Summary Memorandum

Snow Hill Road / Jacobs Trail Outfall Improvement Project

Prepared for

SEMINOLE COUNTY
FLORIDA'S NATURAL CHOICE

Board of County Commissioners
Seminole County, Florida

Prepared by

SAI
SINGHOFEN & ASSOCIATES INCORPORATED

Singhofen & Associates, Inc.
Stormwater Management and Civil Engineering

September 2008

SINGHOFEN & ASSOCIATES INCORPORATED

CERTIFICATION BY A

REGISTERED PROFESSIONAL ENGINEER

PROJECT NAME: Snow Hill Road / Jacobs Trail Outfall Improvement Project (CIP# 191654)

I HEREBY CERTIFY THAT THE MATERIAL AND DATA CONTAINED IN THIS DOCUMENT WAS PREPARED UNDER THE SUPERVISION AND DIRECTION OF THE UNDERSIGNED, WHOSE SEAL AS A REGISTERED PROFESSIONAL ENGINEER IN THE STATE OF FLORIDA IS AFFIXED BELOW.

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DATE: September 9, 2008

FLORIDA REGISTRATION NUMBER: 55512

CORPORATE CERTIFICATION NUMBER: 5112

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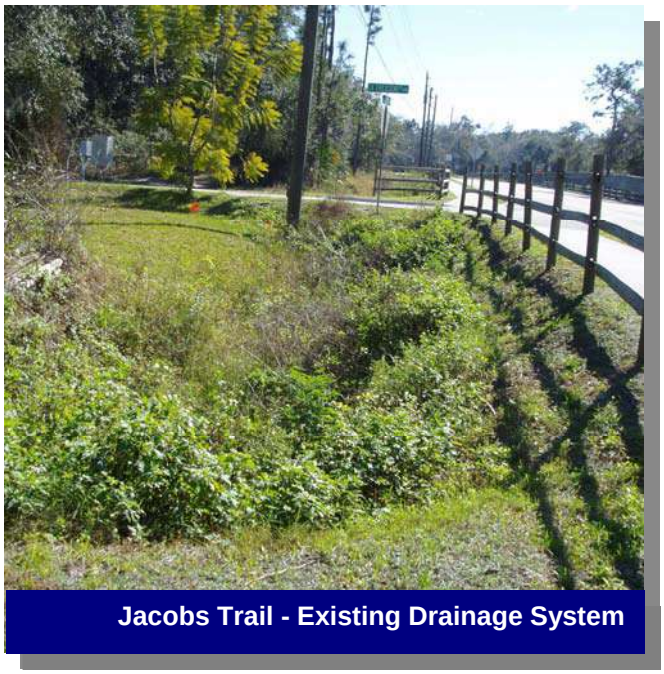
1.1 Project Background

On March 13, 2006, Seminole County (County) contracted with Singhofen & Associates, Inc. (SAI) to prepare an Engineering Evaluation and Drainage Inventory for the Big Econlockhatchee River (Big Econ) Basin (Contract No. PS-0219-05/DRR). The County has since identified maintenance concerns associated with a drainage ditch in the area of Snow Hill Road and Jacobs Trail within the Big Econ Basin and, subsequently, contracted with SAI to prepare construction documents for the implementation of stormwater conveyance improvements in that area.



Jacobs Trail - Existing Drainage System

The Snow Hill Road/Jacobs Trail outfall ditch is located in Sections 20 & 21, Township 21 South, Range 32 East of eastern Seminole County, Florida. More specifically, the ditch and driveway culvert drainage system extends from the northeast intersection of Snow Hill Road and Jacobs Trail to the ditch's outfall at Lake Crescent (See **Figure 1)**.

The County also held a meeting on November 26, 2007 with owners of property adjacent to Lake Crescent. The residents raised concerns regarding adverse water quality and quantity problems in the lake. These concerns included sediment accumulation in the lake, flooding conditions at driveways along the ditch and Jacobs Trail and inundation of two wells on properties adjacent to the lake. The goals and objectives identified at that meeting are also addressed in this report.

The Snow Hill Road/Jacobs Trail Outfall Improvement Project includes the following scope of services:

- Review plans, reports, studies and other data to identify historical drainage patterns;
- Submit a citizen questionnaire and evaluate the residents' responses;
- Review and evaluate available Crescent Lake water quality data;
- Evaluate and model the existing drainage conditions;
- Develop conceptual solutions to address maintenance and water quality issues;
- Conduct a hydrologic/hydraulic analysis for several design alternatives.

1.2 Report Organization

This technical memorandum is organized as follows:

- Section 1 (*Project Background*) provides general background information on the project.

- Section 2 (*Field Reconnaissance and Investigation*) summarizes the results of all site visits, citizen questionnaire responses, data collection efforts, surveying efforts, a geotechnical investigation, an environmental assessment and collected water quality data.
- Section 3 *(Method of Analysis/Existing Condition Evaluation)* presents a summary of the methodology used for the water quantity assessment including the development of the hydrologic and hydraulic models and presents a discussion on the existing conditions stormwater model results.
- Section 4 *(Design Development and Evaluation)* summarizes the development and evaluation of three alternative erosion protection/flood control projects including cost estimates, hydraulic performance, and final design recommendations.

The Appendices to this report include the following:

- Appendix A *(Geotechnical and Environmental Information)* includes a copy of the reports entitled *Report of Geotechnical Engineering Investigation, Jacobs Trail Culvert Replacement, Seminole County, Florida* (GEC, September 5, 2007), *Report of Geotechnical Engineering Investigation, Jacobs Trail Pond, Seminole County, Florida* (GEC, April 4, 2008), *Preliminary Wetland and Endangered Species Assessment for Jacob's Trail Outfall, Seminole County, Florida* (Yvonne I. Froscher, October 16, 2007), and *Summary of Seasonal High Water Elevation Data* (Yvonne I. Froscher, July 23, 2008).
- Appendix B *(Crescent Lake Data, Citizen Questionnaire Responses, and SAI volumetric analysis)* includes a January 22, 2006 letter from Crescent Lake resident Tim Grenz, meeting minutes from a November 26, 2007 meeting with Commissioner Bob Dallari, citizen questionnaire responses, and SAI Lake Crescent Volumetric Analysis.
- Appendix C *(ICPR Model Input Data)* includes Sub-Basin Area, CN, DCIA and T_c data and calculations.
- Appendix D *(SJRWMD Correspondence) includes email from St. Johns River Water Management District engineer, Leonardo Valencia, E.I., M.E. dated July 17, 2008*

This report also includes a CD containing survey data and all ICPR input and output databases for the historic, existing and design condition models. The ICPR project names are as follows:

- *JTO-Hist.icp* - *Historic conditions model (routing simulations used in the volumetric analysis)*
- *JTO-2008EX.icp* - *Existing conditions model.*
- *JTO-Alt1.icp* - *Design Alternative 1 model.*
- *JTO-Alt3.icp* - *Design Alternative 3 model.*
- *JTO-Alt4.icp* - *Design Alternative 4A model.*
- *JTO-Alt4B.icp* - *Design Alternative 4B model.*

SAI	**SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVMENT PROJECT**	**VICINITY MAP**	**FIGURE** 1
			Project No.

O:\SC Jacobs Trail\DGN\JTO-Vicinity Map.dgn
1/31/2007

As part of the first phase of the project, SAI conducted field visits and contracted with sub-consultants to provide construction level survey of the subject area, a geotechnical investigation to support design activities, and an environmental assessment to determine potential wetland impacts and assist in project permitting. The contracted sub-consultants are as follows:

Construction Level Survey: Southeastern Surveying & Mapping Corporation
Geotechnical Investigation: Geotechnical and Environmental Consultants, Inc.
Environmental Assessment: Yvonne I. Froscher

2.1 Construction Level Survey

In September 2007, Southeastern Surveying & Mapping Corporation (Southeastern) completed a construction level survey of the Snow Hill Road/Jacobs Trail outfall system. At the direction of SAI, Southeastern provided detailed topography of the area, utility locations, structure dimensions and elevations, structure photographs, and the extent of wetlands flagged by the project environmental consultant. In addition to the construction level survey provided along Jacobs Trail, supplemental culvert and cross section survey data was provided at selected locations throughout the study area. All surveyed information was provided in Vertical Datum NAVD88. This information was used in development of the stormwater model. Two (2) copies of the original signed/sealed Survey and an electronic copy were sent to the County on October 26, 2007.

A second submittal from Southeastern was completed in June 2008 and includes topographic data along the northeastern ridge between Crescent Lake and a historical wetland outfall, finished floor elevations, and seasonal high water mark elevations. Two (2) copies of the original signed/sealed Survey and an electronic copy are enclosed with this summary report.

2.2 Geotechnical Investigation

In September 2007 and April 2008, Geotechnical and Environmental Consultants, Inc. (GEC) conducted geotechnical investigations in the areas of the proposed drainage improvements. The investigations included a review of soil survey literature, eight machine auger and hand auger borings, manual muck probes, identification of depth to groundwater, and field and laboratory testing of soils for visual classification, moisture content, grain size distribution, corrosivity, and permeability.

Based on the results of the investigation, the soil strata in the area of investigation is primarily comprised of fine sands with silt from ground surface to the depth explored. Based on the classifications defined in the FDOT Structures Design Guidelines, the corrosivity tests indicate that the soils are considered “slightly aggressive” to “moderately aggressive”. The groundwater level observed were at a depths of 4.5 to 9 feet below ground surface in the machine auger boring locations and 0.9 to 2.1 feet below ground surface in the hand auger boring locations. The seasonal high water table is estimated to range from ground surface to 5.5 feet below ground surface.

GEC reports that, with the exception of any organic soils encountered, the existing soils should be suitable or adaptable for pipe bedding material and excavation backfill. GEC also recommended that dewatering systems should be used to maintain groundwater surfaces at least 2 feet below compaction surfaces including the bottom of excavations. A soil permeability rate of 32 feet/day was calculated at the County’s trailhead property; GEC recommended using a rate of 30 feet/day for stormwater pond design. For additional and more specific geotechnical information, refer to the *Report of Geotechnical*

Investigation, Jacobs Trail Culvert Replacement, Seminole County, Florida (**Appendix A.1**) and the *Report of Geotechnical Investigation, Jacobs Trail Pond, Seminole County, Florida* (**Appendix A.2**).

2.3 Environmental Assessment

In July, September, and October 2007, Yvonne I. Froscher conducted a preliminary wetland assessment in the areas of the proposed drainage improvements. The assessment involved descriptions and delineation of wetlands, habitat review for potential occurrence of protected species, and characterization of soils and vegetative cover in the proposed work area as well as site specific comments regarding permitting regulations and requirements. Based on Ms. Froscher's assessment, all wetlands, open waters, and uplands (50 feet landward of the wetland edge) that are contiguous with the Econlockhatchee River are within the Econlochatchee Riparian Habitat Protection Zone (RHPZ). However, Ms. Froscher also indicated that the upland cut drainage ditches and the RHPZ are of marginal quality. Furthermore, no protected species were observed. Details of the environmental assessment are presented in the report entitled *Preliminary Wetland and Habitat Assessment for Jacob's Trail Outfall, Seminole County, Florida* (**Appendix A.3**).

Ms. Froscher also provided detailed information on Crescent Lake and several surrounding wetlands including seasonal high water elevations, hydrology characterization and vegetative cover information. This information was summarized in the letter report entitled *Summary of Seasonal High Water Elevation Data* (**Appendix A.4**).

2.4 Site Reconnaissance Observations

The Snow Hill Road/Jacobs Trail outfall ditch, located along the east side of Jacobs Trail, collects runoff from a portion of Snow Hill Road, the Walker Elementary School property, and areas south of Snow Hill Road before continuing north to the Jacobs Trail culvert/ditch system. This system discharges into Crescent Lake approximately 900 feet north of Snow Hill Road. Land surface elevations vary from approximately 63 feet at the southern boundary to 47 feet at Crescent Lake (Vertical Datum NAVD88).

The outfall consists of a manmade upland cut roadway ditch (approximately 4' bottom width) that includes a single 36" reinforced concrete pipe (RCP) crossing at Snow Hill Road, three 18" driveway culvert crossings, and two concrete check dams. The current configuration of the ditch and sidewalk along Jacobs Trail north of Snow Hill Road limits access of equipment for maintenance activities. Consequently, sediment, vegetation, and trash were observed in the ditch which restrict the designed conveyance of the system. In addition, the 18" driveway crossings appear to be undersized based on the capacity of the ditch cross section and upstream Snow Hill Road culvert.

Outfall to Crescent Lake

Concrete Check Dam

Two concrete weir structures were located in the ditch. It should be noted that a total of three check dam structures were identified in construction plans for the Osprey Lakes development which appear to have been designed for stormwater treatment purposes. Detailed information on the two observed dam structures is provided in the survey documents and is included in the existing conditions model. The third check dam is believed to have been removed in 2005 during construction of three properties along Jacobs Trail to accommodate new septic fields.

Jacobs Trail Runoff

Jacobs Trail is a curb and gutter roadway with two sets of curb inlets that discharge to the roadside ditch. Lake Crescent Drive and several residential driveways also direct runoff directly into the ditch (see photo). Runoff from the northern portion of Jacobs Trail is directed to the Osprey Lakes stormwater system to the north.

2.5 Data Collection

In addition to the site reconnaissance effort, the data collection task required in the Scope of Work included document collection and review. The documents that were gathered include construction plans for existing developments in the study area including the following subdivisions:

Project Name	ERP #	Date on Plans	As-Built Plans?	Datum
Osprey Lakes	65713	Dec. 2001	Yes	NGVD 29
The Trails: Phase 1, 2a, 2b, & 3	65735	2003-2004	Yes	NGVD 29
Walker Elementary School	87227	Aug. 2002	No	NGVD 29
Cornerstone Church	100850	Feb. 2006	No	unknown
Chuluota Bypass	22524	1997	No	unknown
Chuluota – Phase 1 Roadway & Drainage Improvements	109263-1	Jan. 2007	No	unknown
Chuluota – Phase 1B Roadway & Drainage Improvements	109263-2	May 2007	No	n/a

Other data gathered during this task include the Seminole County Chuluota Small Area Study (October 1998), digital copies of construction plans and sub-basin maps for The Trails (Evans Engineering; Vertical Datum NGVD29), digital copies of construction plans and sub-basin maps for Walker Elementary School (provided by the Seminole County School Board; Vertical Datum NGVD29), Seminole County Watershed Atlas (Crescent Lake), and GIS Layers including SJRWMD 2004 Land Use, DEP Soils, Labins 2004 Color Aerials, Seminole County Parcels and SJRWMD One-Foot Contour Elevation Data (Vertical Datum NGVD29).

2.6 Crescent Lake Data Review & Public Concerns

As mentioned previously, the residents of Crescent Lake have expressed concern regarding changes in water quantity and quality entering Crescent Lake. These changes reportedly occurred after the Snow Hill Road and Jacobs Trail paving projects. These issues are described in a January 22, 2006 letter from

Mr. Tim Grenz to the County (**Appendix B.1**) and were discussed further in a meeting of the Crescent Lake Homeowners Association (HOA), Seminole County Stormwater Division Engineers and County Commissioner Bob Dallari on November 26, 2007 (Meeting Minutes included in **Appendix B.2**).

SAI distributed 95 citizen questionnaires to the Crescent Lake, Lake Lenelle, and 1st Street residents in an effort to collect historical information and document flooding and/or water quality issues directly related to the ditch and/or Crescent Lake. The questionnaire included a 2008 drainage map and an historical conditions map (developed from SJRWMD 1' Contour Data (NGVD29) and 1986 aerial photogrammetry obtained from the County). A total of 17 responses, phone calls, or emails were received and are provided in **Appendix B.3**.

Key issues identified by the residents in the correspondence described above have been reviewed by SAI engineers and are summarized below:

2.6.1 Water Quantity Issues:

- Quantity of water entering Crescent Lake. *There were comments made by residents that indicate the Jacobs Trail ditch was historically directed north and bypassed Crescent Lake.*

  SAI Findings/Response - *The Osprey Lakes construction plans show pre-development cross sections of this ditch with an outfall at Crescent Lake. No information has been found or presented by the residents that would indicate a historical bypass existed. A volumetric analysis was completed by SAI (**Appendix B.4**) in an effort to evaluate the historic runoff volume and the current runoff volume that flows to Crescent Lake. As shown on the historical drainage map, the Crescent Lake contributing area covered 67 acres of agricultural or open space area and the 1st Street residential area. Several developments in the vicinity of the lake have resulted in modifications to the basin limits over the years which now is approximately 75 acres in size (net increase of 8 acres). Stormwater runoff from these developed areas is, however, treated by stormwater management systems including Walker Elementary School and 1st Street. In addition, newly paved portions of Jacobs Trail and Snow Hill Road contribute runoff to the Lake after treatment is provided by the existing swale and two concrete check dams.*

  Based on SAI's volumetric analysis, the 25-year/24-hour runoff volume from the historic Crescent Lake basin was 36.0 acre-feet. Under the current conditions, runoff volume is now 42.0 acre-feet from the current basin. However, it is important to note that the Walker Elementary School Environmental Resource Permit application (Kilma Weeks Civil Engineering, Inc., 2003) indicates that the school property retains stormwater runoff from the 25-year/24-hour storm event. Based on Walker Elementary School construction plans, the site provides 7.5 acre-ft retention volume for a net contributing volume to Crescent Lake of 34.5 acre-feet. Therefore, there is a designed net volume reduction of 1.5 ac-ft draining to Crescent Lake during the 25-year/24-hour storm event. The actual volume contributing to Crescent Lake will, however, be impacted by seepage through the northwest pond berm into the adjacent Jacobs Trail ditch. Based on calculations provided in the Walker Elementary School Environmental Resource Permit application, the pond berm will infiltrate approximately 2.4 acre-feet over fourteen days following a 25-year/24-hour storm event. Ignoring evapotranspiration and leakance, this added volume would lead to a flood level increase of 4 inches in Crescent Lake following a 25-year/24-hour storm event.

- Crescent Lake Outfall. *According to comments made by several residents, there is some belief that existing drainage connections exist between the Jacobs Trail/Crescent Lake system and a*

retention pond to the west within the Lake Lenelle subdivision and/or to Osprey Lakes to the north by way of an inlet on the northwest side of the lake.

SAI Findings/Response -*According to field visits, surveys and construction plans reviewed by SAI, there is no such connection to the Lake Lenelle drainage system. Additionally, the inlet mentioned is too high in elevation to effectively drain Lake Crescent and appears to have been designed to collect runoff from a portion of Jacobs Trail only. Furthermore, neither the Lake Lenelle subdivision pond nor the Osprey Lakes drainage system appear to have been designed with excess storage capacity to accommodate Crescent Lake overflows.*

It is also worth noting that, according to the 1986 topographic information mentioned above, it is likely that Crescent Lake historically overtopped a low topographic ridge into a wetland located to the north. This historic connection appears to have been lost due to fill that was placed during development of the Crescent Lake subdivision around the lake. Surveys of the open space between homes in this area indicate the overflow point has been raised approximately 3.5 feet. Under these current conditions, the ICPR model results indicate that the lake will not overtop during storms as great as the 100-year, 24-hour event. ICPR model results and the need for a constructed lake outfall is discussed further in ***Section 3*** *of this summary report.*

- Flooding at 301 Jacobs Trail. *A questionnaire response was received from property owner Patricia A. Hall indicating that front porch flooding occurs during all rainfall events. A letter from Mr. Tim Grentz to the County indicates there is a second property that experiences similar flooding as well.*

  SAI Findings/Response - *Both of these instances of flooding appear to be the result of direct sheetflow from Jacobs Trail onto the properties which are lower in elevation than the roadway. A valley gutter, drop inlet and/or trench drain will be evaluated during final design to collect this runoff and alleviate the flooding.*

- Flooded residential wells at 168 Lake Crescent Drive and 104 Lake Crescent Drive.

  SAI Findings/Response - *Survey data shows that these wells are located at elevation 50.93 and 49.89, respectively. The environmental consultant determined that the seasonal high water level (SHWL) in the lake is 48.68 ft (NAVD88) and Osprey Lakes Record drawings identify a lichen line elevation of 49.79 ft NGVD29 (48.79 NAVD). Both wells are above the SHWL as well as the predicted lake level for the mean annual storm (see* ***Section 3****). The wells are, however, predicted to flood during the 25-yr, 24-hour and 10-yr, 24-hour storm events, respectively. Both locations are reported to have experienced flooding during the 2004 hurricane season as well as the recent T.S. Fay (August 2008).*

- Lake depth fluctuations (LakeWatch Data). *Connie Perry, a resident of the Lake Crescent development, provided SAI with a graph of lake level depth information measured from 2002 to 2008 (See* ***Figure 2.1*** *below). The information includes notations which identify an occurrence of pumping water from Walker Elementary into the Jacobs Trail ditch (August 16, 2003). In addition, notations identified increases in lake stage that occurred during the hurricanes of 2004 that "stayed elevated for ~9 months due to the stormwater drainage and pumping into our lake in 2004". The pumping operations described in 2004 were from localized 1st Street flooding problems.*

SAI Findings/Response - *While the time and duration of the reported pumping from the school property has not been verified, it is noted that 2003 was a relatively dry year in the Big Econ basin (See **Figure 2.2**). There was, however, a significant amount of rainfall that occurred over the week or two preceding the August 16 lake depth measurement described above. This includes several storms of 1" rainfall or more. If these rainfall events occurred during or prior to completion of the construction of the school site, then the need for pumping to dewater and/or maintain conditions for construction is understandable. Another outfall location (i.e., a system with a positive outfall) would, however, have been more suitable. In any case, the primary cause for increases in stages during 2004, as identified by Mrs. Perry, occurred as a result of the significant hurricanes experienced by all of central Florida that year. Rainfall during that year returned to near normal levels, as compared to 2003, and increased to above normal levels in 2005. Lake depth fluctuations would be expected to closely follow rainfall patterns, including cumulative affects, as shown in **Figures 2.1 and 2.2** below. For example, the high water levels during 2005 correspond to the above normal rainfall levels depicted during that year. The data range provided is not suitable to determine if the measured high water levels have been impacted by recently developed areas (Osprey Lakes, Jacobs Trail, and Snow Hill Road were all developed before this data was collected). The volumetric analysis discussed above, however, indicates a net reduction in runoff volume to the lake should occur. In any case, a suitable solution to the concern over future high water levels in the lake would be the construction of a positive outfall structure that would restore the historical lake overflow conditions to the adjacent wetland as discussed above and in Section 3.*

*SAI understands the residents of Crescent Lake concerns regarding pumping operations into their land locked lake system. Fortunately, the pumping operations discussed above are believed to have been temporary dewatering activities and flood relief operations that have since been remedied. It should be noted that temporary dewatering activities are not approved or monitored by Seminole County, rather, they are permitted through the St. Johns River Water Management District and typically require that the contractor provide measures to prevent flooding and sediment transport. Additionally, the Crescent Lake contributing area has been fully developed and with the exception of the retrofit design project described in **Section 4**, no additional construction activities are anticipated. The Chuluota residential area flooding problems have been remedied and no future flood relief pumping operations should occur in the future.*

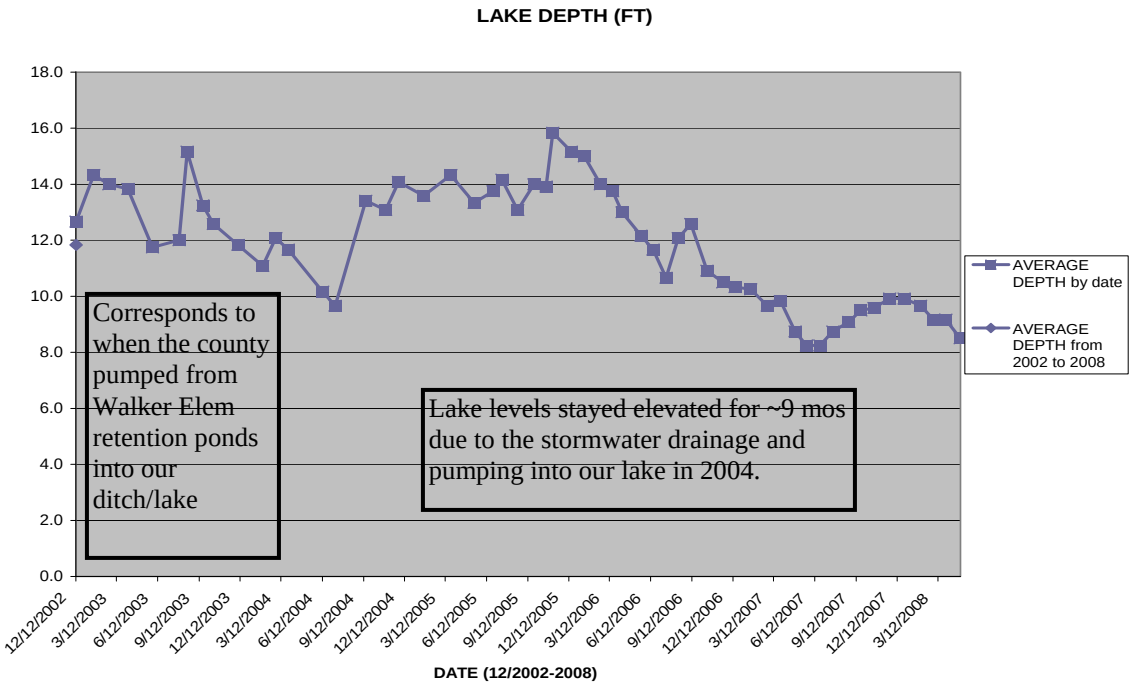


Figure 2.1. Crescent Lake Depth Information
(Source: Lake Crescent homeowner: Connie Perry)

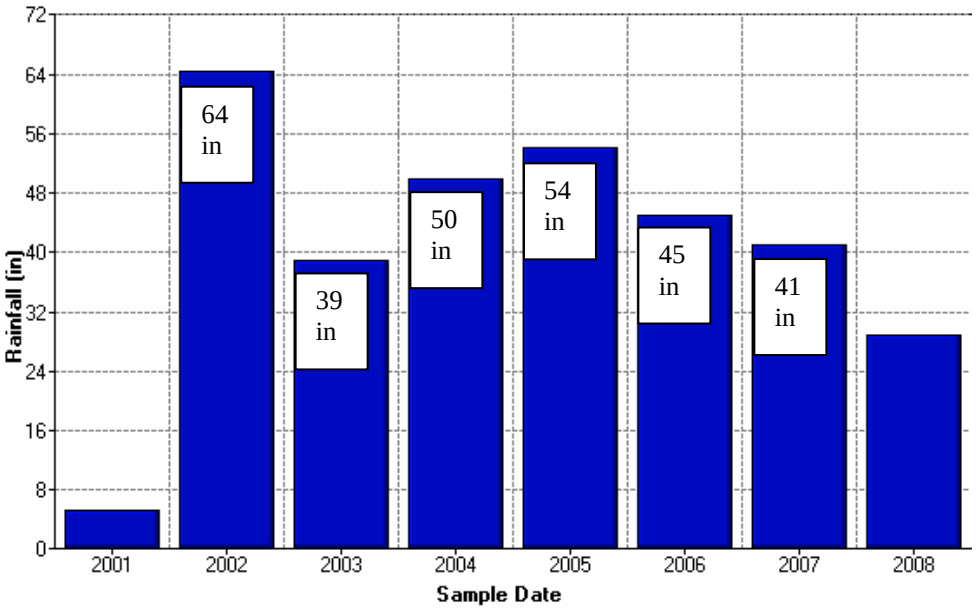


Figure 2.2. Big Econlockhatchee River Rainfall Information
(Source: Seminole County Water Atlas)

2.6.2 Water Quality Issues:

Accumulated sediments in Crescent Lake and removal of open ditch system and check dam near Jacobs Trail outfall and increased impervious area. *Residents' comments indicated that Crescent Lake has experienced a decrease in water clarity since December, 2002. Figures 2-3 and 2-4 below show water quality information for Secchi depth (clarity) vs lake depth and total chlorophyll vs Secchi depth as provided by Mrs. Perry. Several causes for the reduced clarity have been identified by the residents including pumping from Walker Elementary School during its construction in the fall of 2003, pumping from flooded streets in Chuluota resulting from several hurricanes in the summer and fall of 2004 as well as reduced treatment capacity along the Jacobs Trail ditch that resulted from construction of several homes and new driveway culverts in that area in 2004-2005.*

SAI Findings/Response - *Each graph shows that the Secchi depth in December, 2002 was, indeed, quite good (i.e., average 11.2 feet). It has decreased since that date, however, and ranged between 4.6 to 9.7 feet with an average value of 7.4 feet.*

Water clarity is affected by several factors including, among others, algae and suspended solids (i.e., sediments). There appear to have been several instances within the last 5-6 years where stormwater discharges to the lake have caused a reduction in water clarity. Considering the conditions and sources identified above, key among them the active construction site at Walker Elementary in 2003 and the 2004-2005 home construction, it is likely that water quality impacts during those times were a result of sediment discharges into the lake. This statement is further supported by emails obtained from the County Environmentalist, Gloria Eby, which indicate the homesites constructed in 2004-2005, which are located immediately adjacent to the lake, had no silt fence in some areas and failing silt fence in others during their construction. Sediment erosion into the lake was noted to be significant at that time. However, pumping from the school site and Chuluota has been discontinued and the home construction has since been completed. Furthermore, the school site and the Chuluota area now have operational treatment systems that function to reduce pollutants in runoff prior to its release into the Jacobs Trail ditch. In fact, the Walker Elementary School site includes several retention ponds that percolate all runoff from storm events up to the 25-year, 24-hour storm event. Therefore, significant impacts from these sources should not continue and recovery of the lake would be expected to have occurred by this time. Runoff from Snowhill Road eventually reaches the lake by way of grassed swales. These swales, however, also provide some level of treatment prior to discharge into the Jacobs Trail ditch.

Two sources of runoff discharge into the lake, however, which have limited or reduced treatment. The first is Jacobs Trail itself. Runoff from the road flows into the ditch which, as mentioned above, has reduced treatment capacity as a result of the new driveway culverts and removal of one of the check dams originally constructed with the paving of the roadway. The second is runoff from the residential development immediately surrounding the lake. Jacobs Trail can be expected to contribute suspended solids, greases and oils but would not be expected to contribute significant nutrient loads. The adjacent lawn areas, however, would be expected to contribute nutrients which tend to stimulate algal growth. Unfortunately, measurements of lake turbidity are not available to confirm sediments as a source of reduced clarity. Total chlorophyll is measured, however, and appears to correlate with reductions in clarity (See Figure 2-4). Periods of increased chlorophyll (i.e., increased algae concentrations) coincide with reductions in the Secchi depth and vise versa.

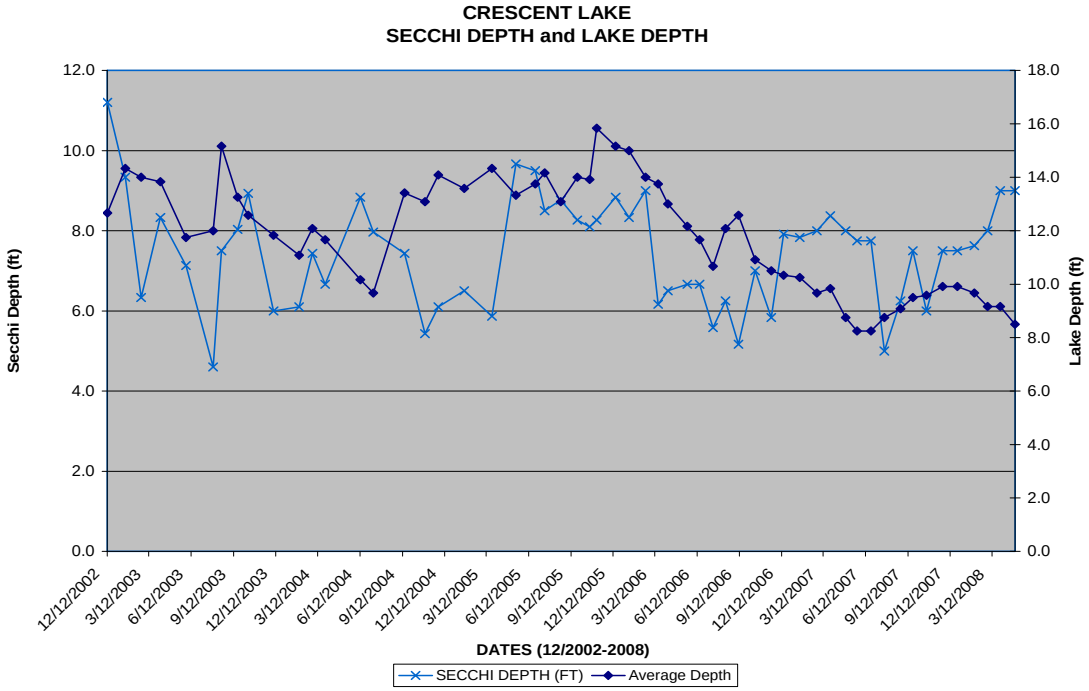


Figure 2-3. Crescent Lake Secchi Depth and Lake Depth
(Source: Lake Crescent homeowner: Connie Perry)

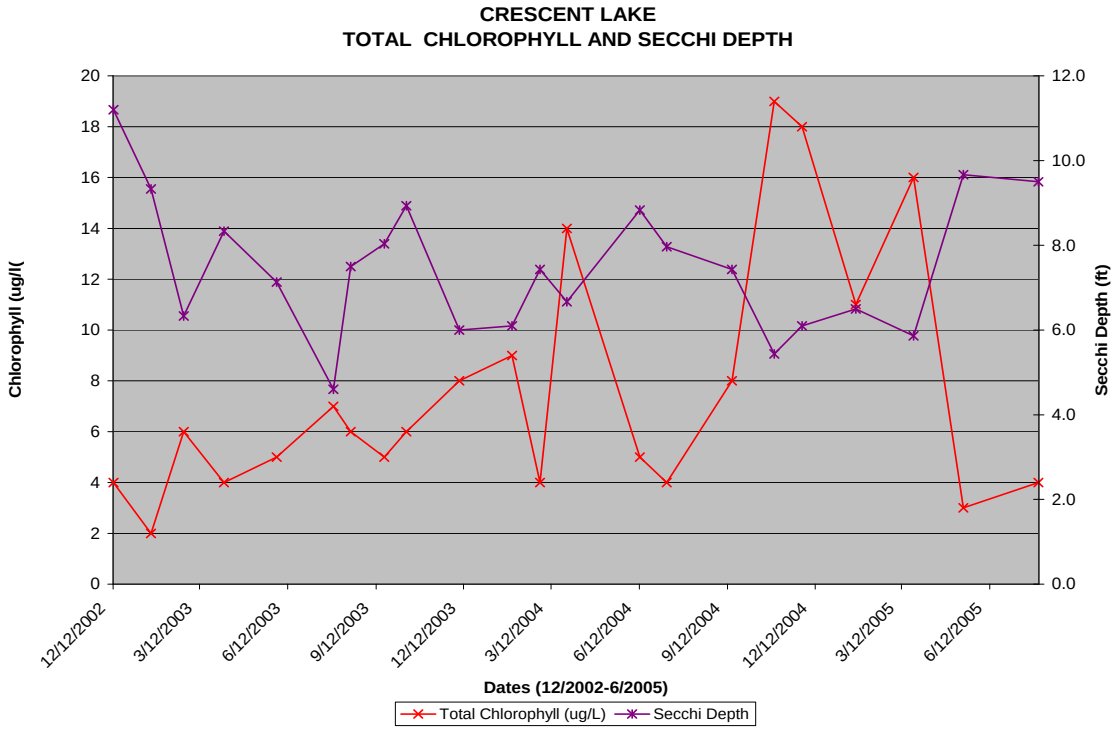


Figure 2-4. Crescent Lake Total Chlorophyll and Secchi Depth
(Source: Lake Crescent homeowner: Connie Perry)

SAI staff understands the residents' concerns and their desire to maintain a healthy lake system. The resident's of Crescent Lake have been working with the County's environmental specialists to preserve their lake and have implemented a Lake Management Plan. As suggested above, it is possible that residential lawns immediately surrounding Lake Crescent are a contributor to the water clarity problems reported by the residents. Ultimately, the success of Lake Management Plan and the health of Crescent Lake are directly related to the lawn care practices of the residents themselves. SAI has developed several design recommendations (presented in **Section 3**) that, along with the residents on-going efforts, will resolve some of the issues discussed above.

The project and designs described in this technical memorandum involved the application of several analytical procedures for water quantity assessment. A hydrologic and hydraulic (H&H) computer model was prepared for the Snow Hill Road/Jacobs Trail Outfall contributing area to accurately simulate the rainfall-runoff process. Rates and volumes of stormwater runoff were determined for five synthetic 24-hour storm events (mean annual, 10-Year, 25-Year, 50-Year, and 100-Year storms). The hydraulic response in lakes, wetlands, depressions, channels and at roadway crossings were calculated at key locations throughout the study area for each of the storms. The Interconnected Channel and Pond Routing Model (ICPR©, Version 3.02 Service Pack 8) was used for all hydrologic and hydraulic calculations. ICPR© uses a junction-reach (i.e., node-link) representation as a framework for watershed analysis. ICPR© calculates rates and volumes of stormwater runoff and then hydrodynamically routes the runoff through the modeled drainage network. This model has also been accepted by the Federal Emergency Management Agency (FEMA) for use on flood plain investigations associated with flood insurance applications.

The existing condition stormwater model for the Snow Hill Road/Jacobs Trail Outfall study area was developed based on the collected information described earlier in this report including: construction level survey, field reconnaissance, construction plans, topographic maps, and previous studies. The purpose of this chapter is to summarize the methodology used for the water quantity assessment.

3.1 Hydrologic Data Development

The SCS unit hydrograph method was used in ICPR© to generate runoff hydrographs for each sub-basin in the study area. In accordance with procedures of the SCS unit hydrograph method, several hydrologic parameters are required for each sub-basin. These include drainage area, NRCS runoff curve numbers (CN), directly connected impervious areas (DCIA), times of concentration (Tc), rainfall distributions and amounts, and peak rate factors. This section describes the development of all parameters necessary to implement the SCS unit hydrograph procedure.

3.1.1 Drainage Areas, Curve Numbers, and DCIA

The project area was segmented into 21 sub-basins. Individual runoff hydrographs were generated for each of the sub-basins and assigned to specific locations along the drainage system for subsequent hydraulic routing. Sub-basins were delineated using 1-foot contour data downloaded from the St. John's River Water Management District (SJRWMD) website and 2006 color aerials provided by Seminole County. This information was supplemented with collected construction plans for the Lake Lenelle subdivision, Osprey Lakes subdivision, The Trails subdivision, and Walker Elementary School as well as field inspections. The delineated drainage sub-basins are presented on **Figure 3.1**.

Land use and Soils information was also obtained from the St. Johns River Water Management District (SJRWMD) in digital form. Land use was checked against the 2006 color aerials and revised as needed (**Figure 3.2**). Soils information was originally derived from the Seminole County Soil Survey prepared by the Soil Conservation Service (SCS) in 1990 (**Figure 3.3**).

Values of drainage area and weighted SCS curve numbers (CN) were calculated for each sub-basin using ArcGIS (Version 9.1) and a custom tool developed by SAI. The tool calculates these geographic-based parameters from digitized GIS layers of sub-basins, land uses and soil hydrologic groups. It does so by generating geographical intersections or combinations of values in the separate data layers and,

through the use of lookup tables, determining geographically weighted values for such parameters as CN and DCIA (See **Exhibit 3.1**).

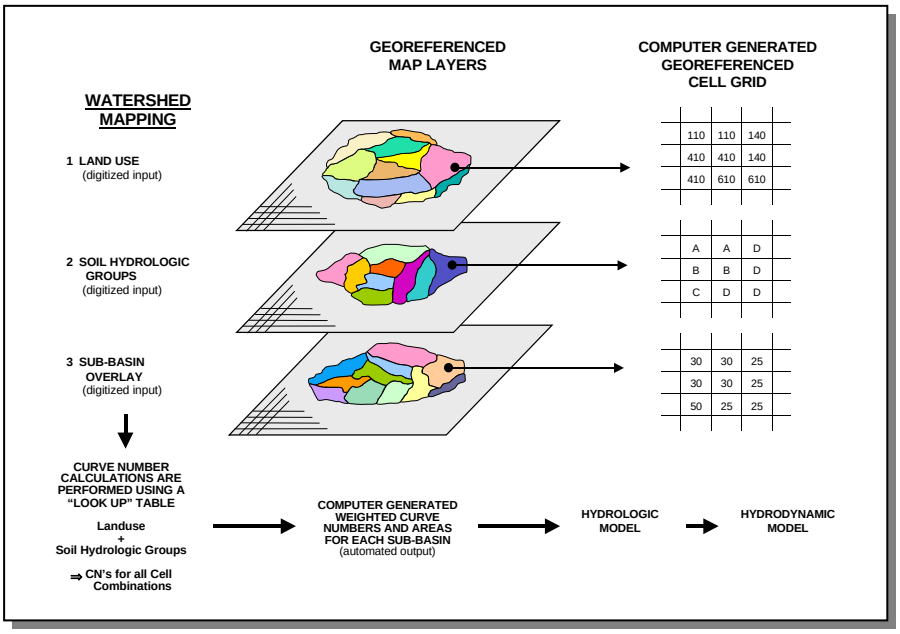


Exhibit 3.1 Computing Runoff Curve Numbers with ArcGIS

The relationships between land use, assumed percentage of total impervious area, assumed percentage of directly connected impervious area (DCIA), soil hydrologic group and runoff curve number for the non-directly connected impervious areas are presented in **Appendix C.1**. Soil types with hydrologic group B/D classifications were assumed to be type D for the purpose of curve number calculations and all water bodies or wetlands were assigned curve numbers of 98. Detailed curve numbers calculations for each of the sub-basins are included in **Appendix C.2**.

3.1.2 Time of Concentration

Time of concentration is defined in TR-55 as "the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed" (USDA, 1986). The time of concentration for any watershed or sub-basin is the summation of individual travel times computed for the various consecutive flow segments, each based on distance, slope, cover, and flow conditions.

The total time of concentration may be broken into three components. These components include sheet flow, shallow concentrated flow and conveyance flow. Sheet flow is assumed to occur for a maximum of 300 feet and its velocity is calculated by accounting for any friction factors that act on the water. The kinematic equation was used to compute sheet flow for the Snow Hill Road/Jacobs Trail Outfall study area. The applicable equation is presented below (**Equation 3.1**).

$$T_t = \frac{0.007(nL)^{0.8}}{P_2^{0.5} S^{0.4}}$$ **(Equation 3.1)**

where,

Tt	= Sheet flow time in hours
n	= Manning's coefficient
L	= Flow length in feet
P2	= 2-year/24-hour rainfall amount in inches
S	= Land slope in feet/feet

Note: The use of this equation assumes a 24-hour rainfall duration.

Runoff flow then typically transitions to shallow concentrated flow. This time component was calculated by determining the flow velocity using **Equation 3.2** and velocities depicted on **Chart 3.1**.

$$T_t = \frac{L}{3{,}600 * V}$$ **(Equation 3.2)**

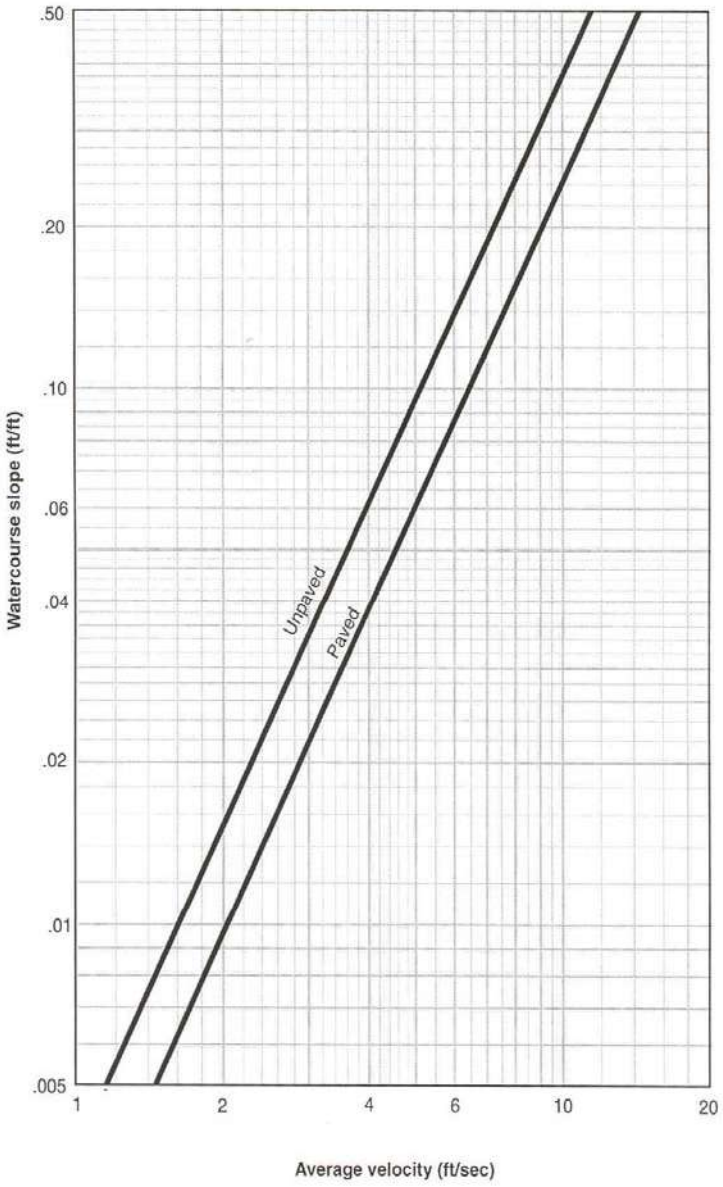
where,

Tt	= Shallow concentrated flow time in hours
L	= Flow length in feet
V	= Average velocity in feet/second
3600	= Conversion factor from seconds to hours

The final element needed when computing the time of concentration is conveyance flow. Conveyance flow is characterized as gutter, gully, channel or pipe flow. The shallow concentrated flow equation was used to compute the time associated with this type of flow. However, the velocity of the water flowing through the conveyance system is typically assumed from historical averages or estimates instead of using **Chart 3.1**.

The sum of all time components for the longest flow time within the basin determines the time of concentration. The above referenced approach was utilized to calculate times of concentration for each of the sub-basins for the Snow Hill Road/Jacobs Trail Outfall Culvert Improvement model. A minimum time of concentration of 10 minutes was applied to all sub-basins. The calculated time of concentration values for each of the sub-basins are included in **Appendix C.3**.

Chart 3.1 Average Velocities for Estimating Travel Time for Shallow Concentrated Flow



Source: TR-55, 2nd Ed., June 1986

3.1.3 Unit Hydrograph and Rainfall

A unit hydrograph is the runoff response of a given basin (in terms of runoff rate versus time) that would result from 1 inch of rainfall excess. The assumption for this method is that each basin has a characteristic unit hydrograph that is a unique function of its physical configuration.

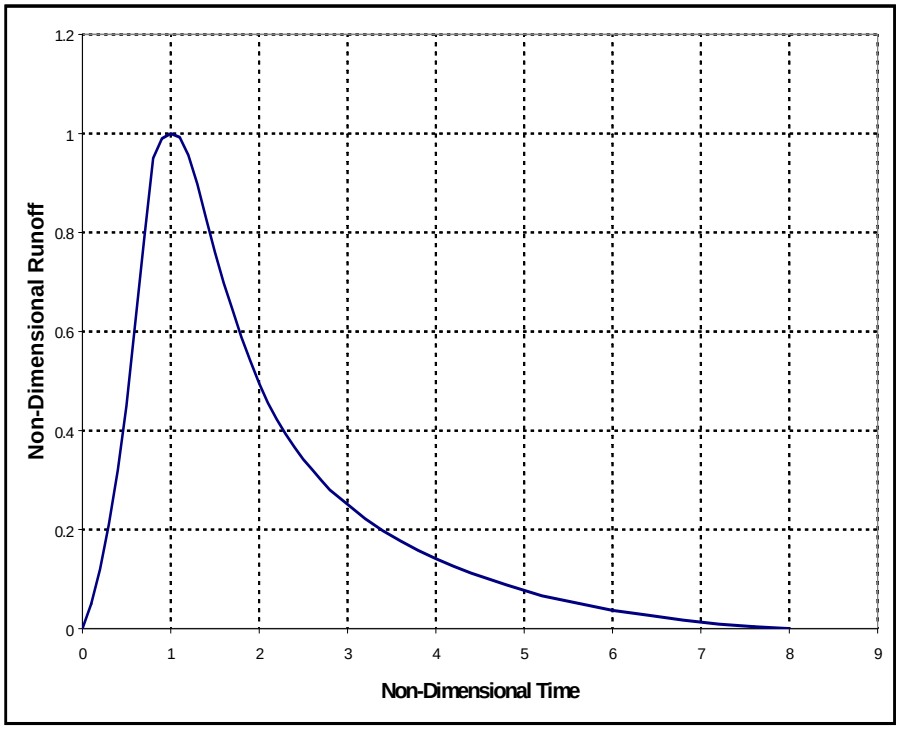
The unit hydrograph method requires that the rainfall event be divided into discrete increments over fixed time intervals. Infiltration is subtracted from each incremental value and the remainder represents the rainfall excess. Each increment of rainfall excess is then applied to the basin's unit hydrograph to obtain a response for the discrete time interval. Responses for all rainfall increments are then distributed in sequence and summed to produce a "composite" sub-basin runoff hydrograph.

To implement this procedure, a rainfall distribution must be specified for the desired storm as a function of time. This project involved the simulation of five 24-hour storm events. Rainfall was distributed over the 24-hour duration storms using the SCS Type II rainfall distribution (modified for Florida). Total rainfall volumes for each respective storm event are listed below.

Storm Event Return Interval	24 Hour Rainfall (in)
Mean Annual 24-hour	4.5
10-Year 24-hour	7.5
25-Year 24-hour	8.6
50-Year 24-hour	9.7
100-Year 24-hour	10.6

The shape of the basin unit hydrograph is also dependent on the peak rate factor, K'. The peak rate factor may be calculated if measured rainfall and runoff rate information is available for a given area, however, it is more commonly selected based on overall watershed properties such as the amount of depressional storage, degree of development and overall slope of the study area. Typically, peaking factor of 256 is used for sub-basins with an average overland slope of less than 0.5 percent, a peaking factor of 323 are is for sub-basins with an average overland slope between 0.5 and 1.5 percent, and a peaking factor of 484 is used for sub-basins with an average overland slope greater than 1.5 percent. The average overland slope for the study area is approximately 1%; therefore, a value of 323 was used for the Snow Hill Road/Jacobs Trail Outfall Improvement system (See **Exhibit 3.2**). This is also the peaking rate value used in the Orange County Big Econ River Basin Study and the Seminole County Little Econ River Basin Study.

Exhibit 3.2. Non-Dimensional Unit Hydrograph for K' = 323



3.2 Hydraulic Data Development

Hydraulic requirements for the ICPR model consist of two general data types: node data and link data. A node is defined as a discrete location in the drainage system where stages are computed (e.g., ponds, major inflow points, slope or geometry changes, etc.). Links are used to connect nodes together and convey water between them (e.g., pipes, channels, weirs, etc.). Sources of data used to generate node and link information for the model are presented below. These generally include field surveys, site inspections, construction plans, and aerial photogrammetry. A nodal diagram including the identification of links and cross sections is included as **Figure 3.3**. All hydraulic data was entered based on the North American Vertical Datum of 1988 (NAVD 88), which is consistent with the construction level survey discussed above. This includes a uniform vertical correction of -1.1 ft that was used to adjust the SJRWMD topographic information and all other data that was originally based on the 1929 NGVD.

3.2.1 Node Data

Node data requirements for ICPR include the node name and group, stage-area relationships for ponds and channel overbank areas, stage-time relationships for boundary conditions, initial water surface elevations, warning elevations and base flow rates (e.g., groundwater seepage, wastewater discharges, etc.) where appropriate.

Stage-Area Relationships: Stage-Area relationships were calculated at storage nodes along each of the channel/ditch systems to account for potential overbank flooding. Other storage areas consisted of depressional wetland systems and pond areas. Stage-area relationships were derived from the delineated

sub-basins and topographic information. Stage-area relationships for existing ponds were obtained from previous studies or construction plans.

Boundary Conditions: A single boundary node was established using stage time relationships in the Snow Hill Road/Jacobs Trail Outfall model. This time-stage relationship was created for the tailwater boundary located at the Osprey Lakes Pond #200 (Node: JTO005) and was derived from the designed normal water level and high water level elevations.

Initial Conditions, Warning Elevations, and Base Flow Rates: ICPR requires that initial water surface elevations be set for all nodes in the model. The program automatically calculates initial flows through the links based on the initial water surface elevations. In most cases, published initial elevations are not available. Therefore, in order to establish a conservative condition, initial elevations at most nodes were set equal to the lowest overflow elevation from that node.

Warning elevations are assigned to nodes as "flags" or reference elevations. They are not used in calculations but as data that appear in certain reports so that the user of the model can quickly identify flooding or other issues when evaluating calculated water levels. Warning elevations are established from construction plan information and survey data and usually include points where roads and/or channel banks are overtopped or where structures are inundated (surveyed finished floor elevations).

Node baseflow data provides a constant inflow to the node during simulations. It is typically used to maintain some base condition when published starting conditions are available. Such published data was not available in the JTO study area and, therefore, no baseflow was assigned to nodes within the model.

3.2.2 Link Data

Link data requirements for ICPR are specific to the type of link being used to model a given location. ICPR link types include channels, pipes, drop structures, bridges, weirs, gates, orifices, pumps and dam breaches. Typical data requirements for links include, among others, invert elevations, structure dimensions and type, structure condition, siltation depths and other pertinent data.

Link information was obtained from field survey and inspections of the primary drainage system as well as collected data. The field surveys were obtained at critical locations (i.e., constrictions, road crossings, etc.) along the drainage system and include cross sections and culverts.

The information obtained at survey locations varies as noted below. In addition to the specific structure information obtained, maintenance condition and any environmental problems (scour, physical deficiencies, etc.) were evaluated.

- Culverts – structure geometry (road crown, number of pipes, length, span, rise, type, material, invert elevations); top of road spot elevations.

- Cross Sections – Surveys of cross sections extended 50 feet from the back of curb along Jacobs Trail and included, as a minimum, shots at the top of bank, toe of slope and lowest elevation along the bottom of the channel.

3.3 Existing Condition Evaluation

Based on the methodologies discussed above, the existing conditions in the project area were modeled and evaluated for flooding. **Table 3.1** presents predicted flood levels at key locations within the study area including residential finished floors and roadway crossings. The results of the existing conditions model were analyzed to establish a baseline condition for use in evaluating various design alternatives.

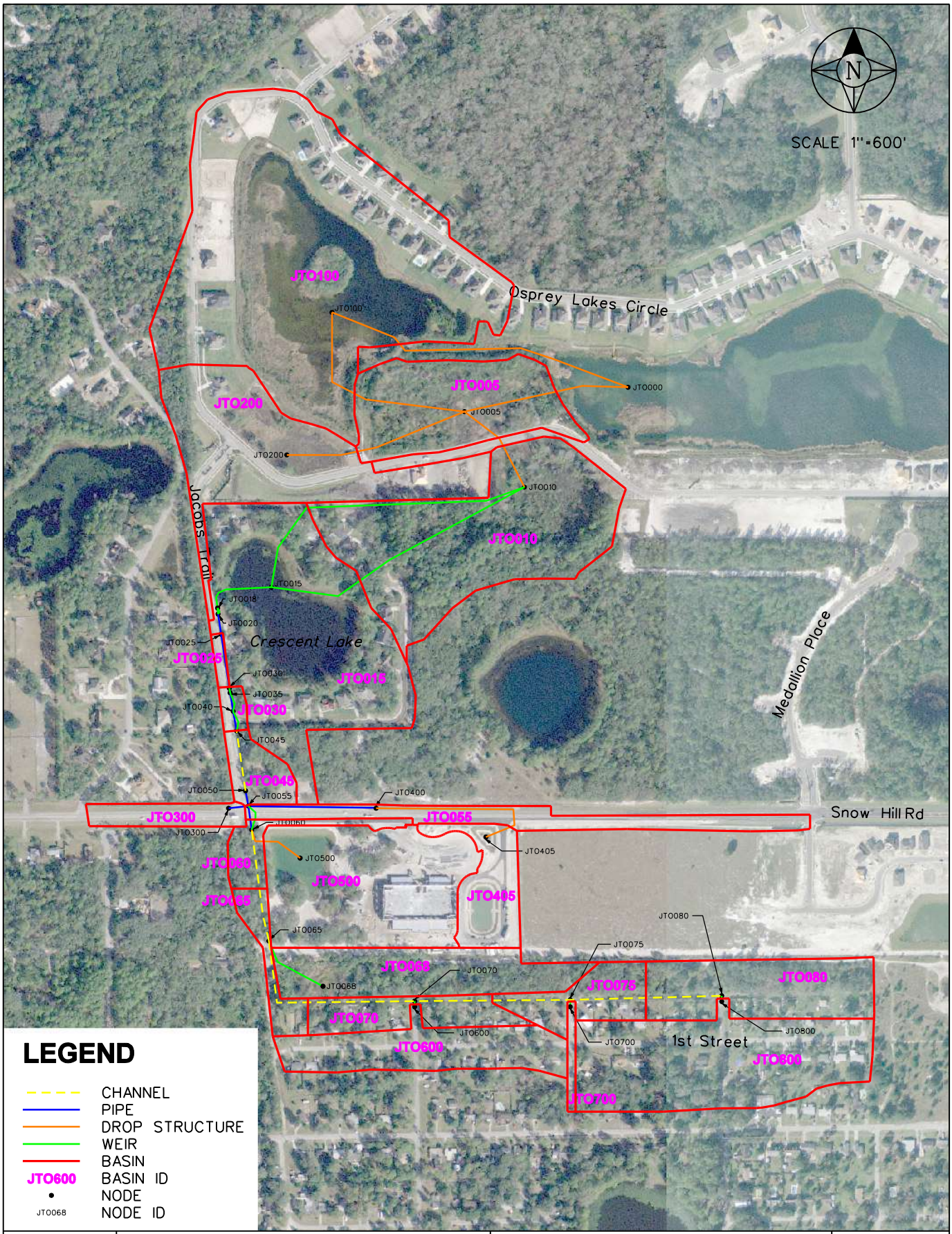
Based on results of model simulations, roadway flooding is predicted to occur at the southern entrance of Lake Crescent Drive. The Jacobs Trail ditch to the south is currently restricted by an undersized 18" roadway crossing under Lake Crescent Drive. Water levels stage up in the ditch before overflowing the topographic low point along Lake Crescent Drive during storms equal to or greater than the mean annual, 24-hour storm event. Flood depths range from approximately 3 inches over the road crown during the mean annual storm to 9 inches during the 100-year storm. The County's goal for secondary drainage systems, including this crossing, is to provide a 10-year level of protection. In addition, driveway flooding is predicted (and was reported) to occur during the mean annual event to a depth of 3". All design solutions presented in **Section 4** will address these flooding issues.

The predicted and surveyed water levels (NAVD 88) for Crescent Lake are as follows:

Mean Annual Storm Event	48.5
10-yr, 24-hour Storm Event	50.7
25-yr, 24-hour Storm Event	51.5
50-yr, 24-hour Storm Event	52.3
100-yr, 24-hour Storm Event	52.5
Surveyed SHWL	48.68
Osprey Lakes Surveyed Lichen Mark	48.79
Seminole County Watershed Atlas 100-year, 24-hour flood level	50.97

The predicted mean annual water level is slightly lower than Yvonne Frosher's surveyed high water level. The predicted 100-yr water level is above the finished floor elevation of one residential structure on Crescent Lake (152 Lake Crescent Drive, FF = 51.98) and is significantly higher that the Seminole County watershed atlas level. It should be noted that the watershed atlas data was derived from FEMA maps that were based on pre-development conditions. Historically, Crescent Lake would have overtopped towards the north, at an approximate overflow elevation of 49 (NAVD 88), to an existing wetland that discharges into an Osprey Lakes borrow pit pond and ultimately into the Big

Econlockhatchee River. Because of the residential development surrounding the lake, the current overflow elevation is 52.4 and the lake has become land locked with no positive outfall causing the lake to stage up to much higher levels than previously experienced. An overflow structure is recommended to restore the historical high water levels and to prevent the predicted structure flooding.



SAI	SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVMENT PROJECT	SUBBASIN MAP	FIGURE 3.1
			Project No.

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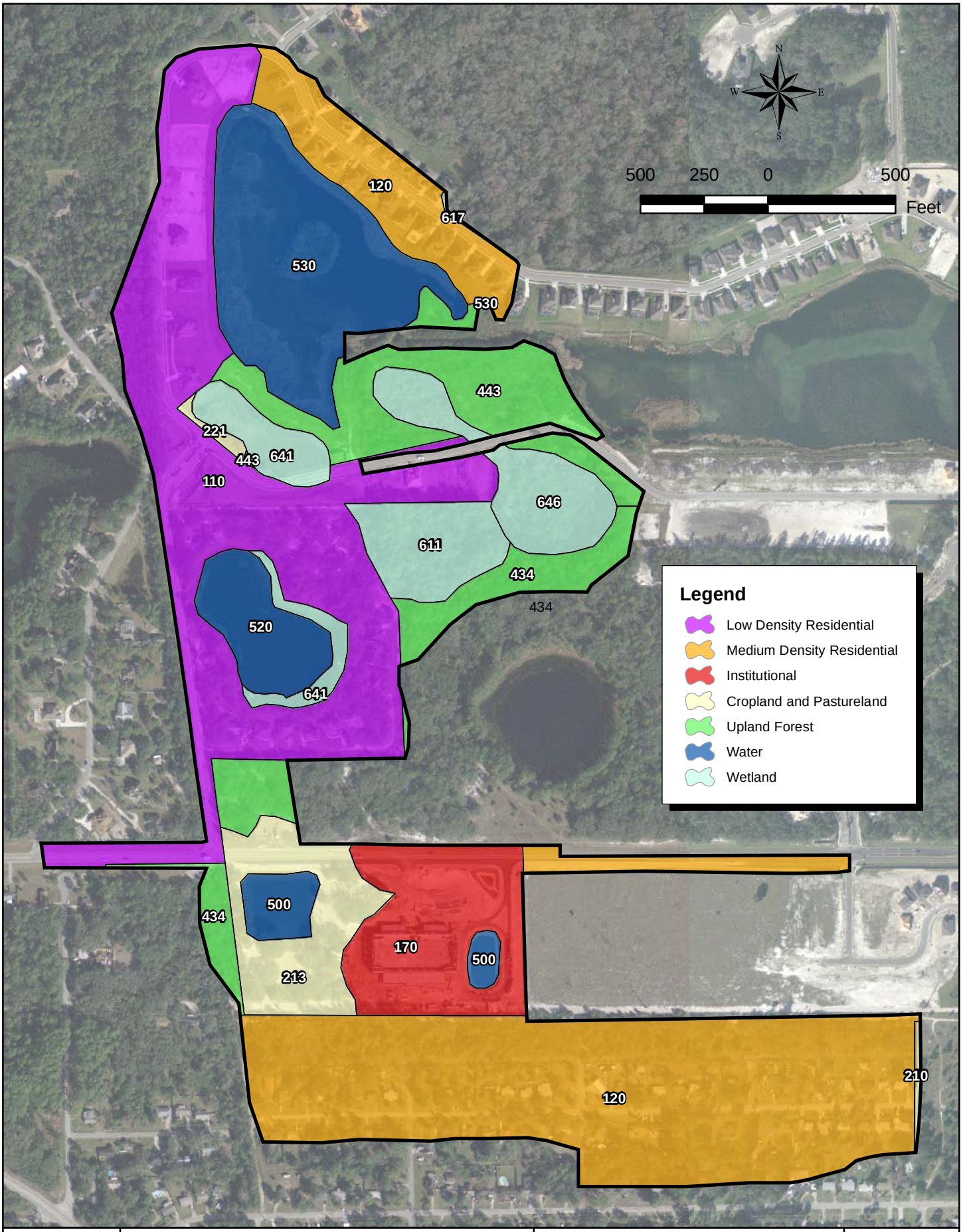

SAI	SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVMENT PROJECT	EXISTING LANDUSE MAP	FIGURE: 3.2

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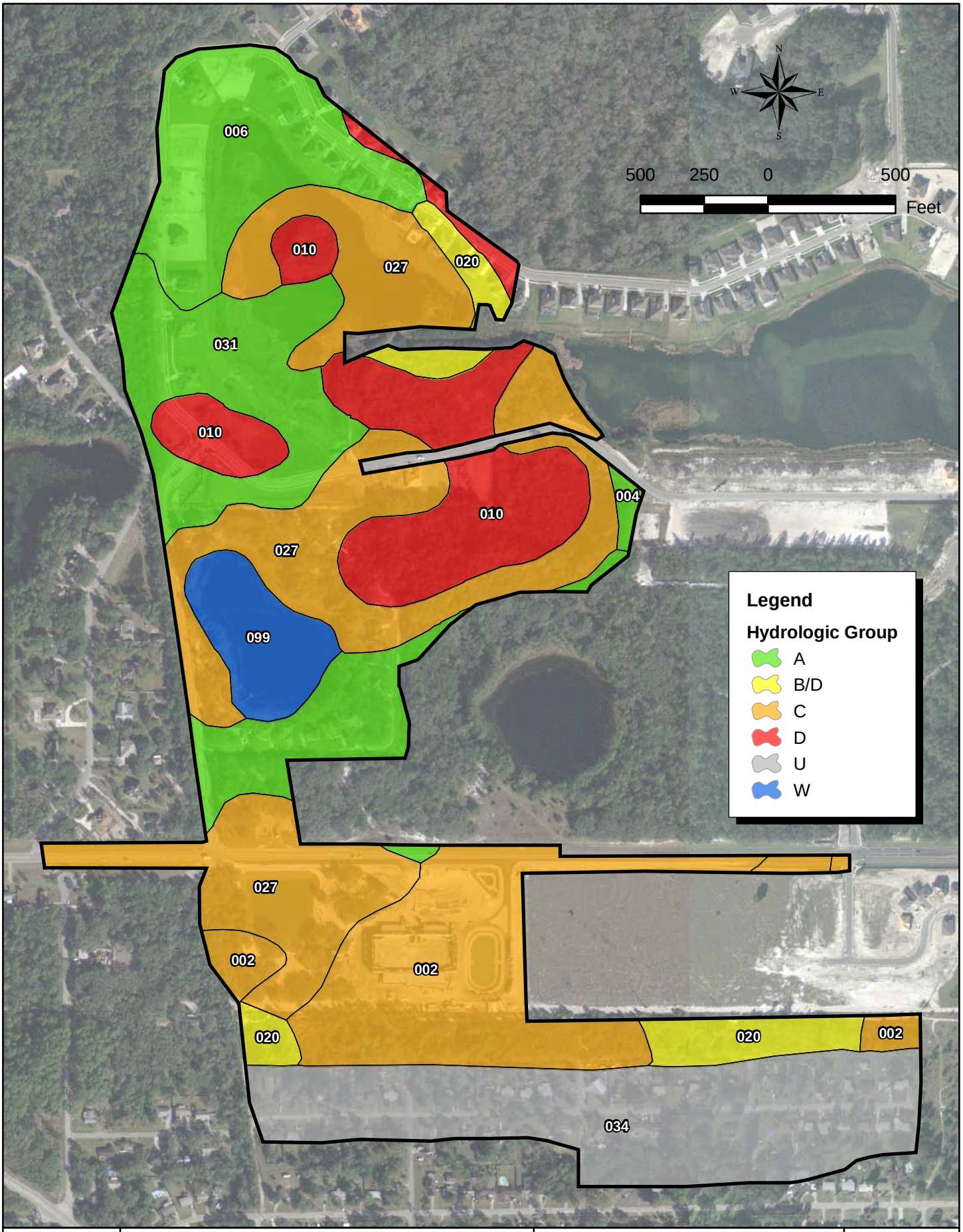

SAI	SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVMENT PROJECT	SOILS MAP	FIGURE: 3.3

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Table 3.1 - Roadway & Structure Flooding

				Mean Annual Storm Event		10-Year Storm Event		25-Year Storm Event		50-Year Storm Event		100-Year Storm Event	
			Crown/FF	Exist		Exist		Exist		Exist		Exist	
Location ID	Bulding Address	Node ID	Elevation (ft)	Stage (ft)	Flood Depth (in)	Stage (ft)	Flood Depth (in)	Stage (ft)	Flood Depth (in)	Stage (ft)	Flood Depth (in)	Stage (ft)	Flood Depth (in)
Well #1	104 Lake Crescent Drive	JTO015	49.89	48.5		50.7	10	51.5	19	52.3	28	52.5	32
Well #2	168 Lake Crescent Drive	JTO015	50.93	48.5		50.7		51.5	7	52.3	16	52.5	19
Lot #6	152 Lake Crescent Drive	JTO015	51.98	48.5		50.7		51.5		52.3	3	52.5	7
Lot #7	148 Lake Crescent Drive	JTO015	53.29	48.5		50.7		51.5		52.3		52.5	
Lot #8	144 Lake Crescent Drive	JTO015	53.57	48.5		50.7		51.5		52.3		52.5	
Lot #4 & Lot 5	156 Lake Crescent Drive	JTO015	53.64	48.5		50.7		51.5		52.3		52.5	
Lot #9	140 Lake Crescent Drive	JTO015	53.91	48.5		50.7		51.5		52.3		52.5	
Lot #2	168 Lake Crescent Drive	JTO015	54.02	48.5		50.7		51.5		52.3		52.5	
Lot #3	164 Lake Crescent Drive	JTO015	54.92	48.5		50.7		51.5		52.3		52.5	
Lot #10	136 Lake Crescent Drive	JTO015	55.2	48.5		50.7		51.5		52.3		52.5	
Lot #21	305 Jacobs Trail	JTO015	55.48	48.5		50.7		51.5		52.3		52.5	
Lot #1	172 Lake Crescent Drive	JTO015	55.56	48.5		50.7		51.5		52.3		52.5	
Lot #17	108 Lake Crescent Drive	JTO015	55.81	48.5		50.7		51.5		52.3		52.5	
Lot #11	132 Lake Crescent Drive	JTO015	55.9	48.5		50.7		51.5		52.3		52.5	
Lot #22	309 Jacobs Trail	JTO015	56.19	48.5		50.7		51.5		52.3		52.5	
Lot #12	128 Lake Crescent Drive	JTO015	56.2	48.5		50.7		51.5		52.3		52.5	
Lot #15	116 Lake Crescent Drive	JTO015	56.54	48.5		50.7		51.5		52.3		52.5	
Lot #23 - Lot #26	313 Jacobs Trail	JTO015	56.6	48.5		50.7		51.5		52.3		52.5	
Lot #16	112 Lake Crescent Drive	JTO015	56.74	48.5		50.7		51.5		52.3		52.5	
Lot #20	301 Jacobs Trail	JTO030	56.86	55.6		55.8		55.8		55.9		55.9	
Lot #13	124 Lake Crescent Drive	JTO015	56.99	48.5		50.7		51.5		52.3		52.5	
Lot #19	100 Lake Crescent Drive	JTO030	57.04	55.6		55.8		55.8		55.9		55.9	
Lot #14	120 Lake Crescent Drive	JTO015	57.49	48.5		50.7		51.5		52.3		52.5	
Lot #18	104 Lake Crescent Drive	JTO015	57.52	48.5		50.7		51.5		52.3		52.5	
301 Jacobs Trail Driveway	301 Jacobs Trail	JTO040	56.62	56.9	3	57.1	5	57.1	6	57.2	7	57.2	7
Lake Crescent Drive	-	JTO045	57.53	57.8	3	58.1	7	58.1	7	58.2	8	58.3	9
Snow Hill Road	-	JTO060	59.57	57.9		58.5		58.7		59.0		59.2	

Notes: 1. "Exist" refers to the 2008 existing conditions model .

2. Maximum stage exceeds the warning elevation (Existing Conditions Model).

3. The finished floor, roadway crown, and well elevations were surveyed by Southeastern Surveying in 2007 & 2008.

In an effort to address the roadway flooding and ditch maintenance concerns mentioned previously in this report, SAI has developed several different design alternatives. The objective in the alternative plan development was to explore possible scenarios that will resolve the identified deficiencies without negative impacts to surrounding areas in terms of environmental, economic, and social aspects. Specifically, the alternative plans must resolve or reduce the identified deficiency without causing undue environmental damage through increased discharges or harm to ecologically sensitive areas. The designs were developed and evaluated based on ten conditions; ❶ Social acceptability, ❷ Construction cost, ❸ Public safety, ❹ Hydraulic performance, ❺ Permitting, ❻ Environmental implications, ❼ ROW and easement requirement, ❽ Impacts to adjacent property, ❾ Construction consideration, and ❿ Maintenance. The existing conditions model was refined to incorporate different design elements.

Four design alternatives were developed and analyzed for this project. They were presented to Seminole County and the St. John's River Water Management District on July 15, 2008 during a pre-application meeting. **Figures 4.1 through 4.4** present design alternative layouts. **Figures 4.5 through 4.7** present the ICPR sub-basin maps and nodal networks for each of the modeled design alternatives. **Table 4.1** presents maximum stages predicted at select locations for each of the alternatives compared with the results of the existing conditions modeling. Each of the design alternatives will include a closed culvert system along Jacobs Trail to eliminate the existing safety hazard and maintenance problems as well as a constructed emergency lake outfall to provide flood protection and restore a portion of historical overflow conveyance to the northeast. A brief description of each of the alternatives, including preliminary construction costs is presented below.

4.1 Design Alternative 1

For this scenario, an off-line dry retention pond will be constructed on the Seminole County property adjacent to Snow Hill Road and Jacobs Trail. This pond will collect runoff from existing drop inlets and an existing mitered end section along Snow Hill Road and from two existing curb inlets along Jacobs Trail. This option requires construction of a new 36" RCP crossing under Snow Hill Road that will convey floodwaters from the existing ditch south of the roadway to a diversion structure located just south of Lake Crescent Drive. The purpose of the diversion structure is to direct the first flush of runoff from Snow Hill Road and Jacobs Trail inlets to the off-line pond for percolation through the soils for treatment. The volumetric analysis discussed in Section 3 describes a net reduction in runoff volume to Crescent Lake that should occur as a result of construction of retention ponds at Walker Elementary. Therefore, further retention is not actually required. It should be noted, however, that the proposed retention pond will provide some retention storage and further reduce the runoff volume contributing to Crescent Lake. For larger storm events, excess stormwater will by-pass the pond by overtopping the weir inside the diversion structure and continue to the existing drainage system outfall into Crescent Lake. Impacts to Crescent Lake during construction of this alternative will be minimal and sediments will be closely monitored. A second set of curb inlets exists along Jacobs Trail that could not be diverted to the pond because the required pipe slope would necessitate a pond bottom elevation that precludes use of dry retention. Instead, these curb inlets would be retrofitted with filter media inserts to capture oils and floatables prior to discharge into the lake. An end of pipe treatment was also considered near the outfall into Crescent Lake, however, the upstream system will be retrofitted to include a stabilized pond inflow, closed culvert system, and the above mentioned filter media. Consequently, significant sediment loads to the lake are not expected after implementation of these design elements and significant benefits would not be expected by adding this type of structure. **Figure**

4.1 presents the project components for this alternative. **Figure 4.5** presents the sub-basin and nodal network for this alternative. Land acquisition is not required for this option as all work will be performed within the County's right-of-way and on existing trail head property. The County's Stormwater Division will, however, need to coordinate and approve the use of this park land with another County department for stormwater pond construction.

The results of the design conditions stormwater model of this alternative indicate that flood stages are reduced upstream of the new pond and slightly reduced at Crescent Lake for all simulated storm events. Some stage increases are shown along Jacobs Trail, however, the flood waters will remain within the new closed culvert system and flooding will not occur. In fact, the existing driveway and Lake Crescent Drive flooding issues will be eliminated. Additionally, the flood stage reduction at Crescent Lake alleviates the finished floor flooding that was predicted to occur under the existing conditions 100-yr/ 24-hour simulation. A summary of the predicted stages for each of the storms is presented in **Table 4.1**. The total cost of construction for this option is estimated at $255,700 (**Table 4.2**).

It is important to note that the residents of Crescent Lake requested that a pond be designed to retain all runoff for storms less than the 100-year return frequency. SAI does not recommend such a pond for several reasons including: potential adverse impacts to Crescent Lake, higher cost to construct a larger pond (required pond would be approx. 7 acres in size), loss of the existing Trailhead and reduced parking area.

The adverse impacts to Crescent Lake mentioned above would include potential water level reductions that could occur if surface water runoff was eliminated as a water source. The lake would be dependant upon a much smaller contributing area (i.e., the area immediately surrounding the lake) and existing groundwater interactions to replenish the volume that is lost to evaporation or leakance. It is noted that the lake has been referred to as "spring fed" by residents. Although most significant springs in Seminole County are located in middle or western portions of the county, there are known artesian wells in the area of Crescent Lake. It is not clear, however, what degree of interaction exists between the Floridan aquifer and the lake. Furthermore, determination of such an interaction is beyond the scope of this study. It is likely, however, that the surficial aquifer acts as a water source to the lake. This is both potentially beneficial and harmful depending upon the quality of that groundwater. For example, the Seminole County soil survey identifies the soils surrounding the lake as Pomello fine sand which have rapid permeability. According to the soil survey, this high permeability rate can cause contamination of ground water in areas of septic tank absorption fields. Ultimately, it may be somewhat risky to rely solely on groundwater and local runoff as the sole source of lake recharge and an outside source of freshwater could serve to help dilute possible pollutant contributions from groundwater.

While the 0.3 acre pond proposed in Alternative 1 would not retain large storm events, as requested by the residents of Crescent Lake, it will provide pollutant removal benefits. Water level control would more easily and consistently be provided by construction of the emergency overflow structure mentioned above.

4.2 Design Alternative 2

This design option was presented to County engineers during a preliminary project planning meeting. The design includes construction of a wet detention pond located between Jacobs Trail and Crescent Lake with a constructed outfall and pipe system discharging to Crescent Lake. After review of the questionnaire response from residents of Crescent Lake and calculation of the required treatment volume, it was determined that the required pond size and subsequent impacts to Crescent Lake would not provide a desirable design option. **Figure 4.2** presents the project components for this alternative, however, no design model or cost estimates were developed and this option was eliminated from further consideration.

4.3 Design Alternative 3

This design option includes construction of a closed 36" culvert system that ties into the existing 36" RCP at Snow Hill Road and continues north to the existing outfall at Crescent Lake. A drop inlet structure will be installed upstream of Snow Hill Road to hold water back in the existing ditch and allow for percolation of smaller storm events. A baffle box will be installed downstream of the existing Jacobs Trail curb inlets and filter media can be used in the existing curb inlets to provide pollutant removal prior to discharge into Crescent Lake. Similar to Alternative 1, impacts to Crescent Lake during construction will be minimal and sediments will be closely monitored. **Figure 4.3** presents the project components for this alternative. **Figure 4.6** presents the sub-basin and nodal network for this alternative. Right-of-way acquisition is necessary for the BMP structure only (approximately 400 SF).

Based on the H&H modeling of this design alternative, stages upstream of Lake Crescent Drive are significantly reduced because the culvert capacity is increased under existing driveways to match the 36" RCP crossing at Snow Hill Road. Similar to Design Alternative 1, this design option alleviates the driveway and Lake Crescent Drive flooding that is predicted to occur under existing conditions. A summary of the predicted stages and flows for each of the storms is presented in **Table 4.1**. The total cost of construction for this option is estimated at $178,200 (**Table 4.2**).

4.4 Design Alternative 4

The final alternative was developed at the request of the Crescent Lake property owners to provide a by-pass option and divert most or all of the contributing area away from Crescent Lake. Multiple scenarios were evaluated for this design option:

4.4.1 Design Alternative 4A

Design Alternative 4A includes replacement of the open ditch north of Snow Hill Road with a closed culvert system and a constructed ditch along Lake Crescent Drive. The new ditch would be constructed between the existing roadway and an existing 6' wall and would require a concrete gravity wall to accommodate an open ditch in this limited space. A concrete weir structure will allow for stormwater to be stored in the ditch for percolation into the soils during small storm events. Ultimately, the drainage system will outfall to the historic receiving wetland referred to previously which is located east of Lake Crescent Drive. **Figure 4.4A** presents the project components for this alternative. **Figure 4.7** presents

the sub-basin and nodal network for this alternative. Right-of-way acquisition is necessary for the new swale (approximately 0.24 acres).

The stormwater design model for this option indicates that increases in stage at the receiving wetland will occur for the 10-year event and greater. Water levels in the wetland do not appear to be impacted during the mean annual storm event, however continuous flow simulations would have to be completed to evaluate long-term impacts to the wetland hydroperiod. In addition, significant negative impacts to Crescent Lake are apparent from the model results during all storm events. Although the lake likely would recover from groundwater inflows (the residents refer to this as a spring fed lake), without the surface water inflows the mean annual water levels are significantly reduced. A summary of the predicted stages and flows for each of the storms is presented in **Table 4.1**. The total cost of construction for this option is estimated at $691,600 (**Table 4.2**).

4.4.2 Design Alternative 4B

This design option is identical to Design Alternative 4A except that it has a high-level overflow to Crescent Lake for extreme storm events. **Figure 4.4B** presents the project components for this alternative. Right-of-way acquisition is necessary for the new ditch as described above (approximately 0.24 acres).

Similar adverse impacts to the Crescent Lake and wetland water levels are predicted with this option as discussed in option 4A above with differences only noted during extreme events. A summary of the predicted stages and flows for each of the storms is presented in **Table 4.1**. The total cost of construction for this option is estimated at $698,600 (**Table 4.2**).

4.4.3 Design Alternative 4C

The final by-pass design option includes construction of the off-line dry retention pond from Design Alternative 1, the 36” RCP Snow Hill Road crossing, diversion structure, and a closed culvert system to outfall at the Osprey Lakes pond #100. **Figure 4.4C** presents the project components for this alternative. Right-of-way acquisition is necessary for the new culvert connection to the Osprey Lakes pond (approximately 0.21 acres).

This option was added at the direction of the County, however, no model results are available at this time. Impacts to Crescent Lake will be similar to those presented for Design Alternative 4A. The total cost of construction for this option is estimated at $452,300 (**Table 4.2**). Wetland impacts to Crescent Lake are anticipated in relation to construction of the bypass pipe to the north.

The permitting process on any of the by-pass options would be significant and may not result in a permitted design. The St. John’s River Water Management District would require detailed analyses on the impacts to Crescent Lake and the proposed receiving water bodies. It may not be possible to justify diverting water from Crescent Lake with no reported significant flooding problems into a healthy wetland or permitted pond system.

4.5 Recommended Alternative

Based on the discussion above, each of the design alternatives (including the do nothing alternative) was evaluated relative to the others. **Table 4.3** presents the scoring and ranking of the design alternatives as well as a description of the evaluation criteria and scoring method.

An important objective of this project is to eliminate the existing public safety hazard and maintenance concerns at the existing Jacobs Trail ditch. Each of the design solutions presented above includes a proposed closed culvert system that will eliminate the maintenance and safety issues associated with having a steep, open ditch adjacent to the existing sidewalk. Although the do-nothing option has no cost or permitting issues associated with doing no work; maintenance, environmental implications, and hydraulic performance were all rated low due to the existing open ditch system with only two of the three designed concrete dams and undersized 18" driveway culverts.

The ranking of the remaining options is as follows:

Design Alternative 1: SAI recommends the implementation of this dry retention pond option. Hydraulically, this option would be an improvement because it restores the capacity to Crescent Lake for large storm events while still allowing the smaller storm events to be retained in the pond and existing swale upstream. An emergency lake outfall structure would be required to allow flood waters to overflow into the wetland to the northeast. Flooding is eliminated at the finished floor and roadway locations that were predicted to flood under existing conditions. Typically, off-line ponds are considered highly effective pollutant removal BMP options. The cost of this option is relatively low and no right-of-way acquisition is anticipated. SAI believes that the property owners would be satisfied with this option, however, it would mean the loss of a portion of the County's trail head property for pond construction.

Design Alternative 3: This option is rated just two point below and is hydraulically similar to design Alternative 1. An emergency lake outfall structure would be required to allow flood waters to overflow into the wetland to the northeast. Pollutant removal levels are reduced compared to the retention system of Alternative 1 and the County would be required to perform more maintenance of the baffle box structure than for the pond. A drainage easement would also be required surrounding this structure.

(The remaining design options are all scored similarly, with only one or two points separating these options.)

Design Alternative 4C: As noted above, this option would require significant permitting efforts and may not result in permit acquisition (see permitting discussion below). ICPR model results for a by-pass option show a 2 foot decrease in lake levels during the mean annual storm event. Without the surface water source, Crescent Lake water levels will be reduced and, in addition to the environmental impacts and permitting challenges that this poses, residents may ultimately be dissatisfied with this design option. As mentioned previously, Crescent Lake water quality could potentially be impacted due to the close proximity of septic tank absorption fields and soil conditions surrounding the lake.

Design Alternative 2: This design option would not be acceptable to the residents of Crescent Lake because of the high impacts associated with pond construction in such close proximity to their lake.

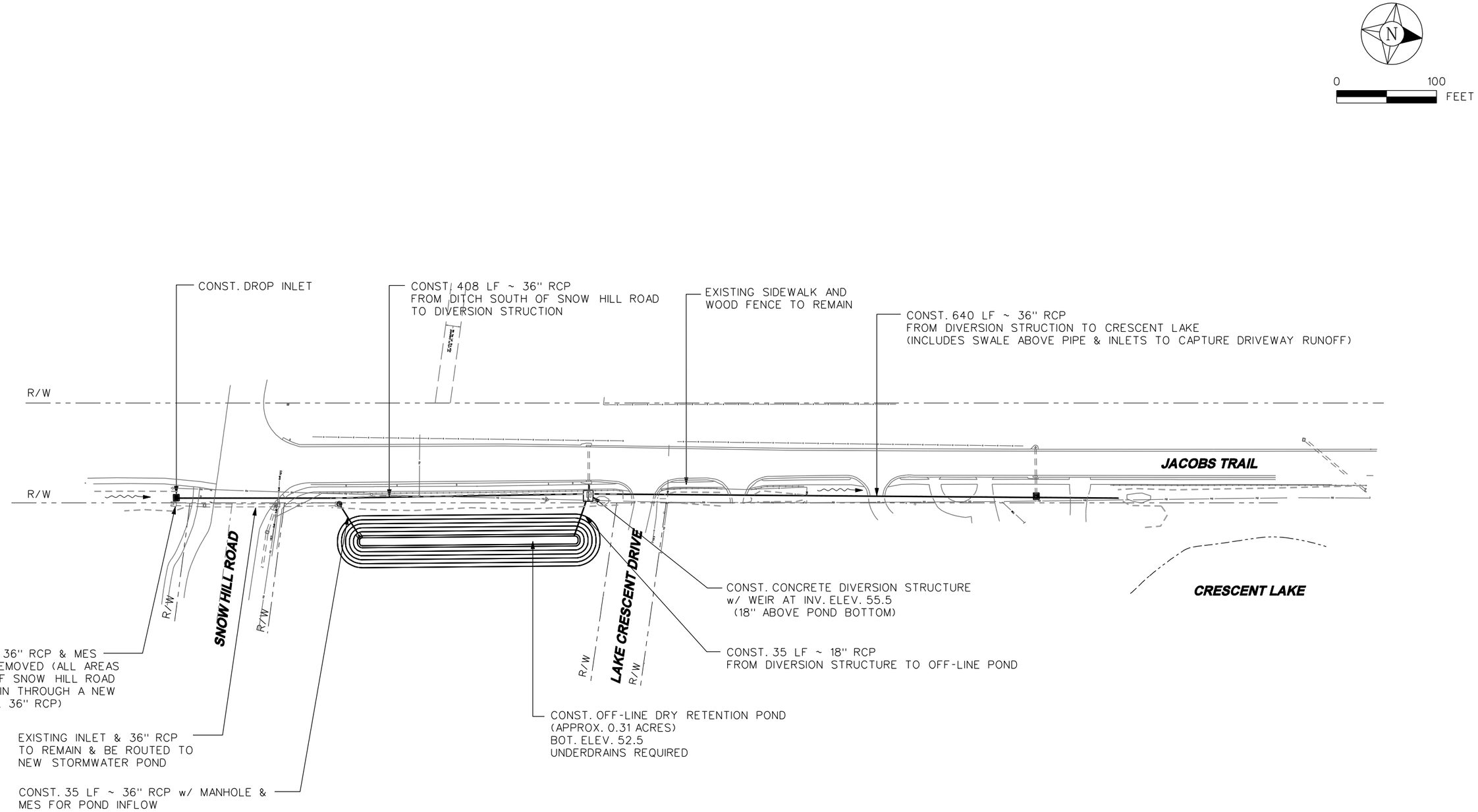
Design Alternative 4A & 4B: Similar permitting challenges exist with these options and the design alternative 4C by-pass option, except that additional caution must be taken in order to preserve the quality of the existing wetland system that will serve as the new outfall location.

Other improvements are recommended in addition to the selected alternative. The first is relocation of the water wells mentioned in Section 2 of this report that are subject to or at risk of being inundated by Crescent Lake. These should be moved to higher elevations to avoid contamination by elevated lake levels. The second involves reduction of pollutant loads from runoff originating on lots adjacent to or that drain into the lake. This can include construction of reverse berms or environmental swales to capture runoff and percolate it prior to entry into the lake, the use of slow-release, granular fertilizers or planting of native, littoral zones. These improvements should be coordinated with the lake management plan that has been implemented by the Lake Crescent HOA. And finally, an emergency overflow structure (FDOT Type E Inlet) is recommended to restore the original lake overflow to the ditch located to the northeast. The cost of this structure is approximately $34,866.00.

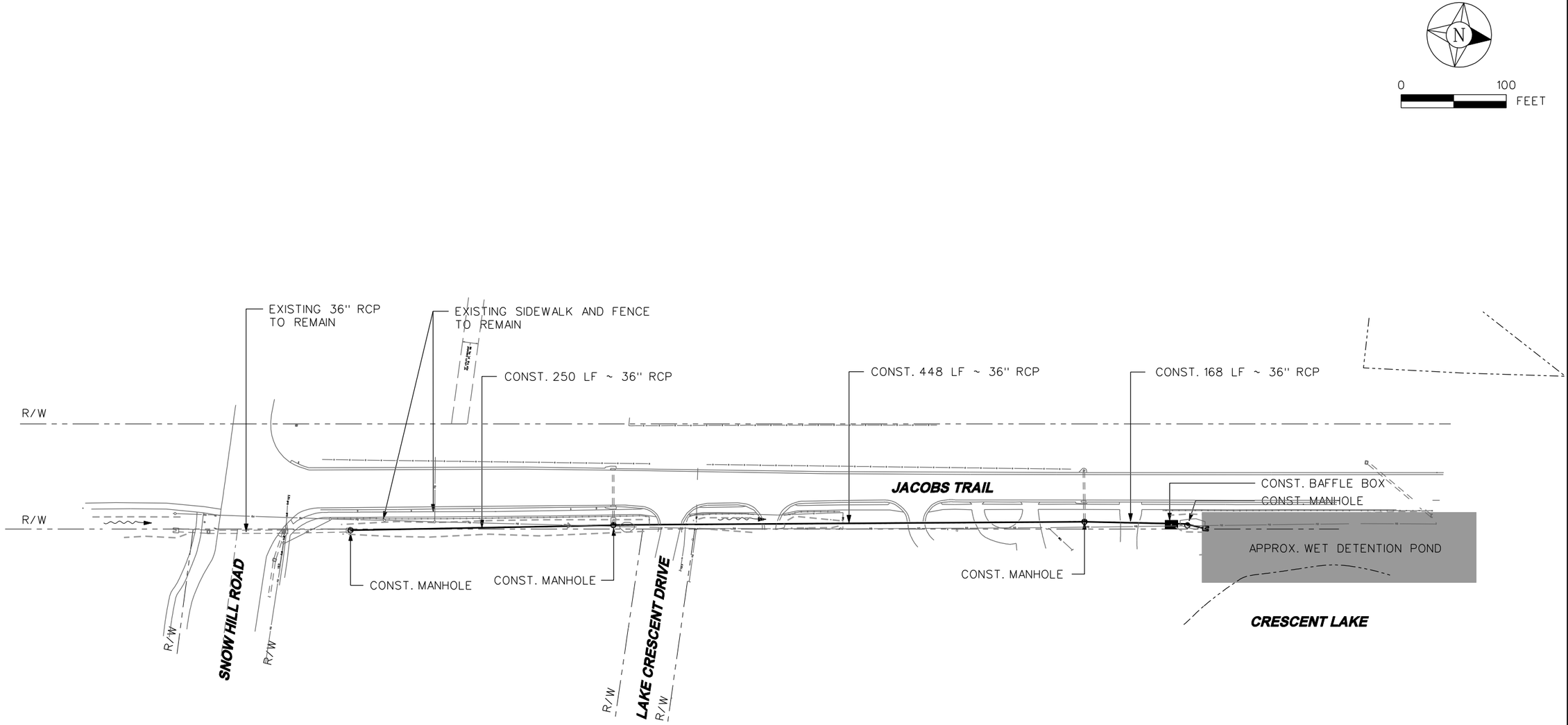
4.6 Permitting

Most dredge and fill permitting interests of the FDEP, including those anticipated for this project, have been delegated to the SJRWMD and will be handled through the environmental resource permit (ERP) process. A pre-application meeting was conducted with District staff of the SJRWMD Altamonte Springs office on July 15, 2008 as mentioned above. The SJRWMD was presented with the design options discussed above and the permitting challenges for each option were discussed. The scoring for each design option was developed based on discussion with the District staff.

In a follow up email from SJRWMD engineer, Leonardo Valencia, E.I., M.E. (**Appendix D**), the permitting challenges with by-pass options were described and several things were discussed that will need to be demonstrated for these alternatives. First, it will need to be shown that modifications do not have adverse impacts on lake stages in Lake Crescent or to offsite areas due to diverting water flow away from the lake. Secondly, reasonable assurances will need to be provided that show the proposed system will not cause alterations to the lake's hydrology (e.g., lowering the seasonal high water elevation or affecting staging) that could potentially cause adverse impacts to the ecological or biological functions currently provided by the lake. Examples of adverse impacts to ecological functions include activities such as decreases or increases to the hydroperiod, frequency of inundation, velocity or mean annual water elevations or groundwater elevations that diminish the abundance, diversity, food sources or habitat of aquatic or wetland-dependent species in any direct, secondary or cumulative way.

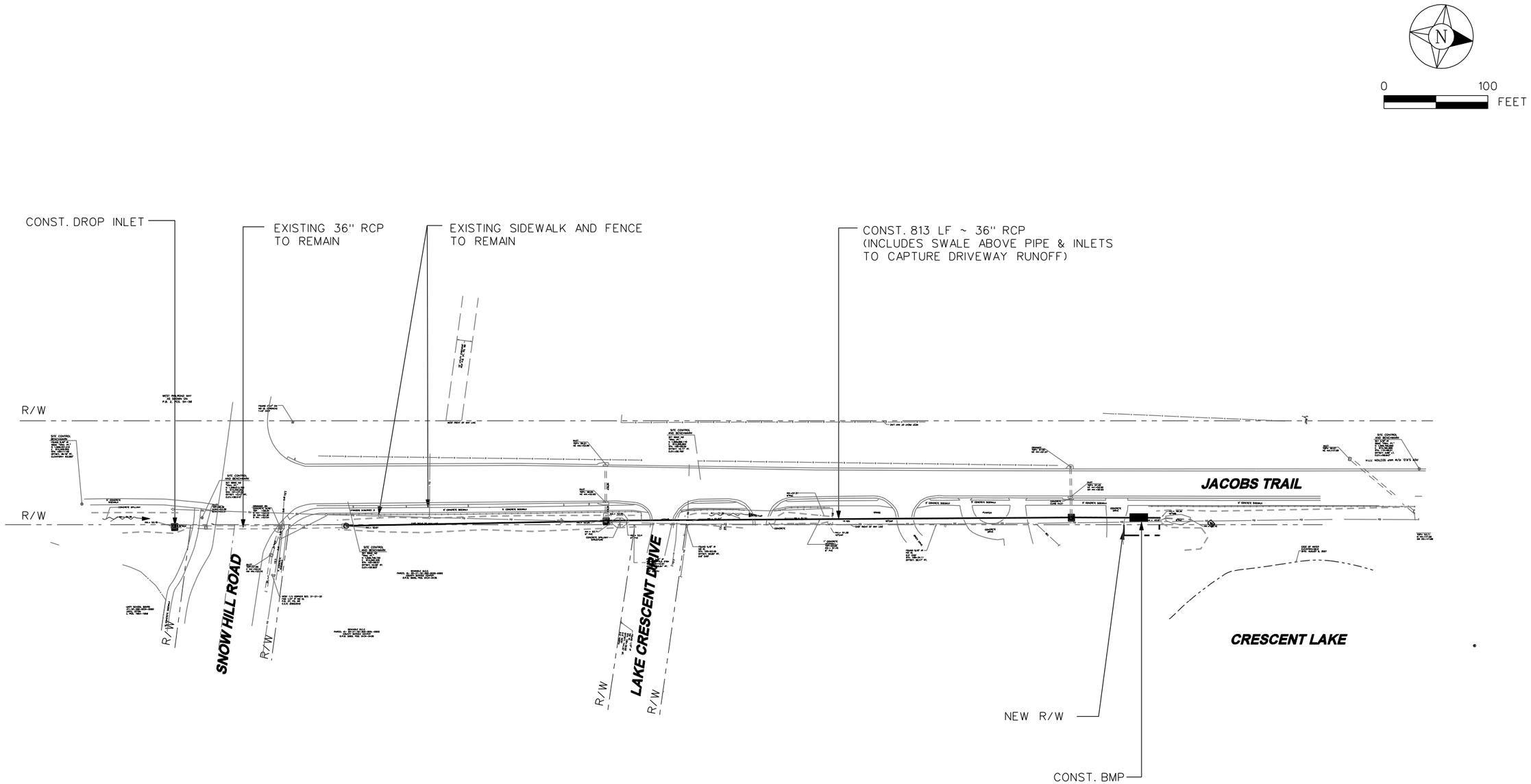


SINGHOFEN & ASSOCIATES, INC. **STORMWATER MANAGEMENT AND CIVIL ENGINEERING**	**SNOW HILL ROAD / JACOBS TRAIL** **OUTFALL IMPROVEMENT PROJECT**	**DESIGN LAYOUT** **ALTERNATE 1**	FIGURE **4.1** Project No. 27001.10

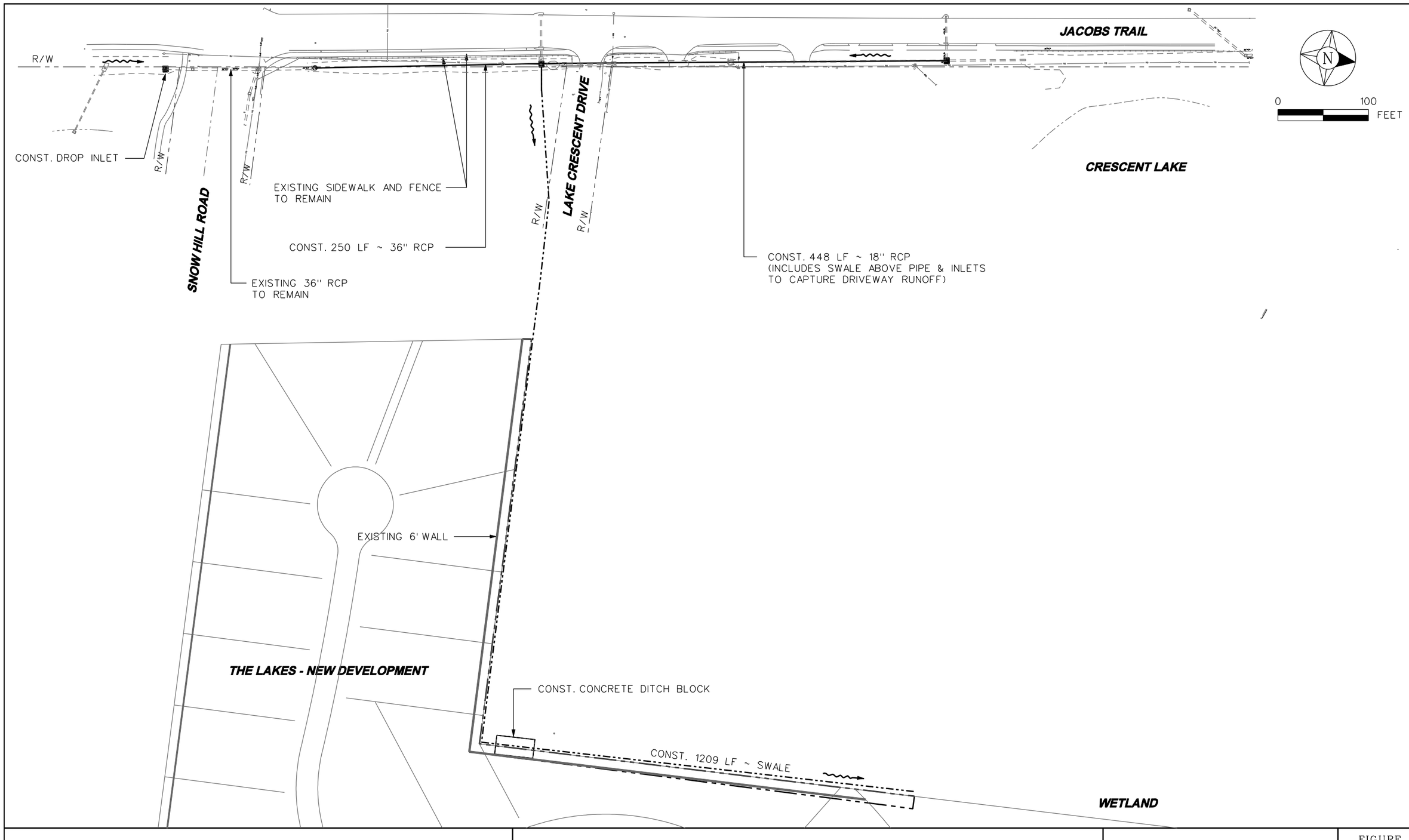


NOTE: THIS OPTION WAS ELIMINATED DUE TO SIGNIFICANT IMPACTS TO CRESCENT LAKE.

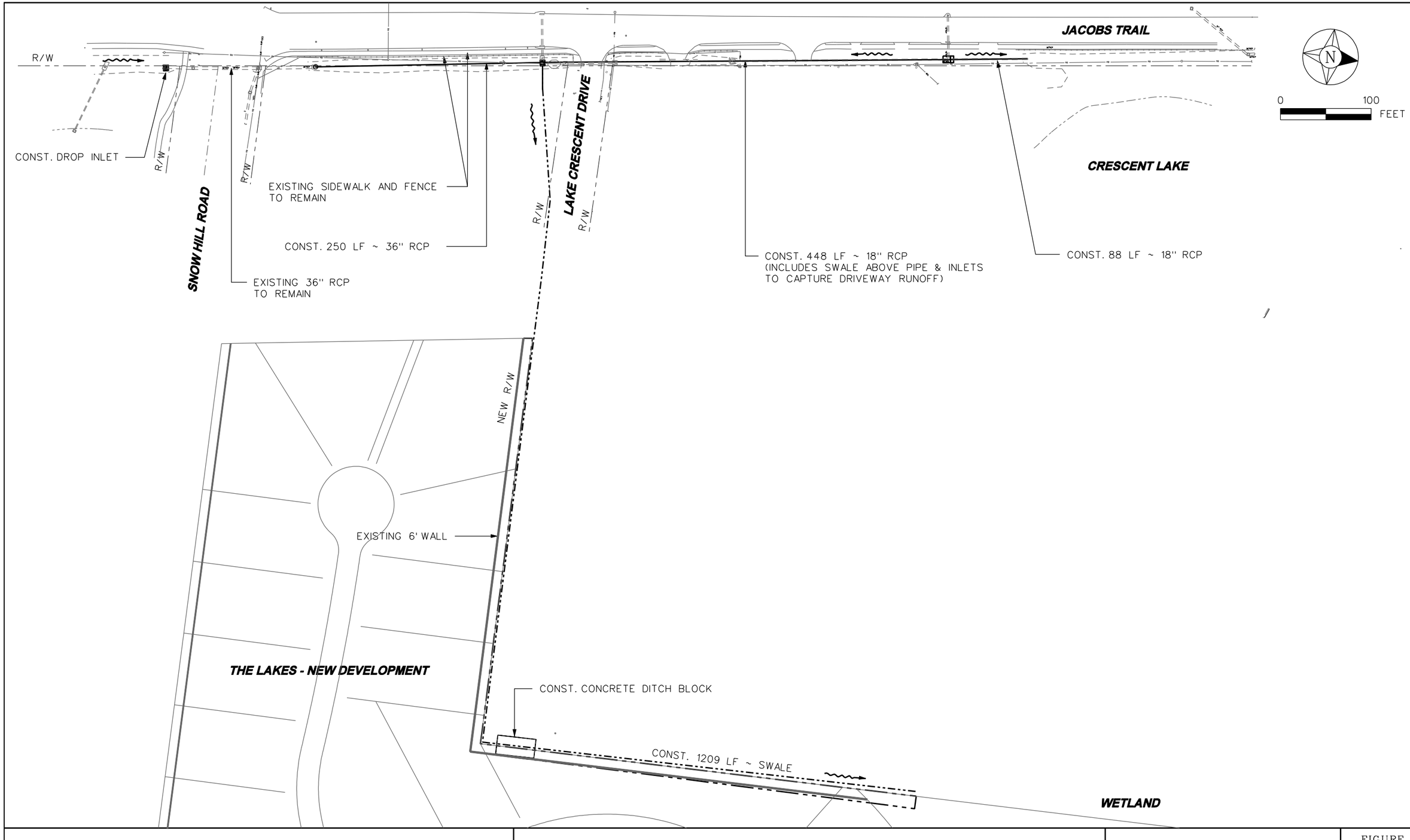
SINGHOFEN & ASSOCIATES, INC. **STORMWATER MANAGEMENT AND CIVIL ENGINEERING**	**SNOW HILL ROAD / JACOBS TRAIL** **OUTFALL IMPROVEMENT PROJECT**	**DESIGN LAYOUT** **ALTERNATE 2**	FIGURE **4.2** Project No. 27001.10



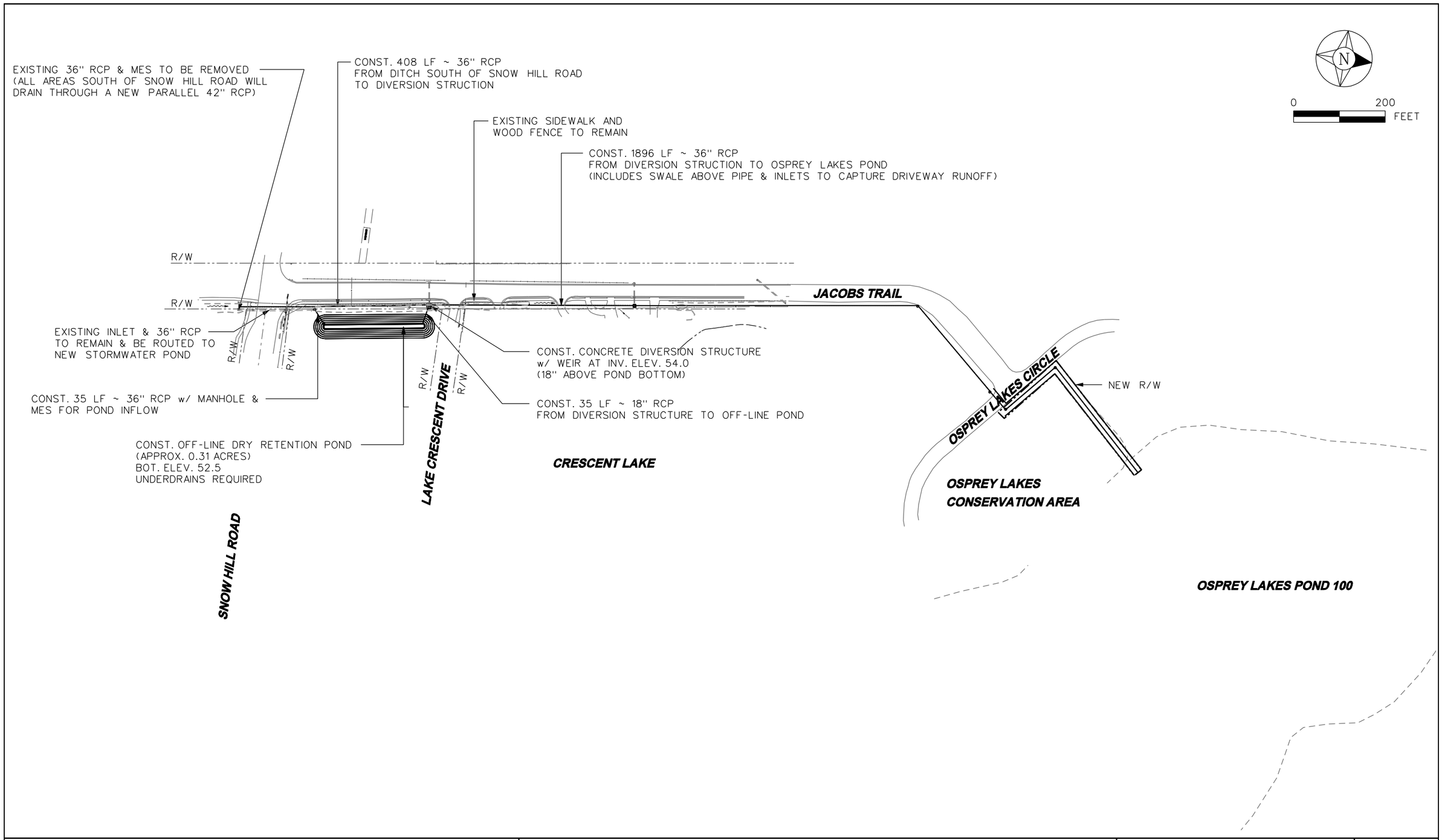
SINGHOFEN & ASSOCIATES, INC. **STORMWATER MANAGEMENT AND CIVIL ENGINEERING**	**SNOW HILL ROAD / JACOBS TRAIL** **OUTFALL IMPROVEMENT PROJECT**	**DESIGN LAYOUT** **ALTERNATE 3**	FIGURE **4.3** Project No. 27001.10



SINGHOFEN & ASSOCIATES, INC. **STORMWATER MANAGEMENT AND CIVIL ENGINEERING**	**SNOW HILL ROAD / JACOBS TRAIL** **OUTFALL IMPROVEMENT PROJECT**	**DESIGN LAYOUT** **ALTERNATE 4A**	FIGURE **4.4A** Project No. 27001.10



SINGHOFEN & ASSOCIATES, INC. **STORMWATER MANAGEMENT AND CIVIL ENGINEERING**	**SNOW HILL ROAD / JACOBS TRAIL** **OUTFALL IMPROVEMENT PROJECT**	**DESIGN LAYOUT** **ALTERNATE 4B**	FIGURE **4.4B** Project No. 27001.10



SINGHOFEN & ASSOCIATES, INC. STORMWATER MANAGEMENT AND CIVIL ENGINEERING	SNOWHILL ROAD / JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT	DESIGN LAYOUT ALTERNATIVE 4C	FIGURE 4.4C Project No. 27001.10

Table 4.1 Maximum Stages
Existing Conditions vs Design

Node ID	Location	Warning Elevation	Warning Elev. Location	Mean Annual Storm Event			10-Year Storm Event			25-Year Storm Event			50-Year Storm Event			100-Year Storm Event		
				Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)
Alternative 1: Dry Retention Pond																		
JTO000	Osprey Lakes Pond 200	38	TOB	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0
JTO100	Osprey Lakes Pond 100	39.20	TOB	37.9	37.9	0.0	38.0	38.0	0.0	38.0	38.0	0.0	38.1	38.1	0.0	38.3	38.3	0.0
JTO200	Osprey Lakes Tract C-4 Conservation Area	45.70	FF	44.6	44.6	0.0	45.0	45.0	0.0	45.1	45.1	0.0	45.3	45.3	0.0	45.5	45.5	0.0
JTO005	Osprey Lakes Tract C-2 Conservation Area	38.90	Rd Crown from plans	37.9	37.9	0.0	38.2	38.2	0.0	38.4	38.4	0.0	38.6	38.6	0.0	38.7	38.7	0.0
JTO010	Osprey Lakes Tract C-3 Conservation Area	38.90	Rd Crown from plans	38.6	38.6	0.0	39.1	39.1	0.0	39.2	39.2	0.0	39.3	39.3	0.0	39.4	39.4	0.0
JTO015	LAKE CRESCENT	51.98	Lot# 6 FF	48.5	48.1	-0.4	50.7	50.1	-0.6	51.5	50.4	-1.1	52.3	50.6	-1.6	52.5	50.7	-1.8
JTO018	D/S 313 Jacobs Trail Driveway	56.59	Lot# 38 FF	49.8	50.1	0.3	50.7	50.3	-0.4	51.5	50.4	-1.0	52.3	50.7	-1.6	52.5	50.8	-1.8
JTO020	U/S check dam	56.59	Lot# 38 FF	51.4	51.7	0.3	51.4	51.9	0.5	51.5	51.9	0.5	52.3	52.0	-0.3	52.5	52.0	-0.5
JTO025	MH Junction with Jacobs Trail Drainage System	57.53	Lot# 22 FF	52.7	52.6	0.0	52.7	53.2	0.5	52.7	53.4	0.6	52.9	53.5	0.5	53.4	53.6	0.2
JTO030	U/S 305 Jacobs Trail Driveway	56.50	Lot# 21 FF	55.6	___	___	55.8	___	___	55.8	___	___	55.9	___	___	55.9	___	___
JTO035	U/S check dam	56.21	Lot# 20 FF	55.6	___	___	55.8	___	___	55.8	___	___	55.9	___	___	55.9	___	___
JTO040	U/S 301 Jacobs Trail Driveway	56.70	Lot# 20 FF	56.9	___	___	57.1	___	___	57.1	___	___	57.2	___	___	57.2	___	___
JTO045	U/S Lake Crescent Drive	57.53	Lake Crescent Drive Crown	57.8	56.4	-1.4	58.1	56.8	-1.3	58.1	56.9	-1.3	58.2	56.9	-1.3	58.3	57.0	-1.3
JTO-POND	NEW POND	58.00	TOB	___	56.4	___	___	57.2	___	___	57.5	___	___	57.6	___	___	57.8	___
JTO050	D/S Snow Hill Road	58.40	Ditch TOB	57.8	___	___	58.1	___	___	58.2	___	___	58.2	___	___	58.3	___	___
JTO055	Snow Hill Road Inlet	59.24	MH Rim Elev.	57.8	56.4	-1.4	58.3	57.9	-0.4	58.4	58.2	-0.2	58.6	58.5	-0.1	58.7	58.7	0.0
JTO060	U/S Snow Hill Road	59.57	Snow Hill Road Crown	57.9	57.0	-0.9	58.5	58.0	-0.5	58.7	58.3	-0.4	59.0	58.6	-0.3	59.2	58.9	-0.3
JTO065	West of Walker Elementary	62.00	TOB	58.0	58.1	0.1	58.6	58.6	-0.1	58.8	58.7	-0.1	59.0	58.9	-0.1	59.2	59.1	0.0
JTO068	Wetland (south of school)	60.00	TOB	58.3	58.3	0.0	58.7	58.6	-0.1	58.8	58.8	-0.1	59.0	58.9	-0.1	59.2	59.1	0.0
JTO070	Swale (d/s of Avenue C)	60.40	Avenue C Crown from plans	59.8	59.8	0.0	60.2	60.2	0.0	60.3	60.3	0.0	60.4	60.4	0.0	60.5	60.5	0.0
JTO075	Swale (d/s of Avenue D)	61.30	Avenue D Crown from plans	60.3	60.3	0.0	60.7	60.7	0.0	60.8	60.8	0.0	60.9	60.9	0.0	61.0	61.0	0.0
JTO080	Swale (d/s of Avenue E)	59.96	Avenue E Crown from plans	60.5	60.5	0.0	60.9	60.9	0.0	61.0	61.0	0.0	61.1	61.1	0.0	61.2	61.2	0.0
JTO300	Snow Hill Road (west of Jacobs Trail)	59.21	Jacobs Trail Crown	57.9	57.9	0.0	58.3	58.3	0.0	58.5	58.5	0.0	58.6	58.6	0.0	58.7	58.8	0.1
JTO400	Snow Hill Road (D/S Walker Elem.)	59.00	Snow Hill Road Crown from plans	57.8	56.4	-1.4	58.3	57.9	-0.4	58.4	58.1	-0.3	58.6	58.4	-0.2	58.7	58.5	-0.2
JTO405	Walker Elementary Pond B & C	60.00	TOB	57.1	57.1	0.0	57.9	57.9	0.0	58.2	58.2	0.0	58.4	58.4	0.0	58.6	58.6	0.0
JTO500	Walker Elementary Pond A	60.00	TOB	57.7	57.7	0.0	59.2	59.2	0.0	59.5	59.5	0.0	59.6	59.6	0.0	59.6	59.6	0.0
JTO600	1st Street & Avenue C	60.40	Avenue C Crown from plans	59.8	59.8	0.0	60.2	60.2	0.0	60.3	60.3	0.0	60.4	60.4	0.0	60.5	60.5	0.0
JTO700	1st Street & Avenue D	61.30	Avenue D Crown from plans	60.3	60.3	0.0	60.7	60.7	0.0	60.8	60.8	0.0	60.9	60.9	0.0	61.0	61.0	0.0
JTO800	1st Street & Avenue E	59.96	Avenue E Crown from plans	60.5	60.5	0.0	60.9	60.9	0.0	61.0	61.0	0.0	61.1	61.1	0.0	61.2	61.2	0.0

Notes:
1. "Exist" refers to the 2008 existing conditions model .
2. "Design" refers to the 2008 design conditions model.
3. Maximum stage exceeds the warning elevation (Existing Conditions Model).
4. Maximum stage exceeds the DESIGN warning elevation (Design Conditions Model).
5. All elevations are based on the NAVD 1988 reference datum.
6. All roadway crown elevations were surveyed by Southeastern Surveying in 2007, unless otherwise noted.

Table 4.1 Maximum Stages
Existing Conditions vs Design

Node ID	Location	Warning Elevation [2]	Warning Elev. Location	Mean Annual Storm Event			10-Year Storm Event			25-Year Storm Event			50-Year Storm Event			100-Year Storm Event		
				Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)
Alternative 3: BMP Option																		
JTO000	Osprey Lakes Pond 200	38.00	TOB	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0
JTO100	Osprey Lakes Pond 100	39.20	TOB	37.9	37.9	0.0	38.0	38.0	0.0	38.0	38.0	0.0	38.1	38.1	0.0	38.3	38.2	0.0
JTO200	Osprey Lakes Tract C-4 Conservation Area	45.70	FF	44.6	44.6	0.0	45.0	45.0	0.0	45.1	45.1	0.0	45.3	45.3	0.0	45.5	45.5	0.0
JTO005	Osprey Lakes Tract C-2 Conservation Area	38.90	Rd Crown from plans	37.9	37.9	0.0	38.2	38.2	0.0	38.4	38.4	0.0	38.6	38.5	0.0	38.7	38.7	0.0
JTO010	Osprey Lakes Tract C-3 Conservation Area	38.90	Rd Crown from plans	38.6	38.6	-0.06	39.1	39.0	0.0	39.2	39.2	0.0	39.3	39.3	0.0	39.4	39.4	0.0
JTO015	LAKE CRESCENT	51.98	Lot# 6 FF	48.5	48.4	-0.2	50.7	50.2	-0.5	51.5	50.4	-1.1	52.3	50.6	-1.7	52.5	50.7	-1.8
JTO018	D/S 313 Jacobs Trail Driveway	56.59	Lot# 38 FF	49.8	50.0	0.2	50.7	50.3	-0.4	51.5	50.5	-1.0	52.3	50.6	-1.6	52.5	50.7	-1.8
JTO020	U/S check dam	56.59	Lot# 38 FF	51.4	51.6	0.2	51.4	51.9	0.5	51.5	52.0	0.5	52.3	52.1	-0.1	52.5	52.2	-0.3
JTO025	MH Junction with Jacobs Trail Drainage System	57.53	Lot# 22 FF	52.7	51.8	-0.9	52.7	52.3	-0.4	52.7	52.6	-0.1	52.9	52.9	0.0	53.4	53.2	-0.2
JTO030	U/S 305 Jacobs Trail Driveway	56.50	Lot# 21 FF	55.6	___	___	55.8	___	___	55.8	___	___	55.9	___	___	55.9	___	___
JTO035	U/S check dam	56.21	Lot# 20 FF	55.6	___	___	55.8	___	___	55.8	___	___	55.9	___	___	55.9	___	___
JTO040	U/S 301 Jacobs Trail Driveway	56.70	Lot# 20 FF	56.9	___	___	57.1	___	___	57.1	___	___	57.2	___	___	57.2	___	___
JTO045	U/S Lake Crescent Drive	57.53	Lake Crescent Drive Crown	57.8	53.8	-4.0	58.1	54.5	-3.5	58.1	54.9	-3.2	58.2	55.2	-3.0	58.3	55.5	-2.8
JTO050	D/S Snow Hill Road	58.40	Ditch TOB	57.8	55.2	-2.6	58.1	55.7	-2.4	58.2	56.0	-2.1	58.2	56.3	-1.9	58.3	56.5	-1.8
JTO055	Snow Hill Road Inlet	59.24	MH Rim Elev.	57.8	55.3	-2.5	58.3	56.0	-2.3	58.4	56.3	-2.1	58.6	56.6	-2.0	58.7	56.8	-1.9
JTO060	U/S Snow Hill Road	59.57	Snow Hill Road Crown	57.9	57.8	-0.1	58.5	58.4	-0.1	58.7	58.6	-0.1	59.0	58.8	-0.1	59.2	59.0	-0.1
JTO065	West of Walker Elementary	62.00	TOB	58.0	58.3	0.3	58.6	58.7	0.1	58.8	58.9	0.1	59.0	59.1	0.1	59.2	59.2	0.0
JTO068	Wetland (south of school)	60.00	TOB	58.3	58.3		58.7	58.7	0.1	58.8	58.9	0.1	59.0	59.1	0.1	59.2	59.2	0.0
JTO070	Swale (d/s of Avenue C)	60.40	Avenue C Crown from plans	59.8	59.8	0.0	60.2	60.2	0.0	60.3	60.3	0.0	60.4	60.4	0.0	60.5	60.5	0.0
JTO075	Swale (d/s of Avenue D)	61.30	Avenue D Crown from plans	60.3	60.3		60.7	60.7	0.0	60.8	60.8	0.0	60.9	60.9	0.0	61.0	61.0	0.0
JTO080	Swale (d/s of Avenue E)	59.96	Avenue E Crown from plans	60.5	60.5		60.9	60.9	0.0	61.0	61.0	0.0	61.1	61.1	0.0	61.2	61.2	0.0
JTO300	Snow Hill Road (west of Jacobs Trail)	59.21	Jacobs Trail Crown	57.9	57.9	0.0	58.3	58.3	0.0	58.5	#N/A	#N/A	58.6	#N/A	#N/A	58.7	#N/A	#N/A
JTO400	Snow Hill Road (D/S Walker Elem.)	59.00	Snow Hill Road Crown from plans	57.8	56.0	-1.8	58.3	56.0	-2.3	58.4	56.0	-2.4	58.6	56.0	-2.6	58.7	56.0	-2.7
JTO405	Walker Elementary Pond B & C	60.00	TOB	57.1	57.1	0.0	57.9	57.9	0.0	58.2	57.9	-0.3	58.4	57.9	-0.6	58.6	57.9	-0.8
JTO500	Walker Elementary Pond A	60.00	TOB	57.7	57.7	0.0	59.2	59.2	0.0	59.5	59.2	-0.3	59.6	59.2	-0.3	59.6	59.2	-0.4
JTO600	1st Street & Avenue C	60.40	Avenue C Crown from plans	59.8	59.8		60.2	60.2	0.0	60.3	60.2	-0.1	60.4	60.2	-0.2	60.5	60.2	-0.3
JTO700	1st Street & Avenue D	61.30	Avenue D Crown from plans	60.3	60.3		60.7	60.7	0.0	60.8	60.7	-0.1	60.9	60.7	-0.2	61.0	60.7	-0.3
JTO800	1st Street & Avenue E	59.96	Avenue E Crown from plans	60.5	60.5		60.9	60.9	0.0	61.0	60.9	-0.1	61.1	60.9	-0.2	61.2	60.9	-0.3

Notes:

1. "Exist" refers to the 2008 existing conditions model .
2. "Design" refers to the 2008 design conditions model.
3. Maximum stage exceeds the warning elevation (Existing Conditions Model).
4. Maximum stage exceeds the DESIGN warning elevation (Design Conditions Model).
5. All elevations are based on the NAVD 1988 reference datum.
6. All roadway crown elevations were surveyed by Southeastern Surveying in 2007, unless otherwise noted.

Table 4.1 Maximum Stages
Existing Conditions vs Design

Node ID	Location	Warning Elevation [2]	Warning Elev. Location	Mean Annual Storm Event			10-Year Storm Event			25-Year Storm Event			50-Year Storm Event			100-Year Storm Event		
				Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)
Alternative 4: By-Pass Option																		
JTO000	Osprey Lakes Pond 200	38.00	TOB	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0
JTO100	Osprey Lakes Pond 100	39.20	TOB	37.9	37.9	0.0	38.0	38.1	0.2	38.0	38.3	0.2	38.1	38.4	0.3	38.3	38.5	0.3
JTO200	Osprey Lakes Tract C-4 Conservation Area	45.70	FF	44.6	44.6	0.0	45.0	45.0	0.0	45.1	45.1	0.0	45.3	45.3	0.0	45.5	45.5	0.0
JTO005	Osprey Lakes Tract C-2 Conservation Area	38.90	Rd Crown from plans	37.9	38.0	0.1	38.2	38.5	0.3	38.4	38.8	0.4	38.6	39.0	0.5	38.7	39.2	0.5
JTO010	Osprey Lakes Tract C-3 Conservation Area	38.90	Rd Crown from plans	38.6	38.8	0.1	39.1	39.5	0.4	39.2	39.7	0.5	39.3	39.8	0.5	39.4	40.0	0.6
JTO011	New Swale	56.99	Lot# 13 FF	___	53.8	___	___	54.2	___	___	54.4	___	___	54.4	___	___	54.5	___
JTO012	New Swale	57.49	Lot# 14 FF	___	55.5	___	___	55.8	___	___	55.9	___	___	55.9	___	___	56.0	___
JTO013	New Swale	57.53	Lake Crescent Drive Crown	___	55.6	___	___	56.0	___	___	56.1	___	___	56.2	___	___	56.2	___
JTO015	LAKE CRESCENT	51.98	Lot# 6 FF	48.5	46.5	-2.0	50.7	47.1	-3.6	51.5	47.4	-4.1	52.3	47.6	-4.6	52.5	47.8	-4.7
JTO020	U/S check dam	56.59	Lot# 38 FF	51.4	___	___	51.4	___	___	51.5	___	___	52.3	___	___	52.5	___	___
JTO025	MH Junction with Jacobs Trail Drainage System	57.53	Lot# 22 FF	52.7	55.6	2.9	52.7	56.1	3.4	52.7	56.3	3.6	52.9	56.5	3.6	53.4	56.6	3.2
JTO030	U/S 305 Jacobs Trail Driveway	56.50	Lot# 21 FF	55.6	___	___	55.8	___	___	55.8	___	___	55.9	___	___	55.9	___	___
JTO035	U/S check dam	56.21	Lot# 20 FF	55.6	___	___	55.8	___	___	55.8	___	___	55.9	___	___	55.9	___	___
JTO040	U/S 301 Jacobs Trail Driveway	56.70	Lot# 20 FF	56.9	___	___	57.1	___	___	57.1	___	___	57.2	___	___	57.2	___	___
JTO045	U/S Lake Crescent Drive	57.53	Lake Crescent Drive Crown	57.8	55.6	-2.2	58.1	56.1	-2.0	58.1	56.3	-1.8	58.2	56.5	-1.7	58.3	56.6	-1.7
JTO050	D/S Snow Hill Road	58.40	Ditch TOB	57.8	55.7	-2.1	58.1	56.4	-1.7	58.2	56.9	-1.2	58.2	57.2	-1.1	58.3	57.3	-1.0
JTO055	Snow Hill Road Inlet	59.24	MH Rim Elev.	57.8	55.8	-2.0	58.3	56.5	-1.8	58.4	57.3	-1.1	58.6	57.6	-1.0	58.7	57.8	-0.9
JTO060	U/S Snow Hill Road	59.57	Snow Hill Road Crown	57.9	57.8	-0.1	58.5	58.4	-0.1	58.7	58.6	-0.1	59.0	58.9	-0.1	59.2	59.0	-0.1
JTO065	West of Walker Elementary	62.00	TOB	58.0	58.3	0.3	58.6	58.7	0.1	58.8	58.9	0.1	59.0	59.1	0.1	59.2	59.2	0.0
JTO068	Wetland (south of school)	60.00	TOB	58.3	58.3	0.0	58.7	58.7	0.1	58.8	58.9	0.1	59.0	59.1	0.1	59.2	59.2	0.0
JTO070	Swale (d/s of Avenue C)	60.40	Avenue C Crown from plans	59.8	59.8	0.0	60.2	60.2	0.0	60.3	60.3	0.0	60.4	60.4	0.0	60.5	60.5	0.0
JTO075	Swale (d/s of Avenue D)	61.30	Avenue D Crown from plans	60.3	60.3	0.0	60.7	60.7	0.0	60.8	60.8	0.0	60.9	60.9	0.0	61.0	61.0	0.0
JTO080	Swale (d/s of Avenue E)	59.96	Avenue E Crown from plans	60.5	60.5	0.0	60.9	60.9	0.0	61.0	61.0	0.0	61.1	61.1	0.0	61.2	61.2	0.0
JTO300	Snow Hill Road (west of Jacobs Trail)	59.21	Jacobs Trail Crown	57.9	57.9	0.0	58.3	58.3	0.0	58.5	58.5	0.0	58.6	58.6	0.0	58.7	58.7	0.0
JTO400	Snow Hill Road (D/S Walker Elem.)	59.00	Snow Hill Road Crown from plans	57.8	56.0	-1.8	58.3	56.0	-2.3	58.4	56.0	-2.4	58.6	56.0	-2.6	58.7	56.0	-2.7
JTO405	Walker Elementary Pond B & C	60.00	TOB	57.1	57.1	0.0	57.9	57.1	-0.8	58.2	57.1	-1.1	58.4	57.1	-1.3	58.6	57.1	-1.6
JTO500	Walker Elementary Pond A	60.00	TOB	57.7	57.7	0.0	59.2	57.7	-1.5	59.5	57.7	-1.8	59.6	57.7	-1.9	59.6	57.7	-1.9
JTO600	1st Street & Avenue C	60.40	Avenue C Crown from plans	59.8	59.8	0.0	60.2	59.8	-0.4	60.3	59.8	-0.5	60.4	59.8	-0.6	60.5	59.8	-0.7
JTO700	1st Street & Avenue D	61.30	Avenue D Crown from plans	60.3	60.3	0.0	60.7	60.3	-0.4	60.8	60.3	-0.5	60.9	60.3	-0.6	61.0	60.3	-0.7
JTO800	1st Street & Avenue E	59.96	Avenue E Crown from plans	60.5	60.5	0.0	60.9	60.5	-0.4	61.0	60.5	-0.5	61.1	60.5	-0.6	61.2	60.5	-0.7

Notes:

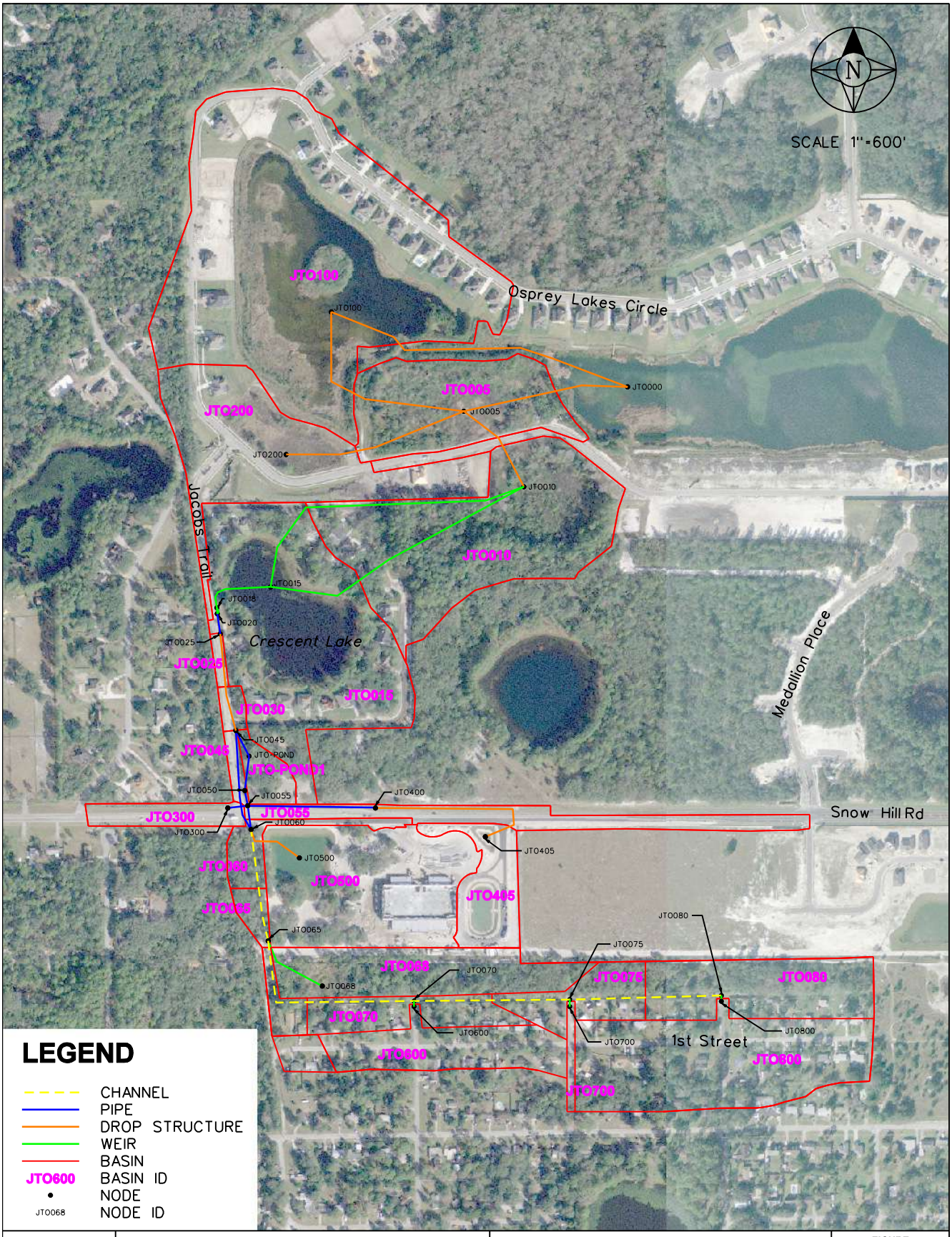
1. "Exist" refers to the 2008 existing conditions model .
2. "Design" refers to the 2008 design conditions model.
3. Maximum stage exceeds the warning elevation (Existing Conditions Model).
4. Maximum stage exceeds the DESIGN warning elevation (Design Conditions Model).
5. All elevations are based on the NAVD 1988 reference datum.
6. All roadway crown elevations were surveyed by Southeastern Surveying in 2007, unless otherwise noted.

Table 4.1 Maximum Stages
Existing Conditions vs Design

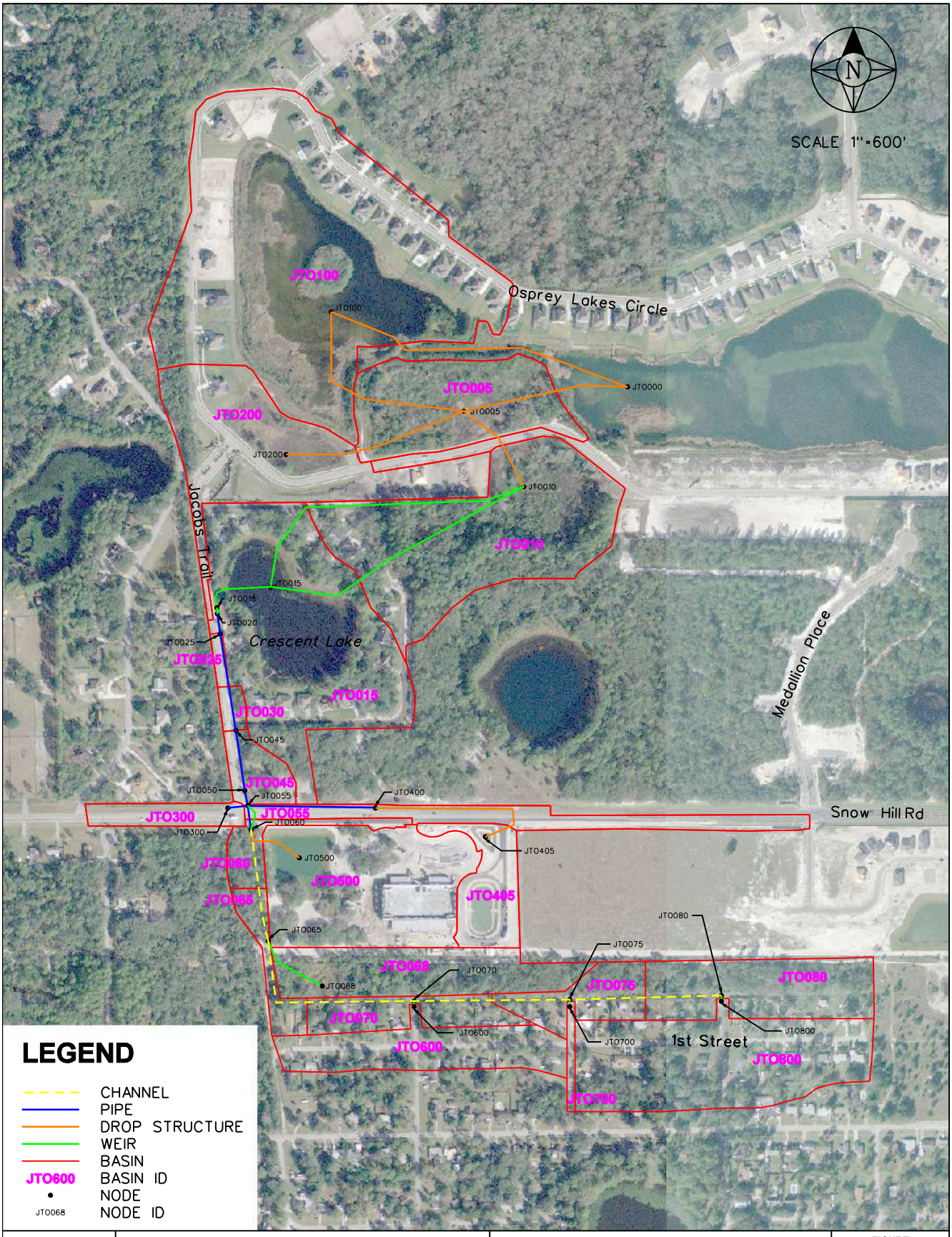
Node ID	Location	Warning Elevation [2]	Warning Elev. Location	Mean Annual Storm Event			10-Year Storm Event			25-Year Storm Event			50-Year Storm Event			100-Year Storm Event		
				Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)	Exist Stage (ft)	Design Stage (ft)	Difference (Design) - (Exist) (ft)
Alternative 4B: By-Pass Option with overflow to Lake Crescent during the 10-yr, 24-hour storm event or greater																		
JTO000	Osprey Lakes Pond 200	38.00	TOB	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0	37.9	37.9	0.0
JTO100	Osprey Lakes Pond 100	39.20	TOB	37.9	37.9	0.0	38.0	38.2	0.2	38.0	38.3	0.3	38.1	38.5	0.3	38.3	38.6	0.3
JTO200	Osprey Lakes Tract C-4 Conservation Area	45.70	FF	44.6	44.6	0.0	45.0	45.0	0.0	45.1	45.1	0.0	45.3	45.3	0.0	45.5	45.5	0.0
JTO005	Osprey Lakes Tract C-2 Conservation Area	38.90	Rd Crown from plans	37.9	38.1	0.2	38.2	38.7	0.5	38.4	38.9	0.5	38.6	39.1	0.5	38.7	39.2	0.6
JTO010	Osprey Lakes Tract C-3 Conservation Area	38.90	Rd Crown from plans	38.6	39.0	0.3	39.1	39.5	0.5	39.2	39.7	0.5	39.3	39.9	0.5	39.4	40.0	0.6
JTO011	New Swale	56.99	Lot# 13 FF	___	54.0	___	___	54.3	___	___	54.3	___	___	54.4	___	___	54.4	___
JTO012	New Swale	57.49	Lot# 14 FF	___	55.6	___	___	55.8	___	___	55.9	___	___	55.9	___	___	55.9	___
JTO013	New Swale	57.53	Lake Crescent Drive Crown	___	55.7	___	___	56.0	___	___	56.1	___	___	56.1	___	___	56.1	___
JTO015	LAKE CRESCENT	51.98	Lot# 6 FF	48.5	46.5	-2.0	50.7	47.1	-3.6	51.5	47.4	-4.1	52.3	47.7	-4.6	52.5	48.0	-4.6
JTO018	D/S 313 Jacobs Trail Driveway	56.59	Lot# 38 FF	49.8	49.1	-0.7	50.7	49.1	-1.6	51.5	49.3	-2.2	52.3	49.4	-2.9	52.5	49.5	-3.1
JTO020	U/S check dam	56.59	Lot# 38 FF	51.4	49.8	-1.6	51.4	49.8	-1.6	51.5	50.3	-1.2	52.3	50.9	-1.3	52.5	51.1	-1.5
JTO025	MH Junction with Jacobs Trail Drainage System	57.53	Lot# 22 FF	52.7	55.8	3.1	52.7	56.2	3.5	52.7	56.3	3.5	52.9	56.3	3.4	53.4	56.4	3.0
JTO030	U/S 305 Jacobs Trail Driveway	56.50	Lot# 21 FF	55.6	___	___	55.8	___	___	55.8	___	___	55.9	___	___	55.9	___	___
JTO035	U/S check dam	56.21	Lot# 20 FF	55.6	___	___	55.8	___	___	55.8	___	___	55.9	___	___	55.9	___	___
JTO040	U/S 301 Jacobs Trail Driveway	56.70	Lot# 20 FF	56.9	___	___	57.1	___	___	57.1	___	___	57.2	___	___	57.2	___	___
JTO045	U/S Lake Crescent Drive	57.53	Lake Crescent Drive Crown	57.8	55.8	-2.0	58.1	56.2	-1.9	58.1	56.3	-1.9	58.2	56.4	-1.9	58.3	56.5	-1.8
JTO050	D/S Snow Hill Road	58.40	Ditch TOB	57.8	56.0	-1.8	58.1	56.7	-1.4	58.2	56.9	-1.2	58.2	57.2	-1.0	58.3	57.5	-0.8
JTO055	Snow Hill Road Inlet	59.24	MH Rim Elev.	57.8	56.1	-1.7	58.3	57.0	-1.3	58.4	57.4	-1.0	58.6	57.8	-0.8	58.7	58.1	-0.6
JTO060	U/S Snow Hill Road	59.57	Snow Hill Road Crown	57.9	56.2	-1.7	58.5	57.2	-1.3	58.7	57.7	-1.1	59.0	58.0	-0.9	59.2	58.4	-0.8
JTO065	West of Walker Elementary	62.00	TOB	58.0	58.0	0.0	58.6	58.4	-0.2	58.8	58.6	-0.2	59.0	58.7	-0.3	59.2	58.9	-0.3
JTO068	Wetland (south of school)	60.00	TOB	58.3	58.3	0.0	58.7	58.5	-0.2	58.8	58.6	-0.2	59.0	58.8	-0.2	59.2	58.9	-0.3
JTO070	Swale (d/s of Avenue C)	60.40	Avenue C Crown from plans	59.8	59.8	0.0	60.2	60.2	0.0	60.3	60.3	0.0	60.4	60.4	0.0	60.5	60.5	0.0
JTO075	Swale (d/s of Avenue D)	61.30	Avenue D Crown from plans	60.3	60.3	0.0	60.7	60.7	0.0	60.8	60.8	0.0	60.9	60.9	0.0	61.0	61.0	0.0
JTO080	Swale (d/s of Avenue E)	59.96	Avenue E Crown from plans	60.5	60.5	0.0	60.9	60.9	0.0	61.0	61.0	0.0	61.1	61.1	0.0	61.2	61.2	0.0
JTO300	Snow Hill Road (west of Jacobs Trail)	59.21	Jacobs Trail Crown	57.9	57.9	0.0	58.3	58.3	0.0	58.5	58.5	0.0	58.6	58.6	0.0	58.7	58.7	0.0
JTO400	Snow Hill Road (D/S Walker Elem.)	59.00	Snow Hill Road Crown from plans	57.8	56.1	-1.7	58.3	57.0	-1.3	58.4	57.4	-1.0	58.6	57.8	-0.8	58.7	58.1	-0.6
JTO405	Walker Elementary Pond B & C	60.00	TOB	57.1	57.1	0.0	57.9	57.9	0.0	58.2	58.2	0.0	58.4	58.4	0.0	58.6	58.6	0.0
JTO500	Walker Elementary Pond A	60.00	TOB	57.7	57.7	0.0	59.2	59.2	0.0	59.5	59.5	0.0	59.6	59.6	0.0	59.6	59.6	0.0
JTO600	1st Street & Avenue C	60.40	Avenue C Crown from plans	59.8	59.8	0.0	60.2	60.2	0.0	60.3	60.3	0.0	60.4	60.4	0.0	60.5	60.5	0.0
JTO700	1st Street & Avenue D	61.30	Avenue D Crown from plans	60.3	60.3	0.0	60.7	60.7	0.0	60.8	60.8	0.0	60.9	60.9	0.0	61.0	61.0	0.0
JTO800	1st Street & Avenue E	59.96	Avenue E Crown from plans	60.5	60.5	0.0	60.9	60.9	0.0	61.0	61.0	0.0	61.1	61.1	0.0	61.2	61.2	0.0

Notes:

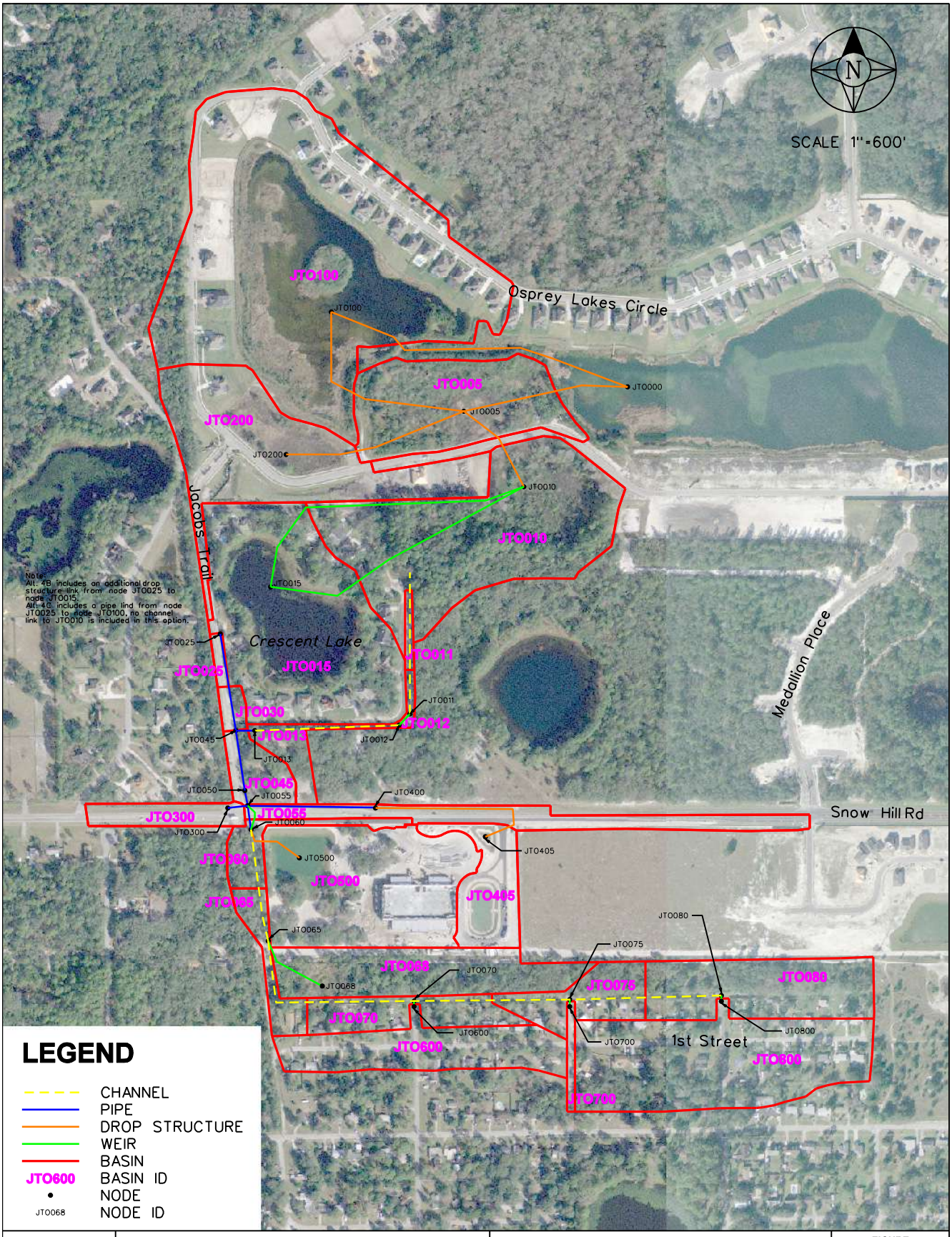
1. "Exist" refers to the 2008 existing conditions model .
2. "Design" refers to the 2008 design conditions model.
3. Maximum stage exceeds the warning elevation (Existing Conditions Model).
4. Maximum stage exceeds the DESIGN warning elevation (Design Conditions Model).
5. All elevations are based on the NAVD 1988 reference datum.
6. All roadway crown elevations were surveyed by Southeastern Surveying in 2007, unless otherwise noted.



SAI	SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVMENT PROJECT	SUBBASIN MAP ALTERNATIVE 1	FIGURE 4.5
			Project No. 27001.10



SAI	SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVMENT PROJECT	SUBBASIN MAP ALTERNATIVE 3	FIGURE 4.6
			Project No. 27001.10



SAI	SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVMENT PROJECT	SUBBASIN MAP ALTERNATIVE 4	FIGURE 4.7
			Project No. 27001.10

Table 4.2 - Preliminary Opinion of Probable Cost

Snow Hill Road / Jacobs Trail Outfall Improvement Project

Design Alternative 1 - Offline Dry Retention Pond

By: HLB

8/23/2008

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
101-1	MOBILIZATION (Limit 6% of Base Bid)	1	LS	$ 14,600.00	$ 14,600.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	$ 20,000.00	$ 20,000.00
104-14	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	$ 10,000.00	$ 10,000.00
110-1-1	CLEARING & GRUBBING	1	AC	$ 5,000.00	$ 4,400.00
120-1	EXCAVATION, REGULAR	1,468	CY	$ 15.00	$ 22,020.00
430-171-101	PIPE CONC CULV (CLASS III) (18" SS)	35	LF	$ 66.64	$ 2,332.40
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	1,107	LF	$ 101.91	$ 112,814.37
425-2-91	MANHOLES (J-8) (<10')	1	EA	$ 7,071.72	$ 7,071.72
425-3-081	JUNCTION BOX (DRAINAGE) (<10')	1	EA	$ 10,000.00	$ 10,000.00
425-1-543	INLETS (DT BOT) (TYPE D w/ 2-TRAV. SLOTS) (J BOT., <10')	4	EA	$ 8,236.48	$ 32,945.90
430-984-125	MITERED END SECTION (18")	1	EA	$ 1,686.25	$ 1,686.25
430-984-138	MITERED END SECTION (36")	2	EA	$ 5,006.47	$ 10,012.94
570-1-2	PERFORMANCE TURF	2850	SY	$ 3.46	$ 9,849.60
				SUB-TOTAL =	$213,133
				20% contingency (rounded to nearest $100) =	$42,600
				Construction Cost Subtotal =	$255,733
				TOTAL STORMWATER PROJECT COST (rounded to nearest $100)=	**$255,700.00**

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Emergency Overflow Structure					
425-1-551.	INLETS (DT BOT) (TYPE E) (MODIFIED SLOT) (<10')	1	EA	$ 2,712.27	$ 2,712.27
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	290	LF	$ 101.91	$ 29,553.90
430-982-138	MITERED END SECTION (36")	1	EA	$ 2,600.00	$ 2,600.00
				Overflow Structure Construction Cost Subtotal =	$34,866

General Notes:

1. All costs are considered preliminary estimates.
2. Costs do not include construction administration.
3. Unit Prices Source: Florida Department of Transportation, Item Average Unit Cost (AREA 8; From 2007/05/01 to 2008/06/20).

Table 4.2 - Preliminary Opinion of Probable Cost

Snow Hill Road / Jacobs Trail Outfall Improvement Project

Design Alternative 3 - BMP Option

By: HLB

8/23/2008

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
101-1	MOBILIZATION (Limit 6% of Base Bid)	1	LS	$ 9,800.00	$ 9,800.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	$ 5,000.00	$ 5,000.00
104-14	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	$ 10,000.00	$ 10,000.00
110-1-1	CLEARING & GRUBBING	0	AC	$ 5,000.00	$ 2,250.00
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	813	LF	$ 101.91	$ 82,852.83
425-1-543	INLETS (DT BOT) (TYPE D w/ 2-TRAV. SLOTS) (J BOT., <10')	5	EA	$ 6,863.73	$ 34,318.65
425-2-91	MANHOLES (J-8) (<10')	1	EA	$ 7,071.72	$ 7,071.72
430-984-138	MITERED END SECTION (36")	1	EA	$ 5,006.47	$ 5,006.47
BMP	BEST MANAGEMENT PRACTICE (FINAL DESIGN)	1	EA	$ 12,000.00	$ 12,000.00
570-1-2	PERFORMANCE TURF	1,450	SY	$ 3.46	$ 5,011.20
				SUB-TOTAL =	$148,511
				20% contingency (rounded to nearest $100) =	$29,700
				Construction Cost Subtotal =	$178,211
				TOTAL STORMWATER PROJECT COST (rounded to nearest $100)=	**$178,200.00**

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Emergency Overflow Structure					
425-1-551.	INLETS (DT BOT) (TYPE E) (MODIFIED SLOT) (<10')	1	EA	$ 2,712.27	$ 2,712.27
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	290	LF	$ 101.91	$ 29,553.90
430-982-138	MITERED END SECTION (36")	1	EA	$ 2,600.00	$ 2,600.00
				Overflow Structure Construction Cost Subtotal =	$34,866

General Notes:

1. All costs are considered preliminary estimates.
2. Costs do not include construction administration.
3. Unit Prices Source: Florida Department of Transportation, Item Average Unit Cost (AREA 8; From 2007/05/01 to 2008/06/20).

Table 4.2 - Preliminary Opinion of Probable Cost

Snow Hill Road / Jacobs Trail Outfall Improvement Project

Design Alternative 4A - By-Pass Swale Option

By: HLB

8/23/2008

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
101-1	MOBILIZATION (Limit 6% of Base Bid)	1	LS	$ 35,500.00	$ 35,500.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	$ 5,000.00	$ 5,000.00
104-14	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	$ 10,000.00	$ 10,000.00
110-1-1	CLEARING & GRUBBING	1	AC	$ 5,000.00	$ 6,100.00
120-1	EXCAVATION, REGULAR	1,800	CY	$ 15.00	$ 27,000.00
430-171-101	PIPE CONC CULV (CLASS III) (18" SS)	448	LF	$ 66.64	$ 29,854.72
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	276	LS	$ 101.91	$ 28,127.16
425-1-541	INLETS (DT BOT) (TYPE D w/ 2-TRAV. SLOTS) (<10')	3	EA	$ 3,581.56	$ 10,744.67
425-1-543	INLETS (DT BOT) (TYPE D w/ 2-TRAV. SLOTS) (J BOT., <10')	2	EA	$ 8,236.48	$ 16,472.95
430-984-138	MITERED END SECTION (36")	1	EA	$ 5,006.47	$ 5,006.47
400-4-11	CONC CLASS IV (RETAINING WALLS)	389	CY	$ 938.03	$ 364,892.89
530-3-4	RIPRAP (RUBBLE)	480	TN	$ 140.42	$ 67,403.52
570-1-2	PERFORMANCE TURF	6000	SY	$ 3.46	$ 20,736.00
				SUB-TOTAL =	$576,338
				20% contingency (rounded to nearest $100) =	$115,300
				Construction Cost Subtotal =	$691,638
				TOTAL STORMWATER PROJECT COST (rounded to nearest $100)=	**$691,600.00**

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Emergency Overflow Structure					
425-1-551.	INLETS (DT BOT) (TYPE E) (MODIFIED SLOT) (<10')	1	EA	$ 2,712.27	$ 2,712.27
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	290	LF	$ 101.91	$ 29,553.90
430-982-138	MITERED END SECTION (36")	1	EA	$ 2,600.00	$ 2,600.00
				Overflow Structure Construction Cost Subtotal =	$34,866

General Notes:

1. All costs are considered preliminary estimates.
2. Costs do not include construction administration.
3. Unit Prices Source: Florida Department of Transportation, Item Average Unit Cost (AREA 8; From 2007/05/01 to 2008/06/20).

Table 4.2 - Preliminary Opinion of Probable Cost

Snow Hill Road / Jacobs Trail Outfall Improvement Project

Design Alternative 4B - By-Pass Swale Option w/ Overflow to Crescent Lake

By: HLB

8/23/2008

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
101-1	MOBILIZATION (Limit 6% of Base Bid)	1	LS	$ 35,800.00	$ 35,800.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	$ 5,000.00	$ 5,000.00
104-14	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	$ 10,000.00	$ 10,000.00
110-1-1	CLEARING & GRUBBING	1	AC	$ 5,000.00	$ 6,100.00
120-1	EXCAVATION, REGULAR	1,800	CY	$ 15.00	$ 27,000.00
430-171-101	PIPE CONC CULV (CLASS III) (18" SS)	536	LF	$ 66.64	$ 35,719.04
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	276	LS	$ 101.91	$ 28,127.16
425-1-541	INLETS (DT BOT) (TYPE D w/ 2-TRAV. SLOTS) (<10')	3	EA	$ 3,581.56	$ 10,744.67
425-1-543	INLETS (DT BOT) (TYPE D w/ 2-TRAV. SLOTS) (J BOT., <10')	2	EA	$ 8,236.48	$ 16,472.95
430-984-138	MITERED END SECTION (36")	1	EA	$ 5,006.47	$ 5,006.47
400-4-11	CONC CLASS IV (RETAINING WALLS)	389	CY	$ 938.03	$ 364,892.89
530-3-4	RIPRAP (RUBBLE)	480	TN	$ 140.42	$ 67,403.52
570-1-2	PERFORMANCE TURF	6000	SY	$ 3.46	$ 20,736.00
				SUB-TOTAL =	$582,203
				20% contingency (rounded to nearest $100) =	$116,400
				Construction Cost Subtotal =	$698,603
				TOTAL STORMWATER PROJECT COST (rounded to nearest $100)=	**$698,600.00**

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Emergency Overflow Structure					
425-1-551.	INLETS (DT BOT) (TYPE E) (MODIFIED SLOT) (<10')	1	EA	$ 2,712.27	$ 2,712.27
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	290	LF	$ 101.91	$ 29,553.90
430-982-138	MITERED END SECTION (36")	1	EA	$ 2,600.00	$ 2,600.00
				Overflow Structure Construction Cost Subtotal =	$34,866

General Notes:

1. All costs are considered preliminary estimates.
2. Costs do not include construction administration.
3. Unit Prices Source: Florida Department of Transportation, Item Average Unit Cost (AREA 8; From 2007/05/01 to 2008/06/20).

Table 4.2 - Preliminary Opinion of Probable Cost

Snow Hill Road / Jacobs Trail Outfall Improvement Project

Design Alternative 4C - By-Pass Option to Osprey Lakes

By: HLB

8/23/2008

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
101-1	MOBILIZATION (Limit 6% of Base Bid)	1	LS	$ 24,300.00	$ 24,300.00
102-1	MAINTENANCE OF TRAFFIC	1	LS	$ 20,000.00	$ 20,000.00
104-14	PREVENTION, CONTROL, AND ABATEMENT OF EROSION AND WATER POLLUTION	1	LS	$ 10,000.00	$ 10,000.00
110-1-1	CLEARING & GRUBBING	1	AC	$ 5,000.00	$ 4,400.00
120-1	EXCAVATION, REGULAR	1,468	CY	$ 15.00	$ 22,020.00
430-171-101	PIPE CONC CULV (CLASS III) (18" SS)	35	LF	$ 66.64	$ 2,332.40
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	2,339	LF	$ 101.91	$ 238,367.49
425-2-91	MANHOLES (J-8) (<10')	5	EA	$ 7,071.72	$ 35,358.60
425-3-081	JUNCTION BOX (DRAINAGE) (<10')	1	EA	$ 10,000.00	$ 10,000.00
425-1-543	INLETS (DT BOT) (TYPE D w/ 2-TRAV. SLOTS) (J BOT., <10')	4	EA	$ 8,236.48	$ 32,945.90
430-984-125	MITERED END SECTION (18")	1	EA	$ 1,686.25	$ 1,686.25
430-984-140	MITERED END SECTION (42")	3	EA	$ 5,837.23	$ 17,511.70
570-1-2	PERFORMANCE TURF	2850	SY	$ 3.46	$ 9,849.60
				SUB-TOTAL =	$374,472
				20% contingency (rounded to nearest $100) =	$74,900
				Construction Cost Subtotal =	$449,372
				TOTAL STORMWATER PROJECT COST (rounded to nearest $100)=	**$449,400.00**

ITEM NO.	DESCRIPTION	EST. QTY.	UNIT	UNIT PRICE	CONTRACT PRICE
Emergency Overflow Structure					
425-1-551.	INLETS (DT BOT) (TYPE E) (MODIFIED SLOT) (<10')	1	EA	$ 2,712.27	$ 2,712.27
430-171-102	PIPE CONC CULV (CLASS III) (36" SS)	290	LF	$ 101.91	$ 29,553.90
430-982-138	MITERED END SECTION (36")	1	EA	$ 2,600.00	$ 2,600.00
				Overflow Structure Construction Cost Subtotal =	$34,866

General Notes:

1. All costs are considered preliminary estimates.
2. Costs do not include construction administration.
3. Unit Prices Source: Florida Department of Transportation, Item Average Unit Cost (AREA 8; From 2007/05/01 to 2008/06/20).

Table 4.3 Design Alternative Evaluation Matrix - Snow Hill Road / Jacobs Trial Outfall

	Alternative						
		1	2	3	4A	4B	4C
Project Description	Do-Nothing	Dry Retention Pond at Seminole County Property	Wet Detention Pond Adjacent to Lk. Crescent	BMP Option	By-Pass Option to Wetland	By-Pass Option to Wetland w/ Overflow to Crescent Lake	By-Pass Option to Osprey Lakes Pond
Estimated Construction Cost	$0	$255,700	(no cost or ICPR model was developed)	$178,200	$691,600	$698,600	$449,400
Social Acceptability	3.0	3.0	2.0	4.0	1.0	1.0	1.0
Construction Cost	5.0	4.0	2.0	5.0	3.0	3.0	3.0
Public Safety	1.0	5.0	5.0	5.0	4.0	4.0	5.0
Hydraulic Performance	2.0	5.0	5.0	4.0	5.0	5.0	5.0
Permitting	5.0	5.0	1.0	5.0	2.0	2.0	2.0
Environmental Implications	2.0	5.0	1.0	4.0	1.0	1.0	2.0
ROW and Easement Requirement	5.0	4.0	1.0	4.0	2.0	2.0	2.0
Construction Considerations	5.0	4.0	3.0	5.0	2.0	2.0	2.0
Maintenance	1.0	5.0	4.0	2.0	3.0	3.0	3.0
Total score	29.0	40.0	24.0	38.0	23.0	23.0	25.0

Evaluation Criteria:

Criteria	Description	Score = 1	Score = 5
Social Acceptability	Public perception and acceptance of project including negative impacts and benefits of the project that will influence that perception.	Least Acceptable	Most Acceptable
Construction Cost	Comparison of total estimated construction costs excluding land acquisition, design engineering, permitting, and wetland mitigation.	Highest Cost	Lowest Cost
Public Safety	Comparison of safety concerns with regard to the existing open ditch hazard to pedestrians and the health issue associated with drinking wells.	Highest Safety	Lowest Safety
Hydraulic Performance	Comparison of hydraulic performance.	Least Protection	Most Protection
Permitting	Difficulty involved in obtaining permitting for the project.	Most difficult	Least Difficult
Environmental Implications	Difficulties due to negative environmental impacts including wetland, wildlife, or other impacts to natural resources.	Most difficult	Least Difficult
ROW and Easement Requirements	Comparison of the total ROW and Easement requirements for the project.	Highest Requirements	Lowest Requirements
Construction Considerations	Difficulty in constructing the project.	Most difficult	Least Difficult
Maintenance	Comparison of maintenance requirements.	High Maintenance	Low Maintenance

Report of Geotechnical Engineering Investigation

JACOBS TRAIL CULVERT REPLACEMENT

Seminole County, Florida

GEC Project No. 2684G

Geotechnical and Environmental Consultants, Inc.

Geotechnical and Environmental Consultants, Inc.
At the very foundation of our community

September 5, 2007

Singhofen & Associates, Inc.
925 South Semoran Boulevard, Suite 104
Winter Park, Florida 32792

Attention: Ms. Heather Patterson, E.I.

Subject: Report of Geotechnical Engineering Investigation
JACOBS TRAIL CULVERT REPLACEMENT
Seminole County, Florida
GEC Project No. 2684G

Dear Ms. Patterson:

Geotechnical and Environmental Consultants, Inc. (GEC) is pleased to present this Report of Geotechnical Engineering Investigation for the above-referenced project. GEC performed this study in general accordance with the scope of work described in our Revised Proposal No. 4605G dated February 8, 2007. We conducted this study to explore general subsurface conditions along the proposed culvert improvement alignment and to use the information obtained to develop geotechnical engineering recommendations regarding design and construction of the culvert improvements. This report documents our field investigation, laboratory testing, engineering analyses, and geotechnical recommendations for this project.

GEC appreciates the opportunity to be of service to you on this project and trusts that the information contained herein is sufficient for your needs. Should you have any questions concerning the contents of this report, or if we may be of further assistance, please contact us.

Very truly yours,

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS, INC.

Kevin J. Hayden, E.I.
Engineer Intern

Daniel C. Stanfill, P.E.
Senior Project Manager
Florida Registration No. 42763

9/5/07

KJH/DCS/crp

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www.g-e-c.com

OFFICES IN ORLANDO AND KISSIMMEE

Table of Contents

1.0 SITE AND PROJECT DESCRIPTION

The project site is located in Sections 20 and 21, Township 21 South, and Range 32 East, in Seminole County, Florida. More specifically, the project area is located along the east side of Jacobs Trail from Snow Hill Road to approximately 400 feet south of Lake Crescent Drive. According to the USGS Oviedo, Florida Quadrangle map (Figure 1), existing ground surface elevations across the subject site range from approximately +50 to +59 feet NGVD.

...project plans consist of the installation of an approximate 500 foot culvert...

We understand project plans consist of the installation of an approximate 500 foot culvert along Jacobs Trail. The culvert may be up to 36 inches in diameter and no deeper than about 5 feet below existing grade.

2.0 NRCS SOIL SURVEY REVIEW

The NRCS Soil Survey of Seminole County was reviewed to obtain near-surface soils and groundwater information in the vicinity of the subject site. An excerpt from the NRCS (formerly SCS) Soil Survey Map of Seminole County is shown on Figure 1 in the Appendix. According to the NRCS, the following soils are present within the projects limits:

Table 1
NRCS Soil Survey Summary

Soil Unit Map No.	Soil Name	Depth (in)	Description	USCS Classification Symbol	Depth to Seasonal High Groundwater (ft)
27	Pomello fine sand, 0 to 5 percent slopes	0 - 31 31 - 40 40 - 80	Fine sand Coarse sand, sand, fine sand Coarse sand, sand, sine sand	SP, SP-SM SP-SM, SM SP, SP-SM	2.0 - 3.5
31	Tavares fine sand, 0 to 5 percent slopes	0 - 6 6 - 80	Fine sand Sand, fine sand	SP, SP-SM SP, SP-SM	3.5 - 6.0
	Millhopper fine sand, 0 to 5 percent slopes	0 - 45 45 - 80	Fine sand Sandy loam, fine sandy loam, sandy clay loam	SP-SM, SM SM, SM-SC, SC	

The soil units listed above are classified as sands with varying amounts of silt fines (SP, SP-SM, SM, SM-SC, SC). These soil units are generally appropriate for the proposed culvert. The NRCS predicts seasonal high groundwater levels within the site limits to range from 2 feet below ground surface to 6 feet below ground surface.

Information contained in the NRCS Soil Survey is very general and may be outdated. It may not therefore be reflective of actual soil and groundwater conditions, particularly if recent development in the site vicinity has modified soil conditions or surface/subsurface drainage.

3.0 SUBSURFACE EXPLORATION

In addition to consulting the sources of information previously discussed for regional and site-specific soils data, GEC conducted a subsurface exploration to evaluate soil and groundwater conditions.

GEC explored the subsurface conditions at the subject site by performing six machine auger borings (AB-1 through AB-6) to a depth of 15 feet below existing ground surface from along the top edge of the swale currently located along the site alignment. GEC also performed six hand auger borings (HA-1 through HA-6) to depths generally ranging from 3 to 3.5 feet below existing ground surface from the bottom of the swale. However, boring HA-5 was performed in an area where the swale was not present and was performed to a depth of 9 feet below existing ground surface. In addition, GEC performed manual muck probes around the outfall structure by the lake. However, muck was not encountered.

3.1 Boring Locations

Boring locations were not established by survey, but rather by taping from prominent site features at suitable locations described by you...

The approximate locations of the borings drilled for this study are shown in Figure 2. Boring locations were not established by survey, but rather by taping from prominent site features at suitable locations described by you. Although the boring locations are, therefore, given only approximately, the methods used to locate the borings are, in GEC's opinion, sufficient to meet the intent of our study. If greater accuracy is desired, a registered Professional Land Surveyor should be retained to survey the boring locations.

3.2 Machine Auger Borings

Machine auger borings were performed in general accordance with ASTM Procedure D-4700. Machine auger borings were made by hydraulically turning a 4-inch wide continuous flight, solid-stem, auger into the ground in 5-foot increments until the desired boring termination depth was achieved. The auger flights were retrieved in 5-foot increments and examined by our technician prior to collection of representative soil samples. The samples were placed in sealed jars and transported to GEC's laboratory for further examination and limited laboratory testing.

3.3 Hand Auger Borings

Our engineering technician performed standard barrel hand auger borings, ASTM D-1452, by manually turning a 3-inch diameter, 6-inch long sampler into the soil until it was full. He then retrieved the sampler and visually examined and classified the soil. This procedure was repeated until the desired termination depth was achieved or the prevailing

3.3 Hand Auger Borings (Cont'd)

groundwater levels caused the boring to collapse. Our technician collected representative samples for further visual examination and limited laboratory testing.

3.4 Manual Muck Probes

Manual muck probes were performed by pushing a slender metal rod into the surficial soil and evaluating the relative resistance of the soil to manual penetration. Highly organic soils, such as muck and/or peat, are characteristically very soft and will easily yield to the manual probe. Manual probes, however, cannot detect peat or muck layers which are present beneath layers of sand or dense soils which cannot be penetrated. The probes can also penetrate to some extent in very loose sands which may be present beneath peat or muck layers. In addition, no soil samples are obtained for visual examination or laboratory testing. The soil type is inferred solely by evaluating the relative resistance of the soil to penetration. These limitations can lead to some under-estimation or over-estimation of peat or muck layer thicknesses. The probe data presented in this report should be evaluated with these limitations in mind and these estimations are not intended to be used for quantity estimates of any kind.

3.5 Groundwater Measurement

A GEC engineering technician measured the depth to groundwater in the boreholes at the time of drilling and again after approximately 24 hours. Once the 24-hour groundwater measurement was recorded, the boreholes were then backfilled with soil cuttings to the prevailing ground surface.

4.0 LABORATORY TESTING

Selected soil samples retrieved from our borings were tested in accordance with Florida Standard Testing Methods (FM). The GEC laboratory is inspected annually by the Construction Materials and Engineering Council, Inc. (CMEC) to verify compliance with FM. Our laboratory testing program is summarized on the following table:

Table 2
Summary of Laboratory Testing Program

Type of Test	Number of Tests
Percent Fines (FM 1-T88)	6
Atterberg Limits (FM 1-T89/90)	1
Natural Moisture Content (FM 1-T265)	1
Corrosion Series (FM S-550/551/552/553)	3

4.0 LABORATORY TESTING (Cont'd)

The individual results of our laboratory tests are shown adjacent to the soil profiles at the approximate depths from which the tested samples were obtained. The results are presented on the Boring Results sheet (Figure 3) in the Appendix.

Two soil and one water corrosion series test were performed on representative samples obtained along the site location to evaluate the substructure environmental classification. The test results are summarized in the following table:

Table 3
Soil Corrosion Series Results

Boring No.	Substructure Environment Classification	
	Concrete	Steel
HA-3	E.A.*	E.A.
HA-6	M.A.**	M.A.
Water Sample	E.A.	M.A.

* Extremely Aggressive **Moderately Aggressive

In accordance with the FDOT Structure Design Guidelines and the results of our corrosion series test results, which are included in Table 4 in the Appendix, the substructure environmental classification is moderately to extremely aggressive for both concrete and steel bridge components.

5.0 DESCRIPTION OF SUBSURFACE CONDITIONS

The auger boring results are included in the Appendix. The boring logs describe the soil layers using the Unified Soil Classification System (USCS) symbol (e.g. SP-SM) and ASTM soils descriptions (e.g. sand with silt). We based our soil classifications and descriptions on visual examination and the test results shown on Figure 3.

The boring logs indicate subsurface conditions only at the specific boring locations at the time of our field exploration.

The boring logs indicate subsurface conditions only at the specific boring locations at the time of our field exploration.

Subsurface conditions, including groundwater levels, at other locations of the subject site may differ from conditions we encountered at the boring locations. Moreover, conditions at the boring locations can change over time. Groundwater levels fluctuate seasonally, and soil conditions can be altered by earthmoving operations.

5.0 DESCRIPTION OF SUBSURFACE CONDITIONS (Cont'd)

The depths and thicknesses of the subsurface strata indicated on the boring logs were interpolated between samples obtained at different depths in the borings. The actual transition between soil layers may be different than indicated. *These stratification lines were used for our analytical purposes. Earthwork quantity estimates based on the results of the borings will vary from the actual quantities measured during construction.*

5.1 Boring Results

In general, the machine auger borings (AB-1 through AB-6) and hand auger borings (HA-1 through HA-6), typically encountered fine sand with varying silt content (SP-SM, SM) from existing ground surface to the termination depths explored. For specific soil information at each boring location, please refer to our Boring Results sheet (Figure 3) in the Appendix.

5.2 Groundwater

Groundwater levels were measured at least 24 hours after completion of the borings. Groundwater levels were encountered at depths ranging from 6.7 to 9 feet below existing ground surface in the machine auger boring locations. Groundwater levels were encountered at depths ranging from 0.9 to 2.1 feet below existing ground surface in the hand auger boring locations with the exception of boring HA-5. Boring HA-5 encountered the groundwater table at a depth of 6.8 feet. It should be noted that the locations of the machine auger borings and boring HA-5 were not taken from the bottom of the swale. The encountered groundwater levels are presented on the Boring Results sheet (Figure 3) in the Appendix.

Groundwater levels can vary seasonally and with changes in subsurface conditions between boring locations. Alterations in surface and/or subsurface drainage brought about by site development can also affect groundwater levels. *Therefore, groundwater depths measured at different times or at different locations on the site can be expected to vary from those measured by GEC during this investigation.*

For purposes of this report, estimated seasonal high groundwater levels are defined as groundwater levels that are anticipated at the end of the wet season during a "normal rainfall" year under pre-development site conditions. We define a "normal rainfall" year as a year in which rainfall quantity and distribution were at or near historical averages.

Our estimated seasonal high groundwater levels are presented on the Boring Results sheet (Figure 3) in the Appendix.

We estimate that predevelopment seasonal high groundwater levels at our boring locations will range from about 0.0 to 5.5 feet below ground surface, depending on site topography. Our estimated seasonal high groundwater levels are presented on the Boring Results sheet (Figure 3) in the Appendix.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Borings cannot be relied upon to accurately reflect the variations that usually exist between boring locations...

The conclusions and recommendations contained in this report are based in part on the data obtained from a limited number of soil samples and groundwater measurements obtained from widely-spaced borings. The sampling methods used indicate subsurface conditions only at the specific boring locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Borings cannot be relied upon to accurately reflect the variations that usually exist between boring locations and these variations may not become evident until construction. If variations from the subsurface conditions described in this report do become evident during construction or if the project characteristics described in this report change, GEC should be retained to reevaluate this report's conclusions and recommendations in light of such changes.

6.1 Pipe Bedding, Backfill and Compaction

The majority of the soils encountered in the auger borings are generally suitable for use as pipe bedding material and pipe excavation backfill.

The majority of the soils encountered in the auger borings are generally suitable for use as pipe bedding material and pipe excavation backfill. Ideally, backfill soils should consist of non-plastic sands with less than about 12% fines content. The fill should not contain any significant amount of organic substances (less than 3% by weight) or other deleterious materials. The contractor should adhere to the following recommendations for pipe bedding, fill placement and compaction.

- Remove any soft, loose, organic soils or soils with organics from below the pipe invert elevation, for the full width of the trench, to a depth of at least 1-foot below the bottom of the pipe invert.
- Compact pipe bedding material to a minimum of 95% of the soil's Modified Proctor maximum dry density to a minimum depth of 6 inches below the bottom of pipe.
- Excavate and shape bedding soils to accommodate pipe "bells" to completely support each pipe section and help to eliminate point loading conditions.
- Place fill in level lifts no thicker than 12 inches.
- Compact each backfill lift to a minimum of 95% of the soil's modified Proctor maximum dry density as determined by AASHTO T-180 for each lift of fill placed.
- Compaction tests should be performed for each run of pipe between manholes or at least one test per 300 linear feet.

6.1 Pipe Bedding, Backfill and Compaction (Cont'd)

- Allow an Engineering Technician, working under the direction of a registered Geotechnical Engineer, to perform in-place density tests to verify that the recommended degree of compaction has been achieved.

- Install sheeting and bracing or properly designed trench shields, if required, to support the sides of excavations during utility installation.

- All excavations including utility trenches, should comply with the recommendations included in the **Utility Excavations** section of this report.

- Where utility lines will traverse roadways and/or other permanent structures, such as sidewalks, the backfill should be compacted to 98% of the soil's Modified Proctor maximum dry density for a depth of 2 feet below ground surface.

6.2 Temporary Dewatering

Temporary dewatering may be required to facilitate stable excavations and placement and compaction of fill during construction.

Temporary dewatering may be required to facilitate stable excavations and placement and compaction of fill during construction. The contractor should be required to provide a dewatering system which maintains groundwater levels at least 2 feet below compaction surfaces, including the bottom of excavations. A system of ditches and sumps may be sufficient in some instances to achieve adequate dewatering, but the contractor should be prepared to install wellpoint dewatering systems as necessary.

7.0 USE OF THIS REPORT

GEC has prepared this report for the exclusive use of our client, Singhofen & Associates, Inc. GEC will not be held responsible for any third party's interpretation or use of this report's subsurface data or engineering analysis without our written authorization.

GEC has not evaluated the site for the potential presence of contaminated soil or groundwater...

The sole purpose of the borings performed by GEC at this site was to obtain indications of subsurface conditions as part of a geotechnical exploration program. GEC has not evaluated the site for the potential presence of contaminated soil or groundwater, nor have we subjected any soil samples to analysis for contaminants.

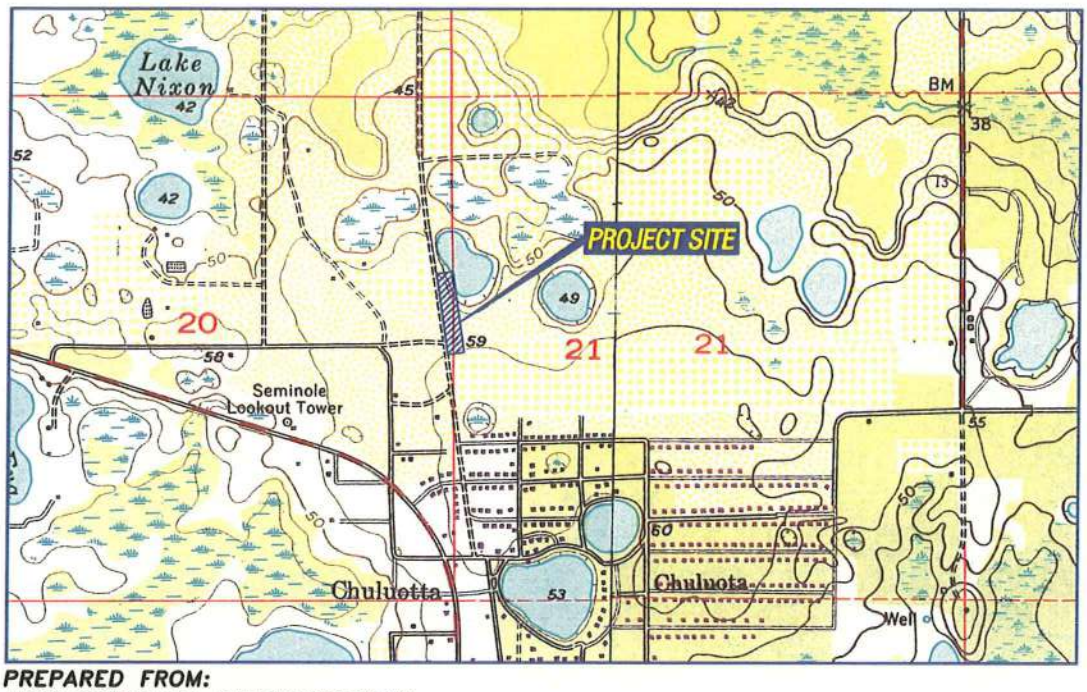
GEC has strived to provide the services described in this report in a manner consistent with that level of care and skill ordinarily exercised by members of our profession currently practicing in Central Florida. No other representation is made or implied in this document.

7.0 USE OF THIS REPORT (Cont'd)

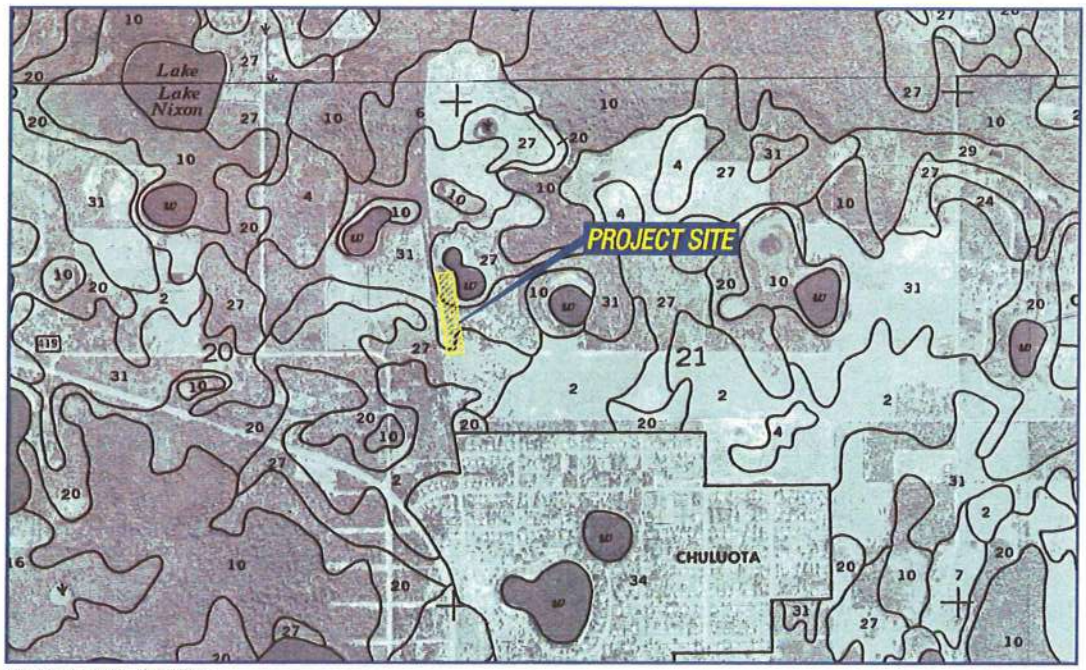
The conclusions or recommendations of this report should be disregarded if the nature, design, or location of the facilities is changed. If such changes are contemplated, GEC should be retained to review the new plans to assess the applicability of this report in light of proposed changes.

APPENDIX

USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS



PREPARED FROM:
USGS OVIEDO, FLA. QUADRANGLE MAP
ISSUED 1956
PHOTOREVISED 1980
SECTIONS: 20, 21
TOWNSHIP: 21 SOUTH
RANGE: 32 EAST



PREPARED FROM:
NRCS SOIL SURVEY OF SEMINOLE CO., FLA.
AERIAL PHOTOBASE DATED 1981

SEMINOLE COUNTY MAP UNIT LEGEND

27 – POMELLO FINE SAND, 0 TO 5 PERCENT SLOPES
31 – TAVARES–MILLHOPPER FINE SANDS, 0 TO 5 PERCENT SLOPES

GEC
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FAX (407) 898–1897
COA NO. 00005882

JACOBS TRAIL CULVERT REPLACEMENT

PROJECT NO.:	2684G
DATE:	8–23–07
SENIOR ENGINEER:	DCS P.E. NO. 42763
PROJECT ENGINEER:	KJH
DRAWN BY:	SKR
REVISION:	

North

0 1000 2000
SCALE (FEET)

USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS

FIGURE 1

J:\DATA\D63\2684G\MAPS.dwg, 9/5/2007 8:39:27 AM, 1:1

SITE PLAN WITH BORING LOCATIONS

GEC
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FAX (407) 898-1897
COA NO. 00005882

JACOBS TRAIL CULVERT REPLACEMENT

PROJECT NO.:	2684G
DATE:	8-23-07
SENIOR ENGINEER:	DCS (P.E. NO. 42763)
PROJECT ENGINEER:	KJH
DRAWN BY:	SKR
REVISION:	

LEGEND

- APPROXIMATE MACHINE AUGER BORING LOCATION
- APPROXIMATE HAND AUGER BORING LOCATION

North

0 50 100

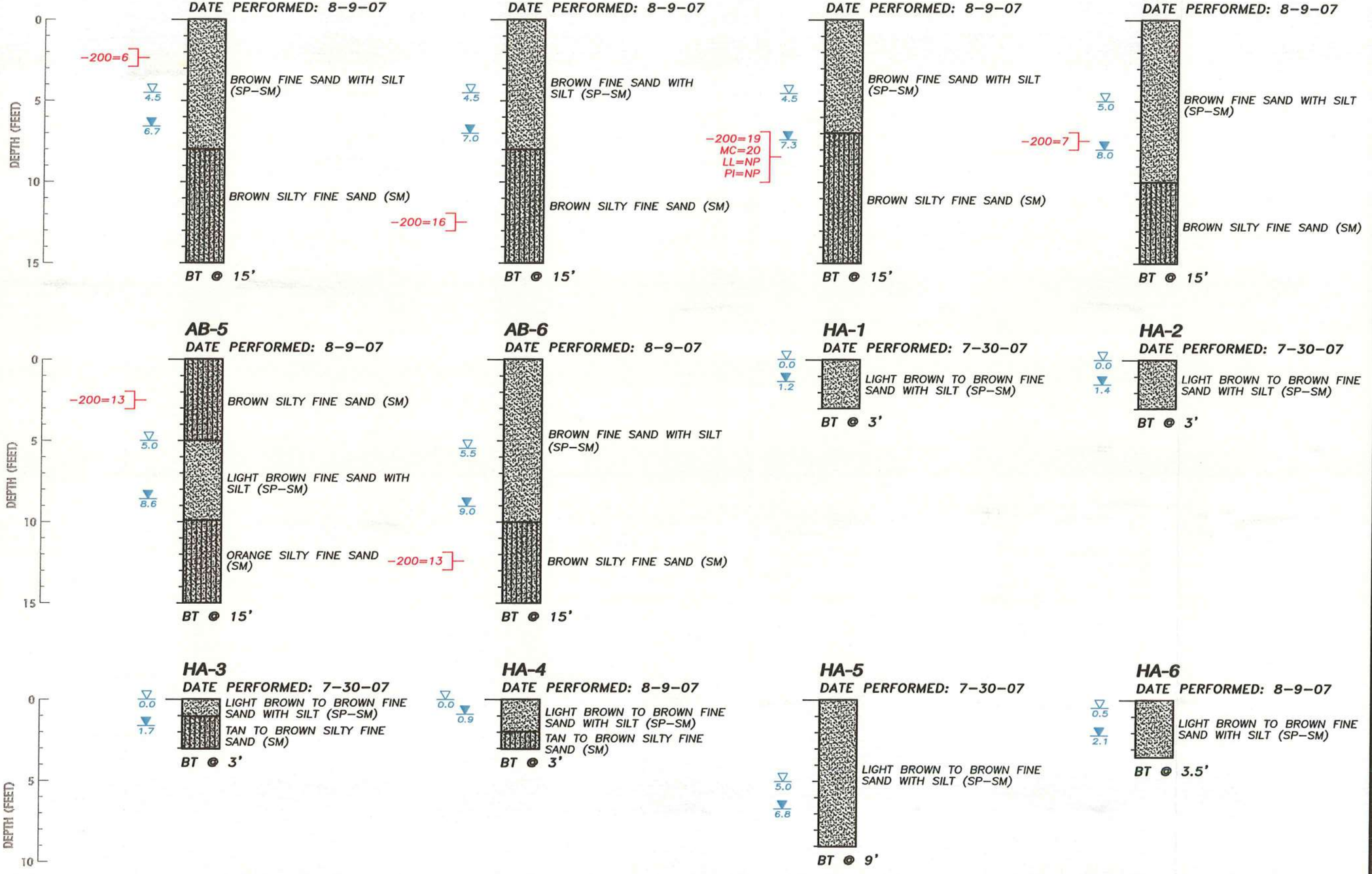
SCALE (FEET)

SITE PLAN WITH BORING LOCATIONS

FIGURE 2

J:\DATA\D6312684G\PLAN.dwg, 9/5/2007 8:39:59 AM, 1:100

BORING RESULTS



NOTE

SUBSURFACE CONDITIONS SHOWN ON THE BORINGS DO NOT REPRESENT THE CONDITIONS BETWEEN THE BORING LOCATIONS. ACTUAL CONDITIONS BETWEEN THE BORINGS MAY VARY FROM THOSE SHOWN. UNIFIED SOIL CLASSIFICATIONS SHOWN ON THE BORINGS ARE BASED ON VISUAL EXAMINATION AND THE LABORATORY TESTING SHOWN.

GEC
Geotechnical and Environmental Consultants, Inc.
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ORLANDO, FLORIDA 32803
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DRAWN BY:	SKR
REVISION:	

LEGEND

- ▽ 4.5 — ESTIMATED SEASONAL HIGH GROUNDWATER DEPTH (FEET)
- ▼ 6.7 — ENCOUNTERED GROUNDWATER DEPTH (FEET)
- BT — BORING TERMINATED AT THE DEPTH INDICATED
- -200 — PERCENT PASSING NO. 200 U.S. STANDARD SIEVE
- MC — PERCENT NATURAL MOISTURE CONTENT
- LL — LIQUID LIMIT
- PI — PLASTICITY INDEX
- NP — NON-PLASTIC
- SAND
- SAND AND SILT

AUGER BORING RESULTS

FIGURE 3

J:\DATA\D63\2684G\BORINGS.dwg, 9/5/2007 8:38:54 AM, 1:1

CORROSION SERIES RESULTS

Table 4
Corrosion Series Test Results
JACOBS TRAIL CULVERT REPLACEMENT
Seminole County, Florida
GEC Project No. 2684G

Boring Location	Unified Classification	Sample Depth (ft)	pH	Minimum Resistivity (ohm-cm)	Chlorides (ppm)	Sulfates (ppm)	Substructure Environmental Classification*	
							Steel	Concrete
HA-3	SM	1 - 3	4.7	31,000	75	41.4	E.A.	E.A.
HA-6	SP-SM	0 - 3.5	6.0	46,000	60	<5	M.A.	M.A.
Water Sample	---	---	5.9	7,300	540	51.6	E.A.	M.A.

*E.A. - Slightly Aggressive M.A. - Moderately Aggressive

Report of Geotechnical Engineering Investigation

JACOBS TRAIL POND

Seminole County, Florida

GEC Project No. 2823G

Geotechnical
and
Environmental
Consultants, Inc.
At the very foundation of our community

April 4, 2008

Singhofen & Associates, Inc.
925 South Semoran Boulevard, Suite 104
Winter Park, Florida 32792

Attention: Ms. Heather L. Brady, E.I.

Subject: Report of Geotechnical Engineering Investigation
JACOBS TRAIL POND
Seminole County, Florida
GEC Project No. 2823G

Dear Ms. Brady:

Geotechnical and Environmental Consultants, Inc. (GEC) is pleased to present this Report of Geotechnical Engineering Investigation for the above-referenced project. GEC performed this study in general accordance with the scope of work described in our Revised Proposal No. 5407G dated February 1, 2008. We conducted this study to explore soil and groundwater conditions at the proposed pond location and to use the information obtained to provide geotechnical engineering recommendations for site preparation and design of the stormwater pond. This report documents our field investigation, laboratory testing, engineering analyses, and geotechnical recommendations for this project.

GEC appreciates the opportunity to be of service to you on this project and trusts that the information contained herein is sufficient for your needs. Should you have any questions concerning the contents of this report, or if we may be of further assistance, please contact us.

Very truly yours,

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS, INC.

Kevin J. Hayden, E.I.
Engineer Intern

Daniel C. Stanfill, P.E.
Senior Project Manager
Florida Registration No. 42763

4/4/08

KJH/DCS/kms

1230 East Hillcrest Street, Orlando, FL 32803-4713
407/898-1818 Fax 407/898-1837 E-mail: gec@g-e-c.com
www.g-e-c.com

OFFICES IN ORLANDO AND KISSIMMEE

TABLE OF CONTENTS

1.0 SITE AND PROJECT DESCRIPTION

The project site is located in Sections 20 and 21, Township 21 South, and Range 32 East, in Seminole County, Florida. More specifically, the site is located along the east side of Jacobs Trail between the intersections with Snow Hill Road (to the south) and Lake Crescent Drive (to the north). According to the United States Geological Survey (USGS) Oviedo, Florida Quadrangle map (Figure 1), existing ground surface elevations across the subject site range from approximately +55 to +59 feet NGVD. The approximate site limits are presented on an excerpt of the USGS Quadrangle map on Figure 1 in the Appendix.

...project plans include the construction of an approximate 0.2 acre...dry retention pond.

We understand project plans include the construction of an approximate 0.2 acre (7,000 square foot) dry retention pond.

2.0 NRCS SOIL SURVEY REVIEW

The NRCS Soil Survey of Seminole County, Florida was reviewed to obtain near-surface soils and groundwater information in the vicinity of the subject site. An excerpt from the NRCS (formerly SCS) Soil Survey Map of Seminole County is shown on Figure 1 in the Appendix. According to the NRCS, the following soils are present within the projects limits:

Table 1
NRCS Soil Survey Summary

Soil Unit Map No.	Soil Name	Depth (in)	Description	USCS Classification Symbol	Depth to Seasonal High Groundwater (ft)
31	Tavares fine sand, 0 to 5 percent slopes	0 - 6 6 - 80	Fine sand Sand, fine sand	SP, SP-SM SP, SP-SM	3.5 – 6.0
	Millhopper fine sand, 0 to 5 percent slopes	0 - 45 45 - 80	Fine sand Sandy loam, fine sandy loam, sandy clay loam	SP-SM, SM SM, SM-SC, SC	

The soil units listed above are classified as sands with varying amounts of silt fines (SP, SP-SM, SM, SM-SC, SC). These soil units are generally appropriate for the proposed pond. The NRCS predicts seasonal high groundwater levels within the site limits to range from 3.5 feet below ground surface to 6 feet below ground surface.

Information contained in the NRCS Soil Survey is very general and may be outdated. It may not therefore be reflective of actual soil and groundwater conditions, particularly if recent development in the site vicinity has modified soil conditions or surface/subsurface drainage.

3.0 SUBSURFACE EXPLORATION

In addition to consulting the sources of information previously discussed for regional and site-specific soils data, GEC conducted a subsurface exploration to evaluate soil and groundwater conditions. GEC explored the subsurface conditions at the subject site by performing two machine auger borings (AB-1 and AB-2) to a depth of 20 feet below existing ground surface. In addition, GEC performed a field permeability test adjacent to boring AB-2. The approximate locations of the borings drilled for this study are shown on Figure 2 in the Appendix.

Boring locations were not surveyed, but established by taping distances from existing features shown on a plan provided by you; therefore, they should be considered approximate. Although the boring locations are given only approximately, the methods used to locate the borings are, in GEC's opinion, sufficient to meet the intent of our study. If greater accuracy is desired, a registered Professional Land Surveyor should be retained to survey the boring locations.

3.1 Machine Auger Borings

Machine auger borings were performed in general accordance with ASTM Procedure D-4700. Machine auger borings were made by hydraulically turning a 4-inch wide continuous flight, solid-stem, auger into the ground in 5-foot increments until the desired boring termination depth was achieved. The auger flights were retrieved in 5-foot increments and examined by our technician prior to collection of representative soil samples. The samples were placed in sealed jars and transported to GEC's laboratory for further examination and limited laboratory testing.

3.2 Field Permeability Test

A falling head permeability test was performed in the field at this site. The field permeability test was performed by driving a 3-inch diameter casing into the ground to the desired test depth and washing the soil out of the casing with water. The casing was backfilled with quartz gravel to 24 inches above the bottom of the casing and was then raised a distance of 18 inches. Water was added to the casing to achieve a stable water level. Once the water level stabilized, the water source was taken away and the drop in the water level in the casing with respect to time was recorded. The field permeability test and calculations were performed in general conformance with NAVFAC DM-7.1-108.

3.3 Groundwater Measurement

A GEC engineering technician measured the depth to groundwater in the boreholes at the time of drilling and again after approximately 24 hours. Once the 24-hour groundwater measurement was recorded, the boreholes were then backfilled with soil cuttings to the prevailing ground surface.

4.0 LABORATORY TESTING

Selected soil samples retrieved from our borings were tested in accordance with Florida Standard Testing Methods (FM). Florida Standard Testing Methods are adaptations of recognized standard methods, e.g., ASTM and AASHTO, which have been modified to accommodate Florida's geological conditions. The GEC laboratory is reviewed annually by the Construction Materials and Engineering Council, Inc. (CMEC) to verify compliance with FM. Our laboratory testing program is summarized on the following table:

Table 2
Summary of Laboratory Testing Program

Type of Test	Number of Tests
Percent Fines (FM 1-T88)	3

The individual results of our laboratory tests are shown adjacent to the soil profiles at the approximate depths from which the tested samples were obtained. The results are presented on the Site Plan with Boring Locations and Boring Results sheet (Figure 2) in the Appendix.

5.0 DESCRIPTION OF SUBSURFACE CONDITIONS

Detailed records of subsurface conditions encountered in our auger borings are shown on Figure 2 in the Appendix. The boring logs describe the soil layers using the Unified Soil Classification System (USCS) symbol (e.g. SP-SM) and ASTM soils descriptions (e.g. sand with silt). We based our soil classifications and descriptions on visual examination and the test results shown on Figure 2.

The boring logs indicate subsurface conditions only at the specific boring locations at the time of our field exploration. Subsurface conditions, including groundwater levels, at other locations of the subject site may differ from conditions we encountered at the boring locations. Moreover, conditions at the boring locations can change over time. Groundwater levels fluctuate seasonally, and soil conditions can be altered by earthmoving operations.

The depths and thicknesses of the subsurface strata indicated on the boring logs were interpolated between samples obtained at different depths in the borings. The actual transition between soil layers may be different than indicated. *These stratification lines were used for our analytical purposes. Earthwork quantity estimates based on the results of the borings will vary from the actual quantities measured during construction.*

5.1 Soil Strata

In general, the machine auger borings (AB-1 and AB-2) typically encountered fine sand with varying silt content (SP, SP-SM, SM) from existing ground surface to the termination depths explored. For specific soil information at each boring location, please refer to our Site Plan with Boring Locations and Boring Results sheet (Figure 2) in the Appendix.

5.2 Field Permeability Test Results

A field permeability test was performed adjacent to boring AB-2 from a depth of 4 to 6 feet and resulted in a rate of about 32 ft/day. Our calculations used in determining these results are presented on the Field Permeability Test Results sheet, which is included in the Appendix. We recommend limiting the permeability rate to 30 ft/day for stormwater pond design and analysis.

5.3 Groundwater Levels

Groundwater levels were encountered at depths of approximately 6.4 and 6.9 feet below existing ground surface in the machine auger boring locations. The encountered groundwater levels are presented on Figure 2 in the Appendix.

Groundwater levels can vary seasonally and with changes in subsurface conditions between boring locations. Alterations in surface and/or subsurface drainage brought about by site development can also affect groundwater levels. *Therefore, groundwater depths measured at different times or at different locations on the site can be expected to vary from those measured by GEC during this investigation.*

For purposes of this report, estimated seasonal high groundwater levels are defined as groundwater levels that are anticipated at the end of the wet season during a "normal rainfall" year under pre-development site conditions. We define a "normal rainfall" year as a year in which rainfall quantity and distribution were at or near historical averages.

Our estimated seasonal high groundwater levels are presented on Figure 2 in the Appendix.

We estimate that predevelopment seasonal high groundwater levels at our boring locations will be approximately 4.5 feet below existing ground surface. Our estimated seasonal high groundwater levels are presented on Figure 2 in the Appendix.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Borings cannot be relied upon to accurately reflect the variations that usually exist between boring locations...

The conclusions and recommendations contained in this report are based in part on the data obtained from a limited number of soil samples and groundwater measurements obtained from widely-spaced borings. The sampling methods used indicate subsurface conditions only at the specific boring locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Borings cannot be relied upon to accurately reflect the variations that usually exist between boring locations and these variations may not become evident until construction. If variations from the subsurface conditions described in this report do become evident during construction or if the project characteristics described in this report change, GEC should be retained to reevaluate this report's conclusions and recommendations in light of such changes.

6.1 Stormwater Pond

The pond borings generally encountered fine sand with varying amounts of silt (SP, SP-SM, SM) to the maximum depths explored. The Select (S) soils encountered in the pond borings appear suitable for use as roadway embankment in accordance with Index 505 of the FDOT Standards. Sands excavated below the water table will need to be dried to a moisture content near optimum to achieve the required degree of compaction.

...we recommend using a soil permeability of 30 feet per day for pond design.

Based on the results of our field permeability test, we recommend using a soil permeability of 30 feet per day for pond design. Seasonal high groundwater levels are estimated to be about 4.5 feet below existing ground surface.

6.2 Temporary Dewatering

Temporary dewatering may be required to facilitate stable excavations and placement and compaction of fill during construction.

Temporary dewatering may be required to facilitate stable excavations and placement and compaction of fill during construction. The contractor should be required to provide a dewatering system which maintains groundwater levels at least 2 feet below compaction surfaces, including the bottom of excavations. A system of ditches and sumps may be sufficient in some instances to achieve adequate dewatering, but the contractor should be prepared to install wellpoint dewatering systems as necessary.

7.0 USE OF THIS REPORT

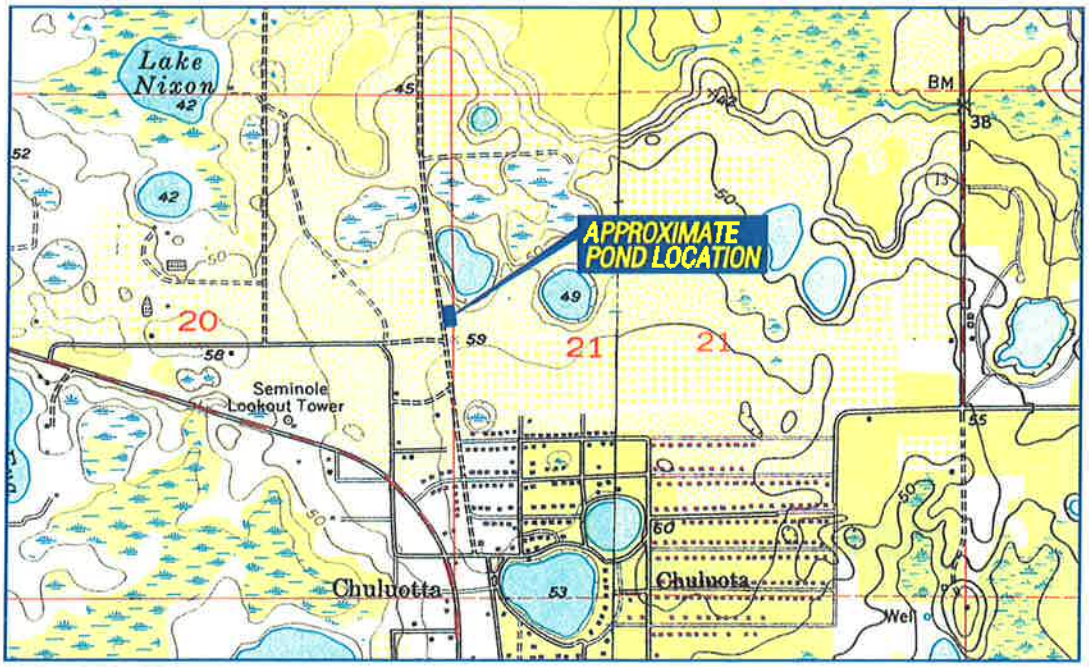
GEC has prepared this report for the exclusive use of our client, Singhofen & Associates, Inc., and for specific application to our client's project. GEC will not be held responsible for any third party's interpretation or use of this report's subsurface data or engineering analysis without our written authorization.

The sole purpose of the borings performed by GEC at this site was to obtain indications of subsurface conditions as part of a geotechnical exploration program. GEC has not evaluated the site for the potential presence of contaminated soil or groundwater, nor have we subjected any soil samples to analysis for contaminants.

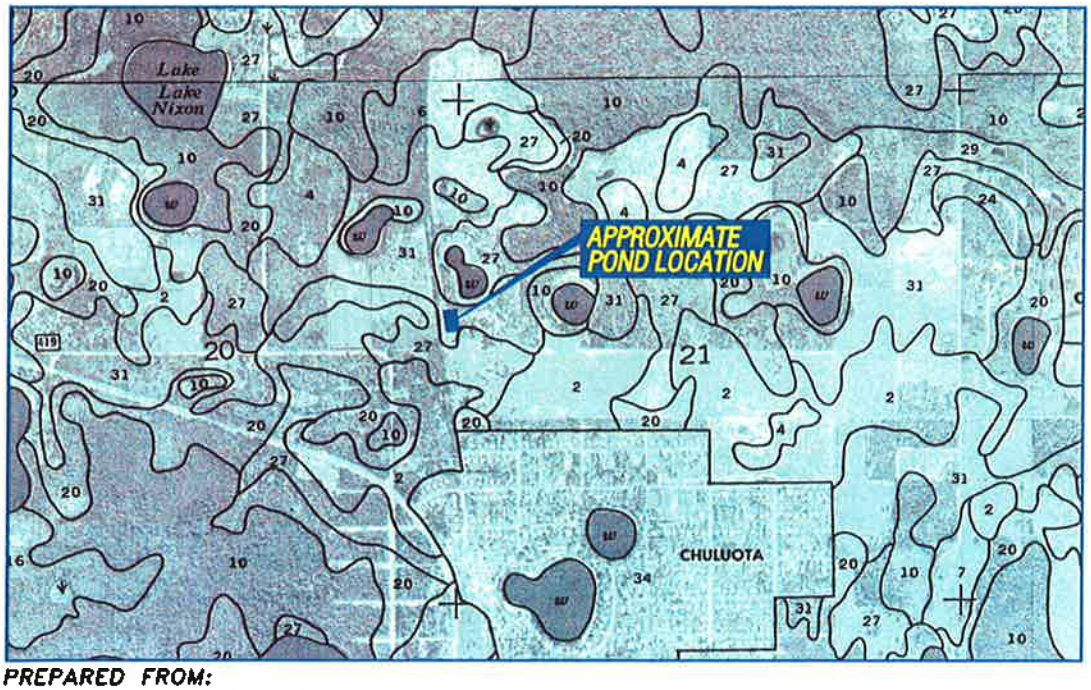
GEC has strived to provide the services described in this report in a manner consistent with that level of care and skill ordinarily exercised by members of our profession currently practicing in Central Florida. No other representation is made or implied in this document.

The conclusions or recommendations of this report should be disregarded if the nature, design, or location of the facilities is changed. If such changes are contemplated, GEC should be retained to review the new plans to assess the applicability of this report in light of proposed changes.

USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS



PREPARED FROM:
USGS OVIEDO, FLA. QUADRANGLE MAP
ISSUED 1956
PHOTOREVISED 1980
SECTIONS: 20, 21
TOWNSHIP: 21 SOUTH
RANGE: 32 EAST



PREPARED FROM:
NRCS SOIL SURVEY OF SEMINOLE CO., FLA.
AERIAL PHOTOBASE DATED 1981

SEMINOLE COUNTY MAP UNIT LEGEND

31 – TAVARES–MILLHOPPER FINE SANDS, 0 TO 5 PERCENT SLOPES

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JACOBS TRAIL POND

PROJECT NO.:	2823G
DATE:	4-2-08
SENIOR ENGINEER:	DCS P.E. NO. 42763
PROJECT ENGINEER:	KJH
DRAWN BY:	TLM
REVISION:	

North

0 1000 2000
SCALE (FEET)

USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS

FIGURE 1

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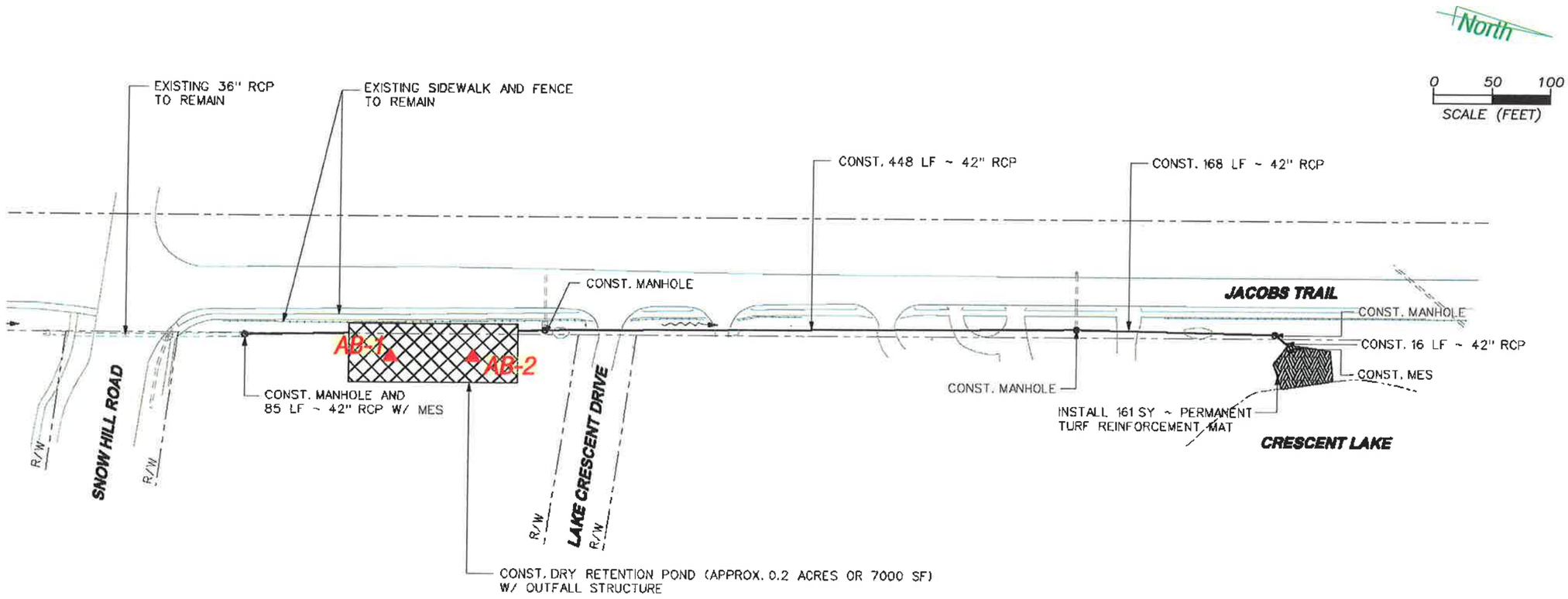
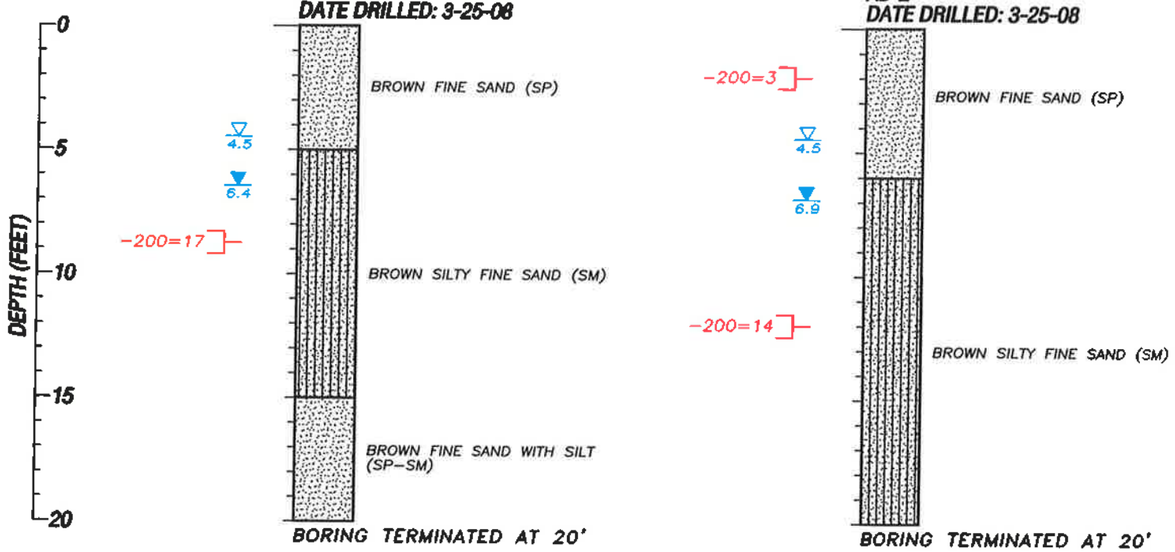
SITE PLAN WITH BORING LOCATIONS AND BORING RESULTS



BORING RESULTS

SCALE: AS SHOWN



NOTES

SUBSURFACE CONDITIONS SHOWN ON THE BORINGS DO NOT REPRESENT THE CONDITIONS BETWEEN THE BORING LOCATIONS. ACTUAL CONDITIONS BETWEEN THE BORINGS MAY VARY FROM THOSE SHOWN. UNIFIED SOIL CLASSIFICATIONS SHOWN ON THE BORINGS ARE BASED ON VISUAL EXAMINATION AND THE LABORATORY TESTING SHOWN.

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PROJECT NO.: 2823G
DATE: 4-2-08
SENIOR ENGINEER: DCS P.E. NO. 42763
PROJECT ENGINEER: KJH
DRAWN BY: TLM
REVISION:

LEGEND

- APPROXIMATE MACHINE AUGER BORING LOCATION
- 4.5 ESTIMATED SEASONAL HIGH GROUNDWATER DEPTH (FEET)
- 6.4 ENCOUNTERED GROUNDWATER DEPTH (FEET)
- -200= PERCENT PASSING NO. 200 U.S. STANDARD SIEVE
- SAND
- SAND AND SILT

SITE PLAN WITH BORING LOCATIONS AND BORING RESULTS

FIGURE 2

J:\DATA\D70\2823G\2823Gsite.dwg, 4/3/2008 8:44:03 AM, 1:1

FIELD PERMEABILITY TEST CALCULATIONS

TEST LOCATION: AB-2

FIELD PERMEABILITY TEST CALCULATIONS
JACOBS TRAIL POND
GEC PROJECT NO. 2823G

SOIL TYPE: SP
TEST DEPTH: 4-6 FEET

INPUT FROM TEST:

$d := 3.25 \cdot in$ CASING DIAMETER

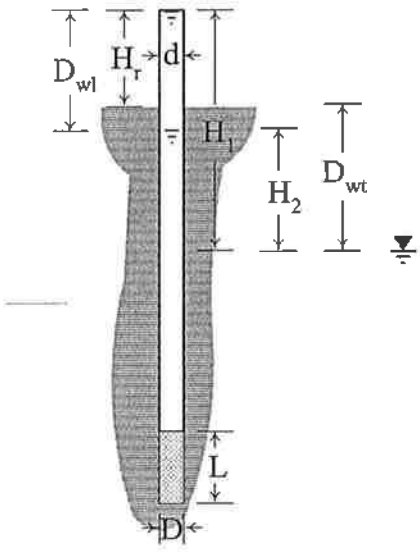
$H_r := 3 \cdot ft$ RISER HEIGHT

$D_{wt} := 6.9 \cdot ft$ DEPTH TO GROUNDWATER

$L := 2 \cdot ft$ LENGTH OF GRAVEL PACK

$D_{wl} := 1 \cdot ft$ WATER LEVEL DROP (DRAWDOWN)

$\Delta t := 0 \cdot min + 4 \cdot sec$ TIME FOR WATER LEVEL TO DROP



$D := d$ DIAMETER OF GRAVEL PACK

$H_1 := H_r + D_{wt}$ INITIAL PIEZOMETRIC HEAD (ASSUMES STARTING WATER LEVEL AT THE TOP OF THE CASING)

$H_2 := H_1 - D_{wl}$ FINAL PIEZOMETRIC HEAD

$m = \sqrt{\frac{kh}{kv}}$ TRANSFORMATION RATIO $m := \sqrt{2}$ ASSUMING kv = 0.5kh

$m \cdot \frac{L}{D} = 10.443$

$k_h := \frac{d^2 \cdot \ln\left(\frac{2 \cdot m \cdot L}{D}\right)}{8 \cdot L \cdot (\Delta t)} \cdot \ln\left(\frac{H_1}{H_2}\right)$ FROM NAVFAC TM 5-818-5 PG. 35 (FORMULA APPLICABLE WHEN mL/D > 4)

$k_h = 32.046 \frac{ft}{day}$ $k_h = 9.767 \frac{meters}{day}$

Yvonne J. Froscher
Environmental Consultant

**PRELIMINARY WETLAND AND ENDANGERED SPECIES ASSESSMENT
FOR JACOB'S TRAIL OUTFALL
SEMINOLE COUNTY, FLORIDA**

Prepared for:
Singhofen and Associates, Inc.
925 South Semoran Blvd., Suite 104
Winter Park, FL 32792

October 16, 2007

P.O. BOX 195305 • WINTER SPRINGS, FLORIDA 32719-5305 • (407) 327-2020 • FAX (407) 327-1718

Yvonne J. Froscher
Environmental Consultant

PRELIMINARY WETLAND AND ENDANGERED SPECIES ASSESSMENT FOR JACOB'S TRAIL OUTFALL SEMINOLE COUNTY, FLORIDA

Table of Contents

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Figures

Appendix

Yvonne J. Froscher
Environmental Consultant

PRELIMINARY WETLAND AND ENDANGERED SPECIES ASSESSMENT FOR JACOB'S TRAIL OUTFALL SEMINOLE COUNTY, FLORIDA

October 16, 2007

INTRODUCTION

A preliminary wetland and habitat assessment has been conducted for the Jacob's Trail Outfall project. The site is proposed for a storm water improvement within the Econlockhatchee River Basin in east Seminole County, Florida. The study has been conducted to facilitate design and permitting of an outfall improvement. The area is located in Section 20, Township 21 South, Range 32 East, as approximately shown on Figure 1: Vicinity Map. The confined study area begins approximately 120 feet south of Snow Hill Road pavement on the east side of the paved Florida Trail and extends northward parallel to the eastern edge of Jacob's Trail to Lake Crescent as shown on Figure 2: Aerial Vicinity w/Soils. The wetland descriptions and wildlife assessments are based on site inspections conducted on July 27, 2007, September 14, 2007, and October 12, 2007.

Figure 2: Natural Features Map is an aerial photograph showing the study area vicinity. Natural features are shown as an informative overlay and include soils and land uses.

LAND USES

Wetlands in the vicinity included vegetated ditches as well as marsh and pond pine forest associated with Cresent Lake. Uplands included paved roadways, recreational paths, a developed school site, and a trailhead/park.

SINGLE FAMILY UNITS (111)

From Crescent Lake Drive northward to where Crescent Lake bulged toward Jacob's Trail, single family residences were present.

EDUCATIONAL FACILITIES (171)

Walker Elementary School with associated parking and stormwater pond occupied the southeast corner of the intersection of Jacob's Trail and Snow Hill Road.

PARKS AND ZOOS (185)

The parks and zoos designation has been assigned to two areas in the vicinity. The first was south of Snow Hill Road and immediately west of the flagged ditch. A paved trail which is part of the Florida Trail was present. The second area was at the northeast corner of the intersection of Jacob's Trail and Snow Hill Road where parking and bicycle racks were present to support recreational value of the public paved trail.

DITCHES (510)

Ditch segments are contiguous via open ditch segments and piping to Crescent Lake. The ditch segment south of Snow Hill Road (1-1 through 1-4 and 2-1 through 1-4) was characterized by very sparse cover of Peruvian primrosewillow (*Ludwigia peruviana*) and a patch of maidencane (*Panicum hemitomom*) near the water's edge. A couple red maple (*Acer* rubrum) and Virginia chain fern (*Woodwardia virginica*) occupied the side slopes of the ditch with a few saw palmetto (*Serenoa repens*) which become more dense at the top of the bank.

P.O. BOX 195305 • WINTER SPRINGS, FLORIDA 32719-5305 • (407) 327-2020 • FAX (407) 327-1718

South of Lake Crescent Drive, the ditch contained no canopy species but did contain substantial presence of exotic species including Peruvian primrosewillow (*Ludwigia peruviana*) and skunkvine (*Paederia foetida*). Other species observed included common ragweed (*Ambrosia artemisiifolia*), jointtailgrass (*Coelorachis sp.*), and Carolina willow (*Salix caroliniana*). No inundation was observed during any of the site inspections.

North of Lake Crescent Drive in two small ditch segments Peruvian primrosewillow (*Ludwigia peruviana*) and Carolina willow (*Salix caroliniana*) are common. No inundation was observed during any of the site inspections.

POND PINE (622)

A small area of pond pine forest occurred immediately north of 313 Jacob's Trail. Interspersed within the pond pine (*Pinus serotina*) were sweetbay (*Magnolia virginiana*), swamp tupelo (*Nyssa sylvatica* var. *biflora*), and swamp bay (*Persea palustris*). Maidencane (*Panicum hemitomom*) and wild sarsaparilla (*Smilax glauca)* were also observed. Soils contained mucky accretions.

FRESHWATER MARSH (641)

Piping extended to wetlands associated with Lake Crescent where floating and emergent plants included American white waterlily (*Nymphaea odorata*), big floatingheart (*Nymphoides aquatica*), and torpedo grass (*Panicum repens*). Other herbaceous species observed landward of the open water included maidencane (*Panicum hemitomon*), fireweed (*Erichtites hieraciifolius*), dewberry (*Rubus trivialis*), jointtailgrass (*Coelorachis sp.*), Cyperaceae, a false buttonweed (*Spermacoce* sp.), rosy camphorweed (*Pluchea rosea*), climbing hempvine (*Mikania scandens*), and pale meadowbeauty (*Rhexia mariana*) Further landward a dense cover of muscadine (*Vitis rotundifolia* var. *munsonia*) begins.

ROADS AND HIGHWAYS (814)

Roads and highways in the vicinity included Snow Hill Road, Jacob's Trail, and Lake Crescent Drive.

SOILS

Soils mapped by the Natural Resource Conservation Service (NRCS, formerly the Soil Conservation Service) on-site are Adamsville-Sparr fine sands; Myakka and EauGallie fine sands; Pomello fine sands, 0 to 5 percent slopes; and Tavares-Millhopper fine sands, 0 to 5 percent slopes..

Adamsville-Sparr fine sands, (number 2 on Figure 2: Natural Features Map), are found on the low ridges on the uplands and are somewhat poorly drained. The seasonal high water table is typically within 12 to 36 inches of the surface for up to six months.

Myakka and EauGallie fine sands (number 20 on Figure 2: Natural Features Map) are soils described by NRCS as nearly level and poorly drained. In undisturbed areas, this soil type typically supports flatwoods. (*Soil Survey of Seminole County, Florida*, 1990) Myakka and EauGallie fine sands, in Seminole County, are described by the Florida Association of Environmental Soil Scientists as containing 5 percent Basinger, 10 percent EauGallie, 10 percent Myakka, and 5 percent Pompano. These components and inclusions are all hydric due to a frequent water table less than one-half foot (0.5') from the surface for a significant period during the growing season. (*Hydric Soils of Florida Handbook, 2nd Edition*, 1995)

Pomello fine sands, 0 to 5 percent slopes, (number 27 on Figure 2: Natural Features Map), are moderately well drained soils found on low ridges and knolls in flatwoods. (*Soil Survey of Seminole County, Florida, 1990*)

Tavares-Millhopper fine sands, 0 to 5 percent slopes (number 31 on Figure 2: Natural Features Map) are moderately well drained and found on low ridges and knolls in flatwoods. Soils are typically gently sloping

and moderately well drained. The seasonal high water table is generally 36 to 60 inches below the surface for two to six months.

AGENCY REGULATION OF WETLANDS

U.S. ARMY CORPS OF ENGINEERS

Jurisdiction

The U.S. Army Corps of Engineers (USACOE) regulates dredging and filling in wetlands under the authority of the Federal Water Pollution Act of 1977 and the River and Harbors Act of 1899. Wetlands are defined by the USACOE as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." The USACOE uses a three-parameter methodology for delineation of wetland boundaries. Hydric vegetative species, hydric soil characteristics, and certain hydrologic characteristics are used to assess limits of water of the United States.

A January 9, 2001, U.S. Supreme Court decision has effected USACOE jurisdiction in isolated wetlands. In 1977 the USACOE expanded its definition of "waters of the United States" to include "isolated wetlands and lakes, intermittent streams, prairie potholes, and other waters that are not part of a tributary system to interstate waters or to navigable waters of the United States, ..." (33 CFR §323.2(a)(5) (1978) Further, the USACOE in 1986 issued the Migratory Bird Rule under which the agency claimed that §404(a) of the Clean Water Act extended federal jurisdiction over areas utilized by migratory birds. The Supreme Court noted a previous decision where the expanded definition of the term "navigable" to include nonnavigable wetlands adjacent to open waters was upheld.

The Supreme Court was asked, specifically, to decide whether provisions of §404(a) extended into abandoned sand and gravel pits which contained no "wetlands" or areas which supported "vegetation typically adapted for life in saturated soil conditions," but which were utilized by many species of migratory birds. The Court decided that the USACOE had no §404(a) jurisdiction in the abandoned pits and that, therefore, the Migratory Bird Rule was irrelevant. The Court further concluded that 1) the "Migratory Bird Rule is not fairly supported by the Clean Water Act, 2) that the text of the statute does not allow the USACOE to extend jurisdiction to "ponds that are not adjacent to open waters."

Types of Permits

"Letters of permission" (LOP) will be issued for certain very minor activities in wetlands; otherwise, the type of permit required for development in wetlands regulated by the USACOE depends on the type and significance of the proposed wetland impact. General permits cover a clearly specified category of projects having no significant environmental impact. General permits are of three types:

- Regional permits incorporate a list of activities and conditions published by the District Engineer.
- Nationwide permits incorporate a list of forty specific activities (with associated conditions) approved by the Department of the Army on a nationwide basis and which have minimal individual and cumulative adverse environmental impact.
- Programmatic permits may be issued to avoid duplication of an existing state, local, or other federal agency program providing for natural resource protection.

Whether an activity is covered by a general permit can be confirmed by the District Engineer or by reviewing the appropriate portion of the Federal Register. The prospective permittee should be aware that preconstruction notification (PCN) or a post-construction report to the District Engineer is required for certain nationwide permit activities. Notification for any activity that results in the loss of greater than one-half (1/2) acre will be forwarded by the USACOE to the following agencies to initiate interagency coordination:

- The U.S. Fish and Wildlife Service/National Marine Fisheries Service regarding the presence of any Federally listed endangered or threatened species or critical habitat effected by the proposed project.
- The State Historic Preservation Office regarding the presence of any historic resources in the project area that may be affected by the proposed project.
- The Environmental Protection Agency.
- The state natural resource or water quality agency.

Important to note is that water quality certification, pursuant to Section 401 of the Clean Water Act, and coastal zone management consistency concurrence (where applicable) are required prior to the issuance of nationwide permits authorizing activities that may potentially result in discharge to waters of the United States. The State of Florida (Florida Department of Environmental Protection or water management district) reviews each of the proposed activities prior to issuing or waiving either the certification or consistency concurrence. (Nationwide Permit General Conditions-Condition 9. Water Quality and Condition 10. Coastal Zone Management)

Based on "Reissuance of Nationwide Permits; Notice" published March 12, 2007, in the Federal Register, some changes to the permit program were made. The new and modified nationwide permits are activity-specific and most do not authorize impacts greater than one-half (1/2) acre.

Mitigation at a minimum 1:1 ratio (one acre of compensation per one acre of impact) will be required for all wetland impacts requiring a PCN. The District Engineer, to be consistent with National policy, will establish a preference for restoration of wetlands to meet the minimum compensatory mitigation ratio. Preservation is to be used in only "exceptional circumstances." Restoration, creation, enhancement, preservation, or purchase of mitigation bank credits will be considered. (See further discussion of mitigation banks under the water management district section of this report.) Preservation is defined as the "protection of ecologically important wetlands or other aquatic resources in perpetuity" and may include uplands adjacent to wetlands. The USACOE may impose a twenty-five to fifty-foot (25' to 50') vegetated buffer adjacent to streams or other open waters. Required buffers may be wider "to address documented water quality concerns." (Nationwide Permit General Conditions-Condition 19. Mitigation) If no mitigation is proposed, the applicant must submit to the USACOE justification explaining why compensatory mitigation should not be required.

For certain nationwide permits, where the proposed activity involves filling within the 100-year floodplain, the PCN must include documentation that the activity complies with FEMA-approved local floodplain requirements. (Nationwide Permit General Conditions-Condition 13. Notification and Condition 26. Fills Within 100-Year Floodplains)

For impacts considered significant by the USACOE, an "individual permit" is required. Public notice is required during the application for this type of permit. Also, as the significance of the impact increases, so does the requirement for compensatory mitigation for wetland impacts.

Site Specific Comments: Crescent Lake is within the permitting jurisdiction of the USCOE. The ditches are ditches through uplands and jurisdiction is determined by a USACOE representative on a case-by-case basis. Nationwide 25 allows for certain Structural Discharges with PCN. Few other activities are authorized by Nationwide Permits in wetlands contiguous with the Econlockhatchee River.

For activities not authorized by a Nationwide Permit or for proposed impacts over one-half acre, filling under an individual permit would also require water quality certification from the State of Florida, compliance with FEMA-approved local floodplain requirements, and a review by the USACOE under Clean Water Act (Section 404(b)(1)) evaluation factors.

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

The Florida Department of Environmental Protection (FDEP) regulates dredging, filling, and discharge of pollutants into surface waters, including wetlands. Present criteria for delineation of wetlands became effective on July 1, 1994, and incorporate assessment of vegetative species, soils, and hydrologic

characteristics as outlined in Chapter 62-340 (F.A.C.). Except for a few minor exempt activities, a permit would be required to dredge or fill or to discharge pollutants into surface waters and wetlands.

Dredge and fill activities permitted by FDEP under the new Environmental Resource Permit (ERP) rules are very limited in the realm of commercial and residential development, except in the Northwest Florida Water Management District where dredge and fill permitting responsibilities have not been delegated to the water management district. An operating agreement between the St. Johns River Water Management District and Department of Environmental Protection summarizes the types of activities permitted by FDEP within the St. Johns River Water Management District where most dredge and fill permitting has been delegated to the District.

Site Specific Comments: All wetlands are within the jurisdiction of the FDEP. Permitting for the proposed activity will be through the SJRWMD for this project.

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

Jurisdiction

The St. Johns River Water Management District (SJRWMD) defines wetlands as "areas that are inundated or saturated by surface water or ground water at a frequency and a duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils." A criterion for delineation of wetlands became effective on July 1, 1994, and incorporates assessment of vegetative species, soils, and hydrologic characteristics as outlined in Chapter 62-340 (F.A.C.)–the same as for FDEP.

If storm water management permitting is to be done through this agency, dredge and fill permitting will generally, though not always, be done by SJRWMD rather than by FDEP. Dredge and fill permitting will be done according to the Environmental Resource Permit (ERP) rules. The type of permit application required for a proposed dredge and fill activity depends on the scope of the project and the extent of proposed wetland impacts. Certain specific activities, anticipated to have minimal impacts and which meet activity-specific criteria outlined in Chapter 40C-400, F.A.C., are permitted under the Noticed General Permit format.

Permit Types

Typically, for projects less than 100 acres or which require less than one (1) acre of wetland impact, a Standard General Permit will be required. If a site is less than ten (10) acres and less than two (2) acres of impervious area are proposed and less than 100 square feet of wetlands are to be dredged or filled and conditions in Rule 40C-40.301 are met, a Standard General Permit for Minor Systems will be necessary. Usually, applications for these "general" permits are reviewed and approved by District staff.

For projects greater than 100 acres or requiring more than one acre of impact, an Individual Permit is required. The District Governing Board takes agency actions related to "individual" permits.

Mitigation

The state has attempted to streamline permitting and standardize permitting criteria through its Environmental Resource Permit (ERP) rule, which was adopted fall 1995. With the exception of certain artificial water bodies, the SJRWMD will consider "secondary impacts"–adverse impacts to water quality, wetland functions, and upland habitat for aquatic and wetland dependent listed species as well as historic and archaeological resources. If undisturbed buffers with a minimum width of fifteen feet (15') and an average width of 25' are provided abutting on-site wetlands, secondary impacts to **habitat functions** of wetlands associated with adjacent upland activities will not be considered adverse.

Cumulative impacts will also be considered through the ERP process. These are impacts are related to other off-site activities regulated under part IV, Chapter 373 which are constructed, approved or under review and adversely effect water quality and wetland functions. How these activities along with any proposed activity will collectively affect water quality and wetland function will be considered by the agency.

February 1, 2004, the Uniform Mitigation Assessment Method (UMAM) was adopted whereby specific criteria are outlined for a) conducting a qualitative characterization and quantitative assessment of proposed impact and mitigation areas, b) assessing ecological value of mitigation preservation, c) assessing mitigation for time lag (length of time required for creation, enhancement, or restoration to be equivalent to impacted wetland) and risk (likelihood that the mitigation area will be successful in perpetuity), and d) assessing the functional gain or loss for impact and mitigation areas. Numerical values will be assigned based on the assessed characteristics and then used in a formula to determine the specific amount of a particular type of mitigation (preservation, creation, enhancement, or restoration) required for a particular impact. For most wetland impacts, the new method will supercede the ratio method previously used by the agency.

In some areas of Florida, mitigation banks are permitted and have credits released by the permitting agencies. The mitigation bank managers then can sell mitigation credits to compensate for wetland impacts. One mitigation credit is equivalent to "the ecological value gained by the successful creation of one acre of wetland." In certain areas where mitigation banks have been approved prior to UMAM and will be used for mitigation, mitigation may still be determined using ratios. With the exception of certain artificial water bodies, the amount of mitigation recommended for impacts to freshwater marshes ranges from one and one half (1.5) to five (5) acres of wetland creation or restoration to one (1) acre of impact. The amount of mitigation recommended for impacts to forested wetlands range two (2) to five (5) acres of wetland creation or restoration to one (1) acre of impact.

Compliance with these mitigation requirements is not required for regulated activities within wetlands that are less than one-half acre, unless one of the following is applicable:

- The wetland is used by threatened or endangered species;
- The wetland is located in an area of critical state concern;
- The wetland is connected by standing or flowing water at seasonal high water level to one or more wetlands, so that the combined acreage of greater than one-half acre;
- The District established that the impacted wetland, or several on-site isolated wetlands, is of value to fish and wildlife.

Riparian Habitat Protection Zone

The SJRWMD also has specific rules for the Riparian Habitat Protection Zone (RHPZ). The RHPZ is defined as:

1) Wetlands contiguous with the Econlockhatchee River, Little Econlockhatchee River north of University Boulevard, Mills Creek, Silcox Branch, Mills Branch, Long Branch, Hart Branch, Cowpen Branch, Green Branch, Turkey Creek, Little Creek, and Fourmile Creek.
2) Uplands which are within 50 feet landward of the wetland edge defined in the previous paragraph.
3) Uplands which are within 550 feet landward of the stream's edge defined, for this section, as the waterward extent of the forested wetlands abutting the Econlockhatchee Raiver and the above named tributaries. In the absence of forested wetlands abutting these streams, the stream's edge shall be defined, for the purpose of this subsection, as the mean annual surface water elevation of the stream; however, if hydrologic records are unavailable, the landward extent of the herbaceous emergent wetland vegetation growing in these streams shall be considered to be the stream's edge."

Any of the following activities within the Riparian Habitat Protection zone is presumed to adversely affect the abundance, food sources, or habitat of aquatic or wetland dependent species provided by the zone: construction of buildings, golf courses, impoundments, roads, canals, ditches, swales, and any land clearing which results in the creation of any system. (Activities not listed above do not receive a presumption of no adverse effect.)

Further, the SJRWMD has stringent requirements related to recharge, the 100-year floodplain, erosion and sediment control, as well as draw down. Applicants for stormwater management systems permits will need to address these Little Econlockhatchee River Basin issues.

Site Specific Comments: All wetlands are within the regulatory jurisdiction of the SJRWMD. Any modifications to the ditch, wetlands, or Lake Crescent would require a permit. Field flagged wetland boundaries are for preliminary planning purposes only, since agency representatives have not yet reviewed them. Within the ditches, presence of exotics, substrate disturbance, and maintenance have diminished their habitat value.

Additionally, those wetlands which are ultimately hydrologically connected to the Econlockhatchee River will have a fifty-foot (50') upland RHPZ associated with them. Impacts to these areas will also need to be mitigated for. Mitigation for much of the upland RHPZ designated as Roads and Highways (814) should be assessed noting that these are paved roadways with diminished habitat value. Areas designated Educational Facilities (171) include a narrow band of oak trees and a retention pond in the immediate vicinity of the ditch. Here, too, uplandRHPZ value was diminished due to the proximity of the Snow Hill Road and the fragmentation of habitat. RHPZ within Single Family Units (111) had limited value with manicured lawns, habitat fragments, and landscape material. Parks and Zoos (185) south of Snow Hill Road contained a paved trail immediately adjacent to the wetland ditch in the upland RHPZ. North of Snow Hill Road, this designation had some maintenance and clearing impacts, but also had native canopy cover.

One mitigation bank includes the study parcel within its service area and has mitigation for wetland and upland RHPZ. TM-Econ Mitigation Bank is permitted by SJRWMD and the USACOE. The bank is permitted using the methodology in effect prior to UMAM and has not been reassessed using UMAM; so mitigation would be assessed using the ratio guidelines outlined above.

SEMINOLE COUNTY

Wetlands

To regulate activities in wetlands, Seminole County uses regulations set in the Seminole County Land Development Code, coordination with area agencies, conservation easements, and zoning. The Conservation Element of Seminole County's Comprehensive Plan states in Policy CON 3.6, " Impacts to wetlands/floodplains beyond what is otherwise allowed in the land development regulations and Comprehensive Plan is prohibited unless the project has a special reason or need to locate within wetlands (or wetland protection areas), there is a clear demonstration of overriding public interest, and there is no feasible alternative. In such cases, impacts to wetlands shall be kept to the minimum feasible alteration, while preserving the functional viability of the wetland to the maximum extent feasible. All impacts to wetlands shall be mitigated in accordance with the applicable provision in the Comprehensive Plan and land development regulations."

Wetland boundaries are defined according to the federal and state criteria described above for the Department of Environmental Protection. Additionally, the County requires classification of wetlands and adjacent areas for any property containing a wetland larger than one half acre in size (The County is re-assessing value and regulation of isolated wetlands less than one-half acre in particular areas of the County). Classification of wetlands and adjacent areas is outlined in Appendix H-Planning Standards for Natural Resources. Significance criteria for the evaluation of wetlands in Seminole County include: size, connectedness, landscape diversity, intactness, uniqueness and quality of surrounding landscape. Values ranging from one to three are assigned for each criterion to determine a significance value for each wetland type.

Development activities are then evaluated within a "compatibility matrix." Performance criteria for dredge and fill activities are primarily related to controlling erosion, not altering natural surface waters or open streams, not impeding surface flows in wetlands, and not degrading water quality.

Within the Future Land Use Element of the comprehensive plan, the future land use designation named "Conservation" includes wetlands and 100-year floodplain areas. Uses allowed within the Conservation designation include open space, recreation, water management areas, natural areas, game preserves, and wildlife management areas, livestock grazing, short term crop production, and silvicultural activities.

Seminole County requires a permit for non-exempt activities related to dredging and filling in waters of the County such as: dredging; filling; construction of buildings, docks, piers, or other structures; or other related activities. When reviewing permit applications, the County will consider:

- Wetlands type and significance value
- Compatibility of a specific activity within a certain wetland type with a certain significance value as well as within adjacent areas
- Compliance with performance criteria

If a certain activity does not meet required performance criteria the County might deny approval of the activity or recommend mitigation/compensation based on site-specific characteristics.

Mitigation

Mitigation is required by the county to compensate for wetland impacts where impacts are not avoidable. In the Urban Area as shown on CON Exhibit-2, the county shall accept mitigation required by the St. Johns River Water Management District for impacts that occur within the Urban Area (Policy CON 7.9 (A). Additionally, Policy CON 3.4 (d) states that the County will work to "coordinate efforts with the St. Johns River Water Management District, and the U.S. Army Corps of Engineers that maximizes the benefits of receiving mitigation projects (preservation and restoration in the Wekiva, Jesup, and Econlockhatchee River basins, and in the rural areas of the County."

Water Body Setbacks

Comprehensive Plan Policy CON2.4 states, "The County shall continue to require that building setbacks for new development be placed at least 50 feet from the ordinary high water mark of water bodies.

Econlockhatchee River Protection Zone

Additionally, Seminole County has regulations in place for the protection of the Econlockhatchee River through their Econlockhatchee River Protection Ordinance No. 91-9. The ordinance establishes an "Econlockhatchee River Protection Zone" which encompasses the following areas:

- The main channels of the Big Econlockhatchee River and its tributaries as depicted on Exhibit A of Ordinance. 91-9;
- All property located within the first one thousand, one hundred feet (1,100') landward as measured from the stream's edge of the main channels of the Big Econlockhatchee River and Little Econlockhatchee River;
- All property located within the first five hundred and fifty feet (550') landward as measured from the stream's edge of the tributaries of the Big Econlockhatchee River;
- Notwithstanding the above physical descriptions of the Econlockhatchee River Corridor Protection Zone, the Zone shall extend to and contain at least fifty feet (50')of uplands property which is landward of the landward edge of the wetlands abutting the main channels of the Big Econlockhatchee River and its tributaries;
- Only the property located within the Econlockhatchee River Basin shall be deemed to be located within the Econlockhatchee River Corridor Protection Zone.
- The term stream's edge means the waterward extent of the forested wetlands abutting the Big Econlockhatchee River or its tributaries. In the absence of forested wetlands abutting the Big Econlockhatchee River or its tributaries, the stream's edge means the annual surface water elevation of the stream; provided, however, that if hydrologic records upon which the County can rely upon are not available, the landward extent of the herbaceous emergent wetland vegetation growing in the Big Econlockhatchee River or its tributaries shall be considered to be the stream's edge.
- The term "Rare Upland Habitats" means those vegetative communities identified by the County as Scrub, Longleaf Pine-Xeric Oak, Sand Pine Scrub, Xeric Oak, and Live Oak Hammock. Those vegetative communities are defined in the Florida Land Use, Cover, and Forms Classification System which is published by the Florida Department of Transportation.

Site Specific Comments: Seminole County will regulate wetlands. Value of the ditches through uplands is minimal; however, the value of Lake Crescent is higher. Below, a preliminary value of 8—moderate significance--has been determined based on county criteria.

A PRELIMINARY VALUE FOR CRESCENT LAKE WETLAND HAS BEEN DESIGNATED BASED ON THE FOLLOWING CRITERIA:

Criteria	Evaluation Category	Known or Assumed	Significance Value
Size	0.5-10 acres	Known (Seminole County Watershed Atlas)	1
Connectedness	Minor connection	Assumed	2
Landscape Diversity	Bordered by 2 plant communities in small area	Known-Marsh and Pond Pine, although mostly lawn	1.5
Intactness	Major alteration by residents	Known	1
Uniqueness	Common, but water quality good	Known (Seminole County Watershed Atlas)	1.5
Quality of Adjacent Area	Major alteration	Residences known to surround lake	1
TOTAL			(Preliminary value) 8

Seminole County regulates a 50-foot upland buffer adjacent to wetlands which are associated with tributaries or wetlands hydrologically connected to the Econlockhatchee River. Upland impacts are anticipated to be minimal and temporary for this project.

AGENCY REGULATION OF SPECIES AND/OR HABITAT

Species are regulated by some agencies and monitored and listed by other organizations. The U.S. Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FFWCC) are the primary regulatory agencies in Florida. Local jurisdictions may also have ordinances related to federal and state listed species, but, typically, these are just further reassurances that the issue will be addressed during the permitting of a development project. Presence of species is usually referred by the local jurisdiction to the USFWS and/or FFWCC.

U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish & Wildlife Service (USFWS) regulates federally protected species through the Endangered Species Act of 1973. This act prohibits the harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capturing or collecting, or attempting to engage in any such conduct (collectively defined as "taking"), or possessing, selling, delivering, carrying, transporting or shipping any endangered species of fish or wildlife. The list of Endangered and Threatened Wildlife and Plants is designated in 50 CFR 17.11 and 17.12. An "endangered" species is one that is threatened with extinction throughout all or a significant portion of its range. A species listed as "threatened" is likely to become endangered in the foreseeable future.

The Endangered Species Act also prohibits removing of any endangered plant from areas under federal jurisdiction. This includes the removal of any listed plant in violation of state law, as well. Other acts enforced by the USFWS are the Bald Eagle Protection Act (16 U.S.C. 668-668d), and the Migratory Bird Treaty Act (16 U.S.C. 703-711). These two acts give additional protection to bald eagles and any migratory bird (list designated in 50 CFR 10), respectively.

Site Specific Comments: Wildlife surveys were conducted on July 27, 2007, September 14, 2007, and October 12, 2007. No endangered or threatened plants, animals, or signs of their occurrence were observed on the parcel. Appendix A: List of Protected Species which Occur or which may

Potentially Occur within Orange County, Florida—Potential Occurrence within Jacob's Trail Outfall Area Noted summarizes potential for occurrence of listed species within the study area.

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

The Wildlife Code of the State of Florida (Chapter 39, F.A.C.) prohibits the "taking" of any wildlife or freshwater fish or their nests, eggs, young, homes or dens, except as specifically provided for in the rule. "Taking" is collectively defined as taking, attempting to take, pursuing, hunting, molesting, capturing or killing. Also prohibited is transporting, storing, serving, buying, selling, possessing or wantonly or willfully wasting any of the above-mentioned wildlife.

Prohibition of the above actions specifically for endangered, threatened, and species of special concern are provided in Rule 39-27.002. Lists of these protected species are provided in Rules 39-27.003 – 005. Species are classified based on abundance and population trends for the species and its habitat. The classifications are defined as:

- ENDANGERED: A species, subspecies, or isolated population that is, or soon may be, in danger of extinction unless the species or its habitat is fully protected and managed for its survival.

- THREATENED: A species, subspecies, or isolated population that is very likely to become endangered in the near future unless the species or its habitat is fully protected or managed for its survival

- SPECIES OF SPECIAL CONCERN: A species, subspecies or isolated population that warrants special protection because: it may, due to pending degradation or human disturbance, become threatened unless protective management strategies are employed; it cannot be classified as threatened until its status is more fully understood; it occupies such an essential ecological position that its decline might adversely affect associated species; or it has not sufficiently recovered from a past decline in abundance.

The Florida Endangered and Threatened Species Act of 1977 confers the responsibility of research and management of freshwater and upland species to the Florida Game and Freshwater Fish Commission (FFWCC). Some of the above activities may be allowed if a permit is obtained from the FFWCC. Permits for taking species will be allowed only: 1) if demonstrated that the permitted activity will clearly enhance the survival potential of an endangered species; 2) if the activity will demonstrably not have a negative impact on the survival potential of threatened species; or 3) if the permitted activity will not be detrimental to the survival potential of species of special concern.

Site Specific Comments: A site review was conducted. No listed species were observed, though sandhill crane (*Grus* canadensis) vocalizations were heard north of the project site. Wading birds may forage in the ditches when they are inundated or at the Lake Crescent shoreline; however, almost no breeding habitat is available along the fully developed lakefront.

FLORIDA DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES

Through the Preservation of Native Flora of Florida Act (Title XXXV, Sections 581.185, 581.186 and 581.201, F.S.), the Florida Department of Agriculture and Consumer Services (FDA) has authority to regulate species listed in the Regulated Plant Index (Chapter 5B-40.0055, F.A.C.). This index classifies plant species as endangered, threatened or commercially exploited. For plants listed as endangered, permission is required from the property owner or legal representative to destroy or harvest these plants on private land of another or on any public land. Permits issued for plants listed on the federal Endangered Species List under the federal Endangered species Act of 1973, as amended, must be consistent with federal standards. For plants listed as threatened, permission is required from the landowner or legal representative to destroy or harvest the plants on private land of another or on any public land. For plants listed as commercially exploited, it is unlawful to destroy or collect more than two plants from the private land of another or from any public land without the permission of the landowner or legal representative.

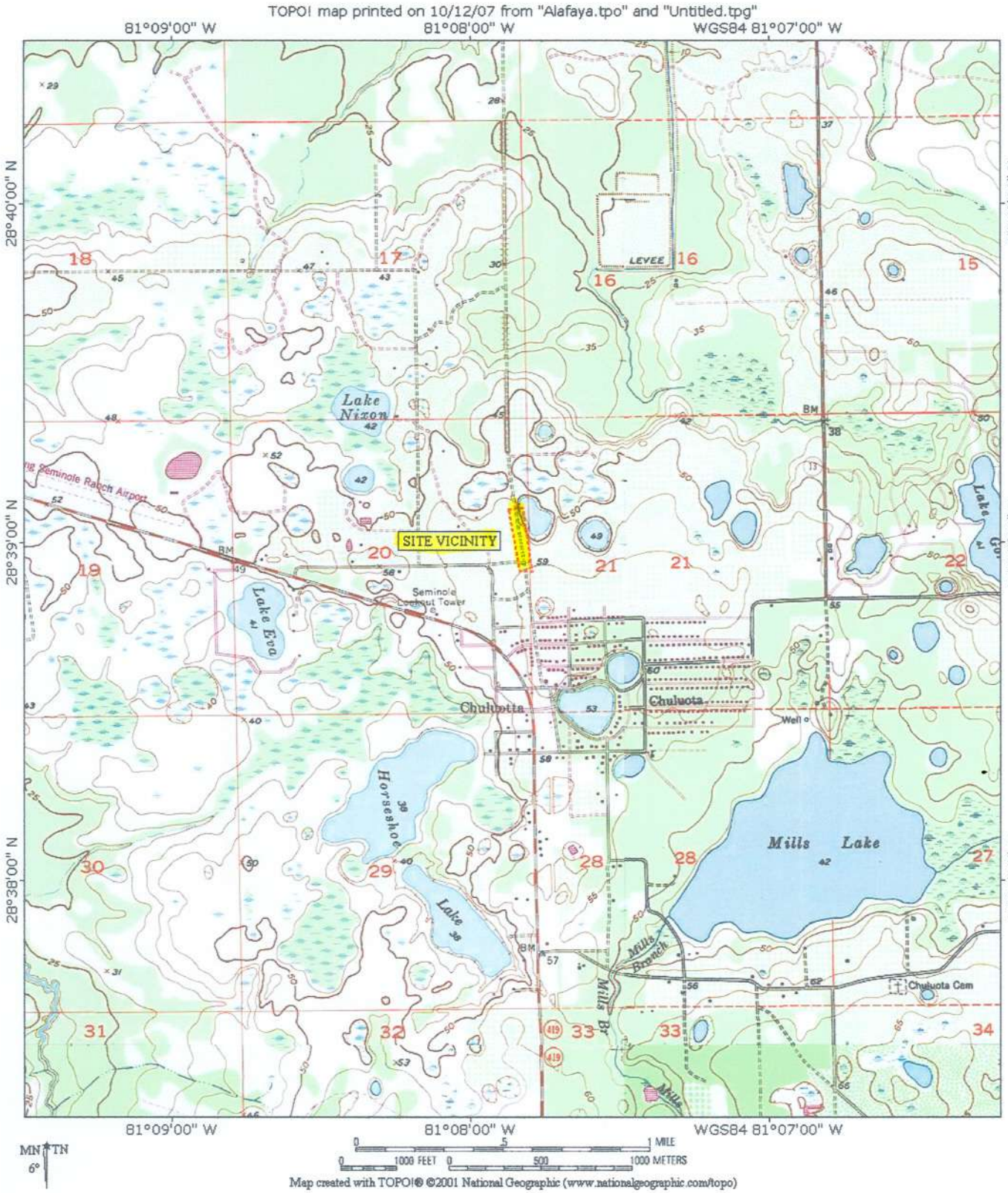
Exemptions **(except for species listed by the USFWS)** include:

- Plants that were legally imported from another country;
- Selling of plants listed on the Regulated Plant Index by licensed, certified nurserymen who grow from seeds or by vegetative propagation to preserve and encourage the propagation of these native plants.
- Agricultural, silvicultural, fire control or mining assessment activities;
- Landowners and their agents clearing regulated plants from canals, ditches, survey lines, building sites, or roads or other rights-of-way on their own land; and
- **Public agencies as well as public or privately owned utilities when providing services to the public.**

The primary focus of the law **(except for species listed by the USFWS)**, as is evident by the exemptions is to protect our less abundant native species from excessive collection and commercial exploitation.

Site Specific Comments: No plants listed by the FDA or USFWS were observed during on site inspections. If any listed plants (except for species listed by the USFWS) were present, the activity of implementing stormwater improvements would be exempt from regulation.

Figures



JACOB'S TRAIL OUTFALL
SEMINOLE COUNTY, FLORIDA

MAP SOURCE: NATIONAL GEOGRAPHIC--TOPO-FLORIDA

FIGURE 1: VICINITY MAP

Yvonne J. Froscher
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Winter Springs, Florida 32719-5305
Telephone: 407-327-2020 FAX: 407-327-1718

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JACOB'S TRAIL OUTFALL
SEMINOLE COUNTY, FLORIDA

AERIAL SOURCE: LABINS FLIGHT DATE: 1/12/04
WETLANDS SOURCE: FLAGGED BY YVONNE I. FROSCHER SURVEYED BY SOUTHEASTERN SURVEYING
SOILS ACCORDING TO NATURAL RESOURCE CONSERVATION SERVICE (FORMERLY SCS) MARCH 1990

Yvonne I. Froscher
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FIGURE 2: NATURAL RESOURCES MAP

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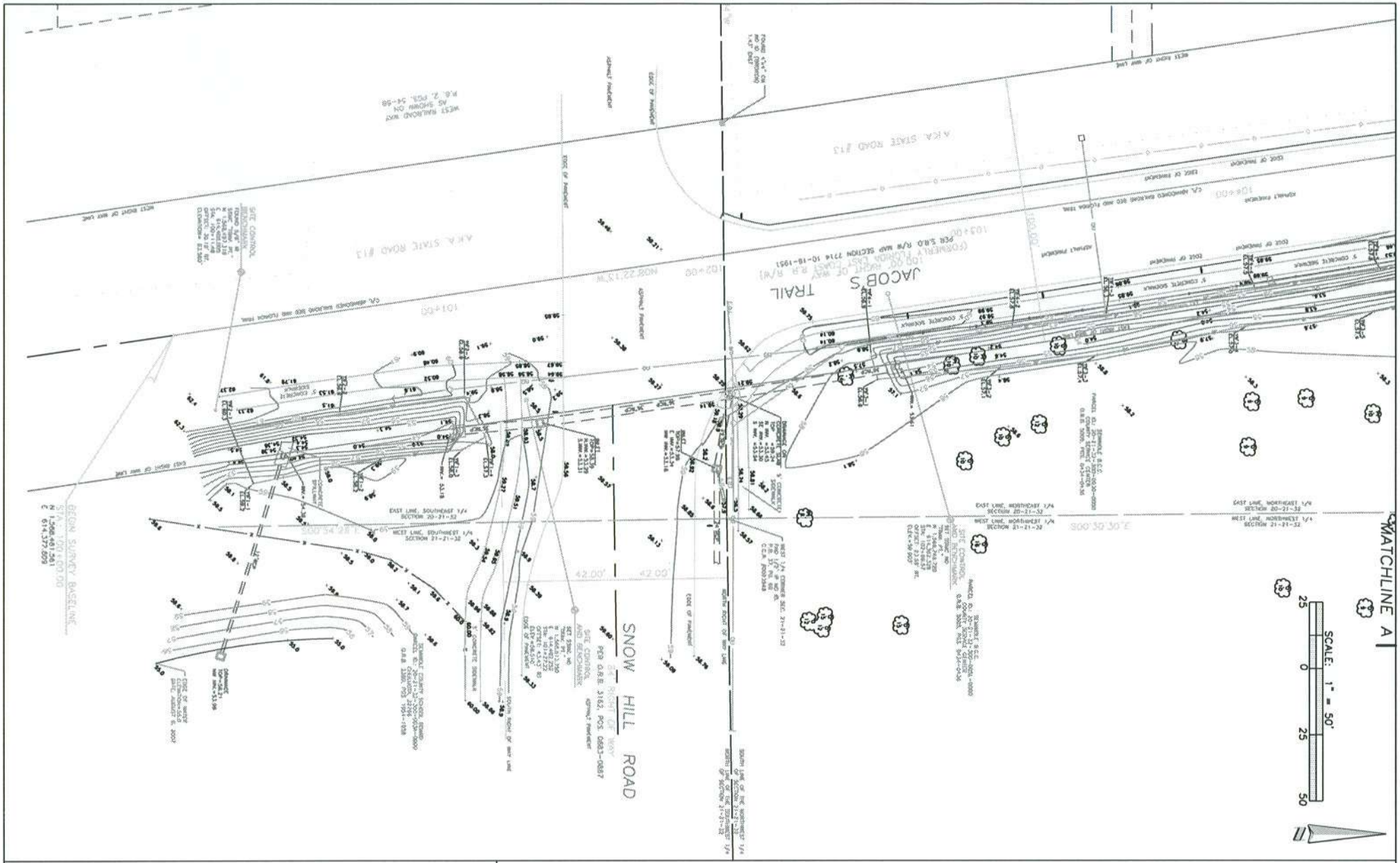

JACOB'S TRAIL OUTFALL
SEMINOLE COUNTY, FLORIDA

MAP SOURCE: Southeastern Surveying and Mapping Corp.

FIGURE3A: WETLAND SURVEY

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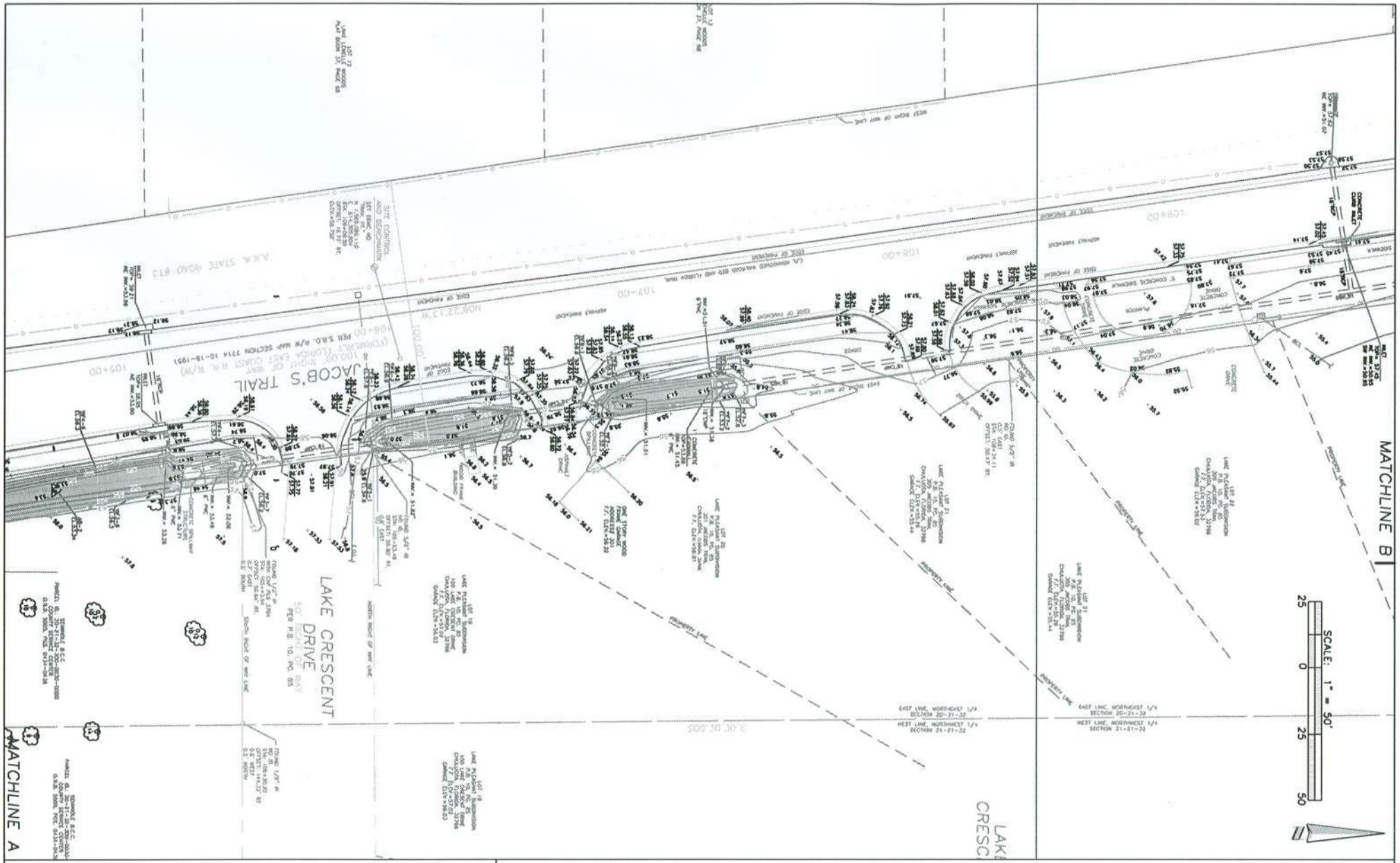

JACOB'S TRAIL OUTFALL
SEMINOLE COUNTY, FLORIDA

MAP SOURCE: Southeastern Surveying and Mapping Corp.

FIGURE3B: WETLAND SURVEY

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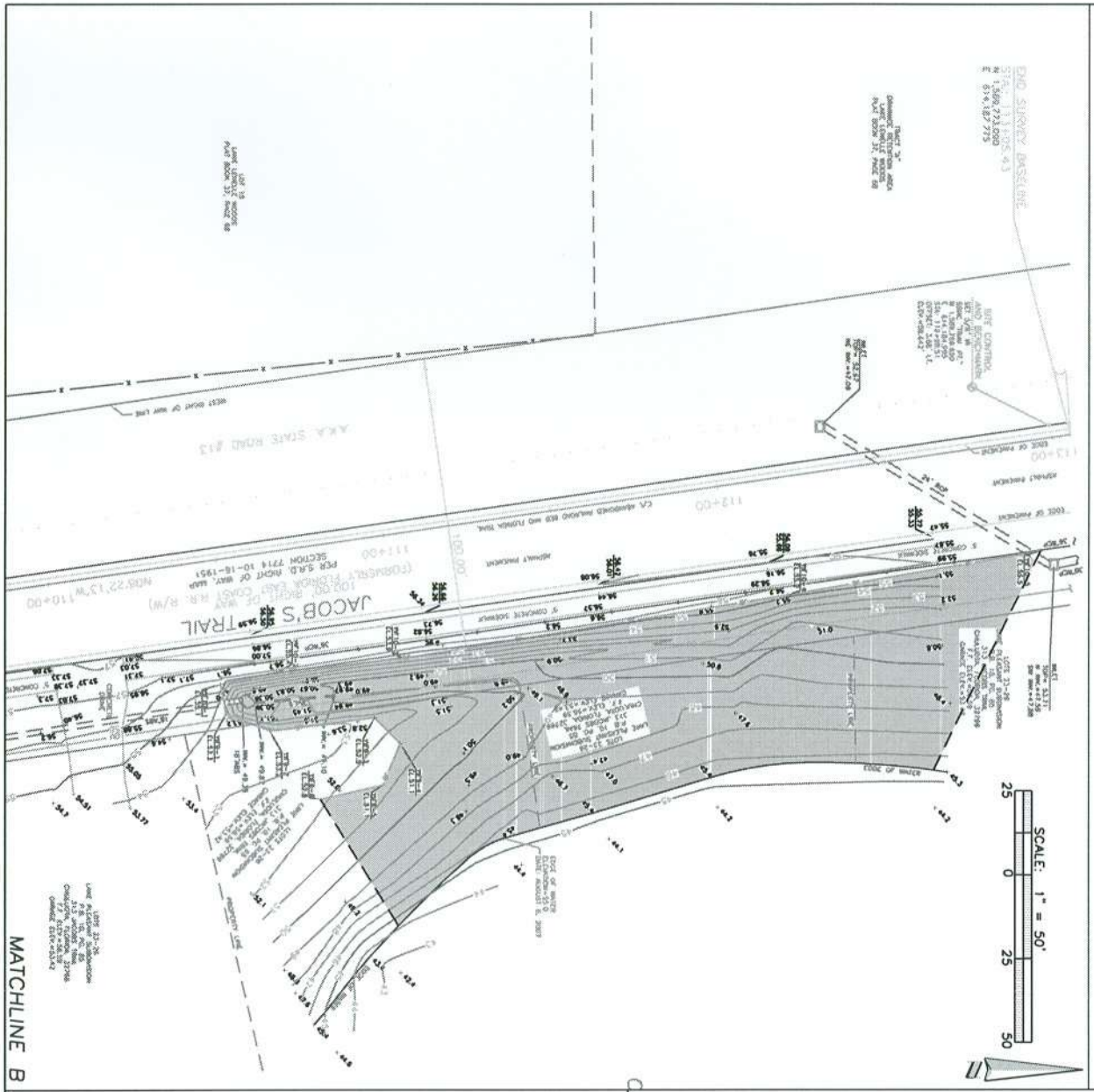

JACOB'S TRAIL OUTFALL
SEMINOLE COUNTY, FLORIDA

MAP SOURCE: Southeastern Surveying and Mapping Corp.

FIGURE3C: WETLAND SURVEY

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Appendix A: List of Protected Species which Occur or which may potentially Occur within Orange County, Florida—Potential Occurrence within the Jacob's Trail Outfall Area Noted

APPENDIX D: LIST OF PROTECTED SPECIES WHICH OCCUR OR MAY POTENTIALLY OCCUR WITHIN SEMINOLE COUNTY, FLORIDA-- POTENTIAL OCCURRENCE WITHIN THE JACOB'S TRAIL OUTFALL AREA NOTED

SCIENTIFIC NAME	COMMON NAME	USFWS	STATE	FCREPA	FNAI	HABITAT PREFERENCES	LIKELINESS OF OCCURRENCE
INVERTEBRATES							
Aphaostracon theiocrenetus	Clifton Springs hydrobe	-	-	T	S1	Mats of Chara other vegetation over a clean hard-sand bottom in shallow flowing water.	No preferred habitat -- Clifton Springs only known habitat
Procambarus acherontis	Orlando cave crayfish	-	-	T	S1	Restricted to groundwater sites associated with spring caves and wells.	No preferred habitat
Spiders							
Geolycosa xera	McCrone's burrowing wolf spider	-	-	R	S2	Open sand and sand pine scrub; not tolerant of leaf litter.	No large sandy patches
Dragonflies and Damselflies							
Progomphus alachuensis	Tawny sanddragon	-	-	SSC	S4	Clear sand bottom lakes.	Could occur
Didymops floridensis	Maidencane cruiser	-	-	SSC	S4	Associated with sand bottom lakes.	Could occur
Libellula jesseana	Purple skimmer	-	-	T	S1	Clear-water, sand-bottomed lakes edged sparse maidencane grass and St. Johns wort bushes.	No preferred habitat
Gomphaeschna antilope	Taper-tailed darner	-	-	R	S4	Bald cypress moss swamps with sphagnum moss in the pools.	No preferred habitat-No sphagnum moss
Nehallenia pallidula	Everglades sprite	-	-	SSC	S3	Occurs along marshy ponds and slow streams.	Could occur
Grasshoppers							
Schistocerca ceratiola	Rosemary grasshopper	-	-	SSC	-	Bushes of *Ceratiola ericoides*, a plant restricted to scrub and sandhills.	No preferred habitat
Melanoplus tequestae	Tequesta grasshopper	-	-	SU	S2S3	Open sand pine scrub and sandhill.	No preferred habitat
Melanoplus forcipatus	Broad cercus scrub grasshopper	-	-	SU	-	Sand pine scrub with scrub oaks; including areas with a rather dense canopy of pine and oak.	No sand pine scrub
Lice							
Various lice on threatened and endangered species		-	-	T or E (depends on host)	-	On host species in its habitat.	Depends on presence of host--recorded in Seminole County (FCREPA)
Beetles							
Aphodius aegrotus	Small pocket gopher scarab	-	-	SSC	S3?	Sandy uplands, primarily sandhill, where its host occurs; feeds on pocket gopher's dung.	No preferred habitat -- no sign of pocket gophers observed.
Aphodius laevigatus	Large pocket gopher scarab	-	-	SSC	S3?	Sandy uplands, primarily sandhill, where its host occurs; feeds on pocket gopher's dung.	No preferred habitat -- no sign of pocket gophers observed.
Aphodius troglodytes	Gopher tortoise aphodius	-	-	T	S2S3	Sandy uplands where gopher tortoises occur.	No gopher tortoise burrows observed
Cincindela scabrosa	Florida scrub tiger	-	-	R	-	Isolated scrub habitats.	No preferred habitat
Copris gopheri	Gopher tortoise copris	-	-	T	S2S3	In sandy uplands inhabited by gopher tortoises.	No preferred habitat
Cremastocheilus squamulosus	Scaly anteater scarab	-	-	SU	S2S3	Unknown	Unknown--recorded in Seminole County (FCREPA)
Hypotrichia spissipes	Florida hypotrichia	-	-	SSC	S3S4	In sand pine scrub and sandhill habitats with deep, well-drained sand.	No preferred habitat
Mycotrupes gaigei	North peninsular mycotrupes	-	-	R	S2S3	Sandhill and scrub areas.	No preferred habitat
Peltotrupes profundus	Florida deepdigger scarab	-	-	SSC	S3S4	Scrub and sandhill with deep, well drained sand.	No preferred habitat
Selonodon mandibularis	Large-jawed cebrionid	-	-	SU	-	Unknown, probably sandy uplands.	Unknown--recoreded in Seminole County (FCREPA)
Serica delicatula	Delicate silkly June beetle	_	_	SU	-	Unknown	Unknown--recoreded in Seminole County (FCREPA)
Serica pusilla	Pygmy silky June beetle	-	-	SU	S2S3	Unknown, but most specimens from scrub or sandhill.	Unkown--recorded in Seminole County (FCREPA)
Caddisfly							
Nectopsyche tavara	Tavares white miller	-	-	SU	S2	Associated with unpolluted mesotrophic lakes of central FL highlands; larvae and pupae are found on submerged aquatic vascular plants.	No preferred habitat
Butterflys and Moths							
Amblyscirtes aesculapius	Textor skipper	-	-	R	S3	In the the vicinity of cane brakes in hammocks and bottomland swamps.	No preferred habitat
Atrytone arogos arogos	Arogos skipper	-	-	R	S2	Pine flatwoods and sandhill ridges.	No preferred habitat
Atrytonopsis hianna loammi	Southern dusted	-	-	R	S1	Pine flatwoods.	No preferred habitat
Euphyes dukesi	Duke's skipper	-	-	R	S1	Shaded moist forests and swamps	No preferred habitat
Poanes zabulon	Zabulon skipper	-	-	R	S3S4	Grassy clearings in hardwood hammocks.	Could occur
Satyrodes appalachia appalachia	Appalachian eyed brown	-	-	R	-	Swamps containing an abundance of the larval food plant, Rynchospora inundata; horned beakrush.	No *Rynchospora inundata* observed

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SCIENTIFIC NAME	COMMON NAME	USFWS	STATE	FCREPA	FNAI	HABITAT PREFERENCES	LIKELINESS OF OCCURRENCE
VERTEBRATES							
BIRDS	BIRDS						
Accipiter cooperii	Cooper's hawk	-	-	SSC	S3	Non-breeding habitat includes those habitats which support small and medium sized birds. The species breeds in closed-canopy river bottoms, hammocks and upland woodlots near open habitats.	Could occur--foraging
Aimophila aestivalis	Bachman's sparrow	-	-	-	S3	Various terrestrial habitats, ruderal.	Not likely
Aphelocoma c. coerulescens	Florida scrub jay	T	T	T	S2	Oak scrub consisting of shrubs of live oak, myrtle oak, chapman oak, along with saw palmetto, and scattered sandpine.	No preferred habitat-adjacent oak association too mature
Aramus guarauna	Limpkin	-	SSC	SSC	S3	Associated with slow-moving freshwater rivers, streams, marshes, and lake shores where apple snails occur.	Not likely
Ardea alba	Great egret	-	-	SSC	S4	Foraging habitat includes coast lines, tidal creeks, seagrass flats, stream banks, lake shores, ponds, fresh and salt water marshes, wet or dry pastures and drainage ditches. Preferred nesting habitat is isolated freshwater swamps or mangrove	Could occur--foraging
Ardea herodias occidentalis	Great white heron	-	-	SSC	S2	Preferred breeding habitat coastal and estuarine on isolated islands or keys. Foraging habitat shallow, open water mud flats and coastal shorelines.	Not likely
Buteo brachyurus	Short-tailed hawk	-	-	R	S1	Stands of mature cypress, riparian hardwoods, mangroves, or pines; particularly where the woods occur adjacent to broad open prairie.	Could occur--foraging
Caracara plancus audubonii	Audubon's crested caracara	T	T	T	S2	Dry prairies with scattered cabbage palms and wetter areas. Can occur in improved pasture lands.	No preferred habitat
Egretta caerulea	Little blue heron	-	SSC	SSC	S4	Foraging habitat includes shallow freshwater, brackish, and saltwater wetlands. Preferred breeding habitat wooded or shrubby wetlands, and cabbage palm areas.	Could occur-foraging
Egretta thula	Snowy egret	-	SSC	SSC	S3	Freshwater and coastal wetlands. Nesting colonies in coastal, estuarine habitat, usually woody and over water.	Could occur-foraging
Egretta tricolor	Louisiana heron	-	SSC	SSC	S4	Feeding habitat includes shallow edges of ponds and lakes, marshes, mangrove swamps, tidal streams, and roadside ditches. Nesting habitat on islands or in woody vegetation over standing water.	Could occur-foraging
Elanoides forficatus	American swallow-tailed kite	-	-	T	S2	Forages in many swamp and floodplain associations. Nest and roost sites are typically in tall, open trees within mixed woodland-savannah habitats.	Not likely
Eudocimus albus	White ibis	-	SSC	SSC	S4	Young require freshwater. They nest on islands in marshes or mangroves. Foraging habitat includes bottomland hardwood, cypress swamps, salt marsh, wet prairies, floating vegetated mats, mudflats, mangrove swamps, sawgrass strand edges,	Could occur--foraging
Falco columbarius	Merlin	-	-	SU	S2	Along shorelines, marshes, mud flats, open parkland, scrubby flatwoods, and edges of open woodland.	Could occur during winter
Falco peregrinus tundrius	Peregrine falcon	-	E	E	S2	Prefer open habitats that permit foraging for avian prey. May occur anywhere in Florida, but more often observed in coastal areas.	Not likely, not much open habitat
Falco sparverius paulus	Southeastern American kestrel	-	T	T	S3	Open pine forests and clearings where dead trees are found. They can also be found in other open habitats.	Not likely, not much open habitat
Grus canadensis pratensis	Florida sandhill crane	-	T	T	S2S3	Nesting habitat preference is emergent palustrine wetland dominated by pickerelweed and maidencane. Foraging commonly occurs in pastures, maintained roadsides and other open grassy areas.	No preferred nesting habitat
Haliaeetus leucocephalus	Southern bald eagle	T	T	T	S3	Primarily riparian, associated with the coast or lake and river shores. Nests in tall living or dead trees.	None observed, none in FFWCC on-line database 10/07
Ixobyrchus exilis	Least bittern	-	-	SSC	S4	Fresh and brackish wetlands are preferred, but will utilize salt marshes and mangrove habitats.	Not likely
Laterallus jamaicensis	Black rail	-	-	R	S2	Upper edges of tidal marshes where dominant vegetation is black rush, freshwater marshes dominated by cordgrass or salt grass. Areas saturated by groundwater, not typically inundated with surface water.	No preferred habitat
Mycteria americana	Wood stork	E	E	E	S2	Freshwater and brackish wetlands, primarily nesting in cypress or mangrove swamps. Feeds in marshes or swamps.	Could occur-foraging
Nyctanassa violacea	Yellow-crowned night heron	-	-	SSC	S3	Typically nest in trees over water. Feeding habitat includes coastal mud flats, marshes and mangrove swamps and inland riverine forests.	No preferred habitat
Nycticorax nycticorax	Black-crowned night heron	-	-	SSC	S3	In Florida breeding habitat is typically comprised of interior ponds and sloughs interiorly and coastal mangrove swamps. Feeding occurs in all types of shallow wetlands.	Could occur-foraging
Pandion haliaetus	Osprey	-	-	T	S3S4	Nests in large living or dead cypress, mangrove, pine, or swamp hardwood trees located near sea coasts, lakes, large swamps or rivers--near open water environments.	No nests observed in vicinity
Passerina ciris	Painted bunting	-	-	SU	-	More open habitats with patches of brush and trees such as scrub and maritime hammock. Also includes yards, roadside thickets, fence rows, fallow farm fields and freeze-killed citrus groves.	Could occur
Piccoides borealis	Red-cockaded woodpecker	E	T	E	S2	Old-growth living pines in a fire-maintained setting of sparse midstory.	No preferred habitat
Picoides villosus	Hairy woodpecker	-	-	SSC	S3	A variety of forested areas including pinelands, sand pine scrub, cypress stands, dediduous swamp forests, and high hammocks.	Not likely--traffic and development
Plegadis falcinellus	Glossy ibis	-	-	SSC	S3	Foraging habitat includes inundated grasslands, prairies, and high marsh. Freshwater habitats are preferred. Nesting habitat is typically in wetlands of small trees or woody shrubs.	Not likely
Recurvirostra americana	American avocet	-	-	SSC	S1S2	Marshes, mud flats, estuaries, alkaline lakes and ponds. Nesting habitat is open salt or mud flats near water and with sparse grass tufts.	Not likey
Setophaga ruticilla	American redstart	-	-	R	S3	Prefers mature deciduous forests with well established understory and subcanopy and near streams.	No preferred habitat
Sterna antillarum	Least tern	-	T	T	S3	Nesting habitat is preferrably sand or gravel with little vegetation in coastal beach areas, but now includes artificial, open habitats such as dredged areas and gravel roofs.	No preferred habitat

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SCIENTIFIC NAME	COMMON NAME	USFWS	STATE	FCREPA	FNAI	HABITAT PREFERENCES	LIKELINESS OF OCCURRENCE
Sterna caspia	Caspian tern	-	-	SSC	S2?	Nesting habitat is sand and shell to gravel on small isolated islands. Foraging habitat includes coastal bays and rivers, inland lakes, and impoundments.	Could occur foraging, no preferred nesting habitat
Sterna maxima	Royal tern	-	-	SSC	S3	Nest in coastal areas on bare substrate in isolated areas.	No preferred nesting habitat
MAMMALS							
Corynorhinus rafinesquii Syn:*Plecotus rafinesquii macrotis*	Rafinsque's big-eared bat	-	-	R	S2	Heavily forested communities, particularly floodplain areas with large hollow trees for nesting. Also pine flatwoods and oak-pine forests. Roosts in old building, behind loose bark, and culverts.	Could occur
Eptesicus fuscus	Big brown bat	-	-	SU	S3	Forage in primarily open habitats. Summer nursery colonies are in buildings, bridges, and hollow trees. During cold periods they may utilize tree cavities.	Could forage
Lasiurus intermedius floridanus	Northern yellow bat	-	-	SU	-	Strongly associated with Spanish moss in longleaf pine-turkey oak sandhill and live oak hammocks. Forage in open habitats. Nest in old cabbage palm frond boots.	No preferred habitat
Mustela frenata peninsulae	Florida long-tailed weasel	-	-	R	S3	No clear habitat preference. Has been observed in sandpine scrub, sandhill, pinelands, cypress swamps, and tropical hammocks.	Not likely
Neofiber alleni	Round-tailed muskrat	-	-	SSC	S3	Shallow emergent marshes. Extremely dense stands of maidencane and pickerelweed provide preferred habitat.	No preferred habitat
Podymys floridanus	Florida mouse	-	SSC	T	S3	Restricted to fire-maintained, xeric upland vegetation on deep, well drained sandy soils. Has been observed in sand pine scrub, coastal scrub, scrubby flatwoods, longleaf pine-turkey oak, upland hammock, live oak (xeric) hammock, and dry pine	No preferred habitat
Sciurus niger shermani	Sherman's fox squirrel	-	SSC	T	S2	Longleaf pine-turkey oak association of mature, fire-maintained sand hills. Small numbers have been seen in ecotonal situation, especially where live oak forest meets pine savannah.	No preferred habitat
Tadarida brasiliensis cynocephala	Brazilian free-tailed bat	-	-	SU	-	Precise habitat requirements not known.	Could occur--within range (FCREPA)
Trichechus manatus	Manatee	E	E			Warm brackish and freshwater areas	No preferred habitat
Ursus americanus floridanus	Florida black bear	-	T	T	S2	Thickets and vine-choked bays called "bay-galls," or swamps.	No preferred habitat
REPTILES							
Alligator mississippiensis	American alligator	T(S/A)	SSC	-	S4	Various wetland types including: the edges of large lakes, ponds, rivers, and the interiors of swamps and freshwater	Could occur
Clemmys guttata	Spotted turtle	-	-	R		Shallow woodland ponds and streams. Fresh or mildly brackish water. Prefers soft bottom and abundant vegetation.	Not likely
Drymarcon corais couperi	Eastern indigo snake	T	T	SSC	S3	Utilizes broad spectrum of wetland to xeric habitats. May prefer hydric habitats during warmer months.	Could occur
Gopherus polyphemus	Gopher tortoise	-	SSC	T	S3	Beach scrub, sand pine, longleaf pine-turkey oak, and live oak hammocks.	No burrows were observed.
Pituophis melanoleucus mugitus	Florida pine snake	-	SSC	SSC	S3	Prefers xeric associations as sandhill, scrubby flatwoods, scrubby hammock, and old field on former sandhill sites.	No preferred habitat
Stilosoma extenuatum	Short-tailed snake	-	T	T	S3	Restricted chiefly to longleaf pine-turkey oak plant associations. Soils preferences in laboratory tend toward Norfolk, Blanton fine, and St. Lucie soils.	No preferred habitat
AMPHIBIANS							
Notophthalmus perstriatus	Striped newt	-	-	R	S2S3	Sinkhole ponds in sandhills and in cypress ponds and bay ponds in pine flatwoods. Not typically in permanent ponds where exposure to predatory fishes are present. The terrestrial efts are found in well-drained sandy areas in sandhill, under debris.	No preferred habitat
Rana capito aesopus	Florida gopher frog	-	SSC	T	S3	Sandhill communities on bluejack and turkey oak ridges, and in sand pine scrub. Associated with gopher tortoise burrows near breeding wetlands that are typically seasonally flooded and do not support predatory fish populations.	No preferred habitiat
PLANTS							
Calopogon multiflorus	Many-flowered grass pink	-	E	-	-	Pine flatwoods, preferring post winter fire conditions.	No preferred habitat
Carex chapmanii	Chapman's sedge	-	-	-	S3	Terrestrial: slope forest; Palustrine: hydric hammock, floodplain	No preferred habitat
Centrosema arenicola	Sand butterfly pea	-	-	-	S2	Sandhill, scrubby flatwoods, ruderal.	No preferred habitat
Cheiroglossa palmata = *Ophioglossum palmatum*	Hand fern	-	E	E	S2	Detritus-filled base of cabbage palm trees in low, moist and very shaded hammocks.	No preferred habitat
Chionanthus pygmaeus	Pygmy fringe-tree	E	E	E	S3	Sandy, dry soil of central Florida scrub.	No preferred habitat
Coelorachis tuberculosa	Florida jointtail	-	-	-	S3	Marshes.	Observed genus
Ctenitis submarginalis	Brown-hair comb fern	E	-	-	S1	Cypress swamps, rockland hammocks, spoil banks.	No preferred habitat
Curcurbita okeechobeensis	Okeechobee gourd	E	E	T	S1	Floodplain forests along the St. Johns River. Wet hammocks and ditch banks.	No observed
Dennstaedtia bipinnata	Cuplet fern	-	E	E	S1	Restricted to deep muck soil in dense hammocks.	No preferred habitat
Encyclia tampensis	Butterfly orchid	-	CE	-	-	Mangrove, cypress swamps, hardwood swamps, and hammocks.	Not likely
Epidendrum conopseum	Green-fly orchid	-	CE	-	-	Cypress swamps, hardwood swamps, and moist hammocks.	No preferred habitat
Garberia heterophylla	Garberia	-	T	-	-	Sand pine and oak scrub .	No preferred habitat
Ilex opaca var. arenicola	Scrub holly	-	-	-	S3	Sand pine scrub	No preferred habitat
Illicium parviflorum	Yellow anise tree	-	E	-	S2	Low hammocks on sandy loams or sandy peat mucks. Generally found along sandy-bottomed clear streams that arise from limesinks. Banks of spring-run or seepage streams, bottonland forest, hydric hammock, and bay areas dominated by red maple and sweetbay.	No preferred habitat

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SCIENTIFIC NAME	COMMON NAME	USFWS	STATE	FCREPA	FNAI	HABITAT PREFERENCES	LIKELINESS OF OCCURRENCE
Lechea cernua	Nodding pinweed	-	T	-	S3	Terrestrial: Scrub, openings, disturbed areas, common after fires.	No preferred habitat--no fire-maintained habitat
Lechea divaricata	Pine pinweed	-	E	-	S2	Found in deep sands, usually ancient dunes or ecotonal to moister dune swales. Mostly found in sand pine scrub.	No preferred habitat
Lilium catesbaei	Catesby lily	-	T	-	-	Moist pine flatwoods and savannas.	Not observed
Lobelia cardinalis	Cardinal flower	-	T	-	-	Streams and spring runs.	No preferred habitat
Lycopodium cernuum	Nodding clubmoss	-	CE	-	-	Wet pinelands, edge of bogs, and wet disturbed sites.	Not observed
Matlea gonocarpus	Anglepod	-	T	-	-	Bluffs, floodplain	Not likely
Myricanthes fragrans var. simpsonii	Simpson's stopper; twinberry	-	T	-	-	Rockland hammock	Not likely--FNAI has no recorded occurrences in Seminole County
Nemastylis floridana	Fall-flowering ixia	-	E	T	S2	A variety of wet habitats. It is found in grassy openings of wet hammocks, in marshlands and in low flatwoods.	Not likely
Osmunda cinnamomea	Cinnamon fern	-	CE	-	-	Wet woods and swamps.	Could occur
Osmunda regalis	Royal fern	-	CE	-	-	Wet woods and swamps.	Could occur
Peltandra sagittifolia	Spoon-flower	-	-	R	-	Boggy areas and ditches, in valley bottoms, within cypress swamps, along lake margins, and at the edges of streams.	Not likely
Pinguicula caerulea	Blue-flowered butterwort	-	T	-	-	Wet acid pinelands.	Not observed
Pinguicula lutea	Yellow butterwort	-	T	-	-	Wet, acid pinelands.	Not observed
Platanthera nivea	Snowy orchid	-	T	-	-	Wet pine flatwoods.	Not observed
Pogonia ophioglossoides	Rose pogonia	-	T	-	-	Marshes and wet pine flatwoods.	Not observed
Polypodium ptilodon	Swamp plume polypoda fern	-	E	-	-	Hammocks, swamps	No preferred habitat
Eulophia ecristata	Non-crested eulophia	-	T	-	-	Upland hardwood forest, scrubby flatwoods, mesic flatwoods.	Not likely
Pycnanthemum floridanum	Florida mountain-mint	-	-	-	S3	Terrestrial: sandhill, upland mixed forest; Palustrine: wet flatwoods, floodplain forest Comments: Found in roadside ditches and in sandhill communities in moist areas.	Not observed
Rhapidophyllum hystrix	Needle palm	-	CE	T	-	Deep hammocks	Not likely
Rhipsalis baccifera	Mistletoe cactus		E	probably extripated	S1	Marine tidal swamp, in the boughs of live oaks (scientists disagree)	No preferred habitat--FNAI has recorded occurrence in Seminole County, FCREPA does not
Salix floridana	Florida willow	-	E	R	S2	Hydric hammock, bottomland forest, and edges of spring runs and streams.	No preferred habitat
Sarracenia minor	Hooded pitcher plant	-	T	-	-	Wet, open pinelands and bogs.	Not observed
Spiranthes laciniata	Ladies' tresses (unnamed)	-	T	-	-	Marshes and cypress swamps.	Not observed
Stenorrhynchos lanceolatus	Leafless beak orchid	-	T	-	-	Wet pine flatwoods and sandhills.	Not observed
Tillandsia fasciculata	Common wild pine	-	E	-	-	Cypress swamps and hammocks.	Likely
Tillandsia utricularia	Giant wild pine	-	E	-	-	Hammocks and cypress swamps.	Not likely
Zamia floridana	Florida coontie	-	CE	-	-	Hammocks, but it may also occur in dry pinelands and on the slopes of shallow sinks in xeric oak woods.	Not observed
Zephyranthes simpsonii	Rain lily	-	T	-	S2S3	Wet pine flatwoods and meadows.	Could occur

EXPLANATION OF ABBREVIATIONS AND NOTES

SPECIES STATUS: USFWS=U.S. FISH AND WILDLIFE SERVICE, STATE=FLORIDA GAME AND FRESH WATER FISH COMMISSION OR FLORIDA DEPARTMENT OF AGRICULTURE*

FCREPA=FLORIDA COMMITTEE ON RARE AND ENDANGERED PLANTS AND ANIMALS

FNAI=FLORIDA NATURAL AREAS INVENTORY (JUNE 2007)

* NOTE:
STATE STATUS FOR FLORA IS ESTABLISHED ACCORDING TO THE FLORIDA DEPARTMENT OF AGRICULTURE (AUGUST 2003)
STATE STATUS FOR FAUNA IS ACCORDING TO THE FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION (CHAPTER 68A-27).

E=ENDANGERED
T=THREATENED
T(S/A)=THREATENED DUE TO SIMILARITY OF APPEARANCE
SCC=SPECIES OF SPECIAL CONCERN
CE=COMMERCIALLY EXPLOITED
R=RARE
SU=STATUS UNDETERMINED
S#=RANK FROM S1 TO S5 (S1 BEING MOST CRITICALLY IMPERILED, S5 BEING SECURE)
S#S#=RANGE OF RANK
S#?=TEMPORARY STATUS UNTIL MORE DATA AVAILABLE
S?=NOT ENOUGH INFORMATION TO DETERMINE STATUS

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January 22, 2006

Michael E. Arnold, Division Manager
Department of Public Works
Roads-Storm Water Division
520 West Lake Mary Blvd. Suite 200
Sanford, FL 32773

RE: Drainage and maintenance of the ditch parallel to Jacobs Trail

Dear Mr. Arnold:

Thank you for your department's recent attention with regard to storm water drainage and ditch maintenance on Jacobs Trail parallel to Lake Crescent in Chuluota. On behalf of the homeowners of Lake Crescent, I would like to take this opportunity to recap significant events and problems that we have faced with this drainage ditch.

As you are aware, Lake Crescent is a freshwater, spring fed lake. Prior to the construction of Osprey Lakes subdivision, Jacobs Trail was an unpaved road, and the ditch was approximately 3 feet in depth and drainage advanced to the north and down through what is now Osprey Lakes and into the national forest. Since Jacobs Trail was paved and the Osprey Lake subdivision built, runoff collected in the substantially deeper ditch advances directly into Lake Crescent, and as a result the following problems have been encountered.

- The design of Jacobs Trail included installing 3 driveway bibs for several Lake Crescent lots including 301 Jacobs Trail. The bibs have curbs, and 2 of the 3 driveway bibs slope from the road, and currently divert unobstructed storm water runoff from Jacobs Trail directly onto each of these properties. The homeowner at 301 Jacobs Trail continues to experience driveway flooding as storm water flows down the driveway, and, at times, has had to place sandbags in the driveway to prevent the home from flooding.

- The existing ditch does not extend all the way to the overflow drain and as a result drains directly into Lake Crescent. To this point, the elevation of the overflow drain is higher than the elevation of several homes around the lake. These homes would experience significant flooding before the lake level would reach the overflow drain.

- In Fall 2003, Seminole County School Board began construction of Walker Elementary on Snowhill Road directly across from Lake Crescent Drive. During the construction of the retention ponds, thousands of gallons of water were diverted from the construction site to the ditch and thus flowed directly into the lake. Homeowners became very concerned about the dramatic rise in lake level to the point that several neighbors became apprehensive about the possibility of well contamination. The school board as well as county officials were notified, and the pumping stopped; however, no further action was taken by the county to divert future runoff nor was the lake or wells inspected for possible contamination or damage. Data collected from the Lakewatch program showed a 3 foot increase in lake level and a decrease in lake clarity of about 3 feet after this intrusion.

- In the summer and fall of 2004, we faced 3 major hurricanes. At one point, water was pumped from flooded streets of Chuluota to the ditch on the south side of Snowhill. This ditch connects to the ditch on Jacobs Trail, and once again the lake began to rise at an alarming rate. Again, county officials were notified and the pumping stopped. By this time, one homeowner had already experienced well contamination. County officials failed to divert future runoff, and officials did not inspect the lake or wells. Data collected from the Lakewatch program has shown average lake depth has increased by 2 feet since the 2004 hurricanes and our maximum lake clarity (vanishing point) has dramatically decreased from 12 to 8 feet.

- Construction of 3 homes on Jacobs Trail has modified the ditch as well. Culverts positioned under the driveways of these homes encompass the entire width of the lots 22 and 23 and part of lot 21. These culverts diminish the storm water containment system by about one-third, and thus the filtration and effectiveness of the system has been altered allowing contaminants to pass into the lake.

- Drainage from several areas (i.e. Snowhill Road) flows into the Jacobs Trail ditch and eventually into our lake. This is new drainage that prior to road and subdivision construction did not occur. Again, data collected from the Lakewatch program since December 2002 has shown maximum lake clarity (vanishing point) decreased from 12 to 8 feet and lake depth has increased.

The Lake Crescent homeowners have attempted to bring attention to these problems using several different avenues.

- Commissioner Maloy was contacted in 2003. After this contact, DR Horton, builder of Osprey Lakes and responsible for maintenance of the ditch at that time, cleaned the ditch and rebuilt damaged portions of the sidewalk.

- County officials in both the Stomwater Program and Field Operations divisions were alerted via Maloy's office as well as by homeowners on numerous occasions.

- In Spring 2004, I personally met with engineer Mark Flomerfelt who reviewed the construction plans with me and agreed that while the ditch was in fact built according to the approved plans, storm water runoff advancing into the freshwater lake was a definite problem.

- In October 2005, Lake Crescent homeowners met with Commissioner Dallari who has reported to me that the background and construction of the ditch as well as possible solutions to the drainage problem are being researched.

- The homeowners have taken an active role in maintaining an environmentally healthy lake; as it was prior to the additional storm water being directed to Lake Crescent from other areas (i.e. Snowhill Road). In 2005, a comprehensive lake management plan was implemented in which homeowners agreed to reduce fertilizer runoff, plant a littoral zone for filtration, remove non-native invasive plants, and replant with Florida native plants. As long as Lake Crescent receives direct storm water runoff our efforts will be adversely affected.

As is obvious, the homeowners have 4 valid concerns regarding the storm water runoff into the Jacobs Trail ditch and ultimately into Lake Crescent.

- At no time did any Lake Crescent homeowner authorize the movement of storm water into Lake Crescent which is a private, freshwater lake.

- Runoff is being taken from other areas not just Jacobs Trail, and flows without filtration of contaminants (i.e. oil, silt) directly into Lake Crescent.

- The average lake depth has increased by 2 feet and water clarity has decreased by 4 feet in less than 1 year. An increase of another foot in lake depth has occurred in just the last 3 months. This rate of increase is very alarming to our residents, and has jeopardized the drinking water (wells) for several of our homeowners.

- The diminishing water quality of the lake not only impacts the natural habitat of wildlife, but also impacts property values.

In light of past problems and the concerns of the Lake Crescent homeowners as outlined above, the storm water runoff draining into Lake Crescent must be diverted.

I appreciate your continued attention to this matter, and look forward to a prompt resolution.

Sincerely,

Tim Grenz, Lake Crescent Homeowner

Cc: Commissioner Dallari
Owen Reagan
Dwayne Crumity
Robert Ballerino
Mark Flomerfelt
Stephen Nowak
Rod Pakzadian, St. Johns River Water Management District Engineer

Yvonne J. Froscher
Environmental Consultant

Summary of Seasonal High Water Elevation Data
Jacob's Trail Project
July 23, 2008

Areas where seasonal high water elevations (SHWE) were to be identified were shown by Singhofen and Associates with pink dots on the attached aerial photograph. Areas and elevations have been identified by survey and are shown on a drawing prepared by Southeastern Surveying and Mapping Corporation. The Vicinity Map of SHWE Markers has been attached; as it shows an approximate location of the flagged items and the surveyed elevations at the flagging or nail.

Area 1-Sweetbay and Marsh
The Sweebay and Marsh Area 1 is a small, but diverse wetland system with herbaceous cover and a peripheral band of sweetbay (*Magnolia virginiana*), sweetgum (*Liquidambar styraciflua*), red maple (*Acer rubrum*), and dahoon (*Ilex cassine*). Other species observed included beggerticks (*Bidens alba*), soft rush (*Juncus effusus*), common buttonbush (*Cephalanthus occidentalis*), a spikerush (*Eleocharis* sp.), and a duckweed (*Lemna* sp.). At the roadside edge was a patch of Peruvian primrosewillow (*Ludwigia peruviana*) and in another area were manyflower marshpennywort (*Hydrocotyle umbellata*), knotroot foxtail (*Setaria parviflora*), dayflower (*Commelina diffusa*), a goldenrod (*Solidago* sp.), Southern cattail (Typha domingensis), muscadine (*Vitis rotundifolia* var. *munsonia*) and dogfennel (*Eupatorium capillifolium*). Red-winged blackbird (*Agelaius phoeniceus*) and Northern cardinal (*Cardinalis cardinalis*) were observed utilizing the area.

While the marsh was inundated at the time of the January 31, 2008, site inspection, evidence of soil subsidence was present at the periphery where exposed upper roots were apparent on older trees.

Seasonal High Water Elevation Flagging:

Location Identification	Surveyed Elevation	Basis
Access from street at south edge of marsh (high flags visible from street)		
1-1	38.17	Twisted flagging at water mark and top of adventitious roots of sweetbay
1-2	38.12	Nail with flag at water mark of dead sweet bay

Opinion: Use average of two surveyed elevations for Seasonal High Water Elevation .

Area 2-Sweetbay and Marsh
The Sweetbay and Marsh Area 2 is primarily herbaceous/shrubby marsh with interior patches of trees and trees at the periphery. Species observed included a cattail (*Typha* sp.), maidencane (*Panicum hemitomon*), sedges, bulltongue arrowhead (*Sagittaria lancifolia*), and Peruvian primrosewillow (*Ludwigia peruviana*). Within forested patches were red maple (*Acer rubrum*), swamp tupelo (*Nyssa sylvatica* var. *biflora*), sweetbay (*Magnolia virginiana*), and wax myrtle (*Myrica cerifera*). At the periphery were sedges, elderberry (*Sambucus nigra* subsp. *canadensis*), red maple and sweetbay. The area appeared to be a wetland area remaining in the midst of excavated pond areas to the east and northwest. Birds observed were wood stork (*Mycteria americana*), and mallard (*Anas platyrhyncos*). No nesting sites were observed.

Existing hydrology appears to be appropriate to support the marsh area.

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Seasonal High Water Elevation Flagging:

Location Identification	Surveyed Elevation	Basis
Access from street to south		
2-1	37.50	Twisted flagging at top of adventitious roots on Carolina willow
Access at treeline near center of marsh (follow game trail along berm)		
2-2	37.49	Nail with flag at water mark of sweetbay
2-3	37.42	Nail with flag at water mark of sweetbay (in overflow area off N end of berm)

Opinion: Use average of three surveyed elevations for Seasonal High Water Elevation .

Area 3-Pond with Marshy/Wax Myrtle Edge and Elderberry Island

Area 3 Pond is an excavated pond supporting patches of elderberry (*Sambucus nigra* subsp. *canadensis*) and cattail (*Typha* sp.). At the shoreline were wax myrtle (*Myrica cerifera*), sedges, water spangles (*Salvinia minima*), and manyflower marshpennywort (*Hydrocotyle umbellata*). Spatterdock (*Nuphar advena*) was observed in areas a bit deeper. Birds observed included killdeer (*Charadrius vociferus*), white ibis (*Eudocimus albus*), anhinga (*Anhinga anhinga*), and common moorhen (*Gallinula chloropus*). Bullfrog vocalizations noted may have been gopher frogs, since that species is a winter breeder.

Seasonal High Water Elevation Flagging:

Location Identification	Surveyed Elevation	Basis
Access between yards at street inlet N of house number 668Osprey Lakes Circle (west side of pond)		
3-1	38.08	Twisted ribbon at water line of dead shrub
Walk northward to ticker flag and go out to water's edge		
3-2	37.44	Twisted ribbon at top of root mound of primrose willow

Opinion: Use elevation at 3-2, since it most closely matches Area 2 elevations and the areas are hydrologically contiguous.

Area 4-Lake

Area 4 Lake is a large excavated area where indicators were sparse and ill-defined along the shoreline or on the wax myrtle peninsula. Near the shoreline were big floatingheart (*Nymphoides aquatica*), a duckweed (*Lemna* sp.), and water spangles (*Salvinia minima*). Shoreline vegetation was sparse but included *Xyris* sp., royal fern (*Osmunda regalis*), and grassleaf rush (*Juncus marginatus*). Birds observed included included killdeer (*Charadrius vociferus*), white ibis (*Eudocimus albus*), red-winged blackbird (*Agelaius phoeniceus*), and little blue heron (*Egretta caerulea*).

Seasonal High Water Elevation Flagging:

Location Identification	Surveyed Elevation	Basis
Access from street to south; then onto wax myrtle peninsula		
4-1	37.50	Nail with flag at top of adventitious roots of wax myrtle
4-2	35.70	Nail with flag at top of adventitious roots of wax myrtle
4-3	35.89	Twisted ribbon at top of adventitious roots of primrose willow

Opinion: Use elevation at 4-1, since it most closely matches Area 2 and 3-2 elevations and the areas appear to be hydrologically contiguous.

Area 5-Bottonbush Marsh with Clump of Sweetbay
Area 5 Buttonbush Marsh with Clump of Sweetbay is just that—a buttonbush (*Cephalanthus accidentalis*) marsh with a patch of sweetbay (*Magnolia virginiana*).

Hydrology appears to be appropriate to support the area.

Seasonal High Water Elevation Flagging:

Location Identification	Surveyed Elevation	Basis
Access from street to south (high flag visible from street)		
5-1	42.82	Nail with ribbon at top of adventitious roots of primrose willow
5-2	42.92	Nail with ribbon at top of adventitious roots of primrose willow

Opinion: Use average of two surveyed elevations for Seasonal High Water Elevation .

Area 6- Pond/Maidencane Marsh
Area 6 Pond/Maidencane Marsh is a small land-locked area. In the marshy area, maidencane (*Panicum hemitomon*), cattail (*Typha* sp.), climbing hempvine (*Mikania scandens*), and beggerticks (*Bidens alba*) were observed. At the southern edge of the depression is a grouping of swamp tupelo (*Nyssa sylvatica* var. *biflora*), sweetbay (*Magnolia virginiana*), dahoon (*Ilex cassine*), and wax myrtle (*Myrica cerifera*). A pair of mallards were observed.

Water elevations vary considerably within the depression. The SHWE was considerably higher than the water elevation during the January site inspection—an indication of how the system responds to seasonal rains. Canopy species present are tolerant of considerable hydrologic variation.

Seasonal High Water Elevation Flagging:
Considerable variation in indicator elevations.

Location Identification	Surveyed Elevation	Basis
Access from Lake Lenelle Dr. at east end end of marsh; then walk clockwise to just before swamp tupelo patch (in water) and E edge of tupelo patch		
6-1	49.22	Twisted ribbon at top of adventitious roots of dahoon holly with 1" diameter
6-2A	50.15	Nail with flag at water mark of swamp tupelo
6-2B	50.52	Nail with flag at top of adventitious roots (historic high elevation?)
6-3	49.80	Nail with flag at lichen line 3" above adventitious roots of wax myrtle
6-4	50.04	Nail with flag at water mark of swamp tupelo (historic high elevation)

Opinion: Use average of surveyed elevations for Seasonal High Water Elevations 6-2A, 6-2B, 6-3, and 6-4. Elevation 6-1 has been eliminated because of the small diameter of the material which may reflect only a recent high water elevation. The lichen line roughly coincides with water marks.

Area 7-Sweetbay/Loblolly Bay
Area 7 is a forested bay swamp comprised of sweetbay (*Magnolia virginiana*) and loblolly bay (*Gordonia lasianthus*) in the canopy. Wax myrtle (*Myrica cerifera*) was interspersed. Other species present were swamp fern (*Blechnum serrulatum*), lizard's-tail (*Sururus cernuus*), Virginia chain fern (*Woodwardia virginica*), and broom sedge (*Andropogon* sp.).

Sweetbay can tolerate some hydrologic fluctuation, but loblolly bay typically occurs in a narrow hydrologic band at the periphery of wetlands. Hydrologic modification is not recommended.

Seasonal High Water Elevation Flagging:
Considerable variation in indicator elevations.

Location Identification	Surveyed Elevation	Basis
Access from Lake Crescent Drive south of the wetland (go in at flag at street—high flags visible from street)		
7-1	41.25	Nail with flag at water mark on sweetbay
7-2	41.66	Nail with flag at water mark on sweetbay

Opinion: Use average of two surveyed elevations for Seasonal High Water Elevation .

Area 8-Lake Crescent

Area 8 Lake Crescent is a land-locked lake. The littoral zone supports torpedo grass (*Panicum repens*), sedges, and a spikerush (*Eleocharis* sp.). Spatterdock (*Nuphar advena*) was observed at the waterward edge of the littoral zone. A single Carolina willow (*Salix caroliniana*) was present with adventitious roots. Most of the shoreline is residential lawn to the saturated zone and no other aquatic woody plants were present.

Water elevations vary within the lake with seasonal rains. A handful of pines

Seasonal High Water Elevation Flagging:
Considerable variation in indicator elevations.

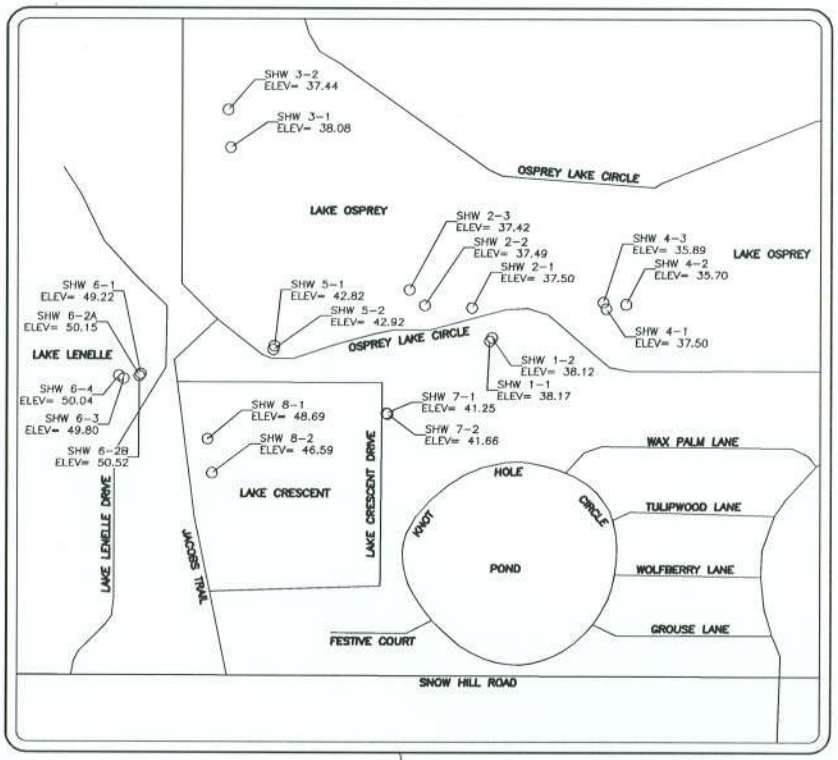
Location Identification	Surveyed Elevation	Basis
Access from Jacob's Trail in vicinity of flagged wetland ditch; then walk clockwise to Carolina willow		
8-1		Nail with flag at top of adventitious roots on Carolina willow
Access from Jacob's Trail in vicinity of flagged wetland ditch; then walk counterclockwise to just below tip of pine area.		
8-2		Wire flag at topographic break into lake bowl (indication of long term ordinary high water elevation)

Opinion: Use surveyed elevation for Seasonal High Water Elevation 8-1.

yif:yif

Attachments: Aerial Photo with Approximate SHWE Locations to be Identified
The Vicinity Map of SHWE Markers

Max\Clients\SAI\JacobsTr\080723r-SHWE.doc/via E-mail to hlb@saiengineers.com /hard copy via USPS



VICINITY MAP OF SHW MARKERS

NOT TO SCALE

Meeting:	Lake Crescent Neighborhood
Date:	Monday, November 26, 2007 7:00 p.m.-8:30 p.m.
Where:	132 Lake Crescent Drive, Chuluota
Present:	Commissioner Bob Dallari Gary Johnson Director of Public Works Roland Raymundo, Engineer
Residents Present:	Phil Bradford, 104 Lake Crescent Drive Judy Warren, 112 Lake Crescent Drive Ted and Karen Moran, 116 Lake Crescent Drive Larry Peletz, 120 Lake Crescent Drive Jeff Meyer, 124 Lake Crescent Drive Tim and Robin Grenz, 132 Lake Crescent Drive Linda Mays, 136 Lake Crescent Drive Mike Perry, 156 and 160 Lake Crescent Drive Greg and Carla Hogan, 313 Jacobs Trail

Meeting commenced at approximately 7:10 p.m. when Commissioner Dallari assured residents that concerns and problems with the ditch and drainage on Jacobs Trail were to be addressed. Monies were appropriated in the 2007-08 budget to perform an initial survey to both assess the drainage problem and to design and engineer a solution. Approximately $400,000 is available in the 2008-09 budget to implement the solution. Commissioner Dallari noted that the monies are tied to the sales tax, and the fiscal year for county begins each October. Appropriations are approved one year at a time, and, therefore, "things" may be moved or postponed—if citizens are not involved. The needs are revisited each year.

Mr. Gary Johnson then reviewed the steps the county has taken thus far. He reminded residents that Public Works maintains the drainage that is built by developers. The department does not permit or approve designs by developers—they are, however, responsible for maintenance once completed. He noted Jacobs Trail is not easily maintained, and the drainage is also not easy to remedy. As run-off projects qualify for sales tax funding, $50,000 was appropriated for assessment and study (as mentioned by Commissioner Dallari). The analysis took into account growth and development as well as the subdivision retrofit in old Chuluota (1st street). The prime concern is water coming off of Snowhill Road down Jacobs Trail, and the engineers are looking at ways to slow the water and remove pollutants before the water enters into lake. Commissioner Dallari clarified that the issues to look at are slowing water to percolate, removing pollutants, and maintenance.

Mr. Raymundo using maps including topographic maps explained the ridgelines and the planned runoff of the Trails. He noted that the field survey has been completed and includes ridgelines and drainage. The next step will be to analyze flow and water volume. Commissioner Dallari confirmed that residents can expect to be told how much water will be going into the lake under certain conditions.

The drainage resulting from the development of the Osprey Lakes subdivision was discussed. Mr. Grenz revisited the development of the Osprey Lakes subdivision and the subsequent drainage into lake. The engineering of the ditches and the drainage along Jacobs Trail rendered Lake Crescent as a retention pond when in fact it was a natural spring fed lake that is shown on historical maps.
Mr. Johnson commented that many areas around county where private lakes take public water. Commissioner Dallari inquired about engineering a retention pond that would hold runoff and water resulting from storms including the infamous 100-year storms. The retention pond would prevent Lake Crescent from taking both runoff and water. Mr. Johnson replied that "technically" they could. Mr. Moran noted that originally the residents had talked about not taking any water from "unnatural" sources, and Mrs. Moran noted that her understanding was that originally, runoff was supposed to go to Osprey Lakes. Commissioner Dallari inquired about engineering a retention

pond that if overfilled would drain into wetlands? Mr. Raymundo responded that it was not economical due to differing elevations.

Further discussion ensued about historical drainage in and around Lake Crescent. Whereupon, Mr. Johnson stated, "The intent of our project is to keep drainage as close to historical as possible using a retention system." Commissioner Dallari clarified for residents that before it [the project] is completed---around 85%--another neighborhood meeting would be held, and Mr. Johnson would explain drainage and flow.

Through discussion, it was decided that Public Works department would investigate

- The popoff that runs under Jacobs Trail to Lake Lenelle
- Runoff on Hogan's property at 313 Jacobs Trail
- Driveway issue for Pat Hall at 301 Jacobs Trail. Pat has experienced flooding under normal rainy conditions as a result of the development of Jacobs Trail.
- Flooded wells at both 168 and 104 Lake Crescent Drive. These floods resulted from the runoff and water moving into Lake Crescent due to storms and pumping for school construction.
- Possibility of holding runoff from Snowhill
- Outflow for lake

Comment: This goes north into Osprey Lakes. We need survey

Comment: Culvert is undersized

Comment: 2 pond design alts presented to County

Comment: We need survey

It was further decided that the Lake Management Department will contact Tim Grenz or Larry Peletz with regard to water quality. Storm Water Management will assist in addressing muck and sediment resulting from past runoff.

In summary, Mr. Johnson agreed that system will be engineered to hold water coming from the south, and a popoff system will be engineered in case of an extreme situation (i.e. 100 year floods)

Minutes respectfully submitted by Robin Grenz

November 26, 2007

Progress Summary for drainage on Jacobs Trail that impacts Lake Crescent

Lake Crescent resident concerns, as documented in the letter dated January 23, 2006 sent to Michael E. Arnold, Division Manager, Department of Public Works with regard to drainage on Jacobs Trail, are shown below.

As discussed with Commissioner Dallari, Gary Johnson, Roland Raymundo, and the residents of Lake Crescent, the concerns have or will be addressed as indicated.

Resident Concern	**Addressed through**
At no time did any Lake Crescent homeowner authorize the movement of storm water into Lake Crescent which is a private, freshwater lake.	Commissioner Dallari has met with the resident as well as the Public Works Department to investigate the situation.
Runoff is being taken from other areas not just Jacobs Trail, and flows without filtration of contaminants (i.e. oil, silt) directly into Lake Crescent.	An initial survey has been completed. Plans to resolve the water movement are being developed. Residents have requested a retention system that holds the water to give ample time for percolation and filtration, and one that is maintainable. When the planning for the project is approximately 85% complete, appropriate personnel will meet with Lake Crescent residents to discuss alleviation of the concerns and impact of the solutions. Plans will include a solution to the driveway flooding experienced by Pat Hall at 301 Jacobs Trail.
The average lake depth has increased by 2 feet and water clarity has decreased by 4 feet in less than 1 year. An increase of another foot in lake depth has occurred in just the last 3 months. This rate of increase is very alarming to our residents, and has jeopardized the drinking water (wells) for several of our homeowners.	Public Works and other appropriate departments will investigate the wells and the drainage overflow on Jacobs Trail.
The diminishing water quality of the lake not only impacts the natural habitat of wildlife, but also impacts property values.	The Lake Management department will contact Tim Grenz or Larry Peletz to address water quality. Storm Water Management will assist in addressing much and sediment resulting from past runoff.

JACOBS TRAIL PROPERTIES

Lake Lenelle Drive

NUMBER	OWNER	MAILING ADDRESS	PROPERTY ADDRESS		RESPONSE
1	Whitener, Randy E & Lisa N	300 Lake Lenelle Dr	300 Lake Lenelle Dr	Oveido, FL 32766	
2	Sarvis, Adam J & Jennifer L	320 Lake Lenelle Dr	320 Lake Lenelle Dr	Oveido, FL 32766	
3	Garcia, Alberto & Adriana	340 Lake Lenelle Dr	340 Lake Lenelle Dr	Oveido, FL 32766	
4	Spann, Reginald R & Cheryal S	350 Lake Lenelle Dr	350 Lake Lenelle Dr	Oveido, FL 32766	
5	Corliss, Carl P & Tammy L	360 Lake Lenelle Dr	360 Lake Lenelle Dr	Oveido, FL 32766	
6	Stanko, Neil A & Gayle T	370 Lake Lenelle Dr	370 Lake Lenelle Dr	Oveido, FL 32766	
7	20213250100000070				
8	Downs, Thomas A & Bernice A	390 Lake Lenelle Dr	390 Lake Lenelle Dr	Oveido, FL 32766	
9	Ortiz, Urbano & Milagros	301 Lake Lenelle Dr	301 Lake Lenelle Dr	Oveido, FL 32766	
10	Chin, Robert X & Shawnmarie C	311 Lake Lenelle Dr	311 Lake Lenelle Dr	Oveido, FL 32766	
11	Lonetti, Luigi & Susan	321 Lake Lenelle Dr	321 Lake Lenelle Dr	Oveido, FL 32766	
12	Collins, Steven G & English, Carol A	331 Lake Lenelle Dr	331 Lake Lenelle Dr	Oveido, FL 32766	
13	Ulrich, Douglas R & Kathleen	341 Lake Lenelle Dr	341 Lake Lenelle Dr	Oveido, FL 32766	
14	Crews, Tina R	351 Lake Lenelle Dr	351 Lake Lenelle Dr	Oveido, FL 32766	
15	Rodriguez, Reinaldo & Nelly L	361 Lake Lenelle Dr	361 Lake Lenelle Dr	Oveido, FL 32766	
16	Exner, Gary E & Shirley H	410 Lake Lenelle Dr	410 Lake Lenelle Dr	Oveido, FL 32766	Letter received. Poor drainage design cause of flooding.
17	Hawk, Ralph & Suzanne	420 Lake Lenelle Dr	420 Lake Lenelle Dr	Oveido, FL 32766	
18	Duarte, Manuel & Cecilia	430 Lake Lenelle Dr	430 Lake Lenelle Dr	Oveido, FL 32766	4/17/08 – Cecilia Duarte called. No flooding problems. Resident for 6 years. Drainage maps are ok. She also inquired about some possible drainage work that is currently under construction at the entrance to her subdivision.
19	20213250100000190				
20	Frankos, Dennis J & Lynne M	490 Lake Lenelle Dr	490 Lake Lenelle Dr	Oveido, FL 32766	
21	Geissler, Donald G Jr & Annette	510 Lake Lenelle Dr	510 Lake Lenelle Dr	Oveido, FL 32766	
22	Cecil, Nancy H	520 Lake Lenelle Dr	520 Lake Lenelle Dr	Oveido, FL 32766	
23	Van Horn, Thomas A & Sandra J	540 Lake Lenelle Dr	540 Lake Lenelle Dr	Oveido, FL 32766	
24	Lyons, Peter M & Stephanie L	550 Lake Lenelle Dr	550 Lake Lenelle Dr	Oveido, FL 32766	
25	Coke, David J & Sheri R	560 Lake Lenelle Dr	560 Lake Lenelle Dr	Oveido, FL 32766	
26	Murray, Scott H & Angela C	561 Lake Lenelle Dr	561 Lake Lenelle Dr	Oveido, FL 32766	
27	Morgan, Alan W & Heyley M	551 Lake Lenelle Dr	551 Lake Lenelle Dr	Oveido, FL 32766	
28	20213250100000280				
29	Craig, William M	471 Lake Lenelle Dr	Lake Lenelle Dr	Oveido, FL 32766	
30	Craig, William M	471 Lake Lenelle Dr	Lake Lenelle Dr	Oveido, FL 32766	
31	Craig, William M	471 Lake Lenelle Dr	Lake Lenelle Dr	Oveido, FL 32766	
32	Campbell, Mitchell E & Michelle	PO Box 620734, Oveido, FL 32762	378 Lake Lenelle Dr	Oveido, FL 32766	
33	Finnessy, Gregory R & Nancy M	441 Lake Lenelle Dr	441 Lake Lenelle Dr	Oveido, FL 32766	Letter received. Location where it floods is Willingham Rd. at Chuluota Rd.
34	Exner, Kevin J & Kristy	421 Lake Lenelle Dr	421 Lake Lenelle Dr	Oveido, FL 32766	

Crescent Lake

NUMBER	OWNER	MAILING ADDRESS	PROPERTY ADDRESS		
1	Mudge, Dennis M & Patricia A	172 Lake Crescent Dr	172 Lake Crescent Dr	Oveido, FL 32766	
2	Czarnatowics, Adam & Gertrude	168 Lake Crescent Dr	168 Lake Crescent Dr	Chuluota, FL 32766	Letter received. Lake came up to well head. Water have never reached the house proper. Poor drainage is cause of flooding.
3	Horstmeyer, Derek D & Katie I	164 Lake Crescent Dr	164 Lake Crescent Dr	Chuluota, FL 32766	
4	Perry, Constance M & Michael C	156 Lake Crescent Dr	156 Lake Crescent Dr	Chuluota, FL 32766	05/13/08 - email to Heather L. Brady (includes LakeWatch Data 12/2002 - 6/2005). Followed up with a phone call to get newer LakeWatch Data - data was never provided by Mrs. Perry or any other residents. Also, I explained that the construction at Jacobs Trail was a water line construction - no additional runoff is being routed to ditch (confirmed by Cornerstone Church engineer).
5					
6	Liles, Mitchell J & Patricia L	152 Lake Crescent Dr	152 Lake Crescent Dr	Oveido, FL 32766	
7	Miller, Robert T & Tyra L	148 Lake Crescent Dr	148 Lake Crescent Dr	Chuluota, FL 32766	Letter received. Lake levels high during 2004 hurricanes, lower driveway did not flood even with excess rain from hurricanes.
8	Wyatt, Carol J	144 Lake Crescent Dr	144 Lake Crescent Dr	Oveido, FL 32766	
9	Schultz, John	140 Lake Crescent Dr	140 Lake Crescent Dr	Oveido, FL 32766	
10	Mays, Richard L & Linda K	136 Lake Crescent Dr	136 Lake Crescent Dr	Oveido, FL 32766	05/01/08 - Linda Mays called. 10-year resident. She spoke to someone on construction site when Jacobs Trail was paved and was told that it would drain to Lake Lenelle, I told her that she was probably given false information at that time because it doesn't match our survey or Osprey Lakes construction plans. Lake Quality - Linda stressed that it is the homeowners desire to not have any runoff into their lake. The Jacobs Trail paving project included raising the roadway and significant excavation in ditch - she says they did not have runoff from ditch prior to this project & lake quality is drastically different. Also, she did not beleive that the ditch was originally designed to flow into their lake - again construction plans show that it was. She is going to try to locate some lake quality data that they had prior to the Jacobs Trail/Osprey Lakes project.
11	Grenz, Timothy E & Robin L	132 Lake Crescent Dr	132 Lake Crescent Dr	Chuluota, FL 32766	05/08 - Letter received. Followed up with phone call to discuss drainage patterns & asked for documentation to show that the ditch historically bypassed Crescent Lake (Osprey Lakes plans have surveyed cross sections of the pre-development ditch with outfall to Lake). Email sent to Mr. Grenz on 5/27, no response heard.
12	McClung, Claudina	128 Lake Crescent Dr	128 Lake Crescent Dr	Chuluota, FL 32766	
13	Nguyen, Anh-Thu Thi	124 Lake Crescent Dr	124 Lake Crescent Dr	Chuluota, FL 32766	
14	Peletz, Lawrence J Jr & Sandra	120 Lake Crescent Dr	120 Lake Crescent Dr	Chuluota, FL 32766	4/18/08 - Larry Peletz called. No flooding problems. We discussed meeting with Commisioner and goals of the project. He wanted to make sure that we are looking into options to divert runoff or treat prior to discharge into L. Crescent. I let him know what we are looking for with survey (feedback from residents on drainage maps, flooding documents or other notes) & he will relay to rest of L. Crescent homeowners. 4/23/08 - Letter received (fax).
15	Moran, John T & Karen A	116 Lake Crescent Dr	116 Lake Crescent Dr	Chuluota, FL 32766	5/1/2008 - Letter received. Hist. drainage area closely matches current area, paved surface has increased.
16	Warren, Judith H	112 Lake Crescent Dr	112 Lake Crescent Dr	Chuluota, FL 32766	4/23/08 - Letter received (fax). No new information.
17	Mathner, Robert P & Dawn R	100 Woodmere Dr Enterprise, AL 36330	108 Lake Crescent Dr	Oveido, FL 32766	Letter received. Garage floods when severe rain occurs/falls. Resident feels that poor design of yard and/or driveway might be the cause of flooding in property.
18	Bradford, Philip J	104 Lake Crescent Dr	104 Lake Crescent Dr	Chuluota, FL 32766	
19	Gregory, Mark	100 Lake Crescent Dr	100 Lake Crescent Dr	Chuluota, FL 32766	05/22/08 - Letter received. No new information.
20	Hall, Patricia A	301 Jacobs Trl	301 Jacobs Trl	Oveido, FL 32766	Letter received. Temporary flooding from storm water running off of paved road due to poor engineering of driveway entry. Water floods pathway to front porch slab; drain when rains stop.
21	Doug Wildman Homes, LLC	17145 Lake Drawdy Ct Orlando FL 32820	305 Jacobs Trl	Oveido, FL 32766	04/21/08 - Letter received (fax). No new information.
22	Estrella, Ivan	309 Jacobs Trl	309 Jacobs Trl	Chuluota, FL 32766	
23	Hogan, Gregory K & Carla N	313 Jacobs Trl	313 Jacobs Trl	Oveido, FL 32766	

24	Hogan, Gregory K & Carla N	313 Jacobs Trl	313 Jacobs Trl	Oveido, FL 32766	
25	Hogan, Gregory K & Carla N	313 Jacobs Trl	313 Jacobs Trl	Oveido, FL 32766	
26	Hogan, Gregory K & Carla N	313 Jacobs Trl	313 Jacobs Trl	Oveido, FL 32766	

1st Street (North Side)

NUMBER	OWNER	MAILING ADDRESS	PROPERTY ADDRESS		
1	May, Melody A	371 1st St	371 1st St	Chuluota, FL 32766	
2	Tryon, Debbie	361 1st St	361 1st St	Chuluota, FL 32766	
3	McPherson, James R & Betty M	351 1st St	351 1st St	Chuluota, FL 32766	
4	Newman, Earl W & Wanda J	PO Box 256 Murrayville GA 30564	341 1st St	Chuluota, FL 32766	
5	Alicea, Mariano & Adriana	331 1st St	331 1st St	Chuluota, FL 32766	
6	Carney, Elisa	321 1st St	321 1st St	Chuluota, FL 32766	
7	Cassandro, Angelo & Bartola	1917 Wiregrass Ct Orlando, FL 32826	311 1st St	Chuluota, FL 32766	
8	Piazza, John & Rhea	301 1st St	301 1st St	Chuluota, FL 32766	
9	Brown, Kenneth M - Life Estate	271 1st St	271 1st St	Oviedo, FL 32766	
10	Petrosky, Dana	261 1st St	261 1st St	Chuluota, FL 32766	
11	Kendrick, Thomas K III	251 1st St	251 1st St	Chuluota, FL 32766	
12	Doroska, Barbara C - Heirs Trust	241 1st St	241 1st St	Oviedo, FL 32766	
13	Doty, Mildred L - Tr	231 1st St	231 1st St	Chuluota, FL 32766	
14	Wishart, Joseph	138 N Central Ave Oviedo, FL 32765	221 1st St	Chuluota, FL 32766	
15	Shirley, Cynthia G	211 1st St	211 1st St	Chuluota, FL 32766	
16	Pick, Mark G	201 1st St	201 1st St	Chuluota, FL 32766	
17	Hollowman, Conchita	171 1st St	171 1st St	Chuluota, FL 32766	
18	Eubanks, David D & Rene G	161 1st St	161 1st St	Chuluota, FL 32766	
19	Rivera, Tracy S & Tom A	13736 Riverpath Grove Dr Orlando, FL 32826	151 1st St	Chuluota, FL 32766	4/23/08 - Email received. No additional information.
20	Littleton, Charles B & Sharon D	141 1st St	141 1st St	Chuluota, FL 32766	
21	Martin, Betty J W	131 1st St	131 1st St	Chuluota, FL 32766	
22	Diab, Rosette	1623 Warner Dr Chuluota, FL 32766	121 1st St	Chuluota, FL 32766	
23	Payton, Karla L	111 1st St	111 1st St	Chuluota, FL 32766	
24	Albert, Shawn & Crystal	101 1st St	101 1st St	Chuluota, FL 32766	
25	Rucker, Douglas P & Vernice S	71 1st St	71 1st St	Chuluota, FL 32766	
26	Clark, Harry A & Diane	8904 Wildlife Ln Sanford FL 32771	61 1st St	Chuluota, FL 32766	
27	Miller, George D & Anita A	51 1st St	51 1st St	Oviedo, FL 32766	
28	Hennessey, David & Adrienne	41 1st St	41 1st St	Chuluota, FL 32766	
29	Marsh, Norma L	31 1st St	31 1st St	Chuluota, FL 32766	
30	Brummond, Alan R & Joelene	21 1st St	21 1st St	Chuluota, FL 32766	4/19/08 - Letter received (fax). Yard or parking lot flooding of extended duration after Hurricane Charley. Water never made it up to house, but was close.
31	Bevilacqua, Robert J	11 1st St	11 1st St	Chuluota, FL 32766	
32	Amey, Denise	9 1st St	9 1st St	Chuluota, FL 32766	

1st Street (South Side)

NUMBER	OWNER	MAILING ADDRESS	PROPERTY ADDRESS	
1	Zakai, Miles	370 1st St	370 1st St	Chuluota, FL 32766
2	Zakai, Miles	370 1st St	360 1st St	Chuluota, FL 32766
3	Le Breux, Roger & Rita	2876 Jacklin Rd Langford, BC VSB 3Y2, Canada	350 1st St	Chuluota, FL 32766
4	Asbury, Jim	340 1st St	340 1st St	Chuluota, FL 32766
5	Ford, Grant L & Frances H	330 1st St	330 1st St	Chuluota, FL 32766
6	Marion, David L	320 1st St	320 1st St	Oviedo, FL 32766
7	Lautenburg, Mary	310 1st St	310 1st St	Chuluota, FL 32766
8	Mackey, David W Jr & Laurie A	300 1st St	300 1st St	Chuluota, FL 32766
9	Brown, Fay E	7890 SW 156th St Palmetto Bay, FL 33157	270 1st St	Chuluota, FL 32766
10	Brown, Fay E	7890 SW 156th St Palmetto Bay, FL 33157	270 1st St	Chuluota, FL 32766
11	Brown, Carl W & Fay E	7890 SW 156th St Palmetto Bay, FL 33157		
12	Suroviec, Alexander G	9450 Perry Hwy Waterford, PA 16441		
13	Perez, Martin & Maria	230 1st St	230 1st St	Oviedo, FL 32766
14	2121325CF15000060			
15	Crouch, Mitchell J Jr & Gina A	200 1st St	200 1st St	Chuluota, FL 32766
16	Crouch, Mitchell J Jr & Gina A	200 1st St	200 1st St	Chuluota, FL 32766
17	Christian, Paul C	170 1st St	170 1st St	Chuluota, FL 32766
18	Hamel, John & Mary	3 Ringway Crescent, Rexdale, Ontario M 9N X2, Canada	1st St	Chuluota, FL 32766
19	Wiehagen, Linda T	150 1st St	150 1st St	Chuluota, FL 32766
20	Davila, Hector E	PO Box 677973 Orlando, FL 32867	140 1st St	Chuluota, FL 32766
21	Garcia, John P & Sharon Y	130 1st St	130 1st St	Chuluota, FL 32766
22	Halinar, Matthew W & Erica	120 1st St	120 1st St	Chuluota, FL 32766
23	McInnis, Theresa E	110 1st St	110 1st St	Oviedo, FL 32766
24	Paseur, Jeff	101 Avenue C	101 Avenue C	Oviedo, FL 32766
25	Rose, Marjorie L	70 1st St	70 1st St	Chuluota, FL 32766
26	Lumpkins, Thomas W & Kristina	60 1st St	60 1st St	Chuluota, FL 32766
27	Carrigan, Deborah L	50 1st St	50 1st St	Chuluota, FL 32766
28	Santiago, David	40 1st St	40 1st St	Oviedo, FL 32766
29	Wharton, Earl R II & Lesa M	30 1st St	30 1st St	Chuluota, FL 32766
30	Finn, Jonathan & Ashley	20 1st St	20 1st St	Chuluota, FL 32766
31	Traeger, Lucas	10 1st St	10 1st St	Chuluota, FL 32766

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): MARK GREGORY

PHONE NUMBER (Optional): 407 971 1313

ADDRESS (Please include): 100 LAKE CRESCENT DR

RECEIVED
MAY 22 2008
Singhofen & Associates

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 3

2. Are you familiar with the drainage patterns in your area? Yes ✓ No

Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. THE WATER drainage has a more direct flow into the lake SINCE the construction of the new homes on JACOBS TRL.

3. Have you ever experienced flooding at this location? Yes No ✓

4. What type(s) of flooding have you experienced? (Circle and describe below.)

   (a) Severe yard or parking lot flooding of extended duration: _____

   (b) Severe street flooding of extended duration: _____

   (c) Flooding of residence (inside house or building): _____

   (d) Other (please describe.): _____

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. _____

6. What type of storm caused flooding of your property? (Circle and describe below.)

   (a) A short intense rain, such as a thunderstorm: _____

   (b) A long moderate rain: _____

   (c) A long heavy rain: _____

   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)

   (a) Once a month
   (b) Once every six months
   (c) Once a year
   (d) Once every two years
   (e) Once every five years
   (f) Less than once every five years

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

10. Please name the streets and describe the locations that flood in your area. JACOBS TRL. + SNOWHILL RD

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.) ADDITIONAL RUN OFF FROM SNOWHILL RD

12. Are you aware of any water quality problems associated with stormwater runoff in your area?

Yes ✓ No _____

Describe (please include dates): THE WATER QUALITY IN CROSCENT LAKE HAS DETERIORATED

Possible source of pollution: HIGHER TRAFFIC ON SNOWHILL RD DUE TO NEW HOUSING DEVELOPMENTS

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. THE QUALITY OF THE WATER IN LAKE CROSCENT IS MY MAJOR CONCERN. LAKE CROSCENT IS A SPRING FED LAKE AND TO POLLUTE IT WITH ROAD RUN OFF WHEN OTHER OPTIONS ARE AVAILABLE DOES NOT MAKE SENSE.

Main Identity

From: "Heather Brady" <hlb@saiengineers.com>
To: <timgrenz@bellsouth.net>
Cc: "Mark Troilo" <MXT@saiengineers.com>; "Robert" <RBG@saiengineers.com>; <KJB@saiengineers.com>; "Lisa Barfield" <LAB@saiengineers.com>; "Rolando Raymundo" <RRaymundo@seminolecountyfl.gov>
Sent: Tuesday, May 27, 2008 9:05 AM
Attach: JTO-ContourMap.pdf
Subject: Jacobs Trail - Data Collection

Mr. Grenz,
Thank you again for your input on the Jacob's Trail/Crescent Lake drainage project. It has been our pleasure to work with such an active community group and we appreciate all of your questionnaire responses. Even though our data collection phase has actually ended, we would still like to collect any available information you or your fellow residents might have on the existing ditch at Jacobs Trial - please forward me this information if you are able to dig anything up.

I mis-spoke to you on the phone last week with regard to the topographic data available for your area. I was actually thinking of historical photographs we had reviewed, not contour data (1940 through 2004 historical aerials are available for download at http://www.seminolecountyfl.gov/it/gis/gisaerial.asp). However, I know that you were looking to review the contour data that shows the historical Crescent Lake outfall location which is to the northeast. Please note that this overflow would only occur during extreme storm events. I have attached a pdf copy of the contour data that we are using for this project (data provided by the St. John's River Water Management District). Keep in mind, though, that our focus is on the ditch outfall on the west side of the lake. If we can find information that shows that the ditch system did actually discharge to another location under historical conditions, it will be easier to recommend a design solution that does not allow runoff into Crescent Lake.

Heather L. Brady, E.I.
Staff Engineer III
Singhofen & Associates, Inc.
925 S. Semoran Blvd. Suite 104
Winter Park, FL 32792
Phone: 407-679-3001
Fax: 407-679-2691

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): Tim & Robin Grenz Tim Grenz @ Bellsouth .net

PHONE NUMBER (Optional): 407-314-6358

ADDRESS (Please include): 132 Uk. Crescent Dr.

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 5 ½

2. Are you familiar with the drainage patterns in your area? Yes ✓ No _____
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. Please See Maps

3. Have you ever experienced flooding at this location? Yes ✓ No _____

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: Very High Water in 04/05
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): _____

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. During Construction of Walker Elementary in 04

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: _____
   (b) A long moderate rain: _____
   (c) A long heavy rain: _____
   (d) Other (please describe): Tropical Depression / Hurricane Dewatering of Walker Elem. Site

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)
   (a) Once a month
   (b) Once every six months
   (c) Once a year
   (d) Once every two years
   (e) Once every five years
   (f) Less than once every five years

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

10. Please name the streets and describe the locations that flood in your area. _____

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)
Storm Drainage into Ck. from New areas

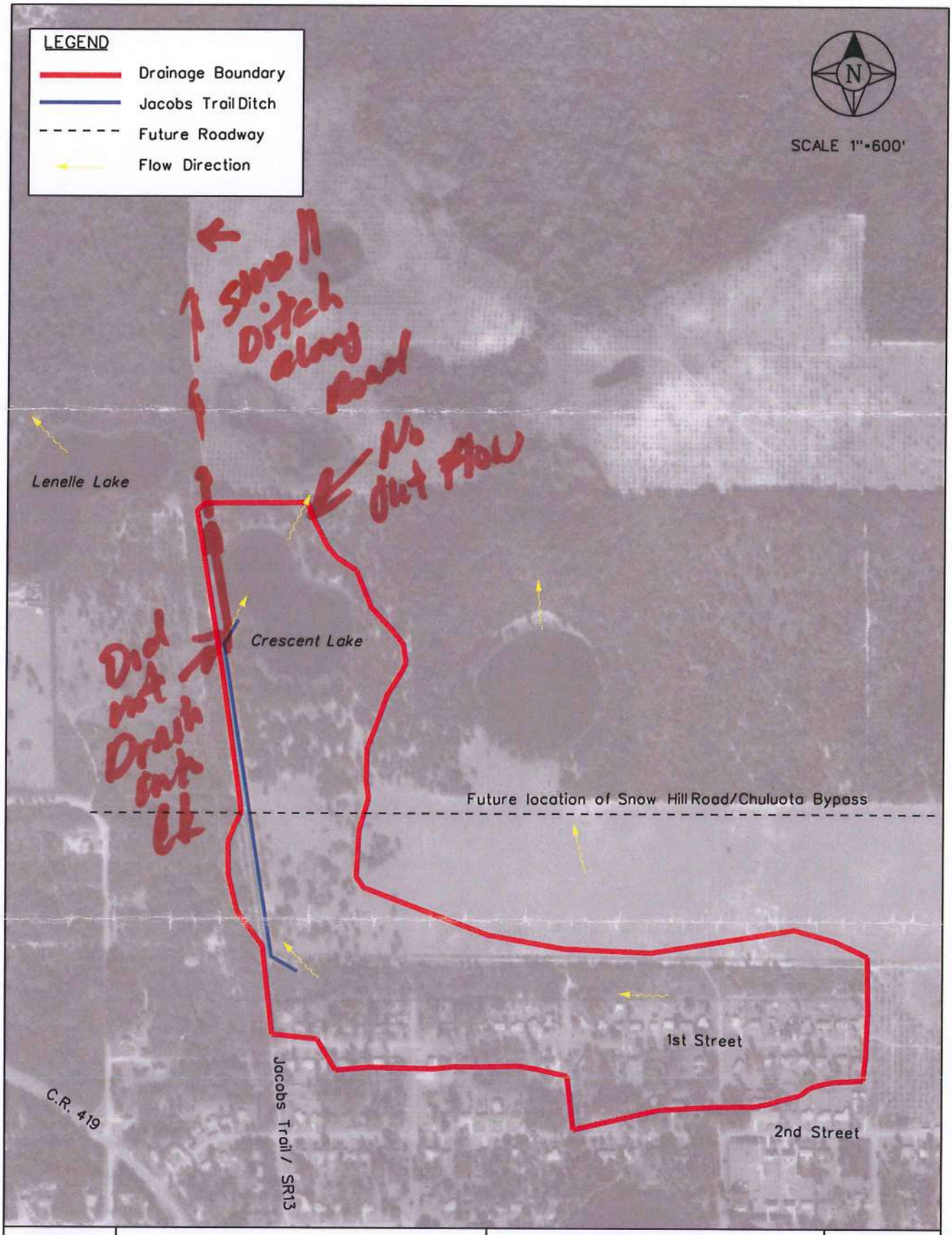
12. Are you aware of any water quality problems associated with stormwater runoff in your area?
Yes X No _____
Describe (please include dates): See Lake Water Dpt. Interest in many areas due to runoff from Drainage ditch
Possible source of pollution: Roadway etc.

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. Your Historical MAP is not accurate. Before Jacobs Trail was improved a small ditch swale ran entire length of Jacobs Tr. not into Ck. ~~This~~ this was recorded incorrectly according to original owners.

Examine old Plates of Subdivision if shows all lots along Jacobs Trail as buildable. After Osprey Cks went in this was changed. I believe the maps & docs for development was not correct. It was shown that way to ease approval for Development

SAI	**SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT**	**2008 DRAINAGE MAP**	**FIGURE** 2
			Project No. 2007-001.20

D:\SC_Jacobs_Trail\DGN\JT0-CurrentDrainagePatterns.dgn
4/16/2008



SAI	**SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT**	**HISTORICAL CONDITIONS DRAINAGE MAP**	**FIGURE** 1
			Project No. 2007-001.20

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4/15/2008

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): _____

PHONE NUMBER (Optional): _____

ADDRESS (Please include): 108 Lake Crescent Drive

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 0

2. Are you familiar with the drainage patterns in your area? Yes _____ No ✓
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. _____

3. Have you ever experienced flooding at this location? Yes ✓ No _____

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: ✓
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): ✓
   (d) Other (please describe.): garage floods when severe rain occurs/falls

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. _____

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: ✓
   (b) A long moderate rain: ✓
   (c) A long heavy rain: ✓
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

10. Please name the streets and describe the locations that flood in your area. 108 Lake Crescent Drive

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)
unknown- poor design of yard / poor design of driveway.

12. Are you aware of any water quality problems associated with stormwater runoff in your area?
Yes _____ No ✓

Describe (please include dates): _____

Possible source of pollution: _____

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. _____

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): BOB + TYRA MILLER

PHONE NUMBER (Optional): (407) 366-8476

ADDRESS (Please include): 148 LAKE CRESCENT DR.

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 5

2. Are you familiar with the drainage patterns in your area? Yes ✓ No _____
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. FIG. #1 - I THINK WATER WILL FLOW AS MARKED - BETWEEN 164 AND 156 ALONG PROPERTY LINE TO ROAD ALONG DITCH TO WETLANDS AT END OF ROAD - PART OF IT IS MY PROPERTY

3. Have you ever experienced flooding at this location? Yes ✓ No _____

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: _____
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): JUST ALONG LAKE LEVEL CAME UP TO BIG PINE

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. 2004-

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: _____
   (b) A long moderate rain: _____
   (c) A long heavy rain: _____
   (d) Other (please describe): HURRICANES - EXCESS RAIN - BUT ONLY AT LAKE - EVEN WITH ALL THAT ~~RAIN~~ LOWER DRIVEWAY DID NOT FLOOD

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.) N/A
   (a) Once a month
   (b) Once every six months
   (c) Once a year
   (d) Once every two years
   (e) Once every five years
   (f) Less than once every five years

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

N/A

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

N/A

10. Please name the streets and describe the locations that flood in your area. _____

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)

DITCH ALONG LAKE CAUSES LAKE LEVELS TO RISE TO HIGH

12. Are you aware of any water quality problems associated with stormwater runoff in your area?

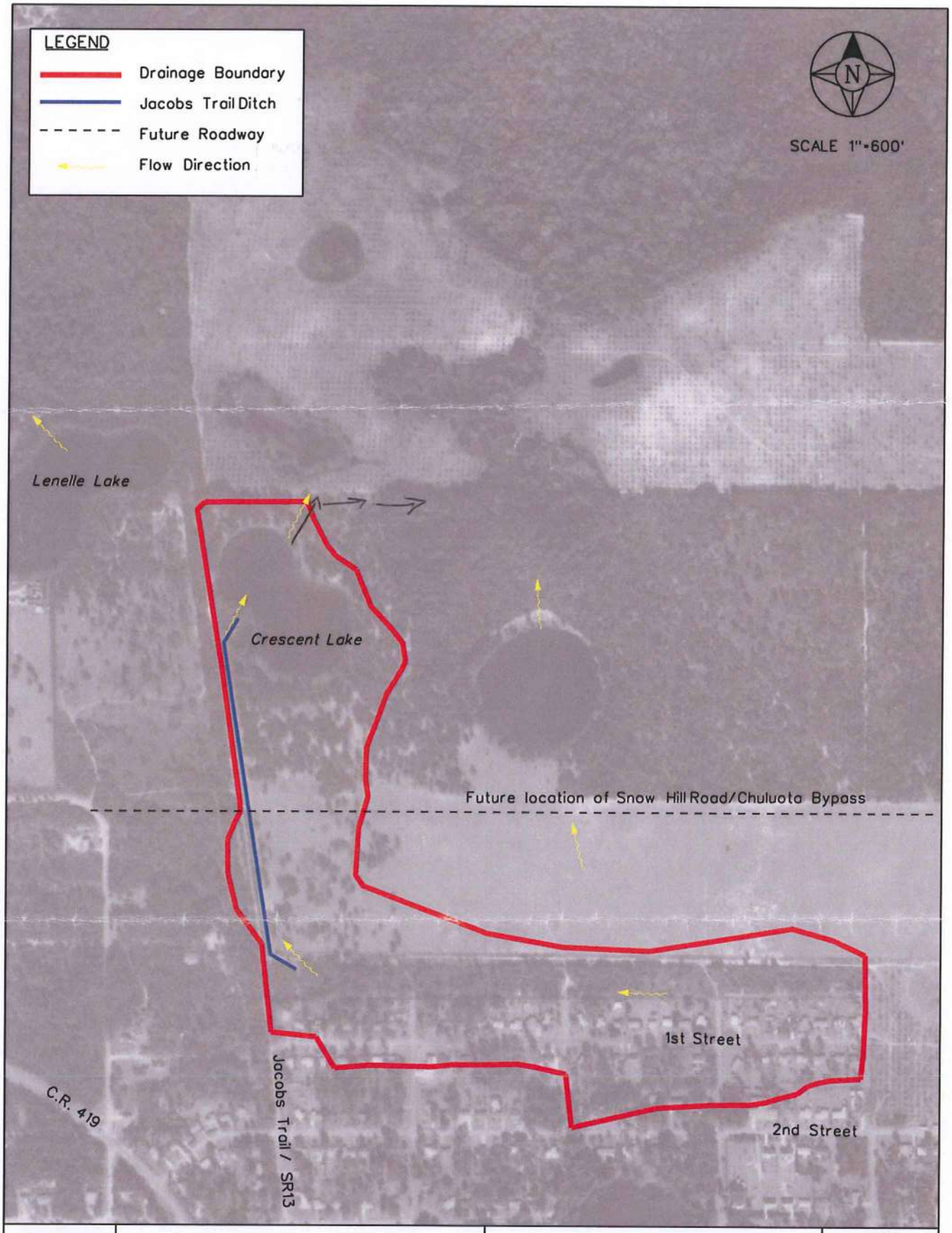
Yes ✓ No _____

Describe (please include dates): LAKE IS SUFFERING FROM EXCESS RUNOFF FROM ROAD

Possible source of pollution: _____

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. COULD YOU INSTALL CONCRETE DRAIN BOX AT [redacted] CERTAIN LEVEL WITH PUMP, LINE CONNECT TO DRAIN TO OSPREY LAKES DRAIN BOX NEXT TO SIDE WALK. WOULD SOLVE LAKE LEVEL PROBLEM - BUT WOULD STILL HAVE SOME RUNOFF FROM ROAD.

WE ALSO [redacted] HAVE HAD EXCESS WATER FROM ACROSS THE ROAD ON SNOWHILL AS MARKED ON FIG. 1



SAI	**SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT**	**HISTORICAL CONDITIONS DRAINAGE MAP**	**FIGURE** 1
			Project No. 2007-001.20

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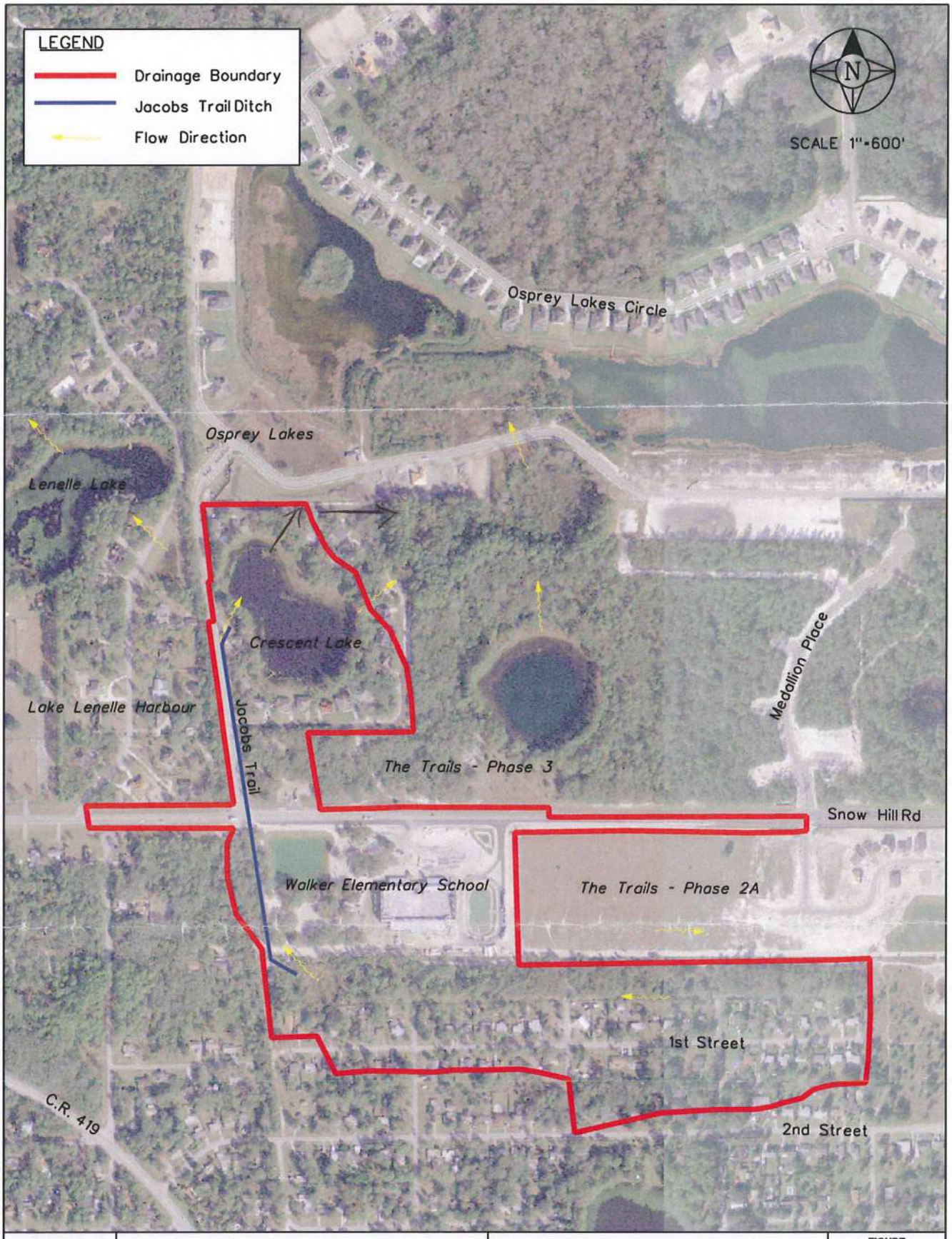
4/18/2008



SAI	**SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT**	**2008 DRAINAGE MAP**	**FIGURE** 2
			Project No. 2007-001.20

O:\SC_Jacobs_Trail\DGN\JTO-CurrentDrainagePatterns.dgn
4/16/2008

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): GREG FINNESSY

PHONE NUMBER (Optional): 407-366-8433

ADDRESS (Please include): 441 LK LENELLE DR. CHULUOTA, FL 32766

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 19 years

2. Are you familiar with the drainage patterns in your area? Yes X No _____
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. NO DISCREPANCIES

3. Have you ever experienced flooding at this location? Yes _____ No X

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: _____
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): _____

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. _____

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: _____
   (b) A long moderate rain: _____
   (c) A long heavy rain: _____
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

10. Please name the streets and describe the locations that flood in your area. Willingham Rd At old Chehoota Rd.

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)

12. Are you aware of any water quality problems associated with stormwater runoff in your area?

Yes _____ No X

Describe (please include dates): _____

Possible source of pollution: _____

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. _____

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): Doug Wildman

PHONE NUMBER (Optional): 407-509-9798

ADDRESS (Please include): 305 Jacobs Trail Chuluota 32766

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792
(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? owned as rental property 2 yrs

2. Are you familiar with the drainage patterns in your area? Yes ✓ No _____
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. _____

3. Have you ever experienced flooding at this location? Yes _____ No ✓

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: _____
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): _____

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. NA

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: NA
   (b) A long moderate rain: _____
   (c) A long heavy rain: _____
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)
   (a) Once a month
   (b) Once every six months
   (c) Once a year
   (d) Once every two years
   (e) Once every five years
   (f) Less than once every five years

Doug Wildman

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

10. Please name the streets and describe the locations that flood in your area. _____

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)

12. Are you aware of any water quality problems associated with stormwater runoff in your area?

Yes _____ No ✓

Describe (please include dates): _____

Possible source of pollution: _____

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. _____

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): Alan Brummond

PHONE NUMBER (Optional): 407-948-4163

ADDRESS (Please include): 21 EAST 1st Street Chuluota

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 4 years

2. Are you familiar with the drainage patterns in your area? Yes ✓ No _____
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. _____

3. Have you ever experienced flooding at this location? Yes ✓ No _____

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: ✓
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): After hurricane Charlie was the worst

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. After the hurricanes

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: _____
   (b) A long moderate rain: _____
   (c) A long heavy rain: ✓
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

The water never made it up to the house but it was close.

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

10. Please name the streets and describe the locations that flood in your area. IN Front & IN the swamp behind my house

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)
Bad design

12. Are you aware of any water quality problems associated with stormwater runoff in your area?
Yes ✓ No _____

Describe (please include dates): _____

Possible source of pollution: Storm water.

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. Before they did all the construction for the ditch behind the house & side walks up front it was bad. If it rained up Front would be flooded. NOW it is better w/ the Diteres But I think you should clean out the swamp behind my house & make it into A retention pond. That might solve the problem.

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): Patricia A. Hall

PHONE NUMBER (Optional): 407-365-9961

ADDRESS (Please include): 301 Jacobs Trail, Chuluota FL 32766

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 9+ years; lot purchased Jan 1992

2. Are you familiar with the drainage patterns in your area? Yes ✓ No _____
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. _____

3. Have you ever experienced flooding at this location? Yes ✓ No _____

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: _____
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): Temporary flooding from storm water running off of paved road due to poor engineering of driveway entry. Water floods pathway to front porch slab; drains when rains stop.

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. _____

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: Walkway drains quickly when rain stops
   (b) A long moderate rain: _____
   (c) A long heavy rain: Drainage takes a little longer, but will drain fairly quickly
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.) Whenever intense rain storms occur

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

10. Please name the streets and describe the locations that flood in your area. _____

_____

_____

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)

_____

_____

_____

12. Are you aware of any water quality problems associated with stormwater runoff in your area?

Yes _____ No _____

Describe (please include dates): _____

_____

_____

Possible source of pollution: _____

_____

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. I join with all of my neighbors in the Lake Crescent community in the belief that stormwater runoff from Jacobs Trail, Snow Hill Road, and other areas as shown in the 2008 Drainage Map, are contributing to the polution of our once pristine lake.

Flooding of my property is not endangering my home, and is at its worst, an inconvenience. It is a problem that can be easily solved with some adjustments to the original attempts at the solution.

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): Adam Czarnatowicz

PHONE NUMBER (Optional): 407-359-6422

ADDRESS (Please include): 168 Lake Crescent Drive, Chuluota

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? Five years Partially

2. Are you familiar with the drainage patterns in your area? Yes _____ No _____
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. _____

3. Have you ever experienced flooding at this location? (Yes) _____ No _____

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) ~~Severe~~ yard or parking lot flooding of extended duration: Lake came up to Well Head
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): _____

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. Summer of ~~2004~~ 2004

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: _____
   (b) A long moderate rain: Consistant Rainfall for a few Days.
   (c) A long heavy rain: _____
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

Never Water level Reached the House proper. AC

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

Never experienced Street Flooding

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

10. Please name the streets and describe the locations that flood in your area. Jacobs Trail, & Lake Crescent Drive Northeast Quadrant

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.) Poor Drainage, and other area properties draining into the lake,

12. Are you aware of any water quality problems associated with stormwater runoff in your area?

Yes _____ No _____

Describe (please include dates): _____

Possible source of pollution: _____

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. _____

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): GARY EXNER

PHONE NUMBER (Optional): 407 365-4662

ADDRESS (Please include): 410 LAKE LENELLE DRIVE, CHULUOTA, FL. 32766

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 12 yrs.

2. Are you familiar with the drainage patterns in your area? Yes ✓ No _____
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. NONE

3. Have you ever experienced flooding at this location? Yes _____ No ✓

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: _____
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): _____

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. N/A

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: N/A
   (b) A long moderate rain: _____
   (c) A long heavy rain: _____
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.) · NEVER

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

10. Please name the streets and describe the locations that flood in your area. 2nd STREET CHULVOTA

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)
POOR OVERALL DRAINAGE DESIGN

12. Are you aware of any water quality problems associated with stormwater runoff in your area?
Yes ✓ No _____
Describe (please include dates): SEE ABOVE
Possible source of pollution: N/A.

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. N/A.

Main Identity

From: "Connie and Mike Perry" <perr500@bellsouth.net>
To: "'Heather Brady'" <hlb@saiengineers.com>
Cc: "'Robert'" <RBG@saiengineers.com>; "'Lisa Barfield'" <LAB@saiengineers.com>; "'Rolando Raymundo'" <RRaymundo@seminolecountyfl.gov>
Sent: Wednesday, May 14, 2008 6:36 PM
Subject: RE: Survey for Snow Hill Rd/Jacobs Tr Outfall Improvement Project

Heather,

I appreciate the feedback. I was not aware that there would be a public meeting with the residents, I am glad to hear that and hope to attend. Thank you so much for checking on the stormwater drainage for the new church. That is good news. We certainly don't need any additional runoff into Lake Crescent.

Regards, Connie Perry

From: Heather Brady [mailto:hlb@saiengineers.com]
Sent: Wednesday, May 14, 2008 10:13 AM
To: Connie and Mike Perry
Cc: Robert; Lisa Barfield; Rolando Raymundo
Subject: Re: Survey for Snow Hill Rd/Jacobs Tr Outfall Improvement Project

Connie,
Thank you for your response and detailed notes on the Lake Crescent issues. I will be reviewing all questionnaire responses beginning next week. Please understand that our goals are the same; once we develop and present our design solutions to Seminole County we will have a public meeting with the Lake Crescent residents. Also, I just spoke with the project engineer for the Cornerstone Church - the pipes that you are being installed at Jacobs Trail are for potable water utilities. The Church's stormwater pond will discharge to the west at Willingham Road.

Heather L. Brady, E.I.
Staff Engineer III
Singhofen & Associates, Inc.
925 S. Semoran Blvd. Suite 104
Winter Park, FL 32792
Phone: 407-679-3001
Fax: 407-679-2691

> ----- Original Message -----
> **From:** Connie and Mike Perry
> **To:** Heather Brady
> **Sent:** Tuesday, May 13, 2008 10:07 PM
> **Subject:** Survey for Snow Hill Rd/Jacobs Tr Outfall Improvement Project
>
> Connie Perry
> 407-977-7791
> 156 Lake Crescent Drive, Chuluota, FL 32766
>
> 1. Years at above address: 6 ½ years
> 2. Familiar with the drainage patterns in area: Somewhat
> 3. Experienced flooding at this location? It depends on your definition of flooding. Lake elevation levels increased considerably to the point where several trees and palmettos were in the lake. 3 of these trees ended up dying. However, the water did not get up to our house or well. During the hurricane season of 2004 I watched our lake water level increase significantly on a

DAILY basis because the county was pumping storm water into our drainage ditch which POURED directly into our lake from neighboring areas. At this rate, it got really scary that our houses were going to end up in water if this did not stop and some of our neighbors ended up having heated discussions with the county to get them to stop the pumping.

4. What types of flooding have you experienced?
    a. Severe yard or parking lot flooding of extended duration? Yes, and the lake levels stayed elevated for over 9 months. See lake depth chart in attached file.
    b. Severe street flooding: No
    c. Flooding of residence: No
    d. Other (please describe): Flooding into yard where several trees and palmettos were literally in the lake. Lost 3 trees as a result.
5. What dates do you recall flooding occurring? If you cannot remember exact dates, give approximate dates.
    a. Jul 2003, During Fall 2003, on the Walker Elementary School property, crews were digging out retention ponds when they hit 3 natural springs, which filled up the ponds. The crews capped the springs and then brought in pumps and pumped the water into the drainage ditch that drains directly into Lake Crescent. This timeframe corresponds with a spike in nutrients into Lake Crescent, a decrease in water clarity and an increase in lake depth.
    b. Sep 2004 thru Mar 2005, when we experienced 3 hurricanes and the county pumped storm water from neighboring areas into our drainage ditch and lake, the lake water level rose RAPIDLY and significantly to the point where 2 of the neighbors wells were consumed by the lake water and another was threatened. The 2 neighbors had contaminated drinking water as a result. This timeframe corresponds with a spike in nutrients into Lake Crescent, a decrease in water clarity and an increase in lake depth.
6. What type of storm caused flooding of your property?
    a. A short intense rain, such as a thunderstorm.
    b. A long moderate rain.
    c. A long heavy rain. Hurricane Francis produced this type of rain. It moved slowly across the state, producing heavy rain.
    d. Other (please). Hurricanes Charley, Francis and Janene, but more importantly, not only was our lake having to handle the storm water from our area, but also from neighboring areas due to the county pumping from neighboring areas into our drainage ditch. It does not appear that we have an overflow drain, so we will in fact flood if the lake rises above our foundation elevations.
7. If your house experiences flooding, how often does it occur? No flooding of house.
8. If your yard experiences flooding, how often does it occur? Of your choices the closest is once every two years. Based on data recorded it is once every 2.5 years.
9. If your street experiences flooding, how often does it occur? No flooding of streets.
10. Please name the streets and describe the locations that flood in your level.
    a. Jacobs Trail ditch resulting in significant increases in lake levels.
    b. Lake Crescent Drive, back yards as the lake level rises. Some homes are very close to the lake and some yards have a very small slope, so significant increases in our lake level poses a moderate to high risk of flooding to our houses. The added risk is that we don't know when the county chooses to pump water into our lake, we have only SEEN it occurring twice. Additional added risk is that we don't appear to have an overflow drain, so the potential is there that our houses will flood if this is not remediated.
    c. 104 Lake Crescent Drive, well went under water.
    d. A second home's well went under water, but don't know exactly which one.
    e. 164 and 168 Lake Crescent Drive, the lake level came extremely close to their wells, don't know if they actually went under or not.
    f. 301 Jacobs Trail, driveway consistently floods due to the poor design of the driveway's connection to Jacob's Trail and sidewalk.
11. What do you feel is the cause or major contributing factor to the flooding in your areas?
    a. Poor drainage design of ditch along Jacobs Trail and Lake Crescent. The water cannot

filter into the ground or even a manmade filtration (non-existent) system before it enters our lake. Results in contamination of our lake which is evidenced in the increased levels of nutrients and reduction in lake clarity during heavy rains or when pumping directly into the drainage ditch.

b. Neighbors on Jacobs Trail have been permitted by the county to install drainage pipes, covering up the ditch, and completely eliminating the intended functionality of the original ditch design. The ability for the water to filter into the ground before flowing into our lake has been decreased by 50 to 75% because of this.

c. Poor design of the driveway's connection to Jacobs Trail and sidewalk at 301 Jacobs Trail. The sidewalk and driveway bib should be constructed the same as the other driveways along Jacobs trail

d. No overflow drain from our lake to other drainage areas to prevent flooding of our homes. If the drain that is at road level past the north end of the ditch is an overflow drain the concern is that its elevation is higher than some or all of our home elevations, thus not protecting our homes.

e. New construction and failure of the county to improve the design of the existing drainage design to effectively handle the additional impacts from the new construction.

f. Based on my observations of the work going on for the new church on snow hill rd, where new pipes are being laid, this work required tearing up part of Jacobs trail at that intersection, it is my fear that yet another major entity has been tied into the Snow Hill/Jacobs trail drainage system. We are already experiencing flooding situations, our lake has already been negatively impacted by the direct runoff pouring into our lake as evidenced in the LAKEWATCH data with increased nutrient levels, decreased water clarity and increased lake depth levels.

12. Are you aware of any water quality problems associated with storm water runoff in your area?
    a. **MOST DEFINITELY!!!!**
    b. Describe: As evidenced in the LAKEWATCH data that has been collected since December 2002 we have watched the water quality degrade considerably. In December 2002 our lake's trophic state was barely outside the range for a oligotrophic state (*A typical oligotrophic waterbody will have clear water,few aquatic plants, few fish, not much wildlife, and a sandy bottom),* meaning it was very clear and our children were able to swim in the lake all of the time. The lake actually had a good amount of fish and aquatic plants, which is why it was just outside the oligotrophic state. Now our lake oscillates between the Mesotrophic and Eutrophic states, it is no longer clear, you can see a good amount of sediment suspended/floating in the water and we have no idea what the contaminants are in the lake from the runoff from the roads from petroleum products, oil, etc. The last time my son went swimming in the lake, several years ago, he got an ACUTE ear infection in BOTH of his ears. Let's just say he was in an extreme amount of pain for several days until the medication started clearing it up. My son only had one, maybe two, ear infections in his entire life prior to this instance and none since then. My children have not been allowed to swim in the lake since then due to the current condition of the lake.
    c. Possible source of pollution: Storm water flowing directly into the lake without any filtration at all. Poor drainage system design along Jacobs Trail. No improvements appear to be made due to increased usage; actually the opposite appears to be happening. Impacts to the drainage system do not appear to be taken into consideration when other entities tie in, for example home owners allowed to install pipes, at varying diameters, contrary to water capacity or flow, Walker Elementary School, increased growth in Osprey Lakes and now the new Church.
13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area.
    a. Please consider eliminating any runoff from Snow Hill Rd/Jacobs Trail into Lake Crescent. It is a spring feed lake feed by 2 natural springs that was a very clear and pristine lake only 6 years ago. We no longer have that clear, pristine lake, but we really want to get it back. As you have seen in the Lake Management Plan, we have

done what we can do on the homeowner side to bring our lake back to the way it was and improve its quality, but we cannot control what the county does to our lake, the design of the drainage system or the decisions that were made in allowing increased activity into this poorly designed system that seems to continue to be modified, but not necessarily improved upon. We truly need your help.

b. Please consider improving the design of the drainage system so that it redirects the runoff to a water body/retention pond that is specifically designed to handle the water capacity and the capability to filter the water prior to allowing it to enter any water body.
    1. There is a retention pond in lake Lenielle just feet from Jacobs Trail. I am at a loss as to why that was never the intended destination drainage flow for Jacobs Trail. It seems to be always dry.
    2. Osprey Lakes has an elaborate drainage system with overflow drains throughout the community. Would that not be a more appropriate destination for the Jacobs Trail runoff?

c. If there must be drainage into Lake Crescent, which I hope changes so that it does not, but if it does, please design the drainage system so that ALL of the water that flows from the drainage system is properly filtered before it enters our lake.

d. The storm water currently flows directly into Lake Crescent with minimal to no filtration, resulting in an adverse environment impact to Lake Crescent.

e. Please consider installing an overflow drain at a level lower than our home foundation elevations so that if the water level of our lake does significantly increase due to hurricanes, etc. that it prevents our homes and properties from flooding.

f. Again, history has shown that Lake Crescent cannot handle the water capacity that has been directed to our lake. Some, if not all, of this capacity has to be redirected somewhere else. Our watershed cannot handle the current capacity as already experienced, let alone any new additions to it, i.e. the new church on snow hill rd.

Heather, sorry for rambling on, but I think you can tell that we really care about our lake and it is so disappointing to watch it deteriorate. Also, our houses and our properties are our homes. Our homes are just as important to us as the ones in Osprey Lakes are to their homeowners or anywhere else and just because we are only 20 homes in a small community shouldn't mean our voices shouldn't be heard and that our homes are any less important than those in a larger community or one with a home owner's association.

Please feel free to call me if you have any questions. By the way, I was the primary author of the Lake Management Plan, with input from several of the neighbors.

Connie Perry
407-977-7791 (home)
321-436-6426 (cell)

Main Identity

From: "Heather Brady" <hlb@saiengineers.com>
To: "Connie and Mike Perry" <perr500@bellsouth.net>
Cc: "Robert" <RBG@saiengineers.com>; "Lisa Barfield" <LAB@saiengineers.com>; "Rolando Raymundo" <RRaymundo@seminolecountyfl.gov>
Sent: Thursday, May 08, 2008 2:40 PM
Subject: Re: snow hill road/jacobs trail outfall improvement project questionnaire

Mrs. Perry,
Excellent, I look forward to seeing this data. However, I believe this time period will be after the Jacobs Trail paving project, correct? It may still be useful to compare to the current data. I recognized your name from the Lake Management plan documents and correspondence that I have reviewed. Thank you for being such an active resident! I have spoken to Mr. Peletz a couple of times and I don't recall any mention of him having any Lakewatch records. You may want to discuss with him and let me know what you come up with.

It was my mistake, but I really should have given you all a deadline to complete the survey. To continue on schedule, I really need to get all responses in by the end of next week. Please email me your response (this can just be an email discussion and doesn't have to follow the survey format) or give me a call. Also, if you have a chance I would appreciate if you could pass this deadline information on to your neighbors.

Thanks,
Heather L. Brady, E.I.
Staff Engineer III
Singhofen & Associates, Inc.
925 S. Semoran Blvd. Suite 104
Winter Park, FL 32792
Phone: 407-679-3001
Fax: 407-679-2691

> ----- Original Message -----
> **From:** Connie and Mike Perry
> **To:** hlb@saiengineers.com
> **Sent:** Wednesday, May 07, 2008 10:09 PM
> **Subject:** snow hill road/jacobs trail outfall improvement project questionnaire
>
> Ms. Brady,
>
> I just wanted to let you know that I am completing the survey/questionnaire that you sent to those of us living on lake crescent. I am trying to pull together some Lakewatch data that I accumulated from 2002 to 2006. Larry Peletz then took over Lakewatch in 2006 and he should have more data from that point to present.
>
> I will try to get the survey in the mail this week.
>
> Regards,
>
> Connie Perry
> 407-977-7791

Main Identity

From: "Heather Brady" <hlb@saiengineers.com>
To: "tk1230" <tk1230@mindspring.com>
Cc: "Rolando Raymundo" <RRaymundo@seminolecountyfl.gov>; "Robert" <RBG@saiengineers.com>; "Lisa Barfield" <LAB@saiengineers.com>
Sent: Thursday, May 01, 2008 6:13 PM
Subject: Re: April 29, 2008

John & Karen,
Thank you for your input. In addition to the meeting minutes that you referred to, I have also had several informative conversations with your neighbors as a result of this survey. It is nice to be working with such active residents! We are working towards a design solution and hope to come up with something favorable to you that will address all of the Lake Crescent concerns.

Take care,
Heather L. Brady, E.I.
Staff Engineer III
Singhofen & Associates, Inc.
925 S. Semoran Blvd. Suite 104
Winter Park, FL 32792
Phone: 407-679-3001
Fax: 407-679-2691

> ----- Original Message -----
> **From:** tk1230
> **To:** hlb@saiengineers.com
> **Cc:** tk1230@mindspring.com
> **Sent:** Thursday, May 01, 2008 5:23 PM
> **Subject:** April 29, 2008
>
> Attached is response to questionnaire concerning Snow Hill Road/Jacobs Trail Outfall Improvement Project

May 1, 2008

Heather Brady, E. I.
Staff Engineer III
Singhofen & Associates, Inc.
925 S. Semoran Blvd. Suite 104
Winter Park, Fl. 32792

Re: Seminole County, Florida Snow Hill Road/Jacobs Trail Outfall Improvement Project Questionnaire

Dear Ms. Brady,

This letter is in response to the survey you sent to the individual homeowners at Lake Crescent Dr. concerning the existing ditch along Jacobs Trail. We understand that you have read all the information from our homeowners meetings so I won't go over most of what was discussed. The root of our concern is though the current area of drainage into the Jacobs Trail ditch is not largely different then the historical one, it does contain much more paved surface. This, I'm sure you are aware, will cause more water flow and a significant amount of pollution. We as a community are concerned with and are sensitive to the quality of our lake, not only for resale value but also for our environment. We have the lake sprayed to control water plant overgrowth and keep the lake in a healthy balance. Homeowners have stocked the lake with fish and we have several bird species that visit or call Lake Crescent home. Any pollution that enters our lake is damaging and we would ask that you take that into consideration when designing impediments to runoff into the Jacobs Trail ditch from surrounding sources.
Thank you for your attention to this matter.

John and Karen Moran
116 Lake Crescent Dr.
Chuluota, Fl. 32766
Home phone 407-971-3990

Main Identity

From: "Heather Brady" <hlb@saiengineers.com>
To: "Tom Rivera" <remy003@hotmail.com>
Sent: Wednesday, April 23, 2008 12:01 PM
Subject: Re: questionnaire

Tom,
That's okay, thanks for your response.

Heather L. Brady, E.I.
Staff Engineer III
Singhofen & Associates, Inc.
925 S. Semoran Blvd. Suite 104
Winter Park, FL 32792
Phone: 407-679-3001
Fax: 407-679-2691

> ----- Original Message -----
> **From:** Tom Rivera
> **To:** hlb@saiengineers.com
> **Sent:** Wednesday, April 23, 2008 11:56 AM
> **Subject:** questionnaire
>
> We recieved a questionnaire about 151 E 1st St. We have never lived at the property. It is a rental property of ours. We have not heard any complaints from our tennants concerning flooding. Thanks Tom Rivera

Main Identity

From: "Peletz, Lawrence J O642" <lawrence.peletz@siemens.com>
To: "Heather Brady" <hlb@saiengineers.com>
Sent: Wednesday, April 23, 2008 12:55 PM
Subject: RE: Reply to April 16, 2008 Jacob Trail Letter

Thank you for your continued efforts.

From: Heather Brady [mailto:hlb@saiengineers.com]
Sent: Wednesday, April 23, 2008 12:54 PM
To: Peletz, Lawrence J O642
Cc: Rolando Raymundo; Robert; Lisa Barfield
Subject: Re: Reply to April 16, 2008 Jacob Trail Letter

Thank you Larry,
We are aware of the issues discussed below. We are working under the County's direction to provide a design solution based on your meeting with County Commissioner Dallari. As stated in the questionnaire, the design solution alternatives will be presented to the Lake Crescent residents and we can address your concerns at that time.

Heather L. Brady, E.I.
Staff Engineer III
Singhofen & Associates, Inc.
925 S. Semoran Blvd. Suite 104
Winter Park, FL 32792
Phone: 407-679-3001
Fax: 407-679-2691

> ----- Original Message -----
> **From:** Peletz, Lawrence J O642
> **To:** Heather Brady
> **Sent:** Wednesday, April 23, 2008 11:42 AM
> **Subject:** RE: Reply to April 16, 2008 Jacob Trail Letter
>
> Heather,
> Attached is a copy of my fax as you requested.
>
> If we use the logic that the Lake Lenelle retention area is private and can't be used, why can Lake Crescent, a private spring feed fresh water lake connected to the aquafier, be used as a discharge for road drainage. Should not the people who own the lake have a say as to if it can be used? I realize that originally, the drainage from Jacobs Trail was allowed to flow into the lake. However, at that time the only travel on the dirt road was a few people getting to the other side of Lake Crescent. Osprey Lakes Subdivision was not there and Snow Hill Road/Chuluota Bypass did not exsist (as per your figure 1). With the Osprey Lakes subdivision now using Jacobs Trail (+200 homes) and Snow Hill traffic, there is a much greater risk for contamination of the Lake. In the future, traffic is only going to increase on Snow Hill Road due to the continued growth of the Trails subdivision, the subdivsion off Ave H as well as the resently sold farm land just north of the Little Econ. This land is scheduled for another 300 homes. To me, even if I did not live on Lake Crescent, would be an environmental concern as it should also for the county.
>
> Where does the "free standing" drain located on the northwest corner of Lake Crescent drain? I know we discussed that it appeared to be a collector for surface water from Jacob Trail but never connected. I can't remember the reason that could not be connected to and used.
>
> Thanks,

Sincerely,
Larry Peletz

Performance Engineer
Boiler Technology Service Q2-W192
Siemens Power Generation Inc.
4400 Alafaya Trail
Orlando, FL 32826
Tel (407) 736-6315
Fax (407) 736-3102
Cell (407) 492-7669
lawrence.peletz@siemens.com

From: Heather Brady [mailto:hlb@saiengineers.com]
Sent: Wednesday, April 23, 2008 10:17 AM
To: Peletz, Lawrence J O642
Cc: Rolando Raymundo; Robert; Lisa Barfield
Subject: Reply to April 16, 2008 Jacob Trail Letter

Mr. Peletz,
Once again, thank you for your input on this project. If you don't mind, could you please mail or email a copy of your survey. A portion of page 5 was cut off in the faxed copy that you sent this morning. In response to your question regarding the retention pond located to the west of Jacobs Trail, this is a private retention area that was designed as part of the Lake Lenelle Harbour subdivision in 1987.

Heather L. Brady, E.I.
Staff Engineer III
Singhofen & Associates, Inc.
925 S. Semoran Blvd. Suite 104
Winter Park, FL 32792
Phone: 407-679-3001
Fax: 407-679-2691

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): Larry Pfletz

PHONE NUMBER (Optional): 407-359-0295

ADDRESS (Please include): 120 Lake Crescent Dr

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 5 yr

2. Are you familiar with the drainage patterns in your area? Yes _____ No X
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. _____

3. Have you ever experienced flooding at this location? Yes _____ No X

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: _____
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): _____

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. _____

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: _____
   (b) A long moderate rain: _____
   (c) A long heavy rain: _____
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

PELGIZ

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a) Once a month
(b) Once every six months
(c) Once a year
(d) Once every two years
(e) Once every five years
(f) Less than once every five years

10. Please name the streets and describe the locations that flood in your area. _____

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)

12. Are you aware of any water quality problems associated with stormwater runoff in your area?

Yes X No _____

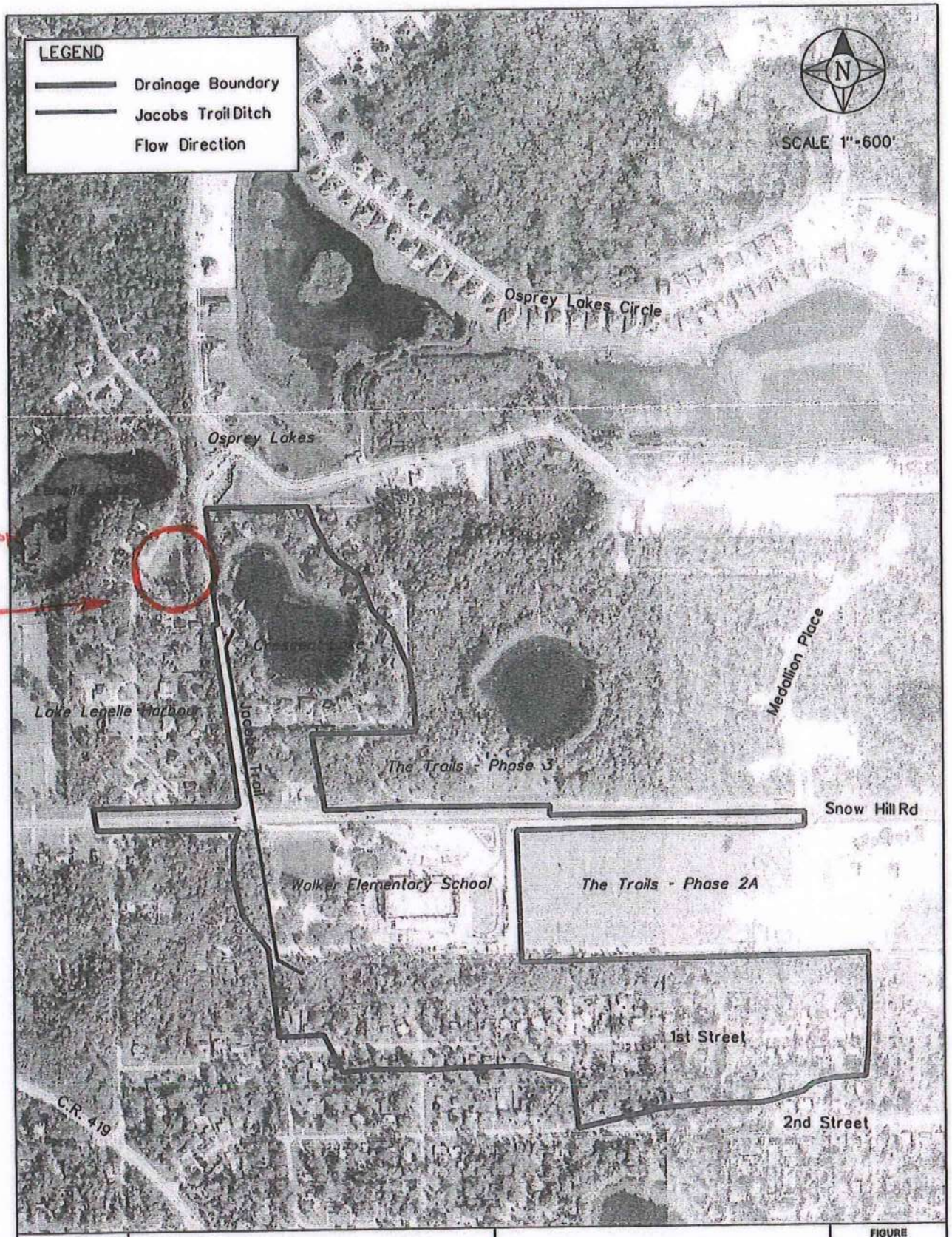
Describe (please include dates): AFTER WATER WAS PUMP FROM AVE H AREA, NEW PLANTS IN LAKE, ALSO "OIL SLICK" WAS SEEN ON WATER - ENGINEERED Ditch has been MODIFIED WITH HARD PIPE - REDUCING THE AMOUNT DITCH TO ALLOW PROPER SETTLING OF PARTICULATE AND ROAD RUNOFF WASTE.

Possible source of pollution:

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. DATA FOR CONCERNING A DRAINAGE TO LAKE LENELLE FROM JACOBS TRAIL, DESIGN DATA FOR THE RETENTION AREA BETWEEN JACOBS TRAIL & LAKE LENELLE SHOULD PROVIDE SOME INFO (SEE CIRCLED AREA ON ENCLOSE MAP)

QUESTION: WHY NOT CONNECT DRAINAGE GOING INTO LAKE CRESCENT, INTO CURRENT RETENTION AREA? THIS WOULD CUT COST IN BUILDING NEW AREA AT INTERSECTION OF JACOBS TRAIL & SNOW HILL PLUS REDUCE FUTURE YEARLY MAINTANCE COST OF THE PROPOSED RETENTION AREA. (WITH School, need for a fence and waste pick-up, similar to one across Snow Hill next to school).

PETERS



SAI	SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT	2008 DRAINAGE MAP	FIGURE 2
			Project No. 2007-001.20

G:\SC_Jacobs_Trail\DGN\FIG-CurrentDrainagePatterns.dgn
4/18/2008

SIEMENS

Siemens Power Generation, Inc.

Fax
To: Heather Brady

Fax. 407 679 2691
Phone:
Date:
4/23/08

From: L Peletz
Phone: 407 359 0295
Fax:
E-Mail:lawrence.peletz@siemens.com
Pages to Follow: 5

Message: Reply to April 16, 2008 Jacob Trail Letter

4400 Alafaya Trail, MC
Orlando, FL 32826-2399

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): Judith H Warren

PHONE NUMBER (Optional): 407 365 1802

ADDRESS (Please include): 112 Lake Crescent Dr

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd; Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 5 years

2. Are you familiar with the drainage patterns in your area? Yes _____ No X
Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. _____

3. Have you ever experienced flooding at this location? Yes _____ No X

4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: _____
   (b) Severe street flooding of extended duration: _____
   (c) Flooding of residence (inside house or building): _____
   (d) Other (please describe.): _____

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. _____

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: _____
   (b) A long moderate rain: _____
   (c) A long heavy rain: _____
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)
   (a) Once a month
   (b) Once every six months
   (c) Once a year
   (d) Once every two years
   (e) Once every five years
   (f) Less than once every five years

Warren

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

10. Please name the streets and describe the locations that flood in your area. _____

_____

_____

11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)

_____

_____

_____

12. Are you aware of any water quality problems associated with stormwater runoff in your area?

Yes _____ No X

Describe (please include dates): _____

_____

_____

Possible source of pollution: _____

_____

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

SEMINOLE COUNTY, FLORIDA
SNOW HILL ROAD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT
QUESTIONNAIRE

RESPONDENTS NAME (Optional): Larry Peletz

PHONE NUMBER (Optional): 407-359-0295

ADDRESS (Please include): 120 Lake Crescent Dr

RETURN TO: Singhofen & Associates, Inc.
Attention: Heather Brady, E.I. - Jacobs Trail Drainage Study
925 S. Semoran Blvd, Suite 104
Winter Park, FL 32792

(Or email: HLB@saiengineers.com)

1. How many years have you lived at the above address? 5 yr

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Please describe any discrepancies that you have with the maps provided or you may mark changes on the maps and return to us. _____

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4. What type(s) of flooding have you experienced? (Circle and describe below.)
   (a) Severe yard or parking lot flooding of extended duration: _____
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   (d) Other (please describe.): _____

5. What date(s) do you recall flooding occurring? If you cannot remember exact date(s), give approximate date(s). Or leave blank. _____

6. What type of storm caused flooding of your property? (Circle and describe below.)
   (a) A short intense rain, such as a thunderstorm: _____
   (b) A long moderate rain: _____
   (c) A long heavy rain: _____
   (d) Other (please describe): _____

7. If your house experiences flooding, how often does it occur? (Circle appropriate answer.)
   (a) Once a month
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   (c) Once a year
   (d) Once every two years
   (e) Once every five years
   (f) Less than once every five years

PELGIZ

8. If your yard experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
(c)	Once a year	(f)	Less than once every five years

9. If your street experiences flooding, how often does it occur? (Circle appropriate answer.)

(a)	Once a month	(d)	Once every two years
(b)	Once every six months	(e)	Once every five years
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10. Please name the streets and describe the locations that flood in your area. _____

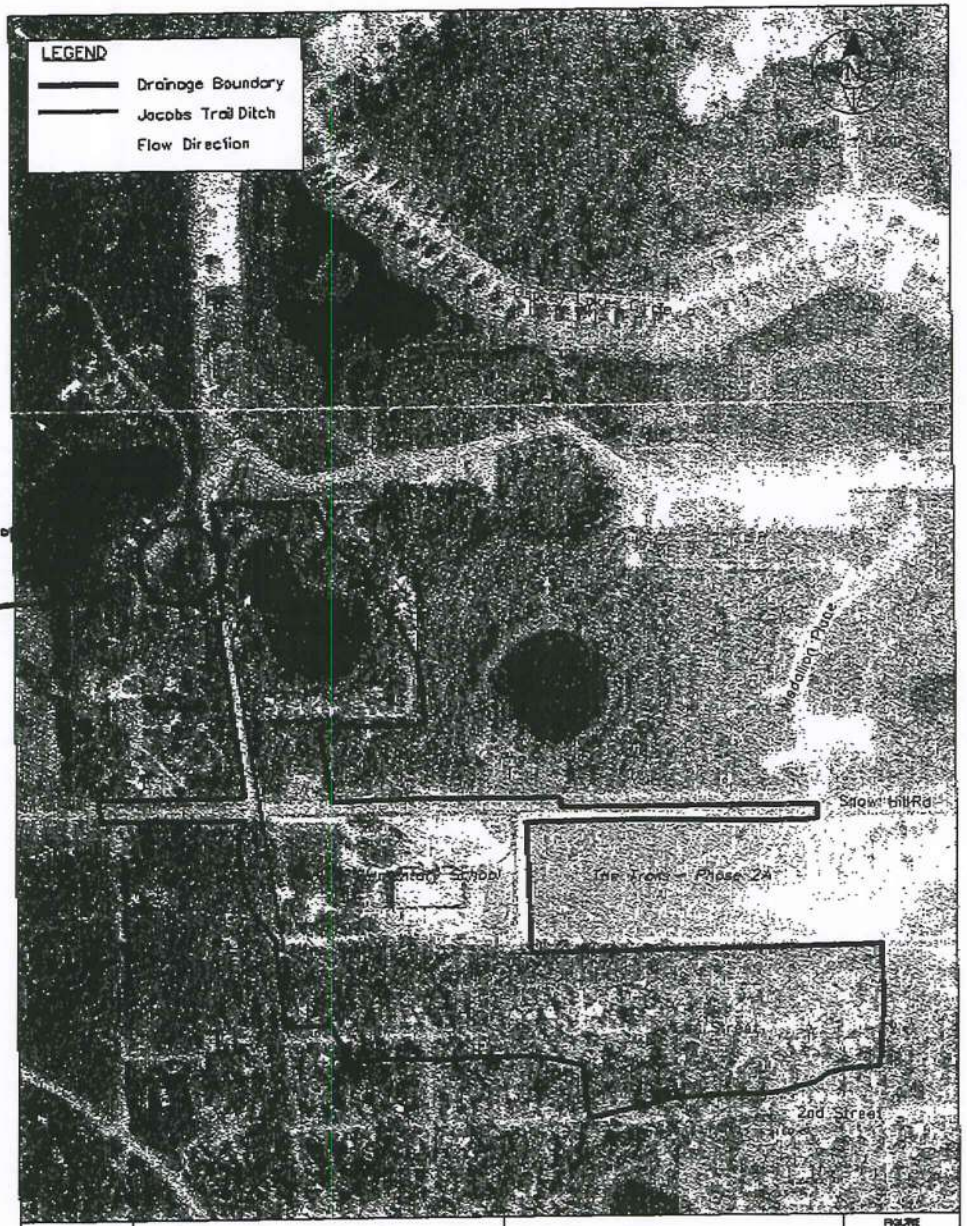
11. What do you feel is the cause or major contributing factor to the flooding in your area? (Please describe.)

12. Are you aware of any water quality problems associated with stormwater runoff in your area?
Yes X No _____
Describe (please include dates): AFTER WATER WAS PUMP FROM AVE H AREA, NEW PLANTS IN LAKE, ALSO "OIL SLICK" WAS SEEN ON WATER - ENGINEERED Ditch has been
~~Possible source of pollution:~~ MODIFIED WITH HARD PIPE - REDUCING THE AMOUNT DITCH TO ALLOW PROPER SETTLING OF PARTICULATE AND ROAD RUNOFF WASTE.

13. Please provide any additional comments you wish relating to drainage, flooding and/or water quality in your area. DATA FOR CONCERNING A DRAINAGE TO LAKE LENELLE FROM JACOBS TRAIL, DESIGN DATA FOR THE RETENTION AREA BETWEEN JACOBS TRAIL & LAKE LENELLE SHOULD PROVIDE SOME INFO (SEE CIRCLED AREA ON ENCLOSE MAP)

QUESTION: WHY NOT CONNECT DRAINAGE GOING INTO LAKE CRESCENT INTO CURRENT RETENTION AREA? THIS WOULD CUT COST IN BUILDING NEW AREA AT INTERSECTION OF JACOBS TRAIL & SNOW HILL PLUS REDUCE FUTURE EARLY MAINTANCE COST OF THE PROPOSED RETENTION AREA. (WITH School, need for a fence and waste pick-up, similar to one across Snow Hill next to

PETER



RETENTION AREA

SAJ	SNOW HILL RD/JACOBS TRAIL OUTFALL IMPROVEMENT PROJECT	2008 DRAINAGE MAP	FIGURE 2
			Project No. 2007-001.28

Appendix B.4. - Snow Hill Road / Jacobs Trail Outfall Project

Lake Crescent Volumetric Analysis (Historic vs. Current Conditions)

Mean Annual 24-hr		
Basin	Current Cond. Runoff Volume (ft^3)	Hist. Cond. Runoff Volume (ft^3)
JTO015	176134	108304
JTO030	1952	---
JTO045	7346	32269
JTO055	40947	---
JTO060	12966	134603
JTO065	14268	---
JTO068	62483	34058
JTO070	31156	---
JTO075	28366	---
JTO080	64228	142442
JTO300	13914	---
JTO405	No Flow	---
JTO500	No Flow	---
JTO600	58457	232044
JTO700	4322	---
JTO800	123645	---
Total:	640186	683720
	Net Difference (Current - Historic) (ft^3) =	**-43534**

50-yr 24-hr		
Basin	Current Cond. Runoff Volume (ft^3)	Hist. Cond. Runoff Volume (ft^3)
JTO015	459706	240267
JTO030	7647	---
JTO045	30185	178034
JTO055	109822	---
JTO060	38803	402591
JTO065	40347	---
JTO068	168062	75554
JTO070	82093	---
JTO075	76092	---
JTO080	169237	315995
JTO300	40737	---
JTO405	No Flow	---
JTO500	67951	---
JTO600	152577	605648
JTO700	11317	---
JTO800	322709	---
Total:	1777285	1818088
	Net Difference (Current - Historic) (ft^3) =	**-40803**

10-yr 24-hr		
Basin	Current Cond. Runoff Volume (ft^3)	Hist. Cond. Runoff Volume (ft^3)
JTO015	336749	184417
JTO030	4957	---
JTO045	19649	108305
JTO055	79939	---
JTO060	27486	285709
JTO065	29017	---
JTO068	122340	57991
JTO070	60149	---
JTO075	55467	---
JTO080	124010	242543
JTO300	29008	---
JTO405	No Flow	---
JTO500	No Flow	---
JTO600	112091	444943
JTO700	8307	---
JTO800	237082	---
Total:	1246249	1323907
	Net Difference (Current - Historic) (ft^3) =	**-77658**

100-yr 24-hr		
Basin	Current Cond. Runoff Volume (ft^3)	Hist. Cond. Runoff Volume (ft^3)
JTO015	510693	263118
JTO030	8827	---
JTO045	34722	208765
JTO055	122215	---
JTO060	43520	451177
JTO065	45047	---
JTO068	187001	82739
JTO070	91155	---
JTO075	84624	---
JTO080	187910	346049
JTO300	45622	---
JTO405	No Flow	---
JTO500	101173	---
JTO600	169281	671953
JTO700	12560	---
JTO800	358037	---
Total:	2002385	2023802
	Net Difference (Current - Historic) (ft^3) =	**-21417**

25-yr 24-hr		
Basin	Current Cond. Runoff Volume (ft^3)	Hist. Cond. Runoff Volume (ft^3)
JTO015	397878	212340
JTO030	6263	---
JTO045	24805	142087
JTO055	94795	---
JTO060	33099	343754
JTO065	34648	---
JTO068	145081	66772
JTO070	71077	---
JTO075	65731	---
JTO080	146535	279267
JTO300	34828	---
JTO405	No Flow	---
JTO500	27542	---
JTO600	132261	525005
JTO700	9806	---
JTO800	279740	---
Total:	1504089	1569223
	Net Difference (Current - Historic) (ft^3) =	**-65134**

25-yr 96-hr		
Basin	Current Cond. Runoff Volume (ft^3)	Hist. Cond. Runoff Volume (ft^3)
JTO015	258289	285797
JTO030	10043	---
JTO045	39345	240407
JTO055	134590	---
JTO060	48267	500015
JTO065	49773	---
JTO068	205986	89907
JTO070	100251	---
JTO075	93158	---
JTO080	206627	376064
JTO300	50543	---
JTO405	4432	---
JTO500	134506	---
JTO600	186005	738342
JTO700	13806	---
JTO800	393484	---
Total:	1929105	2230532
	Net Difference (Current - Historic) (ft^3) =	**-301428**

34.52914241 36.0244123
1.49526989

Notes:

1 C***urrent Conditions Runoff Volume:*** Total basin runoff from the 2008 exising conditions ICPR model (JTO-2008EX.icp) routing simulation results.

2 ***Historic Conditions Runoff Volume:*** Total basin runoff from the historic conditions ICPR model (JTO-Hist.icp) routing simulation results. This model was developed from SJRWMD 1' Contour Data (NGVD29) and 1986 aerial photogrammetry obtained from the County.

3 ***Walker Elementary Sub-Basins (JTO405 & JTO500):*** This project site was designed to retain runoff from the 25-yr/24-hour storm event. However, based on SAI's calculations shown above, the JTO500 (School Pond A) does flow during this storm event. Runoff volumes for larger storm events were calculated from the difference in the pond storage volume versus the site runoff volume for each sub-basin.

Name:	JTO005	JTO010	JTO015	JTO025	JTO030
Group:	JTO	JTO	JTO	JTO	JTO
Type:	SCS	SCS	SCS	SCS	SCS
Node:	JTO005	JTO010	JTO015	JTO025	JTO030
Status:	Onsite	Onsite	Onsite	Onsite	Onsite
Unit Hyd:	uh323	Uh323	Uh323	Uh323	Uh323
Peaking Fact:	323.0	323.0	323.0	323.0	323.0
Rain File:	Flmod	Flmod	Flmod	Flmod	Flmod
Rain Amount(in):	10.600	10.600	10.600	10.600	10.600
Storm Dur(hrs):	24.00	24.00	24.00	24.00	24.00
TC(min):	32.00	17.00	39.00	10.00	10.00
Time Shift(hrs):	0.00	0.00	0.00	0.00	0.00
Area(ac):	7.690	14.780	16.310	0.280	0.480
Curve Num:	82.20	84.30	74.20	51.20	50.90
DCIA(%):	0.00	3.00	41.00	0.00	15.00
Max Q(cfs):	999999.000	999999.000	999999.000	999999.000	999999.000

Name:	JTO045	JTO055	JTO060	JTO065	JTO068
Group:	JTO	JTO	JTO	JTO	JTO
Type:	SCS	SCS	SCS	SCS	SCS
Node:	JTO045	JTO055	JTO060	JTO065	JTO068
Status:	Onsite	Onsite	Onsite	Onsite	Onsite
Unit Hyd:	Uh323	Uh323	Uh323	Uh323	Uh323
Peaking Fact:	323.0	323.0	323.0	323.0	323.0
Rain File:	Flmod	Flmod	Flmod	Flmod	Flmod
Rain Amount(in):	10.600	10.600	10.600	10.600	10.600
Storm Dur(hrs):	24.00	24.00	24.00	24.00	24.00
TC(min):	23.00	37.00	14.00	12.00	93.00
Time Shift(hrs):	0.00	0.00	0.00	0.00	0.00
Area(ac):	1.670	3.960	1.530	1.500	6.020
Curve Num:	61.00	76.30	76.00	79.00	78.30
DCIA(%):	4.00	31.00	9.00	12.00	26.00
Max Q(cfs):	999999.000	999999.000	999999.000	999999.000	999999.000

Name:	JTO070	JTO075	JTO080	JTO100	JTO200
Group:	JTO	JTO	JTO	JTO	JTO
Type:	SCS	SCS	SCS	SCS	SCS
Node:	JTO070	JTO075	JTO080	JTO100	JTO200
Status:	Onsite	Onsite	Onsite	Onsite	Onsite
Unit Hyd:	Uh323	Uh323	Uh323	Uh323	Uh323
Peaking Fact:	323.0	323.0	323.0	323.0	323.0
Rain File:	Flmod	Flmod	Flmod	Flmod	Flmod
Rain Amount(in):	10.600	10.600	10.600	10.600	10.600
Storm Dur(hrs):	24.00	24.00	24.00	24.00	24.00
TC(min):	12.00	28.00	42.00	15.00	21.00
Time Shift(hrs):	0.00	0.00	0.00	0.00	0.00
Area(ac):	2.850	2.700	5.870	31.680	11.170
Curve Num:	81.80	80.10	82.10	74.10	69.80
DCIA(%):	22.00	22.00	21.00	9.00	10.00
Max Q(cfs):	999999.000	999999.000	999999.000	999999.000	999999.000

Name:	JTO300	JTO405	JTO500	JTO600	JTO700
Group:	JTO	JTO	JTO	JTO	JTO
Type:	SCS	SCS	SCS	SCS	SCS
Node:	JTO300	JTO405	JTO500	JTO600	JTO700
Status:	Onsite	Onsite	Onsite	Onsite	Onsite
Unit Hyd:	Uh323	Uh323	Uh323	Uh323	Uh323
Peaking Fact:	323.0	323.0	323.0	323.0	323.0
Rain File:	Flmod	Flmod	Flmod	Flmod	Flmod
Rain Amount(in):	10.600	10.600	10.600	10.600	10.600
Storm Dur(hrs):	24.00	24.00	24.00	24.00	24.00
TC(min):	10.00	33.00	10.00	13.00	10.00
Time Shift(hrs):	0.00	0.00	0.00	0.00	0.00
Area(ac):	1.580	3.120	10.420	5.240	0.390
Curve Num:	76.00	81.70	81.50	82.70	82.40
DCIA(%):	13.00	56.00	32.00	22.00	22.00
Max Q(cfs):	999999.000	999999.000	999999.000	999999.000	999999.000

Name:	JTO800
Group:	JTO
Type:	SCS

```
             Node: JTO800
           Status: Onsite
         Unit Hyd: Uh323
      Peaking Fact: 323.0
         Rain File: Flmod
  Rain Amount(in): 10.600
   Storm Dur(hrs): 24.00
          TC(min): 25.00
  Time Shift(hrs): 0.00
        Area(ac): 11.080
       Curve Num: 82.70
         DCIA(%): 22.00
      Max Q(cfs): 999999.000
```

Appendix C.2 - Curve Number Calculations

Snow Hill Road / Jacobs Trail Outfall Improvements Project

Basin ID	Area (ac)	Total Basin Area (ac)	Landuse	Hydro Group	Curve Number	Weighted Curve Number
JTO005	0.1	7.7	110	C	76.4	1.1
JTO005	0.1	7.7	110	D	81.8	1.1
JTO005	0.0	7.7	443	A	43	0.0
JTO005	0.2	7.7	443	A	43	1.1
JTO005	0.5	7.7	443	C	76	5.0
JTO005	1.9	7.7	443	C	76	18.6
JTO005	1.1	7.7	443	D	82	12.2
JTO005	0.9	7.7	443	B/D	82	9.4
JTO005	1.4	7.7	443	D	82	14.6
JTO005	0.1	7.7	646	B/D	98	0.7
JTO005	1.4	7.7	646	D	98	18.5
JTO005 Total						**82.2**
JTO010	0.0	11.2	110	A	44.9	0.0
JTO010	3.8	11.2	110	A	44.9	15.2
JTO010	0.3	11.2	110	C	76.4	2.0
JTO010	0.0	11.2	110	C	76.4	0.2
JTO010	1.7	11.2	110	C	76.4	11.8
JTO010	0.7	11.2	110	D	81.8	5.2
JTO010	1.2	11.2	110	D	81.8	9.1
JTO010	0.0	11.2	221	A	39	0.0
JTO010	0.3	11.2	221	D	80	2.3
JTO010	0.6	11.2	443	A	43	2.1
JTO010	0.0	11.2	443	C	76	0.2
JTO010	0.0	11.2	443	D	82	0.2
JTO010	0.0	11.2	611	C	98	0.4
JTO010	0.0	11.2	611	D	98	0.0
JTO010	1.2	11.2	641	A	98	10.8
JTO010	0.0	11.2	641	C	98	0.3
JTO010	1.1	11.2	641	D	98	9.7
JTO010	0.0	11.2	646	D	98	0.2
JTO010 Total						**69.8**
JTO015	0.9	16.6	110	W	98	5.3
JTO015	0.0	16.6	110	A	44.9	0.0
JTO015	4.2	16.6	110	A	44.9	11.3
JTO015	0.3	16.6	110	A	44.9	0.9
JTO015	0.0	16.6	110	A	44.9	0.0
JTO015	4.7	16.6	110	C	76.4	21.5
JTO015	0.2	16.6	213	C	79	0.9
JTO015	0.7	16.6	434	A	36	1.5
JTO015	0.1	16.6	434	A	36	0.2
JTO015	0.2	16.6	434	C	73	0.9
JTO015	4.0	16.6	520	W	98	23.5
JTO015	0.0	16.6	520	A	98	0.0
JTO015	0.2	16.6	520	C	98	0.9
JTO015	0.3	16.6	641	W	98	1.9
JTO015	0.2	16.6	641	W	98	1.0
JTO015	0.3	16.6	641	A	98	1.8

Appendix C.2 - Curve Number Calculations

Snow Hill Road / Jacobs Trail Outfall Improvements Project

Basin ID	Area (ac)	Total Basin Area (ac)	Landuse	Hydro Group	Curve Number	Weighted Curve Number
JTO015	0.5	16.6	641	C	98	2.8
JTO015 Total						**74.2**
JTO030	0.4	0.5	110	A	44.9	35.7
JTO030	0.1	0.5	110	C	76.4	14.7
JTO030	0.0	0.5	434	A	36	0.5
JTO030 Total						**50.9**
JTO045	0.4	1.7	110	A	44.9	9.5
JTO045	0.1	1.7	110	C	76.4	4.5
JTO045	0.3	1.7	213	C	79	16.0
JTO045	0.3	1.7	434	A	36	7.3
JTO045	0.5	1.7	434	C	73	23.7
JTO045 Total						**61.0**
JTO055	0.0	4.0	110	C	76.4	0.5
JTO055	0.4	4.0	120	C	77.6	8.8
JTO055	0.1	4.0	120	C	77.6	2.2
JTO055	1.5	4.0	120	C	77.6	29.4
JTO055	0.2	4.0	170	A	49	2.8
JTO055	0.7	4.0	170	C	78.07	13.2
JTO055	0.2	4.0	170	C	78.07	4.9
JTO055	0.7	4.0	213	C	79	14.6
JTO055 Total						**76.3**
JTO060	0.0	1.5	110	C	76.4	0.2
JTO060	0.2	1.5	170	C	78.07	9.9
JTO060	0.0	1.5	213	C	79	1.2
JTO060	0.6	1.5	213	C	79	30.0
JTO060	0.1	1.5	434	C	73	4.2
JTO060	0.6	1.5	434	C	73	30.6
JTO060 Total						**76.0**
JTO065	0.5	1.5	120	U	82.7	29.2
JTO065	0.3	1.5	120	B/D	82.7	14.7
JTO065	0.0	1.5	213	C	79	0.6
JTO065	0.2	1.5	213	C	79	8.0
JTO065	0.0	1.5	213	B/D	84	1.2
JTO065	0.0	1.5	434	C	73	0.0
JTO065	0.5	1.5	434	C	73	24.3
JTO065	0.0	1.5	434	B/D	79	1.0
JTO065 Total						**79.0**
JTO068	4.2	6.0	120	C	77.6	54.5
JTO068	0.0	6.0	120	C	77.6	0.2
JTO068	0.6	6.0	120	B/D	82.7	8.7
JTO068	0.7	6.0	170	C	78.07	9.2
JTO068	0.2	6.0	213	C	79	3.0
JTO068	0.2	6.0	213	C	79	2.1
JTO068	0.0	6.0	213	B/D	84	0.6
JTO068 Total						**78.3**
JTO070	0.5	2.8	120	C	77.6	14.4
JTO070	2.3	2.8	120	U	82.7	66.8

Appendix C.2 - Curve Number Calculations

Snow Hill Road / Jacobs Trail Outfall Improvements Project

Basin ID	Area (ac)	Total Basin Area (ac)	Landuse	Hydro Group	Curve Number	Weighted Curve Number
JTO070	0.0	2.8	120	B/D	82.7	0.6
JTO070 Total						**81.8**
JTO075	1.4	2.7	120	C	77.6	39.8
JTO075	0.5	2.7	120	U	82.7	16.0
JTO075	0.5	2.7	120	U	82.7	14.6
JTO075	0.3	2.7	120	B/D	82.7	9.7
JTO075 Total						**80.1**
JTO080	0.7	5.9	120	C	77.6	8.9
JTO080	0.5	5.9	120	U	82.7	7.7
JTO080	1.7	5.9	120	U	82.7	23.7
JTO080	2.8	5.9	120	B/D	82.7	39.9
JTO080	0.1	5.9	210	C	79	0.8
JTO080	0.1	5.9	210	U	84	1.1
JTO080 Total						**82.1**
JTO100	2.5	31.7	110	A	44.9	3.6
JTO100	6.1	31.7	110	A	44.9	8.7
JTO100	3.7	31.7	120	A	47.85	5.6
JTO100	1.0	31.7	120	C	77.6	2.5
JTO100	1.3	31.7	120	B/D	82.7	3.4
JTO100	1.0	31.7	120	D	82.7	2.5
JTO100	0.8	31.7	443	A	43	1.0
JTO100	0.5	31.7	443	C	76	1.2
JTO100	0.1	31.7	443	D	82	0.4
JTO100	0.0	31.7	443	B/D	82	0.1
JTO100	3.5	31.7	530	A	98	10.9
JTO100	3.3	31.7	530	A	98	10.1
JTO100	6.2	31.7	530	C	98	19.2
JTO100	0.2	31.7	530	D	98	0.5
JTO100	0.0	31.7	530	B/D	98	0.0
JTO100	0.0	31.7	530	B/D	98	0.0
JTO100	1.3	31.7	530	D	98	4.0
JTO100	0.1	31.7	617	D	98	0.2
JTO100 Total						**74.1**
JTO200	0.1	14.8	110	A	44.9	0.4
JTO200	0.0	14.8	110	A	44.9	0.0
JTO200	1.6	14.8	110	C	76.4	8.4
JTO200	0.8	14.8	110	D	81.8	4.5
JTO200	0.1	14.8	110	D	81.8	0.4
JTO200	0.4	14.8	434	A	36	0.9
JTO200	0.0	14.8	434	A	36	0.0
JTO200	0.3	14.8	434	A	36	0.7
JTO200	0.2	14.8	434	A	36	0.6
JTO200	2.3	14.8	434	C	73	11.3
JTO200	0.0	14.8	434	D	79	0.3
JTO200	0.2	14.8	434	D	79	0.9
JTO200	0.3	14.8	443	A	43	0.8
JTO200	0.6	14.8	443	C	76	2.9

Appendix C.2 - Curve Number Calculations

Snow Hill Road / Jacobs Trail Outfall Improvements Project

Basin ID	Area (ac)	Total Basin Area (ac)	Landuse	Hydro Group	Curve Number	Weighted Curve Number
JTO200	0.1	14.8	443	D	82	0.7
JTO200	0.1	14.8	611	C	98	0.6
JTO200	0.4	14.8	611	C	98	2.4
JTO200	3.7	14.8	611	D	98	24.6
JTO200	0.0	14.8	646	A	98	0.0
JTO200	0.7	14.8	646	C	98	4.8
JTO200	0.0	14.8	646	C	98	0.3
JTO200	2.9	14.8	646	D	98	18.9
JTO200 Total						**84.3**
JTO300	1.4	1.6	110	C	76.4	67.5
JTO300	0.2	1.6	434	C	73	8.5
JTO300 Total						**76.0**
JTO405	2.5	3.1	170	C	78.07	63.1
JTO405	0.0	3.1	170	C	78.07	0.9
JTO405	0.6	3.1	500	C	98	17.7
JTO405 Total						**81.7**
JTO500	4.4	10.4	170	C	78.07	33.2
JTO500	0.4	10.4	170	C	78.07	3.1
JTO500	0.6	10.4	213	C	79	4.2
JTO500	0.5	10.4	213	C	79	3.6
JTO500	2.9	10.4	213	C	79	22.3
JTO500	0.0	10.4	500	C	98	0.2
JTO500	1.6	10.4	500	C	98	14.8
JTO500 Total						**81.5**
JTO600	5.2	5.2	120	U	82.7	82.7
JTO600 Total						**82.7**
JTO700	0.0	0.4	120	C	77.6	3.9
JTO700	0.4	0.4	120	U	82.7	78.5
JTO700 Total						**82.4**
JTO800	0.0	11.1	120	B/D	82.7	0.0
JTO800	11.0	11.1	120	U	82.7	81.8
JTO800	0.1	11.1	210	U	84	0.9
JTO800 Total						**82.7**

Appendix C. 3 - Time of Concentration Calculations

Snow Hill Road/Jacobs Trail Outfall Improvements Project

Job No.:		**Name:**	Jacobs Trail
By:	MDD	**Date:**	07/14/08
Checked	HLB	**Date:**	07/14/08

Sheet Flow Surface Codes	
a Smooth Surface	**f** grass, dense
b fallow (no residue)	**g** grass, bermuda
c cultivated < 20% Res.	**h** woods, light
d cultivated > 20% Res.	**i** woods, dense
e grass - range, short	**j** range, natural

Shallow Concentrated Surface Codes
u unpaved surface
p paved surface

Notes:

1. Methodology: SCS, TR-55, 2nd, ed., 1986
2. Use minimum T_c for all basins $\leq$ 1 acre.

Minimum $T_{c\ (min.)}$ =	***10***
Precipitation (inches, mean-annual, 24-hour storm event):	***10.0***

FLOW TYPE	LENGTH (feet)	SLOPE (ft./ft.)	SURFACE CODE	MANNINGS "N"	AREA (sq.ft.)	WP (feet)	VELOCITY (ft./sec.)	TRAVEL TIME (min)
Basin ID: ***JTO100***								
Sheet Flow	205	0.007317	e	0.15	n/a	n/a	n/a	14.72
							Calculated Tc:	14.72
							Tc Used:	**14.72**
Basin ID: ***JTO005***								
Sheet Flow	205	0.007317	h	0.4	n/a	n/a	n/a	32.25
							Calculated Tc:	32.25
							Tc Used:	**32.25**
Basin ID: ***JTO200***								
Sheet Flow	137	0.014599	h	0.4	n/a	n/a	n/a	17.72
Shallow Concentrated Flow	277	0.01083	u	n/a	n/a	n/a	1.65	2.79
Pipe Flow	55	n/a	n/a	n/a	n/a	n/a	2.50	0.37
							Calculated Tc:	20.52
							Tc Used:	**20.52**
Basin ID: ***JTO010***								
Sheet Flow	197	0.030457	f	0.25	n/a	n/a	n/a	12.13
Shallow Concentrated Flow	569	0.012302	u	n/a	n/a	n/a	1.76	5.37
							Calculated Tc:	17.50
							Tc Used:	**17.50**
Basin ID: ***JTO015***								
Sheet Flow	275	0.003636	f	0.25	n/a	n/a	n/a	37.05
Shallow Concentrated Flow	293	0.030717	u	n/a	n/a	n/a	2.82	1.73
							Calculated Tc:	38.78
							Tc Used:	**38.78**
Basin ID: ***JTO030***								
Sheet Flow	78	0.051282	f	0.25	n/a	n/a	n/a	4.69
Sheet Flow	31	0.032258	f	0.25	n/a	n/a	n/a	2.70
							Calculated Tc:	7.39
							Tc Used:	**10.00**
Basin ID: ***JTO045***								
Sheet Flow	175	0.005714	f	0.25	n/a	n/a	n/a	21.54
Sheet Flow	33	0.090909	f	0.25	n/a	n/a	n/a	1.87
							Calculated Tc:	23.41
							Tc Used:	**23.41**
Basin ID: ***JTO055***								
Sheet Flow	44	0.011364	e	0.15	n/a	n/a	n/a	3.60
Shallow Concentrated Flow	1231	0.001625	p	n/a	n/a	n/a	0.82	25.04
Pipe Flow	1184	n/a	n/a	n/a	n/a	n/a	2.50	7.89
							Calculated Tc:	36.54
							Tc Used:	**36.54**
Basin ID: ***JTO060***								
Sheet Flow	125	0.024	h	0.4	n/a	n/a	n/a	13.50
							Calculated Tc:	13.50
							Tc Used:	**13.50**
Basin ID: ***JTO065***								
Sheet Flow	115	0.026087	h	0.4	n/a	n/a	n/a	12.21
							Calculated Tc:	12.21
							Tc Used:	**12.21**
Basin ID: ***JTO068***								
Sheet Flow	300	0.001667	h	0.4	n/a	n/a	n/a	79.04
Shallow Concentrated Flow	672	0.002976	u	n/a	n/a	n/a	0.88	12.72
Shallow Concentrated Flow	162	0.021605	u	n/a	n/a	n/a	2.35	1.15
							Calculated Tc:	92.91
							Tc Used:	**92.91**
Basin ID: ***JTO070***								
Sheet Flow	187	0.010695	e	0.15	n/a	n/a	n/a	11.75
							Calculated Tc:	11.75
							Tc Used:	**11.75**
Basin ID: ***JTO075***								
Sheet Flow	159	0.006289	h	0.4	n/a	n/a	n/a	27.96
							Calculated Tc:	27.96
							Tc Used:	**27.96**

Appendix C. 3 - Time of Concentration Calculations

Snow Hill Road/Jacobs Trail Outfall Improvements Project

Job No.:		**Name:**	Jacobs Trail
By:	MDD	**Date:**	07/14/08
Checked	HLB	**Date:**	07/14/08

Sheet Flow Surface Codes	
a Smooth Surface	**f** grass, dense
b fallow (no residue)	**g** grass, bermuda
c cultivated < 20% Res.	**h** woods, light
d cultivated > 20% Res.	**i** woods, dense
e grass - range, short	**j** range, natural

Shallow Concentrated Surface Codes
u unpaved surface
p paved surface

Notes:

1. Methodology: SCS, TR-55, 2nd, ed., 1986
2. Use minimum T_c for all basins $\leq$ 1 acre.

Minimum $T_{c\ (min.)}$ =	***10***
Precipitation (inches, mean-annual, 24-hour storm event):	***10.0***

FLOW TYPE	LENGTH (feet)	SLOPE (ft./ft.)	SURFACE CODE	MANNINGS "N"	AREA (sq.ft.)	WP (feet)	VELOCITY (ft./sec.)	TRAVEL TIME (min)
Basin ID: ***JTO080***								
Sheet Flow	224	0.004464	h	0.4	n/a	n/a	n/a	42.19
							Calculated Tc:	42.19
							Tc Used:	**42.19**
Basin ID: ***JTO300***								
Sheet Flow	22	0.022727	e	0.15	n/a	n/a	n/a	1.57
Shallow Concentrated Flow	186	0.024194	p	n/a	n/a	n/a	3.09	1.00
Pipe Flow	457	n/a	n/a	n/a	n/a	n/a	2.50	3.05
							Calculated Tc:	5.62
							Tc Used:	**10.00**
Basin ID: ***JTO405***								
Sheet Flow	44	0.011364	e	0.15	n/a	n/a	n/a	3.60
Shallow Concentrated Flow	1232	0.001623	p	n/a	n/a	n/a	0.82	25.07
Pipe Flow	644	n/a	n/a	n/a	n/a	n/a	2.50	4.29
							Calculated Tc:	32.97
							Tc Used:	**32.97**
Basin ID: ***JTO500***								
Shallow Concentrated Flow	195	0.002564	p	n/a	n/a	n/a	1.03	3.16
Pipe Flow	500	n/a	n/a	n/a	n/a	n/a	2.50	3.33
							Calculated Tc:	6.49
							Tc Used:	**10.00**
Basin ID: ***JTO600***								
Sheet Flow	86	0.005814	e	0.15	n/a	n/a	n/a	8.05
Shallow Concentrated Flow	52	0.009615	p	n/a	n/a	n/a	1.92	0.45
Pipe Flow	690	n/a	n/a	n/a	n/a	n/a	2.50	4.60
							Calculated Tc:	13.10
							Tc Used:	**13.10**
Basin ID: ***JTO700***								
Pipe Flow	472	n/a	n/a	n/a	n/a	n/a	2.5	3.15
							Calculated Tc:	3.15
							Tc Used:	**10.00**
Basin ID: ***JTO800***								
Sheet Flow	300	0.006667	e	0.15	n/a	n/a	n/a	20.71
Pipe Flow	700	n/a	n/a	n/a	n/a	n/a	2.50	4.67
							Calculated Tc:	25.38
							Tc Used:	**25.38**

Main Identity

From: "Leo Valencia" <lvalenci@sjrwmd.com>
To: "Heather Brady" <hlb@saiengineers.com>
Cc: "Rolando Raymundo" <RRaymundo@seminolecountyfl.gov>; "Robert" <RBG@saiengineers.com>; "Lisa Barfield" <LAB@saiengineers.com>; "Tonya Guadalupe" <tguadalupe@sjrwmd.com>
Sent: Thursday, July 17, 2008 2:37 PM
Subject: RE: Jacobs Trail - By-Pass Option notes

Heather,

Thanks for coming to our office to meet with us in reference to the Jacob's Trail project. As previously discussed here are our thoughts in reference to the alternative that proposes to divert flow away from Crescent Lake:

Some of the things to consider for this alternative (diversion) is that you will need to demonstrate that there will not be adverse impacts to the stages of Lake Crescent. You will also need to demonstrate no offsite adverse impacts due to diverting flow away from the lake.

In addition, from a biological and ecological stand point your will need to provide reasonable assurances that the proposed system would not cause an alteration of the lake's hydrology by lowering the seasonal high water elevation, or staging, potentially causing adverse impacts to the ecological functions currently provided by the lake. Examples of adverse impacts to the ecological functions include activities (either decreasing or increasing the hydroperiod, frequency of inundation, velocity or mean annual water elevations, groundwater elevations) that diminish the abundance, diversity, food sources or habitat of aquatic or wetland-dependent species in any direct, secondary or cumulative way.

They would need to include the seasonal high water elevation or normal wet season water elevation (indicate the biological indicators, i.e. water marks, lichen lines, adventitious roots and the like, and other methodology used to make this determination), soils, and other documentation/calculations to provide reasonable assurance that an adverse impact to the lake will not occur. If reasonable assurance cannot be provided, they would need to revise their design as appropriate to address reduction/elimination of wetlands and surface waters. If they are unable to provide reasonable assurance and changes to the design are not proposed, they would have to substantiate why alternative designs are not feasible, and propose mitigation to offset impacts to the lake.

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