

Judge Farms (Lake Toho AWS / NeoCity) Project
Potential Reduction of Nutrient Loads Flowing into Lake Tohopekaliga
Summary of Updated Estimates
WSP USA, May 2019

Assumptions

1. CDM report (2012) estimates of total TN and TP loads coming from tributary drainage basins into Lake Toho are still reasonably accurate.
2. WUP-authorized diversions from East City Ditch and Mill Slough into reservoir will only occur if TWA subsequently withdraws from reservoir for water supply.
3. Nutrient removal is estimated herein for two main alternative scenarios:
Scenario 1 : Reservoir (West Pond) used for NeoCity stormwater treatment only (no TWA water supply); nutrient removal achieved by wet detention residence time
Scenario 2 : Reservoir receives NeoCity stormwater plus tributary diversions, and TWA withdraws from reservoir for water supply; nutrient removal due to extraction
4. For Scenario 2, for portion of surface/stormwater that overflows from reservoir into Lake Toho, additional nutrient removal due to wet detention time is neglected.
5. Dewberry (2019) computations of loading increase due to NeoCity development and TP removal by wet detention are accurate and used herein without modification.
6. Estimated TN removal from NeoCity stormwater by wet detention is approximated herein using Dewberry (2019) TP computations and proportional loading ratios.

Table 1. Estimated Nutrient Removal for Scenario 1: NeoCity Stormwater Wet Detention Treatment Only (Buildout Conditions)

Tributary Areas	Drainage Area (acres)	Existing (Baseline) Loading into Lake Toho		Amount Removed by Wet Detention		Remaining After Treatment	
		TN Load (lb/yr)	TP Load (lb/yr)	TN Load Removal (lb/yr)	TP Load Removal (lb/yr)	TN Load Remain (lb/yr)	TP Load Remain (lb/yr)
Judge Farms Ditch (NeoCity West Phase 2 Area)	953	7,546	813	3,225	523	4,320	290
East City Ditch & Mill Slough	9,245	64,292	6,930	0	0	64,292	6,930
Total	10,198	71,838	7,743	3,225	523	68,613	7,220
% Removal (net, out of flow sent into East Pond & West Pond)				43%	64%		
% Removal (net, out of total tributary loading to Lake Toho)				4%	7%		

Notes:

TN removal efficiency estimated as function of residence time (FDOT, 2010): % TN removal = (43.75 td) / (4.38 + td)

Net TP removal estimated from Dewberry (2019) analysis, computed as existing treated mass TP loading minus future pond outflow mass TP loading

Table 2. Estimated Nutrient Removal for Scenario 2A: TWA Water Supply Facility Withdrawals at 3 MGD ADF

Tributary Areas	Drainage Area (acres)	Existing (Baseline) Loading into Lake Toho		Amount Removed by Extraction for Water Supply		Remaining After Extraction	
		TN Load (lb/yr)	TP Load (lb/yr)	TN Load Removal (lb/yr)	TP Load Removal (lb/yr)	TN Load Remain (lb/yr)	TP Load Remain (lb/yr)
Judge Farms Ditch (NeoCity West Phase 2 Area)	953	7,546	813	5,884	634	1,662	179
East City Ditch & Mill Slough	9,245	64,292	6,930	7,753	836	56,540	6,094
Total	10,198	71,838	7,743	13,636	1,470	58,202	6,273
% Removal (out of flow volume sent into West Pond)				78%	78%		
% Removal (net, out of total tributary loading to Lake Toho)				19%	19%		

Notes:

TN and TP removal efficiency for water diverted into reservoir (CDM, 2012): Removal Efficiency = 1.0 - (Emergency Discharge / Total Pond Outflows)

For 3 MGD ADF TWA supply scenario, estimated removal efficiency = 1.0 - (1.01/4.58) = 78.0%

Table 3. Estimated Nutrient Removal for Scenario 2A: TWA Water Supply Facility Withdrawals at 6 MGD ADF

Tributary Areas	Drainage Area (acres)	Existing (Baseline) Loading into Lake Toho		Amount Removed by Extraction for Water Supply		Remaining After Extraction	
		TN Load (lb/yr)	TP Load (lb/yr)	TN Load Removal (lb/yr)	TP Load Removal (lb/yr)	TN Load Remain (lb/yr)	TP Load Remain (lb/yr)
Judge Farms Ditch (NeoCity West Phase 2 Area)	953	7,546	813	6,918	746	628	68
East City Ditch & Mill Slough	9,245	64,292	6,930	18,605	2,005	45,687	4,924
Total	10,198	71,838	7,743	25,523	2,751	46,315	4,992
% Removal (out of flow volume sent into West Pond)				92%	92%		
% Removal (net, out of total tributary loading to Lake Toho)				36%	36%		

Notes:

TN and TP removal efficiency for water diverted into reservoir (CDM, 2012): Removal Efficiency = 1.0 - (Emergency Discharge / Total Pond Outflows)

For 6 MGD ADF TWA supply scenario, estimated removal efficiency = 1.0 - (0.60/7.19) = 91.7%

References

CDM, 2012. *Judge Farms Water Storage Facility Preliminary Feasibility Analysis*. Final report prepared for City of Kissimmee, City of St. Cloud, Osceola County, and Toho Water Authority, February 2012.

Dewberry Engineers, 2019. "West Phase 2 (NeoCity) Pollutant Loading Analysis." Calculation of estimated Total Phosphorus Removal by NeoCity Stormwater Management System, Prepared to support Environmental Resource Permit application, 2016 (original analysis) and 2019 (updated analysis).

Florida Department of Environmental Protection (FDEP), 2010. *Draft Environmental Resource Permit Stormwater Quality Applicant's Handbook*. FDEP and Water Management Districts, Design Requirements for Stormwater Treatment Systems in Florida, March 2010 Draft.