Documentation in Support of Category 4e

Waterbody/Watershed Identification

Organization	City of Ocoee
Point of Contact	Richard Campanale, PE, 301 Maguire Rd, Ocoee, FL 34761, 407-905-3170 X6004
Waterbody(s)	WBID ID #3002E – Lake Prima Vista
No. Waterbody / Pollutant Combinations	1 waterbody segment(s); Impaired for nutrients based on Group 2, Cycle 4 data including chlorophyll-a (CHLA), total nitrogen (TN) and total phosphorus (TP).

Description of Baseline Conditions

Watershed(s): Middle St. Johns, Wekiva River, Orange County

Baseline Data: Lake Prima Vista is a clear lake with high alkalinity. The available Cycle 4 data for Lake Prima Vista are provided below. Annual geometric mean (AGM) CHLA, TN, and TP were analyzed to assess verified impairments during the 1/1/2012 through 6/30/2019 Verified Period. Data were obtained from Impaired Waters Run (IWR) 57.

WBID	Waterbody Name	Parameter	Criterion Concentration or Threshold Not Met	Verified Period AGMs
3002E	Lake Prima Vista	Nutrients (CHLA)	≤ 20 µg/L	2012 (27) 2013 (35) 2015 (29) 2016 (40) 2017 (42)
3002E	Lake Prima Vista	Nutrients (Total Nitrogen)	CHLA AGM ≤ 20 µg/L, TN AGM ≤ 1.91 mg/L; If CHLA has Insufficient or No Data to calculate AGM or if CHLA AGM > 20 µg/L, TN AGM ≤ 1.05 mg/L	2012 (1.31) 2013 (1.48) 2015 (1.78) 2016 (2.05) 2017 (2.05)

WBID	Waterbody Name	Parameter	Criterion Concentration or Threshold Not Met	Verified Period AGMs
3002E	Lake Prima Vista	Nutrients (Total Phosphorus)	CHLA AGM ≤ 20 µg/L, TP AGM ≤ 0.09 mg/L; If CHLA has Insufficient or No Data to calculate AGM or if CHLA AGM > 20 µg/L, TP AGM ≤ 0.03 mg/L	2012 (0.040) 2013 (0.040) 2015 (0.030) 2016 (0.030) 2017 (0.030)

Map

See Figure #1-1 in the attached Lake Prima Vista Hydrologic/Nutrient Loading Study. See Lake Prima Vista monitoring station locations used in the IWR 57 analysis below:

Evidence of Watershed Approach

Area of Effort	Figure# 3-1 in the attached Lake Prima Vista Hydrologic/Nutrient Loading Study.
Key Stakeholders Involved and Their Roles	The City of Ocoee and Orange County are the key stakeholders for the Lake Prima Vista assessment and restoration projects. The City of Ocoee and Orange County will work cooperatively to plan and implement pollutant load reduction projects. Additional stakeholders identified include: Tom West Inc., Sleepy Harbor HOA, Sleepy Harbor Condominium Association. Tom West Inc. owns much of the property on the west side of the lake and may participate in implementing agricultural BMPs either independently or as part of a public-private partnership with the City and Orange County. Both the Sleepy Harbor HOA and the Sleepy Harbor Condominium have expressed their interest to be included as active participants in the planning process.
Watershed Plan & Other Supporting Documentation	The Lake Prima Vista contributing area includes the area identified in Figure #3-1 in the attached Lake Prima Vista Hydrologic/Nutrient Loading Study. Lake Prima Vista is currently impaired for nutrients (chlorophyll-a, total nitrogen, and total phosphorus) and biology (LVI scores <43) based on the number of exceedances for the sample size. Lake Prima Vista normally discharges to Starke Lake although some mixing between the two lakes may occur during low flow. The degree of mixing between the two lakes has not been studied but water quality projects that benefit Starke Lake may also benefit water quality in Lake Prima Vista during certain conditions. The City of Ocoee has taken a proactive approach to addressing Lake Prima Vista's water quality issues and has recently completed the Lake Prima Vista Hydrologic/Nutrient Loading Study (2018) to identify potential pollutant loading sources contributing to the water quality impairments and to develop a suite of project alternatives aimed at correcting the impairment. A copy of the report is attached. Hydrologic inputs to Lake Prima Vista total approximately 165.7 ac-ft annually. The City of Ocoee's study found that stormwater runoff contributes about 44% of the hydrologic inputs, while seepage contributes about 9% with the remaining hydrologic inputs contributed by direct rainfall. The contributing basin is serviced by central sewer, and the study assumed no hydrologic inputs from septic systems. Lake Prima Vista received approximately 425.6 lbs of total phosphorus and 1,463 lbs of total nitrogen annually from external and internal sources. Stormwater runoff generates approximately 15% of the total phosphorus loading, and 25% of the total nitrogen loading. Groundwater seepage contributes about 1% of the total phosphorus loading, and 49% of the total nitrogen loading. Sediment flux is estimated to contribute 81% of the total phosphorus loading and 15% of the total nitrogen loading. The remaining 3% of total phosphorus and 11% of total nitrogen are contributed by atmospheric deposition. The City of Ocoee has developed several projects which are currently in the planning phase and may be implemented to reduce the external and internal nutrient loads to Lake Prima Vista. Both nitrogen and phosphorus appear to be influencing the water quality conditions within the lake by stimulating growth of suspended algae. Projects include methodology to address both nitrogen and phosphorus. The relatively high nitrogen concentration associated with seepage inputs on the west side of the lake could be addressed using a multi-pronged approach that may involve agricultural BMPs that limit nitrate migration into the surficial aquifer and innovative structural projects that facilitate

denitrification and divert the concentrated sources of groundwater nitrogen away from the lake. Potential stormwater BMPs include exfiltration within the rights-of-way along the City's roads along the eastern and northern portions of the contributing area.

Reduction of internal loading within the lake is potentially the most cost-effective means of achieving significant load reduction although its longevity will be diminished if external source controls are not implemented as well. Control of sediment phosphorus flux through sediment nutrient inactivation using a combination of alum and Phoslock® is expected to provide rapid water quality improvement within Lake Prima Vista. The deeper portions of the lake appear to be contributing the majority of phosphorus flux and will be specifically targeted for nutrient inactivation.

The City of Ocoee is actively monitoring Lake Prima Vista and has implemented a monthly ambient water quality monitoring program. Orange County will continue to provide the routine quarterly monitoring as it has since 1982.

Point Sources and Indirect Source Monitoring (Sites)

There are no point sources contributing to Lake Prima Vista.

The City of Ocoee is a co-permitee (FLS 266833) associated with Orange County's MS4 Permit. As part of the Ocoee Downtown Master Plan, the City is currently in the design phase for a Downtown Ocoee Stormwater Park System that will serve to treat runoff from the Starke Lake watershed. In addition, the City is investigating funding and grant sources for the S. Lakeshore Area Central Sewer Project to the serve within Starke Lake Watershed (FLS000011-004). Attached is the Cycle 4, Permit Year 2, NPDES Permit for the City of Ocoee and the most recent Annual Report (May 2017 – May 2018).

Stormwater outfall structures to Lake Prima Vista are shown in Figure # 4-2 in the attached Lake Prima Vista Hydrologic/Nutrient Loading Study.

Note: Generic Permits for stormwater discharge from large and small construction activities are considered temporary; therefore, are not included in this listing.

Nonpoint Sources

FLUCCS: Landuse Description	Area (acres)	%
1100: RESIDENTIAL, LOW DENSITY - LESS THAN 2 DWELLING UNITS/ACRE	4.68	5.61
1200: RESIDENTIAL, MEDIUM DENSITY - 2-5 DWELLING UNITS/ACRE	50.71	60.73
1300: RESIDENTIAL, HIGH DENSITY - 6 OR MORE DWELLING UNITS/ACRE	9.50	11.38
1200: RESIDENTIAL, MEDIUM DENSITY - 2-5 DWELLING UNITS/ACRE	3.79	4.54
2210: CITRUS GROVES	14.00	16.76
1850: PARKS AND ZOOS	0.25	0.30
5200: LAKES	0.57	0.69
Total	**83.51**	**100**

Soil Type	Hydrologic Soil Group	Area (acres)	%
TAVARES-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES	A	10.50	12.57
TAVARES-MILLHOPPER FINE SANDS, 0 TO 5 PERCENT SLOPES	A	20.29	24.30
CANDLER-APOPKA FINE SANDS, 5 TO 12 PERCENT SLOPES	A	0.75	0.89
CANDLER-URBAN LAND COMPLEX, 5 TO 12 PERCENT SLOPES	A	0.24	0.29
TAVARES-MILLHOPPER FINE SANDS, 0 TO 5 PERCENT SLOPES	A	2.73	3.27
CANDLER-APOPKA FINE SANDS, 5 TO 12 PERCENT SLOPES	A	6.37	7.63
TAVARES FINE SAND, 0 TO 5 PERCENT SLOPES	A	1.89	2.26
TAVARES-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES	A	27.06	32.40
CANDLER-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES	A	4.30	5.15
CANDLER-URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES	A	1.77	2.12
TAVARES-MILLHOPPER FINE SANDS, 0 TO 5 PERCENT SLOPES	A	2.03	2.43
TAVARES FINE SAND, 0 TO 5 PERCENT SLOPES	A	3.56	4.26
WATER	W	2.01	2.41
Total		**83.51**	**100**

Land Use and soil type maps for the Lake Prima Vista drainage basin are shown in Figures #3-4 and #3-5 in the attached Lake Prima Vista Hydrologic/Nutrient Loading Study.

Water Quality Criteria

Lake Prima Vista is a clear lake with high alkalinity (lake classification 2). Based on the procedure for determining numeric nutrient criteria (NNC), outlined in F.A.C 62-302, the NNC for nutrients in Lake Prima Vista are 20 ug/L, 0.03 mg/L, and 1.05 mg/L for chlorophyll-a, total phosphorus, and total nitrogen, respectively, which is anticipated to be achieved upon successful completion of all water quality restoration projects.

Restoration Work

The following are water quality restoration projects that will be incorporated into the Ocoee Capital Improvement Projects. Funding is available in the City Stormwater Utility and timeline will be based on 5-year plan.

Project 1 - Exfiltration
Includes installation of approximately 4,217 ft of exfiltration system within the rights-of-way along Stinett, Vandergrift, Broadway, and East Lakeshore Drives in Sub-basin 3 and within the rights-of-way of East Lakeshore and Vandergrift Drives in Sub-basin 7 (Figure #6-1 in the attached Lake Prima Vista Hydrologic/Nutrient Loading Study). These sub-basins are currently served by a collection system of curb inlets with an untreated outfall to Lake Prima Vista. Sub-basins 3 and 7 currently contribute 182 lbs TN, and 30 lbs TP to Lake Prima Vista per year. Alternative 1 focuses on reducing the total volume of surface runoff contributed by Sub-basins 3 and 7.

Project 2 – Seepage Collection/Denitrification
Includes installation of a groundwater seepage water collection system or denitrification wall (also called a bioreactor) landward of the lakeshore and adjacent to the agricultural property in Sub-basin 5 on the west side of the lake (Figure #6-2 in the attached Lake Prima Vista Hydrologic/Nutrient Loading Study). Given the high concentration of nitrate in seepage water and the relatively high volume of water input from seepage, there may be an economic advantage over use of well water and additional fertilizer in recovering seepage water and recycling (pumping) it back to the top of the slope. Alternatively, a soil amendment process that can stimulate denitrification may be of significant benefit to the lake as well.

The proposed BMP would consist of the construction of a subsurface slurry, or clay wall near the lakeshore deep enough to intercept the underlying aquitard. Similar technology has been utilized for recovery of groundwater in environmental remediation applications (e.g., Evans and Whysner, 2017) For the purposes of this discussion, the aquitard is assumed to be within five feet of the surface, but additional geotechnical information will need to be obtained if the project progresses to the design phase. The clay wall will function to intercept the flow of seepage to Lake Prima Vista. Water stopped by the clay wall would then either be collected by a system of underdrains and pumped to a reservoir for irrigation (Alternative 2A) or it could be routed through a denitrification system where a portion of the nitrate would be converted to atmospheric nitrogen through bacterial denitrification (Alternative 2B) (Figure #6-3 in the attached Lake Prima Vista Hydrologic/Nutrient Loading Study). Approximately 40,000 ft^2 could be available along the adjacent property for soil amendments. A wetland delineation would be required prior to construction, which could reduce the available area. The denitrification system would not impact the seepage volume to the lake, but the collection system could reduce seepage by the resulting volume recovered for irrigation.

Project 3 – Water Column Treatment and Sediment Nutrient Inactivation

Sediment nutrient inactivation may be a suitable option for expediting and enhancing water quality improvement within Lake Prima Vista. Phosphorus fractionation and flux analysis indicates the presence of significant sources of phosphorus in some areas of the lake bottom. Inactivation of potentially bioavailable phosphorus by chemical application using a combination of liquid aluminum sulfate (alum) and Phoslock® may provide an economic solution to increase water transparency and reduce sediment nutrient flux. This method of application is often referred to as the "floc-and-lock" method because alum is applied to bind and settle suspended particles (including algae) and Phoslock® provides the overall chemical inactivation of phosphorus in the sediment.

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 biological uptake. Phoslock® application combined with a low-dose alum application is the preferred method in Lake Prima Vista because it will have little effect on pH and Phoslock® has no precautionary environmental concerns.

Project 4 – Public Education

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 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. This also provides an opportunity to promote the Florida Department of Agricultural and Consumer Services (FDACS) BMP enrollment program to agricultural operators. The program should be creative, convey a consistent message, and be sustainable over time. In addition, the education program may 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.

Project 5 – Downtown Ocoee Stormwater Park System
This master stormwater park system will serve approximately 200-acres of the Starke Lake Watershed and 30-acres of future downtown areas. The treatment volume for the watershed is being evaluated, but the design intent will be to treat as much stormwater runoff as practical from the watershed areas. The future downtown area will be comprised of mixed residential and commercial landuse and the primary focus for stormwater treatment. The stormwater park system is funded with a timeline of construction beginning in 2020.

Project 6 - Starke Lake – S. Lakeshore Area Central Sewer and Roadway Project
The City is currently investigating grant funding sources with SJRWMD and FDEP for septic-to-sewer conversion in the areas located along the Starke Lake shoreline from McKey Street and Lafayette Street. The project is contingent on obtaining grant funding, but the City has funding to retrofit the roadway and stormwater system. The project area includes approximately 20-acres of residential landuse and may be constructed within the next five years if a funding source can be identified.

Critical Milestones/Monitoring

Anticipated Critical Milestone(s) and Completion Dates:	The above projects are in the planning phase, but will be incorporated into the Ocoee Capital Improvements Program with implementation anticipated to occur within the next 5 years. The City of Ocoee intends to implement the sediment nutrient inactivation project within the next year. Agricultural BMPs and public education efforts are planned for the next year. The Ocoee Stormwater Park construction is anticipated to start in 2020.
Monitoring Component	City of Ocoee conducts quarterly surface water monitoring of Lake Prima Vista and reports values to Orange County as part of their MS4 permit. Water quality parameters are also collected at each location using a Secchi disk and multimeter: pH, specific conductance, temperature, and dissolved oxygen (% saturation and concentration). This monitoring is ongoing and does not have a set completion date. Surface Water Samples will have the following analyses: 1) Chloride 2) Dissolved solids 3) Fluoride 4) Orthophosphate 5) Sulfate 6) Total organic carbon 7) Total suspended solids 8) Turbidity 9) Un-ionized ammonia 10) Color 11) Total Kjeldahl nitrogen 12) Chlorophyll a (corrected) 13) NOx (nitrate+nitrite) 14) Total nitrogen 15) Total phosphorus 16) Pheophytin-a 17) Salinity 18) Total ammonia nitrogen The City of Ocoee has enlisted the services of Wood Environment and Infrastructure Solutions (Wood) to collect surface water grab samples every month for 12 months from one location. Water quality field parameters will also be collected at each location using a multimeter: pH, specific conductance, temperature, and dissolved oxygen (% saturation and concentration). This work is anticipated to begin by March 2019 and proceed through February 2020. Surface Water Samples will have the following analyses: 1) Total Kjeldahl nitrogen 2) NOx (nitrite + nitrate) 3) Orthophosphate 4) Chlorophyll a (corrected) 5) Alkalinity 6) Color 7) Total ammonia nitrogen 8) Total nitrogen (TKN + TAN)

9) Total Phosphorus
10) Total suspended solids
11) Turbidity
12) *Escherichia coli* (*E. coli*)

Water quality data will be uploaded to the FDEP Watershed Information Network (WIN) as available by Orange County.

Other Key Dates

Estimated Delisting Date

The WBID #3002E is in the State's Group 2 in the Middle St. Johns, Wekiva River Basin. Sufficient data should be acquired by the 2026 review and assessment cycle (cycle 5) to fully assess the WBID, and if not impaired, DEP is expected to request the WBID be delisted from the federal 303(d) list (if applicable).

Financial Commitments

Estimated Implementation Cost

The total estimated conceptual project cost is $2,440,000 as detailed below. The economic and construction feasibility of projects 1, 2A and/or 2B is still under investigation.

Projects are currently in the conceptual design phase and may be eligible for Section 319(h) Clean Water Act grants.

The conceptual costs for the potential projects are as follows:

Alternative	Estimated Cost	Pounds of TP removed (or inactivated)	Cost per Pound of TP Removed (or inactivated)	Pounds of TN removed (or inactivated)	Cost per Pound of TN Removed (or inactivated)
1 – Exfiltration	$1,420,000	110	$12,909	650	$2,185
2A – Seepage Collection	$360,000	40	$9,000	500	$720
2B – Seepage Denitrification	$546,000	40	$13,650	500	$1,092
3 – Water Column Treatment and Sediment Nutrient Inactivation	$72,000	144[A]	$500	N/A	N/A
4 – Homeowner Education	$42,000	38	$1,105	221	$190

[A] Includes TP mass in top 10 cm of sediment only

Land Acquisition (if applicable)

Funding Source: Not Applicable

Total…… **$ ____**

Design and Construction (if applicable)

Primary Funding Source: City of Ocoee
With Potential Support From: Orange County, SJRWMD, FDEP, FDACS, and others.

Total Potential Estimated Cost……...$2,440,000

Attachments:

City of Ocoee – Lake Prima Vista Hydrologic/Nutrient Loading Study, Final Report (WBID 3002E). Wood (October 2018).

City of Ocoee – Annual Report Form for Individual NPDES Permits for Municipal Separate Storm Sewer Systems – Year 2 (May 2018 – May 2019).