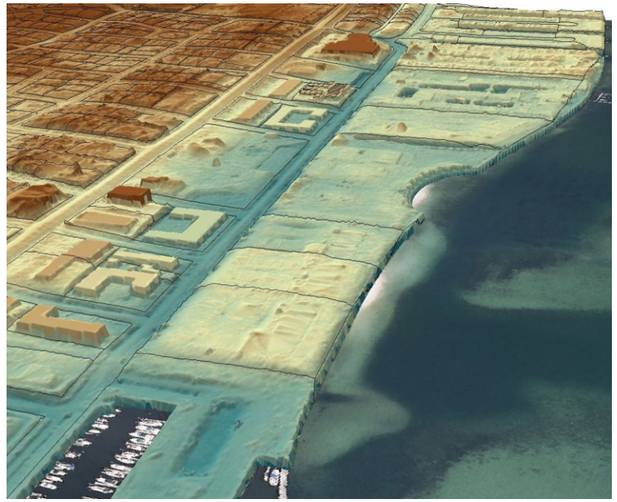
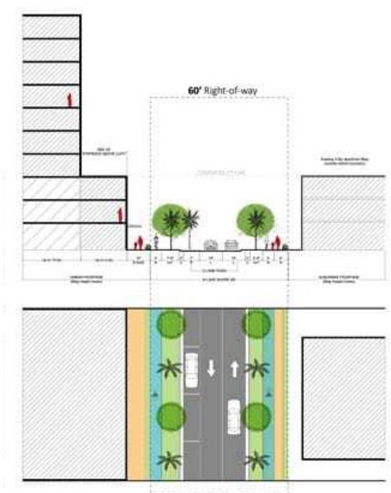
PRELIMINARY DESIGN REPORT

Lake Shore Drive Drainage Improvements

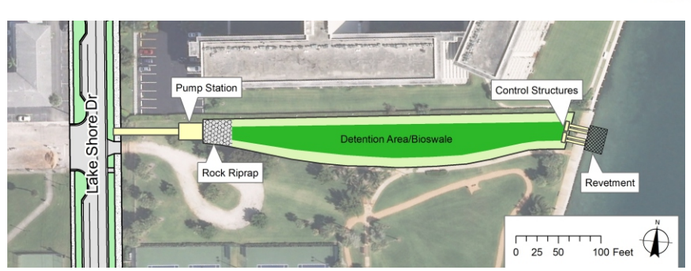




March 2019

FINAL

Prepared by:



BAXTER & WOODMAN
Consulting Engineers

ENGINEER'S CERTIFICATION

I hereby certify, as a Professional Engineer in the State of Florida, that the information in this Preliminary Design Report for Lake Shore Drive Drainage Improvements was assembled under my direct responsible charge. The information provided herein was based on the information that was available and obtained from the Town of Lake Park. The certifying Engineer cannot be responsible for added or deleted information once distributed. This report is not intended or represented to be suitable for any reuse without specific verification or adoption by the Engineer. This Certification is provided in accordance with the Florida Board of Professional Engineers' Rule on Certification under Chapter 61G15-29.

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Town of Lake Park
Lake Shore Drive
Drainage Improvements
Draft Preliminary Design Report

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Section 1 Introduction

1.1 Project Background

The Town of Lake Park (Town) desires to conduct roadway and drainage improvements for Lake Shore Drive from Castlewood Drive extending south to the entrance of the Lake Park Marina (***Figure 1-1***). In conjunction with the Town's project, Seacoast Utility Authority (SUA) desires to install water and sewer improvements within the project area.

Figure 1-1: Project Location Map

The Town has selected Baxter & Woodman, Inc.(BW) to provide these services through the Request for Qualifications (RFQ) No. 105-2018. SUA subsequently requested and approved a proposal from BW to provide the design services for water and sewer facilities.

Lake Shore Drive was originally constructed when the Town of Lake Park was known as Kelsey City. At that time, Kelsey City and was bounded by Lake Worth, hence the name Lake Shore Drive. In the early 1960s, new land was created east of the roadway by dredging fill from Lake Worth (also referred to as the Intracoastal Waterway or the Lake Worth Lagoon). ***Figure 1-2*** shows aerial photos from 1953 and 1964, the latter showing the newly created land on the east side of Lake Shore Drive. During this time period, much of the land on the west side of the road had not been developed.

The road was originally constructed with minimal roadway drainage infrastructure; however, outfall pipes were constructed when the new land was created to allow drainage to be maintained to the Lake Worth Lagoon. As development occurred, the road became a low feature of the overall drainage basin. The high amounts of impervious area associated with the new apartment and condominium complexes along Lake Shore Drive contributed higher volumes of stormwater runoff to road. The lack of existing drainage infrastructure along the road resulted in several areas of ponding/trapped runoff and prolonged saturated soil conditions.

To address the drainage issues along Lake Shore Drive, the Town contracted with an engineering firm to design improvements to the existing drainage system in 2008. A permit was issued by the South Florida Water Management District in 2011 for the proposed stormwater improvements. These proposed stormwater improvements were not implemented and the permit expired in 2016. Shortly after the permit expiration date, Lake Shore Drive experienced flooding due to a king tide event. Concerns over Sea Level Rise (SLR) and king tides prompted the Town to request a study by the same engineering firm to assess the incorporation of a stormwater pumping station. This study was

completed in April of 2018 and recommended changes to the previously designed system as well as a 50,000 gallon per minute (gpm) stormwater pump station.

Lake Shore Drive Aerial, 1953

Lake Shore Drive Aerial, 1964

Figure 1-2: Historical Images

Since completion of the previous study, the Town has started a program designed to revitalize this area of the Town in conjunction with the ongoing countywide Florida Department of Transportation (FDOT) US 1 Corridor Re-Study. This program is called Vision Lake Park (www.visionlakepark.com) and includes roadway reconstruction with bike and pedestrian friendly features, landscaping, lighting and codes designed to steer and manage new development into the area.

The purpose of this project is to review the study previously completed in 2008 and propose drainage and roadway improvements that will support Vision Lake Park into the future. The project will review Sea Level Rise events including storm surges, king tides and consider the effects of climate change.

1.2 Project Components

The following project components were completed as part of this preliminary design report:

- *Topographic Survey* – As a cost saving measure, the survey conducted in the previous design effort was utilized. A field survey check was performed to identify the features that have changed since the previous survey, which was performed by Calvin, Giordano & Associates, Inc. approximately ten years ago. MC survey crews were then dispatched to acquire any missing or changed features also in addition to performing spot-checks on some of the coordinates and elevations that were previously obtained. The horizontal control for the previous survey was maintained which was referenced from the Palm Beach County Control Network – North American Datum of 1983 and the 1990 adjustment for horizontal control. The vertical control, however, was modified from the National Geodetic Vertical Datum (NGVD) of 1929 to the North American Vertical Datum (NAVD) of 1988.The combined survey information is included in ***Appendix A***.

- *Geotechnical* – Terracon, Inc. provided geotechnical subsurface investigations of the project area including pavement cores, auger borings, standard penetration test borings and a field permeability test. The completed geotechnical report is included in ***Appendix B***.

- *Sites Visits* – Site visits were performed to confirm inflow from offsite drainage systems, verify stormwater outfalls and identify areas of ponding.

This Preliminary Design Report provides the above findings and presents infrastructure improvement recommendations for the project area, along with a preliminary Engineer's estimate of probable construction costs. The improvements examined in this project include:

- Stormwater collection, swales, piping, pumping and detention
- Roadway reconstruction
- Signing and pavement markings
- Sidewalks and all Americans with Disability Act (ADA) requirements
- Landscaping
- Lighting
- Driveway impacts
- Coordination with Seacoast for potable water main upgrades and sanitary sewer rehabilitation or replacement

To facilitate review, the Preliminary Design Report has been divided into six (6) sections. The content of each section is briefly summarized below.

Section 1 - Introduction: discusses the project background and scope of the project.

Section 2 -Stormwater Analysis: discusses the review of the existing stormwater system and the proposed stormwater infrastructure improvements. The proposed stormwater improvements are based

on multiple flood routing model scenario results that were run to mitigate ponding, king tides, and SLR. The flood routing model results are provided in ***Appendix C***.

Section 3 -Roadway Analysis: discusses the visual inspection of the existing roadway conditions; geotechnical investigation performed in the project area;; pavement replacement options; pedestrian improvements; and provision of parallel parking in selected areas as prescribed for this area in the Town's Vision Lake Park program.

Section 4 -Landscaping and Lighting: discusses options for plants and trees to be planted in association with the project, taking into account the environmental conditions. Lighting options within the road right-of-way and other pertinent areas for lighting are also discussed.

Section 5 -Seacoast Utility Authority Coordination: discusses potable water main sanitary sewer infrastructure improvements requested by SUA that will be constructed in coordination with the Town's project.

Section 6-Conclusions and Recommendations: summarizes and describes the recommended drainage infrastructure, roadway, landscaping and lighting improvements and the Engineer's estimate of probable construction cost.

Section 2 Stormwater Analysis

2.1 Existing Drainage

Natural drainage patterns within the watershed were drastically altered in the early 1960's when new land was created on the east side of Lake Shore Drive. The newly created land was built at elevations higher than the existing road, preventing the natural stormwater overland flow from the road to the Intracoastal Waterway, also known as the Lake Worth Lagoon. To maintain drainage, three (3) 30-inch diameter outfall pipes were installed spanning the new land from the roadway to the new coastline of the Lake Worth Lagoon. The southern end of the roadway discharges runoff through an existing 60-inch outfall pipe that serves a large portion of the Town west of Lake Shore Drive.

Most of the created land drains east to the Lake Worth Lagoon and does not discharge to the roadway. The roadway, however, accepts drainage from the west up to U.S. Highway 1 where the coastal ridge begins. U.S. Highway 1, also known as Federal Highway and Broadway Avenue, includes a drainage system that does not drain into the watershed. Land immediately east of U.S. Highway 1 sheet flows via parking lots and side-streets to Lake Shore Drive. Existing swales and limited inlets and pipes along Lake Shore Drive assist in directing the water to the four existing outfalls.

For the Lake Shore Drive project area, the overall watershed and internal basin boundaries were determined based on topography, existing drainage infrastructure and field visits. ***Figure 2-1*** shows the existing drainage system including ground elevations from the most recent, available LiDAR (Light Detection and Ranging) data (2017), basin boundaries and the locations of existing drainage pipes.

Flooding has been observed at low lying areas and ponding occurs frequently. In 2012, major flooding occurred due to a large storm event that was estimated to exceed 7-inches in magnitude (***Photo 2-1***). Frequent ponding also occurs due to grading issues where runoff is trapped (see ***Photo 2-2 and Photo 2-3).*** Another severe flooding event occurred in October 2016 when low lying areas were flooded by a king tide event that pushed water from Lake Worth Lagoon into the street (***Photo 2-4***).

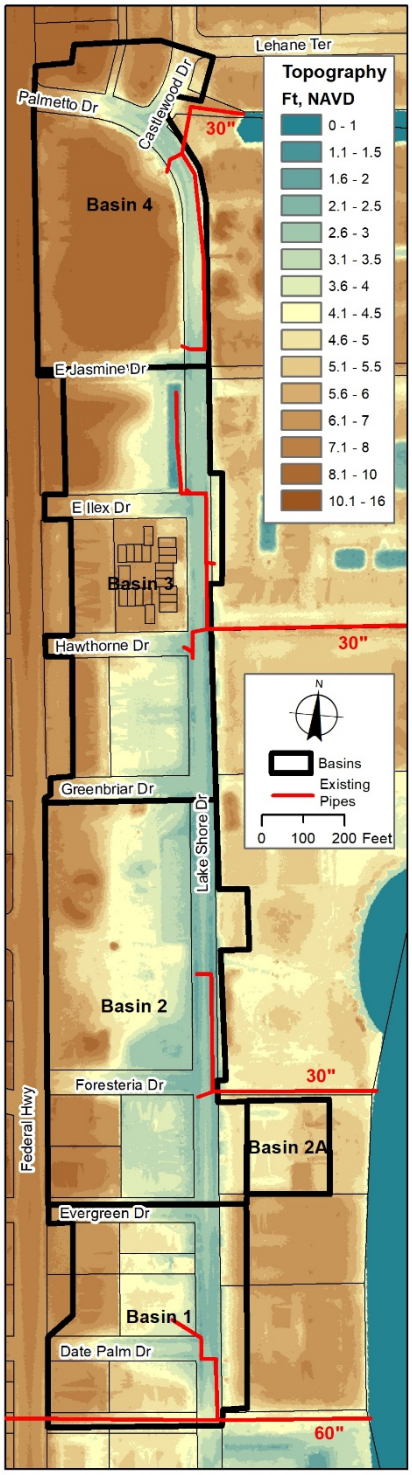


Figure 2-1: Existing Drainage

The existing drainage infrastructure only exists in certain locations. Most of the existing drainage infrastructure is decades old and in fair to poor condition (see ***Photo 2-5***). Closed-circuit televising (CCTV) of the existing drainage system was not part of the project scope, but based on the estimated age of the existing drainage infrastructure and visual observation, it appears that the existing drainage system is near the end of its service life. It is recommended that the existing structures not be utilized in the proposed drainage improvements with the exception of the four existing outfall pipes, which will be maintained and connected to the proposed drainage system.

Photo 2-1: Pictures taken during flood of 2012 in vicinity of Hawthorn Drive

Photo 2-2: Intersection of Lake Shore Drive and Evergreen Drive, looking southwest.

Photo 2-3: Lake Shore Drive, looking south.

Photo 2-4: King tide flooding at Lake Shore Drive and Date Palm Drive (Oct 2016) looking north

Photo 2-5: Existing inlet near entrance to Lake Harbour Towers, South.

2.3 Regulatory Requirements

The South Florida Water Management District (SFWMD) is the controlling agency in regard to permitting, regulation and enforcement of construction related activities that effect Waters of the State. Lake Worth Lagoon is considered Waters of the State. For proposed stormwater improvements, SFWMD imposes a pre- versus post- limitation for peak discharge rates associated with a 25-year, 3-day storm event. In addition to the pre- vs. post-analysis, SFWMD also requires water quality treatment of a determined volume of runoff based on the amount of impervious area. The required water quality treatment is usually accomplished via lakes or dry detention/retention areas.

Since the project area was developed before these requirements existed, SFWMD is primarily concerned with water quality treatment of runoff from any new impervious areas. SFWMD requires treatment for up to 2.5 inches of runoff over the new impervious area. Since the road will be widened to provide parallel parking, the new impervious area will need to be treated in some manner. Typical water quality treatment mechanisms for roadways include exfiltration trenches and swales; however, these methods would have limited effectiveness because of the short depth to the water table.

The primary criteria that SFWMD will use to evaluate the project will be the pre- vs. post- 25-year, 3-day flood stages and peak discharge rates into the Lake Worth Lagoon. Aboveground flood stages cannot be increased as a result of the proposed improvements. Lowering flood stages in one area while increasing flood stages in other areas is not permissible. Additionally, SFWMD will not allow an increase to the peak discharge rates into the Lake Worth Lagoon. Large watershed scale modeling is sometimes needed to make these assessments.

SFWMD also regulates wetlands including seagrass which may exist in the Lake Worth Lagoon. A seagrass survey will be performed at locations where changes are proposed such as new outfall pipes. Impacts to seagrass will need to be avoided or mitigated.

2.4 Stormwater Modeling

A flood routing model was set up to simulate the existing drainage systems using Inter-connected Pond Routing Version 4 (ICPR4) software. This model can simulate various storm events to verify the benefits of potential improvements while verifying that the proposed improvements are able to be permitted per SFWMD requirements (i.e. flood stages and peak discharge rates cannot be increased).. These criteria are evaluated for a 25-year, 3-day storm event. A 3-year, 1-day storm is used to size the drainage pipes which in turn, evaluates the Level of Service (LOS) relative to street flooding.

2.4.1 Hydrology

Subbasins were delineated, as shown in ***Figure 2-1***, to define individual catchment areas that collect runoff and discharge it to pre-determined locations. LiDAR data was used along with locations of existing stormwater infrastructure to determine the hydrologic divides. Land use and soils have a significant influence over the runoff characteristics within the watershed (see ***Figure 2-2*** and ***Figure 2-3***). The majority of the soils within the project area are classified as Arents-Urban Land Complex, 0 To 5 Percent Slopes (Arents) which is defined by the Natural Resources Conservation Service

(NRCS) as "somewhat poorly drained" meaning that is the soil has a lower than average ability to absorb stormwater runoff. Soils in the higher elevations of the watershed include St. Lucie-Paola-Urban Land Complex (St. Lucie), which is defined as "very well drained" with relatively high percolation rates.

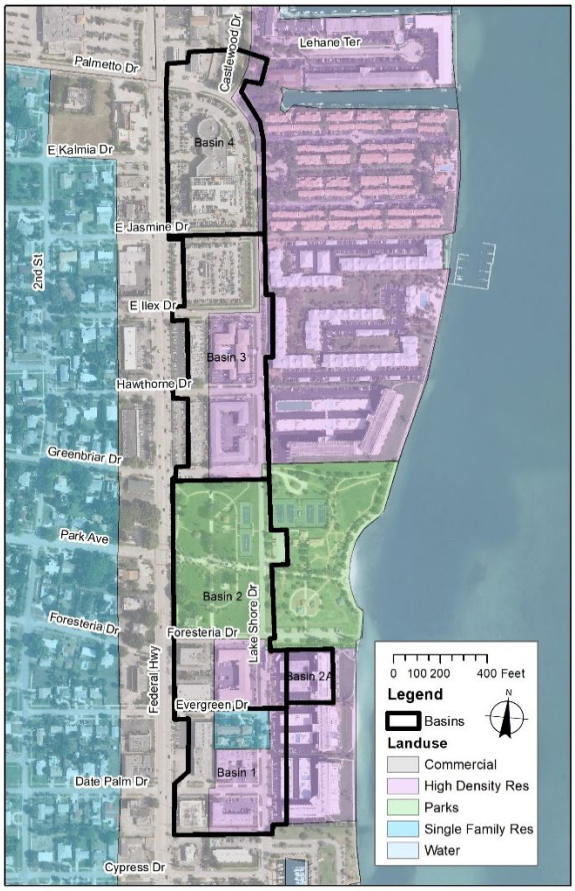


Figure 2-2: Land Use

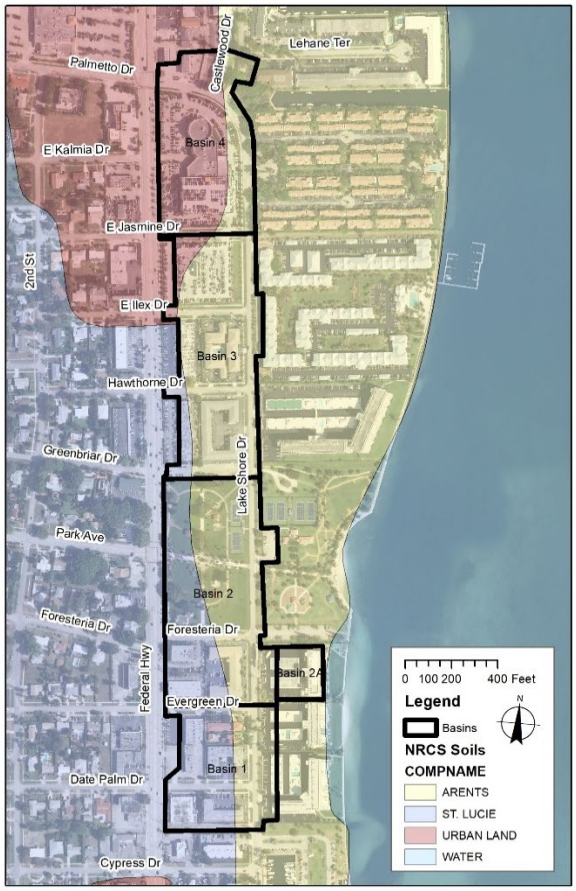


Figure 2-3: Soils

The average depths to the wet season water table varies from 2 to 6 feet. According to SFWMD, the maximum soil storage is 8.18 inches which corresponds to a Curve Number (CN) of 55 for coastal, well drained soils (St. Lucie). Arents soil is considered poorly drained and was designated with a higher CN value of 66 to 84 indicating more runoff and less available soil storage.

These values were used in the model throughout the watershed and were adjusted by impervious values that were applied based on land use. Land use within the area is a mix of high density residential, commercial, park and a small amount of single family residential. Percentages of impervious area by land use range from 25 and 90 percent.

The land use and soils spatial datasets were intersected with the subbasins to create an areal list of land use and soil combinations for each basin. This information is presented in ***Table 2-1*** and was entered into the model's basin parameters. Model reference tables were added for impervious (based on land use) and CN values (based on soils) which the model used to determines each

basin's overall soil capacity. These values are summarized in ***Table 2-1***. Time of Concentration (Tc) values were also calculated for each basin based on travel distances, slopes and types of surfaces.

Table 2-1: Hydrologic Parameters of Land Use and Soil Combinations

Basin	Landuse	Soil	Area (ac)	CN	Impervious
Basin 1	Commercial	ST. LUCIE	1.70	55	90%
Basin 1	High Density Res	ARENTS	1.77	84	90%
Basin 1	High Density Res	ST. LUCIE	1.14	84	90%
Basin 1	Single Family Res	ARENTS	0.46	84	50%
Basin 1	Single Family Res	ST. LUCIE	0.46	55	50%
Basin 2	Commercial	ST. LUCIE	1.18	55	90%
Basin 2	High Density Res	ARENTS	1.49	84	90%
Basin 2	High Density Res	ST. LUCIE	0.52	55	90%
Basin 2	Parks	ARENTS	4.62	84	25%
Basin 2	Parks	ST. LUCIE	2.20	67	25%
Basin 2A	High Density Res	ARENTS	1.05	84	90%
Basin 3	Commercial	ARENTS	3.01	84	90%
Basin 3	Commercial	ST. LUCIE	0.66	55	90%
Basin 3	Commercial	URBAN LAND	0.56	55	90%
Basin 3	High Density Res	ARENTS	4.42	84	90%
Basin 3	Parks	ARENTS	0.04	84	25%
Basin 4	Commercial	ARENTS	1.33	84	90%
Basin 4	Commercial	URBAN LAND	5.05	55	90%
Basin 4	High Density Res	ARENTS	0.72	84	90%

The design storm used for the roadway LOS is a 3-year, 1-day storm event which has an associated rainfall amount of 5.8 inches distributed over a 24-hour statistical hydrograph. A 10-year, 1-day storm event was run which consists of 9.0 inches of rainfall distributed over a 24-hour statistical hydrograph. The design storm used by SFWMD to establish flood stage and discharge criteria is a 25-year, 3-day storm event which has an associated rainfall amount of 13.0 inches distributed over a 72-hour statistical hydrograph. A 50-year, 3-day storm event was also run which consists of 15.5 inches of rainfall distributed over a 24-hour statistical hydrograph.

2.4.2 Hydraulics

The primary existing drainage features used to convey stormwater during a smaller storm event consist of drainage culverts that collect runoff via inlets and transport the water to the Lake Worth Lagoon via the four (4) existing outfall pipes. In addition to these drainage inlets and pipes, larger storm events also rely on overland flow between the basins. This occurs when the drainage infrastructure becomes overwhelmed by the amount of runoff produced by the storm event.

To simulate this in the model, broad crested weirs were placed at subbasin divides. The locations and "irregular" geometry for each weir were determined by producing cross-sectional profiles from the LiDAR information along the subbasin boundaries. These hydraulic features are shown as model elements in ***Figure 2-4*** which was produced from the ICPR4 interface.

A downstream boundary condition node was created to represent tidal conditions in the Lake Worth Lagoon. An average high tide elevation of 1.0 foot, NAVD was used based on monitoring data provided by SFWMD.

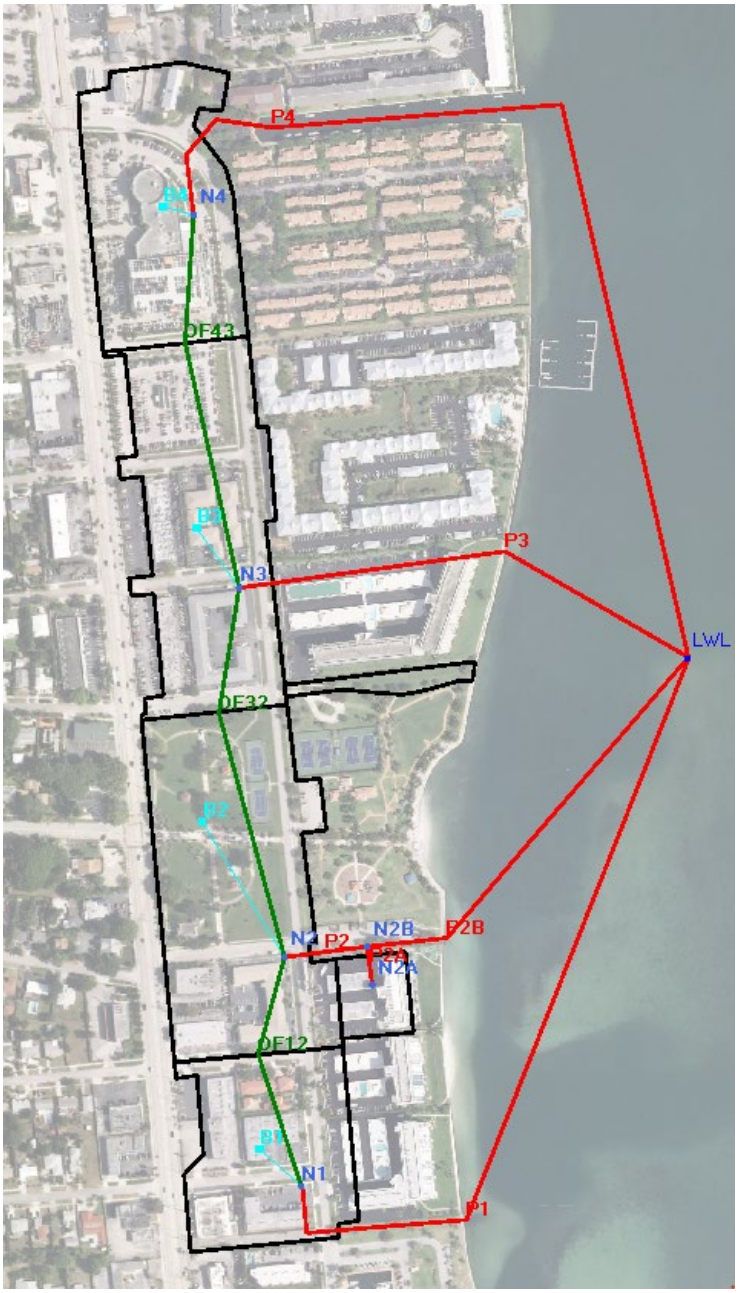


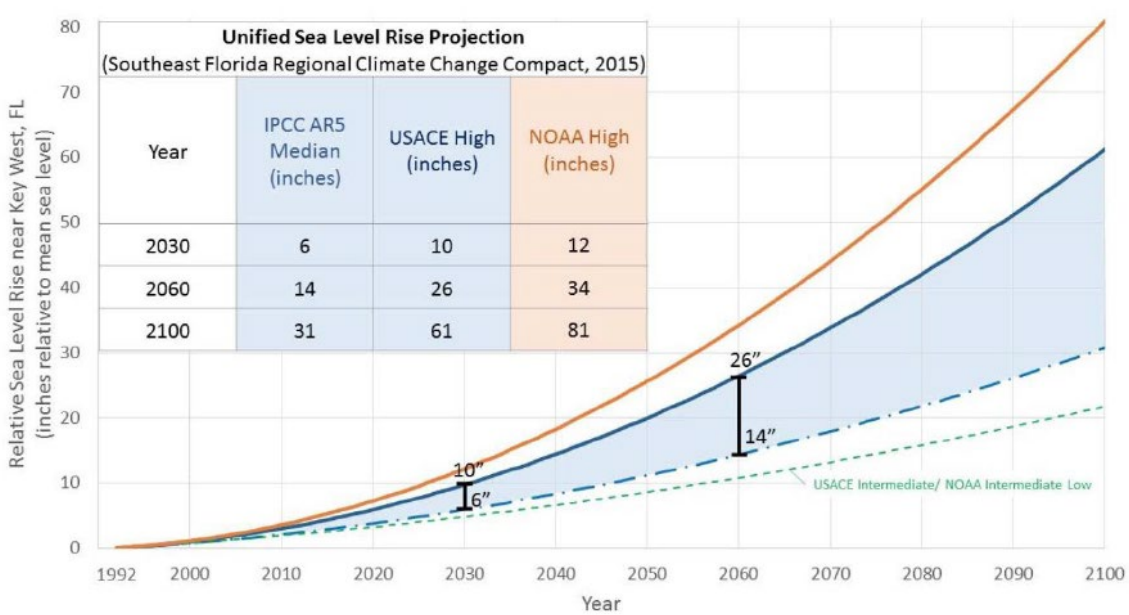
Figure 2-4: ICPR4 Model Network
(Basins = Black, Nodes = Blue, Pipe Links = Red, Overland Flow Weirs = Green)

2.5 Sea Level Rise (SLR) Assessment

Sea Level Rise (SLR) events consist of storm surges, king tides and the effects of climate change. All of which can have adverse impacts on gravity-based drainage systems. Storm surges are usually associated with hurricanes and can vary widely depending on the strength and timing of the storm. The effects are two-fold because the events are accompanied by heavy rains. In contract, king tides are more predictable and rare enough that they usually do not coincide with a major rain event; however, their impacts can be severe. In October of 2016, a king tide event occurred that flooded Lake Shore Drive. It is estimated that the tide associated with that event was 1.4 feet above normal high tide.

The Unified Sea Level Projection was published in October 2015 by the Southeast Florida Regional Climate Change Compact (SEFRCCC) with regional projections for the period from 1992 through 2100 based on projections and scientific literature released since 2011. This publication is being used by local municipalities for SLR planning purposes. The unified projections include three global mean curves that were regionally adapted to account for observed acceleration in SLR in South Florida as shown in ***Figure 2-5***. The three curves consist of an adjusted "NOAA High" curve, U.S. Army Corps of Engineers (USACE) "High" curve (same as the "NOAA Intermediate-High"), and the median of the Intergovernmental Panel on Climate Change Fifth Assessment Report Representative Concentration Pathway 8.5 scenario (i.e. "IPCC AR5 Median" curve). The "USACE Intermediate", which is equivalent to the "NOAA Intermediate-Low" curve, was also included to reflect the projection based on a significant reduction in greenhouse gas emissions, which is not likely given the current emission trends. The "USACE Intermediate/ NOAA Intermediate-Low" curve is not part of SEFRCCC's recommendations.

SEFRCCC Unified Sea Level Rise Projection (SEFRCCC Sea Level Rise Work Group, 2015)



Unified Sea Level Rise Projection
(Southeast Florida Regional Climate Change Compact, 2015)

Year	IPCC AR5 Median (inches)	USACE High (inches)	NOAA High (inches)
2030	6	10	12
2060	14	26	34
2100	31	61	81

Figure 2-5: Sea Level Rise Projections

For this project, the 2060 USACE High prediction was used. According to the graph in ***Figure 2-5***, the change in sea level between 2018 and 2060 is approximately 20 inches for that prediction. This corresponds to 2060 average high tide elevation of 2.7 feet, NAVD. The model was modified to reflect a sea level rise of 1.7 feet corresponding to the year 2060 for storm events up the 25-year 3-day storm. Additional storm surge was assumed for a 50-year 3-day storm event. Tides were raised for this storm event to maximum elevation of 4.1 feet NGVD. Storm surges can certainly be higher, but elevation 4.1 feet elevation is the elevation where water from the Lake Worth Lagoon would begin cresting some portions of Kelsey Park and entering the water management system.

2.6 Drainage Improvement Alternatives

2.6.1 Model Scenarios

Several alternatives were developed to improve and maintain positive drainage for the project area for SLR events. The elements were considered as described below:

- Check valves at pipe outlets
- Raise road elevations
- Pump station
- Detention basin
- Combinations of the above
- Sea level rise assessment

In consideration that the Town's Vision Lake Park plans for the roadway include additional impervious area, it will be necessary to provide water quality treatment of runoff for the new impervious area with methods approved by SFWMD. Acceptable treatment methods include dry detention, swales, lakes or exfiltration trenches. Because of the low depths to the water table, these methods become problematic. An offsite dry detention area is the most practical method and was incorporated in many of the modeling scenarios as described below:

Scenario	Description
Existing	Existing drainage system with no SLR events
Existing Past SL	Existing drainage system with past sea level (-0.5 feet) prior to 1992
Existing w/SLR	Existing drainage system with SLR of 1.7 feet (2060)
Valve Only w/SLR	Add inline check valves to the four existing outfall pipes
Pump and Detention	Add collection system and pump water to a dry detention area located in Kelsey Park with no SLR events. Station includes 1-10 cfs duty pump and 1-20 cfs primary pump and check valves on existing outfall pipes.
Pump & Detention w/SLR	Add collection system and pump water to a dry detention area located in Kelsey Park with SLR of 1.7 feet. Station includes 1-10 cfs duty pump and 2-20 cfs primary pumps and check valves on existing outfall pipes.
Raised Rd & Detention w/SLR	Raise road by 1.5 to 2 feet. Add collection system and drain water via gravity to a dry detention area located in Kelsey Park with SLR of 1.7 feet.

Raised Rd & Det & Pump w/SLR	Raise road by 1.5 to 2 feet. Add collection system and pump water to a dry detention area located in Kelsey Park with SLR of 1.7 feet. Station includes 1-10 cfs duty pump and 2-20 cfs primary pumps and check valves on existing outfall pipes.

A controlling factor in the design of the drainage improvements is the allowable discharge rate which is mandated by SFWMD to not exceed the existing peak discharge rate for a 25-year, 3-day storm event. The 'Existing' model scenario establishes the allowable discharge rate of 57.8 cubic feet per second (cfs). The 'Existing Past SL' scenario was run to assess whether the discharge rate was higher when the current drainage system was original constructed. The results suggest that an allowable peak discharge rate of 62.6 cfs could be supported by the existing drainage system.

Due to the limitation of the peak discharge rate, the 'Pump and Detention' scenario was developed using only one primary pump and turning off the duty pump before the peak of the storm. If the model was run with the combined pumps and outfall pipes, then the allowable discharge rate would have been exceeded. The plan for the proposed pump station would be to design it for a duty pump and single primary pump initially with room to accommodate an second primary pump in the future. As SLR continues to occur, diminishing the capacity of the pipes to discharge via gravity, the need for the additional pump will likely be required in 15 to 20 years.

The 'Raised Rd' scenarios were developed by modifying the LiDAR dataset to fill any areas in the roadway up to elevation 4.0 feet, NAVD which would account for a combined SLR due to climate change and king tides. The detention area was retained in these scenarios because it was assumed that the road would be widened if raised, per the Vision Lake Park plan.

2.6.2 Model Results

The results for the modeled scenarios are presented in ***Table 2-2*** which provides a comparison of the results with the existing conditions model. The basins referred to in the table are shown in ***Figure 2-1*** through ***Figure 2-4.*** LWL refers to Lake Worth Lagoon. Results for three storm events are provided (3-year, 1-day; 10-year, 1-day; 25-year, 3-day and 50-year, 3-day events). For each of the scenarios, the peak stage is reported along with the change in the storm stage compared to the existing conditions models. Color coding has been applied to the table to illustrate the magnitude of increases or decreases in peak stages. The change shown for the past and future sea level scenarios ('Existing' system) was compared to the current sea level condition which assumes an average high tide of 1.0 feet NAVD. The change shown for LWL, for example, reflects the change in sea level that was assumed. The design alternative scenarios were compared to the version of the 'Existing' with the matching sea level conditions. Models denoted with 'w/SLR' include storm surge and king tide events as well as the eventual effects of climate change.

Based on the results, the following observations can be made:

- A comparison of current versus past sea levels shows that peak flood stages were moderately lower prior to 1992 when SLR effects were first perceived. The change, however, associated with the predicted levels in 2060 is much greater with an average rise in flood stages expected

to be 6-inches. It is important to note that other SLR events such as storm surges and king tides have, and will occur again, prior to 2060.

- Adding only inline check valves on the outfall pipes will not improve drainage during a storm event. This was expected because storm events create positive head on the system that would maintain an open valve, essentially functioning the same as having no valve. The inline check valves, however, are still considered to be an important feature because of their ability to prevent dry-weather flooding due to SLR events such as king tides.

- The scenarios involving raising the road resulted in higher flood stages within the watershed. Although the road would not be flooded, the higher stages would have an adverse impact on existing developments adjacent to the road. This flooding occurred regardless of inclusion of a detention area. Addition of a pump station helped to reduce the increases, but the increased stages would still occur – in addition to the increases due solely to SLR. These increases are due to a net loss of storage in the system.

- The pump and detention area scenario provides a moderate improvement compared to the existing system without SLR. However, there is a significant improvement when the model is run with SLR conditions. This is illustrated in ***Figure 2-6*** which shows the flood depths for the 3-year, 1-day storm with a SLR event. Another factor considered is the reduction in the duration of flooding. This is shown with time-series graphs in ***Figure 2-7*** for all four storm events modeled. The fluctuations shown in the red line 'Proposed' stages reflect the on and off activations of the pumps.

- The results for the most extreme event (50-year, 3-day storm with added storm surge) show that the road will be impacted during short intervals corresponding to high tides (***Figure 2-7).*** This is the result of water entering the basin starting at elevation 3.8 feet, NAVD at the southern end of the roadway. Even with these temporary surface inflows, the impacts are manageable.

Table 2-2: Model Results – Comparison of Peak Stages (Feet, NAVD)

Basin	Storm	Existing	Existing Past SL Pre-1992	Change	Existing w/SLR	Change	Valve Only w/SLR	Change	Pump & Detention	Change	Pump & Detention w/SLR	Change	RaisedRd & Detention w/SLR	Change	RaisedRd & Det & Pump w/SLR	Change
LWL	3Y1D	1.00	0.50	-0.50	2.70	1.70	2.70	1.70	1.00	0.00	2.70	0.00	2.70	0.00	2.70	0.00
N1	3Y1D	2.79	2.68	-0.11	3.33	0.54	3.32	0.53	2.69	-0.10	2.72	-0.61	3.70	0.37	3.44	0.11
N2	3Y1D	2.79	2.69	-0.10	3.33	0.54	3.32	0.53	2.67	-0.12	2.70	-0.63	3.69	0.36	3.44	0.11
N2A	3Y1D	4.31	4.31	0.00	4.33	0.02	4.33	0.02	4.31	0.00	4.30	-0.03	4.36	0.03	4.30	-0.03
N3	3Y1D	2.83	2.74	-0.09	3.33	0.50	3.32	0.49	2.69	-0.14	2.72	-0.61	3.69	0.36	3.44	0.11
N4	3Y1D	2.82	2.73	-0.09	3.32	0.50	3.32	0.50	2.71	-0.11	2.74	-0.58	3.69	0.37	3.44	0.12
LWL	10Y1D	1.00	0.50	-0.50	2.70	1.70	2.70	1.70	1.00	0.00	2.70	0.00	2.70	0.00	2.70	0.00
N1	10Y1D	3.28	3.21	-0.07	3.70	0.42	3.71	0.43	3.21	-0.07	3.19	-0.51	3.99	0.29	4.00	0.30
N2	10Y1D	3.28	3.21	-0.07	3.71	0.43	3.72	0.44	3.21	-0.07	3.18	-0.53	3.99	0.28	4.00	0.29
N2A	10Y1D	4.64	4.64	0.00	4.67	0.03	4.67	0.03	4.64	0.00	4.64	-0.03	4.69	0.02	4.63	-0.04
N3	10Y1D	3.28	3.21	-0.07	3.71	0.43	3.71	0.43	3.21	-0.07	3.18	-0.53	3.99	0.28	4.00	0.29
N4	10Y1D	3.28	3.20	-0.08	3.70	0.42	3.71	0.43	3.22	-0.06	3.19	-0.51	3.99	0.29	4.01	0.31
LWL	25Y3D	1.00	0.50	-0.50	2.70	1.70	2.70	1.70	1.00	0.00	2.70	0.00	2.70	0.00	2.70	0.00
N1	25Y3D	3.38	3.31	-0.07	3.78	0.40	3.80	0.42	3.35	-0.03	3.29	-0.49	4.05	0.27	4.09	0.31
N2	25Y3D	3.38	3.32	-0.06	3.78	0.40	3.80	0.42	3.35	-0.03	3.28	-0.50	4.04	0.26	4.08	0.30
N2A	25Y3D	4.69	4.69	0.00	4.72	0.03	4.72	0.03	4.69	0.00	4.69	-0.03	4.74	0.02	4.68	-0.04
N3	25Y3D	3.38	3.31	-0.07	3.78	0.40	3.80	0.42	3.35	-0.03	3.28	-0.50	4.04	0.26	4.08	0.30
N4	25Y3D	3.38	3.31	-0.07	3.78	0.40	3.79	0.41	3.35	-0.03	3.29	-0.49	4.04	0.26	4.09	0.31

DT	25Y3D								4.34	N/A	4.82	N/A	3.93	N/A	4.07	N/A
Discharge (cfs)		57.8	62.6		45.4		41.3		57.7		65.7		69.2		51.8	

Note: 50-Year,3-day storm was run for Existing and Pump & Detention scenarios using a storm surge SLR of elevation 4.1 feet, NAVD (see Figure 2.7 for results)

Figure 2-6: Flood Depths for Existing vs. Proposed (Pump & Detention) System during 3-Year, 1-Day Storm Event

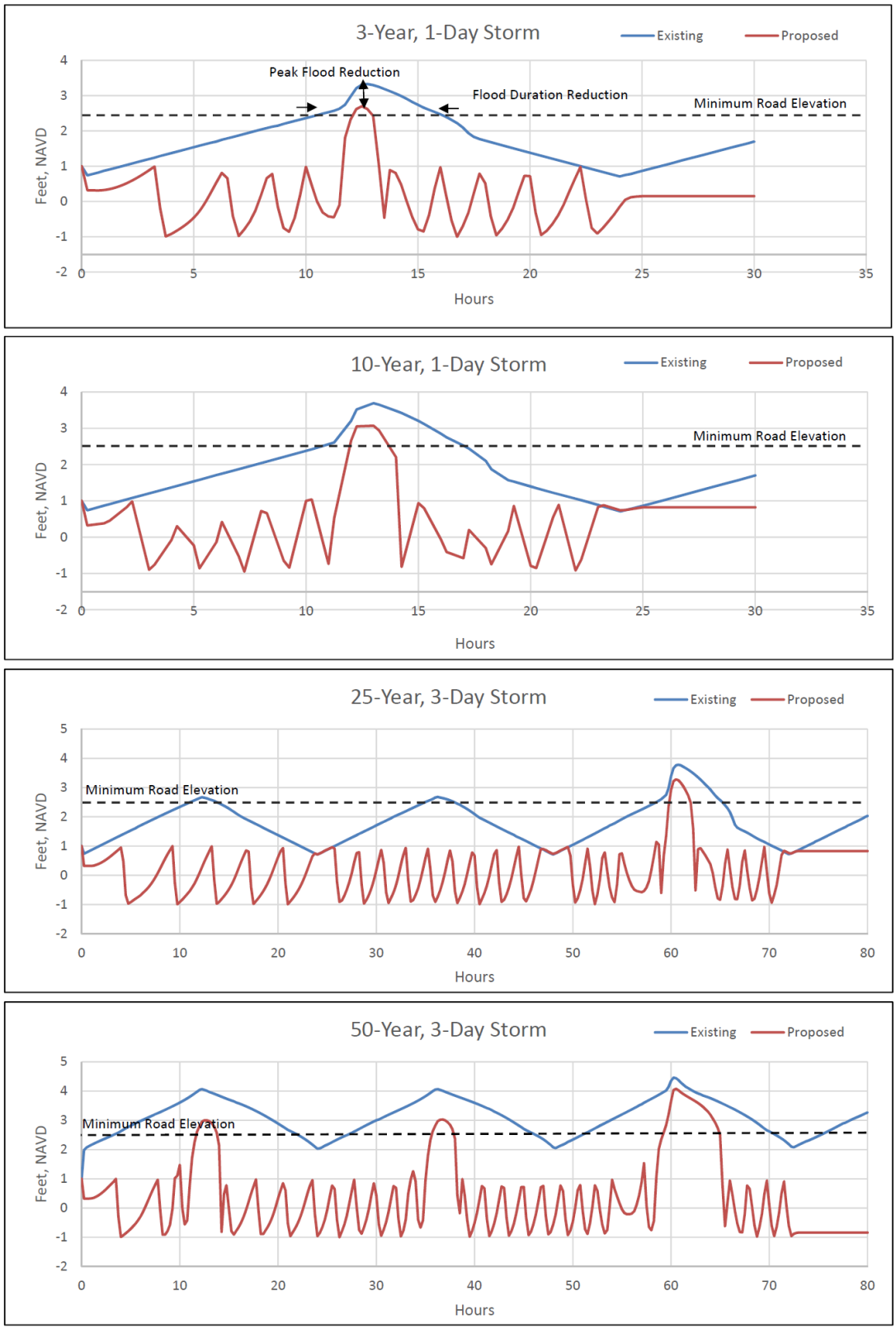


Figure 2-7: Stage vs. Time for Existing and Proposed (Pump & Detention) Systems with SLR

2.7 Stormwater Improvement Recommendations

Based on the Town's Vision Lake Park site plan for this portion of Lake Shore Drive, it is recommended that road runoff be directed to the grassed areas where inlets and pipes will collect and convey the water to its destination. Openings in the curbs can be made corresponding to low points in the road. A swale within each grassed area can direct the runoff to an inlet providing a first flush of water quality treatment within the grassed areas.

The modeling results show that the 'Pump and Detention' alternative would provide the most alleviation from flooding for the project area and would extend that protection to 2060 and beyond. Other benefits of this alternative include the addition of water quality treatment to the system and the ability to discharge water at the maximum allowable rate regardless of the downstream water level (e.g., pumping vs. gravity discharge). It is possible to further enhance the capabilities of the detention area by planting native, salt tolerant plant species in the detention area, essentially producing a large bioswale. The drainage improvements specific to the 'Pump and Detention' alternative are shown in ***Figure 2-8***.

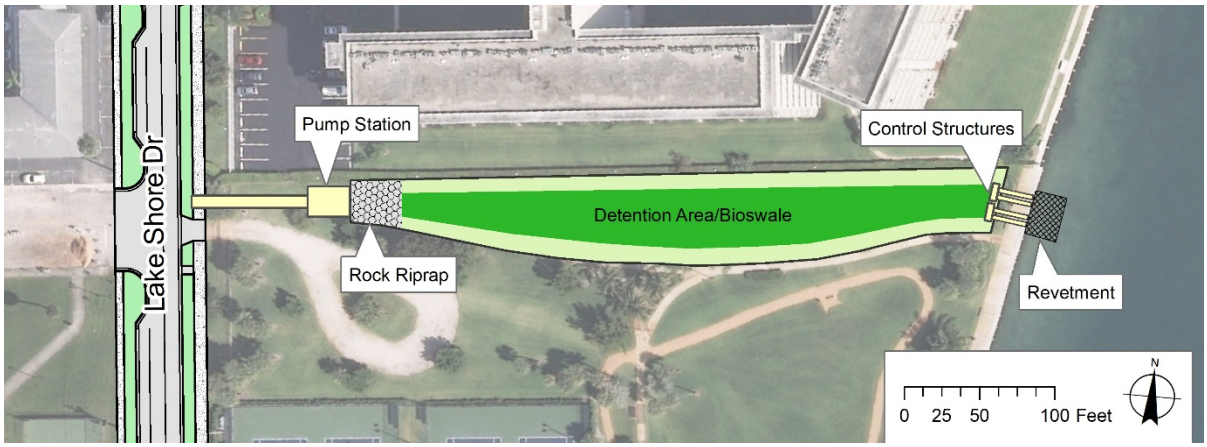


Figure 2-8: Proposed (Pump & Detention) System

The proposed system differs from conventional water management systems which rely internally on gravity to deliver water to a retention/detention area. If pumps are needed for such a system, they would typically be located at the discharge point of the basin. For this project, the road is already at the lowest elevation of the basin and it is not feasible to create a dry detention area at a lower elevation because of the shallow water table. Since a pump station is needed to combat SLR, it would be advantageous to locate the station internally in the system upstream of a dry detention area. Doing so allows the detention area to be raised to an elevation high enough for water to percolate and discharge via gravity to the LWL. The existing sidewalk on the south side of the proposed detention area will need to be replaced and raised approximately one foot so that stormwater can be entirely contained within the detention area during the 25-year, 3-day design storm event.

Since the effects of climate change will not be fully realized for some time, it is possible to continue utilizing the gravity outfall pipes and install the initial pumps until it becomes necessary to increase the capacity of the pump station. The station infrastructure, however, should be built to accommodate the ultimate capacity. A combined pump and gravity system has the benefit of lower energy costs while including the ability to pump in the event of SLR due to storm surges or king tides. The gravity system

provides a back-up in case of a power failure. Ultimately, a generator will be needed as the drainage system becomes more reliant on the pump station.

A model was developed for an interim combined system to size the amount of pumping that can occur without exceeding the allowable discharge rate. Based on the model results, 20-cfs primary pump and a 10-cfs duty pump, with restricted levels of operation, can be used in unison with the gravity outfalls. For the full SLR conditions in the future, a second 20-cfs primary pump will need to be installed. The advantage of having two equally sized primary pumps is that the motor control center can alternate the pump usage to distribute even runtimes. Additionally, two primary pumps provides redundancy in case of a pump failure.

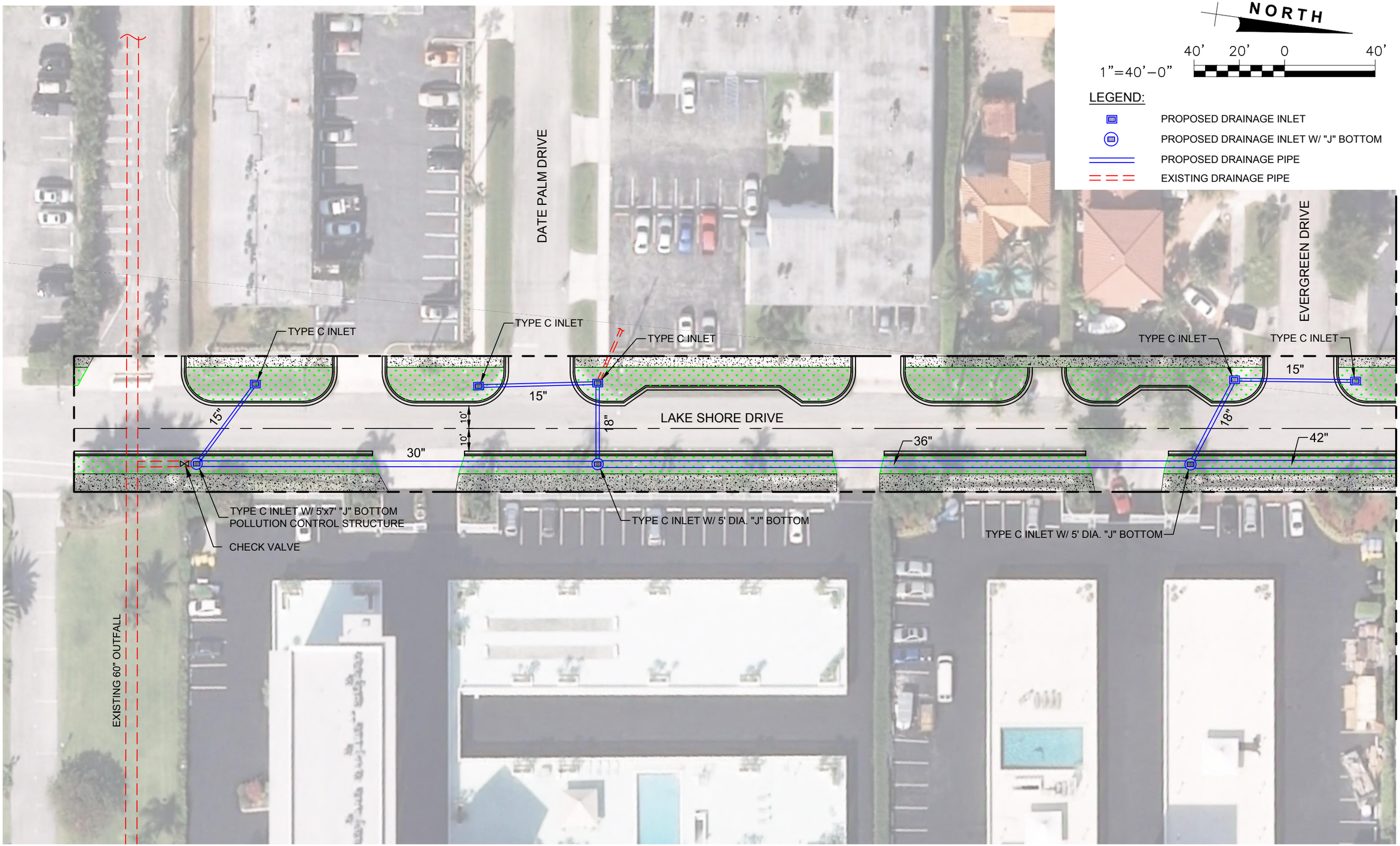
Preliminary calculations of the total dynamic heads indicate that a 20-hp motor will be needed for the duty pump and 30-hp motors will be needed for the primary pumps. The pumps will be axial flow, electric submersible pumps, which are quiet, efficient pumps suited well for low head, high volume discharges. The wet well will be designed based on criteria from the Hydraulic Institute of Standards. A trash rack will be included in the wetwell to capture debris before getting to the pumps.

A new electrical service from FPL will be required to provide power to the proposed pump station. Due to the size of the pump motors, a service voltage of 480/277 volts, 3-phase will be provided. A backup power receptacle will be designed to allow for the connection of a portable generator in the event where the normal power supply is unavailable. The pumps will be locally controlled by a level sensor with backup float switches.

Rock riprap will be used to dissipate the flows at the pump discharge into the detention area. It is recommended that the detention area include a bottom elevation of 3.0-feet, NAVD with an internal meandering swale with an invert elevation of 2.5-feet NAVD. Twin FDOT Type 'H' inlet structures can be modified to include 4-foot wide weirs and a 3-inch diameter orifice that will assist in bleeding down the water level to maintain a dry detention area.

Aspects of other model scenarios are also recommended. In-line check valves should be installed at the four gravity outfall pipes. The installation of these check valves will help protect the road from king tides and other SLR conditions and avoid the potential of activating the pumps and recirculating the water to and from the Lagoon. Addtionally, at the existing low points the roadway crown can be raised by a couple of inches to provide a 3-year LOS for the entire roadway. This produces a minor reduction in storage that is easily compensated by the addition of the detention area.

Conceptual drawings for the entire proposed drainage improvements are provided in ***Figure 2-9*** including the future roadway site plan.



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LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

PROPOSED STORMWATER SYSTEM

FIGURE: 2-9

SHEET: 1 OF 7

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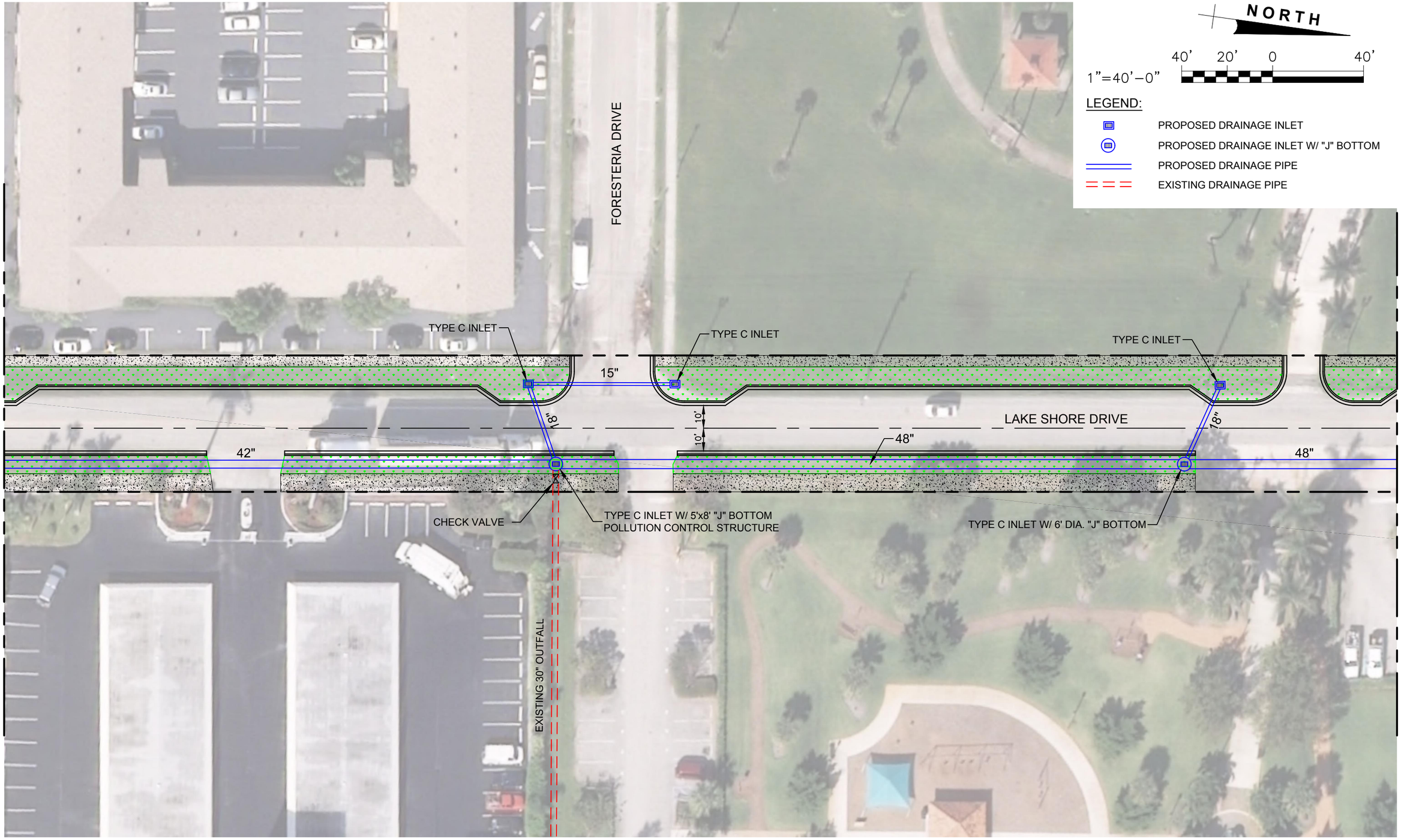

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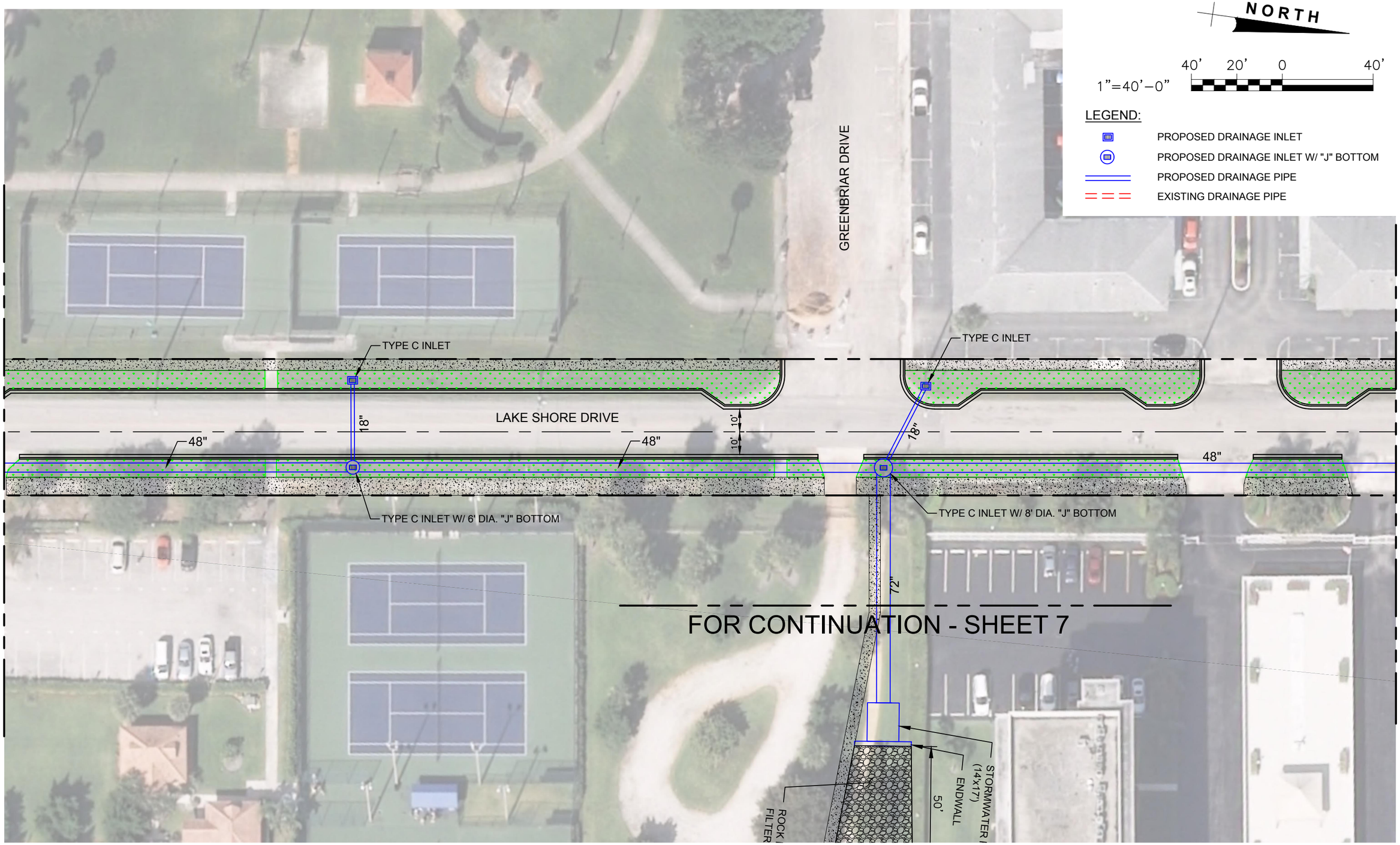
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

PROPOSED STORMWATER SYSTEM

FIGURE:
2-9
SHEET:
2 OF 7



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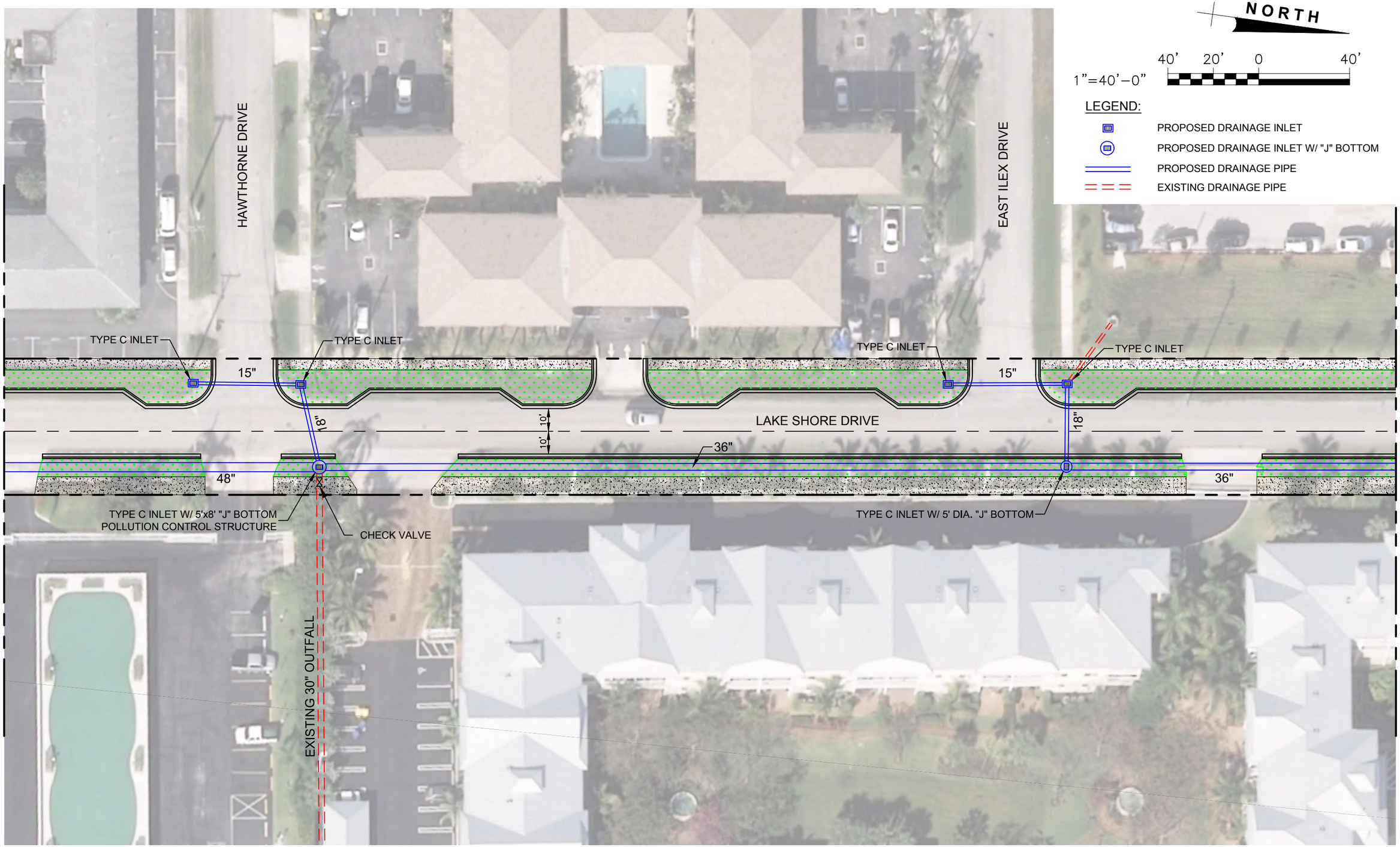
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

PROPOSED STORMWATER SYSTEM

FIGURE:
2-9
SHEET:
3 OF 7



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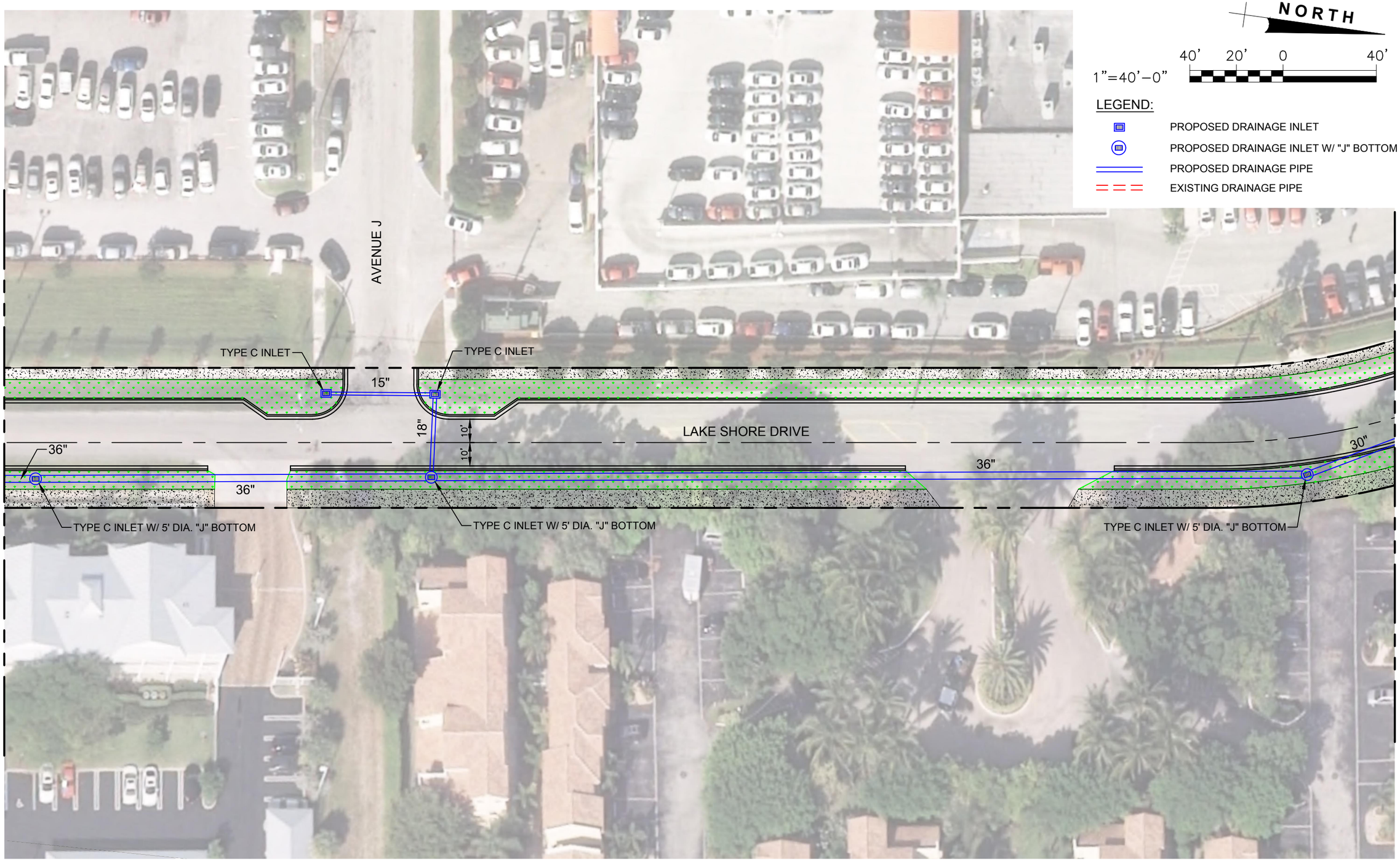
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

PROPOSED STORMWATER SYSTEM

FIGURE:
2-9

SHEET:
4 OF 7



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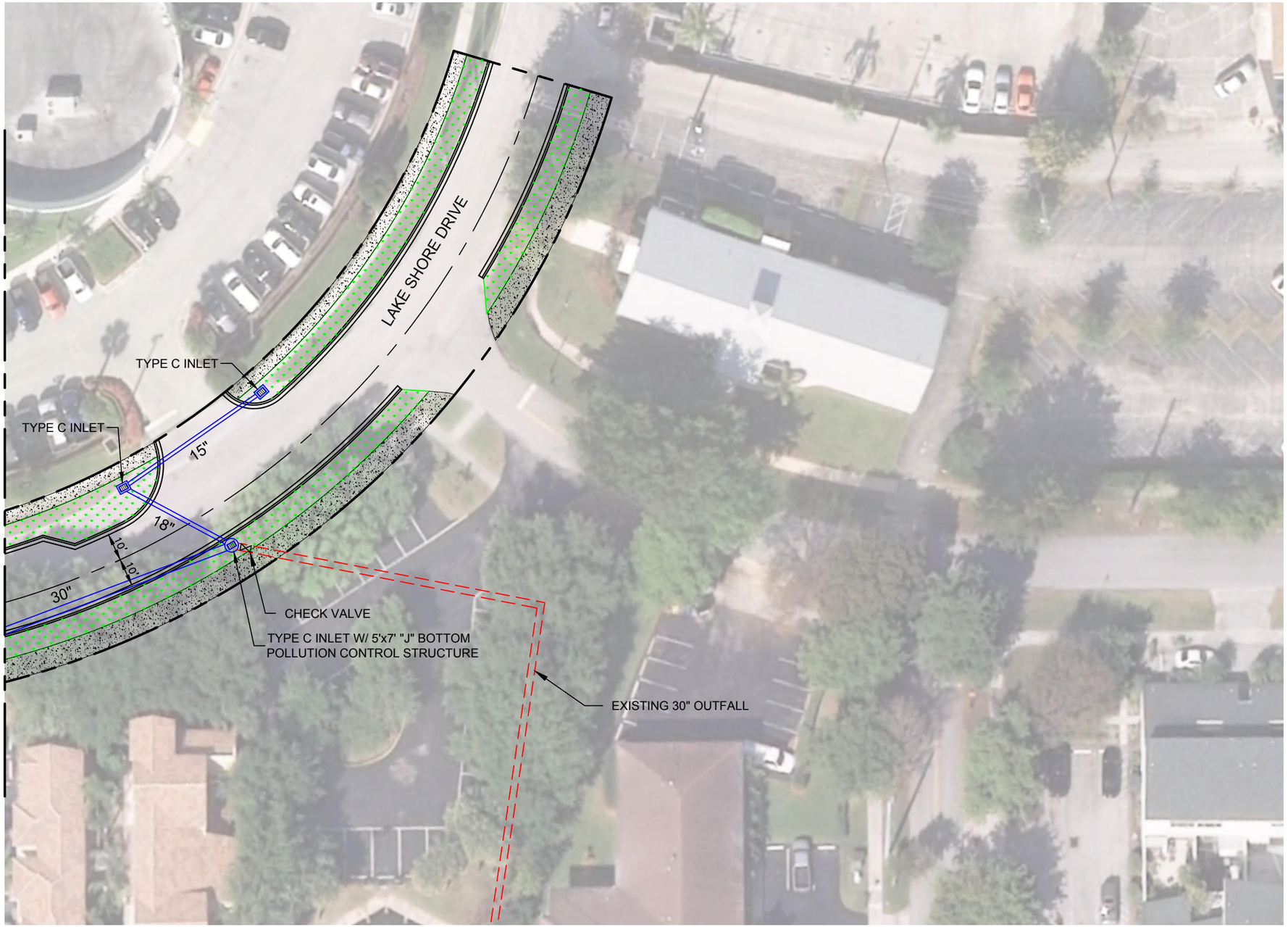
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

PROPOSED STORMWATER SYSTEM

FIGURE:
2-9

SHEET:
5 OF 7



NORTH

1"=40'-0"

40' 20' 0 40'

LEGEND:

- PROPOSED DRAINAGE INLET
- PROPOSED DRAINAGE INLET W/ "J" BOTTOM
- PROPOSED DRAINAGE PIPE
- EXISTING DRAINAGE PIPE

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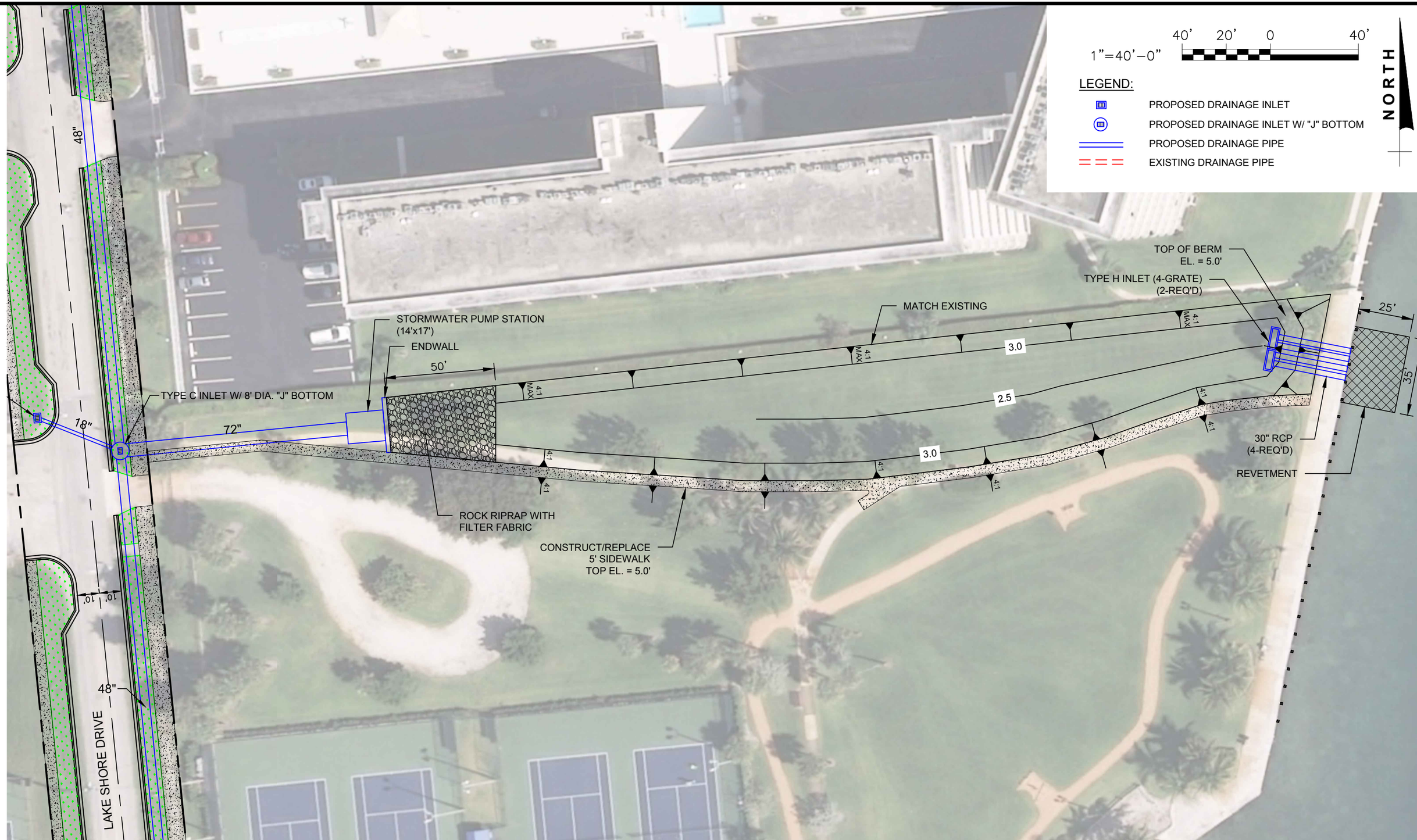
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

PROPOSED STORMWATER SYSTEM

FIGURE: **2-9**

SHEET: 6 OF 7



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LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

PROPOSED RETENTION AREA LAYOUT

FIGURE:
2-9
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7 OF 7

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Section 3 Roadway Design

3.1 Introduction

Baxter & Woodman, Inc. performed a visual inspection of the existing roadway in conjunction with the geotechnical investigation performed by Terracon Consultants, Inc. in order to provide the recommended design pavement section for the project. This section will outline the results from the field investigation and the geotechnical report and provide a pavement design section for the roadway and sidewalk improvements within the Lake Shore Drive right-of-way. A street name map of the project area is provided in ***Figure 3-1***.

Figure 3-1: Street Map

3.2 Existing Roadway Condition

The Lake Shore Drive project extends from the entrance of the Lake Park Marina to Castlewood Drive. The roadway serves multi-family buildings and public park areas. Concrete or asphalt driveways serve the various building parking lots, and there are a number of side-street intersections extending to the west from Lake Shore Drive. The existing 60-foot wide right-of-way section consists of northbound and southbound asphalt paved lanes, grassed swales on each side of the edge of pavement and concrete sidewalk at the right-of-way lines (see ***Photo 3-1)***. There are a few existing ditch bottom inlets, but primarily the runoff is collected in the swale areas or trapped in the driveway aprons (see ***Photo 3-2).*** The northern portion of the roadway (approximately 600-feet) has Type F curb and gutter or valley gutter along both sides of the roadway.

Overhead power lines with transformers run in the swale area between the southbound lane and the western sidewalk. Seacoast Utility Authority (SUA) provides gravity sanitary sewer and potable water service to the area. The gravity sanitary sewer runs along the centerline of Lake Shore Drive between Greenbriar Drive and the entrance to the Bay Reach apartment complex. The potable water main generally runs along the west side of the road centerline and provides domestic water service, fireline connections and fire hydrants which serve the project area.

Photo 3-1: Existing Roadway Configuration

Photo 3-2: Drainage Runoff to Roadside Swales

3.2.1 Visual Condition Assessment

A visual inspection was conducted for the limits of the project. The pavement typically appears to be in fair to poor condition along the areas between Evergreen Drive and Hawthorne Drive. Other areas of Lake Shore Drive are in fair condition. Sidewalks appear to be generally in good condition. Specific problems noted are as follows:

- Cracking of the asphalt along the north and south sides of the box culvert at the former ditch located north of the marina entrance (see ***Photo 3-3***)

Photo 3-3: Asphalt Cracking at Culvert Crossing

- Linear cracking along Lake Shore Drive for several hundred feet north of Date Palm Drive
- Severe alligator cracking at the following intersections
    - Evergreen Drive intersection
    - Foresteria Drive intersection
    - Greenbriar Drive intersection
    - Hawthorne Drive intersection
    - E. Ilex Drive intersection
- Severe linear and alligator cracking along Lake Shore Drive, particularly between Evergreen Drive and Hawthorne Drive. Refer to ***Photo 3-4***.

Photo 3-4: Linear & Alligator Cracking of Asphalt

- Cracking and patching along curb line at entrance to Earl Steward dealership
- Various areas of pavement patching
- Linear cracking along curb line for the majority of the Lake Shore Drive alignment
- Replacement of all pavement markings is required
- Advanced signage notification and pavement markings for crossing of Lake Shore Drive is required
- Cracked gutter (see ***Photo 3-5***)
- There are a number of non-compliance issues with American with Disabilities Act (ADA) including missing sections of sidewalk (lack of continuity of access pathway); need for tactile surfaces at intersections; and miscellaneous ramps (see ***Photo 3-6***).

Photo 3-5: Cracked Gutter

Photo 3-6: Accessibility Shortfalls

Geotechnical Report Results

Baxter & Woodman (BW) hired Terracon Consultants as a geotechnical subconsultant to perform soil borings, pavement cores and field permeability testing for the project. Their report is included in ***Appendix B*** and is summarized herein.

The roadway alignment is underlain by Arents-Urban or Urban Land Complex which are granular sandy soils which have been modified by development. Pavement core and boring data show an average existing asphalt and baserock thickness of 15-inches. At one soil boring location, in front of Bay Reach apartments, a layer of approximately 1-3/8-inches asphalt overlaid on 5-5/8-inches concrete and 17-inches of base rock was found. Due to the close proximity to the Intracoastal Waterway, the groundwater is shallow and was found to be approximately 1.4 feet to 2.4 feet below the ground surface.

3.3 Roadway Improvements Recommendations

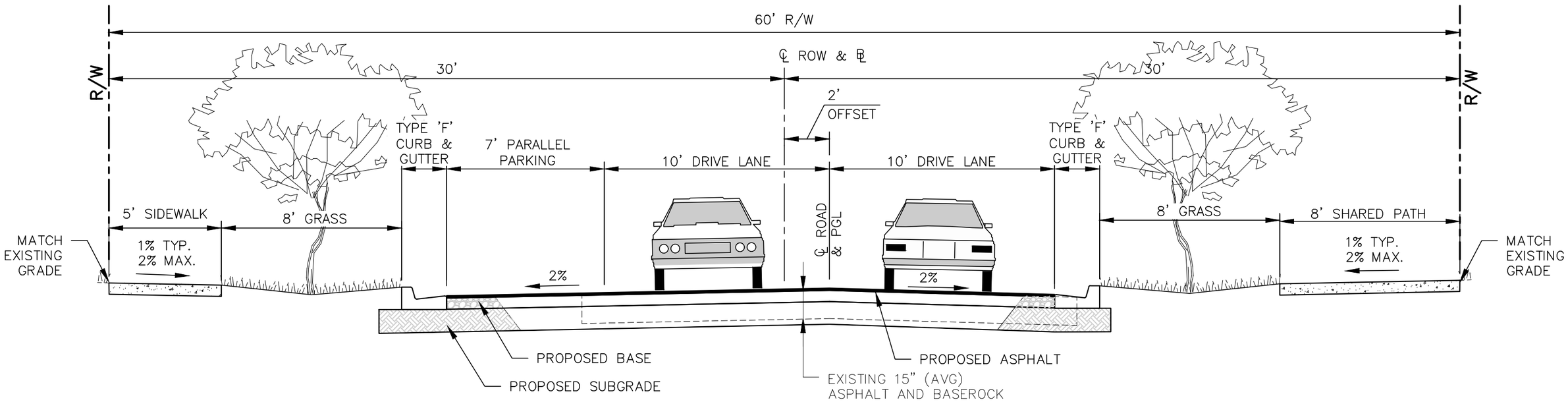
3.3.1 Roadway

The current roadway section with one lane in each direction will be replaced with a single lane in each direction plus parallel parking along the outside of the southbound lane. Refer to the *Proposed Typical Roadway Section* shown in ***Figure 3-2***. Type F curb and gutter will be provided along the proposed lanes which will direct the rainfall runoff into swales with drainage inlets located behind the back of curb. A shared concrete pathway is proposed along the eastern right-of-way line and a concrete sidewalk is proposed along the western right-of-way line. Landscaped areas are proposed between the back of curb and the front of sidewalk on both sides of the roadway.

Due to the shallow depth of groundwater and tide levels relative to the elevation of the roadway pavement, there is concern regarding adequate drainage of the road right-of-way and also the harmful effects of periodic inundation of the road base. The relatively thick asphalt section on the roadway (approximately 6-inches on average), indicates numerous pavement overlays in the past, possibly in an effort to raise the road elevation above the water table.

Utilization of recycled asphalt, or “blackbase” is recommended in areas of frequent groundwater inundation since wetting of typical baserock road base may compromise the structural integrity when subjected to traffic loads. The blackbase is less moisture sensitive than baserock and therefore recommended for use on this project.

The good condition and significant thickness of the asphalt leads to the recommendation to mill approximately 8 ½-inches of pavement within the drive lanes and replace with recycled asphalt base and a surface course of 1-1/2-inches of SuperPave 9.5. In the area under the proposed parallel parking, which requires a new roadway pavement section, 12-inches compacted subgrade, 6-inches of recycled asphalt base and 1-1/2-inches SuperPave is proposed.



PROPOSED TYPICAL ROADWAY SECTION

SCALE: NTS

LAKE SHORE DRIVE

PAVEMENT SPECIFICATIONS	
STRUCTURAL COURSE	1 1/2" SP-12.5
BASE COURSE	6" RECLAIMED ASPHALT PAVEMENT (RAP) AKA BLACKBASE
SUBGRADE	12" SUBGRADE COMPACTED TO 98% MAX DENSITY PER AASHTO T-180 (LBR 40 MIN).

TOWN OF LAKE PARK
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Lake Park, FL 33403

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www.mathewsconsultinginc.com EB-0007929

VERIFY SCALE
1"
BAR IS ONE INCH ON FULL SIZE (22x34) ORIGINAL DRAWING. ADJUST SCALES AS NECESSARY.

LAKE SHORE DRIVE

PROPOSED TYPICAL ROADWAY SECTION

FIGURE: 3-2

Date\Time : Wed, 06 Feb 2019 - 12:09pm Current Plotstyle : ByColor Layout Tab: 3-2
Path\Name : Z:\WestPalmBeach\LPKT\180531-Lakeshore Dr Drainag\Design\Drainage\Typical Section.dwg
Acad Version : R22.0s (LMS Tech)
User Name : 7939in

3.3.2 Sidewalks & Driveways

An 8-foot wide concrete, multi-use pathway is proposed along the east right-of-way line for shared pedestrian and bicycle uses. A 5-foot wide concrete sidewalk is proposed along the western right-of-way line. Sidewalk concrete will be 4-inches thick. An 8-foot wide landscaped strip is provided as a buffer between the pedestrian uses and the back of roadway curb.

The proposed sidewalks will be installed to meet the American with Disabilities Act (ADA) with the appropriate maximum slope limitations and improvements at roadway intersections. Tactile surface mats will be provided at the interface with street intersections and sidewalk ramps will be compliant with all Florida Department of Transportation, Florida Building Code and ADA requirements.

Asphalt, concrete or paver brick driveway aprons into the multi-family building parking lots will be replaced in-kind. The intersection turnouts will be replaced with asphalt pavement with curbing along the radius.

3.3.3 Signage and Pavement Markings

The existing traffic signage will be replaced to meet the latest *Manual on Uniform Traffic Control Devices (MUTCD)* requirements. Stop signs will be provided at stop conditions and other regulatory signs such as No Parking signs will be replaced. The new speed limit signs will be posted at the current speed limit of 30 mph. Existing informational signs will be removed and relocated as appropriate within the new road section.

Pavement markings will be thermoplastic and will meet the Palm Beach County *Typicals for Pavement Markings, Signing & Geometrics*, *April 2018*, and Florida Department of Transportation Standards as appropriate. Striping improvements will include double yellow centerline striping with reflective pavement markers; stop bars; cross-walk striping; parallel parking stall striping; landscape island edge striping and bicycle symbol markings along the shared use pathway.

Section 4 Landscaping and Lighting

4.1 Landscaping

Based on meetings and coordination with the Town, a preliminary approach for the landscaping improvements was established. The goal is to provide a streetscape solution that will enhance the beautification of this area that will meet the various criteria that will work with the specific conditions of this location. Predominantly native and salt tolerant plant material are proposed that can tolerate various soil & water conditions. Lake Shore Drive has existing overhead utilities on the west side and has various underground utilities throughout.

A stormwater pipe is proposed for a significant length of the project on the east side in the proposed grass swale. As such, smaller trees and palms are proposed that will have smaller root systems and will meet the "FPL Right Tree, Right Place" principles. Silver Buttonwood & Christmas Palms are proposed for the Road ROW. The trees will be specified at 12-foot heights overall with a 5-foot clear single trunk and the palms will be specified at 16-foot overall height with a minimum 8-foot clear trunk at installation. There are bulb-outs at the ends of the parallel parking in the proposed site plan where some of the taller palms can be planted. There are several existing trees & palms in the ROW that may need to be removed/relocated. A section view of the proposed landscaping within the road right-of-way is shown in ***Figure 4-1*** and a conceptual landscaping site plan is provided in ***Figure 4-2***.

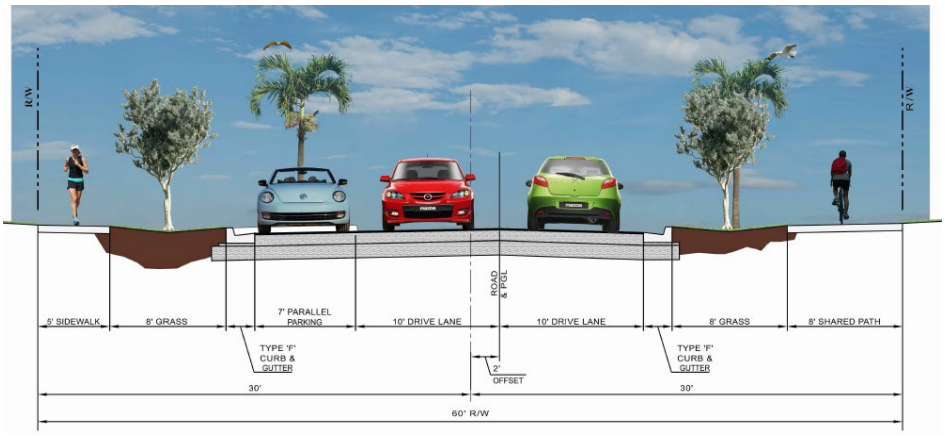
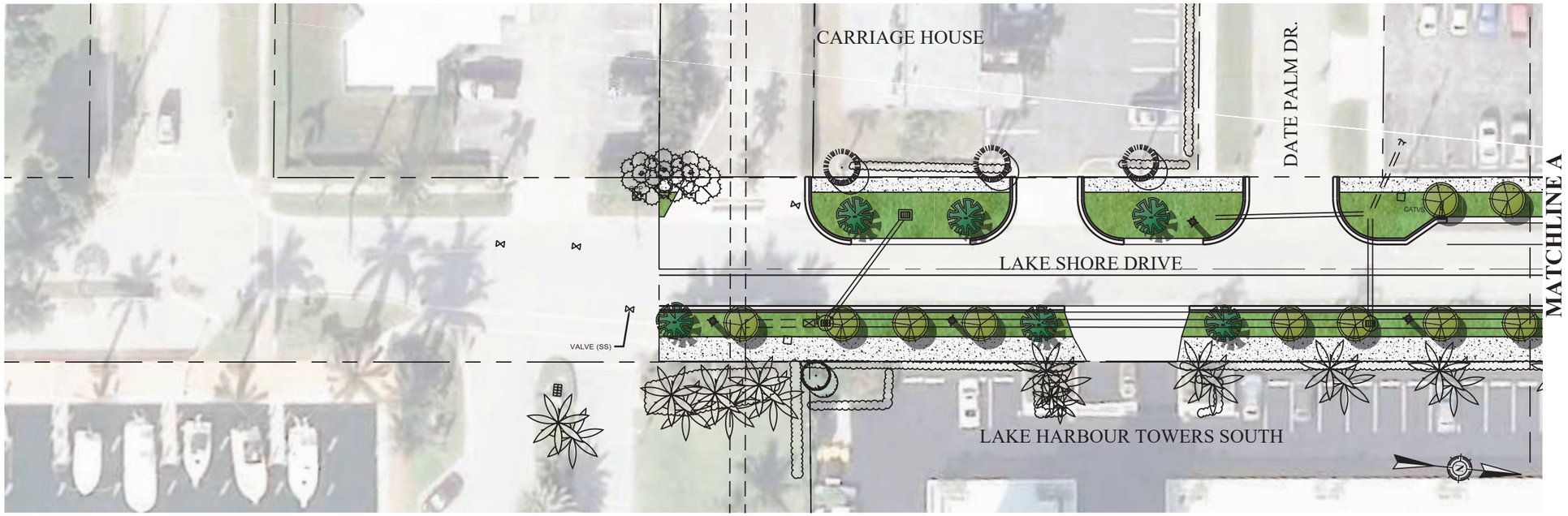


Figure 4-1: Proposed Landscaping in Typical Roadway Section

The proposed detention area in Kelsey Park, along the north property line of the park, will be landscaped to complement the existing vegetation in the park. Predominantly native and salt tolerant plant material is proposed that can tolerate various soil and water conditions. The detention structural elements will be screened with palms, trees or seagrape shrubs along the north side of the park. The landscaping in and around the detention area will be arranged in "natural" forms to enhance and beautify the new water feature. Cabbage Palms and Gumbo Limbo trees will used around the perimeter slopes and Cypress trees will be added along the bottom edge of the detention area enhancing its ability to function as a bio-swale by filtering sediments and removing algae causing nutrients.



TREE/PALM LEGEND

- SILVER BUTTONWOOD
- CHRISTMAS PALM
- CABBAGE PALM
- GUMBO LIMBO
- BALD CYPRESS

0 20' 40' 80' 120'
GRAPHIC SCALE

Wayne Villavaso
Landscape Architecture, Inc.
268 Flamingo Drive West Palm Beach, FL 33401
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Land Planning /Landscape Architecture FL., N.C., N.Y.

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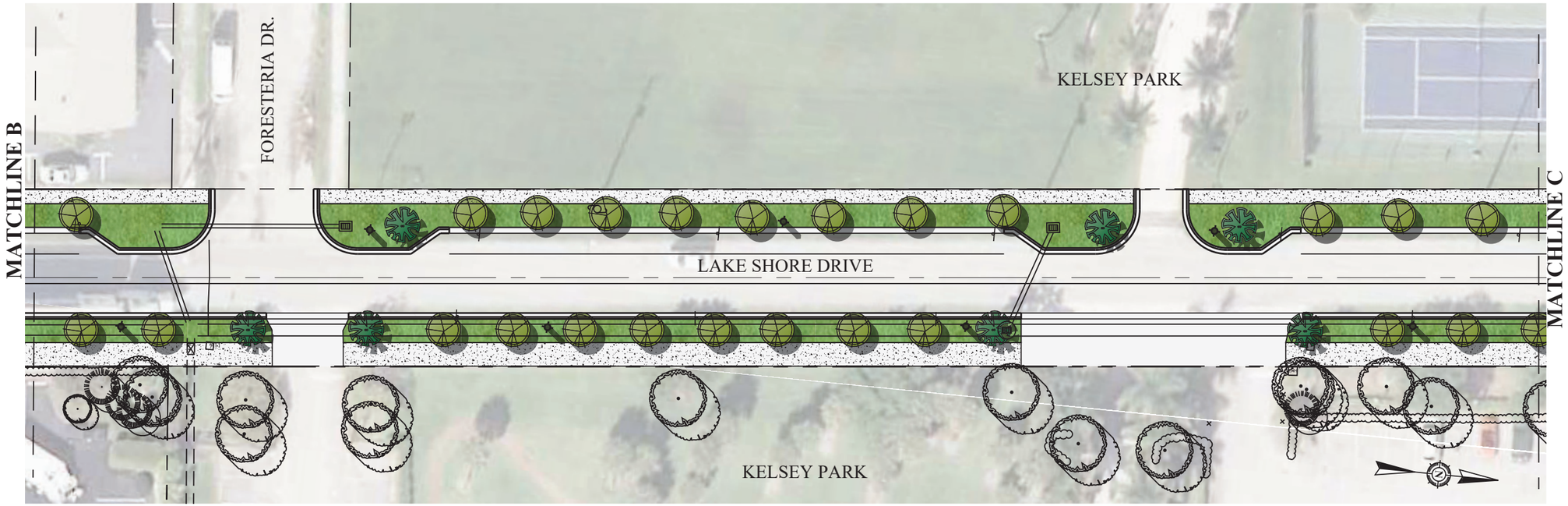
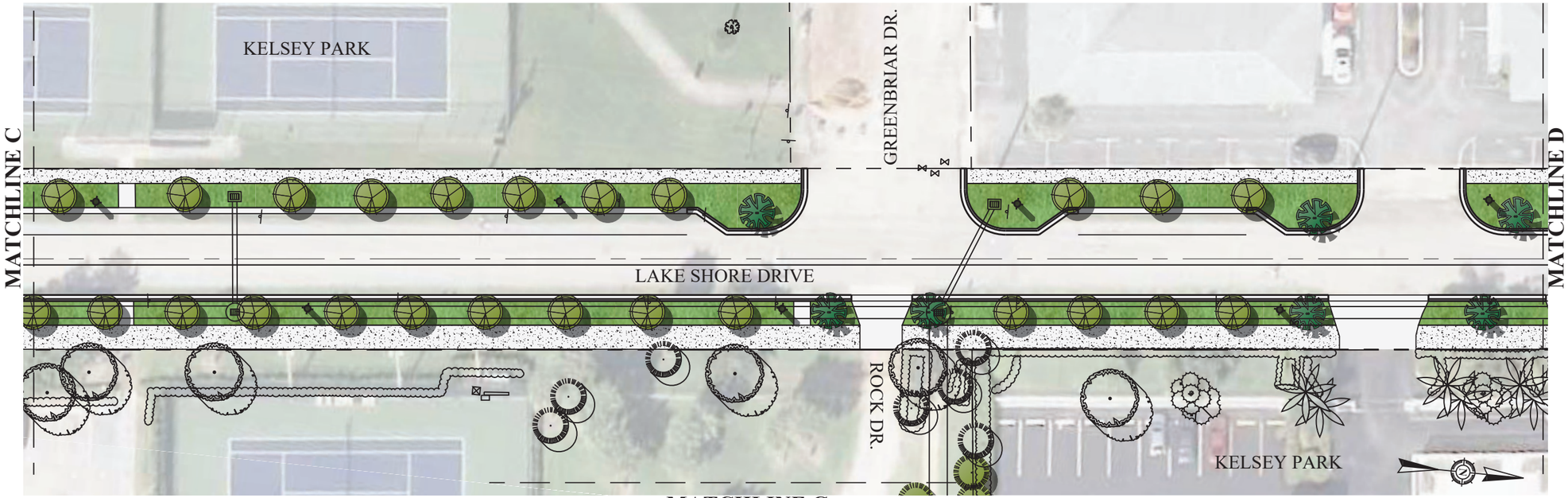
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

CONCEPT LANDSCAPE PLAN

FIGURE: 4-2

SHEET: 1 of 5





TREE/PALM LEGEND

- SILVER BUTTONWOOD
- CHRISTMAS PALM
- CABBAGE PALM
- GUMBO LIMBO
- BALD CYPRESS

0 20' 40' 80' 120'
GRAPHIC SCALE

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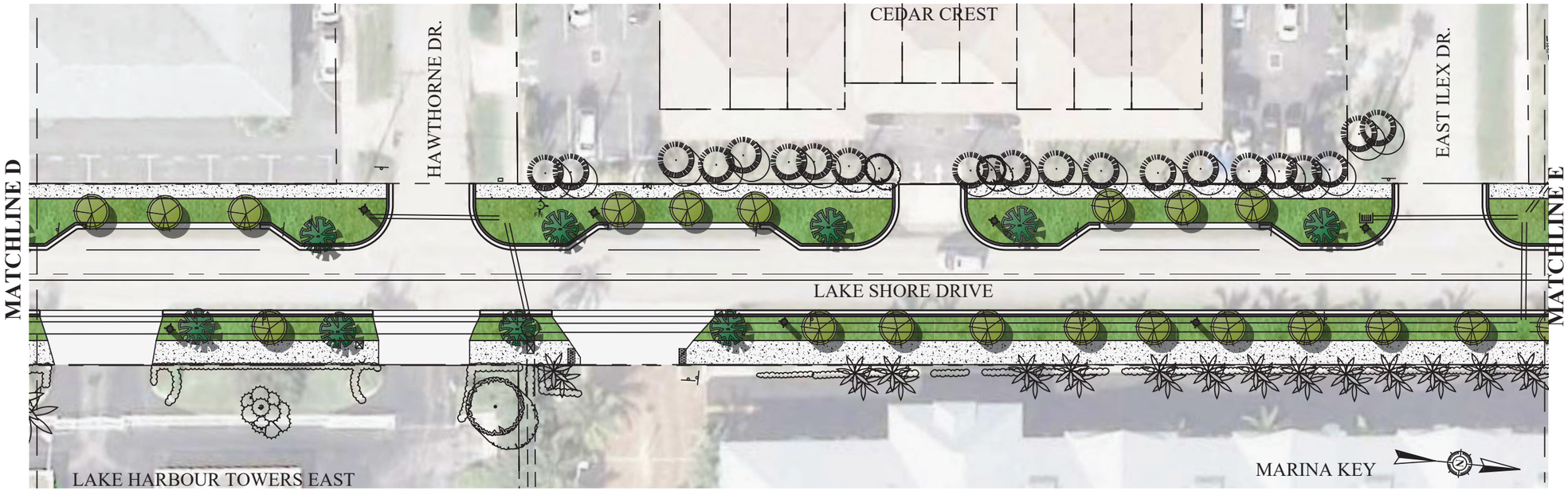
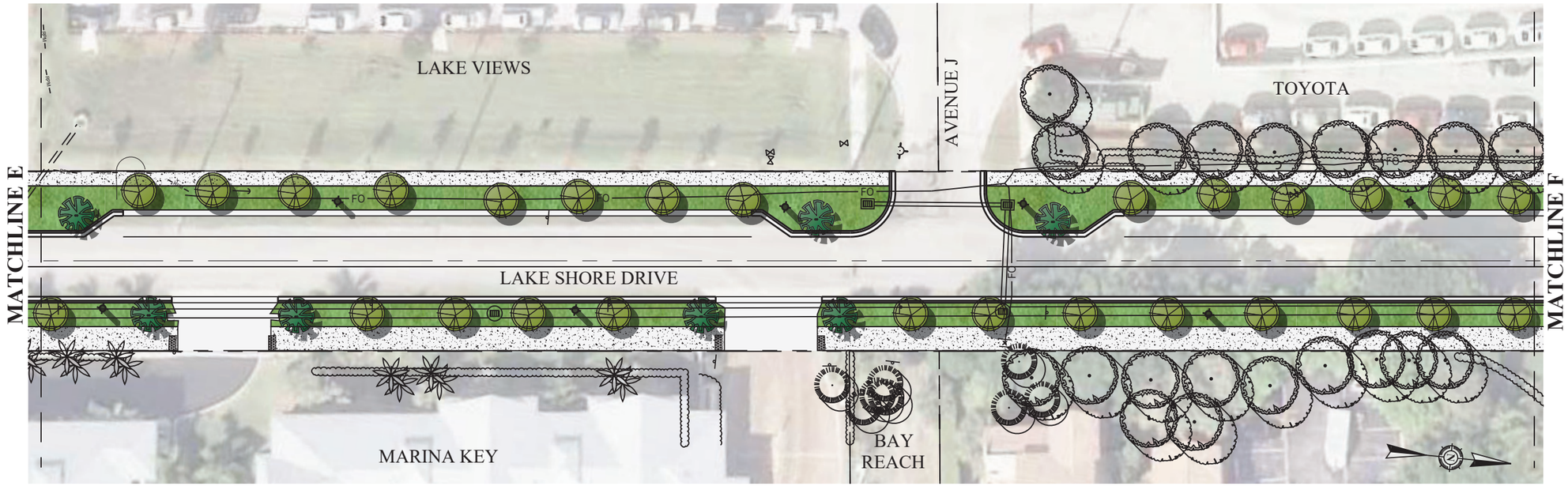
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

CONCEPT LANDSCAPE PLAN

FIGURE: 4-2

SHEET: 2 of 5





TREE/PALM LEGEND

- SILVER BUTTONWOOD
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- CABBAGE PALM
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0 20' 40' 80' 120'
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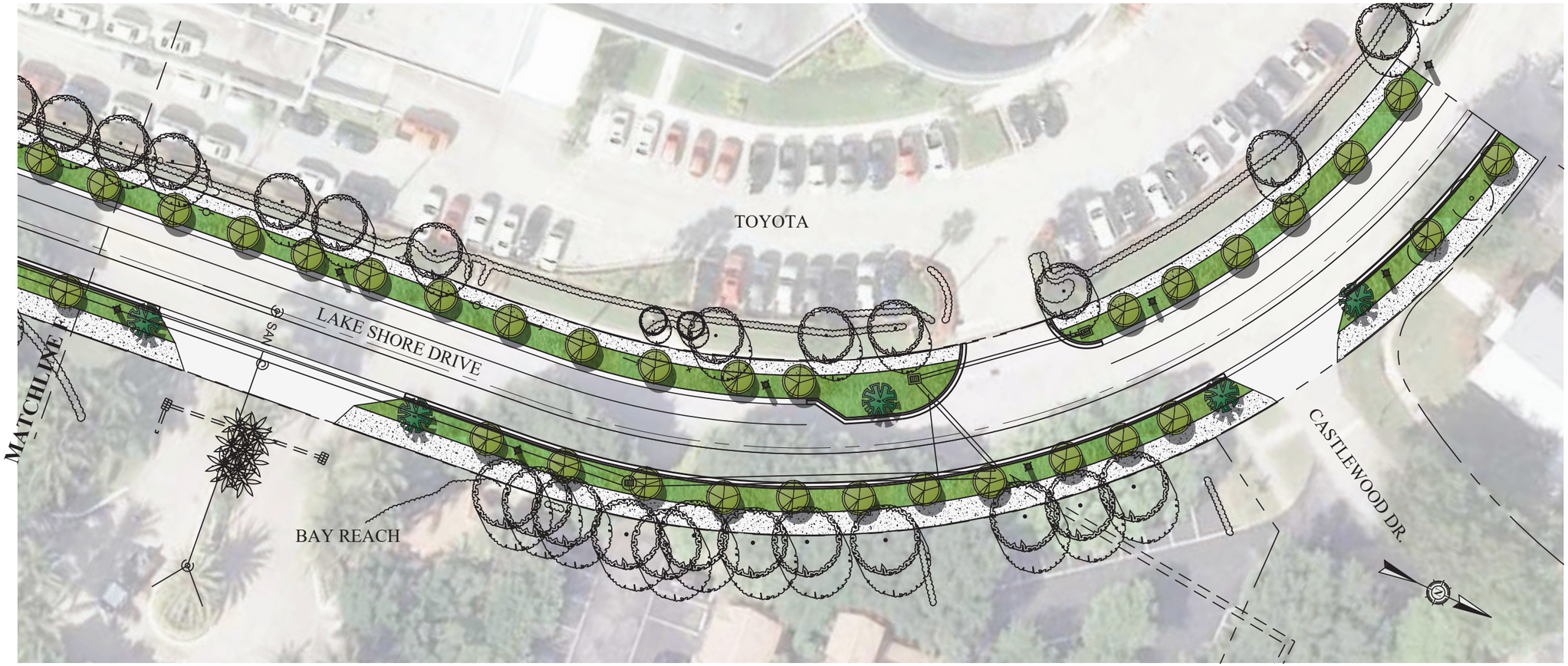
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

CONCEPT LANDSCAPE PLAN

FIGURE: 4-2

SHEET: 3 of 5



TREE/PALM LEGEND

- SILVER BUTTONWOOD
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0 20' 40' 80' 120'
GRAPHIC SCALE

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LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

CONCEPT LANDSCAPE PLAN

FIGURE: 4-2

TREE/PALM LEGEND

- SILVER BUTTONWOOD
- CHRISTMAS PALM
- CABBAGE PALM
- GUMBO LIMBO
- BALD CYPRESS

0 20' 40' 80' 120'
GRAPHIC SCALE

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LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

CONCEPT LANDSCAPE PLAN

FIGURE: 4-2

SHEET: 5 of 5

4.1.1 Irrigation

Per previous investigation and coordination with the Town, potable water will be required due to the fact there is increasing chloride levels in existing wells in the area. For the roadway right-of-way, two (2) 2-inch water meters will be required. It is recommended that the project be divided into two sections running north and south. Each would have a "Smart Controller" with weather monitoring / sensing ability. The sprinkler head layout would have a row of low angle, pressure regulated 6-inch pop ups along the back of curb and back of sidewalk. This would minimize excess water on the roadway and sidewalk. Two locations will be needed that can provide 110 volt electric service for the controllers and two tie-in locations for water service.

It is estimated that the monthly usage for each water meter consumption will be 188,000 gallons per month after the landscape improvements are established. Water usage at time of planting will be higher for an estimated three (3) month period. Irrigation for the detention area is still under investigation.

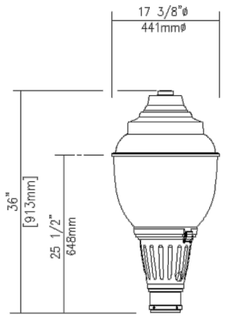
4.2 Lighting

Presently there are "cobra style" FPL light fixtures on the utility poles on the west side of the roadway at the road intersections. The spacing of these fixtures does not provide adequate lighting for the roadway in accordance with industry standards. The Town has expressed a desire to replace this existing lighting with decorative light poles and fixtures. Preliminary illumination calculations (photometrics) have determined that decorative light poles/fixtures would be placed along both sides of Lake Shore Drive alternating at approximately 60 ft. spacing.

There are two main options for decorative lighting; 1) Town-owned and maintained lighting, and 2) FPL-owned and maintained lighting. Town owned lighting allows for a large selection of light fixtures and poles which would be purchased and maintained by The Town. ***Figure 4-3*** shows a typical light pole and fixture presently in use throughout the Town (including Kelsey Park). Other light fixture style options, too numerous to include in this report, can be found at www.lighting.philips.com. The estimated cost to install this lighting along Lake Shore Drive within the project limits is approximately $640,000.

Figure 4-4 shows the light fixtures and poles available through the FPL street lighting program. Although their lighting selections are limited, the main benefits of participating in the FPL street lighting program are that there would be much less initial capital investment and no maintenance required by Town staff. The Town would only need to have installed the FPL supplied conduits and pull boxes at an estimated cost of $40,000. The FPL street lighting program requires the Town to sign a 10 or 20 yr. agreement with FPL to pay for the lighting installation and energy costs over time on a monthly basis.

Town of Lake Park



EPA: 2.4 sq ft / weight: 60 lb (27.3 kg)
Note: 3D image may not represent color or option selected.
Logos above include link, click to access.

Qty	10	Luminaire	[S55-007]-80W48LED4K-T-GL-LE3-VOLT-DMG-SFX-PH9-RCD7-GN3TX

Description of Components:

Hood: Spun aluminum 1100-0 dome, permanently assembled to the globe.

Access-Mechanism: A cast A360.1 aluminum technical ring with latch and hinge. The mechanism shall offer tool-free access to the inside of the luminaire. An embedded memory-retentive gasket shall ensure weatherproofness.

Heat Sink: Made of cast aluminum optimising the LEDs efficiency and life. Product does not use any cooling device with moving parts (only passive cooling device).

Globe: (GL), One-piece, seamless, pressure-molded colorless borosilicate glass globe having internal glare softening prisms with smooth external self-cleaning surface. The globe is permanently sealed onto the access-mechanism.

LED Module: LED type Philips Lumileds LUXEON T. Composed of 48 high-performance white LEDs. Color temperature as per ANSI/NEMA bin Neutral White, 4000 Kelvin nominal (3985K +/- 275K or 3710K to 4260K), CRI 70 Min. 75 Typical.

Optical System: (LE3), IES type III (asymmetrical). Composed of high-performance optical grade PMMA acrylic refractor lenses to achieve desired distribution optimized to get maximum spacing, target lumens and a superior lighting uniformity. Optical system is rated IP66. Performance shall be tested per LM-63, LM-79 and TM-15 (IESNA) certifying its photometric performance. Street side indicated.

Driver: High power factor of 90% minimum. Electronic driver, operating range 50/60 Hz. **Auto-adjusting universal voltage input from 120 to 277 VAC rated for both application line to line or line to neutral, Class I**, THD of 20% max. Maximum ambient operating temperature from -40F(-40C) to 130F(55C) degrees. **Driver comes with dimming compatible 0-10 volts.**

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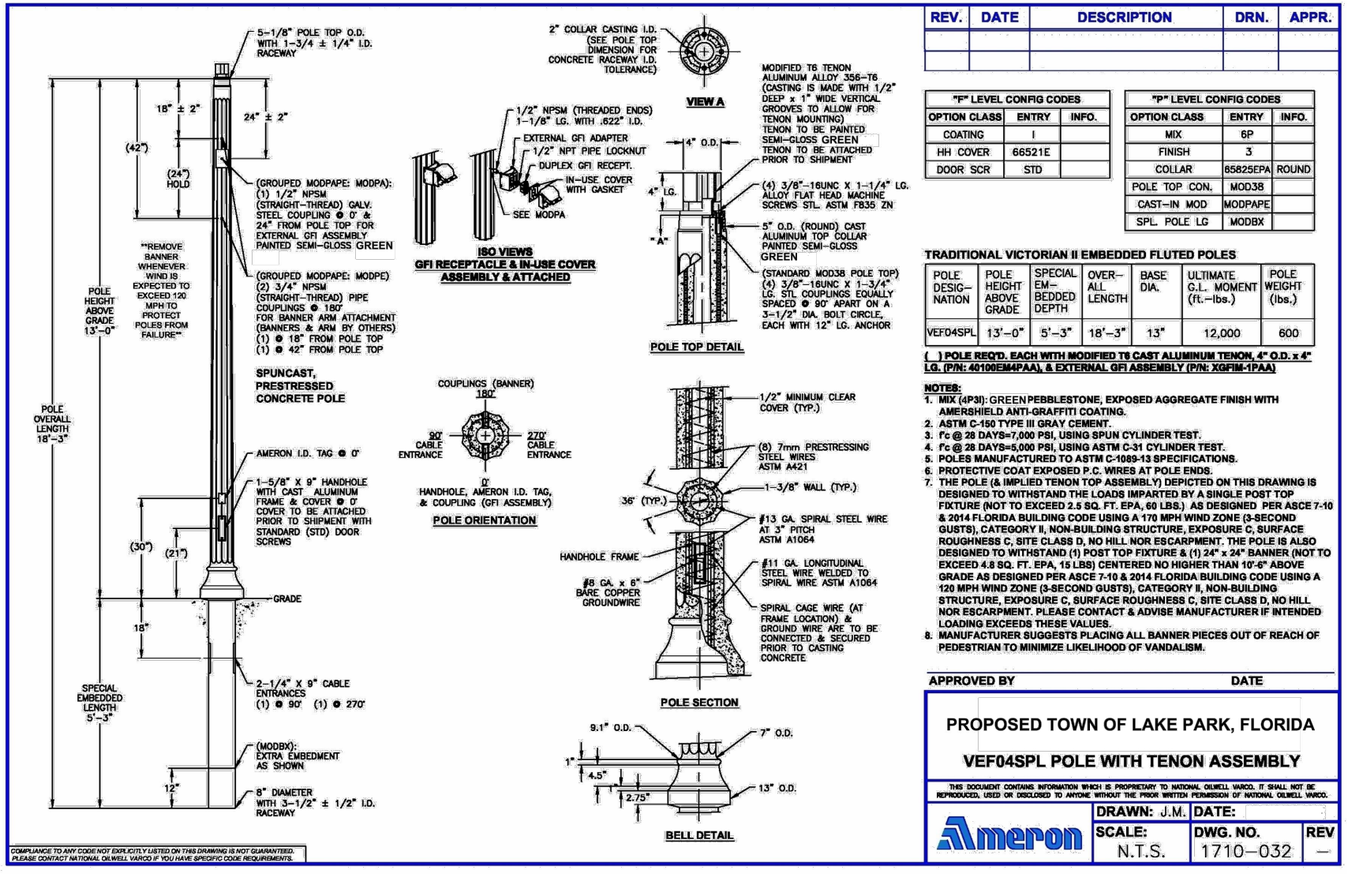
Page 1 / 4



REV.	DATE	DESCRIPTION	DRN.	APPR.

"F" LEVEL CONFIG CODES		
OPTION CLASS	ENTRY	INFO.
COATING	I	
HH COVER	66521E	
DOOR SCR	STD	

"P" LEVEL CONFIG CODES		
OPTION CLASS	ENTRY	INFO.
MIX	6P	
FINISH	3	
COLLAR	85825EPA	ROUND
POLE TOP CON.	MOD38	
CAST-IN MOD	MODPAPE	
SPL. POLE LG	MODBX	

TRADITIONAL VICTORIAN II EMBEDDED FLUTED POLES

POLE DESIG-NATION	POLE HEIGHT ABOVE GRADE	SPECIAL EM-BEDDED DEPTH	OVER-ALL LENGTH	BASE DIA.	ULTIMATE G.L. MOMENT (ft.-lbs.)	POLE WEIGHT (lbs.)
VEF04SPL	13'-0"	5'-3"	18'-3"	13"	12,000	600

( ) POLE REQ'D. EACH WITH MODIFIED T6 CAST ALUMINUM TENON, 4" O.D. x 4" LG. (P/N: 40100EM4PAA), & EXTERNAL GFI ASSEMBLY (P/N: XGFIM-1PAA)

NOTES:
1. MIX (4P3I): GREEN PEBBLESTONE, EXPOSED AGGREGATE FINISH WITH AMERSHIELD ANTI-GRAFFITI COATING.
2. ASTM C-150 TYPE III GRAY CEMENT.
3. f'c @ 28 DAYS=7,000 PSI, USING SPUN CYLINDER TEST.
4. f'c @ 28 DAYS=5,000 PSI, USING ASTM C-31 CYLINDER TEST.
5. POLES MANUFACTURED TO ASTM C-1089-13 SPECIFICATIONS.
6. PROTECTIVE COAT EXPOSED P.C. WIRES AT POLE ENDS.
7. THE POLE (& IMPLIED TENON TOP ASSEMBLY) DEPICTED ON THIS DRAWING IS DESIGNED TO WITHSTAND THE LOADS IMPARTED BY A SINGLE POST TOP FIXTURE (NOT TO EXCEED 2.5 SQ. FT. EPA, 60 LBS.) AS DESIGNED PER ASCE 7-10 & 2014 FLORIDA BUILDING CODE USING A 170 MPH WIND ZONE (3-SECOND GUSTS), CATEGORY II, NON-BUILDING STRUCTURE, EXPOSURE C, SURFACE ROUGHNESS C, SITE CLASS D, NO HILL NOR ESCARPMENT. THE POLE IS ALSO DESIGNED TO WITHSTAND (1) POST TOP FIXTURE & (1) 24" x 24" BANNER (NOT TO EXCEED 4.8 SQ. FT. EPA, 15 LBS) CENTERED NO HIGHER THAN 10'-6" ABOVE GRADE AS DESIGNED PER ASCE 7-10 & 2014 FLORIDA BUILDING CODE USING A 120 MPH WIND ZONE (3-SECOND GUSTS), CATEGORY II, NON-BUILDING STRUCTURE, EXPOSURE C, SURFACE ROUGHNESS C, SITE CLASS D, NO HILL NOR ESCARPMENT. PLEASE CONTACT & ADVISE MANUFACTURER IF INTENDED LOADING EXCEEDS THESE VALUES.
8. MANUFACTURER SUGGESTS PLACING ALL BANNER PIECES OUT OF REACH OF PEDESTRIAN TO MINIMIZE LIKELIHOOD OF VANDALISM.

APPROVED BY DATE

PROPOSED TOWN OF LAKE PARK, FLORIDA

VEF04SPL POLE WITH TENON ASSEMBLY

THIS DOCUMENT CONTAINS INFORMATION WHICH IS PROPRIETARY TO NATIONAL OILWELL VARCO. IT SHALL NOT BE REPRODUCED, USED OR DISCLOSED TO ANYONE WITHOUT THE PRIOR WRITTEN PERMISSION OF NATIONAL OILWELL VARCO.

Ameron | DRAWN: J.M. | DATE: | SCALE: N.T.S. | DWG. NO. 1710-032 | REV –

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WWW.SMITHENGINEERINGCONSULTANTS.COM

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LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

TOWN OWNED AND MAINTAINED
TYPICAL ROADWAY LIGHTING DETAILS

FIGURE: 4-1
SHEET:

ROADWAY LIGHTING

Manufacturer	Style	Fixture	Pole Options	Bracket Options	Light Pattern	Line Watts/ NEMA Label	Color Temp	Lumens	Glare Rating (BUG)	Jes File	Billing Tier
Cree	LEDWay Turtle Friendly	(Gray)	6, 7	1	3	100/100	614nm	5,316	B2-U0-G2	PL04235-001 XSL0306D-UC4.ies	F5
	RSW	(Gray)	6, 7	1	3	28/30	3000K	3,300	B1-U0-G1	RSWS-3ME-3L-30K7.ies	B2
			6, 7	1	3	26/30	4000K	3,300	B1-U0-G1	RSWS-3ME-3L-40K7 CONFIGURED.ies	B2
			6, 7	1	3	45/50	3000K	5,000	B1-U0-G1	RSWS-3ME-5L-30K7 CONFIGURED.ies	C2
			6, 7	1	3	41/40	4000K	5,000	B1-U0-G1	RSWS-3ME-5L-40K7 CONFIGURED.ies	C2
	XSP1-A	(Gray)	6, 7	1	3	53/50	4000K	4,806	B1-U0-G1	BXSP-B-HT-3ME-A-40K-UL PL10397-001.ies	D3
	XSP1-D		6, 7	1	3	38/40	4000K	3,701	B1-U0-G1	BXSP-B-HT-3ME-A-40K-UL-XX-N-Q6 CONFIGURED.ies	C3
	XSP2	(Gray)	6, 7	1	3	102/100	4000K	10,882	B2-U0-G3	BXSP-C-HT-3ME-A-40K-UL-XX-N-Q4 CONFIGURED.ies	F3
			6, 7	1	3	139/140	4000K	13,434	B2-U0-G3	BXSP-C-HT-3ME-F-30K-UL CONFIGURED.ies	H3
AEL	ATBS	(Gray)	6, 7	1	2	40/40	4000K	4,770	B1-U0-G1	ATBS_E_XXXXX_R2.ies	C2
			6, 7	1	2	47/50	4000K	5,392	B1-U0-G1	ATBS_F_XXXXX_R2.ies	C2
			6, 7	1	2	76/80	4000K	8,653	B2-U0-G2	ATBS_I_XXXXX_R2.ies	E2
	ATBM	(Gray)	6, 7	1	3	115/120	4000K	13,416	B2-U0-G3	ATBM_E_XXXXX_R3_XXXX.ies	G2
	ATBL	(Gray)	6, 7	1	3	259/260	4000K	28,091	B3-U0-G5	ATBL_F_XXXXX_R3.ies	N4
	ATB2	(Gray)	6, 7	1	4	133/130	4000K	16,593	B2-U0-G3	ATB2_40BLEDE10_XXXXX_R4.ies	H3
			6, 7	1	4	268/270	4000K	32,329	B3-U0-G5	ATB2_80BLEDE10_XXXXX_R4.ies	O5
		(Bronze)	6, 7	Hybrid only	4	133/130	4000K	16,593	B2-U0-G3	ATB2_40BLEDE10_XXXXX_R4.ies	H3
			6, 7	Hybrid only	4	268/270	4000K	32,329	B3-U0-G5	ATB2_80BLEDE10_XXXXX_R4.ies	O5
		(Black)	4, 6, 7	2	4	133/130	4000K	16,593	B2-U0-G3	ATB2_40BLEDE10_XXXXX_R4.ies	H3
			4, 6, 7	2	4	268/270	4000K	32,329	B3-U0-G5	ATB2_80BLEDE10_XXXXX_R4.ies	O5
Cooper	Verdeon M	(Gray)	6, 7	1	3	182/180	4000K	22,236	B3-U0-G3	VERD-M-A03-E-U-T3-AP.ies	J4
	Verdeon M	(Gray)	6, 7	1	3	247/250	4000K	29,537	B3-U0-G4	VERD-M-A04-E-U-T3-AP.ies	N4

Note: All roadway fixtures are grey unless otherwise noted

AREA LIGHTING

Manufacturer	Style	Fixture	Pole Options	Bracket Options	Light Pattern	Line Watts/ NEMA Label	Color Temp	Lumens	Glare Rating (BUG)	Jes File	Billing Tier
Cooper	Galleon	(Black)	1*	S/D	4	113W/110W	4000K	12,336	B2-U0-G3	GAP-AF-02-LED-U-T4W.ies	G3
			1*	S/D	4	225W/230W	4000K	23,844	B3-U0-G4	GAN-AF-04-LED-U-T4W.ies	M4
			1*	S/D	4	445W/450W	4000K	47,372	B4-U0-G5	GAN-AF-08-LED-U-T4W.ies	T6
			1*	S/D	4	558W/560W	4000K	58,506	B4-U0-G5	GAN-AF-10-LED-U-T4W.ies	T7
		(Gray)	1*	S/D	4	113W/110W	4000K	12,336	B2-U0-G3	GAP-AF-02-LED-U-T4W.ies	G3
			1*	S/D	4	225W/230W	4000K	23,844	B3-U0-G4	GAN-AF-04-LED-U-T4W.ies	M4
			1*	S/D	4	445W/450W	4000K	47,372	B4-U0-G5	GAN-AF-08-LED-U-T4W.ies	T6
			1*	S/D	4	558W/560W	4000K	58,506	B4-U0-G5	GAN-AF-10-LED-U-T4W.ies	T7
		(Bronze)	1*	S/D	4	113W/110W	4000K	12,336	B2-U0-G3	GAP-AF-02-LED-U-T4W.ies	G3
			1*	S/D	4	225W/230W	4000K	23,844	B3-U0-G4	GAN-AF-04-LED-U-T4W.ies	M4
			1*	S/D	4	445W/450W	4000K	47,372	B4-U0-G5	GAN-AF-08-LED-U-T4W.ies	T6
			1*	S/D	4	558W/560W	4000K	58,506	B4-U0-G5	GAN-AF-10-LED-U-T4W.ies	T7

S/D = Single or dual brackets.

* 20' (13' MH) Standard concrete pole for 113W only.
35' (27'6" MH) Standard concrete pole applicable to all.

PENDANT LIGHTING

Manufacturer	Style	Fixture	Pole Options	Bracket Options	Light Pattern	Line Watts/ NEMA Label	Color Temp	Lumens	Glare Rating (BUG)	Jes File	Billing Tier
Holophane	Bern	(Black)	3, 4	3	3	58/60	4000K	6,808	B1-U0-G2	15F3114sips GBLF2 P20 40K XXXX L3.ies	D10
	Domus (Memphis)	(Black)	3, 4	3	3	144/140	4000K	15,098	B3-U0-G3	LTL29277P14 ES2 P35S 40K XX SG 3 DS.ies	H10
	Teardrop (Memphis)	(Black)	3, 4	3	3	144/140	4000K	15,375	B2-U3-G4	LTL29193P14 ES2 P35S 40K XX TG 3.ies	H10

POST TOP LIGHTING

Manufacturer	Style	Fixture	Pole Options	Bracket Options	Light Pattern	Line Watts/ NEMA Label	Color Temp	Lumens	Glare Rating (BUG)	Jes File	Billing Tier
AEL	Traditional Carriage (American Revolution)	(Black)	1 (20'), 2	NA	3	39/40	3000K	2,967	B1-U3-G2	247L_10LEDE10_XXXX_3K_R3_AX.ies	C2
			1 (20'), 2	NA	3	73/70	3000K	5,553	B2-U3-G2	247L_20LEDE10_XXXX_3K_R3_AX.ies	E2
			1 (20'), 2	NA	3	39/40	4000K	3,187	B1-U3-G2	247L_10LEDE10_XXXX_4K_R3_AX.ies	C2
			1 (20'), 2	NA	3	73/70	4000K	5,962	B2-U3-G2	247L_20LEDE10_XXXX_4K_R3_AX.ies	E2
	Contemporary (Contempo)	(Grey)	1 (20'), 2	NA	3	38/40	3000K	2,970	B1-U3-G1	245L_10LEDE10_XXXX_3K_R3_RNA.ies	C2
			1 (20'), 2	NA	3	72/70	3000K	5,565	B2-U3-G2	245L_20LEDE10_XXXX_3K_R3_RNA.ies	E2
			1 (20'), 2	NA	3	38/40	4000K	3,188	B1-U3-G1	245L_10LEDE10_XXXX_4K_R3_RNA.ies	C2
			1 (20'), 2	NA	3	72/70	4000K	5,977	B2-U3-G2	245L_20LEDE10_XXXX_4K_R3_RNA.ies	E2
Cooper	Mesa	(Black)	1 (20'), 2	NA	3	75/80	4000K	7,456	B2-U0-G2	PMM-E03-LED-E-U-T3.ies	E5
			1 (20'), 2	NA	3	150/150	4000K	14,911	B3-U0-G3	PMM-E06-LED-E-U-TE.ies	I6
GE	EPTC	(Black)	1 (20'), 2	NA	5	65/70	4000K	7,300	B3-U1-G1	eptc02_07A40_____.ies	E4
Holophane	Granville	Black/Black	1, 5*	NA or 4	3	39/40	3000K	4,644	B2-U3-G4	ISF 32566P8 GVD2 P20 30K AS 3 NF.ies	C5
			1, 5*	NA or 4	3	39/40	5000K	4,888	B2-U3-G4	ISF 32566P12 GVD2 P20 50K AS 3 NF.ies	C5
			1, 5*	NA or 4	3	60/60	3000K	6,586	B2-U4-G5	ISF 32566P14 GVD2 P30 30K AS 3 NF.ies	D5
			1, 5*	NA or 4	3	60/60	5000K	6,932	B2-U4-G5	ISF 32566P17 GVD2 P30 50K AS 3 NF.ies	D5
	Granville	Clear/Black	1, 5*	NA or 4	3	60/60	5000K	7,440	B2-U5-G4	ISF 30151P5 GVD2 P30 50K AS 3 N.ies	D5
	Granville	Green/Green	1, 5	NA	3	39/40	3000K	4,644	B2-U3-G4	ISF 32566P8 GVD2 P20 30K AS 3 NF.ies	C5
			1, 5	NA	3	39/40	5000K	4,888	B2-U3-G4	ISF 32566P12 GVD2 P20 50K AS 3 NF.ies	C5
			1, 5	NA	3	60/60	3000K	6,586	B2-U4-G5	ISF 32566P14 GVD2 P30 30K AS 3 NF.ies	D5
			1, 5	NA	3	60/60	5000K	6,932	B2-U4-G5	ISF 32566P17 GVD2 P30 50K AS 3 NF.ies	D5
	Granville w/Lunar Optics	Silver/Clear	1, 5	NA	3	39/40	3000K	2,103	B1-U3-G1	ISF 30152P15 GVD2 P20 30K AS 6 N.ies	C5
			1, 5	NA	3	39/40	5000K	2,211	B1-U3-G1	ISF 30152P2 GVD2 P20 50K AS 6 N.ies	C5
			1, 5	NA	3	60/60	3000K	2,982	B1-U3-G2	ISF 30152P3 GVD2 P30 30K AS 6 N.ies	D5
			1, 5	NA	3	60/60	5000K	3,136	B1-U3-G2	ISF 30152P5 GVD2 P30 50K AS 6 N.ies	D5

*Also available in double bracket configuration

POLES AND BRACKETS

1 Standard Concrete — Tenon Mount 20' (13' MH) 35' (27'6" MH)

2 Standard Black Fiberglass — Tenon Mount 13' (10' MH) 20' (15'6" MH)

3 Black Columbia Concrete — Tenon Mount 20' (15'9" MH)

4 Black Octagonal Concrete — Tenon Mount 37' (30' MH)

5 Black or Green Washington Concrete — Tenon Mount 18.5' (14'6" MH)

6 Standard Wood — Arm Mount 35' (29' MH) 40' (33'6" MH) 45' (38" MH)

7 Standard Concrete — Arm Mount 30' (22'6" MH) 35' (27'6" MH) 40' (30'" MH) 45' (35" MH)

*MH = Approximate Mounting Height

BRACKETS

1	2	3	4
Style: Standard 2', 6', 8', 12' Side Mounted	Style: Standard 8' Side Mounted Arm or Standard 6', 8' Tenon Mounted Arm	Style: Decorative 6' Tenon Mounted Arm or Decorative 45" Pedestrian Side Mounted Arm	Style: Decorative Double Bracket Tenon Mounted Arm
Color: Silver	Color: Black	Color: Black	Color: Black

SEC Smith Engineering Consultants, Inc.
State Auth. #8228
2161 Palm Beach Lakes Blvd., Suite 312
West Palm Beach, Fl 33409
(561) 616-3911 fax (561) 616-3912
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www.mathewsconsultinginc.com EB-0007929

LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

FPL OWNED AND MAINTAINED
TYPICAL ROADWAY LIGHTING DETAILS

FIGURE: 4-2

SHEET:

Section 5 Seacoast Utility Authority Coordination

5.1 Introduction

Baxter & Woodman, Inc., is under contract with Seacoast Utility Authority (SUA) for the engineering design, permitting and bidding services associated with the replacement of the existing water main and a portion of the gravity sanitary sewer along Lake Shore Drive. These services will be performed in conjunction with the design services being provided by BW to the Town of Lake Park, for the drainage and roadway improvements along the same alignment. The project is a coordinated effort to simultaneously replace and upgrade the existing infrastructure under a single construction contract.

On January 30, 2019, a coordination meeting was held with SUA to discuss the scope and the logistic of bidding. Although the projects will be bid together, it was agreed that separate plan sets and specifications would be used. SUA will provide "front-end" documents, supplemental to the Town's documents and BW will prepare separate schedule of values. The scope of the SUA project is as follows:

5.2 Potable Water

Approximately 3,025 LF of new 8-inch DIP water main along Lake Shore Drive, extending from south of Castlewood Drive to the existing 8-inch water main south of Date Palm Drive will be installed to replace existing 6-inch water mains. The water mains will connect to existing water services and fire lines in the project area. Existing meters, master meters, backflow preventers, meter boxes and vaults will remain. The existing water distribution system is shown on ***Figure 5-1***.

- Existing fire hydrants along the alignment will be replaced. SUA indicated that fire hydrants shall be placed every 500 feet. There are currently two locations in the vicinity of Kelsey Park where the spacing exceeds 500 feet.

- The existing water mains will be abandoned in place with grouting with the exception of existing water mains in conflict with the proposed improvements, which will be shown to be removed and disposed of. A parallel water main exists in the southern portion of the project. Both of these lines will be replaced with a single water main.

- Existing lines will remain in use while the new line is under construction. Phasing will be needed to accomplish this and maintain service.

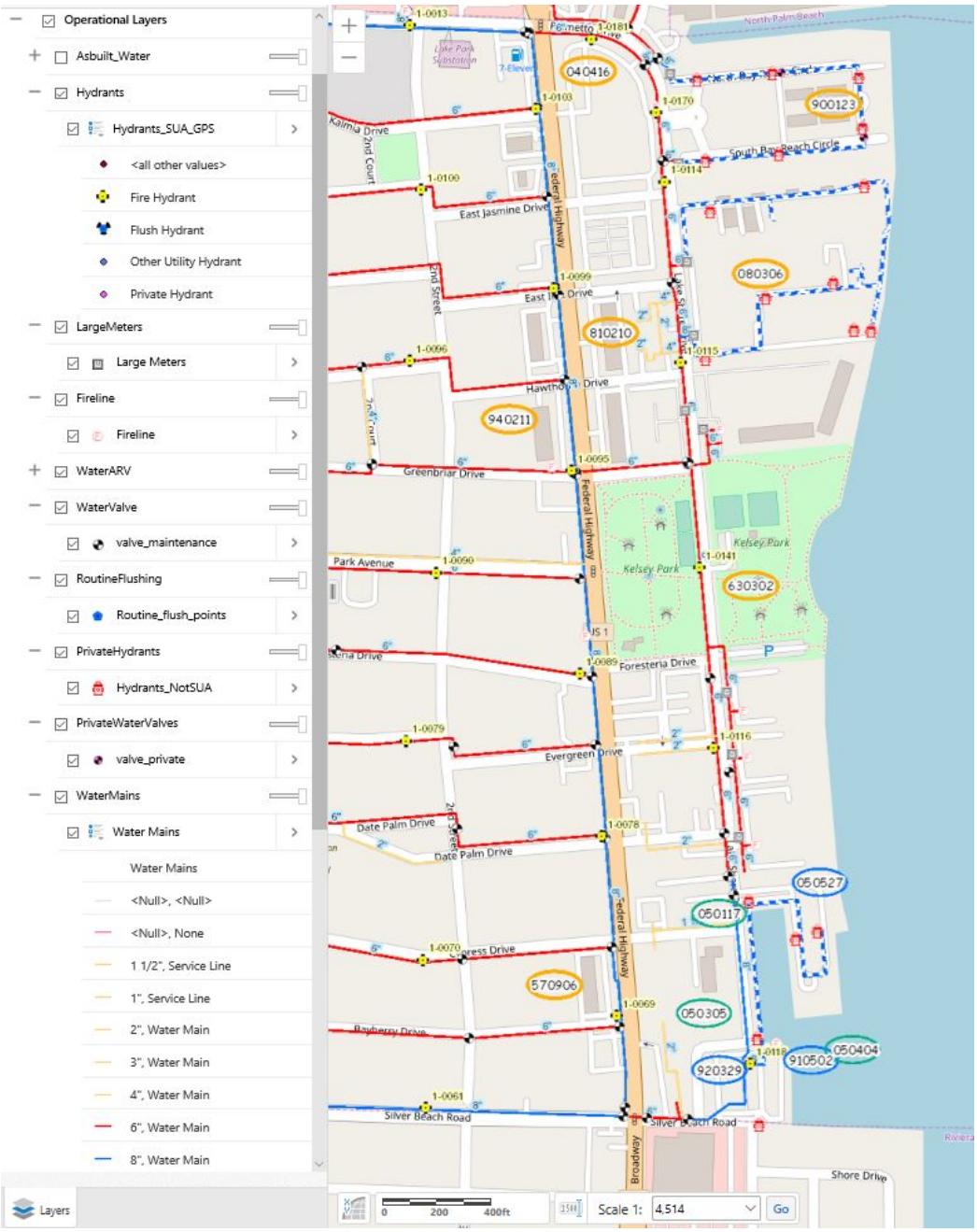


Figure 5-1: SUA Existing Water System

5.3 Sanitary Sewer

The sanitary sewage collection system within the road right-of-way consists of 8-inch pipes located in northern half of the project. The system serves condominiums and businesses located adjacent to the road. The sewage is sent to Lift Station 013 located in Kelsey Park.

Sanitary gravity sewer pipe, laterals and manholes consisting of 522 LF of 8-inch sewer and four (4) manholes along Lake Shore Drive will be replaced, extending from north of Hawthorne Drive to south of Greenbriar Drive. Existing sanitary laterals (6) shall be replaced to the right-of-way line.

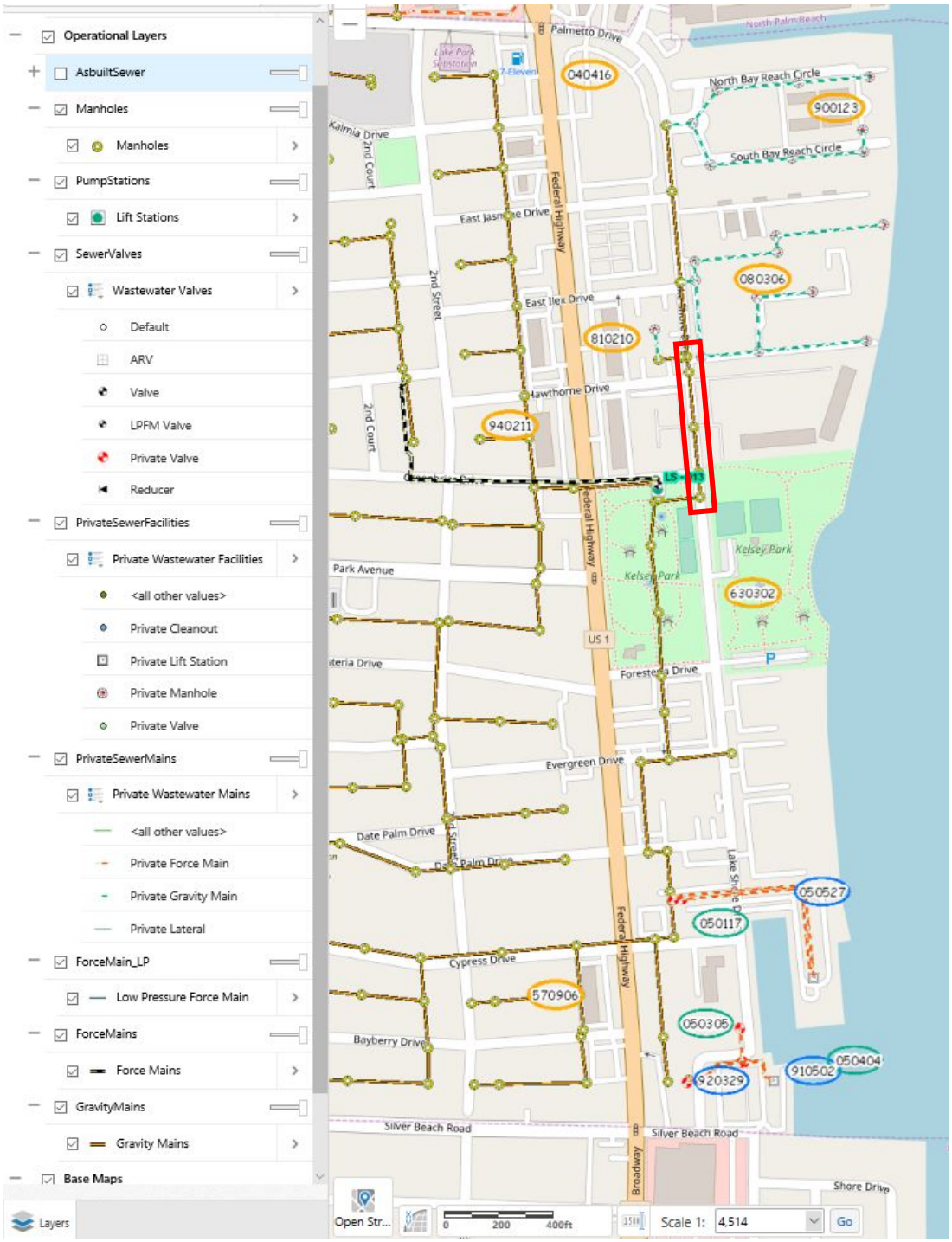


Figure 5-2: SUA Existing Sanitary Sewer System

Section 6 Recommendations & Cost Estimate

6.1 Stormwater Design

It is recommended that road runoff be directed to the grassed areas where inlets and pipes will collect and convey the water to its destination. Openings in the curbs can be made corresponding to low points in the road and swales within each grassed areas can direct the runoff to inlets providing a first flush of water quality treatment within the grassed areas.

Based on the modeling results, the 'Pump and Detention' alternative would provide the most flood protection for the project area and would extend that protection to 2060 and beyond. Other benefits of this alternative include the addition of water quality treatment to the system and the ability to discharge water at the maximum allowable rate regardless of the downstream water level. It is possible to further enhance the capabilities of the detention area by planting native, salt tolerant plant species in the detention area, essentially producing a large bioswale.

Since the effects of climate change will not be fully realized for some time, it is recommended that the existing gravity outfall pipes remain in use and that only one of the two proposed primary pumps be installed until it becomes necessary to increase the capacity of the pump station. The station infrastructure, however, should be built to accommodate the ultimate capacity. Based on the model results of an interim/combined (gravity and pumped) system, 20-cfs primary pump and a 10-cfs duty pump, with restricted levels of operation, can be used in unison with the gravity outfalls. For the full SLR conditions in the future, a second 20-cfs primary pump will need to be installed.

Rock riprap can be used to dissipate the flows into the detention area. It is recommended that the detention area include a bottom elevation of 3.0-feet, NAVD with an internal meandering swale with an invert elevation of 2.5-feet NAVD. Twin FDOT Type 'H' inlet structures can be modified to include 4-foot wide weirs and a 3-inch diameter bleeder orifice that will assist in bringing down the water level to maintain a dry system.

In-line check valves should be installed at the four gravity outfall pipes. This will protect the road from king tides and other SLR conditions and avoid the potential of activating the pumps and recirculating the water to and from the Lagoon. Additionally, at the existing low points the roadway crown can be raised by a couple of inches to provide a 3-year LOS for the entire roadway. This produces a minor reduction in storage that is easily compensated by the addition of the detention area.

6.2 Roadway

The roadway recommendations follow the Town's 'Vision Lake Park' program that calls for replacing the current roadway section with a single lane in each direction plus parallel parking along the outside of the southbound lane. Type F curb and gutter will be provided along the proposed lanes which will direct the rainfall runoff into swales with drainage inlets located behind the back of curb. A shared concrete pathway is proposed along the eastern right-of-way line and a concrete sidewalk is proposed along the

western right-of-way line. Landscaped areas are proposed between the back of curb and the front of sidewalk on both sides of the roadway.

Due to the shallow depth of groundwater and tide levels relative to the elevation of the roadway pavement, there is concern regarding the adverse effects of periodic inundation of the road base. Utilization of recycled asphalt, or "blackbase" is recommended in areas of frequent groundwater inundation. The blackbase is less moisture sensitive than baserock and therefore recommended for use on this project.

The relative good condition and significant thickness of the existing asphalt leads to the recommendation to mill approximately 8 ½-inches of pavement within the drive lanes and replace with recycled asphalt base and a surface course of 1 ½-inches of SuperPave 9.5. In the area under the proposed parallel parking, which requires a new roadway pavement section, 12-inches compacted subgrade, 6-inches of recycled asphalt base and 1-1/2-inches SuperPave is proposed.

An 8-foot wide concrete, multi-use pathway is proposed along the east right-of-way line for shared pedestrian and bicycle uses. A 5-foot wide concrete sidewalk is proposed along the western right-of-way line. Sidewalk concrete will be 4-inches thick. The proposed sidewalks will be designed to meet the American with Disabilities Act (ADA) and Florida Department of Transportation, Florida Building Codes.

The existing traffic signage will be replaced to meet the latest *Manual on Uniform Traffic Control Devices (MUTCD)* requirements. Stop signs will be provided at stop conditions and other regulatory signs such as No Parking signs will be replaced. Pavement markings will be thermoplastic and will meet the Palm Beach County *Typicals for Pavement Markings, Signing & Geometrics*, *April 2018*, and Florida Department of Transportation Standards as appropriate.

6.3 Landscaping and Lighting

Landscaping and lighting is proposed to support the Town's goal to enhance the beautification of the area. Predominantly native and salt tolerant plant material are proposed that can tolerate various soil & water conditions.

Because of overhead and proposed subsurface improvements, smaller trees and palms are proposed that will have smaller root systems and will meet the "FPL Right Tree, Right Place" principles. Silver Buttonwood & Christmas Palms are proposed for the Road ROW. The trees will be specified at 12-foot heights overall with a 5-foot clear single trunk and the palms will be specified at 16-foot overall height with a minimum 8-foot clear trunk at installation. There are bulb-outs at the ends of the parallel parking in the proposed site plan where some of the taller palms can be planted.

The proposed detention area in Kelsey Park, along the north property line of the park, will be landscaped to complement the existing vegetation in the park. Predominantly native and salt tolerant plant material is proposed that can tolerate various soil and water conditions. The landscaping in and around the detention area will be arranged in "natural" forms to enhance and beautify the new water feature. Cabbage Palms and Gumbo Limbo trees will used around the perimeter slopes and Cypress trees will

be added along the bottom edge of the detention area enhancing its ability to function as a bio-swale by filtering sediments and removing algae causing nutrients.

For irrigation, potable water will be required due to the fact there is increasing chloride levels in existing wells in the area. It is recommended that the project be divided into two sections running north and south. Each would have a "Smart Controller" with weather monitoring / sensing ability. The sprinkler head layout would have a row of low angle, pressure regulated 6-inch pop ups along the back of curb and back of sidewalk. This would minimize excess water on the roadway and sidewalk.

Decorative light poles/fixtures would be placed along both sides of Lake Shore Drive alternating at approximately 60 ft. spacing based on preliminary illumination calculations. There are two options for decorative lighting; 1) Town-owned and maintained lighting, and 2) FPL-owned and maintained lighting. Town owned lighting allows for a large selection of light fixtures and poles which would be purchased and maintained by The Town. The estimated cost to install this lighting along Lake Shore Drive within the project limits is approximately $640,000. The FPL-owned option includes limited lighting selections. However, the main benefits of participating in the FPL street lighting program are that there would be much less initial capital investment and no maintenance required by the Town. The Town would only need to have installed the FPL supplied conduits and pull boxes at an estimated cost of $40,000.

6.4 Coordination with SUA

Seacoast Utility Authority, which owns and maintains the water and sanitary infrastructure on Lake Shore Drive, has indicated that the Authority would like to participate in the project with the replacement and upgrade of their facilities. Approximately 3,025 LF of new 8-inch DIP water main along Lake Shore Drive, extending from south of Castlewood Drive to the existing 8-inch water main south of Date Palm Drive will be installed to replace existing 6-inch water mains.

The existing water mains will be abandoned in place with grouting with the exception of existing water mains in conflict with the proposed improvements, which will be shown to be removed and disposed of. A parallel water main exists in the southern portion of the project. Both of these lines will be replaced with a single water main.

The sanitary sewage collection system within the road right-of-way consists of 8-inch pipes located in northern half of the project. The system serves condominiums and businesses located adjacent to the road. Sanitary gravity sewer pipe, laterals and manholes consisting of 522 LF of 8-inch sewer and four (4) manholes along Lake Shore Drive will be replaced, extending from north of Hawthorne Drive to south of Greenbriar Drive.

6.5 Engineer's Estimate of Probable Construction Costs (Preliminary Design)

The preliminary construction cost estimate for the entire project is shown in ***Table 6-1***. The construction cost information is preliminary in nature. It was assumed that the Town will prefer to utilize FPL-owned decorative lighting. The costs for a Town-owned lighting system has been provided separately.

These costs are based upon comparisons of previous and current similar types of work and materials underway in the Southeast Florida area. All costs developed herein are in 2019 dollars and do not include land acquisition or easements. A detailed construction cost estimate will be developed as the final design of the improvements progresses.

PRELIMINARY DESIGN CONSTRUCTION COST OPINION (March 2019)

Lakeshore Drive Drainage Improvements

Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Extended Cost
General					
1	Mobilization, Bonds, Insurance	LS	1	$211,500.00	$211,500.00
2	Maintenance of Traffic	LS	1	$65,000.00	$65,000.00
3	As-Built Record Drawings	LS	1	$10,000.00	$10,000.00
4	NPDES Permit/Erosion Protection Measures	LS	1	$15,000.00	$15,000.00
5	Professional Audio/Video of Construction Site	LS	1	$6,500.00	$6,500.00
				Subtotal General:	**$308,000.00**
Roadway					
6	Mill Existing Pavement (approx. 8.5")	SY	8,500	$12.00	$102,000.00
7	1-1/2" Superpave Asphalt Concrete SP 12.5	TONS	750	$150.00	$112,500.00
8	6" Recycled Asphalt Pavement (RAP) w/ RC-70 Prime Coat	SY	8,800	$7.00	$61,600.00
9	12" Compacted Subgrade (LBR 40)	SY	2,100	$5.00	$10,500.00
10	Remove Existing Concrete Curbing (All Types)	LF	1,200	$5.00	$6,000.00
11	Remove Existing Concrete Sidewalk / Driveway (4"-6" Thick)	SY	4,306	$5.00	$21,530.00
12	Remove & Reinstall Existing Brick Paver Driveway	SF	800	$20.00	$16,000.00
13	Concrete Sidewalk, 4" Thick, 3000 PSI	SF	41,750	$6.00	$250,500.00
14	Concrete Driveway, 6" Thick, 3000 PSI	SF	11,000	$7.50	$82,500.00
15	Type F Curb & Gutter	LF	6,500	$23.00	$149,500.00
16	Curb Ramp with ADA-Compliant Tactile Surface Mat per FDOT Index 304	EA	17	$1,500.00	$25,500.00
17	Replace Existing Signs in Poor Condition	LS	1	$5,000.00	$5,000.00
18	Temporary & Permanent Pavements Markings & RPM's	LS	1	$10,000.00	$10,000.00
				Subtotal Roadway:	**$853,130.00**
Stormwater					
19	Remove Existing Drainage Inlet	EA	18	$1,000.00	$18,000.00
20	Remove Existing Drainage Pipe (12"-30")	LF	1,650	$20.00	$33,000.00
21	Type C Drainage Inlet w/ Casting	EA	18	$3,500.00	$63,000.00
22	Type C Drainage Inlet Top w/ 5' Dia. Type J Bottom	EA	6	$9,000.00	$54,000.00
23	Type C Drainage Inlet Top w/ 5'x7' Type J Bottom	EA	2	$8,000.00	$16,000.00
24	Type C Drainage Inlet Top w/ 5'x8' Type J Bottom & Pollution Control Structure	EA	2	$18,000.00	$36,000.00
25	Type C Drainage Inlet Top w/ 6' Dia. Type J Bottom	EA	2	$10,000.00	$20,000.00
26	Type C Drainage Inlet Top w/ 8' Dia. Type J Bottom	EA	1	$12,000.00	$12,000.00
27	Connect Existing Drainage Pipe to New Drainage Structure	EA	6	$2,000.00	$12,000.00
28	15" RCP	LF	450	$60.00	$27,000.00
29	18" RCP	LF	390	$80.00	$31,200.00
30	30" RCP	LF	470	$140.00	$65,800.00
31	36" RCP	LF	1,300	$160.00	$208,000.00
32	42" RCP	LF	330	$175.00	$57,750.00
33	48" RCP	LF	1,150	$250.00	$287,500.00
34	72" RCP	LF	95	$320.00	$30,400.00
35	Stormwater Pump Station Wetwell including Shoring, Excavation, Dewatering, Cast In Place Concrete, Trash Rack, Grating, Hatch Covers and Backfill	LS	1	$480,000.00	$480,000.00
36	Electric Submersible Pumps including Pump Cans, Discharge Pipes and Flap Gates	LS	1	$375,000.00	$375,000.00
37	Electrical and Controls including SS Rack, Meter Can, Disconnect, Service Light, Stilling Wells, and Nema 4X 316 SS Control Panel with Generator Receptacle, Surge Arrestor, Phase Monitor, Soft Starts, GFI Receptacle, Triplex Pump Station Controller including Level Transmitters and Backup Floats.	EA	1	$252,000.00	$252,000.00
38	Rock Riprap with Filter Fabric	LS	1	$17,500.00	$17,500.00
39	Type H (4-Grate) Intet	EA	2	$16,000.00	$32,000.00
40	Seawall Repair and Revetment	EA	1	$44,000.00	$44,000.00
41	Excavation and Grading Detention Area	CY	1,186	$7.00	$8,303.30
42	Sod Detention Area	SY	2,300	$3.00	$6,900.00
43	24" Inline WaSTOP Valve	EA	1	$11,000.00	$11,000.00
44	30" Inline WaSTOP Valve	EA	3	$13,000.00	$39,000.00
45	Stormwater Bypass Pumping	LS	1	$50,000.00	$50,000.00
46	Swale Regrading and Sod	SY	5,300	$9.00	$47,700.00
				Subtotal Stormwater:	**$2,335,053.30**
Sanitary Sewer					
47	Remove Existing Gravity Sanitary Sewer Main	LF	530	$24.00	$12,720.00
48	Remove & Replace Existing Sanitary Sewer Manhole	EA	4	$6,000.00	$24,000.00
49	8" PVC SDR 26 Sanitary Sewer Pipe	LF	530	$85.00	$45,050.00
50	Remove and Replace Sewer Lateral	EA	6	$1,500.00	$9,000.00
51	Sanitary Sewer Bypass Pumping	LS	1	$20,000.00	$20,000.00
				Subtotal Sanitary Sewer:	**$110,770.00**
Potable Water Main					
52	8" DIP (CL350) WM RJ, cement lined	LF	605	$85.00	$51,425.00
53	8" DIP (CL350) WM Push-On, cement lined	LF	2,420	$80.00	$193,600.00
54	8"x6" Tapping Tee & 8" Tapping Valve	EA	2	$6,000.00	$12,000.00
55	8" Gate Valve	EA	8	$2,100.00	$16,800.00
56	DIP Compact Fittings	TON	1.00	$10,500.00	$10,500.00
57	Connect New Water Service to Existing Water Meter Box / Fire Line (4"-8")	EA	20	$2,000.00	$40,000.00
58	Connect to Existing Water Main	EA	4	$3,000.00	$12,000.00
59	Install FH	EA	6	$4,000.00	$24,000.00
60	Remove Existing FH	EA	6	$500.00	$3,000.00
61	Sample Point	EA	4	$600.00	$2,400.00
62	Fill & Flush Assembly	EA	4	$950.00	$3,800.00
63	Abandon & Grout Existing 6" WM, incl Plugs	LF	5,000	$7.50	$37,500.00
				Subtotal Potable Water Main:	**$407,025.00**
Miscellaneous					
64	Clearing & Grubbing	LS	1	$50,000.00	$50,000.00
65	Landscaping	LS	1	$110,000.00	$110,000.00
65	Irrigation	LS	1	$221,000.00	$221,000.00
66	Street Lighting (FPL-owned)	LS	1	$40,000.00	$40,000.00
				Subtotal Miscellaneous:	**$421,000.00**
Allowances					
67	Undefined Underground Condition Allowance	AL	1	$100,000.00	$100,000.00
				Subtotal Allowances:	**$100,000.00**
				SUBTOTAL	**$4,534,978.30**
Construction Contingency (20%)					$906,995.66
Construction Administration (12%)					$544,197.40
GRAND TOTAL					**$5,986,171.35**

Street Lighting (Town-owned Option)					
68	*2" PVC Conduit*	*LF*	*4,500*	*$12.00*	*$54,000.00*
69	*Pull Box 14"x24"*	*LF*	*75*	*$525.00*	*$39,375.00*
70	*FPL Service Connection*	*LS*	*1*	*$2,500.00*	*$2,500.00*
71	*#6 Lighting Conductor*	*LF*	*21,000*	*$2.50*	*$52,500.00*
72	*Direct Buried Concrete Decortive Light Pole with Pole Top LED Fixture*	*EA*	*85*	*$5,500.00*	*$467,500.00*
73	*Lighting Load Center with Controls*	*LS*	*1*	*$23,500.00*	*$23,500.00*
				Subtotal Street Lighting:	***$639,375.00***

Note: Since the Engineer has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor's methods of determining prices, or over competitive bidding or market conditions, Engineer's opinion of probable Construction Cost provided herein are made on the basis of Engineer's experience and qualifications and represent Engineer's best judgement as an experienced and qualified Engineer familiar with the construction industry. Engineer cannot and does not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable construction cost prepared by Engineer.

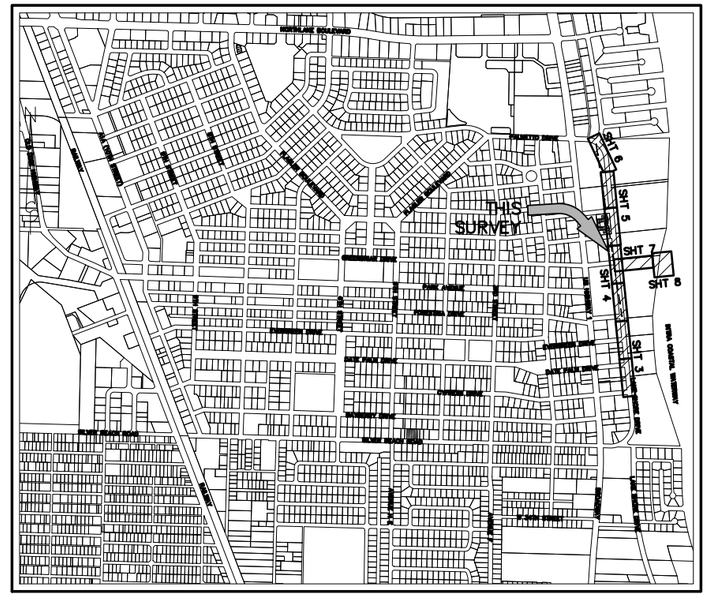
APPENDIX A – Survey Drawings

SPECIFIC PURPOSE SURVEY

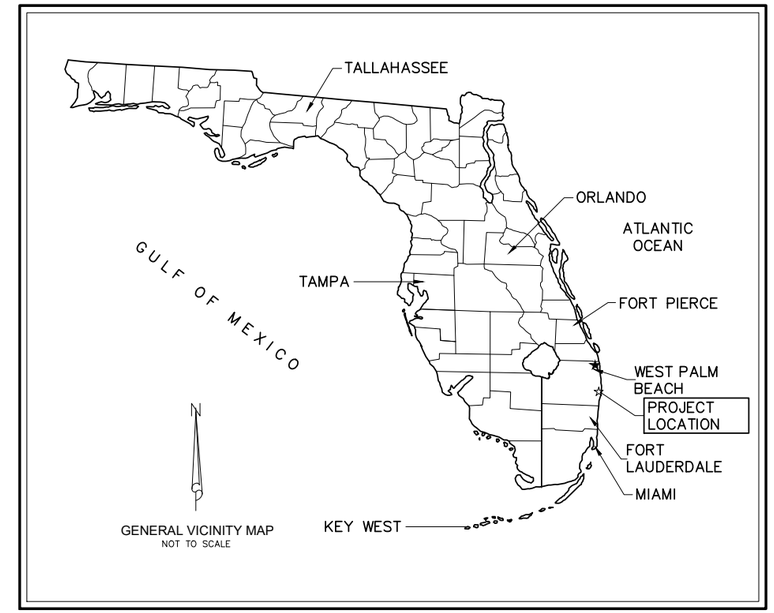
VERTICAL DATUM: NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88)

SURVEY NOTES:

1. THIS SKETCH WAS PREPARED IN ACCORDANCE WITH THE STANDARDS OF PRACTICE FOR SURVEYING ESTABLISHED BY THE BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS IN CHAPTER 5J-17, FLORIDA ADMINISTRATIVE CODES, PURSUANT TO SECTION 472.027, FLORIDA STATUTES. THE SPECIFIC PURPOSE OF THIS SURVEY IS TO AMEND THE SURVEY PREPARED BY CGA AND TO CONVERT THE ELEVATIONS ON SAID CGA SURVEY FROM NGVD 29 DATUM TO NAVD 88 DATUM.
2. THIS SURVEY IS NOT VALID WITHOUT THE SIGNATURE AND THE ORIGINAL RAISED SEAL OF A FLORIDA LICENSED SURVEYOR AND MAPPER.
3. A SEARCH OF THE PUBLIC RECORDS FOR OWNERSHIP, EASEMENTS, RIGHTS-OF-WAY, OR OTHER MATTERS OF RECORD WAS NOT PERFORMED BY BAXTER & WOODMAN, INC. THERE MAY BE ADDITIONAL INFORMATION RECORDED IN THE PUBLIC RECORDS THAT IS NOT SHOWN HEREON. FOR FURTHER INFORMATION, CONTACT A QUALIFIED TITLE COMPANY OR CONSULT THE PUBLIC RECORDS OF PALM BEACH COUNTY, FLORIDA
4. THE BEARINGS SHOWN HEREON ARE BASED ON ASSUMED BEARING BETWEEN CONTROL POINTS CP8 AND CP9 BEING, S 08°31'02" E
5. THE HORIZONTAL COORDINATES SHOWN HEREON ARE BASED ON THE FLORIDA STATE PLANE COORDINATE SYSTEM (EAST ZONE), NORTH AMERICAN DATUM 1983/1990 ADJUSTMENT (N.A.D. 83/90).
6. THE ELEVATIONS SHOWN HEREON ARE BASED ON NORTH AMERICAN VERTICAL DATUM OF 1988 (N.A.V.D. 88). THE ELEVATIONS FROM THE CGA SURVEY ARE BASED ON NGVD 29 DATUM AND HAVE BEEN CONVERTED TO NAVD 88 DATUM BY USE OF THE ACE CORPSCON 6.0.1 SOFTWARE. THE CALCULATED CONVERSION FROM NGVD 29 TO NAVD 88 DATUM IS (-) 1.52 FEET.
7. CERTAIN FEATURES ARE REPRESENTED BY THE SYMBOLS REFLECTED IN THIS MAP. THE LEGEND OF FEATURES MAY HAVE BEEN ENLARGED FOR CLARITY AND MAY NOT REPRESENT THE ACTUAL SHAPE OR SIZE OF THE FEATURE. THE SYMBOLS HAVE BEEN PLOTTED AT THE APPROXIMATE CENTER OF THE FEATURE BASED UPON THE FIELD LOCATION.
8. THIS SKETCH IS NOT A BOUNDARY SURVEY.
9. THIS SKETCH IS INTENDED TO BE DISPLAYED AT A HORIZONTAL SCALE OF 1 INCH = 20 FEET.
10. THE HORIZONTAL ACCURACY FOR WELL DEFINED IMPROVEMENTS DEPICTED ON THIS SKETCH IS ONE-TENTH (0.1' ±) OF A FOOT, PLUS OR MINUS. THE VERTICAL (ELEVATIONS) ACCURACY FOR WELL DEFINED IMPROVEMENTS, FEATURES, AND SURFACES DEPICTED ON THIS SURVEY IS TWO-TENTHS (0.2' ±) OF A FOOT, PLUS OR MINUS.
11. TREES, HEDGES, GROUND COVER, AND OTHER LANDSCAPE FEATURES ARE NOT SHOWN HEREON, UNLESS OTHERWISE NOTED.
12. IRRIGATION FEATURES, SUCH AS SPRINKLERS, ARE NOT SHOWN HEREON.
13. FENCES AND WALL DIMENSIONS ARE APPROXIMATE. THE SURVEYOR DID NOT DETERMINE OWNERSHIP OF FENCES AND WALLS.
14. SUBSURFACE FEATURES ARE NOT SHOWN HEREON. THIS SITE COULD HAVE UNDERGROUND INSTALLATIONS THAT ARE NOT SHOWN HEREON. BEFORE DESIGN, CONSTRUCTION, OR EXCAVATION CONTACT 811 AND/OR THE APPROPRIATE UTILITY COMPANIES FOR FIELD VERIFICATION OF UTILITIES.
15. THE EXTERIOR BUILDING DIMENSIONS SHOWN HEREON REPRESENT THE OVERALL SIZE OF THE BUILDING (FOOTPRINT). SUBSURFACE BUILDING FOOTINGS AND SUPPORTS WERE NOT LOCATED. CERTAIN ARCHITECTURAL FEATURES MAY NOT BE SHOWN ON THE SURVEY. ROOF OVERHANGS ARE NOT SHOWN UNLESS OTHERWISE NOTED. BUILDING DIMENSIONS AND BUILDING SETBACKS ARE SHOWN ROUNDED TO THE NEAREST ONE-TENTH (0.1) OF A FOOT. BEFORE DESIGN OF IMPROVEMENTS CRITICAL DIMENSIONS SHOWN BE CONFIRMED.
16. THE DIMENSIONS SHOWN HEREON ARE BASED UPON U.S. SURVEY FEET AND FRACTIONAL PARTS THEREOF.
17. THE SURVEYOR DID NOT INSPECT THIS PROPERTY FOR ENVIRONMENTAL HAZARDS.
18. THE INFORMATION DEPICTED ON THIS SKETCH OF SURVEY REPRESENTS THE RESULTS OF A FIELD SURVEY ON THE DATE INDICATED ON THIS DRAWING AND CAN ONLY BE CONSIDERED VALID FOR THIS DATE AND INDICATES THE GENERAL CONDITIONS EXISTING AT THE TIME OF THE FIELD SURVEY.
19. THIS SKETCH OF SURVEY CANNOT BE RELIED UPON BY PERSONS OR ENTITIES OTHER THAN THOSE PERSONS OR ENTITIES CERTIFIED TO HEREON. ADDITIONS OR DELETIONS TO THIS SURVEY AND/OR REPORTS BY PEOPLE OR PERSONS OTHER THAN THE SIGNING PARTIES ARE PROHIBITED WITHOUT PRIOR WRITTEN CONSENT OF THE SIGNING PARTY OR PARTIES.
20. THE INFORMATION CONTAINED IN THIS DOCUMENT WAS PREPARED BY BAXTER & WOODMAN, INC. (B&W). B&W HAS TAKEN PRECAUTIONS TO ENSURE THE ACCURACY OF THIS DOCUMENT AND THE DATA REFLECTED HEREIN. B&W CANNOT NOT GUARANTEE THAT ALTERATIONS AND/OR MODIFICATIONS WILL NOT BE MADE TO THE DATA CONTAINED IN THIS DOCUMENT BY OTHERS AFTER IT LEAVES OUR POSSESSION. THIS DOCUMENT MUST BE COMPARED TO THE ORIGINAL HARD COPY (WHICH BEARS THE RAISED SURVEYOR'S CERTIFICATION SEAL) TO ENSURE THE ACCURACY OF THE INFORMATION CONTAINED HEREON AND TO FURTHER ENSURE THAT ALTERATIONS AND/OR MODIFICATIONS HAVE NOT BEEN MADE. B&W MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, CONCERNING THE ACCURACY OF THE INFORMATION CONTAINED IN THIS OR ANY DOCUMENT TRANSMITTED OR REVIEWED BY COMPUTER OR OTHER ELECTRONIC MEANS. CONTACT B&W FOR VERIFICATION OF ACCURACY.
21. RIGHT-OF-WAY AND BOUNDARY INFORMATION IS BASED ON AVAILABLE GIS INFORMATION.
22. AN OVERLAY OF AN EXISTING SURVEY PROVIDED BY CALVIN GIORDANO AND ASSOCIATES (CGA) WAS USED AS A BASIS AND THE TOPOGRAPHY PROVIDED BY BAXTER & WOODMAN, INC. (B&W) DEPICTS CERTAIN AREAS AND FEATURES REQUIRED TO UPDATE. IN NO REGARD DOES B&W VALIDATE CGA OVERLAY TOPOGRAPHY AND TO BE USED AS A GRAPHICAL DEPICTION IDENTIFYING SURVEY PERFORMED PREVIOUSLY AND PROVIDED BY CLIENT.
23. ALL HORIZONTAL SURVEY CONTROL IS PER SURVEY PREPARED BY CGA.



LOCATION MAP AND LIMIT OF SURVEY
NOT TO SCALE



GENERAL VICINITY MAP
NOT TO SCALE

LEGEND:

ASPH. = ASPHALT
BPP = BLACK PLASTIC PIPE
ATT = AT&T TELEPHONE
C/L = CENTERLINE
C = CALCULATED
CB = CATCH BASIN
CGA = CALVIN GIORDANO & ASSOC.
CLF = CHAIN LINK FENCE
CLP = CONCRETE LIGHT POLE
CMP = CORRUGATED METAL PIPE
CONC. = CONCRETE
CP = CONCRETE PIPE
D = CENTRAL ANGLE
DIP = DUCTILE IRON PIPE
DEP. = DEPRESSED (CURB)
ELEV. = ELEVATION
EP = EDGE OF PAVEMENT
EOW = EDGE OF WATER
F.D.O.T. = FLORIDA DEPARTMENT OF TRANSPORTATION
F.P.L. = FLORIDA POWER AND LIGHT
FND = FOUND
GAR. = GARAGE
HDPE = HIGH DENSITY POLYETHYLENE PIPE
INV = INVERT
I.R.C. = IRON ROD & CAP
L. = LENGTH
L.F. = LINEAR FEET
LSA = LANDSCAPE AREA
L.W.D.D. LAKE WORTH DRAINAGE DISTRICT
MP = METAL PIPE
N/A = NOT ACCESSIBLE
N/D = NAIL AND DISK
OHW = OVERHEAD WIRE
PRK MTR = PARKING METER
P.B. = PLAT BOOK
PBC = PALM BEACH COUNTY
P.B.C.R. = PALM BEACH COUNTY RECORDS
PG. = PAGE
PP = PLASTIC PIPE
PK = PARKER-KALON BRAND
PRM = PERMANENT REFERENCE MARKER
PVC = POLYVINYL CHLORIDE
R = RADIUS
FF = FIRST FLOOR ELEVATION
MH = MANHOLE
RCP = REINFORCED CONCRETE PIPE
R/W = RIGHT OF WAY
RWM = RIGHT OF WAY MAP
RLS = REGISTERED LAND SURVEYOR
SEC. = SECTION
STA. = STATION
T.O.N. = TOP OF NUT
T.O.P. = TOP OF PIPE
T.O.W. = TOP OF WALL
U.E. = UTILITY EASEMENT
UNK = UNKNOWN
VERT. = VERTICAL
V.G. = VALLEY GUTTER
VCP = VITRIFIED CLAY PIPE
WPP = WOOD POWER POLE
PP = PLASTIC PIPE
G.U.E. = GENERAL UTILITY EASEMENT
S.E. = SEWER EASEMENT
W.E. = WATER EASEMENT
P.E. = PUBLIC EASEMENT
SSMH = SANITARY SEWER MANHOLE
SDMH = STORM DRAINAGE MANHOLE
--WPM-- = UNKNOWN (WHITE PAINT MARK)
--FO-- = FIBER OPTIC (WJITE PAINT MARK)
--BPM-- = WATER (BLUE PAINT MARK)
--GPM-- = SANITARY SEWER (GREEN PAINT MARK)
--YPM-- = GAS (YELLOW PAINT MARK)
--TEL-- = TELEPHONE (ORANGE PAINT MARK)
X 4.0 = SURVEYED GROUND SHOT BY MATHEWS CONSULTING, INC., A BAXTER WOODMAN CO.
X 4.0 = CALVIN GIORDANO & ASSOCIATES GROUND SHOT (CONVERSION NGVD29 TO NAVD 88 = 1.52')

SYMBOL LEGEND:

Ø DIAMETER
BFP BACK FLOW PREVENTER
WM WATER METER
IV IRRIGATION VALVE
SV SANITARY VALVE
WV WATER VALVE
SPIGOT
SIGN
—OHW— OVERHEAD UTILITY WIRE
X 0.00 EXISTING ELEVATION
HYD FIRE HYDRANT
WOOD POWER POLE
CPP CONCRETE POWER POLE
GROUND LIGHT
WOOD POLE STREET LIGHT
CONCRETE POLE STREET LIGHT
FO FIBER OPTIC MARKER
EM ELECTRIC METER
EH ELECTRIC HANDHOLE
TH TELEPHONE HANDHOLE
CH CABLE/TV HANDHOLE
EB ELECTRIC BOX
ICV IRRIGATION CONTROL VALVE IN CONC. BOX
PARKING METER
RCWV RECLAIMED WATER VALVE
KP KEY PAD
ATT AT&T TELEPHONE MANHOLE
TR TELEPHONE RISER
= ELECTRIC OUTLET
CATCH BASIN
= RED FLAG
= WHITE FLAG
= BLUE FLAG
= YELLOW FLAG
= ORANGE FLAG
= GREEN FLAG
—BPM— BLUE PAINT MARKS
—RPM— RED PAINT MARKS
—GPM— GREEN PAINT MARKS
—OPM— ORANGE PAINT MARKS
—PPM— PURPLE PAINT MARKS
—WPM— WHITE PAINT MARKS
—YPM— YELLOW PAINT MARKS
SPRINKLER HEAD
LIGHT POST
M MAILBOX
WOOD GUIDE POLE
TRAFFIC SIGNAL POLE
TRASH CAN
MONITORING WELL
ELECT PANEL ELECTRICAL PANEL
TRAFFIC HANDHOLD
G.T. BOX GAS TEST BOX
RISER BOX UNKNOWN RISER BOX
CUP CONCRETE UTILITY POLE
CONCRETE PARKING STOP
ET ELECTRIC TRANSFORMER
A AIR RELEASE VALVE
E ELECTRIC MANHOLE
U MANHOLE UNKNOWN TYPE
M DECORATIVE MAILBOX
S SANITARY MANHOLE
D STORM MANHOLE
LSA LIMITS OF LANDSCAPING
LIMITS OF TREE CANOPY
BUSH/HEDGE
CO CLEAN OUT
GUY WIRE ANCHOR
SITE BENCHMARK
W WELL
IRON ROD/REBAR WITH ID DISK SET (LB 8175)
RIGHT-OF-WAY LINE
GUARD RAIL
DECORATIVE LIGHT POST
CONCRETE LIGHT POST
GAS GAS LID
T TRAFFIC SIGNAL BOX
FO FIBER OPTIC HANDHOLE
U.GAS MKR UNDERGROUND GAS MARKER
YD YARD DRAIN
YD 1.5'x1.5' SQUARE YARD DRAIN
SWALE
CTV CABLE TV RISER

SURVEY TREE LEGEND:

00" – ACACIA
00" – PALM SPECIES
00" – BANANA
00" – FICUS
00" – SEAGRAPE
Indicates trunk diameter
00" – UNKNOWN
00" – ROYAL POINCIANA
00" – MAPLE
00" – MAHOGANY
00" – OAK
00" – CITRUS
00" – CACTUS
00" – MANGO
– HEDGE
00" – BUSH
00" – CYPRESS
00" – PAPAYA
00" – GUMBO-LIMBO
00" – PINE

NOTE: VERIFICATION OF TREE SPECIES SHOULD BE CONDUCTED BY A PROFESSIONAL ENGAGED IN THE FIELD OF NATURAL SCIENCE.

DESCRIPTION:

BEING A PART OF SECTION 21, TOWNSHIP 42 SOUTH, RANGE 43 EAST

SURVEYOR CERTIFICATION:

THIS IS TO CERTIFY THAT THIS SKETCH OF A TOPOGRAPHIC SURVEY WAS MADE UNDER MY RESPONSIBLE CHARGE AND IS ACCURATE AND CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. I FURTHER CERTIFY THAT THIS SKETCH MEETS THE STANDARDS OF PRACTICE, ESTABLISHED BY THE BOARD OF PROFESSIONAL SURVEYORS AND MAPPERS, CHAPTER 5J-17, FLORIDA ADMINISTRATIVE CODES, PURSUANT TO SECTION 472.027, FLORIDA STATUTES.

LAST DAY OF FIELD WORK: 01/07/19
DATE OF SIGNATURE: 02/11/19

THOMAS A. ENGLISH
PROFESSIONAL SURVEYOR AND MAPPER NO. 6930
STATE OF FLORIDA
MATHEWS CONSULTING, A BAXTER AND WOODMAN COMPANY LB 8175

NO.	DATE	ISSUED FOR	APRV'D BY

DESIGNED: T.A.E.
DRAWN: H.L.N.
CHECKED: T.A.E
APPROVED:

BAXTER & WOODMAN Consulting Engineers
477 S. Rosemary Avenue, Suite 330, West Palm Beach, Florida 33401
Phone: 561-655-6175 ● Fax: 561-655-6179
www.baxterwoodman.com EB-31795

VERIFY SCALE
1"
BAR IS ONE INCH ON FULL SIZE (22x34) ORIGINAL DRAWING. ADJUST SCALES AS NECESSARY.

ENGINEER NO.: 180551
CLIENT
PROJECT NO.: XX-XXX
CAD REF.: 180551C_P1

TOPOGRAPHIC SURVEY
LAKE PARK, PALM BEACH COUNTY, FLORIDA

PARCEL OF LAND BEING A PART OF SECTION 21, TOWNSHIP 42 SOUTH, RANGE 43 EAST

DATE: JANUARY 2019
SHEET: 1 of 8
DRAWING: V-1

Date\Time : Mon, 11 Feb 2019 – 10:38am Current Plotstyle : ByColor Layout Tab: V-1
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Acad Version : R22.0s (LMS Tech)
User Name : 793kln

PROJECT CONTROL LIST
NOTE: POINT NAMES THAT HAVE A "*" BEFORE IT ARE THE CONTROL POINTS USED, ALL OTHER POINTS ARE FOUND MONUMENTS

POINT NAME	BASELINE STATION	OFFSET	(X) NORTHING	(Y) EASTING	DESCRIPTION
*5	STA: 25+51.53	OFFSET: 22.48 R	N 895792.67	E 965093.78	SET MAG NAIL AND DISK
B	STA: 26+04.88	OFFSET: 33.75 L	N 895840.13	E 965032.50	FND PK NAIL AND ID DISK
C	STA: 27+29.90	OFFSET: 33.71 L	N 895964.53	E 965020.06	FND 5/8" IRON ROD
*10	STA: 27+57.97	OFFSET: 22.65 R	N 895998.09	E 965073.33	SET MAG NAIL AND DISK
J	STA: 27+91.80	OFFSET: 218.69 L	N 896007.65	E 964829.82	FND 5/8" IRON ROD
K	STA: 27+33.51	OFFSET: 394.19 L	N 895932.12	E 964661.02	FND 60D NAIL
D	STA: 29+39.90	OFFSET: 33.69 L	N 896173.49	E 964999.11	FND 1/4" IRON ROD AND CAP
E	STA: 29+13.90	OFFSET: 26.41 R	N 896153.62	E 965061.51	FND BROKEN NAIL IN WALK
M	STA: 30+94.66	OFFSET: 3.59 L	N 896330.48	E 965013.60	FND PK NAIL DISK
*11	STA: 30+94.68	OFFSET: 22.93 R	N 896333.15	E 965039.98	SET MAG NAIL AND DISK
L	STA: 31+26.74	OFFSET: 210.14 L	N 896341.77	E 964804.88	FND 1" PIPE
F	STA: 31+35.11	OFFSET: 26.57 R	N 896373.74	E 965039.57	FND NAIL AND WASHER
G	STA: 31+25	OFFSET: 33.60 L	N 896357.67	E 964980.71	FND 1" PIPE
H	STA: 33+78.45	OFFSET: 207.29 L	N 896592.51	E 964782.58	FND 5/8" IRON ROD
*3	STA: 33+93.69	OFFSET: 23.17 R	N 896630.69	E 965010.37	SET MAG NAIL AND DISK
*9	STA: 34+04.54	OFFSET: 2.66 L	N 896638.90	E 964983.58	SET MAG NAIL AND DISK
*12	STA: 37+61	OFFSET: 23.41 R	N 896996.18	E 964973.92	FND PK NAIL AND DISK
2	STA: 41+20.16	OFFSET: 1.98 L	N 897351.01	E 964912.78	FND PK NAIL DISK IN CUT-OUT
*4	STA: 41+29.67	OFFSET: 23.65 R	N 897363.04	E 964937.34	SET MAG NAIL AND DISK
Q	STA: 41+19.12	OFFSET: 223.67 L	N 897327.84	E 964692.31	FND BOLT
O	STA: 41+48.02	OFFSET: 379.97 L	N 897340.99	E 964533.90	FND PK NAIL AND DISK
R	STA: 41+50.24	OFFSET: 27.98 R	N 897383.94	E 964939.59	FND 5/8" IRON ROD AND CAP
1030	STA: 44+37.21	OFFSET: 381.67 L	N 897628.56	E 964503.33	FND PK NAIL AND WASHER
1031	STA: 44+38.22	OFFSET: 226.68 L	N 897645.04	E 964657.44	FND 5/8" IRON ROD AND CAP
7	STA: 44+69.33	OFFSET: 1.64 L	N 897698.48	E 964878.25	FND PK NAIL AND DISK
1029	STA: 44+98.56	OFFSET: 206.90 L	N 897707.06	E 964671.10	FND 5/8" IRON ROD
1028	STA: 44+99.80	OFFSET: 31.90 L	N 897725.77	E 964845.10	FND 5/8" IRON ROD
*13	STA: 44+94.21	OFFSET: 24.14 R	N 897725.80	E 964901.42	FND 1/2" IRON ROD
1032	STA: 45+00.36	OFFSET: 28.25 R	N 897732.33	E 964904.90	SET MAG NAIL
2207	STA: 45+52.85	OFFSET: 24.21 R	N 897784.16	E 964895.64	SET MAG NAIL
1024	STA: 48+32.54	OFFSET: 384.04 L	N 898021.67	E 964461.49	FND 5/8" IRON ROD AND CAP
1027	STA: 47+74.11	OFFSET: 31.48 L	N 897998.75	E 964818.12	FND X-CUT
1026	STA: 48+04.05	OFFSET: 31.43 L	N 898028.55	E 964815.18	FND NAIL AND WASHER IN X-CUT
1025	STA: 48+34.03	OFFSET: 31.42 L	N 898058.38	E 964812.20	FND NAIL AND WASHER
*14	STA: 48+06.85	OFFSET: 24.55 R	N 898036.92	E 964870.61	SET MAG NAIL
1019	STA: 51+09.12	OFFSET: 30.67 L	N 898332.16	E 964785.47	FND MAG NAIL AND TIN TAB
*15	STA: 51+18.21	OFFSET: 24.96 R	N 898346.76	E 964839.92	SET MAG NAIL
*16	STA: 51+49.54	OFFSET: 25.01 R	N 898377.94	E 964836.83	SET MAG NAIL
1023	STA: 51+06.88	OFFSET: 385.77 L	N 898294.47	E 964432.37	FND NAIL AND WASHER
1022	STA: 51+36.87	OFFSET: 385.96 L	N 898324.30	E 964429.19	FND SHIP SPIKE IN CUT OUT
1020	STA: 51+39.11	OFFSET: 31.04 L	N 898361.97	E 964782.11	FND MAG NAIL AND TIN TAB
1021	STA: 51+66.77	OFFSET: 386.19 L	N 898354.03	E 964425.97	FND BROKEN 4"X4" CONC MONU.
1018	STA: 51+39.63	OFFSET: 29.15 R	N 898368.50	E 964841.94	FND 5/8" IRON ROD
1017	STA: 53+74.75	OFFSET: 30.23 R	N 898602.55	E 964819.54	FND 1-1/4" IRON PIPE
*6	STA: 54+39.86	OFFSET: 25.39 R	N 898666.85	E 964808.22	SET MAG NAIL AND DISK
1016	STA: 54+34.75	OFFSET: 30.92 R	N 898662.32	E 964814.23	FND 1-1/4" IRON PIPE
1014	STA: 54+96.15	OFFSET: 0.63 L	N 898720.25	E 964776.70	FND PK NAIL AND WASHER IN CUT-OUT
1013	STA: 54+95.48	OFFSET: 29.41 R	N 898722.84	E 964806.63	FND 5/8" IRON ROD
1015	STA: 54+96.64	OFFSET: 30.63 L	N 898717.36	E 964746.83	FND PK NAIL AND WASHER
*8	STA: 57+37.02	OFFSET: 22.34 L	N 898902.24	E 964644.60	SET MAG NAIL DISK
1012	STA: 57+26.06	OFFSET: 32.02 R	N 898939.94	E 964685.31	FND NAIL
1011	STA: 57+27.90	OFFSET: 57.52 R	N 898961.69	E 964698.78	FND NAIL
1009	STA: 57+43.74	OFFSET: 41.61 R	N 898959.24	E 964674.41	FND 3/4" PIPE
1005	STA: 57+77.62	OFFSET: 58.53 R	N 898993.67	E 964648.10	FND 3/4" PIPE
1004	STA: 58+66.89	OFFSET: 45.40 R	N 899012.25	E 964543.60	FND 1" PIPE IN CONC
1007	STA: 57+84.32	OFFSET: 229.54 R	N 899152.34	E 964712.63	FND RAILROAD SPIKE IN CUT-OUT
1006	STA: 57+98.92	OFFSET: 214.75 R	N 899149.12	E 964682.77	FND 5/8" IRON ROD
1003	STA: 58+97.95	OFFSET: 33.32 R	N 899003.20	E 964507.42	FND 5/8" IRON ROD
1001	STA: 58+97.97	OFFSET: 3.34 R	N 898973.24	E 964506.44	FND 5/8" IRON ROD AND CAP
1002	STA: 60+19.52	OFFSET: 33.49 R	N 899007.27	E 964385.92	FND 5/8" IRON ROD
1000	STA: 60+44.30	OFFSET: 54.94 R	N 899029.50	E 964361.84	FND PK NAIL WITH TAB

SYMBOL LEGEND

- WOOD P.P. W/LIGHT
- CONCRETE P.P. W/LIGHT
- BELLSOUTH
- GROUND LIGHT
- WOOD POWER POLE
- CONC LIGHT POLE
- GUY WIRE
- LIGHT POLE
- ELECTRIC HAND HOLE
- ELECTRIC MH
- BELLSOUTH MH
- GAS UTILITY VALVE
- GATE VALVE
- IRRIGATION VALVE
- WATER VALVE
- STORM HOLE
- HYDRANT
- WATER METER
- CATCH BASIN
- SANITARY MANHOLE
- CABLE HH
- CLEANOUT
- CATV
- CONCRETE PP
- SUBT CABLE PAINT MARK
- PALM
- UNKOWN/FICUS
- TABEBUIA/GUMBO LIMBO
- OAK/BLACK OLIVE
- PINE
- ELECTRIC
- SANITARY
- GAS
- TELEPHONE
- WATER
- CHAINLINK FENCE
- WOOD FENCE
- ALUMINUM FENCE

SURVEY PREPARED BY:
CALVIN GIORDANO & ASSOCIATES, INC.

SPECIFIC PURPOSE SURVEY

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NO.	DATE	ISSUED FOR	APRV'D BY

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DRAWN: H.L.N.
CHECKED: T.A.E
APPROVED:

BAXTER & WOODMAN Consulting Engineers
477 S. Rosemary Avenue, Suite 330, West Palm Beach, Florida 33401
Phone: 561-655-6175 ● Fax: 561-655-6179
www.baxterwoodman.com EB-31795

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CLIENT PROJECT NO.: XX-XXX
CAD REF.: 180551C_P1

TOPOGRAPHIC SURVEY
LAKE PARK, PALM BEACH COUNTY, FLORIDA

PARCEL OF LAND BEING A PART OF
SECTION 21, TOWNSHIP 42 SOTUH, RANGE 43 EAST

DATE: JANUARY 2019
SHEET: 2 of 8
DRAWING: V-2

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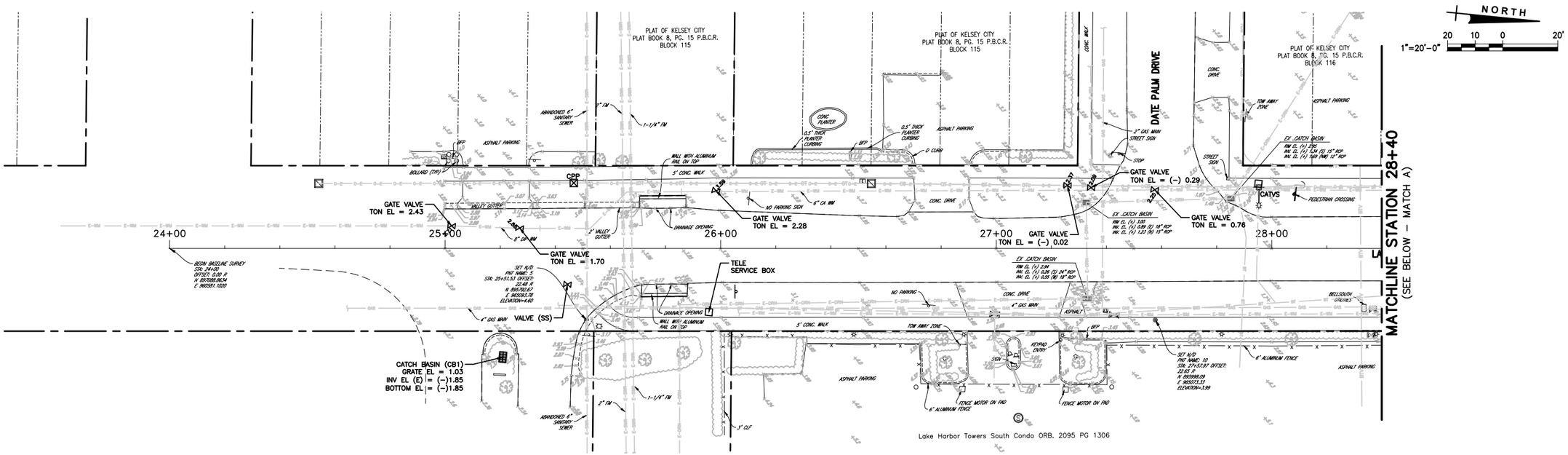

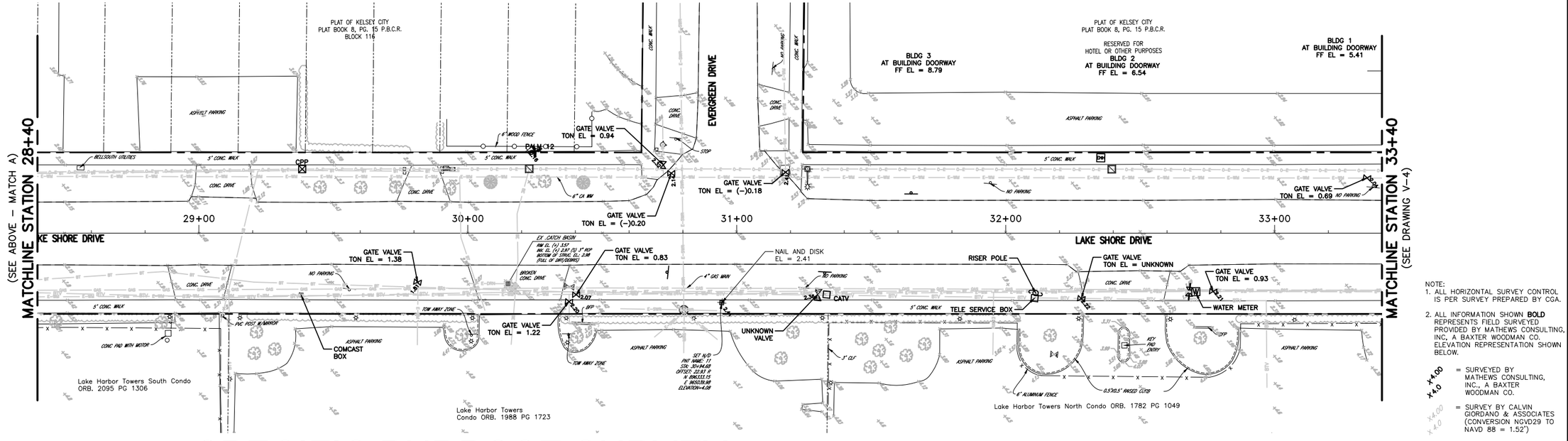

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TOPOGRAPHIC SURVEY
LAKE PARK, PALM BEACH COUNTY, FLORIDA

PARCEL OF LAND BEING A PART OF SECTION 21, TOWNSHIP 42 SOUTH, RANGE 43 EAST

DATE: JANUARY 2019
SHEET: 3 of 8
DRAWING: V–3

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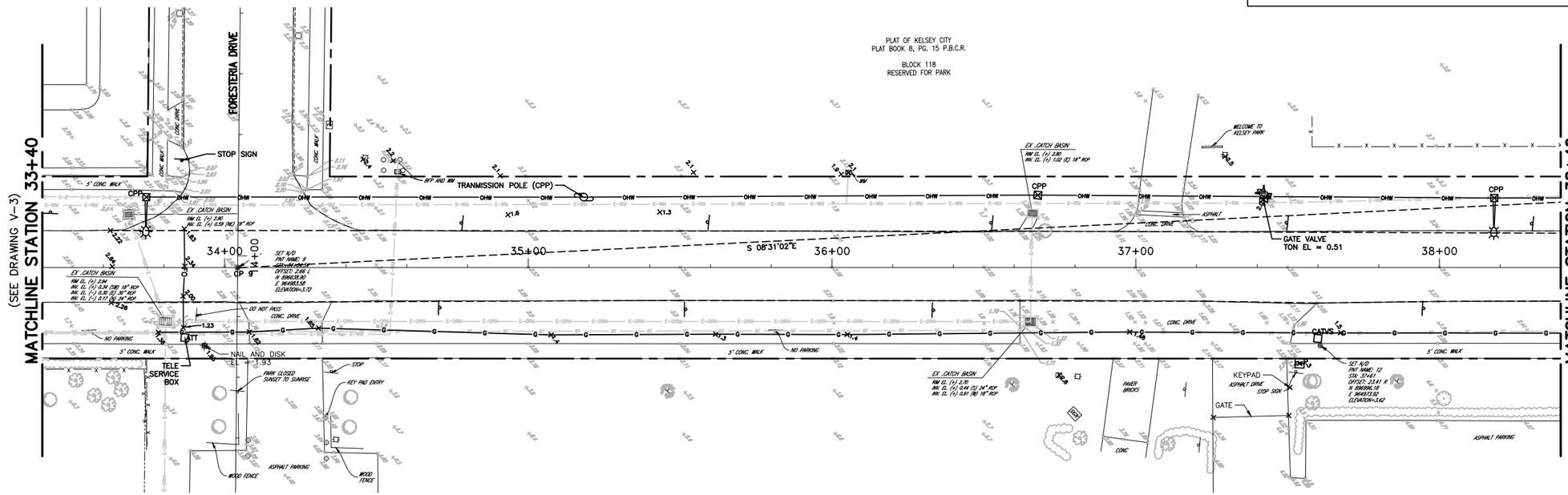

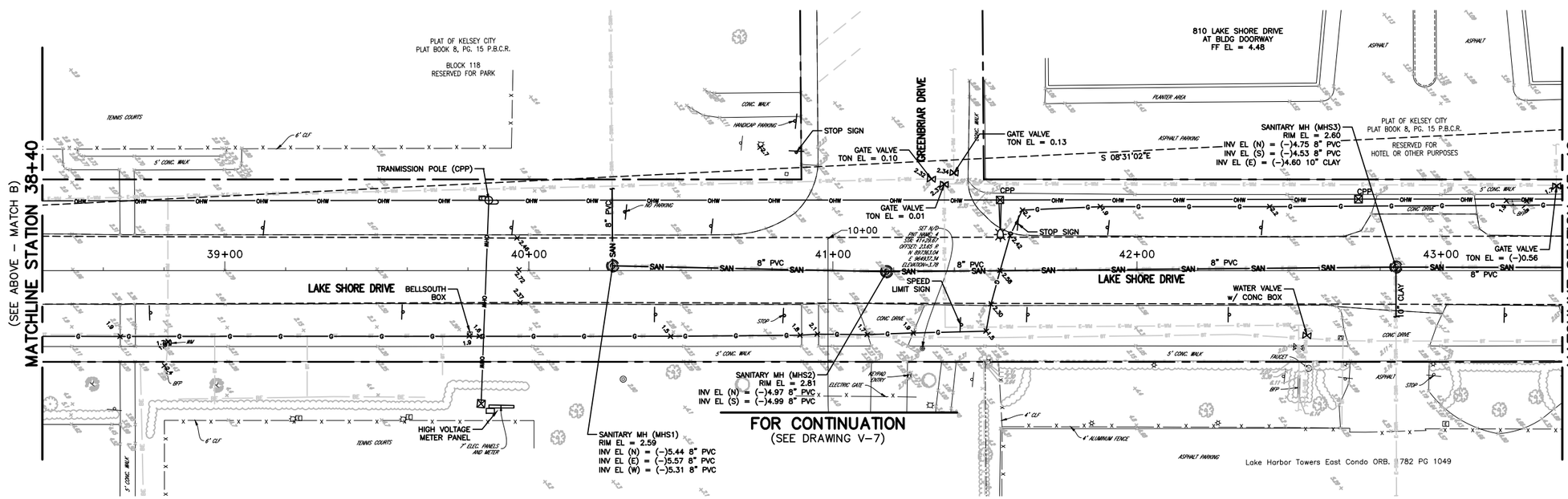

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LAKE PARK, PALM BEACH COUNTY, FLORIDA

PARCEL OF LAND BEING A PART OF
SECTION 21, TOWNSHIP 42 SOUTH, RANGE 43 EAST

DATE: JANUARY 2019
SHEET: 4 of 8
DRAWING: V-4

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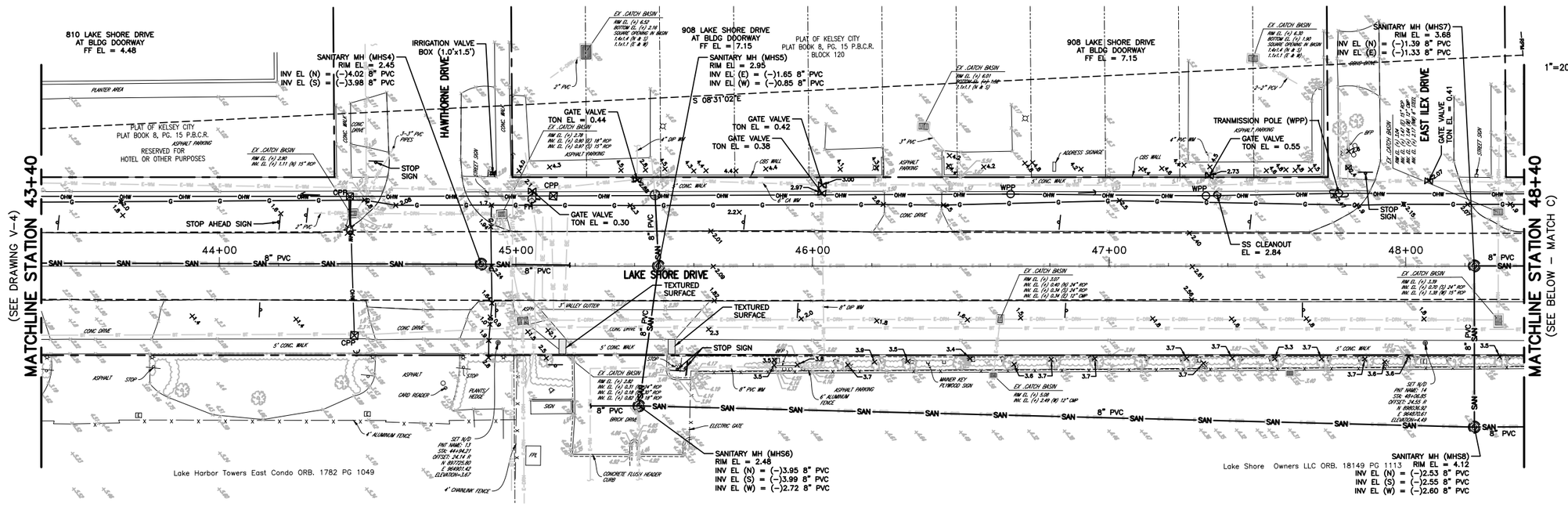

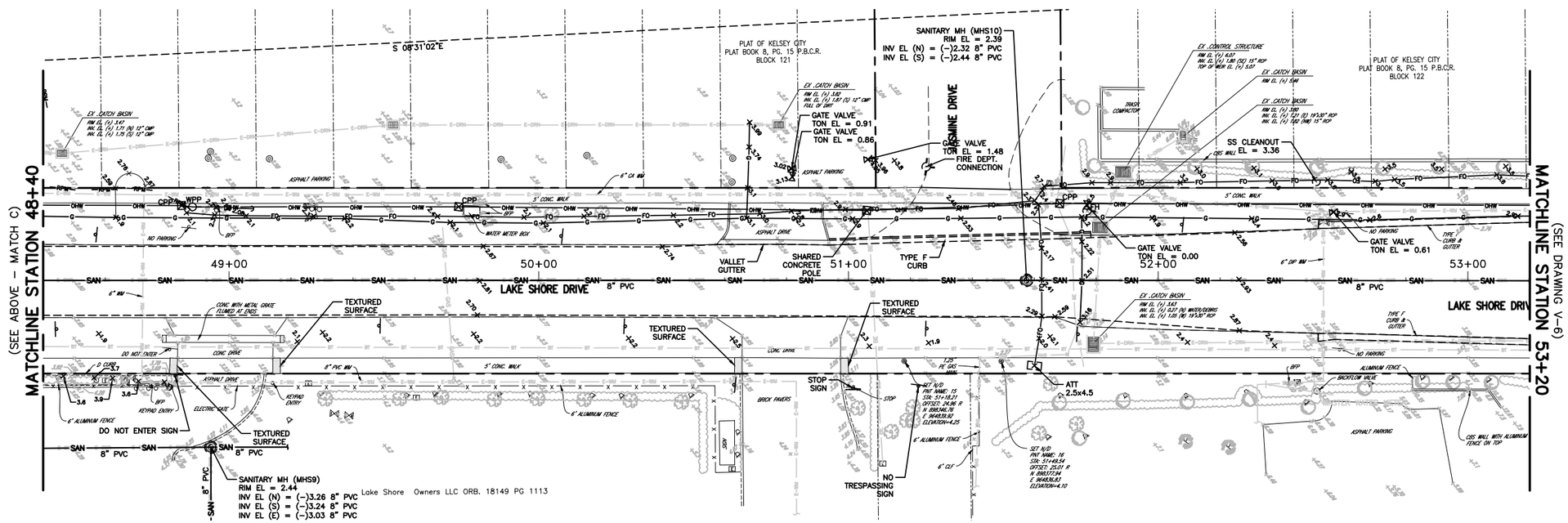

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CLIENT PROJECT NO.: XX–XXX
CAD REF.: 180551C_P1

TOPOGRAPHIC SURVEY
LAKE PARK, PALM BEACH COUNTY, FLORIDA

PARCEL OF LAND BEING A PART OF SECTION 21, TOWNSHIP 42 SOUTH, RANGE 43 EAST

DATE: JANUARY 2019
SHEET: 5 of 8
DRAWING: V–5

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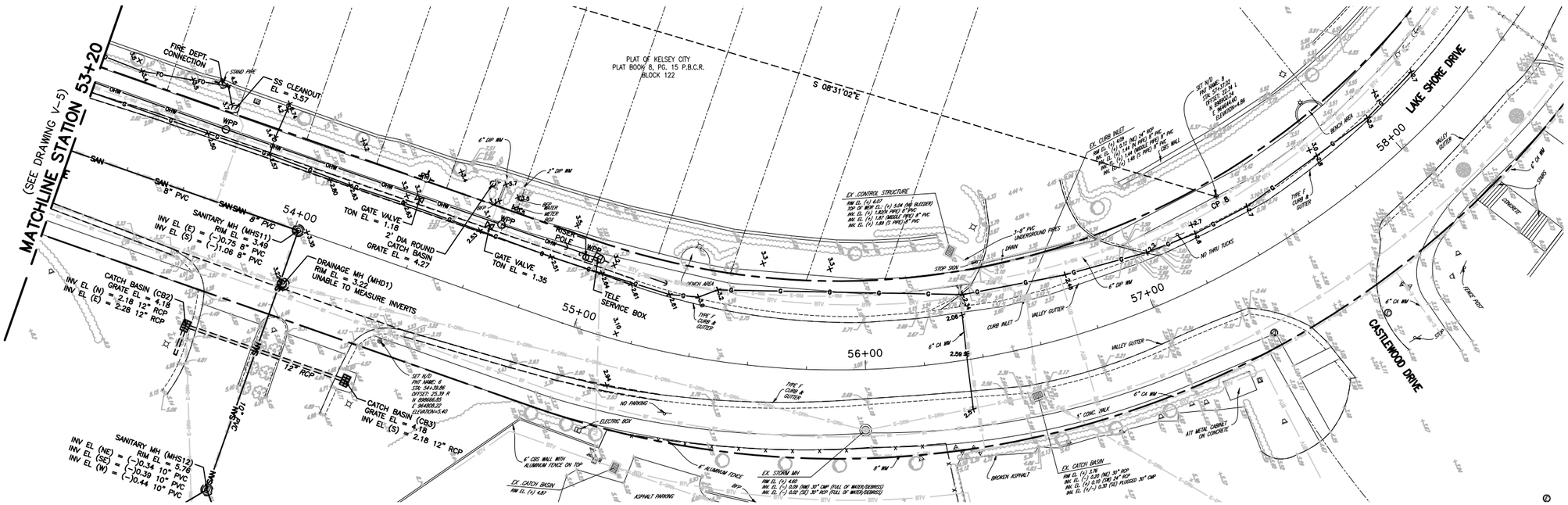

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LAKE PARK, PALM BEACH COUNTY, FLORIDA

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DATE: JANUARY 2019
SHEET: 6 of 8
DRAWING: V-6

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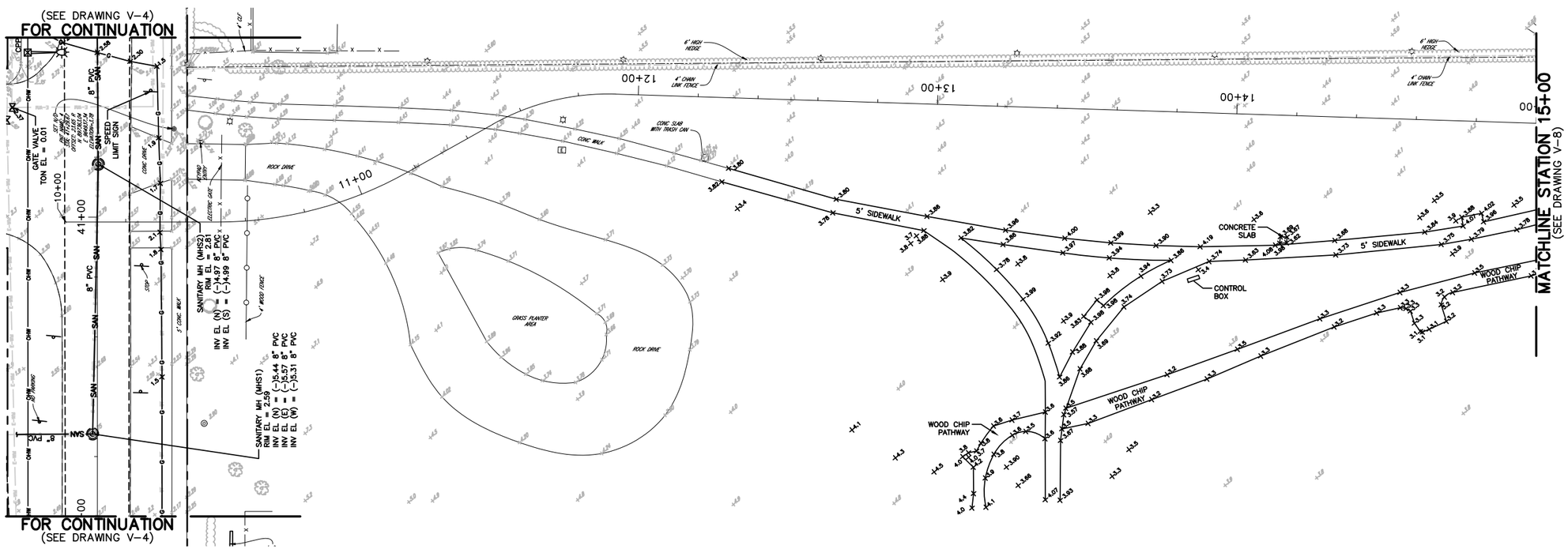

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CLIENT PROJECT NO.: XX-XXX
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TOPOGRAPHIC SURVEY
LAKE PARK, PALM BEACH COUNTY, FLORIDA

PARCEL OF LAND BEING A PART OF SECTION 21, TOWNSHIP 42 SOUTH, RANGE 43 EAST

DATE: JANUARY 2019
SHEET: 7 of 8
DRAWING: V-7

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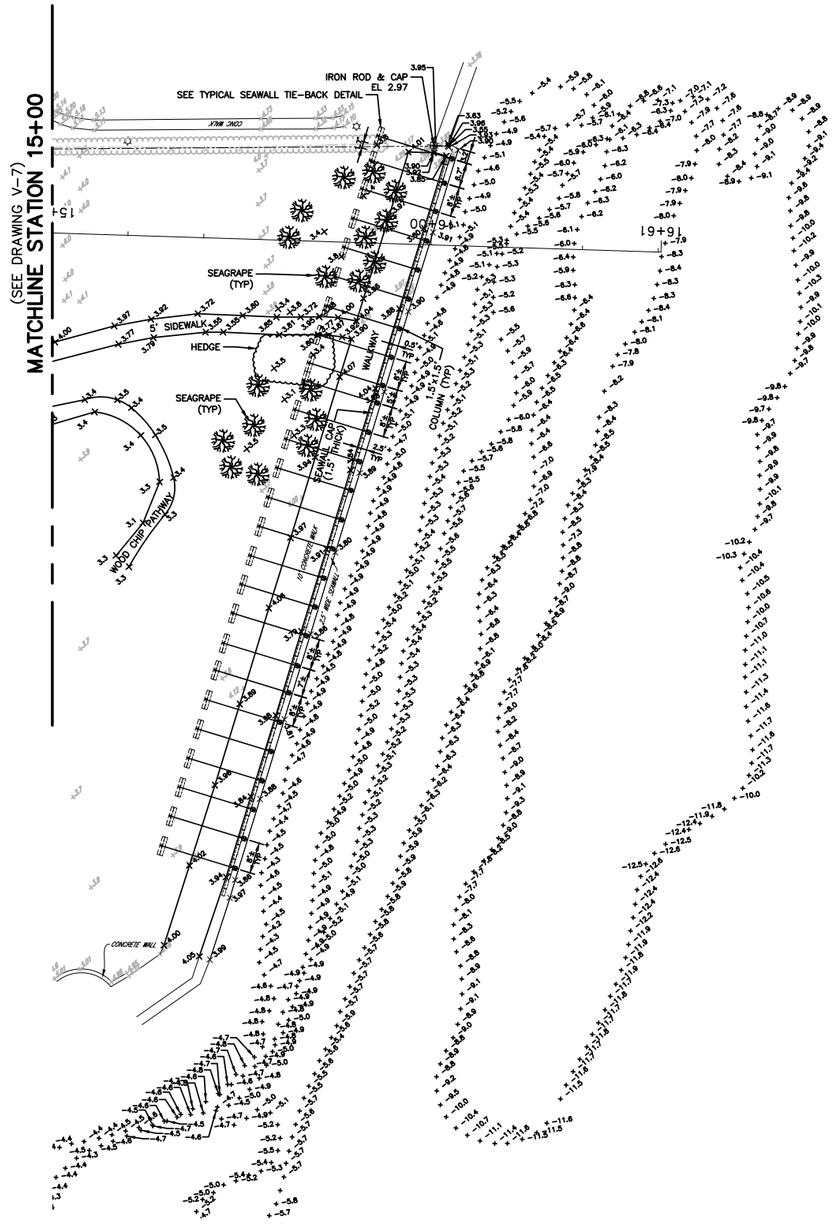
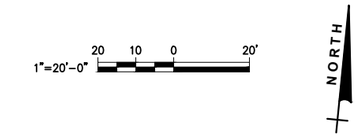
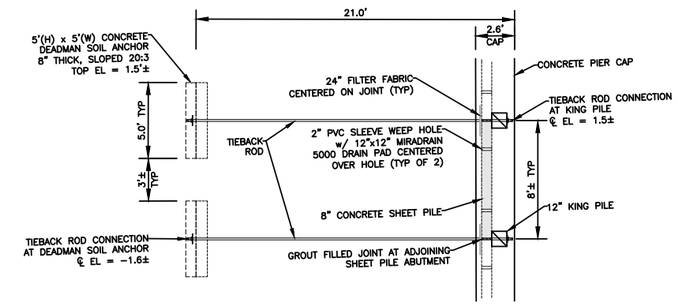
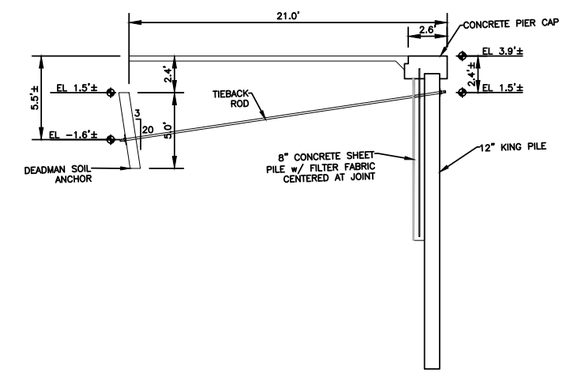






PLAN VIEW



TYP SECTION VIEW

EXISTING SEAWALL TIE-BACK DETAIL

N.T.S.

NOTE:
DETAIL PROVIDED BY TOWN OF LAKE PARK OF KELSEY PARK SEAWALL CONSTRUCTION, SHEET 3 OF 3 BY LEE W. COLLUM, PE. ELEVATIONS CONVERTED FROM NGVD29 TO NAVD88 (SEE DRAWING V-1 FOR CONVERSION)

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ENGINEER NO.: 180551
CLIENT PROJECT NO.: XX-XXX
CAD REF.: 180551C_P1

TOPOGRAPHIC SURVEY
LAKE PARK, PALM BEACH COUNTY, FLORIDA

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DATE: JANUARY 2019
SHEET: 8 of 8
DRAWING: V-8

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User Name : 793Min

APPENDIX B – Geotechnical Report

Geotechnical Engineering Report

LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS

TOWN OF LAKE PARK, FLORIDA

October 18, 2018

Project No. HD185084

Prepared for:

Mathews Consulting, a Baxter & Woodman Company
West Palm Beach, Florida

Prepared by:

Terracon Consultants, Inc.
West Palm Beach, Florida

terracon.com

Terracon

Environmental ■ Facilities ■ Geotechnical ■ Materials

October 18, 2018

Mathews Consulting, a Baxter & Woodman Company
477 S. Rosemary Avenue, Suite 330
West Palm Beach, FL 33401

Project No. HD185084

Attn: Mr. Jeffrey Hiscock, P.E.
Phone: 561.655.6175
Email: JHiscock@baxtorwoodman.com

Re: Geotechnical Engineering Report
Lake Shore Drive Drainage Improvements
Town of Lake Park, Florida
MC Job No. 180551.40

Dear Mr. Hiscock:

Terracon Consultants, Inc. (Terracon) has completed geotechnical engineering services for the above referenced project. This study was performed in accordance with our Subconsultant Agreement for Professional Services dated September 17, 2018.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning the proposed underground utility improvements.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.

Daniel J. Marieni, P.E.
Geotechnical Services Manager
FL Registration No. 78629

Kevin E. Aubry, P.E.
Principal Geotechnical Engineer
FL Registration No. 38175

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2.0 PROJECT CONSIDERATIONS **3**
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ATTACHMENTS

Exhibit 1 – Boring Location Plan
Exhibits 2A and 2B – Subsurface Profiles
Exhibits 3 – Field Permeability Test Results
Exhibit 4A through 4D – Pavement Core Photographs

EXECUTIVE SUMMARY

This Geotechnical Engineering Report was performed in accordance with our Subconsultant Agreement for Professional Services dated September 17, 2018. The attached report includes the results of Standard Penetration Test (SPT) borings, pavement cores and a single borehole permeability (BHP) test that were drilled/completed at the project site.

The pavement cores along Lake Shore Drive indicated a pavement section generally consisting of asphalt concrete over shellrock base course. The asphalt thickness varied between 1⅜ to 11 inches, with a thickness of 4 inches or more at the majority of the locations. About 5 to 6 inches of topsoil was found at the surface of the borings located within Kelsey Park.

Below the pavement and topsoil, the soils found in the borings generally relatively consisted of clean to slightly silty sands. A layer of fill (i.e. sand with trace to some shell fragments and gravel) was found between the pavement/topsoil and underlying sands in the majority of the borings. The sands extended to the maximum depth explored of 10 feet in all of the borings along Lake Shore Drive with the exception of Boring SPT-6, where a formation of cemented sand and shell (locally referred to as coquina) entered the profile at a depth of about 9 feet. The coquina formation entered the profile at a depth of 16 feet at the location of the proposed pump station and extended to the maximum depth explored of 25 feet.

Groundwater levels were measured in the boreholes upon completion of drilling activities. The measured depths to the groundwater level along Lake Shore Drive ranged between approximately 1.4 and 2.4 feet below the ground surface. The measured depth to groundwater in the borings for the proposed pump station location and dry detention area were 3.5 and 3.9 feet below the ground surface, respectively. Utilizing topographic data obtained from the topographic survey and the measured depths to the groundwater surface, we estimate the groundwater was in the range of +2.2 to +2.7 feet NGVD. Owing to the proximity to the Intracoastal Waterway, the groundwater levels may be tidally influenced.

Field permeability testing resulted in a SFWMD K-Value in the range of 7.6×10^{-4} in terms of cubic feet per second, per square foot of seepage area, per foot of head (cfs/sf-ft).

Results of this study confirm that the subsurface conditions are suitable for the planned construction when viewed from a geotechnical engineering perspective. Subsurface conditions at the site are not expected to impose any severe constraints or limitations on the construction from an excavation, pipe support, pipe backfill and roadway reconstruction viewpoint. The subsurface profile components beneath the planned drainage improvements consist generally of reasonably firm sands. These sands are suitable for support of the proposed piping.

The subsurface conditions are also generally suitable for construction of the proposed pump station. After proper site preparation, the sands should provide suitable support to the base of

the pump station when employing a reinforced concrete mat foundation designed for an allowable bearing pressure of 2,000 pounds per square foot (psf).

Groundwater is expected to be relatively shallow at the project site, and therefore will impact excavations and underground works for the pipelines. Development of a detailed design for construction dewatering is outside the scope of this study, but will require careful planning and implementation by the contractor in order to construct the work in the dry. Discussions related to the design and construction of the pipelines and roadway restoration are provided in the following sections of this report.

Since the majority of the roadway alignment has a relatively thick (i.e. 4 to 11 inches) asphalt pavement section, total reconstruction does not appear to be a feasible option for most of the alignment. Considering the existing thick asphalt section, cost, maintenance of traffic during construction and serviceability, partial milling and resurfacing appears to be the most appropriate option for this project.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that the report must be read in its entirety for a comprehensive understanding of the items contained herein. Section 9.0 should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS
TOWN OF LAKE PARK, FLORIDA

Project No. HD185084
October 18, 2018

1.0 INTRODUCTION

This Geotechnical Engineering Report has been prepared for the proposed drainage improvements that are planned at the above referenced site. This report describes the methods of study and key findings from the subsurface exploration and provides geotechnical engineering recommendations for the design of the project and related construction.

2.0 PROJECT CONSIDERATIONS

We understand that the Town of Lake Park plans to improve the stormwater management system along Lake Shore Drive, between Cypress Drive and U.S. Highway 1. The improvements may include the installation of stormwater outfall piping, a pump station, a dry detention area, raising pavement grades and roadway reconstruction.

The scope of work requested by Mathews Consulting, a Baxter & Woodman Company (Mathews) includeed the following:

- Ten (10) 10 ft deep borings with pavement cores along Lake Shore Drive
- Five (5) additional pavement cores along Lake Shore Drive
- One (1) 25 ft deep boring at the proposed pump station location
- One (1) percolation test at the proposal dry detention area location

All test locations were within the travel lanes of Lake Shore Drive with the exception of the 25-ft deep boring and percolation test, which were located to the south of Lake Shore Drive within Kelsey Park.

We understand that the proposed pump station will bottom between about 12 to 14 feet below the ground surface. Plan dimensions of the pump station are not known at this time. We have assumed the pump station will be supported on a mat foundation with plan dimensions not greater than 15 feet by 15 feet.

3.0 SUBSURFACE CONDITIONS

3.1 Soil Survey Maps

The U.S. Department of Agriculture – Soil Conservation Service (SCS) (now NRCS) Soil Survey of Palm Beach County Area, Florida, dated 1978, was reviewed for the project area. The maps indicate the site is underlain by Arents-Urban land complex with the exception of the northern end of the site which is mapped as Urban land. Both of these mapping units are described as granular soils that have been modified by earthwork cutting and filling to grade the site to the current landform. Natural Arents soils have a profile consisting of relatively clean sand to a depth of 60 inches or more. There is sometimes a layer of organic-stained sand with weakly cemented fragments just below the natural ground surface.

It should be noted that the Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types typical for the project area.

3.2 Field Exploration

The subsurface conditions in the project area were explored with eleven (11) Standard Penetration Test (SPT) borings, fifteen (15) pavement cores and one (1) borehole permeability test drilled/completed at the locations shown on Exhibit 1.

Ten (10) of the borings were drilled to a depth of 10 feet within the northbound travel lane of Lake Shore Drive. The remaining one (1) boring was drilled to a depth of 25 feet and was located at the proposed pump station location to the east of Lake Shore Drive. The SPT borings were drilled utilizing a Central Mine Equipment Model 45B (CME 45B) drilling rig employing continuous sampling techniques to 10 feet below surface grades, and were sampled 5 feet on center thereafter. Soil samples were recovered from the borings using a standard split-barrel driven with a 140-pound hammer falling 30 inches (the SPT after ASTM D 1586).

The cores were obtained using a six-inch diameter core barrel powered by the CME 45B drilling rig. Ten (10) of the cores were collected at the SPT borings located along the northbound travel lane of Lake Shore Drive, and five (5) additional cores were collected within the southbound travel lane of Lake Shore Drive. The cores were drilled through the pavement surface and the underlying base course.

The borings and cores located within the travel lanes of Lake Shore Drive required the implementation of a maintenance of traffic plan in accordance with the Town of Lake Park Right-of-Way Permit Number LS101 dated September 25, 2018.

The borehole permeability test (described later in Section 4) was drilled with the CME45B drilling rig using continuous flight augers.

The boreholes were backfilled with bentonite chips and auger cuttings. The boreholes and cores located within the existing pavement were surfaced with gravel and asphalt cold patch in order to match the surrounding pavement types.

Samples of the subsurface materials recovered from the borings and cores were returned to our laboratory where they were visually examined in the laboratory using the Visual-Manual Method (ASTM D 2488) and classified using the Unified Soil Classification System (ASTM D 2487). Profiles of the borings, including their locations, ground surface elevations, soil types and SPT data are shown on Exhibits 2A and 2B. Locations and elevations are approximate and refer to the topographic survey by Calvin, Giordano & Associates, Inc.

3.3 Pavement Section

The existing pavement section was determined at borings and cores along Lake Shore Drive. The pavement section generally consisted of asphalt concrete over shellrock base course. At one location (SPT-9), there was a layer of concrete between the asphalt and base course. Additionally, the structural number of the existing pavement was estimated at each location. Materials found at these locations and their estimated structural numbers are summarized in the following table.

Table 1 – Summary of Pavement Section Data

Location	Thickness (inches)			Estimated Structural Number[1]
	Asphalt	Concrete	Base Course	
SPT-1	2 ⅝	-	9 ½	2.4
PC-1	4	-	7 ½	2.4
SPT-2	4 ¼	-	8 ¾	2.6
SPT-3	6 ½	-	6 ½	2.8
PC-2	6 ¾	-	11 ¼	3.7
SPT-4	6 ¼	-	8 ¾	3.1
SPT-5	7	-	6	2.8
PC-3	7 ¾	-	10 ¼	3.8
SPT-6	7 ¾	-	6 ¼	3.1
SPT-7	9 ½	-	6 ½	3.5
PC-4	11	-	4	3.5
SPT-8	9 ¼	-	6 ¾	3.5
SPT-9	1 ⅜	5 ⅝	17	5.4
PC-5	3	-	18	4.0
SPT-10	1 ⅜	-	13 ½	2.8

Note: 1) The estimated structural number is based on an asphalt layer coefficient of 0.25, a concrete layer coefficient of 0.35 and a base course layer coefficient of 0.18. The asphalt layer coefficient was obtained from Table 7.1 of the 2018 FDOT Flexible Pavement Design Manual for pavements in fair condition. The concrete layer coefficient was obtained from Section 11.2.5 of the 2009 Rigid Pavement Design Manual for reseated concrete in "good" condition. The base course layer coefficient was obtained from Table 5.4 of the 2018 FDOT Flexible Pavement Design Manual.

From visual inspection of the pavement cores, it appears that the asphalt was placed in multiple lifts with exception of some of the cores where the total asphalt thickness was relatively thin (i.e. locations SPT-9 and SPT-10). Some of the cores were placed over existing cracks. The majority of the cracks penetrated through at least the upper lift of asphalt in the cores and sometimes down to about 3 to 4 inches.

3.4 Stratigraphy

Below the asphalt pavement, the soils found in the SPT Borings along Lake Shore Drive generally consisted of relatively clean to slightly silty sands. A layer of fill (i.e. sand with trace to some shell fragments and gravel) was found in about half the borings between the pavement section and the underlying sands. The sands extended to the maximum depth explored of 10 feet in all of the borings along Lake Shore Drive with the exception of Boring SPT-6, where a formation of cemented sand and shell (locally referred to as coquina) entered the profile at a depth of about 9 feet.

The subsurface profile for the boring located at the proposed pump station location consisted of about 5 inches of topsoil over about 6 feet of fill consisting of sand with some shell fragments and gravel. Relatively clean to slightly silty sand was found next in the profile, with a few thin silt lenses between depths of 6.5 and 8 feet. Trace organic lenses were found within the sands between the depths of 8 feet and 11 feet. The coquina formation entered the profile at a depth of 16 feet and extended to the maximum depth explored of 25 feet.

The boring at the proposed dry detention area consisted of about 6 inches of topsoil over fill materials consisting of sand with shell fragments to the maximum depth of 5 feet. Some gravel to cobble sized fragments of cemented sand and shell were found between 1 and 2 feet.

In terms of relative density, the SPT N-values indicate that sands found in the borings are generally very loose to medium dense in terms of relative density and the coquina is generally weakly cemented.

More specific descriptions for the strata found in the borings are provided in the following table.

Table 2 – Stratigraphy

Stratum No.	Relative Density	Soil Description
P	--	Asphalt Concrete over Shellrock Base Course (PAVEMENT)
TS	--	TOPSOIL
F	--	Brown to gray fine SAND, trace to some shell fragments and gravel (FILL)
1	Loose to Medium Dense	Light brown fine to medium SAND, trace shell fragments (SP)
2	Loose	Light gray to gray fine to medium SAND, trace silt to slightly silty, trace to some shell fragments (SP, SP-SM)
3	Very Loose to Loose	Light brown to brown fine to medium SAND, trace silt (SP)
4	Weakly Cemented	Light brown cemented sand and shell (COQUINA)

Note: Subsurface profile is variable. Refer to Exhibits 2A and 2B for strata boundaries for each boring.

3.5 Groundwater

Groundwater levels were measured in the boreholes upon completion of drilling activities. The measured depths to the groundwater level along Lake Shore Drive ranged between approximately 1.4 and 2.4 feet below the ground surface. The measured depth to groundwater in the borings for the proposed pump station location and dry detention area were 3.5 and 3.9 feet below the ground surface, respectively. Owing to the proximity to the Intracoastal Waterway, the groundwater levels found within the borings may be tidally influenced.

Utilizing topographic data obtained from the topographic survey and the measured depths to the groundwater surface, we estimate the groundwater was in the range of +2.2 to +2.7 feet NGVD on the dates of field exploration (September 27 through October 1, 2018). Groundwater elevations and dates of measurement are shown on Exhibits 2A and 2B adjacent to the respective subsurface profiles.

4.0 FIELD PERMEABILITY TEST RESULTS

Field permeability testing was performed at the subject site to evaluate the hydraulic conductivity characteristics of the surficial soils. One field permeability test was conducted in a 6-inch diameter by 5-foot deep borehole whose sidewalls were stabilized with a 2-inch diameter No. 20 slot perforated well screen and 6/20 silica sand. Usual Open Hole, constant head test methodology was utilized for the hydraulic conductivity determination in accordance with procedures and nomenclature provided by the South Florida Water Management District (SFWMD).

The Usual Open Hole permeability test was performed at the location shown on Exhibit 1, designated BHP-1. The depth to groundwater was measured in the borehole on the date that the testing was accomplished, October 1, 2018. The groundwater depth was measured at 3.9 feet below the ground surface. The results of the field permeability testing are presented on Exhibit 3 along with the pertinent stratigraphic, geometric and hydraulic conditions existing at the site. The hydraulic conductivity of the profile components was calculated using an equation presented by the SFWMD (Usual Open Hole – Constant Head Test Method). The hydraulic conductivity value, in terms of cubic feet per second, per square foot of seepage area, per foot of head (cfs/sf-ft), is presented in the following table.

Table 3 – Field Permeability Test Results

Location No.	Depth to Groundwater (feet)	Depth Where Head Maintained During Test (feet)	Hydraulic Conductivity K-Value (cfs/sf-ft)	Approximate Equivalent Horizontal Permeability (ft / day)
BHP-1	3.9	0	7.6×10^{-4}	65

Note: Complete test results are presented on Exhibits 3.

The value of the measured horizontal permeability at the test location is generally consistent with our experience for similar granular materials in other geologic settings. For granular materials similar to the sand with shell fragments found at the test location, the vertical permeability is typically taken as half the horizontal permeability. This is attributed to soil anisotropy where horizontal bedding planes within the soils offer more preferential seepage paths in the horizontal direction when compared with the vertical. Again, since vertical permeability was not tested for, the measured horizontal value should be halved for estimation of the vertical permeability.

Of note, the subsurface profile at the test location appears to be fill materials to at least the bottom of the test (i.e. 5 feet). Due to the potential of high variability for fill materials, the measured horizontal permeability at the test location may not be representative of the entire proposed dry detention area.

5.0 DISCUSSION AND RECOMMENDATIONS

Results of this study confirm that the subsurface conditions are suitable for the planned construction when viewed from a geotechnical engineering perspective. Subsurface conditions at the site are not expected to impose any severe constraints or limitations on the construction from an excavation, pipe support, pipe backfill and roadway reconstruction viewpoint. The subsurface profile components beneath the planned drainage improvements consist generally of reasonably firm sands. These sands are suitable for support of the proposed piping.

The subsurface conditions are also generally suitable for construction of the proposed pump station. After proper site preparation, the sands should provide suitable support to the base of

the pump station when employing a reinforced concrete mat foundation designed for an allowable bearing pressure of 2,000 pounds per square foot (psf).

Groundwater is expected to be relatively shallow at the project site, and therefore will impact excavations and underground works for the pipelines. Development of a detailed design for construction dewatering is outside the scope of this study, but will require careful planning and implementation by the contractor in order to construct the work in the dry. Discussions related to the design and construction of the pipelines and roadway restoration are provided in the following sections of this report.

Since the majority of the roadway alignment has a relatively thick (i.e. 4 to 11 inches) asphalt pavement section, total reconstruction does not appear to a feasible option for most of the alignment. Considering the existing thick asphalt section, cost, maintenance of traffic during construction and serviceability, partial milling and resurfacing appears to be the most appropriate option for this project.

6.0 PIPELINES

6.1 Excavations

Below grade excavations should be made in accordance with all applicable State and Federal requirements. Per the Occupational Safety and Health Administration (OSHA) 29 CFR Part 1926, Sub-part P- “Excavations,” the subsoils throughout the project area fall within the Type C criteria. As such, temporary excavation slopes should be stable when adequately dewatered and constructed no steeper than 1.5:1 (horizontal:vertical). In areas of space limitation where open cut is not practical, the excavations may require sheeting or shoring. Further, we recommend that the contractor exercise extreme caution in any decision to place men and equipment in unbraced excavations.

Groundwater levels should be maintained at least 24 inches below the excavation bottom. Our experience with similar soils has shown that maintaining groundwater levels 24 inches below the base of the excavation will result in a stable excavation bottom. Dewatering may require a combination of methods including pumping from sumps, wells or wellpoints. The method chosen for dewatering should be the responsibility of the contractor.

The results of the borings indicate that the excavations may generally be performed using heavy track-mounted backhoe equipment. Excavated materials consisting of sands and gravels with particle sizes of less than 1 inch in diameter and no more than 10 percent fines (particles passing through the U.S. Number 200 Sieve) may be stockpiled and re-used for backfill. Oversized materials and fine-grained soils that do not meet these requirements are unsuitable for use as backfill and should be removed if found.

6.2 Ground Support

Based upon the results of the borings and anticipated pipe invert elevations, it appears that the pipelines will bottom within granular soils. The granular soils will provide adequate foundation support for the piping. The upper 12 inches of the subgrade beneath the pipeline should be compacted to not less than 100 percent of the maximum dry density determined in accordance with Standard Proctor (AASHTO T-99). If the coquina formation is encountered at the pipe inverts, we recommend over-excavation to 12 inches below the proposed pipe inverts, and the resulting volume should be replaced with granular backfill such that at least 12 inches of granular soils exist below the pipe invert.

6.3 Pipe Bedding and Backfill

Pipe bedding and backfill materials, including that used to replace over-excavated volumes, should consist of sands and/or sand and gravel (ASTM D 2487) that contain no particle sizes larger than 1 inch, less than 10% fines, and no more than 2% organic matter. The backfill should be placed in the dry in maximum 6-inch thick lifts, and be compacted to at least 100 and 95% density (AASHTO T-99) in roadway (including driveways) and non-roadway areas, respectively. We recommend the use of only relatively light, hand-held compaction equipment to limit the potential for damage to the pipelines.

Groundwater levels should be maintained at least 24 inches below the excavation bottom during tamping of the bedding soil and placing of the pipe. During backfilling, groundwater should be maintained a minimum of 24 inches below the working height of the fill.

7.0 PAVEMENTS

7.1 Pavement Restoration

Since the majority of the roadway alignment has a relatively thick (i.e. 4 to 11 inches) asphalt pavement section, total reconstruction does not appear to be a feasible option for most of the alignment. Considering the existing thick asphalt section, cost, maintenance of traffic during construction and serviceability, partial milling and resurfacing appears to be the most appropriate option for this project.

We believe that milling 1½ inches of existing asphalt followed by placement of a minimum of 1½ inches of Type SP-9.5 (or Type S-III) asphalt concrete is an appropriate remedial measure for the project. For areas where the existing asphalt thickness is less than the milling depth, a portion of the existing base course will need to be removed prior to placing the overlay. We expect overbuild in some areas will be needed in order to improve grading for stormwater management. For variable thickness overbuild areas, the lift thicknesses should not exceed 2 inches (ref: FDOT Standard Specifications for Road and Bridge Construction, January 2017).

Since some of the cracks in the pavement cores extended to depths up to 3 to 4 inches, the potential still exists for the existing cracks to re-manifest at the asphalt surface prior to the end of the design life since some of the existing cracks penetrate deeper than the proposed milling depth. Increasing the milling depth can decrease the risk of cracks re-manifesting, however the costs will increase. The design team will need to consider these factors when selecting the milling depth.

We also recommend that the design team explore the option of total reconstruction with full depth asphalt for areas of the roadway where the asphalt pavement section is relatively thin (i.e. less than 2 inches). Full depth asphalt is a rehabilitation technique in which the entire thickness of the asphalt pavement and a predetermined portion of the underlying base is uniformly removed and resurfaced with full depth asphalt. The groundwater depths measured at our test locations along Lake Shore Drive varied between 1.4 and 2.4 feet below surface grades. High groundwater levels have the potential for wetting the base course which can compromise the integrity of the pavement structure when subjected to traffic loads. The replacement of the upper portion of base material with asphalt makes the section significantly less moisture sensitive and therefore applicable for this geologic setting. Due to the relatively thick existing asphalt section along the majority of the roadway, full depth asphalt may have been performed previously in these areas where thick asphalt was measured.

7.2 Pavement Trench Repair

Since the new pipelines will be installed beneath portions of existing roadway, trench repair will be required. We believe that a conventional flexible (asphalt surface) pavement section can be used to restore trench cuts in the existing roadway. A total thickness of Type S-III asphalt concrete of 2 inches (two lifts, each 1 inch thick) combined with 12 inches of base course should provide a pavement section structural number of 3.0 which is approximately the average structural number of the existing pavement estimated at the test locations (excluding SPT-9 which has an unusually high estimated structural number of 5.4 due to the concrete layer). Due to the high groundwater at the site, a thicker asphalt section should be considered to reduce the potential of damage from wetting of the base course.

The asphaltic concrete should meet the specifications of the FDOT Standard Specifications for Road and Bridge Construction, latest edition Section 334. The base course should meet the requirements of either Sections 911 or 913A of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction." The base materials should have a Limerock Bearing Ratio (LBR) of at least 100 and be compacted to not less than 98 percent of the AASHTO T-180 maximum dry density. Subbase materials should have a minimum LBR value of 40, and be densified to not less than 98 percent of the AASHTO T-180 maximum dry density.

8.0 PUMP STATION

8.1 Excavations and Dewatering

Below grade excavations should be made in accordance with all applicable State and Federal requirements. Per OSHA 29 CFR Part 1926, Sub-part P- "Excavations," the surficial sands found throughout the project area falls within the Type C criteria. As such, temporary sideslopes in dewatered excavations could be made at 1.5:1 (horizontal: vertical) inclination or flatter. However, if the prescribed sloping requirement cannot be met in the soils because of space limitations, a sheeting or shoring system will probably be necessary.

If organic soils are found at the excavation bottom, they should be over-excavated down to underlying clean sands. Over-excavations should be replaced with crushed aggregate meeting the criteria of the Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction, No. 57 Stone, wrapped in filter fabric.

The pump station piping will bottom about 12 to 14 feet below grade and therefore dewatering will be required to allow in-the-dry construction of the utility tie-ins. The dewatering method should be determined by the contractor working in conjunction with a hydrogeologist. The dewatering system should be controlled in a manner that does not cause instability of the excavation sidewalls. The dewatering system selected should be capable of maintaining the lowered groundwater level a minimum of 24 inches below the excavation bottoms.

8.2 Excavation Support

If the excavation sidewalls cannot be sloped due to space limitations, then a temporary retaining wall may be used. Design of the retaining wall should utilize the lateral earth pressure design parameters shown in the table that follows. Hydrostatic and surcharge loads should be added as appropriate to the wall design.

Table 4 – Lateral Design Parameters

Parameter	Depth
	0 to 25 ft
Moist Soil Unit Weight (pcf)	100
Buoyant Soil Unit Weight (pcf)	43
Angle of Internal Friction (degrees)	29
Cohesion (psf)	0
Earth Pressure Coefficients	--
Active	0.35
Passive	2.88
At-Rest	0.52

8.3 Backfill

Backfill soils placed around the piping and pump station should consist of sand or sand-gravel mixtures having not more than 10 percent passing the U.S. Standard No. 200 Sieve. Based upon the results of the boring, soils from the excavation generally meet this criterion and therefore can be utilized as backfill. The backfill should be placed in 8-inch thick (maximum) loose lifts and each lift should be compacted to at least 100 percent of maximum density (AASHTO T-99). Equipment utilized for compaction should be limited to relatively light, hand-led compactors to limit the potential for damage to the pipes.

8.4 Foundation Support

The proposed pump station may be supported on a reinforced concrete mat foundation that rests on properly compacted existing sands or approved backfill and proportioned for an allowable soil contact pressure of 2,000 pounds per square foot. The foundation should be reinforced for the loads and bending stresses that it will sustain and should also be appropriately jointed to control shrinkage cracking. To provide an adequate factor of safety against a shearing failure in the subsoils, the foundation should be based not less than 12 inches below the lowest adjacent grade.

Foundation areas should be excavated, formed and have the structural concrete cast in the dry. The excavation bottoms should be tamped with a hand held or walk behind compactor prior to placement of reinforcement steel. The compaction efforts need to achieve at least 95 percent maximum dry density (ASTM D 1557) for a minimum depth of 12 inches below the foundation excavation bottoms.

Foundations designed and constructed in the recommended manner are estimated to sustain tolerable total settlements based upon the assumed load of 2,000 psf for the entire mat foundation, assuming maximum plan dimensions of 15 feet by 15 feet. If mat foundation design ends up being larger than our assumed plan dimensions, further analysis will be needed to determine the appropriate contact pressure. Because the soils at the site are granular in nature, foundation settlement should occur as rapidly as the loads are applied and should be nearly complete by the end of the construction.

9.0 LIMITATIONS

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be

immediately notified so that further evaluation and supplemental recommendations can be provided.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either expressed or implied, are intended or made. Site safety and excavation support are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

Recommendations provided herein for excavation support and dewatering are for the design team only. Contractors bidding this project should align themselves with an experienced structural engineer and hydrogeologist for design of the excavation bracing system and dewatering system, respectively.

ATTACHMENTS

EXHIBIT 1 – BORING LOCATION PLAN

EXHIBIT 2A & 2B – SUBSURFACE PROFILES

EXHIBIT 3 – FIELD PERMEABILITY TEST RESULTS

EXHIBIT 4 – PAVEMENT CORE PHOTOGRAPHS

SOURCE: GOOGLE EARTH PRO

LEGEND

SPT-1 APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

BHP-1 APPROXIMATE LOCATION OF BOREHOLE PERMEABILITY TEST

PC-1 APPROXIMATE LOCATION OF PAVEMENT CORE

200 0 100 200
SCALE IN FEET

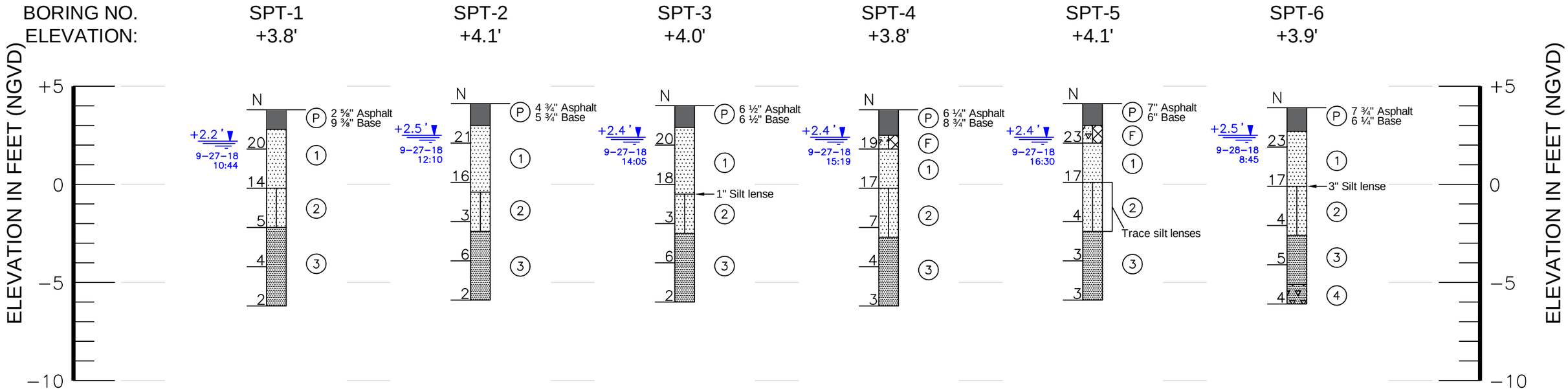
N

Project Mngr:	DM
Drawn By:	JJ
Checked By:	DM
Approved By:	KA
Project No.	HD185084
Scale:	AS-SHOWN
File No.	1
Date:	10-11-18

Terracon
Consulting Engineers and Scientists
1225 OMAR ROAD WEST PALM BEACH, FL 33405
PH. (561) 689-4299 FAX. (561) 689-5955

BORING LOCATION PLAN
GEOTECHNICAL ENGINEERING REPORT
LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS
TOWN OF LAKE PARK, FLORIDA

EXHIBIT 1



LEGEND

- (P) Asphalt concrete over shellrock base course (PAVEMENT)
- (TS) TOPSOIL
- (F) Brown to gray fine SAND, trace to some shell fragments and gravel (FILL)
- (1) Light brown fine to medium SAND, trace shell fragments (SP)
- (2) Light gray to gray fine to medium SAND, trace silt to slightly silty, trace to some shell fragments (SP, SP-SM)
- (3) Light brown to brown fine to medium SAND, trace silt (SP)
- (4) Light brown cemented sand and shell (COQUINA)

SP – Unified Soil Classification System Group Symbol (ASTM D 2487)

N – Indicates the number of blows of a 140 pound hammer, freely falling a distance of 30 inches, required to drive a 2-inch diameter sampler 12 inches (ASTM D 1586)

SPT-1 – Standard Penetration Test (SPT) boring and number

+2.2' 9−27−18 10:44 – Elevation of groundwater (feet-NGVD), date, & time measured

NOTES

(1) Borings were drilled from September 27 to October 1, 2018 using a Central Mine Equipment Model 45B (CME 45B) drilling rig.

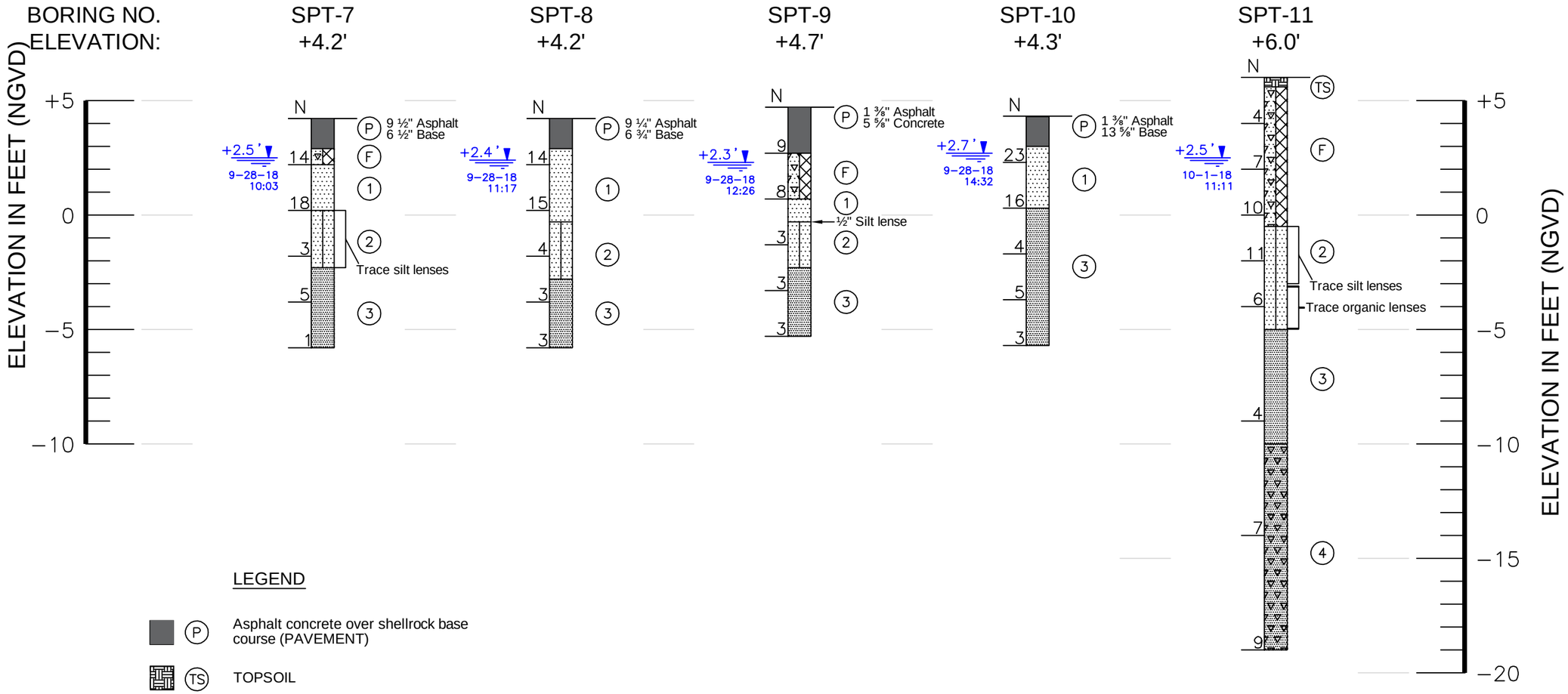
(2) Strata boundaries are approximate and represent soil strata at each test hole location only. Soil transitions may be more gradual than implied.

(3) Groundwater elevations shown on the subsurface profiles represent groundwater surfaces on the dates and times shown. Groundwater level fluctuations should be anticipated throughout the day due to tide changes and throughout the year.

(4) Elevation data was estimated from the Topographic Survey by Calvin, Giordano & Associates, Inc.

Project Mngr: DM	Project No. HD185084	Terracon Consulting Engineers and Scientists	SUBSURFACE PROFILES
Drawn By: JJ	Scale: AS-SHOWN	1225 OMAR ROAD WEST PALM BEACH, FL 33405	GEOTECHNICAL ENGINEERING REPORT
Checked By: DM	File No. 2	PH. (561) 689-4299 FAX. (561) 689-5955	LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS
Approved By: KA	Date: 10-11-18		TOWN OF LAKE PARK, FLORIDA

EXHIBIT 2A



LEGEND

- (P) Asphalt concrete over shellrock base course (PAVEMENT)
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- (F) Brown to gray fine SAND, trace to some shell fragments and gravel (FILL)
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- (3) Light brown to brown fine to medium SAND, trace silt (SP)
- (4) Light brown cemented sand and shell (COQUINA)

SP – Unified Soil Classification System Group Symbol (ASTM D 2487)

N – Indicates the number of blows of a 140 pound hammer, freely falling a distance of 30 inches, required to drive a 2-inch diameter sampler 12 inches (ASTM D 1586)

SPT-7 – Standard Penetration Test (SPT) boring and number

+2.5' 9−28−18 10:03 – Elevation of groundwater (feet-NGVD), date, & time measured

NOTES

(1) Borings were drilled from September 27 to October 1, 2018 using a Central Mine Equipment Model 45B (CME 45B) drilling rig.

(2) Strata boundaries are approximate and represent soil strata at each test hole location only. Soil transitions may be more gradual than implied.

(3) Groundwater elevations shown on the subsurface profiles represent groundwater surfaces on the dates and times shown. Groundwater level fluctuations should be anticipated throughout the day due to tide changes and throughout the year.

(4) Elevation data was estimated from the Topographic Survey by Calvin, Giordano & Associates, Inc.

Project Mngr: DM	Project No. HD185084	Terracon Consulting Engineers and Scientists	SUBSURFACE PROFILES
Drawn By: JJ	Scale: AS-SHOWN	1225 OMAR ROAD WEST PALM BEACH, FL 33405	GEOTECHNICAL ENGINEERING REPORT
Checked By: DM	File No. 3	PH. (561) 689-4299 FAX. (561) 689-5955	LAKE SHORE DRIVE DRAINAGE IMPROVEMENTS
Approved By: KA	Date: 10-11-18		TOWN OF LAKE PARK, FLORIDA

EXHIBIT 2B

Terracon

Project Name: Lake Shore Drive Drainage Improvements
Town of Lake Park, Florida

Project No. HD185084

TEST NUMBER: BHP-1
TEST LOCATION: See Boring Location Plan (Exhibit 1)

SUBSURFACE PROFILE

Depth (feet)	Soil Description
0 – 0.5	Topsoil
0.5 – 5.0	Light brown fine to medium SAND with shell fragments, some gravel to cobble sized fragments of cemented sand and shell between 1 and 2 feet (FILL)

Water Table Depth: 3.9 feet below ground surface on October 1, 2018
Constant Head Maintained at: Ground surface

PERMEABILITY RESULTS

Uncased (U) or Cased (C): C
Casing Depth (ft): 5.0
Casing Stick-up (ft): 0
Perforated length (ft): 5.0

Constant Head		
Start	Stop	Volume Used (gallons)
0 sec.	30 min.	198.3

Note: Flow rate measured with flow meter.

*K, Hydraulic Conductivity (CFS/Ft^2 - Ft Head)

= 7.6×10^{-4}

*(Reference: South Florida Water Management District Usual Open Hole Test Method)

Note: Borehole was charged with 81 gallons of water for 10 minutes prior to initiation of test.

Exhibit 3

Photograph 1 – SPT-1

Photograph 2 – PC-1

Photograph 3 – SPT-2

Photograph 4 – SPT-3

Photograph 5 – PC-2

Photograph 6 – SPT-4

Photograph 7 – SPT-5

Photograph 8 – PC-3

Photograph 9 – SPT-6

Photograph 10 – SPT-7

Photograph 11 – PC-4

Photograph 10 – SPT-8

Photograph 11 – SPT-9

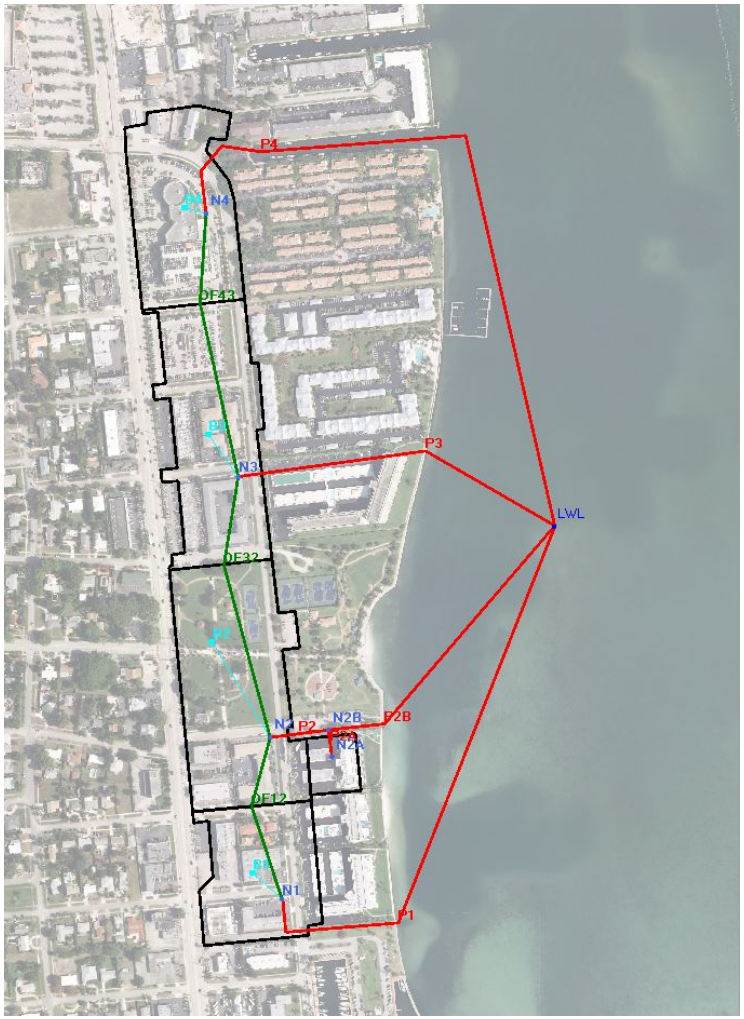
Photograph 12 – PC-5

Photograph 13 – SPT-10

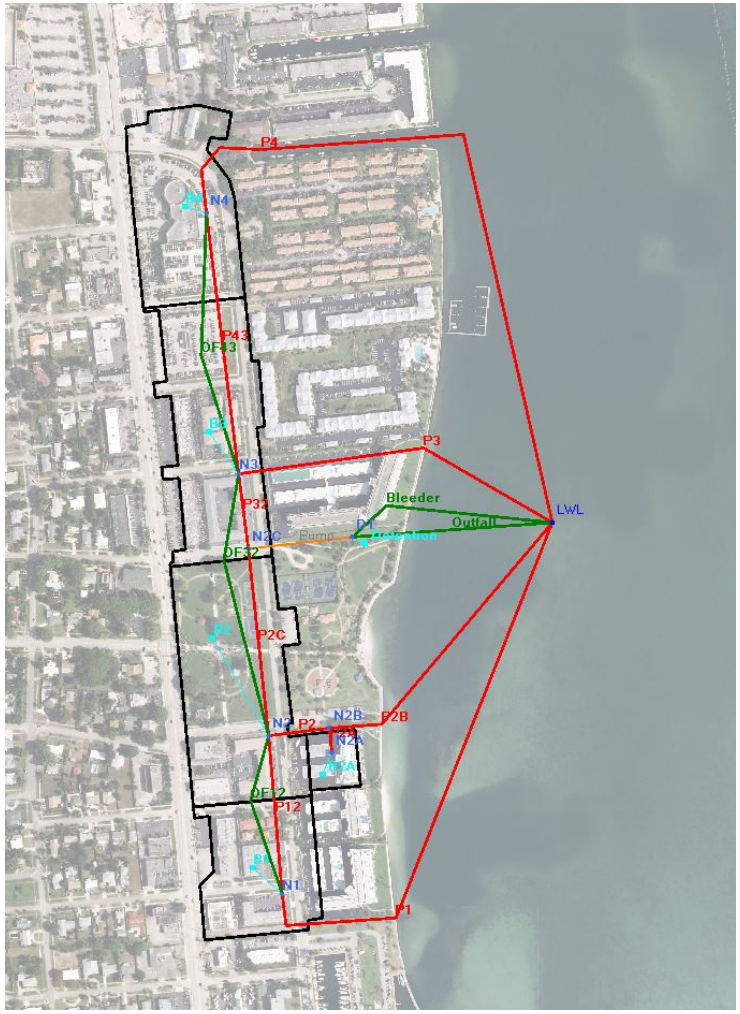
APPENDIX C – ICPR4 Model Input and Output

ICPR Model Schematics

Existing = Existing System without SLR conditions
ExistingSLR = Existing System with SLR conditions



PumpDet = Pump and Detention System without SLR conditions
PumpDetSLR = Pump and Detention System with SLR conditions



Simulation: 10Y1D

Scenario: Existing
Run Date/Time: 2/11/2019 8:19:51 AM
Program Version: ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CNs

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERV

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft

IA Recovery Time: 24.0000 hr

Manual Basin Rain Opt: Global

Max dZ:	1.0000 ft		
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	~FLMOD
		Rainfall Amount:	9.00 in
Edge Length Option:	Automatic	Storm Duration:	24.0000 hr
		Dflt Damping (1D):	0.0050 ft
		Min Node Srf Area (1D):	100 ft2
		Energy Switch (1D):	Energy

Comment:

Simulation: 25Y3D

Scenario: Existing
Run Date/Time: 1/15/2019 3:00:00 PM
Program Version: ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	80.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Lookup Tables

Rainfall Folder:		Boundary Stage Set:	
		Extern Hydrograph Set:	
Unit Hydrograph Folder:		Curve Number Set:	CNs
		Green-Ampt Set:	
		Vertical Layers Set:	
		Impervious Set:	IMPERV

Tolerances & Options

Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6		
Over-Relax Weight Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Manual Basin Rain Opt:	Global
Max dZ:	1.0000 ft		
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	~SFWMD-72
		Rainfall Amount:	13.00 in
Edge Length Option:	Automatic	Storm Duration:	72.0000 hr
		Dflt Damping (1D):	0.0050 ft
		Min Node Srf Area (1D):	100 ft2
		Energy Switch (1D):	Energy

Comment:

Simulation: 3Y1D

Scenario:	Existing
Run Date/Time:	1/15/2019 3:02:16 PM
Program Version:	ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CNs
Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERV

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft
Max dZ: 1.0000 ft
Link Optimizer Tol: 0.0001 ft
Edge Length Option: Automatic

IA Recovery Time: 24.0000 hr
Manual Basin Rain Opt: Global
Rainfall Name: ~FLMOD
Rainfall Amount: 5.80 in
Storm Duration: 24.0000 hr
Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Comment:

Simulation: 10Y1D

Scenario: ExistingSLR
Run Date/Time: 2/11/2019 8:20:22 AM
Program Version: ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:

Extern Hydrograph Set:

Curve Number Set: CNs

Green-Ampt Set:

Vertical Layers Set:

Impervious Set: IMPERV

Tolerances & Options

Time Marching: SAOR

Max Iterations: 6

Over-Relax Weight Fact: 0.5 dec

dZ Tolerance: 0.0010 ft

Max dZ: 1.0000 ft

Link Optimizer Tol: 0.0001 ft

Edge Length Option: Automatic

IA Recovery Time: 24.0000 hr

Manual Basin Rain Opt: Global

Rainfall Name: ~FLMOD

Rainfall Amount: 9.00 in

Storm Duration: 24.0000 hr

Dflt Damping (1D):	0.0050 ft
Min Node Srf Area (1D):	100 ft2
Energy Switch (1D):	Energy

Comment:

Simulation: 25Y3D

Scenario:	ExistingSLR
Run Date/Time:	1/15/2019 3:06:58 PM
Program Version:	ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	80.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:

Extern Hydrograph Set:

Curve Number Set: CNs

Green-Ampt Set:

Vertical Layers Set:	
Impervious Set:	IMPERV

Tolerances & Options

Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6		
Over-Relax Weight Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Manual Basin Rain Opt:	Global
Max dZ:	1.0000 ft		
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	~SFWMD-72
		Rainfall Amount:	13.00 in
Edge Length Option:	Automatic	Storm Duration:	72.0000 hr
		Dflt Damping (1D):	0.0050 ft
		Min Node Srf Area (1D):	100 ft2
		Energy Switch (1D):	Energy

Comment:

Simulation: 3Y1D

Scenario:	ExistingSLR
Run Date/Time:	1/15/2019 3:08:52 PM
Program Version:	ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CNs
Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERV

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft
Max dZ: 1.0000 ft
Link Optimizer Tol: 0.0001 ft
Edge Length Option: Automatic

IA Recovery Time: 24.0000 hr
Manual Basin Rain Opt: Global
Rainfall Name: ~FLMOD
Rainfall Amount: 5.80 in
Storm Duration: 24.0000 hr
Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Comment:

Simulation: 10Y1D

Scenario: PumpDet
Run Date/Time: 2/11/2019 8:20:45 AM
Program Version: ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000

End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CNs

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERV

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft
Max dZ: 1.0000 ft
Link Optimizer Tol: 0.0001 ft

Edge Length Option: Automatic

IA Recovery Time: 24.0000 hr

Manual Basin Rain Opt: Global

Rainfall Name: ~FLMOD
Rainfall Amount: 9.00 in
Storm Duration: 24.0000 hr

Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Comment:

Simulation: 25Y3D

Scenario: PumpDet
Run Date/Time: 1/22/2019 10:00:13 AM
Program Version: ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	80.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CNs

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERV

Tolerances & Options

Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6		
Over-Relax Weight Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Manual Basin Rain Opt:	Global
Max dZ:	1.0000 ft		
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	~SFWMD-72
		Rainfall Amount:	13.00 in
Edge Length Option:	Automatic	Storm Duration:	72.0000 hr
		Dflt Damping (1D):	0.0050 ft
		Min Node Srf Area (1D):	100 ft2
		Energy Switch (1D):	Energy

Comment:

Simulation: 3Y1D

Scenario:	PumpDet
Run Date/Time:	1/22/2019 10:01:51 AM
Program Version:	ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CNs

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERV

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft
Max dZ: 1.0000 ft
Link Optimizer Tol: 0.0001 ft

Edge Length Option: Automatic

IA Recovery Time: 24.0000 hr

Manual Basin Rain Opt: Global

Rainfall Name: ~FLMOD
Rainfall Amount: 5.80 in
Storm Duration: 24.0000 hr

Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Comment:

Simulation: 10Y1D

Scenario: PumpDetSLR
Run Date/Time: 2/11/2019 8:21:15 AM
Program Version: ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000

Max Calculation Time: 30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CNs

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERV

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft
Max dZ: 1.0000 ft
Link Optimizer Tol: 0.0001 ft

Edge Length Option: Automatic

IA Recovery Time: 24.0000 hr

Manual Basin Rain Opt: Global

Rainfall Name: ~FLMOD
Rainfall Amount: 9.00 in
Storm Duration: 24.0000 hr

Dflt Damping (1D): 0.0050 ft
Min Node Srf Area (1D): 100 ft2
Energy Switch (1D): Energy

Comment:

Simulation: 25Y3D

Scenario: PumpDetSLR
Run Date/Time: 1/22/2019 10:02:45 AM
Program Version: ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	80.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Rainfall Folder:

Unit Hydrograph Folder:

Lookup Tables

Boundary Stage Set:
Extern Hydrograph Set:
Curve Number Set: CNs

Green-Ampt Set:
Vertical Layers Set:
Impervious Set: IMPERV

Tolerances & Options

Time Marching: SAOR
Max Iterations: 6
Over-Relax Weight Fact: 0.5 dec
dZ Tolerance: 0.0010 ft

IA Recovery Time: 24.0000 hr

Manual Basin Rain Opt: Global

Max dZ:	1.0000 ft		
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	~SFWMD-72
		Rainfall Amount:	13.00 in
Edge Length Option:	Automatic	Storm Duration:	72.0000 hr
		Dflt Damping (1D):	0.0050 ft
		Min Node Srf Area (1D):	100 ft2
		Energy Switch (1D):	Energy

Comment:

Simulation: 3Y1D

Scenario: PumpDetSLR
Run Date/Time: 1/22/2019 10:03:52 AM
Program Version: ICPR4 4.04.00

General

Run Mode: Normal

	Year	Month	Day	Hour [hr]
Start Time:	0	0	0	0.0000
End Time:	0	0	0	30.0000

	Hydrology [sec]	Surface Hydraulics [sec]
Min Calculation Time:	30.0000	0.1000
Max Calculation Time:		30.0000

Output Time Increments

Hydrology

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Surface Hydraulics

Year	Month	Day	Hour [hr]	Time Increment [min]
0	0	0	0.0000	15.0000

Restart File

Save Restart: False

Resources & Lookup Tables

Resources

Lookup Tables

Rainfall Folder:		Boundary Stage Set:	
		Extern Hydrograph Set:	
Unit Hydrograph Folder:		Curve Number Set:	CNs
		Green-Ampt Set:	
		Vertical Layers Set:	
		Impervious Set:	IMPERV

Tolerances & Options

Time Marching:	SAOR	IA Recovery Time:	24.0000 hr
Max Iterations:	6		
Over-Relax Weight Fact:	0.5 dec		
dZ Tolerance:	0.0010 ft	Manual Basin Rain Opt:	Global
Max dZ:	1.0000 ft		
Link Optimizer Tol:	0.0001 ft	Rainfall Name:	~FLMOD
		Rainfall Amount:	5.80 in
Edge Length Option:	Automatic	Storm Duration:	24.0000 hr
		Dflt Damping (1D):	0.0050 ft
		Min Node Srf Area (1D):	100 ft2
		Energy Switch (1D):	Energy

Comment:

Manual Basin: B1

Scenario:	Existing
Node:	N1
Hydrograph Method:	NRCS Unit Hydrograph
Infiltration Method:	Curve Number
Time of Concentration:	10.0000 min
Max Allowable Q:	0.00 cfs
Time Shift:	0.0000 hr
Unit Hydrograph:	UH256
Peaking Factor:	256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.7000	Commercial	ST. LUCIE	
1.7700	High Density Res	ARENTS	
1.1400	High Density Res	ST. LUCIE	
0.4600	Single Family Res	ARENTS	
0.4600	Single Family Res	ST. LUCIE	

Comment:

Manual Basin Runoff Summary [Existing]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B1	10Y1D	28.60	12.0500	9.00	8.07	5.5300	92.4	83.35	0.00
B1	25Y3D	31.29	60.0167	13.00	12.03	5.5300	92.2	83.35	0.00
B1	3Y1D	17.80	12.0500	5.80	4.94	5.5300	92.6	83.35	0.00

Manual Basin: B2

Scenario: Existing
Node: N2
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.1800	Commercial	ST. LUCIE	
1.4900	High Density Res	ARENTS	
0.5200	High Density Res	ST. LUCIE	
4.6200	Parks	ARENTS	
2.2000	Parks	ST. LUCIE	

Comment:

Manual Basin Runoff Summary [Existing]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B2	10Y1D	48.99	12.0500	9.00	7.39	10.0100	86.7	45.71	0.00
B2	25Y3D	55.51	60.0250	13.00	11.29	10.0100	86.5	45.71	0.00
B2	3Y1D	29.18	12.0500	5.80	4.33	10.0100	87.0	45.71	0.00

Manual Basin: B2A

Scenario: Existing
Node: N2A
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs

Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.0500	High Density Res	ARENTS	

Comment:

Manual Basin Runoff Summary [Existing]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B2A	10Y1D	5.66	12.0500	9.00	8.77	1.0500	98.1	90.00	0.00
B2A	25Y3D	6.03	60.0167	13.00	12.77	1.0500	98.1	90.00	0.00
B2A	3Y1D	3.64	12.0500	5.80	5.57	1.0500	98.1	90.00	0.00

Manual Basin: B3

Scenario: Existing
Node: N3
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 12.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
3.0100	Commercial	ARENTS	
0.6600	Commercial	ST. LUCIE	
0.5600	Commercial	URBAN LAND	
4.4200	High Density Res	ARENTS	
0.0400	Parks	ARENTS	

Comment:

Manual Basin Runoff Summary [Existing]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B3	10Y1D	43.59	12.0667	9.00	8.67	8.6900	97.3	89.70	0.00
B3	25Y3D	47.16	60.0333	13.00	12.66	8.6900	97.3	89.70	0.00
B3	3Y1D	27.90	12.0667	5.80	5.48	8.6900	97.3	89.70	0.00

Manual Basin: B4

Scenario: Existing
Node: N4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.3300	Commercial	ARENTS	
5.0500	Commercial	URBAN LAND	
0.7200	High Density Res	ARENTS	

Comment:

Manual Basin Runoff Summary [Existing]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B4	10Y1D	37.55	12.0500	9.00	8.28	7.1000	94.1	90.00	0.00
B4	25Y3D	40.57	60.0167	13.00	12.26	7.1000	94.1	90.00	0.00
B4	3Y1D	23.66	12.0500	5.80	5.11	7.1000	94.1	90.00	0.00

Manual Basin: B1

Scenario: ExistingSLR
Node: N1
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.7000	Commercial	ST. LUCIE	
1.7700	High Density Res	ARENTS	
1.1400	High Density Res	ST. LUCIE	
0.4600	Single Family Res	ARENTS	
0.4600	Single Family Res	ST. LUCIE	

Comment:

Manual Basin Runoff Summary [ExistingSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B1	10Y1D	28.60	12.0500	9.00	8.07	5.5300	92.4	83.35	0.00
B1	25Y3D	31.29	60.0167	13.00	12.03	5.5300	92.2	83.35	0.00
B1	3Y1D	17.80	12.0500	5.80	4.94	5.5300	92.6	83.35	0.00

Manual Basin: B2

Scenario: ExistingSLR
Node: N2
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.1800	Commercial	ST. LUCIE	
1.4900	High Density Res	ARENTS	
0.5200	High Density Res	ST. LUCIE	
4.6200	Parks	ARENTS	
2.2000	Parks	ST. LUCIE	

Comment:

Manual Basin Runoff Summary [ExistingSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B2	10Y1D	48.99	12.0500	9.00	7.39	10.0100	86.7	45.71	0.00
B2	25Y3D	55.51	60.0250	13.00	11.29	10.0100	86.5	45.71	0.00
B2	3Y1D	29.18	12.0500	5.80	4.33	10.0100	87.0	45.71	0.00

Manual Basin: B2A

Scenario: ExistingSLR
Node: N2A
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs

Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.0478	High Density Res	ARENTS	

Comment:

Manual Basin Runoff Summary [ExistingSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B2A	10Y1D	5.64	12.0500	9.00	8.77	1.0478	98.1	90.00	0.00
B2A	25Y3D	6.02	60.0167	13.00	12.77	1.0478	98.1	90.00	0.00
B2A	3Y1D	3.63	12.0500	5.80	5.57	1.0478	98.1	90.00	0.00

Manual Basin: B3

Scenario: ExistingSLR
Node: N3
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 12.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
3.0100	Commercial	ARENTS	
0.6600	Commercial	ST. LUCIE	
0.5600	Commercial	URBAN LAND	
4.4200	High Density Res	ARENTS	
0.0400	Parks	ARENTS	

Comment:

Manual Basin Runoff Summary [ExistingSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B3	10Y1D	43.59	12.0667	9.00	8.67	8.6900	97.3	89.70	0.00
B3	25Y3D	47.16	60.0333	13.00	12.66	8.6900	97.3	89.70	0.00
B3	3Y1D	27.90	12.0667	5.80	5.48	8.6900	97.3	89.70	0.00

Manual Basin: B4

Scenario: ExistingSLR
Node: N4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.3300	Commercial	ARENTS	
5.0500	Commercial	URBAN LAND	
0.7200	High Density Res	ARENTS	

Comment:

Manual Basin Runoff Summary [ExistingSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B4	10Y1D	37.55	12.0500	9.00	8.28	7.1000	94.1	90.00	0.00
B4	25Y3D	40.57	60.0167	13.00	12.26	7.1000	94.1	90.00	0.00
B4	3Y1D	23.66	12.0500	5.80	5.11	7.1000	94.1	90.00	0.00

Manual Basin: B1

Scenario: PumpDet
Node: N1
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.7000	Commercial	ST. LUCIE	
1.7700	High Density Res	ARENTS	
1.1400	High Density Res	ST. LUCIE	
0.4600	Single Family Res	ARENTS	
0.4600	Single Family Res	ST. LUCIE	

Comment:

Manual Basin Runoff Summary [PumpDet]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B1	10Y1D	28.60	12.0500	9.00	8.07	5.5300	92.4	83.35	0.00
B1	25Y3D	31.29	60.0167	13.00	12.03	5.5300	92.2	83.35	0.00
B1	3Y1D	17.80	12.0500	5.80	4.94	5.5300	92.6	83.35	0.00

Manual Basin: B2

Scenario: PumpDet
Node: N2
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.1800	Commercial	ST. LUCIE	
1.4900	High Density Res	ARENTS	
0.5200	High Density Res	ST. LUCIE	
4.6200	Parks	ARENTS	
2.2000	Parks	ST. LUCIE	

Comment:

Manual Basin Runoff Summary [PumpDet]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B2	10Y1D	48.99	12.0500	9.00	7.39	10.0100	86.7	45.71	0.00
B2	25Y3D	55.51	60.0250	13.00	11.29	10.0100	86.5	45.71	0.00
B2	3Y1D	29.18	12.0500	5.80	4.33	10.0100	87.0	45.71	0.00

Manual Basin: B2A

Scenario: PumpDet
Node: N2A
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs

Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.0478	High Density Res	ARENTS	

Comment:

Manual Basin Runoff Summary [PumpDet]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B2A	10Y1D	5.64	12.0500	9.00	8.77	1.0478	98.1	90.00	0.00
B2A	25Y3D	6.02	60.0167	13.00	12.77	1.0478	98.1	90.00	0.00
B2A	3Y1D	3.63	12.0500	5.80	5.57	1.0478	98.1	90.00	0.00

Manual Basin: B3

Scenario: PumpDet
Node: N3
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 12.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
3.0100	Commercial	ARENTS	
0.6600	Commercial	ST. LUCIE	
0.5600	Commercial	URBAN LAND	
4.4200	High Density Res	ARENTS	
0.0400	Parks	ARENTS	

Comment:

Manual Basin Runoff Summary [PumpDet]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B3	10Y1D	43.59	12.0667	9.00	8.67	8.6900	97.3	89.70	0.00
B3	25Y3D	47.16	60.0333	13.00	12.66	8.6900	97.3	89.70	0.00
B3	3Y1D	27.90	12.0667	5.80	5.48	8.6900	97.3	89.70	0.00

Manual Basin: B4

Scenario: PumpDet
Node: N4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.3300	Commercial	ARENTS	
5.0500	Commercial	URBAN LAND	
0.7200	High Density Res	ARENTS	

Comment:

Manual Basin Runoff Summary [PumpDet]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B4	10Y1D	37.55	12.0500	9.00	8.28	7.1000	94.1	90.00	0.00
B4	25Y3D	40.57	60.0167	13.00	12.26	7.1000	94.1	90.00	0.00
B4	3Y1D	23.66	12.0500	5.80	5.11	7.1000	94.1	90.00	0.00

Manual Basin: Detention

Scenario: PumpDet
Node: DT
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
0.3000	Parks	ARENTS	

Comment:

Manual Basin Runoff Summary [PumpDet]

Basin	Sim Name	Max Flow	Time to	Total	Total	Area [ac]	Equivalent	% Imperv	% DCIA

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
Detention	10Y1D	1.51	12.0500	9.00	7.48	0.3000	87.5	25.00	0.00
Detention	25Y3D	1.69	60.0250	13.00	11.42	0.3000	87.5	25.00	0.00
Detention	3Y1D	0.91	12.0500	5.80	4.38	0.3000	87.5	25.00	0.00

Manual Basin: B1

Scenario: PumpDetSLR
Node: N1
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.7000	Commercial	ST. LUCIE	
1.7700	High Density Res	ARENTS	
1.1400	High Density Res	ST. LUCIE	
0.4600	Single Family Res	ARENTS	
0.4600	Single Family Res	ST. LUCIE	

Comment:

Manual Basin Runoff Summary [PumpDetSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B1	10Y1D	28.60	12.0500	9.00	8.07	5.5300	92.4	83.35	0.00
B1	25Y3D	31.29	60.0167	13.00	12.03	5.5300	92.2	83.35	0.00
B1	3Y1D	17.80	12.0500	5.80	4.94	5.5300	92.6	83.35	0.00

Manual Basin: B2

Scenario: PumpDetSLR
Node: N2
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr

Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.1800	Commercial	ST. LUCIE	
1.4900	High Density Res	ARENTS	
0.5200	High Density Res	ST. LUCIE	
4.6200	Parks	ARENTS	
2.2000	Parks	ST. LUCIE	

Comment:

Manual Basin Runoff Summary [PumpDetSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B2	10Y1D	48.99	12.0500	9.00	7.39	10.0100	86.7	45.71	0.00
B2	25Y3D	55.51	60.0250	13.00	11.29	10.0100	86.5	45.71	0.00
B2	3Y1D	29.18	12.0500	5.80	4.33	10.0100	87.0	45.71	0.00

Manual Basin: B2A

Scenario: PumpDetSLR
Node: N2A
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.0478	High Density Res	ARENTS	

Comment:

Manual Basin Runoff Summary [PumpDetSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B2A	10Y1D	5.64	12.0500	9.00	8.77	1.0478	98.1	90.00	0.00
B2A	25Y3D	6.02	60.0167	13.00	12.77	1.0478	98.1	90.00	0.00
B2A	3Y1D	3.63	12.0500	5.80	5.57	1.0478	98.1	90.00	0.00

Manual Basin: B3

Scenario: PumpDetSLR
Node: N3
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 12.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
3.0100	Commercial	ARENTS	
0.6600	Commercial	ST. LUCIE	
0.5600	Commercial	URBAN LAND	
4.4200	High Density Res	ARENTS	
0.0400	Parks	ARENTS	

Comment:

Manual Basin Runoff Summary [PumpDetSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B3	10Y1D	43.59	12.0667	9.00	8.67	8.6900	97.3	89.70	0.00
B3	25Y3D	47.16	60.0333	13.00	12.66	8.6900	97.3	89.70	0.00
B3	3Y1D	27.90	12.0667	5.80	5.48	8.6900	97.3	89.70	0.00

Manual Basin: B4

Scenario: PumpDetSLR
Node: N4
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
1.3300	Commercial	ARENTS	
5.0500	Commercial	URBAN LAND	
0.7200	High Density Res	ARENTS	

Comment:

Manual Basin Runoff Summary [PumpDetSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
B4	10Y1D	37.55	12.0500	9.00	8.28	7.1000	94.1	90.00	0.00
B4	25Y3D	40.57	60.0167	13.00	12.26	7.1000	94.1	90.00	0.00
B4	3Y1D	23.66	12.0500	5.80	5.11	7.1000	94.1	90.00	0.00

Manual Basin: Detention

Scenario: PumpDetSLR
Node: DT
Hydrograph Method: NRCS Unit Hydrograph
Infiltration Method: Curve Number
Time of Concentration: 10.0000 min
Max Allowable Q: 0.00 cfs
Time Shift: 0.0000 hr
Unit Hydrograph: UH256
Peaking Factor: 256.0

Area [ac]	Land Cover Zone	Soil Zone	Rainfall Name
0.3000	Parks	ARENTS	

Comment:

Manual Basin Runoff Summary [PumpDetSLR]

Basin Name	Sim Name	Max Flow [cfs]	Time to Max Flow [hrs]	Total Rainfall [in]	Total Runoff [in]	Area [ac]	Equivalent Curve Number	% Imperv	% DCIA
Detention	10Y1D	1.51	12.0500	9.00	7.48	0.3000	87.5	25.00	0.00
Detention	25Y3D	1.69	60.0250	13.00	11.42	0.3000	87.5	25.00	0.00
Detention	3Y1D	0.91	12.0500	5.80	4.38	0.3000	87.5	25.00	0.00

Node: LWL

Scenario: Existing
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	-1.00
0	0	0	12.0000	1.00

Year	Month	Day	Hour	Stage [ft]
0	0	0	24.0000	-1.00
0	0	0	36.0000	1.00
0	0	0	48.0000	-1.00
0	0	0	60.0000	1.00
0	0	0	72.0000	-1.00
0	0	0	84.0000	1.00
0	0	0	96.0000	-1.00

Comment:

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
LWL	10Y1D	0.00	1.00	0.0011	56.72	0.18	0
LWL	25Y3D	0.00	1.00	0.0013	57.80	0.25	0
LWL	3Y1D	0.00	1.00	0.0010	50.28	0.18	0

Node: N1

Scenario: Existing
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.20 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0200	871
2.50	0.4300	18731
3.00	0.8400	36590
3.50	1.2700	55321
4.00	1.7400	75794
4.50	2.4100	104980
5.00	2.8600	124582
5.50	3.2300	140699
6.00	3.6300	158123
6.50	4.4000	191664
7.00	4.7300	206039
7.50	4.7800	208217
8.00	5.5300	240887

Comment:

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N1	10Y1D	2.20	3.28	0.0049	28.60	21.71	47123
N1	25Y3D	2.20	3.38	0.0051	31.29	21.57	50858
N1	3Y1D	2.20	2.79	0.0041	17.80	12.68	28935

Node: N2

Scenario: Existing
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.10 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0100	436
2.00	0.2300	10019
2.50	1.2200	53143
3.00	2.5500	111078
3.50	3.5100	152896
4.00	4.4500	193842
4.50	5.6000	243936
5.00	6.9400	302306
5.50	7.3900	321908
6.00	7.8400	341510
6.50	8.3200	362419
7.00	8.9800	391169
7.50	9.3800	408593
8.00	9.7400	424274

Comment:

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2	10Y1D	2.10	3.28	0.0011	67.12	20.34	134745
N2	25Y3D	2.10	3.38	0.0011	70.38	20.98	143077
N2	3Y1D	2.10	2.79	0.0010	29.22	14.68	86697

Node: N2A

Scenario: Existing
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0
2.50	0.0000	0
3.00	0.0000	0
3.50	0.0000	0
4.00	0.0400	1742
4.50	0.2600	11326
5.00	0.5700	24829
5.50	0.8800	38333
6.00	0.9700	42253
6.50	1.0400	45302
7.00	1.0400	45302
7.50	1.0400	45302
8.00	1.0400	45302

Comment:

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2A	10Y1D	0.00	4.64	0.0012	5.66	2.37	15178
N2A	25Y3D	0.00	4.69	0.0011	6.03	2.40	16468
N2A	3Y1D	0.00	4.31	0.0011	3.64	2.16	7741

Node: N2B

Scenario: Existing
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0500	2178
10.00	0.0500	2178

Comment:

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2B	10Y1D	0.00	2.00	0.0010	14.51	14.60	3116
N2B	25Y3D	0.00	2.05	0.0010	14.78	14.87	3116
N2B	3Y1D	0.00	1.78	0.0010	12.89	13.80	3116

Node: N3

Scenario: Existing
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.50 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0700	3049
2.00	0.2300	10019
2.50	0.8100	35284
3.00	1.9800	86249
3.50	2.5100	109336
4.00	3.2800	142877
4.50	3.7700	164221
5.00	4.1900	182516
5.50	5.3200	231739
6.00	5.7600	250906
6.50	6.3000	274428
7.00	6.7200	292723
7.50	7.2600	316246
8.00	8.2900	361112

Comment:

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N3	10Y1D	2.50	3.28	0.0010	56.20	26.05	99218
N3	25Y3D	2.50	3.38	0.0010	61.09	27.05	103823

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N3	3Y1D	2.50	2.83	0.0010	34.45	20.48	68505

Node: N4

Scenario: Existing
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 3.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0
2.50	0.0400	1742
3.00	0.4300	18731
3.50	0.9300	40511
4.00	1.2500	54450
4.50	1.4600	63598
5.00	1.7000	74052
5.50	1.9700	85813
6.00	2.2100	96268
6.50	2.4600	107158
7.00	2.8200	122839
7.50	3.4900	152024
8.00	4.2500	185130

Comment:

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N4	10Y1D	3.00	3.28	0.0038	37.55	29.68	30731
N4	25Y3D	3.00	3.38	0.0039	40.57	31.49	35083
N4	3Y1D	3.00	2.82	0.0028	23.66	22.45	12680

Node: LWL

Scenario: ExistingSLR
Type: Time/Stage

Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	0.70
0	0	0	12.0000	2.70
0	0	0	24.0000	0.70
0	0	0	36.0000	2.70
0	0	0	48.0000	0.70
0	0	0	60.0000	2.70
0	0	0	72.0000	0.70
0	0	0	84.0000	2.70
0	0	0	96.0000	0.70

Comment:

Node Max Conditions [ExistingSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
LWL	10Y1D	0.00	2.70	0.0010	42.43	0.61	0
LWL	25Y3D	0.00	2.70	0.0011	45.40	5.72	0
LWL	3Y1D	0.00	2.70	0.0010	32.33	0.61	0

Node: N1

Scenario: ExistingSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.20 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0200	871
2.50	0.4300	18731
3.00	0.8400	36590
3.50	1.2700	55321
4.00	1.7400	75794
4.50	2.4100	104980
5.00	2.8600	124582
5.50	3.2300	140699
6.00	3.6300	158123

Stage [ft]	Area [ac]	Area [ft2]
6.50	4.4000	191664
7.00	4.7300	206039
7.50	4.7800	208217
8.00	5.5300	240887

Comment:

Node Max Conditions [ExistingSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N1	10Y1D	2.20	3.70	0.0038	28.60	10.21	63673
N1	25Y3D	2.20	3.78	0.0038	31.29	12.37	66703
N1	3Y1D	2.20	3.33	0.0038	17.80	6.12	48822

Node: N2

Scenario: ExistingSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.10 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0100	436
2.00	0.2300	10019
2.50	1.2200	53143
3.00	2.5500	111078
3.50	3.5100	152896
4.00	4.4500	193842
4.50	5.6000	243936
5.00	6.9400	302306
5.50	7.3900	321908
6.00	7.8400	341510
6.50	8.3200	362419
7.00	8.9800	391169
7.50	9.3800	408593
8.00	9.7400	424274

Comment:

Node Max Conditions [ExistingSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2	10Y1D	2.10	3.71	0.0010	63.45	14.52	169784
N2	25Y3D	2.10	3.78	0.0010	68.86	15.27	175869
N2	3Y1D	2.10	3.33	0.0010	40.05	11.82	138514

Node: N2A

Scenario: ExistingSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0
2.50	0.0000	0
3.00	0.0000	0
3.50	0.0000	0
4.00	0.0400	1742
4.50	0.2600	11326
5.00	0.5700	24829
5.50	0.8800	38333
6.00	0.9700	42253
6.50	1.0400	45302
7.00	1.0400	45302
7.50	1.0400	45302
8.00	1.0400	45302

Comment:

Node Max Conditions [ExistingSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2A	10Y1D	0.00	4.67	0.0010	5.64	2.17	15839
N2A	25Y3D	0.00	4.72	0.0010	6.02	2.18	17169
N2A	3Y1D	0.00	4.33	0.0010	3.63	2.05	8073

Node: N2B

Scenario: ExistingSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0500	2178
10.00	0.0500	2178

Comment:

Node Max Conditions [ExistingSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2B	10Y1D	0.00	3.13	0.0010	10.35	10.45	2255
N2B	25Y3D	0.00	3.17	0.0010	10.60	10.70	2255
N2B	3Y1D	0.00	2.97	0.0010	8.49	8.59	2255

Node: N3

Scenario: ExistingSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.50 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0700	3049
2.00	0.2300	10019
2.50	0.8100	35284
3.00	1.9800	86249
3.50	2.5100	109336
4.00	3.2800	142877
4.50	3.7700	164221
5.00	4.1900	182516
5.50	5.3200	231739
6.00	5.7600	250906
6.50	6.3000	274428
7.00	6.7200	292723
7.50	7.2600	316246
8.00	8.2900	361112

Comment:

Node Max Conditions [ExistingSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N3	10Y1D	2.50	3.71	0.0010	58.75	17.93	123265
N3	25Y3D	2.50	3.78	0.0010	61.82	17.24	128288
N3	3Y1D	2.50	3.33	0.0010	38.10	15.39	101351

Node: N4

Scenario: ExistingSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 3.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0
2.50	0.0400	1742
3.00	0.4300	18731
3.50	0.9300	40511
4.00	1.2500	54450
4.50	1.4600	63598
5.00	1.7000	74052
5.50	1.9700	85813
6.00	2.2100	96268
6.50	2.4600	107158
7.00	2.8200	122839
7.50	3.4900	152024
8.00	4.2500	185130

Comment:

Node Max Conditions [ExistingSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N4	10Y1D	3.00	3.70	0.0066	37.55	24.89	46212
N4	25Y3D	3.00	3.78	0.0066	40.57	25.12	48303

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N4	3Y1D	3.00	3.32	0.0066	23.66	17.79	32821

Node: DT

Scenario: PumpDet
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 0.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0
2.50	0.0400	1742
3.00	0.3000	13068
3.50	0.3700	16117
4.00	0.4300	18731
4.50	0.5000	21780
5.00	0.5800	25265
5.50	0.6000	26136
6.00	0.6000	26136
6.50	0.6000	26136
7.00	0.6000	26136
7.50	0.6000	26136
8.00	0.6000	26136

Comment:

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
DT	10Y1D	0.00	4.43	0.0100	31.51	31.01	21362
DT	25Y3D	0.00	4.44	0.0100	31.69	31.30	21410
DT	3Y1D	0.00	4.42	0.0100	30.91	30.44	21269

Node: LWL

Scenario: PumpDet
Type: Time/Stage

Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	-1.00
0	0	0	12.0000	1.00
0	0	0	24.0000	-1.00
0	0	0	36.0000	1.00
0	0	0	48.0000	-1.00
0	0	0	60.0000	1.00
0	0	0	72.0000	-1.00
0	0	0	84.0000	1.00
0	0	0	96.0000	-1.00

Comment:

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
LWL	10Y1D	0.00	1.00	0.0010	57.36	0.05	0
LWL	25Y3D	0.00	1.00	0.0011	57.69	0.17	0
LWL	3Y1D	0.00	1.00	0.0010	53.72	0.05	0

Node: N1

Scenario: PumpDet
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.20 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0200	871
2.50	0.4300	18731
3.00	0.8400	36590
3.50	1.2700	55321
4.00	1.7400	75794
4.50	2.4100	104980
5.00	2.8600	124582
5.50	3.2300	140699
6.00	3.6300	158123

Stage [ft]	Area [ac]	Area [ft2]
6.50	4.4000	191664
7.00	4.7300	206039
7.50	4.7800	208217
8.00	5.5300	240887

Comment:

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N1	10Y1D	2.20	3.21	0.0049	28.60	19.74	44621
N1	25Y3D	2.20	3.35	0.0049	31.29	19.74	49691
N1	3Y1D	2.20	2.69	0.0049	17.80	19.74	25648

Node: N2

Scenario: PumpDet
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.10 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0100	436
2.00	0.2300	10019
2.50	1.2200	53143
3.00	2.5500	111078
3.50	3.5100	152896
4.00	4.4500	193842
4.50	5.6000	243936
5.00	6.9400	302306
5.50	7.3900	321908
6.00	7.8400	341510
6.50	8.3200	362419
7.00	8.9800	391169
7.50	9.3800	408593
8.00	9.7400	424274

Comment:

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2	10Y1D	2.10	3.21	0.0135	70.92	49.64	128699
N2	25Y3D	2.10	3.35	0.0135	77.66	49.64	140071
N2	3Y1D	2.10	2.67	0.0135	39.41	49.64	72427

Node: N2A

Scenario: PumpDet
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0
2.50	0.0000	0
3.00	0.0000	0
3.50	0.0000	0
4.00	0.0400	1742
4.50	0.2600	11326
5.00	0.5700	24829
5.50	0.8800	38333
6.00	0.9700	42253
6.50	1.0400	45302
7.00	1.0400	45302
7.50	1.0400	45302
8.00	1.0400	45302

Comment:

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2A	10Y1D	0.00	4.64	0.0012	5.64	2.37	15130
N2A	25Y3D	0.00	4.69	0.0011	6.02	2.40	16421
N2A	3Y1D	0.00	4.31	0.0011	3.63	2.16	7705

Node: N2B

Scenario: PumpDet
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0500	2178
10.00	0.0500	2178

Comment:

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2B	10Y1D	0.00	1.95	0.0010	14.19	14.27	3111
N2B	25Y3D	0.00	2.00	0.0010	14.59	14.68	3111
N2B	3Y1D	0.00	1.72	0.0010	12.37	13.80	3111

Node: N2C

Scenario: PumpDet
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 0.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
-5.00	0.1000	4356
10.00	0.1000	4356

Comment:

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2C	10Y1D	0.00	3.14	0.0026	113.21	30.00	6061
N2C	25Y3D	0.00	3.32	0.0026	113.21	30.00	6068
N2C	3Y1D	0.00	2.61	0.0026	113.21	30.00	6062

Node: N3

Scenario: PumpDet
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.50 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0700	3049
2.00	0.2300	10019
2.50	0.8100	35284
3.00	1.9800	86249
3.50	2.5100	109336
4.00	3.2800	142877
4.50	3.7700	164221
5.00	4.1900	182516
5.50	5.3200	231739
6.00	5.7600	250906
6.50	6.3000	274428
7.00	6.7200	292723
7.50	7.2600	316246
8.00	8.2900	361112

Comment:

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N3	10Y1D	2.50	3.21	0.0034	74.34	75.52	96080
N3	25Y3D	2.50	3.35	0.0034	79.30	75.52	102362
N3	3Y1D	2.50	2.69	0.0034	50.64	75.52	55054

Node: N4

Scenario: PumpDet
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 3.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0

Stage [ft]	Area [ac]	Area [ft2]
2.50	0.0400	1742
3.00	0.4300	18731
3.50	0.9300	40511
4.00	1.2500	54450
4.50	1.4600	63598
5.00	1.7000	74052
5.50	1.9700	85813
6.00	2.2100	96268
6.50	2.4600	107158
7.00	2.8200	122839
7.50	3.4900	152024
8.00	4.2500	185130

Comment:

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N4	10Y1D	3.00	3.22	0.0046	37.55	31.72	28314
N4	25Y3D	3.00	3.35	0.0046	40.57	32.92	34138
N4	3Y1D	3.00	2.71	0.0046	23.66	22.74	9014

Node: DT

Scenario: PumpDetSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 0.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0
2.50	0.0400	1742
3.00	0.3000	13068
3.50	0.3700	16117
4.00	0.4300	18731
4.50	0.5000	21780
5.00	0.5800	25265
5.50	0.6000	26136
6.00	0.6000	26136
6.50	0.6000	26136
7.00	0.6000	26136

Stage [ft]	Area [ac]	Area [ft2]
7.50	0.6000	26136
8.00	0.6000	26136

Comment:

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
DT	10Y1D	0.00	4.92	0.0100	51.51	50.78	24691
DT	25Y3D	0.00	4.92	0.0100	51.69	50.80	24694
DT	3Y1D	0.00	4.91	0.0100	50.91	50.28	24610

Node: LWL

Scenario: PumpDetSLR
Type: Time/Stage
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft
Boundary Stage:

Year	Month	Day	Hour	Stage [ft]
0	0	0	0.0000	0.70
0	0	0	12.0000	2.70
0	0	0	24.0000	0.70
0	0	0	36.0000	2.70
0	0	0	48.0000	0.70
0	0	0	60.0000	2.70
0	0	0	72.0000	0.70
0	0	0	84.0000	2.70
0	0	0	96.0000	0.70

Comment:

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
LWL	10Y1D	0.00	2.70	0.0010	64.72	0.10	0
LWL	25Y3D	0.00	2.70	0.0010	65.71	0.11	0
LWL	3Y1D	0.00	2.70	0.0010	56.02	0.10	0

Node: N1

Scenario: PumpDetSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.20 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0200	871
2.50	0.4300	18731
3.00	0.8400	36590
3.50	1.2700	55321
4.00	1.7400	75794
4.50	2.4100	104980
5.00	2.8600	124582
5.50	3.2300	140699
6.00	3.6300	158123
6.50	4.4000	191664
7.00	4.7300	206039
7.50	4.7800	208217
8.00	5.5300	240887

Comment:

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N1	10Y1D	2.20	3.19	0.0109	28.60	17.88	43624
N1	25Y3D	2.20	3.29	0.0109	31.29	18.08	47391
N1	3Y1D	2.20	2.72	0.0109	17.80	10.94	26496

Node: N2

Scenario: PumpDetSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.10 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0100	436
2.00	0.2300	10019

Stage [ft]	Area [ac]	Area [ft2]
2.50	1.2200	53143
3.00	2.5500	111078
3.50	3.5100	152896
4.00	4.4500	193842
4.50	5.6000	243936
5.00	6.9400	302306
5.50	7.3900	321908
6.00	7.8400	341510
6.50	8.3200	362419
7.00	8.9800	391169
7.50	9.3800	408593
8.00	9.7400	424274

Comment:

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2	10Y1D	2.10	3.18	0.0135	71.39	49.64	126433
N2	25Y3D	2.10	3.28	0.0135	78.18	49.64	134866
N2	3Y1D	2.10	2.70	0.0135	39.54	49.64	76018

Node: N2A

Scenario: PumpDetSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0
2.50	0.0000	0
3.00	0.0000	0
3.50	0.0000	0
4.00	0.0400	1742
4.50	0.2600	11326
5.00	0.5700	24829
5.50	0.8800	38333
6.00	0.9700	42253
6.50	1.0400	45302
7.00	1.0400	45302

Stage [ft]	Area [ac]	Area [ft2]
7.50	1.0400	45302
8.00	1.0400	45302

Comment:

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2A	10Y1D	0.00	4.64	0.0013	5.64	2.30	15157
N2A	25Y3D	0.00	4.69	0.0012	6.02	2.30	16548
N2A	3Y1D	0.00	4.30	0.0011	3.63	2.23	7453

Node: N2B

Scenario: PumpDetSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0500	2178
10.00	0.0500	2178

Comment:

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2B	10Y1D	0.00	2.92	0.0010	7.75	7.85	2331
N2B	25Y3D	0.00	2.97	0.0010	8.26	8.35	2341
N2B	3Y1D	0.00	2.72	0.0010	3.50	7.59	2368

Node: N2C

Scenario: PumpDetSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 0.00 ft

Warning Stage: 0.00 ft

Stage [ft]	Area [ac]	Area [ft2]
-5.00	0.1000	4356
10.00	0.1000	4356

Comment:

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2C	10Y1D	0.00	2.99	0.0026	113.21	50.00	6068
N2C	25Y3D	0.00	3.09	0.0026	113.21	50.00	6068
N2C	3Y1D	0.00	2.51	0.0026	113.21	50.00	6069

Node: N3

Scenario: PumpDetSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 2.50 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0700	3049
2.00	0.2300	10019
2.50	0.8100	35284
3.00	1.9800	86249
3.50	2.5100	109336
4.00	3.2800	142877
4.50	3.7700	164221
5.00	4.1900	182516
5.50	5.3200	231739
6.00	5.7600	250906
6.50	6.3000	274428
7.00	6.7200	292723
7.50	7.2600	316246
8.00	8.2900	361112

Comment:

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N3	10Y1D	2.50	3.18	0.0032	74.43	68.19	94674
N3	25Y3D	2.50	3.28	0.0032	79.65	68.19	99312
N3	3Y1D	2.50	2.72	0.0032	50.61	68.19	57612

Node: N4

Scenario: PumpDetSLR
Type: Stage/Area
Base Flow: 0.00 cfs
Initial Stage: 1.00 ft
Warning Stage: 3.00 ft

Stage [ft]	Area [ac]	Area [ft2]
0.00	0.0000	0
1.50	0.0000	0
2.00	0.0000	0
2.50	0.0400	1742
3.00	0.4300	18731
3.50	0.9300	40511
4.00	1.2500	54450
4.50	1.4600	63598
5.00	1.7000	74052
5.50	1.9700	85813
6.00	2.2100	96268
6.50	2.4600	107158
7.00	2.8200	122839
7.50	3.4900	152024
8.00	4.2500	185130

Comment:

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N4	10Y1D	3.00	3.19	0.0030	37.55	30.96	27069
N4	25Y3D	3.00	3.29	0.0030	40.57	32.55	31398
N4	3Y1D	3.00	2.74	0.0030	23.66	22.72	9874

Link: OF12

Scenario: Existing
Type: Weir
From Node: N1
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF12	10Y1D	12.49	-3.16	-0.14	1.03	1.03	1.03
OF12	25Y3D	12.33	-3.20	-0.13	1.02	1.02	1.02
OF12	3Y1D	3.62	-2.41	-0.28	0.76	0.76	0.76

Link: OF1LWL

Scenario: Existing
Type: Weir
From Node: N1
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF1LWL	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF1LWL	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
OF1LWL	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00

Link: OF32

Scenario: Existing
Type: Weir
From Node: N3
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF32	10Y1D	13.98	-6.20	-0.13	1.43	1.43	1.43
OF32	25Y3D	14.90	-6.75	-0.11	1.38	1.38	1.38
OF32	3Y1D	3.36	-1.70	-0.13	1.14	1.14	1.14

Link: OF43

Scenario: Existing
Type: Weir
From Node: N4
To Node: N3
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF43	10Y1D	12.73	-11.66	-0.18	-1.20	-1.20	-1.20
OF43	25Y3D	14.99	-11.78	-0.17	1.28	1.28	1.28
OF43	3Y1D	7.19	-9.43	-0.06	-1.19	-1.19	-1.19

Link: P1

Scenario: Existing
Type: Pipe
From Node: N1
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P1	10Y1D	10.55	-0.03	-0.02	3.36	4.43	3.36
P1	25Y3D	10.75	-0.03	-0.33	3.42	4.43	3.42
P1	3Y1D	9.35	-0.03	-0.02	2.98	4.43	3.06

Link: P2

Scenario: Existing
Type: Pipe
From Node: N2
To Node: N2B
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2	10Y1D	12.15	-0.04	0.20	2.48	2.48	2.48
P2	25Y3D	12.39	-0.04	-0.45	2.52	2.52	2.52
P2	3Y1D	11.09	-0.04	-0.33	2.26	2.26	2.26

Link: P2A

Scenario: Existing
Type: Pipe
From Node: N2A
To Node: N2B
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2A	10Y1D	2.37	0.00	-0.01	3.02	4.33	3.67
P2A	25Y3D	2.40	0.00	-0.01	3.05	4.35	3.70
P2A	3Y1D	2.16	0.00	-0.01	2.75	4.18	3.46

Link: P2B

Scenario: Existing
Type: Pipe
From Node: N2B
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2B	10Y1D	14.60	-0.08	-0.29	2.97	5.46	4.13
P2B	25Y3D	14.87	-0.17	0.52	3.03	5.46	4.13
P2B	3Y1D	13.80	-0.08	-0.25	2.81	5.46	4.13

Link: P3

Scenario: Existing
Type: Pipe
From Node: N3
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P3	10Y1D	12.80	-0.05	-0.01	2.61	2.61	2.61
P3	25Y3D	13.05	-0.05	0.04	2.66	2.66	2.66
P3	3Y1D	12.09	-0.05	-0.01	2.56	2.46	2.51

Link: P4

Scenario: Existing
Type: Pipe
From Node: N4
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P4	10Y1D	18.77	-0.03	-0.07	3.82	5.31	3.82
P4	25Y3D	19.14	-0.03	0.52	3.90	5.31	3.90
P4	3Y1D	16.69	-0.03	-0.28	3.40	5.31	3.81

Link: OF12

Scenario: ExistingSLR
Type: Weir
From Node: N1
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF12	10Y1D	3.36	-3.81	-0.07	-0.58	-0.58	-0.58
OF12	25Y3D	4.19	-5.32	-0.09	-0.59	-0.59	-0.59
OF12	3Y1D	2.44	-1.48	-0.03	0.58	0.58	0.58

Link: OF1LWL

Scenario: ExistingSLR
Type: Weir
From Node: N1
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF1LWL	10Y1D	2.95	0.00	0.02	1.15	1.15	1.15
OF1LWL	25Y3D	4.92	0.00	0.03	1.31	1.31	1.31
OF1LWL	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00

Link: OF32

Scenario: ExistingSLR
Type: Weir
From Node: N3
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF32	10Y1D	12.21	-4.78	-0.09	-1.08	-1.08	-1.08
OF32	25Y3D	10.93	-4.90	-0.08	-1.09	-1.09	-1.09
OF32	3Y1D	9.95	-3.68	-0.07	1.12	1.12	1.12

Link: OF43

Scenario: ExistingSLR
Type: Weir
From Node: N4
To Node: N3
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF43	10Y1D	15.95	-7.58	-0.16	-1.16	-1.16	-1.16
OF43	25Y3D	16.19	-7.72	-0.21	-1.17	-1.17	-1.17
OF43	3Y1D	10.39	-6.43	-0.15	-1.11	-1.11	-1.11

Link: P1

Scenario: ExistingSLR
Type: Pipe
From Node: N1
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P1	10Y1D	7.33	-0.02	0.28	2.33	2.33	2.33
P1	25Y3D	7.53	-1.22	-0.31	2.40	2.40	2.40
P1	3Y1D	5.96	-0.02	-0.33	1.90	1.90	1.90

Link: P2

Scenario: ExistingSLR
Type: Pipe
From Node: N2
To Node: N2B
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2	10Y1D	8.70	-0.21	-0.24	1.77	1.77	1.77
P2	25Y3D	8.93	-2.12	-0.42	1.82	1.82	1.82
P2	3Y1D	7.18	-0.56	0.29	1.46	1.46	1.46

Link: P2A

Scenario: ExistingSLR
Type: Pipe
From Node: N2A
To Node: N2B
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2A	10Y1D	2.17	0.00	0.00	2.76	2.76	2.76
P2A	25Y3D	2.18	0.00	0.07	2.77	2.77	2.77
P2A	3Y1D	2.05	0.00	0.00	2.61	2.61	2.61

Link: P2B

Scenario: ExistingSLR
Type: Pipe
From Node: N2B
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2B	10Y1D	10.45	-0.32	-0.10	2.13	2.13	2.13
P2B	25Y3D	10.70	-2.17	0.26	2.18	2.18	2.18
P2B	3Y1D	8.59	-0.45	-0.10	1.75	1.75	1.75

Link: P3

Scenario: ExistingSLR
Type: Pipe
From Node: N3
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P3	10Y1D	8.90	-0.27	-0.08	1.81	1.81	1.81
P3	25Y3D	9.14	-1.03	0.16	1.86	1.86	1.86
P3	3Y1D	7.23	-0.27	-0.08	1.47	1.47	1.47

Link: P4

Scenario: ExistingSLR
Type: Pipe
From Node: N4
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P4	10Y1D	13.04	-0.01	-0.57	2.66	2.66	2.66
P4	25Y3D	13.40	-1.36	-0.58	2.73	2.73	2.73
P4	3Y1D	10.58	-0.01	-0.57	2.16	2.16	2.16

Link: Bleeder

Scenario: PumpDet
Type: Weir
From Node: DT
To Node: LWL
Link Count: 1
Flow Direction: Positive

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
Bleeder	10Y1D	0.40	0.00	0.01	0.00	0.00	0.00
Bleeder	25Y3D	0.40	0.00	0.01	0.00	0.00	0.00
Bleeder	3Y1D	0.39	0.00	0.01	0.00	0.00	0.00

Link: OF12

Scenario: PumpDet
Type: Weir
From Node: N1
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF12	10Y1D	10.51	0.00	0.06	0.96	0.96	0.96
OF12	25Y3D	10.95	0.00	0.06	0.97	0.97	0.97
OF12	3Y1D	1.81	0.00	0.02	0.66	0.66	0.66

Link: OF1LWL

Scenario: PumpDet
Type: Weir
From Node: N1
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF1LWL	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF1LWL	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
OF1LWL	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00

Link: OF32

Scenario: PumpDet
Type: Weir
From Node: N3
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF32	10Y1D	9.29	-3.45	-0.10	1.36	1.36	1.36
OF32	25Y3D	12.50	-4.44	-0.09	1.33	1.33	1.33
OF32	3Y1D	0.76	-0.23	-0.03	0.81	0.81	0.81

Link: OF43

Scenario: PumpDet
Type: Weir
From Node: N4
To Node: N3
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF43	10Y1D	26.30	0.00	-0.09	1.43	1.43	1.43
OF43	25Y3D	28.13	0.00	-0.07	1.46	1.46	1.46
OF43	3Y1D	13.96	0.00	-0.06	1.27	1.27	1.27

Link: Outfall

Scenario: PumpDet
Type: Weir
From Node: DT
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
Outfall	10Y1D	30.61	0.00	-0.04	3.11	3.11	3.11
Outfall	25Y3D	30.91	0.00	-0.04	3.12	3.12	3.12
Outfall	3Y1D	30.05	0.00	-0.03	3.09	3.09	3.09

Link: P1

Scenario: PumpDet
Type: Pipe
From Node: N1
To Node: LWL
Link Count: 1
Flow Direction: None

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P1	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P1	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
P1	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00

Link: P12

Scenario: PumpDet
Type: Pipe
From Node: N1
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P12	10Y1D	19.74	-1.75	2.76	2.05	2.05	2.05
P12	25Y3D	19.74	-1.75	2.76	2.05	2.05	2.05
P12	3Y1D	19.74	-1.75	2.76	2.05	2.05	2.05

Link: P2

Scenario: PumpDet
Type: Pipe
From Node: N2
To Node: N2B
Link Count: 1
Flow Direction: Positive

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2	10Y1D	11.83	0.00	-0.27	2.41	2.41	2.41
P2	25Y3D	12.22	0.00	0.22	2.49	2.49	2.49
P2	3Y1D	10.23	0.00	-0.22	2.08	2.08	2.08

Link: P2A

Scenario: PumpDet
Type: Pipe
From Node: N2A
To Node: N2B
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2A	10Y1D	2.37	0.00	-0.01	3.02	4.33	3.67
P2A	25Y3D	2.40	0.00	-0.01	3.05	4.35	3.70
P2A	3Y1D	2.16	0.00	-0.01	2.75	4.18	3.46

Link: P2B

Scenario: PumpDet
Type: Pipe
From Node: N2B
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2B	10Y1D	14.27	-0.05	0.05	2.91	5.46	4.13
P2B	25Y3D	14.68	-0.17	0.11	2.99	5.46	4.13
P2B	3Y1D	13.80	-0.05	-0.08	2.81	5.46	4.13

Link: P2C

Scenario: PumpDet
Type: Pipe
From Node: N2
To Node: N2C
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2C	10Y1D	49.64	-3.43	-1.35	3.95	3.95	3.95
P2C	25Y3D	49.64	-3.43	1.33	3.95	3.95	3.95
P2C	3Y1D	49.64	-3.43	-1.39	3.95	3.95	3.95

Link: P3

Scenario: PumpDet
Type: Pipe
From Node: N3
To Node: LWL
Link Count: 1
Flow Direction: Positive

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P3	10Y1D	12.48	0.00	-0.12	2.54	2.54	2.54
P3	25Y3D	12.87	0.00	-0.12	2.62	2.62	2.62
P3	3Y1D	11.95	0.00	-0.13	2.53	2.43	2.48

Link: P32

Scenario: PumpDet
Type: Pipe
From Node: N3
To Node: N2C
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P32	10Y1D	63.57	-6.20	-1.41	5.06	5.06	5.06
P32	25Y3D	63.57	-6.20	-1.39	5.06	5.06	5.06
P32	3Y1D	63.57	-6.20	0.88	5.06	5.06	5.06

Link: P4

Scenario: PumpDet
Type: Pipe
From Node: N4
To Node: LWL
Link Count: 1
Flow Direction: None

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P4	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P4	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
P4	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00

Link: P43

Scenario: PumpDet
Type: Pipe
From Node: N4
To Node: N3
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P43	10Y1D	15.59	0.00	1.18	2.21	2.21	2.21
P43	25Y3D	17.73	-0.10	-1.35	2.51	2.51	2.51
P43	3Y1D	15.04	0.00	-1.12	2.13	2.13	2.13

Link: Pump

Scenario: PumpDet
Type: Rating Curve
From Node: N2C
To Node: DT
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
Pump	10Y1D	30.00	0.00	-15.00	0.00	0.00	0.00
Pump	25Y3D	30.00	0.00	-15.00	0.00	0.00	0.00
Pump	3Y1D	30.00	0.00	-15.00	0.00	0.00	0.00

Link: Bleeder

Scenario: PumpDetSLR
Type: Weir
From Node: DT
To Node: LWL
Link Count: 1
Flow Direction: Positive

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
Bleeder	10Y1D	0.38	0.00	0.01	0.00	0.00	0.00
Bleeder	25Y3D	0.38	0.00	0.01	0.00	0.00	0.00
Bleeder	3Y1D	0.37	0.00	0.01	0.00	0.00	0.00

Link: OF12

Scenario: PumpDetSLR
Type: Weir
From Node: N1
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF12	10Y1D	10.76	0.00	0.06	0.96	0.96	0.96
OF12	25Y3D	11.03	0.00	0.06	0.97	0.97	0.97
OF12	3Y1D	2.92	0.00	0.03	0.71	0.71	0.71

Link: OF1LWL

Scenario: PumpDetSLR
Type: Weir
From Node: N1
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF1LWL	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF1LWL	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
OF1LWL	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00

Link: OF32

Scenario: PumpDetSLR
Type: Weir
From Node: N3
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF32	10Y1D	8.73	-4.56	-0.13	1.35	1.35	1.35
OF32	25Y3D	11.04	-5.27	-0.11	1.31	1.31	1.31
OF32	3Y1D	1.10	-0.59	-0.07	0.88	0.88	0.88

Link: OF43

Scenario: PumpDetSLR
Type: Weir
From Node: N4
To Node: N3
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF43	10Y1D	26.49	0.00	-0.11	1.41	1.41	1.41
OF43	25Y3D	28.50	0.00	-0.11	1.44	1.44	1.44
OF43	3Y1D	14.93	0.00	-0.06	1.28	1.28	1.28

Link: Outfall

Scenario: PumpDetSLR
Type: Weir
From Node: DT
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
Outfall	10Y1D	50.43	0.00	-0.04	3.67	3.67	3.67
Outfall	25Y3D	50.44	0.00	-0.04	3.67	3.67	3.67
Outfall	3Y1D	49.92	0.00	-0.04	3.66	3.66	3.66

Link: P1

Scenario: PumpDetSLR
Type: Pipe
From Node: N1
To Node: LWL
Link Count: 1
Flow Direction: None

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P1	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P1	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
P1	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00

Link: P12

Scenario: PumpDetSLR
Type: Pipe
From Node: N1
To Node: N2
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P12	10Y1D	11.16	-0.78	2.57	1.16	1.16	1.16
P12	25Y3D	11.95	-0.78	2.57	1.24	1.24	1.24
P12	3Y1D	10.94	-0.78	2.57	1.14	1.14	1.14

Link: P2

Scenario: PumpDetSLR
Type: Pipe
From Node: N2
To Node: N2B
Link Count: 1
Flow Direction: Positive

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2	10Y1D	5.45	0.00	-0.17	1.11	1.11	1.11
P2	25Y3D	5.96	0.00	0.19	1.21	1.21	1.21
P2	3Y1D	1.30	0.00	0.14	0.26	0.26	0.26

Link: P2A

Scenario: PumpDetSLR
Type: Pipe
From Node: N2A
To Node: N2B
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2A	10Y1D	2.30	0.00	0.00	2.93	2.93	2.93
P2A	25Y3D	2.30	0.00	0.00	2.93	2.93	2.93
P2A	3Y1D	2.23	0.00	0.00	2.85	2.85	2.85

Link: P2B

Scenario: PumpDetSLR
Type: Pipe
From Node: N2B
To Node: LWL
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2B	10Y1D	7.85	-0.10	-0.12	1.60	1.60	1.60
P2B	25Y3D	8.35	-0.11	-0.12	1.70	1.70	1.70
P2B	3Y1D	7.59	-0.10	-0.12	1.55	1.55	1.55

Link: P2C

Scenario: PumpDetSLR
Type: Pipe
From Node: N2
To Node: N2C
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P2C	10Y1D	49.64	-3.79	1.41	3.95	3.95	3.95
P2C	25Y3D	49.64	-3.79	1.51	3.95	3.95	3.95
P2C	3Y1D	49.64	-3.79	1.55	3.95	3.95	3.95

Link: P3

Scenario: PumpDetSLR
Type: Pipe
From Node: N3
To Node: LWL
Link Count: 1
Flow Direction: Positive

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P3	10Y1D	6.27	0.00	-0.29	1.28	1.28	1.28
P3	25Y3D	6.75	0.00	-0.29	1.38	1.38	1.38
P3	3Y1D	4.62	0.00	-0.29	0.98	0.94	0.96

Link: P32

Scenario: PumpDetSLR
Type: Pipe
From Node: N3
To Node: N2C
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P32	10Y1D	63.57	-0.10	-1.17	5.06	5.06	5.06
P32	25Y3D	63.57	-0.09	1.38	5.06	5.06	5.06
P32	3Y1D	63.57	0.00	-1.44	5.06	5.06	5.06

Link: P4

Scenario: PumpDetSLR
Type: Pipe
From Node: N4
To Node: LWL
Link Count: 1
Flow Direction: None

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P4	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P4	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
P4	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00

Link: P43

Scenario: PumpDetSLR
Type: Pipe
From Node: N4
To Node: N3
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P43	10Y1D	14.00	0.00	-1.07	1.98	1.98	1.98
P43	25Y3D	15.51	-0.02	-0.99	2.19	2.19	2.19
P43	3Y1D	13.22	-0.01	0.84	1.87	1.87	1.87

Link: Pump

Scenario: PumpDetSLR
Type: Rating Curve
From Node: N2C
To Node: DT
Link Count: 1
Flow Direction: Both

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
Pump	10Y1D	50.00	0.00	-25.00	0.00	0.00	0.00
Pump	25Y3D	50.00	0.00	-25.00	0.00	0.00	0.00
Pump	3Y1D	50.00	0.00	-25.00	0.00	0.00	0.00

Node Max Conditions [Existing]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
LWL	10Y1D	0.00	1.00	0.0011	56.72	0.18	0
N1	10Y1D	2.20	3.28	0.0049	28.60	21.71	47123
N2	10Y1D	2.10	3.28	0.0011	67.12	20.34	134745
N2A	10Y1D	0.00	4.64	0.0012	5.66	2.37	15178
N2B	10Y1D	0.00	2.00	0.0010	14.51	14.60	3116
N3	10Y1D	2.50	3.28	0.0010	56.20	26.05	99218
N4	10Y1D	3.00	3.28	0.0038	37.55	29.68	30731
LWL	25Y3D	0.00	1.00	0.0013	57.80	0.25	0
N1	25Y3D	2.20	3.38	0.0051	31.29	21.57	50858
N2	25Y3D	2.10	3.38	0.0011	70.38	20.98	143077
N2A	25Y3D	0.00	4.69	0.0011	6.03	2.40	16468
N2B	25Y3D	0.00	2.05	0.0010	14.78	14.87	3116
N3	25Y3D	2.50	3.38	0.0010	61.09	27.05	103823
N4	25Y3D	3.00	3.38	0.0039	40.57	31.49	35083

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
LWL	3Y1D	0.00	1.00	0.0010	50.28	0.18	0
N1	3Y1D	2.20	2.79	0.0041	17.80	12.68	28935
N2	3Y1D	2.10	2.79	0.0010	29.22	14.68	86697
N2A	3Y1D	0.00	4.31	0.0011	3.64	2.16	7741
N2B	3Y1D	0.00	1.78	0.0010	12.89	13.80	3116
N3	3Y1D	2.50	2.83	0.0010	34.45	20.48	68505
N4	3Y1D	3.00	2.82	0.0028	23.66	22.45	12680

Node Max Conditions [ExistingSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
LWL	10Y1D	0.00	2.70	0.0010	42.43	0.61	0
N1	10Y1D	2.20	3.70	0.0038	28.60	10.21	63673
N2	10Y1D	2.10	3.71	0.0010	63.45	14.52	169784
N2A	10Y1D	0.00	4.67	0.0010	5.64	2.17	15839
N2B	10Y1D	0.00	3.13	0.0010	10.35	10.45	2255
N3	10Y1D	2.50	3.71	0.0010	58.75	17.93	123265
N4	10Y1D	3.00	3.70	0.0066	37.55	24.89	46212
LWL	25Y3D	0.00	2.70	0.0011	45.40	5.72	0
N1	25Y3D	2.20	3.78	0.0038	31.29	12.37	66703
N2	25Y3D	2.10	3.78	0.0010	68.86	15.27	175869
N2A	25Y3D	0.00	4.72	0.0010	6.02	2.18	17169
N2B	25Y3D	0.00	3.17	0.0010	10.60	10.70	2255
N3	25Y3D	2.50	3.78	0.0010	61.82	17.24	128288
N4	25Y3D	3.00	3.78	0.0066	40.57	25.12	48303
LWL	3Y1D	0.00	2.70	0.0010	32.33	0.61	0
N1	3Y1D	2.20	3.33	0.0038	17.80	6.12	48822
N2	3Y1D	2.10	3.33	0.0010	40.05	11.82	138514
N2A	3Y1D	0.00	4.33	0.0010	3.63	2.05	8073
N2B	3Y1D	0.00	2.97	0.0010	8.49	8.59	2255
N3	3Y1D	2.50	3.33	0.0010	38.10	15.39	101351
N4	3Y1D	3.00	3.32	0.0066	23.66	17.79	32821

Node Max Conditions [PumpDet]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
DT	10Y1D	0.00	4.43	0.0100	31.51	31.01	21362
LWL	10Y1D	0.00	1.00	0.0010	57.36	0.05	0
N1	10Y1D	2.20	3.21	0.0049	28.60	19.74	44621
N2	10Y1D	2.10	3.21	0.0135	70.92	49.64	128699

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N2A	10Y1D	0.00	4.64	0.0012	5.64	2.37	15130
N2B	10Y1D	0.00	1.95	0.0010	14.19	14.27	3111
N2C	10Y1D	0.00	3.14	0.0026	113.21	30.00	6061
N3	10Y1D	2.50	3.21	0.0034	74.34	75.52	96080
N4	10Y1D	3.00	3.22	0.0046	37.55	31.72	28314
DT	25Y3D	0.00	4.44	0.0100	31.69	31.30	21410
LWL	25Y3D	0.00	1.00	0.0011	57.69	0.17	0
N1	25Y3D	2.20	3.35	0.0049	31.29	19.74	49691
N2	25Y3D	2.10	3.35	0.0135	77.66	49.64	140071
N2A	25Y3D	0.00	4.69	0.0011	6.02	2.40	16421
N2B	25Y3D	0.00	2.00	0.0010	14.59	14.68	3111
N2C	25Y3D	0.00	3.32	0.0026	113.21	30.00	6068
N3	25Y3D	2.50	3.35	0.0034	79.30	75.52	102362
N4	25Y3D	3.00	3.35	0.0046	40.57	32.92	34138
DT	3Y1D	0.00	4.42	0.0100	30.91	30.44	21269
LWL	3Y1D	0.00	1.00	0.0010	53.72	0.05	0
N1	3Y1D	2.20	2.69	0.0049	17.80	19.74	25648
N2	3Y1D	2.10	2.67	0.0135	39.41	49.64	72427
N2A	3Y1D	0.00	4.31	0.0011	3.63	2.16	7705
N2B	3Y1D	0.00	1.72	0.0010	12.37	13.80	3111
N2C	3Y1D	0.00	2.61	0.0026	113.21	30.00	6062
N3	3Y1D	2.50	2.69	0.0034	50.64	75.52	55054
N4	3Y1D	3.00	2.71	0.0046	23.66	22.74	9014

Node Max Conditions [PumpDetSLR]

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
DT	10Y1D	0.00	4.92	0.0100	51.51	50.78	24691
LWL	10Y1D	0.00	2.70	0.0010	64.72	0.10	0
N1	10Y1D	2.20	3.19	0.0109	28.60	17.88	43624
N2	10Y1D	2.10	3.18	0.0135	71.39	49.64	126433
N2A	10Y1D	0.00	4.64	0.0013	5.64	2.30	15157
N2B	10Y1D	0.00	2.92	0.0010	7.75	7.85	2331
N2C	10Y1D	0.00	2.99	0.0026	113.21	50.00	6068
N3	10Y1D	2.50	3.18	0.0032	74.43	68.19	94674
N4	10Y1D	3.00	3.19	0.0030	37.55	30.96	27069
DT	25Y3D	0.00	4.92	0.0100	51.69	50.80	24694
LWL	25Y3D	0.00	2.70	0.0010	65.71	0.11	0
N1	25Y3D	2.20	3.29	0.0109	31.29	18.08	47391
N2	25Y3D	2.10	3.28	0.0135	78.18	49.64	134866
N2A	25Y3D	0.00	4.69	0.0012	6.02	2.30	16548
N2B	25Y3D	0.00	2.97	0.0010	8.26	8.35	2341
N2C	25Y3D	0.00	3.09	0.0026	113.21	50.00	6068

Node Name	Sim Name	Warning Stage [ft]	Max Stage [ft]	Min/Max Delta Stage [ft]	Max Total Inflow [cfs]	Max Total Outflow [cfs]	Max Surface Area [ft2]
N3	25Y3D	2.50	3.28	0.0032	79.65	68.19	99312
N4	25Y3D	3.00	3.29	0.0030	40.57	32.55	31398
DT	3Y1D	0.00	4.91	0.0100	50.91	50.28	24610
LWL	3Y1D	0.00	2.70	0.0010	56.02	0.10	0
N1	3Y1D	2.20	2.72	0.0109	17.80	10.94	26496
N2	3Y1D	2.10	2.70	0.0135	39.54	49.64	76018
N2A	3Y1D	0.00	4.30	0.0011	3.63	2.23	7453
N2B	3Y1D	0.00	2.72	0.0010	3.50	7.59	2368
N2C	3Y1D	0.00	2.51	0.0026	113.21	50.00	6069
N3	3Y1D	2.50	2.72	0.0032	50.61	68.19	57612
N4	3Y1D	3.00	2.74	0.0030	23.66	22.72	9874

Link Min/Max Conditions [Existing]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF12	10Y1D	12.49	-3.16	-0.14	1.03	1.03	1.03
OF1LWL	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	10Y1D	13.98	-6.20	-0.13	1.43	1.43	1.43
OF43	10Y1D	12.73	-11.66	-0.18	-1.20	-1.20	-1.20
P1	10Y1D	10.55	-0.03	-0.02	3.36	4.43	3.36
P2	10Y1D	12.15	-0.04	0.20	2.48	2.48	2.48
P2A	10Y1D	2.37	0.00	-0.01	3.02	4.33	3.67
P2B	10Y1D	14.60	-0.08	-0.29	2.97	5.46	4.13
P3	10Y1D	12.80	-0.05	-0.01	2.61	2.61	2.61
P4	10Y1D	18.77	-0.03	-0.07	3.82	5.31	3.82
OF12	25Y3D	12.33	-3.20	-0.13	1.02	1.02	1.02
OF1LWL	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	25Y3D	14.90	-6.75	-0.11	1.38	1.38	1.38
OF43	25Y3D	14.99	-11.78	-0.17	1.28	1.28	1.28
P1	25Y3D	10.75	-0.03	-0.33	3.42	4.43	3.42
P2	25Y3D	12.39	-0.04	-0.45	2.52	2.52	2.52
P2A	25Y3D	2.40	0.00	-0.01	3.05	4.35	3.70
P2B	25Y3D	14.87	-0.17	0.52	3.03	5.46	4.13
P3	25Y3D	13.05	-0.05	0.04	2.66	2.66	2.66
P4	25Y3D	19.14	-0.03	0.52	3.90	5.31	3.90
OF12	3Y1D	3.62	-2.41	-0.28	0.76	0.76	0.76
OF1LWL	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	3Y1D	3.36	-1.70	-0.13	1.14	1.14	1.14
OF43	3Y1D	7.19	-9.43	-0.06	-1.19	-1.19	-1.19
P1	3Y1D	9.35	-0.03	-0.02	2.98	4.43	3.06
P2	3Y1D	11.09	-0.04	-0.33	2.26	2.26	2.26
P2A	3Y1D	2.16	0.00	-0.01	2.75	4.18	3.46
P2B	3Y1D	13.80	-0.08	-0.25	2.81	5.46	4.13

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P3	3Y1D	12.09	-0.05	-0.01	2.56	2.46	2.51
P4	3Y1D	16.69	-0.03	-0.28	3.40	5.31	3.81

Link Min/Max Conditions [ExistingSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF12	10Y1D	3.36	-3.81	-0.07	-0.58	-0.58	-0.58
OF1LWL	10Y1D	2.95	0.00	0.02	1.15	1.15	1.15
OF32	10Y1D	12.21	-4.78	-0.09	-1.08	-1.08	-1.08
OF43	10Y1D	15.95	-7.58	-0.16	-1.16	-1.16	-1.16
P1	10Y1D	7.33	-0.02	0.28	2.33	2.33	2.33
P2	10Y1D	8.70	-0.21	-0.24	1.77	1.77	1.77
P2A	10Y1D	2.17	0.00	0.00	2.76	2.76	2.76
P2B	10Y1D	10.45	-0.32	-0.10	2.13	2.13	2.13
P3	10Y1D	8.90	-0.27	-0.08	1.81	1.81	1.81
P4	10Y1D	13.04	-0.01	-0.57	2.66	2.66	2.66
OF12	25Y3D	4.19	-5.32	-0.09	-0.59	-0.59	-0.59
OF1LWL	25Y3D	4.92	0.00	0.03	1.31	1.31	1.31
OF32	25Y3D	10.93	-4.90	-0.08	-1.09	-1.09	-1.09
OF43	25Y3D	16.19	-7.72	-0.21	-1.17	-1.17	-1.17
P1	25Y3D	7.53	-1.22	-0.31	2.40	2.40	2.40
P2	25Y3D	8.93	-2.12	-0.42	1.82	1.82	1.82
P2A	25Y3D	2.18	0.00	0.07	2.77	2.77	2.77
P2B	25Y3D	10.70	-2.17	0.26	2.18	2.18	2.18
P3	25Y3D	9.14	-1.03	0.16	1.86	1.86	1.86
P4	25Y3D	13.40	-1.36	-0.58	2.73	2.73	2.73
OF12	3Y1D	2.44	-1.48	-0.03	0.58	0.58	0.58
OF1LWL	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	3Y1D	9.95	-3.68	-0.07	1.12	1.12	1.12
OF43	3Y1D	10.39	-6.43	-0.15	-1.11	-1.11	-1.11
P1	3Y1D	5.96	-0.02	-0.33	1.90	1.90	1.90
P2	3Y1D	7.18	-0.56	0.29	1.46	1.46	1.46
P2A	3Y1D	2.05	0.00	0.00	2.61	2.61	2.61
P2B	3Y1D	8.59	-0.45	-0.10	1.75	1.75	1.75
P3	3Y1D	7.23	-0.27	-0.08	1.47	1.47	1.47
P4	3Y1D	10.58	-0.01	-0.57	2.16	2.16	2.16

Link Min/Max Conditions [PumpDet]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
Bleeder	10Y1D	0.40	0.00	0.01	0.00	0.00	0.00
OF12	10Y1D	10.51	0.00	0.06	0.96	0.96	0.96
OF1LWL	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	10Y1D	9.29	-3.45	-0.10	1.36	1.36	1.36
OF43	10Y1D	26.30	0.00	-0.09	1.43	1.43	1.43
Outfall	10Y1D	30.61	0.00	-0.04	3.11	3.11	3.11
P1	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P12	10Y1D	19.74	-1.75	2.76	2.05	2.05	2.05
P2	10Y1D	11.83	0.00	-0.27	2.41	2.41	2.41
P2A	10Y1D	2.37	0.00	-0.01	3.02	4.33	3.67
P2B	10Y1D	14.27	-0.05	0.05	2.91	5.46	4.13
P2C	10Y1D	49.64	-3.43	-1.35	3.95	3.95	3.95
P3	10Y1D	12.48	0.00	-0.12	2.54	2.54	2.54
P32	10Y1D	63.57	-6.20	-1.41	5.06	5.06	5.06
P4	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P43	10Y1D	15.59	0.00	1.18	2.21	2.21	2.21
Pump	10Y1D	30.00	0.00	-15.00	0.00	0.00	0.00
Bleeder	25Y3D	0.40	0.00	0.01	0.00	0.00	0.00
OF12	25Y3D	10.95	0.00	0.06	0.97	0.97	0.97
OF1LWL	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	25Y3D	12.50	-4.44	-0.09	1.33	1.33	1.33
OF43	25Y3D	28.13	0.00	-0.07	1.46	1.46	1.46
Outfall	25Y3D	30.91	0.00	-0.04	3.12	3.12	3.12
P1	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
P12	25Y3D	19.74	-1.75	2.76	2.05	2.05	2.05
P2	25Y3D	12.22	0.00	0.22	2.49	2.49	2.49
P2A	25Y3D	2.40	0.00	-0.01	3.05	4.35	3.70
P2B	25Y3D	14.68	-0.17	0.11	2.99	5.46	4.13
P2C	25Y3D	49.64	-3.43	1.33	3.95	3.95	3.95
P3	25Y3D	12.87	0.00	-0.12	2.62	2.62	2.62
P32	25Y3D	63.57	-6.20	-1.39	5.06	5.06	5.06
P4	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
P43	25Y3D	17.73	-0.10	-1.35	2.51	2.51	2.51
Pump	25Y3D	30.00	0.00	-15.00	0.00	0.00	0.00
Bleeder	3Y1D	0.39	0.00	0.01	0.00	0.00	0.00
OF12	3Y1D	1.81	0.00	0.02	0.66	0.66	0.66
OF1LWL	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	3Y1D	0.76	-0.23	-0.03	0.81	0.81	0.81
OF43	3Y1D	13.96	0.00	-0.06	1.27	1.27	1.27
Outfall	3Y1D	30.05	0.00	-0.03	3.09	3.09	3.09
P1	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P12	3Y1D	19.74	-1.75	2.76	2.05	2.05	2.05
P2	3Y1D	10.23	0.00	-0.22	2.08	2.08	2.08
P2A	3Y1D	2.16	0.00	-0.01	2.75	4.18	3.46
P2B	3Y1D	13.80	-0.05	-0.08	2.81	5.46	4.13
P2C	3Y1D	49.64	-3.43	-1.39	3.95	3.95	3.95
P3	3Y1D	11.95	0.00	-0.13	2.53	2.43	2.48

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
P32	3Y1D	63.57	-6.20	0.88	5.06	5.06	5.06
P4	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P43	3Y1D	15.04	0.00	-1.12	2.13	2.13	2.13
Pump	3Y1D	30.00	0.00	-15.00	0.00	0.00	0.00

Link Min/Max Conditions [PumpDetSLR]

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
Bleeder	10Y1D	0.38	0.00	0.01	0.00	0.00	0.00
OF12	10Y1D	10.76	0.00	0.06	0.96	0.96	0.96
OF1LWL	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	10Y1D	8.73	-4.56	-0.13	1.35	1.35	1.35
OF43	10Y1D	26.49	0.00	-0.11	1.41	1.41	1.41
Outfall	10Y1D	50.43	0.00	-0.04	3.67	3.67	3.67
P1	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P12	10Y1D	11.16	-0.78	2.57	1.16	1.16	1.16
P2	10Y1D	5.45	0.00	-0.17	1.11	1.11	1.11
P2A	10Y1D	2.30	0.00	0.00	2.93	2.93	2.93
P2B	10Y1D	7.85	-0.10	-0.12	1.60	1.60	1.60
P2C	10Y1D	49.64	-3.79	1.41	3.95	3.95	3.95
P3	10Y1D	6.27	0.00	-0.29	1.28	1.28	1.28
P32	10Y1D	63.57	-0.10	-1.17	5.06	5.06	5.06
P4	10Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P43	10Y1D	14.00	0.00	-1.07	1.98	1.98	1.98
Pump	10Y1D	50.00	0.00	-25.00	0.00	0.00	0.00
Bleeder	25Y3D	0.38	0.00	0.01	0.00	0.00	0.00
OF12	25Y3D	11.03	0.00	0.06	0.97	0.97	0.97
OF1LWL	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	25Y3D	11.04	-5.27	-0.11	1.31	1.31	1.31
OF43	25Y3D	28.50	0.00	-0.11	1.44	1.44	1.44
Outfall	25Y3D	50.44	0.00	-0.04	3.67	3.67	3.67
P1	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
P12	25Y3D	11.95	-0.78	2.57	1.24	1.24	1.24
P2	25Y3D	5.96	0.00	0.19	1.21	1.21	1.21
P2A	25Y3D	2.30	0.00	0.00	2.93	2.93	2.93
P2B	25Y3D	8.35	-0.11	-0.12	1.70	1.70	1.70
P2C	25Y3D	49.64	-3.79	1.51	3.95	3.95	3.95
P3	25Y3D	6.75	0.00	-0.29	1.38	1.38	1.38
P32	25Y3D	63.57	-0.09	1.38	5.06	5.06	5.06
P4	25Y3D	0.00	0.00	0.00	0.00	0.00	0.00
P43	25Y3D	15.51	-0.02	-0.99	2.19	2.19	2.19
Pump	25Y3D	50.00	0.00	-25.00	0.00	0.00	0.00
Bleeder	3Y1D	0.37	0.00	0.01	0.00	0.00	0.00

Link Name	Sim Name	Max Flow [cfs]	Min Flow [cfs]	Min/Max Delta Flow [cfs]	Max Us Velocity [fps]	Max Ds Velocity [fps]	Max Avg Velocity [fps]
OF12	3Y1D	2.92	0.00	0.03	0.71	0.71	0.71
OF1LWL	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00
OF32	3Y1D	1.10	-0.59	-0.07	0.88	0.88	0.88
OF43	3Y1D	14.93	0.00	-0.06	1.28	1.28	1.28
Outfall	3Y1D	49.92	0.00	-0.04	3.66	3.66	3.66
P1	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P12	3Y1D	10.94	-0.78	2.57	1.14	1.14	1.14
P2	3Y1D	1.30	0.00	0.14	0.26	0.26	0.26
P2A	3Y1D	2.23	0.00	0.00	2.85	2.85	2.85
P2B	3Y1D	7.59	-0.10	-0.12	1.55	1.55	1.55
P2C	3Y1D	49.64	-3.79	1.55	3.95	3.95	3.95
P3	3Y1D	4.62	0.00	-0.29	0.98	0.94	0.96
P32	3Y1D	63.57	0.00	-1.44	5.06	5.06	5.06
P4	3Y1D	0.00	0.00	0.00	0.00	0.00	0.00
P43	3Y1D	13.22	-0.01	0.84	1.87	1.87	1.87
Pump	3Y1D	50.00	0.00	-25.00	0.00	0.00	0.00

TOWN OF LAKE PARK, FLORIDA

1923

BAXTER & WOODMAN

Consulting Engineers