VILLAGE OF KEY BISCAYNE

Village Council
Joe I. Rasco, Mayor
Oscar Sardinas, Vice Mayor
Michael F. Bracken
Franklin H. Caplan
Edward London
Nancy Stoner
Fernando A. Vazquez

SPECIAL COUNCIL MEETING

WEDNESDAY, APRIL 22, 2026
6:00 PM

1. CALL TO ORDER/ROLL CALL OF MEMBERS

2. PLEDGE OF ALLEGIANCE

3. PUBLIC COMMENTS:
If you would like to speak during public comments, please fill out a blue request form available at the Council Chamber entrance and submit it to the Village Clerk prior to the start of the meeting. When your name is called, please come forward to the podium and state your name and address. (If applicable, please state if you are a hired consultant or Village employee and/or engaged in lobbying activities and/or representing an organization.) Unless otherwise provided by Council, members of the public will have three (3) minutes to speak.

4. REFERENCE MATERIALS:

4.A. SUMMARY ALTERNATIVES COMPARISON
TAB 1

4.B. FULL ALTERNATIVES ANALYSIS
TAB 2

4.C. ALTERNATIVES COST COMPARISON
TAB 3

4.D. GIT SYSTEM CONCEPT PLAN & COST ESTIMATE

5. **DISCUSSION:**

5.A. RIAP AD HOC COMMITTEE RECOMMENDATION TO COUNCIL (AD HOC COMMITTEE)

5.B. HIGH-LEVEL DISCUSSION OF CENTERALIZED AND DECENTRALIZED STORMWATER SYSTEMS (VILLAGE COUNCIL)

5.C. DECENTRALIZED SYSTEM Q & A (GIT & VILLAGE COUNCIL)

5.D. COST AND FUNDING ANALYSIS FOR Q & A (VILLAGE STAFF & VILLAGE COUNCIL)

5.E. COUNCIL ACTION (VILLAGE COUNCIL)

6. **OTHER BUSINESS/GENERAL DISCUSSION**

7. **SCHEDULE OF FUTURE MEETINGS/EVENTS:**

COUNCIL WORKSHOP: SHORELINE UPDATE
TUESDAY, APRIL 28, 2026, 6:00 P.M., COUNCIL CHAMBER

REGULAR COUNCIL MEETING
THURSDAY, MAY 14, 2026, 6:30 P.M., COUNCIL CHAMBER

8. **ADJOURNMENT**

I. ANY PERSON WISHING TO ADDRESS THE VILLAGE COUNCIL ON AN ITEM ON THIS AGENDA IS ASKED TO REGISTER WITH THE VILLAGE CLERK PRIOR TO THAT ITEM BEING HEARD. PRIOR TO MAKING A STATEMENT, PLEASE STATE YOUR NAME AND ADDRESS FOR THE RECORD.

II. IN ACCORDANCE WITH THE AMERICANS WITH DISABILITIES ACT OF 1990, ALL PERSONS WHO ARE DISABLED AND WHO NEED SPECIAL ACCOMMODATIONS TO PARTICIPATE IN THIS PROCEEDING BECAUSE OF THAT DISABILITY SHOULD CONTACT THE OFFICE OF THE VILLAGE CLERK, 88 WEST MCINTYRE STREET, KEY BISCAYNE, FLORIDA 33149, TELEPHONE NUMBER (305) 365-5506, NOT LATER THAN TWO BUSINESS DAYS PRIOR TO SUCH PROCEEDINGS.

III. IF A PERSON DECIDES TO APPEAL ANY DECISION MADE BY THE VILLAGE COUNCIL WITH RESPECT TO ANY MATTER CONSIDERED AT A MEETING OR

HEARING, THAT PERSON WILL NEED A RECORD OF THE PROCEEDINGS AND, FOR SUCH PURPOSE, MAY NEED TO ENSURE THAT A VERBATIM RECORD OF THE PROCEEDINGS IS MADE, WHICH RECORD INCLUDES THE TESTIMONY AND EVIDENCE UPON WHICH THE APPEAL IS TO BE BASED (F.S.286.0105).

IV. IN ACCORDANCE WITH VILLAGE CODE SECTION 2-161, ADOPTING SECTION 2-11.1(s) OF THE MIAMI-DADE COUNTY CODE, ANY PERSON ENGAGING IN LOBBYING ACTIVITIES, AS DEFINED THEREIN, MUST REGISTER AT THE VILLAGE CLERK'S OFFICE BEFORE ADDRESSING THE COUNCIL ON THE ABOVE MATTERS OR ENGAGING IN LOBBYING ACTIVITIES.

THE ABOVE MEETINGS ARE HELD IN THE COUNCIL CHAMBER, 560 CRANDON BOULEVARD AND ARE SUBJECT TO CHANGE. ZONING MEETINGS AND SPECIAL COUNCIL MEETINGS WILL BE SCHEDULED ON AN AS NEEDED BASIS. PLEASE VISIT www.keybiscayne.fl.gov TO VIEW THE MEETING SCHEDULE.

ZONE 1 STORMWATER ALTERNATIVE SYSTEM COMPARISON

Evaluation Criterion	Decentralized – GIT	Centralized – AECOM
System Description	**6 Pump stations** (12 pumps) **and 6 injection wells** connected to new and existing pipes and catch basins	**1 Central pump station** (3-6 pumps) connected to entire new pipe network and discharging through upgraded outfalls.
Discharge Capacity	**90 cfs** (cubic feet per second) ⚠️ Capacity may drop due to sediment, fouling, ground acceptance and groundwater level.	**57 cfs initial**, designed to be expandable to **155 cfs**. ⚠️ Full capacity requires approval of additional outfalls/force main.
Design Level of Service	5-yr 24-hour storm, 2050 horizon, NOAA Intermediate, partial private property ⚠️ Accepted risk for outfall capacity, absorption, and property rainwater retention	10-yr 24-hour storm, 2060 horizon, NOAA Intermediate High, full private property
Modeled Flood Results	Some roads show water above the crown of the road **after 3.5 hours**. ⚠️ Allows some water on roads by design.	Crown of the roads **clear after 3.5 hours**.
Drainage & Conveyance	Combination of **existing stormwater pipes** and **targeted new piping** to route water to well sites. ⚠️ Performance depends on the condition of existing pipes. ⚠️ Project scope may increase as unknown pipe conditions are identified.	**Replaces the entire stormwater** conveyance network with new, large-diameter pipes and a force main system with a 50+ year design life.
Adaptability & Future Expandability	**Modular approach** that can be implemented and extended in phases. System plan to extend Zone 1 from 311 to 644 parcels through additional conveyance network. ⚠️ Extended Zone 1 does not have the same level of service.	The system is **designed to increase its discharge capacity** by adding pumps and new outfalls. Conveyance piping is sized to accommodate future capacity increases. ⚠️ Extension of conveyance beyond Zone 1 service level and cost is unknown at this time.
Road Elevations	Includes **targeted road regrading** to improve drainage. ⚠️ May require road raising in the future.	Comprehensive **road raising and grading** to improve drainage and protect roadway against sea-level rise and sunny day flooding.
System Reliability	Decentralized system with dual pumps per site (12 pumps total). ⚠️ No permanent backup power included. ⚠️ Well bypass discharges water back to street.	Redundant pumps (6 pumps total) and **permanent back up generator**. ⚠️ There is a single point of failure at the pump station.
Water Quality	**Reduce direct discharge of the bay** by injecting stormwater into the ground and pretreatment at each well. The existing outfalls remain in service for localized untreated gravity discharge. ⚠️ Difficult to verify water quality and time for water to reach the bay.	Treats stormwater through a **centralized treatment train** before discharge to Biscayne Bay, permitted by DERM. The system is designed to remove 87.2% of suspended solids, 74.1% of phosphorus, and 33.15% of nitrogen ⚠️ Treatment may underperform or require future upgrades.
Regulatory Monitoring	Under FDEP requirements, each well to include pretreatment and monitoring to ensure compliance with regulations, protect groundwater quality, and minimize discharges to the bay.	Under DERM and NPDES permits, reporting required with defined monitoring and sampling locations.

⚠️ - Risk Consideration

ZONE 1 STORMWATER ALTERNATIVE SYSTEM COMPARISON

Landscaping & Trees	Localized impacts near pump stations and catch basins. ⚠️ Swale/tree impacts not yet defined.	**565 trees** will be replaced. Palm trees replaced by shade trees to address heat resilience. ⚠️ Canopy cover will be reduced until the newly planted trees reach maturity.
Aesthetics	Mostly underground; minimal visual change with exception of electrical panels at pump stations.	⚠️ Driveways to be harmonized, drop curbs prevalent, significant tree and landscape changes, visible pump station at Harbor Park.
Utilities Coordination	Smaller conveyance pipe intended to limit interaction with existing and future utilities. ⚠️ Deconfliction with water, sewer, power, telecom yet to be coordinated.	Coordinated with utilities with deconflictions already in design.
Interagency Coordination	⚠️ Existing agreements would need revision.	Coordinated with County, utilities, School District. ⚠️ WASD construction JPA needs to be finalized.
Construction Disruption	Localized, phased construction zones. Duration estimated at **24-36 months** depending on phasing. ⚠️ Full extent of conveyance pipe installation is unknown.	Area-wide construction for **30–36 months** sequenced to minimize disruption. ⚠️ Driveway, swale, and road impact may be larger and last longer than expected.
Easements	No easement requirements identified at this time. ⚠️ May require easements once well locations are confirmed during design.	Easements are in place for existing and planned pump station, piping and outfalls.
Capital Cost	**Zone 1: $56.7M** [Class 5 Range: $28.7-$99.2M] **Zone 1 - Ext: $67.3M** [Class 5 Range: $33.7-$117.8M] ⚠️ High uncertainty (+75% / −50%). ⚠️ Cost may increase as design matures.	**$66.8M** [Class 1 Range (-3%-+15%): $64.8 - $76.8M] ⚠️ Estimate ~1 year old; expect 3% inflation.
Funding Status	GOB and Village reserves are available funding sources. New funding and financial planning would be required. Stormwater fees to increase. ⚠️ Increase in competition for grants, appropriations, and loans.	Funding is secured through grants, appropriations, and low interest SRF loans. Stormwater fees to increase. **$15.6M** of **grant money** has been secured. ⚠️ $540k - $1.5M of WASD JPA funding may be canceled.
Operation and Maintenance (Cost)	**~$944k/year**. ⚠️ Sensitive to well performance and rehab frequency.	**~$555k/year**. Lower complexity for centrally located pumps and stormwater treatment unit. ⚠️ High maintenance burden of basket filter sponges for water quality testing.
Procurement Considerations	Delivery method to be determined. Smaller bid packages possible for increased competition.	Procurement package is ready for release. ⚠️ Set for one large contract which may reduce interest of smaller contractors.

***** The decentralized approach focuses on phased implementation and selective use of existing infrastructure, while the centralized approach emphasizes a higher level of resiliency through comprehensive system replacement, increased discharge capacity, and reduced long-term operational costs, with greater near-term construction, roadway, and landscape impacts.*****

⚠️ - Risk Consideration

DRAFT

STORMWATER SYSTEM ALTERNATIVES

Zone 1 Project

PREPARED FOR

Village of Key Biscayne

21 APRIL 2026

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1.0 Executive Summary

The Village of Key Biscayne is evaluating two approaches to address chronic flooding in Zone 1 (the K-8 School neighborhood). The intent of this report is to provide an analytic comparison of the integrated central pump station to outfall design completed by AECOM and the conceptual design of a decentralized system including multiple pump stations to injection wells conducted by GIT.

The AECOM plan would pump excess stormwater to Biscayne Bay through multiple upgraded outfalls requiring built-out dissipater boxes and a series of water treatment filtration approaches. In contrast, the GIT concept would inject stormwater into the ground via six new shallow injection wells. The AECOM alternative is nearly ready to build, with detailed engineering complete, a financing plan in place, grant dollars awarded, and major permits secured, allowing procurement for construction to begin within relatively short notice. The GIT alternative is still in the conceptual phase, requiring additional design, financing, field testing, and regulatory permitting efforts before it can be implemented. The difference in developmental stages is taken into consideration for the opportunities and risks in the analysis below. The AECOM system is designed to provide predictable flood control capacity and was designed with criteria based on a 2060 timeframe, a 10-year storm, and NOAA Intermediate High Sea Level Curve. The GIT system is designed for a 2050 timeframe, a 5-year storm, and NOAA Intermediate Sea Level Curve. However, both systems have similar nominal baseline capacities for discharging stormwater and both systems were designed to meet the level of service for preventing more than 14" of water above the low crown of road during the design storm and to remove water from the road within a 3.5 hour timeframe. This analysis focuses on the risks and benefits of each system and should be viewed in addition to the associated construction and lifecycle cost estimates and deliverables from both engineers.

The AECOM alternative is based on a fully integrated pumping and conveyance system designed for long-term operation, including redundancy and backup power. The approach is intended to function largely independent of groundwater variability and to provide consistent flood mitigation performance over an extended planning horizon. Implementation would require substantial construction within public rights-of-way, a visible permanent infrastructure footprint, and ongoing water quality treatment and monitoring, along with sustained coordination with residents.

The GIT alternative employs a modular, phased approach intended to reduce initial surface disruption and limit direct stormwater discharge to Biscayne Bay through groundwater injection. The system allows for incremental implementation and smaller right-of-way impacts but relies more heavily on subsurface conditions and long-term well performance. Ongoing monitoring, maintenance, and potential future supplemental investments would be required, and the long-term funding and implementation framework will require additional development.

2.0 Technical Performance

2.1 Discharge Capacity

AECOM's design has a central pump station initially sized to discharge ~77 cubic feet per second (cfs) (handling a 1-inch-per-hour pumping rate), with the ability to roughly double capacity to ~155 cfs in the future by adding three more pumps and additional outfalls to the bay. However, the current design is limited to approximately 57cfs with the existing outfalls.

GIT's design proposes six decentralized well sites with dual pumps rated for ~7.5cfs per pump, ~15 cfs per well, and a total capacity of ~90 cfs. While the injection pump system meets requirements for those capacities, it is recommended to install a pilot well prior to construction to confirm local conditions.

Existing injection wells in Key Biscayne have mixed results based on documented discharge capacities at similar depths. Additionally, the well capacity is expected to decrease over time due to sediment accumulation and biofouling, and as rising groundwater levels reduce the infiltration rate. Nominal discharge will still be expected through localized gravity drainage to the existing outfalls, which will remain in tact.

The AECOM plan currently does not meet the required discharge requirement, but has a clear path to upgrade and exceed requirements while having a known capacity from the outset. The GIT plan has a higher total initial design discharge capacity but could vary and degrade without field verification and aggressive maintenance.

2.2 Flood Reduction Effectiveness (Depth, Duration, Frequency)

AECOM's system is engineered to meet a 10-year, 24-hour storm event, with standing water limited to no more than 12 inches above the road crown and fully drained within approximately 3.5 hours. This level of service can be enhanced in the future to limit standing water to approximately 9 inches and reduce drainage time to about 1.25 hours if additional pumps are installed and new outfall capacity is provided.

GIT's system is designed for a 5-year, 24-hour storm event without exceeding flooding over the road crown and to drain runoff within approximately 3.5 hours. The modeling results still indicate some level of ponding at the road crown under this scenario after the 3.5 hours, although that ponding is below 6". System performance is dependent on both initial and long-term injection well capacity. Under typical rainfall it should manage floods comparably, whereas under higher intensity storms or elevated groundwater conditions, the wells might not drain water fast enough, potentially resulting in deeper or longer-lasting ponding. The extended zone area from GIT also meets this level of service, however the modeling shows additional ponding compared to the baseline Zone 1.

The GIT concept has an option for a bypass from the wells to a pressurized force main discharging to the bay through existing outfalls that would be upsized to provide additional discharge capacity in the event the injection capacity is exceeded. While this system is not included in the base design, it is recommended.

Both systems are modeled and comply with the level of service requested by the Village to allow for emergency service vehicles to pass through roads at all times and to have the water drain to provide regular vehicle passage within 3.5 hours after the storm.

2.3 Drainage and Conveyance Capacity

AECOM's plan proposes the removal of the entire existing stormwater piping and the installation of a complete upsized new gravity and force main pipe network throughout Zone 1. This system will provide significant internal storage by installing conveyance piping up to 72" and inlets to convey stormwater to the central pump station, which then discharge to the bay via a pressurized force main. The roads will be raised and graded and drop curbs will be installed to convey surface water to the inlets. This will require considerable harmonization for each resident's driveway and right of way area in order to prevent stormwater from traversing to private property.

GIT's plan will utilize the existing conveyance piping when above 18" and in appropriate locations. New conveyance piping and storm drains will be installed with targeted upgrades such as adding additional catch basin drains, upsizing certain pipe segments, and connecting missing links to route water to each well site. A CCTV analysis of the existing system will be completed prior to complete design in order to check the condition of the existing drainage pipes. An allowance has been included to repair or slip-line if needed. If injection wells are installed ahead of necessary conveyance repairs, there is a risk of repeatedly pumping groundwater that infiltrates deteriorated pipes, reducing overall system efficiency. Road resurfacing is intended only for localized ponding and does not significant raising. This reduces the impact on the right of way.

GIT's approach combines existing Village infrastructure along with the installation of new piping where needed. It also includes new conveyance piping and drainage inlets in the extended Zone 1 area which will connect more of the Village stormwater system. Existing pipe condition is to be determined during full design. The AECOM design is more extensive with full amount of stormwater piping being replaced and the planned road raising and driveway harmonization.

2.4 Groundwater Interaction

AECOM's system pumps stormwater to outfalls avoiding dependence on groundwater infiltration, even during king tide conditions. The design also includes roadway elevation increases intended to reduce the frequency and duration of roadway inundation, including during recurrent ("sunny day") flooding.

GIT's concept relies on subsurface drainage and injection wells, so system performance is sensitive to groundwater levels and soil saturation. Under conditions such as elevated groundwater, extended rainfall, or high tides, injection rates may be reduced and required injection head may increase, which could affect compliance with UIC permit pressure limits and the ability to achieve the targeted level of service. Elevated ambient groundwater levels may therefore constrain well performance until groundwater conditions return to baseline.

2.5 System Reliability and Redundancy

AECOM's design concentrates pumping in one location which creates a single point of potential failure. Internal to that pump station, redundancy is met with standby pumps for mechanical failure and an on-site backup generator to mitigate power failure. A model of the pump station was built through a third party and tested to validate water flow and capacity.

GIT's design distributes pumping across six smaller pump-well sites to provide redundancy from a single pump station failure. A malfunction at one well only affects its immediate service area, and each well has two pumps for partial redundancy. The GIT approach currently proposes no permanent generators at well sites, which would render the well ineffective if a power failure occurs until portable generators can be deployed and connected. This raises challenges in flood conditions due to safety risks.

GIT decentralizes the risk of mechanical failure, but is vulnerable to power loss. AECOM centralizes risk but provides on-site backups to maintain operation.

2.6 System Performance Over Time

AECOM's infrastructure has a sea level projection of a 2060 design horizon. The major elements like the pump station structure, pipelines, and raised roads are expected to last 40+ years. The pumps and generators would be replaced or upgraded roughly every 20-30 years to sustain performance through operational failure.

GIT's proposal has a 2050 sea level rise design horizon with an anticipated reduction as groundwater rises. Injection wells typically lose efficiency over time as sediment and bio-growth gradually clog the wells, requiring re-drilling or intensive cleaning every 5–10 years. Additionally, the GIT proposal relies on re-using existing conveyance piping that will have a lower remaining design life. As a result, portions of the conveyance system may need to be rehabilitated or replaced before the end of the new system's service life to avoid performance losses.

The GIT alternative faces potential performance degradation and capacity loss over time, which would necessitate ongoing well maintenance and possibly the future addition of new conveyance piping, new wells or deeper wells to maintain the same level of flood protection. The AECOM alternative is a longer-term solution with known upgrade cycles.

2.7 Accountability for Meeting Flood Goals

The centralized pump station alternative has been formally modeled, tested, and is based on well-established engineering practices with quantifiable outputs. The system's current outfall capacity of approximately 53-57 cfs is known and measurable, and the identified need for an additional outfall to achieve the full initial 1-inch-per-hour level of service (an additional 20–24 cfs) is clearly defined and within the Village's control to implement as easements have been received. As a result, any shortfall in performance can be traced to specific, correctable design or construction elements, allowing responsibility to be assigned and remedies to be pursued.

The decentralized well-based system carries uncertainty as long-term performance is influenced by variables that are difficult to predict or control, including tidal effects, rising groundwater levels, sediment accumulation, clogging rates, and the effectiveness and consistency of ongoing maintenance. In addition, overall system reliability is sensitive to power availability across multiple sites, which remains difficult to guarantee even with undergrounded utilities. These inherent uncertainties make it challenging to conclusively determine whether unmet flood goals are due to design limitations, environmental conditions, or operational factors, thereby increasing the Village's exposure to performance risk and limiting clear liability for corrective action.

2.8 Performance Under Failure Conditions (Power Outages, Pump Failures, Clogged Inlets)

AECOM's system is designed to handle failure scenarios through the redundant systems discussed above. If complete pump station failure occurs, the bypass of the mechanical systems will continue to push stormwater at a significantly lower rate through the outfalls. The AECOM design uses a network of large pipes and multiple storm inlets to mitigate a localized clog (e.g. a blocked inlet or pipe segment) resulting in ponding in one area while neighboring drains pick up the flow.

GIT's system in normal operations similarly localizes the impact of a clogged inlet or a disabled well as other well sites would continue draining their area. Optional bypass systems to a force main to outfalls can be built to provide redundancy under clogged wells. However, both the bypass and primary injection are reliant on power without backup.

The GIT alternative provides inherently independent sub-systems so no single failure will flood the whole area. The AECOM alternative offers more built-in resiliency with on-site backup power and extra pump capacity to maintain partial service through common failures and includes a bypass for outfall failures.

3.0 Environmental Risk & Climate Resilience

3.1 Resilience to Sea-Level Rise, Rising Groundwater, and Extreme Rainfall

AECOM's approach accounts for future sea-level conditions using NOAA's Intermediate-High scenario for 2060. It includes raising road elevations and constructing a centralized pump station so the system can continue to perform even as groundwater levels rise. Raising roads not only improves drivability during heavy rain but also helps reduce “sunny-day” flooding and protects the roadway structure by keeping it above the rising water table.

GIT’s approach accounts for future sea-level conditions using NOAA’s Intermediate scenario for 2050. However, sea level and groundwater rise will diminish the effectiveness of each injection well because there is less capacity for stormwater to infiltrate. While the system is modular and additional wells or pumps can be added over time, expansion is constrained by available space and the risk of interference between wells. The system is compatible with limited impact if the Village decides to raise the road in the future if reduce “sunny-day” flooding or road structural problems become chronic.

AECOM’s pumped system is more robust to long-term climate change factors whereas GIT’s infiltration system will gradually lose effectiveness as the environment changes.

3.2 Ability to Operate During Storm Surge / Backflow Prevention

AECOM’s system uses bay outfalls equipped with backflow prevention valves to block tidal surge. Pumping against a high tide or storm surge will be less efficient and could temporarily slow down drainage if the bay water level is elevated above the outfall.

GIT’s baseline system utilizes minimal direct bay outfall, and storm surge impact will be limited to coastal catch basins. GIT’s wells might still see reduced injection rates during surge due to a temporarily elevated water table acting against them. If the optional force main to the existing outfalls is installed, backflow valves will have to be installed.

Neither system is designed to remove all water from an extreme hurricane scenario and they both would have reduced capacity during major storm surge condition.

3.3 Adaptability and Future Expandability

For future adaptability and potential expansion, the primary considerations are conveyance capacity (moving water to collection points) and discharge capacity (releasing water once collected).

Future adaptability in the AECOM concept is primarily tied to discharge capacity. The central pump station can be upgraded over time with additional pumps or additional outfalls. The drainage network is sized to accommodate up to double the initial discharge. If needed, it can be expanded beyond Zone 1 through added gravity piping and pumping improvements, allowing the conveyance system to be extended to serve a broader area.

GIT’s approach is modular, meaning it can be constructed in stages and expanded over time. Future adaptability in this concept depends on both conveyance capacity and discharge capacity. The Village could add additional pump-and-well units, enhance drainage connections, or upgrade individual components to move and inject greater amounts of stormwater. GIT’s proposal also includes the option to expand the drainage area by extending the conveyance system beyond the original Zone 1, allowing runoff from adjacent areas to be captured and managed as part of the overall system. Additionally, the system can be adapted to overcome well fouling by installing a back up force main.

The GIT concept can be implemented in smaller increments, with capacity increased through additional pumps and wells. The AECOM design will require a significant portion of the system installed before partial capacity is achieved, but subsequent capacity expansion will require fewer additional components.

4.0 Environmental Impacts

4.1 Water Quality Effects

AECOM's design uses a treatment train approach, with nutrient load reduction provided through street sweeping, catch basin filtration, hydrodynamic separators and through pump station filtration to remove solid and dissolved pollutants before discharge to Biscayne Bay. Filters at each catch basin will require maintenance and replacement in order to maintain effectiveness. This approach is intended to meet National Pollutant Discharge Elimination System (NPDES) surface-water quality standards.

GIT's design largely reduces direct stormwater discharge to Biscayne Bay by routing flows to injection wells. Additionally, a hydrodynamic separator is installed with each pump station to reduce pollutants. Because the groundwater system and Biscayne Bay are hydraulically connected, stormwater must be adequately pretreated at each injection well to prevent contaminants (e.g., nutrients, oils) from migrating into the aquifer and ultimately to the bay. This issue is regulated under Florida's Underground Injection Control (UIC) program, which requires protective measures to safeguard groundwater quality. The existing coastal outfalls in Zone 1 would remain in use, but discharge would be limited to localized gravity drainage.

The GIT solution shifts water-quality risk from surface waters to the groundwater system, reducing the amount of direct discharge to the by. It does require treatment and monitoring to be performed individually at each injection well. The AECOM solution discharges directly to the bay, but provides a treat-and-release approach to water quality, allowing straightforward monitoring of the constituent loads.

4.2 Impacts on Natural Ecosystems:

AECOM's plan introduces new outfalls to Biscayne Bay through outfalls that are engineered to prevent erosion and compatible with existing sea walls. They are in compliance with strict velocity limits required by permitting agencies. By filtering and controlling stormwater prior to discharge, the AECOM system is expected to reduce the nutrient load of the stormwater compared to the existing system. The increase of the road height will require harmonization throughout the Village which is planned to include the replacement of approximately 565 existing trees.

GIT's alternative minimizes new marine infrastructure and primarily uses injection wells for stormwater disposal. Environmental considerations would focus on subsurface conditions, including groundwater quality, groundwater level response, and compliance with UIC permitting requirements. In coastal settings, groundwater levels are influenced by tides due to hydraulic connectivity with adjacent surface waters; constituent transport pathways and long-term effects would require site-specific evaluation and monitoring.

GIT's approach shifts the environmental concern from surface water to groundwater quality and the potential delayed migration of injected stormwater to the bay. The GIT proposal will also have limited impact on existing trees, but will require some landscaping disruption, specifically around the new pump stations. AECOM's approach involves direct interaction with Biscayne Bay but has been permitted to limit negative impacts. The tree replacement will reduce shade coverage initially, but the more shade trees have been selected to replace palms to increase coverage long term. Both options will present a dramatic improvement from the current condition.

4.3 Integration of Green Infrastructure

AECOM's design is predominantly a gray infrastructure solution as it relies on engineered components (pipes, pumps, raised roads) and makes limited use of natural infiltration given the existing high-water table expected to increase over time.

GIT's project technically leverages a natural process (aquifer recharge) as its primary means of stormwater disposal, by using wells to infiltrate water. It takes advantage of the ground's capacity to absorb water rather than channeling flow to surface waters.

While neither plan heavily employs traditional "green" features like bioswales or wetlands, GIT's concept represents a more decentralized, infiltration-based strategy (using the island's geology as a functional asset), whereas AECOM's remains a conventional pump-and-pipe system. Both system will continue to use the existing swales for stormwater storage.

4.4 Landscaping and Tree Canopy Impact

AECOM's construction will entail full roadway reconstruction in Zone 1, which means removing approximately 565 existing trees along with vegetation throughout the streets during the build phase. However, the project includes restoring swales and replanting or replacing trees after construction, potentially with more salt-tolerant species to improve the long-term streetscape and overall tree canopy to provide increased shaded area to combat future climate change related heat challenges.

GIT's construction does not include road reconstruction, so it is projected to disturb a smaller area and remove fewer mature trees.

The GIT alternative preserves more of the current trees with less disruption while the AECOM alternative causes greater short-term impact to greenery while providing an opportunity to have positive long term benefits.

4.5 Overall Environmental Benefits

The GIT solution provides a less direct path for the stormwater to reach the protected waters of Biscayne Bay. Both approaches improve upon existing conditions by reducing heavy stormwater ponding in swales and sitting water in the streets. Both systems include the filtration of stormwater to the ground or bay.

5.0 Constructability & Regulatory Compliance

5.1 Permit Status and Feasibility

AECOM's project has already acquired the required permits from DERM, South Florida Water Management District, and the US Army Corps. The water and sewer permits have been submitted and are pending approval with final acceptance of plans, and it adheres to all established criteria for stormwater treatment and flood control. The design is essentially permit-ready at this time.

The GIT's design is in the concept stage and will need to be designed further until permit applications are submitted. However, preliminary consultations with regulators (e.g. Miami-Dade DERM and the Florida DEP for UIC wells) have received positive feedback and no significant risks to permitting are anticipated. Additional design and documentation will be needed to actually obtain the Class V injection well permits. Modifications to the SFWMD environmental resource permits and any Class I or II Miami Dade County DERM permits would be required if there are modifications of existing outfalls.

5.2 National Flood Insurance Program (NFIP) Community Rating System (CRS)

Both approaches have the potential to support Key Biscayne's Community Rating System (CRS) objectives by reducing flood risk, which can translate into lower flood insurance premiums for residents. CRS credit is based on demonstrated and sustained flood-mitigation performance rather than the specific flood-control method used.

5.3 NPDES vs UIC (Regulatory Pathways)

AECOM's design includes new stormwater outfalls to surface waters and would therefore be regulated under the National Pollutant Discharge Elimination System (NPDES). This framework requires compliance with established surface-water quality standards and periodic effluent monitoring to protect Biscayne Bay. The project's centralized pumping and built-in filtration systems provide a clear and well-defined point for monitoring stormwater discharges.

GIT's design largely avoids direct surface discharge and would instead be regulated under Florida's Underground Injection Control (UIC) program for Class V stormwater wells. UIC permitting focuses on protecting groundwater quality and may require monitoring wells, limits on injection pressures, and site-specific performance criteria, even though the island's shallow aquifer is brackish and not used for drinking water. Monitoring at individual injection wells would likely be required to verify compliance with permitted injection pressures and water-quality safeguards.

Both regulatory pathways are viable but differ in emphasis. The NPDES framework applicable to AECOM's approach is well established and relies on direct measurement of surface-water discharges. GIT's approach would follow a different regulatory regime focused on subsurface protection, requiring additional analysis, monitoring, and regulatory oversight to demonstrate that injected stormwater does not adversely affect groundwater or result in unintended impacts to Biscayne Bay over time.

5.4 Easements and Land Acquisition Requirements

The AECOM alternative has identified and secured the required sites and easements on both public land and limited private property in regards to stormwater. The proposed pump station would be located on publicly controlled land (e.g., Harbor Park or within a public right-of-way), and new outfall pipes would be installed beneath public rights-of-way with the necessary easements and permits already established. Minor easements are anticipated for utility relocations (such as transformers), with no significant private land acquisition required.

GIT alternative similarly intends to place its pump/well units in existing public rights-of-way or publicly owned parcels (like street corners, swales, or perhaps a corner of a park) to avoid taking private land. Each decentralized unit is mostly underground (roughly a 23 ft × 9 ft vault and an 8 ft diameter pre-treatment structure, plus a 24"-wide well shaft ~80 ft deep), with only manhole covers and a small electrical/control box visible at the surface. While the conceptual layout relies on Village-controlled spaces, final design may identify a need for small easements or land-use agreements if locations shift. However, no private land purchases have been identified to date.

5.5 Overall Regulatory Alignment

AECOM's design aligns well with major regulatory and policy and has been developed in line with state and county resilience guidelines (e.g. meeting flood protection and road elevation standards).

GIT's project is an accepted method of discharging stormwater and has been approved in other coastal communities. County requirements for flood protection would have to be proved through the modeling and injection well requirements be regulated through the agencies listed above.

5.6 Construction Complexity

AECOM's plan is a large, multi-faceted construction project that will involve building a large pump station, trenching and laying a network of large-diameter pipes, raising roadways, harmonizing driveways and right of ways, and relocating or burying utilities, all of which necessitate extensive project management, phased traffic control, coordination with multiple utility disciplines, and contractor expertise in complex civil and infrastructure construction. The project's complexity is mitigated by a completed 100% design and a coordinated plan for mobilization, movement of traffic and communication with residents and stakeholders. Design deconfliction has been conducted through coordination with WASD, FPL, and the telecom utilities.

GIT's plan relies on repeating a modular construction approach at multiple locations, consisting of drilling an injection well, installing a pump within an underground vault, and connecting it to nearby drainage infrastructure. While each site is individually less complex than a large pump station, constructing and coordinating multiple sites inside the neighborhood still requires careful staging and utility coordination. The approach also requires extensive roadway civil work to add or upgrade local conveyance piping needed to direct stormwater to the wells and to interconnect dead-ended areas with limited or no piping. Importantly, if assumptions about reusing existing pipes prove inaccurate, the project could require widespread pipe replacement, significantly increasing complexity and cost to levels comparable with a more integrated system.

The AECOM project centralizes the challenge into a large, sequential construction effort with higher upfront complexity but with fewer unknowns. The GIT project reduces complexity in smaller subprojects and can be more flexible to build in parts. However, it carries a risk of scope expansion through surveying of existing pipes and future deconfliction with utilities.

5.7 Utility Conflicts and Coordination

AECOM's design has been developed with utility coordination and has been incorporated in a Joint Participation Agreement (JPA) with Miami-Dade WASD to replace water and sewer lines concurrently in Zone 1. It accommodates FPL's plans for burying power lines (e.g. space for FPL equipment was incorporated into the pump station site) and has incorporated telecom undergrounding from AT&T and Comcast. As a result, the integrated project will proactively handle known utility conflicts by relocating or upgrading utilities as part of construction.

The GIT plan will require similar deconfliction although due to smaller and less amount of new pipe, it is anticipated to have less conflicts. The continuation of the WASD JPA will need to be renegotiated. The existing FPL and telecom design will be planned to be reused and modified only where needed.

5.8 Phasing Feasibility

AECOM's project is designed to be built as one comprehensive phase covering the entire zone; with sequencing of the components in order of requirement for use. The pump station, outfalls, and force mains would be constructed first, followed by trunk lines and laterals. Road raising, utilities, and landscaping would be incorporated on a street by street basis as the project progresses.

GIT's project is more conducive to phased implementation. The Village could initially install a limited number of well units in the most flood-prone areas and expand the system over time as funding or performance data become available, with each unit providing localized flood relief. However, full zone-wide performance would only be achieved once all planned wells and supporting conveyance are constructed. If injection wells are installed ahead of necessary conveyance repairs, there is a risk of repeatedly pumping groundwater that infiltrates deteriorated pipes, reducing overall system efficiency.

5.9 Disruption During Construction

AECOM's construction will be a substantial undertaking across much of Zone 1, anticipated to take 30-36 months and involving digging up every road for new pipes, constructing the pump station in Harbor Park, and replacing driveways and sidewalks. Residents and the K-8 school will experience significant phased inconveniences with ongoing road closures or detours, heavy machinery in the area, noise, dust, and restricted driveway or swale access as the work progresses street by street. The Village and contractors would mitigate these impacts with traffic management plans, phasing around school schedules, and public communication, but the fact remains it will be a major neighborhood-wide construction period.

GIT's construction is more localized as each of the 6 pump/well sites would create a work zone of about a block for a few months with additional roadway work to replace or install conveyance piping following. This means disruption would be spread out in smaller areas and short-term lane closures or detours around a single intersection instead of zone-wide disturbances. It is anticipated the construction process would last approximately 24-36 months as well depending on how many pump stations were to be constructed at the same time.

5.10 Risks of Delays, Change Orders, and Cost Overruns

AECOM's project has a fully defined scope and completed design, which reduces uncertainty. However, the need for additional outfalls will require additional design and construction costs. Mobilization, staging, and environmental factors can have significant impacts on construction costs. Unforeseen conditions that were not accounted for in existing surveys can result in additional conflicts.

GIT's project is at a conceptual stage with substantial unknowns. Design details such as actual well capacities, precise locations, extent of conveyance piping replacement and required pre-treatment systems are not yet finalized, meaning the initial cost estimate is subject to change. Phasing the GIT project may mitigate repetitive risks, but extending the construction over multiple years or contracts exposes it to inflation and market variability.

The AECOM alternative offers greater cost and schedule certainty due to its shovel-ready status (less risk of scope creep), whereas the GIT alternative carries a higher risk of evolving requirements, budget increases, and timeline extensions as engineering and field data are gathered and as each phase is implemented.

5.11 Overall Project Readiness and Feasibility

AECOM's project is ready to proceed with procurement and is set to have one contractor act as prime responsible for completion of the entire scope. Final coordination and construction JPA would be required with WASD to be completed in parallel with procurement.

GIT's project will require a longer lead time before any construction can begin. The concept will need to be fully designed for permit and construction drawings. A design build or CMAR delivery method may reduce some time for design, but expected to last 6-12 months. Additionally, funding will need to be procured which will require a new Facilities Plan, permits, construction drawings and construction drawings. This may push the procurement to the end of 2027.

5.12 Confidence in Project Completion

The AECOM operational analysis indicates the design will work as intended, but does require the new outfall to fully achieve the specified 1"/hour initial pumping capacity and allow the future 2"/hour upgrade. This outfall has been accounted for in planning and would need to be constructed along with the pump station.

The GIT engineering analysis suggests the concept is technically feasible and the spacing in the Village appears accommodating. It is recommended to perform an injectivity tests well to confirm capacity at each well site and conduct the CCTV analysis of the existing piping to confirm design requirements.

6.0 Cost

6.1 Capital Costs (Upfront Construction Costs)

AECOM's integrated project has an estimated construction cost at approximately $81 million total for Zone 1, which includes ~$43.7M for the core stormwater components, ~$21.3M for roadway reconstruction, ~$11.8M for undergrounding power/telecom, ~$2.6M for water/sewer updates. Additionally, construction management and support costs will be included. This cost estimate is based on a 100% design and would be considered a class 1 cost estimate with a +15%/-3% range of uncertainty. For the stormwater and roadway portion of this estimate, the range would be from $64.8M to $76.8M. This estimate is almost a year old and typical inflation and escalation should be anticipated.

GIT's decentralized project has a current engineer estimate of probable cost of $56.7M included for the stormwater and roadway system for the Zone 1 area. This cost estimate does not include water and sewer or utility undergrounding work at this time and will need to be increased as design progresses. Additionally, due to this level of planning, this is considered a class 5 cost estimate with a +75%/-50% range of uncertainty which would put the estimate between $28.7M and $99.2M. This range mitigates the risks of escalation, inflation, and the uncertainty of scope which can occur during the design and construction process. The engineers estimate for the extended zone, which provides a better cost ratio per home is currently at $67.3M with a range of $33.7M to $117.8M.

6.2 Lifecycle Costs (Long-Term O&M and Replacements)

AECOM's system has an estimated costs for operation and maintenance of $554,789. This includes approximate costs of pump station maintenance including fuel for generator, two stormwater treatment units, pipe and force main cleaning, and water quality filter maintenance. The major component infrastructure is expected to last 20 – 30 years but would have a current price estimate for replacement of approximately $1.5M for pumps and $3.2M for electrical equipment.

The GIT system has an estimate annual operation and maintenance cost of $943,798 for the baseline system. This cost reflects maintaining six separate sites with each pump and control unit, well rehabilitation, energy use, and sediment and pretreatment cleaning. Additional lifecycle costs include well redevelopment and major component replacements such as pumps, motors, and controls which have not been determined at this time. Increases in maintenance for the extended Zone 1 only entail the additional piping and catch basin cleaning resulting in approximately an additional $100k per year.

6.3 Financing Costs (Debt Service, Interest)

AECOM's project has financing secured through the low-interest Clean Water State Revolving Fund (CWSRF) loan and the Village's 2020 General Obligation Bond (GOB), so the borrowing costs are known and built into the financial plan. The design costs of the plan also are being financed through a design CWSRF loan which will begin payments shortly.

GIT's project does not currently have dedicated financing, but it is assumed the Village can pursue a separate SRF loan for both design and construction as needed. The loan applications will require a new facility plan, permits, construction drawings and procurement documents which may delay the procurement until late 2027/early 2028. GOB funding may be used for design until grants and loans for construction are secured. Interest rates vary and there is a risk of higher costs over time if terms are less favorable at time of application.

6.4 Cost Structure (Grants vs Loans vs Village Funds)

AECOM's project benefits from a funding mix already in place as it has secured external grants, loans, bonds and commitments such as a Miami-Dade WASD contribution for utility work. Cost projections per resident have been developed for the lifespan of the repayment for the project based on current and best case scenarios.

GIT's project would require assembling a new funding package as the majority of the funding sources will not transfer to the new scope. The Village will have to reapply or identify alternate sources and new cost projections will be developed as the cost estimate progresses with more certainty along with the design.

6.5 Insurance and Liability Considerations

The AECOM system is modeled for a 10 year storm while the GIT system is modeled for a 5 year storm. While both systems would provide similar flood mitigation resulting in more favorable insurance protections, we are not able to provide a definitive benefit.

6.6 Cost Over Time per Resident

The below table represents an breakdown based on current engineers estimates for the three alternatives. This table is largely dependent on funding availability and may alter as designs progress. Additionally, it should be noted that the AECOM alternative can provide a similar extended coverage area by increasing conveyance piping, but that has not been developed at this time. The CWSRF loan is 20-year repayment at 3.5% and GOB is 30-year repayment at 5.5%. All costs are in 2025 dollars, as no inflation included.

	AECOM	GIT	GIT Ext.
	CWSRF + $15.6M in grants	***GOB***	***GOB***
Capital Cost	**$66,783,265**	**$56,700,000**	**$67,300,000**
Cost to the Village	**$72,018,884**	**$117,037,968**	**$138,918,082**

Parcels Served	**311***	**311**	**644**
Total Taxpayers	**7,386**	**7,386**	**7,386**
Cost per Parcel	**$231,572**	**$376,328**	**$215,711**
Cost per Taxpayer	**$9,751**	**$15,846**	**$18,808**
Annual Average Cost per Taxpayer	**$488/year**	**$528/year**	**$627/year**
O&M Cost			
O&M Cost per year	**$554,789**	**$943,798**	**$1,049,153**
O&M over 30 years	**$16,643,670**	**$28,313,940**	**$31,474,590**

6.7 Benefit-Cost Analysis (BCA)

AECOM's project underwent a benefit-cost evaluation as part of grant applications and the FDEM backed Vulnerability Assessment through a HAZUS and REMI modeled economic analysis. The positive BCA was determined largely due to the significant reduction in flood damages and community disruption expected over the project's life. A economic analysis with estimated BCA may be conducted for the GIT project as key performance and cost data are refined. It is anticipated that the BCA would be comparable based on cost and flood protection estimates.

7.0 Funding

7.1 Availability of Future Grants and Loans

AECOM's project is well positioned to attract additional funding from state and federal resilience and infrastructure programs due to its readiness and benefit to the community and environment. It has already been included in multiple grant applications (e.g. Florida DEP's Resilient Florida program, Biscayne Bay Water Quality) and, given its scale and clearly defined risk-reduction benefits, the Village can continue to pursue further external funding if needed.

The GIT's plan will also be eligible for similar grants or low-interest loans, and the intent would be to begin applications for planning at earliest opportunity. The construction grants will require further design and benefit projections but due to the ability to break the project up in smaller portions, it may be more competitive for smaller grants.

7.2 Secured Grants and Loans

AECOM's project already has about $72–$75 million in funding commitments ($2.8M from a Biscayne Bay water quality grant, $2M in federal appropriations, an expected $10M in Resilient Florida Grant, and $60M in low-interest SRF loan), which together cover virtually the entire project cost. Additionally, the AECOM design itself received an EPA Community Grant for $400k, a Resilient Florida Grant for $750k, state appropriations for $500k and a SRF loan for $3.6M. A payment of $530k from WASD has been provided from the design JPA for the AECOM utility coordination with their team.

GIT's project currently has no dedicated funding secured, meaning new funding arrangements would have to be developed from scratch.

There is a high risk of losing the secured construction grants and appropriations due to application requirements. Any impact on future applications are unknown. It is expected that competition will continue to grow as more communities progress in similar projects.

7.3 Readiness/Availability of Funding

The funding for the AECOM project is mostly accessible. There has already been awarded $2.9M in grants and future grants listed above are ready for award. The SRF loan is pending final approval before its funding is available. Repayment on the SRF loan is not made until costs are incurred and the entire project is completed.

GIT's funding timeline would depend on preparing a new facility plan, 100% design, and permits to qualify for programs like SRF or other grant applications. SRF loans are due in June and Resilient Florida Grants applications are typically due by September. The Village might not access significant state loans until mid-2027 or 2028 if it switches to the new concept.

7.4 Vulnerability of Future Funding

Per above, there is a high risk of losing the secured construction grants and appropriations due to application requirements. Any impact on future applications are unknown. It is expected that competition will continue to grow as more communities progress in similar projects. Relationships with WASD will require consideration given the amount of effort and cost paid for the previous design.

7.5 Partnerships (Private/Governmental)

A formal partnership has been committed with WASD through a design JPA for AECOMs design. At this point, WASD has paid approximately $530k toward the AECOM design. A draft construction JPA is underway for the construction of that design for an estimated $950k, but has not been signed yet. Coordination is also underway with the Miami-Dade School District and a draft Interlocal Agreement (ILA) has been proposed for the work proposed near the K-8 school.

The existing JPA with WASD will require modifications to incorporate the GIT design and it is unknown if the County will automatically fund new modifications or new utility work associated with the revised concept. Additionally, the County may expect the identified water and sewer line upgrades to be completed being that they already paid for the design of those specific upgrades. The school ILA is still in draft and can be modified.

8.0 Operations & Maintenance (O&M)

8.1 O&M Cost Impacts

As noted above, both systems will require extensive operation and maintenance costs with lifecycle costs incurred as larger mechanical components fail. For the AECOM design, the generator and filter replacement costs set it apart as being more intensive over time. For the GIT system, the well redevelopment and increase in pumps require more attention.

8.2 System Monitoring Requirements

AECOM's pump station will be equipped with a SCADA (Supervisory Control and Data Acquisition) system that allows remote monitoring of key metrics (pump status, sump water levels, flow rates, generator fuel, etc.) for one location. Compliance monitoring (e.g. water quality sampling) is directly take from the outfall locations or the single wet well prior to entering the force main as required by both the NPDES and MDC permits.

GIT's system would require a network of sensors at each well site to monitor well water levels, pump operation and head pressures, flow rates, and possibly water quality monitoring wells. These will be connected back to a central dashboard but will require a few additional components. UIC permits may mandate installing groundwater monitoring wells around each injection requiring regular testing.

8.3 Equipment and Expertise Needs

The operation and maintenance of the AECOM system will require the Village or subcontractor to have proficiency in maintaining large pumps, a diesel generator, electrical control systems, and filtration units. Specialty training for the generator and pump repairs may be required. Filtration cleaning and routine maintenance should be able to be serviced in house if needed.

The GIT operation and maintenance will require technicians capable of maintaining injection wells (periodically pulling pumps and redeveloping wells), managing multiple electronic control panels and SCADA telemetry, testing bypass pipes should any well need to divert flow to a different outlet, and performing water sampling for UIC compliance. The Village has subcontracts for the other injection wells to conduct well rehabilitations and redevelopments as needed. to As mentioned, back up generators would be needed in order to provide power in the event of an outage.

8.4 Staff Capacity and Training

Both options will require some increase in staff training and potentially personnel.

8.5 System Design Life

Both options use long-lasting materials for the main infrastructure. New pipes in either system are expected to last 50 years or more, while pumps and motors typically need major servicing or replacement every 15–20 years.

The GIT system includes a portion of the conveyance system with existing pipes that will have a shorter lifespan. Any repairs due to an end of life pipe would require a return to disturbing the street for either replacement or strip-lining. While a well structure itself can last many years, its performance can decline over time due to clogging. As a result, injection wells may require major rehabilitation or even replacement within 20 to 50 years based on usage and conditions.

8.6 Maintaining and Storing Spare Equipment

For the AECOM pump station, it is recommended the Village keep small spare parts such as an extra pump cartridge or critical electrical components on site at the constructed pump station in Harbor Park.

Similarly for GIT's multiple sites, a strategy would be needed to have redundant parts and possibly an additional pump somewhere in the Village. A portable generator would be recommended if able to store somewhere nearby. A storage location would have to be acquired for the materials to be stored as the Village currently does not have a yard facility for storing back up equipment or standby emergency generating equipment.

9.0 Community Impact & Public Acceptance

9.1 Risk of Inaction

Both plans aim to significantly reduce the flood risk in Zone 1, and will provide flood reduction to support the K-8 school basin at the level of service. Without any project, the community will continue to face frequent disruptive flooding, infrastructure deterioration, and declining property conditions. Both options would be expected to rise in cost and complexity as time continues due to normal inflation, continued Village growth, and the competitive nature of shared resources such as labor, funding, and public space.

9.2 Construction and Operational Disruption

Both projects will inevitably cause temporary disruption to residents during construction, including traffic detours, noise, dust, and general inconvenience. As noted above, AECOM's approach will include the sequential disturbance of each street in Zone 1.

GIT's approach can be disseminated into smaller disruptions over multiple phases. Additionally, some streets and many right of ways will not be impacted from the stormwater system as the pipe sizes are smaller and there will be some utilization of the existing system.

Once operational, both systems operate quietly and largely out-of-sight. The injection well pump stations are designed to be low-noise and underground, with only small surface installations such as the electrical panels. The pump station at Harbor Park will remain visible to the community during operation but the sound mitigation is performed by the walls of the building.

9.3 Aesthetics and Streetscape Impacts

AECOM's project will alter the streetscape by raising road elevations and constructing the pump station in Harbor Park, which means the addition of visible infrastructure in that area the size of a small house. Additionally, it includes the replacement of driveways, the replanting of many trees, and the installation of new curbs around corners and drop curbs in certain streets.

GIT's project has very little visible infrastructure, as each well site would only have flush manhole covers and hatches, and an electrical control panel box approximately the size of a traffic signal cabinet visible above ground. Some trees will be relocated due to the interaction with the injection well systems and the new catch basins, but since the road will not be raised throughout, may of the street right of ways are expected to remain the same.

Both systems will be designed to coordinate with the utility undergrounding program which will include the removal of telephone poles around the streets, but the installation of transformers, pedestals and large electrical boxes in the rights of way.

9.4 Perceived Value and Community Support

AECOM's integrated solution can be characterized as a higher-cost approach that combines flood mitigation with broader infrastructure upgrades, including roadway improvements, drainage enhancements, and utility modernization. However, the complete overhaul of the existing system may be viewed as providing an excessive amount of service for the community needs. Additionally, there is a perception that the discharge of stormwater directly into the bay may result in increased pollution. Approval of additional work for the design and construction of outfalls will be critical to complete this project.

GIT's injection well–based solution represents a more targeted strategy focused primarily on addressing flooding. The approach may involve a lower initial cost and a narrower scope, which could be viewed as fiscally conservative and focused on the core problem. At the same time, the solution does not address ancillary infrastructure needs such as roadway conditions, and its reliance on injection well technology introduces uncertainties regarding long-term performance and effectiveness. As a result, it may be perceived as a more limited or higher-risk option compared to a comprehensive infrastructure upgrade. The ability to discharge water back to the aquifer presents a more environmentally friendly solution, while pre-treatment and well maintenance will be required to ensure that perception is reality.

9.5 Property Value Implications

Both alternatives should enhance property values in Zone 1 relative to the status quo by reducing flood risk. Generally, any effective flood mitigation makes homes safer and more attractive to buyers (and potentially lowers insurance costs, e.g. via CRS as noted). Specific decisions regarding level of service and design criteria can play a role in CRS ratings, but generally speaking, both options will provide similar values.

9.6 Public Communication and Stakeholder Buy-In

The construction plan for the AECOM design will require extensive communications and public outreach prior to the beginning and during construction. Coordination with local stakeholders such as Miami Dade Parks will be critical for staging of equipment and materials. A thorough construction sequence will be required to mitigate disturbance throughout the Zone 1 area. Disruptions to Harbor Park, residential driveways and sidewalks, the school area, and private property for utility connections will be made through direct discussions with residents and community events.

The GIT plan will require a new public outreach campaign to inform residents and the differences in design and impact for the Village. Construction considerations will also include staging, mobilization, and disruption to Zone 1 streets and rights of way. Although the impact on driveways will be less, there will still need to be direct engagement with residents as street closures are required. Any need for easements will need to be discovered early in the design as the siting for the new pump stations is determined. New funding plans and costs to residents will be developed as cost estimates get refined and grant and loan opportunities are procured.

9.7 Noise Considerations

AECOM construction will involve heavy machinery and possibly pile-driving for the pump station foundation, leading to construction noise. This will be mitigated by restricting work to daytime and using noise barriers where needed. After completion, the noise from the pump station equipment is mitigated through submersible pumps and sound-attenuated enclosures.

GIT construction will involve drilling wells which will produce excessive noise levels. Additional construction noise from trucks and heavy machinery will be routine during the project on a localized basis. Mitigation efforts for the noise can include during work during daytime hours, providing temporary sound attenuating barriers. In operation, the decentralized pumps are relatively small and can be placed in underground vaults, making them nearly inaudible at street level.

9.8 Traffic Impacts

AECOM's construction will necessitate multiple lane closures and detours on main Zone 1 roads like Harbor Drive, W. McIntyre, and W. Enid as crews install trunk lines and rebuild streets. A complete MOT plan will be provided from a sequential standpoint and then on a weekly basis. There will be coordination to maintain access to the K-8 school (e.g. doing the most disruptive work during summer breaks or off-peak hours) and to always allow emergency vehicle passage, but residents should expect periods of congestion and rerouting during the ~2-year construction window. Access to driveways and sidewalks will be limited during periods of construction during the day. All access will be returned after working hours.

GIT's construction will have smaller, isolated traffic disruptions if pump stations are sequenced with consideration. It could be designed for only one intersection or street segment to be partially closed at a time for well installation, and traffic can be relatively easily re-routed around that block. However, in areas where conveyance piping needs to be added, upgraded or repaired, a traffic plan to route around construction would be expected. Site work around the school can be planned and coordinated during summer months when school season is over.

10.0 Coordination & Supporting Efforts

10.1 Interagency Coordination

AECOM's plan was developed with multi-agency collaboration and aligns with Miami-Dade WASD's utility upgrade plans and with FPL's, AT&T and Comcast undergrounding schedule. It involved early coordination with Miami-Dade County's Department of Environmental Resources Management (DERM) and the School Board for work near school property. This integrated approach has garnered support from these agencies because it meets shared goals such as modernizing sewer infrastructure, improving power reliability, and providing better flood protection for child drop off and pick up.

GIT's plan will still require the same interagency coordination and will have some changes to the existing utility designs. Efforts will be made to keep the same JPA with WASD and to incorporate the utility undergrounding design into the new stormwater system. Relationships with the permitting agencies and the School District should remain.

10.2 Alignment with Related Initiatives

AECOM's project directly advances several parallel resilience and infrastructure initiatives, by raising roads, undergrounding utilities, and incorporating new streetlights and swale management. Environmental protection is improved through nutrient load reduction in the stormwater discharge and the planting of more canopy trees inline with the Village's tree master plan.

GIT's project aligns with water quality goals (since reducing instantaneous bay discharge fits regional efforts to protect Biscayne Bay), and the Village would still pursue road raising and undergrounding in the future, albeit separately. Coordination will be needed to ensure the GIT stormwater system doesn't conflict with the eventual utility undergrounding plan (e.g. spacing of wells and trenches).

10.3 Need for External Partnerships

Both the AECOM and GIT approaches require coordination with external stakeholders and rely on cooperative arrangements to support project implementation. Each would involve agreements or easements related to school property for access, staging, or system components located near the site, as well as potential coordination with adjacent property owners if facilities extend beyond public rights-of-way. In addition, both approaches anticipate multi-phase construction supported by contractors and oversight from a program manager or owner's representative to manage delivery, construction inspection, scheduling, and coordination. While the specific arrangements are at different stages of development, both approaches depend on similar institutional partnerships and management structures to advance implementation.

10.4 Reputation among Industry Professionals

The AECOM design has been presented to regional contractors during multiple industry presentations hosted at the Village to generate interest and make the bidding more competitive. Multiple experienced stormwater and utility contractors have expressed their interest in bidding and have requested updates on the status of the procurement and funding.

The GIT design is expected to draw a large interest from the professional contractor industry in both the stormwater and utility undergrounding fields. The project would require a similar outreach effort to communicate that the Village is committed to delivering this alternative. Clear messaging when funding is in place will indicate that the project will be ready for bid. The modular and phased nature of the GIT approach could attract interest from smaller firms by allowing the work to be divided into smaller, specialized contracts (e.g., well drilling, pipe rehabilitation, electrical work). While this may broaden participation, it would also require more active program and construction management to coordinate multiple contracts effectively.

System Cost Comparison

	AECOM	AECOM	GIT	GIT Ext.
	CWSRF + $15.6M in grants	*CWSRF only*	*GOB*	*GOB*
Capital Cost	$66,783,265	$66,783,265	$56,700,000	$67,300,000
Cost to the Village	$72,018,884	$93,978,849	$117,037,968	$138,918,082
Parcels Served	311*	311*	311	644
Total Taxpayers	7,386	7,386	7,386	7,386
Cost per Parcel	$231,572	$302,183	$376,328	$215,711
Cost per Taxpayer	$9,751	$12,724	$15,846	$18,808
Annual Average Cost per Taxpayer	$488/year	$636/year	$528/year	$627/year
O&M Cost				
O&M Cost per year	$554,789	$554,789	$943,798	$1,049,153
O&M over 30 years	$16,643,670	$16,643,670	$28,313,940	$31,474,590
O&M Cost per Taxpayer per year	$75.11	$75.11	$127.78	$142.05

O&M Cost per Parcel per year: AECOM - $1,784, GIT - $3,035, GIT Ext. - $1,629

*AECOM conveyance system could also be expanded to cover the Zone 1 – Extended Area

Notes:
CWSRF loan is 20-year repayment at 3.5% and GOB is 30-year repayment at 5.5%
2025 dollars, no inflation included

1

Zone 1 Alternative Stormwater Modeling and Planning

Village Council Meeting

April 22, 2026

Presenters:

- Georgio Tachiev, PE, PHD - GIT Consulting
- Alberto Pisani, PE, ENV SP - Chen Moore

GIT Consulting LLC and

chenmoore

1. PRESENTATION OUTLINE

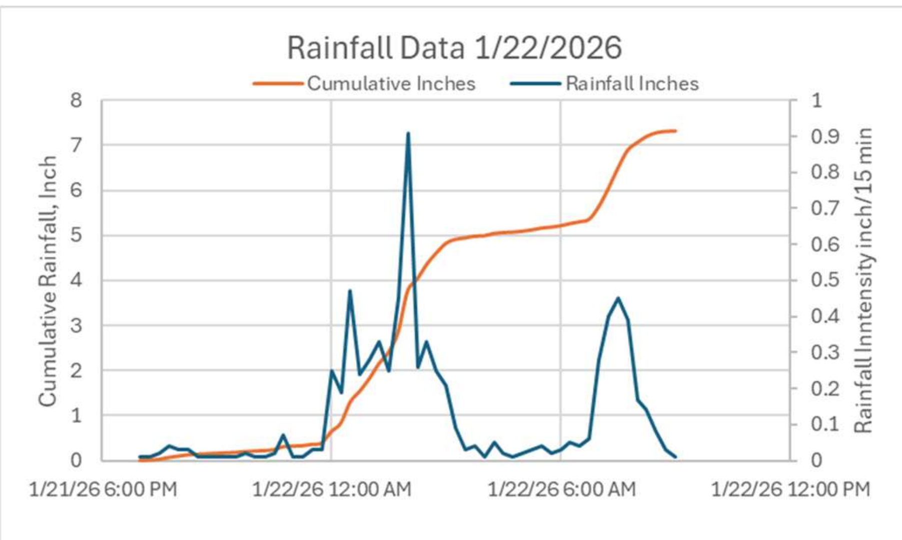
1. Project Summary: Alternative Stormwater Plan of Zone 1 and Zone 1 Ext
2. Level of Service
3. Water Quality/Environmental Aspects
4. Implementation : Landscaping and Tree Impact, Roadway Regrading, Constructability and Implementation
5. Cost Management and O&M Considerations
6. Recommendations

1.1 PROJECT PURPOSE AND DECISION CONTEXT

- Present a decision-ready comparison of decentralized and centralized stormwater concepts for Zone 1.
- Support evaluation of capital cost, constructability, phasing, annual O&M, and environmental posture.
- Focus of this deliverable is the distributed injection concepts and their implementation framework.
- Based on 3 deliverable products:
  - Data Collection and Flood Delineation
  - Conceptual Alternative Stormwater Plan
  - Constructability, Implementation and Cost Management Strategies

1.2 EXISTING DRAINAGE SETTING AND NEED

- Low-gradient, tidally influenced coastal system.
- Roadway flooding is influenced by tailwater, aging storm sewer deficiencies, and discontinuities in conveyance.

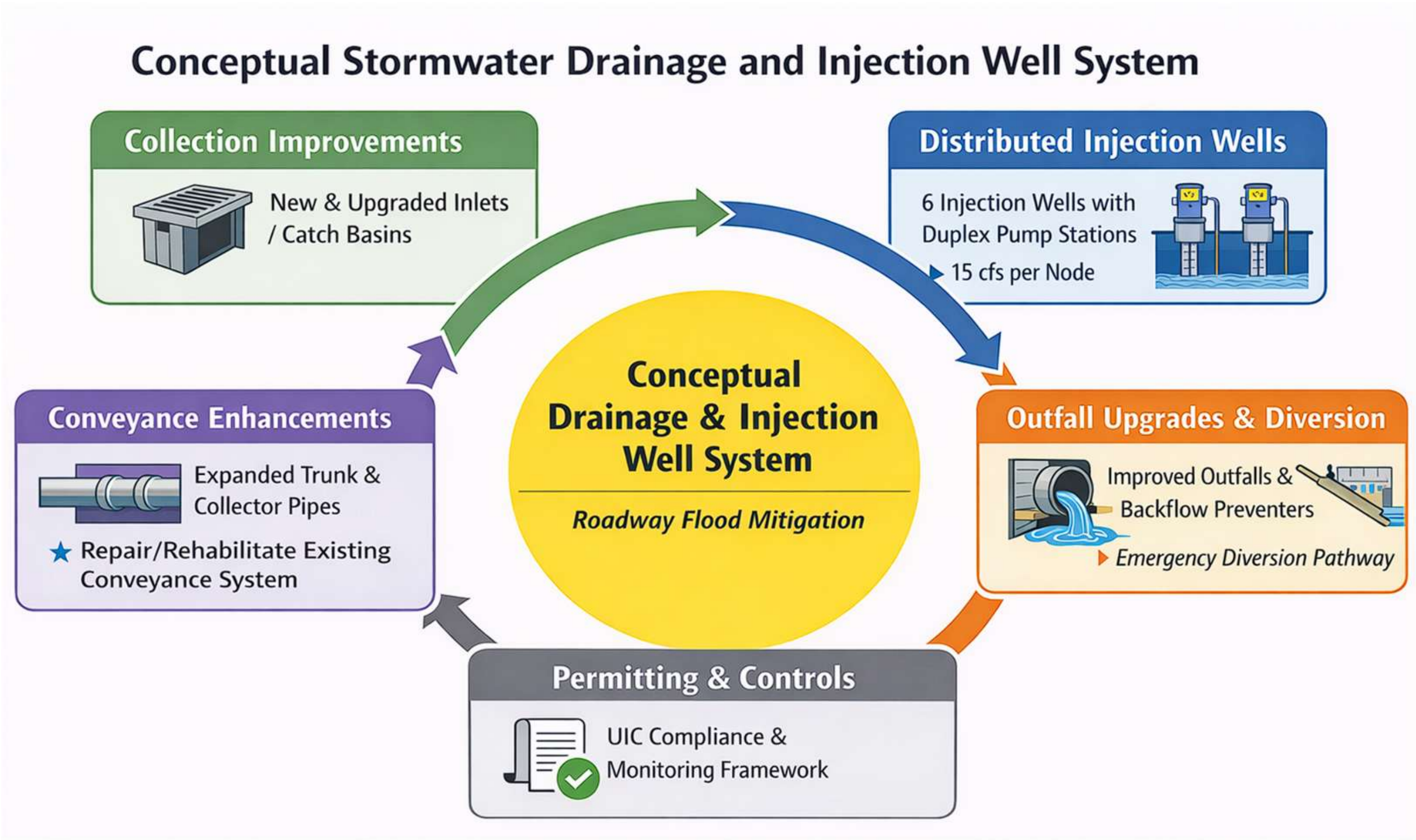


Recent Example: 1/22/2026 7.3 inch almost 10-yr storm (7.93 inch)

1.3. PROJECT SUMMARY

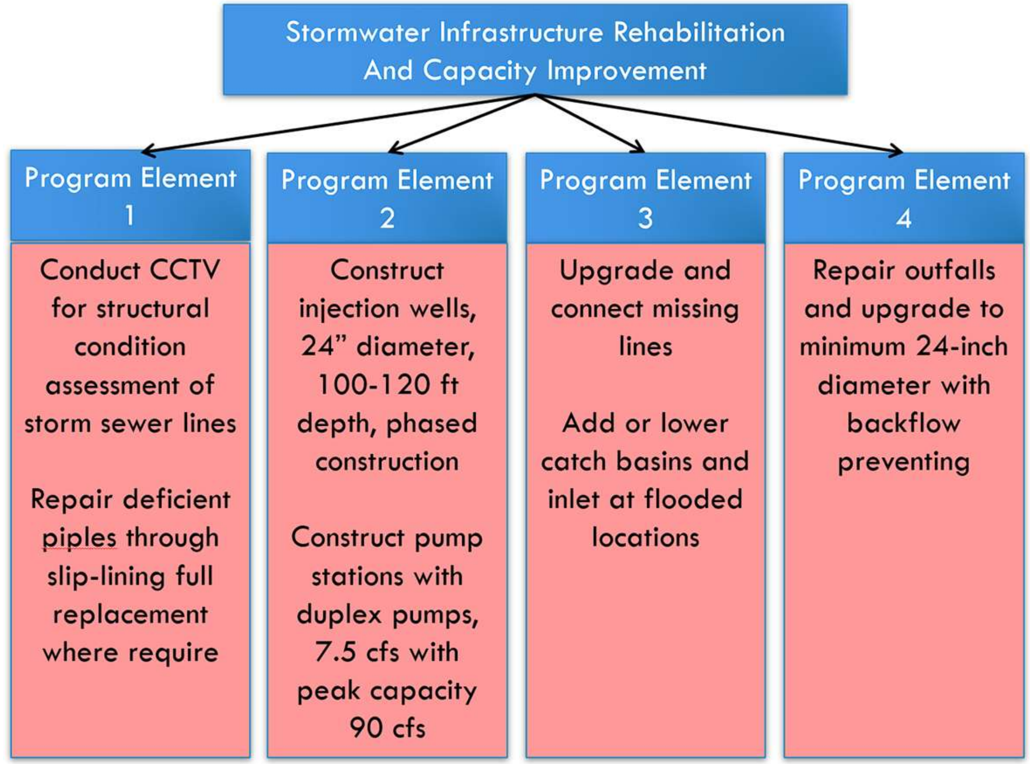
- **Summary:** Addressed Comments related to Network Configuration, Cost Management, Constructability and Implementation Strategies
- **Constructability:** The decentralized system will have local issues including drilling access, utilities, dewatering, and restoration.
- **Implementation Strategy:** Three design-build packages, each with 2 pump stations and 2 injection wells, under one owner criteria package.
- **Cost Management:** Decentralized alternatives are lower than the centralized basis

2 CONCEPTUAL STORMWATER DRAINAGE AND INJECTION WELL SYSTEM



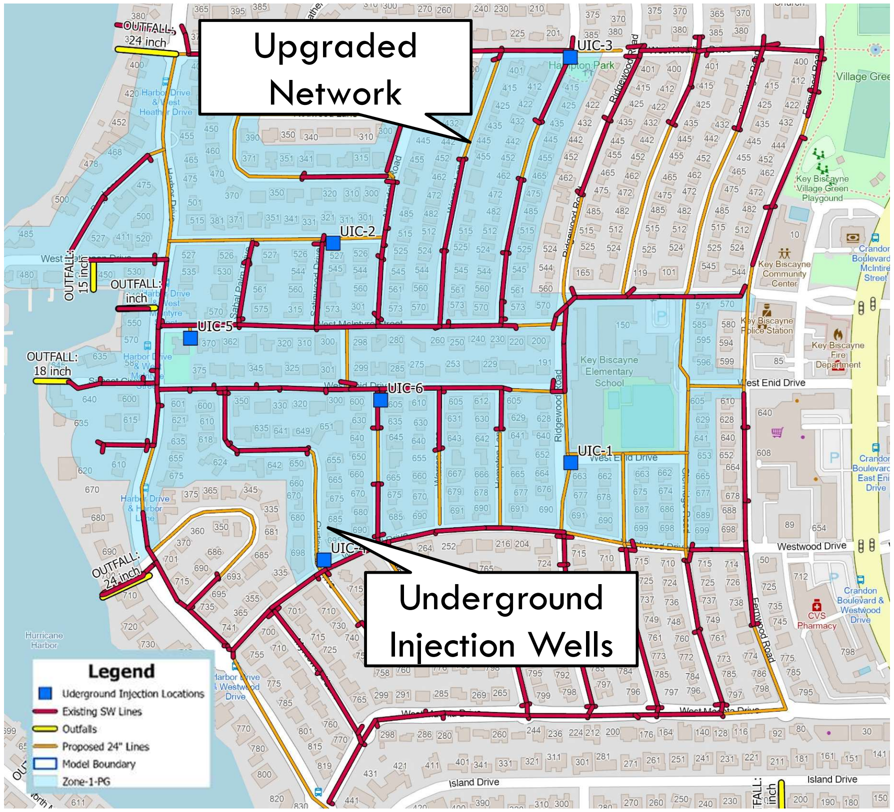
2.1 PROGRAM ELEMENTS OF THE PROPOSED IMPROVEMENT STRATEGY

- Program Element 1: CCTV inspection and storm sewer repair.
- Program Element 2: Six groundwater injection wells paired with six pump stations.
- Program Element 3: Pipeline upgrades, new connections, and inlet improvements.
- Program Element 4: Outfall upgrades and backflow prevention



2.2 ALTERNATIVES EVALUATED

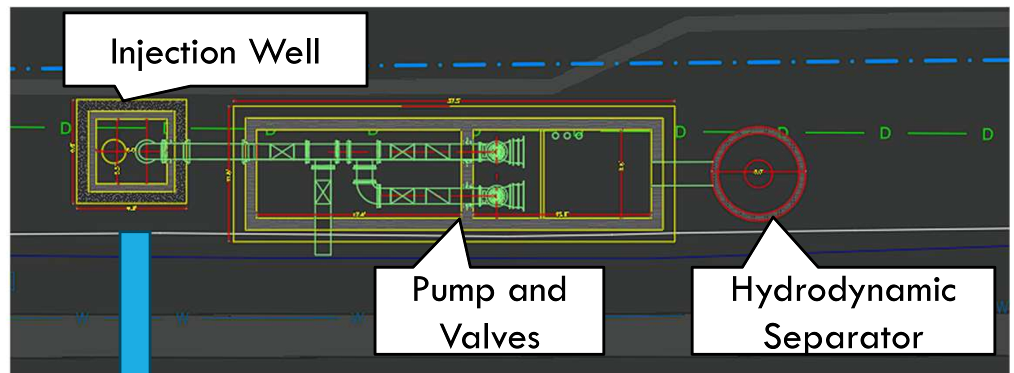
- Zone 1 Injection: Base distributed concept for the original service area – 6 modules consisting of duplex pumps, injection wells, appurtenance, control panels and sediment and water quality control all underground except electric panel
- Zone 1 Ext Injection: Same six-well active system with broader passive drainage capture area.
- Addition of storm lines to improve flow conveyance and distribution
- Addition of catch basins and inlets to improve flow capacity
- Grading and resurfacing to improve flow direction

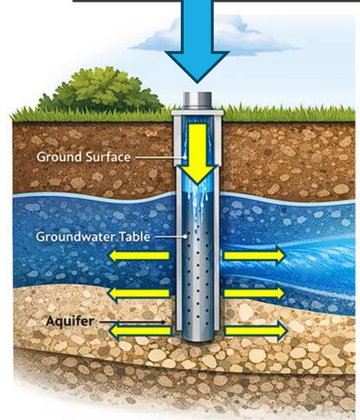


Alternative Stormwater System Concept

2.3 CONCEPTUAL TECHNICAL BASIS OF THE DISTRIBUTED SYSTEM

- Runoff is intercepted locally and routed to distributed node locations by gravity
- Pretreatment and pumping are used to convey runoff to injection wells for subsurface disposal.
- Backup diversion to outfalls is available during offline or head-limited conditions.





Well Injection

- Example: West Enid Drive (south of K-8 School)
- Total dimension of each module 65 ft x 15 ft, lowest point is 20 ft below ground
- Well depth 120 ft below ground
- El electric panel 4x4 ft is above ground, could be made telescopic for storm event to be elevated

2.5 BEST ENGINEERING PRACTICES – BACKUP GENERATORS

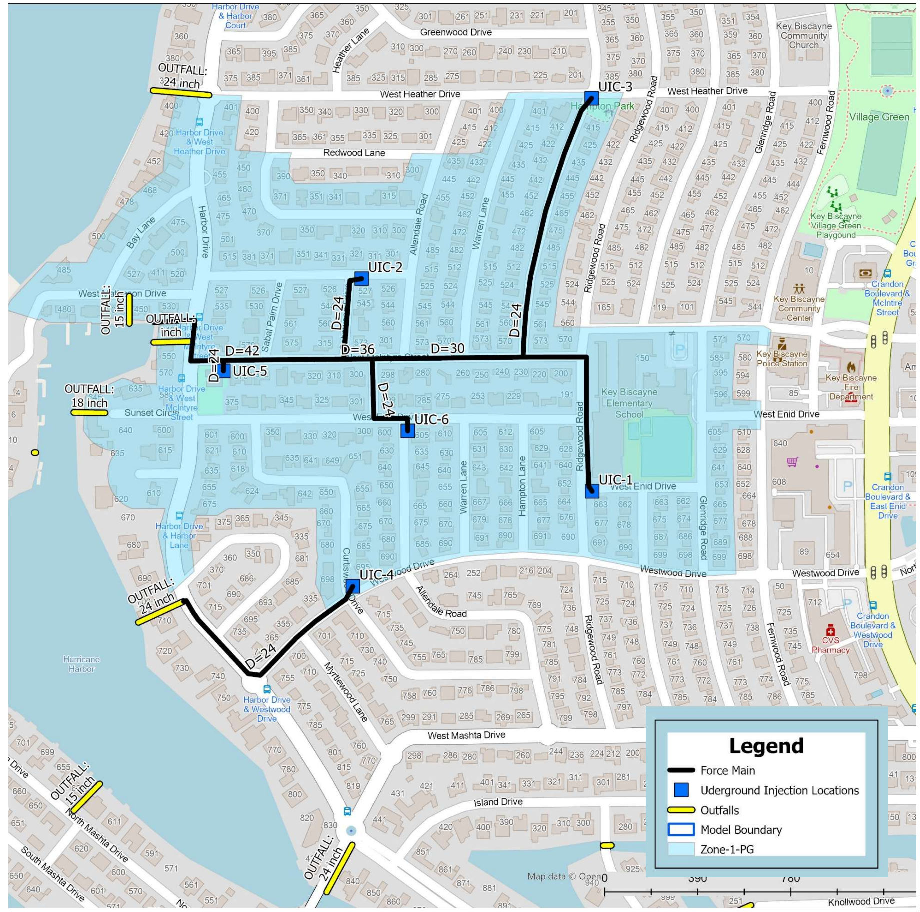
- Permanent backup generators are not recommended as a standard feature at planning level for Zone 1 or Zone 1 Ext
- System resilience is provided primarily by distributed nodes and reduced single-point-failure exposure.
- Generator-ready or site-specific future provisions may be considered where later design identifies a high-consequence node.

Village of Key Biscayne

2.6 BEST ENGINEERING PRACTICES – FORCE MAINS

- Not included - a manifolded force main system for a secondary conveyance path connected to the injection well nodes - a pressure conveyance relief header that can be activated.

- Provides a controlled pumped diversion route to convey stormwater away from a well node when one or more of the following conditions occur:
  - (a) the instantaneous inflow to a node exceeds the well acceptance capacity,
  - (b) the well is temporarily unavailable due to inspection, rehabilitation, or maintenance,
  - (c) groundwater mounding or localized backpressure limits injection rates, or
  - (d) an extreme event requires routing to a permitted outfall to manage system-level risk.

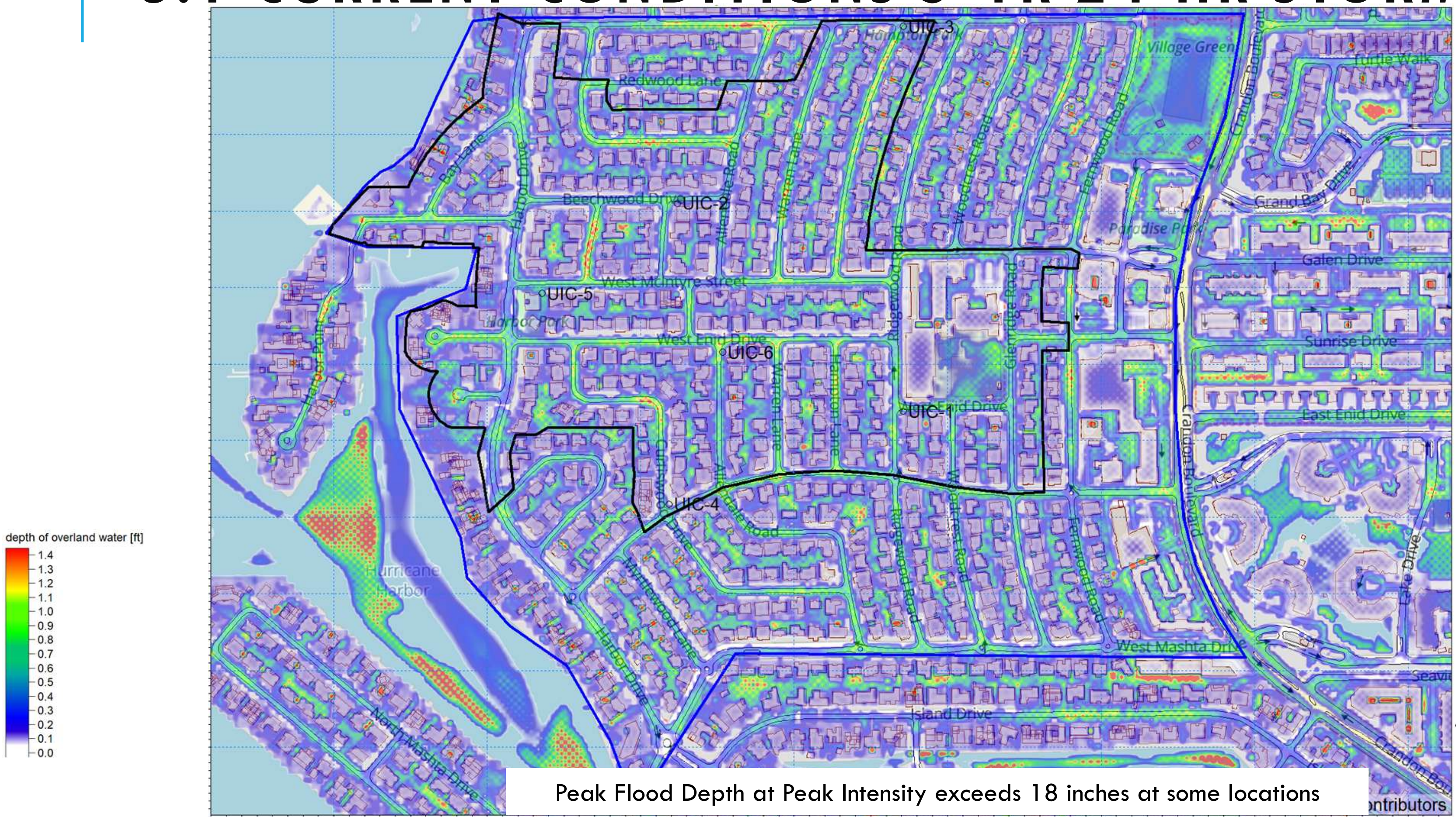


3 REQUIRED LEVEL OF SERVICE SUMMARY

- The injection well project meets the Zone 1 level of service using the 2050 planning horizon, NOAA Intermediate sea level rise, and the SFWMD 5-year, 24-hour design storm.
- Configured to reduce roadway flooding to the target performance of no more than 14 inches above the low crown for no longer than 3.5 hours.
- Distributed collection, pumping, and injection to provide drainage relief where gravity discharge alone is limited by flat grades.
- Focused capacity in the priority service area to provide immediate local flood relief and remain compatible with future phased Village improvements.
- Addressed both current and future conditions by improving flood depth reduction, drawdown time, and system resilience under rising tailwater and groundwater constraints.

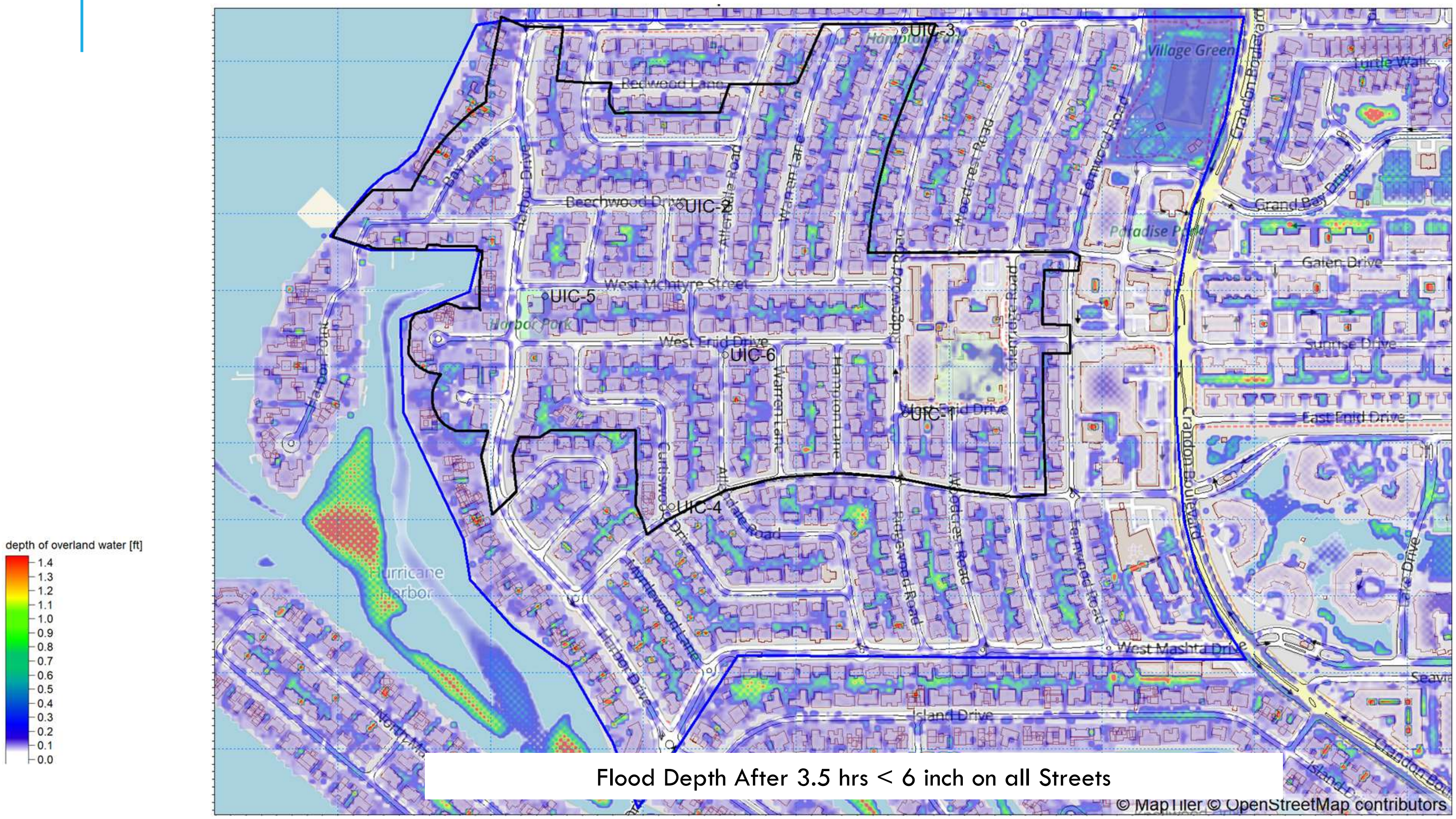
Category	Requirement
Project area	Zone 1, with focus on the K-8 Basin / K-8 School area
Design horizon	2050
Sea level rise basis	NOAA Intermediate curve
Design storm	SFWMD 5-year, 24-hour storm
Residential home elevation criterion	Base Flood Elevation + 3 ft
Residential contributing area criterion	25 ft from Right of Way
Minimum roadway elevation criterion	Mean Sea Level + 1 ft
Level of service performance target	Maximum depth of 14 inches over the low crown of road for no longer than 3.5 hours
K-8 area objective	Provide a solution that gives immediate relief to the K-8 School area and can function as a standalone system within the larger Village plan
Additional modeling consideration	Evaluate discharge requirements considering present and future groundwater table elevations and how required discharge capacity may change over the design life

3.1 CURRENT CONDITIONS 5-YR 24-HR STORM



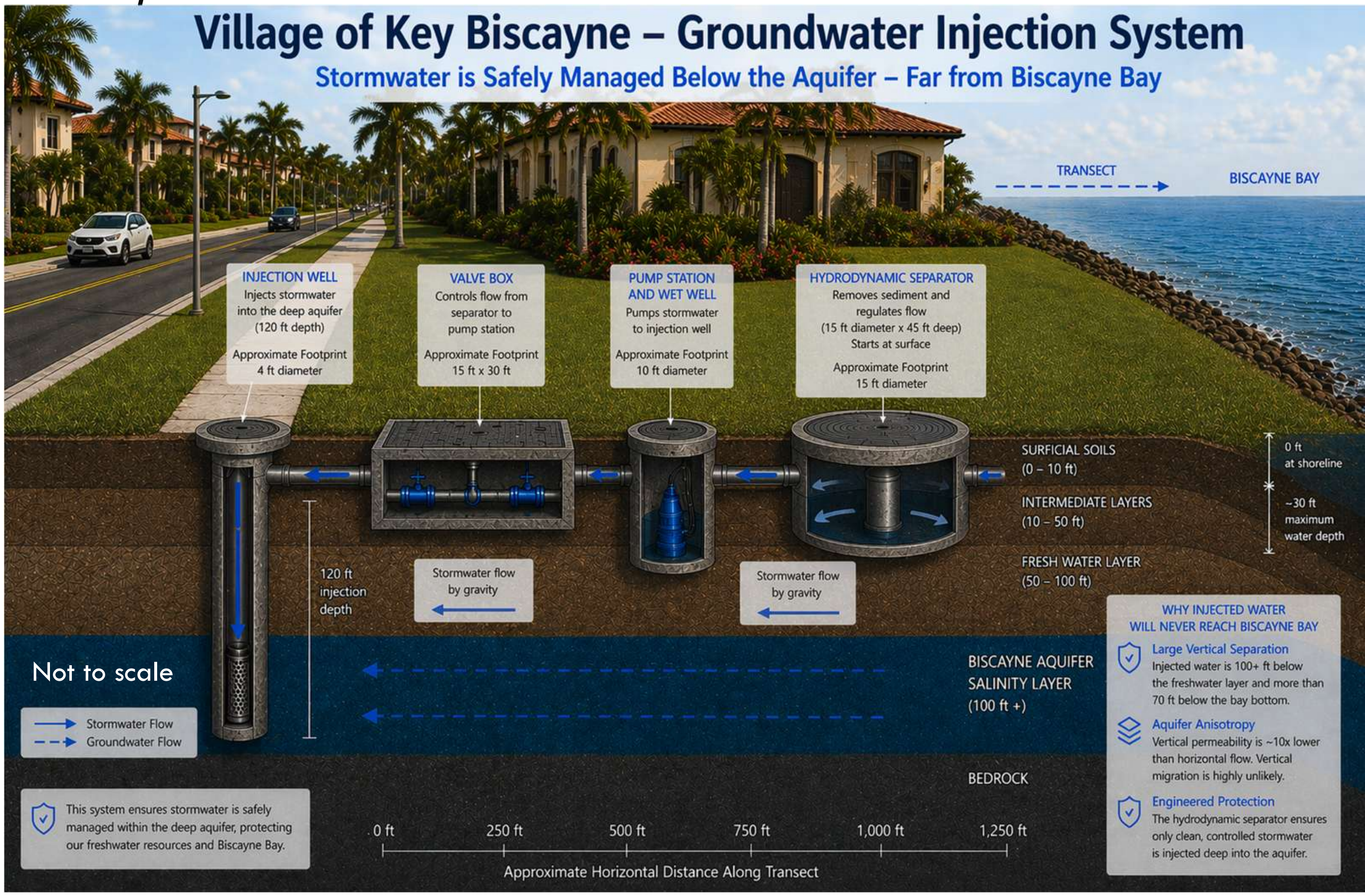
Peak Flood Depth at Peak Intensity exceeds 18 inches at some locations

3.3 PROPOSED MITIGATION 5-YR 24-HR STORM



4. ENVIRONMENTAL/WATER QUALITY

- Stormwater drains by gravity to the hydrodynamic separator.
- After hydrodynamic separation of solids, runoff enters pumping wet well
- Submersible pumps transfers runoff to a valve box with bypass capabilities
- Pressurized fluid is injected in the well at depth between 50 and 120 ft and spreads in horizontal radial direction



5. IMPLEMENTATION

- The proposed system does not present any major inherent deficiencies.
- The principal implementation challenges are expected to include drilling access, dewatering, utility conflicts, pretreatment configuration, electrical integration, and site restoration.
- Construction would be distributed across each localized nodes and connection tie-ins.

5.1 NODE-BASED CONSTRUCTION LOGIC

- Each node combines collection tie-ins, pretreatment, wet well or node structure, pumps, valves, wellhead works, electrical service, and controls.
- Standardized layout and repeatable sequence are needed to control cost and reduce field variation.
- Well drilling and completion can control the node schedule more than wet-well excavation.

5.2 SCHEDULE AND PHASING

- Notice to Proceed planning basis: October 1, 2026.
- Preconstruction and procurement period: about 18 months for both decentralized alternatives.
- Total duration: about 28 months for Zone 1 and 29 months for Zone 1 Ext, with overlapping design-build activities.

5.3 ROAD RAISING VERSUS DRAINAGE-FOCUSED RETROFIT

- Preferred strategy is increased inlet density, conveyance continuity, and discharge improvements.
- Roadway raising should be reserved for isolated residual sags or future full-reconstruction contexts.
- Drainage-focused retrofit better addresses tailwater-controlled flooding with fewer secondary impactss

North Bay Village
CMA, 2026

5.4 UTILITY, DEWATERING, AND SITE CONSTRAINTS

- Utility conflicts remain material, but occur as repeated site-specific constraints rather than one continuous corridor issue.
- Repeated moderate excavations require standardized dewatering and geotechnical support methods.
- Zone 1 Ext has greater cumulative exposure because of broader passive footprint and more local tie-ins.

6. COST MANAGEMENT AND O&M FRAMEWORK

- Comparison extends beyond total capital cost alone.
- Framework separates collection, conveyance, active systems, discharge and treatment, civil restoration, implementation support, O&M, qualitative factors, and environmental considerations.
- Estimate fields include basis of cost, cost year, confidence, and applicability by alternative.

A. Collection and Inflow
B. Conveyance
C. Active Systems
D. Discharge and Treatment
E. Civil and Restoration
F. Implementation Support
G. Benefit and Evaluation Metrics
H. Annual Operations and Maintenance
I. Design Criteria Package, Basis of Design, and Procurement Support
J. Qualitative Evaluation Criteria
K. Not Included
L. Environmental and Receiving Water Considerations
M. Project Level Costs

6.1 MAJOR COST DRIVERS BY CATEGORY

- Active Systems is the largest capital component for both decentralized alternatives.
- Conveyance is the second major cost driver.
- Civil and Restoration increases substantially in Zone 1 Ext and dominates the centralized basis.

North Bay Village Trench and Road Restoration CMA, 2026

6.2 PROJECT-LEVEL SUMMARY

TOTAL ESTIMATED CONSTRUCTION COST		Zone 1 Injection	Zone 1 Extended Injection
		TOTAL	TOTAL
1	ITEM NO. 1 - GENERAL CONDITIONS	$2,900,000	$4,000,000
2	ITEM NO. 2 - SYSTEM EXPLORATION & DEMOLITION	$843,373	$1,132,686
3	ITEM NO. 3 - STORM DRAINAGE - PUMP STATION	$24,395,121	$24,395,121
4	ITEM NO. 4 - STORM DRAINAGE - GRAVITY COLLECTION SYSTEM	$3,511,869	$6,566,742
5	ITEM NO. 5 - STORM DRAINAGE - FUTURE FORCE MAIN DISCHARGE	$4,165,931	$4,165,931
6	ITEM NO. 6 - ROADWAY AND SITE IMPROVEMENTS	$2,324,674	$4,844,691
7	ITEM NO. 7 - DEWATERING, EROSION CONTROL, & ENVIRONMENTAL	$1,080,000	$2,250,000
8	ITEM NO. 8 - ALLOWANCES	$4,377,218	$4,377,218
PROJECT SUBTOTAL		**$43,598,187**	**$51,732,389**
	CONTINGENCY (30%)	$13,079,456	$15,519,717
PROJECT TOTAL		**$56,677,643**	**$67,252,105**

*Budget Estimate: A comparable system including 7 injection wells, duplex pumping with a total capacity of approximately 36,000 gpm (about 80 cfs), and water quality treatment was budgeted at approximately $4.0 million. A contractor bid for a similar system was $3.97M.

6.3 BENEFIT AND EVALUATION METRICS SUMMARY

G. Benefit and evaluation metrics	Zone 1 Injection	Zone 1 Ext Injection
Parcels served	311	644
Area served (acres)	93	217
Cost per acre served	$516,930	$270,012
Cost per parcel served	$154,580	$90,982
Cost per acre-foot managed	$451,785	$460,272

- The benefit metrics indicate that Zone 1 Ext serves a substantially larger area and parcel count than Zone 1, while maintaining comparable hydraulic benefit metrics.
- Zone 1 Ext shows improved unit cost performance for cost per acre served and cost per parcel served.

7. RECOMMENDATION

- Zone 1 is the base case for initial implementation and procurement.
- Zone 1 Ext is the preferred value alternative because it expands drainage benefit using the same core six-node active investment.
- Proceed with node-based design-build delivery, early constructability screening, and estimate refinement focused on passive works, utilities, drilling logistics, and restoration.

Thank you!

QUESTIONS