



Orange County
Orange County, Florida

October 2021
Wood Project No.:600478.22

Lake Bass

Final Loading Study and Lake Management Plan
WBID 3168F



**LAKE BASS
LOADING STUDY AND LAKE MANAGEMENT PLAN WBID
3168F**

Prepared for



Orange County, Florida

Prepared by

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Wood Project No. 600478.22

October 2021

EXECUTIVE SUMMARY

This study assesses the water quality, hydrology, and nutrient loading of Lake Bass and provides potential water quality management alternatives for the Orange County Environmental Protection Division. Lake Bass is located in central Orange County, upstream of the Conway Chain of Lakes, and is part of the Boggy Creek/Kissimmee watershed, which, in turn is in the Okeechobee BMAP area. During the Florida Department of Environmental Protection's (FDEP) Cycle 3 verification period (2009 – 2016), the lake was listed as impaired for chlorophyll-*a* and total nitrogen and was placed on the planning list for total phosphorus impairment.

A review of the available Lake Bass water quality data from 2008 through 2019 indicates the annual geometric mean (AGM) chlorophyll-*a* concentrations exceeded the numeric nutrient criteria (NNC) in all years except 2008, 2014, 2015, and 2017. Total nitrogen AGM concentrations exceeded the NNC in 2009, 2010 and 2016 while total phosphorus AGM concentrations exceeded the NNC in 2013, 2016 and 2018. Recent water quality sampling by Wood (2020 and 2021) indicated the total phosphorus and chlorophyll-*a* exceeded the NNC while total nitrogen did not. Temperature and dissolved oxygen depth profiles suggest that the lake is not strongly thermally stratified but anoxic conditions (<2 mg/L) or near anoxic conditions were observed at the sediment-water interface for half of the year. Based on data from the latest FDEP Cycle 4 evaluation period (2014 – 2021), it is likely that the lake will remain on the verified impaired list for chlorophyll-*a*, and will be verified as impaired for total phosphorus. The AGM total nitrogen concentration did not exceed the NNC criteria and is expected to be delisted.

Lake Bass has accumulated a substantial amount of soft sediments which averaged about 10.9 feet in thickness, up to 26 feet in thickness. The deepest, central portion of the lake contained highly organic sediments (bulk density 0.11 g/cm³) and was also enriched in phosphorus (1,950 mg/kg TP). About 89% of the total phosphorus in the sediments was considered to be bioavailable. An assessment of sediment nutrient flux indicates substantial internal nutrient recycling of about 422 lb/yr TP and 1,010 lb/yr TN.

Wood conducted a nutrient loading analysis of the Lake Bass watershed to determine the potential nutrient loading sources. Available geographic information system (GIS) data was evaluated and updated based on field reconnaissance and aerial and topographic information. The Lake Bass watershed was divided into eight sub-basins and each sub-basin was evaluated using land use cover and soil classification information to support water quantity and quality modeling. In addition, Wood deployed three stormwater autosamplers and three seepage meters to support the modeling efforts and provide site-specific empirical pollutant load estimates from both stormwater and groundwater seepage. The results indicated that stormwater runoff from the Lake Bass watershed is the largest external source of pollutants at 191 lb/yr total phosphorus (96%) and 1,292 lb/yr total nitrogen (78%). Seepage inputs contribute approximately 7 lb/yr total phosphorus (4%) and 314 lb/yr total nitrogen (19%). Direct atmospheric loading was a relatively minor pollutant source. Internal flux from sediments contributes about twice as much total phosphorus and 59% as much total nitrogen loading as all of the external loads combined.

Wood developed six conceptual structural stormwater treatment options in the sub-basins with the highest untreated pollutant loading based on the information provided by this study. Three non-structural alternatives were also identified and described both in terms of pollutant removal and estimated cost per pound of pollutants removed. These alternatives are summarized below and are recommended for further investigation.

Summary of Alternatives

Alternative / Description	Rank*	TP Removed each year (lb)	\$ per lb of TP Removed	TN Removed each year (lb)	\$ per lb of TN Removed	Type of Reduction
Alternative 1 / Sub-Basin BL035 Linear Bioretention	1	11.9	277	65.2	50	Bioretention
Alternative 2 / Sub-Basin BL010 Linear Bioretention	2	7.0	298	90.1	23	Bioretention
Alternative 3 / Sub-Basin BL020 Upflow Filter with Recirculation	4	33.3	342	151.9	75	BAM Upflow
Alternative 4 / Sub-Basin BL025 BAM Soil Enhancement	7	32.9	1,624	160.7	333	Bioretention
Alternative 5 / Sub-Basin BL005 Nutrient Separating Baffle Box	8	9.2	3,076	130.8	216	NSBB
Alternative 6 / Sub-Basin BL015 Linear Bioretention	6	4.5	675	26.6	113	Bioretention
Alternative 7 / Sediment Nutrient Inactivation	5	330**	389	--	---	Sediment Nutrient Inactivation
Alternative 8 / Public Education	3	6	333	34	58	Public Education
Alternative 9 / Natural Attenuation	--	--	--	--	--	Natural Attenuation

* Rank based on \$/lb of TP removed

**Single treatment

TABLE OF CONTENTS

1.0 INTRODUCTION.....	11
1.1 General Description.....	11
1.2 Water Quality Status	12
1.3 Basin Description	12
1.4 Scope of Work.....	12
2.0 PHYSICAL AND CHEMICAL CHARACTERISTICS OF LAKE BASS	13
2.1 Physical Description	13
2.2 Bathymetry and Sediment Thickness	13
2.3 Sediment Assessment	14
2.3.1 Sediment Physical Characteristics and Phosphorus Fractionation.....	14
2.4 Sediment Nutrient Flux	15
2.4.1 Methodology for Sediment Flux and Loading Calculation.....	15
2.4.2 Sediment Nutrient Flux and Loading Results.....	16
2.4.3 Sediment Flux Analysis Summary.....	17
2.5 Surface Water Quality	18
2.5.1 Data Acquisition	18
2.5.2 Long-Term Water Quality Evaluation Methodology	18
2.5.3 Water Quality Sampling Conducted By Wood.....	18
2.5.4 Results.....	19
2.6 Depth Profiles	21
2.7 Water Quality Summary	22
3.0 DRAINAGE BASIN CHARACTERISTICS	22
3.1 Basin Delineations.....	22
3.2 Land Use	23
3.3 Soil Characteristics	23
4.0 HYDROLOGIC BUDGET	24
4.1 Hydrologic Characteristics.....	24
4.2 Hydrologic Inputs.....	24
4.2.1 Precipitation	24
4.2.2 Stormwater Runoff	24
4.2.3 Groundwater Seepage.....	26
4.3 Hydrologic Losses	28
4.3.1 Evaporation	28
4.3.2 Groundwater Recharge.....	28
4.3.3 Surface Outflow.....	28
4.4 Hydrologic Budget Summary	28
4.4.1 Lake Hydrologic Residence Time	29
5.0 NUTRIENT BUDGET	29

5.1 Nutrient Inputs.....	29
5.1.1 Atmospheric Deposition.....	29
5.1.2 Stormwater Runoff	29
5.1.3 Seepage Contribution.....	31
5.1.4 Summary of Annual Pollutant Loads by Source.....	32
6.0 WATER QUALITY IMPROVEMENT ALTERNATIVES.....	32
6.1 Structural Alternatives	33
6.1.1 Alternative 1 – Sub-Basin BL035 Linear BAM Bioretention Basin with underdrain & overflow control structures.....	33
6.1.2 Alternative 2 – Sub-Basin BL010: BAM Bioretention Basin with underdrain & overflow control structures.....	35
6.1.3 Alternative 3 – Sub-Basin BL020: BAM Upflow filtration with continuous recycle/lake filtration.....	36
6.1.4 Alternative 4 – Sub-Basin BL025: BAM Bioretention System with underdrain & overflow control structure	39
6.1.5 Alternative 5 – Sub-Basin BL005: Nutrient Separating Baffle Box.....	40
6.1.6 Alternative 6 – Sub-Basin BL015: BAM Bioretention Basin with underdrain & overflow control structures.....	41
6.2 Non-Structural Alternatives	42
6.2.1 Alternative 7 – In-Lake Sediment Nutrient Inactivation	42
6.2.2 Alternative 8 – Public Education.....	43
6.2.3 Alternative 9 –Natural Attenuation Alternative.....	46
6.3 Summary of Alternatives	46
7.0 RESULTS AND CONCLUSIONS.....	46
8.0 REFERENCES.....	48

LIST OF TABLES

Table 1-1	Florida’s Lake Numeric Nutrient Criteria
Table 2-1	Phosphorus Fractionation Forms with Drivers of Bioavailable Phosphorus Release
Table 2-2A	Physical and Chemistry Results from Sediments Collected in Lake Bass Stations Core-1, Core-2, Core-3, and Core-4
Table 2-2B	Phosphorus Fractionation Results from Sediments Collected in Lake Bass Stations Core-1, Core-2, Core-3, and Core-4
Table 2-3	Summary of Lake Bass Sediment Characterization and Phosphorus Fractionation Data
Table 2-4	Ranges of In-situ Sample Profile Water Quality Data at Each Station
Table 2-5	Summary of Anoxic and Aerobic Flux Rates and Internal Loads (Slope Equation)

Table 2-6	Summary of Anoxic and Aerobic Flux Rates and Internal Loads (NRR Equation)
Table 2-7	Surface Water Quality Summary Data in Lake Bass from 2008 through 2019
Table 2-8	Adjusted Surface Water Quality Results for Lake Bass from June 2020 to April 2021
Table 2-9	Summary of Lake Bass Surface Water Field Parameters from June 2020 through April 2021
Table 3-1	Area of Sub-Basins in Lake Bass Basin
Table 3-2	Landuse within Lake Bass Watershed
Table 3-3	Hydrologic Soil Groups within the Lake Bass Watershed
Table 4-1	Annual Rainfall at Orlando International Airport from 1953 through 2019
Table 4-2	Estimated Monthly Inputs from Direct Precipitation to Lake Bass
Table 4-3	Estimated Sub-Basin Stormwater Runoff for Lake Bass Watershed
Table 4-4	Lake Bass Seepage Flow Monitoring Data
Table 4-5	Volume of Water and YSI Field Measurements for Lake Bass Seepage Meters
Table 4-6	Lake Bass Seepage Water Quality Summary Data
Table 4-7A	Hydrologic Inputs to Lake Bass
Table 4-7B	Hydrologic Outputs from Lake Bass
Table 5-1	Lake Bass Sub-Basin TN, TP, and TSS EMC's
Table 5-2	Stormwater Water Quality Summary Data for Lake Bass Autosamplers
Table 5-3	TN, TP, and TSS Loading to Lake Bass by Sub-Basin
Table 5-4	Water Quality Data and Loadings from Lake Bass Seepage Meters from May 2020 through April 2021
Table 5-5	Annual Lake Bass Pollutant Loading Summary by Source
Table 6-1	BMP Alternative 1 for Sub-Basin BL035 – TN & TP Removal
Table 6-2	BMP Alternative 1 for Sub-Basin BL035 – Cost
Table 6-3	BMP Alternative 2 for Sub-Basin BL010 – TN & TP Removal
Table 6-4	BMP Alternative 2 for Sub-Basin BL010 – Cost
Table 6-5	BMP Alternative 3 for Sub-Basin BL020 – TP Removal
Table 6-6	BMP Alternative 3 for Sub-Basin BL020 – TN Removal
Table 6-7	BMP Alternative 3 for Sub-Basin BL020 – Cost
Table 6-8	BMP Alternative 4 for Sub-Basin BL025 – TN & TP Removal
Table 6-9	BMP Alternative 4 for Sub-Basin BL025 – Cost
Table 6-10	BMP Alternative 5 for Sub-Basin BL005 – TN & TP Removal
Table 6-11	BMP Alternative 5 for Sub-Basin BL005 – Cost
Table 6-12	BMP Alternative 6 for Sub-Basin BL015 – TN & TP Removal
Table 6-13	BMP Alternative 6 for Sub-Basin BL015 – Cost
Table 6-14	Summary Cost Benefit for Conceptual Alternatives

LIST OF FIGURES

Figure 1-1	Lake Bass Location Map
Figure 1-2	Kissimmee Basin
Figure 1-3	Lake Bass Basin and Jurisdictional Boundaries
Figure 2-1	Aerial Photographs of Lake Bass from 1947 and 1963
Figure 2-2	Digital Elevation Model (DEM)
Figure 2-3	Water Depth Contours
Figure 2-4	Bathymetric Elevation
Figure 2-5	Sediment Thickness
Figure 2-6	Sediment Core Sample Locations
Figure 2-7	Bulk Density (g/cc)
Figure 2-8	Total Organic Carbon (mg/kg Dry)
Figure 2-9	Total Phosphorus (mg/kg Dry)
Figure 2-10	Labile Phosphorus (mg/kg Dry)
Figure 2-11	Sediment Reductant-Soluble Phosphorus (mg/kg Dry)
Figure 2-12	Metal-Oxide Adsorbed Phosphorus (mg/kg Dry)
Figure 2-13	Organic Phosphorus (mg/kg Dry)
Figure 2-14	Porewater Phosphorus (mg/kg Dry)
Figure 2-15	Total Phosphorus Concentrations Measured under Anoxic Conditions during Laboratory Incubations of Sediment Cores
Figure 2-16	Total Phosphorus Concentrations Measured under Aerobic Conditions during Laboratory Incubations of Sediment Cores
Figure 2-17	Ammonia Concentrations Measured under Anoxic Conditions during Laboratory Incubations of Sediment Cores
Figure 2-18	Ammonia Concentrations Measured under Aerobic Conditions during Laboratory Incubations of Sediment Cores
Figure 2-19	Color in Lake Bass Surface Water from 2008 through 2019
Figure 2-20	Alkalinity Concentrations in Lake Bass Surface Water from 2008 through 2019
Figure 2-21	Chlorophyll-a (corrected) Concentrations in Lake Bass Surface Water from 2008 through 2019
Figure 2-22	Chlorophyll-a Concentrations in Lake Bass Surface Water from June 2020 through April 2021
Figure 2-23	Total Phosphorus Concentration in Lake Bass Surface Water from 2008 through 2019
Figure 2-24	Total Phosphorus and Orthophosphate Concentrations in Lake Bass Surface Water from June 2020 through April 2021

Figure 2-25	Total Nitrogen and Nitrate+Nitrite Concentrations in Lake Bass Surface Water from 2008 through 2019
Figure 2-26	Total Nitrogen and Nitrate+Nitrite Concentrations in Lake Bass Surface Water from June 2020 through April 2021
Figure 2-27	Mean Annual TN:TP Ratios in Lake Bass from 2008 through 2019
Figure 2-28	TN:TP Ratios in Lake Bass Surface Water from June 2020 through April 2021
Figure 2-29	Secchi Disk Depth for Lake Bass from 2008 through 2019
Figure 2-30	Secchi Disk Depth in Lake Bass Surface Water from June 2020 through April 2021
Figure 2-31	Annual Geometric Mean Trophic State Index in Lake Bass Surface Water from 2008 through 2019
Figure 2-32	Temperature Depth Profile for Lake Bass from June 2021 through April 2021
Figure 2-33	Dissolved Oxygen Depth Profile for Lake Bass from June 2021 through April 2021
Figure 3-1	Lake Bass Sub-Basins Map
Figure 3-2	Stormwater Structures and Drainage Map
Figure 3-3	Land Use Map
Figure 3-4	Hydrologic Soils Map
Figure 4-1	Average Annual Rainfall from 1953 through 2019 for NOAA Station USW00012815 at Orlando International
Figure 4-2	Typical Seepage Meter Installation
Figure 4-3	Seepage Meter Locations
Figure 4-4	Recharge Rates
Figure 5-1	Autosampler Locations
Figure 5-2	Lake Bass BLA-1 Autosampler Location
Figure 5-3	Lake Bass BLA-2 Autosampler Location
Figure 5-4	Lake Bass BLA-3 Autosampler Location
Figure 5-5	Total Nitrogen and Nitrate/Nitrite Concentrations in Lake Bass Seepage Meters from June 2020 through April 2021
Figure 5-6	Total Phosphorus and Orthophosphate Concentrations in Lake Bass Seepage Meters from June 2020 through April 2021
Figure 5-7	Ammonia Concentrations in Lake Bass Seepage Meters from June 2020 through April 2021
Figure 6-1	Alternative 1 Sub-Basin BL035 Linear BAM Bioretention Basin with Underdrain and Overflow Control Structures
Figure 6-2	Alternative 1 Linear BAM Bioretention Basin with Underdrain and Overflow Control Structures Cross Section
Figure 6-3	Alternative 2 Sub-Basin BL010 BAM Bioretention Basin with Underdrain and Overflow Control Structures

Figure 6-4	Alternative 3 Sub-Basin BL020 BAM Upflow Filtration with Continuous Recycle/Lake Filtration
Figure 6-5	Alternative 3 Sub-Basin BL020 BAM Upflow Filtration with Continuous Recycle/Lake Filtration Detail
Figure 6-6	Alternative 4 Sub-Basin BL025 BAM Bioretention Basin with Underdrain and Overflow Control Structures
Figure 6-7	Alternative 5 Sub-Basin BL005 Nutrient Separating Baffle Box
Figure 6-8	Alternative 6 Sub-Basin BL015 BAM Bioretention Basin with Underdrain and Overflow Control Structures
Figure 6-9	Alternative 6 Sub-Basin BL015 BAM Bioretention Basin with Underdrain and Overflow Control Structures Detail
Figure 6-10	Alternative 7 Sediment Nutrient Inactivation
Figure 6-11	Parcels by Wastewater Treatment Type

LIST OF APPENDICES

Appendix A	Sediment Phosphorus Fractionation Lab Report
Appendix B	Sediment Flux Data
Appendix C	Surface - Seepage Water Quality Lab Reports
Appendix D	Stormwater Structure Report
Appendix E	Hydrologic Tables
Appendix F	Stormwater Quality Lab Reports
Appendix G	Examples of Biofiltration Systems
Appendix H	Examples of BAM Fact Sheets
Appendix I	Examples of Upflow BAM System
Appendix J	BMP Trains Removal Efficiencies
Appendix K	Example of Large Footprint Bioretention Pond

LIST OF ACRONYMS AND ABBREVIATIONS

ac	acre
ac-ft	acre-feet
ADV	acoustic Doppler velocimeter
BMAP	Basin Management Action Plan
BMP	Best Management Practice
cfs	cubic feet per second
Chl- <i>a</i>	chlorophyll- <i>a</i>
cm	centimeter
CN	curve number
DCIA	directly connected impervious area
EMC	event mean concentrations
FAC	Florida Administrative Code
FDACS	Florida Department of Agriculture and Consumer Services
FDEP	Florida Department of Environmental Protection
ft	feet
ft ²	square feet
ft ³	cubic feet
FYN	Florida Yards and Neighborhoods
GIS	Geographic Information System
HSG	Hydrologic Soil Groups
IFAS	Institute of Food and Agricultural Sciences
IWR	Impaired Waters Run
in	inches
kg	kilogram
LOD	limit-of-detection
lb	pound
m	meter
m ²	square meter
MFW	Marsh Flow Way
mg/L	milligrams per liter
mg/kg	milligrams per kilogram
mg/m ²	milligrams per square meter
ml	milliliter
NAVD88	North American Vertical Datum of 1988
NDCIA	non-directly connected impervious area
NEXRAD	Next Generation Radar
NNC	Numeric Nutrient Criteria

NO ₂ ⁻	nitrite
NO ₃ ⁻	nitrate
NTU	nephelometric turbidity units
OCEPD	Orange County Environmental Protection Division
OP	Orthophosphate
PCU	Platinum Cobalt Unit
SCS	Soil Conservation Service
SLADV	side looking acoustic Doppler velocimeter
SJRWMD	St. Johns River Water Management District
STORET	Storage and Retrieval
TMDLs	Total Maximum Daily Loads
TN	total nitrogen
TP	total phosphorus
TSI	Trophic State Index
TSS	total suspended solids
µg/L	micrograms per liter
UORB	Upper Ocklawaha River Basin
USDA	US Department of Agriculture
UnCF	unconsolidated flocculent
UF	University of Florida
USEPA	US Environmental Protection Agency
WAV	Watershed Action Volunteer
WIN	Watershed Information Network
WLM	Water Level Model
Wood	Wood Environment & Infrastructure Solutions, Inc.
WBID	Water body ID
yd ³	cubic yards
yr	year

1.0 INTRODUCTION

1.1 General Description

This report was prepared by Wood Environment & Infrastructure Solutions, Inc. (Wood) for the Orange County Environmental Protection Division (OCEPD) in support of the OCEPD's desire to characterize and ultimately improve the water quality in Lake Bass. Lake Bass (WBID 3168F) is a 24.0-acre lake with a 300.4-acre contributing basin in central Orange County (**Figure 1-1**) within the Boggy Creek Watershed (**Figure 1-2**). The lake is located within the Florida Department of Environmental Protection's (FDEP) Upper Kissimmee Planning Unit and within the Lake Okeechobee Basin Management Action Plan (BMAP) area. Lake Bass was identified by the FDEP as impaired for chlorophyll-*a* (Chl-*a*), and total nitrogen (TN) on June 27, 2017 and placed on the state's Comprehensive Verified List (<https://floridadep.gov/dear/watershed-assessment-section/documents/comprehensive-verified-list>).

In advance of the Total Maximum Daily Load (TMDL) or 4e Restoration Plan development, the OCEPD requested Wood to perform an evaluation of the water quality and pollutant sources and loads for Lake Bass, with a focus on nitrogen and phosphorus. Wood also performed an initial evaluation of Best Management Practices (BMPs) designed to reduce the sources of nutrient pollutant loading within the Lake Bass watershed, including identification and ranking of potential structural and non-structural BMPs to support water quality conditions that are consistent with Class III designated uses of Lake Bass and downstream water bodies.

Specifically, the following tasks were completed to understand what, if any, additional action may be taken to improve water quality conditions:

- 1) Verify and ground truth the Lake Bass drainage basins
- 2) Collect surface water quality samples every other month for one year
- 3) Estimate the volume of soft sediments in Lake Bass
- 4) Develop a bathymetric survey for Lake Bass
- 5) Collect sediment cores for phosphorus fractionations and nutrient flux
- 6) Install seepage meters to measure groundwater loading
- 7) Install autosamplers to collect event-based stormwater quality
- 8) Model stormwater runoff and nutrient loading
- 9) Develop hydrologic and nutrient budgets
- 10) Evaluate alternative BMPs to reduce nutrient loading

All field work performed by Wood conformed to the FDEP's Standard Operating Procedures for Field Activities, DEP-SOP-001/01, dated January 2017, effective April 16, 2018. All laboratory analyses were conducted pursuant to Chapter 62-160, FAC. Laboratories included: DB Laboratories (NELAP Certification: #E 83330) and Southern Research Laboratories (SRL, NELAP Certification: #E 83484).

1.2 Water Quality Status

Section 303(d) of the Clean Water Act requires the State of Florida to submit lists of surface water bodies that do not meet applicable water quality standards. These water bodies are defined as “impaired waters” and TMDLs may be established for these waters on a prioritized schedule. A TMDL quantifies the current pollutant load, sets the required load reduction to meet water quality standards and identifies stakeholders. Alternatively, a 4e Restoration Plan may be initiated for a water body, which allows water quality improvement activities to be implemented and assessed, potentially resulting in attainment of water quality standards without a TMDL. The FDEP’s Numeric Nutrient Criteria (NNC) used to determine impairments are provided in **Table 1-1**.

1.3 Basin Description

The 300.4-acre Lake Bass basin is primarily located northeast and west of the lake (**Figure 1-1**). The northern boundary of the basin extends along South Crystal Lake Dr. to Coe Ave. The northeast portion of the basin extends to the Wedgwood Groves community and to Conway Gardens Rd. on the southeast side. The southern boundary runs along Raeford Road between Conway Gardens Rd. and Clark St. The western boundary of the basin is irregular but roughly follows South Bumby Avenue from Raeford Ave. to East Grant St. where it heads north along Peel Ave. and east once it reaches Tennessee Ter. Medium-density residential land use (>95% of area) dominates the basin. The Lake Bass basin is primarily within unincorporated Orange County, but portions extend into the City of Orlando as shown in **Figure 1-3**. Detailed basin information is presented in **Section 3**.

1.4 Scope of Work

This report presents results of a hydrologic and nutrient loading evaluation along with conceptual project recommendations for Best Management Practices (BMPs) in the Lake Bass drainage basin. Wood first evaluated the physical characteristics of the lake and surrounding watershed including topographic conditions, land use, soil type, and major drainage structures and conveyances. Sediments were then characterized using bathymetric soundings and core samples to determine phosphorus speciation.

Basin evaluations were developed for Lake Bass to identify hydrologic contributions, pollutant loadings, and to provide a ranking of sub-basin areas with respect to annual mass loadings. Stormwater inputs to the lake were characterized during three wet weather rainfall events and three dry weather rainfall events using automated stormwater sampling equipment including ISCO portable samplers, tipping bucket rain gauges, Campbell Scientific data loggers, and cell phone modems which provided telemetric data transmittal and notification of sampler triggers.

Stormwater data were used in combination with literature-based runoff characterizations of the specific land use types within the basin to develop a stormwater loading model.

Groundwater inputs were measured using three seepage meters installed along the perimeter, of the lake. Seepage meters were sampled six times during the study period in 2020 and 2021. Quantity of water, as well as quality of this water, was measured.

2.0 PHYSICAL AND CHEMICAL CHARACTERISTICS OF LAKE BASS

2.1 Physical Description

Wood reviewed historic aerials of Lake Bass and the surrounding area provided by the University of Florida Map & Digital Image Library to evaluate land use changes. Lake Bass and the surrounding area were primarily agricultural-based on the 1947 aerial shown in **Figure 2-1**. Most of the agricultural land had been converted to residential by 1963 and no stormwater treatment is evident.

The Lake Bass basin ranges from 110 feet in elevation to the northeastern and western extents to 100 feet at the southeast corner (**Figure 2-2**). The surface of Lake Bass is approximately 95 feet. All elevations in this report are provided as North American Vertical Datum of 1988 (NAVD). Raeford Road provides a hydrologic divide between Lake Bass and Little Bass Lake and there is no culvert connection between these two lakes.

The normal high-water elevation for Lake Bass is 93.07 ft based on the 50-year record, between 1970 and 2020. Minimum and maximum water elevations were 90.0 and 96.1 ft, respectively. (Source: Orange County's Water Atlas <https://www.orange.wateratlas.usf.edu/waterbodies/lakes/140003/>).

Lake Bass is a closed basin with no surface connections to downstream water bodies. However, a drainage well on the west side of the lake provides some level of flood protection for lakefront property owners.

2.2 Bathymetry and Sediment Thickness

Barnes, Ferland & Associates, (BFA) performed a bathymetric and sediment thickness survey of Lake Bass on June 4, 2020. The lake elevation was 92.42 on the day of the survey. Each point was first located using GPS. Then the depth to the top of the soft sediment layer was measured by dropping a Secchi disk to the bottom. The depth to refusal was measured by pushing a survey rod to resistance. The difference between these two measurements was defined as the soft sediment thickness. Water depth (to the top of the muck layer) averaged 14.0 feet and had a maximum of 35.8 feet (**Figure 2-3**). Approximate volume of water within the lake at the time of the survey was 336 ac-ft at the lake elevation of 92.42. Top of muck elevation for Lake Bass is provided in **Figure 2-4**.

Sediment muck thickness averaged 10.9 ft and ranged between 0 and 26.2 feet as shown in **Figure 2-5**. The thickest muck layers were in the deepest area of the lake. Total muck volume in Lake Bass is approximately 11.4 million ft³ (422,048 yd³).

2.3 Sediment Assessment

2.3.1 Sediment Physical Characteristics and Phosphorus Fractionation

An important component of a lake management plan is an understanding of internal sediment conditions because sediments can be a significant source of internal pollutant loading even after external loading sources are addressed. Wood first evaluated the physical and chemical properties by collecting samples at four different locations in the lake (**Figure 2-6**). Sediment sampling locations were selected based on lake bathymetry and Wood's soft sediment thickness survey so they were representative of the lake bottom conditions. The potential for sediment phosphorus release was estimated by performing a sequential fractionation procedure.

Sediments were sampled on August 28, 2020, using a piston tube sampler to collect the top 10 cm of the sediments at each location. Sediment samples were immediately extruded into sealed plastic bags and shipped to DB Labs for physical and chemical analyses including:

- Bulk density
- Moisture content
- Pore water analyses for phosphorus and ammonia
- Total organic carbon
- Phosphorus fractionation

Phosphorus fractionation is a sequential extraction procedure that provides a quantitative estimate of the amount of phosphorus in the sediments, ranging from the most (labile) to the least bioavailable fractions. An overview of this procedure including the different drivers of P release and likelihood of P release to the water column can be found in **Table 2-1**. Bioavailable phosphorus (BAP) is defined as the sum of labile P [NH_4Cl total soluble phosphorus (TSP)], reductant-soluble P ($\text{NaHCO}_3/\text{Na}_2\text{S}_2\text{O}_4$ TSP), organic P [NaOH TSP minus NaOH soluble reactive phosphorus (SRP)], and metal-oxide adsorbed P (NaOH SRP) (Meis et al., 2012). The sequential phosphorus extraction method is based on a procedure developed by Hupfer et al. (1995) and Psenner et al. (1998) and later modified by Meis et al. (2012). Sediment phosphorus bio-availability is operationally defined by the extraction sequence, from most bio-available to least bio-available:

1. Labile P: Extraction with 1M NH_4Cl to determine loosely adsorbed and porewater P
2. Reductant-soluble P: Extraction with 0.11 M NaHCO_3 /0.11 M $\text{Na}_2\text{S}_2\text{O}_4$ to determine P mainly bound to Fe-hydroxides or Mn
3. Metal-oxide adsorbed P: Extraction in 1 M NaOH to mobilize P, which is mainly exchangeable against hydroxide ions determined as SRP
4. Organic-P: Organic bound P in the same fraction quantified by subtraction NaOH -SRP from NaOH TSP

Laboratory analytical reports for sediment phosphorus fractionation and additional parameters are provided in **Appendix A**.

The bulk density of the sediments averaged 1.03 g/cm³ and ranged from 0.11 to 1.4 g/cm³ (**Table 2-2A** and **Figure 2-7**). The sediments were high in organic matter, with total organic carbon average of 102,756 (range: 3,910 to 394,000) mg/kg dry weight (DW) as total organic carbon (**Table 2-2A** and **Figure 2-8**). The sediments were also enriched in phosphorus, with an average total phosphorus of 658 mg/kg DW with a range from 178 to 1,950 mg/kg (**Table 2-2B**). Core 3 was located near the deepest portion of the lake with the greatest sediment thickness. Sediment analysis results from Core 3 were markedly different from the other 3 sites, with much higher nutrients concentrations and lower density and dry weight. For example, while Core 1, Core 2, and Core 4 TP ranged from 178 to 254 mg/kg DW, TP at BL-3 was 1950 mg/kg DW (**Figure 2-9**). Wood has measured total phosphorus content in sediments of 14 lakes in central Florida (average: 1,884 mg/kg DW, range: 149 to 7,480 mg/kg DW). Sediment total phosphorus concentration in Lake Bass was the seventh highest of the 14 lakes. **Figures 2-10** through **2-14** provide isopleths for the lake bottom for phosphorus fractions including labile, reductant, metal-oxide absorbed, organic, and porewater. Core 3 consistently had the highest concentrations of all phosphorus fractions.

Summary statistics for chemical and physical sediment analyses are provided in **Table 2-3**. Approximately 88% of the total phosphorus in these sediments is anticipated to be bioavailable. The majority (average: 79.6%, range: 57.3 to 98.3%) of bioavailable phosphorus was in the metal-oxide adsorbed fraction, meaning that phosphorus in this fraction is relatively recalcitrant, and has a medium to high likelihood of release under elevated pH conditions (e.g., reduced carbon dioxide concentration during photosynthetic activity) (Meis et. al., 2012).

2.4 Sediment Nutrient Flux

2.4.1 Methodology for Sediment Flux and Loading Calculation

On January 18, 2021, Wood technicians attempted to collect four intact sediment cores in clear polycarbonate cylinders (7.3 cm diameter, 30 cm long) for flux analyses. Flux core collection locations were the same as the phosphorus fractionation cores and were intended to be representative of areas of low, medium, and high sediment phosphorus concentrations within the lake. However, flux core samples could only be recovered from the original Core 1 and Core 3 locations due to sandy conditions. These two locations were renamed BL-1 and BL-3 for the purposes of the flux analyses. At the time of sampling, in-situ physicochemical data were recorded using a YSI along a vertical depth profile at the top, middle, and bottom of the water column (**Appendix B**). Parameters included water temperature, dissolved oxygen (DO), pH, specific conductivity, and turbidity. Near-bottom ambient lake water was also collected and filtered for use during sediment nutrient flux incubations.

Sediment flux analyses were performed in the Wood Flux Laboratory in accordance with Standard Operating Procedure (SOP) Wood-SFLUX-002 Rev. 9 (**Appendix B**). Sediment cores were prepared and incubated in four sets of two cores, representing aerobic and anoxic conditions. To minimize biological activity, cores were kept in the dark, and temperatures were controlled in the range of 23 to 27 degrees C. One of the duplicate BL-1 core sets developed a leak in the laboratory

and no samples were collected. OCEPD elected not to proceed with the remaining BL-3 duplicate core set so Wood proceeded with flux analysis using four of the eight cores originally collected. Water column samples for each core were collected at 0, 24, 48, 96, 168, and 216 hours and analyzed for TP and ammonia in a NELAC certified analytical laboratory (laboratory reports provided in **Appendix B**). Turbidity values were monitored throughout incubation to examine the timing of sediment core equilibrium before conducting flux measurements. DO and pH were also monitored during the study to confirm that appropriate redox conditions were being met throughout the incubation period.

Sediment nutrient flux rates were estimated using the nutrient release rate (NRR) equation and the slopes calculated from the concentration vs. time curve as described in the flux SOP. Typically, the slope method is considered more conservative and more appropriate, especially if the curves are non-linear. Annual internal nutrient loads were estimated at each station and as spatial averages following the methods described by Ogdahl et al. (2014). Overall average loads were calculated from average flux rates representing the average of anoxic and aerobic rates for all stations.

2.4.2 Sediment Nutrient Flux and Loading Results

Sediment cores collected at location BL-1 appeared to be composed primarily of a mixture of colored sand and brown organic sediments, while cores collected at location BL-3 contained flocculant dark brown organic sediments. Detailed descriptions and photographs of the sediment cores used during flux analyses can be found in **Appendix B**. **Table 2-4** provides the range of in-situ water quality data measured across the vertical profiles during the time of sediment core collection. In-situ water quality data measurements were taken at depths ranging from 0.3 to 3.4 meters, representing the top, middle, and bottom of the water column. Overall, water temperatures ranged from 15.9 to 16.3 °C, and the observed pH values ranged from 6.2 to 7.4. Dissolved oxygen values suggested an aerobic environment throughout the water column. Turbidity measurements collected at the time of sampling ranged from 6.9 to 19.9 NTU and were observed at a water depth of 0.3 meters.

Figures 2-15 through **2-18** display non-linear TP and ammonia concentration flux curves representing anoxic and aerobic sediment core conditions. Sediment core BL-1, analyzed under anoxic conditions, maintained low TP concentrations throughout the incubation period, while TP concentrations in anoxic core BL-3 were initially low and began to increase at the 168-hour mark. Aerobic sediment core BL-1 showed an initial peak between the 24 and 48-hour mark, then a decrease between 48 to 96 hours, and then remained constant until the end of the incubation period. In contrast, core BL-3 showed an initial peak at the 24-hour mark before decreasing till the end of the incubation period.

Ammonia flux from the lake sediments represents the dissolved species of nitrogen that is mineralized from organic nitrogen and then released from the sediment into the water column by diffusion through the sediment-water interface. Ammonia is used as a proxy for total nitrogen since it approximates TN flux. Ammonia concentrations in sediment cores incubated under anoxic

conditions gradually increased over the incubation period. Sediment core BL-1, analyzed under aerobic conditions, generally maintained low ammonia concentrations, only forming a peak at the 48-hour mark. Aerobic core BL-3 formed a peak between the 24 and 48-hour marks, decreased, and began to increase at the 168-hour mark.

Tables 2-5 and **Table 2-6** provide summaries of anoxic and aerobic gross nutrient flux rates and internal loads for sediment core locations within Lake Bass. Sediment cores incubated under anoxic conditions displayed higher overall averages for both TP and ammonia concentrations than sediment cores incubated under aerobic conditions. The flux rates calculated for sediment cores incubated under anoxic conditions for TP ranged from 2.02 to 27.26 mg/m²/d (by the slope method) and 2.37 to 37.03 mg/m²/d (using the NRR equation), and for ammonia 32.48 to 33.04 mg/m²/d (slope) and 30.67 to 33.01 mg/m²/d (NRR). These results were similar across the two methods that can be used to calculate flux rates, so either method is valid, but it is recommended to use the results from the slope method to be conservative. Sediment cores incubated under aerobic conditions displayed flux rates for TP that ranged from -3.54 to -4.08 mg/m²/d (slope) and -0.07 to 0.10 mg/m²/d (NRR), and for ammonia -2.38 to -11.30 mg/m²/d (slope) and 0.00 to 3.01 mg/m²/d (NRR). The results indicate that the lake sediments may be acting as a sink during periods where the benthic zone is aerobic. However, if the bottom of the water column near the sediment-water interface becomes anaerobic or anoxic, it may be expected that the lake sediments can become an internal nutrient loading source.

Spatially averaged flux rates (average of the two cores) were calculated for the aerobic and anoxic rates and the values were applied to the entire surface area of Lake Bass (24 acres) to estimate representative values for internal loading rates. The average loading rates for sediment cores incubated under aerobic and anoxic conditions for TP were estimated to be -297 and 1,141 lb/yr (slope) and 1.30 and 1,536 lb/yr (NRR), respectively. The average loading rates for cores incubated under aerobic and anoxic conditions for ammonia were estimated to be -533 and 2,554 lb/yr (slope) and 117 and 2,483 lb/yr (NRR), respectively. Due to the lack of routine vertical profile in-situ DO data near the bottom of the water column, it is unknown whether the lake regularly experiences aerobic conditions or if the lake becomes anoxic during parts of the year. Therefore, assuming that the lake may become anoxic for half of the year, the overall average from all sites and representative redox conditions for TP loading rates was 422 (slope) and 768 (NRR) lb/yr, respectively. For ammonia, the overall average loading rates was 1,010 (slope) and 1,300 (NRR) lb/yr, respectively.

2.4.3 Sediment Flux Analysis Summary

Sediment flux analyses showed that total phosphorus and ammonia concentrations for sediment cores in Lake Bass were generally higher under anoxic treatment conditions than those under aerobic conditions. As expected, sediments containing higher values of organic material and biologically available phosphorus displayed greater nutrient flux rates and loads.

Flux rates and loads that were estimated using the slope equation were, on average, slightly lower and more conservative than values calculated using the NRR equation. Therefore, the slope-method loading rates of 422 lb/yr TP and 1,010 lb/yr TN were used to estimate the flux loading to Bass Lake. Negative aerobic flux rates were estimated by the slope equation for sites BL-1 and BL-3, which may suggest that under aerobic conditions, the sediments at those locations may act as a sink for phosphorus and ammonia, rather than a source. A negative total phosphorus flux value was also estimated by the NRR equation for site BL-1 under aerobic conditions. Positive flux rates were found for the remaining sites, which would indicate that the sediments are likely a source of total phosphorus and/or ammonia at those locations.

2.5 Surface Water Quality

2.5.1 Data Acquisition

Wood downloaded water quality data from the Orange County Water Atlas (<http://www.orange.wateratlas.usf.edu/>) for Orange County Station ID BC3 for the period between 2008 and 2019. Data were checked for duplicate values and outliers. For parameters qualified as "U" (meaning the parameter was not detected), 1/2 the detection limit was used as the parameter concentration.

2.5.2 Long-Term Water Quality Evaluation Methodology

Parameters included in this analysis are color, alkalinity, Chl-*a*, total phosphorus (TP), orthophosphate (OP), total nitrogen (TN), nitrate, nitrite, ammonia, and Secchi depth (SD). Long term or annual geometric means were calculated for appropriate parameters to compare to NNC. Annual Trophic State Indices (TSI) were obtained from the Orange County Water Atlas and evaluated for historical trends. Additionally, TN: TP ratios were evaluated to assess which nutrient is most likely to be limiting algal growth in Lake Bass. The Water Atlas data and data collected by Wood are shown in **Figures 2-19** through **2-31**. Average surface water quality summary is shown in **Table 2-7**. Period of record data was compared to surface water quality criteria per Chapters 62-302 and 62-303 of the Florida Administrative Code (FAC) to identify exceedances. "I" qualified data were adjusted to the MDL for annual geometric mean (AGM) calculations used in the assessment analysis of Chl-*a* and TP. Additionally, results were rounded following FDEP procedures for impairment assessment.

2.5.3 Water Quality Sampling Conducted By Wood

Wood sampled from June 2020 through April 2021 surface water quality monitoring at Lake Bass. Samples were collected every two months at one sampling location (total of 6 events), approximately in the location of OCEPD's BC3 station. Water samples were collected at the surface (0.5 m) and analyzed for TKN, ammonia, TN, TP, OP, Chl-*a*, NO_x, alkalinity, TSS, turbidity, and color. Water depth profiles were measured using a YSI multimeter. The water quality parameters measured in these depth profiles included specific conductance, pH, DO (%), DO (mg/L),

temperature (C°), and ORP. These parameters were measured every 0.5 m. Secchi depth measurements were collected at the same time as sampling. For summary statistics, lab reported values that were below the detection limit were adjusted to ½ the detection limit. Wood's summary water quality data and field parameters are provided in **Tables 2-8** and **2-9**, respectively. Laboratory reports are provided in **Appendix C**.

2.5.4 Results

2.5.4.1 *Color*

Color values in Lake Bass are relatively low with a long-term geometric mean of 7.8 platinum cobalt units (PCU) (**Figure 2-19**). This value is in the lowest 10th percentile Florida lakes (Hand, 2004). Lakes with low color levels tend to be more sensitive to excess nutrient inputs and respond with increasing productivity and greater abundance of algae that can have a negative impact on more desirable submerged aquatic plants.

During Wood's year-long sampling period, color was consistently 10 PCU (**Table 2-8**).

2.5.4.2 *Alkalinity*

Alkalinity is used in combination with color for determining the NNC impairment thresholds for a given lake. Alkalinity is a measure of buffering capacity, or the ability of a water body to maintain a stable pH. Large fluctuations in pH can be harmful to aquatic organisms (Wilson, 2019) and lakes with higher alkalinity have more buffering capacity and are less susceptible to pH fluctuations.

The long-term geometric mean alkalinity in Lake Bass between 2008 and 2019 was 44.8 mg/L placing it in the intermediate NNC impairment threshold category shown in **Table 1-1**. Alkalinity ranged from 39 to 65 mg/L (**Figure 2-20**).

During the one-year sampling period Wood conducted, the geometric mean was 30.9 mg/L (as CaCO₃) and ranged between 24.6 and 35.2 mg/L. (**Table 2-8**).

2.5.4.3 *Chlorophyll-a*

Chlorophyll-*a* is a measure of the amount of suspended algae in the water column. Chl-*a* concentration from 2008 through 2019 period ranged from 8.8 to 356.5 µg/L (**Figure 2-21**). The highest value was recorded on March 29, 2016 and coincides with high concentrations of TP and TN. Annual geometric mean Chl-*a* exceeded the 20 µg/L categorical impairment threshold for all years from 2008 through 2019 with the exception of 2008, 2014, 2015 and 2017. These AGMs were calculated by converting "I" qualified data to the MDL. Even without the unusually high concentration on March 29, 2016, the Chl-*a* would have exceeded the NNC for that year.

Chlorophyll-*a* concentrations in surface water samples collected from Lake Bass by Wood are shown in **Figure 2-22**. The overall geometric mean was 23.4 µg/L and Chl-*a* ranged from 12 to 44

µg/L (**Tables 2-8**). Based on exceedances of more than once in a three-year period during the verified period, it is anticipated that the lake will remain on the verified impaired list for Chl-*a*.

2.5.4.4 *Total Phosphorus and Orthophosphate*

Total phosphorus (TP) concentrations in Lake Bass ranged from 0.023 to 0.41 mg/L between 2008 and 2019 (**Figure 2-23**). High TP concentrations were reported on March 29, 2016 (0.27 mg/L) and March 13, 2017 (0.41 mg/L). The AGM TP concentration exceeded the NNC limit in 2013, 2016 and 2018. These AGMs were calculated by converting “I” qualified data to the MDL. Even without the unusually high concentration on March 29, 2016, the TP would have exceeded the NNC for that year.

Orthophosphate (OP) is considered bioavailable to algae and plants. Orthophosphate concentrations in Lake Bass were at or below the detection limit during the 2008 through 2019 evaluation period suggesting that the majority of phosphorus in Lake Bass is associated with suspended algal cells.

Wood’s water quality data indicate TP and OP concentrations are comparable to the longer-term data (**Figure 2-24**). TP concentrations ranged between 0.021 and 0.071 mg/L while OP concentrations were low, with a range between 0.004 and 0.014 mg/L (**Tables 2-8**). The geometric mean values were 0.041 mg/L and 0.007 mg/L respectively. Based on exceedances of more than once in a three-year period during the verified period, it is anticipated that the lake will be added to the verified impaired list for TP.

2.5.4.5 *Nitrogen, Nitrate, and Nitrite*

Long-term TN concentrations within Lake Bass between 2008 and 2019 ranged from 0.51 to 5.12 mg/L (**Figure 2-25**). The highest value was recorded on March 29, 2016 and coincides with other unusually high concentrations of TP and Chl-*a*. Annual geometric mean TN concentration only exceeded the NNC in 2009, 2010 and 2016, when the limit was 1.05 mg/L. Even without the unusually high concentration on March 29, 2016, the TN would have exceeded the NNC for that year.

Long-term nitrate concentrations ranged from 0.001 to 0.438 mg/L with a long-term geometric mean of 0.011 mg/L while long-term nitrite concentrations were normally undetectable, as expected. Since 2015, nitrate concentrations have been above the detection limit (“U” code) but still represent a relatively small portion of TN.

Wood’s water quality data collected from Lake Bass suggest similar TN concentrations to the long-term monitoring program with a geometric mean of 0.88 mg/L and a range from 0.66 to 1.2 mg/L (**Figure 2-26**). The geometric mean nitrate+nitrite concentration was 0.05 mg/L with a range between 0.02 and 0.19 (**Figure 2-26**). Based on the lack of exceedances of more than once in a three-year period during the verified period, it is anticipated that the lake will be removed from the verified impaired list for TN.

2.5.4.6

TN:TP Ratio

Phosphorus is the macro-nutrient that limits primary production in most Florida lakes. Lakes are typically considered phosphorus-limited when the ratio of TN to TP (TN:TP, by mass) is greater than 30. However, in some aquatic systems nitrogen can be limiting or co-limiting. When the TN:TP ratio is less than 10, a lake is considered to be nitrogen limited. When the TN:TP ratio falls between 10 and 30 the lake is considered to be balanced, or dependent upon both nutrients (FDEP 1996).

The mean annual TN:TP ratio for Lake Bass over the eleven-year evaluation period averaged 26.3 and ranged between 5.7 and 41.5 (**Figure 2-27**). Generally, algal growth within Lake Bass is phosphorus-limited although, during 2013, 2014, and 2016, phosphorus and nitrogen were both co-limiting. **Figure 2-28** suggests that algal growth within Lake Bass was co-limited by phosphorus and nitrogen during the 2020-2021 Wood sample period.

2.5.4.7

Secchi Disk Depth

Secchi disk depth is a measure of water transparency. The long-term Secchi disk depths were low averaging 1.1 m and ranging from 0.5 to 2.0 m (**Figure 2-29**). The low standard deviation (0.35m) suggests that the clarity of this lake was relatively consistent over the eleven-year period.

Secchi depth measurements by Wood technicians were similar to the long-term data, with a mean of 0.95 m and range from 0.5 to 1.3 m (**Figure 2-30**).

2.5.4.8

Trophic State Index

Trophic State Index (TSI) is a lake water quality metric used to classify the health of lakes. The TSI, developed by the FDEP for Florida lakes, uses Chl-*a*, TN, and TP values to calculate a single numeric metric. It was once used as a metric to determine water quality impairments. The methodology used by FDEP for calculating TSI and impairment assessments can be found at: http://www.orange.wateratlas.usf.edu/shared/learnmore.asp?toolsection=lm_tsi.

Although the TSI is no longer used for impairment determination, it is still a useful metric to describe the general condition of Florida lakes.

Lake Bass TSI was relatively consistent between 2008 and 2019 and the AGM ranged between 53.1 and 65.3 (**Figure 2-31**). These values suggest that the lake is in the mid-eutrophic classification, and water quality is fair to poor. TSI values greater than 70 generally indicate that the lake is hypereutrophic and is of poor water quality.

2.6 Depth Profiles

Wood staff also conducted depth profile measurement, by recording temperature and dissolved oxygen from the surface to the bottom of the lake. These measurements were conducted concurrently with surface water sampling: six times per year. Temperature and dissolved oxygen

was recorded every 0.5 m, starting at 0.5 m to about 0.5 m off the bottom. These depth profiles can give an indication if the lake is stratified and if the deep areas of the lake are anoxic. Low dissolved oxygen at the sediment-water interface can result in nutrient flux from the sediments to the water column, and limit habitat for aquatic organisms.

The depth profile shown in **Figure 2-32** suggests that the lake was not thermally stratified between June 2020 and April 2021. However, lower portions of the lake were near or below anoxic conditions (<2.0 mg/L) during three of the six sample events (**Figure 2-33**). This suggests that sediment conditions may be a source of nutrient release for approximately half of the year.

2.7 Water Quality Summary

Lake Bass is characterized by low transparency and relatively high levels of nutrients and Chl-*a*. The long-term data suggest that the water quality of the lake has been relatively unchanged over the past 13 years. Water quality data collected by Wood was similar to the long-term data collected between 2008 and 2019. Lake Bass was listed as impaired by FDEP for Chl-*a* and TN for exceeding the NNC more than once in a three-year period between 2009 and 2014. The draft verified list released by FDEP in September 2021 indicates that Lake Bass will be delisted for TN, but will remain listed for Chl-*a*. Additionally, it lists the waterbody as impaired for TP based on exceedances in 2016 and 2018. Wood's analysis of long-term data and recent sample collection efforts concurs with this assessment.

Wood's sediment chemistry and nutrient flux analyses suggest portions of the lake may contribute a significant amount of internal nutrient loading which contributes to poor water quality conditions. Depth profiles suggested that the anoxic conditions occur in the deeper (>3.5 m) parts of the lake and sediment nutrient flux is likely a significant factor affecting water quality.

3.0 DRAINAGE BASIN CHARACTERISTICS

3.1 Basin Delineations

Wood delineated the Lake Bass basin and sub-basins using land elevation contours, existing storm water drainage conveyance systems, and field observations. ESRI ArcView was used to generate contour maps displaying elevation changes with color gradients. Contour maps and aerial photographs were used to determine maximum elevations and topographic physical features (e.g., roadways, railways, etc.). These were then used to delineate the watershed boundaries.

The Lake Bass watershed covers 300 acres (not including Lake Bass), with the majority of the watershed northwest of the lake (**Figure 1-1**). Using the methodology above, Wood delineated eight sub-basins ranging from 5 to 70 acres (**Figure 3-1, Table 3-1**).

Sub-basin delineations, stormwater conveyances, and stormwater outfall locations for the Lake Bass basin were field verified by BFA personnel. Major stormwater outfall locations and drainage systems were identified by BFA within each sub-basin and are shown in **Figure 3-2**. Copies of the

field notes, pictures and field waypoint locations are provided in **Appendix D**. Sub-Basin BL040 was identified and included to Wood's delineation following additional field confirmation and St. Johns River Water Management District (SJRWMD) Environmental Resource Permit verification.

3.2 Land Use

Land use information for the Lake Bass sub-basins was obtained from the SJRWMD 2014 Land Use Cover Characteristics coverage. Sub-basin land use cover was compiled in a Geographic Information System (GIS) for further analysis. A total of ten land use categories were used for the analyses (**Table 3-2**). The dominant land use in the Lake Bass sub-basins was residential (primarily medium density) covering 93.6% of the watershed (**Figure 3-3, Table 3-2**). Other land use categories include institutional (2.5%) and commercial and services (1.0%). Stormwater pond land uses include 3.13 acres of surface water collection basins within Sub-Basins BL020, BL025, and BL040, and 2.68 acres of reservoir within Sub-Basin BL040 for a total of 1.9% of the overall area.

3.3 Soil Characteristics

Information on soil types within the Lake Bass watershed was obtained from the Natural Resources Conservation Service (NRCS) Soil Survey Geographic database for Orange County, Florida (2012). Soil information was extracted in the form of Hydrologic Soil Groups (HSG) which classify soil types with respect to runoff-producing characteristics. Using this system, soils are classified into five (5) groups for evaluation and modeling purposes. The chief consideration in each of the soil group types is inherent capacity of bare soil to permit infiltration. A summary of the characteristics of each hydrologic soil group is presented below.

Group A: Soils having low runoff potential and high infiltration rates even when thoroughly saturated. They consist primarily of deep, well to excessively drained sands or gravels and have a high rate of water transmission.

Group B: Soils having moderate infiltration rates when thoroughly saturated and consist primarily of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

Group C: Soils having low infiltration rates when thoroughly saturated and consist primarily of soils with a layer that impedes downward movement of water and soils with moderately fine to fine texture. These soils have a low rate of water transmission.

Group D: Soils having high runoff potential: These soils have low infiltration rates when thoroughly saturated and consist primarily of clay soils with high swelling potential, soils with a permanent high-water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very low rate of water transmission.

Dual Hydrologic Soil Groups (Group X/D): Soils located in areas where the water table is within 60 cm of the surface: In their saturated state, these soils still have a hydraulic conductivity that may be favorable for water transmission. If these soils can be adequately drained, they are

assigned a dual hydrologic soil group (A/D, B/D, and C/D). The first letter applies to the drained condition and the second to the undrained condition.

Group W (Water): Soils are categorized as wetland or hydric soils.

A map of the HSGs within the Lake Bass watershed is provided in **Figure 3-4** and reported in **Table 3-3**. The soils within the basin are classified as (in decreasing extent):

- A (96.3%)
- A/D (3.0%)
- Water (0.7%)

The majority of the basin is covered by soils in the A HSG.

4.0 HYDROLOGIC BUDGET

4.1 Hydrologic Characteristics

A hydrologic budget was developed for the Lake Bass watershed based on data from January 1953 through July 2020. The hydrologic budget includes inputs from direct precipitation, stormwater runoff, and groundwater seepage. Hydrologic losses include evaporation, groundwater recharge, and surface outflows through a drainwell. The water budget is used as an input for development of a nutrient budget and water quality model as well as estimation of hydraulic residence time within the lake. A discussion of identified hydrologic inputs and losses for Lake Bass is provided in the following sections.

4.2 Hydrologic Inputs

4.2.1 Precipitation

Annual rainfall for the Lake Bass basin was estimated using data reported at the Orlando International Airport between January 1, 1953, and December 31, 2019 (except for 1971 and 1972, as these years had missing data) for station USW00012815 (**Figure 4-1** and **Table 4-1**). Mean annual rainfall from this time period was 48.52 inches.

Annual direct precipitation to Lake Bass was calculated by multiplying the mean annual rainfall during the 1953 to 2020 evaluation period by the lake surface area of 24 acres; this is equivalent to 97.0 ac-ft. Estimated mean monthly inputs to Lake Bass from direct rainfall are shown in **Table 4-2**.

4.2.2 Stormwater Runoff

The annual runoff volume was estimated for each sub-basin within the contributing area using local runoff characteristics; local runoff characteristics including annual rainfall depth, sub-basin

area, non-Directly Connected Impervious Area Curve Number (NDCIA CN), which is a function of land use and HSG, percent Directly Connected Impervious Area (DCIA), and a runoff coefficient.

4.2.2.1 *Runoff Curve Number Calculation*

Hydrologic characteristics of the drainage sub-basin areas were first developed for utilization in the stormwater runoff model. In order to estimate the runoff volume from each of the sub-basins, basin specific hydrologic characteristics were estimated using land use and hydrologic soils data for the sub-basin watersheds. Land use information from 2009 was provided by SJRWMD (**Table 3-2** and **Figure 3-3**). Soils data from 2010 were obtained from the NRCS Soil Survey Geographic Database for Orange County, FL, 2010 (**Table 3-3**, **Figure 3-4**). Using the HSGs from the soils data layer and the land use classification, NDCIA CNs were assigned using the "Curve Number Lookup Table" provided in **Appendix E: Table 1-2**. This table was adapted from the "Urban Hydrology for Small Watersheds-TR-55 document (USDA 1986).

4.2.2.2 *Spreadsheet Runoff Model*

Estimation of annual stormwater runoff requires a known amount of precipitation falling on the project area as well as the sub-basin runoff NDCIA CN and percent DCIA. Sub-basin NDCIA CNs were defined as described above. Representative DCIA percentages were applied for each landuse category to represent runoff conditions within the sub-basin (**Appendix E: Table 1-1**).

Stormwater runoff modeling was conducted to estimate the annual stormwater runoff associated with each drainage sub basin. Stormwater runoff modeling was accomplished using a Microsoft Excel spreadsheet named "Pollutant Loadings Assessment (PLA) Tool" developed in-house by Wood. It is based on design criteria that were developed by FDEP and the Water Management Districts during production of the draft guidance documents conceived during statewide stormwater regulation efforts. The model utilizes the modified U.S. Environmental Protection Agency's (EPA) Simple Method (Schueler, 1987).

For this investigation, the Simple Method calculation of runoff volume was modified in accordance with the methodology developed by FDEP and the Water Management Districts when Florida was considering a statewide stormwater rule for calculating annual runoff as follows:

$$Q = 0.083 * c * i * A$$

Where:

Q = Runoff Volume (ac-ft/yr)

c = Runoff coefficient determined based on Florida Meteorological Zones as classified in the draft Stormwater Quality Applicant's Handbook, March 2010.

i = Annual rainfall depth (in)

0.083 = Conversion factor (inches to feet)

A = Area (ac)

The runoff coefficient 'c' is determined based on the drainage sub basin NDCIA CN and percent DCIA combination and the meteorological zone within which the project area falls (Zone 2). The March 2010 Draft Stormwater Quality Applicant's Handbook published the runoff coefficients for each NDCIA CN /DCIA combination and for each meteorological zone in Florida (DEP 2010). Lake Bass is in Zone 2. Runoff coefficients for Zone 2 are listed in **Appendix E: Table 1-1**. The NDCIA CN for the various land uses and soil types comprising the drainage basins were determined by using the lookup table provided in this report as **Appendix E: Table 1-2**.

The procedure described above allows for the determination of total runoff volume generated from a given area. Additional hydrologic attenuation can be provided by stormwater BMPs which were identified in **Appendix D**.

Lake Bass is assumed to be at brim-full condition for modeling purposes and volume attenuation is not applied.

4.2.2.3 *Lake Bass Runoff Characterization*

Annual runoff calculations for the Lake Bass basin indicate stormwater runoff is a large component of the hydrologic budget. This is consistent with the large and moderately-developed contributing area. Annual stormwater runoff volume from Lake Bass basin is approximately 234 ac-ft or approximately 2.5 times the direct overlake rainfall contribution. **Table 4-3** summarizes the estimated stormwater runoff from each sub-basin. Sub-Basin BL040 generates the largest amount of stormwater runoff (38%) followed by Sub-Basin BL025 (29%), Sub-Basin BL020 (26%), and Sub-Basin BL005 (14%).

4.2.3 Groundwater Seepage

Seepage meters provide a means of direct groundwater discharge measurement and sample collection for nutrient concentrations to calculate loading. The seepage meter consists of an open-bottom chamber driven into the lake bottom. A collection bag prefilled with a small amount of distilled water is attached to the top of the meter after the chamber has been installed. The amount of groundwater contribution (or loss) is determined by measuring the change in volume of water in the bag. This method has been successfully used for decades, having been first developed in 1944 (Israelson and Reeve, 1944). Improvements to this method were made by Lee (1977), and this method is still currently used in lake studies. A diagram of a typical seepage meter is presented in **Figure 4-2**.

4.2.3.1 *Groundwater Seepage Collection Methods*

Seepage meters were constructed using 55-gallon stainless steel drums with a diameter of 23 inches. Each drum covers 2.89 ft² of the sediment. A 0.75-inch threaded tubing connection was inserted into the top of the drum and sealed with Teflon tape to ensure that it was watertight. A collection bag was connected to this threaded insert using 0.75-inch inner diameter reinforced polyethylene tubing. The open end of each collection bag was attached to a PVC ball valve that

was connected to the tubing extending from the meter. Heavy duty polyethylene bags (35 gallons, 132 liters) were then attached to the PVC ball valve.

The volume of groundwater seepage entering Bass was measured directly using three seepage meters (BLSM1, BLSM2, and BLSM3) installed in approximately four feet of water depth. Seepage meters were placed approximately equidistant around the lake to provide a representative estimate of overall groundwater movement (**Figure 4-3**).

Meters were installed 8 to 10 inches into the sediment. This resulted in 4-5 inches of water between the sediments and the top of the meter. Meters were tilted slightly during installation so that the open end was partially elevated, allowing for the escape of any gasses collected in the container prior to sampling. The tubing attached to each meter was left open during installation to allow for equalization as the meter was pushed into the sediment. Prior to attaching the collection bag, seepage meters were kept open for one month for equilibration. After this one-month equilibration, 2 liters of distilled water was added to the bag, immediately prior to installation. Pre-filling each bag prior to installation allowed for the measurement of a potential negative movement of water out of the meter. Ionic diffusion from the sediment is assumed to compensate for any dilution that would occur by the initial introduction of this distilled water. Air within the collection bag was removed by partially submerging the bag with the ball valve above water. Once all the air was evacuated, the ball valve was closed and submerged for connection to the tubing/meter. Once this connection was made the ball valve was opened, allowing for water exchange between the meter and collection bag. A floating buoy was attached to each meter to mark its location.

At the time of collection, the PVC ball valve was closed. Then the water in the plastic bag was measured using a bucket and/or a graduated cylinder. A total of 18 seepage samples (six events with three locations sampled for each event) were collected every other month between June 2020 to April 2021. For each event, hourly volumetric fluxes were calculated for each seepage meter based on time of deployment. Summary seepage volume data is provided in **Table 4-4**. Summary seepage field parameters and lab water quality data are provided in **Tables 4-5** and **4-6**. The seepage meter at BLSM2 exhibited recharge conditions (recovered volume was less than starting volume) and no field or lab water quality data were collected.

Seepage data were used to quantify both the hydrologic and nutrient mass contribution from groundwater seepage. Groundwater seepage is assumed to occur primarily in depths less than 10 ft which is conservative based on findings reported by Deevey (1988). Deevey (1988) stated that the limit to which seepage was detected in lakes occurred within 30 m (98 ft) of the lake shoreline. A similar result was observed in Lakes Conway and Apopka (Fellow and Brezonik, 1980). Total seepage was estimated using average flow rates for each meter and dividing the total seepage volume (final volume minus initial volume) by the cross-sectional area of each meter (2.89 ft²) for each sample collection event. Groundwater seepage was calculated by multiplying the average seepage meter flow rate and the lake area corresponding to ten feet of depth or less (7.8 acres).

Seepage rates for individual meters were determined by dividing the net volume collected from each meter by the cross-sectional area of each meter. Total seepage volume for Lake Bass was estimated by multiplying the average seepage rate for all seepage meters by the lake area.

4.2.3.2 *Groundwater Seepage Volume Data*

Seepage rates averaged 1.98 L/m²-day and ranged from -0.005 to 12.20 L/m²-day. Higher seepage values may correspond to areas of greater upgradient pressure or less up-flow resistance. Seepage rates for Lake Bass are consistent with seepage rates for lakes with similar surrounding topographic conditions including Lakes Roper and Carlton (n=111 measurements, average of 0.7 L/m²-day, range from -0.2 to 12.3 L/m²-day). The seepage area for Lake Bass was estimated to be 7.8 acres using the 10 ft depth contour. Total annual seepage contribution to Lake Bass was estimated to be 18.5 ac-ft/yr. Portions of the lake deeper than 10 feet were assumed to have no seepage contribution.

4.3 **Hydrologic Losses**

4.3.1 Evaporation

Evaporative loss was not directly measured in this study. Wood utilized an estimate of 47.33 in/year based on results from a pan evaporation study conducted on the Butler Chain of Lakes (ERD, 2007). The pan evaporation station in the study was located about 11 miles from Lake Bass. This evaporation rate is similar to long-term evaporation rates previously measured in Central Florida (e.g., Litcher *et al*, 1976). Using the estimate of 47.33 in/yr, and a lake area of 24.0 acres, the total evaporative loss from Lake Bass is estimated to be 94.7 ac-ft/yr.

4.3.2 Groundwater Recharge

Groundwater recharge within the Lake Bass basin is expected to be 10 in/yr or greater as shown in **Figure 4-4** (SJRWMD, 2015). The maximum hydrologic loss of 10 inches per year attributed to recharge from the 24.0-acre lake bottom is anticipated to be 20.0 ac-ft/yr.

4.3.3 Surface Outflow

Discharge to the drainage well is assumed to be the difference between total hydrologic inputs and outputs (evaporation and groundwater recharge). Total discharge is estimated to be 162.0 ac-ft per year.

4.4 **Hydrologic Budget Summary**

Annual hydrologic inputs to Lake Bass total 349.7 ac-ft and include direct precipitation, stormwater runoff, and groundwater seepage (**Table 4-7A**). Stormwater runoff contributes approximately 70% of the hydrologic inputs. Direct precipitation contributes about 27.7%. Estimated contribution from groundwater seepage is 5.3%.

Discharge represents approximately 67.2% of the hydrologic outputs from Lake Bass with evaporative losses of about 27.1% (**Table 4-7B**). Groundwater recharge represents about 5.7% of Lake Bass' hydrologic losses.

4.4.1 Lake Hydrologic Residence Time

Hydrologic residence time is calculated by dividing the volume of the lake (336 ac-ft) by the total annual hydrologic inputs (349.7 ac-ft). Using this approach, Lake Bass has a hydrologic residence time of 0.96 years. In comparison, major lakes in the Upper Ocklawaha River Basin downstream of Lake Apopka range from 0.16 to 4.45 years with five out of six lakes reporting hydrologic residence times of 0.54 years or greater (Fulton, 1995).

5.0 **NUTRIENT BUDGET**

5.1 **Nutrient Inputs**

A nutrient budget was developed for Lake Bass utilizing the hydrologic budget described in **Section 4** with literature-based and site-specific water quality data. Nutrient inputs include precipitation, atmospheric loading, stormwater runoff, and groundwater seepage. Nutrient inputs to the lake are provided in the following sections.

5.1.1 Atmospheric Deposition

Literature values were utilized to estimate direct wet and dry atmospheric loading of nitrogen and phosphorus. Badruzzaman et al. (2012) summarized the atmospheric deposition of TN and TP into Florida waters indicating that nitrogen deposition may range from 195 to 208 mg TN/m²-yr, while phosphorus was typically 7.5 mg TP/m²-yr. Thus, using the area of the lake (24.0 acres, or 97,124.5 m²) and the average TN-loading estimate (201 mg TN/m²-yr), TN and TP atmospheric contribution to Lake Bass is estimated to be 42.9 and 1.6 lb/yr, respectively.

5.1.2 Stormwater Runoff

Stormwater runoff volume was obtained from the hydrologic budget previously described in **Section 4**. Hydrologic inputs from stormwater runoff from each sub-basin were estimated from the hydrologic model described in **Section 4.2.2.2**.

5.1.2.1 *Literature Based EMCs*

Literature-based event mean concentrations (EMC) (**Appendix E: Table 1-3**) for specific land uses were applied to surface runoff volumes to estimate total annual mass pollutant loading. EMCs were developed using land use specific pollutant concentrations obtained from past monitoring activities conducted throughout the State of Florida and were derived from several sources as noted in the documentation. EMCs included in this modeling analysis included TN, TP, and total suspended solids (TSS).

Appendix E: Table 1-3 lists the EMCs used to estimate pollutant loads for non-monitored contribution areas based on land use. The site specific or composite EMCs used for each basin are shown in **Table 5-1**.

5.1.2.2 *Stormwater Quality Monitoring*

Site-specific EMCs were determined by calculating the average concentrations for stormwater samples collected from specific areas of interest. Site-specific EMCs improve the accuracy of the loading model and are especially important in areas where literature-based EMCs may not suffice. Three locations were selected for deployment of auto-sampling equipment and subsequent water quality monitoring based on the anticipated potential for greatest hydrologic and nutrient contribution to Lake Bass (**Figure 5-1**).

Beginning in June 2020, Wood installed rain gauges and autosampler units at three locations shown in **Figure 5-1**. Locations selected for monitoring include an existing stormwater pond on the west side of Lake Bass adjacent to the drainage well (BLA1; **Figure 5-2**), a 24-inch outfall pipe providing drainage for Lake Bass Boulevard. (BLA2; **Figure 5-3**), and a 36-inch outfall pipe on the south side of the lake providing drainage for Raeford Road (BLA3; **Figure 5-4**). The drainage areas were selected for monitoring based on the relative basin size, current stormwater treatment level, and ability to differentiate specific portions of the basin for potential stormwater Best Management Practices (BMPs).

Six storm events were sampled from September 2020 through February 2021 at each of the three locations. Autosamplers were equipped with a tipping bucket rain gauge programmed to trigger the autosampler after a rainfall event exceeded 0.25 inches within 2 hours and no antecedent rainfall for at least 72 hours. Once triggered, flow-weighted samples were collected using a pacing interval that provided sufficient sample volume. Samples were composited for each sampling event.

Laboratory reports for stormwater runoff are provided in **Appendix F**. Samples were analyzed for ammonia, nitrate+nitrite, total Kjeldahl nitrogen (TKN), TP, OP, and TSS. Total nitrogen was calculated as the sum of TKN and nitrate+nitrite.

5.1.2.3 *Stormwater Quality Monitoring Results*

Mean values for water chemistry data for each station are provided in **Table 5-2**. Concentrations of pollutants were highest at the BLA2 location and the mean TN concentration of 9.60 mg/L at this location was considerably higher than the comparable literature-based EMC of 1.85 mg/L for the predominant medium-density land use which may indicate more extensive use of turfgrass fertilizer. Mean nitrate + nitrite concentration was twenty times that of BLA1 and seven times that of BLA3. Water samples collected at the BLA1 autosampler exhibited TP and TN concentrations that were 60% and 18% of BLA2, respectively. Samples collected at the BLA3 autosampler had TP and TN concentrations that were 40% and 30% of BLA2, respectively. BLA1 and BLA2 locations

exhibited lower TP and TN concentrations but both had higher orthophosphate concentrations than BLA3.

Mean TP, TN, and TSS data from each autosampler were used to develop site-specific EMCs concentrations at Sub-Basins BL020 (BLA1), BL005 (BLA2), and BL035 (BLA3) as shown in **Table 5-1**. Site-specific and composite EMCs were used in conjunction with runoff estimates from each sub-basin to provide pollutant mass loading estimates as discussed in **Section 5.1.2.4**.

5.1.2.4 *Surface Runoff Loading Estimate Model*

The Lake Bass watershed pollutant loading model was developed based on regional land use and soils information as well as the site-specific EMC data obtained from direct stormwater sampling. Modeled TN, TP, and TSS values were combined with modeled runoff to develop annual nutrient budgets for the lake. The results of the nutrient budget and pollutant loading model were used to make specific recommendations for BMPs within the watershed. An estimate of anticipated water quality improvements with implemented BMP recommendations was also performed.

A total of 1,130 lbs TN, 159 lbs TP, and 9,368 lbs TSS were estimated to be generated annually from the eight sub-basins (**Table 5-3**). Sub-Basin BL005 had a relatively high site-specific TN concentration and generated the greatest portion of TN loading at 54%. Sub-Basin BL020 had the highest portion of TP at 38%. Sub-Basin BL005 also contributed a relatively large portion of TP at 33%. Together, Sub-Basins BL005 and BL020 are estimated to contribute 71% of the TP and 72% of the TN stormwater runoff load to Lake Bass.

5.1.3 Seepage Contribution

Water volume was measured, and water samples were collected from each seepage meter approximately every two months from locations shown in **Figure 4-3**. Seepage samples were analyzed for ammonia, nitrate+nitrite, TKN, TP, and OP and standard field parameters including temperature, DO, specific conductance, pH, and ORP. Seepage water quality laboratory reports are provided in **Appendix C**. Summary seepage data are provided in **Table 5-4**. Loading from groundwater seepage was calculated using the average estimated annual seepage volume to Lake Bass (1.98 L/m²-day) and the average nutrient concentrations are listed in **Table 5-4**.

Water quality field parameters were measured in seepage water and compared to conditions within the surrounding water column as a quality control check to verify the seepage meter was functioning properly. Low dissolved oxygen and high specific conductance in seepage water are typical of groundwater sources and suggest the seepage meters were functioning properly.

Lake Bass seepage samples generally exhibited nutrient concentrations that were higher than lake nutrient concentrations, averaging 0.15 and 4.6 mg/L for TP and TN, respectively (**Table 2-9**, **Figures 5-5** and **5-6**). Water samples collected from BLS2 exhibited the highest average TP concentration (0.240 mg/L) while BLS3 exhibited the highest average TN concentration (7.1 mg/L) (**Table 5-4**). Average nitrate + nitrite concentrations in seepage water collected from all three

locations ranged between 0.13 and 2.07 mg/L and were not unusually high (>10 mg/L). Ammonia-N concentration (**Figure 5-7**) was highest at BLSM-3, averaging 4.68 mg/L. BLSM-1 and BLSM-2 exhibited moderate ammonia concentrations of 1.73 and 1.09 mg/L, respectively.

Groundwater seepage loading was estimated by combining flows and concentrations from the seepage meters. TP and TN estimated groundwater seepage loading was 0.3 and 12.4 mg/m²-day, respectively (**Table 5-4**). This is equivalent to 7.4 lb/yr TP and 314.2 lbs/yr for TP and TN, respectively.

5.1.4 Summary of Annual Pollutant Loads by Source

Pollutant loading estimates from surface runoff, atmospheric deposition, and seepage to Lake Bass are presented in **Table 5-5**. TP load to Lake Bass is estimated to be 200.3 lb/yr with surface runoff contributing 95.6%. TN load to Lake Bass is estimated to be 1,648.6 lb/yr with surface runoff contributing 78.3%. TSS load to Lake Bass is estimated to be 9,368.1 lb/yr with surface runoff contributing 100% of the TSS load.

6.0 **WATER QUALITY IMPROVEMENT ALTERNATIVES**

Stormwater runoff introduces the majority of external phosphorus and nitrogen loading to Lake Bass. Internal sediment flux is estimated to release approximately twice as much TP mass as the external TP load and approximately 59% of the external TN load. Seepage represents only 4% of the external TP load and 19% of the external TN load. Wood evaluated both structural stormwater BMPs which address external loads and non-structural alternatives which address both external and internal loading. Limited open space within the basin restricts the opportunity for traditional stormwater BMPs so opportunities to implement innovative projects within the available rights-of-way have been considered.

Wood utilized the information provided during reconnaissance activities and combined this with a desk-top procedure to identify potential sites for stormwater BMPs. Wood began by evaluating sub-basins with higher pollutant loadings (**Table 5-3**). Next, Wood used aerial imagery to identify areas with favorable hydrologic settings. Sub-basins without existing BMPs were prioritized over sub-basins with existing BMPs (**Figure 3-2**). Conceptual structural BMP treatment alternatives are shown in **Figures 6-1** through **6-9** and are discussed in **Section 6.1** below. The majority of BMPs considered for Lake Bass involve incorporation of biosorption activated media (BAM) to provide stormwater treatment within the existing right-of-way. General information regarding these types of BMPs is provided in **Appendix G**. Additional non-structural BMP treatment alternatives are discussed in **Section 6.2**.

Stormwater treatment technologies involving BAM require evaluation of stormwater runoff using an intensity-based method instead of the long-term mean annual rainfall total used by the pollutant loading model to develop loading estimates. This allows for the BMP to be sized based on a given maximum rainfall event. The intensity-based analysis requires use of the NexRad data (obtained from ftp://ftp.swfwmd.state.fl.us/pub/radar_rainfall/) which provides radar-estimated

hourly rainfall for a given period and location within the coverage area. Wood utilized NexRad data pixels 112710 and 113184 for the runoff analyses below. The BAM stormwater treatment systems were sized to treat 100% of the runoff volume from a 0.95 inch rainfall event with a mean intensity of 0.31 inches per hour, or more. Note that the “Existing Conditions” nutrient loadings are based on the Simple Method discussed in **Section 4.2.2.2**, which uses daily rainfall data from the Orlando International Airport (OIA), while the load reductions for the proposed BMP alternatives use hourly NexRad rainfall data. Use of hourly NexRad data is necessary to determine the appropriate size of the BAM BMPs but it introduces some minor variation in the assumed runoff volume. For reference, mean annual rainfall for the Lake Bass basin is 48.5 inches based on OIA data and 54.8 inches based on NexRad data.

Sizing BAM filtration systems to treat runoff during a storm event requires permeability and treatment rates. Additional information regarding BAM media is provided in **Appendix H**. For both upflow and downflow systems, a safety factor of 2 was applied to the permeability constant of the BAM (SJRWMD, 2006) (FDOT, 2004) (ECS, 2021). For downflow BAM filtration systems, the downward, vertical, unsaturated (i.e., infiltration) rate was estimated as 2/3 of the permeability constant (SJRWMD, 2006; FDOT, 2004).

Estimated costs and the associated annual pollutant load reductions (rounded to the nearest integer) were used to calculate the cost per pound of pollutant removed for each alternative. Anticipated water quality benefits have been estimated using the previously described pollutant load modeling techniques. When possible, design (engineering and surveying) and permitting costs were estimated and are subject to vary depending on existing infrastructure (e.g., if substantial conflicts arise, pipes need replacement, design/installation of non-standard control structures, curbing/pavement replacement, etc.) and other permitting and construction issues. Future modeling will need to be conducted to determine pipe size sufficiency and evaluate potential upstream flooding impacts.

6.1 Structural Alternatives

6.1.1 Alternative 1 – Sub-Basin BL035 Linear BAM Bioretention System with Underdrain and Overflow Control Structures

Alternative 1 provides treatment for most of Sub-Basin BL035, which is primarily medium-to-high density residential land uses. Running parallel to Peel Ave. and Raeford Rd. there is an existing roadside swale/depression with multiple ditch bottom inlets (DBIs) that drains to a storm sewer under the roadside swale; no nutrient removal has been credited to the existing conditions. Note that ditch bottom inlets are also known as grated drop inlets (GDIs). The existing storm sewer discharges to Lake Bass from Raeford Road

6.1.1.1 *Description*

BMP **Alternative 1** is a linear bioretention system (LBS) utilizing BAM with underdrains and overflow control structures. The LBS will utilize a high permeability BAM for downflow filtration

of the stormwater during the storm event, additionally, it has a small amount of attenuation (1 ft of storage depth); thus, the desired treatment volume is achieved through a combination of percolation into the media and attenuation if the influent rate exceeds the maximum filtration rate. Stormwater that has passed through the BAM will then flow into the perforated underdrain pipes and ultimately into the existing storm sewer (ACF Environmental, 2021) (US EPA, n.d.) (US EPA, 1999) (University of Florida - IFAS Extension, 2008). With proper distribution, it is anticipated that approximately 170 ft of the LBS BMP will provide effective treatment for up to a majority of Sub-Basin BL035. The LBS will consist of modular sections of media and drainage structures spaced strategically along Peel Ave. and Raeford Rd. **Figure 6-1** shows the existing stormwater conveyance system and the potential placement path for an approximate total of 170 linear feet of overlying LBS distributed at critical treatment locations. **Figure 6-2** provides a conceptual cross section of the LBS for this specific site. **Appendix G** contains a vendor supplied example of a commercially available bioretention system and a plan view drawing of a generic bioretention system.

The downward, vertical, unsaturated flow (i.e., infiltration) through the BAM is approximated as 2/3 of the coefficient of permeability of the BAM (SJRWMD, 2006) (FDOT, 2004). A safety factor of 2 is then applied to obtain the design maximum filtration rate (SJRWMD, 2006) (FDOT, 2004) (ECS, 2021). The cost estimate is based on sizing that uses this design's maximum filtration rate. For this BMP alternative evaluation, a BAM coefficient of permeability of 96 in/hr was used (ECS, 2021). Based on a coefficient of permeability of 96 in/hr, the resulting design volumetric treatment loading rate of 32 in/hr is used.

6.1.1.2 *Efficiency*

Currently, stormwater runoff enters an existing storm sewer through a series of GDIs located along Raeford Rd. and Peel Ave. This storm sewer then discharges into Lake Bass. The stormwater runoff currently receives no treatment.

Commercially available BAM bioretention systems claim removal efficiencies of 60-80% for total phosphorus (TP) and 40-50% for total nitrogen (TN) (ACF Environmental, 2021). This is consistent with a University of Central Florida study where a roadside downflow BAM filtration system utilizing a high permeability media, composed of 75% 3/8" expanded clay and 25% tire crumb by volume, removed 71% TP and 95% SRP (Hood, et al., 2013; Hood, 2012).

The existing condition has no nutrient reduction. The proposed BAM LBS will, on average, treat 17.3 acre-ft of runoff per year. Assuming a TN and TP removal efficiencies of 45% and 70% respectively, the system will remove an additional 65.2 pounds of TN and 11.9 pound of TP per year. **Table 6-1** summarizes the applied pollutant load reduction for the existing and proposed conditions.

6.1.1.3 *Cost*

The estimated conceptual cost, not considering inflation or interest, (including design, construction, operation, and maintenance) for this alternative assuming a 20-year life span, one BAM replacement, and a safety factor of 2 is approximately \$65,756 which translates to approximately \$3,288 in annualized cost. Based on the previously stated efficiencies and load reduction for the proposed treatment condition, this alternative would cost approximately \$50/lb TN or \$277/lb TP for additional nutrient removal beyond the existing condition over the 20-year life of the project; note that each of these costs are independent and are determined by dividing the cost of the entire project by the mass of the specific nutrient removed. **Table 6-2** summarizes the cost estimate for **Alternative 1**.

6.1.2 Alternative 2 – Sub-Basin BL010: BAM Bioretention System with Underdrain and Overflow Control Structures

Alternative 2 provides treatment for the near entirety of Sub-Basin BL010. Runoff in Sub-Basin BL010 travels along a series of roadside curb and gutters to two existing curb inlets on Bass Lake Blvd. These curb inlets connect to a storm sewer that discharges to Lake Bass; these two curb inlets appear to be the only inlets into this storm sewer (**Figure 6-3**). The BAM bioretention systems will be located on Bass Lake Blvd. at the location of the two existing curb inlets.

6.1.2.1 *Description*

BMP **Alternative 2** is a BAM LBS with an underdrain and overflow control structures. The LBS will utilize a high permeability BAM for downflow filtration of the stormwater during the storm event. The BAM bioretention system also has a small amount of attenuation (1 ft of storage depth) and the required treatment volume is achieved through a combination of percolation into the media and attenuation if the influent rate exceeds the maximum filtration rate. Stormwater that has passed through the BAM will then flow into the perforated underdrain pipes and then into the existing storm sewer (ACF Environmental, 2021) (US EPA, n.d.) (US EPA, 1999) (University of Florida - IFAS Extension, 2008). The BMP will provide treatment for the near entirety of Sub-Basin BL010. The BAM LBS will be located on Bass Lake Blvd. at the location of the two existing curb inlets. The curb inlets will be modified to route water into the BAM LBS. The BAM LBS will have a bottom width of 9 ft and a combined length of 45 ft distributed along the existing conveyance system, to achieve the desired surface area. The BAM LBS will be divided appropriately to provide treatment for both inlets. Due to the smaller footprint of these two systems and their location in a residential area, it may be desirable to include a vegetated bioswale. Harvesting of the planted vegetation can also lead to additional nutrient removal and extension of the life of the sorption capacity. There are commercially available, semi-predesigned, customizable systems available for this size (**Appendix G**).

The downward, vertical, unsaturated flow (i.e., infiltration) through the BAM is approximated as 2/3 of the coefficient of permeability of the BAM (SJRWMD, 2006) (FDOT, 2004). A safety factor of 2 is then applied to obtain the design maximum filtration rate (SJRWMD, 2006) (FDOT, 2004) (ECS, 2021). The cost estimate is based on sizing that uses this design's maximum filtration rate. For this BMP alternative evaluation, a BAM coefficient of permeability of 96 in/hr was used (ECS,

2021). Based on a coefficient of permeability of 96 in/hr, the resulting design volumetric treatment loading rate of 32 in/hr is used.

6.1.2.2 *Efficiency*

Currently, stormwater runoff in Sub-Basin BL010 travels along a road curb and gutter system to two curb inlets located on Bass Lake Blvd. At the two curb inlets, the stormwater runoff enters an existing storm sewer and discharges into Lake Bass. The stormwater runoff currently receives no treatment.

Commercially available BAM Bioretention systems claim removal efficiencies of 60-80% for total phosphorus (TP) and 40-50% for total nitrogen (TN) (ACF Environmental, 2021). In regards to phosphorus, the commercially available system removal efficiency performance claim of 60-80% TP is in agreement with a University of Central Florida study where a roadside downflow BAM filtration system removed 71% TP and 95% soluble reactive phosphorus (SRP) (Hood, et al., 2013) (Hood, 2012).

The existing condition has no nutrient reduction. The proposed BAM Bioretention System BMP will, on average, treat 11.3 acre-ft of runoff per year. Assuming a TN and TP removal efficiencies of 45% and 70% respectively, the system will remove an additional 90.1 pounds of TN and 7.0 pounds of TP per year. **Table 6-3** summarizes the applied pollutant load reduction for the existing and proposed conditions.

6.1.2.3 *Cost*

The estimated conceptual cost, not considering inflation or interest, (including design, construction, operation, and maintenance) for this alternative assuming a twenty-year life span and a safety factor of 2 is approximately \$41,764 which translates to approximately \$3,480 in annualized cost. Based on the previously stated efficiencies and load reduction for the proposed treatment condition, this alternative would cost approximately \$298/lb TP or \$23/lb TN for additional nutrient removal beyond the existing condition over the 20-year life of the project; note that each of these costs is independent and are determined by dividing the cost of the entire project by the mass of the specific nutrient removed. **Table 6-4** summarizes the cost estimate for **Alternative 2**.

6.1.3 Alternative 3 – Sub-Basin BL020: BAM Upflow Filtration with Continuous Recycle/Lake Filtration

Alternative 3 is an upflow BAM filter with a continuous recirculation/lake filtration stream that will provide additional treatment for the majority of Sub-Basin BL020. Currently, runoff in Sub-Basin BL020 enters into an existing stormwater pond located at the south end of S. Crystal Lake Dr. (**Figure 6-4**). Field reports and information from the Orange County suggest that this normally a dry pond with a draw-down pipe near the bottom of the pond. The performance of the existing

dry detention pond is unknown but, based on the relatively small size for the sub-basin, it likely provides little current treatment and is therefore assigned no current reduction.

6.1.3.1 *Description*

BMP **Alternative 3** involves installation of an upflow BAM filtration system with a continuous recirculation/lake filtration stream within Orange County's Pond #7102. The recommended upflow BAM filtration system consists of a geotextile liner and a flow distribution system to move water into and out of the BAM media without the need for an expensive prefabricated concrete structure. These systems are specifically designed to be integrated into the side of an existing stormwater pond to provide additional treatment. Additional information regarding this design is provided in **Appendix I**. Stormwater will continue to flow to and receive its current level of design treatment through the existing dry detention pond. The existing drawdown pipe will be replaced with a floating skimmer that leads to an upflow BAM filter. Water will flow into the floating skimmer where it will drain into the upflow BAM filter and out through a pipe to a discharge structure located below the seasonal low water surface elevation of Lake Bass. The discharge structure will also include an intake pipe for a recirculating treatment system that can be configured to collect effluent from the BAM filter or from Lake Bass to provide additional treatment while maintaining suitable conditions for biofilm in the media filter.

The recirculation stream will be continuous and driven by centrifugal pump. Piping for the recirculation stream will travel back up to the influent side of the existing dry detention pond. It is anticipated that the recirculation system will provide a flow rate capable of achieving an 18.75-minute empty bed contact time (EBCT), which is the minimum specified EBCT (i.e. maximum flow rate) for certain BAM types. Flow rate can be decreased if desired to achieve higher removal efficiencies, although the volume treated will then decrease (Hood, 2019). Additional modifications to the pond include installation of a baffle system to decrease short circuiting of the flow path. An overhead view of this flow path is illustrated in **Figure 6-5**.

The recirculation stream provides multiple benefits. One of the mechanisms by which BAM upflow filters achieve nitrogen removal is by the biological processes of nitrification and denitrification. If a BAM filter is allowed to desiccate or is not supplied with sufficient nutrients, the microbial biofilm will cease to function leading to reduced nutrient removal during storm events. For example, wastewater trickling filters have shown nutrient removal efficiency deterioration after just 1-2 hours without flow (Metcalf & Eddy, 2003).

Another advantage of recirculation pertains to the capture of sloughed biofilm. The microbes that compose the biofilm bio-assimilate soluble reactive phosphorus (SRP) into biomass. As the biofilm becomes thicker, portions will slough off, thus releasing organic phosphorus. During higher flow conditions when sloughing is more problematic, the intake will be configured to recirculate BAM filter effluent to the influent side of the dry detention pond. This will allow the sloughed biomass to settle in the pond instead of being discharged to Lake Bass which is problematic for typical upflow filters and similar to secondary clarifiers in a wastewater plant trickling filter (Pa. DEP, 2016). A study of stormwater upflow BAM filters demonstrated this by showing the decrease in SRP was

greater than the decrease in TP and indicated there may be an opportunity to capture as much as 15% more TP if all the sloughed biomass could be captured (Hood, 2020; Hood, 2019). The additional TP removal that may be achieved by capturing sloughed biomass is not quantified or included in the TP removal by the upflow BAM filter BMP for Lake Bass.

A third, and quantifiable, advantage of including a recirculation stream is that even when there is no stormwater entering into the system from rain events, the upflow BAM filtration system is operating and continuously removing nutrients from Lake Bass.

6.1.3.2 *Efficiency*

The existing dry detention pond receives influent loadings of 206.4 lb/yr of TN and 60.7 lb/yr of TP. A BAM upflow filter will be installed on the downstream side of the existing dry detention pond; thus, the runoff will travel in series through two BMPs. It is assumed that the existing dry detention pond is achieving 15% TN removal and 20% TP removal efficiencies for the pollution abatement volume (Harper & Baker, 2007). Based on BMP TRAINS, an upflow filter, utilizing a BAM with an organic component, can be expected to remove 45% of the TN and TP that remain in the stormwater after it has passed through a pond, given a 96 in/hr hydraulic loading rate (Wanielista, 2020). **Appendix J** contains an excerpt from the BMP Trains manual with information regarding type BAM removal efficiencies for different BMP systems and removal efficiency calculations for BMPs in series.

Additionally, the BAM upflow filter system will include a continuous recirculation stream that draws water from Lake Bass, enabling it to remove nutrients from Lake Bass during dry periods. The proposed BAM upflow filter could potentially remove up to 31 lb/yr TP from Sub-Basin BL020 stormwater inflows and an additional 2.4 lb/yr from the recirculating system (**Table 6-5**). The proposed BAM upflow filter would also have the potential to remove up to 99.7 lb/yr TN and an additional 52.2 lb/yr from the recirculating system (**Table 6-6**). Including both stormwater and recirculation treatment, the proposed BAM upflow filter would remove an additional 33 lb/yr of TP and 152 lb/yr of TN. This corresponds with a 55% reduction in TP load and a 74% reduction in TN load to Lake Bass.

6.1.3.3 *Cost*

The estimated conceptual cost, not considering inflation or interest, (including design, construction, operation, and maintenance) for this alternative assuming a twenty-year life span and a safety factor of 2 is approximately \$228,090, which translates to \$11,405 in annualized cost. Based on the previously stated efficiencies and load reduction for the proposed treatment condition, this alternative would cost approximately \$342/lb TP or \$75/lb TN for additional nutrient removal beyond the existing condition over the 20-year life of the project; note that each of these costs is independent and are determined by dividing the cost of the entire project by the mass of the specific nutrient removed. A note on the cost estimation, since the intake pipe for the recirculation stream must always be below the Lake Bass water surface elevation, a floating

discharge structure may be considered; for cost estimate purposes, the price of a floating skimmer will be utilized. **Table 6-7** summarizes the cost estimate for **Alternative 3**.

6.1.4 Alternative 4 – Sub-Basin BL025: BAM Soil Enhancements with Underdrain and Overflow Control Structure

Alternative 4 involves converting the existing Orange County dry detention pond #7116, which currently provides treatment for the majority of Sub-Basin BL025, into a bioretention basin with underdrain. Lower permeability BAM bioretention systems can remove 75% TN and 95% TP (Wanielista, 2020). Additional information for large BAM bioretention systems is provided in **Appendix K**. Runoff in Sub-basin BL025 currently travels through a series of roadside curb and gutters, curb inlets, and storm sewers until it is discharged into an existing dry detention pond located on the south side of E Grant Ave., between South Crystal Lake Drive and Rest Haven Ave, see **Figure 6-6**. Currently, water infiltrates through the existing cover soil and into the underdrains which are assumed to be at least two feet below the current surface. For the pollution abatement volume, dry detention ponds achieve 0-30% TN removal and 0-40% TP removal (Harper & Baker, 2007). It is assumed that the existing dry detention pond is achieving 15% TN removal and 20% TP removal efficiencies for the pollution abatement volume.

6.1.4.1 *Description*

Alternative 4 will involve removal of the soil on top of the existing underdrain system and replacement with a low-infiltration-rate BAM (coefficient of permeability ≈ 10 in/hr. The downward, vertical, unsaturated flow (i.e., infiltration) through the BAM is approximated as $2/3$ of the coefficient of permeability of the BAM (SJRWMD, 2006) (FDOT, 2004). A safety factor of 2 is then applied to obtain the design maximum filtration rate (SJRWMD, 2006) (FDOT, 2004) (ECS, 2021). Stormwater that has passed through the BAM will then flow into the existing perforated underdrain pipes. The flow from the underdrain pipes discharges into the existing outflow control structure on the southeast side, which is connected to the existing storm sewer (US EPA, n.d.) (US EPA, 1999) (University of Florida - IFAS Extension, 2008).

6.1.4.2 *Efficiency*

Dry detention ponds with underdrains achieve nutrient removal primarily via sedimentation and filtration of particulates, precipitation, and adsorption (Harper & Baker, 2007). Additional nutrient removal can also be accomplished by volume reduction due to water that infiltrated through the bottom of the pond instead of entering the underdrain system (Harper & Baker, 2007). For the purpose of comparing the exiting dry detention pond with underdrain to the proposed BAM system, volume reduction by infiltration shall not be considered.

The proposed low permeability BAM Bioretention System with underdrain BMP will, on average, treat 49.9 acre-ft of runoff per year. The proposed system will remove an additional 160.7 lb/yr TN for a new total removal of 194.9 lb/yr TN removed, see **Table 6-8**. The proposed system will remove an additional 32.9 lb/yr of TP for a new total removal of 40.4 lb/yr TP, **Table 6-8**.

6.1.4.3 Cost

The estimated conceptual cost, not considering inflation or interest, (including design, construction, operation, and maintenance) for this alternative assuming a twenty-year life span is approximately \$1,069,750 which translates to approximately \$53,488 in annualized cost. Based on the previously stated efficiencies and load reduction for the proposed treatment condition, this alternative would cost approximately \$1,624/lb TP or \$333/lb TN for additional nutrient removal beyond the existing condition over the 20-year life of the project; note that each of these costs are independent and are determined by dividing the cost of the entire project by the mass of the specific nutrient removed. **Table 6-9** summarizes the cost estimate for **Alternative 4**.

6.1.5 Alternative 5 – Sub-Basin BL005: Nutrient Separating Baffle Box

Alternative 5 involved installation of a nutrient separating baffle box (NSBB). The NSBB will be placed within Orange County property at the southwest corner of E. Jersey Ave. and Bass Lake Blvd. at the location of the existing discharge structure. Stormwater flows to this location through a combination of unpaved street gutters, curb and gutters, and storm sewers. The Alternative 5 NSBB will provide treatment for most of Sub-Basin BL005, see **Figure 6-7**. There is currently no nutrient treatment for the existing conditions although one of the curb inlets has been retrofitted with an inlet basket.

6.1.5.1 Description

NSBBs are a structural BMP that are placed in line with a storm for the purpose of removing, trash/debris, leaf litter, and settleable particulate bound nutrients. Second generation NSBBs are assigned a TP removal of 15.5% and a TN removal of 19.05% (FDEP, 2020).

6.1.5.2 Efficiency

The proposed NSBB will, on average, treat 23.29 acre-ft of runoff per year. The proposed system could potentially remove 130.8 lb/yr TN and 9.2 lb/yr of TP, **Table 6-10**.

6.1.5.3 Cost

The estimated conceptual cost, not considering inflation or interest, (including design, construction, operation, and maintenance) for this alternative assuming a twenty-year life span is approximately \$566,031 which translates to approximately \$47,169 in annualized cost. Based on the previously stated efficiencies and load reduction for the proposed treatment condition, this alternative would cost approximately \$3,077/lb TP or \$216/lb TN for additional nutrient removal beyond the existing condition over the 20-year life of the project; note that each of these costs is independent and are determined by dividing the cost of the entire project by the mass of the specific nutrient removed. **Table 6-11** summarizes the cost estimate for **Alternative 5**.

6.1.6 Alternative 6 – Sub-Basin BL015: BAM Bioretention System with Underdrain and Overflow Control Structures

Alternative 6 involves installation of a BAM bioretention system and underdrains within Sub-Basin BL015. The BAM bioretention system will provide treatment for an 18.2-ac portion of Sub-Basin BL015 indicated in **Figure 6-8**. Runoff in Sub-basin BL015 travels along a series of roadside curb and gutters to two existing curb inlets on Dawley Ave., near the corner of Dawley Ave. and Gulf Dr. Both curb inlets been retrofit with a curb inlet basket and connect to a storm sewer that discharges to Lake Bass (see **Figure 6-9** detail).

6.1.6.1 *Description*

The BAM bioretention system will be installed within the right-of-way on the west corner of Dawley Ave. and Gulf Dr. (**Figure 6-9**). Unlike the LBS systems discussed above, surface flows from the basin will be diverted to the inflow of the bioretention system prior to the curb inlet and discharged to the existing cross-connection under Dawley Ave. This particular bioretention system will require approximately 70 linear feet of BAM treatment area with a width of 9 ft depth and a media depth of 2.5 ft for a total BAM volume of 1,575 ft³ (58.33 yd³). For conceptual design purposes, it is assumed that all stormwater discharge can be routed to the BAM bioretention system location on the west side. The cost of regrading Dawley Ave. to direct water to the west side, or possibly installing a pipe running from the east curb inlet to the bioretention system on the west side, is not included in the cost estimate. **Appendix G** contains a vendor supplied example of a commercially available bioretention system and a plan view drawing of a generic bioretention system.

6.1.6.2 *Efficiency*

Commercially available BAM bioretention systems claim removal efficiencies of 60-80% for TP and 40-50% for TN (ACF Environmental, 2021). In regard to phosphorus, the commercially available system removal efficiency performance claim of 60-80% TP is in agreement with a University of Central Florida study where a roadside downflow BAM filtration system utilizing high permeability media, composed of 75% 3/8" expanded clay and 25% tire crumb by volume, removed 71% TP and 95% soluble reactive phosphorus (SRP) (Hood, et al., 2013) (Hood, 2012).

The BL015 Sub-Basin has limited stormwater treatment from curb inlet baskets and no other stormwater BMPs. The proposed BAM bioretention system structural BMP will, on average, treat 12.71 ac-ft of runoff per year. Assuming a TN and TP removal efficiencies of 45% and 70% respectively, the system will remove an additional 26.6 pounds of TN and 4.5 pounds of TP per year. **Table 6-12** summarizes the applied pollutant load reduction for the existing and proposed conditions.

6.1.6.3 *Cost*

The estimated conceptual cost, not considering inflation or interest, (including design, construction, operation, and maintenance) for this alternative assuming a twenty-year life span and a safety factor of 2 is approximately \$60,298 which translates to approximately \$3,015 in annualized cost. Based on the previously stated efficiencies and load reduction for the proposed treatment condition, this alternative would cost approximately \$675/lb TP or \$113/lb TN for additional nutrient removal beyond the existing condition over the 20-year life of the project; note that each of these costs is independent and are determined by dividing the cost of the entire project by the mass of the specific nutrient removed. **Table 6-13** summarizes the cost estimate for **Alternative 6**. Note that it is unknown if regrading Dawley Ave. to direct water to the BMP on the west side, or possibly installing a pipe running from the east curb inlet to the Bioretention System on the west side, is needed; thus, a cost for that has not been included.

6.2 Non-Structural Alternatives

6.2.1 Alternative 7 – In-Lake Sediment Nutrient Inactivation

Sediment nutrient inactivation may be a suitable option for expediting and enhancing water quality improvement within Lake Bass. Phosphorus fractionation and flux analysis indicate the presence of significant sources of phosphorus in the center third of the lake bottom. Inactivation of potentially bioavailable phosphorus by chemical application using a combination of Phoslock® and liquid aluminum sulfate (alum) can be used in conjunction to provide an economic solution to increase water transparency and reduce sediment nutrient flux. Lake Bass appears to have marginal clarity so alum treatment may not be necessary if the application is performed during relatively clear conditions.

6.2.1.1 *Description*

Phoslock® is a proprietary product utilizing elemental lanthanum to selectively bind free phosphate ions. Phoslock® is not a flocculent like alum but selectively binds with phosphate to prevent sediment release and subsequent biological uptake. Phoslock® is the recommended in Lake Bass because it will have little effect on pH, unlike alum, and Phoslock® has no precautionary environmental concerns and does not remove beneficial zooplankton from the water column.

6.2.1.2 *Efficiency*

Internal load reduction occurs when BAP is liberated from the sediments and is subsequently bound by lanthanum prior to diffusing into the water column. Phoslock® used in this type of application is broadcast over the lake surface but can be targeted to settle within the deepest areas that have the greatest ability to release phosphorus. The lanthanum mass applied would be available for phosphate inactivation at a 1:1 ratio.

6.2.1.3 *Cost*

Sediment inactivation cost for the Phoslock® application is estimated based on targeting approximately six acres of the lake bottom with the highest BAP phosphorus mass (**Figure 6-10**). Wood obtained a cost range from SePro to include a Phoslock® application that will inactivate between 300 and 360 pounds of phosphorus that could otherwise be released into the water column.

SePro estimates Phoslock® treatment costs for this alternative range between \$100,000 and \$150,000 with an average one-time TP removal cost of approximately \$389 per pound. It should be noted that the longevity of chemical inactivation projects is generally limited by continuing sources of external pollutant input and the retention time of water within the lake. It is recommended that OCEPD proceed with control of external loading sources in conjunction with this immediate but temporary means of improving water quality. It should also be noted that application of chemicals designed to inactivate sediment phosphorus (e.g., alum or Phoslock®) is likely to require a Individual ERP and a 404 Dredge and Fill Permit from the FDEP. FDEP has indicated that the bottom of Lake Bass is not likely to be considered Sovereign Submerged Lands which suggests that the project is permissible.

6.2.2 Alternative 8 – Public Education

OCEPD is actively participating in public education throughout the county and should work to focus specifically on the Lake Bass basin. Community outreach and education are vital components of any stormwater management plan, as the originating source for a great deal of these pollutants are residents, agricultural operators, lawn maintenance companies, and other individuals who may lack understanding or knowledge of the potentially deleterious impact their particular actions or habits have on local waterbodies. The primary remedy is to implement a well-conceived public education program that persuades citizens that they have a valuable role in the maintenance of the water quality within their community and teaches practices to minimize or eliminate the sources of pollution. The program should be creative, convey a consistent message, and be sustainable. In addition, the education program could be supplemented with an incentive program to encourage and facilitate community members in implementing site specific solutions to non-point source pollution and water quality problems.

Orange County recently implemented Ordinance No. 2017-14 (Chapter 15, Article XVII of the Orange County Municipal Code) which supersedes the prior fertilizer ordinance (2009-26) and places additional restrictions on the application of fertilizer throughout the County.

The new ordinance requires the following:

- Only fertilizers with zero phosphorus are permitted without a supporting soil test
- Broadcast spreaders must be equipped with a deflector shield
- Maintain at least a 15-ft buffer between fertilizer application and wetlands/water
- Fertilizers containing nitrogen must be at least 65% slow release
- No more than one pound of nitrogen per 1000 ft² can be applied per application

- Only trained residents and commercial applicators may apply fertilizer containing nitrogen between June 1 and September 30

Guidance pertaining to the ordinance is available through the following link:

<http://www.orangecountyfl.net/Environment/FertilizeResponsibly.aspx>

The focus is primarily on reducing nitrogen loading in response to the 2016 Springs and Aquifer Protection Act, but the ordinance also prohibits the application of fertilizers containing phosphorus on residential property unless a phosphorus deficiency is proven. Retailers are required to post a notice of the fertilizer ordinance during summer months which increases awareness. Some areas within the Lake Bass basin are agricultural and exempt from the new ordinance. Therefore, the managers of the agricultural areas should be directed to the agricultural BMP enrollment program.

In addition to the measures prescribed in the ordinance, a wide range of BMPs is available as guidelines for homeowners and others involved in turf grass maintenance. Exemplary BMP information is available from:

The Florida Yards & Neighborhoods (FYN) program, an educational outreach program of UF/IFAS Extension (<http://sfyl.ifas.ufl.edu/sarasota/gardening-and-landscaping/horticulture-residential/florida-yards-and-neighborhoods/>); the FYN Handbook (FYN, 2003); and FDEP's Statewide Best Management Practice Efficiencies website <https://floridadep.gov/dear/water-quality-restoration/content/statewide-best-management-practice-bmp-efficiencies>.

Information for professional lawn care service providers is also available from diverse sources including industry associations such as the Florida Turfgrass Association (<https://www.ftga.org/>).

The primary sources of guidance used by most residential fertilizer users are package labels; advice by family, friends, and neighbors; and information from retail sources of the product (see Israel and Knox, 2001). Additional guidance is available through Orange County's Fertilizer Responsibly page through the link listed above. More effective public education programs should be implemented to increase citizens' understanding of the FYN Program, residential turfgrass BMPs, and their importance to Florida's environment. A potential funding source for enhanced community awareness programs could include a dedicated tax on fertilizer sales. Completion of UF/IFAS certified training could be a criterion for exempting the fertilizer purchaser from the fertilizer tax.

Both rain sensors and soil moisture sensors, if used properly, can facilitate irrigation management, conserve water, and prevent excessive chemical leaching by overriding automatic operation of a sprinkler system. Furthermore, Florida is the only state in the nation with an overall rain sensor statute. Beginning in 1991, this statute applies to all new automatic sprinkler systems: "Any person who purchases and installs an automatic lawn sprinkler system after May 1, 1991, shall install, and must maintain and operate a rain sensor device or switch that will override the irrigation cycle of

the sprinkler system when adequate rainfall has occurred" (Florida Statute 373.662). This requirement was intended to conserve water. However, avoiding overwatering clearly will have additional benefits in preventing nutrient runoff and leaching to groundwater. Consequently, enhancements of the state and/or County's approach to encouraging sensor-controlled irrigation may be warranted. One potential enhancement could be the provision of funds for operation of a program to install and maintain sensor-controlled irrigation systems. For example, water supply utilities could administer a program to install and maintain sensor-controlled irrigation systems, targeting large users of irrigation water, regardless of the applicability of the rain sensor statute to that user. Based on industry experience with such systems, providing for routine maintenance would be an important part of such a program.

An estimate of the potential benefit of more widespread adoption of residential turf grass BMPs was developed in a similar study performed by Wood (previously MACTEC, 2007) for the SJRWMD. Specifically, it was assumed that use of turf grass BMPs would eliminate specific practices (excess watering, excess fertilization, and/or exclusive use of "fast-release" fertilizer formulations) that were studied by Morton, et al. (1988) and Snyder, et al. (1984). MACTEC (2007) concluded that effective implementation of turf grass BMPs could achieve a 33% reduction in groundwater loadings of TN from residential land uses. Although not specifically addressed by MACTEC (2007), their methodology suggests a similar reduction in stormwater loadings of TN.

Information regarding proper servicing and routine septic system maintenance should also be included as part of the public education program. The Lake Bass watershed is predominantly serviced by septic systems which are a likely source of groundwater nitrogen although seepage does not indicate unusually high concentrations (**Figure 6-10**). Conversion of these adjacent septic systems to central sewer is possible but would likely be cost prohibitive for the resulting pollutant load reduction.

6.2.2.1 *Efficiency*

Homeowner education is achieved through mass advertising using primarily social media, television commercials, and signage. The cost for these broad-reaching public awareness campaigns is distributed over the entire county and is minimal in any one basin. However, success of these advertising campaigns is difficult to measure on a large scale, and a more targeted approach for this specific basin is recommended. The effort to identify and work with homeowners immediately adjacent to Lake Bass, and should focus on minimizing fertilizer application, particularly near the shoreline; importance of maintaining riparian vegetation; and proper septic system maintenance.

6.2.2.2 *Cost*

Orange County is in the process of continuing a comprehensive countywide public outreach program. A maximum of 6% loading reduction (11.5 lb TP and 77.5 lb TN) could be realized annually in the Lake Bass watershed based on FDEP criteria. The actual cost is assumed to be approximately \$2,000 per year or \$174 per lb of TP and \$26 per lb of TN. Increased public

education can easily be incorporated into the lake management plan provided sufficient staffing resources are available.

6.2.3 Alternative 9 –Natural Attenuation Alternative

6.2.3.1 *Description*

The natural attenuation alternative assumes TP concentration will stabilize or decrease without additional BMP implementation. The natural attenuation alternative is not recommended because cost-effective BMPs are available to reduce loading to the lake and minimize the potential for future impairment listings.

6.2.3.2 *Efficiency*

The natural attenuation alternative does not have an associated efficiency.

6.2.3.3 *Cost*

OCEPD performs in-house ambient monitoring of Lake Bass and evaluates data periodically.

6.3 **Summary of Alternatives**

Table 6-14 provides a comparison of the costs and benefits (nutrient load reductions) associated with each alternative for Lake Bass.

7.0 RESULTS AND CONCLUSIONS

The majority of the Lake Bass watershed was developed prior to the implementation of stormwater regulations. Lack of existing stormwater treatment provides opportunities for BMP retrofits, but relatively little undeveloped land exists within the basin.

Chlorophyll-*a*, and TN concentrations exceeded the NNC thresholds more than once in three consecutive years within the 2009–2016 verification period which resulted in Lake Bass being listed as impaired for Chl-*a* and TN by the FDEP. The most recent evaluation period (2014 – 2021) suggests that Lake Bass will remain impaired for Chl-*a*, a new impairment will be verified for TP, and the current TN impairment will likely be delisted.

The majority of external nutrient loading appears to be from stormwater runoff although some concentrated sources of nitrogen are entering the lake as ammonia from seepage sources as well. Internal loading from sediments also appears to be a significant source of loading and could be addressed through sediment inactivation technology. Reducing loading from external sources will prolong the benefits of an internal load reduction project.

Based on the results of the pollutant load modeling, Wood developed conceptual stormwater treatment options in the sub-basins with the highest untreated pollutant loadings. Six structural alternatives and two non-structural alternatives were proposed and described both in terms of pollutant removal and estimated cost per pound of pollutants removed. Project alternatives are summarized in **Table 6-14**. Wood recommends that OCEPD proceed with implementation of sediment nutrient inactivation (**Alternative 7**) and public education (**Alternative 8**). Wood recommends a feasibility study to evaluate bioretention **Alternatives 1** through **6**. Potential TP load reduction could be over 98 lbs/yr if all of the stormwater treatment options are implemented. TN load reduction could be as high as 625 lbs/yr if all stormwater treatment options are implemented. Most of the alternatives making use of existing conveyance systems and BAM are anticipated to be relatively cost-effective (<\$1000/lb TP removed) structural projects. **Alternative 4** is slightly more expensive at \$1,624/lb TP removed than the other BAM treatment alternatives because it is a larger-scale project with considerably more media volume. However, **Alternative 4** has the potential to provide the greatest load reduction to Lake Bass at 659 pounds of TP over 20 years. Given the number of project opportunities within the Lake Bass basin, the lake would be a good candidate for development of a 4e Restoration Plan instead of a traditional TMDL. Wood recommends that OCEPD move forward with feasibility assessments and implementation of the highest ranking projects, as budget allows, and continue water quality monitoring of Lake Bass over the next five years to evaluate trends in Chl-*a*, TN, and TP.

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TABLES

Table 1-1 - Florida's Lake Numeric Nutrient Criteria

Long Term Geometric Mean Lake Color and Alkalinity	Annual Geometric Mean Chlorophyll <i>a</i>	Minimum calculated numeric interpretation		Maximum calculated numeric interpretation	
		Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen	Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen
≥ 40 Platinum Cobalt Units	20 µg/L	0.05 mg/L	1.27 mg/L	0.16 mg/L ¹	2.23 mg/L
≤ 40 Platinum Cobalt Units and ≥ 20 mg/L CaCO ₃	20 µg/L	0.03 mg/L	1.05 mg/L	0.09 mg/L	1.91 mg/L
≤ 40 Platinum Cobalt Units and ≤ 20 mg/L CaCO ₃	6 µg/L	0.01 mg/L	0.51 mg/L	0.03 mg/L	0.93 mg/L

¹ For lakes with color ≥ 40 PCU in the West Central Nutrient Watershed Region, the maximum TP limit shall be the 0.49 mg/L TP streams threshold for the region.

From: *Florida Administrative Code 62-302.531*

Table 2-1 – Phosphorus Fractionation Forms with Drivers of Bioavailable Phosphorus Release

P FRACTION	P FORMS IN FRACTION	DRIVER OF BAP RELEASE FROM SEDIMENTS	LIKELIHOOD OF BAP RELEASE TO WATER COLUMN
Labile P	Directly bioavailable P; loosely bound or adsorbed P	Desorption; diffusion; steep concentration gradients	High
Reductant soluble P	P bound to Fe-hydroxides and Mn-compounds	Anoxia	High
Metal-oxide adsorbed P	P adsorbed to metal oxides (mainly Fe, Al); P exchangeable against OH-	High pH (e.g., from high levels of photosynthetic activity in water column)	Medium to High
Organic P	Allochthonous organic material; detritus	Bacterial mineralization (temperature dependent)	Medium to High
Apatite bound P	P bound to carbonates and apatite P	Low pH	Low to Medium
Residual P	Refractory compounds		Low
Total BAP	Labile P + Reductant soluble P + Metal oxide adsorbed P + Organic P	See above	Medium to High

Note: Information adapted from Meis et al. 2012

**Table 2-2A –Physical and Chemistry Results from Sediments Collected in Lake Bass
Stations Core 1, Core 2, Core 3, and Core 4**

Parameter	Core 1	Core 2	Core 3	Core 4
Percent Dry Weight (%)	77.98	76.67	10.93	73.75
Bulk Density (g/cc)	1.3	1.4	0.11	1.3
Porewater Ammonia (mg/kg DW)	0.25	0.68	94.7	0.55
Porewater Soluble Reactive Phosphorus (mg/kg DW)	0.018	0.018	0.92	0.015
Total Organic Carbon (mg/kg DW)	3,910	5307	394,000	7,810
Volatile Solids (%)	0.7	0.7	66.5	1.59

**Table 2-2B –Phosphorus Fractionation Results from Sediments Collected in Lake Bass
Stations Core 1, Core 2, Core 3, and Core 4**

Phosphorus Fraction Concentration (mg/kg DW)				
P Fraction	Core 1	Core 2	Core 3	Core 4
Labile P	<0.7	1.5	1.7	1.1
Reductant Soluble P	4.2	<2.9	31.9	3.5
Metal-oxide adsorbed P	237	163	994	127
Organic P	<15.4	16	706	44
Total BAP*	249.3	182.9	1733.6	175.6
Apatite bound P	12.8	12.0	19.0	4.2
Residual P	29	43	159	12
Total P	254	249	1950	178

Note: DW = Dry weight, *BAP =Bioavailable phosphorus, which is the sum of: Labile P (NH₄Cl TSP) + Reductant-Soluble P (NaHCO₃/Na₂S₂O₄ TSP) + Metal-oxide P (NaOH-SRP) + Organic P (NaOH TSP minus NaOH SRP) (Meis et. al., 2012). Sum of phosphorus fractionations are less than total phosphorus, since the fractionation procedure measures soluble phosphorus (e.g., the supernatant is filtered through a 0.45 µM filter), and not analyzed for total phosphorus. For calculations, 1/2 the value was used for analyses below detection value.

Table 2-3 – Summary of Lake Bass Sediment Characterization and Phosphorus Fractionation Data

Parameter	Mean Value	Min Value	Max Value
Bulk Density (g/cm ³)	1.0275	0.11	1.4
Total Phosphorus (mg/kg DW)	657.75	178	1950
Bioavailable (mg/kg DW)*	582.7	175.6	1733.6
Residual Phosphorus (mg/kg DW)	60.75	12	159
Reductant Soluble Phosphorus (mg/kg DW)	9.9	<2.9	31.9

Note: Mean values are average of four samples. DW = Dry weight

* Bioavailable phosphorus includes: Labile P (NH₄Cl TSP) Reductant-Soluble P (NaHCO₃/Na₂S₂O₄ TSP), and Organic P (NaOH TSP minus NaOH SRP) (Meis et. al., 2012).

Table 2-4 – Ranges of In-situ Sample Profile Water Quality Data at Each Station

Station	Sample Depth (m)	Water Temperature (°C)	Dissolved Oxygen (mg/L)	Dissolved Oxygen (%)	Specific Conductance (uS/cm)	pH	Turbidity (NTU)
BL-1	0.3-3.0	15.90-16.20	9.25-12.17	93.5-126.0	148	6.20-7.24	19.9
BL-3	0.3-3.4	15.93-16.33	9.13-10.00	92.2-104.1	148	7.34-7.41	6.9

**Table 2-5 – Summary of Anoxic and Aerobic Flux Rates and Internal Loads
(Slope Equation)**

Site	REDOX (Oxygen) Conditions	Flux Parameter	Diffusive Flux Rate (mg/m ² /d)	Load (lb/yr)
BL-1	Aerobic	Total Phosphorus, as P, (mg/L)	-4.08	-305.11
BL-3	Aerobic	Total Phosphorus, as P, (mg/L)	-3.54	-264.37
Average	Aerobic	Total Phosphorus, as P, (mg/L)	-3.81	-284.74
BL-1	Aerobic	Ammonia, as N, (mg/L)	-2.38	-177.99
BL-3	Aerobic	Ammonia, as N, (mg/L)	-11.30	-844.51
Average	Aerobic	Ammonia, as N, (mg/L)	-6.84	-511.25
BL-1	Anoxic	Total Phosphorus, as P, (mg/L)	2.02	150.65
BL-3	Anoxic	Total Phosphorus, as P, (mg/L)	27.26	2,037
Average	Anoxic	Total Phosphorus, as P, (mg/L)	14.64	1,094
BL-1	Anoxic	Ammonia, as N, (mg/L)	33.04	2,469
BL-3	Anoxic	Ammonia, as N, (mg/L)	32.48	2,427
Average	Anoxic	Ammonia, as N, (mg/L)	32.76	2,448
Overall Average	Anoxic and Aerobic	Total Phosphorus, as P, (mg/L)	5.42	404.75
Overall Average	Anoxic and Aerobic	Ammonia, as N, (mg/L)	12.96	968.62

**Table 2-6 – Summary of Anoxic and Aerobic Flux Rates and Internal Loads
(NRR Equation)**

Site	REDOX (Oxygen) Conditions	Flux Parameter	Diffusive Flux Rate (mg/m²/d)	Load (lb/yr)
BL-1	Aerobic	Total Phosphorus, as P, (mg/L)	-0.07	-4.98
BL-3	Aerobic	Total Phosphorus, as P, (mg/L)	0.10	7.47
Average	Aerobic	Total Phosphorus, as P, (mg/L)	0.02	1.25
BL-1	Aerobic	Ammonia, as N, (mg/L)	0.00	0.00
BL-3	Aerobic	Ammonia, as N, (mg/L)	3.01	224.72
Average	Aerobic	Ammonia, as N, (mg/L)	1.50	112.36
BL-1	Anoxic	Total Phosphorus, as P, (mg/L)	2.37	176.89
BL-3	Anoxic	Total Phosphorus, as P, (mg/L)	37.03	2,767
Average	Anoxic	Total Phosphorus, as P, (mg/L)	19.70	1,472
BL-1	Anoxic	Ammonia, as N, (mg/L)	30.67	2,292
BL-3	Anoxic	Ammonia, as N, (mg/L)	33.01	2,466
Average	Anoxic	Ammonia, as N, (mg/L)	31.84	2,379
Overall Average	Anoxic and Aerobic	Total Phosphorus, as P, (mg/L)	9.86	736.83
Overall Average	Anoxic and Aerobic	Ammonia, as N, (mg/L)	16.67	1,246

Table 2-7 - Surface Water Quality Summary Data in Lake Bass from 2008 through 2019

Parameters	Count	Mean	Geometric Mean	Minimum	Maximum	Standard Deviation	Coefficient of Variation
<i>Ammonia (mg/L)</i>	48	0.029	0.02	0.005	0.2	0.04	130.81
<i>Chlorophyll a (corrected, µg/L)</i>	49	34.8	26.2	8.8	356.5	48.50	139.36
<i>True Color (PCU)</i>	47	8.4	7.8	1.3	14	2.80	33.30
<i>Nitrate-Nitrite (mg/L)</i>	48	0.05	0.01	0.002	0.438	0.08	163.92
<i>Orthophosphate (mg/L)</i>	46	0.0024	0.002	0.001	0.01	0.002	68.77
<i>Alkalinity (mg/L)</i>	50	45.0	44.8	39	65	4.28	9.52
<i>Total Kjeldahl Nitrogen (mg/L)</i>	50	1.01	0.9	0.51	5.12	0.63	62.66
<i>Total Nitrogen (mg/L)</i>	50	1.06	1.0	0.51	5.21	0.64	60.49
<i>Total Phosphorus (mg/L)</i>	45	0.049	0.037	0.023	0.41	0.07	134.88
<i>Secchi Depth (m)</i>	50	1.1	1.0	0.52	2	0.35	31.86
<i>Trophic State Index</i>	43	58.8	58.4	46	94	7.57	12.88

Source: Orange County Water Atlas

Table 2-8 – Adjusted Surface Water Quality Results for Lake Bass from June 2020 to April 2021

Parameters	Count	Mean	Geometric Mean	Minimum	Maximum	Standard Deviation	Coefficient of Variation
<i>Ammonia as N</i>	6	0.01	0.01	0.0098	0.038	0.01	79.40
<i>Chlorophyll a</i>	6	26.33	23.37	12	44	13.53	51.38
<i>Color</i>	6	10	10	10	10	0.00	0.00
<i>Nitrate/Nitrite as N</i>	6	0.09	0.06	0.016	0.19	0.07	81.79
<i>Orthophosphate as P</i>	6	0.007	0.007	0.004	0.014	0.00	59.15
<i>pH for Color</i>	6	7.1	7.1	6.6	7.8	0.47	6.62
<i>Total Phosphorus</i>	6	0.045	0.041	0.021	0.071	0.02	47.21
<i>Total Alkalinity as CaCO₃</i>	6	31.08	30.9	24.6	35.2	3.91	12.57
<i>Total Kjeldahl Nitrogen</i>	6	0.82	0.81	0.66	1.1	0.17	20.23
<i>Total Nitrogen</i>	6	0.89	0.88	0.66	1.2	0.19	21.63
<i>Total Suspended Solids</i>	6	8.0	7.7	5.3	13	2.73	33.95
<i>Turbidity</i>	6	9.5	7.4	3	23	7.44	78.76

Source: Wood (6 events)

Table 2-9 - Summary of Lake Bass Surface Water Field Parameters from June 2020 through April 2021

Parameters	Count	Mean	Geometric Mean	Minimum	Maximum	Standard Deviation	Coefficient of Variation
<i>Temperature (C°)</i>	6	26.2	25.9	21.7	31.7	4.76	18.2
<i>Dissolved Oxygen (%)</i>	6	109.8	109.2	94.5	124.7	11.87	10.8
<i>Dissolved Oxygen (mg/L)</i>	6	8.9	8.9	7.9	10	0.84	9.5
<i>Specific Conductance (μS/cm)</i>	6	198	197	179	213	14.26	7.2
<i>pH (STU)</i>	6	7.7	7.7	7.3	8.1	0.31	4.0
<i>Secchi Disk Depth (m)</i>	6	0.95	0.9	0.5	1.3	0.27	28.4

Source: Wood (6 events)

Table 3-1 Area of Sub-Basins in Lake Bass Basin

Sub-Basin Name	Area (acres)
BL005	36.49
BL010	17.59
BL015	29.53
BL020	57.09
BL025	69.87
BL030	5.05
BL035	27.87
BL040	56.89
Total Area	300.38

Table 3-2 - Landuse within Lake Bass Watershed

Level 2 Landuse	Sub-Basin (ac)								
	BL005	BL010	BL015	BL020	BL025	BL030	BL035	BL040	Total
1100: Residential Low Density	-	-	-	-	-	-	-	0.16	0.16
1200: Residential Medium Density	36.22	17.33	26.22	49.81	64.05	3.15	27.78	1.23	225.81
1300: Residential High Density	-	-	-	1.64	1.23	1.90	0.08	50.33	55.17
1400: Commercial and Services	-	-	-	3.15	-	-	-	-	3.15
1700: Institutional	0.02	-	3.31	1.37	2.53	-	-	0.33	7.55
5300: Reservoirs	-	-	-	-	-	-	-	2.68	2.68
6430: Wet Prairies	-	-	-	-	-	-	-	1.46	1.46
6440: Emergent Aquatic Vegetation	0.25	0.25	-	0.05	-	-	-	-	0.54
8140: Roads and Highways	-	-	-	0.71	-	-	-	-	0.71
8370: Surface Water Collection Basins	-	-	-	0.36	2.07	-	-	0.70	3.13
									300.36

Table 3-3 - Hydrologic Soil Groups within the Lake Bass Watershed

HydroGroup	Sub-Basin (ac)								
	BL005	BL010	BL015	BL020	BL025	BL030	BL035	BL040	Total
A/D	1.33	5.53	1.81	-	-	-	0.35	-	9.02
A	35.15	12.06	27.73	57.09	69.88	5.05	27.51	54.79	289.25
Water	-	-	-	-	-	-	-	2.10	2.10
									300.37

Table 4-1 – Annual Rainfall at Orlando International Airport from 1953 through 2019

Annual Rainfall (inches)			
Orlando International Airport, FL US USW00012815			
Year	Rainfall	Year	Rainfall
1953	58.76	1988	52.49
1954	45.1	1989	45.66
1955	33.31	1990	31.68
1956	36.77	1991	60.9
1957	45.38	1992	52.96
1958	52.93	1993	44.53
1959	64.8	1994	67.85
1960	51.86	1995	43.05
1961	34.23	1996	56.66
1962	44.46	1997	64.51
1963	38.28	1998	43.75
1964	45.2	1999	54.8
1965	41.48	2000	30.38
1966	48.87	2001	54.92
1967	45.18	2002	66.39
1968	53.59	2003	52.68
1969	43.56	2004	59.24
1970	37.41	2005	60.51
1973	42.04	2006	36.35
1974	44.65	2007	38.49
1975	47.04	2008	53.8
1976	47.08	2009	51.48
1977	38.12	2010	45.72
1978	50.59	2011	56.88
1979	50.23	2012	41.09
1980	41.21	2013	42.71
1981	47.1	2014	55.35
1982	51.61	2015	54.08
1983	55.52	2016	54.3
1984	44.44	2017	46.62
1985	47.19	2018	51.55
1986	49.83	2019	47.99
1987	56.79		
Average Annual Rainfall			48.52

Table 4-1

**Table 4-2 - Estimated Monthly Inputs from Direct Precipitation to Lake Bass
(OIA Station USW00012815 Data from 1953 through 2019)**

Month	Average Monthly Rainfall (inches)	Average Monthly Contribution to Lake* (ac-ft)
Jan	2.4	4.7
Feb	2.4	4.9
Mar	3.3	6.6
Apr	2.3	4.6
May	3.5	7.1
Jun	7.5	14.9
Jul	7.3	14.7
Aug	6.7	13.4
Sep	6.0	12.0
Oct	3.0	6.0
Nov	1.8	3.7
Dec	2.2	4.5
Annual Total	48.5	97.0

** – For a lake surface area of 24 acres*

Table 4-3 - Estimated Sub-Basin Stormwater Runoff for Lake Bass Watershed

Sub-Basin	Sub-Basin Area (acre)	Annual Sub-Basin Runoff* (ac-ft)	% Contribution
BL005	36.49	23.29	13.75
BL010	17.51	11.32	6.68
BL015	29.53	19.18	11.32
BL020	57.09	44.64	26.35
BL025	69.88	49.89	29.45
BL030	5.08	3.78	2.23
BL035	27.87	17.31	10.22
BL040	56.89	64.80	38.25
Total	300.33	234.21	100

**Assumes 48.52 inches of rainfall*

Table 4-4 - Lake Bass Seepage Flow Monitoring Data

Date	Sample ID	Initial Volume (L)	Volume After Removal (L)	Total Volume Change (L)	Collection Period (hrs)	Collection Period (days)	Meter Area (m ²)	Seepage Flow Rate (L/m ² -hr)	Seepage Flow Rate (L/m ² -day)
6/24/2020 11:20	BLSM1	2.0	4.5	2.5	1174	49	0.25	0.0085	0.20
6/24/2020 10:48	BLSM2	2.0	151	149	1173	49	0.25	0.5082	12.20
6/24/2020 10:02	BLSM3	2.0	11	9	1172	49	0.25	0.0307	0.74
8/11/2020 9:50	BLSM1	2.0	6.8	4.8	1150	48	0.25	0.0167	0.40
8/11/2020 10:12	BLSM2	2.0	30.3	28.3	1151	48	0.25	0.0984	2.36
8/11/2020 11:06	BLSM3	2.0	28.8	26.8	1153	48	0.25	0.0930	2.23
10/12/2020 9:38	BLSM1	2.0	7.6	5.6	1488	62	0.25	0.0151	0.36
10/12/2020 10:01	BLSM2	2.0	2.2	0.2	1488	62	0.25	0.0005	0.01
10/12/2020 10:54	BLSM3	2.0	151	149	1488	62	0.25	0.4006	9.62
12/1/2020 9:52	BLSM1	2.0	9.5	7.5	1200	50	0.25	0.0250	0.60
12/1/2020 10:09	BLSM2	2.0	35.2	33.2	1200	50	0.25	0.1107	2.66
12/1/2020 10:59	BLSM3	2.0	25.5	23.5	1200	50	0.25	0.0783	1.88
2/18/2021 10:25	BLSM1	2.0	18.9	16.9	1896	79	0.25	0.0356	0.86
2/18/2021 10:12	BLSM2	2.0	1.9	-0.1	1896	79	0.25	-0.0002	-0.01
2/18/2021 9:48	BLSM3	2.0	15.1	13.1	1895	79	0.25	0.0277	0.66
4/12/2021 9:45	BLSM1	2.0	12.3	10.3	1271	53	0.25	0.0324	0.78
4/12/2021 10:02	BLSM2	2.0	2.46	0.46	1272	53	0.25	0.0014	0.03
4/12/2021 10:45	BLSM3	2.0	3.8	1.8	1273	53	0.25	0.0057	0.14
								Average	1.98

Table 4-5 - Volume of Water and YSI Field Measurements for Lake Bass Seepage Meters

Paramters	Count	Mean	Geometric Mean	Minimum	Maximum	Standard Deviation	Coefficient of Variation
<i>Temperature (C°)</i>	16	26.2	25.8	20.5	32.5	4.64	17.73%
<i>Dissolved Oxygen (%)</i>	16	77.2	68.8	7.2	100.7	24.00	31.10%
<i>Dissolved Oxygen (mg/L)</i>	16	6.3	5.6	0.5	8.6	2.09	33.08%
<i>Specific Conductance (μS/cm)</i>	16	227	188	34	530	138.65	61.11%
<i>pH (STU)</i>	16	7.3	7.3	6.6	8	0.33	4.53%
<i>Volume (L)</i>	16	28.8	12.5	1.9	151.42	45.73	158.81%

Source: Wood (June 2020 – April 2021)

Table 4-6 - Lake Bass Seepage Water Quality Summary Data

Parameters	Count	Mean	Geometric Mean	Minimum	Maximum	Standard Deviation	Coefficient of Variation
Ammonia as N	17	2.59	1.06	0.0098	12	3.13	120.8%
Nitrate/Nitrite as N	17	0.88	0.36	0.022	4.5	1.17	133.3%
Orthophosphate as P	17	0.022	0.014	0.004	0.096	0.02	110.4%
Total Phosphorus	17	0.152	0.109	0.029	0.56	0.14	89.6%
Total Kjeldahl Nitrogen	17	3.70	2.72	0.6	13	3.57	96.4%
Total Nitrogen	17	4.61	3.50	0.86	14	3.73	81.0%
Total Suspended Solids	17	10.94	8.27	2.5	41	9.45	86.4%

Source: Wood (June 2020 – April 2021)

Table 4-7A - Hydrologic Inputs to Bass Lake

Hydrologic Input	ac-ft/yr	% Input
Stormwater Runoff	234.2	70.0
Direct Precipitation	97.0	27.7
Groundwater Seepage	18.5	5.3
Total	349.7	100.0

Table 4-7B - Hydrologic Outputs from Bass Lake

Hydrologic Output	ac-ft/yr	% Output
Discharge (to drain well)	235.0	67.2
Evaporation	94.7	27.1
Groundwater Recharge	20.0	5.7
Total	349.7	100.0

Table 5-1 - Lake Bass Sub-Basin TN, TP, and TSS EMCs

Sub-Basin	EMC Method	TN EMC (µg/L)	TP EMC (µg/L)	TSS EMC (mg/L)
BL005	Site Specific (BLA-2)	9,600.00	830.00	15.98
BL010	Composite Literature	1,812.26	299.66	36.26
BL015	Composite Literature	1,714.76	287.97	40.64
BL020	Site-Specific (BLA-1)	1,700.00	500.00	37.48
BL025	Composite Literature	255.59	37.78	3.97
BL030	Composite Literature	253.10	55.32	5.69
BL035	Site Specific (BLA-3)	2,910.00	340.00	12.43
BL040	Composite Literature	755.90	101.56	9.26

Table 5-2 – Stormwater Summary Data for Lake Bass Autosamplers

BLA1				
Parameter	Average	Minimum	Maximum	Standard Deviation
Ammonia (mg/L)	0.015	0.0049	0.059	0.021
Nitrate + Nitrite (mg/L)	0.443	0.018	1.3	0.474
Orthophosphate (mg/L)	0.216	0.091	0.45	0.145
TP (mg/L)	0.50	0.26	0.78	0.228
TKN (mg/L)	1.26	0.63	2.0	0.53
TN (mg/L)	1.70	0.78	3.3	0.94
TSS (mg/L)	37.5	4.9	130.0	46.4
BLA2				
Parameter	Average	Minimum	Maximum	Standard Deviation
Ammonia (mg/L)	0.011	0.005	0.023	0.008
Nitrate + Nitrite (mg/L)	8.650	6.4	10.0	1.48
Orthophosphate (mg/L)	0.054	0.023	0.11	0.03
TP (mg/L)	0.833	0.086	4.2	1.65
TKN (mg/L)	0.93	0.60	1.3	0.26
TN (mg/L)	9.60	7.0	11	1.69
TSS (mg/L)	16.0	<2.5	39.0	13.8
BLA3				
Parameter	Average	Minimum	Maximum	Standard Deviation
Ammonia (mg/L)	0.031	0.005	0.072	.0028
Nitrate + Nitrite (mg/L)	1.313	0.2	2.8	1.12
Orthophosphate (mg/L)	0.175	0.14	0.2	0.022
TP (mg/L)	0.337	0.19	0.57	0.12
TKN (mg/L)	1.62	0.47	4.4	1.47
TN (mg/L)	2.91	0.67	6.6	2.33
TSS (mg/L)	12.4	<2.5	26.0	10.3
All Stations, Combined				
Parameter	Average	Minimum	Maximum	Standard Deviation
Ammonia (mg/L)	0.019	0.005	0.072	0.021
Nitrate + Nitrite (mg/L)	3.469	0.018	10.0	3.93
Orthophosphate (mg/L)	0.148	0.23	0.45	0.10
TP (mg/L)	0.556	0.086	4.2	0.93
TKN (mg/L)	1.27	0.47	4.4	0.90
TN (mg/L)	4.74	0.67	11	3.93
TSS (mg/L)	22.0	<2.5	130.0	19.9

Table 5-3 - TN, TP, and TSS Loading to Lake Bass by Sub-Basin

Sub-Basin	Estimated Existing Annual TN Load (lb)	% of Total TN Load	Estimated Existing Annual TP Load (lb)	% of Total TP Load	Estimated Existing Annual TSS Load (lb)	% of Total TSS Load
BL005	605.20	46.9	52.33	27.4	1,007.37	7.4
BL010	55.67	4.3	9.20	4.8	1,113.94	8.1
BL015	89.20	6.9	14.98	7.8	2,114.29	15.5
BL020	205.81	15.9	60.53	31.6	4,537.47	33.2
BL025	196.02	15.2	37.64	19.7	4,852.60	35.5
BL030	2.59	0.2	0.57	0.3	58.25	0.4
BL035	137.02	10.6	16.01	8.4	585.28	4.3
BL040	132.86	10.3	17.85	9.3	1,627.66	11.9
Total	1,291.52	100.0	191.26	100.0	13,683.92	100.0

Source: Wood

Table 5-4 – Water Quality Data and Loadings from Lake Bass Seepage Meters from June 2020 through April 2021

Seepage Meter	Date	Temperature °C	DO %	DO mg/L	Specific Conductance µS/cm	pH	Ammonia mg/L	Nitrate-Nitrite mg/L	OP mg/L	TP mg/L	TKN mg/L	TN mg/L	TSS mg/L	TP Seepage Load mg/m2-day	TN Seepage Load mg/m2-day
BLSM1	24-Jun-20	31.8	96	7.1	81	7.4	1	0.11	0.008	0.078	1.7	1.8	6.3	0.01595	0.36811
BLSM2	24-Jun-20	30.5	7.2	0.5	178	6.7	2.6	1.8	0.014	0.1	3.5	5.3	4.1	1.21965	64.6412
BLSM3	24-Jun-20	30.6	67	5	481	7.5	8.8	0.093	0.012	0.084	12	12	11	0.06194	8.84843
BLSM1	11-Aug-20	31.4	94	6.9	152	7.1	1.8	0.18	0.005	0.029	2.1	2.3	3.4	0.01162	0.9216
BLSM2	11-Aug-20	30.7	38	2.8	110	6.6	0.84	1.8	0.006	0.17	2.3	4.1	20	0.40128	9.67799
BLSM3	11-Aug-20	32.5	70	5	530	7.5	12	0.62	0.012	0.17	13	14	16	0.3795	31.2526
BLSM1	12-Oct-20	28	101	7.9	185	7.2	2.1	0.2	0.009	0.084	2.7	2.9	9.5	0.03036	1.048
BLSM2	12-Oct-20	27.9	124	9.8	201	8.1	0.22	4.5	0.096	0.56	2.5	7	41	0.00723	0.09035
BLSM3	12-Oct-20	28.4	89	6.9	402	7.5	3.2	1.4	0.054	0.19	6.9	8.3	7.8	1.82686	79.805
BLSM1	1-Dec-20	20.5	96	8.6	196	7.4	2.1	0.21	0.005	0.036	2.6	2.8	4.5	0.0216	1.68007
BLSM2	1-Dec-20	20.8	83	7.4	125	7.4	1.8	2	0.031	0.16	2.4	4.4	6.3	0.42505	11.6888
BLSM3	1-Dec-20	21.3	78	7	283	7.4	1.6	1.3	0.05	0.37	2.5	3.89	17	0.69572	7.31442
BLSM1	18-Feb-21	22	85	7.4	215	7.3	1.7	0.066	0.014	0.036	2	2.1	2.5	0.0308	1.79655
BLSM2	18-Feb-21													0	0
BLSM3	18-Feb-21	22.1	80	7	274	7.3	2.5	0.16	0.014	0.15	3.2	3.4	4.5	0.09957	2.25696
BLSM1	12-Apr-21	22.7	75	6.5	198	7.6	1.7	0.022	0.004	0.03	2	2	4	0.02334	1.5558
BLSM2	12-Apr-21	21.4	90	8	34	8	0.0098	0.26	0.03	0.21	0.6	0.86	15	0.00729	0.02986
BLSM3	12-Apr-21	24.3	88	7.3	186	7.5	0.0098	0.21	0.01	0.12	0.97	1.2	13	0.01629	0.16292
BLSM1	Average	26.1	91.1	7.4	171	7.3	1.73	0.13	0.008	0.049	2.2	2.3	5.0	0.02228	1.22836
BLSM2	Average	26.3	68.4	5.7	130	7.4	1.09	2.07	0.035	0.240	2.3	4.3	17.3	0.34342	14.3547
BLSM3	Average	26.5	78.4	6.4	359	7.5	4.68	0.63	0.025	0.181	6.4	7.1	11.6	0.51331	21.6067
All Seepage	Average	26.2882353	80	6.535	225.352941	7.38	2.58704	0.8783	0.022	0.152	3.704	4.609	10.94	0.293	12.3966

Source: Wood

Table 5-5 - Annual Lake Bass Pollutant Loading Summary by Source

Inputs	TP (lbs/yr)	%	TN (lbs/yr)	%	TSS (lbs/yr)	%
External						
Surface Runoff	191.3	95.6	1,291.5	78.3	13,683.9	100%
Atmospheric Deposition	1.6	0.8	42.9	2.6	---	---
Seepage	7.4	3.7	314.2	19.1	---	---
Total External	200.3	100%	1,648.6	100%	13,683.9	100%
Internal						
Sediment Flux	422	100%	1,010	100%	---	---
Total Internal	422	100%	1,010	100%	---	---

**Table 6-1 – BMP Alternative 1 for Sub-Basin BL035
TN & TP Removal**

Existing Annual Runoff Volume (ac-ft/ year)	Existing Annual TN loading of Runoff (lb/year as N)	Existing Annual TN removal (lb/year as N)	Existing Annual TN Discharge to Lake Bass (lb/year as N)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP: Annual TN removal (lb/year as N)	Proposed BMP: Annual TN Discharge to Lake Bass (lb/year as N)	Additional Annual TN Removal Achieved (lb/year as N)
17.3	137.0	0.0	137.0	18.3	65.2	89.4	65.2

Existing Annual Runoff Volume (ac-ft)/ year	Existing Annual TP loading of Runoff (lb/year as P)	Existing Annual TP removal (lb/year as P)	Existing Annual TP Discharge to Lake Bass (lb/year as P)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP Annual TP removal (lb/year as P)	Proposed BMP Annual TP Discharge to Lake Bass (lb/year as P)	Additional Annual TP Removal Achieved (lb/year as P)
17.3	16.0	0.00	16.0	18.3	11.9	6.2	11.9

Note: Existing Condition runoff volumes and associated mass loadings are based on OIA daily rainfall data.
Proposed BMP runoff volumes and associated mass loadings are based on NexRad hourly rainfall data.

Table 6-2 – Cost: BMP Alternative 1 -Sub-Basin BL035

FDOT INDEX NO or quoted	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED ESTIMATED TOTAL
CONCEPTUAL CONSTRUCTION COST					
440-1-50	Under Drain, Type V	340.0	ft	\$32.42	\$11,022.80
425-4	Modify existing drainage structure	7.0	each	\$111.68	\$781.76
quoted	FocalPoint BAM, or equivalent specifications (not accounting for space occupied by existing Storm sewer pipe)	47.2	CY	\$275.00	\$12,986.11
quoted	delivery of BAM	47.2	CY	\$17.00	\$802.78
120-6	estimated install of BAM (FDOT BOE embankment)	47.2	CY	\$8.61	\$406.58
120-1	excavation	47.2	CY	\$6.72	\$317.33
570- 1-2	sod	283.3	sqyd	\$2.72	\$770.67
	topsoil (use on site excavated soil)	NA		NA	NA
101-1	mobilization	1.0	LS	\$5,000.00	\$5,000.00
NA-001	EROSION CONTROL / POLLUTION PREVENTION	1.0	LS	\$1,000.00	\$1,000.00
CONST. SUB-TOTAL					\$33,088.03
ASSUMED CONTINGENCY				35%	\$11,580.81
CONST. TOTAL COST					\$44,668.84
20 YR MAINTENANCE COST					
quoted	BAM material	1	Events	\$12,986.11	\$12,986.11
quoted	BAM delivery	1	Events	\$802.78	\$802.78
120-6	Estimated install of B&G (FDOT BOE embankment)	1	Events	\$406.58	\$406.58
120-1	Labor of BAM removal (assume excavation)	340	CY	\$2.72	\$924.80
Experience Estimate	Disc to break up caked surface sediment and increase infiltration every 10 years, if needed.	1	Events	\$500.00	\$500.00
20 YEAR MAINTENANCE SUB-TOTAL					\$15,620
ASSUMED CONTINGENCY				35%	\$5,467.10
20 YEAR MAINTENANCE TOTAL					\$21,087
COSTS					
Total Cost (not considering inflation or interest)					\$65,756.21
Total Annual Cost (not considering inflation or interest)					\$3,287.81
NUTRIENT REMOVAL in terms of COSTS					
Nutrient	Additional pounds per year removed beyond existing conditions as N or P	Total pounds removed over 20 years	\$ per additional pound removed beyond existing conditions over 20 years (not considering the value of any other nutrient removed)		
TN	65.2	1,305	\$50		
TP	11.9	237	\$277		

Table 6-2

**Table 6-3 – BMP Alternative 2 for Sub-Basin BL010
TN & TP Removal**

Existing Annual Runoff Volume (ac-ft/ year)	Existing Annual TN loading of Runoff (lb/year as N)	Existing Annual TN removal (lb/year as N)	Existing Annual TN Discharge to Lake Bass (lb/year as N)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP: Annual TN removal (lb/year as N)	Proposed BMP: Annual TN Discharge to Lake Bass (lb/year as N)	Additional Annual TN Removal Achieved (lb/year as N)
11.3	55.7	0.0	55.7	12.3	90.1	112.4	90.1

Existing Annual Runoff Volume (ac-ft)/ year	Existing Annual TP loading of Runoff (lb/year as P)	Existing Annual TP removal (lb/year as P)	Existing Annual TP Discharge to Lake Bass (lb/year as P)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP Annual TP removal (lb/year as P)	Proposed BMP Annual TP Discharge to Lake Bass (lb/year as P)	Additional Annual TP Removal Achieved (lb/year as P)
11.3	9.2	0.0	9.2	12.3	7.0	3.4	7.0

Note: Existing Condition runoff volumes and associated mass loadings are based on OIA daily rainfall data.
Proposed BMP runoff volumes and associated mass loadings are based on NexRad hourly rainfall data.

**Table 6-4 – BMP Alternative 2 for Sub-Basin BL010
COST**

FDOT INDEX NO	ITEM DESCRIPTION	QUANTITY	UNIT	WORCS UNIT PRICE	EXTENDED ESTIMATED TOTAL
CONCEPTUAL CONST. COST					
440-1-50	Under Drain, Type V	45	ft	\$32.42	\$1,458.90
quoted	FocalPoint BAM, or equivalent specifications (2.5 ft deep)	37.5	CY	\$275.00	\$10,312.49
quoted	delivery of BAM	37.5	CY	\$17.00	\$637.50
120-6	estimated install of BAM (FDOT BOE embankment)	37.5	CY	\$8.61	\$322.87
570-1-2	sod	75.0	sqyd	\$2.72	\$204.00
	topsoil (use on site excavated soil)	NA		NA	NA
120-1	excavation	37.5	CY	\$6.72	\$252.00
101-1	mobilization	1	LS	\$5,000.00	\$5,000.00
	EROSION CONTROL / POLLUTION PREVENTION	1	LS	\$1,000.00	\$1,000.00
425-4	Modify existing drainage structure	2	each	\$111.68	\$223.36
CONST. SUB-TOTAL					\$19,411.12
ASSUMED CONTINGENCY				35%	\$6,793.89
CONST. TOTAL COST					\$26,205.02
20 YR MAINTENANCE COST					
quoted	BAM material	1	Events	\$10,312.49	\$10,312.49
quoted	BAM delivery	1	Events	\$637.50	\$637.50
assumption	BAM install	1	Events	\$322.87	\$322.87
120-1	labor of BAM removal (assume excavation)	1	Events	\$252.00	\$252.00
20 YEAR MAINTENANCE SUB-TOTAL					\$11,524.86
ASSUMED CONTINGENCY				35%	\$4,033.70
20 YEAR MAINTENANCE TOTAL					\$15,558.57
COSTS					
Total Cost (not accounting for inflation or depreciation)					\$41,763.58
Total Annual Cost over 20 year life span (not considering inflation or interest)					\$3,480.30
NUTRIENT REMOVAL in terms of COSTS					
Nutrient	Additional pounds per year removed beyond existing conditions as N or P	Additional Total pounds removed beyond existing conditions over 20 years	\$ per additional pound removed beyond existing conditions over 20 years (not considering the value of any other nutrient removed)		
TN	90.1	1,802	\$23		
TP	7.0	140	\$298		

Table 6-4

**Table 6-5 – BMP Alternative 3 for Sub-Basin BL020
TP Removal**

Stormwater Runoff							
Existing Condition: Annual Runoff Volume (ac-ft/ year)	Existing Condition: Annual TP loading of Runoff (lb/year as P)	TP concentration of Runoff (µg/L as P)	Existing Annual TP removal (lb/yr as P)	Existing Condition: Annual TP Discharge to Lake Bass (lb/yr as P)	Proposed BMP: Annual Runoff Volume treated (ac-ft/year)	Proposed BMP: Annual TP removal (lb/yr as P)	Proposed BMP Additional Annual TP removal (lb/yr as P)
44.6	60.7	500.0	0.2	60.5	40.7	31.0	30.8

Note: Existing Condition runoff volumes and associated mass loadings are based on OIA daily rainfall data.
Proposed BMP runoff volumes and associated mass loadings are based on NexRad hourly rainfall data.

Lake Water Recirculation				
Recirculation EBCT (minutes)	Recirculation flow rate (cfm)	Annual Recirculation volume (ac-ft/ year)	Lake Bass TP mean concentration (µg/L as P)	Proposed BMP Annual TP removal (lb/yr as P)
18.8	3.3	40.2	49.0	2.4

Note: Lake Water Recirculation Removal calculations assume that the system is constantly moving lake water through the filter the entire year. During storm events, the recirculation flow may need to be periodically interrupted since the system will need to treat stormwater runoff.

NEW Total TP removal (lb/yr as P)	Additional Annual TP Removal Achieved beyond the Existing Condition (lb/yr as P)
33.5	33.3

**Table 6-6 – BMP Alternative 3 for Sub-Basin BL020
TN Removal**

Stormwater Runoff							
Existing Condition: Annual Runoff Volume (ac-ft/ year)	Existing Condition: Annual TN loading of Runoff (lb/year as N)	TN concentration of Runoff (µg/L as N)	Existing Annual TN removal (lb/yr as N)	Existing Condition: Annual TN Discharge to Lake Bass (lb/yr as N)	Proposed BMP: Annual Runoff Volume treated (ac-ft/year)	Proposed BMP: Annual TN removal (lb/year as N)	Proposed BMP Additional Annual TN removal (lb/yr as N)
44.6	206.4	1,700.2	0.6	205.8	40.7	100.3	99.7

Note: Existing Condition runoff volumes and associated mass loadings are based on OIA daily rainfall data.
Proposed BMP runoff volumes and associated mass loadings are based on NexRad hourly rainfall data.

Lake Water Recirculation				
Recirculation EBCT (minutes)	Recirculation flow rate (cfm)	Annual Recirculation volume (ac-ft/ year)	Lake Bass TN mean concentration (µg/L as N)	Proposed BMP Annual TN removal (lb/yr as N)
18.8	3.3	40.2	1,060.0	52.2

Note: Lake Water Recirculation Removal calculations assume that the system is constantly moving lake water through the filter the entire year. During storm events, the recirculation flow may need to be periodically interrupted since the system will need to treat stormwater runoff.

NEW Total TN removal (lb/yr as N)	Additional Annual TN Removal Achieved beyond the Existing Condition (lb/yr as N)
152.4	151.9

**Table 6-7 – BMP Alternative 3 for Sub-Basin BL020
COST**

FDOT INDEX NO	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED ESTIMATED TOTAL
CONCEPTUAL CONST. COST					
previous project quote	BAM Upflow filter - material	25	sqft	\$500.00	\$12,500.00
previous project quote	Install of Upflow filter (install)	25	sqft	\$500.00	\$12,500.00
previous project quote	fiber glass flow guide wall -material	244	linear ft	\$100.00	\$24,400.00
previous project quote	fiber glass flow guide wall - install	244	linear ft	\$100.00	\$24,400.00
quoted	floating skimmer	2	EA	\$1,987.00	\$3,974.00
NA	Install of skimmer	2	EA	\$1,987.00	\$3,974.00
430-963-1	piping (PVC Pipe for Back of Sidewalk Drainage)	345	linear ft	\$32.39	\$11,174.55
quoted	water pump (10-year life)	1	EA	\$2,000.00	\$2,000.00
quoted	solar panels	1	EA	\$722.64	\$722.64
NA	solar panel install (assume cost equal to panels)	1	EA	\$722.64	\$722.64
quoted	batteries	4	EA	\$239.00	\$956.00
NA-001	EROSION CONTROL / POLLUTION PREVENTION	1	LS	\$1,000.00	\$1,000.00
570- 1-2	sod	25.0	sqyd	\$2.72	\$68.00
101-1	mobilization	1	LS	\$5,000.00	\$5,000.00
CONST. SUB-TOTAL					\$103,391.83
ASSUMED CONTINGENCY				35%	\$36,187.14
CONSTRUCTION. TOTAL COST					\$139,578.97
20 YR MAINTENANCE COST					
assumption	# of times BAM will need replacement since it will be running constantly (assumption).	3	BAM replacement	-	-
quoted price for B&G ETC3	B&G OTE media, or equivalent specifications (2.5 ft deep)	63	CY/replacement	\$275.00	\$51,562.50
quoted	delivery of B&G	63	CY/replacement	\$17.00	\$3,187.50
120-6	estimated install of B&G (FDOT BOE embankment)	63	CY/replacement	\$8.61	\$1,614.38
570- 1-2	sod	25	sqyd/replacement	\$2.72	\$204.00
120-1	excavation	63	CY/replacement	\$6.72	\$1,260.00
quoted	batteries every 3 years	6	battery change events	\$956.00	\$5,736.00
quoted	water pump (10-year life)	1	EA	\$2,000.00	\$2,000.00
20 YEAR MAINTENANCE SUB-TOTAL					\$65,564.38
ASSUMED CONTINGENCY				35%	\$22,947.53
20 YEAR MAINTENANCE TOTAL					\$88,511.91
TOTAL COSTS					
Total Cost (not accounting for inflation or depreciation)					\$228,090.88
Total Annual Cost over 20 year life span (not considering inflation or interest)					\$11,404.54
NUTRIENT REMOVAL in terms of COSTS					
Nutrient	Additional pounds per year removed beyond existing conditions as N or P	Additional Total pounds removed beyond existing conditions over 20 years	\$ per additional pound removed beyond existing conditions over 20 years (not considering the value of any other nutrient removed)		
TN	151.85	3,036.91	\$75.11		
TP	33.25	665.01	\$342.49		

Table 6-7

**Table 6-8 – BMP Alternative 4 for Sub-Basin BL025
TN & TP Removal**

Existing Annual Runoff Volume (ac-ft/ year)	Existing Annual TN loading of Runoff (lb/year as N)	Existing Annual TN removal (lb/year as N)	Existing Annual TN Discharge to Lake Bass (lb/year as N)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP: Annual TN removal (lb/year as N)	Proposed BMP: Annual TN Discharge to Lake Bass (lb/year as N)	Additional Annual TN Removal Achieved (lb/year as N)
49.9	230.2	34.2	196.0	56.3	194.9	65.0	160.7

Existing Annual Runoff Volume (ac-ft)/ year	Existing Annual TP loading of Runoff (lb/year as P)	Existing Annual TP removal (lb/year as P)	Existing Annual TP Discharge to Lake Bass (lb/year as P)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP Annual TP removal (lb/year as P)	Proposed BMP Annual TP Discharge to Lake Bass (lb/year as P)	Additional Annual TP Removal Achieved (lb/year as P)
49.9	37.7	7.4	30.2	56.3	40.4	2.1	32.9

Note: Existing Condition runoff volumes and associated mass loadings are based on OIA daily rainfall data.
Proposed BMP runoff volumes and associated mass loadings are based on NexRad hourly rainfall data.

Table 6-9 – BMP Alternative 4 for Sub-Basin BL025
COST

FDOT INDEX NO	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED ESTIMATED TOTAL
CONCEPTUAL CONST. COST					
440-1-50	Under Drain, Type V (use existing underdrain)	NA	ft	\$32.42	NA
120-1	excavation	2,785.33	CY	\$6.72	\$18,717.42
quoted	CTS B&G MEDIA (2 ft deep)	2,785.33	CY	\$240.00	\$668,479.33
quoted	delivery of B&G	2,785.33	CY	\$17.00	\$47,350.62
120-6	estimated install of B&G (FDOT BOE embankment)	2,785.33	CY	\$8.61	\$23,981.70
570- 1-2	sod	10,058	sqyd	\$2.72	\$27,358.89
	topsoil (use on site excavated soil)	NA		NA	NA
101-1	mobilization	1	LS	\$5,000.00	\$5,000.00
NA-001	EROSION CONTROL / POLLUTION PREVENTION	1	LS	\$1,000.00	\$1,000.00
CONST. SUB-TOTAL					\$791,887.96
ASSUMED CONTINGENCY				35%	\$277,160.79
CONSTRUCTION. TOTAL COST					\$1,069,048.75
20 YR MAINTENANCE COST					
	Disc to break restore infiltration every 10 years, if needed. Unit price provided by Dr. Wanielista from past projects in Marion County, FL	2.1	Acre	\$250.00	\$519.54
20 YEAR MAINTENANCE SUB-TOTAL					\$519.54
ASSUMED CONTINGENCY				35%	\$181.84
20 YEAR MAINTENANCE TOTAL					\$701.38
TOTAL COSTS					
Total Cost (not accounting for inflation or depreciation)					\$1,069,750.13
Total Annual Cost over 20 year life span (not considering inflation or interest)					\$53,487.51
NUTRIENT REMOVAL in terms of COSTS					
Nutrient	Additional pounds per year removed beyond existing conditions as N or P	Additional Total pounds removed beyond existing conditions over 20 years	\$ per additional pound removed beyond existing conditions over 20 years (not considering the value of any other nutrient removed)		
TN	160.71	3,214.22	\$332.82		
TP	32.93	658.55	\$1,624.40		

Table 6-9

**Table 6-10 – BMP Alternative 5 for Sub-Basin BL005
TN & TP Removal**

Existing Annual Runoff Volume (ac-ft/ year)	Existing Annual TN loading of Runoff (lb/year as N)	Existing Annual TN removal (lb/year as N)	Existing Annual TN Discharge to Lake Bass (lb/year as N)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP: Annual TN removal (lb/year as N)	Proposed BMP: Annual TN Discharge to Lake Bass (lb/year as N)	Additional Annual TN Removal Achieved (lb/year as N)
23.3	608.1	0	608.1	26.3	130.8	477.4	130.8

Existing Annual Runoff Volume (ac-ft)/ year	Existing Annual TP loading of Runoff (lb/year as P)	Existing Annual TP removal (lb/year as P)	Existing Annual TP Discharge to Lake Bass (lb/year as P)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP Annual TP removal (lb/year as P)	Proposed BMP Annual TP Discharge to Lake Bass (lb/year as P)	Additional Annual TP Removal Achieved (lb/year as P)
23.3	52.6	0	52.6	26.3	9.2	43.4	9.2

Note: Existing Condition runoff volumes and associated mass loadings are based on OIA daily rainfall data.
Proposed BMP runoff volumes and associated mass loadings are based on NexRad hourly rainfall data.

**Table 6-11 – BMP Alternative 5 for Sub-Basin BL005
COST**

FDOT INDEX NO	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED ESTIMATED TOTAL
CONCEPTUAL CONST. COST					
N/A-001	NSBB 5X10.5; NSBB	1	EA	\$55,500.00	\$55,500.00
N/A-002	Install of Baffle box	1	EA	\$88,800.00	\$88,800.00
101-1	mobilization	1	LS	\$5,000.00	\$5,000.00
102-1	maintenance of traffic	2	day	\$491.23	\$982.46
NA-001	EROSION CONTROL / POLLUTION PREVENTION	1	LS	\$1,000.00	\$1,000.00
CONST. SUB-TOTAL					\$151,282.46
ASSUMED CONTINGENCY				35%	\$52,948.86
CONSTRUCTION. TOTAL COST					\$204,231.32
20 YR MAINTENANCE COST					
based on experience	Vac truck for baffle box	20	year	\$500.00	\$10,000.00
quoted	Inspection & Service per year	20	event (1 event per year)	\$900.00	\$18,000.00
quoted	Screen Maintenance with Inspection Service	100	event (5 events per year)	\$1,200.00	\$120,000.00
quoted	Chamber Maintenance	40	event (2 events per year)	\$3,000.00	\$120,000.00
20 YEAR MAINTENANCE SUB-TOTAL					\$268,000.00
ASSUMED CONTINGENCY				35%	\$93,800.00
20 YEAR MAINTENANCE TOTAL					\$361,800.00
TOTAL COSTS					
Total Cost (not accounting for inflation or depreciation)					\$566,031.32
Total Annual Cost over 20 year life span (not considering inflation or interest)					\$28,301.57
NUTRIENT REMOVAL in terms of COSTS					
Nutrient	Additional pounds per year removed beyond existing conditions as N or P	Additional Total pounds removed beyond existing conditions over 20 years	\$ per additional pound removed beyond existing conditions over 20 years (not considering the value of any other nutrient removed)		
TN	130.77	2,615.35	\$216.43		
TP	9.20	183.98	\$3,076.57		

Table 6-11

**Table 6-12 – BMP Alternative 6 for Sub-Basin BL015
TN & TP Removal**

Existing Annual Runoff Volume (ac-ft/ year)	Existing Annual TN loading of Runoff (lb/year as N)	Existing Annual TN removal (lb/year as N)	Existing Annual TN Discharge to Lake Bass (lb/year as N)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP: Annual TN removal (lb/year as N)	Proposed BMP: Annual TN Discharge to Lake Bass (lb/year as N)	Additional Annual TN Removal Achieved (lb/year as N)
19.2	89.2	0	89.2	12.7	26.6	35.4	26.6

Existing Annual Runoff Volume (ac-ft)/ year	Existing Annual TP loading of Runoff (lb/year as P)	Existing Annual TP removal (lb/year as P)	Existing Annual TP Discharge to Lake Bass (lb/year as P)	Proposed BMP: Annual Runoff Volume Treated (ac-ft/year)	Proposed BMP Annual TP removal (lb/year as P)	Proposed BMP Annual TP Discharge to Lake Bass (lb/year as P)	Additional Annual TP Removal Achieved (lb/year as P)
19.2	15.0	0	15.0	12.7	4.5	3.5	4.5

Note: Existing Condition runoff volumes and associated mass loadings are based on OIA daily rainfall data.
Proposed BMP runoff volumes and associated nutrient mass calculations are based on NexRad hourly rainfall data.

Table 6-13 – BMP Alternative 6 for Sub-Basin BL015
COST

FDOT INDEX NO	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	EXTENDED ESTIMATED TOTAL
CONCEPTUAL CONST. COST					
440-1-50	Under Drain, Type V	70	ft	\$32.42	\$2,269.40
quoted	FocalPoint BAM, or equivalent specifications (2.5 ft deep)	58.33	CY	\$275.00	\$16,041.65
quoted	delivery of BAM	58.33	CY	\$17.00	\$991.67
120-6	estimated install of BAM (FDOT BOE embankment)	58.33	CY	\$8.61	\$502.25
570- 1-2	sod	116.67	sqyd	\$2.72	\$317.33
	topsoil (use on site excavated soil)	NA		NA	NA
120-1	excavation	58.33	CY	\$6.72	\$392.00
101-1	mobilization	1	LS	\$5,000.00	\$5,000.00
NA-001	EROSION CONTROL / POLLUTION PREVENTION	1	LS	\$1,000.00	\$1,000.00
425-4	Modify existing drainage structure	2	each	\$111.68	\$223.36
CONST. SUB-TOTAL					\$26,737.66
ASSUMED CONTINGENCY				35%	\$9,358.18
CONSTRUCTION. TOTAL COST					\$36,095.84
20 YR MAINTENANCE COST					
quoted	BAM material	1	Events	\$16,041.65	\$16,041.65
quoted	BAM delivery	1	Events	\$991.67	\$991.67
assumption	BAM install	1	Events	\$502.25	\$502.25
120-1	labor of BAM removal (assume excavation)	1	Events	\$392.00	\$392.00
20 YEAR MAINTENANCE SUB-TOTAL					\$17,927.57
ASSUMED CONTINGENCY				35%	\$6,274.65
20 YEAR MAINTENANCE TOTAL					\$24,202.21
TOTAL COSTS					
Total Cost (not accounting for inflation or depreciation)					\$60,298.05
Total Annual Cost over 20 year life span (not considering inflation or interest)					\$3,014.90
NUTRIENT REMOVAL in terms of COSTS					
Nutrient	Additional pounds per year removed beyond existing conditions as N or P	Additional Total pounds removed beyond existing conditions over 20 years	\$ per additional pound removed beyond existing conditions over 20 years (not considering the value of any other nutrient removed)		
TN	26.61	532.18	\$113.30		
TP	4.47	89.37	\$674.68		

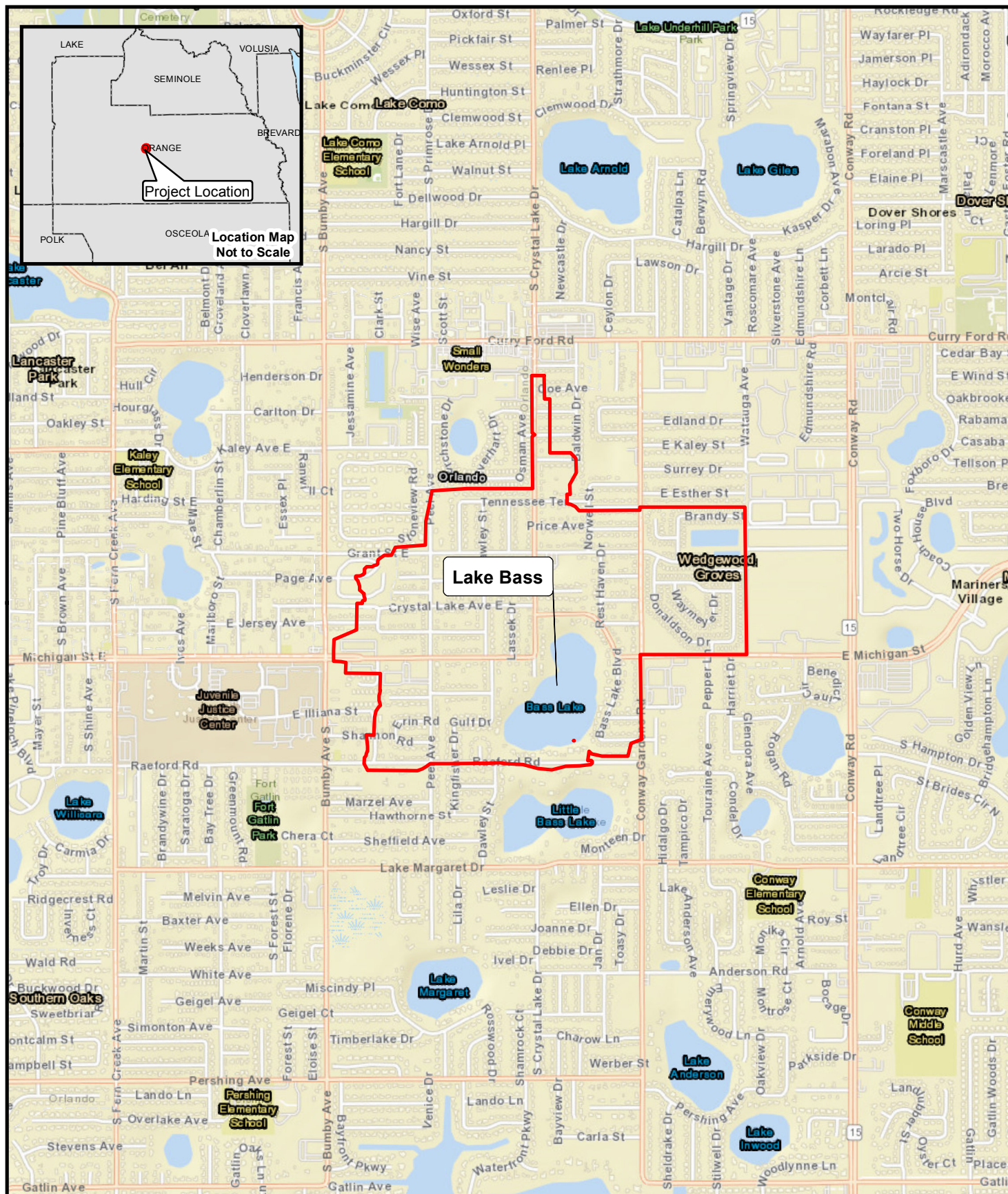
Table 6-13

Table 6-14 - Summary Cost Benefit for Conceptual Alternatives

Alternative	BMP Name	20-year TN Reduction (lbs)	20-year TP Reduction (lbs)	20-Year Cost (\$)	Cost (\$) per lb TN Removed	Cost (\$) per lb TP Removed
Alternative 1	BL035 Bioretention	1,305	237	\$65,756	\$50	\$277
Alternative 2	BL010 Bioretention	1,802	140	\$41,764	\$23	\$298
Alternative 3	BL020 BAM Upflow	3,037	665	\$228,091	\$75	\$342
Alternative 4	BL025 Bioretention	3,214	659	\$1,069,750	\$333	\$1,624
Alternative 5	BL005 NSBB	2,615	184	\$566,031	\$216	\$3,077
Alternative 6	BL015 Bioretention	532	89	\$60,298	\$113	\$675
Alternative 7	Sediment Nutrient Inactivation	---	330*		---	\$389
Alternative 8	Public Education	1,550	230	\$40,000	\$26	\$174
Alternative 9	Natural Attenuation	---	---	---	---	---

*Long-term reduction based on average of high and low dose range and available phosphorus-binding capacity of Phoslock® applied

FIGURES



Notes:

- 1- Project No.:600478x22
- 2- Data Source - ESRI StreetMap
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 11/17/20
Created By: CL
Checked By: SB



Explanation of Features

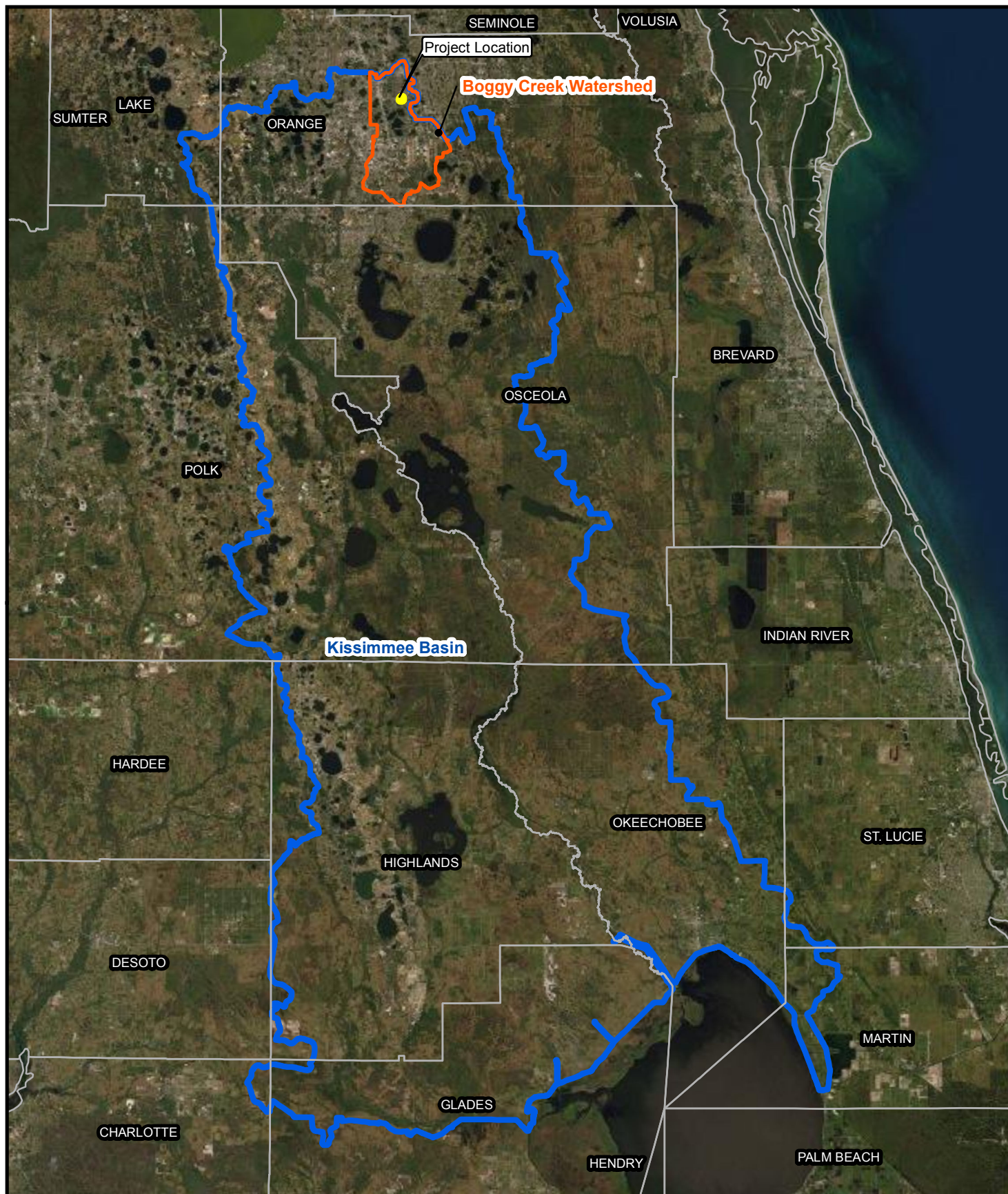


Lake Bass Basin

0 1,300
Feet

Figure 1-1
Location Map
Lake Bass
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x22
 - 2- Data Source - ESRI Imagery, SFWMD
 - 3- This map is intended to be used for planning purposes only. It is not a survey.
- Date: 11/17/20
 Created By: CL
 Checked By: SB



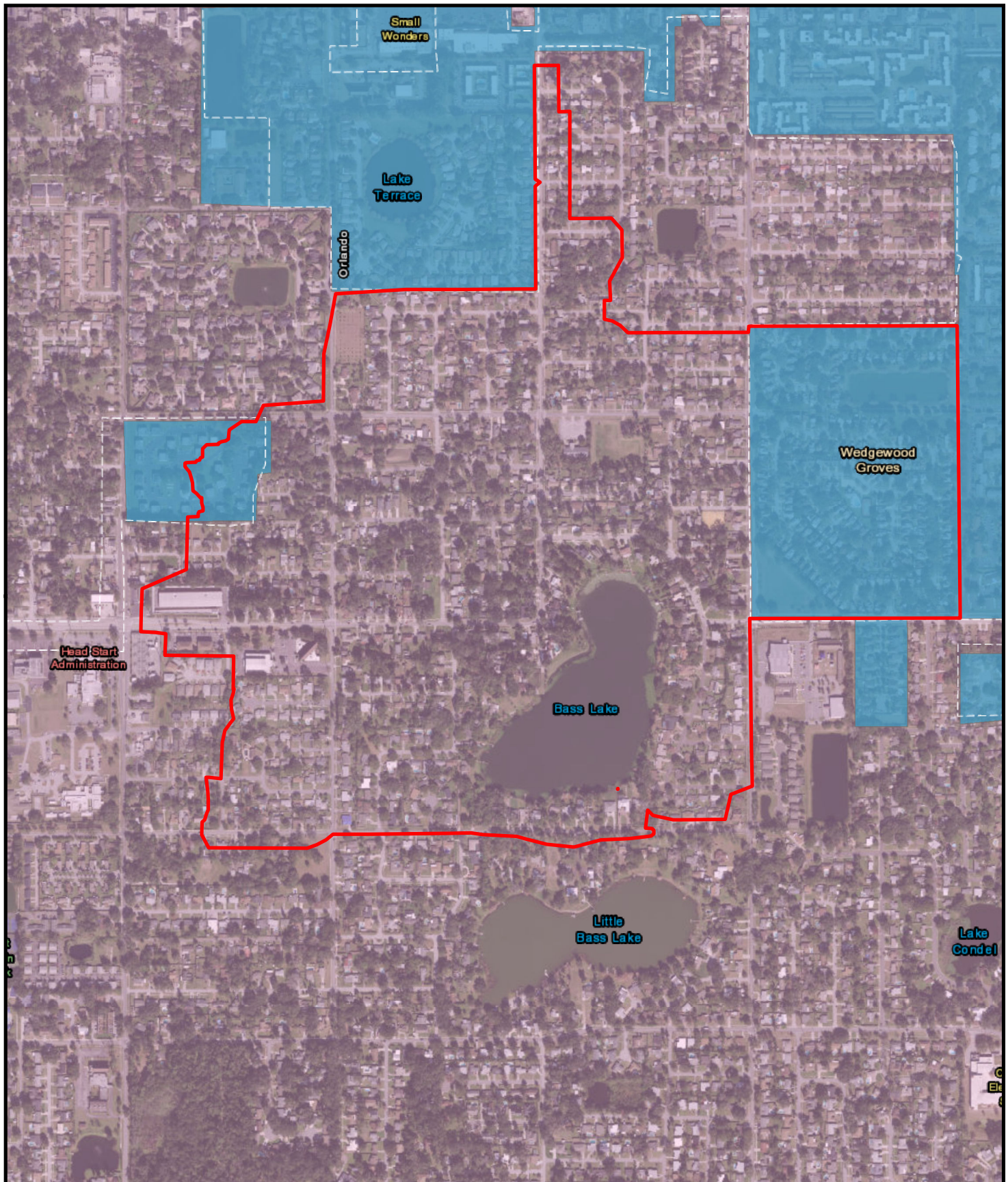
Explanation of Features

- Lake Bass Boundary
- Bogy Creek Watershed
- Kissimmee Basin

0 12
 Miles

Figure 1-2
Kissimmee Basin
Orange County, Florida

wood.



Notes:

- 1- Project No.: 600478x22
- 2- Data Source - ESRI Imagery
SFWMD, Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 11/17/20
Created By: CL
Checked By: SB



Explanation of Features

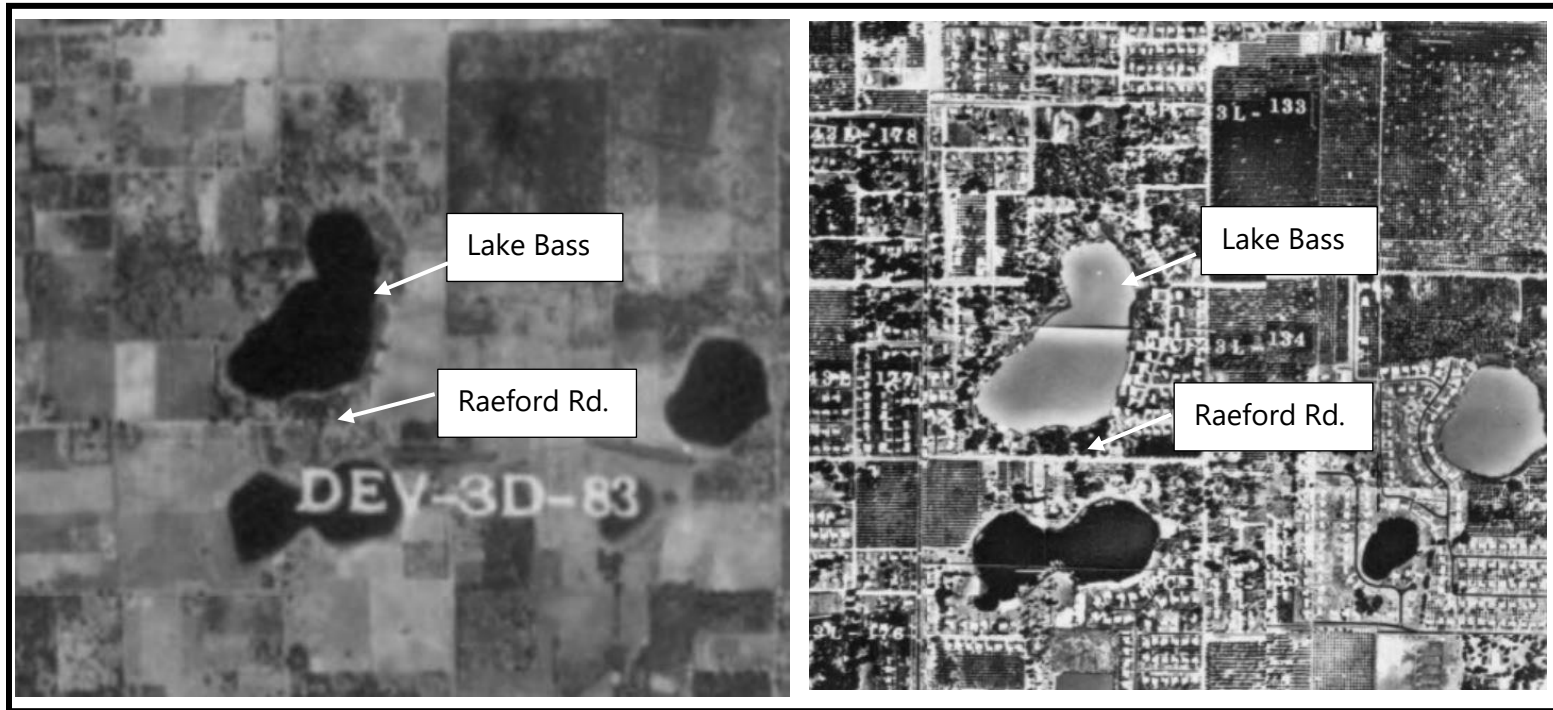
- | | |
|---|--|
| Lake Bass Basin | Orlando City Limits |
| Unincorporated Orange County | |

0 680
Feet

Figure 1-3
Lake Bass Basin
Jurisdictional Map
Orange County, Florida

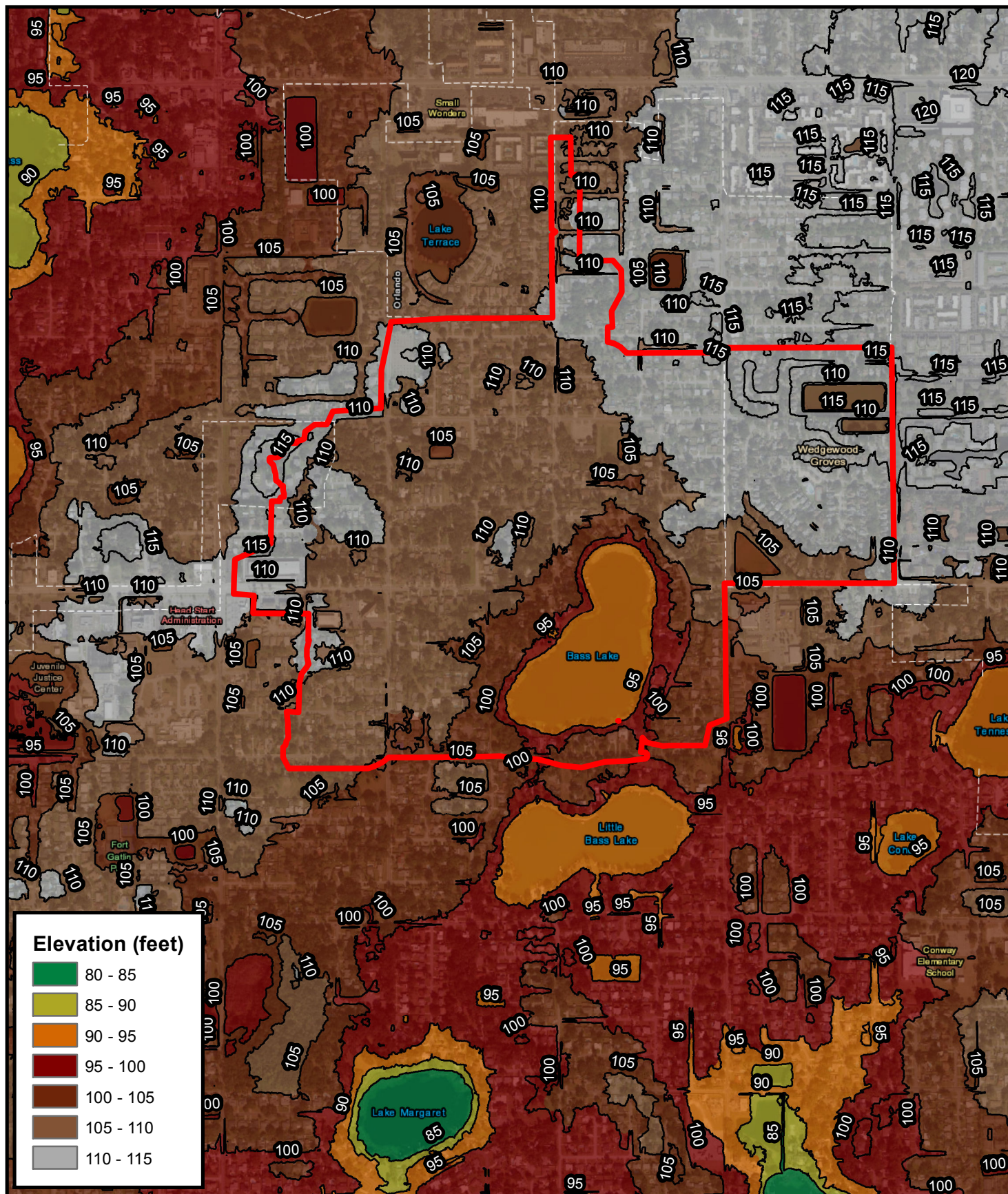
wood.

Figure 2-1 - Aerial Photographs of Lake Bass from 1947 and 1963



Source: 1947, University of Florida Digital Collections

1963, University of Florida Digital Collections



Notes:

- 1- Project No.: 600478x22
 - 2- Data Source - ESRI Imagery, SJRWMD, Wood, LIDAR NAVD88
 - 3- This map is intended to be used for planning purposes only. It is not a survey.
- Date: 11/17/20
Created By: CL
Checked By: SB



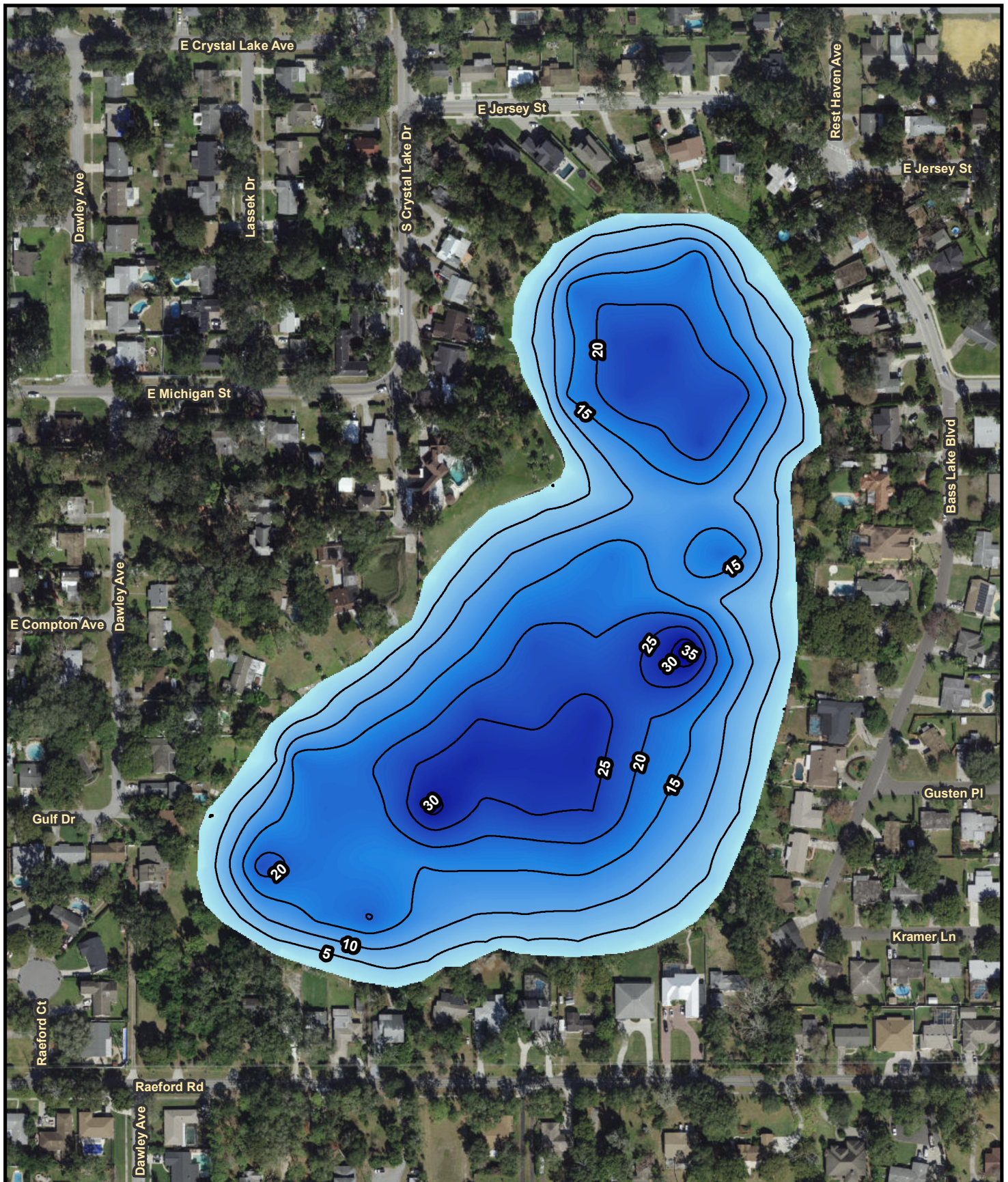
Explanation of Features

- Lake Bass Basin
- 5ft Contour Interval

0 900
Feet

Figure 2-2
Digital Elevation Model (DEM)
Lake Bass
Orange County, Florida

wood.



Notes:

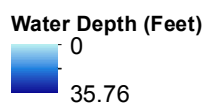
- 1- Project No.: 600478x22
- 2- Data Source - Wood BFA, ESRI
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 04/19/2021
Revised: AB
Checked By: LL



Explanation of Features

— 5ft Contours



Top of Water : 92.42 ft

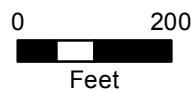
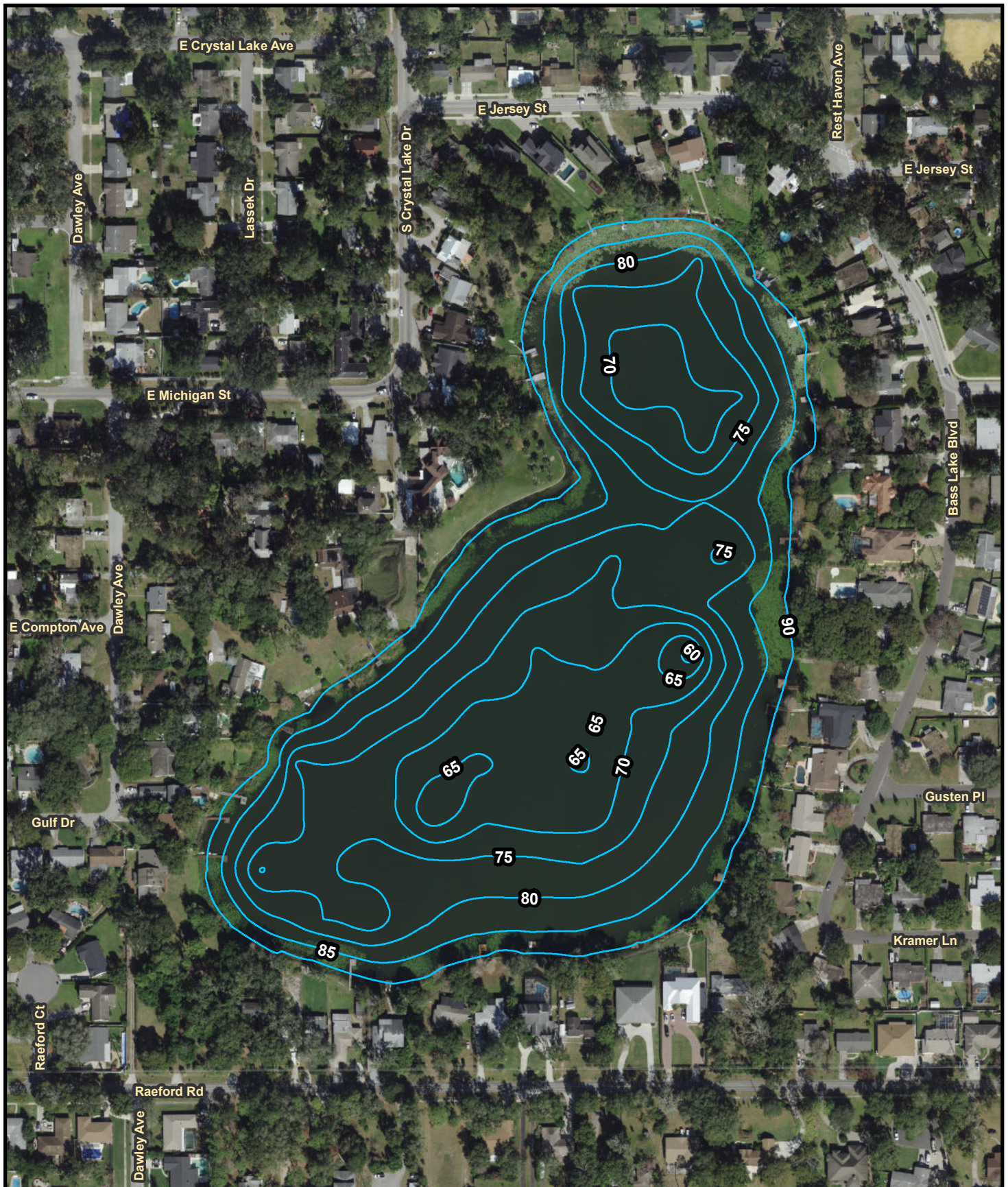


Figure 2-3
Lake Bass
Water Depth Contours
Orange County, Florida

wood.



Notes:

- 1- Project No.: 600478x22
- 2- Data Source - Wood BFA, ESRI
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 04/19/2021
 Revised: AB
 Checked By: LL



Explanation of Features

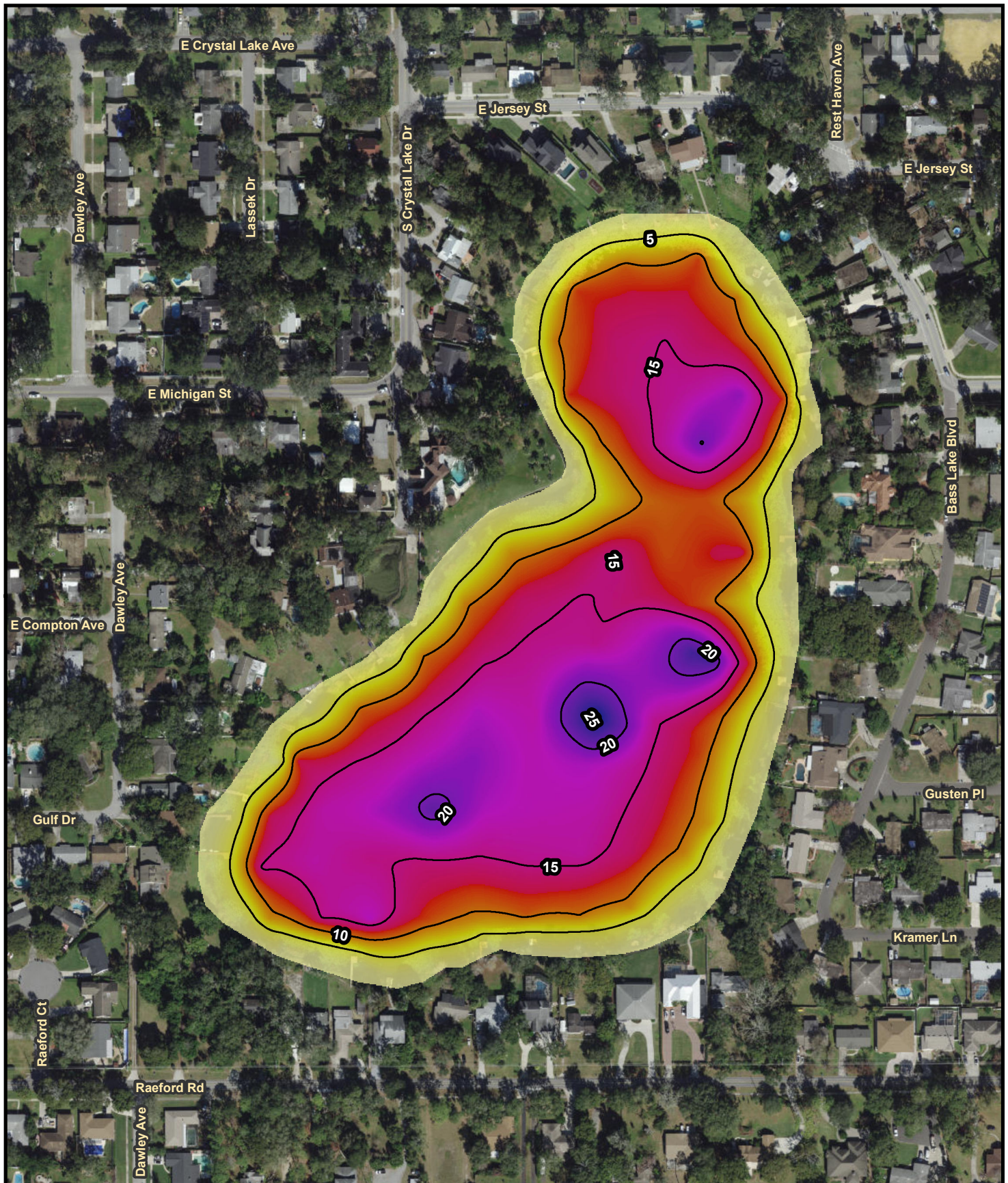
— 5 ft Contours Top of Water : 92.42 ft

0 200

Feet

Figure 2-4
Lake Bass Bathymetric Elevation
Orange County, Florida

wood.



Notes:

- 1- Project No.: 600478x22
- 2- Data Source - Wood BFA, ESRI
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 04/19/2021
Revised: AB
Checked By: LL



Explanation of Features Thickness (Feet)



High : 26.25

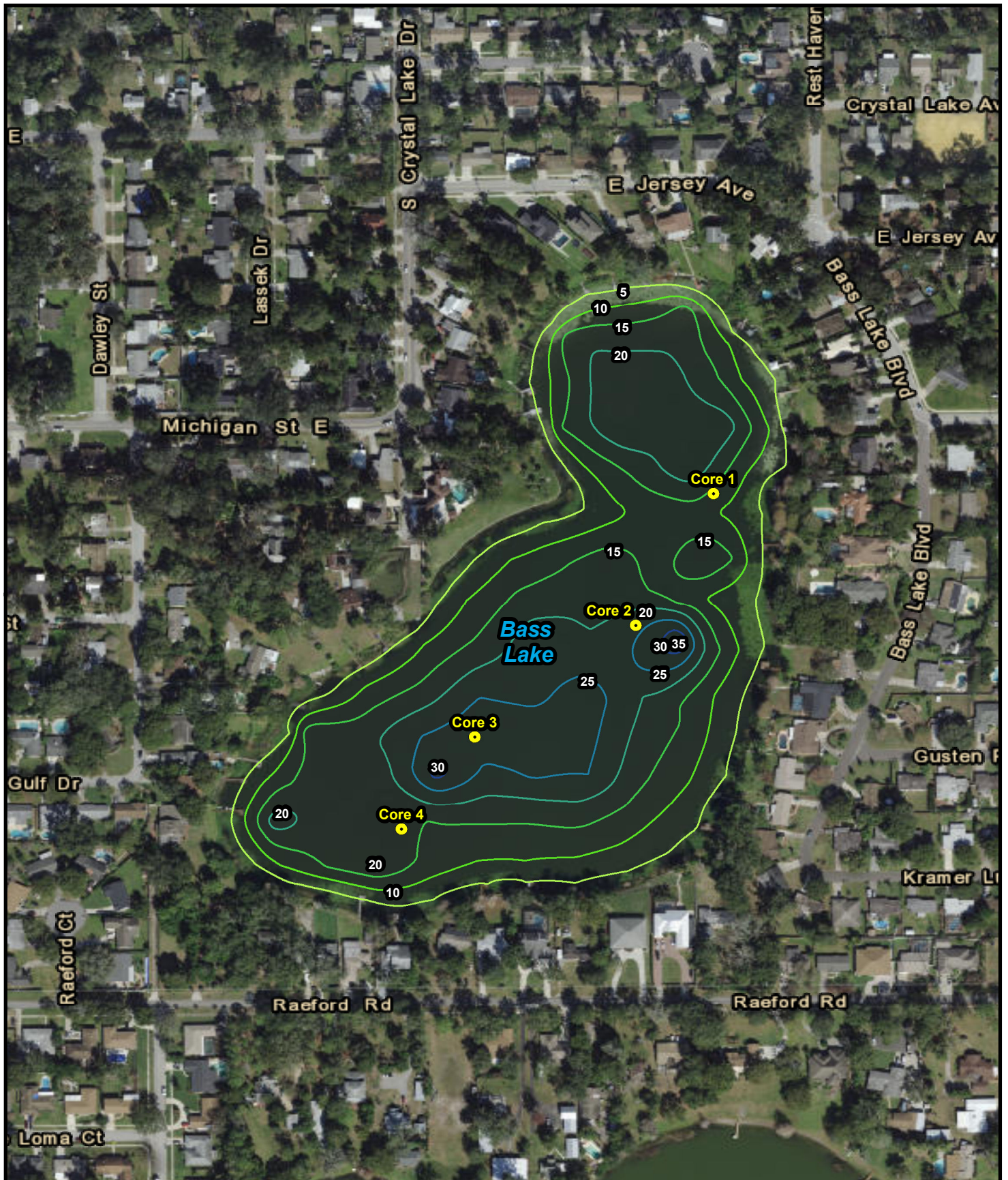
Low : 0

— 5ft Contours



Figure 2-5
Lake Bass
Sediment Thickness
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x16
- 2- Data Source - ESRI 2019 Imagery Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 05/21/2021
Revised/AB
Checked By:LL



Explanation of Features

Water Depth Contours (ft)

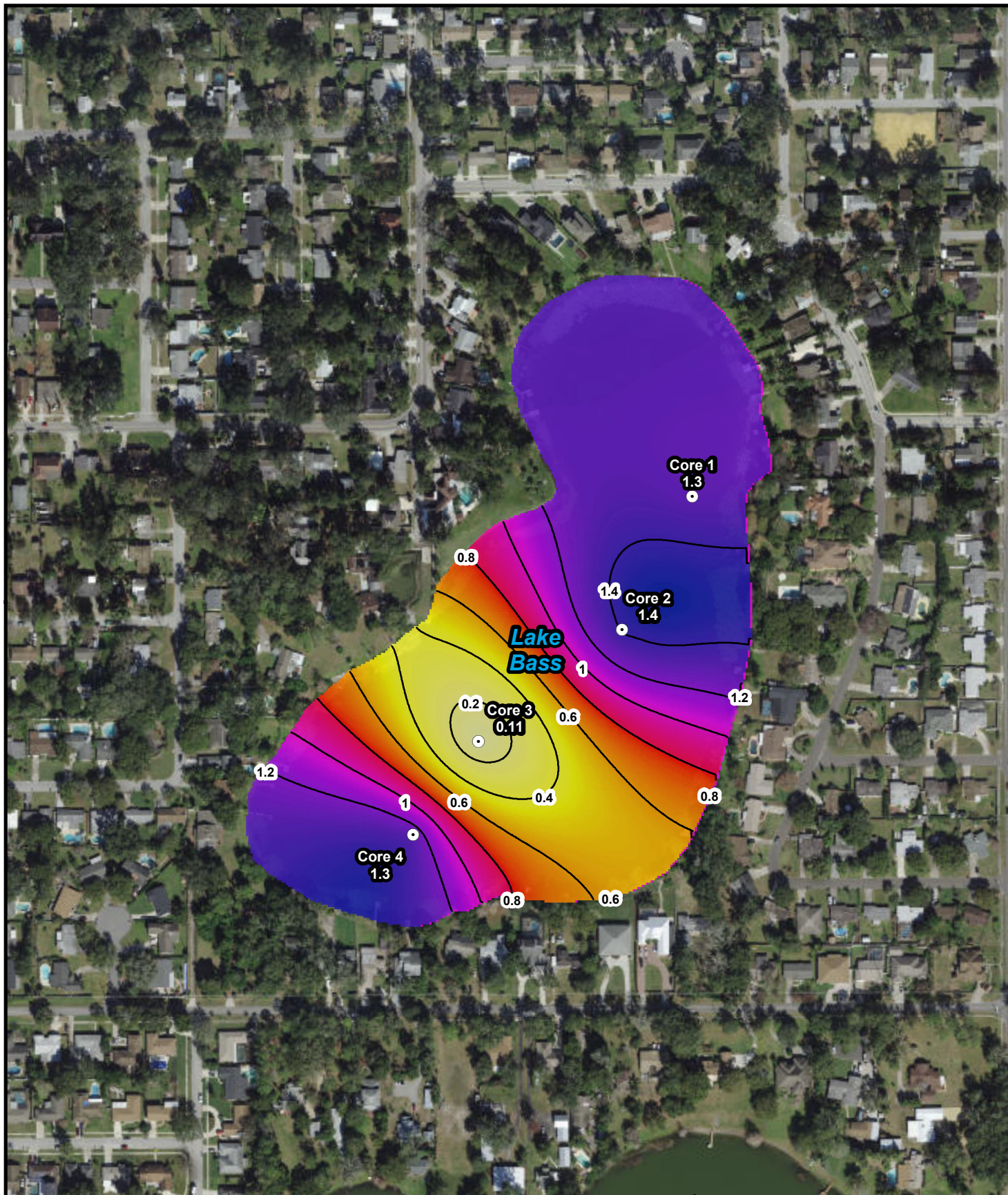
- | | |
|---|--|
| — 5 | — 25 |
| — 10 | — 30 |
| — 15 | — 35 |

- Sediment Sample Location

0 250
Feet

Figure 2-6
Sediment Core Sample Locations
Lake Bass
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x16
- 2- Data Source -
ESRI 2019 Imagery
Wood
- 3- This map is intended to be
used for planning purposes
only. It is not a survey.

Date: 05/21/2021
Revised/AB
Checked By:LL



Explanation of Features

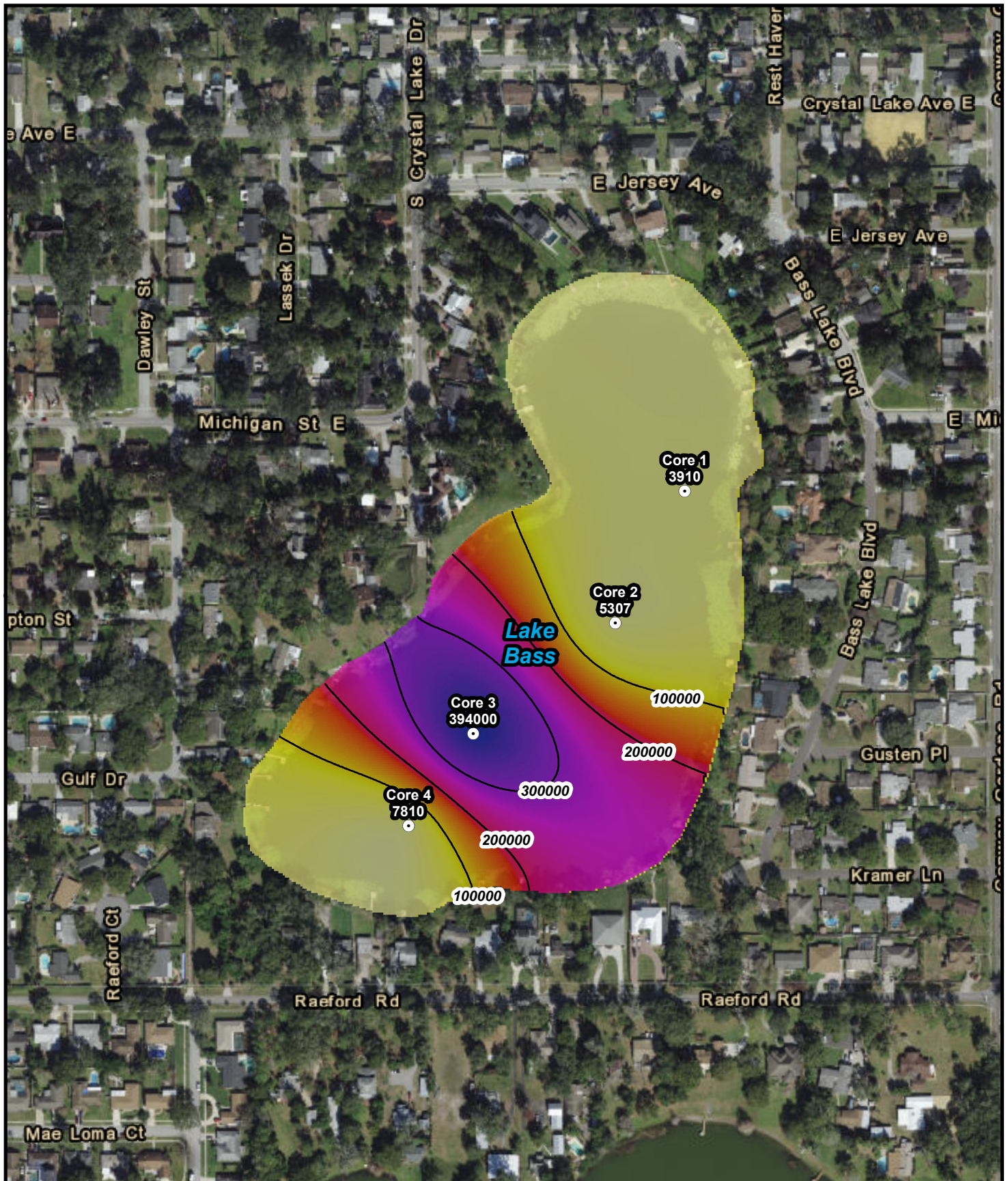
Bulk Density g/cc
High : 1.4
Low : 0.11

- Sediment Sample Location
- Bulk Density Contours

0 250
Feet

Figure 2-7
Lake Bass
Bulk Density (g/cc)
Orange County, Florida

wood.



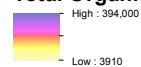
Notes:

- 1- Project No.:600478x16
- 2- Data Source - ESRI 2019 Imagery Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 05/21/2021
Revised/AB
Checked By:LL

Explanation of Features

Total Organic Carbon (mg/kg Dry)



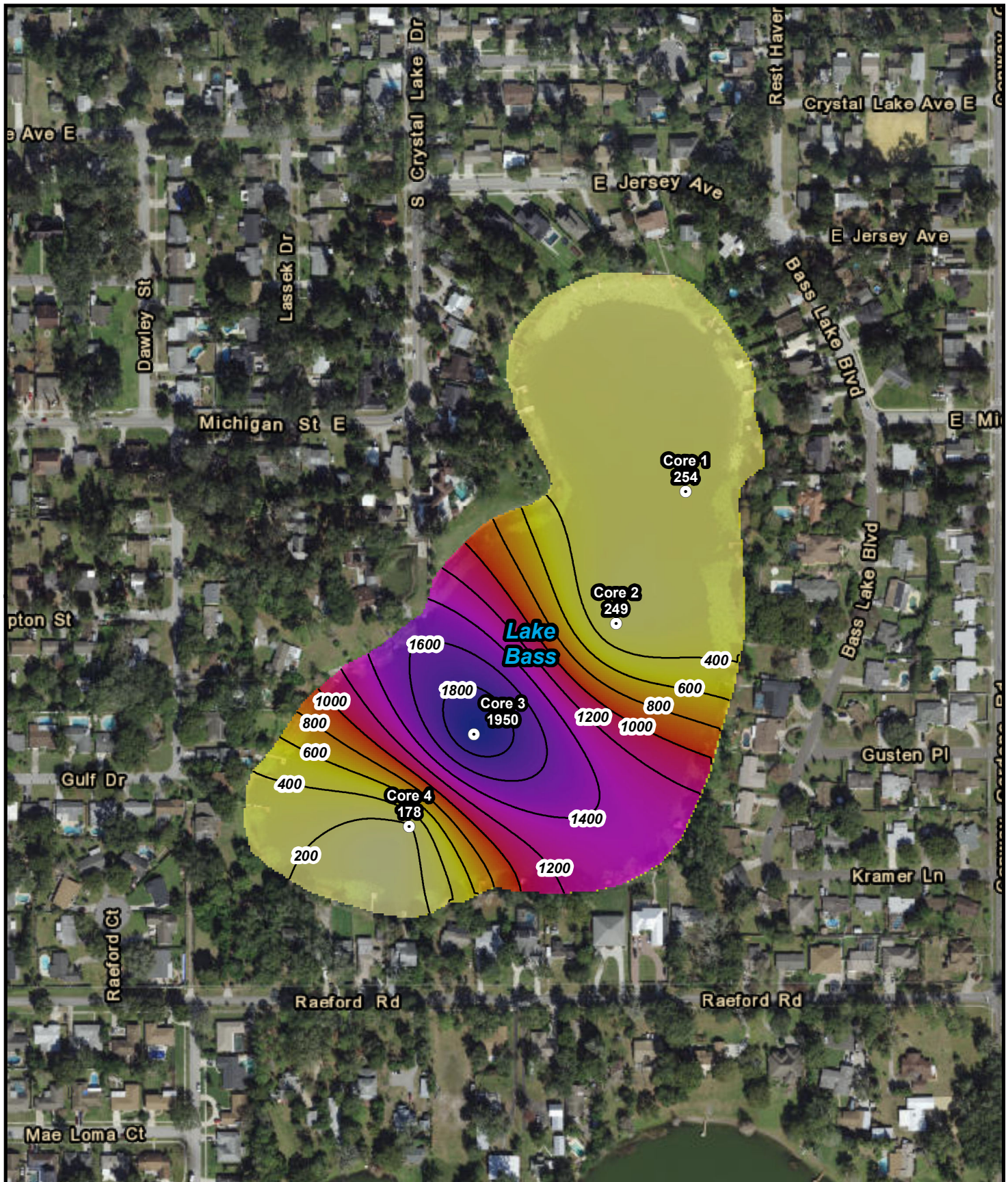
○ Sediment Sample Location

— Total Organic Carbon Contours



Figure 2-8
Total Organic Carbon (mg/kg Dry)
Lake Bass
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x16
- 2- Data Source -
ESRI 2019 Imagery
Wood
- 3- This map is intended to be
used for planning purposes
only. It is not a survey.

Date: 05/21/2021
Revised/AB
Checked By:LL



Explanation of Features

Total Phosphorus (mg/kg Dry)

 High : 1950
 Low : 178

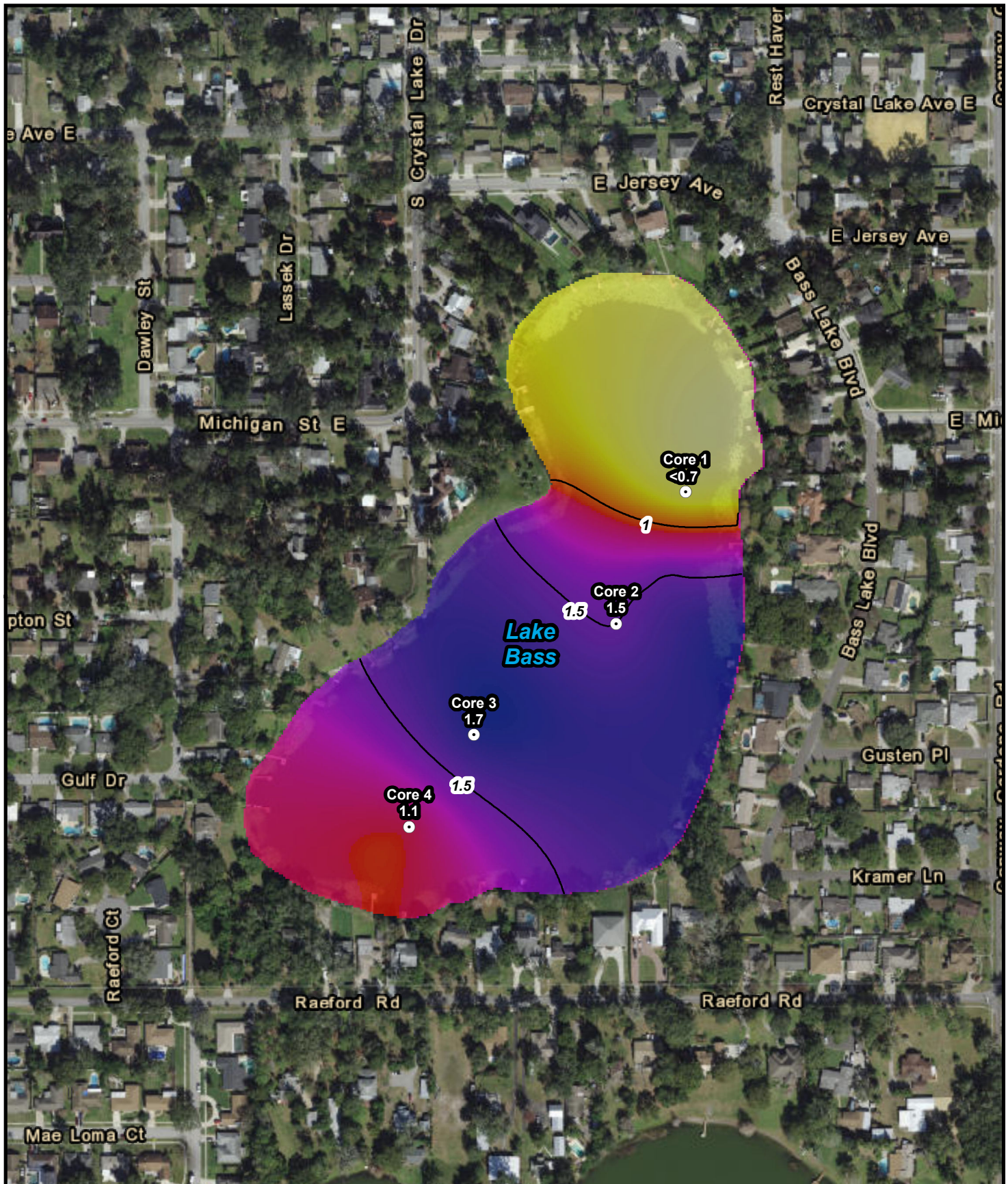
-  Sediment Sample Location
-  Total Phosphorus Contours

0 250

 Feet

Figure 2-9
Total Phosphorus (mg/kg Dry)
Lake Bass
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x16
- 2- Data Source - ESRI 2019 Imagery Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 05/21/2021
Revised/AB
Checked By:LL

Explanation of Features

Labile (mg/kg Dry)

High : 1.7



Low : <0.7

○ Sediment Sample Location

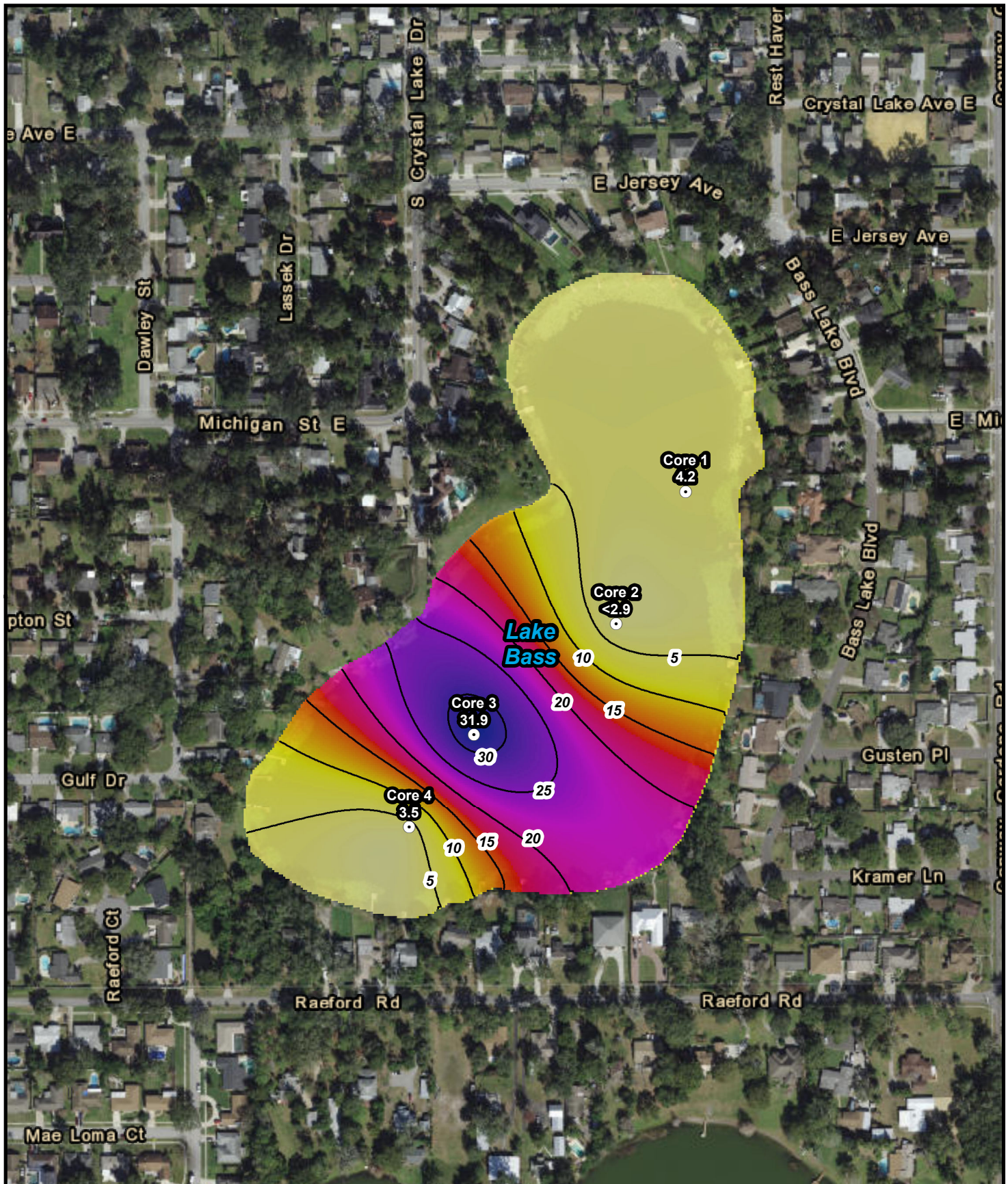
— Labile Contours

0 250

Feet

Figure 2-10
Lake Bass
Labile P (mg/kg Dry)
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x16
- 2- Data Source - ESRI 2019 Imagery Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

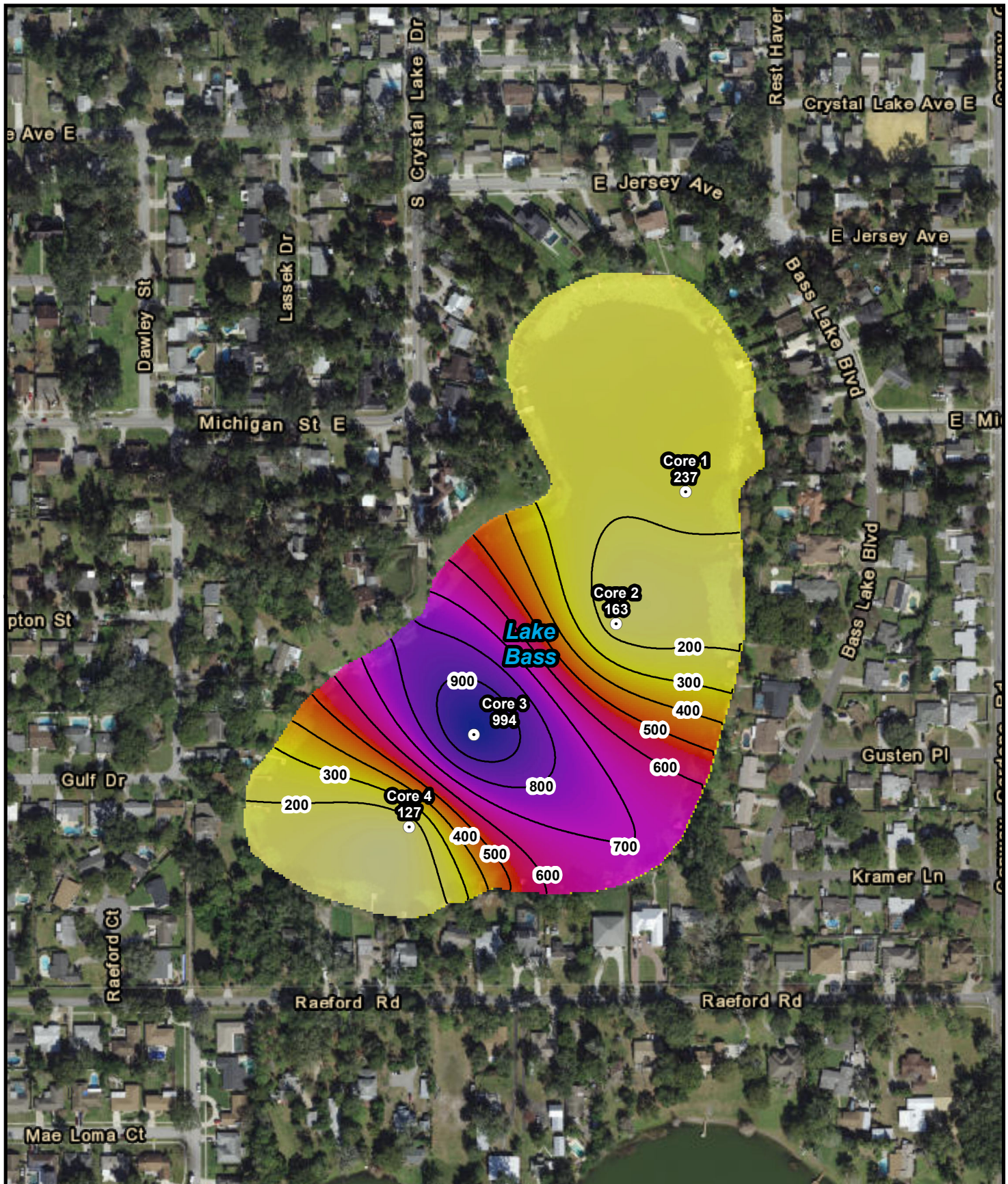
Date: 05/21/2021
Revised/AB
Checked By:LL

Explanation of Features



Figure 2-11
Reductant-Soluble P (mg/kg Dry)
Lake Bass
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x16
- 2- Data Source - ESRI 2019 Imagery Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 05/21/2021
Revised: AB
Checked By: LL

Explanation of Features



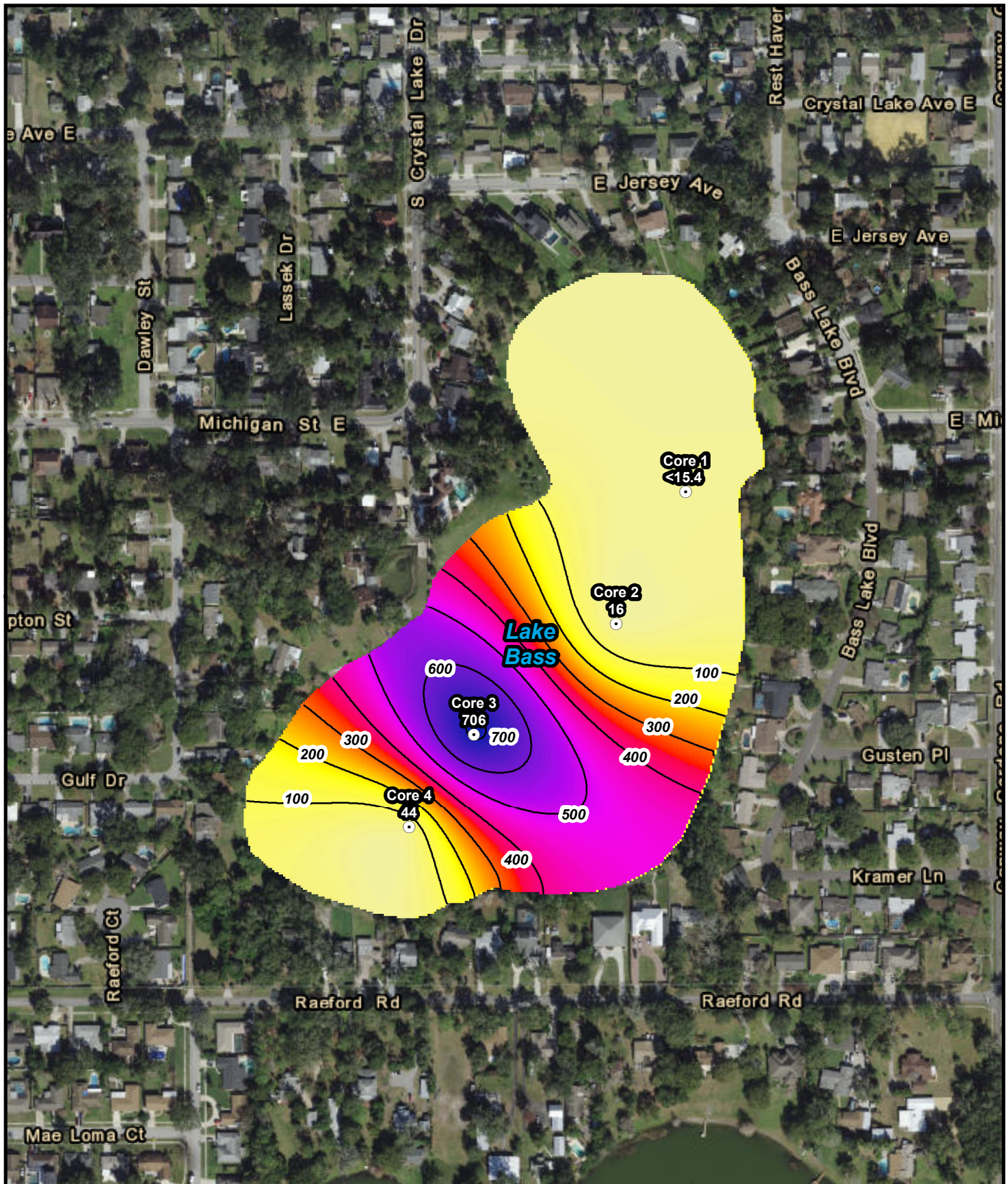
Metal-Oxide Adsorbed P (mg/kg Dry)
High : 994
Low : 127

- Sediment Sample Location
- Metal-Oxide Adsorbed P Contours

0 250
Feet

Figure 2-12
Metal-Oxide Adsorbed P (mg/kg Dry)
Lake Bass
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x16
- 2- Data Source - ESRI 2019 Imagery Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 05/21/2021
Revised/AB
Checked By:LL

Explanation of Features

Organic-P (mg/kg Dry)
High : 706
Low : <15.4

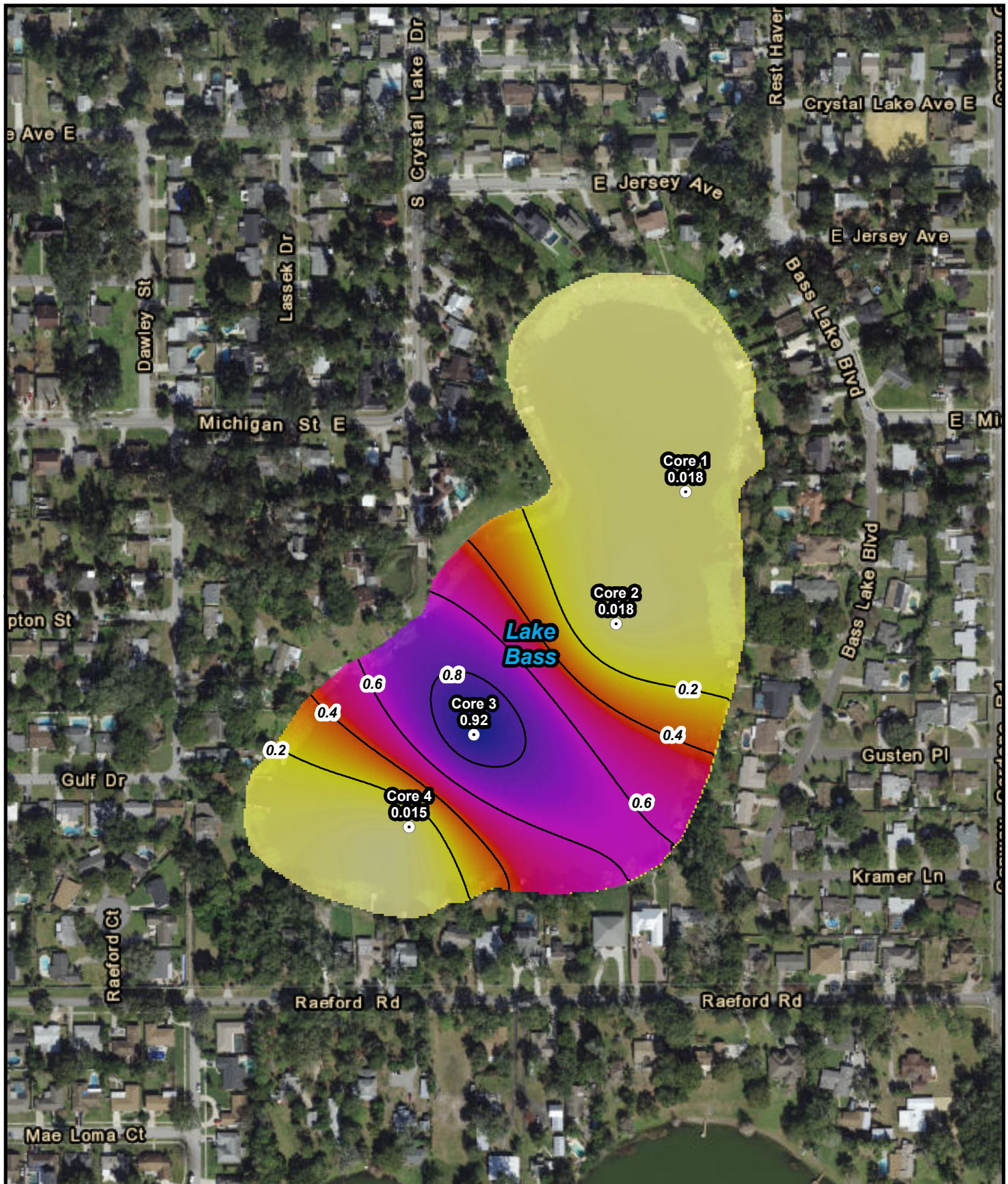


- Sediment Sample Location
- Organic-P Contours

0 250
Feet

Figure 2-13
Organic-P (mg/kg Dry)
Lake Bass
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x16
- 2- Data Source -
ESRI 2019 Imagery
Wood
- 3- This map is intended to be
used for planning purposes
only. It is not a survey.

Date: 05/21/2021
Revised/AB
Checked By:LL

Explanation of Features

Porewater P (mg/kg Dry)
High : 0.92
Low : 0.015

○ Sediment Sample Location
— Porewater SRP

0 250
Feet

Figure 2-14
Porewater P (mg/kg Dry)
Lake Bass
Orange County, Florida

wood.

Figure 2-15 – Total Phosphorus Concentrations Measured under Anoxic Conditions during Laboratory Incubations of Sediment Cores

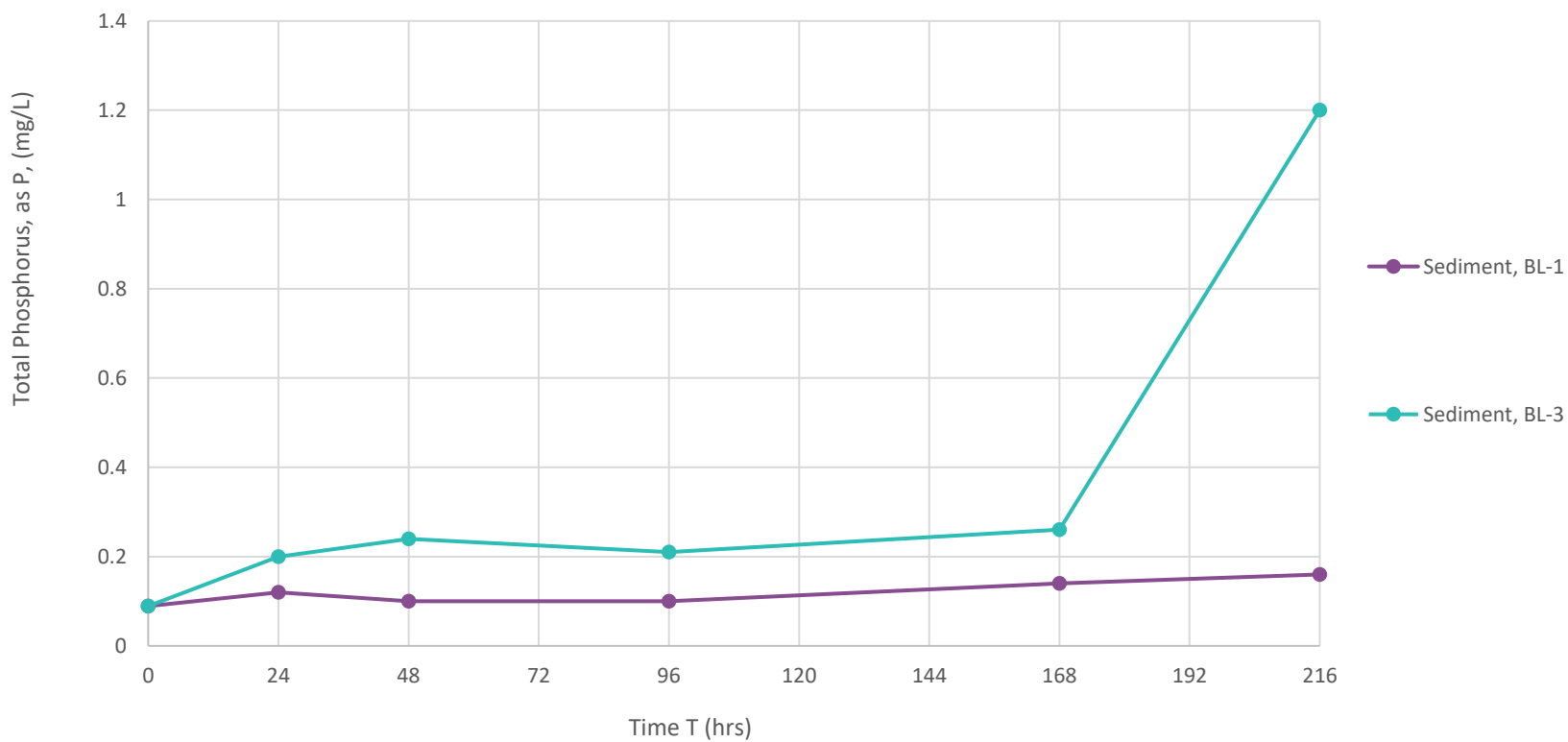


Figure 2-16 – Total Phosphorus Concentrations Measured under Aerobic Conditions during Laboratory Incubations of Sediment Cores

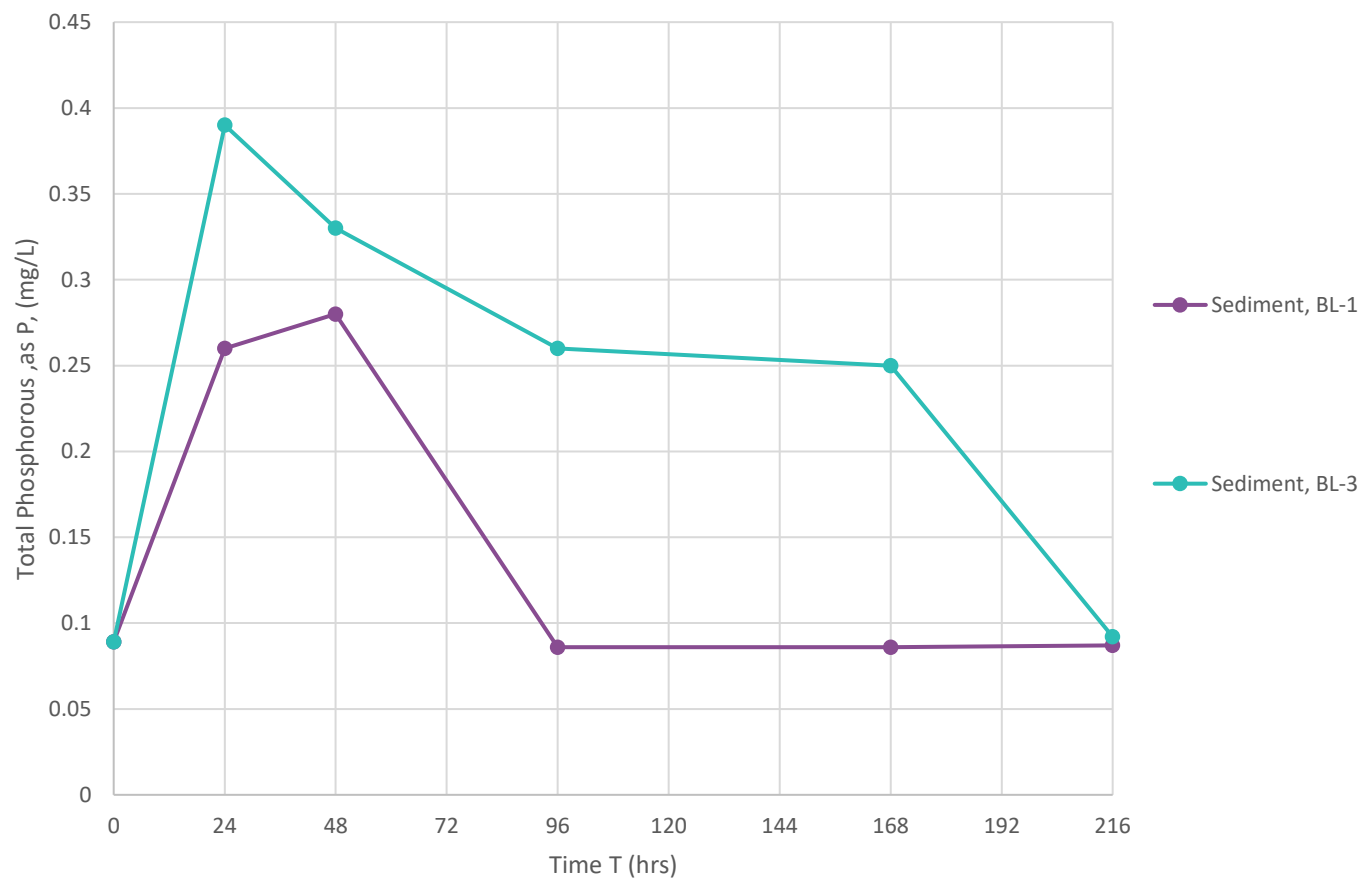


Figure 2-17 – Ammonia Concentrations Measured under Anoxic Conditions during Laboratory Incubations of Sediment Cores

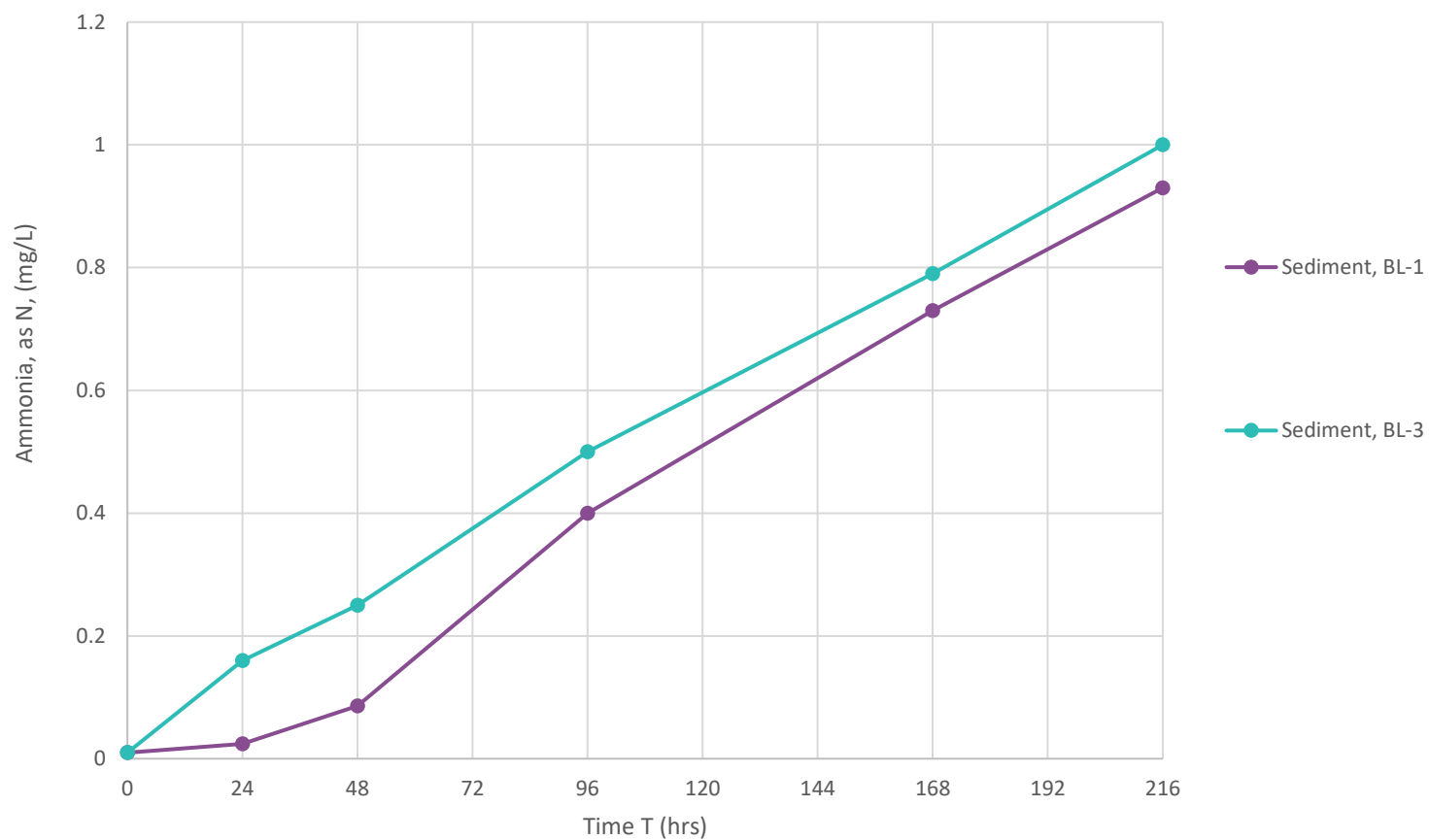


Figure 2-18 – Ammonia Concentrations Measured under Aerobic Conditions during Laboratory Incubations of Sediment Cores

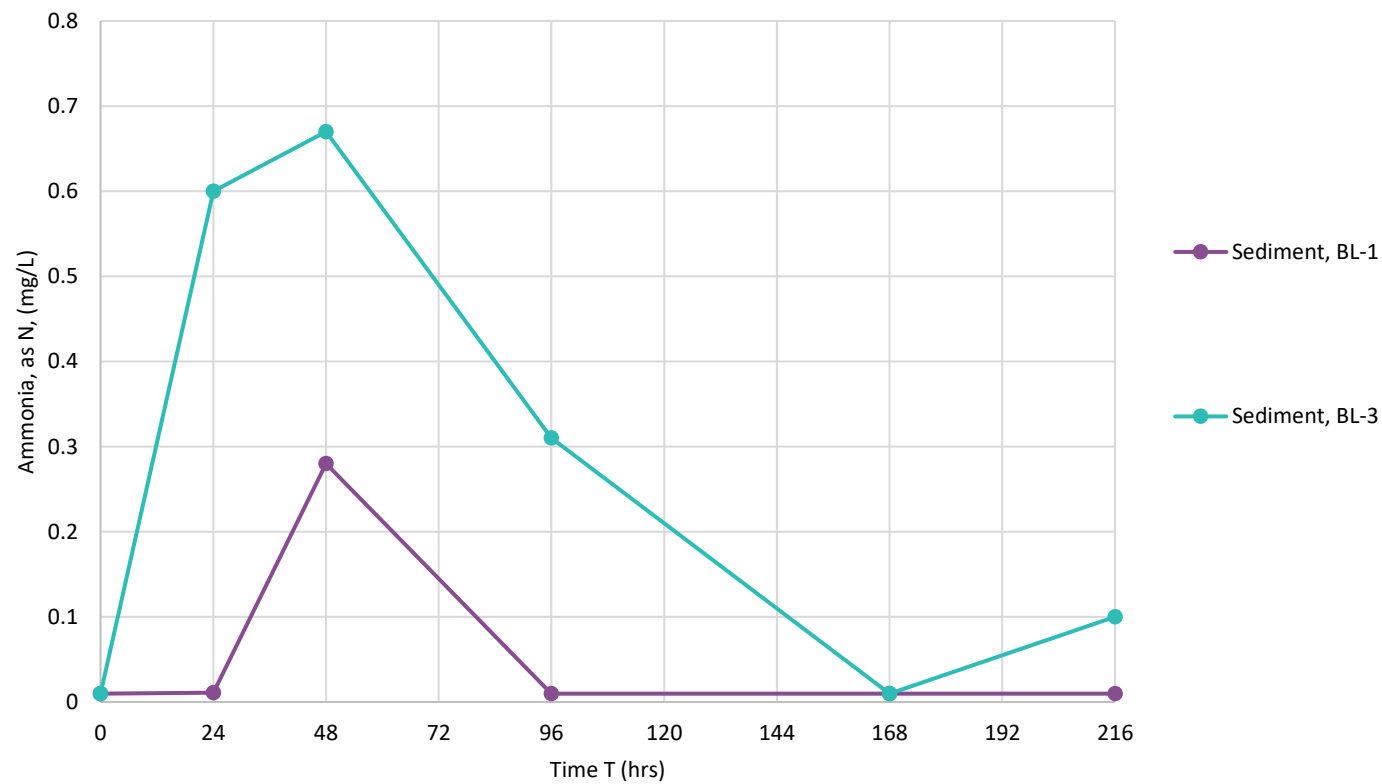
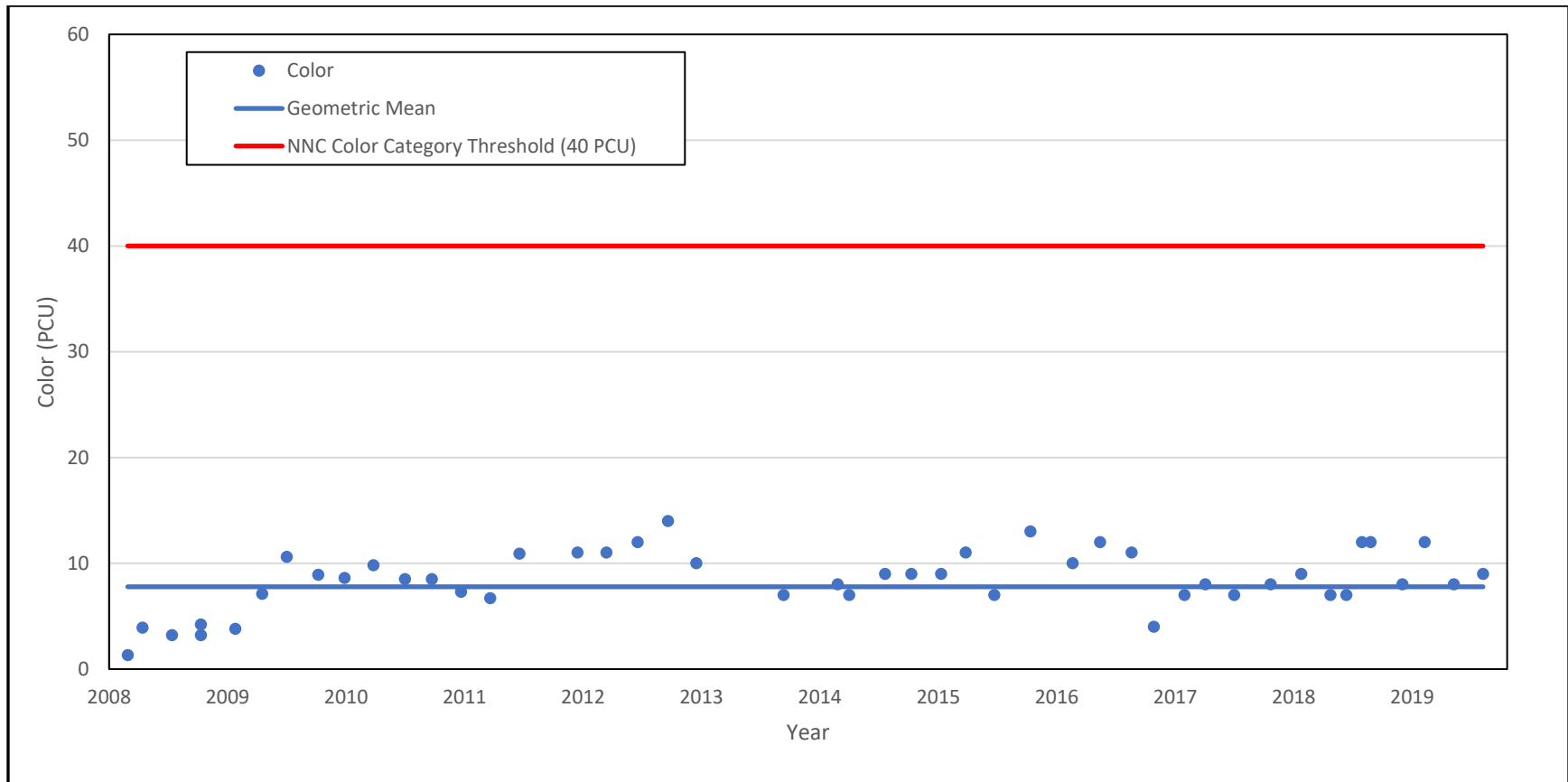
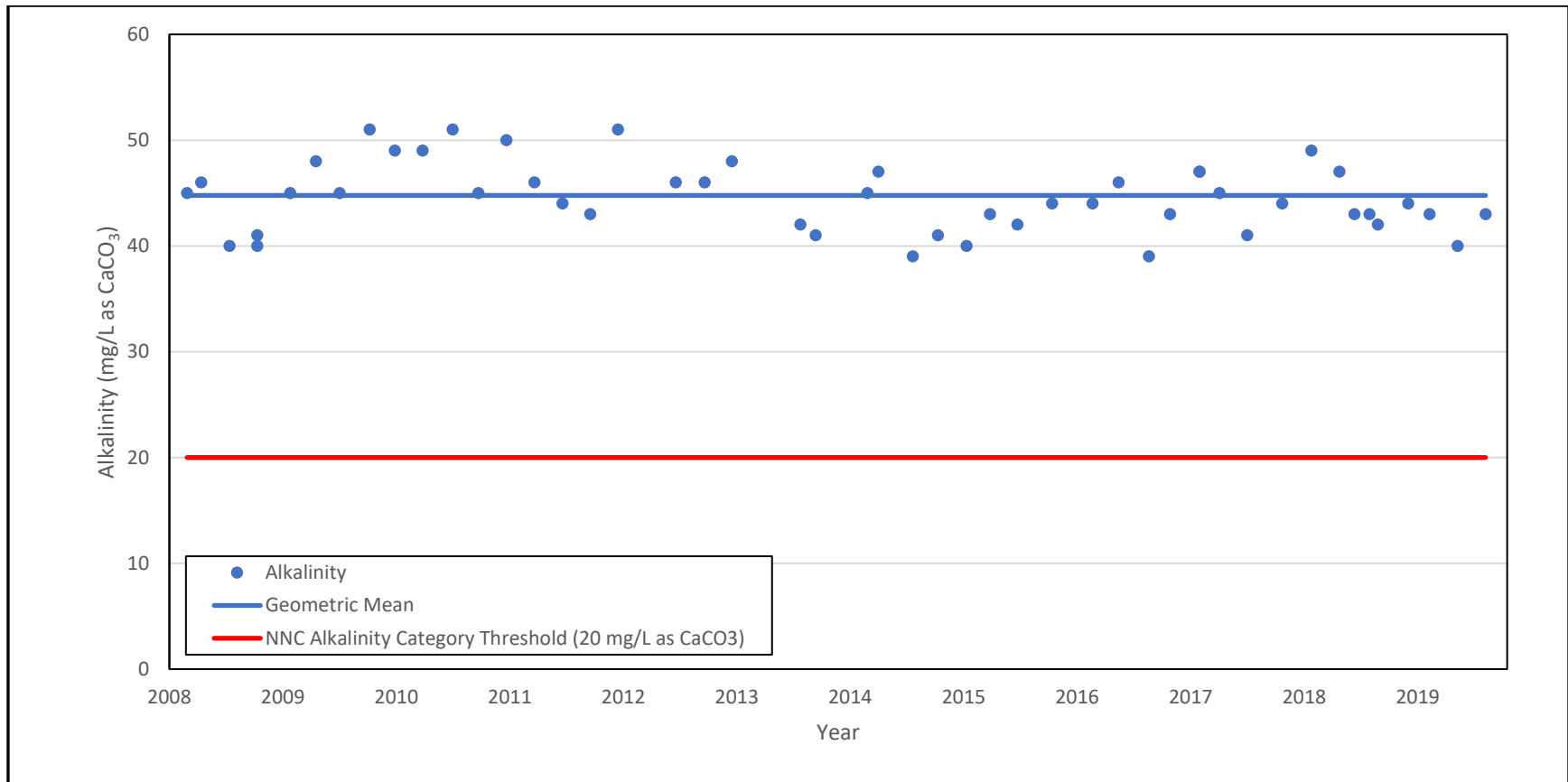


Figure 2-19 – Color in Lake Bass Surface Water from 2008 through 2019



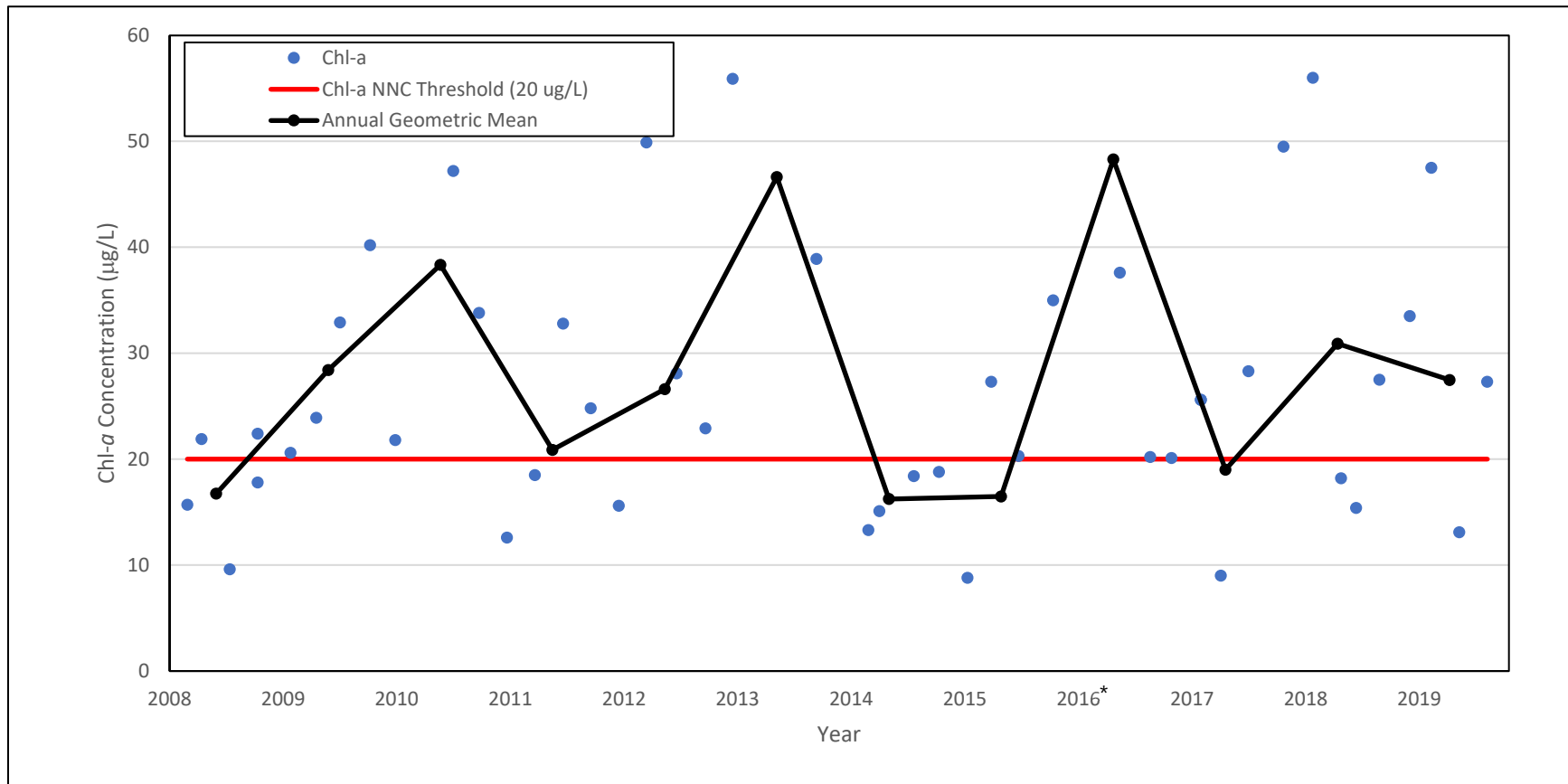
Source: Orange County Water Atlas

Figure 2-20 – Alkalinity Concentrations in Lake Bass Surface Water from 2008 through 2019



Source: Orange County Water Atlas

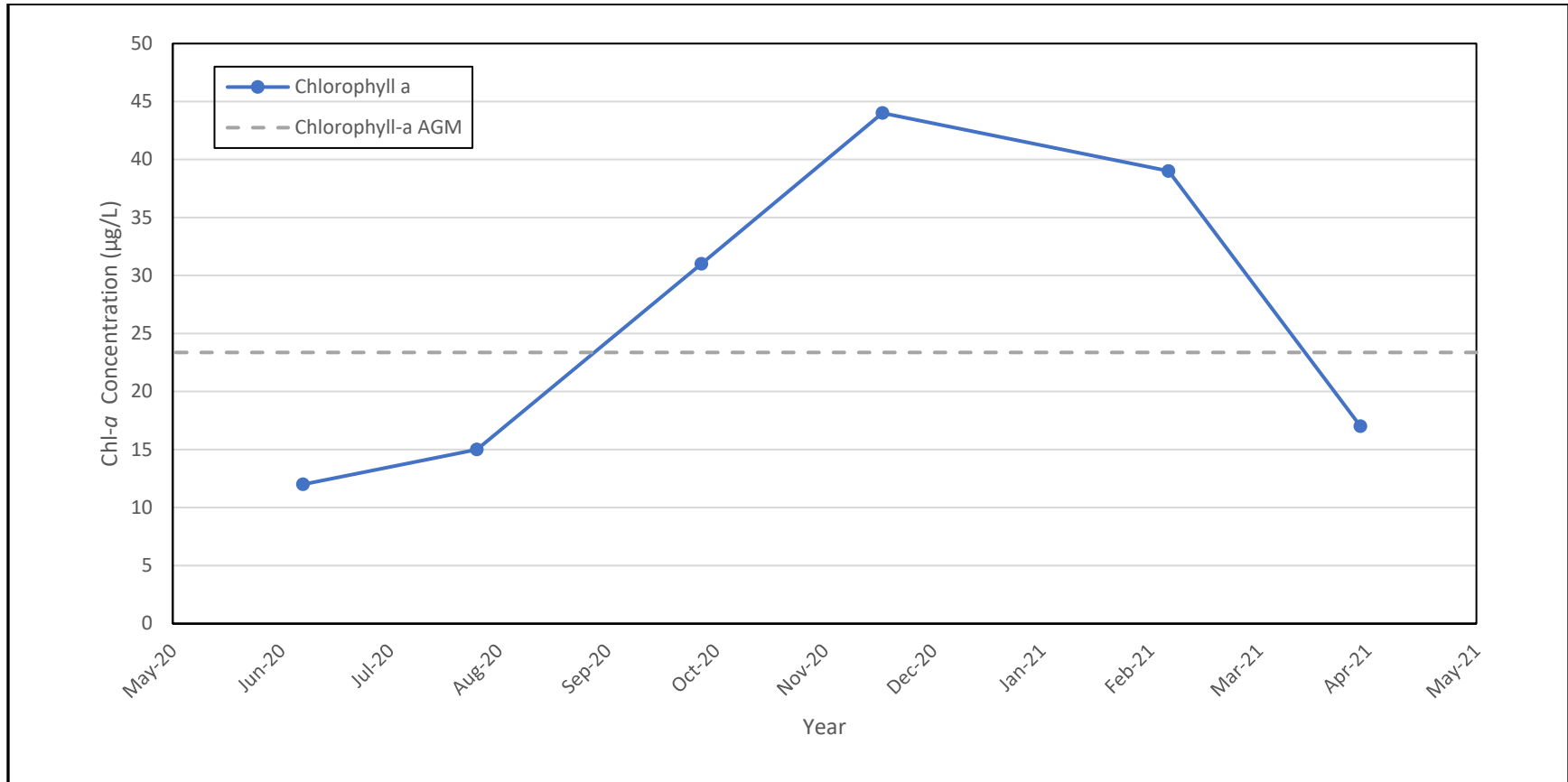
Figure 2-21 – Chlorophyll-a (corrected) Concentrations in Lake Bass Surface Water from 2008 through 2019



Source: Orange County Water Atlas

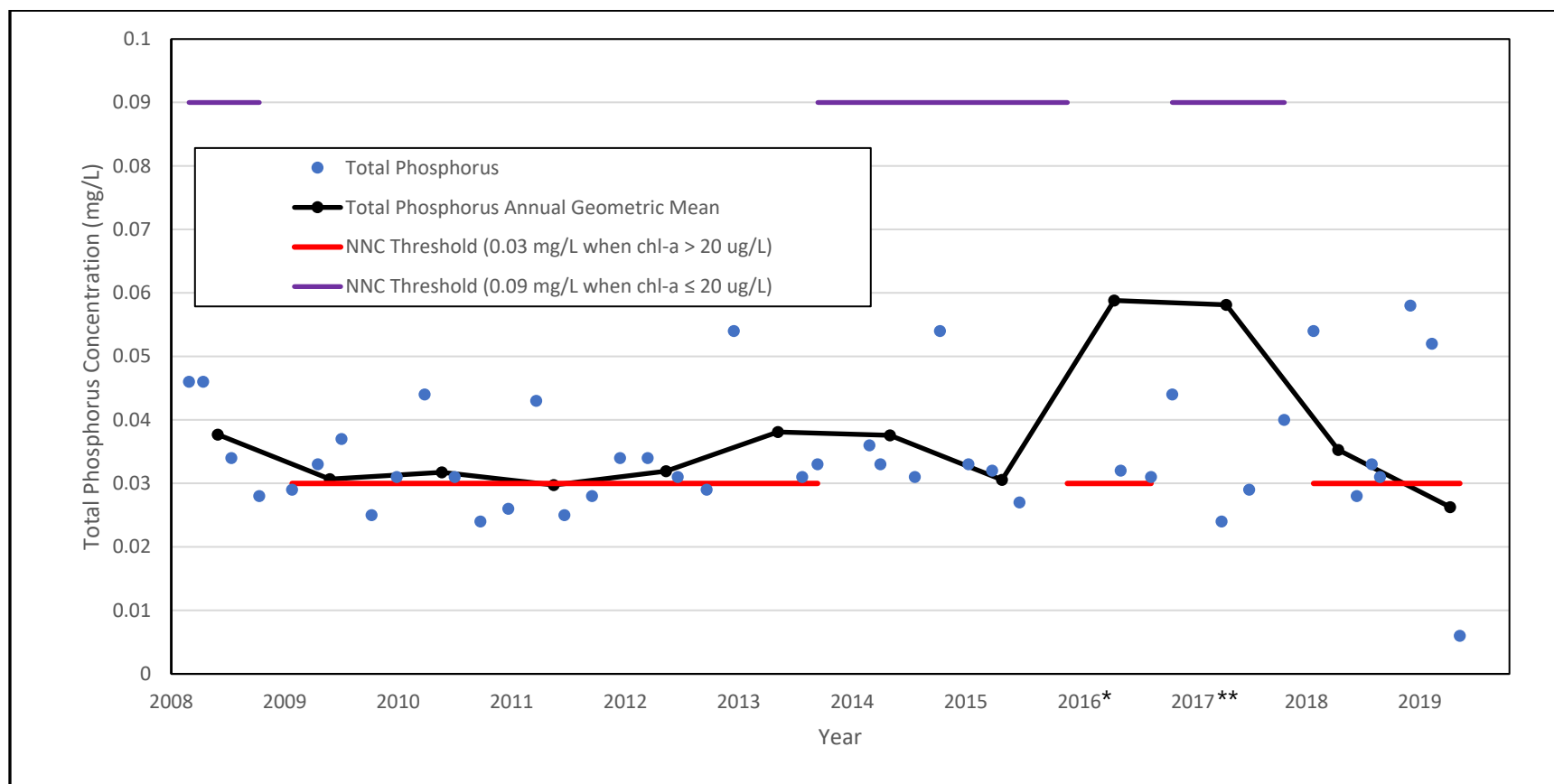
Note: * - 356.5 $\mu\text{g/L}$ reported on 3/29/2016 (not shown on graph)

Figure 2-22 – Chlorophyll-*a* Concentrations in Lake Bass Surface Water from June 2020 through April 2021



Source: Wood (6 events)

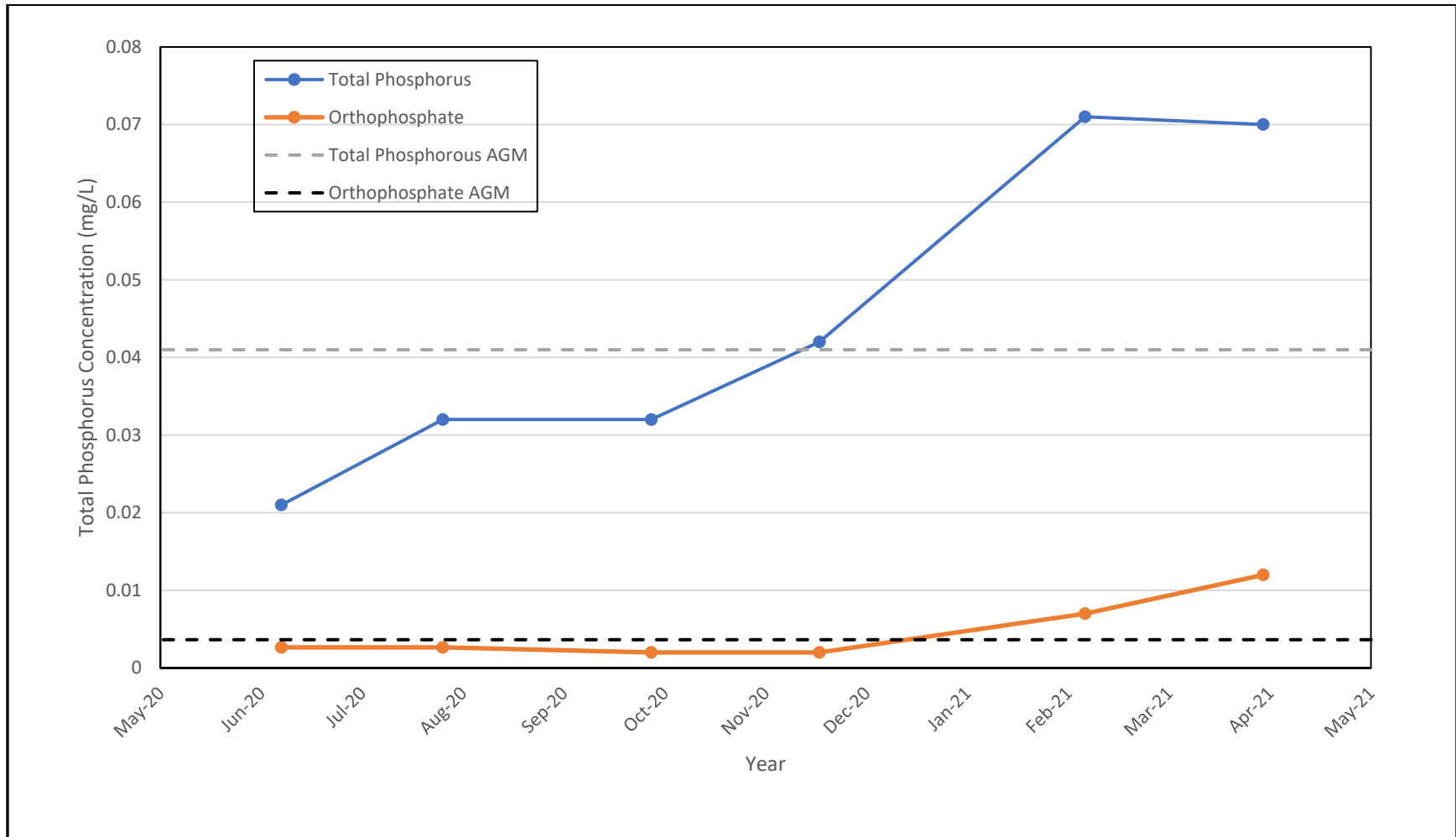
Figure 2-23 – Total Phosphorus Concentration in Lake Bass Surface Water from 2008 through 2019



Source: Orange County Water Atlas

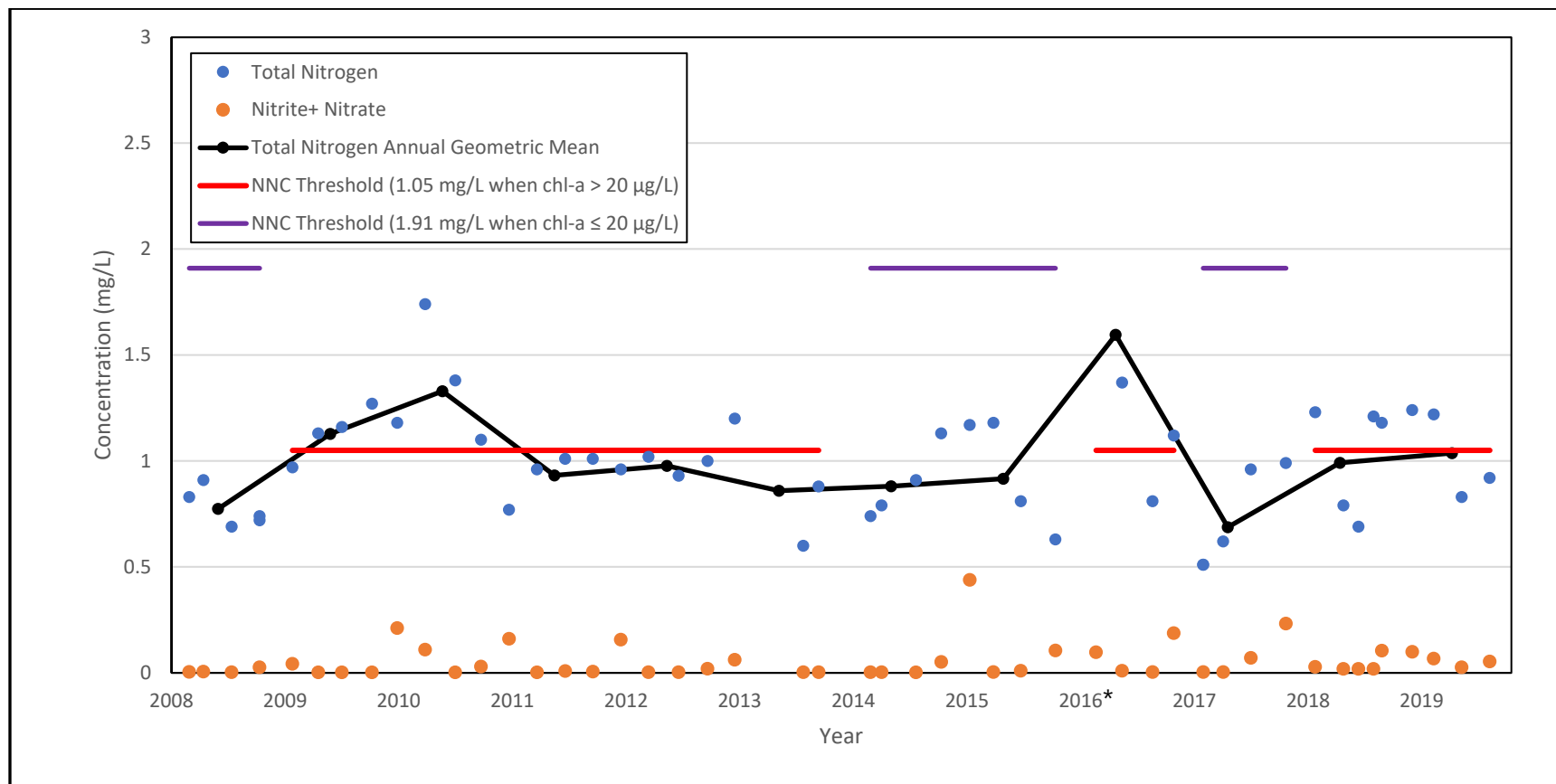
Note: * - 0.274 mg/L reported on 3/29/2016 (not shown on graph), ** - 0.410 mg/L reported on 3/13/2017 (not shown on graph)

Figure 2-24 – Total Phosphorus and Orthophosphate Concentrations in Lake Bass Surface Water from June 2020 through April 2021



Source: Wood (6 events)

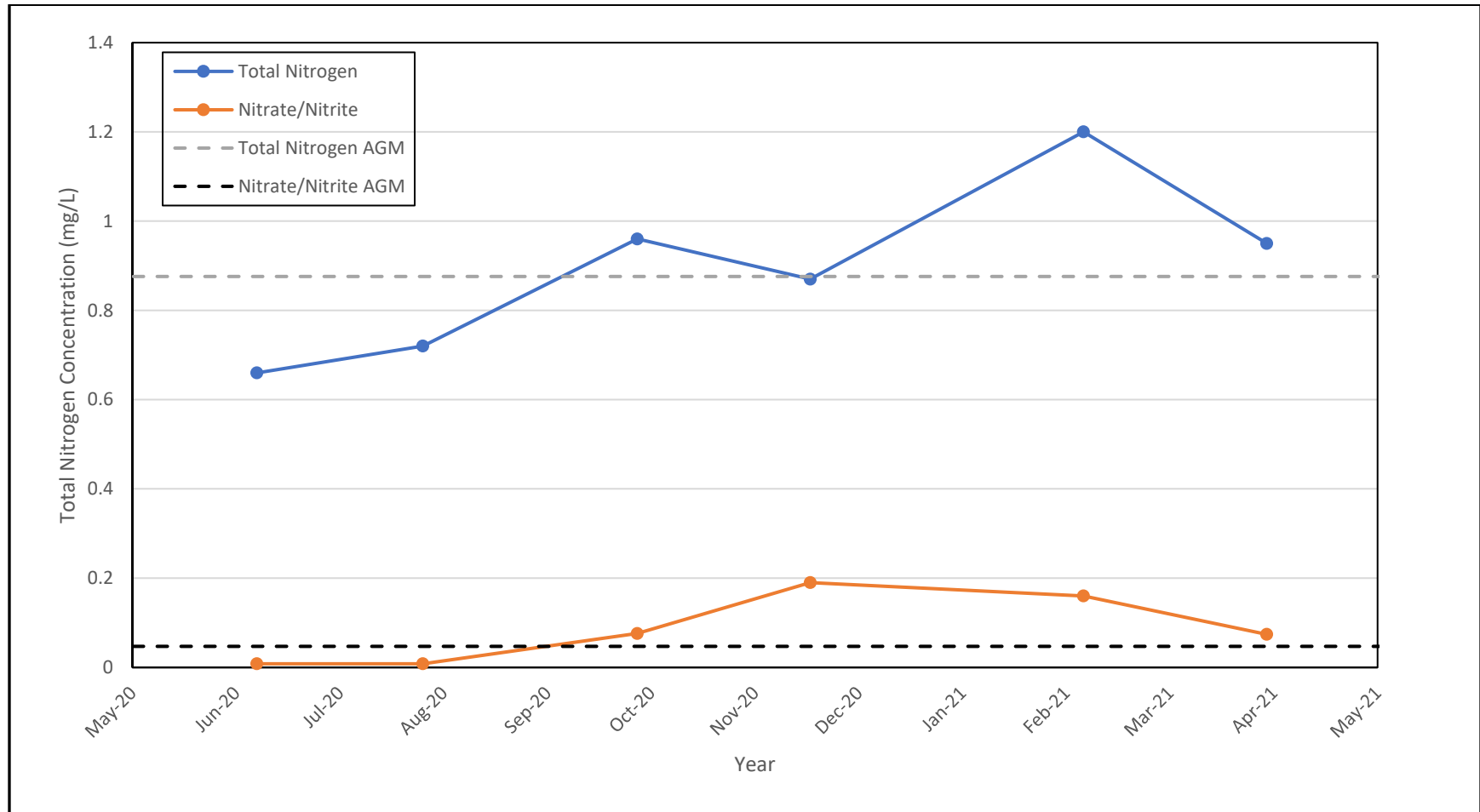
Figure 2-25 – Total Nitrogen and Nitrate+Nitrite Concentrations in Lake Bass Surface Water from 2008 through 2019



Source: Orange County Water Atlas

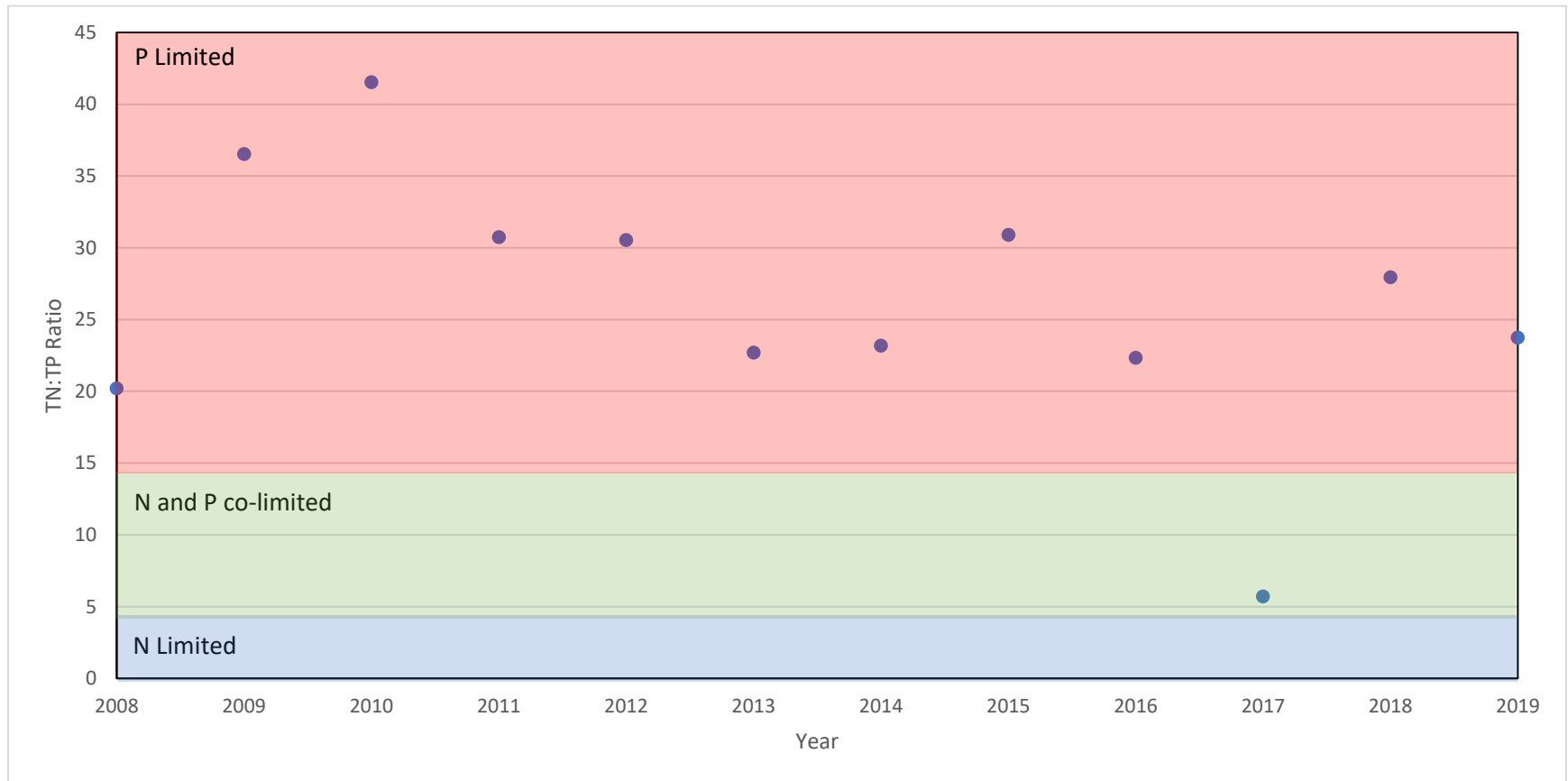
Note: * - 5.21 mg/L reported on 3/29/2016 (not shown on graph)

Figure 2-26 – Total Nitrogen and Nitrate/Nitrite Concentrations in Lake Bass Surface Water from June 2020 through April 2021



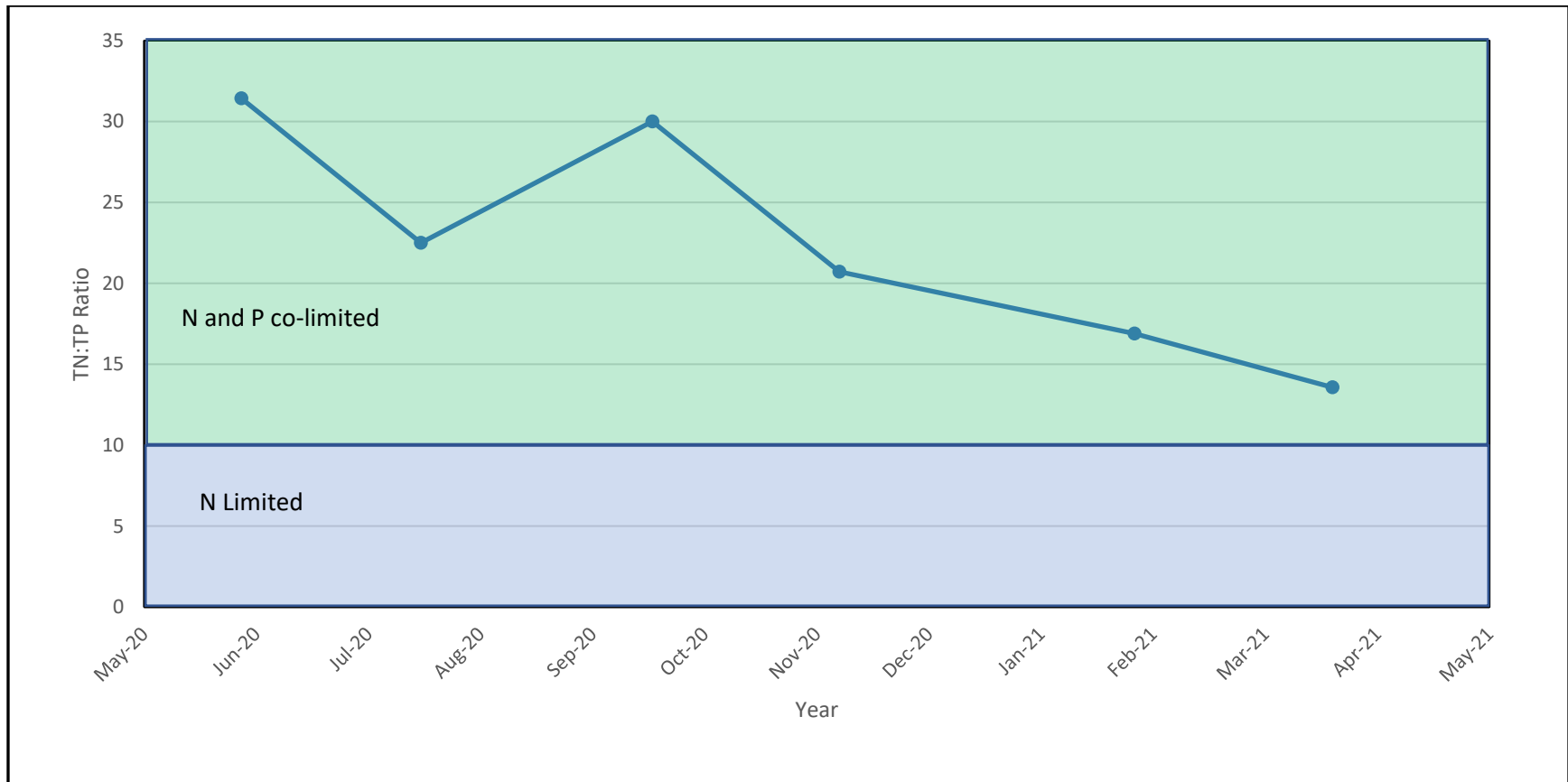
Source: Wood (6 events)

Figure 2-27 – Mean Annual TN:TP Ratios in Lake Bass from 2008 through 2019



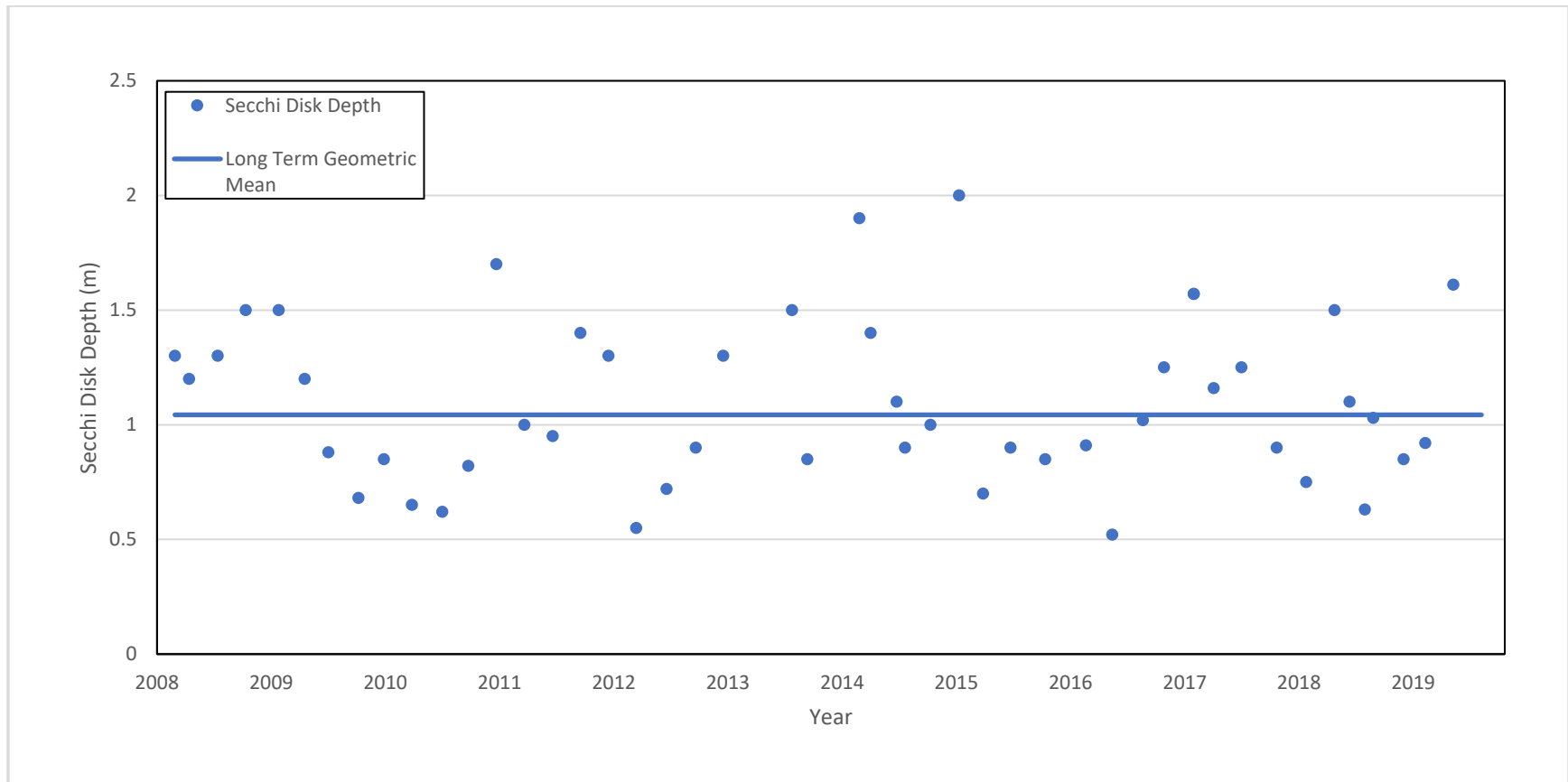
Source: Orange County Water Atlas

Figure 2-28 – TN:TP Ratios in Lake Bass Surface Water from June 2020 through April 2021



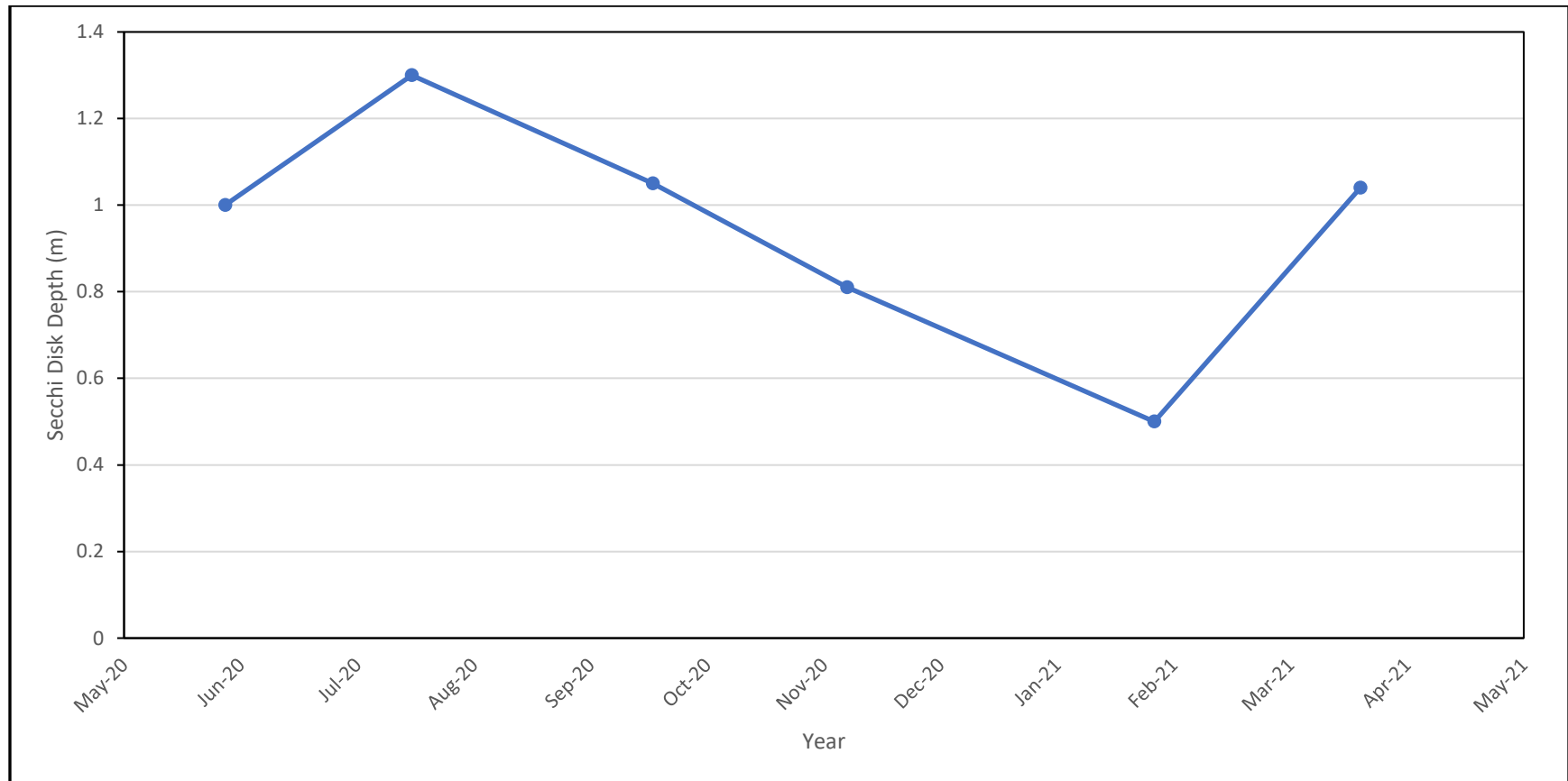
Source: Wood (6 events)

Figure 2-29 – Secchi Disk Depth for Lake Bass from 2008 through 2019



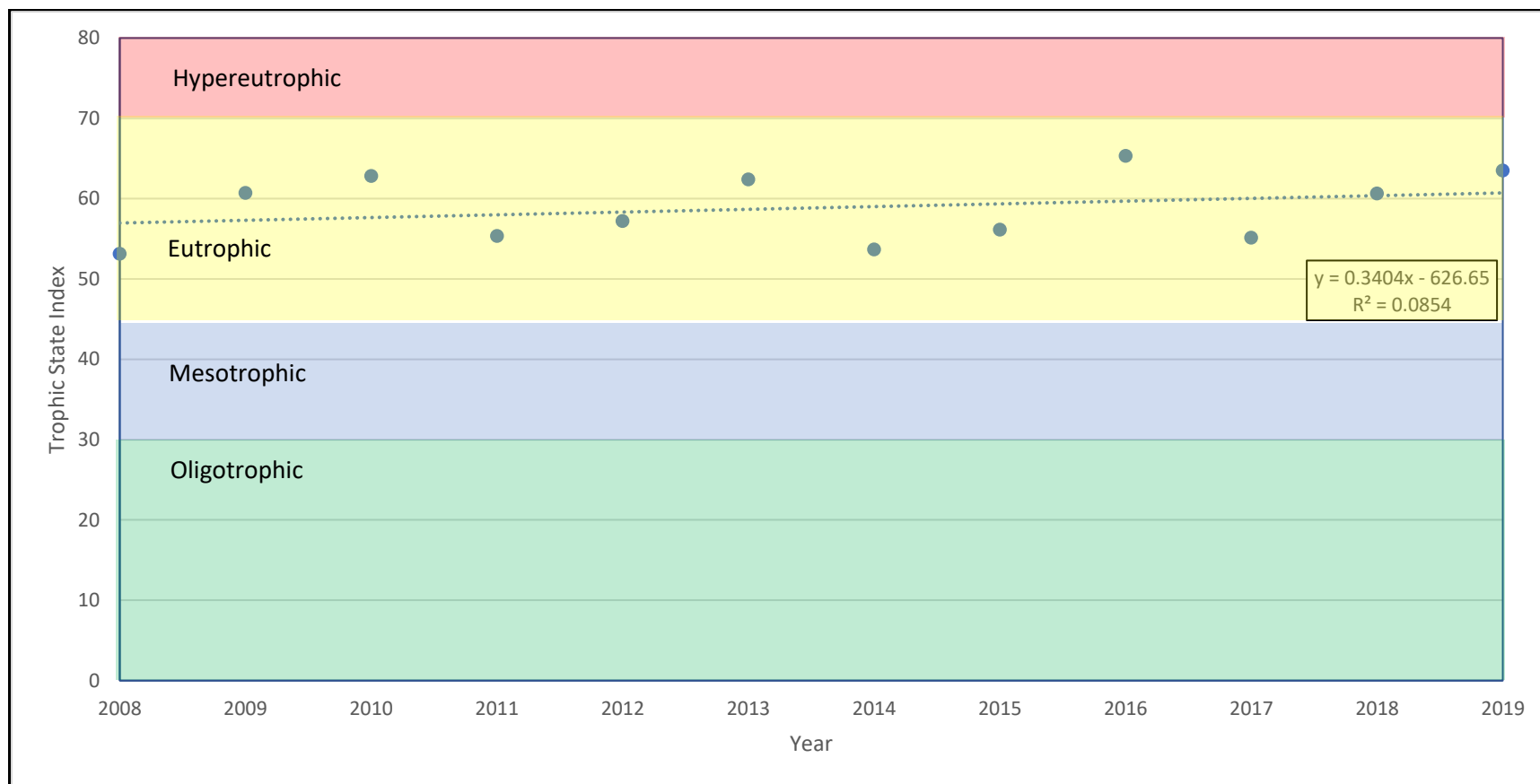
Source: Orange County Water Atlas

Figure 2-30 – Secchi Disk Depth in Lake Bass Surface Water from June 2020 through April 2021



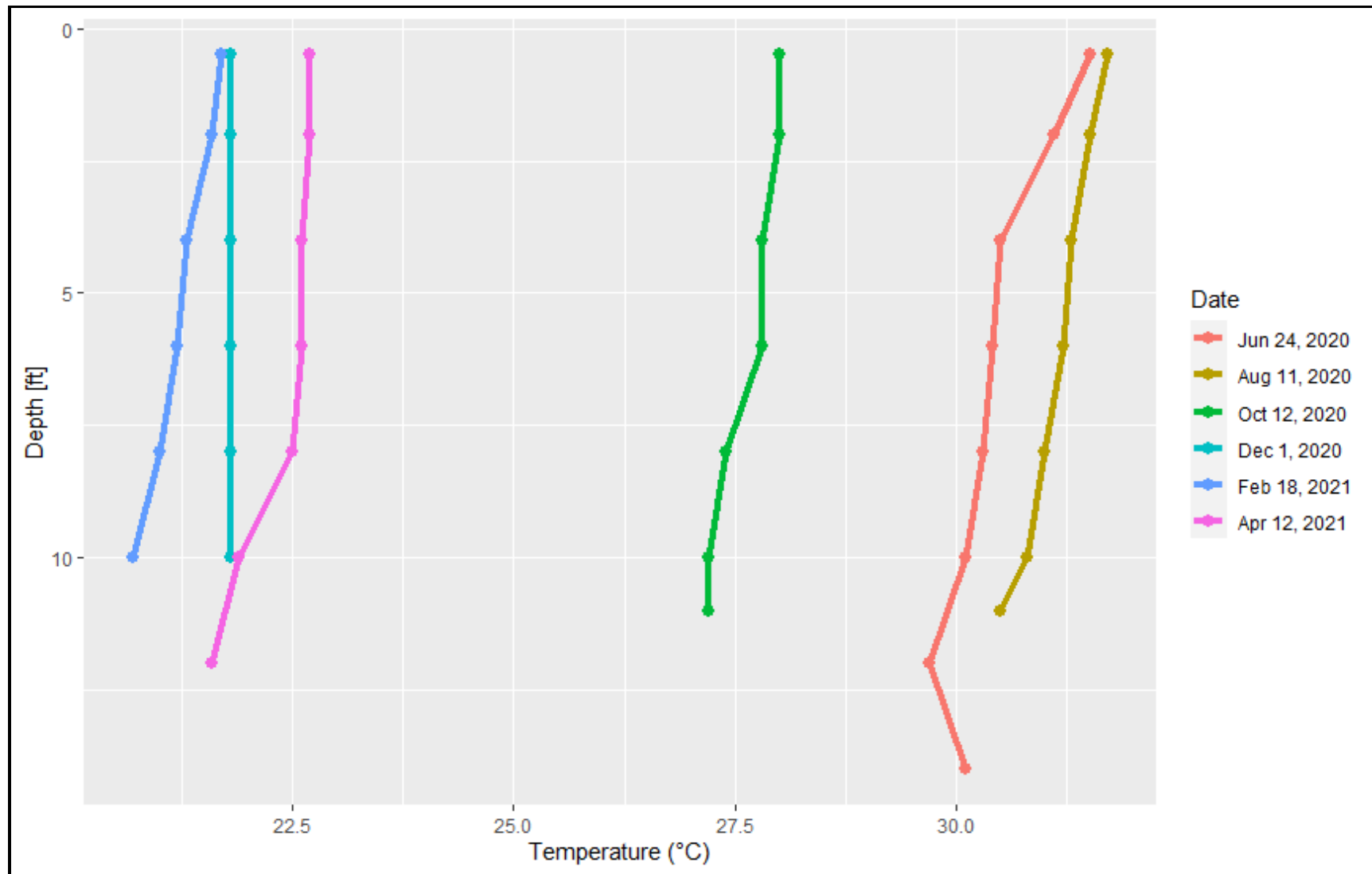
Source: Wood (6 events)

Figure 2-31 – Annual Geometric Mean Trophic State Index in Lake Bass Surface Water from 2008 through 2019



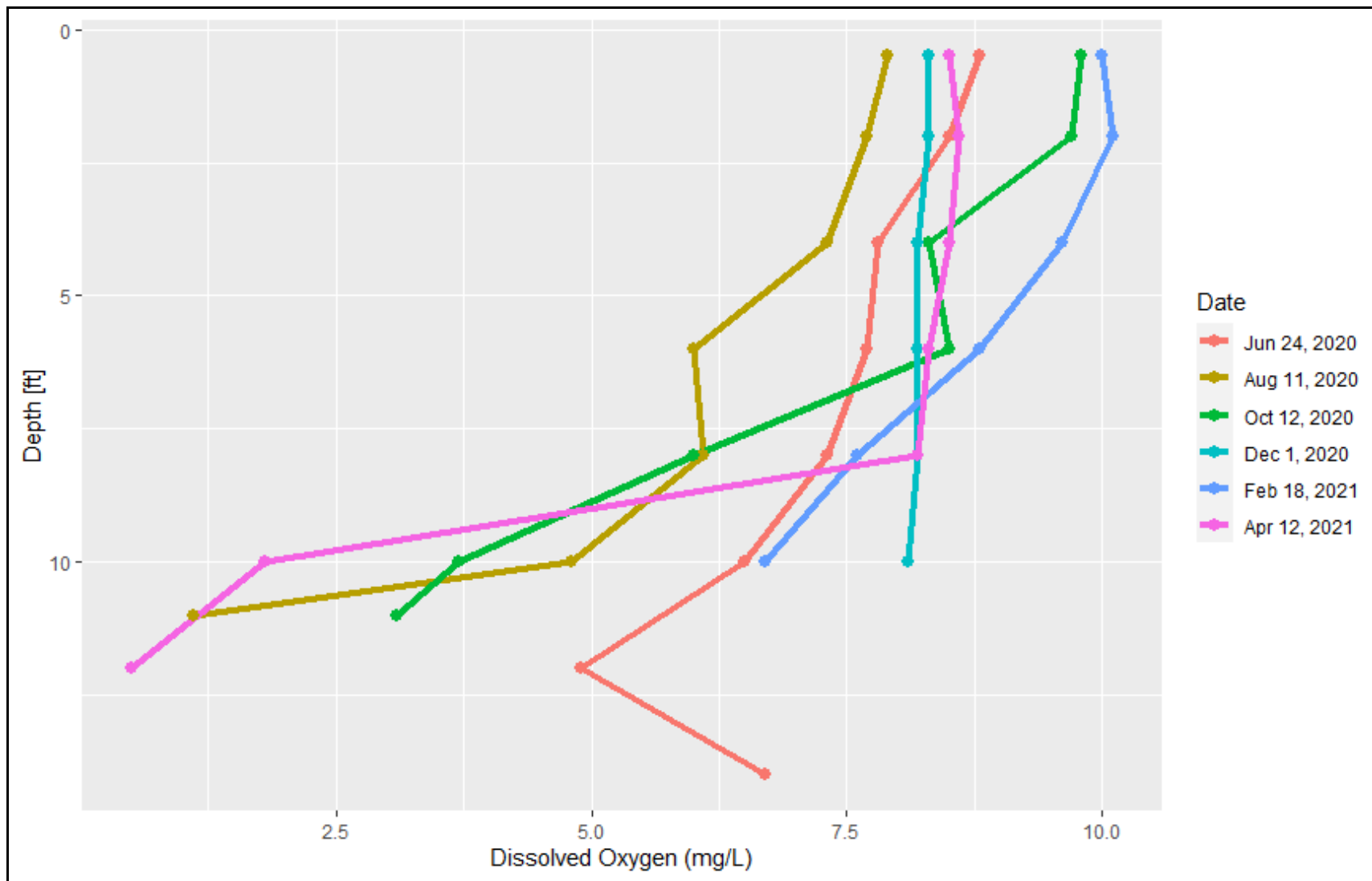
Source: Orange County Water Atlas

Figure 2-32 – Temperature Depth Profile for Lake Bass from June 2021 through April 2021

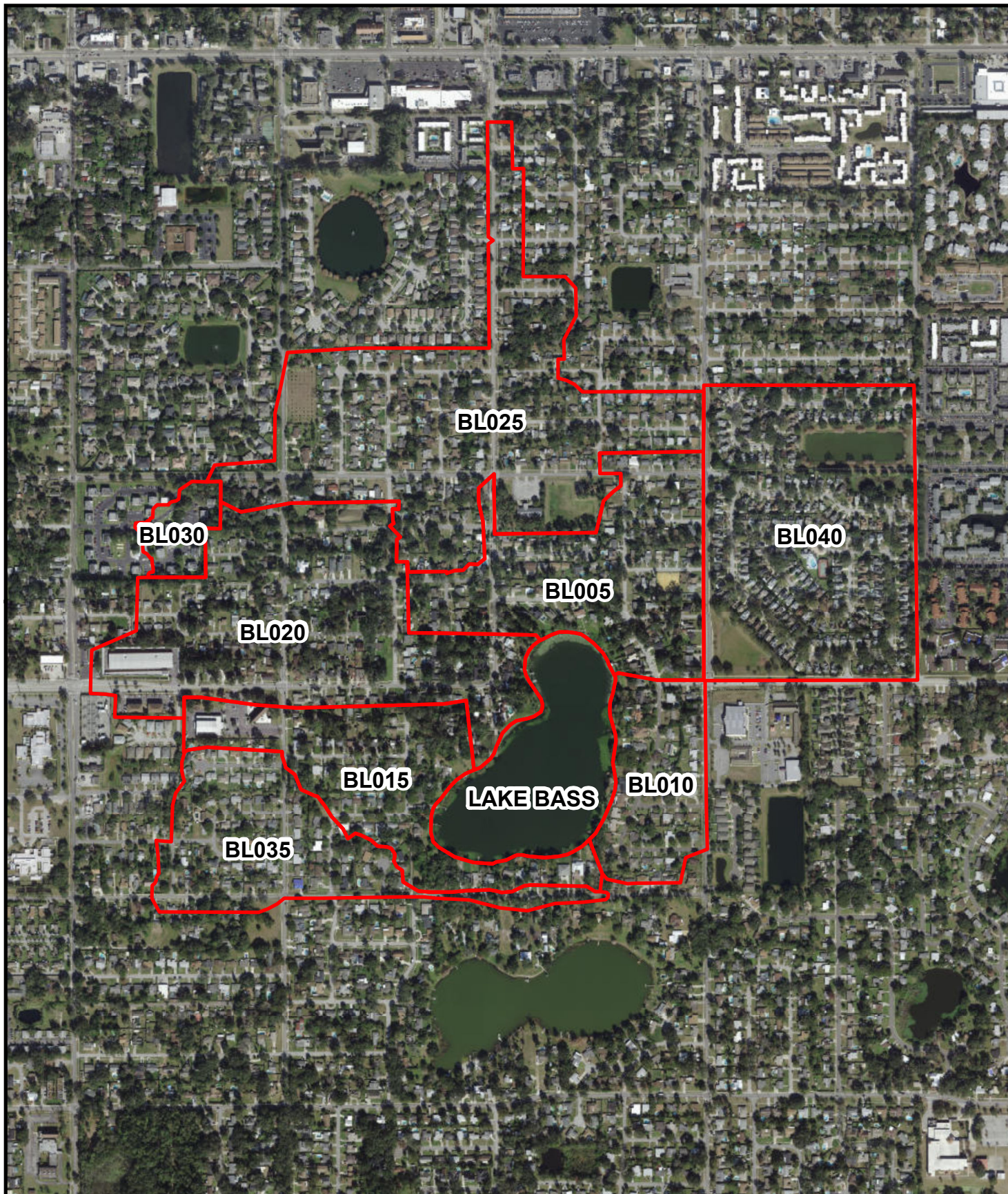


Source: Wood (6 events)

Figure 2-33 – Dissolved Oxygen Depth Profile for Lake Bass from June 2021 through April 2021



Source: Wood (6 events)



Notes:

- 1- Project No.:600478x22
- 2- Data Source - ESRI Imagery, SJRWMD, Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 11/18/20
Created By: CL
Checked By: SB



Explanation of Features

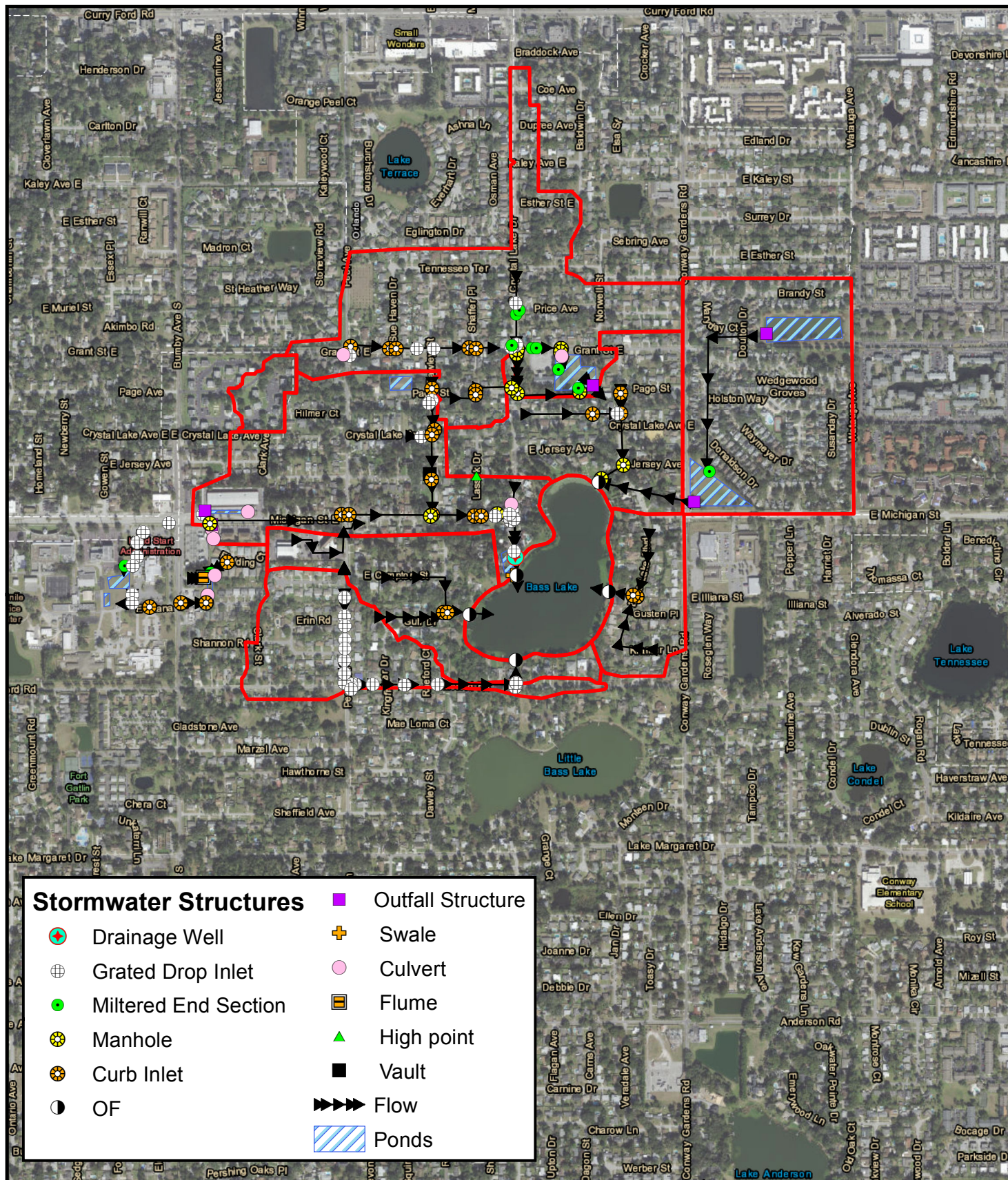


Lake Bass Sub-Basins

0 0.12
Miles

Figure 3-1
Lake Bass Sub-Basins
Orange County, Florida

wood.



Stormwater Structures

- | | |
|----------------------|-------------------|
| Drainage Well | Outfall Structure |
| Grated Drop Inlet | Swale |
| Filtered End Section | Culvert |
| Manhole | Flume |
| Curb Inlet | High point |
| OF | Vault |
| Flow | Ponds |

Notes:

- 1- Project No.: 600478x22
- 2- Data Source - ESRI Imagery, SJRWMD, Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 11/18/20
Created By: CL
Checked By: SB



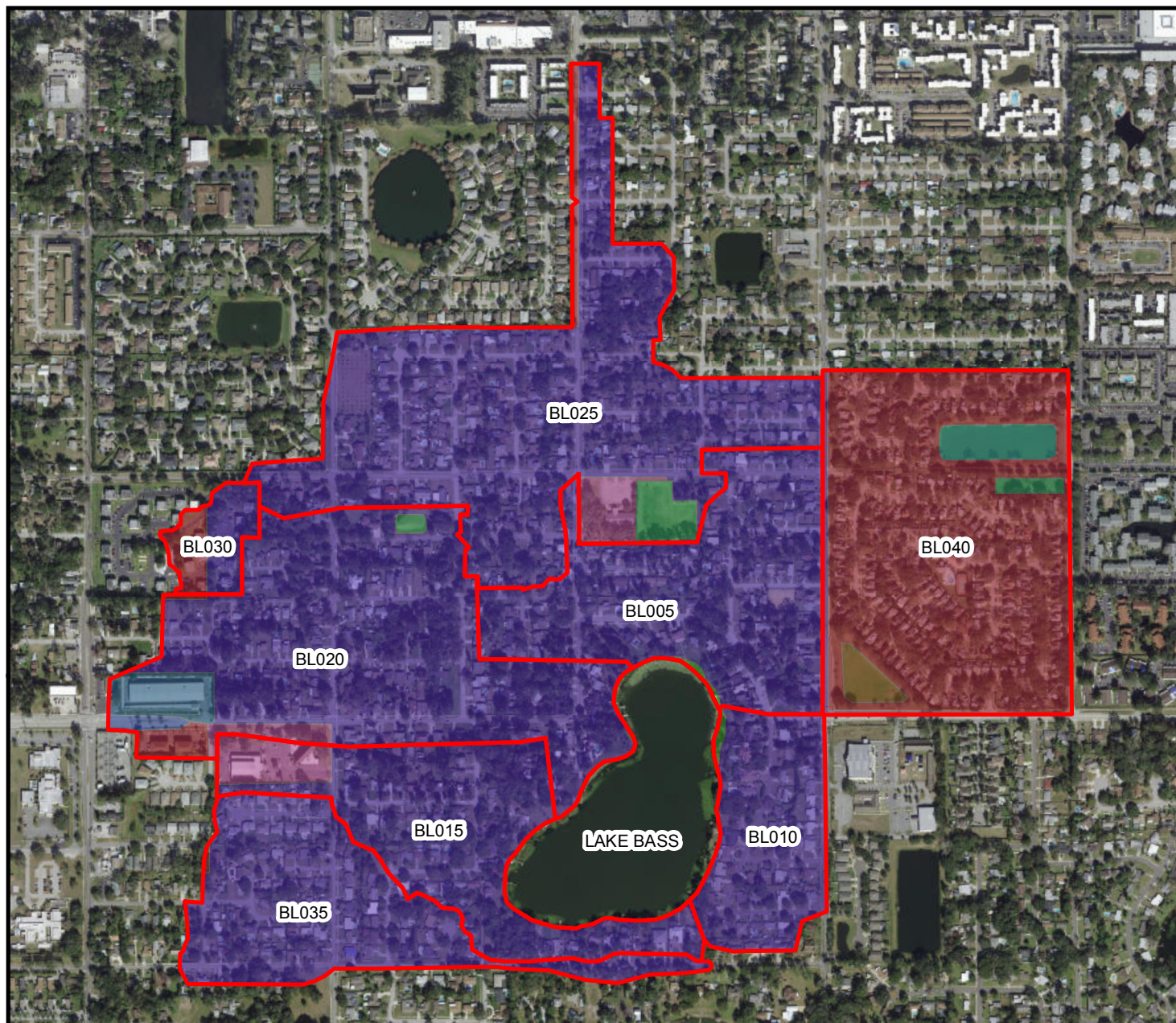
Explanation of Features

- Lake Bass Sub-Basins

0 0.16
Miles

Figure 3-2
Stormwater Structures and
Drainage Map
Lake Bass
Orange County, Florida

wood.



Explanation of Features

 Lake Bass Sub-Basins

Land Use Code

1100: Residential, low density - less than 2 dwelling units/acre
 1200: Residential, medium density - 2-5 dwelling units/acre
 1300: Residential, high density - 6 or more dwelling units/acre
 1400: Commercial and services
 1700: Institutional

5300: Reservoirs - pits, retention ponds, dams
 6430: Wet prairies
 6440: Emergent aquatic vegetation
 8140: Roads and highways (divided 4-lanes with medians)
 8320: Electrical power transmission lines
 8370: Surface water collection basins

Notes:

- 1- Project No.:600478x22
- 2- Data Source - ESRI Imagery, SJRWMD, Wood,
- 3- This map is intended to be used for planning purposes only. It is not a survey.

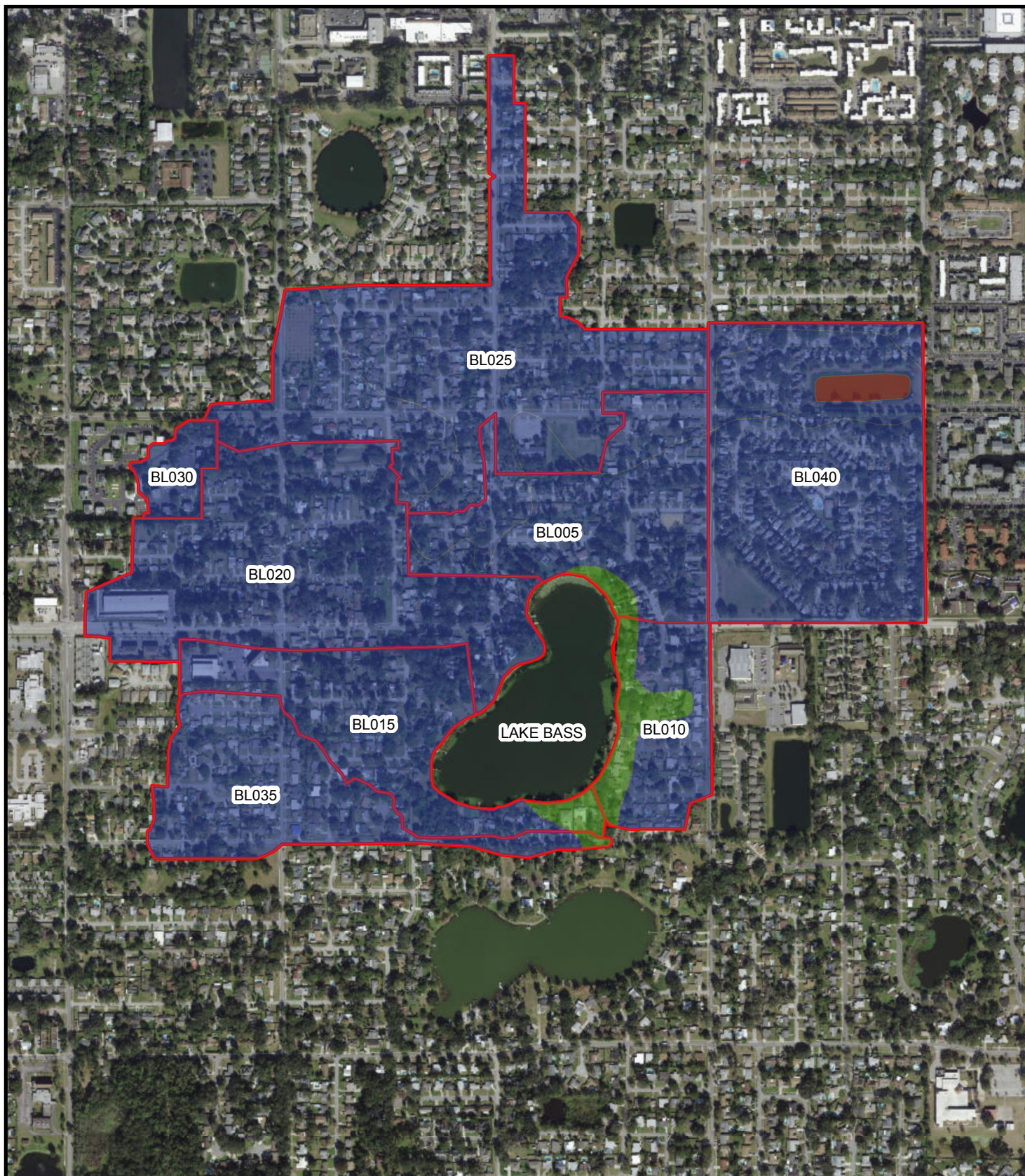
Date: 11/18/20
 Created By: CL
 Checked By: SB



0 0.12

 Miles

Figure 3-3
SJRWMD 2014
Land Use Map
Lake Bass
Orange County, Florida

Notes:

- 1- Project No.: 600478x22
- 2- Data Source - ESRI Imagery, SJRWMD, Wood, NRCS 2018
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 11/18/20
Created By: CL
Checked By: SB



Explanation of Features

HYDRGRP	 Bass Lake Sub-Basins
 A	
 A/D	
 W	

0 0.12
Miles

Figure 3-4
NRCS 2019
Hydrologic Soils Group
Lake Bass
Orange County, Florida

wood.

Figure 4-1 – Average Annual Rainfall from 1953 through 2019 for NOAA Station USW00012815 at Orlando International Airport

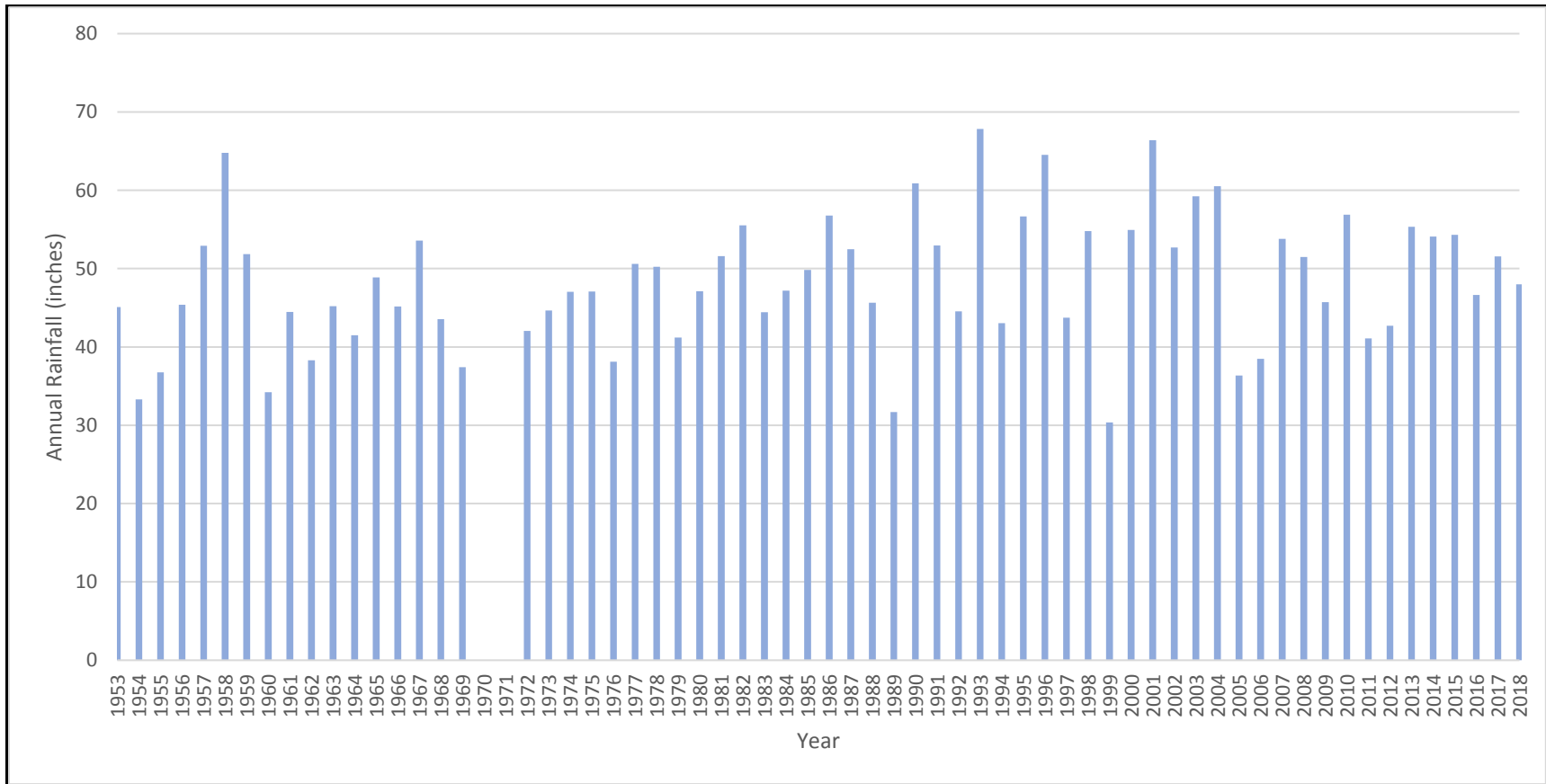
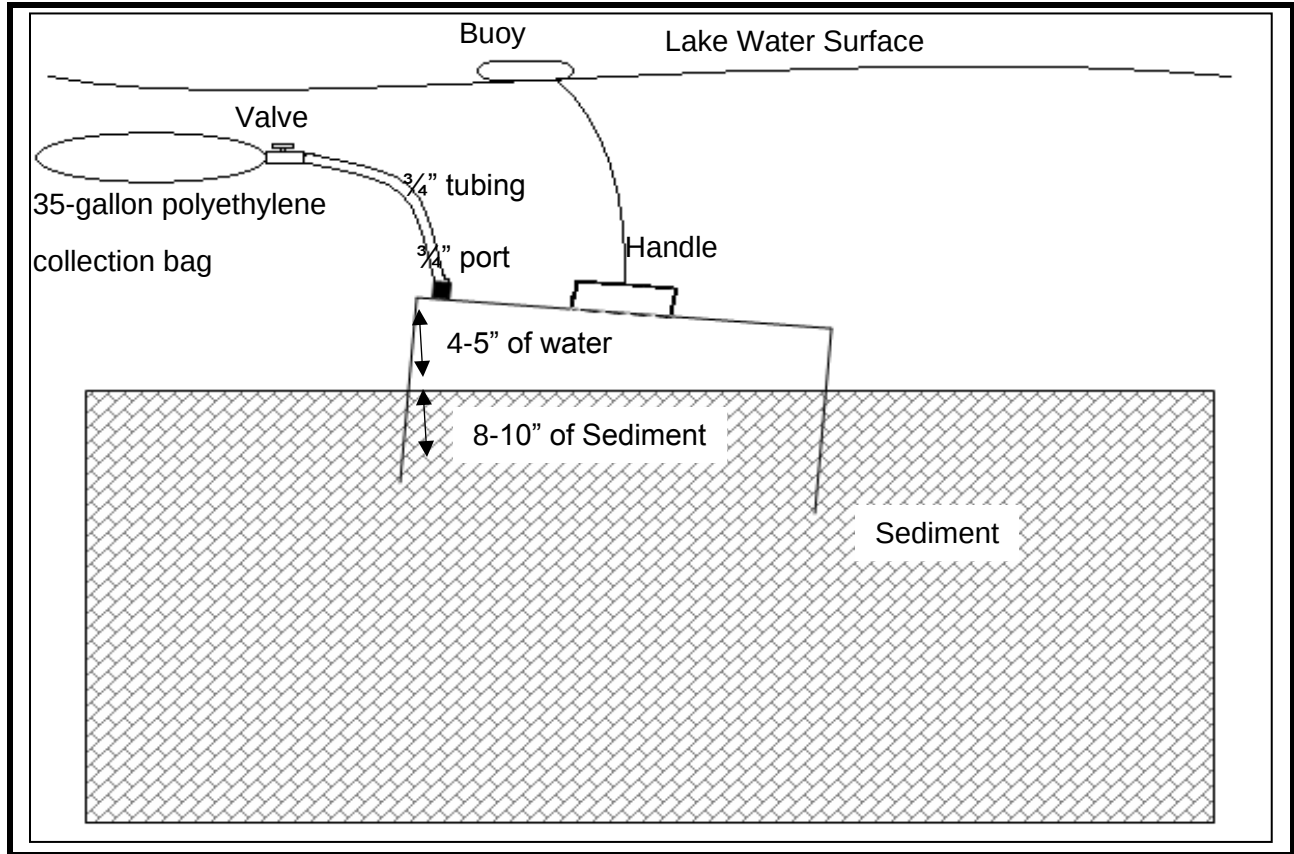


Figure 4-1

Figure 4-2 - Typical Seepage Meter Installation





Notes:

- 1- Project No.: 600478x3
- 2- Data Source - SFWMD Open Data
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 9/13/19
Revised: SF
Checked By: LL

Explanation of Features



Seepage Meters



Lake Bass

0

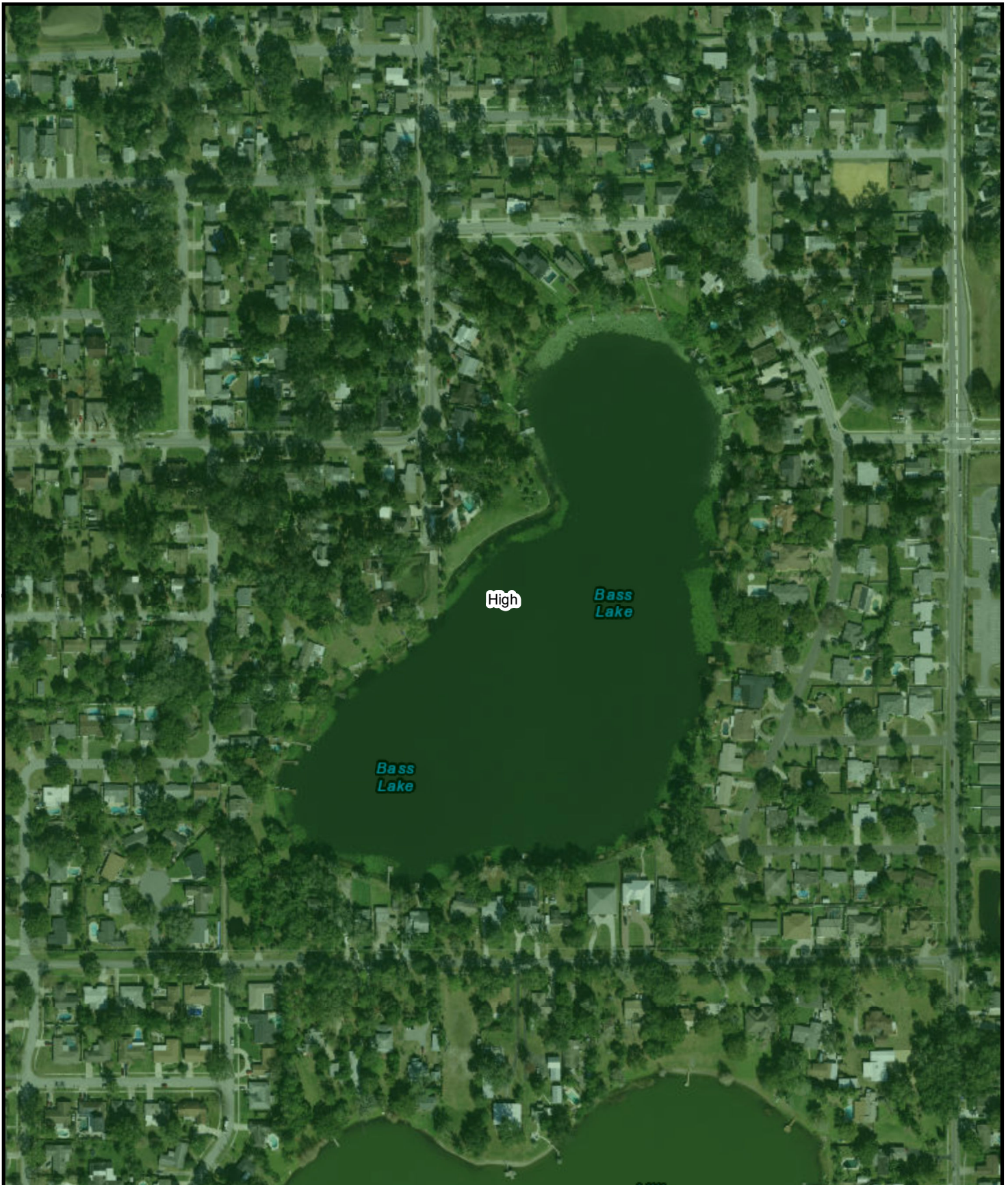
200



Feet

Figure 4-3
Lake Bass
Seepage Meter Locations
Orange County, Florida

wood.



Notes:

- 1- Project No.: 600478x16
- 2- Data Source - ESRI Imagery
SJRWMD 2015 Recharge Data
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 08/06/2020
Revised: AB
Checked By: LL

Explanation of Features



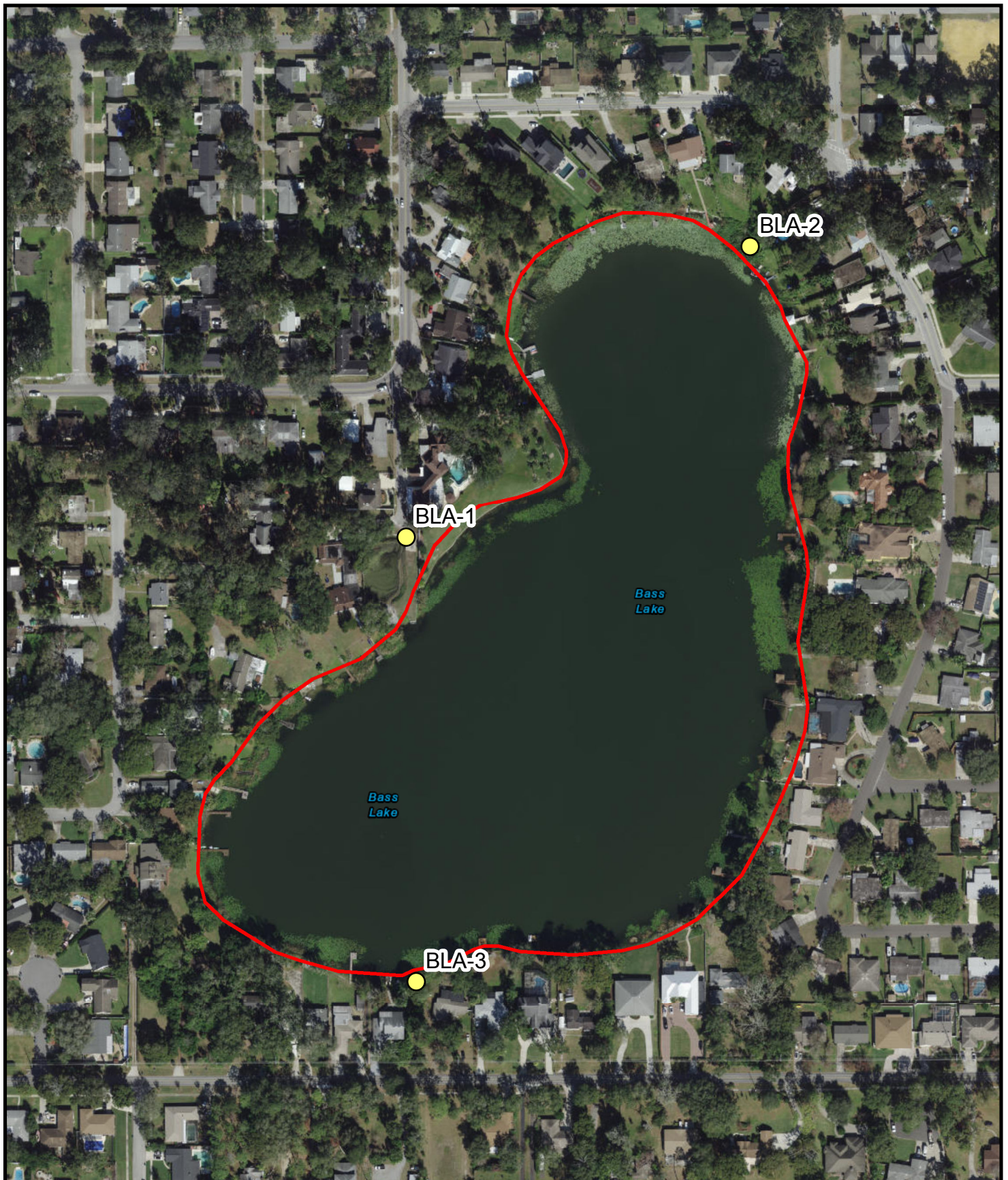
RECH_RANGE

- Discharge
- High (> 10 in/yr)
- Low (1-5 in/yr)
- Medium (5-10 in/yr)

0 260
Feet

Figure 4-4
Recharge Rates
Lake Bass
Orange County, Florida

wood.



Notes:

- 1- Project No.: 600478x3
- 2- Data Source - SFWMD Open Data
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 9/13/19
Revised: SF
Checked By: LL

Explanation of Features



-  Autosampler Locations Lake Bass
-  Lake Bass

0 200

Feet

Figure 5-1
Lake Bass
Autosampler Locations
Orange County, Florida

wood.

Figure 5-2 – Lake Bass BLA-1 Autosampler Location



Source: Wood

Figure 5-3 – Lake Bass BLA-2 Autosampler Location



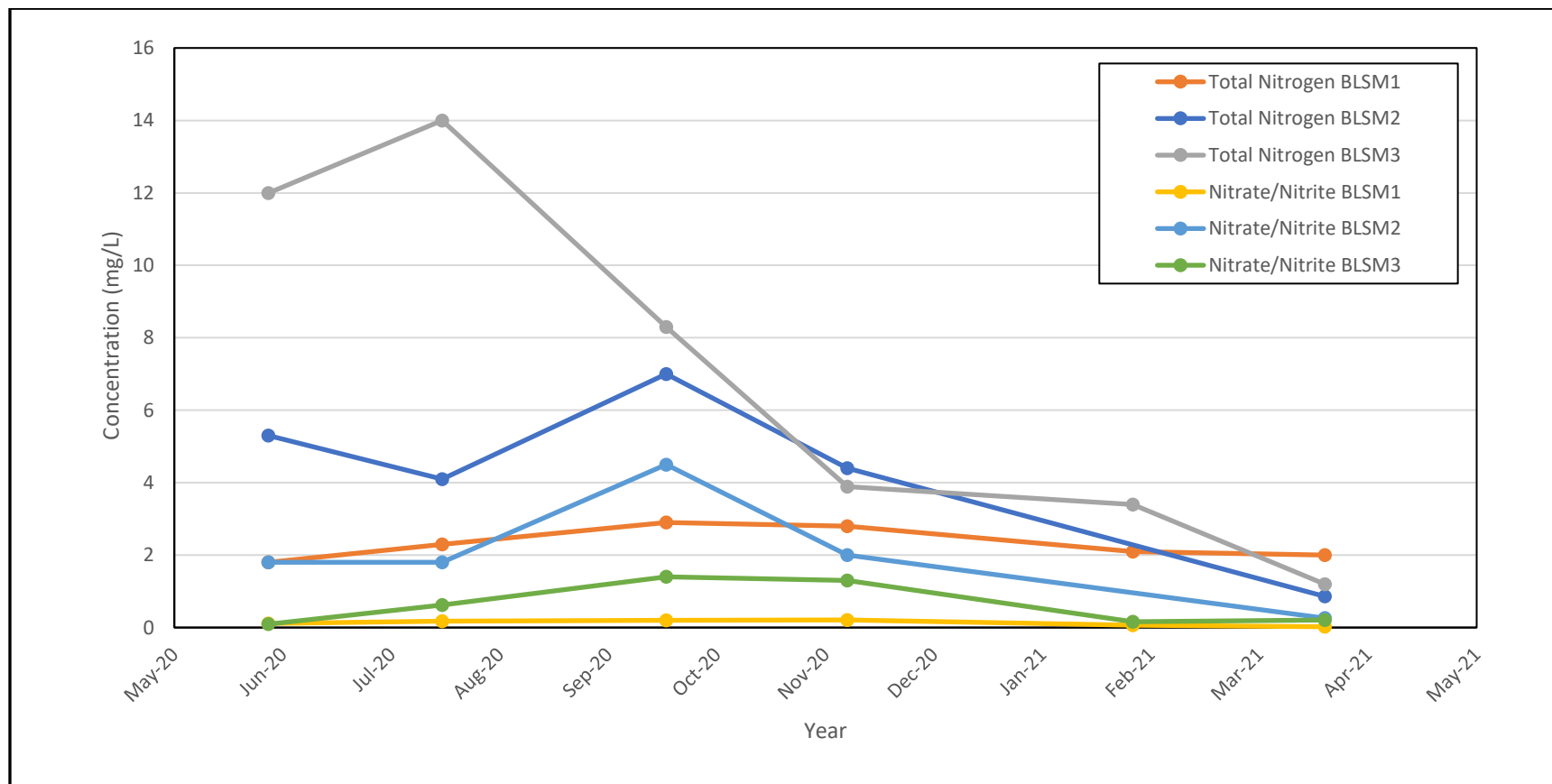
Source: Wood

Figure 5-4 – Lake Bass BLA-3 Autosampler Location



Source: Wood

Figure 5-5 – Total Nitrogen and Nitrate/Nitrite Concentrations in Lake Bass Seepage Meters from June 2020 through April 2021



Source: Wood (6 events)

Figure 5-6 – Total Phosphorus and Orthophosphate Concentrations in Lake Bass Seepage Meters from June 2020 through April 2021

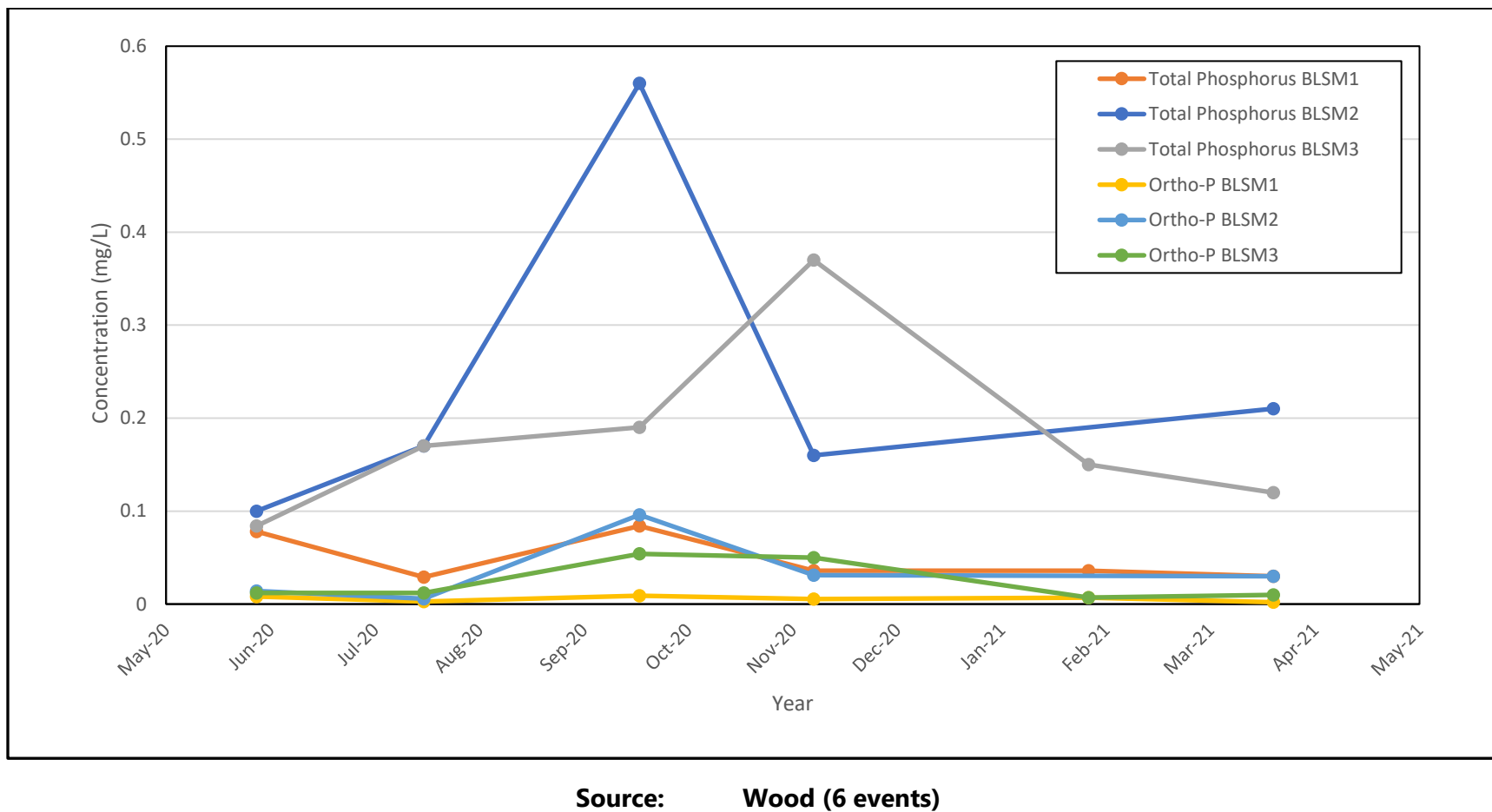
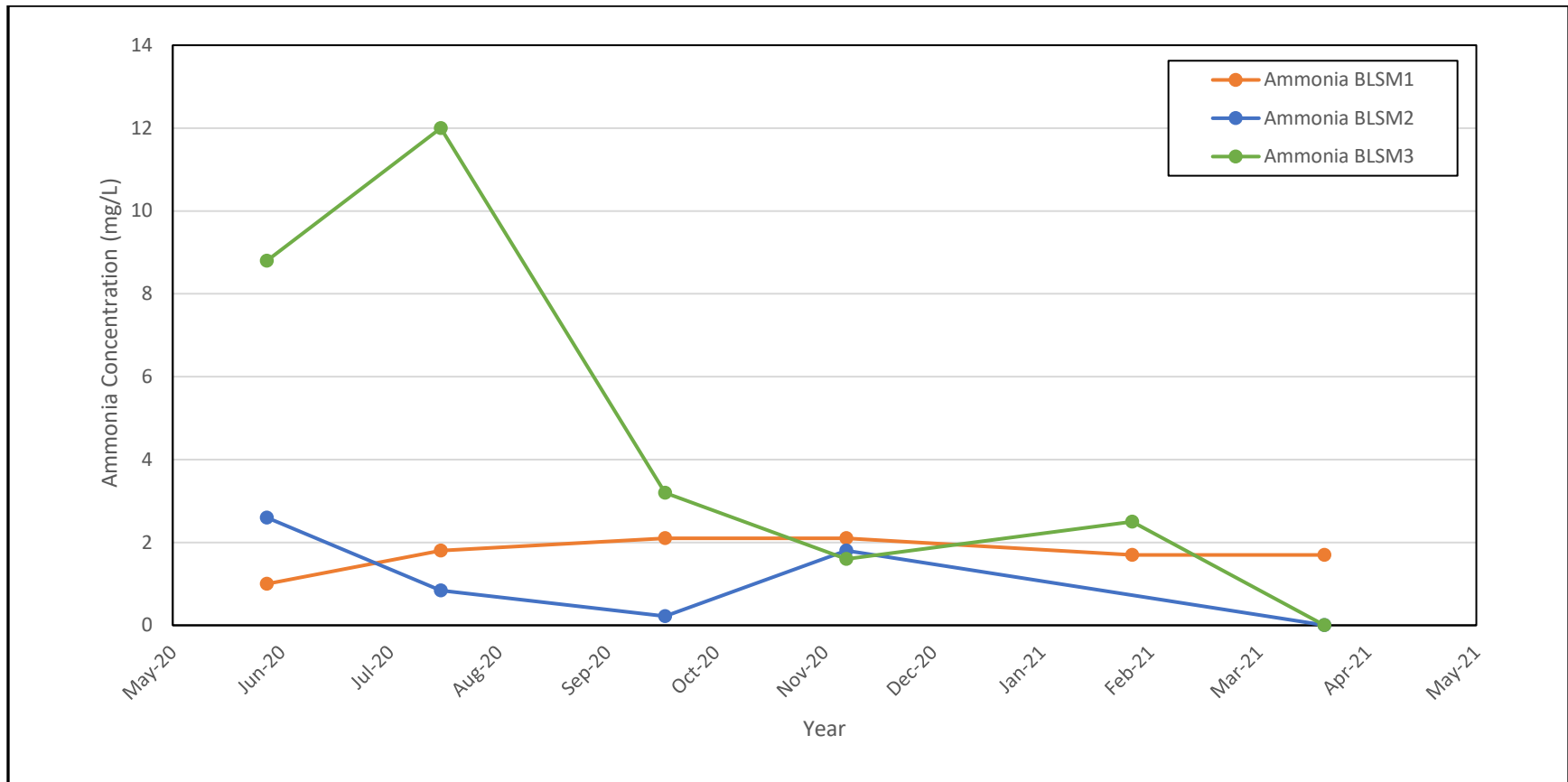
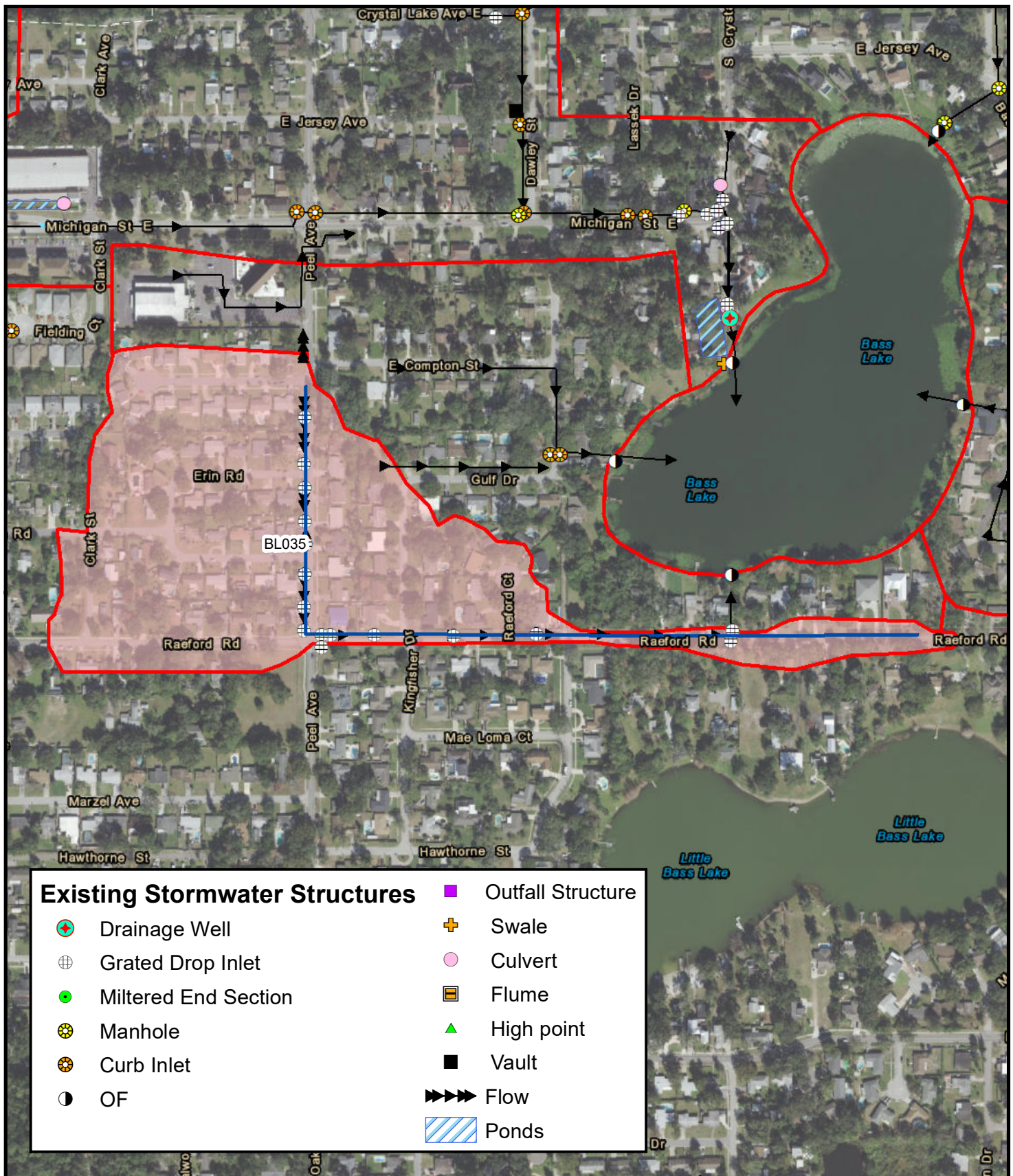


Figure 5-6

Figure 5-7 – Ammonia Concentrations in Lake Bass Seepage Meters from June 2020 through April 2021



Source: Wood (6 events)



Notes:

- 1- Project No.: 600478x22
- 2- Data Source - ESRI Imagery, SJRWMD, Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 06/09/21
Created By: ACH
Checked By:



Explanation of Features

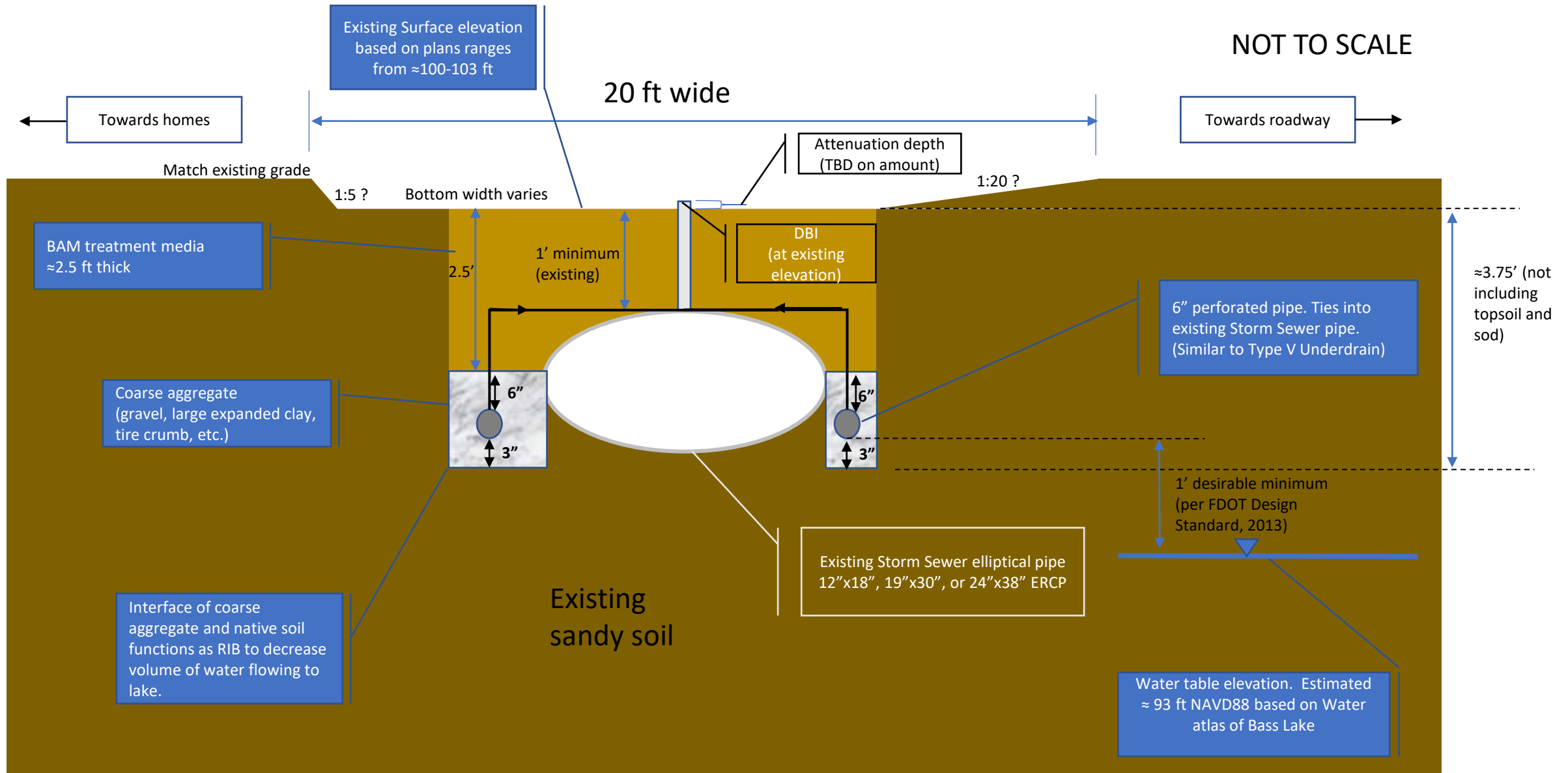
- BL035 BMP Alternative_1
- Lake Bass Sub-Basins
- Sub_Basin_BL035

0 340
Feet

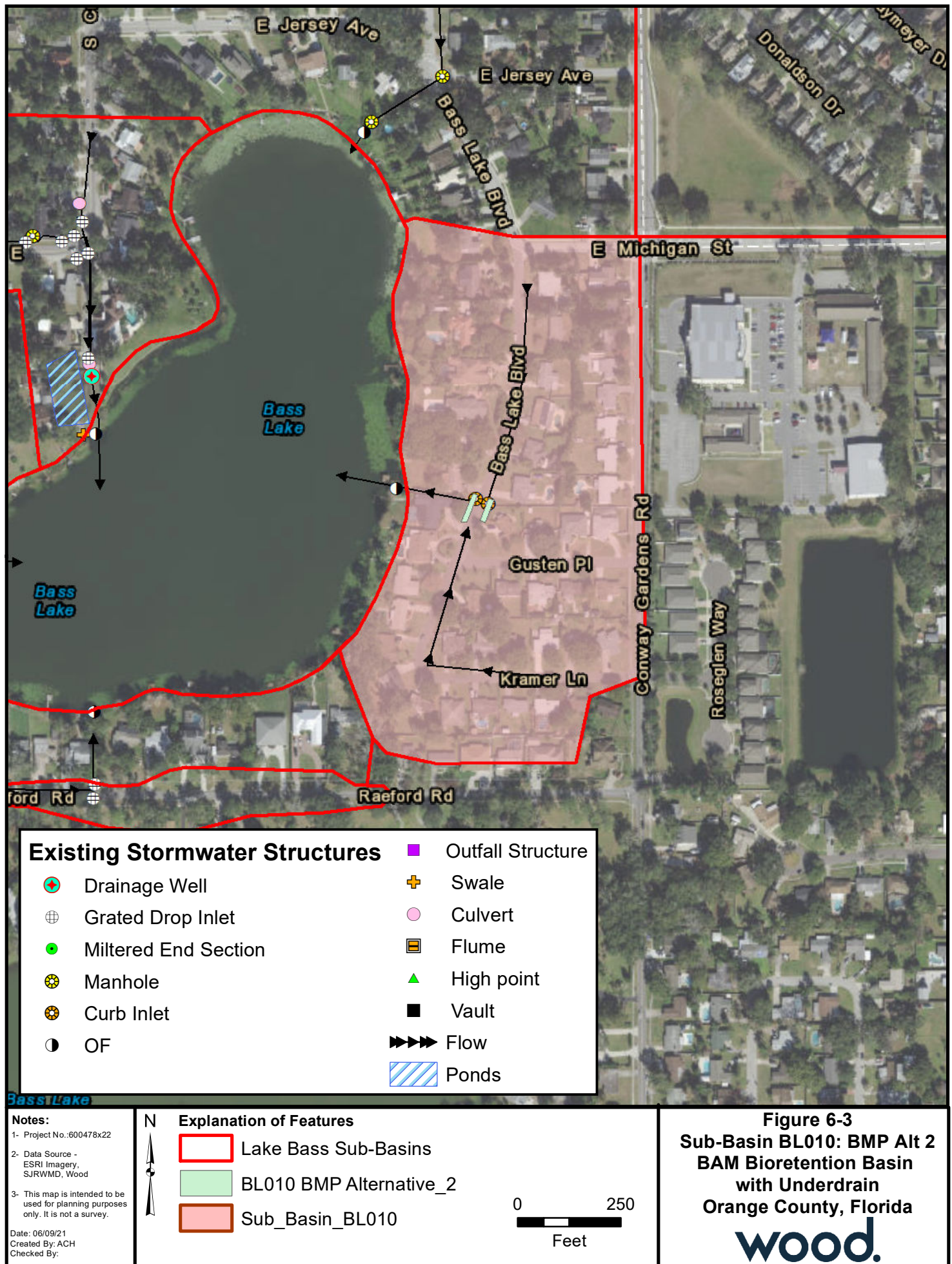
Figure 6-1
Sub-Basin BL035; BMP Alt. 1
Linear BAM Bioretention
System with Underdrain
Orange County, Florida

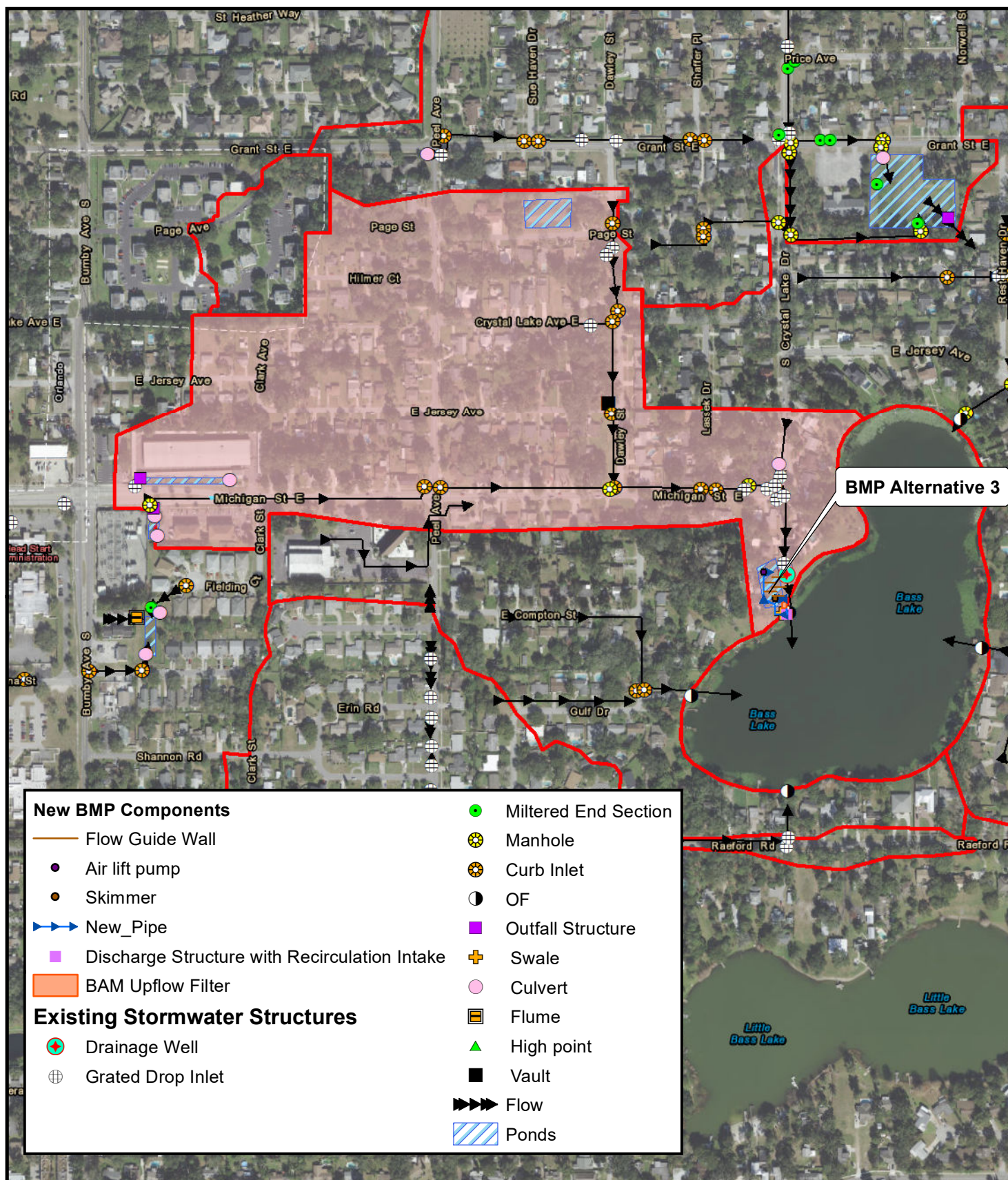
wood.

Figure 6-2 Cross Section of a Linear BAM Bioretention System



It is desired for the minimal amount of water to flow through the perforated underdrain pipes as possible. It is more desirable for water to flow through the B&G and then enter the native soil, thus creating a volume flow reduction to Bass Lake as well as reducing nutrients entering the surficial groundwater. It is common for surficial groundwater to flow towards and enter lakes as seepage. Thus, reducing the nutrient content of water that infiltrates to native soil will also be beneficial to Bass Lake; this is an added, although not quantified, nutrient removal for Bass Lake.





Notes:

- 1- Project No.:600478x22
- 2- Data Source - ESRI Imagery, SJRWMD, Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 06/09/21
Created By: ACH
Checked By:



Explanation of Features

- Lake Bass Sub-Basins
- Sub_Basin_BL020

0 400
Feet

Figure 6-4
Sub-Basin BL020; BMP Alt. 3
BAM Upflow Filtration with
Recirculation
Orange County, Florida

wood.



Notes:

1- Project No.:600478x22

2- Data Source -
ESRI Imagery,
SJRWMD, Wood

3- This map is intended to be
used for planning purposes
only. It is not a survey.

Date: 06/10/21
Created By: ACH
Checked By:



Explanation of Features

New BMP Components

Flow Guide Wall

Discharge Structure with
Recirculation Intake



Recirculating Pump



Skimmer

New_Pipe

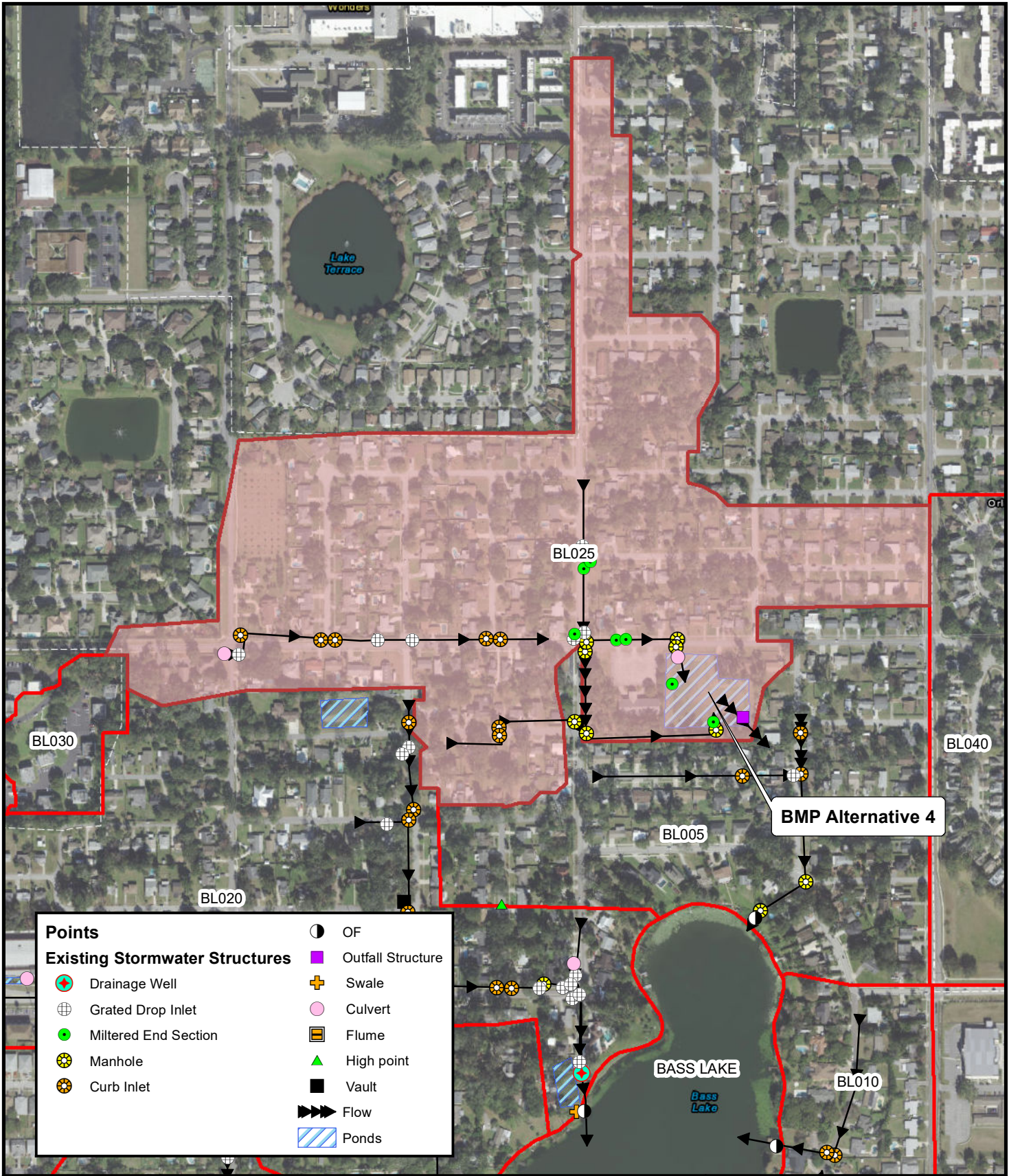


BAM Upflow Filter

0 30
Feet

Figure 6-5
Sub-Basin BL020; BMP Alt 3
Detail
Orange County, Florida

wood.



Points
Existing Stormwater Structures

Drainage Well
 Grated Drop Inlet
 Mitered End Section
 Manhole
 Curb Inlet

OF
 Outfall Structure
 Swale
 Culvert
 Flume
 High point
 Vault
 Flow
 Ponds

Notes:

- 1- Project No.:600478x22
- 2- Data Source - ESRI Imagery, SJRWMD, Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 06/10/21
 Created By: ACH
 Checked By:

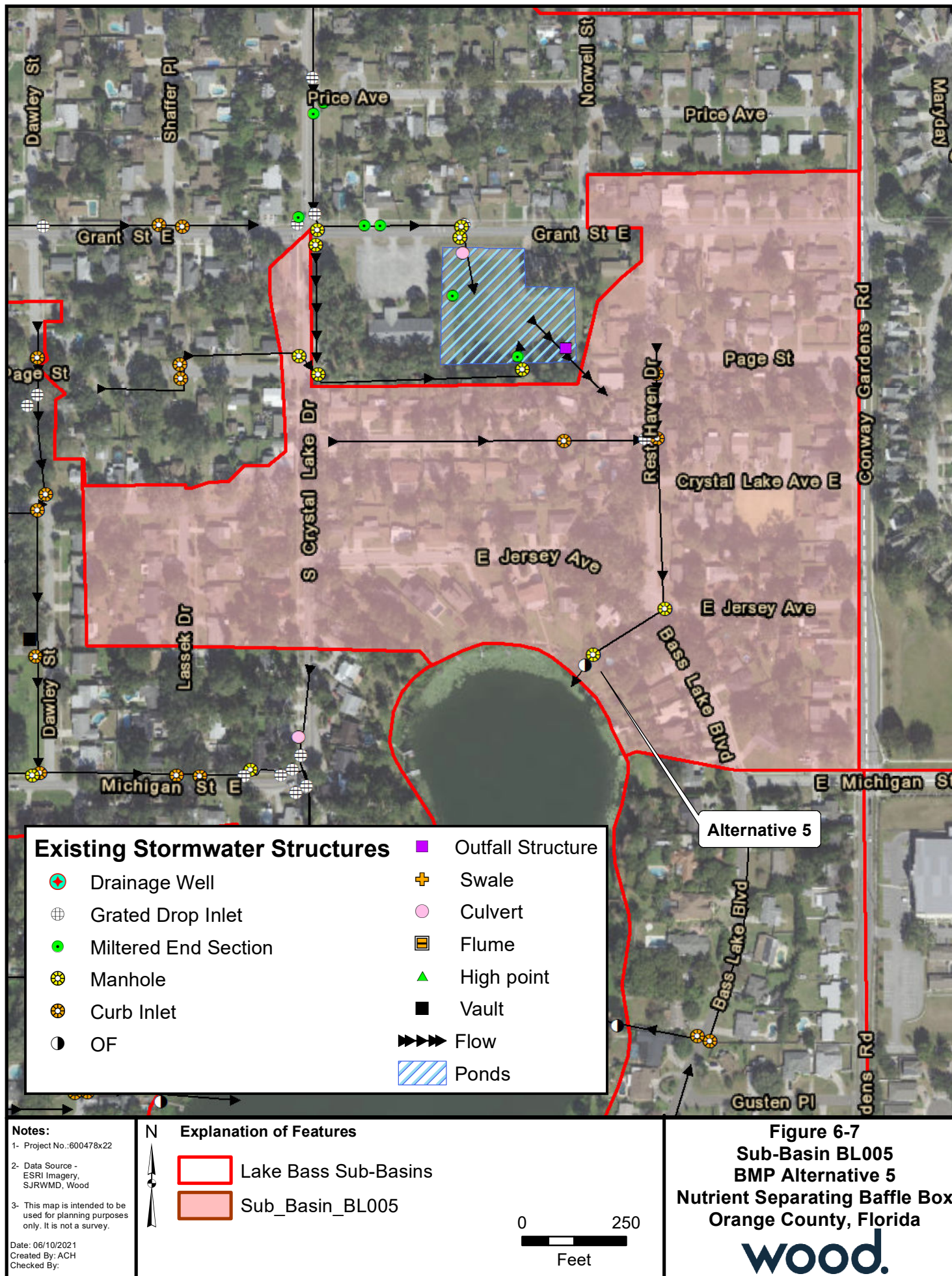


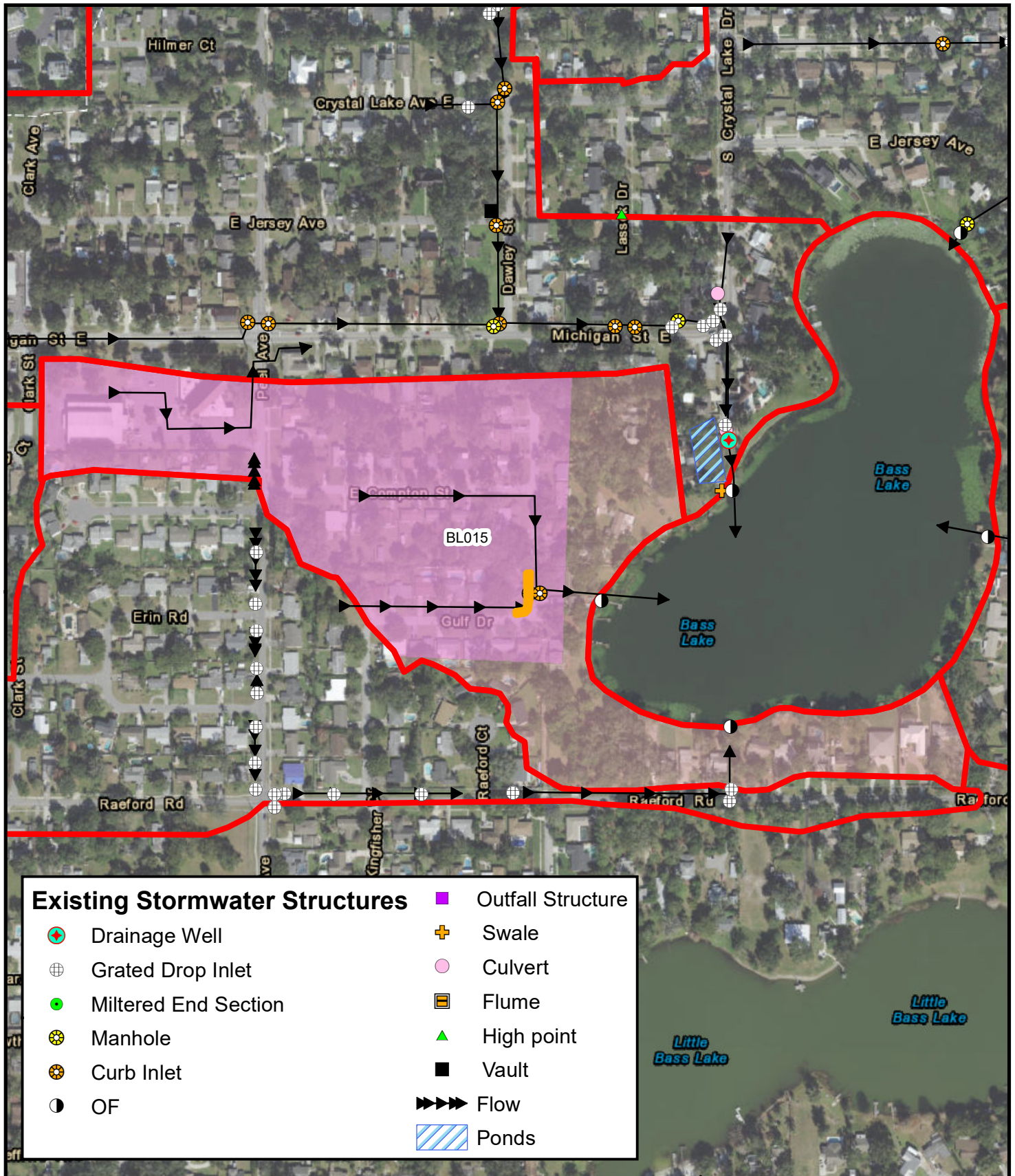
Explanation of Features

- Lake Bass Sub-Basins
 Sub_Basin_BL025



Figure 6-6
Sub-Basin BL025; BMP Alt. 4
BAM Bioretention System with
Underdrain
Orange County, Florida





Notes:
 1- Project No.:600478x22
 2- Data Source - ESRI Imagery, SJRWMD, Wood
 3- This map is intended to be used for planning purposes only. It is not a survey.
 Date: 06/10/21
 Created By: ACH
 Checked By:

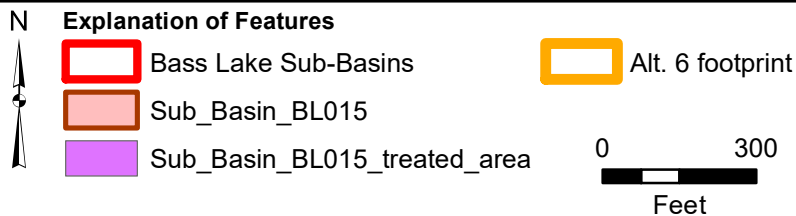
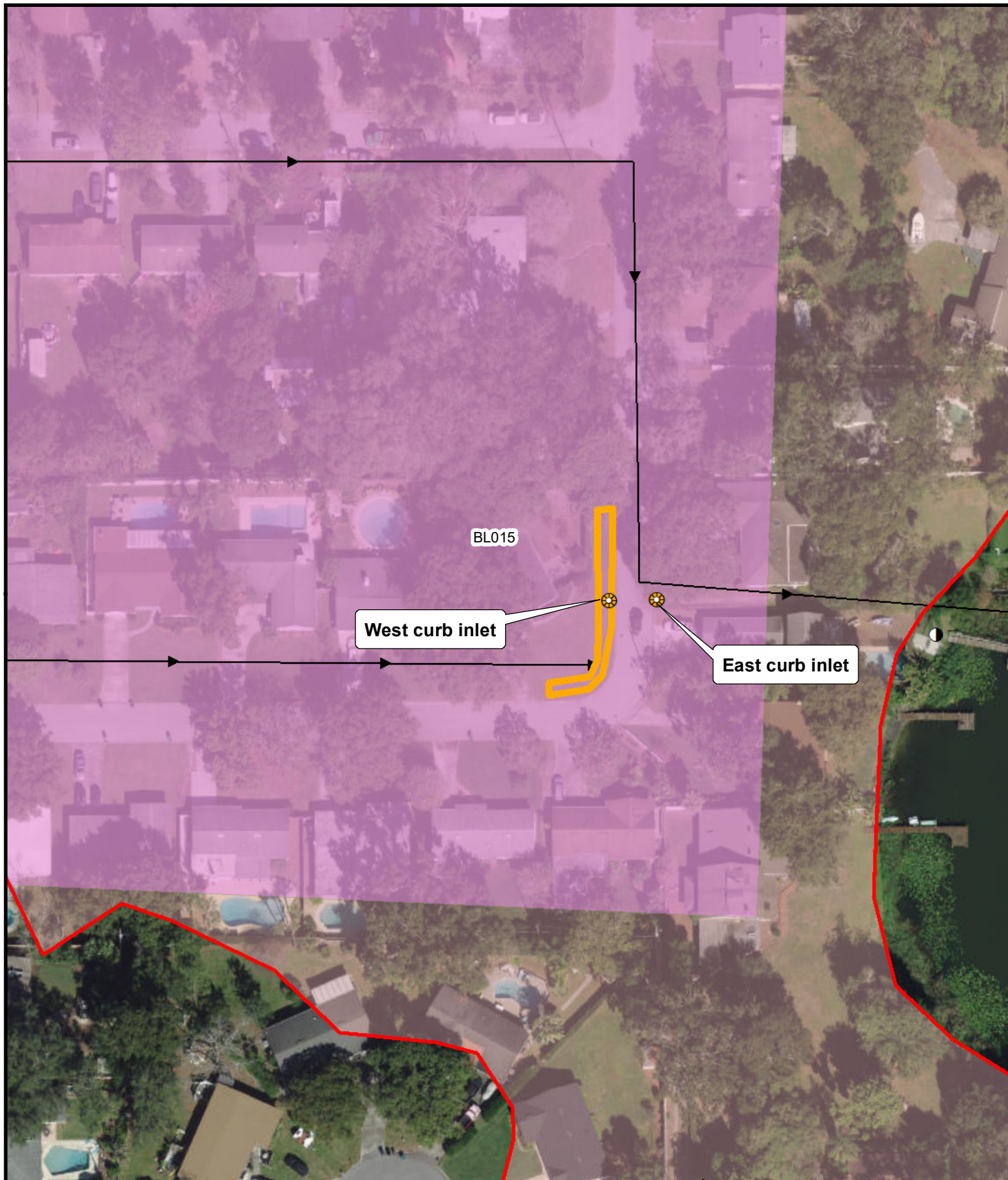


Figure 6-8
Sub-Basin BL015
BMP Alternative 6
Bioretention System
Orange County, Florida



Notes:

- 1- Project No.:600478x22
- 2- Data Source -
ESRI Imagery,
SJRWMD, Wood
- 3- This map is intended to be
used for planning purposes
only. It is not a survey.

Date: 06/10/21
Created By: ACH
Checked By:



Explanation of Features



Bass Lake Sub-Basins



Alt. 6 footprint



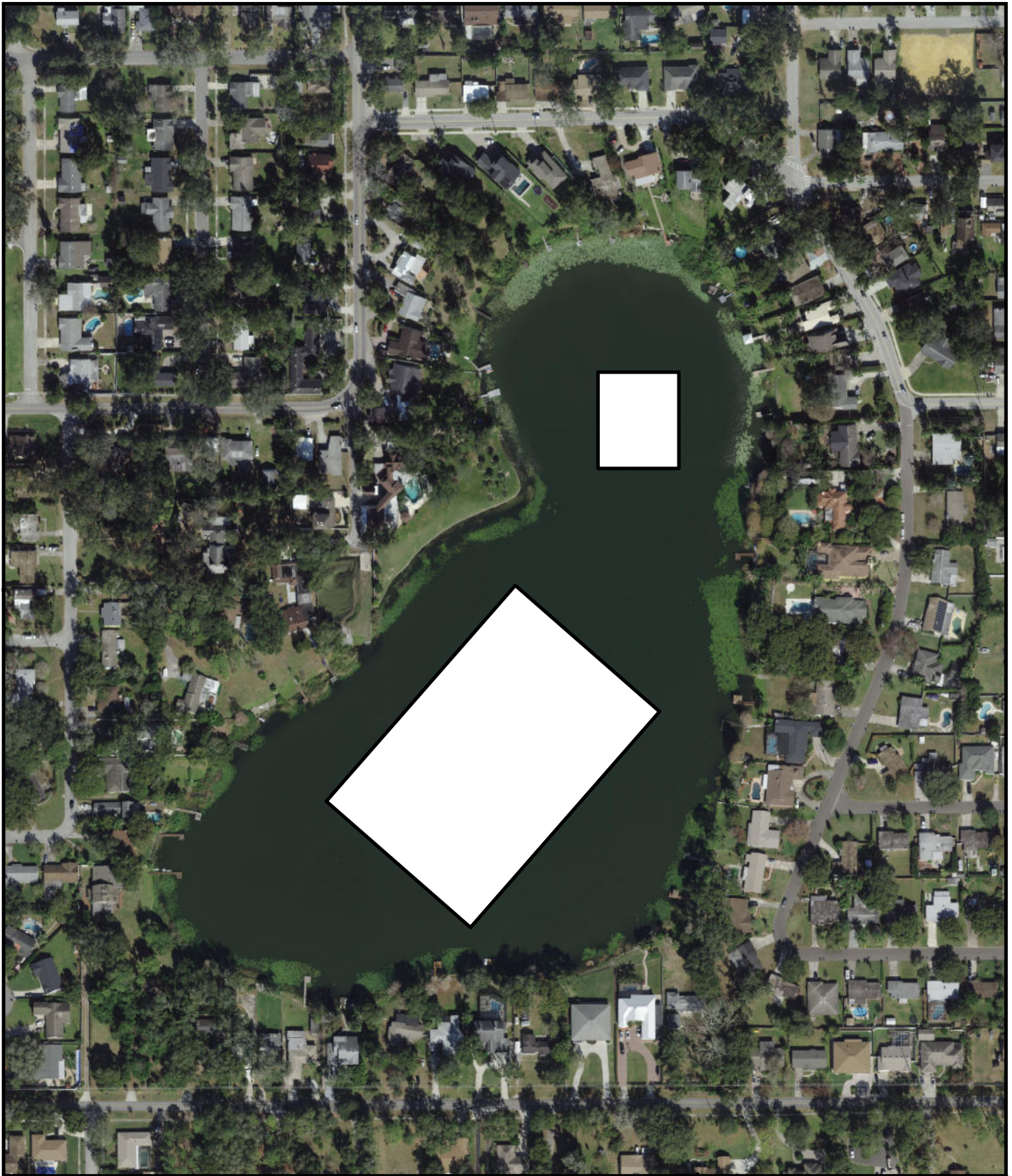
Sub_Basin_BL015_treated_area



Sub_Basin_BL015

0 60
Feet

Figure 6-9
Sub-Basin BL015
BMP Alternative 6
Detail
Orange County, Florida
wood.



Notes:

1- Project No.:600478x22

2- Data Source -
ESRI Imagery,
SJRWMD, Wood

3- This map is intended to be
used for planning purposes
only. It is not a survey.

Date: 06/10/21
Created By: ACH
Checked By:



Explanation of Features

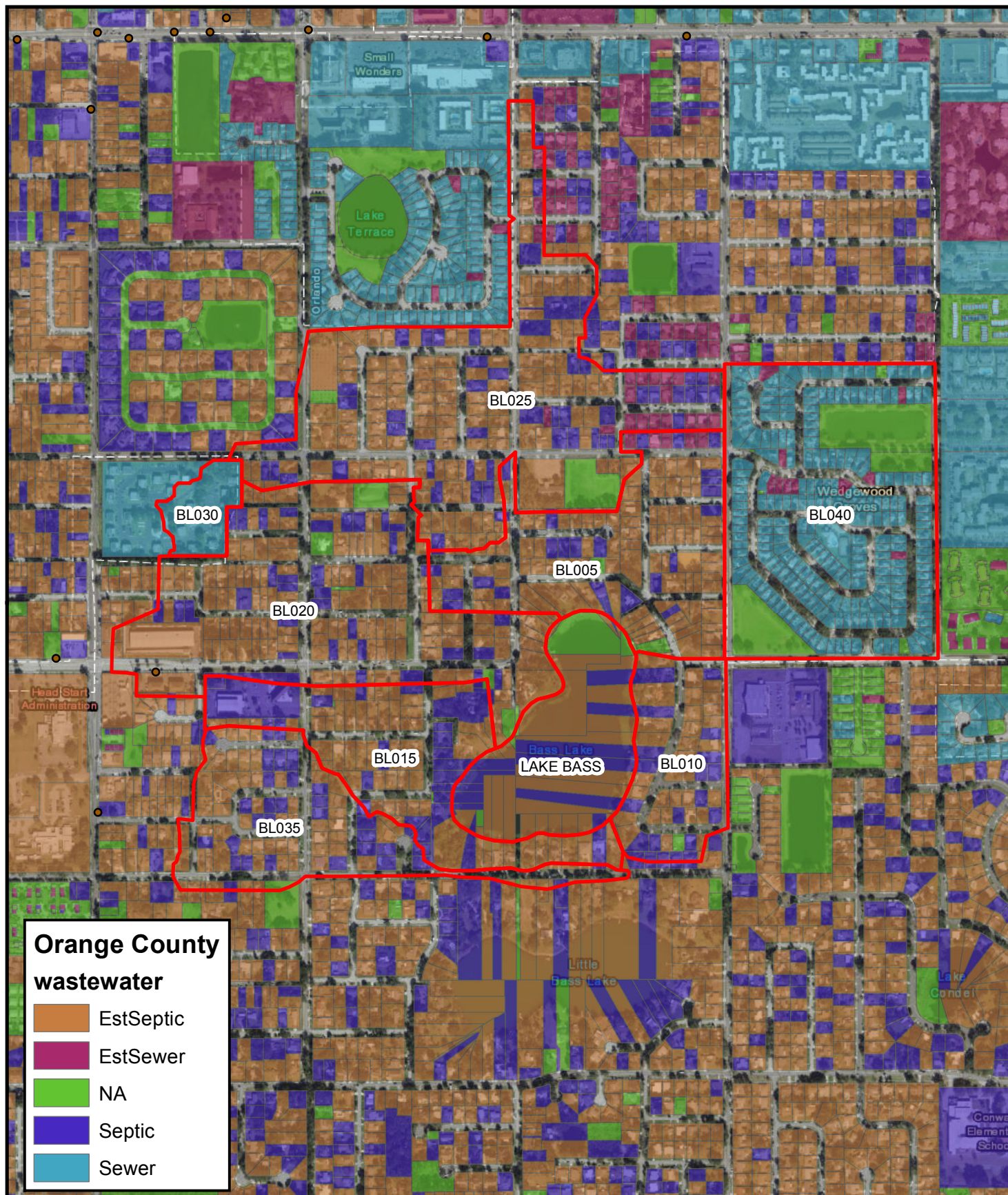


Approximate Treatment Area

0 200
Feet

Figure 6-10
Sediment Nutrient Inactivation
BMP Alternative 7
Orange County, Florida

wood.



Notes:

- 1- Project No.:600478x16
- 2- Data Source - ESRI StreetMap SJRWMD, Wood
- 3- This map is intended to be used for planning purposes only. It is not a survey.

Date: 08/27/2019
 Revised/AB
 Checked By:LL

Explanation of Features

Lake Bass Sub-Basins

Figure 6-11
Wastewater Treatment Type
Lake Bass
Orange County, Florida

wood.

APPENDIX A

Sediment Phosphorus Fractionation Lab Report



October 13, 2020

Wood PLC
Attention: Lance Lumbard
550 Northlake Blvd. Suite 1000
Altamonte Springs, FL 32701

PO #: C012609568
Project Name: Bass Lake Loading Study
Project No.: 600478x22
Batch ID: 366062

Dear Lance Lumbard:

DB Environmental received samples on September 1, 2020 @ 12:40 for the analyses presented in the following report.

Analyses are performed with method required calibration and QA/QC samples whenever applicable. Method performance, which is based on the calibration and QA/QC samples, establishes the validity and certainty of the reported sample results. These results are calculated on a dry-weight basis, unless otherwise noted. These results relate only to the samples as received. The report shall not be reproduced except in full, without the written approval of the laboratory.

This report contains a total of 6 pages:

cover letter	<u>1</u>	case narrative	<u>0</u>	report	<u>3</u>
QC summary	<u>1</u>	COC	<u>1</u>	analytical results	<u>0</u>
correspondence	<u>0</u>	invoice	<u>0</u>		

Please note that any unused portion of the samples will be disposed of 30 days following issuance of report, unless you have requested otherwise.

If you have any questions regarding the analytical results, please feel free to call me at 321-639-4896.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Nancy Chan', is written over a blue circular stamp.

Nancy Chan
Project Manager

Enclosure

cc: Craig Duxbury

THIS DOCUMENT MEETS NELAC STANDARDS
NELAP Certification #E 83330

Date: October 13, 2020

REPORT OF ANALYSIS

Client: Wood PLC
Attention: Lance Lumbard
550 Northlake Blvd. Suite 1000
Altamonte Springs, FL 32701

Date and Time Received: 9/1/2020 12:40

PO #: C012609568
Project Name : Bass Lake Loading Study
Project No. : 600478x22
Matrix: Sediment

SAMPLE ID	LAB LOG NUMBER	DATE SAMPLED	TIME SAMPLED	PARAMETER	METHOD NUMBER	RESULTS	UNITS	METHOD DETECTION LIMIT	DATE/TIME OF ANALYSIS	QUALIFIER CODE
Bass Sed Core 1	366062	8/28/2020	11:30	% Dry Weight	ASA 21-2	77.98	%	0.01	9/8/2020	
Bass Sed Core 2	366063	8/28/2020	12:02	% Dry Weight	ASA 21-2	76.67	%	0.01	9/8/2020	
Bass Sed Core 3	366064	8/28/2020	13:10	% Dry Weight	ASA 21-2	10.93	%	0.01	9/8/2020	
Bass Sed Core 4	366065	8/28/2020	13:45	% Dry Weight	ASA 21-2	73.75	%	0.01	9/8/2020	
Bass Sed Core 1	366062	8/28/2020	11:30	Bulk Density	ASA 13	1.3	g/cc	0.001	9/8/2020	
Bass Sed Core 2	366063	8/28/2020	12:02	Bulk Density	ASA 13	1.4	g/cc	0.001	9/8/2020	
Bass Sed Core 3	366064	8/28/2020	13:10	Bulk Density	ASA 13	0.11	g/cc	0.001	9/8/2020	
Bass Sed Core 4	366065	8/28/2020	13:45	Bulk Density	ASA 13	1.3	g/cc	0.001	9/8/2020	
Bass Sed Core 1	366062	8/28/2020	11:30	Volatile Solids	EPA/COE 3-59	<1.35	%	1.35	10/9/2020	U
Bass Sed Core 2	366063	8/28/2020	12:02	Volatile Solids	EPA/COE 3-59	<1.35	%	1.35	10/9/2020	U
Bass Sed Core 3	366064	8/28/2020	13:10	Volatile Solids	EPA/COE 3-59	66.5	%	1.35	10/9/2020	
Bass Sed Core 4	366065	8/28/2020	13:45	Volatile Solids	EPA/COE 3-59	1.59	%	1.35	10/9/2020	I
Bass Sed Core 1	366062	8/28/2020	11:30	Total Phosphorus	DBE SOP TP	254	mg/kg dry	10	10/8/2020	
Bass Sed Core 2	366063	8/28/2020	12:02	Total Phosphorus	DBE SOP TP	249	mg/kg dry	20	10/8/2020	
Bass Sed Core 3	366064	8/28/2020	13:10	Total Phosphorus	DBE SOP TP	1950	mg/kg dry	100	10/8/2020	A
Bass Sed Core 4	366065	8/28/2020	13:45	Total Phosphorus	DBE SOP TP	178	mg/kg dry	10	10/8/2020	
Bass Sed Core 1	366062	8/28/2020	11:30	Porewater SRP	DBE SOP OPO4	0.018	mg/kg dry	0.0003	9/4/2020 9:55	A
Bass Sed Core 2	366063	8/28/2020	12:02	Porewater SRP	DBE SOP OPO4	0.018	mg/kg dry	0.0003	9/4/2020 9:55	
Bass Sed Core 3	366064	8/28/2020	13:10	Porewater SRP	DBE SOP OPO4	0.92	mg/kg dry	0.016	9/4/2020 9:55	A
Bass Sed Core 4	366065	8/28/2020	13:45	Porewater SRP	DBE SOP OPO4	0.015	mg/kg dry	0.0004	9/4/2020 9:55	
Bass Sed Core 1	366062	8/28/2020	11:30	Porewater NH ₃ -N	SM 4500-NH3 (18th ed.)	0.25	mg/kg dry	0.003	9/16/2020	A
Bass Sed Core 2	366063	8/28/2020	12:02	Porewater NH ₃ -N	SM 4500-NH3 (18th ed.)	0.68	mg/kg dry	0.033	9/16/2020	

SAMPLE ID	LAB LOG NUMBER	DATE SAMPLED	TIME SAMPLED	PARAMETER	METHOD NUMBER	RESULTS	UNITS	METHOD DETECTION LIMIT	DATE/TIME OF ANALYSIS	QUALIFIER CODE
Bass Sed Core 3	366064	8/28/2020	13:10	Porewater NH ₃ -N	SM 4500-NH3 (18th ed.)	94.7	mg/kg dry	1.6	9/16/2020	A
Bass Sed Core 4	366065	8/28/2020	13:45	Porewater NH ₃ -N	SM 4500-NH3 (18th ed.)	0.55	mg/kg dry	0.040	9/16/2020	
Bass Sed Core 1	366062	8/28/2020	11:30	NH ₄ Cl TSP*	DBE SOP TP	<0.7	mg/kg dry	0.7	10/5/2020	U
Bass Sed Core 2	366063	8/28/2020	12:02	NH ₄ Cl TSP*	DBE SOP TP	1.5	mg/kg dry	0.7	10/5/2020	I
Bass Sed Core 3	366064	8/28/2020	13:10	NH ₄ Cl TSP*	DBE SOP TP	1.7	mg/kg dry	0.8	10/5/2020	A I
Bass Sed Core 4	366065	8/28/2020	13:45	NH ₄ Cl TSP*	DBE SOP TP	1.1	mg/kg dry	0.7	10/5/2020	I
Bass Sed Core 1	366062	8/28/2020	11:30	NaHCO ₃ /Na ₂ S ₂ O ₄ TSP**	DBE SOP TP	4.2	mg/kg dry	2.9	10/5/2020	A I
Bass Sed Core 2	366063	8/28/2020	12:02	NaHCO ₃ /Na ₂ S ₂ O ₄ TSP**	DBE SOP TP	<2.9	mg/kg dry	2.9	10/5/2020	U
Bass Sed Core 3	366064	8/28/2020	13:10	NaHCO ₃ /Na ₂ S ₂ O ₄ TSP**	DBE SOP TP	31.9	mg/kg dry	3.1	10/5/2020	A
Bass Sed Core 4	366065	8/28/2020	13:45	NaHCO ₃ /Na ₂ S ₂ O ₄ TSP**	DBE SOP TP	3.5	mg/kg dry	2.9	10/5/2020	I
Bass Sed Core 1	366062	8/28/2020	11:30	NaOH SRP***	DBE SOP OPO4	237	mg/kg dry	15.4	9/10/2020 10:14	
Bass Sed Core 2	366063	8/28/2020	12:02	NaOH SRP***	DBE SOP OPO4	163	mg/kg dry	15.4	9/10/2020 10:14	A
Bass Sed Core 3	366064	8/28/2020	13:10	NaOH SRP***	DBE SOP OPO4	994	mg/kg dry	16.8	9/10/2020 10:14	A
Bass Sed Core 4	366065	8/28/2020	13:45	NaOH SRP***	DBE SOP OPO4	127	mg/kg dry	15.5	9/10/2020 10:14	
Bass Sed Core 1	366062	8/28/2020	11:30	NaOH TSP	DBE SOP TP	244	mg/kg dry	6.0	10/6/2020	A
Bass Sed Core 2	366063	8/28/2020	12:02	NaOH TSP	DBE SOP TP	179	mg/kg dry	6.0	10/6/2020	
Bass Sed Core 3	366064	8/28/2020	13:10	NaOH TSP	DBE SOP TP	1700	mg/kg dry	6.6	10/6/2020	A
Bass Sed Core 4	366065	8/28/2020	13:45	NaOH TSP	DBE SOP TP	171	mg/kg dry	6.1	10/6/2020	
Bass Sed Core 1	366062	8/28/2020	11:30	NaOH TSP minus NaOH SRP†	Calculation	<15.4	mg/kg dry	15.4	n/a	U
Bass Sed Core 2	366063	8/28/2020	12:02	NaOH TSP minus NaOH SRP†	Calculation	16	mg/kg dry	15.4	n/a	A I
Bass Sed Core 3	366064	8/28/2020	13:10	NaOH TSP minus NaOH SRP†	Calculation	706	mg/kg dry	16.8	n/a	I
Bass Sed Core 4	366065	8/28/2020	13:45	NaOH TSP minus NaOH SRP†	Calculation	44	mg/kg dry	15.5	n/a	A
Bass Sed Core 1	366062	8/28/2020	11:30	HCl TSP††	DBE SOP TP	12.8	mg/kg dry	2.9	10/6/2020	A
Bass Sed Core 2	366063	8/28/2020	12:02	HCl TSP††	DBE SOP TP	12.0	mg/kg dry	2.9	10/6/2020	
Bass Sed Core 3	366064	8/28/2020	13:10	HCl TSP††	DBE SOP TP	19.0	mg/kg dry	3.1	10/6/2020	A
Bass Sed Core 4	366065	8/28/2020	13:45	HCl TSP††	DBE SOP TP	4.2	mg/kg dry	2.9	10/6/2020	I
Bass Sed Core 1	366062	8/28/2020	11:30	Residual P	DBE SOP TP	29	mg/kg dry	19	10/8/2020	I
Bass Sed Core 2	366063	8/28/2020	12:02	Residual P	DBE SOP TP	43	mg/kg dry	20	10/8/2020	I
Bass Sed Core 3	366064	8/28/2020	13:10	Residual P	DBE SOP TP	159	mg/kg dry	11	10/8/2020	A
Bass Sed Core 4	366065	8/28/2020	13:45	Residual P	DBE SOP TP	12	mg/kg dry	10	10/8/2020	I

SAMPLE ID	LAB LOG NUMBER	DATE SAMPLED	TIME SAMPLED	PARAMETER	METHOD NUMBER	RESULTS	UNITS	METHOD DETECTION LIMIT	DATE/TIME OF ANALYSIS	QUALIFIER CODE
Bass Sed Core 1	366062	8/28/2020	11:30	Total Organic Carbon	DBE SOP MVP/COE 3-73	3910	mg/kg dry	3030	10/9/2020	I
Bass Sed Core 2	366063	8/28/2020	12:02	Total Organic Carbon	DBE SOP MVP/COE 3-73	5307	mg/kg dry	3030	10/9/2020	A I
Bass Sed Core 3	366064	8/28/2020	13:10	Total Organic Carbon	DBE SOP MVP/COE 3-73	394000	mg/kg dry	3030	10/9/2020	
Bass Sed Core 4	366065	8/28/2020	13:45	Total Organic Carbon	DBE SOP MVP/COE 3-73	7810	mg/kg dry	3030	10/9/2020	I

Key to Qualifier Code

- A Result based on the mean of two or more determinations; average of lab dup and/or extraction dup results.
I Result is between the method detection limit and the practical quantitation limit.

Project Manager: 
Nancy Chan

Reference

Meis, S., Spears, B.M., Maberly, S.C., O'Malley, M.B., Perkins, R.G. 2012. Sediment amendment with Phoslock® in Clatto Reservoir (Dundee, UK): Investigating changes in sediment elemental composition and phosphorus fractionation. *J. Environ. Manag.*; 93, 185-193.

*NH₄Cl TSP = Labile P

**NaHCO₃/Na₂S₂O₄ TSP = Reductant-Soluble P

***NaOH SRP = Metal-Oxide Adsorbed P

†NaOH TSP minus NaOH SRP = Organic P

††HCl TSP = Apatite Bound P

QC SUMMARY
Wood PLC
PO # : C012609568
Project Name: Bass Lake Loading Study
Project No. : 600478x22
(366062-366065)

PARAMETER	LAB DUPLICATES	% RSD	SPIKES	% RECOVERY	BLANKS
Volatile Solids	366062	ND			<1.35 %
Total Phosphorus / Residual P	366064	7.1	366065	102	<10 mg/kg
Porewater SRP	366062	2.2	366063	97	<0.001 mg/kg dry
Porewater NH3-N	366062	0.3	366065	108	<0.010 mg/kg dry
NH ₄ Cl TSP	366062	ND	366063	104	<0.8 mg/kg dry
NaHCO ₃ /Na ₂ S ₂ O ₄ TSP	366062	26.0	366063	ND	<3.0 mg/kg dry
NaOH SRP	366063	0.0	366065	102	<16.0 mg/kg dry
NaOH TSP	366062	4.6	366063	101	<6.2 mg/kg dry
HCl TSP	366062	8.6	366063	100	<3.0 mg/kg dry
Total Organic Carbon	366063	0.9	366064	98	<3030 mg/kg dry

ND - Not determined; not calculated because one or both results were below detection limit.

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CHAIN OF CUSTODY

Revision 8.0, Effective 8/31/2018

[illegible]

APPENDIX B

Sediment Flux Lab Report

SOP Nutrient Flux: B-1

STANDARD OPERATING PROCEDURE EVALUATION OF TREATMENT ALTERNATIVE EFFICIENCIES THROUGH DIRECT MEASUREMENT OF DIFFUSIVE FLUX

Effective Date: June 11, 2018

Prepared by: Water Resources Technical Lead Scientist; Laboratory Scientist

Approved by: Quality Assurance Field Officer; Quality Assurance Laboratory Director

TABLE OF CONTENTS

1.0 Purpose	1
2.0 Scope, Application and Applicable Matrix	1
3.0 Materials and Methods	3
3.1 Field Sample Collection Procedures, Preservation and Storage	3
3.2 Sample Type C: Internal Laboratory Sample Preparation Procedure, Preservation and Storage for Intact Sediment Core Incubation Flux Measurement	5
4.0 Data Analyses	8
4.1 Calculation of Nutrient Flux Rates	8
5.0 Quality Control	8
6.0 Safety and Waste Management	8
7.0 References	9

1.0 Purpose

This SOP describes field and laboratory methods recommended to evaluate the potential internal nutrient loading from sediments that may occur in a waterbody, as part of the sediment nutrient flux assessment component of the subject Project. In addition, various treatment alternatives can also be evaluated by measuring the reduction of diffusive nutrient flux, which would directly relate to the alternative's treatment efficiency.

The flux study will aid in quantifying the potential beneficial impacts of adding a biological or chemical amendment or cap to improve water quality.

2.0 Scope, Application and Applicable Matrix

Sediment nutrient accumulations in waterbodies over time can contribute pollutant sources to the overlying water column, through biogeochemical processes such as adsorption, desorption and diffusion processes (Lijklema et al. 1993). Detailed physical and chemical characterizations of sediments are therefore essential to evaluate the nutrient exchange processes that occur at the sediment-water interface (Sahin et al. 2012).

Phosphorus is typically the limiting nutrient in lentic systems, and when found in excess, eutrophication can occur (Dorich et al. 1985). As a growing number of waterbodies worldwide suffer from cultural eutrophication, determination of the causes of water quality degradation is becoming increasingly important for water resource management and restoration (Ogdahl et al. 2014). Bottom sediments in waterbodies play a major role in releasing nutrients to the overlying water column during wind induced sediment resuspension and/or by constant flux due to diffusion (Reddy et al. 1996). Projects that include treatment alternatives to cap sediments containing high concentrations of biologically available

nutrients are beneficial to the recovery of water quality and ecological conditions in waterbodies such as lakes and streams.

Nutrient bioavailability and reactivity in the sediments can be quantified by measuring different forms of nitrogen (N) and phosphorus (P) content in the sediment (Olila et al. 1995) and release from the sediments into the water column (Ogdahl et al. 2014). The amounts and forms of reactive and nonreactive P in sediments can be examined using chemical extraction procedures to differentiate between the P fraction's solubility when exposed to various chemical extractants (Psenner et al. 1988; Olila et al. 1995). Readily available P (i.e. labile P) is defined as the sum of water-soluble P and NH_4Cl or KCl extractable P. These labile P fractions are desorbed and hydrolyzed or loosely bound or adsorbed (Hieltjes and Lijklema 1980; Topcu and Pulatsu 2008). The NaOH-extractable P fraction is the reductant soluble P form that can be released under certain environmental conditions and is extracted from iron hydroxide and aluminum hydroxide surfaces in the laboratory (Hieltjes and Lijklema 1980; Topcu and Pulatsu 2008). The sum of labile P and reductant soluble P forms typically account for the total biologically available P (BAP), which can be used as fuel to promote growth by phytoplankton in the water column (Reddy et al. 1998). Nutrient loading rates that diffuse from the sediments are dependent on the geologic nature (i.e. high natural phosphorus content) and/or legacy point source inputs into the system.

Flux rates of biologically available nutrients from the sediments can be quantified in the laboratory by incubating intact sediment cores under controlled laboratory conditions and measuring changes in nutrient concentrations over time in the water column overlying the sediment cores (e.g., Schelske et al. 1991, Trefry et al. 1992, Moore et al. 1998, and Ogdahl et al. 2014,). The primary benefit of the laboratory incubation approach is that the experimental conditions and the range of factors affecting flux rates can be carefully controlled. A slight drawback is the possibility that laboratory studies cannot completely mimic *in-situ* waterbody conditions and are subject to laboratory artifacts if sufficient controls are not put in place.

Intact sediment core incubations to determine flux rates rely on careful sediment extraction in the field and minimum disturbance during laboratory incubations. At the lab, nutrient concentration changes in the overlying water are evaluated overtime. Flux rates could be highly variable, depending on the conditions that were encountered before and during incubation. Some important considerations include the following:

- 1) Depth of sediment profiles collected and analyzed in the core
- 2) Depth of water analyzed on top of the sediment in the core
- 3) Initiation of incubation after inclusion of source water
- 4) The number and distribution (on time scale) of data points to develop the flux rate
- 5) The beginning and end points, and the length of incubation and time spanning between data points and from beginning to end of the run
- 6) Whether the tests are conducted in aerobic, anoxic, quiescent and/or turbulent conditions.

Depending on the study objective, it is possible to conduct the flux tests in both aerobic and anoxic conditions in separate core profiles (with replicates) to limit error introduced from biogeochemical processes not regularly encountered in the waterbody. Therefore, maintenance of low oxygen concentrations at anoxic levels by gentle purging with N_2 gas mixture is necessary to maintain the appropriate anoxic conditions. In contrast, gentle purging of air gas mixture is needed to maintain aerobic conditions. In addition, an appropriate stirring rate may be desired to establish a representative diffusive boundary layer thickness similar to the level of turbulence of the subject waterbody.

The intact sediment core laboratory incubation approach was selected to take advantage of strictly controlled laboratory conditions that can be manipulated to answer specific resource management questions.

Details of the experimental design and methodology are provided below, which are applicable to sediment samples collected by Wood field technicians, processed and/or analyzed by the Wood Laboratory and/or other certified laboratories. Trained field technicians and laboratory technical staff with applicable training and experience are responsible for performance of this SOP.

3.0 Materials and Methods

3.1 Field Sample Collection Procedures, Preservation and Storage

Three different types of samples and analyses should be conducted at each sampling site. The three types are identified by letters **a** through **c** below and should be collected in the following order for quality control purposes:

- a) Water Chemistry *In-situ* Vertical Profile
- b) Sediment Depth (*In-situ*)
- c) Intact Sediment Cores

Intact sediment cores should be transported to the Wood Flux Laboratory for set-up and immediately after core extrusion. Sampling methods and laboratory procedures for each of the different sampling types are described in the following sub-sections.

3.1.1 Field Equipment and Supplies

- 1) Safety plan
- 2) Boat with motor
- 3) GPS
- 4) Camera
- 5) Maps with access, site locations, and contact information
- 6) FDEP SOPs for water sampling
- 7) Field sheets
- 8) Fine point sharpies
- 9) Labels
- 10) Putty knife and screwdriver
- 11) Metric ruler
- 12) YSI MDS 550 multiparameter water quality sonde (calibrated and checked (ICV, CCV) documented on calibration logs per FDEP SOP)
- 13) Turbidimeter (calibrated and checked (ICV, CCV) documented on calibration logs per FDEP SOP)
- 14) Secchi disk
- 15) Levelling rod for muck depth and hard bottom depth
- 16) Peristaltic pump or submersible pump for collection of near-bottom ambient water for carboys/jugs for use in incubations
- 17) 12 X 3" outer diameter (OD) clean clear polycarbonate core tube, with 2 ⁷/₈" inner diameter (ID) and a ¹/₁₆" wall thickness, cut into 2' long pieces
- 18) Piston corer assembly for intact flux cores
- 19) Minimum of 16 3" test plugs to serve as bottom and top core plugs
- 20) Duct tape, epoxy glue, or other material to prevent leakage from cores
- 21) Extra-large black garbage bags to cover and keep core samples in the dark
- 22) Coolers with upright frame for flux core storage and transport

3.1.2 Field Equipment Calibration

Staff generated documentation of initial calibration, initial calibration verification and continuing calibration verification of water quality multiparameter sondes used to collect *in-situ* water chemistry profiles, and other field data collection equipment, as applicable. The FDEP SOPs (FS1000, FT1000, FD1000, FT1100, FT1200, FT1300, FT1400, FT1500, and FT1600), should be used for pre and post-

event instrument calibration and/or verification conducted prior to commencing sampling and at the end of each sampling day.

3.1.3 Field Sample Collection and QA/QC Procedures

Several SOPs such as the FDEP SOPs for water and sediment sampling (FS1000, FS2000, FS2100, and FS4000) should be kept on-hand during mobilization or pre-event preparation, and sampling. These SOPs should be followed to maintain a high level of accuracy in data collection and to ensure sound QA/QC management practices should be being followed.

3.1.3.1 Sample Type A: *In-situ* Vertical Profile of Water Chemistry

- 1) At each site, photographs should be taken showing the water column and habitat conditions of the site. In addition, photos should be taken of each of the sediment cores collected. The photographs taken should be noted on the field sheets.
- 2) Any notable field conditions should be noted such as weather or other environmental conditions that may affect sampling results.
- 3) At each site, *in-situ* water chemistry vertical depth profiles should be collected with a properly calibrated YSI multiparameter sonde.
- 4) The length of the YSI cord should be long enough to reach the bottom of the water column
- 5) At each site, YSI measurements should be recorded at three depths in the water column at the top, middle, and as near to the bottom as possible without disturbing the sediments (within 0.5 m of benthic surface).
- 6) Care must be taken to not disturb the sediments to cause error in the measurements.
- 7) The following parameters should be recorded for the overall site: total water depth, Secchi depth and measurement depth.
- 8) The following parameters should be recorded at each incremental depth: water temperature, dissolved oxygen (DO), pH, specific conductivity, salinity, ORP, and turbidity.

3.1.3.2 Sample Type B: Sediment Depth Collection

- 1) At each site, the top and bottom depth of flocculent sediment layer (muck), and the depth to hard bottom (refusal) should be measured with a levelling rod.
- 2) Sediment muck depths should be recorded on corresponding field sheets.

3.1.3.3 Sample Type C: Sediment Intact Cores Collection

- 1) At three predetermined sites, intact undisturbed sediment cores should be collected with a coring assembly (3' clear polycarbonate tube coupled with drive rods) to a depth of 20 cm from the top of sediment (0-20 cm).
 - a. At all three predetermined sites 2 cores will be collected at each location (one for anoxic and one for aerobic incubation).
 - b. Two water controls (one aerobic, and one anoxic) will be incubated along with the intact cores.
- 2) All core tubes must be labeled properly with site name, date, time, sampler names, and replicate number (1-8) on a piece of removable tape.
- 3) Care should be taken to ensure that homogenous replicate samples are collected from each site, which will require inspection of the replicates prior to placing the samples into the upright core racks (for storage and transportation). If the stratigraphy of the core samples differ, then a different, more homogeneous sediment strata should be located.
- 4) 25 to 40 cm of near-bottom ambient water should be included on top of the sediment core
- 5) After sediment is captured by the coring device, the core will be brought to the water's surface, sealed with a rubber stopper prior to breaking the water surface. Core retrieval approach may vary depending on the type of substrate. Slippage of sediments out of the bottom of the core must be stopped to avoid sample loss out of the bottom of the core and to avoid disturbing the sediments within the core.

- 6) The intact cores should be sealed with the appropriate top and bottom rubber stoppers.
- 7) The intact cores rubber stoppers will be wrapped with duct tape or an epoxy will be applied to the stopper to prevent leakage (epoxy is primarily needed for sandy samples with low organic matter content to prevent sample falling out the bottom of the core).
- 8) All cores must be,
 - a. covered with a dark garbage bag to limit light affecting the cores, and
 - b. transported in an upright position (using a rack) to the Wood Flux Lab for incubation and nutrient flux experiments
- 9) All COC paperwork must be filled out completely, and provided to the Wood lab
- 10) A copy of the COC signed by the laboratory must be received prior to departure

3.2 Sample Type C: Internal Laboratory Sample Preparation Procedure, Preservation and Storage for Intact Sediment Core Incubation Flux Measurement

3.2.1 Laboratory Equipment and Supplies

For set-up

- 1) Teflon tubing
- 2) Acid washed carboys
- 3) Deionized water (DI)
- 4) Labeling tape
- 5) 0.45 micron filtered ambient water

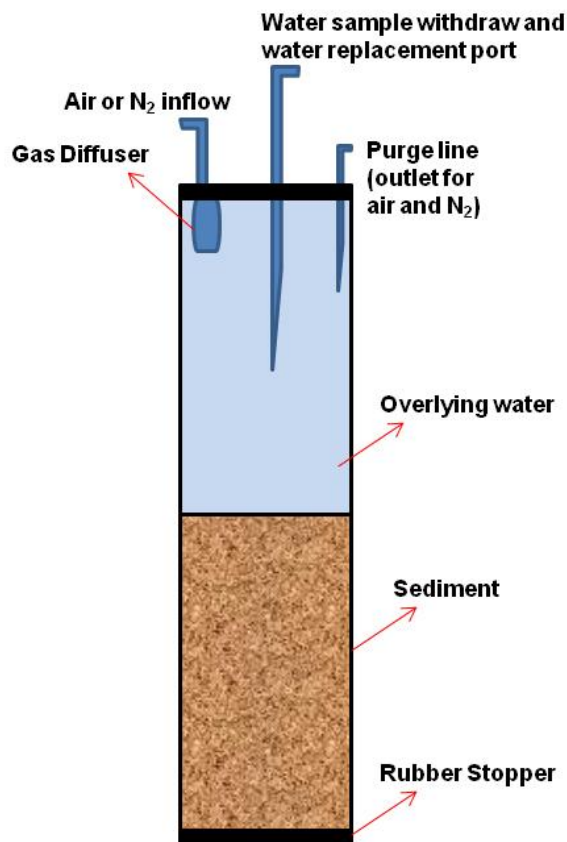
For nutrient flux experiment

- 1) Thermostat
- 2) Verification thermometer (ambient temperature)
- 3) pH meter
- 4) Oxygen meter with incorporated thermometer
- 5) Turbidity meter
- 6) Sterile polyethylene syringes
- 7) 0.45 µm membrane filters
- 8) Clean sample collection bottles (provided by analytical lab)
- 9) Diffuser
- 10) Teflon tubing
- 11) Labeling tape

3.2.2 Reagents and Standards

- 1) Nitrogen Gas

Figure 1. Intact Core Incubation Apparatus



3.2.3 Laboratory Procedure: Intact Sediment Core Preparation and Incubation

Near Bottom Ambient Water Preparation:

- 1) Prior to initialization of core incubation, the ambient water should be filtered using an in-line 0.45-micron capsule filter with a peristaltic pump. Once filtered, half of the containers should be bubbled with N₂ gas at a rapid rate to achieve and maintain anoxic conditions prior and during flux sampling. The other half will be stored until needed for water replacements on the intact cores. At that time, water containers will be bubbled with N₂ gas at room temperature until anoxic conditions are achieved and then used to refill intact cores.
- 2) The setup of the intact core apparatus is shown in **Figure 1**, and it includes fittings and tubing required for subsampling.

Adjustment of Sediment on Cores:

- 3) If cores are received with sediment depths that are not the desired amount (20 cm), then cores may be adjusted to the desired depth of sediment and overlying water column (~30 cm) prior to incubation.
- 4) To adjust sediment volumes on the cores, first remove overlaying water by siphoning with a Teflon tube, making sure not to disturb or remove the top layer of sediment, then remove the bottom stopper and carefully let the sediment out of the bottom of the core tube. Make sure to seal the bottom of the core well to prevent water leakage during flux study. Refill with filtered ambient water as described in step 5 below.

Replacing Overlying Water with Filtered Ambient Water:

- 5) If the sediments on the core do not require adjustment, remove the overlying water and replace with ~30 cm of filtered near bottom ambient water from the carboy. The water should reach to the

top of the core. The water must be added slowly to prevent disturbance of sediments. After the water is replaced on the core, it is time to begin the stabilization/equilibration period.

Sediment Core Equilibration:

- 6) The time necessary for sedimentation/equilibration to be achieved is dependent on the composition of the sediment in upper portion of the core. Flocculent sediment material will require a longer duration for complete settling (up to 24 hours), whereby, sandy sediment may be equilibrated within the 12 hour timeframe). Systematic monitoring of turbidity can inform the length of time needed to achieve full equilibration and sedimentation in the core. It is recommended to allow enough time for the equilibration period to achieve ca. 85-90% reduction of measured turbidity values (via settling) prior to commencing flux sampling.
- 7) Nutrient release dynamics can be variable at the start of the intact sediment cores incubation, and are influenced by the cores equilibration time (Ogdahl et al. 2014). Therefore, the cores should be allowed to stabilize/equilibrate for a minimum of 24 hours, to allow for complete sedimentation processes to occur (Ogdahl et al. 2014) prior to commencement of the flux measurements.

Sediment Core Incubation and Sampling:

- 8) Cores from each site should be incubated in the dark using a temperature range between 23 to 27°C (with a target incubation temperature of 25°C), which should be consistent with ambient water conditions at the collection site with a tolerance range of $\pm 4^{\circ}\text{C}$ during median temperature ranges.
- 9) The cores should be exposed and incubated under anoxic and aerobic conditions with replicates.
- 10) For the anoxic redox treatment, it is imperative to prevent oxygen exposure to the water column at all times while preparing for and during flux incubation and sampling. The water column should be bubbled with N_2 gas at a consistent rate that does not disturb and resuspend the upper layer of sediment in the core. However, the bubbling rate must be rapid enough to achieve and maintain anoxic conditions in the water column and sediment prior to commencing flux sampling.
- 11) Dissolved oxygen (DO) should be systematically monitored (e.g. every 6-8 hours) to ensure that the appropriate redox treatment is being achieved and maintained at the beginning and throughout the incubation. A DO concentration of less than 1 mg/L is required to maintain anoxic conditions.
- 12) The cores should be incubated for a period of no less than 5 days (120 hours), and up to 10 days (240 hours) with at least three discrete sampling time intervals between time= 0 hr, and time= 240 (if 10 days is selected as the length of incubation). Typically, sampling intervals should occur at T= at 48 hr, 168 hr, and 240 hours. However, depending on the day that the samples are collected, and the analytical lab's operating schedule, these intervals may be adjusted as needed. On many occasions, at four to five sampling intervals will be collected for better data resolution and to fit the curve.
- 13) A water sample should be periodically removed for sample analysis with a polyethylene syringe fitted with a length of 1-mm polyethylene tubing positioned to withdraw samples at mid-lower water column from each core as part of the sampling interval collections. Critical parameters for flux sampling include iron, total phosphorus and ammonia (NH_3) to meet project objectives, which should only require 50 ml per parameter, for a total of 150 ml of water removed from each core for a sample. However, additional parameters could also be sampled. The number of parameters sampled is based on the study design and goals, but it must be understood that with each parameter sampled, additional water volume must be replaced on the core, which can potentially introduce dilution error into later sampling interval samples. It is recommended to sample as few parameters as possible to avoid introducing dilution error into the results.
 - a. For the NH_3 sample, sulfuric acid must be added to properly preserve the sample.
- 14) The depth of water on top of the core should be maintained throughout the incubation at ~30 cm. The volume of water (150 ml) that is removed if all three parameters are collected during each subsampling interval shall be replaced with an equal volume of ambient water (under the appropriate redox condition). Based on a 7.3 cm diameter core, and a depth of 30 cm, the volume of water on top of each sediment core will be maintained at approximately 1260 ml. The ~150 ml

that would be removed if all three parameters are collected during each subsampling event represents less than 5% of the total volume of water on top of the sediment in the core, which should not have an effect on dilution of the remaining volume. The replacement amount shall not exceed more than 5% during each sampling interval to minimize the effect of replacement water on the remaining core water nutrient concentrations.

- 15) Discrete interval subsamples will be placed into sample containers and transported to the analytical laboratory in coolers on ice for analysis.

4.0 Data Analyses

4.1 Calculation of Nutrient Flux Rates

Nutrient flux rates should be estimated using the nutrient release rate equation, which was calculated based on the change of nutrient concentration over time (see equation below) and also by calculating the slope by using the interval sampling data and time step. Annual internal load of nutrients should be estimated following the methods described by Ogdahl et al. (2014) by using the nutrient release rate calculation and by calculating the rate with the slope.

Nutrient Release Rate Calculation - The flux rates for nitrogen and phosphorus species can be calculated using the following equation:

$$\text{Eq. 1 } N_{rr} = [(C_t - C_i) \times V / A] / \Delta t$$

Where:

N_{rr} = the gross nutrient release (positive values) or retention (negative values) rate per unit surface area of sediment ($\text{mg}/\text{m}^2/\text{d}$),

C_t = the final nutrient concentration at time t , or near the end of the incubation,

C_i = the initial nutrient concentration at time i , near the beginning of the incubation,

V = the volume of water in the water column,

A = the surface area of the sediment core, and

Δt = change in time, from time $t-i$.

5.0 Quality Control

- 1) All equipment was calibrated before use in the field and laboratory per FDEP SOPs noted in previous sections. Continuing verification of calibration was performed at the end of the day. SOPs should be used as a reference during field and laboratory activities to maintain quality control.

6.0 Safety and Waste Management

- 1) Laboratory staff must use proper safety equipment (e.g., eye protection, gloves, close-toe shoes)
- 2) Staff will perform necessary leak checks on gas cylinders.
- 3) Gas cylinders will be secured at all times and capped when not in use.
- 4) Sediments in core will be disposed as a solid waste.

7.0 References

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SRL Flux Study Lab Report : B-2



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Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 01/18-01/27/21
Contact Name: Lance Lumbard	Date Received: 01/27/21
Project Name: Bass Lake Sediment Flux	Time Received: 15:25
Project Number: 600478x22.02.09	Date Reported : 02/15/21
Phone Number: (407) 522-7570	Date Emailed : 02/15/21
Fax Number: (407) 522-7576	SRL Work Order # 21-01031

SRL WO #	Clients #	Matrix	Analysis Requested
2101031-001	BL-1-T=24	Liquid	Total Phosphorus/Ammnia/Iron
2101031-002	BL-3-T=24	Liquid	Total Phosphorus/Ammnia/Iron
2101031-003	BL-WC-1-T=24	Liquid	Total Phosphorus/Ammnia/Iron
2101031-004	BL-A-T=24	Liquid	Total Phosphorus/Ammnia/Iron
2101031-005	BL-C-T=24	Liquid	Total Phosphorus/Ammnia/Iron
2101031-006	BL-WC-A-T=24	Liquid	Total Phosphorus/Ammnia/Iron
2101031-007	DI-T=0	Liquid	Total Phosphorus/Ammnia/Iron
2101031-008	DI-T-0 DUP	Liquid	Total Phosphorus/Ammnia/Iron
2101031-009	Ambient-T=0	Liquid	Total Phosphorus/Ammnia/Iron
2101031-010	Ambient-T=0 DUP	Liquid	Total Phosphorus/Ammnia/Iron
2101031-011	BL-1-T=48	Liquid	Total Phosphorus/Ammnia/Iron
2101031-012	BL-3-T=48	Liquid	Total Phosphorus/Ammnia/Iron
2101031-013	BL-WC-1-T=48	Liquid	Total Phosphorus/Ammnia/Iron
2101031-014	BL-A-T=48	Liquid	Total Phosphorus/Ammnia/Iron
2101031-015	BL-C-T=48	Liquid	Total Phosphorus/Ammnia/Iron
2101031-016	BL-WC-A-T=48	Liquid	Total Phosphorus/Ammnia/Iron
2101031-017	BL-1-T=96	Liquid	Total Phosphorus/Ammnia/Iron
2101031-018	BL-3-T=96	Liquid	Total Phosphorus/Ammnia/Iron
2101031-019	BL-WC-1-T=96	Liquid	Total Phosphorus/Ammnia/Iron
2101031-020	BL-A-T=96	Liquid	Total Phosphorus/Ammnia/Iron
2101031-021	BL-C-T=96	Liquid	Total Phosphorus/Ammnia/Iron
2101031-022	BL-WC-A-T=96	Liquid	Total Phosphorus/Ammnia/Iron
2101031-023	BL-1-T=168	Liquid	Total Phosphorus/Ammnia/Iron
2101031-024	BL-3-T=168	Liquid	Total Phosphorus/Ammnia/Iron
2101031-025	BL-WC-1-T=168	Liquid	Total Phosphorus/Ammnia/Iron
2101031-026	BL-A-T=168	Liquid	Total Phosphorus/Ammnia/Iron
2101031-027	BL-C-T=168	Liquid	Total Phosphorus/Ammnia/Iron



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SRL WO #	Clients #	Matrix	Analysis Requested
2101031-028	BL-WC-A-T=168	Liquid	Total Phosphorus/Ammnia/Iron
2101031-029	BL-1-T=216	Liquid	Total Phosphorus/Ammnia/Iron
2101031-030	BL-3-T=216	Liquid	Total Phosphorus/Ammnia/Iron
2101031-031	BL-WC-1-T=216	Liquid	Total Phosphorus/Ammnia/Iron
2101031-032	BL-A-T=216	Liquid	Total Phosphorus/Ammnia/Iron
2101031-033	BL-C-T=216	Liquid	Total Phosphorus/Ammnia/Iron
2101031-034	BL-WC-A-T=216	Liquid	Total Phosphorus/Ammnia/Iron

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-01031
Received Date : 01/27/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-1-T=24
SRL (Lab) ID# : 2101031-001
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.024		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.12		mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-1-T=24
SRL (Lab) ID# : 2101031-001
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	28.9	I	ug/L	1	25.0	50.0	EPA 6020B	01/29/21	02/04/21

Classical Chemistry Parameters

Client ID # : BL-3-T=24
SRL (Lab) ID# : 2101031-002
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.16		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.20		mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-3-T=24
SRL (Lab) ID# : 2101031-002
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	35.6	I	ug/L	1	25.0	50.0	EPA 6020B	01/29/21	02/04/21

Classical Chemistry Parameters

Client ID # : BL-WC-1-T=24
SRL (Lab) ID# : 2101031-003
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	01/29/21	01/29/21
Phosphorus	7723-14-0	0.020		mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-1-T=24
SRL (Lab) ID# : 2101031-003
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	01/29/21	02/04/21

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Received Date : 01/27/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-A-T=24
SRL (Lab) ID# : 2101031-004
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.011	I	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.26		mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-A-T=24
SRL (Lab) ID# : 2101031-004
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	34.2	I	ug/L	1	25.0	50.0	EPA 6020B	01/29/21	02/04/21

Classical Chemistry Parameters

Client ID # : BL-C-T=24
SRL (Lab) ID# : 2101031-005
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.60		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.39		mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-C-T=24
SRL (Lab) ID# : 2101031-005
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	56.2		ug/L	1	25.0	50.0	EPA 6020B	01/29/21	02/04/21

Classical Chemistry Parameters

Client ID # : BL-WC-A-T=24
SRL (Lab) ID# : 2101031-006
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	01/29/21	01/29/21
Phosphorus	7723-14-0	0.064		mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-A-T=24
SRL (Lab) ID# : 2101031-006
Date Collected : 01/19/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

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SRL Lab Ref # : 21-01031
Received Date : 01/27/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : DI-T=0
SRL (Lab) ID# : 2101031-007
Date Collected : 01/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	01/29/21	01/29/21
Phosphorus	7723-14-0	0.041		mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : DI-T=0
SRL (Lab) ID# : 2101031-007
Date Collected : 01/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

Classical Chemistry Parameters

Client ID # : DI-T-0 DUP
SRL (Lab) ID# : 2101031-008
Date Collected : 01/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.096		mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : DI-T-0 DUP
SRL (Lab) ID# : 2101031-008
Date Collected : 01/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

Classical Chemistry Parameters

Client ID # : Ambient-T=0
SRL (Lab) ID# : 2101031-009
Date Collected : 01/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.044		mg/L	1	0.0098	0.020	EPA 350.1	01/29/21	01/29/21
Phosphorus	7723-14-0	0.13		mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : Ambient-T=0
SRL (Lab) ID# : 2101031-009
Date Collected : 01/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : Ambient-T=0 DUP
SRL (Lab) ID# : 2101031-010
Date Collected : 01/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.046		mg/L	1	0.0098	0.020	EPA 350.1	01/28/21	01/29/21
Phosphorus	7723-14-0	0.14		mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : Ambient-T=0 DUP
SRL (Lab) ID# : 2101031-010
Date Collected : 01/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

Classical Chemistry Parameters

Client ID # : BL-1-T=48
SRL (Lab) ID# : 2101031-011
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.086		mg/L	1	0.0098	0.020	EPA 350.1	01/28/21	01/29/21
Phosphorus	7723-14-0	0.10		mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-1-T=48
SRL (Lab) ID# : 2101031-011
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.9	I	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

Classical Chemistry Parameters

Client ID # : BL-3-T=48
SRL (Lab) ID# : 2101031-012
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.25		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.24		mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-3-T=48
SRL (Lab) ID# : 2101031-012
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	37.6	I	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

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Received Date : 01/27/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-WC-1-T=48
SRL (Lab) ID# : 2101031-013
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	01/28/21	01/29/21
Phosphorus	7723-14-0	0.087		mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-1-T=48
SRL (Lab) ID# : 2101031-013
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

Classical Chemistry Parameters

Client ID # : BL-A-T=48
SRL (Lab) ID# : 2101031-014
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.047		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.28		mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-A-T=48
SRL (Lab) ID# : 2101031-014
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	32.4	I	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

Classical Chemistry Parameters

Client ID # : BL-C-T=48
SRL (Lab) ID# : 2101031-015
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.67		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.33		mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-C-T=48
SRL (Lab) ID# : 2101031-015
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	59.0		ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-WC-A-T=48
SRL (Lab) ID# : 2101031-016
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.12		mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-A-T=48
SRL (Lab) ID# : 2101031-016
Date Collected : 01/20/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21

Classical Chemistry Parameters

Client ID # : BL-1-T=96
SRL (Lab) ID# : 2101031-017
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.40		mg/L	1	0.0098	0.020	EPA 350.1	01/28/21	01/29/21
Phosphorus	7723-14-0	0.10		mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-1-T=96
SRL (Lab) ID# : 2101031-017
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/03/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-3-T=96
SRL (Lab) ID# : 2101031-018
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.50		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.21		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-3-T=96
SRL (Lab) ID# : 2101031-018
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/03/21	02/08/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-01031
Received Date : 01/27/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-WC-1-T=96
SRL (Lab) ID# : 2101031-019
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.049		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-1-T=96
SRL (Lab) ID# : 2101031-019
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/03/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-A-T=96
SRL (Lab) ID# : 2101031-020
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.086		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-A-T=96
SRL (Lab) ID# : 2101031-020
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/03/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-C-T=96
SRL (Lab) ID# : 2101031-021
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.31		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.26		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-C-T=96
SRL (Lab) ID# : 2101031-021
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	44.5	I	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

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SRL Lab Ref # : 21-01031
Received Date : 01/27/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-WC-A-T=96
SRL (Lab) ID# : 2101031-022
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	01/28/21	01/29/21
Phosphorus	7723-14-0	0.027		mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-A-T=96
SRL (Lab) ID# : 2101031-022
Date Collected : 01/22/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-1-T=168
SRL (Lab) ID# : 2101031-023
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.73		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.14		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-1-T=168
SRL (Lab) ID# : 2101031-023
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	88.0		ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-3-T=168
SRL (Lab) ID# : 2101031-024
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.79		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.26		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-3-T=168
SRL (Lab) ID# : 2101031-024
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-WC-1-T=168
SRL (Lab) ID# : 2101031-025
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.074		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-1-T=168
SRL (Lab) ID# : 2101031-025
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-A-T=168
SRL (Lab) ID# : 2101031-026
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.086		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-A-T=168
SRL (Lab) ID# : 2101031-026
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-C-T=168
SRL (Lab) ID# : 2101031-027
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.25		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-C-T=168
SRL (Lab) ID# : 2101031-027
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

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Received Date : 01/27/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-WC-A-T=168
SRL (Lab) ID# : 2101031-028
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.12		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-A-T=168
SRL (Lab) ID# : 2101031-028
Date Collected : 01/25/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-1-T=216
SRL (Lab) ID# : 2101031-029
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.93		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.16		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-1-T=216
SRL (Lab) ID# : 2101031-029
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-3-T=216
SRL (Lab) ID# : 2101031-030
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	1.0		mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	1.2		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-3-T=216
SRL (Lab) ID# : 2101031-030
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	347		ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

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Received Date : 01/27/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-WC-1-T=216
SRL (Lab) ID# : 2101031-031
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.038		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-1-T=216
SRL (Lab) ID# : 2101031-031
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-A-T=216
SRL (Lab) ID# : 2101031-032
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.087		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-A-T=216
SRL (Lab) ID# : 2101031-032
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.4	I	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

Classical Chemistry Parameters

Client ID # : BL-C-T=216
SRL (Lab) ID# : 2101031-033
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.092		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-C-T=216
SRL (Lab) ID# : 2101031-033
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

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NELAP Certified
FDOH Cert #: E83484
SRL Lab Ref #: 21-01031
Received Date : 01/27/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

Client ID # : BL-WC-A-T=216
SRL (Lab) ID# : 2101031-034
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.15		mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : BL-WC-A-T=216
SRL (Lab) ID# : 2101031-034
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21

Classical Chemistry Parameters

Client ID # : Blanks
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	01/28/21	01/29/21
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	01/29/21	01/29/21
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	02/01/21	02/03/21
Phosphorus	7723-14-0	0.020	U	mg/L	1	0.020	0.030	EPA 365.4	02/02/21	02/05/21
Phosphorus	7723-14-0	0.020	U	mg/L	1	0.020	0.030	EPA 365.4	02/03/21	02/05/21

Metals (total recoverable) by EPA 6000/7000 Methods

Client ID # : Blanks
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	01/29/21	02/04/21
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/04/21
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/02/21	02/08/21
Iron	7439-89-6	25.0	U	ug/L	1	25.0	50.0	EPA 6020B	02/03/21	02/08/21

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	103/96/101	90-110	90-110		4	0-10
Phosphorus	106/114/103	90-110	90-110	QM-07	8	0-10
Phosphorus	106/98/99	90-110	90-110		1	0-10
	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS1/MS2/MSD1	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	100/78/92/74	90-110	90-110	QM-07	2	0-10
Nitrogen, Ammonia (as N)	101/92/94/90	90-110	90-110		2	0-10
Nitrogen, Ammonia (as N)	98/104/54/56	90-110	90-110	QM-07	0.1	0-10
Nitrogen, Ammonia (as N)	99/89/89/90	90-110	90-110		1	0-10
	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Iron	102/126/131	80-120	75-125	QM-17	0.4	0-20
Iron	99/103/101	80-120	75-125		2	0-20
Iron	101/98/103	80-120	75-125		5	0-20
Iron	101/64/62	80-120	75-125	QM-17	0.1	0-20

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Project Number/Project Name
600478x22.02.09
Bass Lake Sediment Flux
Bass Lake

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

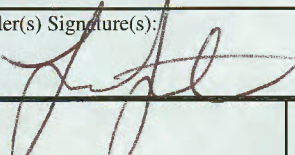
Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

QM-17 Matrix spike recovery was outside acceptance limits due to high concentration of analyte in source sam

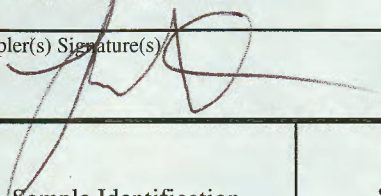
2101031

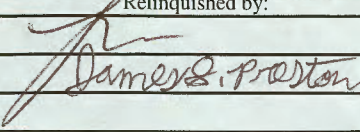
Project Manager: Lance Lumbard		 Southern Research Laboratories, Inc. 2251 Lynx Lane, Suite #1 Orlando, Florida 32804 (407) 522-7100 Toll Free 1 (888) 420-TEST Fax: (407) 522-7043		Page 1 of 5	
Company: Wood E&S				Project Name: Bass Lake Sediment Flux	
Address: 550 Northlake Blv				c1026 09562	
City, State, Zip: Altamonte Springs, FL 32701				Project Location Bass Lake	
Phone: 407 522-7570 Fax:					
Sampled by [Print Name(s)] / Affiliation: Francesca Lauterman		Preservatives (see codes)		Project Number: 600478X22.02.09	
Sampler(s) Signature(s): 		Analyses Requested		REQUESTED DUE DATE:	
Sample Identification		TP/NH3		Sampling QAP No.:	
Sampled		Iron		Approval Date:	
Date: Time:				Comments:	
Grab or Composite	Matrix: (see codes)	Total Number of Containers			
1	BL-1-T= 24	1/19/21 20:00	Grab	SW	2
2	BL-3-T= 24	1/19/21 20:05	Grab	SW	2
3	BL-WC-1-T= 24	1/19/21 20:15	Grab	SW	2
4	BL-A-T= 24	1/19/21 20:20	Grab	SW	2
5	BL-C-T= 24	1/19/21 20:25	Grab	SW	2
6	BL-WC-A-T= 24	1/19/21 20:35	Grab	SW	2
7	DI-T=0	1/18/21 20:05	Grab	SW	2
8	DI-T=0 avg	1/18/21 20:00	Grab	SW	2
9	Ambient-T=0	1/18/21 20:10	Grab	SW	2
10	Ambient-T=0 Rg	1/18/21 20:15	Grab	SW	2
Shipment Method:		Relinquished by:		Date:	Time:
Out: / /		Via:		1/27/21	1:45pm
Returned: / /		Via:		1/27/21	5:25pm
Additional Comments:				Accepted by:	Date: Time:
				James B. Patton	1/27/21 1:45pm
				Shelley Turner	1-27-21 15:25
Cooler No(s) / Temperature(s) (°C):		Sampling Kit No.:		Equipment ID No.:	
(X375) (00) (501)		8836			
Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water(Blanks) HW = Potential Haz Waste O = Other(Specify:)					
Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other(Specify:)					

Chain of Custody

2101031

Project Manager: Lance Lumbard		 Southern Research Laboratories, Inc. 2251 Lynx Lane, Suite #1 Orlando, Florida 32804 (407) 522-7100 Fax: (407) 522-7043		Page 2 of 5	
Company: Wood E&S				Project Name: Bass Lake Sediment Flux	
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City, State, Zip: Altamonte Springs, FL 32701				Project Location Bass Lake	
Phone: 407 522 7570 Fax:		Toll Free 1 (888) 420-TEST		Fax: (407) 522-7043	

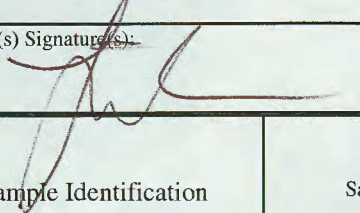
Sampled by [Print Name(s)] / Affiliation: Francesca Lauterman							Preservatives (see codes)							Project Number: 600478X22.02.09	
Sampler(s) Signature(s): 							Analyses Requested S N							REQUESTED DUE DATE:	
														Sampling QAP No.:	
Sample Identification		Sampled Date: Time:		Grab or Composite	Matrix: (see codes)	Total Number of Containers	TP/NH3	Iron							Approval Date:
1	BL-1-T= 48	1/20/21	19:30	Grab	SW	2	①	①							2101031-011
2	BL-3-T= 48	1/20/21	19:35	Grab	SW	2	①	①							-012
3	BL-WC-1-T= 48	1/20/21	19:45	Grab	SW	2	①	①							-013
4	BL-A-T= 48	1/20/21	19:50	Grab	SW	2	①	①							-014
5	BL-C-T= 48	1/20/21	19:55	Grab	SW	2	①	①							-015
6	BL-WC-A-T= 48	1/20/21	20:05	Grab	SW	2	①	①							-016
7															
8															
9															
10															

Shipment Method:		Relinquished by:		Date:	Time:	Accepted by:		Date:	Time:
Out: / /	Via:			1/27/21	1:45pm	James S. Preston		1/27/21	1:45pm
Returned: / /	Via:	James S. Preston		1/27/21	3:25pm	Helen Jurek		1/27/21	1:5:25
Additional Comments:									
Cooler No.(s) / Temperature(s) (°C):				Sampling Kit No.:		Equipment ID No.:			

Matrix Codes:	A = Air	GW = Groundwater	SE = Sediment	SO = Soil	SW = Surface Water	W = Water(Blanks)	HW = Potential Haz Waste	O = Other(Specify: _____)
Preservative Codes:	H = Hydrochloric Acid & Ice	I = Ice Only	N = Nitric Acid & Ice	S = Sulfuric Acid & Ice	X = Sodium Hydroxide & Ice	O = Other(Specify: _____)		

Chain of Custody

2101031

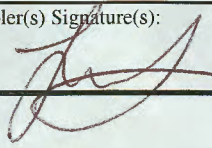
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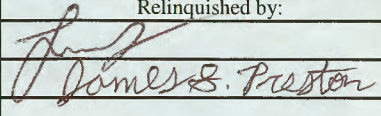
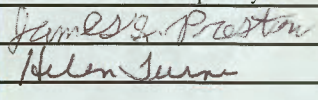
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Project Manager: Lance Lombard						Southern Research Laboratories, Inc.								2251 Lynx Lane, Suite #1 Orlando, Florida 32804							Page 4 of 5																	
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#1 BL-I-T= 168	1/25/21	16:20	Grab	SW	2	(P)(I)																					2101031-023											
#2 BL-3-T= 168	1/25/21	16:25	Grab	SW	2	(P)(I)																					-028											
#3 BL-WC-I-T= 168	1/25/21	16:05	Grab	SW	2	(P)(I)																					-025											
#4 BL-A-T= 168	1/25/21	16:10	Grab	SW	2	(P)(I)																					-026											
#5 BL-C-T= 168	1/25/21	16:15	Grab	SW	2	(P)(I)																					-027											
#6 BL-WC-A-T= 168	1/25/21	16:00	Grab	SW	2	(P)(I)																					-028											
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Returned: / / Via:				James S. Preston				1/27/21				3:23pm				Nelen Kur				1/27/21				15:25														
Additional Comments:																																						
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Shipment Method:		Relinquished by:		Date:	Time:	Accepted by:		Date:	Time:
Out: / /	Via:	 James S. Preston		1/27/21	1:45pm	 Helen Turner		1/27/21	1:45pm
Returned: / /	Via:			1/27/21	3:25pm			1/27/21	15:25
Additional Comments:									
		Cooler No.(s) / Temperature(s) (°C):		Sampling Kit No.:		Equipment ID No.:			

Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water(Blanks) HW = Potential Haz Waste O = Other(Specify:)
 Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other(Specify:)

Sediment Core Photo's: B-3

Descriptions and Photos: Sediment Core Profiles

Client: Orange County

Site Name: Bass Lake

Project Number: 600478.22

**Sample Location
and Name:**

BL-3, Anoxic

Description:

0-6 cm – Flocculant dark brown muck

6-28 cm – Dark brown spongy sediment, trace sand



Descriptions and Photos: Sediment Core Profiles

Client: Orange County

Site Name: Bass Lake

Project Number: 600478.22

**Sample Location
and Name:**

BL-3, Aerobic

Description:

0-5 cm – Flocculant dark brown muck

6-29 cm – Dark brown spongy sediment, trace sand



Descriptions and Photos: Sediment Core Profiles

Client: Orange County

Site Name: Bass Lake

Project Number: 600478.22

Sample Location
and Name:

BL-1, Anoxic

Description:

0-1 cm – Flocculant dark brown muck

1-12 cm – Brown sediment and gray sand mixture

12-28 cm – Dark brown sediment with trace sand



Descriptions and Photos: Sediment Core Profiles

Client: Orange County

Site Name: Bass Lake

Project Number: 600478.22

Sample Location
and Name:

BL-1, Aerobic

Description:

0-1 cm – Flocculant dark brown muck

1-13 cm – Brown sediment and gray sand mixture

13-30 cm – Dark brown sediment with trace sand



Field Data: B-4

11/18/12

Bass Lake
600478.22

SP & FL

7107 core collection

Site	Latitude	Longitude	Sample Date	Secchi Depth (ft)	Total Depth (ft)	Sample Time	Top/Mid/Bottom	WQ Depth (ft)	Water Temp (°C)	DO (mg/L)	DO (%)	Sal GRP	Specific Conductance (µS/cm)	pH	Turbidity (NTU)	Sediment notes
Bass Lake Core 1	28.57279	-81.34145	1/18/21	3.0	12.9	10:00 T	1.6	16.20	12.17	126.0	0.07	0.07	148	7.24	19.9	fluctuant, loose
Bass Lake Core 2			1/18/21	3.0	14.0	10:03 D	5.0	16.03	16.38	105.1	0.07	0.07	148	6.20	—	consolidated + sand
Bass Lake Core 2			1/18/21	3.0	14.0	11:00 T	1.6	16.13	10.61	109.4	0.07	0.07	148	7.42	7.7	core not easy to pull
Bass Lake Core 2			1/18/21	3.0	14.0	11:05 M	6.6	15.90	9.44	45.2	0.07	0.07	148	7.27	7.7	no core!
Bass Lake Core 2			1/18/21	3.0	14.0	11:08 D	11.0	15.85	8.91	90.4	0.07	0.07	148	7.21	7.7	fluctuant, loose
Bass Lake Core 3	28.5126	-81.34245	1/18/21	3.0	16.6	11:45 T	1.0	16.52	10.41	110.00	0.07	0.07	148	7.41	6.88	fluctuant, loose
Bass Lake Core 3			1/18/21	3.0	16.6	11:50 M	6.0	16.33	9.61	48.4	0.07	0.07	148	7.36	—	—
Bass Lake Core 3			1/18/21	3.0	16.6	11:55 P	11.0	15.93	9.13	92.2	0.07	0.07	148	7.34	—	—
Bass Lake Core 4			1/18/21	2.8	12.6	11:20 T	1.0	16.74	10.55	108.5	0.07	0.07	148	7.51	9.28	very consolidated
Bass Lake Core 4			1/18/21	2.8	12.6	11:24 M	5.0	16.65	10.08	103.5	0.07	0.07	148	7.04	—	core site difficult
Bass Lake Core 4			1/18/21	2.8	12.6	11:29 D	10.0	15.92	9.70	93.0	0.07	0.07	148	7.02	—	no core!

Notes

Site: 1 - Fluctuant organic, small amounts of sand, some organic mixed in

Site: 2 - sand w/ small amounts of shell

Site: 3 - Fluctuant organic, trace sand

Site: 4 - sand w/ some organic mixed in

* active algal bloom on surface of lake - pictures taken !!!

Calibration Log

600 478.22

Project #: Bass Lake

Meter #: YSI SSC Flux core collection

Dissolved Oxygen	DEP SOP FT	Initials	Date	Time	Temp C	Saturation (Chart)	Reading	Probe Gain	Probe Gain	Pass or Fail
	1500									

Acceptance Criteria: +/- 0.3mg/L

CAL ICV CCV	FL	11/18/21	0530	72.6	8.644	8.65	100.2			P
CAL ICV CCV	FL	11/19/21	0535	22.7	8.627	8.71	101.0			P
CAL ICV CCV	FL	11/18/21	1655	24.4	8.386	8.47	94.2			P
CAL ICV CCV										P
CAL ICV CCV										P
CAL ICV CCV										P

pH	DEP SOP FT	Initials	Date	Time	Standard SU	Reading	Bottle #	Expected Values SU/mV	Pass or Fail
	1100								

Acceptance Criteria: +/- 0.2 SU

CAL ICV CCV	FL	11/18/21	0537	4	4.0	136.5		7.00/250	P
CAL ICV CCV	FL	11/18/21	0538	7	7	-20.2		10.00/(160-177)	P
CAL ICV CCV	FL	11/18/21	0539	10	10	-180.4		4.00/160-177	P
CAL ICV CCV	FL	11/18/21	0550	7	7.0				P
CAL ICV CCV									P
CAL ICV CCV									P
CAL ICV CCV									P
CAL ICV CCV									P
CAL ICV CCV									P
CAL ICV CCV									P

Specific Conductance	DEP SOP FT	Initials	Date	Time	Standard μmhos/cm	Reading μmhos/cm	Bottle #	Pass or Fail
	1200							

Acceptance Criteria: +/- 5%

CAL ICV CCV	FL	11/18/21	0540	14.3	1438				P
CAL ICV CCV	FL	11/18/21	0545	14.3	1442				P
CAL ICV CCV	FL	11/18/21	0705	14.3	1447				P
CAL ICV CCV									P
CAL ICV CCV									P
CAL ICV CCV									P

Standard Value	Lot#	Expiration Date	Standard Value	Lot#	Expiration Date
7.0	660105	2122	100		
4.0	965198	2122	500		
10.0	963556	3122	1413	660103	4121
2.0			50000		

pH Buffer:					

APPENDIX C

Seepage and Surface Water Quality Lab Report



2251 Lynx Lane, Suite 1
Orlando, Florida 32804
(407) 522-7100 Fax (407) 522-7043
Toll Free 1 (888) 420-Test

Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we **Sincerely Appreciate Your Business**. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 06/24/20
Contact Name: Lance Lumbard	Date Received: 06/24/20
Project Name: OC Bass Lake Water Quality	Time Received: 13:30
Project Number: 600478x22.02.07	Date Reported : 07/03/20
Phone Number: (407) 522-7570	Date Emailed : 07/03/20
Fax Number: (407) 522-7576	SRL Work Order # 20-06057

SRL WO #	Clients #	Matrix	Analysis Requested
2006057-001	BLSM 4	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2006057-002	BLSM 2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2006057-003	BLSM 1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2006057-004	BLSW	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia/Color/ Alkalinity/Turbidity/Chlorophyll A

Sherri Payne
Vice President & Quality Assurance Officer
Southern Research Laboratories, Inc.

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-06057
Received Date : 06/24/20

Lance Lumbard
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLSM 4**
SRL (Lab) ID# : 2006057-001
Date Collected : 06/24/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	8.8		mg/L	10	0.098	0.20	EPA 350.1	06/26/20	06/26/20
Nitrate/Nitrite as N		0.093		mg/L	1	0.016	0.050	4500NO3 H-	06/29/20	06/30/20
Orthophosphate as P	1426-54-42	0.012		mg/L	1	0.0053	0.010	EPA 365.1	06/25/20	06/25/20
Phosphorus	7723-14-0	0.084		mg/L	1	0.010	0.015	EPA 365.4	06/29/20	07/01/20
Total Kjeldahl Nitrogen		12		mg/L	5	0.18	0.25	EPA 351.2	06/29/20	07/02/20
Total Nitrogen	17778-88-0	12		mg/L	5	0.18	0.25	CALC	06/29/20	07/02/20
Total Suspended Solids		11		mg/L	1	2.5	2.5	M-2540D-201	06/26/20	06/29/20

Client ID # : **BLSM 2**
SRL (Lab) ID# : 2006057-002
Date Collected : 06/24/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	2.6		mg/L	2	0.020	0.040	EPA 350.1	06/26/20	06/26/20
Nitrate/Nitrite as N		1.8		mg/L	5	0.080	0.25	4500NO3 H-	06/29/20	06/30/20
Orthophosphate as P	1426-54-42	0.014		mg/L	1	0.0053	0.010	EPA 365.1	06/25/20	06/25/20
Phosphorus	7723-14-0	0.10		mg/L	1	0.010	0.015	EPA 365.4	06/29/20	07/01/20
Total Kjeldahl Nitrogen		3.5		mg/L	1	0.037	0.050	EPA 351.2	06/29/20	07/02/20
Total Nitrogen	17778-88-0	5.3		mg/L	5	0.080	0.25	CALC	06/29/20	07/02/20
Total Suspended Solids		4.1		mg/L	1	2.5	2.5	M-2540D-201	06/26/20	06/29/20

Client ID # : **BLSM 1**
SRL (Lab) ID# : 2006057-003
Date Collected : 06/24/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	1.0		mg/L	1	0.0098	0.020	EPA 350.1	06/26/20	06/26/20
Nitrate/Nitrite as N		0.11		mg/L	1	0.016	0.050	4500NO3 H-	06/29/20	06/30/20
Orthophosphate as P	1426-54-42	0.0081	I	mg/L	1	0.0053	0.010	EPA 365.1	06/25/20	06/25/20
Phosphorus	7723-14-0	0.078		mg/L	1	0.010	0.015	EPA 365.4	06/29/20	07/01/20
Total Kjeldahl Nitrogen		1.7		mg/L	1	0.037	0.050	EPA 351.2	06/29/20	07/02/20
Total Nitrogen	17778-88-0	1.8		mg/L	1	0.037	0.050	CALC	06/29/20	07/02/20
Total Suspended Solids		6.3		mg/L	1	2.5	2.5	M-2540D-201	06/26/20	06/29/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 20-06057
Received Date : 06/24/20

Lance Lombard
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : BLSW
SRL (Lab) ID# : 2006057-004
Date Collected : 06/24/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	06/26/20	06/26/20
Chlorophyll a	42617-16-3	12	V	mg/m3	1	0.50	0.50	A 10200 H-20	06/25/20	06/26/20
Color		10		Color Units	1	5.0	5.0	M 2120B-201	06/25/20	06/25/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	06/29/20	06/30/20
Orthophosphate as P	1426-54-2	0.0053	U	mg/L	1	0.0053	0.010	EPA 365.1	06/25/20	06/25/20
pH for Color (pH units)		7.4		Color Units	1			SM 2120B-201	06/25/20	06/25/20
Phosphorus	7723-14-0	0.021		mg/L	1	0.010	0.015	EPA 365.4	06/29/20	07/01/20
Total Alkalinity as CaCO3	471-34-1	32.4		mg/L	1	1.90	10.0	EPA 310.2	06/26/20	06/26/20
Total Kjeldahl Nitrogen		0.66		mg/L	1	0.037	0.050	EPA 351.2	06/29/20	07/02/20
Total Nitrogen	17778-88-0	0.66		mg/L	1	0.037	0.050	CALC	06/29/20	07/02/20
Total Suspended Solids		5.9		mg/L	1	2.5	2.5	M-2540D-201	06/26/20	06/29/20
Turbidity		3.0		NTU	1	1.0	1.0	EPA 180.1	06/25/20	06/25/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-06057
Received Date : 06/24/20

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Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	06/26/20	06/26/20
Chlorophyll a	42617-16-3	0.53		mg/m3	1	0.50	0.50	A 10200 H-20	06/25/20	06/26/20
Color		5.0	U	Color Units	1	5.0	5.0	M 2120B-201	06/25/20	06/25/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	06/29/20	06/30/20
Orthophosphate as P	1426-54-2	0.0053	U	mg/L	1	0.0053	0.010	EPA 365.1	06/25/20	06/25/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	06/29/20	07/01/20
Total Alkalinity as CaCO3	471-34-1	1.90	U	mg/L	1	1.90	10.0	EPA 310.2	06/26/20	06/26/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	06/29/20	07/02/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	06/29/20	07/02/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	06/26/20	06/29/20
Turbidity		1.0	U	NTU	1	1.0	1.0	EPA 180.1	06/25/20	06/25/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-06057
Received Date : 06/24/20

Lance Lumbar
Wood Env. & Infrastructure Solutions, Inc.
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Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD/MS2	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	102/0.9/1	84-116	84-116	QM-07	1	0-10
Total Kjeldahl Nitrogen	101/152/152/143	90-110	90-110	QM-07	0	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	102/93/94	90-110	90-110		0.9	0-10
Total Alkalinity as CaCO3	100/101/102	90-110	90-110		0.8	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	101/100/92	90-110	90-110		6	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	101/98/97	90-110	90-110		0.8	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	95	80-120

	Result	Source	RPD	Notes	RPD
		Result	Limit		Limit
Total Suspended Solids (DUP-1)	48	42	13		0-20

	Result	Source	RPD	Notes	RPD
		Result	Limit		Limit
Chlorophyll a (DUP-1)	2.2	2.7	22	QB-01	0-25

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Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	Acceptable			
	LCS	Limits			
Color	100	90-110			
	Result	Source	RPD	Notes	RPD
Color (DUP-1)	10	Result	0		Limit
		10			0-10
	% Recovery	Acceptable			
	LCS	Limits			
Turbidity	106	90-110			
	Result	Source	RPD	Notes	RPD
Turbidity (DUP-1)	2.9	Result	3		Limit
		3.0			0-10

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Received Date : 06/24/20

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550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time

Q01 Analysis performed outside of method-specified holding time

Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF = Matrix Effect Dilution Factor.**

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

QB-01 The method blank had a positive result for the analyte; however, the concentration in the method blank is less than 10% of the sample result. There is minimal impact to the data.



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we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 08/11/20
Contact Name: Lance Lumbard	Date Received: 08/11/20
Project Name: OC Bass Lake Water Quality	Time Received: 12:15
Project Number: 600478x22.02.07	Date Reported : 08/20/20
Phone Number: (407) 522-7570	Date Emailed : 08/20/20
Fax Number: (407) 522-7576	SRL Work Order # 20-08021

SRL WO #	Clients #	Matrix	Analysis Requested
2008021-001	BLSM 1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2008021-002	BLSM 2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2008021-003	BLSM 4	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2008021-004	BLSW	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia/Color/ Alkalinity/Turbidity/Chlorophyll A

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-08021
Received Date : 08/11/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLSM 1**
SRL (Lab) ID# : 2008021-001
Date Collected : 08/11/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	1.8		mg/L	2	0.020	0.040	EPA 350.1	08/14/20	08/17/20
Nitrate/Nitrite as N		0.18		mg/L	1	0.016	0.050	4500NO3 H-	08/13/20	08/13/20
Orthophosphate as P	1426-54-42	0.0053	U	mg/L	1	0.0053	0.010	EPA 365.1	08/12/20	08/12/20
Phosphorus	7723-14-0	0.029		mg/L	1	0.010	0.015	EPA 365.4	08/12/20	08/14/20
Total Kjeldahl Nitrogen		2.1		mg/L	1	0.037	0.050	EPA 351.2	08/12/20	08/14/20
Total Nitrogen	17778-88-0	2.3		mg/L	1	0.037	0.050	CALC	08/12/20	08/14/20
Total Suspended Solids		3.4		mg/L	1	2.5	2.5	M-2540D-201	08/13/20	08/14/20

Client ID # : **BLSM 2**
SRL (Lab) ID# : 2008021-002
Date Collected : 08/11/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.84		mg/L	1	0.0098	0.020	EPA 350.1	08/14/20	08/17/20
Nitrate/Nitrite as N		1.8		mg/L	5	0.080	0.25	4500NO3 H-	08/13/20	08/13/20
Orthophosphate as P	1426-54-42	0.0058	I	mg/L	1	0.0053	0.010	EPA 365.1	08/12/20	08/12/20
Phosphorus	7723-14-0	0.17		mg/L	1	0.010	0.015	EPA 365.4	08/12/20	08/14/20
Total Kjeldahl Nitrogen		2.3		mg/L	1	0.037	0.050	EPA 351.2	08/12/20	08/14/20
Total Nitrogen	17778-88-0	4.1		mg/L	5	0.080	0.25	CALC	08/12/20	08/14/20
Total Suspended Solids		20		mg/L	1	2.5	2.5	M-2540D-201	08/13/20	08/14/20

Client ID # : **BLSM 4**
SRL (Lab) ID# : 2008021-003
Date Collected : 08/11/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	12		mg/L	10	0.098	0.20	EPA 350.1	08/14/20	08/17/20
Nitrate/Nitrite as N		0.62		mg/L	1	0.016	0.050	4500NO3 H-	08/13/20	08/13/20
Orthophosphate as P	1426-54-42	0.012		mg/L	1	0.0053	0.010	EPA 365.1	08/12/20	08/12/20
Phosphorus	7723-14-0	0.17		mg/L	1	0.010	0.015	EPA 365.4	08/12/20	08/14/20
Total Kjeldahl Nitrogen		13		mg/L	5	0.18	0.25	EPA 351.2	08/12/20	08/14/20
Total Nitrogen	17778-88-0	14		mg/L	5	0.18	0.25	CALC	08/12/20	08/14/20
Total Suspended Solids		16		mg/L	1	2.5	2.5	M-2540D-201	08/13/20	08/14/20

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Received Date : 08/11/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : BLSW
SRL (Lab) ID# : 2008021-004
Date Collected : 08/11/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	08/14/20	08/17/20
Chlorophyll a	42617-16-3	15		mg/m3	1	0.50	0.50	A 10200 H-20	08/12/20	08/18/20
Color		10		Color Units	1	5.0	5.0	M 2120B-201	08/13/20	08/13/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	08/13/20	08/13/20
Orthophosphate as P	1426-54-2	0.0053	U	mg/L	1	0.0053	0.010	EPA 365.1	08/12/20	08/12/20
pH for Color (pH units)		7.4		Color Units	1			SM 2120B-201	08/13/20	08/13/20
Phosphorus	7723-14-0	0.032		mg/L	1	0.010	0.015	EPA 365.4	08/12/20	08/14/20
Total Alkalinity as CaCO3	471-34-1	24.6		mg/L	1	1.90	10.0	EPA 310.2	08/14/20	08/17/20
Total Kjeldahl Nitrogen		0.72		mg/L	1	0.037	0.050	EPA 351.2	08/12/20	08/14/20
Total Nitrogen	17778-88-0	0.72		mg/L	1	0.037	0.050	CALC	08/12/20	08/14/20
Total Suspended Solids		5.3		mg/L	1	2.5	2.5	M-2540D-201	08/13/20	08/14/20
Turbidity		3.2		NTU	1	1.0	1.0	EPA 180.1	08/12/20	08/12/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	08/14/20	08/17/20
Chlorophyll a	42617-16-3	0.50	U	mg/m3	1	0.50	0.50	A 10200 H-20	08/12/20	08/18/20
Color		5.0	U	Color Units	1	5.0	5.0	M 2120B-201	08/13/20	08/13/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	08/13/20	08/13/20
Orthophosphate as P	1426-54-2	0.0053	U	mg/L	1	0.0053	0.010	EPA 365.1	08/12/20	08/12/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	08/12/20	08/14/20
Total Alkalinity as CaCO3	471-34-1	1.90	U	mg/L	1	1.90	10.0	EPA 310.2	08/14/20	08/17/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	08/12/20	08/14/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	08/12/20	08/14/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	08/13/20	08/14/20
Turbidity		1.0	U	NTU	1	1.0	1.0	EPA 180.1	08/12/20	08/12/20

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Project Number/Project Name
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Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD/MS3	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	105/112/113	84-116	84-116		0.9	0-10
Total Kjeldahl Nitrogen	100/102/101/102	90-110	90-110		0.7	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	101/400/NR	90-110	90-110	QM-07	8	0-10
Total Alkalinity as CaCO3	95/96/98	90-110	90-110		2	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	104/99/110	90-110	90-110		5	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MS2/MSD2	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	101/106/198/198	90-110	90-110	QM-07 QM-11	0	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	86	80-120

	Result	Source	RPD	Notes	RPD
		Result	Limit		Limit
Total Suspended Solids (DUP-1)	25	27	8		0-20

	Result	Source	RPD	Notes	RPD
		Result	Limit		Limit
Chlorophyll a (DUP-1)	11	15	32	QM-12	0-25

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Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	Acceptable			
	LCS	Limits			
Color	100	90-110			
	Result	Source	RPD	Notes	RPD
Color (DUP-1)	10	10	0		0-10
	% Recovery	Acceptable			
	LCS	Limits			
Turbidity	100	90-110			
	Result	Source	RPD	Notes	RPD
Turbidity (DUP-1)	3.3	3.2	3		0-10

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Project Number/Project Name
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OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time

Q01 Analysis performed outside of method-specified holding time

Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

QM-11 Precision between duplicate matrix spikes of the same sample was outside acceptance limits

QM-12 Precision between duplicate samples was outside acceptance limits

2008021

[illegible]



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Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 10/12/20
Contact Name: Lance Lumbard	Date Received: 10/12/20
Project Name: OC Bass Lake Water Quality	Time Received: 12:00
Project Number: 600478x22.02.07	Date Reported : 10/22/20
Phone Number: (407) 522-7570	Date Emailed : 10/22/20
Fax Number: (407) 522-7576	SRL Work Order # 20-10012

SRL WO #	Clients #	Matrix	Analysis Requested
2010012-001	BLSM 1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2010012-002	BLSM 2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2010012-003	BLSM 4	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2010012-004	BLSW	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia/Color/ Alkalinity/Turbidity/Chlorophyll A

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FDOH Cert # : E83484
SRL Lab Ref # : 20-10012
Received Date : 10/12/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLSM 1**
SRL (Lab) ID# : 2010012-001
Date Collected : 10/12/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	2.1		mg/L	5	0.049	0.10	EPA 350.1	10/14/20	10/14/20
Nitrate/Nitrite as N		0.20		mg/L	1	0.016	0.050	4500NO3 H-	10/13/20	10/16/20
Orthophosphate as P	1426-54-42	0.0090	I	mg/L	1	0.0040	0.010	EPA 365.1	10/13/20	10/13/20
Phosphorus	7723-14-0	0.084		mg/L	1	0.010	0.015	EPA 365.4	10/15/20	10/19/20
Total Kjeldahl Nitrogen		2.7		mg/L	1	0.037	0.050	EPA 351.2	10/19/20	10/19/20
Total Nitrogen	17778-88-0	2.9		mg/L	1	0.037	0.050	CALC	10/15/20	10/19/20
Total Suspended Solids		9.5		mg/L	1	2.5	2.5	M-2540D-201	10/15/20	10/16/20

Client ID # : **BLSM 2**
SRL (Lab) ID# : 2010012-002
Date Collected : 10/12/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	0.22		mg/L	1	0.0098	0.020	EPA 350.1	10/14/20	10/14/20
Nitrate/Nitrite as N		4.5		mg/L	10	0.16	0.50	4500NO3 H-	10/13/20	10/16/20
Orthophosphate as P	1426-54-42	0.096		mg/L	1	0.0040	0.010	EPA 365.1	10/13/20	10/13/20
Phosphorus	7723-14-0	0.56		mg/L	1	0.010	0.015	EPA 365.4	10/15/20	10/19/20
Total Kjeldahl Nitrogen		2.5		mg/L	1	0.037	0.050	EPA 351.2	10/19/20	10/19/20
Total Nitrogen	17778-88-0	7.0		mg/L	10	0.16	0.50	CALC	10/15/20	10/19/20
Total Suspended Solids		41		mg/L	1	2.5	2.5	M-2540D-201	10/15/20	10/16/20

Client ID # : **BLSM 4**
SRL (Lab) ID# : 2010012-003
Date Collected : 10/12/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	3.2		mg/L	10	0.0098	0.020	EPA 350.1	10/14/20	10/14/20
Nitrate/Nitrite as N		1.4		mg/L	5	0.016	0.050	4500NO3 H-	10/13/20	10/16/20
Orthophosphate as P	1426-54-42	0.054		mg/L	1	0.0040	0.010	EPA 365.1	10/13/20	10/13/20
Phosphorus	7723-14-0	0.19		mg/L	1	0.010	0.015	EPA 365.4	10/15/20	10/19/20
Total Kjeldahl Nitrogen		6.9		mg/L	2	0.037	0.050	EPA 351.2	10/19/20	10/19/20
Total Nitrogen	17778-88-0	8.3		mg/L	5	0.037	0.050	CALC	10/15/20	10/19/20
Total Suspended Solids		7.8		mg/L	1	2.5	2.5	M-2540D-201	10/15/20	10/16/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 20-10012
Received Date : 10/12/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : BLSW
SRL (Lab) ID# : 2010012-004
Date Collected : 10/12/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	10/14/20	10/14/20
Chlorophyll a	42617-16-3	31		mg/m3	1	0.50	0.50	A 10200 H-20	10/13/20	10/20/20
Color		10		Color Units	1	5.0	5.0	M 2120B-201	10/14/20	10/14/20
Nitrate/Nitrite as N		0.076		mg/L	1	0.016	0.050	4500NO3 H-	10/15/20	10/16/20
Orthophosphate as P	1426-54-2	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	10/13/20	10/13/20
pH for Color (pH units)		6.7		Color Units	1			SM 2120B-201	10/14/20	10/14/20
Phosphorus	7723-14-0	0.032		mg/L	1	0.010	0.015	EPA 365.4	10/15/20	10/19/20
Total Alkalinity as CaCO3	471-34-1	30.2		mg/L	1	1.90	10.0	EPA 310.2	10/19/20	10/20/20
Total Kjeldahl Nitrogen		0.88		mg/L	1	0.037	0.050	EPA 351.2	10/15/20	10/19/20
Total Nitrogen	17778-88-0	0.96		mg/L	1	0.037	0.050	CALC	10/15/20	10/19/20
Total Suspended Solids		8.0		mg/L	1	2.5	2.5	M-2540D-201	10/15/20	10/16/20
Turbidity		7.3		NTU	1	1.0	1.0	EPA 180.1	10/13/20	10/13/20

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SRL Lab Ref# : 20-10012
Received Date : 10/12/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : **MB**
Date Collected : **NA**
Lab FDOH Certification # : **E83182**

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	10/14/20	10/14/20
Chlorophyll a	42617-16-3	0.50	U	mg/m3	1	0.50	0.50	A 10200 H-20	10/13/20	10/20/20
Color		5.0	U	Color Units	1	5.0	5.0	M 2120B-201	10/14/20	10/14/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	10/15/20	10/16/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	10/15/20	10/16/20
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	10/13/20	10/13/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	10/15/20	10/19/20
Total Alkalinity as CaCO3	471-34-1	1.90	U	mg/L	1	1.90	10.0	EPA 310.2	10/19/20	10/20/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	10/15/20	10/19/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	10/15/20	10/19/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	10/15/20	10/16/20
Turbidity		1.0	U	NTU	1	1.0	1.0	EPA 180.1	10/13/20	10/13/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-10012
Received Date : 10/12/20

Lance Lumbar
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS1/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	106/86/84	84-116	84-116		2	0-10
Nitrate/Nitrite as N	108/93/83	84-116	84-116	QM-07	8	0-10
Total Kjeldahl Nitrogen	105/106/64/103	90-110	90-110	QM-07	3	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	94/95/85	90-110	90-110	QM-07	10	0-10
Total Alkalinity as CaCO3	93/99/98	90-110	90-110		0.7	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	104/100/97	90-110	90-110		2	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS2/MS3/MSD3	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	101/106/105/106	90-110	90-110		0.3	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	86	80-120

	Result	Source	RPD	Notes	RPD
		Result			Limit
Total Suspended Solids (DUP-1)	44	45	2		0-20

	Result	Source	RPD	Notes	RPD
		Result			Limit
Chlorophyll a (DUP-1)	170	190	7		0-25

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	Acceptable			
	LCS	Limits			
Color	100	90-110			
	Result	Source	RPD	Notes	RPD
		Result			Limit
Color (DUP-1)	10	10	0		0-10
	% Recovery	Acceptable			
	LCS	Limits			
Turbidity	104	90-110			
	Result	Source	RPD	Notes	RPD
		Result			Limit
Turbidity (DUP-1)	7.2	7.3	1		0-10

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

Chain of Custody

20100112

Project Manager: Lanca Lumbard Company: Wood Environment & Infrastructure Solutions, Inc. Address: 550 Northlake Blvd., Suite 1000 Altamonte Springs Florida 32701 Phone: 407-522-7570 Fax: +1 (407) 522-7576		 Southern Research Laboratories, Inc. 2251 Lynx Lane, Suite #1 Orlando, Florida 32804 Main (407) 522-7100 Fax: (407) 522-7043		Project Name: OC Bass Lake Water Quality Seepage Meters Project Location: Bass Lake		Page of
Sampled by [Print Name(s)] / Affiliation: James Preston/wood Kate Ballew/BFA		Project Number: 600478x22		Requested Due Date:		
Sampler(s) Signature(s): 		Analyses Requested Color ☒ Turbidity ☒ Alkalinity ☒		Facility ID#:		
Sample Identification		Sampled Date: Time:		Petroleum Restoration Program yes ☒ no ☐		
1 BLSM 1	10/12/2020	0945	3	SW	Color	2040012-001
2 BLSM 2	1005	1005	3	L	Color	-002
3 BLSM 4	1105	1105	3	L	Color	-003
4 BLSW	1035	1035	6	L	Color	-004
Relinquished by Helen E. Preston James E. Preston		Date: 10-19-20 10/12/2020		Accepted by: James E. Preston Helen E. Preston		
Shipments Method: Out: / / Returned: / /		Time: 10:45 12:00		Date: 10-19-20 10/12/20		
Additional Comments:		Cooler No.(s) / Temperature(s) (°C): 2 stock coolers 4.0		Equipment ID No.:		
Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) HW = Potential Haz Waste O = Other (Specify)		Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other (Specify)		Sampling Kit No.: 8677		



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Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 12/01/20
Contact Name: Lance Lumbard	Date Received: 12/01/20
Project Name: OC Bass Lake Water Quality	Time Received: 12:15
Project Number: 600478x22.02.07	Date Reported : 12/11/20
Phone Number: (407) 522-7570	Date Emailed : 12/11/20
Fax Number: (407) 522-7576	SRL Work Order # 20-12001

SRL WO #	Clients #	Matrix	Analysis Requested
2012001-001	BLSW	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia/Color/ Alkalinity/Turbidity/Chlorophyll A

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FDOH Cert # : E83484
SRL Lab Ref# : 20-12001
Received Date : 12/01/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : BLSW
SRL (Lab) ID# : 2012001-001
Date Collected : 12/01/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.038		mg/L	1	0.0098	0.020	EPA 350.1	12/07/20	12/08/20
Chlorophyll a	42617-16-3	44	V	mg/m3	1	0.50	0.50	A 10200 H-20	12/01/20	12/08/20
Color		10		Color Units	1	5.0	5.0	M 2120B-201	12/02/20	12/02/20
Nitrate/Nitrite as N		0.19		mg/L	1	0.016	0.050	4500NO3 H-	12/04/20	12/04/20
Orthophosphate as P	1426-54-2	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	12/02/20	12/02/20
pH for Color (pH units)		6.6		Color Units	1			SM 2120B-201	12/02/20	12/02/20
Phosphorus	7723-14-0	0.042		mg/L	1	0.010	0.015	EPA 365.4	12/02/20	12/07/20
Total Alkalinity as CaCO3	471-34-1	29.5		mg/L	1	1.90	10.0	EPA 310.2	12/07/20	12/08/20
Total Kjeldahl Nitrogen		0.69		mg/L	1	0.037	0.050	EPA 351.2	12/02/20	12/07/20
Total Nitrogen	17778-88-0	0.87		mg/L	1	0.037	0.050	CALC	12/02/20	12/07/20
Total Suspended Solids		13		mg/L	1	2.5	2.5	M-2540D-201	12/03/20	12/04/20
Turbidity		23		NTU	1	1.0	1.0	EPA 180.1	12/02/20	12/02/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 20-12001
Received Date : 12/01/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	12/07/20	12/08/20
Chlorophyll a	42617-16-3	0.53		mg/m3	1	0.50	0.50	A 10200 H-20	12/01/20	12/08/20
Color		5.0	U	Color Units	1	5.0	5.0	M 2120B-201	12/02/20	12/02/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	12/04/20	12/04/20
Orthophosphate as P	1426-54-2	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	12/02/20	12/02/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	12/02/20	12/07/20
Total Alkalinity as CaCO3	471-34-1	1.90	U	mg/L	1	1.90	10.0	EPA 310.2	12/07/20	12/08/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	12/02/20	12/07/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	12/02/20	12/07/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	12/03/20	12/04/20
Turbidity		1.0	U	NTU	1	1.0	1.0	EPA 180.1	12/02/20	12/02/20

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Received Date : 12/01/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS1/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	107/119/104	84-116	84-116	QM-07	3	0-10
Total Kjeldahl Nitrogen	100/105/109/110	90-110	90-110		4	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	99/88/86	90-110	90-110	QM-07	2	0-10
Total Alkalinity as CaCO3	94/107/108	90-110	90-110		0.2	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	106/104/106	90-110	90-110		1	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	102/90/107/94	90-110	90-110		3	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	91	80-120

	Result	Source	RPD	Notes	RPD
		Result	Limit		Limit
Total Suspended Solids (DUP-1)	22	21	5		0-20

	Result	Source	RPD	Notes	RPD
		Result	Limit		Limit
Chlorophyll a (DUP-1)	250	250	0	QB-03	0-25

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	Acceptable			
	LCS	Limits			
Color	100	90-110			
	Result	Source	RPD	Notes	RPD
Color (DUP-1)	10	10	0		0-10
	% Recovery	Acceptable			
	LCS	Limits			
Turbidity	104	90-110			
	Result	Source	RPD	Notes	RPD
Turbidity (DUP-1)	4.1	4.2	2		0-10

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time

Q01 Analysis performed outside of method-specified holding time

Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

QB-03 The associated method blank had a positive result and may suggest sample result is biased high. There is no additional sample available for repeat testing.



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Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 12/01/20
Contact Name: Lance Lumbard	Date Received: 12/01/20
Project Name: OC Bass Lake Water Quality	Time Received: 12:15
Project Number: 600478x22.02.07	Date Reported : 12/11/20
Phone Number: (407) 522-7570	Date Emailed : 12/11/20
Fax Number: (407) 522-7576	SRL Work Order # 20-12002

SRL WO #	Clients #	Matrix	Analysis Requested
2012002-001	Bass Spm1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2012002-002	Bass Spm2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2012002-003	Bass Spm3	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

Sherri Payne
Vice President & Quality Assurance Officer
Southern Research Laboratories, Inc.

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-12002
Received Date : 12/01/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : Bass Spm1
SRL (Lab) ID# : 2012002-001
Date Collected : 12/01/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	2.1	D	mg/L	2	0.020	0.040	EPA 350.1	12/07/20	12/08/20
Nitrate/Nitrite as N		0.21		mg/L	1	0.016	0.050	4500NO3 H-	12/04/20	12/04/20
Orthophosphate as P	1426-54-42	0.0053	I	mg/L	1	0.0040	0.010	EPA 365.1	12/02/20	12/02/20
Phosphorus	7723-14-0	0.036		mg/L	1	0.010	0.015	EPA 365.4	12/02/20	12/07/20
Total Kjeldahl Nitrogen		2.6		mg/L	1	0.037	0.050	EPA 351.2	12/02/20	12/07/20
Total Nitrogen	17778-88-0	2.8		mg/L	1	0.037	0.050	CALC	12/02/20	12/07/20
Total Suspended Solids		4.5		mg/L	1	2.5	2.5	M-2540D-201	12/03/20	12/04/20

Client ID # : Bass Spm2
SRL (Lab) ID# : 2012002-002
Date Collected : 12/01/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	1.8		mg/L	1	0.0098	0.020	EPA 350.1	12/07/20	12/08/20
Nitrate/Nitrite as N		2.0	D	mg/L	5	0.080	0.25	4500NO3 H-	12/07/20	12/08/20
Orthophosphate as P	1426-54-42	0.031		mg/L	1	0.0040	0.010	EPA 365.1	12/02/20	12/02/20
Phosphorus	7723-14-0	0.16		mg/L	1	0.010	0.015	EPA 365.4	12/02/20	12/07/20
Total Kjeldahl Nitrogen		2.4		mg/L	1	0.037	0.050	EPA 351.2	12/02/20	12/07/20
Total Nitrogen	17778-88-0	4.4	D	mg/L	5	0.080	0.25	CALC	12/02/20	12/08/20
Total Suspended Solids		6.3		mg/L	1	2.5	2.5	M-2540D-201	12/03/20	12/04/20

Client ID # : Bass Spm3
SRL (Lab) ID# : 2012002-003
Date Collected : 12/01/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	1.6		mg/L	1	0.0098	0.020	EPA 350.1	12/07/20	12/08/20
Nitrate/Nitrite as N		1.3	D	mg/L	5	0.080	0.25	4500NO3 H-	12/07/20	12/08/20
Orthophosphate as P	1426-54-42	0.050		mg/L	1	0.0040	0.010	EPA 365.1	12/02/20	12/02/20
Phosphorus	7723-14-0	0.37		mg/L	1	0.010	0.015	EPA 365.4	12/02/20	12/07/20
Total Kjeldahl Nitrogen		2.5		mg/L	1	0.037	0.050	EPA 351.2	12/02/20	12/07/20
Total Nitrogen	17778-88-0	3.8	D	mg/L	5	0.080	0.25	CALC	12/02/20	12/08/20
Total Suspended Solids		17		mg/L	1	2.5	2.5	M-2540D-201	12/03/20	12/04/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-12002
Received Date : 12/01/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : **MB**
Date Collected : **NA**
Lab FDOH Certification # : **E83182**

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	12/07/20	12/08/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	12/04/20	12/04/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	12/07/20	12/08/20
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	12/02/20	12/02/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	12/02/20	12/07/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	12/02/20	12/07/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	12/02/20	12/07/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	12/03/20	12/04/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-12002
Received Date : 12/01/20

Lance Lumbar
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	107/119/104	84-116	84-116	QM-07	3	0-10
Nitrate/Nitrite as N	103/103/104	84-116	84-116		2	0-10
Total Kjeldahl Nitrogen	100/105/109/110	90-110	90-110		4	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	99/88/86	90-110	90-110	QM-07	2	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	106/104/106	90-110	90-110		1	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	102/90/107/94	90-110	90-110		3	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	91	80-120

	Result	Source	RPD	Notes	RPD
		Result	Limit		Limit
Total Suspended Solids (DUP-1)	22	21	5		0-20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-12002
Received Date : 12/01/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.



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Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 02/18/21
Contact Name: Lance Lumbard	Date Received: 02/18/21
Project Name: OC Bass Lake Surface Water	Time Received: 12:10
Project Number: 600478x22.01.07	Date Reported : 03/04/21
Phone Number: (407) 522-7570	Date Emailed : 03/04/21
Fax Number: (407) 522-7576	SRL Work Order # 21-02035

SRL WO #	Clients #	Matrix	Analysis Requested
2102035-001	BLSW	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia/Color/ Alkalinity/Turbidity/Chlorophyll A

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 21-02035
Received Date : 02/18/21

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Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : BLSW
SRL (Lab) ID# : 2102035-001
Date Collected : 02/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/24/21	02/25/21
Chlorophyll a	42617-16-3	39		mg/m3	1	0.50	0.50	A 10200 H-20	02/16/21	02/22/21
Color		10		Color Units	1	5.0	5.0	M 2120B-201	02/18/21	02/19/21
Nitrate/Nitrite as N		0.16		mg/L	1	0.016	0.050	4500NO3 H-	02/22/21	02/23/21
Orthophosphate as P	1426-54-2	0.014	U	mg/L	1	0.014	0.040	EPA 365.3	02/19/21	02/19/21
pH for Color (pH units)		7.8		Color Units	1			SM 2120B-201	02/19/21	02/19/21
Phosphorus	7723-14-0	0.071		mg/L	1	0.010	0.015	EPA 365.4	02/23/21	02/26/21
Total Alkalinity as CaCO3	471-34-1	35.2		mg/L	1	1.90	10.0	EPA 310.2	02/24/21	02/25/21
Total Kjeldahl Nitrogen		1.1		mg/L	1	0.037	0.050	EPA 351.2	02/26/21	03/02/21
Total Nitrogen	17778-88-0	1.2		mg/L	1	0.037	0.050	CALC	02/26/21	03/02/21
Total Suspended Solids		8.5		mg/L	1	2.5	2.5	M-2540D-201	02/24/21	02/25/21
Turbidity		12		NTU	1	1.0	1.0	EPA 180.1	02/19/21	02/19/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 21-02035
Received Date : 02/18/21

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Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : **MB**
Date Collected : **NA**
Lab FDOH Certification # : **E83182**

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/24/21	02/25/21
Chlorophyll a	42617-16-3	0.50	U	mg/m3	1	0.50	0.50	A 10200 H-20	02/16/21	02/22/21
Color		5.0	U	Color Units	1	5.0	5.0	M 2120B-201	02/18/21	02/18/21
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	02/22/21	02/23/21
Orthophosphate as P	1426-54-2	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	02/19/21	02/19/21
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	02/23/21	02/26/21
Total Alkalinity as CaCO3	471-34-1	1.90	U	mg/L	1	1.90	10.0	EPA 310.2	02/24/21	02/25/21
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	02/26/21	03/02/21
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	02/26/21	03/02/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	02/24/21	02/25/21
Turbidity		1.0	U	NTU	1	1.0	1.0	EPA 180.1	02/19/21	02/19/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02035
Received Date : 02/18/21

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Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS1/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	108/107/105	84-116	84-116		1	0-10
Total Kjeldahl Nitrogen	105/90/105/102	90-110	90-110		1	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	98/119/118	90-110	90-110	QM-07	0.5	0-10
Total Alkalinity as CaCO3	98/88/90	90-110	90-110	QM-07	2	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	102/99/94	90-110	90-110		4	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS3/MS4/MSD4	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	99/95/100/106	90-110	90-110		1	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	90	80-120

	Result	Source	RPD	Notes	RPD
		Result			Limit
Total Suspended Solids (DUP-1)	3.0	2.5 U			0-20

	Result	Source	RPD	Notes	RPD
		Result			Limit
Chlorophyll a (DUP-1)	180	180	3		0-25

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Received Date : 02/18/21

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Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	Acceptable			
	LCS	Limits			
Color	100	90-110			
	Result	Source	RPD	Notes	RPD
Color (DUP-1)	35	Result 35	0		Limit 0-10
	% Recovery	Acceptable			
	LCS	Limits			
Turbidity	102	90-110			
	Result	Source	RPD	Notes	RPD
Turbidity (DUP-1)	2.3	Result 2.3	0		Limit 0-10

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02035
Received Date : 02/18/21

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Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

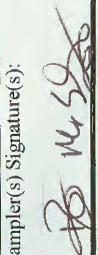
Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

Chain of Custody

Project Manager: Lance Lumbard Company: Wood Address: 550 Northlake Blvd. Suite 1000 City, State, Zip: Altamonte Springs, FL 32701 Phone: 407-592-3235 Fax:				2251 Lynx Lane, Suite #1 Orlando, Florida 32804 (407) 522-7100 Fax: (407) 522-7043		Project Name: Bass Lake Surface Water PO# C012609562 Project Location: Bass Lake		Page 1 of 1	
Sampled by [Print Name(s)] / Affiliation: Robert Sheridan/Wood		Project Number: 600478X22.01.07		Requested Due Date:		Preservatives (see codes) I S I I I I		Analyses Requested	
Sampler(s) Signature(s): 		Relinquished by: 		Accepted by: Helen Sumner		Equipment ID No.:		Comments: 2102035-001	
Sample Identification		Sampled Date: 2/18/21 Time: 1050		Grab or Composite G		Matrix: (see codes) SW		Total Number of Containers 9	
1 B L SW		2/18/21 1050		G		SW		9	
2									
3									
4									
5									
6									
7									
8									
9									
10									
Shipment Method: Out: / / Via: Returned: / / Via:		Relinquished by: 		Date: 2/18/21 Time: 1210		Date: 2/18/21 Time: 12:10		Accepted by: Helen Sumner	
Additional Comments:		Cooler No(s) / Temperature(s) (°C): Client cooler 2.1		Sampling Kit No.:		Equipment ID No.:		Matrix Codes: A = Air GW = Groundwater SE = Sediment Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice W = Water (Blanks) HW = Potential Haz Waste O = Other (Specify)	



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we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 02/18/21
Contact Name: Lance Lumbard	Date Received: 02/18/21
Project Name: OC Bass Lake Seepage Water	Time Received: 12:10
Project Number: 600478x22.01.06	Date Reported : 03/01/21
Phone Number: (407) 522-7570	Date Emailed : 03/01/21
Fax Number: (407) 522-7576	SRL Work Order # 21-02034

SRL WO #	Clients #	Matrix	Analysis Requested
2102034-001	BLSM1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2102034-002	BLSM4	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

Sherri Payne
Vice President & Quality Assurance Officer
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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02034
Received Date : 02/18/21

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Project Number/Project Name
600478x22.01.06
OC Bass Lake Seepage Water
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLSM1**
SRL (Lab) ID# : 2102034-001
Date Collected : 02/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	1.7		mg/L	1	0.0098	0.020	EPA 350.1	02/24/21	02/25/21
Nitrate/Nitrite as N		0.066		mg/L	1	0.016	0.050	4500NO3 H-	02/22/21	02/23/21
Orthophosphate as P	1426-54-42	0.014	U	mg/L	1	0.014	0.040	EPA 365.3	02/19/21	02/19/21
Phosphorus	7723-14-0	0.036		mg/L	1	0.010	0.015	EPA 365.4	02/23/21	02/26/21
Total Kjeldahl Nitrogen		2.0		mg/L	1	0.037	0.050	EPA 351.2	02/23/21	02/26/21
Total Nitrogen	17778-88-0	2.1		mg/L	1	0.037	0.050	CALC	02/23/21	02/26/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	02/24/21	02/25/21

Client ID # : **BLSM4**
SRL (Lab) ID# : 2102034-002
Date Collected : 02/18/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	2.5	D	mg/L	2	0.020	0.040	EPA 350.1	02/24/21	02/25/21
Nitrate/Nitrite as N		0.16		mg/L	1	0.016	0.050	4500NO3 H-	02/22/21	02/23/21
Orthophosphate as P	1426-54-42	0.014	U	mg/L	1	0.014	0.040	EPA 365.3	02/19/21	02/19/21
Phosphorus	7723-14-0	0.15		mg/L	1	0.010	0.015	EPA 365.4	02/23/21	02/26/21
Total Kjeldahl Nitrogen		3.2		mg/L	1	0.037	0.050	EPA 351.2	02/23/21	02/26/21
Total Nitrogen	17778-88-0	3.4		mg/L	1	0.037	0.050	CALC	02/23/21	02/26/21
Total Suspended Solids		4.5		mg/L	1	2.5	2.5	M-2540D-201	02/24/21	02/25/21

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/24/21	02/25/21
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	02/22/21	02/23/21
Orthophosphate as P	1426-54-42	0.014	U	mg/L	1	0.014	0.040	EPA 365.3	02/19/21	02/19/21
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	02/23/21	02/26/21
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	02/23/21	02/26/21
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	02/23/21	02/26/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	02/24/21	02/25/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02034
Received Date : 02/18/21

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Project Number/Project Name
600478x22.01.06
OC Bass Lake Seepage Water
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MS3/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	108/107/105	84-116	84-116		1	0-10
Total Kjeldahl Nitrogen	102/108/103/106	90-110	90-110		1	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	98/119/118	90-110	90-110	QM-07	0.5	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	102/99/94	90-110	90-110		4	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS3/MS4/MSD4	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	99/95/100/106	90-110	90-110		1	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	90	80-120

	Result	Source	RPD	Notes	RPD
		Result			Limit
Total Suspended Solids (DUP-1)	3.0	2.5 U			0-20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02034
Received Date : 02/18/21

Lance Lumbar
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.06
OC Bass Lake Seepage Water
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

Chain of Custody

Project Manager: Lance Lumbard		2251 Lynx Lane, Suite #1 Orlando, Florida 32804		Page 1 of 1	
Company: Wood				Project Name: Bass Lake Seepage Water	
Address: 550 Northlake Blvd. Suite 1000				PO# C012609562	
City, State, Zip: Altamonte Springs, FL 32701				Project Location: Bass Lake	
Phone: 407-592-3235		Fax: (407) 522-7100			

Sampled by [Print Name(s)] / Affiliation: Robert Sheridan/Wood		Project Number: 600478X22.01.01	
Sampler(s) Signature(s): 		REQUESTED DUE DATE:	

Sample Identification	Sampled Date	Sampled Time	Grab or Composite	Matrix: (see codes)	Total Number of Containers	Analyses Requested					Comments
						TSS	Ammonia	DP (Low level)	Field Filtered	Preservatives (see codes)	
1 BLSM1	2/18/21	1025	G	G1W	3	1	1	1	1	I S I	2102034-001
2 BLSM4	2/18/21	0952	G	G1W	3	1	1	1	1		-002
3											
4											
5											
6											
7											
8											
9											
10											

Shipment Method:		Relinquished by: 		Date: 2/18/21	Time: 1210	Accepted by: Helen Juv	Date: 2/18/21	Time: 1210
Out: / /	Via:							
Returned: / /	Via:							
Additional Comments:								
Cooler No(s) / Temperature(s) (°C):		Client cooler 2.1		Stack		Equipment ID No.:		
Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water		N = Nitric Acid & Ice		S = Sulfuric Acid & Ice		HW = Potential Haz Waste O = Other(Specify):		
Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only		N = Nitric Acid & Ice		S = Sulfuric Acid & Ice		X = Sodium Hydroxide & Ice O = Other(Specify):		



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Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 04/12/21
Contact Name: Lance Lumbard	Date Received: 04/12/21
Project Name: OC Bass Lake Surface Water	Time Received: 11:50
Project Number: 600478x22.01.07	Date Reported : 04/23/21
Phone Number: (407) 522-7570	Date Emailed : 04/23/21
Fax Number: (407) 522-7576	SRL Work Order # 21-04018

SRL WO #	Clients #	Matrix	Analysis Requested
2104018-001	BLSW	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia/Color/ Alkalinity/Turbidity/Chlorophyll A

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 21-04018
Received Date : 04/12/21

Lance Lombard
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : BLSW
SRL (Lab) ID# : 2104018-001
Date Collected : 04/12/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	04/16/21	04/19/21
Chlorophyll a	42617-16-3	17		mg/m3	1	0.50	0.50	A 10200 H-20	04/13/21	04/20/21
Color		10		Color Units	1	5.0	5.0	M 2120B-201	04/13/21	04/13/21
Nitrate/Nitrite as N		0.074		mg/L	1	0.016	0.050	4500NO3 H-	04/14/21	04/15/21
Orthophosphate as P	1426-54-2	0.012		mg/L	1	0.0040	0.010	EPA 365.1	04/13/21	04/13/21
pH for Color (pH units)		6.9		Color Units	1			SM 2120B-201	04/13/21	04/13/21
Phosphorus	7723-14-0	0.070		mg/L	1	0.010	0.015	EPA 365.4	04/13/21	04/16/21
Total Alkalinity as CaCO3	471-34-1	34.6		mg/L	1	1.90	10.0	EPA 310.2	04/16/21	04/19/21
Total Kjeldahl Nitrogen		0.88		mg/L	1	0.037	0.050	EPA 351.2	04/15/21	04/20/21
Total Nitrogen	17778-88-0	0.95		mg/L	1	0.037	0.050	CALC	04/15/21	04/20/21
Total Suspended Solids		7.5		mg/L	1	2.5	2.5	M-2540D-201	04/19/21	04/20/21
Turbidity		8.2		NTU	1	1.0	1.0	EPA 180.1	04/13/21	04/13/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 21-04018
Received Date : 04/12/21

Lance Lombard
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Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	04/16/21	04/19/21
Chlorophyll a	42617-16-3	0.50	U	mg/m3	1	0.50	0.50	A 10200 H-20	04/13/21	04/20/21
Color		5.0	U	Color Units	1	5.0	5.0	M 2120B-201	04/13/21	04/13/21
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	04/14/21	04/15/21
Orthophosphate as P	1426-54-2	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	04/13/21	04/13/21
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	04/13/21	04/16/21
Total Alkalinity as CaCO3	471-34-1	1.90	U	mg/L	1	1.90	10.0	EPA 310.2	04/16/21	04/19/21
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	04/15/21	04/20/21
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	04/15/21	04/20/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	04/19/21	04/20/21
Turbidity		1.0	U	NTU	1	1.0	1.0	EPA 180.1	04/13/21	04/13/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-04018
Received Date : 04/12/21

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Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
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Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS1/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	103/91/90	84-116	84-116		2	0-10
Total Kjeldahl Nitrogen	92/95/95/95	90-110	90-110		0.7	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	102/98/95	90-110	90-110		3	0-10
Total Alkalinity as CaCO3	97/101/104	90-110	90-110		3	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	102/100/101	90-110	90-110		0.8	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS2/MS3/MSD3	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	98/102/99/98	90-110	90-110		0.4	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	92	80-120

	Result	Source	RPD	Notes	RPD
		Result	Limit		Limit
Total Suspended Solids (DUP-1)	12	12	0	LP-02	0-20

	Result	Source	RPD	Notes	RPD
		Result	Limit		Limit
Chlorophyll a (DUP-1)	21	17	23		0-25

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Received Date : 04/12/21

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Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	Acceptable			
	LCS	Limits			
Color	100	90-110			
	Result	Source	RPD	Notes	RPD
Color (DUP-1)	20	20	0		0-10
	% Recovery	Acceptable			
	LCS	Limits			
Turbidity	106	90-110			
	Result	Source	RPD	Notes	RPD
Turbidity (DUP-1)	12	12	0.8		0-10

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Project Number/Project Name
600478x22.01.07
OC Bass Lake Surface Water
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

LP-02 Filtered residue did not meet 2.5-200mg range

Chain of Custody

2104018

Project Manager: Lance Lumbard		2251 Lynx Lane, Suite #1 Orlando, Florida 32804		Page 1 of 1	
Company: Wood				Project Name: Bass Lake Seepage surface	
Address: 550 Northlake Blvd, Suite 1000				PO: C012609562	
City, State, Zip: Altamonte Springs, FL 32701		(407) 522-7100		Project Location: Bass Lake (Orange County)	
Phone: 407-592-3235		Toll Free 1 (888) 420-TEST		Fax: (407) 522-7043	
Sampled by [Print Name(s)] / Affiliation:		Preservatives (see codes)			
James S. Preston / Wood		I I I I I S			
Sampled by Signature(s):		Analyses Requested			
James S. Preston		TSS (Color) Alkalinity/Turbidity TN/TP/Lowry			
Sample Identification	Sampled Date: Time:	Grab or Composite	Matrix: (see codes)	Total Number of Containers	
1 BLSW	4/12/21 10:25	G	SW	6	
2					
3					
4					
5					
6					
7					
8					
9					
10					
Shipment Method:		Relinquished by:		Accepted by:	
Out: / /	Via:	James S. Preston		Date: 4/12/21 11:15	
Returned: / /	Via:	Kathleen		Date: 4/12/21 11:50	
Additional Comments:		Cooler No.(s) / Temperature(s) (°C): Stack 3.1			
Equipment ID No.:		Sampling Kit No.: 8867			
Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) HW = Potential Haz Waste O = Other (Specify)					
Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other (Specify)					

2104018-001

REQUESTED DUE DATE:

Sampling QAP No.:

Approval Date:

Comments:

Date: 4/12/21 11:15

Time: 11:15

Date: 4/12/21

Relinquished by:

Shipment Method:

Out: / /

Returned: / /

Additional Comments:

Equipment ID No.:

Sampling Kit No.:

Cooler No.(s) / Temperature(s) (°C):

Matrix Codes:

Preservative Codes:



2251 Lynx Lane, Suite 1
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Toll Free 1 (888) 420-Test

Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 04/12/21
Contact Name: Lance Lumbard	Date Received: 04/12/21
Project Name: OC Bass Lake Seepage Water	Time Received: 11:50
Project Number: 600478x22.01.06	Date Reported : 04/23/21
Phone Number: (407) 522-7570	Date Emailed : 04/23/21
Fax Number: (407) 522-7576	SRL Work Order # 21-04017

SRL WO #	Clients #	Matrix	Analysis Requested
2104017-001	BLSM1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2104017-002	BLSM2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2104017-003	BLSM3	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

Sherri Payne
Vice President & Quality Assurance Officer
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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-04017
Received Date : 04/12/21

Lance Lumbard
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550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.06
OC Bass Lake Seepage Water
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLSM1**
SRL (Lab) ID# : 2104017-001
Date Collected : 04/12/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	1.7		mg/L	1	0.0098	0.020	EPA 350.1	04/16/21	04/19/21
Nitrate/Nitrite as N		0.022	I	mg/L	1	0.016	0.050	4500NO3 H-	04/14/21	04/15/21
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	04/13/21	04/13/21
Phosphorus	7723-14-0	0.030		mg/L	1	0.010	0.015	EPA 365.4	04/13/21	04/16/21
Total Kjeldahl Nitrogen		2.0		mg/L	1	0.037	0.050	EPA 351.2	04/15/21	04/20/21
Total Nitrogen	17778-88-0	2.0		mg/L	1	0.037	0.050	CALC	04/15/21	04/20/21
Total Suspended Solids		4.0		mg/L	1	2.5	2.5	M-2540D-201	04/19/21	04/20/21

Client ID # : **BLSM2**
SRL (Lab) ID# : 2104017-002
Date Collected : 04/12/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	04/16/21	04/19/21
Nitrate/Nitrite as N		0.26		mg/L	1	0.016	0.050	4500NO3 H-	04/14/21	04/15/21
Orthophosphate as P	1426-54-42	0.030		mg/L	1	0.0040	0.010	EPA 365.1	04/13/21	04/13/21
Phosphorus	7723-14-0	0.21		mg/L	1	0.010	0.015	EPA 365.4	04/13/21	04/16/21
Total Kjeldahl Nitrogen		0.60		mg/L	1	0.037	0.050	EPA 351.2	04/15/21	04/20/21
Total Nitrogen	17778-88-0	0.86		mg/L	1	0.037	0.050	CALC	04/15/21	04/20/21
Total Suspended Solids		15		mg/L	1	2.5	2.5	M-2540D-201	04/19/21	04/20/21

Client ID # : **BLSM3**
SRL (Lab) ID# : 2104017-003
Date Collected : 04/12/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	04/16/21	04/19/21
Nitrate/Nitrite as N		0.21		mg/L	1	0.016	0.050	4500NO3 H-	04/14/21	04/15/21
Orthophosphate as P	1426-54-42	0.010		mg/L	1	0.0040	0.010	EPA 365.1	04/13/21	04/13/21
Phosphorus	7723-14-0	0.12		mg/L	1	0.010	0.015	EPA 365.4	04/13/21	04/16/21
Total Kjeldahl Nitrogen		0.97		mg/L	1	0.037	0.050	EPA 351.2	04/15/21	04/20/21
Total Nitrogen	17778-88-0	1.2		mg/L	1	0.037	0.050	CALC	04/15/21	04/20/21
Total Suspended Solids		13		mg/L	1	2.5	2.5	M-2540D-201	04/16/21	04/19/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 21-04017
Received Date : 04/12/21

Lance Lombard
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550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.06
OC Bass Lake Seepage Water
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	04/16/21	04/19/21
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	04/14/21	04/15/21
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	04/13/21	04/13/21
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	04/13/21	04/16/21
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	04/15/21	04/20/21
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	04/15/21	04/20/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	04/16/21	04/19/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	04/19/21	04/20/21

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-04017
Received Date : 04/12/21

Lance Lumbar
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.06
OC Bass Lake Seepage Water
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery LCS/MS/MS2/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Nitrate/Nitrite as N	103/91/90	84-116	84-116		2	0-10
Total Kjeldahl Nitrogen	92/95/95/95	90-110	90-110		0.7	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery LCS/MS/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Orthophosphate as P	102/98/95	90-110	90-110		3	0-10

	% Recovery LCS/MS/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Phosphorus	102/100/101	90-110	90-110		0.8	0-10

	% Recovery LCS/MS2/MS3/MSD3	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Nitrogen, Ammonia (as N)	98/102/99/98	90-110	90-110		0.4	0-10

	% Recovery LCS	Acceptable Limits
Total Suspended Solids	92	80-120

	Result	Source Result	RPD	Notes	RPD Limit
Total Suspended Solids (DUP-1)	7.0	8.0	13	LP-02	0-20

	% Recovery LCS	Acceptable Limits
Total Suspended Solids	92	80-120

	Result	Source Result	RPD	Notes	RPD Limit
Total Suspended Solids (DUP-1)	12	12	0	LP-02	0-20

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DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

LP-02 Filtered residue did not meet 2.5-200mg range

Chain of Custody

Project Manager: Lance Lumbard

Company: Wood

Address: 550 Northlake Blvd, Suite 1000

City, State, Zip: Altamonte Springs, FL 32701

Phone: 407-592-3235 **Fax:**



Southern Research Laboratories, Inc.

2251 Lynx Lane, Suite #1
Orlando, Florida 32804

(407) 522-7100

Fax: (407) 522-7043

Project Name: Bass Lake Seepage

PO: C012609562

Project Location: Bass Lake (Orange County)

Project Number: 600478X22.01.06

REQUESTED DUE DATE:

Sampling QAP No.:

Approval Date:

Comments:

Page 1 **of** 1

Sampled by [Print Name(s)] / Affiliation:
James Preston/wood

Sampler(s) Signature(s):
James Preston

Preservatives (see codes)

Analyses Requested

Toll Free 1 (888) 420-TEST

Sample Identification	Sampled		Grab or Composite	Matrix: (see codes)	Total Number of Containers	Date		Time	Relinquished by:	Date		Time	Accepted by:	Date	Time
	Date	Time				Date	Date								
1 BLSM1	4/10/21	0950	G	SW	3	4/12/21	1115	1115	James S. Preston	4/12/21	1115	1115	4/12/21	1115	
2 BLSM2		1005	I	I	3	4/12/21	1150	1150	Kate Baller	4/12/21	1150	1150	4/12/21	1150	
3 BLSM3		1050	I	I	3										
4															
5															
6															
7															
8															
9															
10															

Shipment Method:

Out: / / **Via:**

Returned: / / **Via:**

Additional Comments:

Cooler No.(s) / Temperature(s) (°C):
Stack 3.1

Sampling Kit No.:
8867

Equipment ID No.:

Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) HW = Potential Haz Waste O = Other (Specify)

Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other (Specify)

APPENDIX D

Stormwater Structure Report

PROJECT MEMORANDUM

TO: Lance Lumbard, Project Manager, Wood Environment and Infrastructure
FROM: Katie Ballew, Environmental Scientist, Barnes, Ferland and Associates, Inc.
SUBJECT: Summary of Watershed Delineation – Bass Lake
DATE: October 13th, 2020
BFA JOB: 2020-13.2A

INTRODUCTION

The overall objective for this project is to identify the source of the elevated nitrogen concentrations in the Bass Lake basin and to develop conceptual management recommendations to reduce total nitrogen concentrations and loadings discharging into Bass Lake

Specifically, Barnes, Ferland and Associates, Inc (BFA), under the direction of Wood Environment and Infrastructure Solutions, Inc. (Wood) was tasked with field reconnaissance of the Bass Lake Basin to identify the conveyance characteristics of the stormwater drainage system and field verification of the Bass Lake sub-basins. Field verification of drainage structures throughout the Bass Lake basin began in May 2020. Katie Ballew and Ben Stormont with BFA and Robert Sheridan with Wood utilized one day to walk and drive the Bass Lake basin area. BFA reviewed a 2020 ArcMap file of the Bass Lake watershed provided by Wood. Where access was available, the watershed basin of Bass Lake was surveyed to identify storm water curb inlets, Best Management Practices (BMP), weirs, and storm water ponds. Some manhole covers were removed to provide a visual identification of storm water piping leading to Bass Lake and to verify the water conveyance directional flow.

Information from this reconnaissance is attached titled *Exhibit 1* and *Exhibit 1a* which includes a structure map and reference table. *Exhibits 2-1* through *2-5* include structure photographs taken during the field investigation.

BASIN BOUNDARY DELINEATION

Drainage plans for the area surrounding Bass Lake were unavailable so BFA and Wood walked and drove throughout the watershed basin and investigated storm manholes to verify flow direction and pipe size. Google Earth was also utilized for historical aerial reference.

CONVEYANCE SYSTEM AND BEST MANAGEMENT PRACTICES

Exhibit 1 shows the Bass Lake Basin Boundaries. The Bass Lake drainage basin extends from Bumby Ave. east to Conway Gardens Rd. and from Tennessee Terr. south to Raeford Rd. The Bass Lake basin area covers approximately 0.5 square miles. Using the information gathered in the field, BFA was able to identify 5 outfalls and their sub-basins to track water flow more accurately throughout the Bass Lake area. The Sub-basin delineation is discussed in more detail below.

Bass Lake has 3 main outfalls which collect road run-off from high to moderate traffic streets such as Crystal Lake Dr., Michigan Ave., and Peel Ave. These outfalls (BLA1, BLA2, BLA3) have been selected to characterize the water quality entering the lake through these sub-basins. BLA4 and BLA5 are smaller areas made up of 1 to 2 minor streets with run-off mainly controlled by elevation and captured by 2 curb inlets adjacent to each outfall.

BLA1

This sub-basin collects road runoff from Michigan Avenue east of Bumby Ave. west to Crystal Lake Dr. and from Grant St. south to Peel Ave. and E. Compton Ave. A drainage system made up of grated drop inlets conducts run-off from Crystal Lake Drive and Michigan Ave. to a drain well at the corner where these streets meet. In addition to the drain well, there is a retention pond with rip-rap swale, and an overflow weir at the outfall. The drain well, retention pond and overflow weir help to control the large volume of water directed to this location and prevent flooding.

BLA2

BLA2 is the northern border of the Bass Lake Basin and collects storm water from Crystal Lake Dr. just north of Tennessee Terr. south to E. Jersey Ave. and from Peel Ave. and Grant Ave. east to Conway Gardens Rd. Much of the stormwater collected in this basin is directed toward a large retention pond on Grant Ave. just east of Rest Haven Ave. The main drainage path toward this retention pond is from Grant Ave. to a 58" culvert with a large weir. Two other culverts about 24" each enter the retention pond from the west and south. An overflow weir at the southeast corner of the retention pond directs water east to Rest Haven Ave. and south to Bass Lake Bv. / Jersey Ave. where the BLA2 outfall is located. The retention pond at Grant Ave. is large enough to mitigate flooding for a large residential area.

BLA3

The outfall at BLA3 collects storm water from streets to the west of Peel Ave. south of Michigan St. and directs them to Peel Ave. south to Raeford Rd. and east to the outfall. Elevation carries run-off to a system of swales and grated drop inlets along the western side of Peel Ave. and the north side of Raeford Rd. Each grated inlet in this area contains a debris strainer to keep leaves and other road litter from entering Bass Lake.

Bass Lake Nutrient Sourcing Study

October 13th, 2020

Page 3

BLA4

This outfall collects water from the southern portion of Bass Lake Bv. as well as from Gusten Pl. and Kramer Ln., two minor streets west of Conway Gardens Rd. Elevation carries run-off from Bass Lake Bv. to two curb inlets which flow west into the outfall at BLA4.

BLA5

Like the outfall at BLA4, BLA5 collects water from a few minor streets via elevation: E. Compton Ave., Dawley Ave. south of Michigan St., and Gulf Dr. Two curb inlets on Dawley Ave. direct run-off east to the outfall.

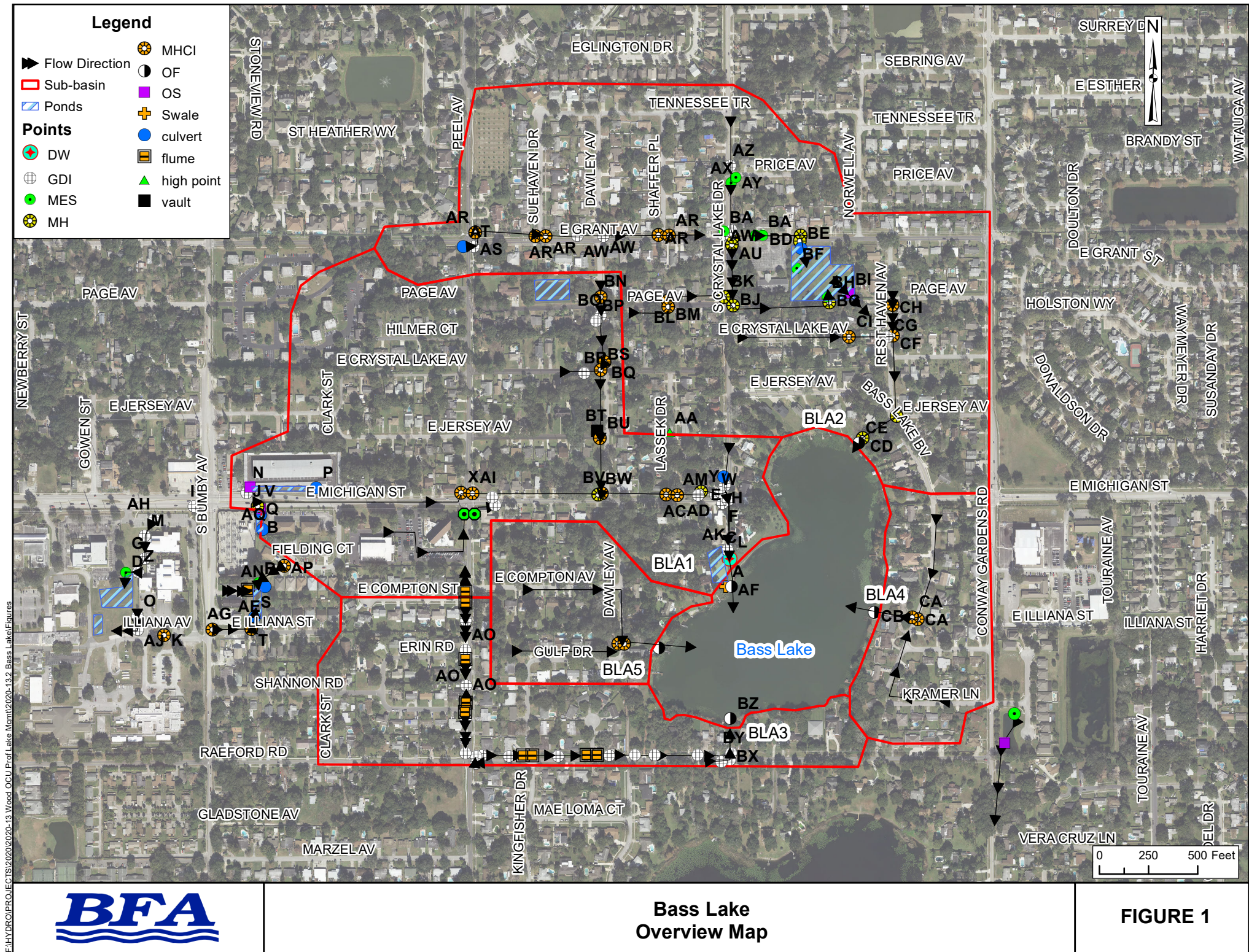
Katie Ballew
Environmental Scientist



Katie Ballew

Attachment

F:\HYDRO\PROJECTS\2020\2020-13 Wood OCU Prof Lake Mgmt\2020-13.2 Bass Lake\20-13.2A - Hydro



Orange County Nutrient Loading Evaluation and Conceptual Projects

Field Data - Bass Lake

CI- curb inlet, MES- mitered end section, MH- manhole, GDI- grated drop inlet, OS- overflow structure, OF- outfall
*unless otherwise indicated

Waypoint	Structure_ID	Latitude (N)	Longitude (W)	Size of pipes coming INTO* structure	Description	Picture_1	Picture_2	Picture_3
A	Swale	28.511995	-81.343407		spreader swale with riprap in retention pond at a crystal lake dr. Bass lake	2280	2281	
B	culvert	28.512985	-81.350777	14"	culvert w head wall into retention pond at south side of Michigan next to teasers salon 14"			
C	culvert	28.51247	-81.343369	24"	24"			
D	MES	28.512173	-81.352913	18"	Into retention pond near medical examiner building from north 18"			
E	GDI	28.513208	-81.343384		north to south down crystal lake to Bass lake OF			
F	GDI	28.51317	-81.34346		West to east to GDI at crystal lake/Michigan leads to Bass lake OF			
G	GDI	28.512373	-81.352615	32", 24"	in field on south side of medical examiner building. 2 pipes lead from parking lot 32" and from east 24"(?) toward south retention pond			
H	GDI	28.513416	-81.343422		North side of Michigan / CL from crystal lake dr to Bass lake			
I	GDI	28.513105	-81.351837		flows west to east down Michigan toward bass lake			
J	GDI	28.513296	-81.351006		Bumby / Michigan north side of Michigan. From public storage retention pond. Pipes not visible.	2316		
K	MHCI	28.511288	-81.352303		collects runoff from OC complex flows north toward medical examiner building			
L	DW	28.512392	-81.343346		drainage well DW 107 into upper floridan			
M	GDI	28.512695	-81.352615		in field next to medical examiner building- from parking lot GDI system			
N	OS	28.513374	-81.350945		OS in public storage retention pond north side of Michigan-			
O	GDI	28.511559	-81.35273	32"	In field near medical examiner / Orange County office complex. pipes coming from north and east to south. 32"			
P	culvert	28.513363	-81.349899		Culvert w headwall into public storage retention			
Q	OS	28.513067	-81.350784		in retention pond south side of Michigan near Teasers salon. flows out to MH and east toward Bass lake OF	2324		
R	MES	28.512033	-81.350807		grated MES leads north			
S	culvert	28.511553	-81.350876	24"	headwall from illiana street MHCI into retention pond 24"			
T	MHCI	28.511387	-81.350922		2 on either side of illiana st. Leads north to retention pond behind Kwik mart			
U	culvert	28.513540	-81.343445		Pipe- under side walk n side of Michigan / w side of CL collects runoff from curve			
V	MH	28.513102	-81.350830		flow from east/west down Michigan. Collects flow from retention pond on south side of Michigan			
W	GDI	28.513287	-81.343575		west/east leads to GDI then to Bass lake	2308		
X	MHCI	28.513300	-81.347603		at peel and Michigan north side flows to Bass lake			
Y	MH	28.513323	-81.343796		storm man hole - sealed shut			
Z	GDI	28.512184	-81.352722	32"	in field next to medical examiner building. Leads from parking lot and east 32" to south			

Orange County Nutrient Loading Evaluation and Conceptual Projects

Field Data - Bass Lake

CI- curb inlet, MES- mitered end section, MH- manhole, GDI- grated drop inlet, OS- overflow structure, OF- outfall
*unless otherwise indicated

Waypoint	Structure_ID	Latitude (N)	Longitude (W)	Size of pipes coming INTO* structure	Description	Picture_1	Picture_2	Picture_3
AA	high point	28.514156	-81.344299		high point on 2521 Lassek Dr- flow travels north and south from this point. Open gutter (?) on sides of street	2312		
AB	GDI	28.513212	-81.343376		From GDI north side of Michigan toward lake	2298		
AC	MHCI	28.513283	-81.344353		northwest side of Michigan and lassek - leads toward Bass lake GDI system	2310		
AD	GDI	28.513277	-81.343849	18"	West/east down south side of Michigan- leads to Bass lake GDI system 18"			
AE	flume	28.511934	-81.350983		Into retention pond from west behind kwik mart			
AF	OF	28.511997	-81.343315	24"	24" pipe with grate. leads north to drainage well	2398		
AG	MHCI	28.511375	-81.351540		collects storm water from illiana st and bumby to retention pond at Illiana St.			
AH	GDI	28.512917	-81.352463		GDI system in parking lot of dist 9 medical examiner leads west and then south toward drain in field next to medical examiner building - to retention pond in office complex			
AI	MHCI	28.513296	-81.347420		at peel and Michigan- north side flows to Bass lake system			
AJ	GDI	28.511370	-81.352722		in field in OC complex- pipe coming in from north leading west			
AK	GDI	28.512512	-81.343376		Flows south to Bass Lake from Michigan/crystal lake dr.			
AL	GDI	28.513323	-81.343483		On north side of Michigan/crystal lake leads to Bass lake			
AM	MHCI	28.513277	-81.344177	24"	North side of Michigan leads east/west toward Bass lake GDI system 24" captures flow from lassek dr.			
AN	culvert	28.511984	-81.350708		Headwall into kwik mart retention pond from northeast			
AO	GDI	28.511106	-81.347527		several- heading north/south down peel toward Michigan st			
AP	MHCI	28.512268	-81.350403		from fielding ct cul de sac into kwik mart retention pond			
AQ	culvert	28.512777	-81.350746	12"	Headwall into teasers retention pond south side. 12"			
AR	MHCI	28.516947	-81.347389		north east corner of grant and peel. Leads east toward Conway gardens			
AS	GDI	28.516750	-81.347412		Flume into GDI at peel/grant intersection from south concrete swale. Leads east down grant			
AT	culvert	28.516756	-81.347580		Collects storm water in swale on south side of grant street at peel- leads east across peel toward Conway gardens			
AU	MH	28.516790	-81.343323		southeast corner of grant and crystal lake			
AV	MH	28.516891	-81.343307		In walkway at east side of intersection of crystal lake and grant. 42" from north and splits east/west			
AW	GDI	28.516993	-81.343330	42"	Northeast corner of grant/crystal lake pipe in approx 42" heading south			
AX	MES	28.517656	-81.343338	42"	MES leads into GDI with overland flow east/west from price ave. 42" pipe coming into GDI from north leads south toward grant st.			
AY	MES	28.517727	-81.343262		southeast corner of price ave and crystal lake- into GDI/MES leads south to grant street			
AZ	GDI	28.517891	-81.343353	42"	in roadside swale east side of crystal lake dr. 42" Pipe coming in from north leads south toward grant			

Orange County Nutrient Loading Evaluation and Conceptual Projects

Field Data - Bass Lake

CI- curb inlet, MES- mitered end section, MH- manhole, GDI- grated drop inlet, OS- overflow structure, OF- outfall
*unless otherwise indicated

Waypoint	Structure_ID	Latitude (N)	Longitude (W)	Size of pipes coming INTO* structure	Description	Picture_1	Picture_2	Picture_3
BA	MES	28.516947	-81.343086		in swale heading east toward grant street retention pond			
BB	GDI	28.516926	-81.342216		north side of grant street. Leads south to grant st retention pond. Collects over land flow from grant north swale			
BC	MH	28.516916	-81.342232		from GDI at north side of grant street across to retention pond at south side of grant street			
BD	MH	28.516840	-81.342247		Large closed pipe within mh sump heading east/west (? Sewer?) from MH on north side of grant into grant retention pond.			
BE	culvert	28.516737	-81.342224	58"	Headwall with weir. Into grant street retention pond from north drainage swale system. 58"	2365	2366	
BF	MES	28.516459	-81.342293	24"	Into retention pond from adjacent GDI in parking lot 24"	2368		
BG	MH	28.515976	-81.341774		into retention pond MES. From west/crystal lake.			
BH	MES	28.516058	-81.341805	36"	into south side of grant st retention pond 36"	2371		
BI	OS	28.516111	-81.341454		GDI OS in grant st retention pond. Over flow leads south east	2372		
BJ	MH	28.515957	-81.343315	24"	east side of crystal lake dr at page st. 24" Pipe from north and 24" pipe from west into MH east toward grant st retention pond.			
BK	MH	28.516058	-81.343445	24"	Northwest corner of page ave and crystal lake dr. Small 14" grate pipe coming in. 24" pipe coming from west. Leads east to grant st retention pond.			
BL	MHCI	28.515932	-81.344299		on north side of page pipe in from south side of page. Leads east to crystal lake dr.			
BM	MHCI	28.515909	-81.344330		Runoff from page street. leads north to MHCI then east to crystal lake. Grant st retention pond			
BN	MHCI	28.516045	-81.345398	36"	east side of dawley av and page av. 36" pipe running north/south			
BO	GDI	28.515791	-81.345398	24"	east side of dawley. 14" pipe coming in from west. 24" coming in from north leads south			
BP	GDI	28.515717	-81.345474		west side of dawley goes into GDI on east side. No pipes coming in			
BQ	MHCI	28.515137	-81.345337		east side Dawley av leads west to MHCI west side of dawley.			
BR	GDI	28.514988	-81.345657		South side of crystal lake ave. Leads east toward MHCI at south side of dawley			
BS	MHCI	28.515028	-81.345398		Southwest corner of dawley and crystal lake Pipe in from west to east. Leading south.			
BT	vault	28.514179	-81.345451		vault northwest corner of dawley and jersey av. In swale on north side of jersey. Leads south down dawley			
BU	MHCI	28.514067	-81.345406	24"	southwest corner of jersey ave and dawley. 24" pipe coming in from north. Leads south to Michigan			
BV	MHCI	28.513300	-81.345375		northwest corner of Michigan and dawley ave. Pipe coming in from west leading east toward crystal lake.			
BW	MH	28.513279	-81.345428	24"	24" pipe coming in from north. 24" coming in from west. Leads east toward crystal lake dr.			
BX	GDI	28.509575	-81.343330		south side of Raeford rd collects overland flow and leads north to Bass lake	2388		
BY	GDI	28.509666	-81.343315		north side of raeford leads east to Bass Lake. GDI has debris capture tray	4005	4003	
BZ	OF	28.510153	-81.343323		MES outfall into Bass lake from raeford	2392		

Orange County Nutrient Loading Evaluation and Conceptual Projects

Field Data - Bass Lake

CI- curb inlet, MES- mitered end section, MH- manhole, GDI- grated drop inlet, OS- overflow structure, OF- outfall
*unless otherwise indicated

Waypoint	Structure_ID	Latitude (N)	Longitude (W)	Size of pipes coming INTO* structure	Description	Picture_1	Picture_2	Picture_3
CA	MHCI	28.511610	-81.340347		2 MHCI east and west sides of Bass lake Blvd. leads west to Bass lake OF.	4006		
CB	OF	28.511642	-81.341049		open pipe into bass lake from bass lake blvd	2397		
CC	MH	28.514393	-81.340706		at east end of jersey ave at rest haven intersection			
CD	MH	28.514088	-81.341240	24"	2 manholes on a vault in OC easement. 24" pipe coming in from northeast into Bass lake OF	2396		
CE	OF	28.514015	-81.341301		From northeast MH vault/bass lake blvd. Open pipe with grated cage. Heavy vegetation. Used to be recharge well. Moved across to where it is now about 5 years ago.			
CF	MHCI	28.515516	-81.340767		2 curb inlets on either side of rest haven. Collects road runoff sends south to Bass lake			
CG	GDI	28.515507	-81.340858	24"	East side of rest haven. 24" Pipe coming in from east. leading to MHCI on west side of rest haven.			
CH	MHCI	28.515949	-81.340775		east side of rest haven. No pipes coming in. Leads south toward jersey ave.			
CI	MHCI	28.515497	-81.341461		grated manhole cover. End of cul de sac at crystal lake ave. Collects overland down crystal lake- leads east toward MHCI on rest haven			
AO	GDI	28.511106	-81.347527		several- heading north/south down peel toward Michigan st			
AO	GDI	28.511106	-81.347527		several- heading north/south down peel toward Michigan st			
AO	GDI	28.511106	-81.347527		several- heading north/south down peel toward Michigan st			
CA	MHCI	28.511610	-81.340347		2 MHCI east and west sides of Bass lake Blvd. leads west to Bass lake OF.			
AR	MHCI	28.516947	-81.347389		north east corner of grant and peel. Leads east toward Conway gardens			
AR	MHCI	28.516947	-81.347389		north east corner of grant and peel. Leads east toward Conway gardens			
AW	GDI	28.516993	-81.343330		Northeast corner of grant/crystal lake pipe in approx 42" heading south			
AR	MHCI	28.516947	-81.347389		north east corner of grant and peel. Leads east toward Conway gardens			
AR	MHCI	28.516947	-81.347389		north east corner of grant and peel. Leads east toward Conway gardens			
AW	GDI	28.516993	-81.343330	42"	Northeast corner of grant/crystal lake pipe in approx 42" heading south			
BA	MES	28.516947	-81.343086		in swale heading east toward grant street retention pond			



2280, retention pond at outfall
BLA1, looking south



2279, drainage pipe from Crystal
Lake Dr. to retention pond BLA1,
looking north



2285, overflow weir and outfall
at BLA1, looking south



2281, riprap swale into Bass Lake
from retention pond at BLA1,
looking southeast



2290, interior of outfall overflow
weir at BLA1



2291, grated drop inlet to outfall
at BLA1, looking south

wood.

BFA Environmental Consultants
Barnes, Ferland and Associates, Inc.
1230 Hillcrest Street, Orlando, FL, 32803
PH: (407) 896-8608 FAX: (407) 896-1822

Bass Lake Field Verification Photos

Exhibit 2-1



2298, grated drop inlet from Crystal Lake Dr. to outfall BLA1, looking south



2308, grated drop inlet on south side of Crystal Lake Dr. to outfall BLA1, looking east



2310, curb inlet at Lassek Dr. and Crystal Lake Dr. looking east



2312, concrete flowlines and slope on Lassek Dr. toward Crystal Lake Dr., looking north



2316, grated drop inlet in retention pond on north side of Michigan St., looking east



2324, overflow weir in retention pond on south side of Michigan St., looking east



2361, grated drop inlet on north side of Grant St. looking south to retention pond



2366, culvert headwall in retention pond looking south from Grant St.



2365, culvert headwall in retention pond looking north toward Grant St.



2368, mitered end section at west end of retention pond, looking east toward Rest Haven Ave.



2371, mitered end section at south end of retention pond, looking north toward Grant St.



2372, grated drop inlet overflow weir in retention pond, looking northwest



4004, grated drop inlet on the south side of Raeford Rd., east of Peel Ave. looking east



4005, 2 grated drop inlets on the north side of Raeford Rd., east of Peel Ave. looking east



4003, debris strainer in each grated drop inlet along the north side of Raeford Rd.



2388, grated drop inlet on south side of Raeford Rd. looking north toward BLA3



2390, mitered end section at outfall BLA3, looking south toward Raeford Rd.



2392, outfall BLA3 looking north toward Bass Lake



2396, manhole at outfall BLA2, looking southwest toward Bass Lake



2397, outfall BLA 2, looking southwest to view of Bass Lake



2398, barred culvert headwall at outfall BLA 2, looking northeast toward Jersey Ave.



4006, curb inlets on Bass Lake Blvd. looking west toward Bass Lake outfall BLA4

wood.

BFA Environmental Consultants
Barnes, Ferland and Associates, Inc.
1230 Hillcrest Street, Orlando, FL, 32803
PH: (407) 896-8608 FAX: (407) 896-1822

Bass Lake
Field Verification Photos

Exhibit 2-5

APPENDIX E

Hydrologic Tables

APPENDIX E

Table 1-1	Published Runoff Coefficients (c) for Meteorological Zone 2 Based on Non-DCIA CN and Percent DCIA
Table 1-2	Summary of Curve Numbers Based on Land use and Soil Group
Table 1-3	Summary of Literature-Based Runoff Characterization for General Land use Categories in Florida

TABLE 1-1
Published Runoff Coefficients (c) for Meteorological Zone 2 Based on Non-DCIA CN and Percent DCIA

NDCIA CN	PERCENT DCIA																				
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100
30	0.002	0.043	0.083	0.123	0.164	0.204	0.244	0.285	0.325	0.366	0.406	0.446	0.487	0.527	0.567	0.608	0.648	0.688	0.729	0.769	0.809
35	0.004	0.044	0.085	0.125	0.165	0.205	0.246	0.286	0.326	0.366	0.407	0.447	0.487	0.528	0.568	0.608	0.648	0.689	0.729	0.769	0.809
40	0.007	0.047	0.087	0.127	0.167	0.207	0.248	0.288	0.328	0.368	0.408	0.448	0.488	0.528	0.569	0.609	0.649	0.689	0.729	0.769	0.809
45	0.01	0.05	0.09	0.13	0.17	0.21	0.25	0.29	0.33	0.37	0.41	0.45	0.49	0.53	0.57	0.61	0.65	0.69	0.729	0.769	0.809
50	0.015	0.055	0.095	0.134	0.174	0.214	0.254	0.293	0.333	0.373	0.412	0.452	0.492	0.531	0.571	0.611	0.651	0.69	0.73	0.77	0.809
55	0.022	0.061	0.101	0.14	0.179	0.219	0.258	0.298	0.337	0.376	0.416	0.455	0.494	0.534	0.573	0.613	0.652	0.691	0.731	0.77	0.809
60	0.03	0.069	0.108	0.147	0.186	0.225	0.264	0.303	0.342	0.381	0.42	0.459	0.498	0.537	0.576	0.615	0.654	0.693	0.731	0.77	0.809
65	0.042	0.08	0.119	0.157	0.195	0.234	0.272	0.311	0.349	0.387	0.426	0.464	0.502	0.541	0.579	0.618	0.656	0.694	0.733	0.771	0.809
70	0.057	0.095	0.133	0.17	0.208	0.245	0.283	0.321	0.358	0.396	0.433	0.471	0.509	0.546	0.584	0.621	0.659	0.697	0.734	0.772	0.809
75	0.079	0.116	0.152	0.189	0.225	0.262	0.298	0.335	0.371	0.408	0.444	0.481	0.517	0.554	0.59	0.627	0.663	0.7	0.736	0.773	0.809
80	0.111	0.146	0.181	0.216	0.251	0.285	0.32	0.355	0.39	0.425	0.46	0.495	0.53	0.565	0.6	0.635	0.67	0.705	0.74	0.774	0.809
85	0.16	0.192	0.225	0.257	0.29	0.322	0.355	0.387	0.42	0.452	0.485	0.517	0.55	0.582	0.614	0.647	0.679	0.712	0.744	0.777	0.809
90	0.242	0.27	0.299	0.327	0.355	0.384	0.412	0.44	0.469	0.497	0.526	0.554	0.582	0.611	0.639	0.667	0.696	0.724	0.753	0.781	0.809
95	0.404	0.424	0.444	0.464	0.485	0.505	0.525	0.546	0.566	0.586	0.606	0.627	0.647	0.667	0.688	0.708	0.728	0.749	0.769	0.789	0.809
98	0.595	0.605	0.616	0.627	0.638	0.648	0.659	0.67	0.68	0.691	0.702	0.713	0.723	0.734	0.745	0.756	0.766	0.777	0.788	0.799	0.809

Source: Stormwater Quality Applicant's Handbook, Design Requirements for storm water Treatment Systems in Florida, March 2010 Draft

TABLE 1-2
Summary of Curve Numbers Based on Land use and Soil Group

FLUCCS	Generalized Land Use Description	% DCIA	Hydrologic Soils Group					
			A	B	B/D	C	D	W
1100	Residential-Low Density	20	39	61	61	74	80	99.8
1200	Residential-Med Density	25	39	61	61	74	80	99.8
1300	Residential-High Density	50	39	61	61	74	80	99.8
1400	Commercial	85	39	61	61	74	80	99.8
1500	Industrial	72	39	61	61	74	80	99.8
1600	Extractive	0	39	61	61	74	80	99.8
1700	Institutional	16	39	61	61	74	80	99.8
1800	Recreational	10	39	61	80	74	80	99.8
1900	Open Land	0	39	61	80	74	80	99.8
2100	Cropland and Pastureland	0	39	61	80	74	80	99.8
2200	Tree Crops - Citrus	10	32	58	79	72	79	99.8
2300	Feeding Operations	10	32	58	79	72	79	99.8
2400	Nurseries and Vineyards	5	67	78	89	85	89	99.8
2500	Specialty Farms	5	67	78	89	85	89	99.8
2600	Other Open Lands - Rural	0	39	61	80	74	80	99.8
3100	Herbaceous Rangeland	0	39	61	80	74	80	99.8
3200	Shrub and Brush Rangeland	0	30	48	73	65	73	99.8
3300	Mixed Rangeland	0	30	48	73	65	73	99.8
4100	Upland Coniferous Forest	0	32	58	79	72	79	99.8
4200	Upland Hardwood Forests	0	32	58	79	72	79	99.8
4300	Mixed Hardwood Forests	0	32	58	79	72	79	99.8

TABLE 1-2
Continued
Summary of Curve Numbers Based on Land use and Soil Group

FLUCCS	Generalized Land Use Description	% DCIA	Hydrologic Soils Group					
			A	B	B/D	C	D	W
4400	Tree Plantations	0	32	58	79	72	79	99.8
5000	Water	100	99.8	99.8	99.8	99.8	99.8	99.8
5100	Streams and Waterways	100	99.8	99.8	99.8	99.8	99.8	99.8
5200	Lakes	100	99.8	99.8	99.8	99.8	99.8	99.8
5300	Reservoirs	100	99.8	99.8	99.8	99.8	99.8	99.8
6100	Wetland Hardwood Forests	100	99.8	99.8	99.8	99.8	99.8	99.8
6200	Wetland Coniferous Forests	100	99.8	99.8	99.8	99.8	99.8	99.8
6300	Wetland Forested Mixed	100	98	98	98	98	98	99.8
6400	Vegetated Non-Forested Wetlands	100	98	98	98	98	98	99.8
7400	Mining	0	39	61	80	74	80	99.8
8100	Transportation / Utilities	25	83	89	89	92	93	99.8
8200	Communications	25	83	89	89	92	93	99.8
8300	Utilities	25	83	89	89	92	93	99.8

TABLE 1-3
Summary of Literature-Based Runoff Characterization for General Land use
Categories in Florida

Land Use Category	Typical Runoff Concentration (mg/l)						
	TN	TP	BOD	TSS	Cu	Pb	Zn
Low-Density Residential ¹	1.5	0.18	4.7	23	0.008 ⁴	0.002 ⁴	0.031 ⁴
Single-Family	1.85	0.31	7.9	37.5	0.016	0.004	0.062
Multi-Family	1.91	0.48	11.3	77.8	0.009	0.006	0.086
Low-Intensity Commercial	0.93	0.16	7.7	57.5	0.018	0.005	0.094
High-Intensity Commercial	2.48	0.23	11.3	69.7	0.015	--	0.16
Light Industrial	1.14	0.23	7.6	60	0.003	0.002	0.057
Highway	1.37	0.17	5.2	37.3	0.032	0.011	0.126
Pasture	2.48	0.7	5.1	94.3	--	--	--
Citrus	2.31	0.16	2.55	15.5	0.003	0.001	0.012
Row Crops	2.47	0.51	--	19.8	0.022	0.004	0.03
General Agriculture ²	2.42	0.46	3.8	43.2	0.013	0.003	0.021
Undeveloped / Rangeland / Forest	1.15	0.055	1.4	8.4	--	--	--
Mining / Extractive	1.18	0.15	7.6 ³	60.0 ³	0.003 ³	0.002 ³	0.057 ³

TABLE 1-3
Continued
Summary of Literature-Based Runoff Characterization for General Land use
Categories in Florida

Land Use Category	Typical Runoff Concentration (mg/l)						
	TN	TP	BOD	TSS	Cu	Pb	Zn
Wetland	1.01	0.09	2.63	11.2	0.001	0.001	0.006
Open Water / Lake	1.6	0.067	1.6	3.1		0.025 ⁵	0.028

1. Average of single-family and undeveloped loading rates
2. Mean of pasture, citrus, and row crop land uses
3. Runoff concentrations assumed equal to industrial values for these parameters
4. Value assumed to be equal to 50% of single-family concentration
5. Runoff concentrations assumed equal to wetland values for these parameters

Notes: This table is a replica of the Table 4-17 in the Final Report of "Evaluation of Current Stormwater Design Criteria within the state of Florida" prepared for: Florida Department of Environmental Protection (June 2007). Prepared by Environmental Research & Design, Inc. Harvey H. Harper, Ph.D., P.E. & David M. Baker, P.E.

Total N and Total P EMC values are from the Table 3.4 in March 2010 Draft Department of Environmental Protection and Water Management Districts Environmental Resource Permit Stormwater Quality Applicant's Handbook Design Requirements for Stormwater Treatment Systems in Florida.

Wetland and Open Water/Lake EMC values are from Table 7 of the Final Report of "Evaluation of Alternative Stormwater Regulations for Southwest Florida". (Revised Sept 08, 2003) Submitted to Water Enhancement & Restoration Coalition, Inc. Prepared by Environmental Research & Design, Inc. Harvey H. Harper, Ph.D., P.E. & David M. Baker, P

APPENDIX F

Stormwater Quality Lab Report



2251 Lynx Lane, Suite 1
Orlando, Florida 32804
(407) 522-7100 Fax (407) 522-7043
Toll Free 1 (888) 420-Test

Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 09/08/20
Contact Name: Lance Lumbard	Date Received: 09/08/20
Project Name: OC Bass Lake Water Quality	Time Received: 12:45
Project Number: 600478x22.02.07	Date Reported : 09/18/20
Phone Number: (407) 522-7570	Date Emailed : 09/18/20
Fax Number: (407) 522-7576	SRL Work Order # 20-09008

SRL WO #	Clients #	Matrix	Analysis Requested
2009008-001	BLA-1	Liquid	TSS/Total Nitrogen/Ammonia Total Phosphorus

Sherri Payne
Vice President & Quality Assurance Officer
Southern Research Laboratories, Inc.

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-09008
Received Date : 09/08/20

Lance Lumbard
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLA-1**
SRL (Lab) ID# : 2009008-001
Date Collected : 09/08/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.010	I	mg/L	1	0.0098	0.020	EPA 350.1	09/10/20	09/11/20
Nitrate/Nitrite as N		0.65		mg/L	1	0.016	0.050	4500NO3 H-	09/10/20	09/10/20
Phosphorus	7723-14-0	0.54		mg/L	1	0.010	0.015	EPA 365.4	09/10/20	09/14/20
Total Kjeldahl Nitrogen		1.6		mg/L	1	0.037	0.050	EPA 351.2	09/10/20	09/14/20
Total Nitrogen	17778-88-0	2.3		mg/L	1	0.037	0.050	CALC	09/10/20	09/14/20
Total Suspended Solids		18		mg/L	1	2.5	2.5	M-2540D-201	09/15/20	09/16/20

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	09/10/20	09/11/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	09/10/20	09/10/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	09/10/20	09/14/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	09/10/20	09/14/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	09/10/20	09/14/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	09/15/20	09/16/20

Southern Research Laboratories, Inc.
an MBE Environmental Laboratory
2251 Lynx Lane, Suite 1
Orlando, Florida 32804 (407) 522-7100

NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-09008
Received Date : 09/08/20

Lance Lombard
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery LCS/MS/MSD/MS2	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Nitrate/Nitrite as N	99/114/102	84-116	84-116		8	0-10
Total Kjeldahl Nitrogen	108/101/103	90-110	90-110		2	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery LCS/MS/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Phosphorus	102/104/91	90-110	90-110	QM-11	12	0-10

	% Recovery LCS/MS/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Nitrogen, Ammonia (as N)	99/101/98	90-110	90-110		2	0-10

	% Recovery LCS	Acceptable Limits
Total Suspended Solids	99	80-120

	Result	Source Result	RPD	Notes	RPD Limit
Total Suspended Solids (DUP-1)	32	32	0		0-20

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2251 Lynx Lane, Suite 1
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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-09008
Received Date : 09/08/20

Lance Lumbar
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550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF = Matrix Effect Dilution Factor.**

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-11 Precision between duplicate matrix spikes of the same sample was outside acceptance limits.

2009008

Project Manager: Lance Lumbard		2251 Lynx Lane, Suite #1 Orlando, Florida 32804		Project Name: Bass Lake		Page of	
Company: Wood Environment & Infrastructure Solutions, Inc.		Southern research laboratories, Inc.		Project Location:			
Address: 550 Northlake Blvd., Suite 1000 Altamonte Springs Florida 32701		Main (407) 522-7100		Fax: (407) 522-7043			
Phone: 407-522-7570		Fax: (407) 522-7576		Project Number: 600478X22			
Sampled by [Print Name(s)] / Affiliation: Katie Balley / BFA		Preservatives (see codes)		REQUESTED DUE DATE:			
Sampler(s) Signature(s): [Signature]		Analyses Requested		Facility ID#:			
Sample Identification		Sampled		Petroleum Restoration Program			
Date: 9/18/20		Time: 1200		yes no			
1 B LA 1		C		2009008-001			
Total Number of Containers		Matrix: (see codes)		Date: 9/13/20		Time: 1230	
2		SW		9/18/20		1245	
Relinquished by		Date: 9/18/20		Time: 1245		Accepted by	
[Signature]		[Signature]		[Signature]		[Signature]	
Cooler No(s) / Temperature(s) (°C):		X300		25		Equipment ID No.:	
Additional Comments:							
Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water		W = Water (Blanks)		HW = Potential Haz Waste		O = Other (Specify)	
Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other (Specify)							



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Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 09/18/20
Contact Name: Lance Lumbard	Date Received: 09/18/20
Project Name: OC Bass Lake Water Quality	Time Received: 10:55
Project Number: 600478x22.02.07	Date Reported : 10/01/20
Phone Number: (407) 522-7570	Date Emailed : 10/01/20
Fax Number: (407) 522-7576	SRL Work Order # 20-09027

SRL WO #	Clients #	Matrix	Analysis Requested
2009027-001	BLA1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2009027-002	BLA3	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

Sherri Payne
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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-09027
Received Date : 09/18/20

Lance Lumbard
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLA1**
SRL (Lab) ID# : 2009027-001
Date Collected : 09/18/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.059		mg/L	1	0.0098	0.020	EPA 350.1	09/23/20	09/24/20
Nitrate/Nitrite as N		0.15		mg/L	1	0.016	0.050	4500NO3 H-	09/21/20	09/21/20
Orthophosphate as P	1426-54-42	0.12		mg/L	1	0.0040	0.010	EPA 365.1	09/18/20	09/18/20
Phosphorus	7723-14-0	0.26		mg/L	1	0.010	0.015	EPA 365.4	09/21/20	09/25/20
Total Kjeldahl Nitrogen		0.63		mg/L	1	0.037	0.050	EPA 351.2	09/21/20	09/23/20
Total Nitrogen	17778-88-0	0.78		mg/L	1	0.037	0.050	CALC	09/23/20	09/23/20
Total Suspended Solids		4.9		mg/L	1	2.5	2.5	M-2540D-201	09/23/20	09/24/20

Client ID # : **BLA3**
SRL (Lab) ID# : 2009027-002
Date Collected : 09/18/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.054		mg/L	1	0.0098	0.020	EPA 350.1	09/23/20	09/24/20
Nitrate/Nitrite as N		0.20		mg/L	1	0.016	0.050	4500NO3 H-	09/21/20	09/21/20
Orthophosphate as P	1426-54-42	0.16		mg/L	1	0.0040	0.010	EPA 365.1	09/18/20	09/18/20
Phosphorus	7723-14-0	0.19		mg/L	1	0.010	0.015	EPA 365.4	09/21/20	09/25/20
Total Kjeldahl Nitrogen		0.47		mg/L	1	0.037	0.050	EPA 351.2	09/21/20	09/23/20
Total Nitrogen	17778-88-0	0.67		mg/L	1	0.037	0.050	CALC	09/23/20	09/23/20
Total Suspended Solids		5.9		mg/L	1	2.5	2.5	M-2540D-201	09/23/20	09/24/20

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	09/23/20	09/24/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	09/21/20	09/21/20
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	09/18/20	09/18/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	09/21/20	09/25/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	09/21/20	09/23/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	09/23/20	09/23/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	09/23/20	09/24/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-09027
Received Date : 09/18/20

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Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Nitrate/Nitrite as N	LCS/MS/MSD 106/104/102	84-116	84-116		1	0-10
Total Kjeldahl Nitrogen	106/101/99	90-110	90-110		2	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Orthophosphate as P	LCS/MS/MSD 99/106/103	90-110	90-110		3	0-10

	% Recovery	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Phosphorus	LCS/MS/MSD 106/100/101	90-110	90-110		0.6	0-10

	% Recovery	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Nitrogen, Ammonia (as N)	LCS/MS/MS3/MSD 99/108/110/102	90-110	90-110		1	0-10

	% Recovery	Acceptable Limits
Total Suspended Solids	LCS 95	80-120

	Result	Source Result	RPD	Notes	RPD Limit
Total Suspended Solids (DUP-1)	3.0	4.0	1		0-20

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SRL Lab Ref # : 20-09027
Received Date : 09/18/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-12 Precision between duplicate samples was outside acceptance limits

LP-02 Filtered residue did not meet 2.5-200mg range

2009027

City)



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Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 09/28/20
Contact Name: Lance Lumbard	Date Received: 09/28/20
Project Name: OC Bass Lake Water Quality	Time Received: 11:50
Project Number: 600478x22.02.07	Date Reported : 10/12/20
Phone Number: (407) 522-7570	Date Emailed : 10/12/20
Fax Number: (407) 522-7576	SRL Work Order # 20-09046

SRL WO #	Clients #	Matrix	Analysis Requested
2009046-001	BLA1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2009046-002	BLA2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2009046-003	BLA3	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-09046
Received Date : 09/28/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLA1**
SRL (Lab) ID# : 2009046-001
Date Collected : 09/28/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	10/01/20	10/01/20
Nitrate/Nitrite as N		0.37		mg/L	2	0.032	0.10	4500NO3 H-	09/30/20	09/30/20
Orthophosphate as P	1426-54-42	0.26		mg/L	1	0.014	0.040	EPA 365.3	09/29/20	09/29/20
Phosphorus	7723-14-0	0.78		mg/L	1	0.010	0.015	EPA 365.4	09/29/20	10/02/20
Total Kjeldahl Nitrogen		0.70		mg/L	1	0.037	0.050	EPA 351.2	09/29/20	10/06/20
Total Nitrogen	17778-88-0	1.1		mg/L	2	0.037	0.10	CALC	09/29/20	10/06/20
Total Suspended Solids		34		mg/L	1	2.5	2.5	M-2540D-201	09/30/20	10/01/20

Client ID # : **BLA2**
SRL (Lab) ID# : 2009046-002
Date Collected : 09/28/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.023		mg/L	1	0.0098	0.020	EPA 350.1	10/01/20	10/01/20
Nitrate/Nitrite as N		10		mg/L	20	0.32	1.0	4500NO3 H-	09/30/20	09/30/20
Orthophosphate as P	1426-54-42	0.11		mg/L	1	0.014	0.040	EPA 365.3	09/29/20	09/29/20
Phosphorus	7723-14-0	0.30		mg/L	1	0.010	0.015	EPA 365.4	09/29/20	10/02/20
Total Kjeldahl Nitrogen		1.3		mg/L	1	0.037	0.050	EPA 351.2	09/29/20	10/06/20
Total Nitrogen	17778-88-0	11		mg/L	20	0.32	1.0	CALC	09/29/20	10/06/20
Total Suspended Solids		16		mg/L	1	2.5	2.5	M-2540D-201	09/30/20	10/01/20

Client ID # : **BLA3**
SRL (Lab) ID# : 2009046-003
Date Collected : 09/28/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	10/01/20	10/01/20
Nitrate/Nitrite as N		0.39		mg/L	1	0.016	0.050	4500NO3 H-	09/30/20	09/30/20
Orthophosphate as P	1426-54-42	0.19		mg/L	1	0.014	0.040	EPA 365.3	09/29/20	09/29/20
Phosphorus	7723-14-0	0.33		mg/L	1	0.010	0.015	EPA 365.4	09/29/20	10/02/20
Total Kjeldahl Nitrogen		0.62		mg/L	1	0.037	0.050	EPA 351.2	09/29/20	10/06/20
Total Nitrogen	17778-88-0	1.0		mg/L	1	0.037	0.050	CALC	09/29/20	10/06/20
Total Suspended Solids		4.7		mg/L	1	2.5	2.5	M-2540D-201	09/30/20	10/01/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-09046
Received Date : 09/28/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : **MB**
Date Collected : **NA**
Lab FDOH Certification # : **E83182**

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	10/01/20	10/01/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	09/30/20	09/30/20
Orthophosphate as P	1426-54-42	0.014	U	mg/L	1	0.014	0.040	EPA 365.3	09/29/20	09/29/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	09/29/20	10/02/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	09/29/20	10/02/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	09/29/20	10/06/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	09/29/20	10/06/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	09/30/20	10/01/20

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FDOH Cert # : E83484
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Received Date : 09/28/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	106/114/118	84-116	84-116	QM-07	2	0-10
Total Kjeldahl Nitrogen	104/99/100	90-110	90-110		1	0-10
Total Kjeldahl Nitrogen	101/95/96	90-110	90-110		1	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD/LCS Dup	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	95/96/97/94	90-110	90-110		1	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	108/102/103	90-110	90-110		1	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	100/82/82/77	90-110	90-110	QM-07	6	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	88	80-120

	Result	Source	RPD	Notes	RPD
		Result	Limit		
Total Suspended Solids (DUP-1)	200	190	2		0-20

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FDOH Cert # : E83484
SRL Lab Ref # : 20-09046
Received Date : 09/28/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

Chain of Custody

2009046

Project Manager: Lance Lumbard Company: Wood Environment & Infrastructure Solutions, Inc. Address: 550 Northlake Blvd., Suite 1000 Altamonte Springs Florida 32701 Phone: 407-522-7570 Fax: +1 (407) 522-7576		Southern Research Laboratories, Inc. 2251 Lynx Lane, Suite #1 Orlando, Florida 32804 Main (407) 522-7100 Fax: (407) 522-7043		Project Name: Bass Lake Project Location:		Page _____ of _____
Sampled by [Print Name(s)] / Affiliation: Katie Ballew Sampler(s) Signature(s): 			Project Number: 600478x22			
Sample Identification			Preservatives (see codes)			
Sampled Date: Time:			Analyses Requested			
Grab or Composite			Facility ID#:			
Matrix: (see codes)			Petroleum Restoration Program yes ___ no ___			
Total Number of Containers			REQUESTED DUE DATE:			
1 BLA1 9/28/20 1030 3 SW TSS Nitrate Nitrite Nitrogen Ammonia Orthophosphorus			2009046-001 -002 -003			
2 BLA2 9/28/20 1050 3 SW						
3 BLA3 9/28/20 1110 3 SW						
Relinquished by:			Date: Time:			
Shipment Method:			Accepted by: Date: Time:			
Out: / / Via:			9/28/20 1150 Helen Sumner 9-28-20 11:50			
Returned: / / Via:						
Additional Comments:						
Cooler No.(s) / Temperature(s) (°C): Client cooler 1.9 °C			Sampling Kit No.: 8678			
Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) HW = Potential Haz Waste O = Other (Specify):						
Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other (Specify)						



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we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 10/08/20
Contact Name: Lance Lumbard	Date Received: 10/08/20
Project Name: OC Bass Lake Water Quality	Time Received: 12:55
Project Number: 600478x22.02.07	Date Reported : 10/20/20
Phone Number: (407) 522-7570	Date Emailed : 10/20/20
Fax Number: (407) 522-7576	SRL Work Order # 20-10010

SRL WO #	Clients #	Matrix	Analysis Requested
2010010-001	BLA1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2010010-002	BLA2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2010010-003	BLA3	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

Affected Samples: BLA 3 [20-10010-03] (Limited Volumn Collected)

Nonconformance: During verification of sample preservation it was ascertained that the wrong preservation
protocol was used in the field.

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-10010
Received Date : 10/08/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLA1**
SRL (Lab) ID# : 2010010-001
Date Collected : 10/08/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	10/14/20	10/14/20
Nitrate/Nitrite as N		0.17		mg/L	1	0.016	0.050	4500NO3 H-	10/12/20	10/12/20
Orthophosphate as P	1426-54-42	0.16	D	mg/L	2	0.0080	0.020	EPA 365.1	10/09/20	10/09/20
Phosphorus	7723-14-0	0.28		mg/L	1	0.010	0.015	EPA 365.4	10/12/20	10/15/20
Total Kjeldahl Nitrogen		1.2		mg/L	1	0.037	0.050	EPA 351.2	10/14/20	10/19/20
Total Nitrogen	17778-88-0	1.3		mg/L	1	0.037	0.050	CALC	10/14/20	10/19/20
Total Suspended Solids		130		mg/L	1	2.5	2.5	M-2540D-201	10/14/20	10/15/20

Client ID # : **BLA2**
SRL (Lab) ID# : 2010010-002
Date Collected : 10/08/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	10/14/20	10/14/20
Nitrate/Nitrite as N		10	D	mg/L	50	0.80	2.5	4500NO3 H-	10/12/20	10/12/20
Orthophosphate as P	1426-54-42	0.035		mg/L	1	0.0040	0.010	EPA 365.1	10/09/20	10/09/20
Phosphorus	7723-14-0	0.13		mg/L	1	0.010	0.015	EPA 365.4	10/12/20	10/15/20
Total Kjeldahl Nitrogen		0.88		mg/L	1	0.037	0.050	EPA 351.2	10/14/20	10/19/20
Total Nitrogen	17778-88-0	11	D	mg/L	50	0.037	0.050	CALC	10/14/20	10/19/20
Total Suspended Solids		39		mg/L	1	2.5	2.5	M-2540D-201	10/14/20	10/15/20

Client ID # : **BLA3**
SRL (Lab) ID# : 2010010-003
Date Collected : 10/08/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	10/14/20	10/14/20
Nitrate/Nitrite as N		2.3	D	mg/L	10	0.16	0.50	4500NO3 H-	10/12/20	10/12/20
Orthophosphate as P	1426-54-42	0.17		mg/L	1	0.0040	0.010	EPA 365.1	10/09/20	10/09/20
Phosphorus	7723-14-0	0.36		mg/L	1	0.010	0.015	EPA 365.4	10/12/20	10/15/20
Total Kjeldahl Nitrogen		4.4		mg/L	1	0.037	0.050	EPA 351.2	10/14/20	10/19/20
Total Nitrogen	17778-88-0	6.6	D	mg/L	10	0.16	0.50	CALC	10/14/20	10/19/20
Total Suspended Solids		26		mg/L	1	2.5	2.5	M-2540D-201	10/14/20	10/15/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 20-10010
Received Date : 10/08/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : **MB**
Date Collected : **NA**
Lab FDOH Certification # : **E83182**

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	10/14/20	10/14/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	10/12/20	10/12/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	10/12/20	10/12/20
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	10/09/20	10/09/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	10/12/20	10/15/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	10/14/20	10/19/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	10/14/20	10/19/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	10/14/20	10/15/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 20-10010
Received Date : 10/08/20

Lance Lumbar
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	103/103/103	84-116	84-116		0	0-10
Nitrate/Nitrite as N	106/NR/190	84-116	84-116	QM-07	12	0-10
				QM-11		
Total Kjeldahl Nitrogen	105/98/NR/103	90-110	90-110		5	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS2/MSD2	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	92/98/78	90-110	90-110	QM-07	8	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	105/103/101	90-110	90-110		1	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	101/102/101/105	90-110	90-110		3	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	93	80-120

	Result	Source	RPD	Notes	RPD
		Result	Limit		
Total Suspended Solids (DUP-1)	79	82	4		0-20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time

Q01 Analysis performed outside of method-specified holding time

Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF = Matrix Effect Dilution Factor.**

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

QM-11 Precision between duplicate matrix spikes of the same sample was outside acceptance limits

Chain of Custody

2010010

Project Manager: Lance Lumbard		2251 Lynx Lane, Suite #1 Orlando, Florida 32804		Page 1 of 1	
Company: Wood Environment & Infrastructure Solutions, Inc.		Southern Research Laboratories, Inc.		Project Name: Bass Lake Stormwater	
Address: 550 Northlake Blvd., Suite 1000 Altamonte Springs Florida 32701		Main (407) 522-7100 Fax: (407) 522-7043		Project Location:	
Phone: 407-522-7570		Fax: +1 (407) 522-7576		Project Number: 600478x22.02	
Sampled by [Print Name(s)] / Affiliation: Patrick Barnes Jr.		Preservatives (see codes)		REQUESTED DUE DATE:	
Sampler(s) Signature(s): 		Analyses Requested		Facility ID#:	
Sample Identification		Total Number of Containers		Petroleum Restoration Program yes no	
Sampled Date: Time:		Matrix: (see codes)		2010010-001	
1 BLA 1 10/8/20 1112		C SW		-002	
2 BLA 2 10/8/20 1135		C SW		-003	
3 BLA 3 10/8/20 1203		C SW			
Shipment Method:		Relinquished by		Accepted by:	
Out: / /		Date: 10/8/20		Date: 10/8/20	
Via:		Time: 1255		Time: 1255	
Returned: / /		Date: 10/8/20		Date: 10/8/20	
Via:		Time: 1255		Time: 1255	
Additional Comments: limited volume		Cooler No. (s) / Temperature(s) (°C): 3.9		Equipment ID No.:	
Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water W = Water (Blanks) HW = Potential Haz Waste O = Other (Specify)		Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other (Specify)			



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we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 11/15-16/20
Contact Name: Lance Lumbard	Date Received: 11/16/20
Project Name: OC Bass Lake Water Quality	Time Received: 10:53
Project Number: 600478x22.02.07	Date Reported : 11/30/20
Phone Number: (407) 522-7570	Date Emailed : 11/30/20
Fax Number: (407) 522-7576	SRL Work Order # 20-11029

SRL WO #	Clients #	Matrix	Analysis Requested
2011029-001	BLA1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2011029-002	BLA2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2011029-003	BLA3	Liquid	Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 20-11029
Received Date : 11/16/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLA1**
SRL (Lab) ID# : 2011029-001
Date Collected : 11/15/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	11/17/20	11/18/20
Nitrate/Nitrite as N		0.018	I	mg/L	1	0.016	0.050	4500NO3 H-	11/19/20	11/20/20
Orthophosphate as P	1426-54-42	0.091		mg/L	2	0.0080	0.020	EPA 365.1	11/16/20	11/16/20
Phosphorus	7723-14-0	0.39		mg/L	1	0.010	0.015	EPA 365.4	11/18/20	11/23/20
Total Kjeldahl Nitrogen		1.4		mg/L	1	0.037	0.050	EPA 351.2	11/18/20	11/23/20
Total Nitrogen	17778-88-0	1.4		mg/L	1	0.037	0.050	CALC	11/18/20	11/23/20
Total Suspended Solids		14		mg/L	1	2.5	2.5	M-2540D-201	11/17/20	11/18/20

Client ID # : **BLA2**
SRL (Lab) ID# : 2011029-002
Date Collected : 11/16/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	11/17/20	11/18/20
Nitrate/Nitrite as N		9.5		mg/L	20	0.32	1.0	4500NO3 H-	11/19/20	11/20/20
Orthophosphate as P	1426-54-42	0.023		mg/L	1	0.0040	0.010	EPA 365.1	11/16/20	11/16/20
Phosphorus	7723-14-0	0.14		mg/L	1	0.010	0.015	EPA 365.4	11/18/20	11/23/20
Total Kjeldahl Nitrogen		1.2		mg/L	1	0.037	0.050	EPA 351.2	11/18/20	11/23/20
Total Nitrogen	17778-88-0	11		mg/L	20	0.32	1.0	CALC	11/18/20	11/23/20
Total Suspended Solids		21		mg/L	1	2.5	2.5	M-2540D-201	11/17/20	11/18/20

Client ID # : **BLA3**
SRL (Lab) ID# : 2011029-003
Date Collected : 11/15/20
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	11/17/20	11/18/20
Nitrate/Nitrite as N		2.8		mg/L	20	0.32	1.0	4500NO3 H-	11/19/20	11/20/20
Orthophosphate as P	1426-54-42	0.20		mg/L	2	0.0080	0.020	EPA 365.1	11/16/20	11/16/20
Phosphorus	7723-14-0	0.57		mg/L	1	0.010	0.015	EPA 365.4	11/18/20	11/23/20
Total Kjeldahl Nitrogen		1.3		mg/L	1	0.037	0.050	EPA 351.2	11/18/20	11/23/20
Total Nitrogen	17778-88-0	4.1		mg/L	20	0.32	1.0	CALC	11/18/20	11/23/20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref# : 20-11029
Received Date : 11/16/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	11/17/20	11/18/20
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	11/19/20	11/20/20
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	11/16/20	11/16/20
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	11/18/20	11/23/20
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	11/18/20	11/23/20
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	11/18/20	11/23/20
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	11/17/20	11/18/20

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FDOH Cert # : E83484
SRL Lab Ref # : 20-11029
Received Date : 11/16/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS2/MS3/MSD3	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	111/116/117	84-116	84-116	QM-07	0.6	0-10
Total Kjeldahl Nitrogen	110/107/28/8	90-110	90-110	QM-07	2	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS2/MSD2	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	97/98/96	90-110	90-110		1	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	100/108/107	90-110	90-110		1	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS4/MS5/MSD5	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	101/101/100/100	90-110	90-110		0	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	94	80-120

	Result	Source	RPD	Notes	RPD
		Result	Limit		
Total Suspended Solids (DUP-1)	20	12	50	QM-12 LP-02	0-20

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Received Date : 11/16/20

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Project Number/Project Name
600478x22.02.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time

Q01 Analysis performed outside of method-specified holding time

Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-12 Precision between duplicate samples was outside acceptance limits

LP-02 Filtered residue did not meet 2.5-200mg range

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

Chain of Custody

2011029

Project Manager: Lance Lumbard Company: Wood Environment & Infrastructure Solutions, Inc. Address: 550 Northlake Blvd., Suite 1000 Altamonte Springs, Florida 32701 Phone: 407-522-7570 Fax: +1 (407) 522-7576		2251 Lynx Lane, Suite #1 Orlando, Florida 32804  Southern Research Laboratories, Inc. Main (407) 522-7100 Fax: (407) 522-7043		Project Name: Bass Lake DC-Hickoryville Project Project Location: 600478XZZ	Page 1 of 1	
Project Number: 600478XZZ		REQUESTED DUE DATE:				
Preservatives (see codes) 1 1 S		Analyses Requested TSS Orthophosphates Nitrogen, Ammonia Nitrate				
Facility ID#:		Petroleum Restoration Program yes no				
Sample Identification 1 BLA1 2 BLA2 3 BLA3		Sampled Date: 11/15/20 11/16/20 11/15/20	Time: 2240 2400 2245	Grab or Composite C C C	Matrix: (see codes) SW SW SW	Total Number of Containers 3 3 2
Sampler(s) Signature(s): 		Relinquished by SPRINKIT 				
Shipment Method: Out: / / Returned: / / Additional Comments:		Date: 11/16/20	Time: 1053	Accepted by: Helen Turner	Date: 11-16-20 Time: 10:53	
Cooler No.(s) / Temperature(s) (°C): Ambient cooler 2.8		Sampling Kit No.: 8676				
Matrix Codes: A = Air GW = Groundwater SE = Sediment SO = Soil SW = Surface Water HW = Potential Haz Waste O = Other(Specify:) Preservative Codes: H = Hydrochloric Acid & Ice I = Ice Only N = Nitric Acid & Ice S = Sulfuric Acid & Ice X = Sodium Hydroxide & Ice O = Other(Specify)		Equipment ID No.:				



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in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 01/27/21
Contact Name: Lance Lumbard	Date Received: 01/28/21
Project Name: OC Bass Lake Water Quality	Time Received: 12:00
Project Number: 600478x22.01.07	Date Reported : 02/11/21
Phone Number: (407) 522-7570	Date Emailed : 02/11/21
Fax Number: (407) 522-7576	SRL Work Order # 21-01034

SRL WO #	Clients #	Matrix	Analysis Requested
2101034-001	BLSA1	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2101034-002	BLSA2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-01034
Received Date : 01/28/21

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Project Number/Project Name
600478x22.01.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLSA1**
SRL (Lab) ID# : 2101034-001
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Nitrate/Nitrite as N		1.3		mg/L	5	0.080	0.25	4500NO3 H-	02/01/21	02/02/21
Orthophosphate as P	1426-54-42	0.45		mg/L	5	0.020	0.050	EPA 365.1	01/29/21	01/29/21
Phosphorus	7723-14-0	0.75		mg/L	1	0.010	0.015	EPA 365.4	02/03/21	02/05/21
Total Kjeldahl Nitrogen		2.0		mg/L	1	0.037	0.050	EPA 351.2	02/02/21	02/05/21
Total Nitrogen	17778-88-0	3.3		mg/L	5	0.080	0.25	CALC	02/02/21	02/05/21
Total Suspended Solids		24		mg/L	1	2.5	2.5	M-2540D-201	02/01/21	02/02/21

Client ID # : **BLSA2**
SRL (Lab) ID# : 2101034-002
Date Collected : 01/27/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.011	J	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Nitrate/Nitrite as N		7.4		mg/L	50	0.80	2.5	4500NO3 H-	02/01/21	02/02/21
Orthophosphate as P	1426-54-42	0.065		mg/L	1	0.0040	0.010	EPA 365.1	01/29/21	01/29/21
Phosphorus	7723-14-0	0.14		mg/L	1	0.010	0.015	EPA 365.4	02/03/21	02/05/21
Total Kjeldahl Nitrogen		0.81		mg/L	1	0.037	0.050	EPA 351.2	02/02/21	02/05/21
Total Nitrogen	17778-88-0	8.3		mg/L	50	0.80	2.5	CALC	02/02/21	02/05/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	02/01/21	02/02/21

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution Factor	MDL	PQL	Method	Date Prepared	Date Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/03/21	02/04/21
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	02/01/21	02/02/21
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	01/29/21	01/29/21
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	02/03/21	02/05/21
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	02/02/21	02/05/21
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	02/02/21	02/05/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	02/01/21	02/02/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-01034
Received Date : 01/28/21

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Project Number/Project Name
600478x22.01.07
OC Bass Lake Water Quality
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MS3/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	100/101/99	84-116	84-116		2	0-10
Total Kjeldahl Nitrogen	102/102/80/76	90-110	90-110	QM-07	1	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	96/84/89	90-110	90-110	QM-07	0.9	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	104/99/96	90-110	90-110		2	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS3/MS5/MSD3	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	100/84/80/127	90-110	90-110	QM-07	4	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	98	80-120

	Result	Source	RPD	Notes	RPD
		Result	RPD		Limit
Total Suspended Solids (DUP-1)	22	18	20	LP-02	0-20

Southern Research Laboratories, Inc.
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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-01034
Received Date : 01/28/21

Lance Lumbar
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.07
OC Bass Lake Water Quality
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time
Q01 Analysis performed outside of method-specified holding time
Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

LP-02 Filtered residue did not meet 2.5-200mg range

Chain of Custody

2101034

Project Manager: Lance Lumbard		2251 Lynx Lane, Suite #1 Orlando, Florida 32804		Project Name: Bass Lake Stormwater collection	
Company: Wood				PO C012609562	
Address: 550 Northlake Blvd, Suite 1000				Project Location: Bass Lake Autosampler locations	
City, State, Zip: Altamonte Springs FL 32701		(407) 522-7100			
Phone: 407-522-7570		Fax: 407-522-7576		Toll Free 1 (888) 420-TEST	
Sampled by [Print Name(s)] / Affiliation: Katie Ballew / BFA					
Sampler(s) Signature(s): 					

Sample Identification	Sampled		Grab or Composite	Matrix: (see codes)	Total Number of Containers	Analyses Requested										Project Number: 600478X22.01.07	REQUESTED DUE DATE:
	Date	Time				1	2	3	4	5	6	7	8	9	10		
1 ELISA1	1/27/21	20:48	C	SW	3												
2 ELISA2	1/27/21	22:01	C	SW	3												
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

Shipment Method:		Relinquished by: 		Date: 1/28/21		Time: 1200		Accepted by: Helen Turner		Date: 1-28-21		Time: 12:00	
Out: / /	Via:												
Returned: / /	Via:												
Additional Comments:													

Cooler No(s) / Temperature(s) (°C):		Sampling Kit No.: 8676		Equipment ID No.:	
(139) 1.5					

Matrix Codes: A = Air	GW = Groundwater	SE = Surface Water	SW = Soil	W = Water (Blanks)	HW = Potential Haz Waste	O = Other (Specify:)
Preservative Codes: H = Hydrochloric Acid & Ice	I = Ice Only	N = Nitric Acid & Ice	S = Sulfuric Acid & Ice	X = Sodium Hydroxide & Ice	O = Other (Specify)	



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Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 02/12/21
Contact Name: Lance Lumbard	Date Received: 02/12/21
Project Name: OC Bass Lake Stormwater Collection	Time Received: 11:05
Project Number: 600478x22.01.07	Date Reported : 02/24/21
Phone Number: (407) 522-7570	Date Emailed : 02/24/21
Fax Number: (407) 522-7576	SRL Work Order # 21-02022

SRL WO #	Clients #	Matrix	Analysis Requested
2102022-001	BLA2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

Sherri Payne
Vice President & Quality Assurance Officer
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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02022
Received Date : 02/12/21

Lance Lumbard
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.07
OC Bass Lake Stormwater Collection
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLA2**
SRL (Lab) ID# : 2102022-001
Date Collected : 02/12/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/16/21	02/17/21
Nitrate/Nitrite as N		8.6	D	mg/L	50	0.80	2.5	4500NO3 H-	02/12/21	02/15/21
Orthophosphate as P	1426-54-42	0.032		mg/L	1	0.0040	0.010	EPA 365.1	02/12/21	02/12/21
Phosphorus	7723-14-0	4.2	D	mg/L	10	0.10	0.15	EPA 365.4	02/16/21	02/18/21
Total Kjeldahl Nitrogen		0.78		mg/L	1	0.037	0.050	EPA 351.2	02/16/21	02/18/21
Total Nitrogen	17778-88-0	9.3	D	mg/L	50	0.80	2.5	CALC	02/16/21	02/18/21
Total Suspended Solids		16		mg/L	1	2.5	2.5	M-2540D-201	02/19/21	02/22/21

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/16/21	02/17/21
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	02/12/21	02/15/21
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	02/12/21	02/12/21
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	02/16/21	02/18/21
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	02/16/21	02/18/21
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	02/16/21	02/18/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	02/19/21	02/22/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02022
Received Date : 02/12/21

Lance Lumbar
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.07
OC Bass Lake Stormwater Collecti
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MS2/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrate/Nitrite as N	100/117/120	84-116	84-116	QM-07	2	0-10
Total Kjeldahl Nitrogen	104/106/101/104	90-110	90-110		2	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Orthophosphate as P	96/98/95	90-110	90-110		3	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS/MSD	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Phosphorus	101/164/132	90-110	90-110	QM-07	2	0-10

	% Recovery	LCS	MS/MSD		%RPD	Acceptable
	LCS/MS3/MS4/MSD3	Acceptable	Acceptable	Notes	MS/MSD	Limits
		Limits	Limits			
Nitrogen, Ammonia (as N)	98/93/90/97	90-110	90-110		1	0-10

	% Recovery	Acceptable
	LCS	Limits
Total Suspended Solids	92	80-120

	Result	Source	RPD	Notes	RPD
		Result	RPD		Limit
Total Suspended Solids (DUP-1)	11	11	0	LP-02	0-20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02022
Received Date : 02/12/21

Lance Lumbar
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550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.07
OC Bass Lake Stormwater Collecti
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

When quality control results are outside established control limits reanalysis, including re-extraction (if applicable), is preferred. If re-analysis is not viable or desirable, then results may be qualified. Sample results associated with quality control data that exceed acceptance criteria will be qualified with an appropriate comment.

D = Data reported from a dilution and or multiple dilutions.

I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time

Q01 Analysis performed outside of method-specified holding time

Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF = Matrix Effect Dilution Factor.**

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

LP-02 Filtered residue did not meet 2.5-200mg range

2102022

Page 1 of 1

Page 1 of 1



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Toll Free 1 (888) 420-Test

Thank you **Lance Lumbard** for the opportunity to be of service to you and your company,
we Sincerely Appreciate Your Business. SRL certifies these **Laboratory Results** were produced
in accordance with NELAC Standards. Hold times and preservation requirements were met for
all analytes unless specifically noted in the report. Results relate only to the samples as received.

Client Name: Wood Environment & Infrastructure Solutions, Inc.	Date(s) Collected: 02/13/21
Contact Name: Lance Lumbard	Date Received: 02/15/21
Project Name: OC Bass Lake	Time Received: 12:45
Project Number: 600478x22.01.07	Date Reported : 02/25/21
Phone Number: (407) 522-7570	Date Emailed : 02/25/21
Fax Number: (407) 522-7576	SRL Work Order # 21-02025

SRL WO #	Clients #	Matrix	Analysis Requested
2102025-001	BLA2	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia
2102025-002	BLA3	Liquid	TSS/Orthophosphate/Total Nitrogen/ Total Phosphorus/Ammonia

Sherri Payne
Vice President & Quality Assurance Officer
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2251 Lynx Lane, Suite 1
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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02025
Received Date : 02/15/21

Lance Lumbard
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.07
OC Bass Lake
Bass Lake-Florida

Classical Chemistry Parameters

Client ID # : **BLA2**
SRL (Lab) ID# : 2102025-001
Date Collected : 02/13/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	0.018	I	mg/L	1	0.0098	0.020	EPA 350.1	02/16/21	02/17/21
Nitrate/Nitrite as N		6.4		mg/L	10	0.16	0.50	4500NO3 H-	02/22/21	02/23/21
Orthophosphate as P	1426-54-42	0.059		mg/L	1	0.0040	0.010	EPA 365.1	02/16/21	02/17/21
Phosphorus	7723-14-0	0.086		mg/L	1	0.010	0.015	EPA 365.4	02/16/21	02/22/21
Total Kjeldahl Nitrogen		0.60		mg/L	1	0.037	0.050	EPA 351.2	02/17/21	02/22/21
Total Nitrogen	17778-88-0	7.0		mg/L	10	0.16	0.50	CALC	02/22/21	02/23/21
Total Suspended Solids		2.6		mg/L	1	2.5	2.5	M-2540D-201	02/19/21	02/22/21

Client ID # : **BLA3**
SRL (Lab) ID# : 2102025-002
Date Collected : 02/13/21
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	0.039		mg/L	1	0.0098	0.020	EPA 350.1	02/16/21	02/17/21
Nitrate/Nitrite as N		0.39		mg/L	1	0.016	0.050	4500NO3 H-	02/22/21	02/23/21
Orthophosphate as P	1426-54-42	0.14		mg/L	1	0.0040	0.010	EPA 365.1	02/16/21	02/17/21
Phosphorus	7723-14-0	0.25		mg/L	1	0.010	0.015	EPA 365.4	02/16/21	02/22/21
Total Kjeldahl Nitrogen		0.90		mg/L	1	0.037	0.050	EPA 351.2	02/17/21	02/22/21
Total Nitrogen	17778-88-0	1.3		mg/L	1	0.037	0.050	CALC	02/22/21	02/23/21
Total Suspended Solids		17		mg/L	1	2.5	2.5	M-2540D-201	02/19/21	02/22/21

Client ID # : **Blanks**
SRL (Lab) ID# : MB
Date Collected : NA
Lab FDOH Certification # : E83182

Analyte	CAS Number	Results	Flag	Units	Dilution		PQL	Method	Date	Date
					Factor	MDL			Prepared	Analyzed
Ammonia as N	7664-41-7	0.0098	U	mg/L	1	0.0098	0.020	EPA 350.1	02/16/21	02/17/21
Nitrate/Nitrite as N		0.016	U	mg/L	1	0.016	0.050	4500NO3 H-	02/22/21	02/23/21
Orthophosphate as P	1426-54-42	0.0040	U	mg/L	1	0.0040	0.010	EPA 365.1	02/16/21	02/17/21
Phosphorus	7723-14-0	0.010	U	mg/L	1	0.010	0.015	EPA 365.4	02/16/21	02/22/21
Total Kjeldahl Nitrogen		0.037	U	mg/L	1	0.037	0.050	EPA 351.2	02/17/21	02/22/21
Total Nitrogen	17778-88-0	0.037	U	mg/L	1	0.037	0.050	CALC	02/22/21	02/23/21
Total Suspended Solids		2.5	U	mg/L	1	2.5	2.5	M-2540D-201	02/19/21	02/22/21

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02025
Received Date : 02/15/21

Lance Lumbar
Wood Env. & Infrastructure Solutions, Inc.
550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.07
OC Bass Lake
Bass Lake-Florida

Classical Chemistry Parameters

QAQC

	% Recovery LCS/MS/MS3/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Nitrate/Nitrite as N	101/98/101	84-116	84-116		1	0-10
Total Kjeldahl Nitrogen	102/102/100/101	90-110	90-110		0.9	0-10

Total Nitrogen (Calculated as: (Nitrogen, Total Kjeldahl) + (Nitrogen, Nitrate + Nitrite)

	% Recovery LCS/MS/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Orthophosphate as P	99/86/86	90-110	90-110	Q-02 QM-07	0	0-10

	% Recovery LCS/MS/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Phosphorus	104/97/102	90-110	90-110		5	0-10

	% Recovery LCS/MS/MS3/MSD	LCS Acceptable Limits	MS/MSD Acceptable Limits	Notes	%RPD MS/MSD	Acceptable Limits
Nitrogen, Ammonia (as N)	98/107/60/102	90-110	90-110	QM-07	4	0-10

	% Recovery LCS	Acceptable Limits
Total Suspended Solids	92	80-120

	Result	Source Result	RPD	Notes	RPD Limit
Total Suspended Solids (DUP-1)	11	11	0	LP-02	0-20

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NELAP Certified
FDOH Cert # : E83484
SRL Lab Ref # : 21-02025
Received Date : 02/15/21

Lance Lumbar
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550 Northlake Blvd., Suite 1000
Altamonte Springs, FL. 32701 (407) 522-7570

Project Number/Project Name
600478x22.01.07
OC Bass Lake
Bass Lake-Florida

DATA QUALIFIER CODES

Reporting Exceptions and Qualified Data

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I = Estimated Value, The reported value is between the Laboratory Method Detection Limit (**MDL**) and the Laboratory Practical Quantitation Limit (**PQL**)

J = Estimated Value

L = Off-Scale high; exceeds the linear range or highest calibration standard.

O = Sampled, but analysis lost or not performed

Q = Sample held beyond normal holding time

Q01 Analysis performed outside of method-specified holding time

Q02 Sample received outside of method-specified holding time

U = indicates the compound was analyzed for, but not detected. The numerical value preceding the "U" is the limit of detection for that compound based upon the dilution. **MEDF** = **M**atrix **E**ffected **D**ilution **F**actor.

V = Analyte was detected in both the sample and associated Laboratory Method Blank; Laboratory Contamination

Y = The analysis was from an unpreserved or improperly preserved sample. The data may not be accurate

Unless otherwise noted, ug/Kg and mg/Kg denote dry weight.

(SOILS) Actual Reporting Limit will depend on moisture content of sample and the amount of sample received.

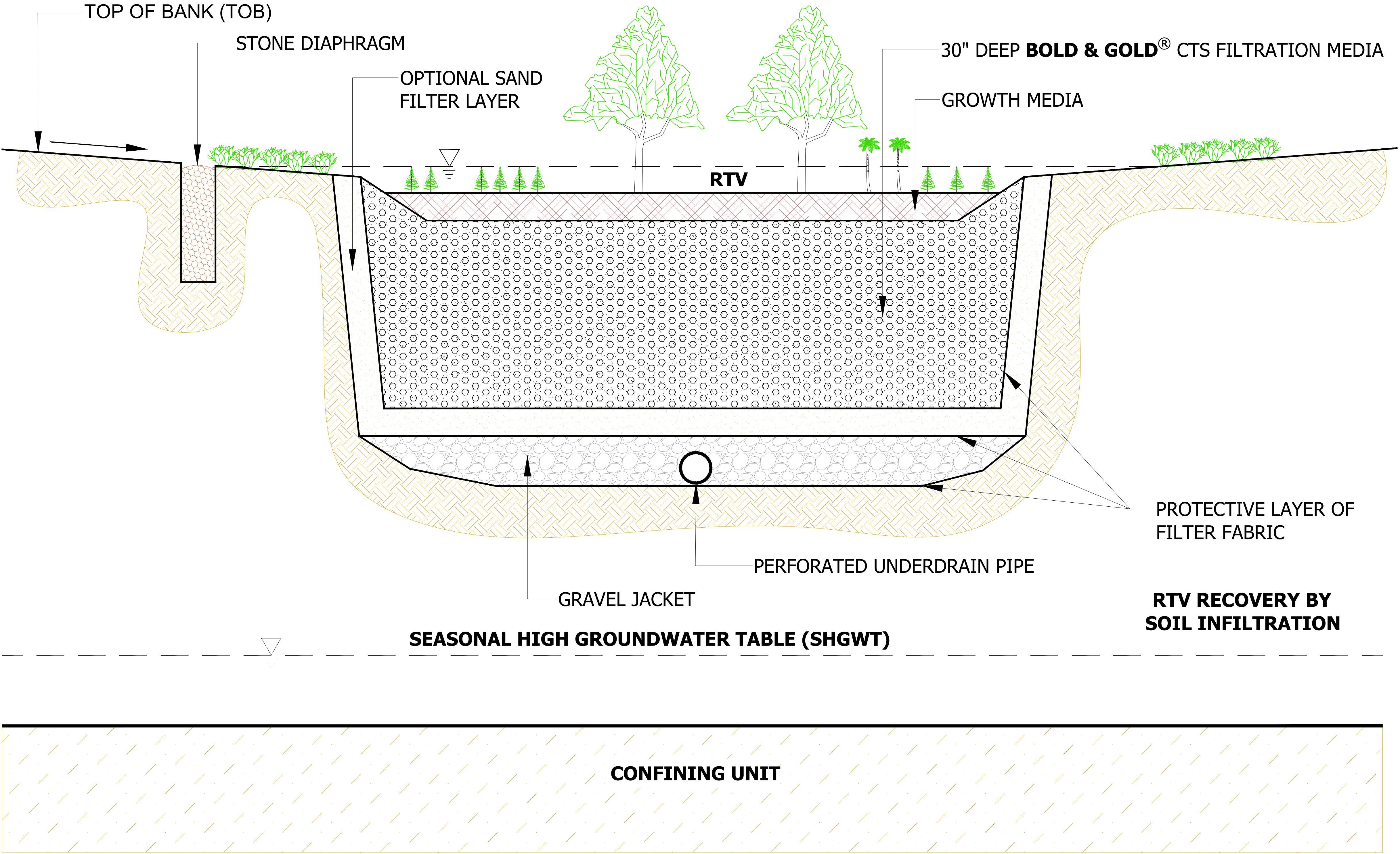
QM-07 The spike recovery was outside acceptance limits for the MS and/or MSD. The batch was accepted based on acceptable LCS recovery.

LP-02 Filtered residue did not meet 2.5-200mg range

Q-02 Sample received outside of method - specified holding time.

APPENDIX G

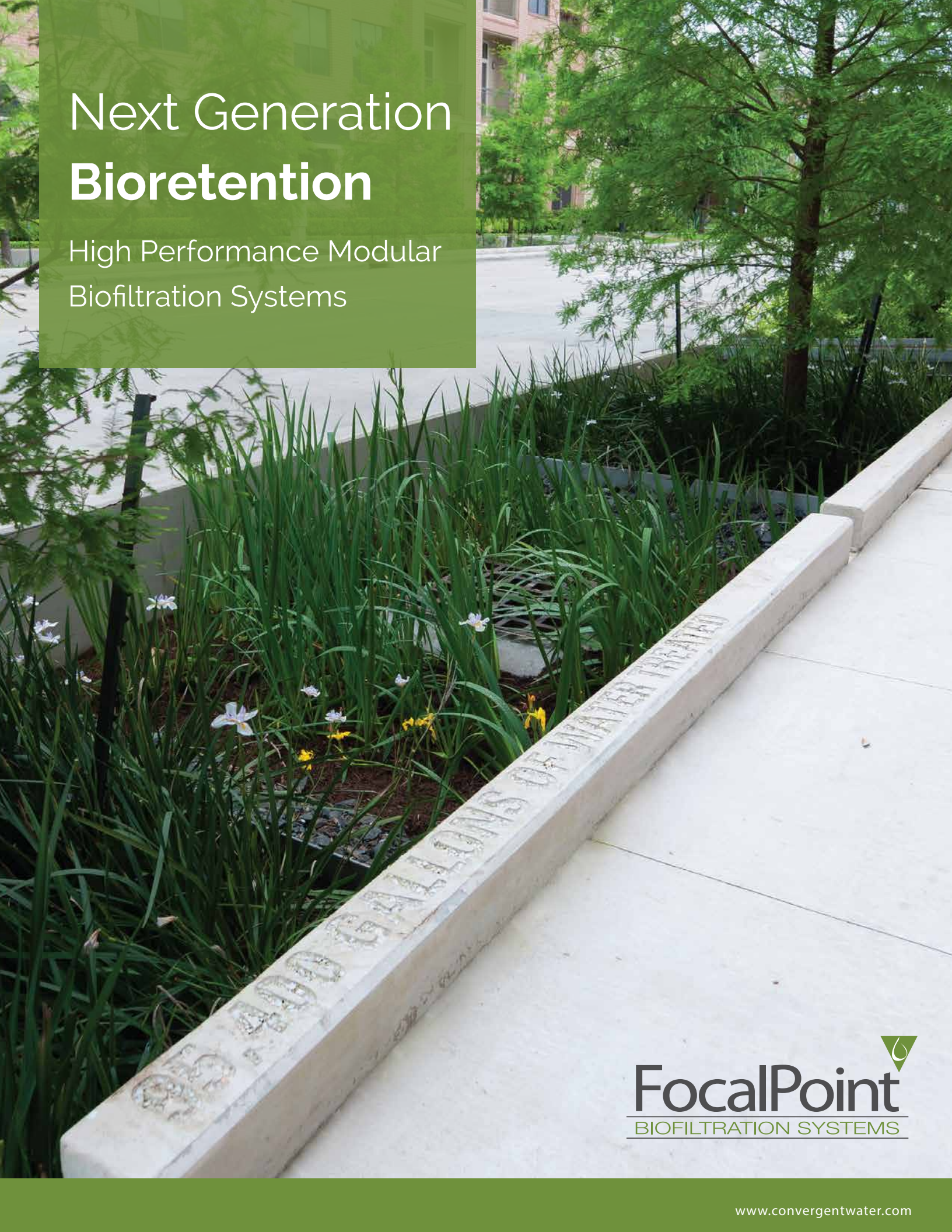
Examples of Biofiltration Systems



TITLE: Section Details for Bioretention Basin Using 30-inch Deep B&G® Filter Media		DRAWN: IGA		CHECKED: IGA	
		DATE: 09/10/2019	PROJECT #: ECSI--yy####		
DESCRIPTIONS	CHK				
	DRW				
	REV				
PROJECT NAME: XYZ					
PROJECT LOCATION: Street Address City, State, Zip Code					
BOLD & GOLD ® Bold & Gold® Filtration Media (Biosorption Activated Media - BAM)					
 Environmental Conservation Solutions, LLC. 2500 Westgate Drive Apopka, FL 32703					
Scale: NTS					
SHEET 00					

Next Generation **Bioretention**

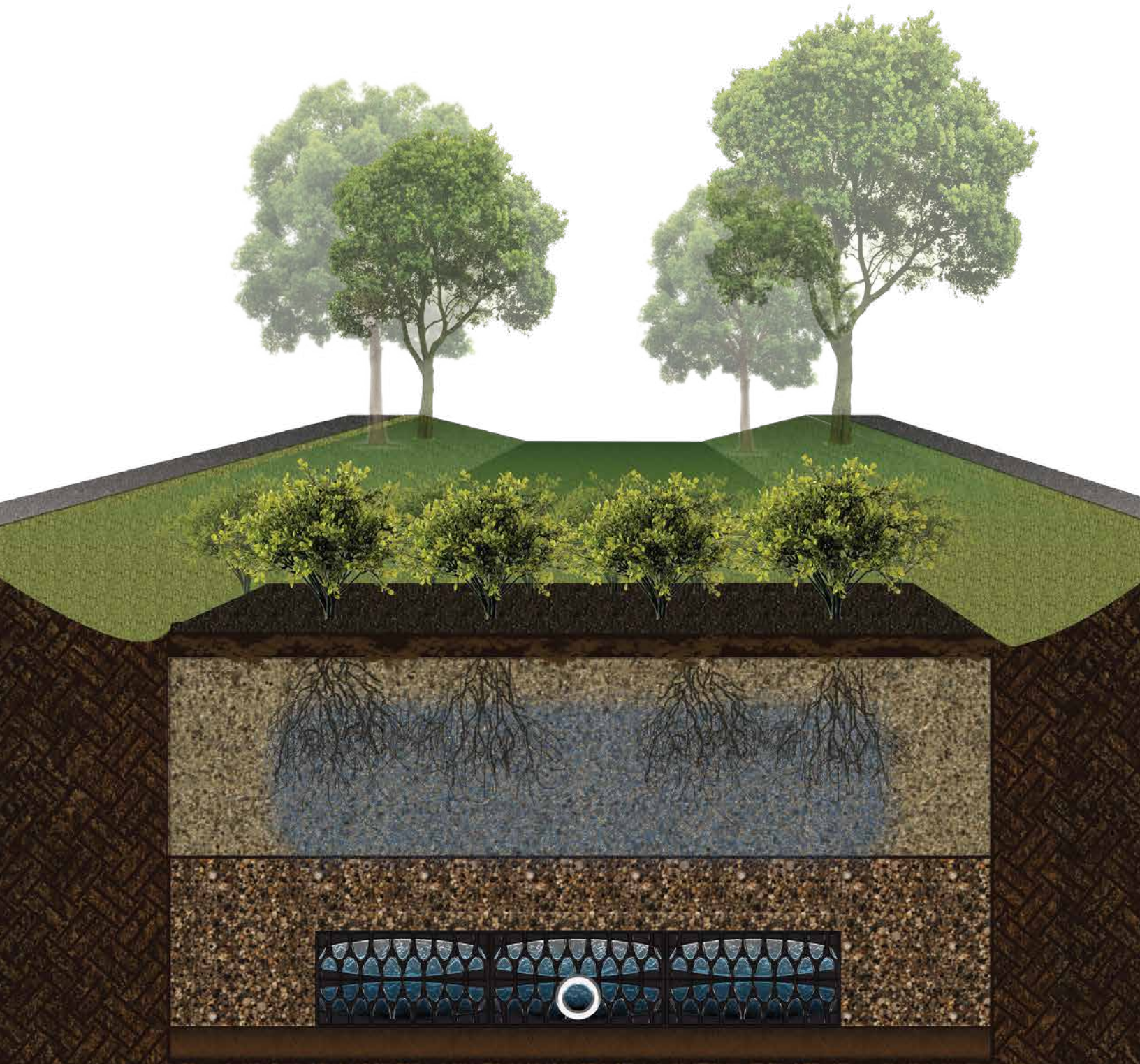
High Performance Modular
Biofiltration Systems



FocalPoint
BIOFILTRATION SYSTEMS



FocalPoint High Performance Modular Biofiltration Systems (HPMBS) is a scalable biofiltration system which combines the efficiency of high flow rate engineered soils with the durability and modularity of a highly pervious expandable underdrain/storage/infiltration system. The modular FocalPoint HPMBS is a complete, integrated system with a demanding specification that insures functionality, performance and maintainability. With rigorous quality assurance standards and post-construction in-situ performance verification, FocalPoint HPMBS provides guaranteed performance.





Uniquely Specified, Site Built

System Components

High Flow Media

At the heart of every FocalPoint HPMBs is its high performance engineered soil blend. Developed by LID pioneer, Larry Coffman, advanced high flow rate biofiltration media utilizes physical, chemical and biological mechanisms of the soil, plant and microbe complex, to remove pollutants found in stormwater runoff. Infiltration rates at 100" per hour or more, overcome many of the challenges inherent in traditional slow flow rate media and creates design flexibilities that drive lower costs and greater application opportunities.

Separation Layer

A wide aperture mesh layer is utilized to prevent bridging stone from entering the underdrain system. A separation layer which utilizes the concept of 'bridging' to separate the biofiltration media from the underdrain without the use of geotextile fabrics.

Open Cell Underdrain

A modular, high infiltration rate underdrain/storage system which is designed to directly infiltrate or exfiltrate water through it's surface. The modular underdrain overcomes the limited collection capacity of traditional stone and pipe underdrains. A 95% open surface area accepts water significantly faster and can be extended to accommodate any volume needs.

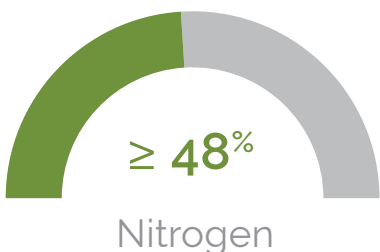
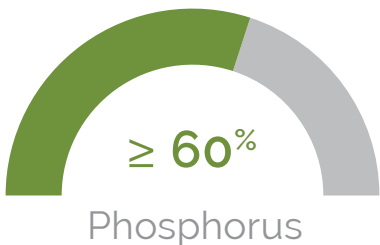
Mulch

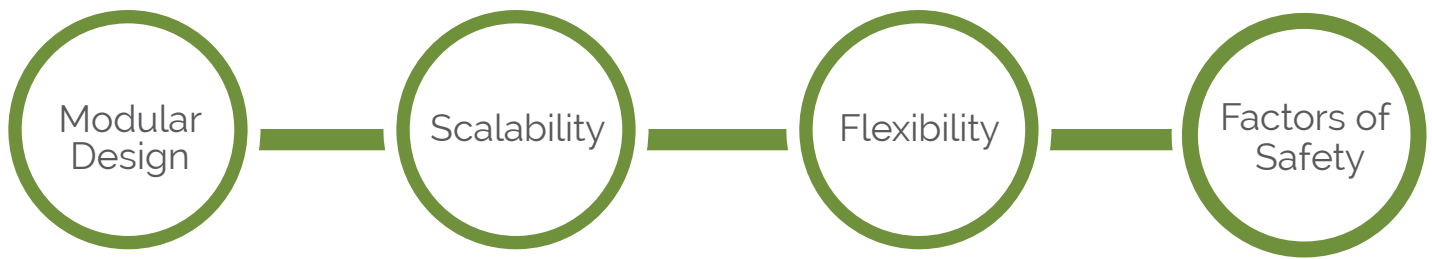
Shredded, hardwood mulch acts as a pre-treatment mechanism, capturing silt, sediment and certain other pollutants, and preventing trash from entering the system. Removal and replacement of mulch is typically necessary at 6-12 month intervals and is the most significant maintenance activity required with the FocalPoint HPMBs.

Plants

Native plants are preferred, but a broad palette of plants which thrive in FocalPoint HPMBs systems exist. They are typically characterized by rhizomatous root systems and tolerate both drought and inundation.

Pollutant Removal Efficiency



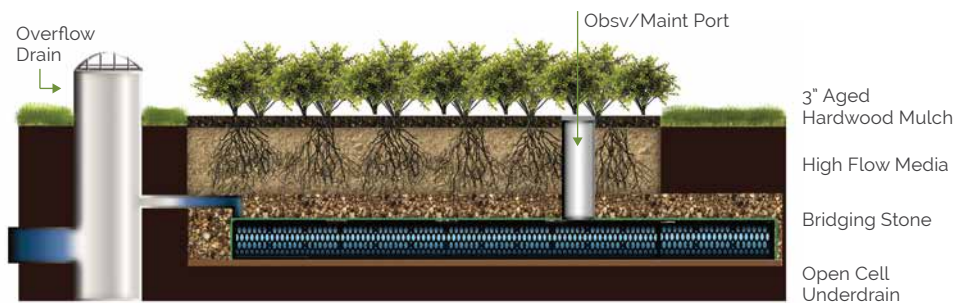


The FocalPoint's modular underdrain, unlike a traditional perforated pipe, not only supports the flow rate of the media, but can be expanded beyond the footprint of the media bed to provide unlimited underground detention, infiltration and/or storage for water reuse/infiltration.



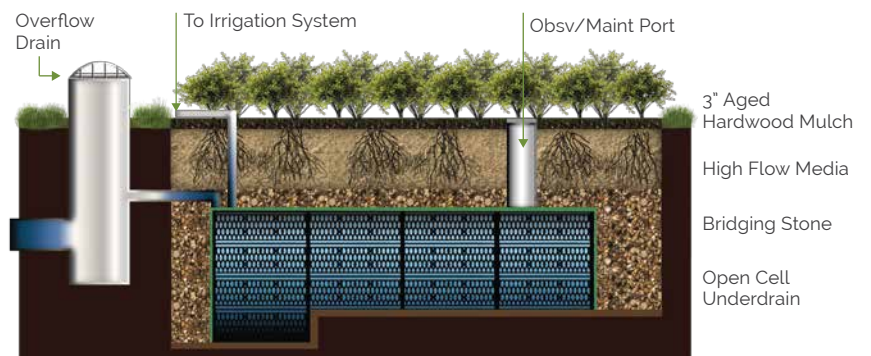
Expanded Detention

FocalPoint HPMBS gives designers maximum flexibility in meeting both water quality and volume requirements



Expanded Infiltration

The system can be used in combination with traditional LID BMPs such as grassy swales and vegetated depressions. It enables implementation of green streets using urban sidewalk planters; which because of the small footprint can support designs with large trees. These systems are also used for downspout planters, replacing underground treatment systems and are an easy retrofit for failed traditional bioretention systems. FocalPoint provides unlimited application opportunities for new construction and redevelopment.



Rainwater Harvesting

'Cap & Seal' Protection

During Ongoing Construction Activity

Protecting the FocalPoint HPMBs during construction is of the utmost importance. The 'Cap & Seal' protection ensures a viable system regardless of the construction sequencing by sealing off the media bed until the contributing drainage area is stabilized. Solving this problem solves one of the most problematic issues in bioretention. Due to its small scale, FocalPoint HPMBs can be capped and sealed, allowing installation to take place early in the project construction cycle when other site utilities are installed.



Convergent Water Technologies guarantees post-construction performance and we make sure your client gets it.



Performance Guaranteed

Post-Installation Verification

The first year's maintenance is included in all FocalPoint HPMBs installations to insure that the system is given the best opportunity to succeed, and low cost annual maintenance contracts are available.

The potential of failure for most LID/GI BMP's is highest within the first year and success and failure is often dependent on whether the system is being properly inspected and maintained. Convergent's commitment to system success doesn't stop when the installation is complete.

Maintenance In Mind

Simple & Cost Effective

This hydraulic conductivity test procedure measures the entire media profile under saturated conditions to produce a reliable and accurate result.

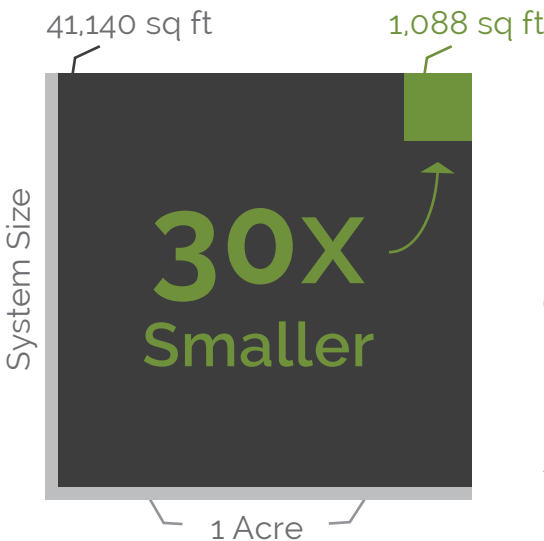
To ensure the highest level of effectiveness, Convergent specifies that the FocalPoint HPMBs be tested within 90 days of activation and we recommend the system be tested annually thereafter to provide ongoing quality assurance.

The Economic Case

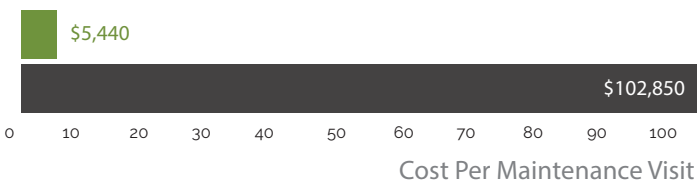
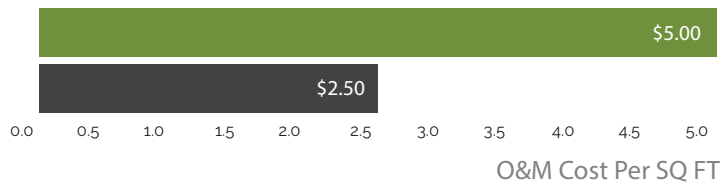
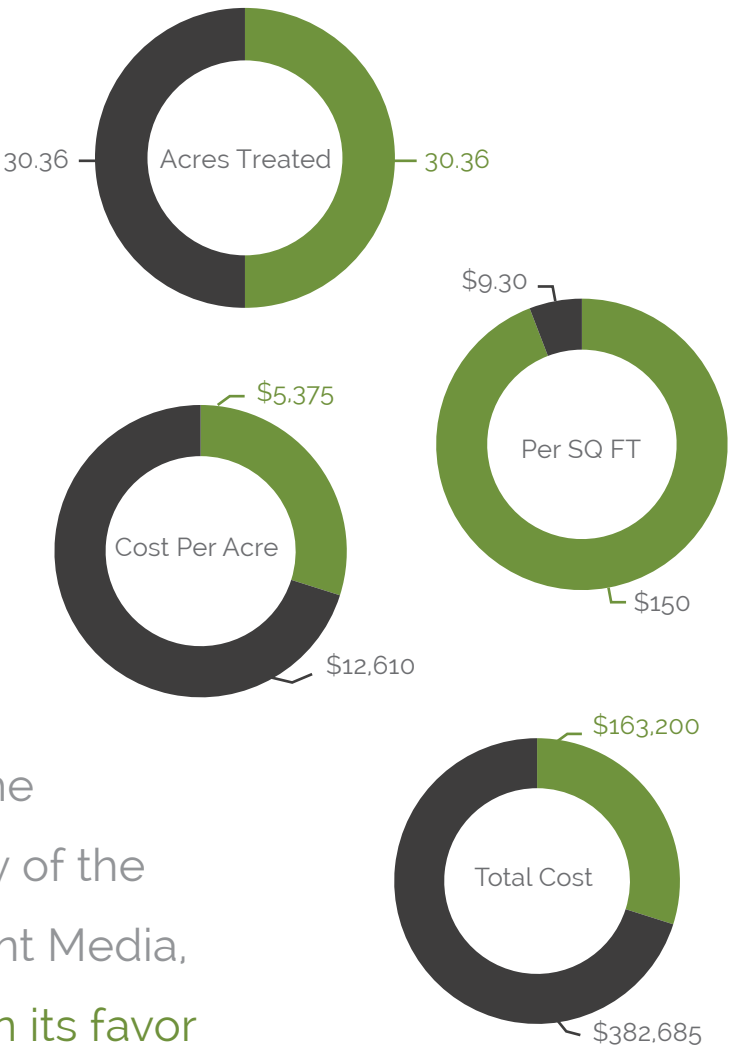
FocalPoint HPMBS vs Traditional Bioretention Soils

- FocalPoint HPMBS
- Traditional Bioretention

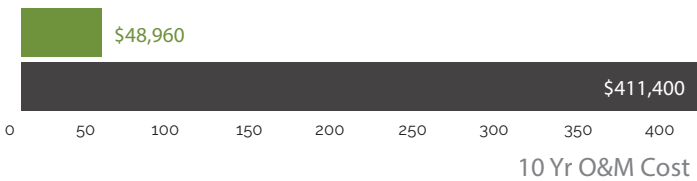
The typical economic case for the FocalPoint HPMBS is demonstrated on both the up front and life cycle cost of a recent project. Both the FocalPoint HPMBS and Traditional Bioretention system were budgeted by a contractor specializing in the installation of Low Impact Development Systems. Although the price per square foot of FocalPoint is many times higher than traditional bioretention, the efficiency of the FocalPoint High Performance Media makes the system more than 30 times smaller, per acre treated, resulting in a 50% cost savings per acre treated.



Due to the efficiency of the FocalPoint Media, scale is in its favor



Due to the size maintenance is a fraction of the cost.





GreenRoads Silver Certified

Bagby Street, Houston, TX
Midtown Redevelopment

The design teams goal for Bagby Street was to provide large street trees within the right of way while also removing pollutants such as heavy metals, floatables, sediment and oil and grease from the roadway stormwater runoff before it outfalls to nearby Buffalo Bayou. With the FocalPoint HPMBs high flow-rate engineered media, the designers didn't need to fill the entire planter box with a bioretention media and underdrain system. This allowed placing the HPMBs away from the tree roots and allowed the design team to meet their objective of having both street trees and biofiltration. The result was an award winning project.



Multi-Family Development

Queenston Manor Apartment

At Queenston Manor Apartments, all of the drainage areas are also common areas and courtyards so it was imperative that the system drain within 24 hours of a rain event. The FocalPoint HPMBs was placed at the lowest elevation in the four landscaped swale systems on site to provide a reliable drainage, detention and water quality solution. The design team was able to decrease the surface storage volume requirements enough to reclaim the land needed to build two additional apartment buildings. For the developers, the 48 additional apartment units was the difference between success and a canceled project.



Parking Lot Retrofit

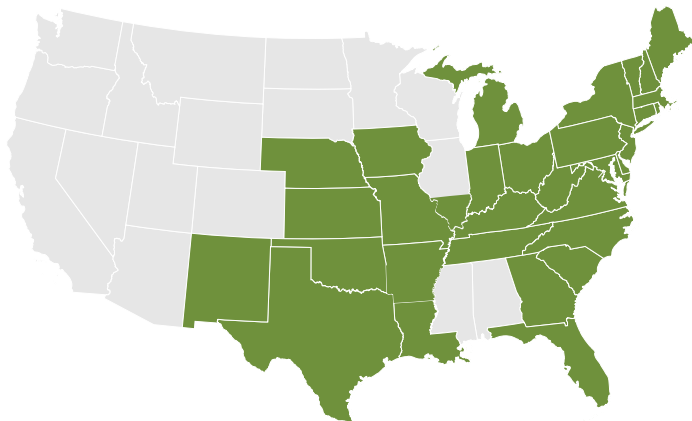
Sugarland Conference Center

A complete parking lot retrofit incorporates a combination of bioswales, FocalPoint HPMBs, and an expanded underdrain Rainwater Harvesting System. This Low Impact Development and Green Infrastructure retrofit has increased aesthetic appeal, increased time of concentration and decreased peak flows. The reuse system reduces annual potable water use by over 50% and the FocalPoint HPMBs removes more than 80% of the TSS from the discharge along with hydrocarbons, phosphorus, nitrogen and other pollutants before delivering it to the harvesting system.



VAR Connection

Changing Stormwater Systems Distribution



The Convergent Value-Added Reseller (VAR) network consists of regional organizations that focus on cost-effective answers to all manner of stormwater problems, utilizing innovative systems that deliver value that's greater than the sum of their parts.

Convergent provides its VARs with the latest technologies, guidance and innovations, and like Convergent, these VARs are firms whose value-added approach has required them to take a non-traditional path in the stormwater industry; it's a path that leads to the experience, diverse relationships and solutions orientation that is so rare and critically needed in the stormwater industry.

Convergent's VARs are locally rooted and deeply connected in the communities they serve. They know the local regulations and act as agents of beneficial change. On average, Convergent VAR firms have been in business for 21 years; old enough to know their markets well and experienced enough to recognize and respond quickly to the LID/Green Infrastructure paradigm that is remaking our industry.

Capitalizing on the power of collaborative effort VAR network firms are able to respond rapidly to changing regulations, access 'lessons learned' by network peers and respond to the opportunity to be a driving force for innovation in the stormwater marketplace.

The firms which make up this network serve in exclusive territories, and incorporate both sales and service elements (directly or indirectly) in their operations. Every VAR will provide installation, oversight, verification and maintenance for Convergent Systems. Like Low Impact Development itself, the Convergent VAR network is cumulatively powerful and can deliver more cost-effective solutions than traditional distribution.



804.275.4126
acfenvironmental.com



800.869.9600
aspent.com



800.597.2180
d2lwr.com



832.456.1000
ecosvs.com



1-616.836.3535
interfaceh2o.com



800.362.2245
quicksupplydm.com



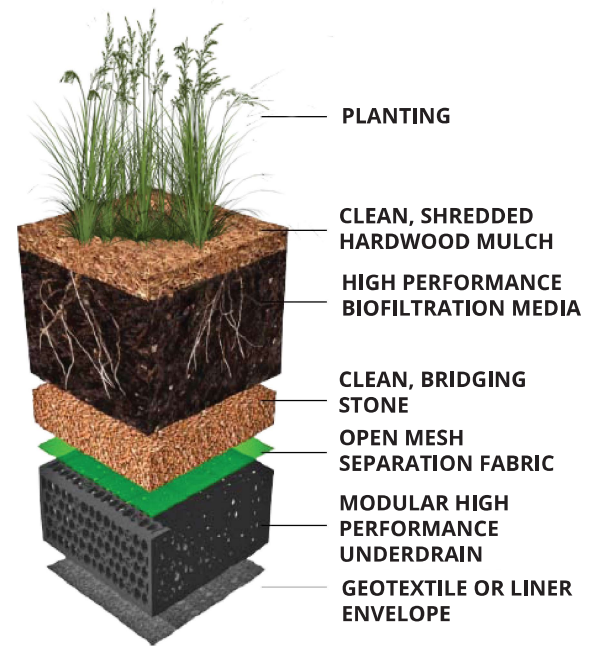
800.465.0900
sitefabric.com

FOCALPOINT BIOFILTRATION SYSTEM

STORMWATER MANAGEMENT

HIGH PERFORMANCE MODULAR BIOFILTRATION SYSTEM FOR FILTRATION OF STORMWATER

FocalPoint is an ultra-efficient, modular biofiltration system that treats and drains large volumes of stormwater runoff in a small footprint to meet post-construction stormwater treatment requirements. The biofiltration system utilizes the physical, chemical and biological mechanisms of a soil, plant and microbe complex to remove pollutants typically found in urban stormwater runoff. The system can be installed along the edge of a roadway behind curb lines, in landscaped stormwater basins and can be incorporated into an urban green infrastructure streetscapes. Infiltration flow rates for the system's standard media exceed 100" per hour. It is a complete, integrated system with a demanding specification that ensures functionality, performance and maintainability.

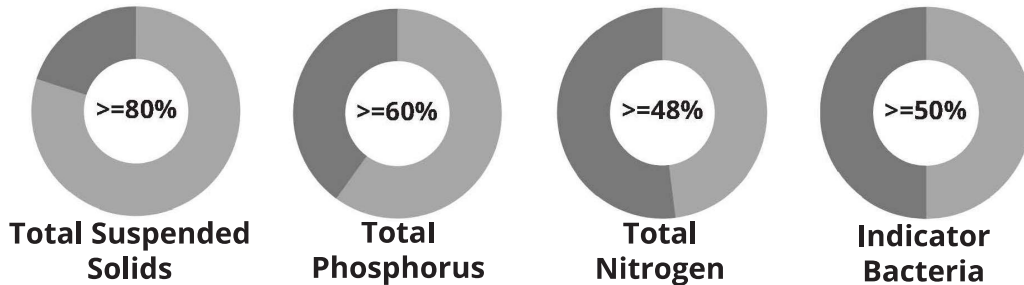


ADVANTAGES:

- Gain usable square footage
- Reduce material requirements and cost
- Improve property aesthetic and value
- 100"+ per hour infiltration rate
- Treat the same amount of water in <10% of the area required for traditional bioretention
- ACF provides 1st year of maintenance on system

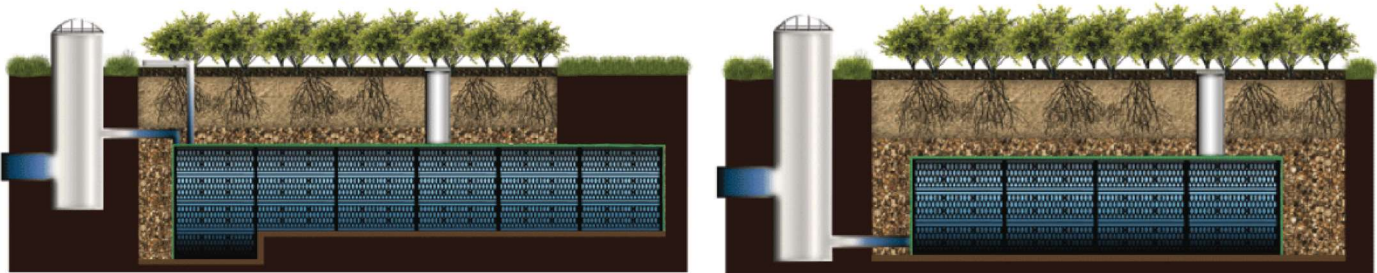
POLLUTANT REMOVAL

FocalPoint achieves pollutant removal rates consistent with traditional bioretention, and the option of increased removal characteristics for specific pollutant targets. The system is 3rd party field tested under TAPE (Technology Assessment Protocol – Ecology), independently field tested by the North Carolina State University, and has numerous agencies' approvals that meet state water quality standards for post construction BMPs.

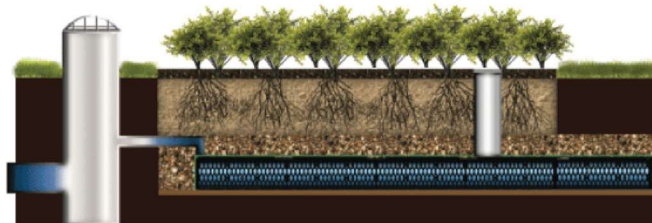


MODULAR UNDERDRAIN

FocalPoint's modular open cell underdrain system, unlike traditional underdrains, not only supports the flow rate of the media, but can be expanded beyond the footprint of the media bed to provide unlimited underground detention, infiltration and/or storage for water reuse. This can help meet channel protection, infiltration and flood control requirements.



R-Tank underdrain can be extended beyond FocalPoint footprint as shown above



ACCESSORY PRODUCTS



Beehive Overflow Filter Riser
for collection of gross solids during major storm events



Rain Guardian Turret
for curbline pretreatment and energy dissipation



LET'S GET IT DONE

800.448.3636
acfenvironmental.com

APPENDIX H

Examples of BAM Fact Sheets



BOLD & GOLD® CTS BIOSORPTION ACTIVATED MEDIA SPECIFICATIONS

1.1 Description

Bold & Gold CTS Filtration media is a Biosorption Activated Media (BAM) for stormwater treatment in conjunction with other structural or non-structural stormwater BMPs. Bold & Gold Filtration media is a patented product developed at the Stormwater Management Academy of the University of Central Florida. Environmental Conservation Solutions, LLC. (ECS) is the licensed manufacturer of the Bold & Gold Filtration media.

1.2 Responsibility

The contractor shall be responsible for the satisfactory delivery, stockpiling, installation, and maintenance of the Bold & Gold CTS Filtration media during construction based on information provided in the Contract Documents and as provided by the supplier. The Bold & Gold CTS Filtration media shall be purchased from an approved source.

Contact the local Ferguson Waterworks branch for pricing information. ECS will provide a Certificate of Authenticity to the Engineer of Record at the completion of the project. The Certificate of Authenticity includes the quantity of media delivered to the project site and certifies the Bold & Gold media delivered meets the patent requirements of the University of Central Florida.

1.3 Material

Composition: The Bold & Gold CTS Filtration media is manufactured with mineral materials and no organic materials. The final product has more than 2% but less than 6% passing the US #200 (75 micron opening size) sieve. The mix is composed of 85% poorly graded clean sand (washed) and 15% sorption materials by volume. The sorption materials are composed of recycled tire crumb with no metal contents and mined kaolin clay that has no less than 99% clay content.



Percentages shall be determined by in-place volume. Water passing through the media must not exhibit acute toxicity and not change the pH of the filtered water by more than 1.0 unit. The material shall have a water holding capacity (amount of water that the media can hold for crop use) of at least 10% as measured by porosity, and total porosity of 32%. The permeability as measured in the laboratory for a media at 95 pounds per cubic feet must be greater than 10.0 inches per hour.

Storage and Handling: The Bold & Gold CTS Filtration media is delivered pre-mixed and ready to install. Media shall not be stockpiled longer than 30 days before installation and must be covered to prevent separation of the material due to adverse weather and environmental conditions such as but not limited to rainfall and win.

1.4 Construction

Delivery: Bold & Gold CTS Filtration media is delivered to the jobsite pre-mixed and ready for installation. The delivered material is certified to meet the patent requirements and a certificate shall be issued as stated in Section 1.2 of this specification.

Installation: Surface on which the Bold & Gold CTS Filtration media is placed shall be reasonably levelled within ± 1 -inch of the elevations shown in the plans. Unless a slope grade is specified in the plans, a level surface is recommended for the subgrade soil to ensure even infiltration of filtered stormwater spread over the entire surface area.

1. The surface of the subgrade soil underneath the Bold & Gold CTS Filtration media shall be compacted and/or scarified to meet the requirements as specified by the design engineer. All necessary construction practices shall be taken to minimize the compaction of the subgrade soil, above the specified subgrade density, to avoid the reduction of the infiltration rate at the soil-filter media interface. The contractor shall take all necessary measures needed to control the deposition of sediments on the surface of the subgrade soil prior to the placement of the Bold & Gold CTS Filtration media.
2. The Bold & Gold CTS Filtration media shall not be installed until all areas that drain to it have temporal/permanent erosion and sedimentation stabilization in place. No runoff shall be directed to the specified location of the Bold & Gold CTS Filtration Media until all drainage area leading to the location are stabilized. If the installed Bold & Gold CTS Filtration media becomes contaminated with sediment, prior to the placement of the cover material, it shall be removed and replaced at the contractor's expense.
3. The Bold & Gold CTS Filtration media may be placed in one lift and compacted to the density specified in the plan by the design engineer. For traffic load-bearing BMP applications, the Bold & Gold CTS Filtration media shall be installed, in number and depth of lifts, as specified by the design engineer to achieve target installation density. The maximum dry density of the Bold & Gold CTS Filtration media ranges between 100 and 105 pounds per cubic feet. Unless specified by the design engineer; a) the suggested installation dry density of the Bold & Gold CTS Filtration media shall not be greater than 95 pounds per cubic feet for all non-traffic bearing BMP applications; or b) no less than 100 pounds per cubic feet for all traffic bearing BMP applications. The final in-place thickness of the Bold & Gold CTS Filtration media shall not be less than the thickness shown in the plans for the specific project.
4. Compaction of the Bold & Gold CTS Filtration Media shall be achieved by using industry-standard compaction techniques. Water free of contaminants (sediments and nutrients) may be sprinkled on to the Bold & Gold CTS Filtration media to achieve the compaction requirements. If the compacted Bold & Gold CTS Filtration media has an in-place density greater than 105% of the required density, the material will be reworked to meet density requirements.
5. Unless specified by the design engineer, the surface of the Bold & Gold CTS Filtration media shall have a slope of between zero and 0.5 percent in preparation for the placement of the top cover material. The top cover material shall serve as a spreader of runoff over the filter media and prefilter of gross pollutants from contaminating the Bold & Gold CTS Filtration media. In the event of clogging, the top cover material shall be removed and replaced with clean top cover material, at the same depth, to rejuvenate flow into the filter media. The top cover shall be free- draining material that is free of organics, sediments and all other pollutants that negates the purpose for the installation of the Bold & Gold CTS Filtration media. Top cover materials shall be, but not limited to clean sand, gravel, geotextile, grass, and others that may be specified by the design engineer and does not hinder the performance of the Bold & Gold CTS Filtration media.

6. If required by the design engineer, sod or seed shall be placed over the Bold & Gold CTS Filtration media within two days of placement. The sod used as cover for the Bold & Gold CTS Filtration media shall have been grown in a predominantly sandy site with less than 5% of the soil attached to the sod passing the #200 (75 micron opening size) sieve and have no added fertilizer.
7. After placement of the topsoil over the Bold & Gold CTS Filtration media, driving and parking on the installed Bold & Gold CTS Filtration media maybe allowed, if the surface is intended for traffic loading. If rutting to the Bold & Gold CTS Filtration media occurs due to vehicles or equipment during installation, the contractor shall repair it to the grades and elevations in the plans.

1.5 Maintenance

1. Maintenance requirements for the Bold & Gold CTS Filtration media shall be dependent on the proper functioning and maintenance of the applicable BMP in which the filter media is used. To prevent the clogging of the voids of the Bold & Gold CTS Filtration media, there shall be installed an intermediary aggregate media that is free-draining and free of organics (clean sand, acceptable aggregates, etc.) as cover material directly above the top of the filter media surface. In addition, the cover material shall serve to control the erosion of Bold & Gold CTS Filtration media.
2. In the event of the clogging resulting from the reduction of permeability through the cover material and the filter media, the sediment-laden cover material shall be removed and replaced with new material meeting the original specifications. Reduction in permeability shall be described as the increase of the drawdown time that exceeds the design duration for the specific BMP application.
3. Bold & Gold CTS Filtration media is typically designed to last the life span of the applicable BMP. However, maintenance shall be performed if the Bold & Gold CTS Filtration media has shown a reduction in the performance efficiencies on the reduction of Total Phosphorus (TP) below the design value before and/or at the expiration of the design service life. The maintenance procedure shall involve the removal of the cover material and Bold & Gold CTS Filtration media and replaced with new material and filter media meeting the original specifications. The spent filter media and cover material shall be disposed of at an approved landfill.

1.6 Applications

1. Bold & Gold CTS Filtration media is recommended for stormwater nutrient removal to be used in low loading or slow-flow filters, either in 12-, 24- or 30-inch depth filters, after a wet pond or within a dry basin, swale, and strips.
2. It is also used in stormwater low impact development applications in either a detention or retention capacity, and in a wastewater, Rapid Infiltration Basin for nutrient reduction.
3. It is not intended for storage in volume attenuation but provides some storage capacity to the limits of the available porosity of 0.25 of the volume occupied by the filter media.
4. Types of Stormwater BMPs where it can be used:
 - Side-bank and shelf filters in wet detention ponds and retention ponds with shallow seasonal high groundwater table elevations
 - Bottom of retention pond; roadside ditches; swales; trench underdrains; permeable pavements; vegetated filter strips (VFS)
 - Underneath subsurface storage systems used as retention systems
 - Low Impact Development (LID) devices such as – tree wells, rain gardens, bioretention, bioswales, sand filters, and other user-defined slow-flow BMPs

1.7 Design Considerations

The primary control for sizing the Bold & Gold CTS Filtration media is to capture the water quality volume (WWW_v) and pass it through the filter media with a specified hydraulic residence time (HRT) to achieve a specified drawdown time. The capture volume is dependent on the flow-through rate per available surface area of the filter media. Thus, primary design parameter for the filter media is the minimum surface area, which is expressed as:

$$SSSS_{fmm} = \frac{WWW_v}{1/SSSS \cdot k_{fmm} \cdot tt} = \frac{EEEEEE \cdot TTTT}{1/SSSS \cdot k_{fmm} \cdot tt}$$

where $SSSS_{fmm}$ = surface area of filter media (square feet); $EEEEEE$ = Effective Impervious area (square feet); $TTTT$ = treatment depth over the contributing area (feet); $SSSS$ = factor of safety (2.0); k_{fmm} = laboratory permeability of the filter media (0.83 ft/hr); and tt = required drawdown time (72 hr).

Environmental Conservation Solutions
2346 Vulcan Road
Apopka, FL 32703

ecs-water.com
407.298.5121
admin@ecs-water.com



BOLD & GOLD®

Filtration Media

BOLD & GOLD® ECT3

BIOSORPTION ACTIVATED MEDIA SPECIFICATIONS

1.1 Description

Bold & Gold ECT3 Filtration media is a Biosorption Activated Media (BAM) for stormwater treatment in conjunction with other structural or non-structural stormwater BMPs. Bold & Gold Filtration media is a patented product developed at the Stormwater Management Academy of the University of Central Florida. Environmental Conservation Solutions, LLC. (ECS) is the licensed manufacturer of the Bold & Gold Filtration media.

1.2 Responsibility

The contractor shall be responsible for the satisfactory delivery, stockpiling, installation and maintenance of the Bold & Gold ECT3 Filtration media during construction based on information provided in the Contract Documents and as provided by the supplier. The Bold & Gold ECT3 Filtration media shall be purchased from an approved source.

Contact the local Ferguson Waterworks branch for pricing information. ECS will provide a Certificate of Authenticity to the Engineer of Record at the completion of the project. The Certificate of Authenticity includes the quantity of media delivered to the project site and certifies the Bold & Gold media delivered meets the patent requirements of the University of Central Florida.

1.3 Material

Composition: The Bold & Gold ECT3 Filtration media shall be manufactured with mineral materials and no organic materials. The final product shall have less than 2% passing the US #200 (75 micron opening size) sieve. The media mix shall be composed of 75% expanded clay (light-weight aggregate of maximum aggregate size of $\frac{3}{8}$ inches) and 25% sorption materials composed of recycled tire chip with no measurable metal contents. Percentages shall be determined by in place volume. Water passing through the media must not exhibit acute or chronic toxicity and not change the pH of the filtered water by more than 1.0 unit. The material shall have a water holding capacity of at least 5%, as measured by porosity, and a total porosity of 40%. The permeability as measured in the laboratory must be greater than 96 inches per hour at maximum compaction.



Storage and Handling: The Bold & Gold ECT3 Filtration media is delivered pre-mixed and ready to install. Material shall not be stockpiled longer than 30 days before installation and must be covered always, to prevent separation of the material due to adverse weather and environmental conditions such as, but not limited to rainfall and wind.

1.4 Construction

Delivery: Bold & Gold ECT3 Filtration media is delivered to the jobsite pre-mixed. The delivered material is certified to meet the patent requirements and a certificate shall be issued as stated in Section 1.2 of this specification.

Installation: Surface on which the Bold & Gold ECT3 Filtration media is placed shall be reasonably levelled within ± 1 -inch of the elevations shown in the plans. Unless a slope grade is specified in the plans, a level surface is recommended for the subgrade soil to ensure even infiltration of filtered stormwater spread over the entire surface area.

1. The Bold & Gold ECT3 Filtration media shall not be installed until all areas that drain to it have temporal/permanent erosion and sedimentation stabilization in place. No runoff shall be directed to the specified location of the Bold & Gold ECT3 Filtration Media until all drainage area leading to the location are stabilized. If the installed Bold & Gold ECT3 Filtration media becomes contaminated with sediment, prior to the placement of the cover material, it shall be removed and replaced at the contractor's expense.
2. The Bold & Gold ECT3 Filtration media shall be placed loosely or compacted to meet the specifications as shown in the plan by the design engineer. Compaction of the Bold & Gold ECT3 Filtration Media shall be achieved by using industry-standard compaction techniques. The Bold & Gold ECT3 Filtration media may be placed in one lift and compacted to the density specified in the plan by the design engineer. The compacted thickness shall be no less than the thickness shown in the plans. Clean water with no contaminants may be added to the material to meet the compaction requirements. If the compacted Bold & Gold ECT3 Filtration media has an in-place density greater than 105% of the required density, the material will be reworked to meet density requirements.

1.5 Maintenance

1. Maintenance requirements for the Bold & Gold ECT3 Filtration media shall be dependent on the proper functioning and maintenance of all components of the applicable BMP in which the filter media is used. To prevent the clogging of the voids of the Bold & Gold ECT3 Filtration media, there shall be installed a prefilter prior to the filter media surface for gross pollutant controls.
2. In the event of the clogging resulting from the reduction of permeability through the prefilter material and the filter media, the sediment-laden cover prefilter shall be removed and replaced with new material meeting the original specifications. Reduction in permeability shall be described as the increase of the drawdown time that exceeds the design duration for the specific BMP application.
3. Bold & Gold ECT3 Filtration media is typically designed to last the life span of the applicable BMP. However, maintenance shall be performed if the Bold & Gold ECT3 Filtration media has shown a reduction in the performance efficiencies on the reduction of Total Phosphorus (TP) below the design value before and/or at the expiration of the design service life. The maintenance procedure shall involve the removal of the prefilter and Bold & Gold ECT3 Filtration media and replaced with new material and filter media meeting the original specifications. The spent filter media and cover material shall be disposed off at an approved landfill.

1.6 Applications

1. Bold & Gold ECT3 Filtration media is recommended for use as in inter-event flow using Up-flow filter at wet pond and Down-flow filter at dry basins (filtration).
2. It is not intended for storage to control volume attenuation but provides some storage capacity to the limits of the available porosity of 0.25 of the volume occupied by the filter media.

1.7 Design Considerations

The primary control for sizing the Bold & Gold ECT3 Filtration media is to capture the water quality volume (WWW_v) and pass it through the filter media with a specified hydraulic residence time (HRT) to achieve a specified drawdown time. The capture volume is dependent on the flow- through rate per available surface area of the filter media. Thus, primary design parameter for the filter media is the minimum surface area, which is expressed as:

$$SSS_{fff} = \frac{WWW_v}{1/SSS \cdot k_{fff} \cdot tt} = \frac{EEEE \cdot TTT}{1/SSS \cdot k_{fff} \cdot tt}$$

where SSS_{fff} = surface area of filter media (square feet); $EEEE$ = EffECT3ive Impervious area (square feet); TTT = treatment depth over the contributing area (feet); SSS = factor of safety (2.0); k_{fff} = laboratory permeability of the filter media (16.0 ft/h); and tt = required drawdown time (72 h).

Environmental Conservation Solutions
2346 Vulcan Road
Apopka, FL 32703

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407.298.5121
admin@ecs-water.com





BOLD & GOLD® OTE BIOSORPTION ACTIVATED MEDIA

1.1 Description

Bold & Gold® OTE Septic media is a Biosorption Activated Media (BAM) for storm water treatment in conjunction with other structural or non-structural stormwater BMPs. Bold & Gold® (B&G) is a patented product developed at The Stormwater Management Academy at The University of Central Florida. Environmental Conservation Solutions, LLC. is the licensed provider of the Bold & Gold® media. Contact Environmental Conservation Solutions, LLC. for a price quotation.

Environmental Conservation Solutions, LLC.
PO BOX 607356
Orlando, FL 32860
(407) 298-5121

1.2 Responsibility

The contractor shall be responsible for the satisfactory delivery, stockpiling, installation and maintenance of the Bold & Gold® OTE media during construction based on information provided in the Contract Documents and as provided by the supplier. The Bold & Gold® OTE media shall be purchased from an approved source.

1.3 Material

1-3.1 Composition: The Bold & Gold® OTE media shall be manufactured with mineral materials and no organic materials. The final product shall have less than 2% passing the 200 sieve. The media mix shall be composed of 70% expanded clay (light-weight aggregate of maximum aggregate size of $\frac{3}{8}$ inches), 25% sorption materials composed of recycled tire crumb with no measurable metal contents, and 5% wood chip. Percentages shall be determined by in place volume. The mix will have an average dry weight of non-compacted media less than 30 pounds per cubic foot and be non-flammable up to 482° F. Water passing through the media must not exhibit acute or chronic toxicity and not change the pH of the filtered water by more than 1.0 units. The material will have a water holding capacity of at least 5%, as measured by porosity, and total porosity of 40%. The permeability as measured in the laboratory must be greater than 100 inches per hour at maximum compaction. The Bold & Gold® OTE media has a dissolved phosphorus (DP) removal capacity that exceeds 0.2 mg DP/gram of media as measured in the laboratory during normal operating conditions. Plastic Tubing Industries, Inc. will provide certification of authenticity on the above composition and performance.

1-3.2 Storage and Handling: At the contractor's option, the Bold & Gold® OTE media may be delivered pre-mixed and ready to install or the material components delivered separately and mixed on site. Pre-mixed material shall be stored in a covered and well-drained area. Material shall not be stockpiled longer than 30 days before installation to prevent separation of the material due to rainfall.



1.4 Construction

1-4.1 **Delivery of the Material:** Bold & Gold® OTE may be delivered to the jobsite premixed OR the component materials may be delivered for onsite mixing by manufacturer.

1-4.2 **Premixed Delivery:** Bold & Gold® OTE will be mixed by Environmental Conservation Solutions, LLC. and delivered to the jobsite ready for installation. The delivered material is certified to meet the patent requirements.

1-4.3 **Onsite Mixing Delivery:** The mixing shall be done either in a pugmill or other mechanical mixing system that has the capability of uniformly mixing the component material to the requirements of Section 1.3.1 of this specification. An Environmental Conservation Solutions, LLC. representative shall mix the material on site. Care shall be taken to avoid contaminating the component material with the existing ground in the stockpile area. The mixed material may be stockpiled and covered for up to 30 days before installation.

1-4.4 **Installation:** Surface on which the Bold & Gold® OTE media is placed shall be reasonably smooth and within ± 1 of the elevations shown in the plans. The surface of the Bold & Gold® OTE media is to be placed or shall be compacted to meet the requirements as specified by the design engineer. The Bold & Gold® OTE media shall not be installed until all areas that drain to it have the final stabilization in place. If the installed Bold & Gold® OTE media becomes contaminated with sediment it shall be removed and replaced at the contractor's expense.

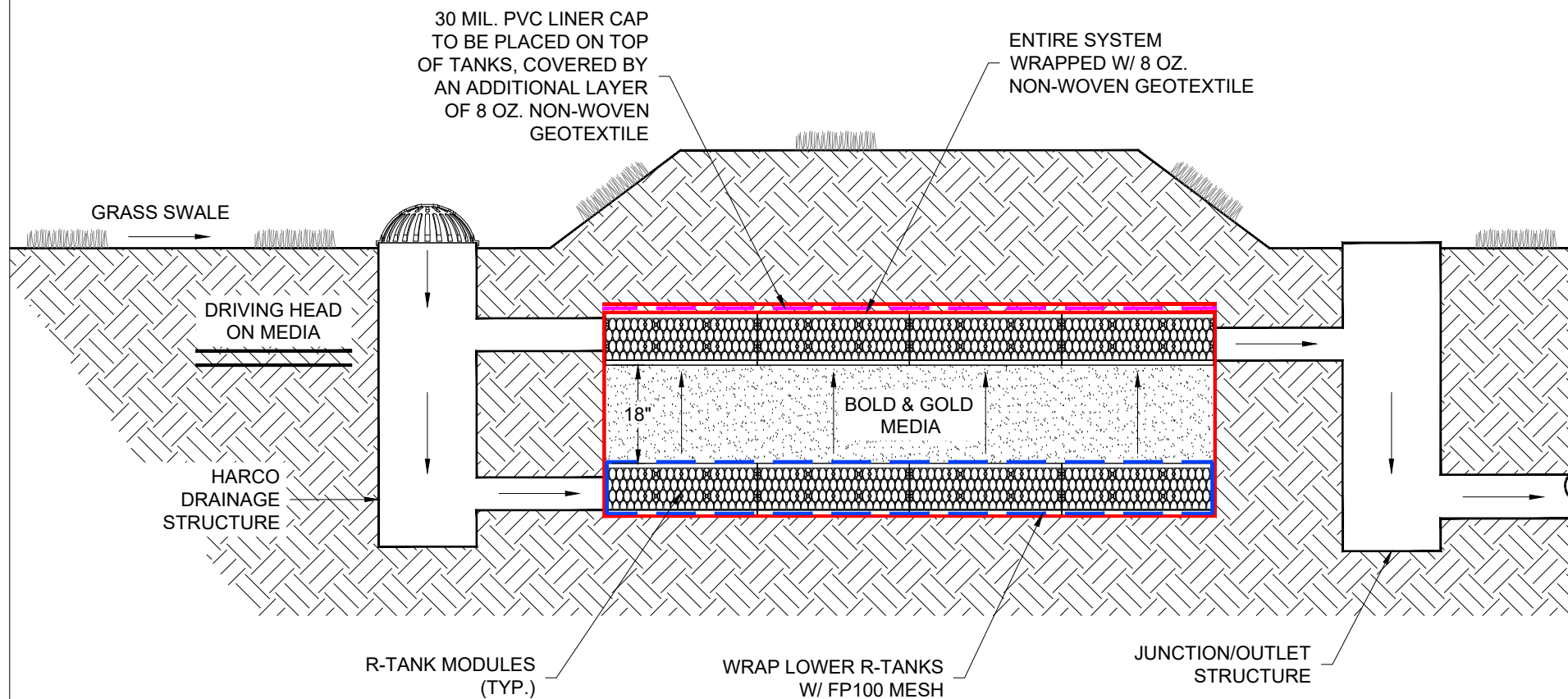
The Bold & Gold® OTE media may be placed in one lift and compacted to the density specified in the plan by the design engineer. The compacted thickness will be no less than the thickness shown in the plans. Clean water with no contaminants may be added to the material to meet the compaction requirements. If the compacted Bold & Gold® OTE media has an in-place density greater than 105% of the required density, the material will be reworked to meet density requirements.

1.5 Applications

1.5.1 Recommended for use in up-flow at wet pond and dry basin outflow.

APPENDIX I

Examples of Upflow BAM System



UP-FLOW BOLD & GOLD FILTER W/ GRASS SWALE

06/06/18

FOR ADDITIONAL INFORMATION PLEASE CONTACT: ACF ENVIRONMENTAL, 1-800-448-3636, www.acfenvironmental.com

SUMMIT

HIGH-PERFORMANCE UPFLOW FILTER

STORMWATER MANAGEMENT



SUMMIT
High-Performance
Up-Flow Filter

NUTRIENT MANAGEMENT SYSTEM
ACCEPTED BY FLORIDA WATER MANAGEMENT DISTRICTS

The Summit High-Performance Upflow filter System (Summit HPUF) includes a mix of products to remove nitrogen, phosphorus, bacteria and more from stormwater, wastewater and agriculture applications. The system is powered by Bold & Gold® biosorption activated media which is composed of natural materials (clay and sand) and recycled products (tires).

Often, higher water-quality goals and pollutant removal rates are required in areas where standard solutions won't suffice. This system offers a space-efficient option to meet these difficult goals.

COMMON APPLICATIONS INCLUDE:

Wetponds: The system is useful as a polishing filter in wetponds and can reduce the wetpond size while increasing treatment effectiveness.

Ultra-Urban Developments: This system integrates well with detention, permeable pavement, biofiltration, bioswales, etc.

Non-Infiltrating Areas: The Summit HPUF filter offers filtration and discharge assistance in non-infiltrating areas.



Accepted by Florida Water Management Districts as a filtration BMP.

- Can be used in BMAPS (Basin Management Action Plans)
- Useful in Net Improvement Projects

Integrated in BMP Trains 2020



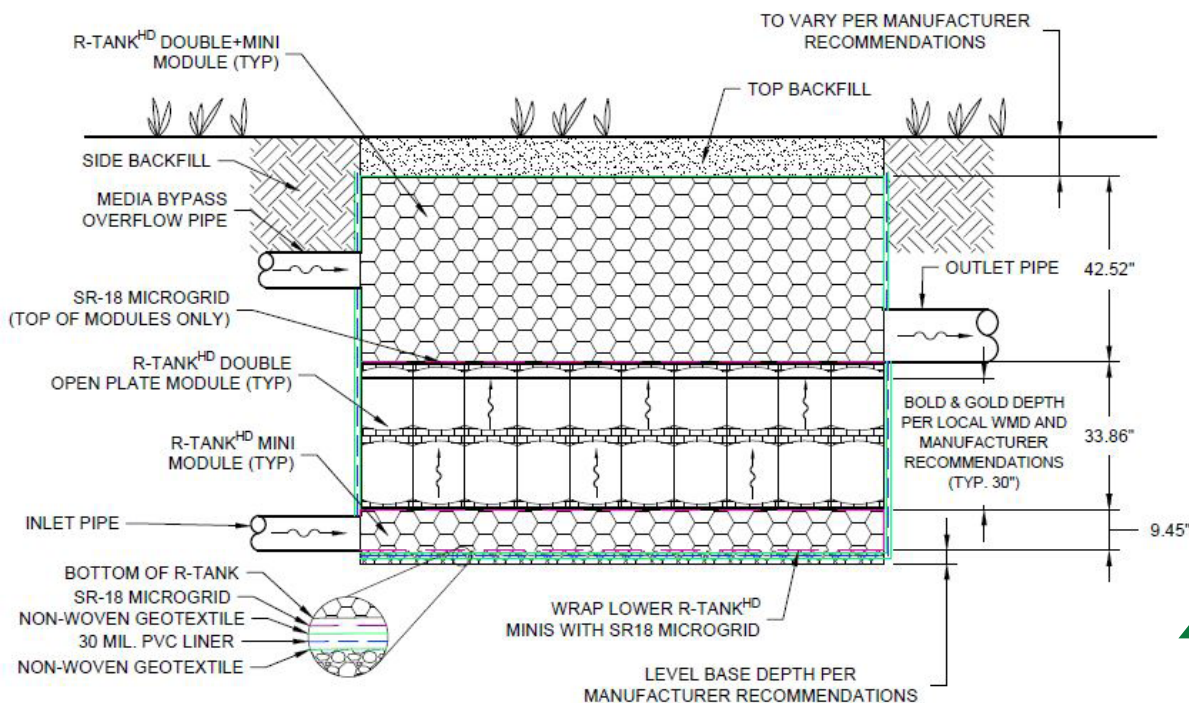
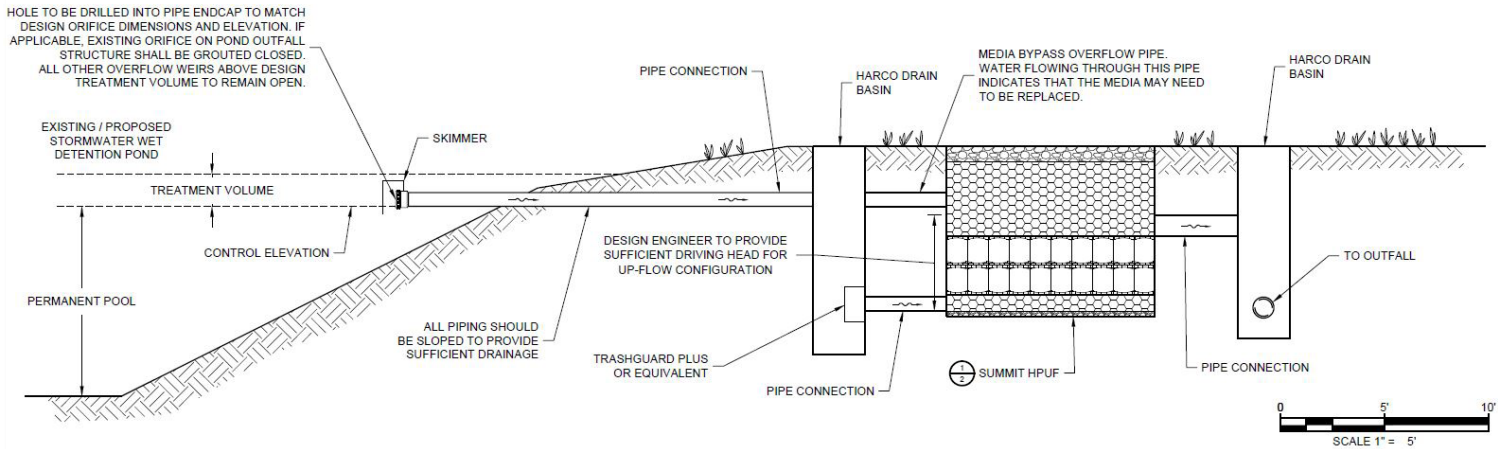
ADVANTAGES

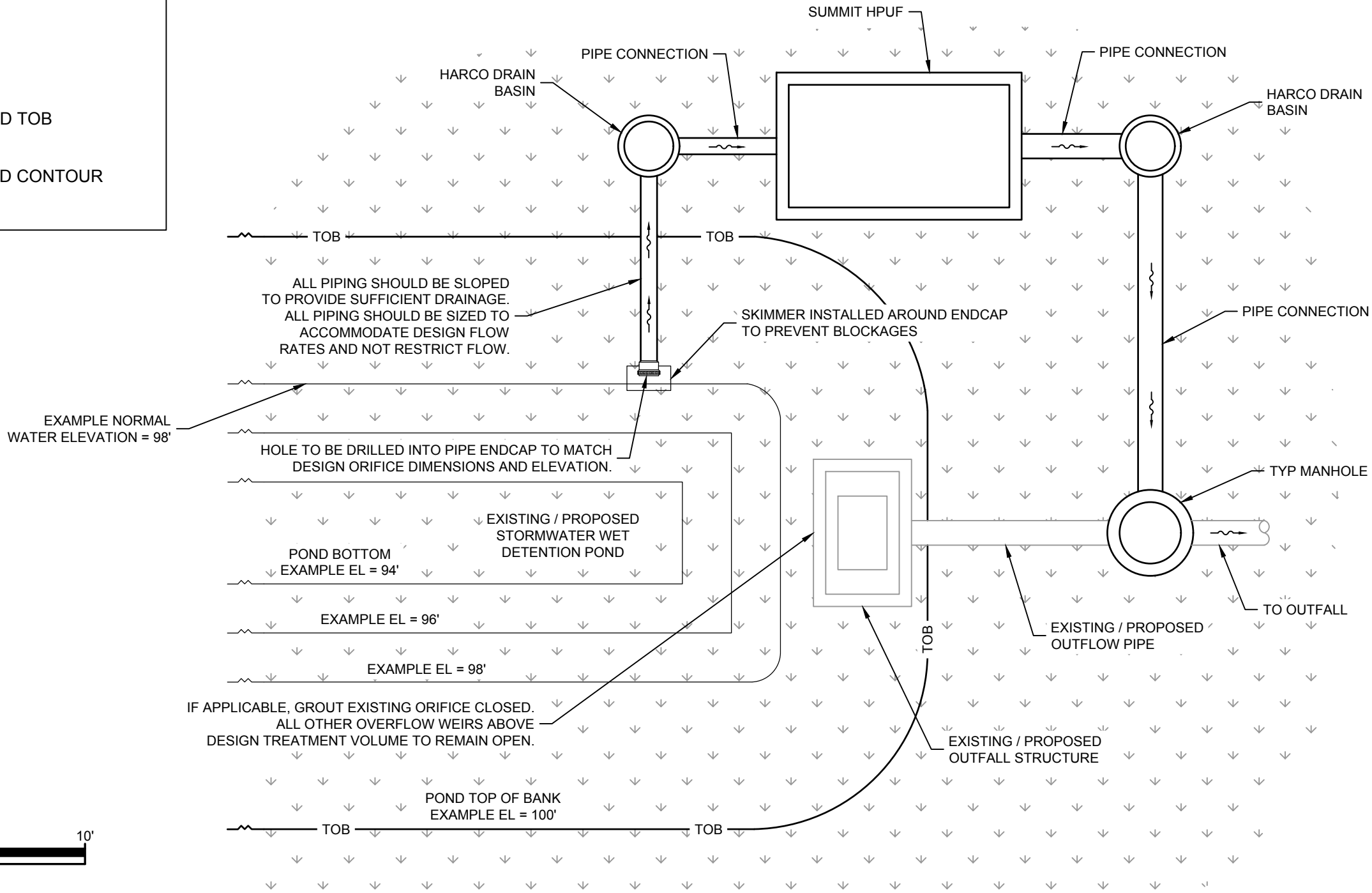
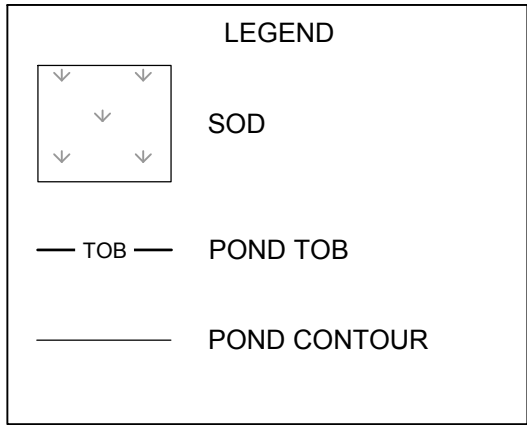
- Upflow design reduces clogging and maintenance
- Targets TN, TP, TSS and bacteria
- No leaching of pollutants as it permanently bonds with dissolved nutrients
- Media is non-toxic and non-organic (won't degrade)
- Designed with longevity and sustainability in mind
- Space efficient footprint

SUMMIT HPUF STANDARD SIZES:

Larger sizes are available and can be customized to site specific conditions.

PROPERTY	TREATMENT MEDIA (SF)	TREATMENT FLOW (CFS)	TREATMENT VOLUME OVER 24 HOURS (FT ³)
S-HPUF 3-5	12.0	0.027	2,309
S-HPUF 3-7	18.5	0.041	3,354
S-HPUF 3-9	24.6	0.055	4,734
S-HPUF 4-5	28.0	0.062	5,388
S-HPUF 5-9	49.0	0.191	9,429
S-HPUF 7-9	61.6	0.137	11,854
S-HPUF 7-12	77.0	0.171	14,817
S-HPUF 8-12	92.4	0.206	17,780





GENERAL NOTES

1. THE SUMMIT HIGH PERFORMANCE UPFLOW FILTER (HPUF), HARCO DRAIN BASINS, AND INTAKE PIPE ENDCAP SHOULD BE INSPECTED ON A ROUTINE BASIS TO ENSURE THAT THEY ARE FUNCTIONING ACCORDING TO MANUFACTURER RECOMMENDATIONS.
2. INSPECTIONS SHOULD BE PERFORMED ON A SEMI-ANNUAL BASIS AND FOLLOWING MAJOR STORMS PER SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT (SWFWMD) OPERATION AND MAINTENANCE GUIDELINES.
3. RECORDS SHOULD BE KEPT ON ALL MAINTENANCE OPERATIONS TO HELP PLAN FUTURE WORK AND IDENTIFY FACILITIES REQUIRING ATTENTION.
4. PER SWFWMD OPERATION AND MAINTENANCE GUIDELINES, NORMAL MAINTENANCE REQUIREMENTS ARE AS FOLLOWS:
 - 4.1. THE INTAKE PIPE ENDCAP SHOULD BE INSPECTED TO CHECK THAT THE ORIFICE IS NOT CLOGGED AND IS FLOWING AT A SUBSTANTIAL RATE.
 - 4.2. THE DISCHARGE PIPE(S) SHOULD BE VISUALLY INSPECTED TO DETERMINE IF THE PIPE(S) REQUIRE CLEANING. ALL DEBRIS FOUND IN THE PIPE SHOULD BE REMOVED.
 - 4.3. BERMS AND OTHER STRUCTURES SHOULD BE INSPECTED FOR BREAKS. REPAIRS, IF NECESSARY, SHOULD BE PERFORMED IMMEDIATELY.
5. FAILURE TO EFFECTIVELY MAINTAIN THESE SYSTEMS WILL RESULT IN

INSUFFICIENT DRAWDOWN OF DETAINED STORMWATER RUNOFF AFTER RAINFALL EVENTS.

6. THE UPSTREAM HARCO DRAIN BASIN SHOULD BE INSPECTED PER MANUFACTURER RECOMMENDATIONS TO SEE IF WATER IS BYPASSING THE MEDIA FILTER. WATER FLOWING THROUGH THE MEDIA BYPASS OVERFLOW PIPE COULD INDICATE THAT THE FILTER MEDIA HAS ACCUMULATED EXCESS DEBRIS AND SILT.
7. DEBRIS SHOULD BE REMOVED FROM HARCO DRAIN BASINS AND ASSOCIATED PIPING IN ACCORDANCE WITH MANUFACTURER RECOMMENDATIONS.
8. PER SWFWMD OPERATION AND MAINTENANCE GUIDELINES, EFFLUENT FILTERS SHOULD DISCHARGE THE DESIGN TREATMENT VOLUME WITHIN A 36-HOUR PERIOD. OBSERVATIONS SHOULD BE MADE PERIODICALLY TO VERIFY THAT THE FILTER IS PASSING THE RUNOFF WITHIN THE DESIGN TIME FRAME.
9. PER SWFWMD OPERATION AND MAINTENANCE GUIDELINES, RUNOFF REMAINING IN THE DESIGN TREATMENT VOLUME LONGER THAN 72 HOURS FOLLOWING A STORM EVENT IS INDICATIVE OF A CLOGGED OR SILT LADEN FILTER, SHOULD THIS OCCUR, THE MEDIA MAY NEED TO BE REPLACED. THE OWNER SHOULD RETAIN A QUALIFIED CONTRACTOR AND SHOULD CONSULT WITH THE ENGINEER PRIOR TO REPLACING FILTER MEDIA.
10. REFERENCES TO A SPECIFIC WATER MANAGEMENT DISTRICT (WMD) IN THESE

NOTES ARE INCLUDED FOR GUIDANCE AND INFORMATIONAL PURPOSES. THE ENGINEER SHALL ADHERE TO THEIR LOCAL WMD REQUIREMENTS AND REGULATIONS.

FILTER MEDIA

1. FILTER MEDIA SHALL BE BOLD & GOLD ECT3 MEDIA. BOLD & GOLD ECT3 MEDIA IS A BIOSORPTION ACTIVATED MEDIA (BAM) THAT PROVIDES STORMWATER TREATMENT IN CONJUNCTION WITH OTHER STRUCTURAL OR NON-STRUCTURAL STORMWATER BEST MANAGEMENT PRACTICES (BMPs).
2. PER SAINT JOHNS RIVER WATER MANAGEMENT DISTRICT (SJRWMD), AT LEAST 2 FEET OF SUITABLE FINE TEXTURED GRANULAR MEDIA SHALL BE USED FOR FILTRATION APPLICATIONS.
3. THE ENGINEER SHALL REFER TO MANUFACTURER SPECIFICATIONS FOR ADDITIONAL DETAILS AND DESIGN CRITERIA RELATED TO BOLD & GOLD ECT3 MEDIA.

R-TANK UNITS

1. R-TANK UNITS ARE INJECTION MOLDED PLASTIC TANK PLATES ASSEMBLED TO FORM A 95% VOID MODULAR STRUCTURE OF PREDESIGNED HEIGHT (CUSTOM FOR EACH PROJECT).
2. THE ENGINEER SHALL REFER TO MANUFACTURER SPECIFICATIONS FOR ADDITIONAL DETAILS AND DESIGN CRITERIA RELATED TO R-TANK UNITS.

SUMMIT



ENGINEER OF
RECORD TO
REVIEW, APPROVE
AND ENDORSE
FINAL SITE
SPECIFIC DESIGN.

FOR ADDITIONAL INFORMATION PLEASE CONTACT:
ACF ENVIRONMENTAL 1-800-448-3636
www.acfenvironmental.com



SUMMIT HPUF POWERED BY BOLD & GOLD MEDIA - PLAN DETAIL

PROJECT NAME

LOCATION, STATE

SITE DESIGNATION: ##

ACF ENVIRONMENTAL, 1-800-448-3636, www.acfenvironmental.com

DRAWN BY

NH

DATE

03/13/2019

SHEET NO.

1 of 2

HOLE TO BE DRILLED INTO PIPE ENDCAP TO MATCH DESIGN ORIFICE DIMENSIONS AND ELEVATION. IF APPLICABLE, EXISTING ORIFICE ON POND OUTFALL STRUCTURE SHALL BE GROUTED CLOSED. ALL OTHER OVERFLOW WEIRS ABOVE DESIGN TREATMENT VOLUME TO REMAIN OPEN.

EXISTING / PROPOSED
STORMWATER WET
DETENTION POND

TREATMENT VOLUME

CONTROL ELEVATION

PERMANENT POOL

ALL PIPING SHOULD
BE SLOPED TO PROVIDE
SUFFICIENT DRAINAGE

TRASHGUARD PLUS
OR EQUIVALENT

DESIGN ENGINEER TO PROVIDE
SUFFICIENT DRIVING HEAD FOR
UP-FLOW CONFIGURATION

PIPE CONNECTION

HARCO DRAIN
BASIN

MEDIA BYPASS OVERFLOW PIPE.
WATER FLOWING THROUGH THIS PIPE
INDICATES THAT THE MEDIA MAY NEED
TO BE REPLACED.

HARCO DRAIN
BASIN

TO OUTFALL

PIPE CONNECTION

1
2 SUMMIT HPUF

0 5' 10'
SCALE 1" = 5'

GEOSYNTHETICS

1. A GEOTEXTILE ENVELOPE IS REQUIRED TO PREVENT BACKFILL MATERIAL FROM ENTERING THE R-TANK MODULES. PER MANUFACTURER RECOMMENDATIONS, THE STANDARD GEOTEXTILE SHALL BE AN 8 OZ PER SQUARE YARD NONWOVEN GEOTEXTILE (ACF N080 OR EQUIVALENT).
2. THE ENGINEER SHALL REFER TO MANUFACTURER SPECIFICATIONS FOR ADDITIONAL DETAILS AND DESIGN CRITERIA RELATED TO THE 30 MIL. PVC LINER.
3. PER MANUFACTURER RECOMMENDATIONS, FOR INSTALLATIONS SUBJECT TO TRAFFIC LOADS AND/OR WHEN REQUIRED BY PROJECT PLANS, INSTALL GEOGRID (ACF BX12 OR EQUIVALENT) TO REINFORCE BACKFILL ABOVE THE R-TANK SYSTEM.
4. THE ENGINEER SHALL REFER TO MANUFACTURER SPECIFICATIONS FOR ADDITIONAL DETAILS AND DESIGN CRITERIA RELATED TO ALL GEOSYNTHETICS.

BACKFILL & COVER MATERIAL

1. PER MANUFACTURER RECOMMENDATIONS, STONE (ANGULAR AND SMALLER THAN 1.5" IN DIAMETER) OR SOIL (GW, GP, SW, OR SP AS CLASSIFIED BY THE UNIFIED SOIL CLASSIFICATION SYSTEM) SHALL BE USED BELOW THE R-TANK SYSTEM (MINIMUM DEPTH SPECIFIED BY MANUFACTURER).
2. PER MANUFACTURER RECOMMENDATIONS, SIDE AND TOP BACKFILL MATERIAL MUST BE FREE FROM LUMPS, DEBRIS, AND ANY SHARP OBJECTS THAT COULD CUT, PUNCTURE, OR OTHERWISE DAMAGE THE GEOTEXTILE. THE ENGINEER SHALL REFER TO R-TANK MANUFACTURER SPECIFICATIONS FOR TRAFFIC & NON-TRAFFIC / GREEN SPACE APPLICATIONS.
3. PER MANUFACTURER RECOMMENDATIONS, STRUCTURAL FILL SHALL CONSIST OF GRANULAR MATERIALS MEETING THE GRADATIONAL REQUIREMENTS OF SM, SP, SW, GM, GP, OR GW AS CLASSIFIED BY THE UNIFIED SOIL CLASSIFICATION SYSTEM.
4. THE ENGINEER SHALL REFER TO MANUFACTURER SPECIFICATIONS FOR RECOMMENDED DEPTHS AND COMPACTION OF BACKFILL & COVER MATERIAL.

HARCO DRAINAGE STRUCTURES

1. HARCO DRAIN BASINS ARE FABRICATED FROM PVC PIPE STOCK. HARCO EMPLOYS A THERMO-MOLDING PROCESS TO ENSURE A CONSISTENT WATERTIGHT SEAL THROUGHOUT THE DRAINAGE STRUCTURE AND ITS OUTLET STUBS.
2. THE ENGINEER SHALL REFER TO MANUFACTURER SPECIFICATIONS FOR ADDITIONAL DETAILS AND DESIGN CRITERIA RELATED TO HARCO DRAINAGE STRUCTURES.

DESIGN CONSIDERATIONS

1. THE ENGINEER SHALL PROVIDE SUFFICIENT DRIVING HEAD FOR UP-FLOW CONFIGURATION PER THE MEDIA MANUFACTURER AND ACF DESIGN SPECIFICATIONS AND RECOMMENDATIONS.
2. THE ENGINEER SHALL SIZE THE SUMMIT HPUF TO ACHIEVE A MINIMUM HYDRAULIC RESIDENCE TIME (HRT) PER THE MEDIA MANUFACTURERS RECOMMENDATIONS.
3. THE HRT CAN BE DIVIDED BY THE TOTAL POROSITY OF THE BOLD & GOLD ECT3 MEDIA TO CALCULATE AN EMPTY BED CONTACT TIME (EBCT).
4. THE MINIMUM MEDIA VOLUME CAN BE CALCULATED BY MULTIPLYING THE EBCT BY THE DESIGN FLOW RATE TO THE SUMMIT HPUF.
5. THE FOOTPRINT CAN BE CALCULATED BY DIVIDING THE MEDIA VOLUME BY THE DESIGN DEPTH OF THE BOLD & GOLD ECT3 MEDIA.
6. IT IS RECOMMENDED THAT THE ENGINEER APPLY A SAFETY FACTOR APPROPRIATE FOR THE SPECIFIC PROJECT APPLICATION DURING THE CALCULATIONS.

$$EBCT = HRT / n$$

Where n = Total media porosity

$$\text{Min. Media Volume} = EBCT \times Q$$

Where Q = Design flow rate to the Summit HPUF

$$\text{Media Footprint} = \text{Min. Media Volume} / y$$

Where y = Design depth of filter media

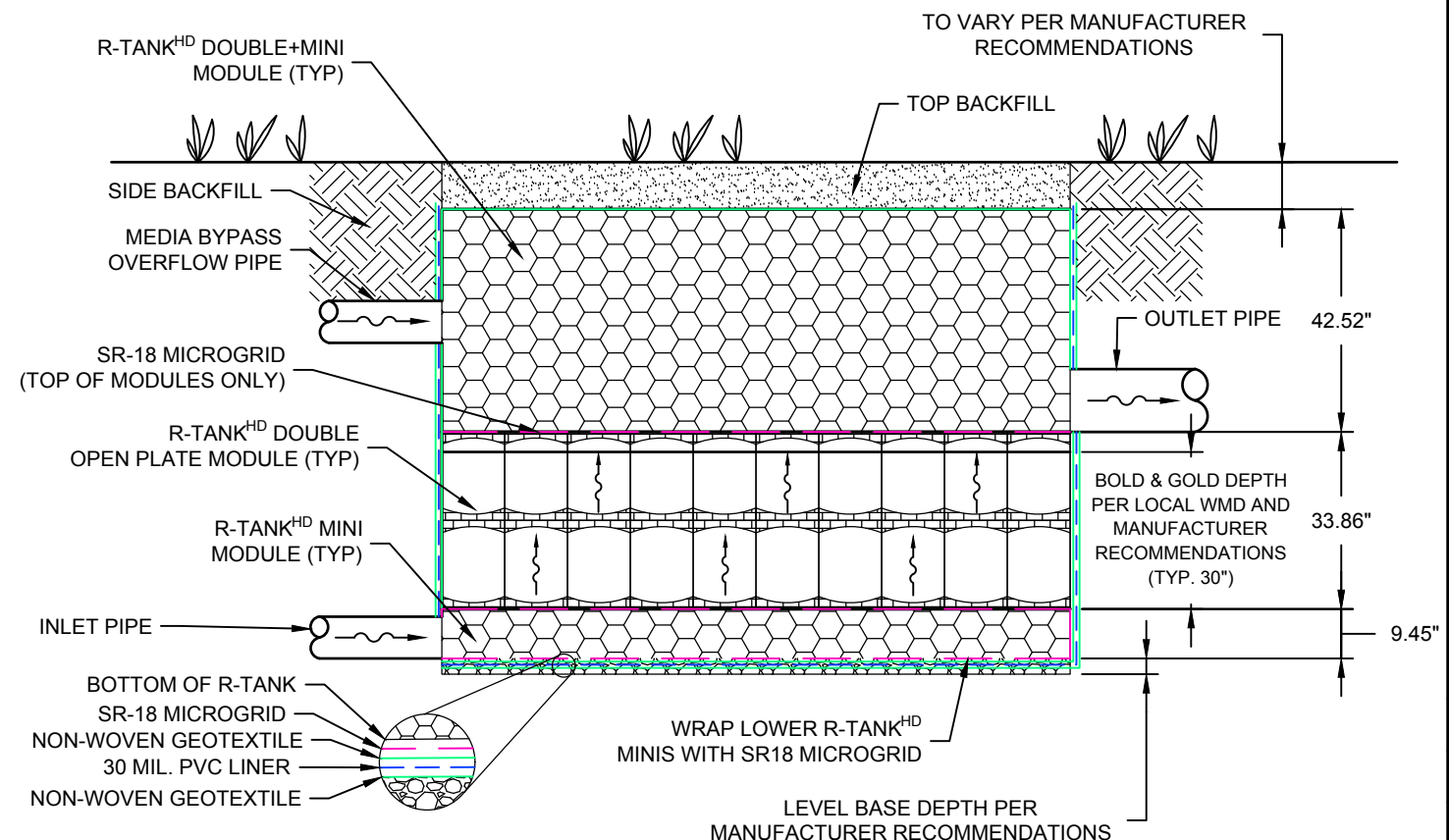
Note: Design Engineer to apply a safety factor as appropriate.

1
2

DETAIL

SECTION VIEW OF SUMMIT HPUF

SCALE: N.T.S.
XREF:



ENGINEER OF
RECORD TO
REVIEW, APPROVE
AND ENDORSE
FINAL SITE
SPECIFIC DESIGN.

FOR ADDITIONAL INFORMATION PLEASE CONTACT:
ACF ENVIRONMENTAL 1-800-448-3636
www.acfenvironmental.com



SUMMIT HPUF POWERED BY BOLD & GOLD MEDIA - SECTION DETAIL

PROJECT NAME
LOCATION, STATE

SITE DESIGNATION: ##

ACF ENVIRONMENTAL, 1-800-448-3636, www.acfenvironmental.com

DRAWN BY
NH

DATE
03/13/2019

SHEET NO.

2 of 2

APPENDIX J

BMP Trains Removal Efficiencies

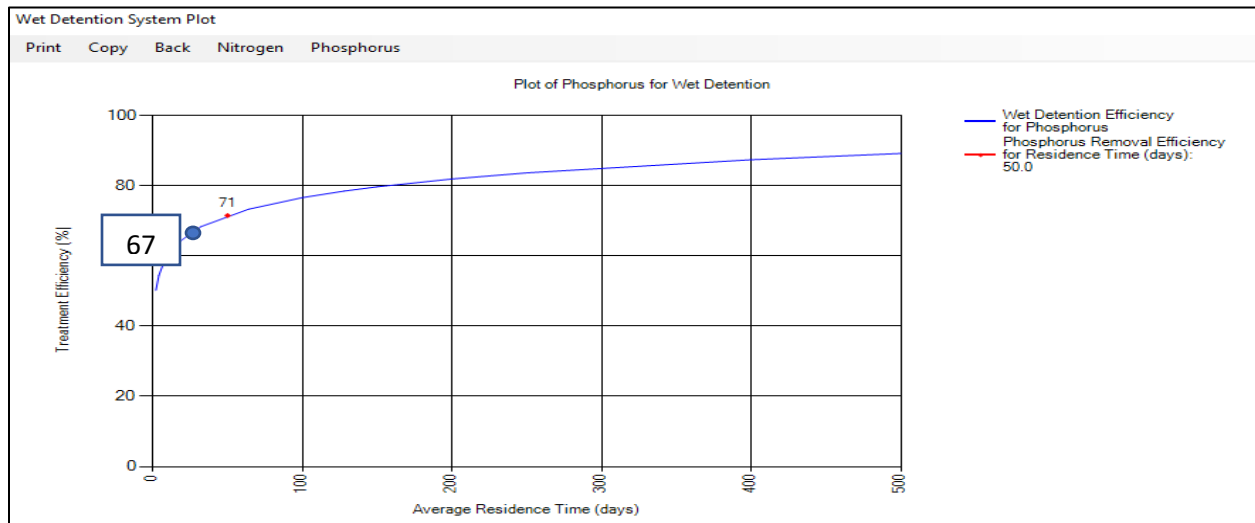
DESCRIPTION OF MEDIA		PROJECTED TREATMENT PERFORMANCE *			TYPICAL OPERATING LIMITING FILTRATION RATE (in/hr)
Media and Typical Location in BMP Treatment Train	MATERIAL	TSS REMOVAL EFFICIENCY	TN REMOVAL EFFICIENCY	TP REMOVAL** EFFICIENCY	
B&G ECT ^(ref A) Follow a BMP As a stand alone	Tire Chips ¹ Expanded Clay ²	60% 70%	25% 45%	25% 45%	96 in/hr
B&G OTE ^(ref A,B) Up-flow Filter at Wet Pond or Dry Basin Outflow (FILTRATION)	Organics ⁸ Tire Chips ¹ Expanded Clay ⁴		45%	45%	96 in/hr
B&G ECT3 ^(ref C) After Wet Detention using Up-flow Filter As a stand alone	Expanded Clay ⁴ Tire Chip ¹	60% 70%	25% 45%	25% 45%	96 in/hr
SAT ^(ref D) A first BMP, as a Down-flow Filter (FILTRATION)	Sand ³	85%	30%	45%	2 in/hr
B&G CTS12 ^(ref E,F) Down-Flow Filters 12" depth*** at wet pond or dry basin pervious pave, tree well, rain garden, sw ale, and strips	Clay ⁶ Tire Crumb ⁵ Sand ⁷ & Topsoil ⁹	90%	60%	90%	5.0 in/hr
B&G CTS 24 ^(ref E,F) Down-Flow Filters 24" depth*** at wet pond or dry basin pervious pave, tree well, rain garden, sw ale, and strips	Clay ⁶ Tire Crumb ⁵ Sand ⁷ & Topsoil ⁹	95%	75%	95%	5.0 in/hr

NOTES acceptable by review agencies in State of Florida as of September 2020
 *All Effectiveness Estimates to nearest 5%; **Phosphorus removal has limited life expectancy; ***24" depth has TN and TP removals of 75 & 95%
 acronyms B&G - BOLD & GOLD; SAT - Sand Austin Tx; ECT- Expanded Clay and Tire; ECT3 Expanded Clay and Tire in Treatment Train
¹ Tire Chip 3/8" and no measurable metal content (approximate dry density = 730 lbs/CY)
² Expanded Clay 5/8 and 3/8 blend (approximate dry density = 950 lbs/CY)
³ Sand ASTM C-33 with no more than 3% passing # 200 sieve (approximate dry density = 2200 lbs/CY)
⁴ Expanded Clay 3/8 in blend (approximate density = 950 lbs/CY)
⁵ Tire Crumb 1-5 mm and no measurable metal content (approximate density = 730 lbs/CY)
⁶ Medium Plasticity typically light colored Clay (approximate density = 2500 lbs/CY)
⁷ Sand with less than 5% passing #200 sieve (approximate density = 2200 lbs/CY)
⁸ Organics: Either compost (approximate density of 700 lbs/CY) Class 1A Compost or wood chips (sawdust) without pesticides
⁹ Local top soil is used over CTS media in dry basins, gardens, swales and strips, is free of roots & debris but is not used in other BMPs.

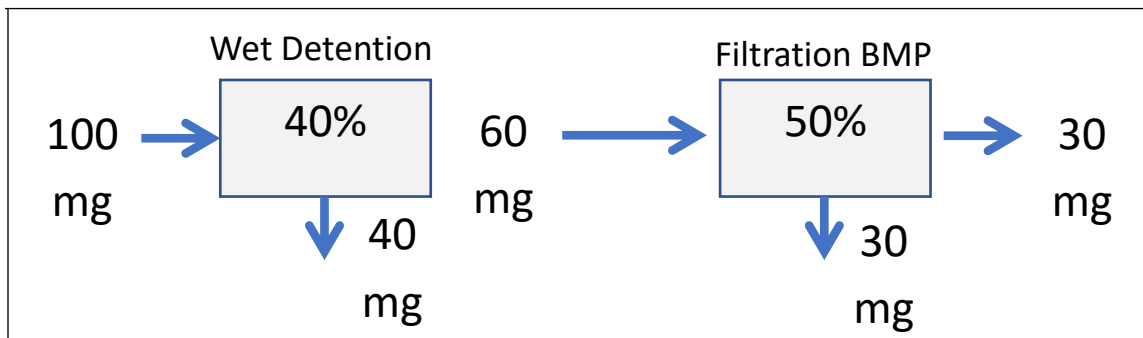
A - Demonstration Bio Media for Ultra-urban Stormwater Treatment, Wanielista, et.al. FDOT Project BDK78 977-19, 2014
 B - Nutrient Reduction in a Stormwater Pond Discharge in Florida, Ryan, et al, Water Air Soil Pollution, 2010
 C - Up-Flow Filtration for Wet Detention Ponds, Wanielista and Flint, Florida Stormwater Association, June 12, 2014.
 D - City of Austin Environmental Criteria Manual, Section 1.6.5, Texas, 2012
 E - Nitrogen Transport and Transformation in Retention Basins, Marion Co, FL, Wanielista, et al, State DEP, 2011
 F - Improving Nitrogen Efficiencies in Dry Ponds, Williams and Wanielista, Florida Stormwater Association, June 18 2015

15. Annual Effectiveness for BMPs in Series

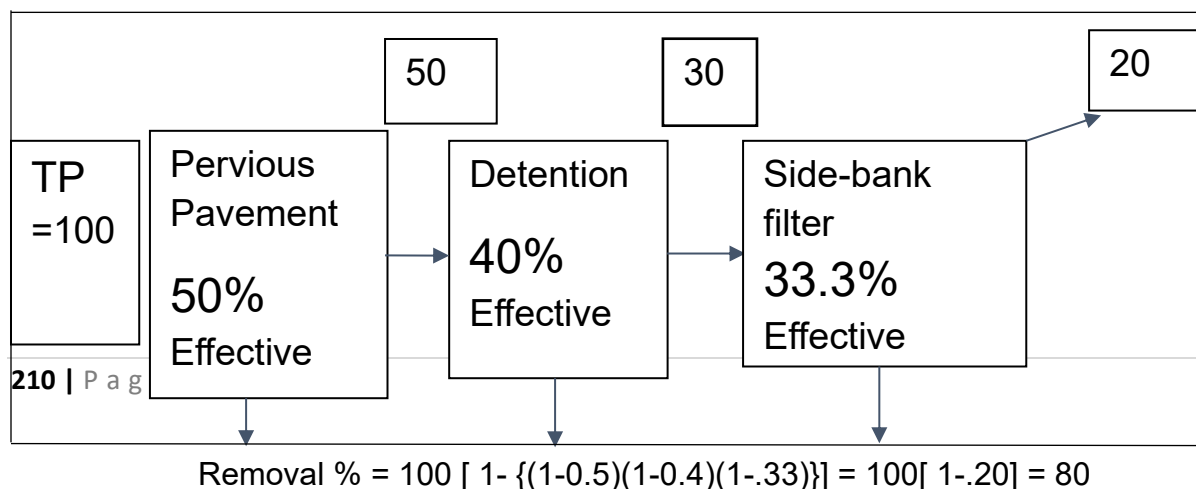
Retention in series: When the runoff from a catchment enters one BMP and the discharge enters into another BMP without additional catchment flow, the BMPs are said to be in series for the catchment. Examples for retention BMPs in series are pervious pavement followed by a retention basin and rain garden followed by exfiltration. Without any additional runoff to the second BMP, the annual capture effectiveness is calculated from the total capture depth of the two retention systems. The annual capture effectiveness as a function of treatment volume is shown in the Figure below; for example problem 3 as 75% removal for a retention basin (use “plot” button) with a treatment depth of 0.552 inches over the catchment. The applicant wishes to get additional credit to be applied to another discharge in the same watershed. It was decided



BMPs in Series for which the removal mechanisms are not the same or neither follows the same removal principles: An example is a wet pond followed by a filter. The wet pond produces a 40% removal of TN and the filter removes 50% of the remaining TN. The following diagram illustrates the calculations. For this example, there is an overall 70% removal of TN. The removal is not 90%.



Another example is pervious pavement, wet pond, and filter BMPs (note wet pond removal decreased because of the presence of particulate removal by the pervious pavement):



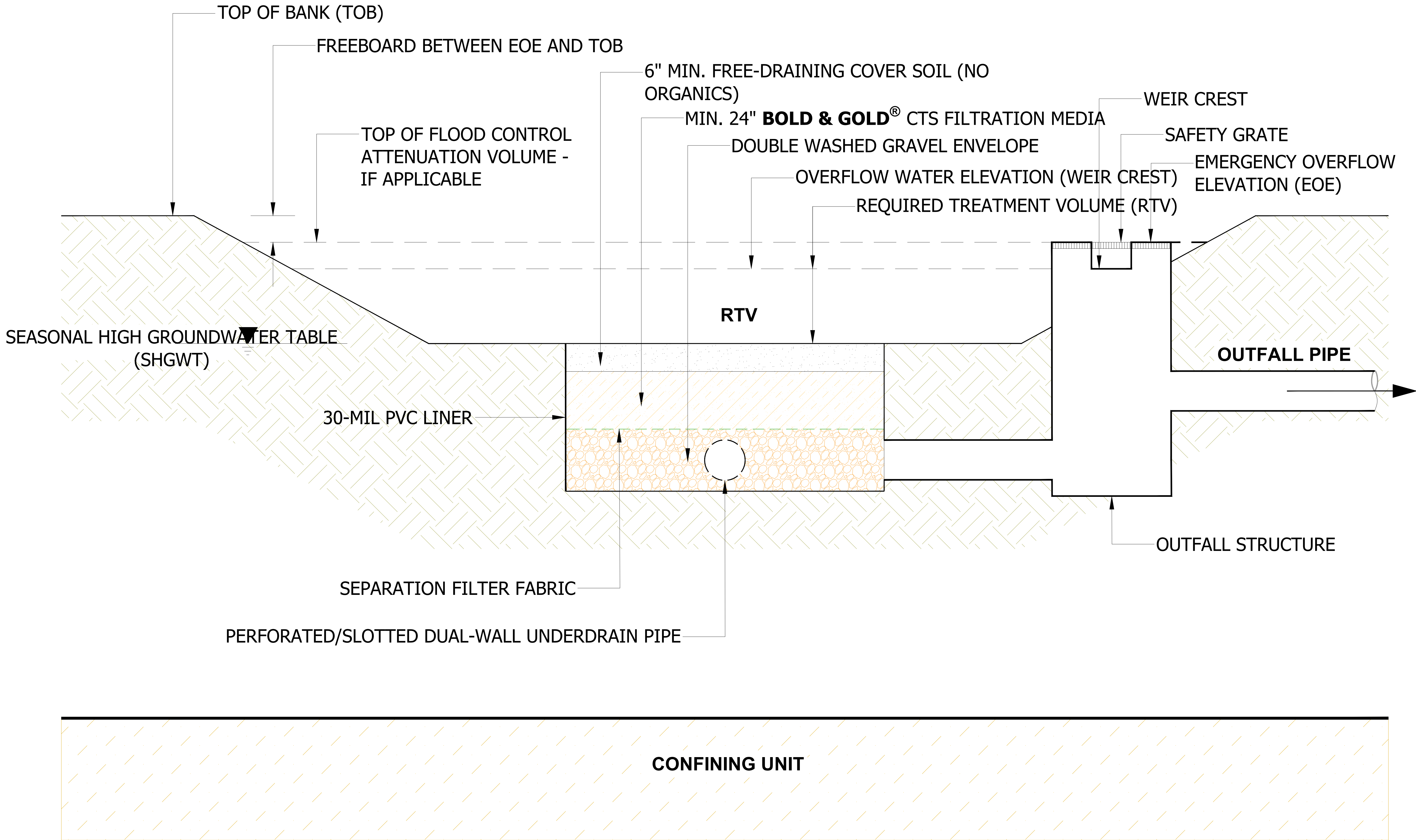
APPENDIX K

Example of Large Footprint BioretentionPond

B&G Dry Detention Pond with Underdrain Filtration System.dwg

9/12/2019

lkengogo



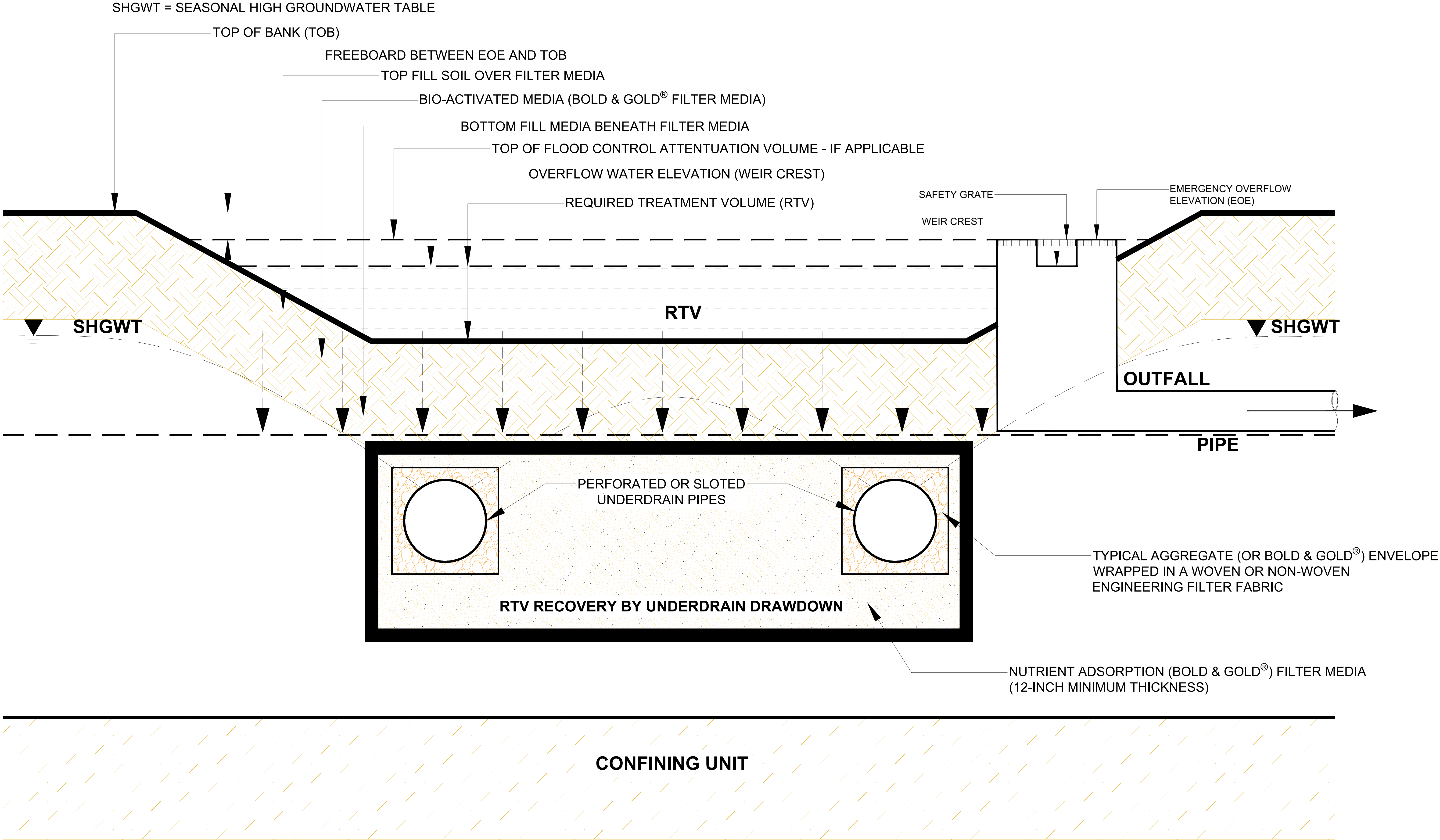
BOLD & GOLD® CTS FILTRATION MEDIA USED AS A FILTER MEDIA AT THE BOTTOM OF A POND



TITLE: Section Details for Dry Detention with Underdrain Filtration System using Bold & Gold® Media		DATE: 09/12/2019		DRAWN: IGA	CHECKED: IGA
		PROJECT #:		ECS--yy####	
PROJECT NAME:		XYZ			
PROJECT LOCATION:		Street Address City, State, Zip Code			
BOLD & GOLD® Bold & Gold® Filtration Media (Biosorption Activated Media - BAM)					
 Environmental Conservation Solutions, LLC. 2346 Vulture Road Apopka, FL 32703					

THIS IS A GENERIC CADD DETAIL SHOWING THE REFERENCED SECTION OF A BEST MANAGEMENT SYSTEM USING BOLD & GOLD® FILTRATION MEDIA FOR NUTRIENT REDUCTION. THE DIMENSIONS AND FIT ARE NOT APPLICABLE TO THE SPECIFIC PROJECT, BUT TO PROVIDE GENERIC SECTION DETAILS TO THE DESIGN ENGINEER. IT IS NOT A SUBSTITUTE FOR PROFESSIONAL JUDGEMENT, AS THE DESIGN ENGINEER IS RESPONSIBLE TO COMPLY FULLY WITH APPLICABLE LAWS AND REGULATIONS GUIDING THE DESIGN AND INSTALLATION OF SUBSURFACE STORMWATER SYSTEMS. ENVIRONMENTAL CONSERVATION SOLUTIONS, LLC. DOES NOT BEAR ANY LIABILITY IN THE USE OF THE GENERIC DETAILS.

B&G_Detention Underdrain Filtration System.dwg
11/16/2017
lkengogo



TITLE: Section Details for Detention Underdrain Filtration System with Bold & Gold® Media					DRAWN: IGA	
					PROJECT #: ECS-yy#### CHECKED: IGA	
DATE: mm/dd/yyyy						
REV	DRW	CHK	DESCRIPTIONS			
PROJECT NAME:				XYZ		
PROJECT LOCATION:						
Street Address						
City, State, Zip Code						
BOLD & GOLD®						
Bold & Gold® Filtration Media (Biosorption Activated Media - BAM)						
			Environmental Conservation Solutions, LLC. 2346 Vulcan Road, Apopka, FL 32703			
Scale: NTS						
SHEET 00						

THIS IS A GENERIC CADD DETAIL SHOWING THE REFERENCED SECTION OF THE PIPE-R™ RESERVOIR SYSTEM. THE DIMENSIONS AND FIT ARE NOT APPLICABLE TO THE SPECIFIC PROJECT, BUT TO PROVIDE GENERIC SECTION DETAILS TO THE DESIGN ENGINEER. IT IS NOT A SUBSTITUTE FOR PROFESSIONAL JUDGEMENT, AS THE DESIGN ENGINEER IS RESPONSIBLE TO COMPLY FULLY WITH APPLICABLE LAWS AND REGULATIONS GUIDING THE DESIGN AND INSTALLATION OF SUBSURFACE STORMWATER SYSTEMS. ENVIRONMENTAL CONSERVATION SOLUTIONS, LLC. DOES NOT BEAR ANY LIABILITY IN THE USE OF THE GENERIC DETAILS.

wood.