTES:

1. W = MAXIMUM PERMISSIBLE TRENCH WIDTH, BASED UPON, W = O.D. + 24", UNLESS APPROVED BY THE ENGINEER.
2. TRENCHES TO BE SHEETED AND BRACED AS REQUIRED.
3. PROVIDE BEARING FOR FULL LENGTH OF BARREL, DIG HOLES FOR THE BELL.
4. BACKFILL TO BE COMPACTED IN 6" LAYERS TO 95% OF MAXIMUM DENSITY AT OPTIMUM MOISTURE (+2%) IN ROADS AND STREETS. COMPACT TO MATCH EXISTING GROUND IN OTHER AREAS.
5. MAINTAIN MINIMUM OF 4' OF COVER TO THE TOP OF PIPE.
6. A CASING PIPE SHALL BE REQUIRED IN ROAD CROSSINGS WHERE SHOWN ON PLANS
7. ALL WATER LINES REQUIRE PERMIT FROM APPLICABLE REGULATORY ENTITIES. PERMIT REQUIREMENTS SUPERCEDE WHAT IS SHOWN ON THIS DETAIL.

Charles Town Utility Board 832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 • Fax: (304) 725-4313	WATER LINE TRENCH DETAIL	Standard Detail No. W-9 NOT TO SCALE APRIL 2015

CASING SCHEDULE FOR C900, DI, OR DI TR FLEX RESTRAINED JT 350 PSI		
CARRIER PIPE DIA. (IN.)	MIN. CASING PIPE DIA. (IN.)	NOM. WALL THICKNESS
4	10	0.313
6	12	0.313
8	16	0.313
10	18	0.375
12	20	0.375

NOTE: SDR 35 PVC, CASING FOR 4" CARRIER IS 12" DIA. AND FOR 6" CARRIER IS 16" DIA. OTHER SIZE SDR 35 ARE SAME AS ABOVE. STEEL CASING SHALL BE USED WITH SPECIFIED MINIMUM YIELD STRENGTH OF AT LEAST 35,000 PSI.



Charles Town Utility Board 832 S. George Street, P.O. Box 359, Charles Town, WV 25414 Phone: (304) 725-2316 • Fax: (304) 725-4313	PIPE CASING DETAIL	Standard Detail No. W-14 NOT TO SCALE APRIL 2015

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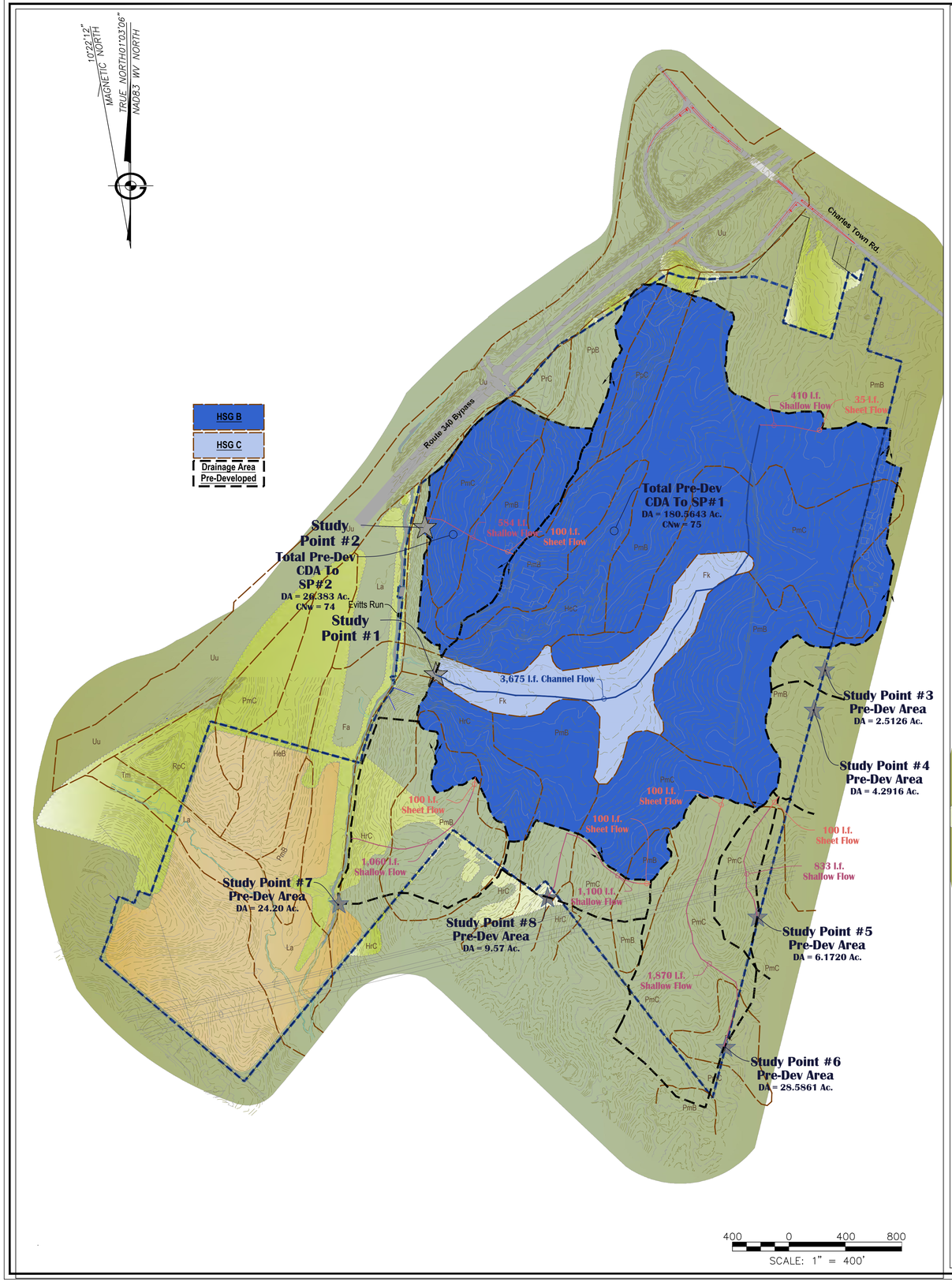

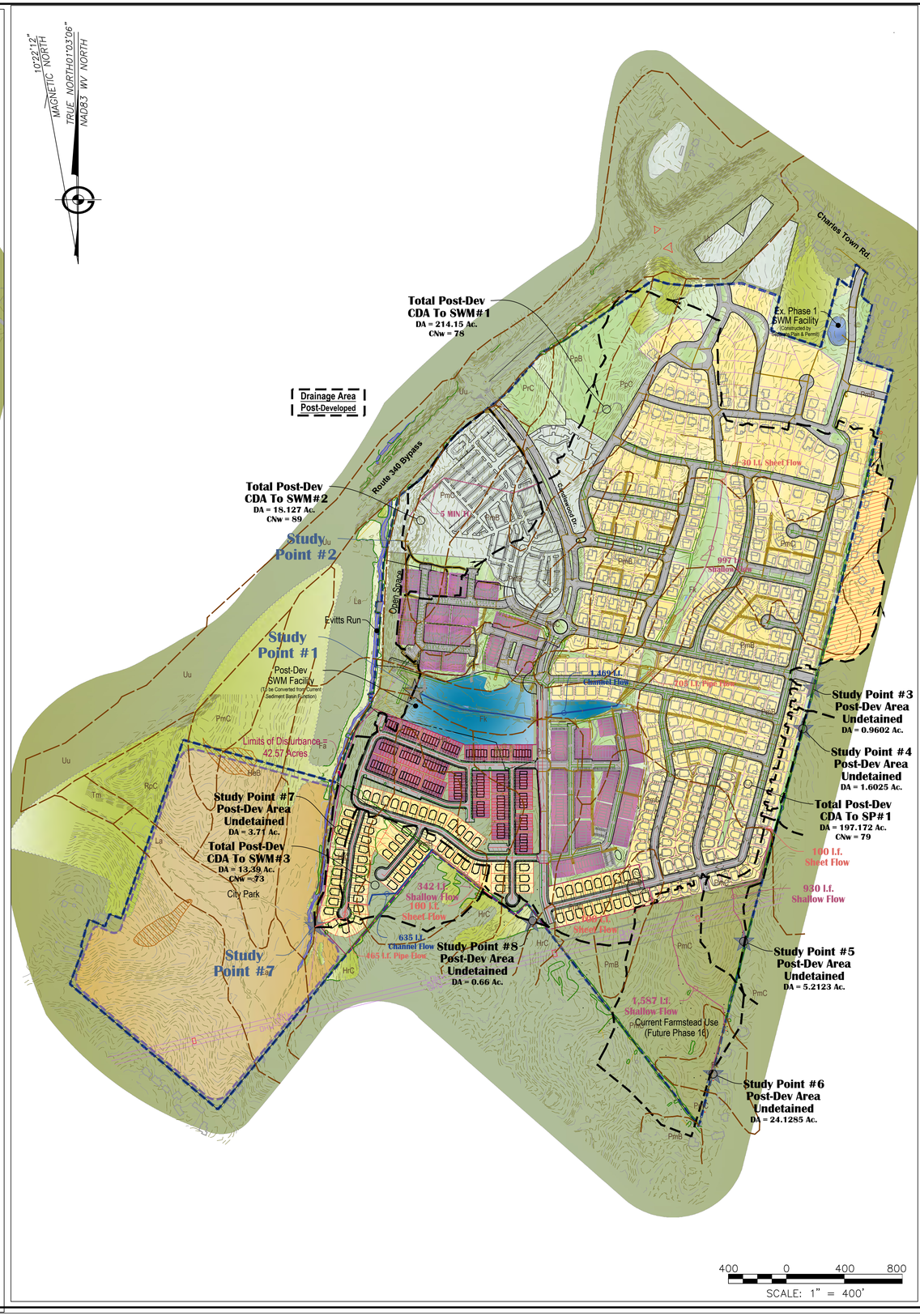

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SWM PLAN

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999

Study Point #1			
Pre-Development Weighted Curve Number (CNw)			
Drainage Area	Soils Group	Land Use	CN
161.378 Ac.	HSG B	Farmstead	74
19.186 Ac.	HSG C	Farmstead	82
Total D.A. = 180.564			CNw = 75

Study Point #1						
Pre-Development Time of Concentration (Tc) Calculation						
Segment	Segment Length	Segment Slope (%)	Flow Velocity	Manning s "n"	Surface	Time of Concentration
Sheet Flow	35 lf	2.00%	0.09 fps	0.240	Dense Grass	6.5 mins.
Shallow Concentrated	410 lf	2.50%	2.55 fps		Unpaved	2.7 mins.
					(Kv=16.1 fps)	
Channel Flow	3,675 lf	1.00%	1.60 fps	0.080	Capacity = 32.01 cfs	38.3 mins.
Area = 20.0 sf, Perim = 25.0', r= 0.80'						
					Total Tc =	47.5 Minutes

Study Point #1		
Pre-Development Discharge Summary		
24 Hour Storm Event	Inflow = Outlow	Peak Elevation
	(cfs)	(feet)
1 Year	48.42	454.50
2 Year	77.15	454.74
5 Year	125.80	455.03
10 Year	170.60	455.25
25 Year	239.12	455.52
50 Year	299.15	455.72
100 Year	366.55	455.92

Post-Development Study Point #1			
Weighted Curve Number (CNw)			
Drainage Area (Acres)	Land Use*	Soils Group	CN
32.238	Paved Road & R/W Area	HSG B	94
1.165	Paved Road & R/W Area	HSG C	96
19.387	Open Space - Good Grass cover	HSG B	61
3.762	Open Space - Good Grass cover	HSG C	74
2.013	Open Spaces - Medians in R/W	HSG B	61
7.123	SWM Area, 100% Impervious	HSG C	98
1.709	SFA Lots, 65% Impervious	HSG B	85
0.105	SFA Lots, 65% Impervious	HSG C	90
112.373	SFD Lots, 38% Impervious	HSG B	75
8.979	SFD Lots, 38% Impervious	HSG C	83
8.318	Commercial Lots, 85% Impervious	HSG B	92
Total D.A. = 197.172 Ac.			CNw = 79

Study Point #1						
Post-Development Time of Concentration (Tc) Calculation						
Segment	Segment Length	Segment Slope (%)	Flow Velocity	Manning s "n"	Surface	Time of Concentration
Sheet Flow	30 lf	3.30%	0.15 fps	0.150	Short Grass	3.2 mins.
Shallow Concentrated	997 lf	1.80%	2.16 fps		Unpaved	7.7 mins.
					(Kv=16.1 fps)	
Pipe Flow	275 lf	0.75%	6.76 fps	0.012	Capacity = 21.22 cfs	0.7 mins.
24" HDPE (Ex. Str. # 200 - Ex. Str.# 501, Area = 3.1 sf, Permim. 6.3' r=0.50'						
Channel Flow	430 lf	0.65%	12.35 fps	0.028	Capacity = 293.30 cfs	0.6 mins.
mooth Alum. (Ex. Str. # 600 - Ex. Str.# 200, Area = 23.8 sf, Permim. 17.3' r=1.38'						
Channel Flow	1,469 lf	0.50%	6.24 fps	0.035	Capacity = 1,030.39 cfs	3.9 mins.
Area = 165 sf, Permim. 55.0' r=3.00'						
Total Flow Length = 3,201 lf					Total Tc =	16.1 Minutes

Study Point #1					
Post-Development Discharge Summary					
24 Hour Storm Event	Inflow	Primary Outflow	Peak Elevation	Storage	Storage
	(cfs)	(cfs)	(feet)	(cubic feet)	(Acre-feet)
1 Year	75.81	0.95	466.91	508,476	11.6730
2 Year	108.73	1.08	468.12	741,130	17.0140
5 Year	162.65	12.36	468.65	867,672	19.9190
10 Year	217.37	32.95	469.15	994,301	22.8260
25 Year	296.71	80.71	469.57	1,239,195	28.4480
50 Year	365.70	120.12	470.61	1,427,026	32.7600
100 Year	442.72	171.17	471.22	1,629,492	37.4080

Study Point #2			
Pre-Development Weighted Curve Number (CNw)			
Drainage Area	Soils Group	Land Use	CN
26.383 Ac.	HSG B	Farmstead	74
Total D.A. = 26.383			CNw = 74

Study Point #2					
Pre-Development Time of Concentration (Tc) Calculation					
Segment	Segment Length	Segment Slope (%)	Manning s "n"	Surface	Time of Concentration
Sheet Flow	100 lf	5.00%	0.240	Dense Grass	10.4 mins.
Shallow Concentrated	584 lf	6.00%		Short Grass Pasture	5.7 mins.
				Total Tc =	16.1 Minutes

Study Point #2	
Pre-Development Discharge Summary	
24 Hour Storm Event	Inflow = Outlow
	(cfs)
1 Year	7.16
2 Year	10.92
5 Year	17.28
10 Year	23.17
25 Year	32.26
50 Year	41.59
100 Year	51.40

Study Point #2	
Post-Development Time of Concentration (Tc) Calculation	
Total Flow Length = 1,035 lf	Total Tc = 5 Minutes

Post-Development Study Point #2			
Weighted Curve Number (CNw)			
Drainage Area (Acres)	Land Use*	Soils Group	CN
0.322	Paved Road & R/W Area	HSG B	94
1.234	Open Space - Good Grass cover	HSG B	61
1.28	SFD Lots, 37% Impervious	HSG B	75
15.291	Commercial Lots, 85% Impervious	HSG B	92
Total D.A. = 18.127 Ac.			CNw = 89

Study Point #2					
Post-Development Discharge Summary					
24 Hour Storm Event	Inflow	Primary Outflow	Peak Elevation	Storage	Storage
	(cfs)	(cfs)	(feet)	(cubic feet)	(Acre-feet)
1 Year	16.99	4.67	464.88	42,558	0.9770
2 Year	22.31	9.85	465.84	53,971	1.2390
5 Year	30.44	16.51	466.70	65,035	1.4930
10 Year	37.38	21.32	467.32	73,529	1.6880
25 Year	47.41	26.28	468.24	86,989	1.9970
50 Year	55.83	35.69	468.69	93,872	2.1550
100 Year	65.01	52.69	469.06	99,535	2.2850

Study Point #3			
Pre-Development Weighted Curve Number (CNw)			
Drainage Area	Soils Group	Land Use	CN
2.513	HSG B	Farmstead	74
Total D.A. = 2.513			CNw = 74

Study Point #3					
Pre-Development Time of Concentration (Tc) Calculation					
Total Flow Length = 398 lf				Total Tc =	5 Minutes

Study Point #3		
Pre-Development Discharge Summary		
24 Hour Storm Event	Flow	Runoff Volumes
	(cfs)	(acre-ft)
1 Year	0.76	0.116
2 Year	1.26	0.174
5 Year	2.12	0.274
10 Year	2.91	0.367
25 Year	4.13	0.510
50 Year	5.21	0.637
100 Year	6.42	0.781

Post-Development Study Point #3			
Weighted Curve Number (CNw)			
Drainage Area (Acres)	Land Use*	Soils Group	CN
0.26	Paved Road & R/W Area	HSG B	94
0.7	SFD Lots, 37% Impervious	HSG B	75
Total D.A. = 0.96 Ac.			CNw = 77

Study Point #3	
Post-Development Time of Concentration (Tc) Calculation	
Total Flow Length = 260 lf	Total Tc = 5 Minutes

Study Point #3		
Post-Development Discharge Summary		
24 Hour Storm Event	Flow	Runoff Volumes
	(cfs)	(acre-ft)
1 Year	0.54	0.070
2 Year	0.78	0.098
5 Year	1.16	0.143
10 Year	1.51	0.184
25 Year	2.02	0.245
50 Year	2.46	0.298
100 Year	2.94	0.358

Study Point #4			
Pre-Development Weighted Curve Number (CNw)			
Drainage Area	Soils Group	Land Use	CN
4.29	HSG B	Farmstead	74
Total D.A. = 4.29			CNw = 74

Study Point #4					
Pre-Development Time of Concentration (Tc) Calculation					
Total Flow Length = 364 lf				Total Tc =	5 Minutes

Study Point #4		
Pre-Development Discharge Summary		
24 Hour Storm Event	Flow	Runoff Volumes
	(cfs)	(acre-ft)
1 Year	1.29	0.198
2 Year	2.15	0.298
5 Year	3.61	0.468
10 Year	4.97	0.627
25 Year	7.06	0.871
50 Year	8.89	1.088
100 Year	10.96	1.334

Post-Development Study Point #4			
Weighted Curve Number (CNw)			
Drainage Area (Acres)	Land Use*	Soils Group	CN
1.6	SFD Lots, 37% Impervious	HSG B	75
Total D.A. = 1.60 Ac.			CNw = 75

Study Point #4	
Post-Development Time of Concentration (Tc) Calculation	
Total Flow Length = 600 lf	Total Tc = 5 Minutes

Study Point #4		
Post-Development Discharge Summary		
24 Hour Storm Event	Flow	Runoff Volumes
	(cfs)	(acre-ft)
1 Year	0.54	0.079
2 Year	0.87	0.118
5 Year	1.43	0.183
10 Year	1.95	0.244
25 Year	2.74	0.337
50 Year	3.43	0.419
100 Year	4.21	0.512

Study Point #5			
Pre-Development Weighted Curve Number (CNw)			
Drainage Area	Soils Group	Land Use	CN
6.172	HSG B	Farmstead	74
Total D.A. = 6.172 Ac			CNw = 74

Study Point #5						
Pre-Development Time of Concentration (Tc) Calculation						
Segment	Segment Length	Segment Slope (%)	Manning s "n"	Surface	Time of Concentration	
Sheet Flow	100 lf	3.00%	0.240	Dense Grass	12.8 mins.	
Shallow Concentrated	833 lf	5.00%		Short Grass Pasture	8.9 mins.	
					Total Tc =	21.7 Minutes

Study Point #5		
Pre-Development Discharge Summary		
24 Hour Storm Event	Flow	Runoff Volumes
	(cfs)	(acre-ft)
1 Year	1.86	0.284
2 Year	2.86	0.428
5 Year	4.53	0.673
10 Year	6.05	0.900
25 Year	8.36	1.252
50 Year	10.38	1.563
100 Year	12.63	1.916

Post-Development Study Point #5			
Weighted Curve Number (CNw)			
Drainage Area (Acres)	Land Use*	Soils Group	CN
0.052	Paved Road & R/W Area	HSG B	94
4.145	Farmsteads	HSG B	74
1.015	SFD Lots, 37% Impervious	HSG B	75
Total D.A. = 18.127 Ac.			CNw = 74

Study Point #5						
Post-Development Time of Concentration (Tc) Calculation						
Segment	Segment Length	Segment Slope (%)	Manning s "n"	Surface	Time of Concentration	
Sheet Flow	100	3.00%	0.240	Dense Grass	12.8 mins.	
Shallow Concentrated	930 lf	5.00%		Short Grass Pasture	9.9 mins.	
					Total Tc =	18.4 Minutes

Study Point #5		
Post-Development Discharge Summary		
24 Hour Storm Event	Flow	Runoff Volumes
	(cfs)	(acre-ft)
1 Year	1.59	0.240
2 Year	2.45	0.362
5 Year	3.88	0.569
10 Year	5.19	0.761
25 Year	7.18	1.058
50 Year	8.92	1.321
100 Year	10.85	1.620

Pre-Development Weighted Curve Number (CNw)			
Drainage Area	Soils Group	Land Use	CN
28.586	HSG B	Farmstead	74
Total D.A. = 28.586 Ac			CNw = 74

Study Point #6					
Pre-Development Time of Concentration (Tc) Calculation					
Segment	Segment Length	Segment Slope (%)	Manning s "n"	Surface	Time of Concentration
Sheet Flow	100 lf	3.30%	0.240	Dense Grass	12.3 mins.
Shallow Concentrated	1,870 lf	3.00%		Short Grass Pasture	25.7 mins.
				Total Tc =	38.0 Minutes

Study Point #6		
Pre-Development Discharge Summary		
24 Hour Storm Event	Flow	Runoff Volumes
	(cfs)	(acre-ft)
1 Year	8.12	1.309
2 Year	13.02	1.973
5 Year	21.31	3.104
10 Year	28.95	4.154
25 Year	40.62	5.778
50 Year	50.84	7.217
100 Year	82.32	8.850

Post-Development Study Point #6			
Weighted Curve Number (CNw)			
Drainage Area (Acres)	Land Use*	Soils Group	CN
0.141	Paved Road & R/W Area	HSG B	94
23.306	Farmsteads	HSG B	74
0.681	SFD Lots, 37% Impervious	HSG B	75
Total D.A. = 24.128 Ac.			CNw = 74

Study Point #6					
Post-Development Time of Concentration (Tc) Calculation					
Segment	Segment Length	Segment Slope (%)	Manning s "n"	Surface	Time of Concentration
Sheet Flow	100	3.00%	0.240	Dense Grass	12.8 mins.
Shallow Concentrated	1,587 lf	3.00%		Short Grass Pasture	21.8 mins.
				Total Tc =	34.6 Minutes

Study Point #6			
Post-Development Discharge Summary			
24 Hour Storm Event	Flow	Runoff Volumes	
	(cfs)	(acre-ft)	
1 Year	7.15	1.112	
2 Year	11.37	1.675	
5 Year	18.49	2.633	
10 Year	25.02	3.523	
25 Year	35.00	4.898	
50 Year	43.73	6.117	
100 Year	53.51	7.500	

SEDIMENT BASIN 1 VOLUMES			
Elevation	C.Y.	C.F.	Acre-Ft
458	98	2,640.6	0.06062
459	315	8,504.8	0.19524
460	714	19,286.9	0.44277
461	1,391	37,559.4	0.86225
462	2,553	68,916.6	1.58211
463	4,397	118,718.2	2.72539
464	6,956	187,813.5	4.31161
465	10,697	288,821.0	6.63042
466	15,561	420,136.3	9.645
467	21,971	593,214.7	13.61833
468	30,182	814,907.6	18.70771
469	40,793	1,101,407.2	25.28483
470	53,725	1,450,562.8	33.30034
471	69,875	1,886,611.1	43.31063
472	89,143	2,406,868.7	55.2541

SEDIMENT BASIN 2 VOLUMES			
Elevation	C.Y.	C.F.	Acre-Ft
462	510	13,770.9	0.31614
463	846	22,846.2	0.52448
464	1,218	32,878.1	0.75478
465	1,626	43,899.1	1.00778
466	2,072	55,943.2	1.28428
467	2,557	69,045.1	1.58506
468	3,083	83,245.5	1.91105
469	3,651	98,584.8	2.2632
470	4,263	115,093.9	2.64219
470.7	4,718	127,387.6	2.92442

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SWM COMPS

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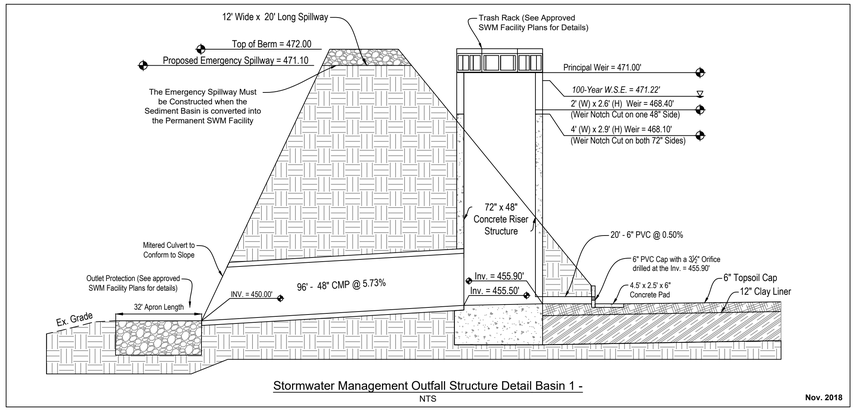
PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: N/A
DESIGNED BY: CC/CW
FILE NO. 4542A
SHEET 93 OF 97
SLD2022-06

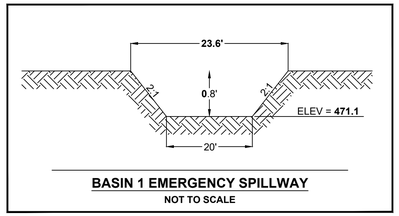
1000



Stormwater Management Outfall Structure Detail Basin 1 -

NTS

Nov. 2018



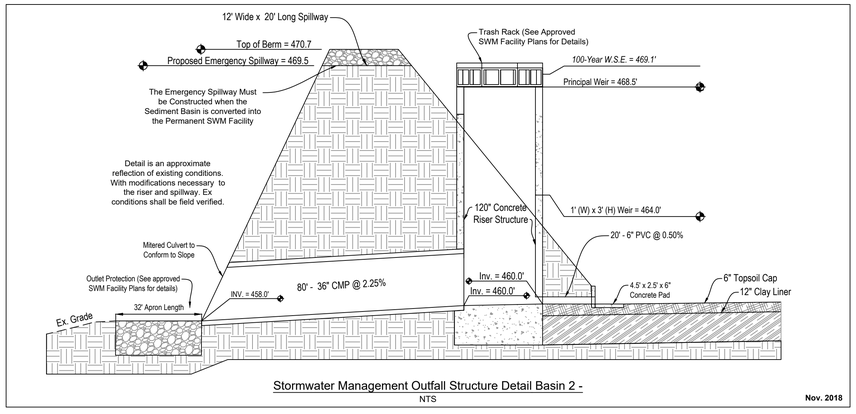
BASIN 1 EMERGENCY SPILLWAY

NOT TO SCALE

Notes:

- **Area within design high water area to remain at grades shown on E&S Phase I plan until stabilization and transition to E&S Phase II plan
- Contractor to coordinate with Geotechnical Engineer to ensure wet area is stable and can hold water prior to construction

SEDIMENT BASIN 1 VOLUMES			
Elevation	C.Y.	C.F.	Acre-Ft
458	98	2,640.6	0.06062
459	315	8,504.8	0.19524
460	714	19,286.9	0.44277
461	1,391	37,559.4	0.86225
462	2,553	68,916.6	1.58211
463	4,397	118,718.2	2.72539
464	6,956	187,813.5	4.31161
465	10,697	288,821.0	6.63042
466	15,561	420,136.3	9.645
467	21,971	593,214.7	13.61833
468	30,182	814,907.6	18.70771
469	40,793	1,101,407.2	25.28483
470	53,725	1,450,562.8	33.30034
471	69,875	1,886,611.1	43.31063
472	89,143	2,406,868.7	55.2541



Stormwater Management Outfall Structure Detail Basin 2 -

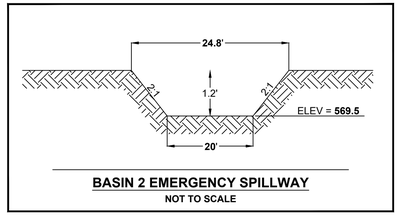
NTS

Nov. 2018

SWM Facility Data Reference Note:
The Outfall Structure Dimensions and Elevations are Design Elevations referenced from the Approved "Site Plan for Stormwater Management Facility - Norborne Glebe" dated 2001.

Storage Volumes represent the current constructed state of the SWM Facility. These Volumes were derived from 2' interval contours and spot elevations, from a 2013 Aerial Survey. Modified to represent construction of 14A.

The Facility was constructed as a Sediment Basin, had achieved stabilization and was in functional operation. The facility is unaltered from this condition as of November, 2018.



BASIN 2 EMERGENCY SPILLWAY

NOT TO SCALE

Notes:

- **Area within design high water area to remain at grades shown on E&S Phase I plan until stabilization and transition to E&S Phase II plan
- Contractor to coordinate with Geotechnical Engineer to ensure wet area is stable and can hold water prior to construction

SEDIMENT BASIN 2 VOLUMES			
Elevation	C.Y.	C.F.	Acre-Ft
462	510	13,770.9	0.31614
463	846	22,846.2	0.52448
464	1,218	32,878.1	0.75478
465	1,626	43,899.1	1.00778
466	2,072	55,943.2	1.28428
467	2,557	69,045.1	1.58506
468	3,083	83,245.5	1.91105
469	3,651	98,584.8	2.2632
470	4,263	115,093.9	2.64219
470.7	4,718	127,387.6	2.92442

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SWM DETAILS

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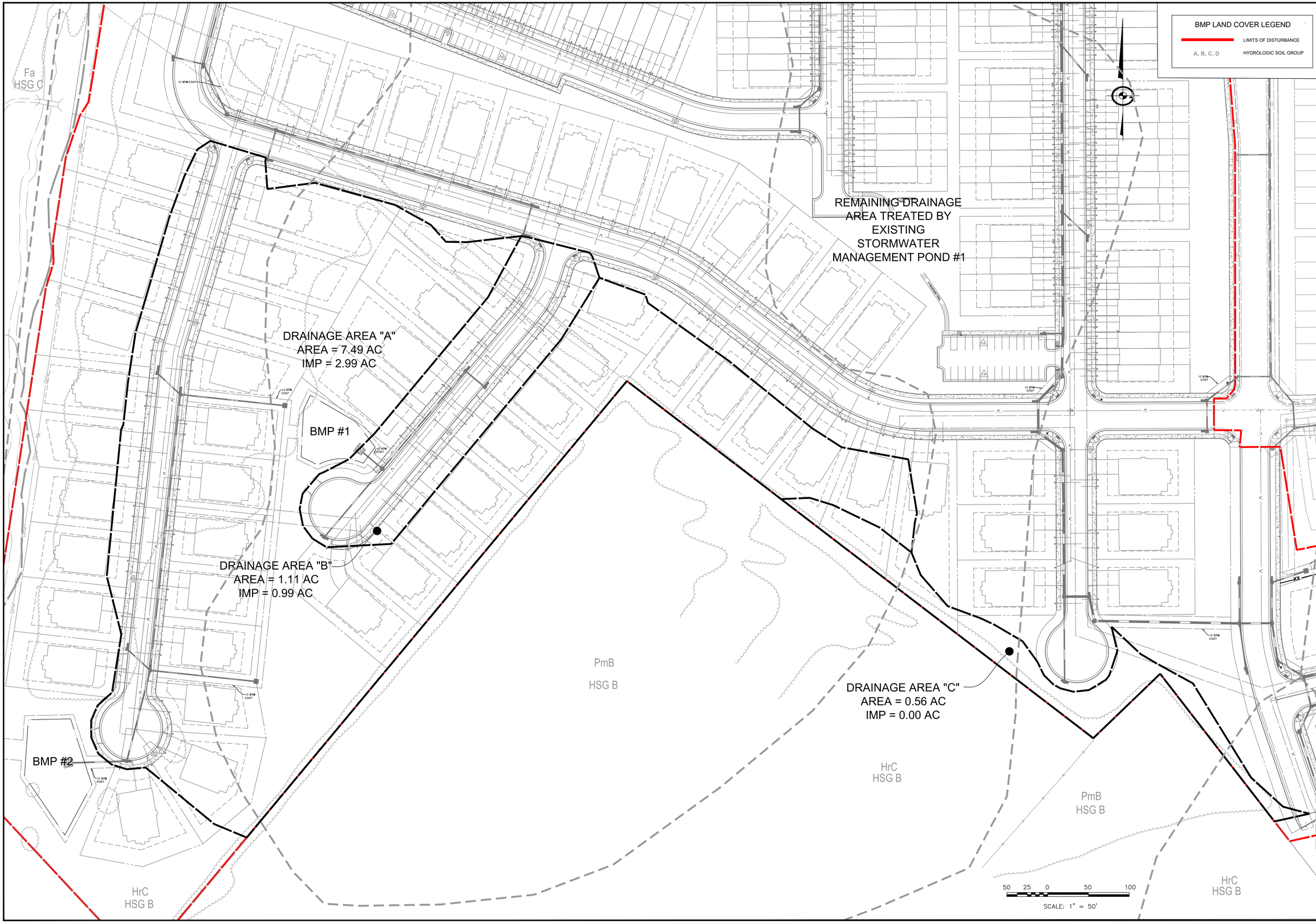
SHEET 94 OF 97

SLD2022-06



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BMP PLAN

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023
SCALE: 1" = 50'
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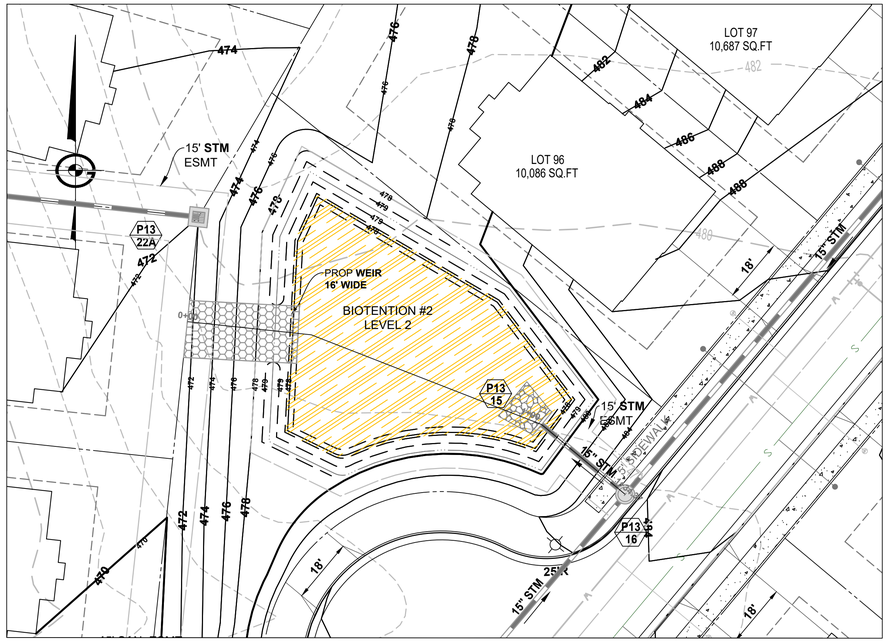
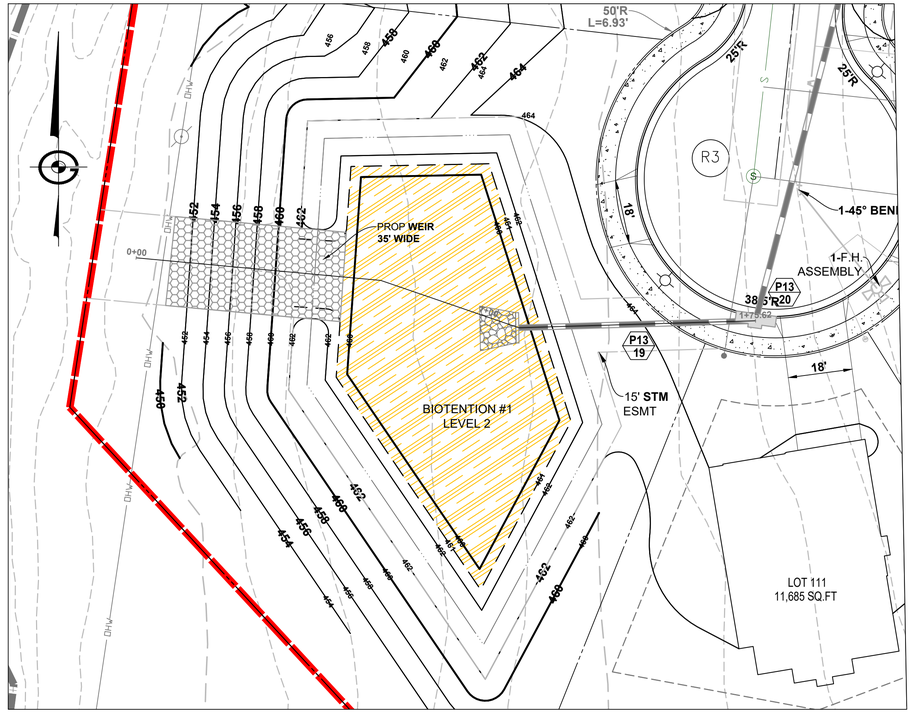
FILE NO. 4542A
SHEET 95 OF 97
SLD2022-06

1002



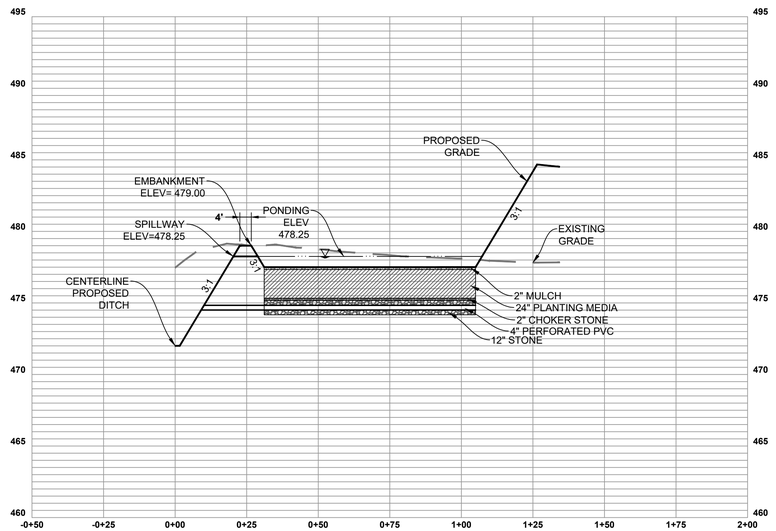
BMP #1

SCALE: 1" = 20'



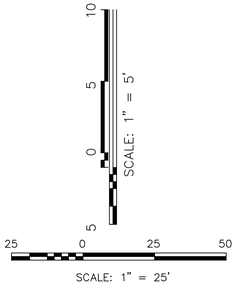
BMP #2

SCALE: 1" = 20'

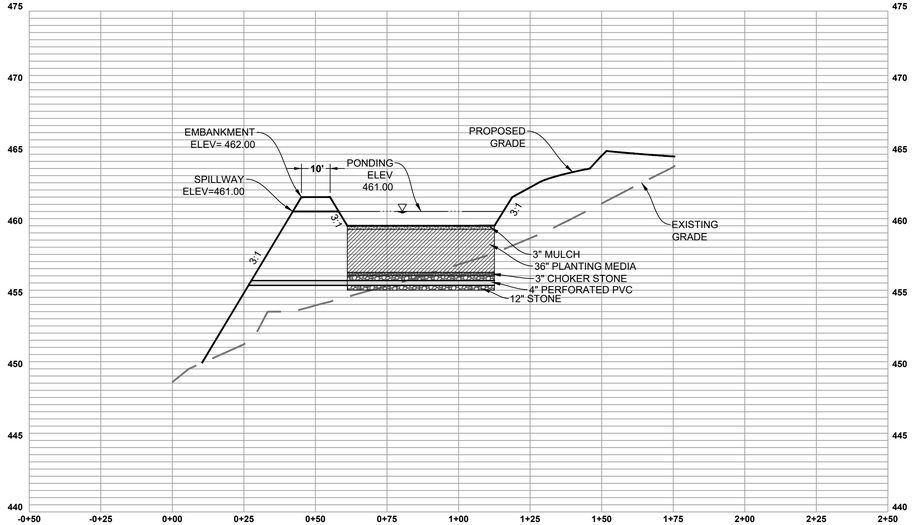


BIORETENTION FACILITY #1 - LEVEL 2

SCALE: 1"=25' HORIZ
1"=5' VERT



SCALE: 1" = 25'



BIORETENTION FACILITY #2 - LEVEL 2

SCALE: 1"=25' HORIZ
1"=5' VERT

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BMP DETAIL & SECTIONS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

SCALE: AS SHOWN

DESIGNED BY: CC/CW

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SHEET 96 OF 97

SLD2022-06

1003

Design of Bioretention Facility #1
DA-A

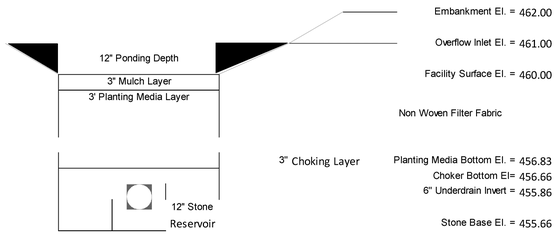
Objective #1: Define the drainage area.

Total Drainage Area (DA) =	326,264 sf	7.49 ac
Total Impervious Area (Ai) =	130,244 sf	2.99 ac
Impervious Percentage (I) =	39.9%	
Design Volume (DV)=	10,000 cf	

Objective #2: Determine the ESD Volume provided.

Bottom Area of Ponding =	4,197 sf
Top Area of Ponding =	5,988 sf
Ponding Depth =	12"
Ponding Volume =	5,093 cf
Filter Area (A_f) =	4,197 sf
Planting Media Thickness =	3 ft.
Storage within Planting Media =	3,148 cf
Gravel Depth=	1 ft
Gravel Storage=	1,679 cf
Total Storage Provided =	9,919 cf

Objective #3: Provide a schematic of the facility.



Objective #4: Analyze the 10-yr event, determining peak discharge and peak water surface elevation.

C-Factor Computation

Cover Type	Soil	C	Area (A)	C x A	C_W
Impervious	B	0.9	130,244 sf	117219.96	
Turf	B	0.3	196,020 sf	58806	
		Total	326,264 sf	176025.96	0.54

Time of Concentration (Tc) =	5 min	assumed
Rainfall Intensity (I_{10}) =	6.5	
10-yr Peak Discharge (Q_{10}) =	**26.44 cfs**	$Q_X = C_W \times I_X \times DA$
Weir Length (L) =	25.00 ft.	Perimeter of Overflow Inlet
Weir Coefficient (c) =	3	
Head for 10-yr event (H_{10}) =	0.50 ft.	$H_X = (Q_X / c / L)^{(2/3)}$
10-yr Water Surface Elevation =	**461.50**	
Freeboard to Embankment =	0.50 ft.	

Objective #5: Analyze the 100-yr event, determining peak discharge and peak water surface elevation.

Time of Concentration (Tc) =	5 min	assumed
Rainfall Intensity (I_{100}) =	9.3	
100-yr Peak Discharge (Q_{100}) =	**37.58 cfs**	$Q_X = C_W \times I_X \times DA$
Weir Length (L) =	25.00 ft.	Perimeter of Overflow Inlet
Weir Coefficient (c) =	3	
Head for 100-yr event (H100) =	0.63 ft.	$H_X = (Q_X / c / L)^{(2/3)}$
100-yr Water Surface Elevation =	**461.63**	
Freeboard to Embankment =	0.37 ft.	

Objective #6: Determine Pretreatment

Pretreatment Cell= 15% of total storage volume

Required cell volume= 1488 cf

Provided volume= 1,500 cf

Using Grass Channel and sheetflow to vegetated areas for pretreatment

Design of Bioretention Facility #2
DA-B

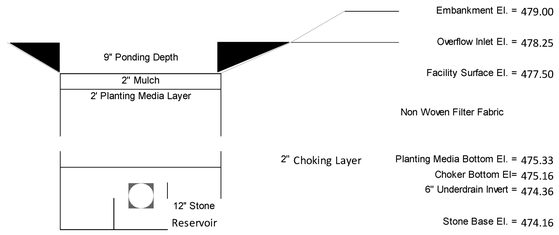
Objective #1: Define the drainage area.

Total Drainage Area (DA) =	48,352 sf	1.11 ac
Total Impervious Area (Ai) =	43,124 sf	0.99 ac
Impervious Percentage (I) =	89.2%	
Design Volume (DV)=	3,500 cf	

Objective #2: Determine the ESD Volume provided.

Bottom Area of Ponding =	3,005 sf
Top Area of Ponding =	3,715 sf
Ponding Depth =	9"
Ponding Volume =	2,520 cf
Filter Area (A_f) =	1,215 sf
Planting Media Thickness =	2 ft.
Storage within Planting Media =	608 cf
Gravel Depth=	1 ft
Gravel Storage=	486 cf
Total Storage Provided =	3,614 cf

Objective #3: Provide a schematic of the facility.



Objective #4: Analyze the 10-yr event, determining peak discharge and peak water surface elevation.

C-Factor Computation

Cover Type	Soil	C	Area (A)	C x A	C_W
Impervious	B	0.9	43,124 sf	38811.96	
Turf	B	0.3	5,227 sf	1568.16	
		Total	48,352 sf	40380.12	0.84

Time of Concentration (Tc) =	5 min	assumed
Rainfall Intensity (I_{10}) =	6.5	
10-yr Peak Discharge (Q_{10}) =	**6.07 cfs**	$Q_X = C_W \times I_X \times DA$
Weir Length (L) =	16.00 ft.	Perimeter of Overflow Inlet
Weir Coefficient (c) =	3	
Head for 10-yr event (H_{10}) =	0.25 ft.	$H_X = (Q_X / c / L)^{(2/3)}$
10-yr Water Surface Elevation =	**478.50**	
Freeboard to Embankment =	0.50 ft.	

Objective #5: Analyze the 100-yr event, determining peak discharge and peak water surface elevation.

Time of Concentration (Tc) =	5 min	assumed
Rainfall Intensity (I_{100}) =	9.3	
100-yr Peak Discharge (Q_{100}) =	**8.62 cfs**	$Q_X = C_W \times I_X \times DA$
Weir Length (L) =	16.00 ft.	Perimeter of Overflow Inlet
Weir Coefficient (c) =	3	
Head for 100-yr event (H100) =	0.32 ft.	$H_X = (Q_X / c / L)^{(2/3)}$
100-yr Water Surface Elevation =	**478.57**	
Freeboard to Embankment =	0.43 ft.	

Objective #6: Determine Pretreatment

Pretreatment Cell= 15% of total storage volume

Required cell volume= 542 cf

Provided volume= 550 cf

Using Grass Channel and sheetflow to vegetated areas for pretreatment

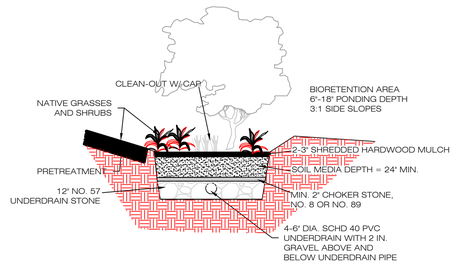


Figure BR-5

West Virginia MS4 Stormwater Compliance Spreadsheet v2.0; April 2013

data input cells
calculation cells
constant values

Site Data

Site Name: Norborne Glebe - Phase 10B-13

Site Information

Post-Development Land Cover

Drainage Area A

Land Cover Type	HSG A Soils	HSG B Soils	HSG C Soils	HSG D Soils	Totals
Forest/Preserved Open Space (acres)	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	4.50	0.00	0.00	4.50
Impervious Cover (acres)	0.00	2.99	0.00	0.00	2.99
				Total	7.49

Drainage Area B

Land Cover Type	HSG A Soils	HSG B Soils	HSG C Soils	HSG D Soils	Totals
Forest/Preserved Open Space (acres)	0.00	0.12	0.00	0.00	0.12
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00
Impervious Cover (acres)	0.00	0.99	0.00	0.00	0.99
				Total	1.11

Drainage Area C

Land Cover Type	HSG A Soils	HSG B Soils	HSG C Soils	HSG D Soils	Totals
Forest/Preserved Open Space (acres)	0.00	0.56	0.00	0.00	0.56
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00
				Total	0.56

Drainage Area D

Land Cover Type	HSG A Soils	HSG B Soils	HSG C Soils	HSG D Soils	Totals
Forest/Preserved Open Space (acres)	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00
				Total	0.00

Drainage Area E

Land Cover Type	HSG A Soils	HSG B Soils	HSG C Soils	HSG D Soils	Totals
Forest/Preserved Open Space (acres)	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00
				Total	0.00

Total Site Area

Land Cover Type	HSG A Soils	HSG B Soils	HSG C Soils	HSG D Soils	Totals
Forest/Preserved Open Space (acres)	0.00	0.68	0.00	0.00	0.68
Managed Turf (acres)	0.00	4.50	0.00	0.00	4.50
Impervious Cover (acres)	0.00	3.98	0.00	0.00	3.98
Total:	0.00	9.16	0.00	0.00	9.16

Rv Coefficients

Land Cover Type	HSG A Soils	HSG B Soils	HSG C Soils	HSG D Soils
Forest/Preserved Open Space	0.00	0.00	0.00	0.00
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Land Cover Summary

Forest/Preserved Open Space (acres)	0.68
Weighted Rv(forest)	0.00
% Forest	7%
Managed Turf (acres)	4.50
Weighted Rv(turf)	0.20
% Managed Turf	49%
Impervious Cover (acres)	3.98
Rv(impervious)	0.95
% Impervious	43%
Site Area (acres)	9.16
Site Rv	**0.51**

Development Credits (Select all that apply)

Is the proposed development:

a) Redevelopment?	No
b) Brownfield redevelopment?	No
c) High density (>7 units per acre)?	No
d) Vertical Density, (Floor to Area Ratio (FAR) of 2 or >18 units per acre)?	No
e) Mixed use or Transit Oriented Development (within 1/2 mile of transit)?	No
Total Credits (inches)	**0**

Runoff Reduction Rainfall Event (inches)	1.00
Target Runoff Reduction Volume, RRv (acre-feet)	0.39
Target Runoff Reduction Volume, RRv (cubic feet)	16,992

West Virginia MS4 Stormwater Compliance Spreadsheet v2.0; April 2013

Update

Print

Site Data Summary

Site Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest (acres)	0.00	0.68	0.00	0.00	0.68	*7.42*
Turf (acres)	0.00	4.50	0.00	0.00	4.50	*49.13*
Impervious (acres)	0.00	3.98	0.00	0.00	3.98	*43.45*
					9.16	*100.00*

Site Rv	0.51
Post Development Treatment Volume (ft3)	16,992
Total Runoff Volume Reduction (ft3)	16,992

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest (acres)	0.00	0.12	0.56	0.00	0.00	*0.68*
Turf (acres)	4.50	0.00	0.00	0.00	0.00	*4.50*
Impervious (acres)	2.99	0.99	0.00	0.00	0.00	*3.98*
						9.16

Drainage Area A Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest (acres)	0.00	0.00	0.00	0.00	0.00	*0.00*
Turf (acres)	0.00	4.50	0.00	0.00	4.50	*60.08*
Impervious (acres)	0.00	2.99	0.00	0.00	2.99	*39.92*
					7.49	

BMP Selections

Practice	Credit Area (acres)	Runoff Reduction (ft3)	Downstream Practice
Simple Disconnection to A/B Soils or Soil-Amended Filter Path in C/D Soils (4.2.2, Appendix D)	1.67	4,410	Bioretention, Level 2
Bioretention, Level 2	5.82	9,168	

Total Impervious Cover Treated (acres)	2.99
Total Turf Area Treated (acres)	4.50

Drainage Area B Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest (acres)	0.00	0.12	0.00	0.00	0.12	*1.60*
Turf (acres)	0.00	0.00	0.00	0.00	0.00	*0.00*
Impervious (acres)	0.00	0.99	0.00	0.00	0.99	*13.32*
					1.11	

BMP Selections

Practice	Credit Area (acres)	Runoff Reduction (ft3)	Downstream Practice
Bioretention, Level 2	1.11	3,414	

Total Impervious Cover Treated (acres)	0.99
Total Turf Area Treated (acres)	Please

Drainage Area C Summary

Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest (acres)	0.00	0.56	0.00	0.00	0.56	*7.48*
Turf (acres)	0.00	0.00	0.00	0.00	0.00	*0.00*
Impervious (acres)	0.00	0.00	0.00	0.00	0.00	*0.00*
					0.56	

BMP Selections

No Practices in this Drainage Area	Credit Area (acres)	Runoff Reduction (ft3)	Downstream Practice

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00

704 Foxcroft Avenue
Martinsburg, West Virginia 25401
Telephone: (304) 267-5111
Fax: (540) 722-8528
www.greenwayeng.com

GREENWAY ENGINEERING
PND 1971
PROUDLY SERVING VIRGINIA & WEST VIRGINIA
OFFICES IN: WINCHESTER, VA & MARTINSBURG, WV

BMP COMPUTATIONS & DETAILS

NORBORNE GLEBE

PHASE 10B, 11, 12, & 13
CHARLES TOWN CORP. DISTRICT (3)
CITY OF CHARLES TOWN-JEFFERSON COUNTY, WV

Rev. No.	Date

DATE: 11/06/2023

SCALE: 1" = 50'

DESIGNED BY: CC/CW

FILE NO. 4542A

SHEET 97 OF 97

SLD2022-06

Kimley»Horn

Memorandum

To: Dan Murphy
Project Manager
Greenway Engineering
151 Windy Hill Drive
Winchester, VA 22602

From: Mark Phillips, P.E.

Through: Mr. James Newman, AICP
City of Charles Town
101 E Washington Street
Charles Town, WV 25414

Date: February 16, 2024

Subject: Norborne Glebe Phases 10B through 13 Preliminary Plan Review: Submittal 3

This memorandum summarizes our review of the Preliminary Plan for Norborne Glebe Phases 10B through 13 (dated February 15, 2024, prepared by Greenway Engineering, Inc.) for 146 townhouses and 78 single-family units on a 106.29-acre property. The site is currently zoned Neighborhood Residential.

Kimley-Horn's review of this application is limited to the Preliminary Plan and Plat and Application provided. Based upon our review, we have no further comments:

Thank you for the opportunity to review this Preliminary Plan and Plat. In the meantime, please feel free to contact us at 703-870-3631 should you have any questions.

KIMLEY-HORN & ASSOCIATES, INC.

Mark Phillips, P.E.
Project Manager

Planning Commission
101 East Washington Street
Charles Town, WV 25414

SCHEDULED

Meeting: 02/26/24
Department: Planning Commission
Category: Report
Initiator:

AGENDA ITEM (ID #)

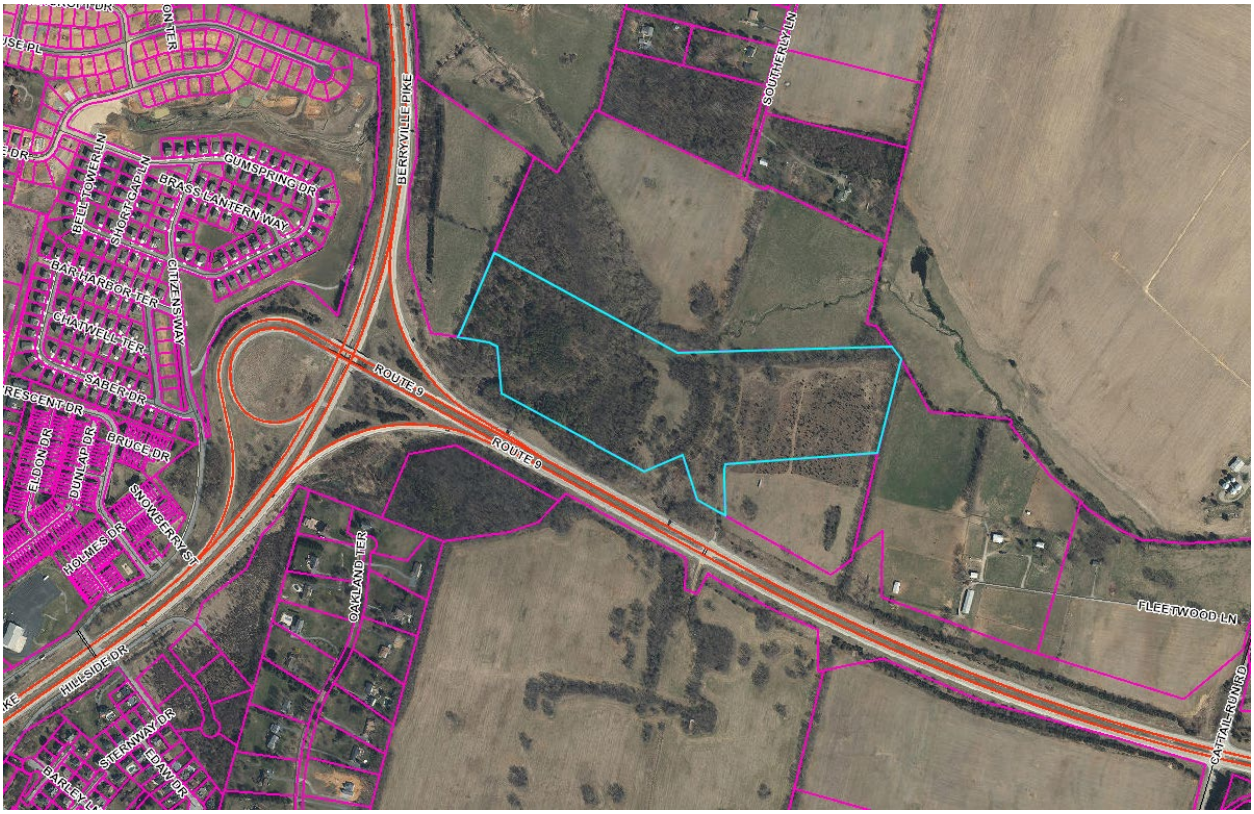
Commission Review: SLD2024-01 - University Healthcare Foundation sketch plan completeness review

ATTACHMENTS:

- 1. Staff Report.pdf
- 2. Application.pdf
- 3. Plans.pdf
- 4. KH Comments.pdf

Sketch Plan Completeness Review
SLD2024-01

Date: For the February 26, 2024 Planning Commission meeting
Applicant: Gresham Smith
Property Owner: University Healthcare Foundation Inc.
Report by: James Newman, City Planner, Zoning/Subdivision Administrator.
Proposal: Major Land Development.
Property Location: U.S. Rte. 9
Current Zoning: Neighborhood Residential



PROJECT OVERVIEW

The development of 74.9 acres for a medical office, parking, and new roads.

ZONING REVIEW

The property is zoned Neighborhood Residential (NR).

COMPLETENESS REVIEW

Code Requirements for completeness, per section 1332.04.E. (Major Subdivision/Land Development):

a. Existing conditions, including boundary lines of the property
Provided.

b. A land use plan, showing the location, arrangement and approximate boundaries of all proposed land uses
Provided.

c. Vicinity Map, North arrow, scale (written and graphic) and date
Provided.

d. Names of the abutting owners, adjoining lot lines and structures on abutting lots within 100 feet of the property
Provided.

e. Title of the proposed project; the date, month and year the plan was prepared or revised; the name of the applicant(s), owner(s), and contract owner(s) and the name and address of the Engineer, Surveyor, Architect, Landscape Architect, or Land Planner who prepared the plan, including firm name.
Provided.

f. Current zoning and total area of the property
Provided. General Commercial zoning.

g. Maximum and proposed density based on the Net Buildable Land Area
Not applicable. Commercial development only proposed.

h. Available utilities
Provided.

i. All existing sanitary sewer facilities and combined sewer facilities
Provided.

j. Depict location or statement of proposed water and sewer supply and other utility improvements.
Provided. See plan sheet C201.

k. Existing covenants
None.

l. General layout of any proposed number of Lots, average Lot sizes and any proposed commercial uses, including any associated parking. Include proposed height of structures.
Provided. The building is 3 stories with the bottom level exposed on the west side and only the top 2 levels exposed on the east.

m. Statement of total acreage of the tract being subdivided or developed, including the Net Buildable Land Area
Lot to be subdivided into 7 parcels. No residential component shown on plans.

n. The approximate acreage in common open space, in each use and housing type and in roads, streets or rights-of-way for the total development
See item 'M' above.

o. The proposed number of dwelling units of each type in each in the total development
Not applicable.

p. Location of proposed Street layout, including connections to adjoining streets or vacant lots,
Provided.

q. The location of sidewalks, trails and crosswalks, as may be applicable.
Provided. Plan shows right-of-way areas. Sidewalk provided on both sides of road.

r. Proposed open space and/or recreation areas, including notes on the plan describing the proposed use, activity area and/or improvement. The amount, approximate boundaries and location of common open space, with the percentage of the total acreage of the site to be placed in common open space.
Provided.

s. The location of environmental sensitive land to be included in common open space.
No environmentally sensitive lands identified.

t. Notes indicating any modifications, waivers, variances, special exceptions and/or conditional uses that are required.
None requested.

u. The location and extent of proposed buffers

Adjacent property is the Springfield/Stone Spring housing development. Buffers will be required between the proposed non-residential office building and new housing currently under construction.

v. The proposed location, arrangement, and right-of-way widths of roads and streets, including roads and streets providing access to adjoining parcels. The location and arrangement of street entrances, driveways and parking areas
Right-of-way width and location has been provided. Parking areas are also shown.

w. Calculations describing all proposed bonus factors with the location of and specifications for bonus improvements, when proposed.
No applicable bonus factors.

x. Any other information requested by the Subdivision Administrator in order for the Subdivision Administrator to make an accurate determination.
None required.

y. Commercial Design Review Standards as required in Section 1333.29, of this article.
To be provided at time of preliminary plan submission.

KIMLEY-HORN
The City's 3rd party engineering firm, Kimley-Horn, has reviewed this application and plan and has no comments at this stage.

ADDITIONAL APPLICATIONS
The property owners have also filed for a rezoning application and a property merger application. Both of those requests are scheduled for the March 25, 2024 Planning Commission meeting. The requested rezoning is to General Commercial.

CONCLUSION
The sketch plan meets the requirement of being a complete application as stated in Subdivision Ordinance Section 1332.03.C.2.C. This does not mean the subdivision application meets the criteria for approval; it merely means that the application is deemed complete by staff.

The Planning Commission should vote to determine the application is complete. If deemed complete, a public hearing would be scheduled for March 25, 2024.

1011

Sketch Plan Application No._____

SKETCH PLAN APPLICATION

SUBDIVISION AND LAND DEVELOPMENT ORDINANCE
ARTICLE 1332, SUBDIVISION AND LAND DEVELOPMENT APPLICATION & APPROVAL REQUIREMENTS

To assist the Subdivision Administrator in the review of a Sketch Plan Application, the Applicant must utilize this form to supply the City with the information prescribed under Section 1332.03 of the Charles Town S/LD Ordinance. The submission of this form, along with the prescribed information and required fees, shall serve as the Applicant's Sketch Plan Application as required by Ordinance Section 1332.03. Applicant is responsible to ensure the standards of Ordinance Section 1332.04, Sketch Plan Requirements, are met and provided herein is a checklist of the Sketch Plan requirements.

1. DATE _____ December 28 , 2023

2. APPLICATION TYPE* ☐ Zoning Use Permit, Special Exception Use and Sketch Plan requirements found in the Supplemental Regulations of the Zoning Ordinance
   - Submit Three (3) 11" x 17" copies of the Sketch Plan shall be submitted and in Adobe PDF format

   ☒ Major S/LD Development
   - Submit Three (3) 18" x 24" copies of the Sketch Plan shall be submitted and in Adobe PDF format

*There are two types of Sketch Plan submissions:

1. For Zoning Use Permit, Special Exception Use and Sketch Plan requirements found in the Supplemental Regulations of the Zoning Ordinance. Submission standards are found in Section 1332.04(D).
2. For a Sketch Plan for a Major S/LD application, submission standards are found in Section 1332.04(E)

3. APPLICANT'S NAME* Gresham Smith - Contact: Rob Whitson

Address: 222 2nd Ave S, Suite 1400, Nashville, TN 37201

Telephone Number (615)770-8312 Fax Number ( )

Email Address rob.whitson@greshamsmith.com

4. PROPERTY OWNER'S NAME University Healthcare Foundation, Inc. - Contact: Brad Freeman

Address: 2500 Hospital Dr, Martinsburg, WV 25401

Telephone Number (304)596-2847 Fax Number ( )

Email Address bradley.freeman.m@wvumedicine.org

5. LEGAL DESCRIPTION OF THE SUBJECT PROPERTY (list all parcels that apply)

Property Address: NE of Highways 9 and 340 interchange

Tax Map # and Parcel: Charles Town Corp District, Tax Map 15, Parcels 7.2, 7.3, part of 7.4, and 8

Deed Book and Page #: Book/Page: 1147/325, 1262/140, 1030/343, 1248/348

Property Area in Square Feet or Acres: 73.65 acres (includes 9.4 acres of adjacent Langlet property)

6. DESCRIPTION OF PROJECT AND PROPOSED USE(S) OF THE PROPERTY:

Proposed 40,000 SF medical office building,

along with infrastructure for additional future development

7. DESCRIPTION OF THE EXISTING (OR FORMER) USE(S) OF THE PROPERTY AND CURRENT ZONING:

Vacant land / wooded and agriculture

*Applicants include: Property owner(s), Engineer(s), Surveyor(s), or Consultant(s)

8. ARE THERE ANY ANTICIPATED WAIVERS OR VARIANCES? IF YES, PROVIDE DETAILS.

Not for this application. A separate application is made for rezoning of 9.4 acres from Neighborhood Residential to General Commercial, to be included in the proposed project property and zoned consistently.

9. HAS THE PROPERTY BEEN THE SUBJECT OF ANY COURT ACTION?

☐ Yes (Please specify nature of all proceedings and current status and attach any documents showing court decisions, etc.)

☒ No

10. PARCEL HISTORY (List all pending or previously approved applications on the subject parcels inventoried above, including previous site plan applications if this application is a site plan amendment)

Application No.	Project Name and Phase	Status	Approval Date
None			

11. INTERESTED PARTY ADDRESSES, FOR PUBLIC NOTICE (including across street)
(Interested parties are defined as adjacent properties within 100 feet).

Owner	# and Street	City, State, Zip
Springfield Partners, LLC	412 Keyes Ferry Road	Charles Town, WV 25414
Mark F. Langlet, as Trustee of the Jules F. Langlet and Mary Lou Langlet Irrevocable Trust	544 Lego Drive	Charlottesville, VA 22911
Thomas W. Newcomer & Kim Yeunshin	P.O. Box 515	Charles Town, WV 25414
Federal Hill Farms, Inc.	1434 Cattail Run Road	Charles Town, WV 25414

APPLICANT CERTIFICATION

I certify that, to the best of my knowledge, the submitted information and statements are true and correct. I also certify that I have received and read Section 1332.02 of the Charles Town S/LD Ordinance and relevant provisions of the Charles Town City Code.

Signature of Applicant

Nelson R White Date 12/14/2023

Signature of Property Owner (If different than Applicant)

Dean Thomas Date 12/21/23

Please submit an original completed Application and specified number of Site Plan copies to the following:

Subdivision Administrator
City of Charles Town
101 E. Washington Street
Charles Town, WV 25414

FOR CITY USE ONLY

Application Number:_____ Date Application Received:_____

Fee: $_____ Paid:$_____ Check No._____

Receipt No._____

Subdivision Administrator Approval:_____ Date:_____

Planning Commission Approval:_____ Date:_____

Comments:_____

_____

_____

_____

_____

_____

1016

CHARLES TOWN, WEST VIRGINIA
Department of Community Development
Division of Planning and Zoning

101 East Washington Street, P.O. Box 14
Charles Town, West Virginia 25414

Phone: (304) 725-2311 □

Fax (304) 725-1014

File Number: _____
Staff Initials: _____
Fees Paid: _____

https://goo.gl/KGzDMZ

Sketch Plan Review Checklist
Amended 2017 Subdivsion Ordinance

(please check one) ___X___ **Major S/LD Application** or
_____ **Zoning Use Permit, Special Exception Use, or Sketch Plan (requirements found in the Supplemental Regulations of the Zoning Ordinance)**

Project Name: WVU Medicine Medical Office Building

Property Owner Information					
Property Owner:	University Healthcare Foundation, Inc. - Contact: Brad Freeman				
Mailing Address:	2500 Hospital Drive				
City:	Martinsburg	State:	WV	Zip Code:	25401
Phone Number:	(304) 596-2847	Email:	bradley.freeman.m@wvumedicine.org		
Signature:				Date:	

Applicant's Registered Engineer or Surveyor or Design Consultant					
Name:	Gresham Smith - Contact: Rob Whitson				
Mailing Address:	222 2nd Ave S, Suite 1400				
City:	Nashville	State:	TN	Zip Code:	37201
Phone Number:	(615) 770-8312	Email:	rob.whitson@greshamsmith.com		

Physical Property Details					
Physical Address:	NE of Highways 9 and 340 interchange				
City:	Charles Town	State:	WV	Zip Code:	25401
Tax District:	3 - Charles Town Corp District	Map No:	15	Parcel No:	7.2, 7.3, part of 7.4, & 8
Parcel Size:	73.65 total acres	Deed Book:		Page No:	
		Book/Page: 1147/325, 1262/140, 1030/343, 1248/348			

Zoning of Subject Property			**Is the Project to Be:**	**Is Property In:**
Urban Reserve (UR)	Residential Medium-High Density (R-15)	Neighborhood Commercial (NC)	Planned Unit Development (PUD)	Historic Overlay District (HOD)
General Commercial (GC)	Old Town Residential (OT-R)			Floodplain Overlay District (FOD)
Old Town Mixed Use Commercial (OT-MUC)	Neighborhood Residential (NR)			

City Use Only	1st Review	2nd Review	3rd Review	4th Review
Submittal Date				
Zoning Administrator				
City Planner				
GIS/Addressing				
Return Date				

Conditions of Approval (Attach Additional Comments As Needed)

Instructions

1. This checklist is provided as a quick reference guide only. The Consultant/Developer is responsible for reading the regulations and fully complying with all the requirements. All references to the Subdivision Ordinance and Zoning Ordinance are cited for informational purposes only.

2. The checklist shall be completed by the Engineer/Surveyor or Design Consultant and attached to the Sketch Plan review submission.

Requried Submittal Information

__x__ 1 Check for Applciation Fees

__x__ 1 Completed Application and Checklist (Signed by owner)

__x__ 3 Sets of Sketch Plans and Adobe PDF Format

Sub-Section	*Ordinance Requirements: (See instructions on page 2)*	Engineer /Surveyor	1st Review	2nd Review	3rd Review	4th Review	Review Key: ✓ Ok; O Incomplete; N/A Not Applicable; X Unacceptable
Sub-Section	**SUBDIVISION ORDINANCE Section 1332.04, Sketch Plan Requirements**						
A	**THERE ARE TWO TYPES OF SKETCH PLAN SUBMISSIONS: Sections in Red and Blue are depict the different types.**						
A1 and D	For: • **Zoning Use Permit** • **Special Exception Use** • **Sketch Plan requirements found in the Supplemental Regulations of the Zoning Ordinance** The following information shall be provided for Sketch Plan review:						
D1	Three (3) 11" x 17" copies of the Sketch Plan shall be submitted and in Adobe PDF format.						
D2	The Sketch Plan shall be drawn to a 1"=50' scale						
D2	The Sketch Plan must illustrate the following elements in such a way that the Subdivision Administrator or authorized designee can determine if the proposed Subdivision or Land Development meets the criteria of this Ordinance, **as applicable:**						
D2a	Existing conditions, including boundary lines of the property						
D2b	A land use plan, showing the location, arrangement and approximate boundaries of all proposed land uses						
D2c	Vicinity map, north arrow, scale (written and graphic) and date						
D2d	Name of proposed project or other identifying title and date plan was prepared. Name and address of the Engineer, Surveyor, Architect, Landscape Architect, Land Planner or Property Owner who prepared the plan						
D2e	Current zoning and total area of the property						
D2f	Maximum and proposed density						
D2g	Available utilities						
D2h	All existing sanitary sewer facilities and combined sewer facilities						
D2i	Depict location or statement of proposed water and sewer supply and other utility improvements						
D2j	Existing covenants						
D2k	General layout of any proposed number of Lots, average Lot sizes and any proposed commercial uses, including any associated parking. Include proposed height of structures						
D2l	Statement of total acreage of the tract being subdivided or developed						
D2m	Location of proposed Street layout, including connections to adjoining streets or vacant lots						
D2n	The location of sidewalks, trails and crosswalks						
D2o	Proposed open space and/or recreation areas, including notes on the plan describing the proposed use, activity area and/or improvement						
D2p	Any other information requested by the Subdivision Administrator in order for the Subdivision Administrator to make an accurate determination.						
A2 and E	For a **Major S/LD Application**. The following information shall be provided for Sketch Plan review:	X					
E1	Three (3) 18" x 24" copies of the Sketch Plan shall be submitted and in Adobe PDF format.	X					
E2	The Sketch Plan shall be drawn to a 1"=50' scale	X					
E2	The Sketch Plan must illustrate the following elements in such a way that the Subdivision Administrator or authorized designee can determine if the proposed Subdivision or Land Development meets the criteria of this Ordinance:	X					
E2a	Existing conditions, including boundary lines of the property	X					
E2b	A land use plan, showing the location, arrangement and approximate boundaries of all proposed land uses	X					

	Ordinance Requirements: (See instructions on page 2)	Engineer /Surveyor	1st Review	2nd Review	3rd Review	4th Review	Review Key: ✓ Ok; O Incomplete; N/A Not Applicable; X Unacceptable
E2c	Vicinity Map, North arrow, scale (written and graphic) and date	X					
E2d	Names of the abutting owners, adjoining lot lines and structures on abutting lots within 100 feet of the property	X					
E2e	Title of the proposed project; the date, month and year the plan was prepared or revised; the name of the applicant(s), owner(s), and contract owner(s) and the name and address of the Engineer, Surveyor, Architect, Landscape Architect, or Land Planner who prepared the plan, including firm name	X					
E2f	Current zoning and total area of the property	X					
E2g	Maximum and proposed density based on the Net Buildable Land Area	X					
E2h	Available utilities	X					
E2i	All existing sanitary sewer facilities and combined sewer facilities	X					
E2j	Depict location or statement of proposed water and sewer supply and other utility improvements	X					
E2k	Existing covenants	X					
E2l	General layout of any proposed number of Lots, average Lot sizes and any proposed commercial uses, including any associated parking. Include proposed height of structures	X					
E2m	Statement of total acreage of the tract being subdivided or developed, including the Net Buildable Land Area	X					
E2n	The approximate acreage in common open space, in each use and housing type and in roads, streets or rights-of-way for the total development	X					
E2o	The proposed number of dwelling units of each type in each in the total development	X					
E2p	Location of proposed Street layout, including connections to adjoining streets or vacant lots	X					
E2q	The location of sidewalks, trails and crosswalks, as may be applicable	X					
E2r	Proposed open space and/or recreation areas, including notes on the plan describing the proposed use, activity area and/or improvement. The amount, approximate boundaries and location of common open space, with the percentage of the total acreage of the site to be placed in common open space	X					
E2s	The location of environmental sensitive land to be included in common open space	X					
E2t	Notes indicating any modifications, waivers, variances, special exceptions and/or conditional uses that are required	X					
E2u	The location and extent of proposed buffers	X					
E2v	The proposed location, arrangement, and right-of-way widths of roads and streets, including roads and streets providing access to adjoining parcels. The location and arrangement of street entrances, driveways and parking areas	X					
E2w	Calculations describing all proposed bonus factors with the location of and specifications for bonus improvements, when proposed	X					
E2x	Any other information requested by the Subdivision Administrator in order for the Subdivision Administrator to make an accurate determination	X					
Sub-Section	**SUBDIVISION ORDINANCE Section 1333.01, General Site Planning and Design Specifications**						
D1d	There is **no** requirement that a Sketch Plan or Preliminary Plat show phasing.						

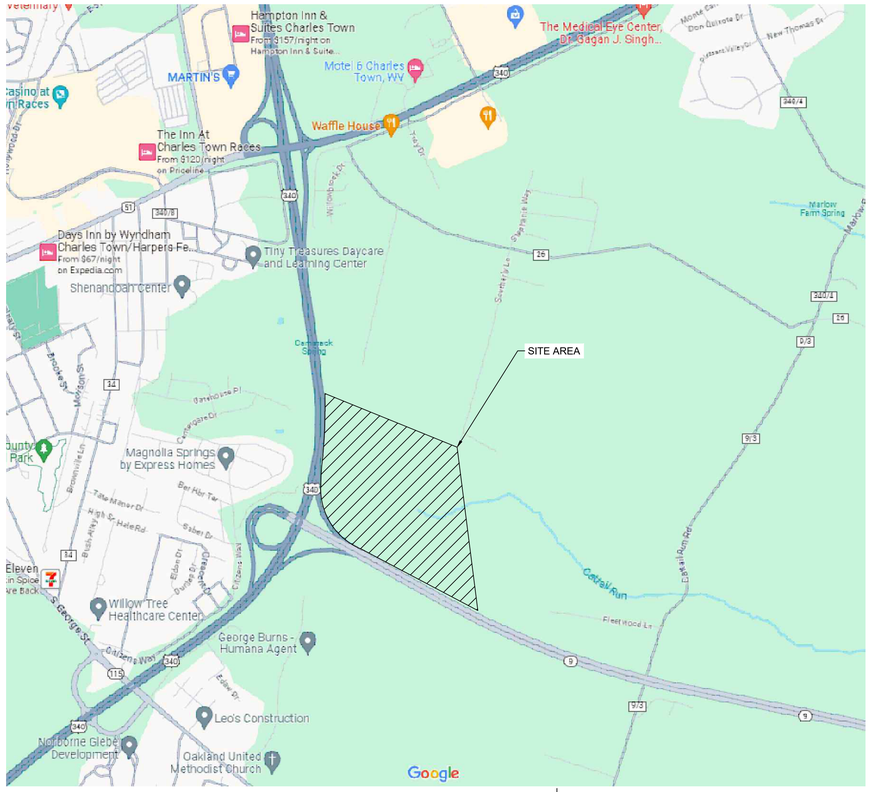
Drawn By: KL
Checked By: RW
Approved By: RW

SKETCH PLAN FOR

WVU - BLUE RIDGE CROSSING

INTERSECTION OF ROUTE 9 AND 340
JEFFERSON COUNTY
CHARLES TOWN, WV

GRESHAM SMITH PROJECT NO. 45550.02



VICINITY MAP
NOT TO SCALE

Sheet List Table	
Sheet Number	Sheet Title
C000	COVER SHEET
C100	EXISTING CONDITIONS
C101	PROPERTY INFORMATION
C200	OVERALL SITE PLAN
C201	DETAILED SITE PLAN
L200	OVERALL LANDSCAPE PLAN
L201	DETAILED LANDSCAPE PLAN

OWNER / DEVELOPER
WVU Medicine
2500 Hospital Drive
Martinsburg, WV 25401
Owner Contact: Brad Freeman
Phone: (304) 596-2847

ENGINEER/ARCHITECT/LANDSCAPE ARCHITECT
Gresham Smith
222 Second Avenue South
Suite 1400
Nashville, TN 37201
Architect Contact: Laurel Nee, AIA, NCARB, EDAC
Phone: (704) 944-7989
Email: laurel.nee@greshamsmith.com
Civil Contact: Rob Whitson
Phone: (615) 770-8312
Email: rob.whitson@greshamsmith.com
Landscape Architect Contact: Trey Rudolph
Phone: (615) 770-8148
Email: trey.rudolph@greshamsmith.com

SURVEYOR
TRIAD ENGINEERING, INC.
1075-D Sherman Avenue
Hagerstown, MD 21740
Survey Contact: Ron Bidle, PLS
Phone: (301) 797-6400
Email: rbidle@triaeng.com

ISSUE DATE:
JANUARY 2, 2024

Gresham Smith
201 South College Street
Suite 1950
Charlotte, NC 28244
704.944.7970
Firm Certification
Nos. 51100 / C-416 / C-2056
GreshamSmith.com

WVU Medicine

BLUE RIDGE CROSSING -
MEDICAL OFFICE BUILDING

WVU MEDICINE
CHARLES TOWN, WEST VIRGINIA

PRELIMINARY
NOT FOR
CONSTRUCTION

Revision		
No.	Date	Description

COVER SHEET

C000

45550.02
1/2/2024

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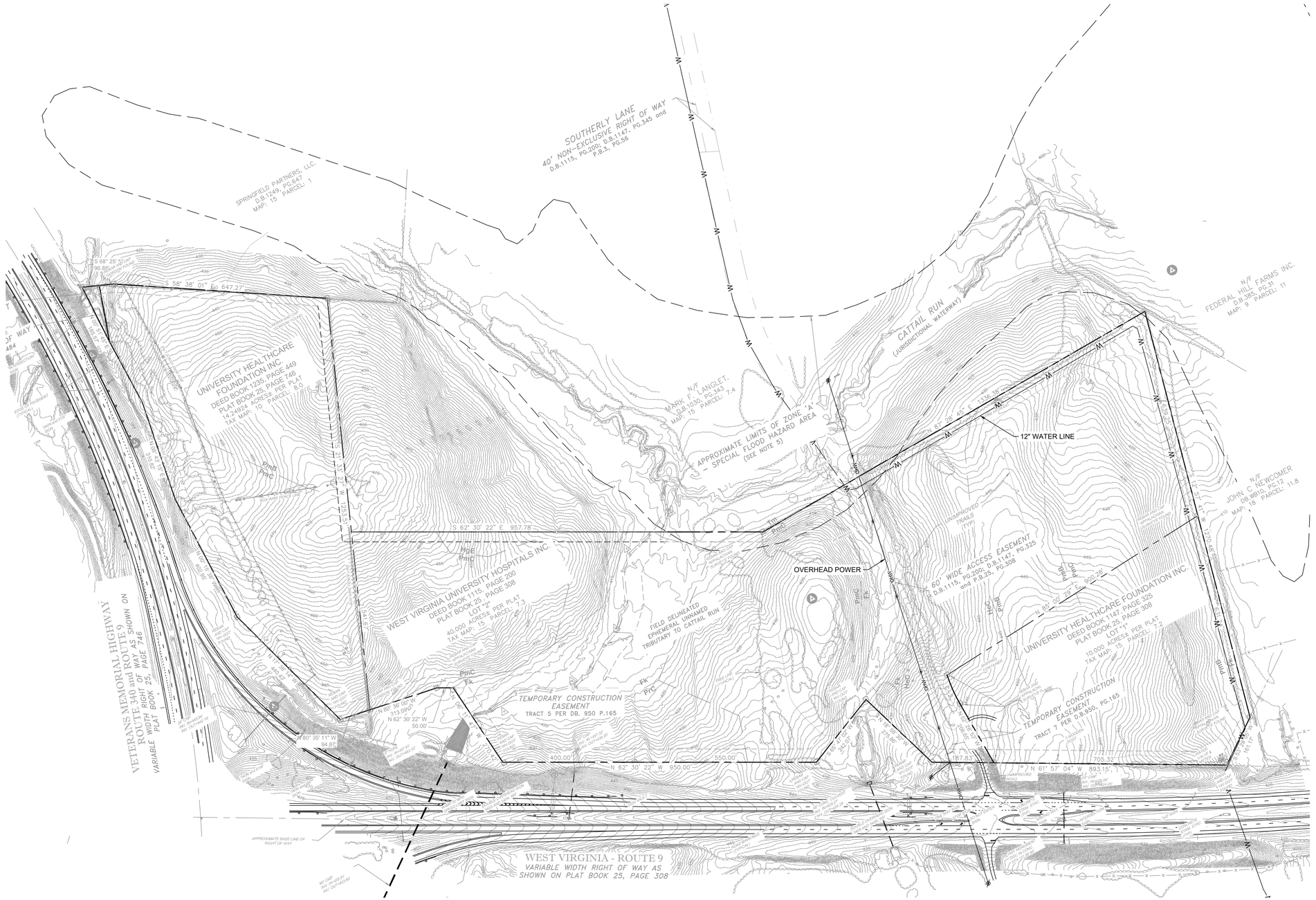
Approved By: RW



NORTH

150' 0 150' 300'
GRAPHIC SCALE
SCALE:
1" = 150'

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WVU MEDICINE

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Revision

No.	Date	Description

EXISTING CONDITIONS

C100

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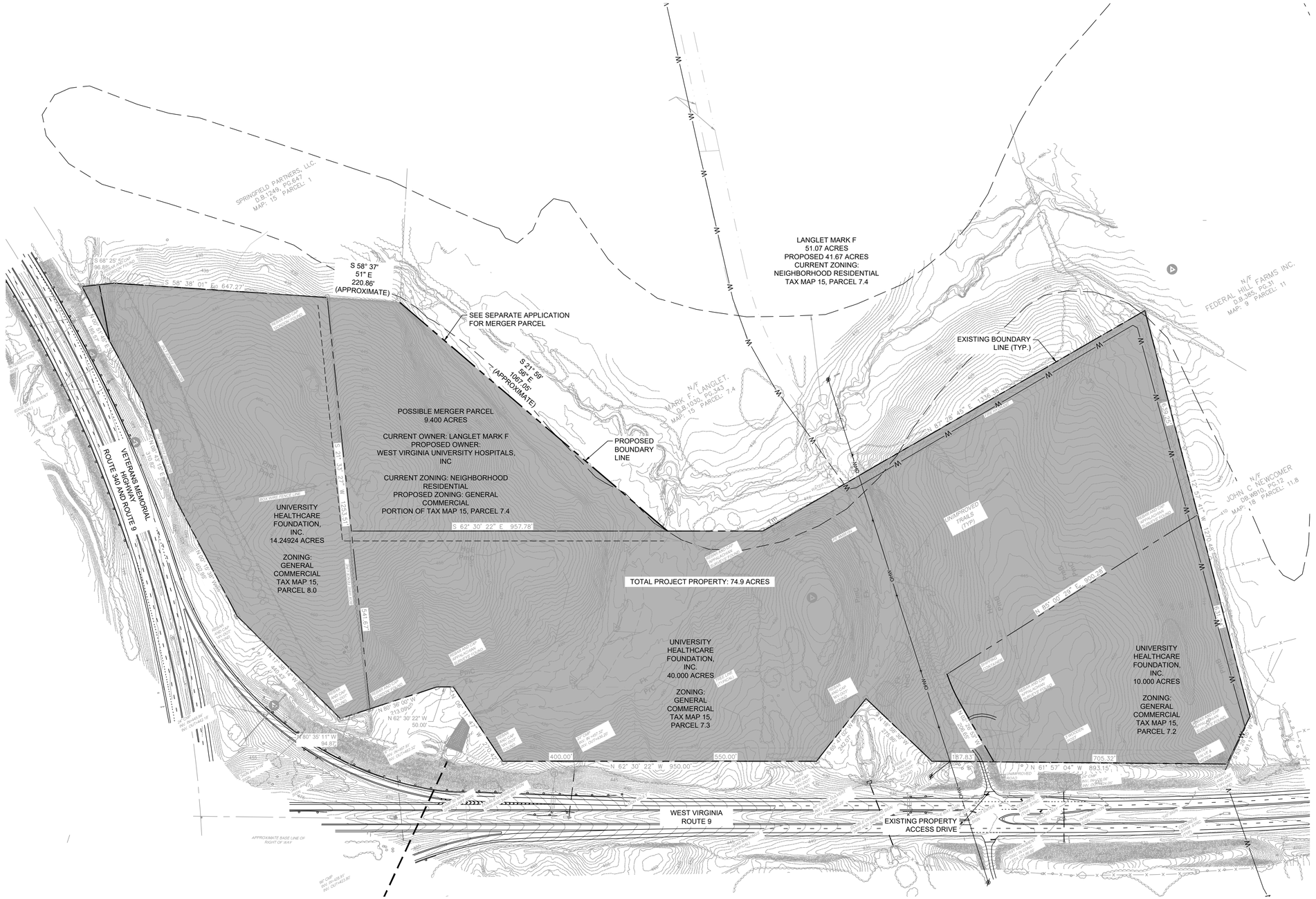
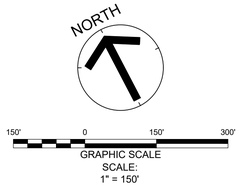
Approved By: RW





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CHARLES TOWN, WEST VIRGINIA

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CONSTRUCTION

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No.	Date	Description

PROPERTY
INFORMATION

C101

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1/2/2024

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1022

Drawn By: KL
Checked By: RW
Approved By: RW

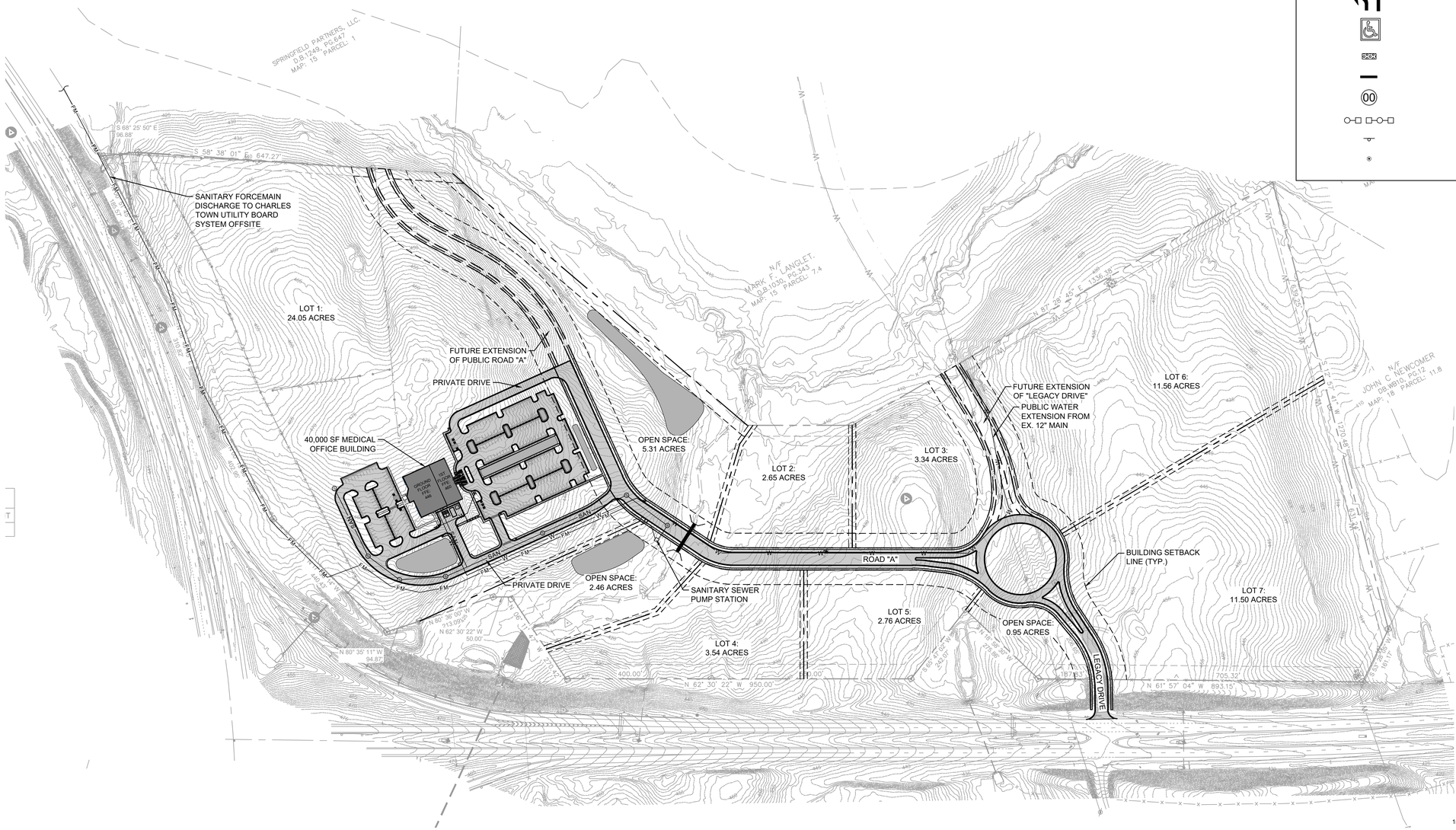
ZONING CRITERIA FOR GENERAL COMMERCIAL (GC):

PROPOSED USE: MEDICAL OFFICE, ITE CODE: 720 (PERMITTED USE)

MAX. DENSITY: NO REQUIREMENT
MIN. LOT SIZE: NO REQUIREMENT
MIN. SETBACKS:

FRONT YARD: 40 FT
SIDE YARD: 10 FT (25 FT ADJACENT TO RESIDENTIAL)
REAR YARD: 30 FT

MAX. LOT COVERAGE: 90 PERCENT
MIN. REQUIRED OPEN SPACE: NO REQUIREMENT
MAX. BUILDING HEIGHT: 55 FT
MAX. STORIES HEIGHT: 5



NORTH

150' 0 150' 300'
GRAPHIC SCALE
SCALE:
1" = 150'

LEGEND

- EXISTING PROPERTY LINE
- PROPOSED LOT LINE
- PROPERTY SETBACK LINE
- BUILDING LINE
- BUILDING CANOPY
- FENCE
- CURB
- CURB & GUTTER
- RETAINING WALL
- LIGHT DUTY CONCRETE PAVEMENT
- HEAVY DUTY CONCRETE PAVEMENT
- LIGHT DUTY ASPHALT PAVEMENT
- HEAVY DUTY ASPHALT PAVEMENT
- GRAVEL
- CONCRETE SIDEWALK
- CROSS-WALK
- TRANSFORMER PAD
- TURN ARROW
- ACCESSIBLE PARKING SPACE SYMBOL
- DETECTABLE WARNING SURFACE
- WHEEL STOP
- PARKING COUNT
- LIGHT POLE
- SIGN
- BOLLARD

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BLUE RIDGE CROSSING - MEDICAL OFFICE BUILDING

WVU MEDICINE
CHARLES TOWN, WEST VIRGINIA

PRELIMINARY NOT FOR CONSTRUCTION

Revision

No.	Date	Description

OVERALL SITE PLAN

C200

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1/2/2024

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Drawn By: KL
Checked By: RW
Approved By: RW

SANITARY FORCEMAIN DISCHARGE TO CHARLES TOWN UTILITY BOARD SYSTEM OFFSITE

FUTURE ROAD EXTENSION TO STONE SPRING SUBDIVISION

BUILDING SETBACK LINE (TYP.)

40'

UPPER PARKING: 201 SPACES

SANITARY MANHOLE STUB FOR FUTURE BUILDOUT

LOWER PARKING: 75 SPACES

ADA PARKING (TYP.)

GROUND FLOOR FFE: 446

1ST FLOOR FFE: 460

STORMWATER

DUMPSTER

TRANSFORMER

GENERATOR PAD

SCREEN WALL

FIRE HYDRANT (TYP.)

SANITARY SERVICE

WATER SERVICE

STORMWATER (TYP.)

GRAVITY SANITARY SEWER (TYP.)

SANITARY MANHOLE (TYP.)

8" WATER LINE (TYP.)

FORCE MAIN (TYP.)

SANITARY PUMP STATION

BOX CULVERT FOR STORMWATER CONVEYANCE

5' CONCRETE SIDEWALK (TYP.)

PROPOSED BOUNDARY LINE (TYP.)

EPHEMERAL STREAM TOP OF BANK

50' BUFFER FROM TOP OF BANK

100-YR FLOODPLAIN

N 80° 36' 00" W 213.09'

N 80° 35' 11" W 94.87'

N 62° 30' 22" W 50.00'

N 06° 11' 47" W

LEGEND

- EXISTING PROPERTY LINE
- PROPOSED LOT LINE
- PROPERTY SETBACK LINE
- BUILDING LINE
- BUILDING CANOPY
- FENCE
- CURB
- CURB & GUTTER
- RETAINING WALL
- LIGHT DUTY CONCRETE PAVEMENT
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- ACCESSIBLE PARKING SPACE SYMBOL
- DETECTABLE WARNING SURFACE
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- SIGN
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NORTH

50' 0 50' 100'
GRAPHIC SCALE
SCALE: 1" = 50'

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BLUE RIDGE CROSSING - MEDICAL OFFICE BUILDING

WVU MEDICINE
CHARLES TOWN, WEST VIRGINIA

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Revision

No.	Date	Description

DETAILED SITE PLAN

C201

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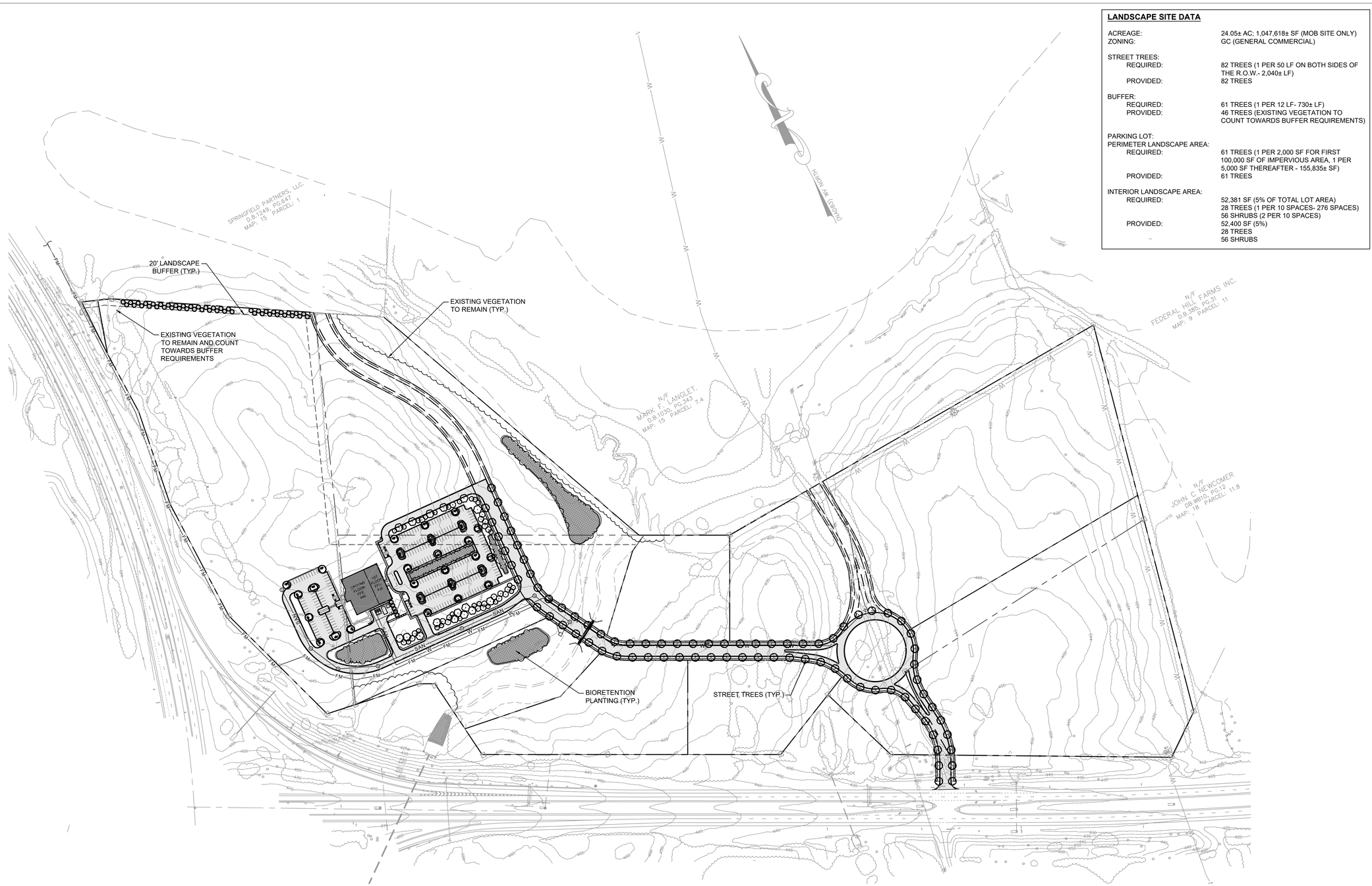
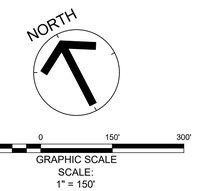
Drawn By: KL
Checked By: RW
Approved By: RW

LANDSCAPE SITE DATA

ACREAGE:	24.05± AC; 1,047,618± SF (MOB SITE ONLY)
ZONING:	GC (GENERAL COMMERCIAL)
STREET TREES:	
REQUIRED:	82 TREES (1 PER 50 LF ON BOTH SIDES OF THE R.O.W.- 2,040± LF)
PROVIDED:	82 TREES
BUFFER:	
REQUIRED:	61 TREES (1 PER 12 LF- 730± LF)
PROVIDED:	46 TREES (EXISTING VEGETATION TO COUNT TOWARDS BUFFER REQUIREMENTS)
PARKING LOT:	
PERIMETER LANDSCAPE AREA:	
REQUIRED:	61 TREES (1 PER 2,000 SF FOR FIRST 100,000 SF OF IMPERVIOUS AREA, 1 PER 5,000 SF THEREAFTER - 155,835± SF)
PROVIDED:	61 TREES
INTERIOR LANDSCAPE AREA:	
REQUIRED:	52,381 SF (5% OF TOTAL LOT AREA) 28 TREES (1 PER 10 SPACES- 276 SPACES) 56 SHRUBS (2 PER 10 SPACES)
PROVIDED:	52,400 SF (5%) 28 TREES 56 SHRUBS





150' 0 150' 300'
GRAPHIC SCALE
SCALE:
1" = 150'

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CHARLES TOWN, WEST VIRGINIA

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Revision		
No.	Date	Description

OVERALL LANDSCAPE PLAN

L200

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Drawn By: KL
Checked By: RW
Approved By: RW

GROUND FLOOR FFE: 446

1ST FLOOR FFE: 460

EXISTING VEGETATION TO REMAIN (TYP.)

STREET TREES (TYP.)

BIORETENTION PLANTING (TYP.)

NORTH

40' 0 40' 80'

GRAPHIC SCALE
SCALE:
1" = 40'

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BLUE RIDGE CROSSING - MEDICAL OFFICE BUILDING

WVU MEDICINE

CHARLES TOWN, WEST VIRGINIA

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DETAILED LANDSCAPE PLAN

L201

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1/2/2024

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Kimley»Horn

Memorandum

To: Rob Whitson
Gresham Smith
222 2nd Ave S, Suite 1400
Nashville, TN 37201

From: Mark Phillips, P.E.

Through: James Newman
City of Charles Town
101 E Washington Street
Charles Town, WV 25414

Date: January 9, 2024

Subject: WVU-Blue Ridge Crossing Sketch Plan Review

This memorandum summarizes our review of the Sketch Plan for the WVU – Blue Ridge Crossing (dated January 2, 2024, prepared by Gresham Smith) for a proposed medical office building. The site contains 4 parcels; three are currently zoned General Commercial and one is zoned as Neighborhood Residential per the City of Charles Town Zoning Ordinance dated June 18, 2012 (Rev. July 6, 2020). This application proposes a by-right development of approximately 74.9 acres of property.

Kimley-Horn's review of this application is limited to the Sketch Plan and Application provided. Based upon our review, we have no comments as this application is generally in conformance with the Sketch Plan requirements per the City of Charles Town Subdivision and Land Development Ordinance dated June 23, 2012 (Rev. July 1, 2019).

Thank you for the opportunity to review this Sketch Plan. Please feel free to contact us at 703-870-3631 should you have any questions.

KIMLEY-HORN & ASSOCIATES, INC.

Mark Phillips, P.E.
Project Manager, Associate