Documentation in Support of Category 4e for WBID 1497H: Lake Morton

Waterbody/Watershed Identification

Organization	City of Lakeland (COL) – Local Government Agency
Point of Contact	Laurie Smith, 407 Fairway Avenue, Lakeland, FL 33801, laurie.smith@lakelandgov.net, 863-834-6276
Waterbody(s)	WBID ID 1497H – Lake Morton
No. Waterbody / Pollutant Combinations	1 waterbody segment; Verified and/or Impaired for Nutrients (Chlorophyll-a, Total Nitrogen, and Total Phosphorous) on the Sarasota Bay-Peace-Myakka Group 3/ Cycle 4 Assessment.
EPA Completed TMDL	EPA has not completed a TMDL for the impaired waterbody segment listed in this document.

Description of Baseline Conditions

Watershed(s)	Basin Group 3, Sarasota Bay- Peace- Myakka (HUC 03100101)
Baseline Data	The available Cycle 3 data for Lake Morton are provided below. Bioassessments and Annual geometric mean (AGM) Chlorophyll-a (CHLA), Total Phosphorous (TP), and Total Nitrogen (TN) were reviewed to assess verified impairments during the 2009 through 2012 and 2013 through 2020 Verified periods. The long-term true color and alkalinity geometric means were calculated to be 14.66 PCU and 62.94 mg/L, respectively, using the long-term period of record data from 2009 to 2020. Data were obtained from Impaired Waters Run 60.

WBID	Waterbody Name	Parameter	Criterion Concentration or Threshold Not Met	Data*
1497H	Lake Morton	Nutrients (CHLA)	≤ 20 µg/L	AGMs# 2009 (53 µg/L) 2010 (62 µg/L) 2011 (64 µg/L) 2012 (52 µg/L) 2013 (67 µg/L) **2015 (57 µg/L)** 2016 (83 µg/L) **2017 (67 µg/L)** **2018 (90 µg/L)** **2019 (79 µg/L)** 2020 (71 µg/L)

WBID	Waterbody Name	Parameter	Criterion Concentration or Threshold Not Met	Data*
1497H	Lake Morton	Nutrients (TP)	Chl-a AGM ≤ 20 µg/L, TP AGM ≤ 0.09 mg/L; If Chl-a has Insufficient or No Data to calculate AGM or if Chl-a AGM > 20 µg/L, TP AGM ≤ 0.03 mg/L	AGMs 2009 (0.08 mg/L) 2010 (0.10 mg/L) 2011 (0.09 mg/L) 2012 (0.08 mg/L) 2013 (0.10 mg/L) 2014 (0.08 mg/L) **2015 (0.09 mg/L)** 2016 (0.09 mg/L) **2017 (0.12 mg/L)** **2018 (0.12 mg/L)** **2019 (0.09 mg/L)** 2020 (0.13 mg/L)
1497H	Lake Morton	Nutrients (TN)	Chl-a AGM ≤ 20 µg/L, TN AGM ≤ 1.91 mg/L; If Chl-a has Insufficient or No Data to calculate AGM or if Chl-a AGM > 20 µg/L, TN AGM ≤ 1.05 mg/L	AGMs 2009 (1.54 mg/L) 2010 (1.31 mg/L) 2011 (1.88 mg/L) 2012 (1.61 mg/L) 2013 (1.54 mg/L) 2014 (1.92 mg/L) **2015 (1.77 mg/L)** 2016 (2.36 mg/L) **2017 (1.88 mg/L)** **2018 (1.98 mg/L)** **2019 (1.76 mg/L)** 2020 (2.27 mg/L)

***Bolded values represent data used in the 2013 to 2020 verified period assessment.** Non-bolded values either do not meet the data sufficiency requirements used by FDEP to verify impairment, or they represent data from previous verified impairment assessment periods.
#Data for 2014 were not available in IWR Run 60.

Map	**Attachment 1** delineates the watershed area.

Evidence of Watershed Approach

Area of Effort	Lake Morton is located within the Peace River watershed and the immediate contributing watershed to the lake is approximately 160 acres in size. The lake is located within the Lakeland/Bone Valley Upland lake region of Florida, in the eastern portion of Polk County. Lake Morton encompasses a surface area of approximately 39 acres, with a maximum water depth of 22.0 feet and an average water depth of 11.8 feet. Lake Morton is not influenced by inflows from any other lakes and its waters discharge to either Lake Hollingsworth and/or Lake Horney via an adjustable control structure and a downstream in-pipe diversion dam (City of Lakeland 2010).
Key Stakeholders Involved and Their Roles	The City of Lakeland oversees the Lake Morton assessment and restoration projects. The Southwest Florida Water Management District (SWFWMD) and/or Florida Department of Environmental Protection (FDEP) may be involved in future restoration projects by providing cooperative funding.
Watershed Plan & Other	*Impaired Waters Listing* The area includes the watershed drainage area from the Lake Morton watershed within 1497H. This WBID is impaired for nutrients (chlorophyll-a and TP) based on the years the

Supporting Documentation	AGMs and sample sizes were exceeded during the Verified Period (2009-2015). In FDEP's latest version of the Comprehensive Verified Impaired List (August 18, 2020), Lake Morton is not listed as impaired for total nitrogen (TN). However, according to FDEP's preliminary Biennial Assessment Verified List, TN concentrations in Lake Morton meet the listing threshold for the verified list based on data obtained during the 2013 through 2020 verified period assessment. *Watershed Plan* The City's overall Watershed Plan to restore Lake Morton includes projects to improve water quality in the lake. The City will focus on the implementation of structural and non-structural stormwater improvements in the watershed and in the lake, and will also include shoreline restoration, aquatic vegetation management, sediment management, stormwater quality improvement, street sweeping and public education. In the Atkins and ESA **2019 Water Quality Management Plan,** laboratory analyses of surface water monitoring data and phytoplankton presence indicate that in-lake water quality is limited by both TN and TP and that projects involving enhancement and/or maintenance of native emergent or submerged vegetation should be a priority (further detail is provided in the Restoration Work Section). *Supporting Documentation* The **2019 Water Quality Management Plan** found that the large presence of waterfowl along the lake's shoreline, and prior results from ERD (2002) suggest that sediments are a likely source of internal nutrient loads to the lake, and that artificial circulation would likely improve water quality. Recommendations included implementation of a BACI study on the benefits of whole-lake circulation and collection and analysis of locally derived paleo data to quantify potential impacts from sediment flux. Additionally, the expansion of submerged aquatic vegetation (SAV) within the lake and emergent aquatic vegetation (EAV) along the lake fringe was listed as a priority to improve water quality via assimilation of nutrients from the water column and the soil-pore water. Therefore, water quality restoration projects will also focus on re-vegetation efforts, whole lake aeration, shoreline restoration, and sediment management in addition to addressing stormwater loads. Geosyntec recently completed a Stormwater BMP Feasibility Study of Lake Morton (Geosyntec, In Progress). The study includes further delineation of stormwater contributing areas, stormwater quality assessment and laboratory analysis, water quality modeling to determine pollutant loading capacities and the development and ranking of proposed BMPs for stormwater treatment. Documentation will be provided to FDEP once the final report is complete. The preliminary sediment characterization results from Wood's Sediment Characterization study found large deposits of soft sediment (estimated 139,463 cubic yards) in Lake Morton (please see **Attachment 2**). Phosphorous fractionation results show somewhat elevated concentrations of biologically available phosphorous (166 – 3,984 mg/kg) within areas of the lake with the greatest soft sediment accumulation. Sampling locations and preliminary results can be found in the **Wood Lake Morton 4e Plan Technical Support Services Technical Memorandum DRAFT (2021)**. Due to the high potential for internal loading, water quality restoration projects will also need to focus on sediment management alternatives such as chemical amendment and/or targeted sediment removal.

	A groundwater seepage screening level study is currently being designed by Wood to confirm if groundwater is a contributor to in-lake water quality. Four groundwater seepage meters are scheduled to be installed and monitored. Additional documentation will be provided to FDEP upon completion of this study.
Point Sources and Indirect Source Monitoring (Sites)	There are 54 stormwater discharges in the Lake Morton watershed, including 36 minor outfalls, one retention/detention outfalls, one lake/creek outlet, 15 end of pipe inputs, and one major outfall (please see **Attachment 3**). The existing residential developments within the watershed utilize sanitary sewer for wastewater treatment provided by the City of Lakeland. The entire area is regulated by a MS4 permit # FLS000015-004, issued by FDEP to Polk County and co-permittee City of Lakeland. Note: Generic Permits for stormwater discharge from large and small construction activities are considered temporary; therefore, are not included in this listing.
Nonpoint Sources	The Lake Morton watershed consists mostly of residential and commercial land use, with some institutional areas (please see **Attachments 4 and 5**). Most of the shoreline vegetation has been modified as a result of residential and commercial encroachment, predominantly including landscaping activities. The natural shoreline has experienced significant erosion in the past due to runoff from surrounding developed areas. The Water Quality Diagnostic Evaluation Report of Lake Morton (ERD 2002) identified nutrient inputs from groundwater seepage and recycling from bottom sediments. The southern side of the Lake Morton watershed slopes towards the lake and is comprised of type A soils (please see **Attachment 6**). This, in addition to being located between 80 and 90-foot potentiometric surface elevations for the Floridan Aquifer, indicates a potential driver of groundwater. A groundwater seepage screening level study is currently being designed by Wood to confirm if groundwater is a contributor of nutrients. As previously discussed, the preliminary results from Wood's Sediment Characterization study of Lake Morton indicate presence of localized soft sediment, within the center of the lake, with high potential for phosphorous release. Additional sediment samples may be collected and analyzed to determine the impact that internal nutrient cycling from sediment flux has on internal loading and water quality conditions in the lake. The primary nonpoint sources of nutrients are assumed to be internal sediment loading, groundwater seepage and stormwater runoff. Several studies are currently being conducted to characterize both internal and external nutrient nonpoint sources that impact in-lake water quality.
Water Quality Criteria	Lake Morton is a low-color lake with high alkalinity (lake assessment type 2). Based on the procedure for determining numeric nutrient criteria (NNC), outlined in Rule 62-30.531, F.A.C, the NNC for nutrients in Lake Morton are 20 ug/L, 0.03 – 0.09 mg/L, and 1.05 – 1.91 mg/L for chlorophyll-a, total phosphorus, and total nitrogen, respectively, which is anticipated to be achieved upon successful implementation of the Water Quality Restoration Plan.
Restoration Work	Individual project locations, descriptions, cost, and completion dates (actual and anticipated) are included below and summarized in greater detail within **Attachment 7**.

Ongoing

- The City of Lakeland has a robust street sweeping program in place where the streets within the Lake Morton watershed are swept approximately once to twice per month; downtown Lakeland streets within the contributing drainage of Lake Morton are swept twice per week. The City is currently reviewing options that would allow tracking of street debris, and subsequently nutrient load, removed within distinct drainage basins. During the previous NPDES reporting year (October 1, 2019 through September 30, 2020) a total of 1,896.29 tons of street debris was swept from City streets, removing 1,032.62 lbs, of TN and 2,257.07 lbs. of total phosphorus loading to City lakes. See **Attachment 8** for the current street sweeping routes and schedule.
- Polk County passed a Fertilizer Ordinance in 2013, which was adopted by the City of Lakeland. See **Attachment 10** for ordinance document. Additional relevant City ordinances are provided at the end of this document for reference.
- The City regularly participates in educational and outreach events that provide education regarding stormwater pollution and lake ecology. The education and outreach programs consist of public events, social and digital media, and school presentations:
    - Public events such as the annual Green Celebration Earth Day event every April
    - Annual Water, Wings & Wild Things educational event sponsoring more than 2,500 second grade students from Polk County
    - School presentations to more than 10 classrooms annually as part of the Great American Teach in each November (K-5)
    - Cardboard Boat Challenge and Lakes Festival attended by more than 500 participants each October
    - Social Media (City of Lakeland Facebook and Instagram) posts featuring “Water Warriors Tuesday” and “Lakefront Friday” with 486,000 impressions in FY19 and up almost 300,000 in FY20
    - The City has produced public service announcements featuring Toby’s Water Warriors (Toby the Turtle, Finn the Fish, Ollie the Otter, and Hope the Heron) highlighting the importance of healthy lakes and stormwater pollution prevention actions that are shown before each movie screening at Lakeland movie theaters, (as well as on multiple cable TV channels combining for more than 2,000,000 views annually
    - Distribution of educational materials including educational activity books, Adopt a Lake, Living at the Lake, and Stormwater Pollution Prevention brochures (more than 1,000 pieces annually)
- The City has robust submerged and emergent aquatic plant management plans that include targeted removal of nuisance and invasive species and introduction of beneficial aquatic plants for water quality and shoreline protection
- Employment of a City Environmental Code Enforcement Officer that focuses on stormwater pollution prevention, illicit discharge identification and elimination activities within City limits

Completed

- Lake Morton Bathymetric survey
- Lake Morton Submerged Aquatic Vegetation (SAV) survey

Planned and Underway

Specific pollutant load reductions were not calculated for the Lake Morton projects, but the cumulative effect of these projects will reduce nutrient loadings and will improve water quality of the subject waters.

Nine restoration activities are planned or currently underway within the Lake Morton Watershed with an estimated cost of $1.16 million. Several of the projects are expected to commence upon approval of the 4e application, while some are currently underway, with an estimated completion date of 2026. These projects will focus on improvement of surface water quality, habitat enhancement, reductions in sediment flux and transport from erosion, and selection of additional restoration projects. Several of the current investigations will result in implementation of additional stormwater treatment and water quality improvement projects in the future. Funding for the selected projects, contingent upon results from ongoing studies, is included in the Stormwater Capital Improvement Plan (CIP).

- Geosyntec recently completed a BMP Feasibility Study for Lake Morton (Geosyntec, In progress). The City is currently evaluating logistical considerations for selection of appropriate, effective BMPs for stormwater treatment that will be funded in the Stormwater Capital improvement Plan (CIP).
- Wood has completed a sediment characterization and muck thickness study for Lake Morton to assess the extent that internal sediment cycling may have on nutrient loading into the lake. Sediment capping was proposed to address the sediment driven internal nutrient load.
- Wood will conduct a groundwater screening level study for Lake Morton to assess if groundwater is source of nutrient loading to the lake. Results from this assessment will provide additional guidance on which types of restoration activities may be the most effective in improving in-lake water quality.
- ESA is currently conducting a Before, After, Control Investigation using a Solar Bee to evaluate the efficacy of water circulation in Lake Morton. Once the study is completed, the City will develop a final design and implement circulation and aeration within Lake Morton, using CIP funds.
- Shoreline restoration and revegetation efforts have been ongoing. Approximately 1,000 feet of shoreline have been stabilized and repaired using Dredgesox technology since 2014.
- Reintroduction of native aquatic plant species
    - Continuous efforts to promote native vegetation in Lake Morton. Additional planting is planned for Summer of 2021.

Critical Milestones/Monitoring

Anticipated Critical Milestone(s) and Completion Dates:	Additional information is contained within **Attachment 7**. • BMP Feasibility Study – In progress, with an anticipated completion date of 2021 • Sediment Characterization - Complete • Before, After, Control and Impact Study of Water Circulation and Aeration – In progress, with an anticipated completion date of 2022
Monitoring Component	**Existing and ongoing City of Lakeland and Polk County Division of Natural Resources ambient water quality monitoring programs:** The City of Lakeland's L&S Division, in coordination with the Polk County Natural Resources Division, completes ambient monitoring of Lake Morton, on a quarterly basis.

Lake	Station	Start Date	End Date	Number of Samples				
				TN (mg/L)	TP (mg/L)	TSS (mg/L)	ChlA (ug/)	ChlA C (ug/L)
Lake Morton	MORTON-COL	3/16/2011	3/16/2021	25	36	25	36	36
Lake Morton	MORTONWQ	11/18/1987	3/16/2021	344	344	344	344	309

A list of parameters sampled, as part of the ambient monitoring program, is provided as **Attachment 9.**

City of Lakeland Biological Monitoring
The City of Lakeland completed a Lake Vegetation Index (LVI) for Lake Morton on May 18th, 2021.

Wood sediment characterization for City of Lakeland:
Wood collected four sediment cores from locations within Lake Mirror on May 13th, 2021 to characterize the physical and chemical composition of the sediment. Analyzed parameters include grain size (i.e. % silt and % clay), % dry weight, bulk density, volatile solids, total phosphorus, total Kjeldahl nitrogen, ammonia, total organic carbon, iron, calcium, aluminum, nitrate-nitrite, total sulfur, and the full suite of phosphorus fractionation parameters. At the time of sampling, in-situ measurements of pH, temperature, specific conductance, and dissolved oxygen were also collected in the lake at various depths at each sampling location. A complete list of parameters and sediment quality results can be found in the **Wood Lake Morton 4e Plan Technical Support Services Technical Memorandum DRAFT (2021)**. Further review of these initial data is being conducted to determine if additional sampling efforts will be needed to calculate sediment nutrient flux rates, internal loads and to assess the effectiveness of various treatment alternatives.

City of Lakeland Phytoplankton Monitoring:
Phytoplankton samples are collected quarterly and analyzed for cyanobacteria. The City samples phytoplankton on a quarterly basis and data can be provided upon request.

SWFWMD water level monitoring program:
The SWFWMD recorded water levels monthly, from 2007 to 2019, at Station 19084.

USGS National Water Information System monitoring program:
The USGS recorded water levels monthly, from 1954 to 1959, at Station 02294247.

Other Key Dates

Estimated Date for Delisting from Verified List or Removal from Study List	WBID 1497H (Lake Morton) is in the state's Group 3 Sarasota Bay – Peace – Myakka Basin. The current review and assessment cycle (the initial biennial assessment) is scheduled for completion in 2022. This waterbody is currently impaired for nutrients (chlorophyll-a and total phosphorus) and the earliest opportunity for delisting would happen during the upcoming biennial assessment. However, if this WBID doesn't meet delisting requirements, it will remain in assessment category 4e for an additional biennial assessment cycle, which will postpone TMDL development.

Financial Commitments

Estimated Implementation Cost	Total Financial Commitment of Completed Projects $1.16 Total Anticipated Ongoing /Planned Financial Commitments $500,000 The estimated 20-year operation and maintenance cost is $500,000 (if applicable). *Additional grant applications may be submitted for subsequent activities, including SWFWMD CFI and/or 319(h) Clean Water Act Section grants.

References:

City of Lakeland Codes/Ordinances:

Code of the City of Lakeland, Ordinance no. 5080, Chapter 86, Section 86-3:

It shall be unlawful for any person to throw, spill, place deposit or leave, or cause to be thrown, spilled, placed, deposited or left, or to permit any servant, agent or employee to throw, spill, place deposit in or upon any street, highway, alley, sidewalk, park or other public place in the city any dirt, sweepings, filth, shells, garbage, vegetables, dead carcasses, sewage, slops excrement, compost, stable manure, ashes, soot, tin cans, rags, wastepaper, leaves, brush, weeds, grass, straw, hay, excelsior, shavings, barrels, crates, boxes, litter, or loose combustible material; materials subject to be carried by the wind, or unwholesome, noisome or putrescible matter of any kind.

Code of the City of Lakeland Land Development Regulations under Natural Resource Protection Regulations, *Article no. 34.06.05.01*:

Adequate measures of erosion control shall be established upon all applicable sites. Compilation of all features on site may necessitate unified measures of control. Adequate measure of control shall be defined as those needed to minimize or eliminate any transfer or removal of soil from a site during a rainfall event.

Code of the City of Lakeland, Chapter 86, Ordinance 5080 Section 86-4

It shall be unlawful for any person to allow any swill, slops or malodorous or noxious liquids to run, drop, or fall into or upon any sidewalk, street, alley, park, lake, stream, or other public place and it shall be unlawful for any person to allow any water, grease, or any slippery matter to fall, drop, or to be deposited upon any sidewalk, street, highway, or alley within the city.

City of Lakeland. 2010. 2009 Lakes Report. City of Lakeland Lakes and Stormwater. 64 pp
ERD. 2002. Lake Morton Water Quality Diagnostic Evaluation. 141 pp
Geosyntec. In progress. Stormwater BMP Feasibility Study of Lake Morton

MS4 Annual Report:

ftp://ftp.dep.state.fl.us/pub/NPDES_Stormwater/Phase_I_MS4s/FLS000015_Polk_County/Lakeland/Permit%204%20Year%203%20Annual%20Report/

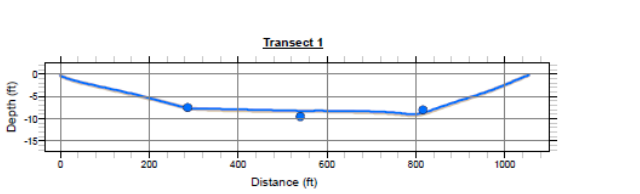
Attachments: Supporting Documentation

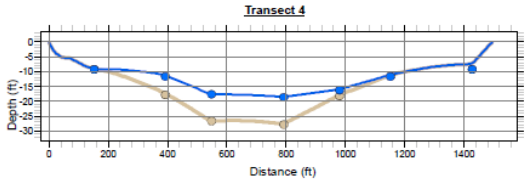
1) Lake Morton Location Map
2) Lake Morton Soft Sediment Transect Profiles
3) Lake Morton Contributing Outfalls Map
4) Lake Morton Land Use Map
5) Land Use Description and Acreage Table
6) Lake Morton Soils and Contours Map

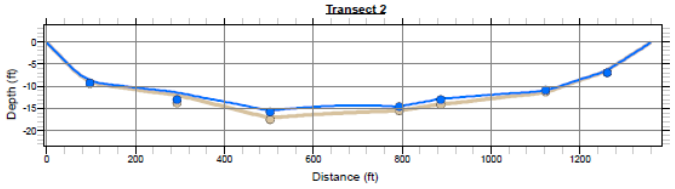
7) City of Lakeland Completed & Planned Projects
8) City of Lakeland Street Sweeping Route and Zones
9) Water Quality Monitoring Program Sampled Parameters Table
10) Polk County Fertilizer Ordinance (*provided under separate cover as a .zip file)*
11) 2019 City of Lakeland Water Quality Management Plan (*provided under separate cover as a .zip file)*
12) Wood Lake Morton 4e Plan Technical Support Services Technical Memorandum DRAFT (*provided under separate cover as a .zip file)*

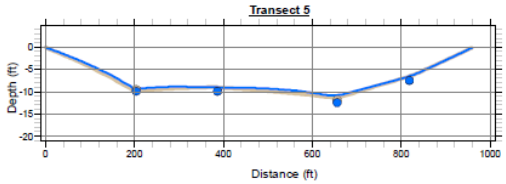
Attachment 1- Location Map

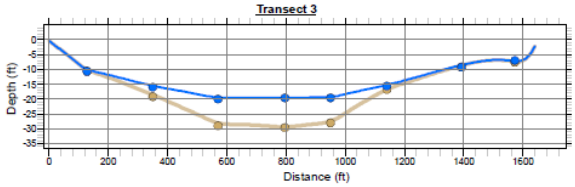
Attachment 2- Soft Sediment Transect Profiles



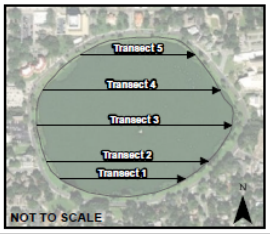








TOTAL SOFT SEDIMENT VOLUME: 139,463.5 CUYDs



Notes:

1- Project No.:600537x21

2- Data Sources - Wood, ESRI

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

4- Vertical exaggeration 10 times

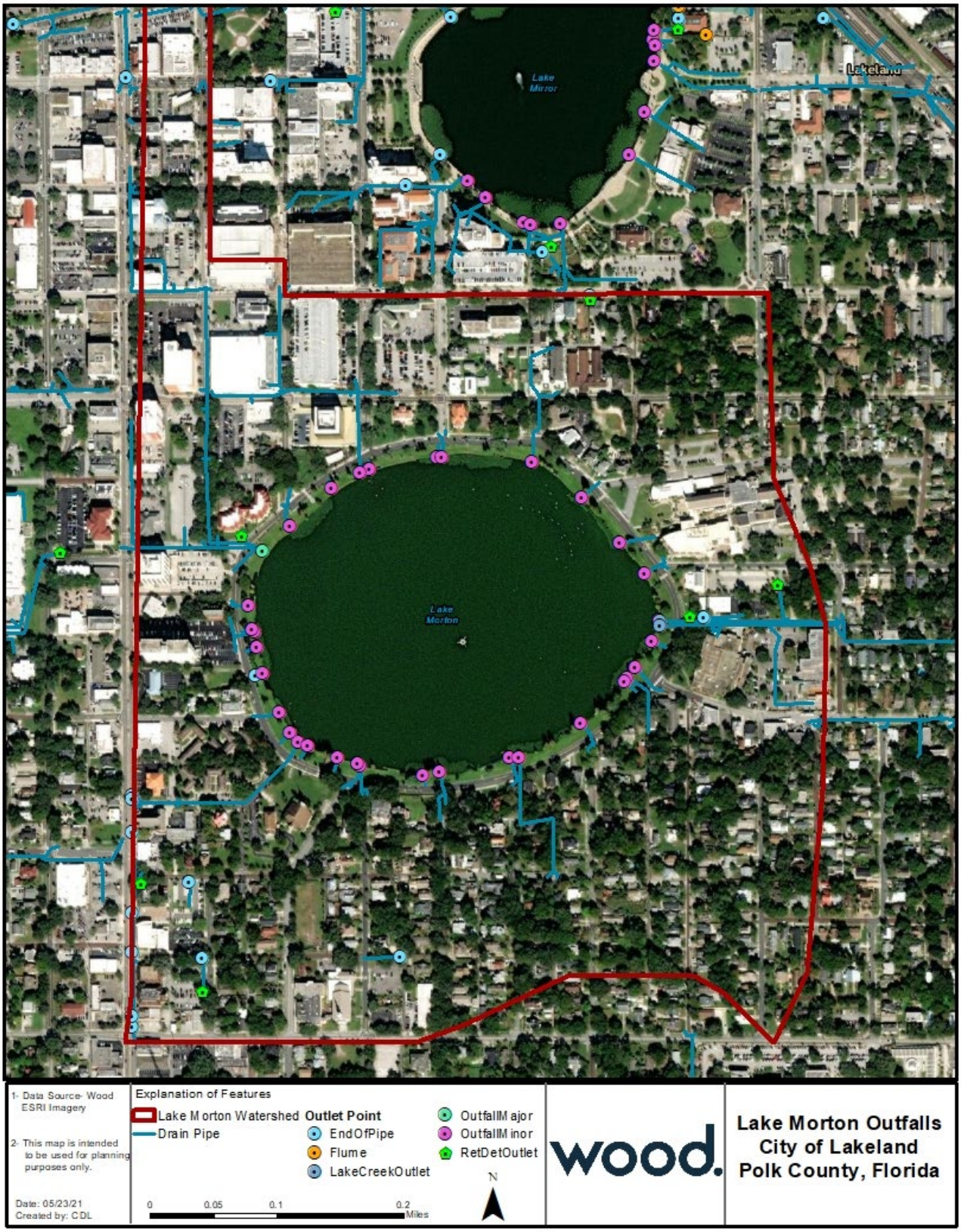
Explanation of Features

- Transect Lines
- Water Depth (ft)
- Depth of Refusal (ft)

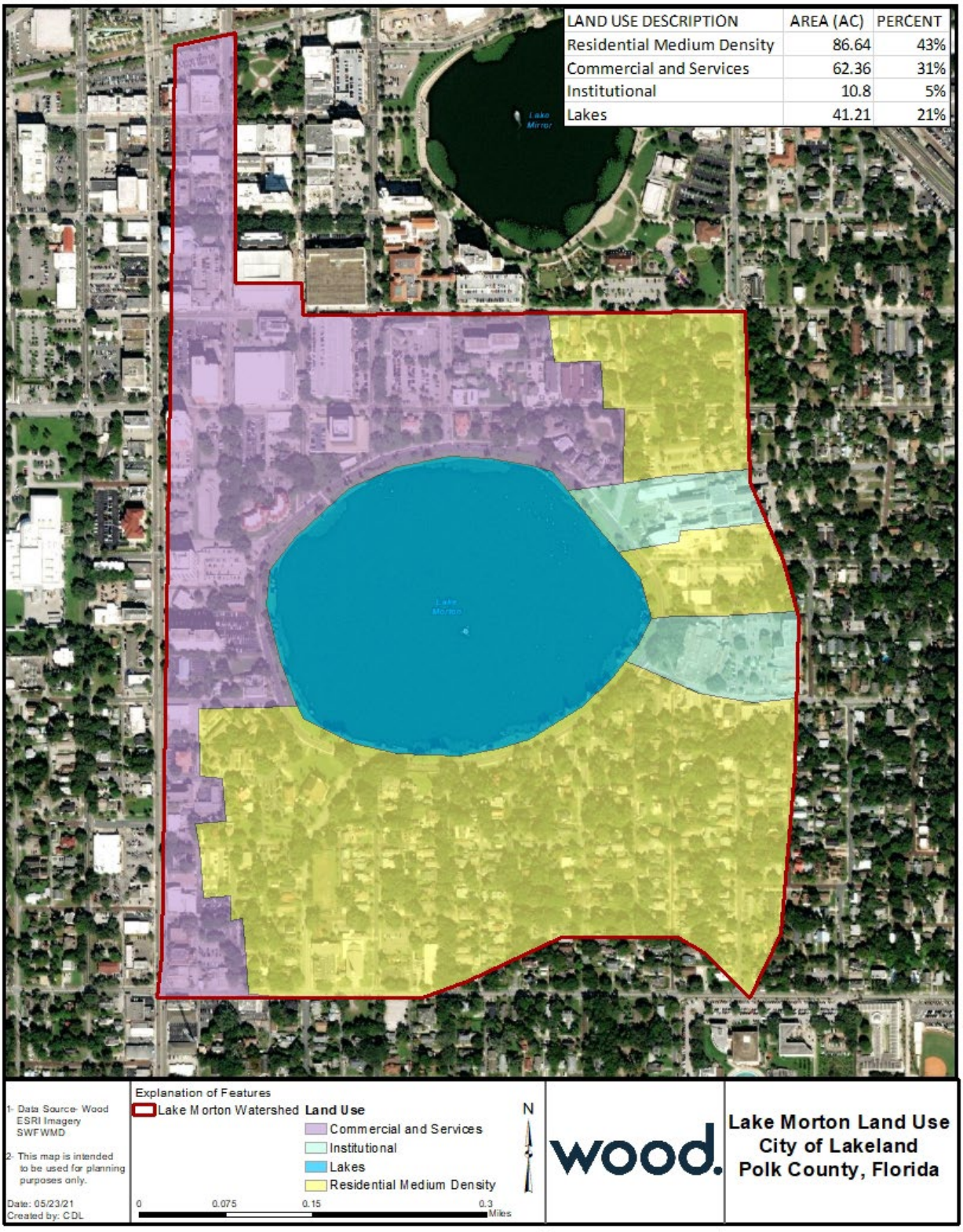
wood.

Figure
Lake Morton
Transect Profiles
City of Lakeland
Polk County, Florida

Attachment 3- Contributing Outfalls Map



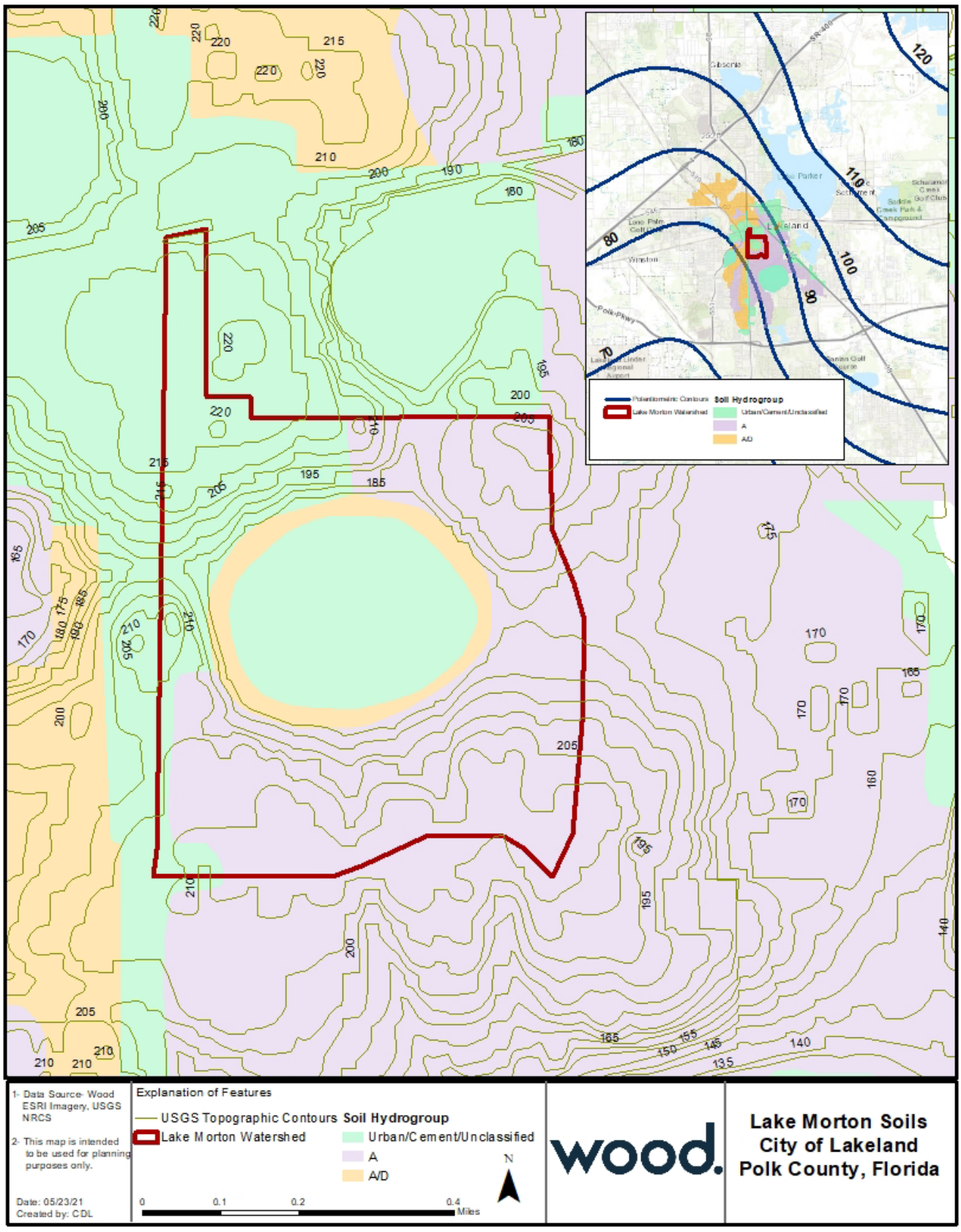
Attachment 4- Land Use Map



Attachment 5- Land Use Description Table

FLUCCS CODE	LAND USE DESCRIPTION	AREA (AC)	PERCENT
1200	Residential Medium Density	86.64	54%
1400	Commercial and Services	62.36	39%
1700	Institutional	10.80	7%
Total		160	100%

Attachment 6- Soils and Contours



Attachment 7

City of Lakeland Stormwater Projects in the Lake Morton Watershed

Completed and Ongoing Projects

Project Name	Description	Cost	Restoration Activity	Completion Date
Shoreline Restoration (City)	Restoration of natural shoreline and revegetation efforts (approximately 250 linear feet per year since 2014)	$25,000	Revegetation of the natural shoreline and littoral shelf with submerged and emergent native plant species to promote stability	Ongoing (restorations completed as needed
Shoreline Restoration (City)	Dredgesox technology to repair eroded shoreline	$90,000	Restored shoreline reduced sedimentation into the lake	Ongoing (repairs completed as needed)
BMP Feasibility Study (Geosyntec)	Assessment and review of stormwater and ambient water quality, development of models to determine pollutant loading capacities and flood routes, and development of ranked BMPs to treat stormwater	$165,000	Selection of appropriate, effective BMPs for stormwater treatment to improve water quality	2021
Sediment Characterization (Wood)	Screening level muck thickness survey and sediment characterization to establish if sediment flux has potential to impact the system	$16,000	Analysis of physical and chemical parameters of sediment and mapping of soft-sediment thickness. If sediment is found to be a major source, then sediment management projects will be developed to reduce internal load	Summer 2021
Native aquatic plant species planting (City)	Reintroduction of native aquatic plant species	$20,000	Re-establish healthy population of aquatic vegetation and improve water quality	Ongoing (indefinitely as needed)

Attachment 7 (cont'd)

Planned Projects

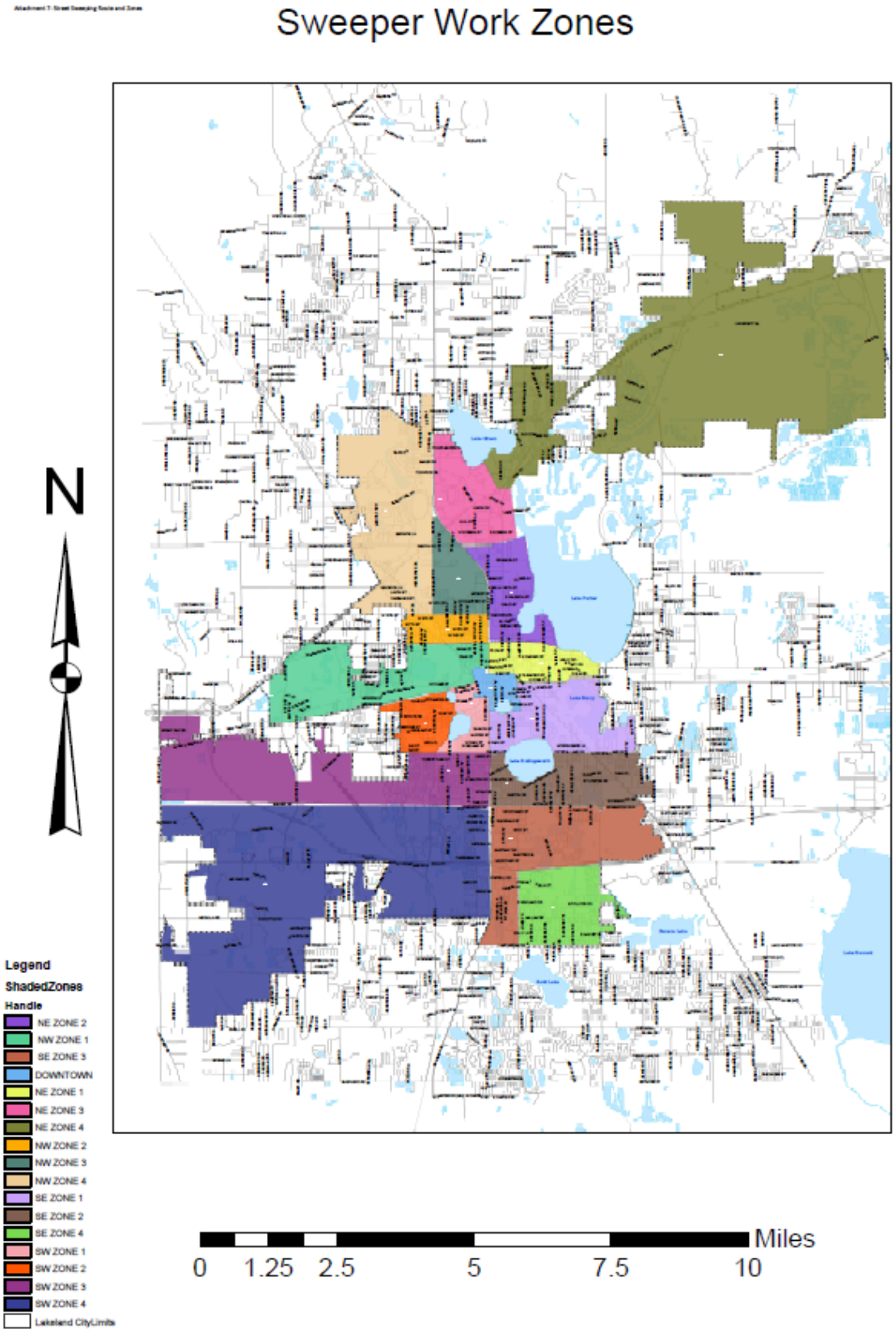
Project Name	Description	Cost	Restoration Activity	Estimated Completion Date
Before, After, Control and Impact Study of Water Circulation and Aeration (ESA)	Water quality sampling before, during, and after installation of a Solar Bee water circulation unit to improve surface water quality	$95,000	Add aeration system to the lake to enhance circulation and increase dissolved oxygen levels and reduce nutrient flux from sediments	2022
Groundwater Seepage Screening	Screening level study to determine if groundwater seepage is a contributor to nutrient loading in the lake	$75,000	Gain a better understanding of the actual sources of nutrient loading and provide additional nutrient reduction projects	TBA
Pollutant Control Device	Installation of 1st and 2nd generation baffle boxes at select outfalls to the lake	$500,000	Removal of floatable trash, sediments and nutrients from stormwater stream prior to entering lake	2026
Outfall and Stage modification	Slightly increasing stage on Lake Morton by modifying existing outfall to Lake Hollingsworth with a new discharge structure fitted with a BAM upflow filter.	TBD	Increased flooding attenuation in Lake Morton and reduction of pollutant loading to Lake Hollingsworth	Conceptual phase – to be completed by 2024
South Bank Denitrification Wall	Installation of a denitrification wall on the South side of Lake Morton	TBD	Nutrient reductions	Conceptual phase – to be completed by 2025
Rain Gardens with Curb Cuts	Construction of rain gardens at select locations	$50,000	Nutrient reductions and groundwater recharge	Conceptual phase – to be completed by 2025
Tree Wells/Modular Wetlands	Retrofitting existing inlets to include tree wells/modular wetlands	$80,000	Nutrient reductions and groundwater recharge	Conceptual phase – to be completed by 2025
Temporary Herbivory Exclusion Cages	Installation of temporary herbivory exclusion cages to protect newly planted vegetation from large bird population	$75,000	Establishment of vegetation	Ongoing as needed when planting
Linear Treatment Systems	Routing surface runoff from Lake Morton Drive and stormwater from existing outfalls into linear treatment systems that are enhanced with BAM	$75,000	Nutrient reductions and groundwater recharge	Conceptual phase – to be completed by 2026
Pump and Treat	Construction of a pump and treat system with a subsurface upflow wetland at the lakeshore	$250,000	Nutrient reductions	Conceptual phase – to be completed by 2026
Lake Morton Sediment Treatment	Treatment of the sediment via chemical inactivation to reduce internal nutrient cycling and loads to the lake	$225,000 - $585,000	Internal loading nutrient reductions	Conceptual phase – to be completed by 2027

Attachment 8- Street Sweeping Routes and Zones

Truck 1	Truck 2	Truck 3	Truck 4	Truck 5	Truck6
NE 1 NE 2 NE 3 NE 4 each zone swept every 3 weeks	NW 1 NW 2 NW 3 NW 4 each zone swept every 3 weeks	SE 1 SE 2 SE 3 SE 4 each zone swept every 3 weeks	SW 1 SW 2 SW 3 SW 4 each zone swept every 3 weeks	Lake Basins This truck sweeps roads immediately adjacent to lakes on an ongoing basis	Parking Lots/landfill Every Wednesday
Also sweeps downtown every Monday & Thursday	Also sweeps downtown every Monday & Thursday	Also sweeps downtown every Monday & Thursday			

- We have six sweepers; one mechanical and five vacuum trucks.
- The mechanical sweeper (Truck 6) does parking lots, the landfill, and the C&M yard.
- One of our vacuum trucks (Truck 5) does the lake basin route on an ongoing basis.
- The other four vacuum trucks (Trucks 1 - 4) are assigned to zones. We have four zones and each zone is broken up into quadrants. They sweep quadrants in a clockwise rotation within the zone.
- It takes the crews about three weeks to complete one zone rotation.
- The downtown quadrant is swept by three trucks (Truck 1 - 3) twice a week on Mondays and Thursdays.

Attachment 8- Street Sweeping Routes and Zones (Cont'd)



Attachment 9- Water Quality Monitoring Program Parameters

Ambient Monitoring Program Sampled Water Quality Parameters
Alkalinity, Total
Chloride
Chlorophyll a, corrected for pheophytin
Chlorophyll-a, uncorrected for pheophytin
Dissolved Oxygen
Hardness, Ca + Mg
Iron
Magnesium
Nitrogen, ammonia (NH3) as NH3
Nitrogen, Kjeldahl
Nitrogen Oxides (NOx)
Total Nitrogen (TN)
pH
Phosphorus as P
Phosphorus, orthophosphate as P
Secchi disk depth
Sodium
Specific conductance
Sulfur, sulfate (SO4) as SO4
Temperature, water
Total Suspended Solids (TSS)
True Color
Turbidity