



Northwoods Pond Study

July 22, 2024

Process, Goals, & Scope

Data Collection & Resident Feedback

Stormwater & Drainage

Modeling & Analysis, Recommendations

Water Quality & Maintenance

Analysis, Recommendations, Dredging

Summary of Recommendations

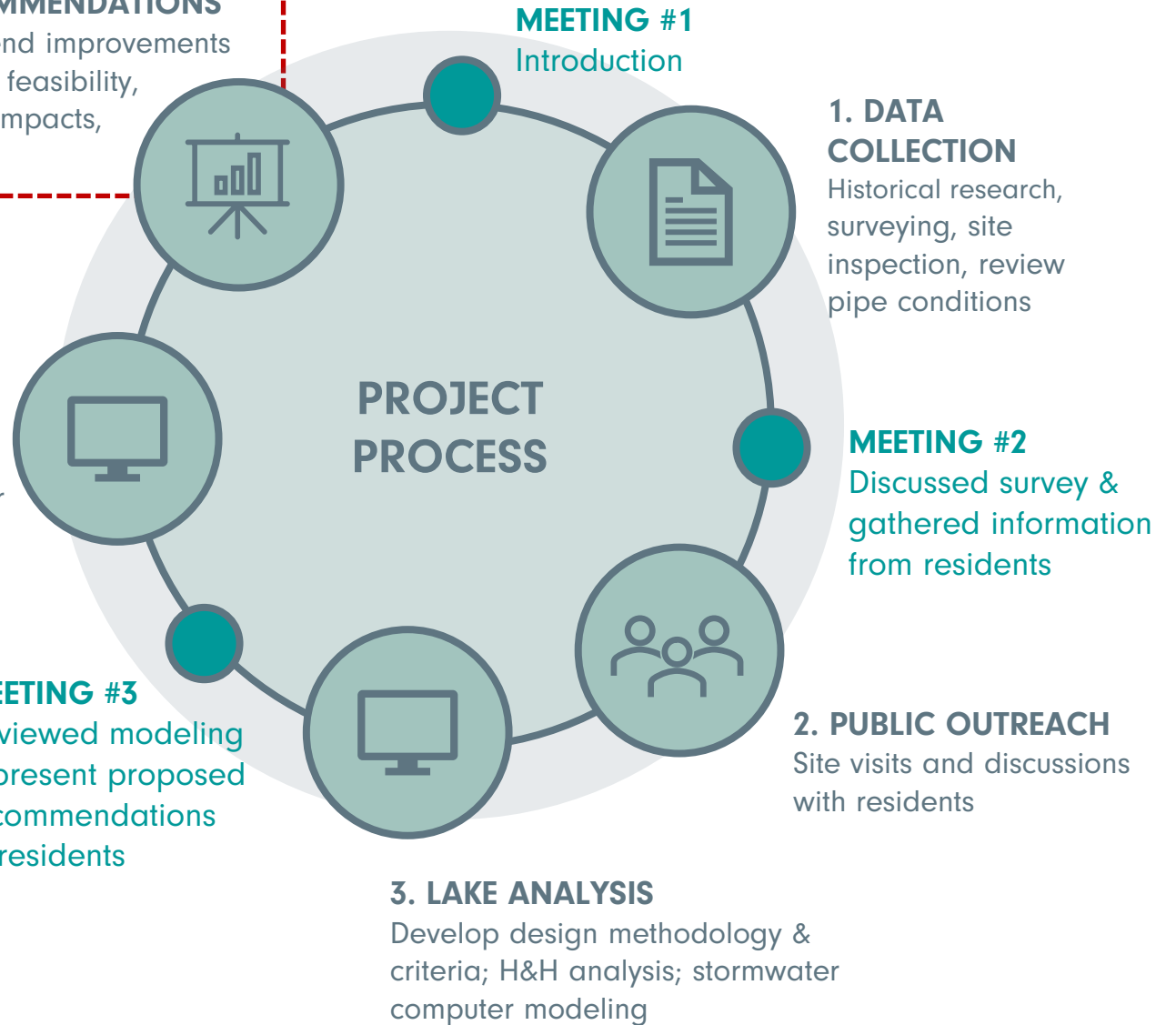
OBJECTIVE

Identify and analyze existing conditions and evaluate remedial actions in the form of **outfall improvements** that will **reduce future flooding** and **maintenance recommendations** that will **improve the aesthetic quality** of the Northwoods pond system.



4. LAKE 4 & FURTHER DRAINAGE ANALYSIS
 Develop design methodology & criteria; H&H analysis; stormwater computer modeling

5. RECOMMENDATIONS
 Recommend improvements based on feasibility, property impacts, cost, etc.





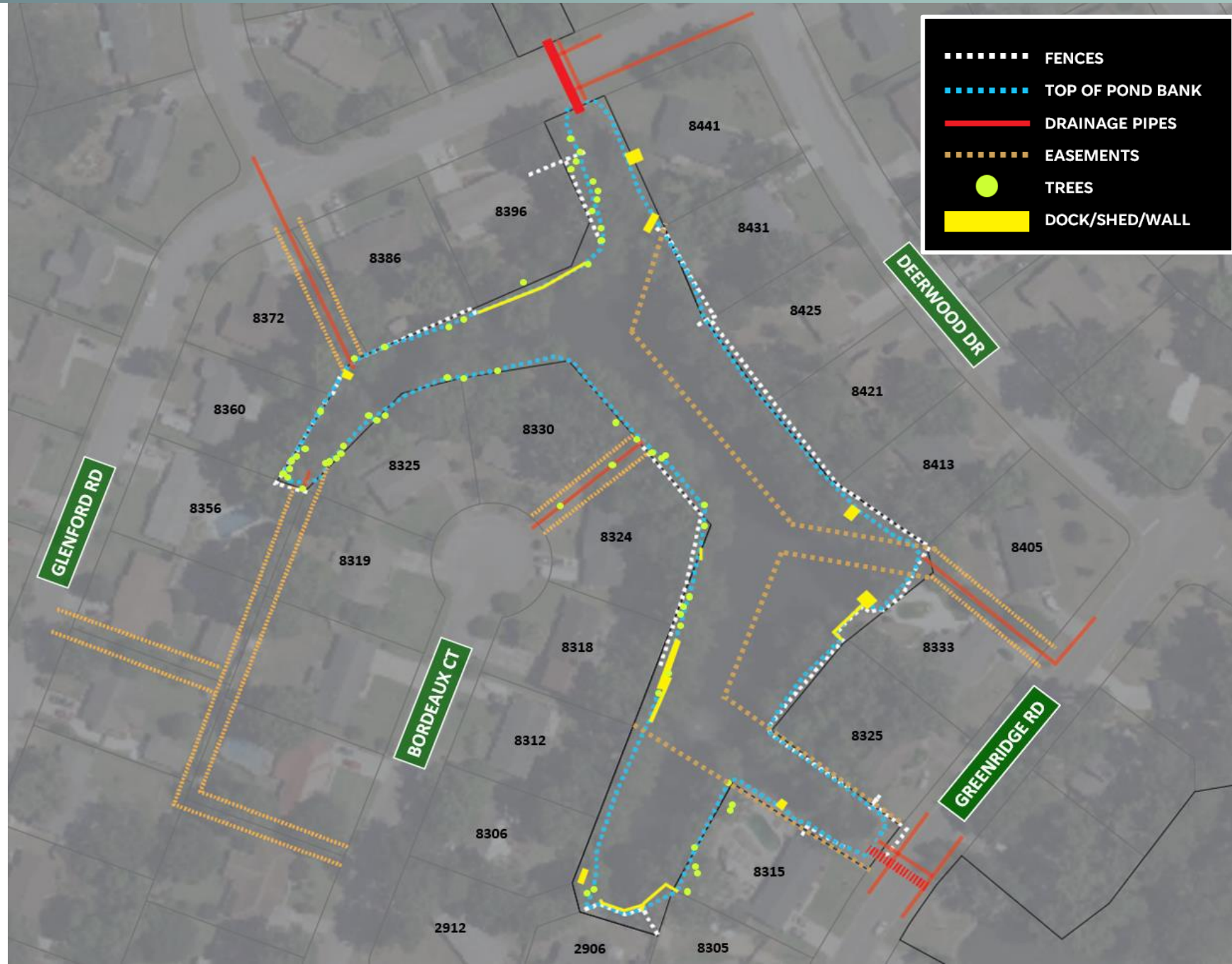


Existing conditions & current challenges in maintaining the pond system include:

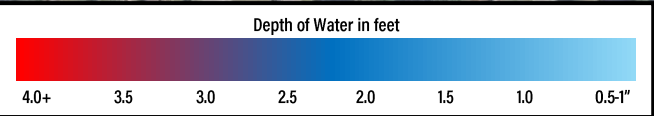
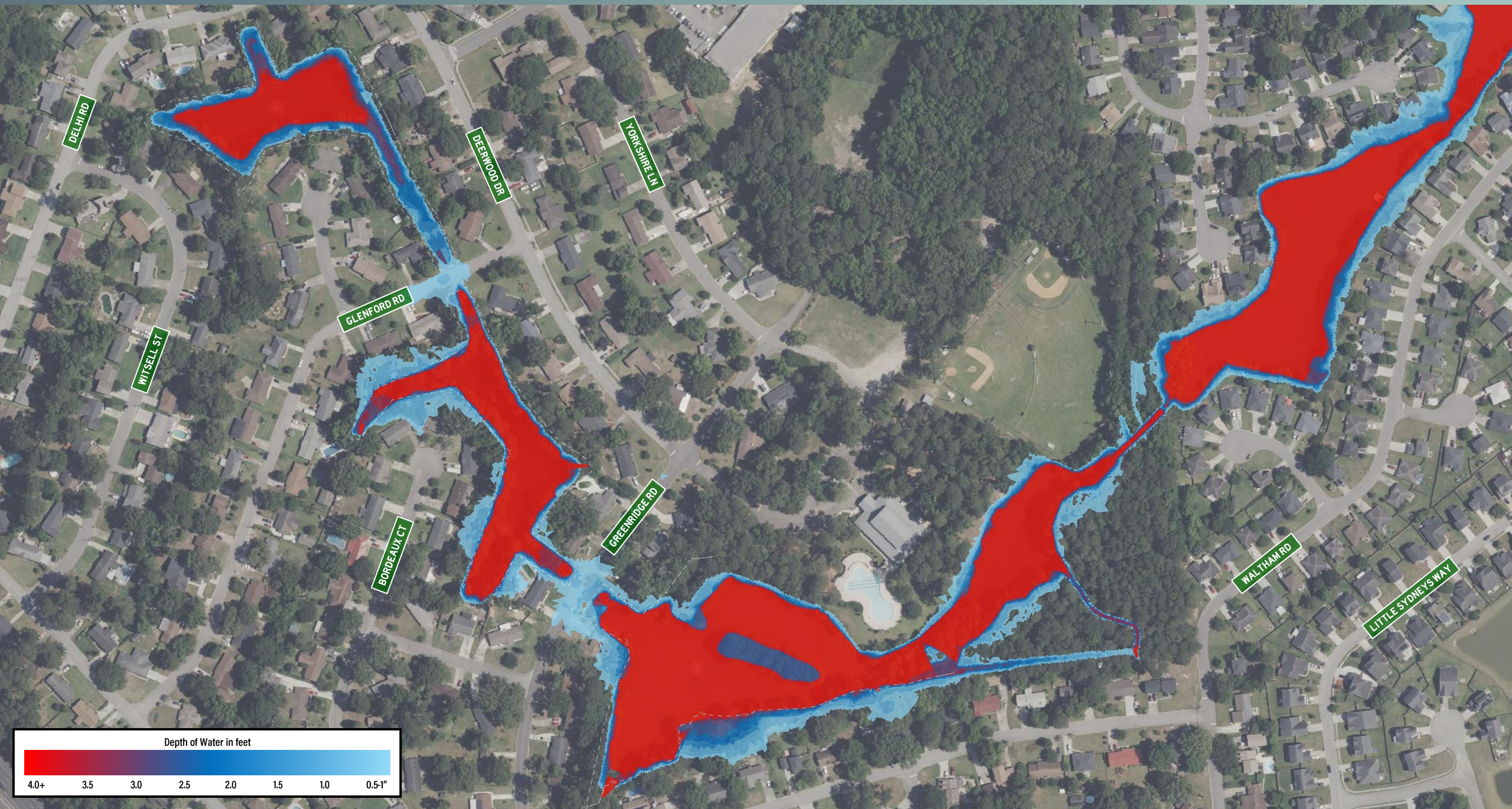
- Lack of access behind resident yards
- Obstructions – docks, fences, etc.
- Lack of maintenance shelf around pond

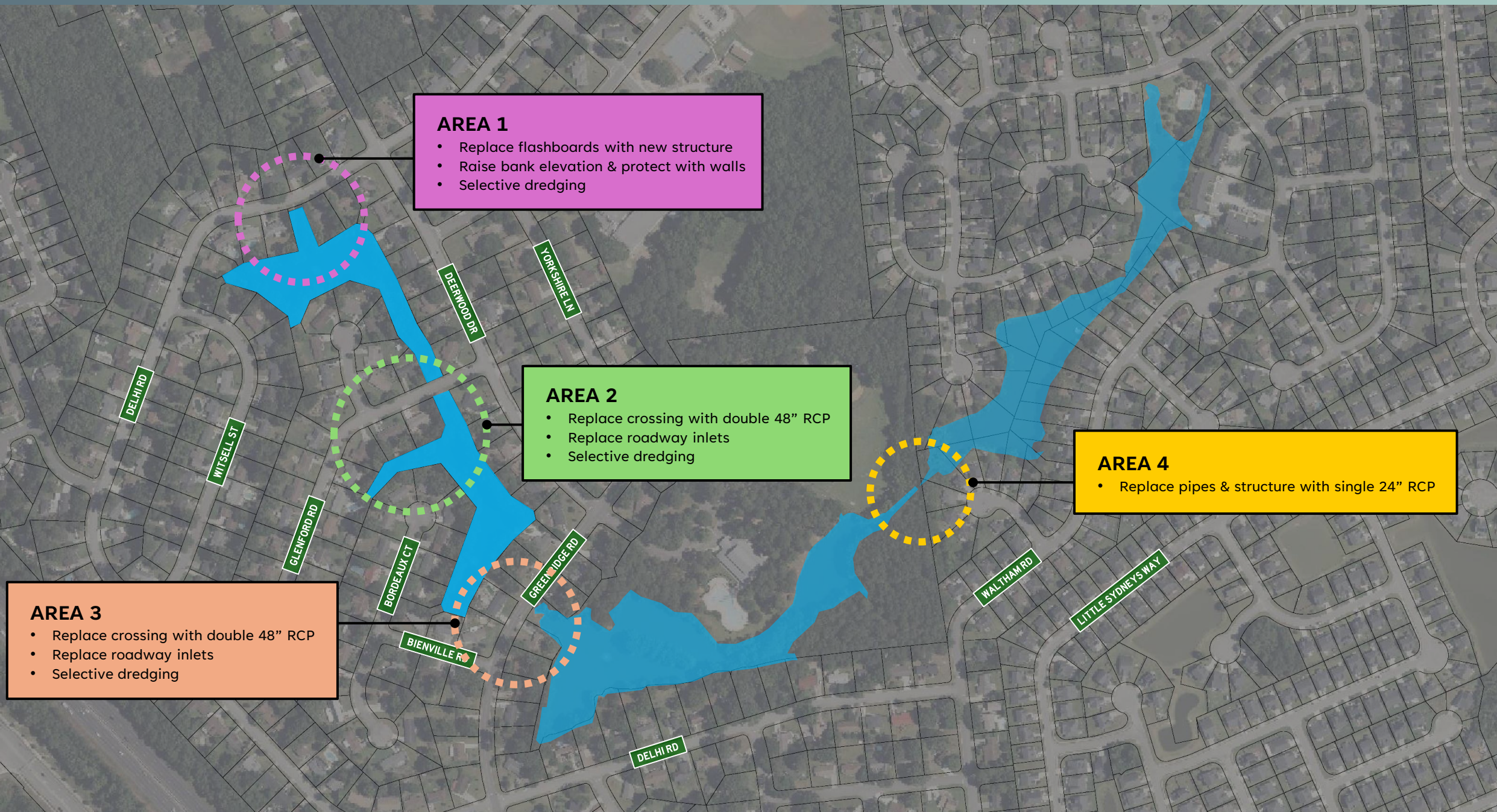
RECOMMENDATION

- City will work with homeowners to re-establish access at existing easements
- City will partner with willing homeowners in establishing new maintenance access









AREA 1

- Replace flashboards with new structure
- Raise bank elevation & protect with walls
- Selective dredging

AREA 2

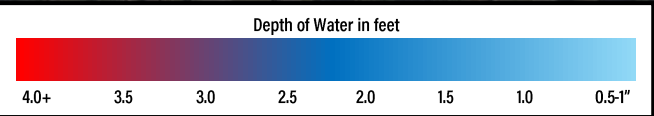
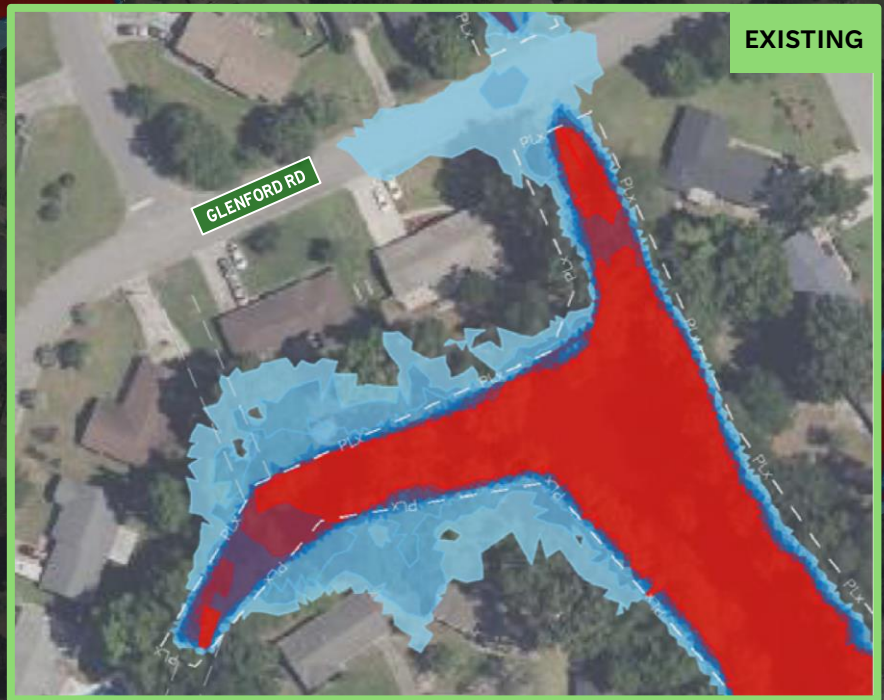
- Replace crossing with double 48" RCP
- Replace roadway inlets
- Selective dredging

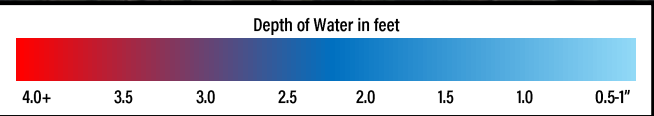
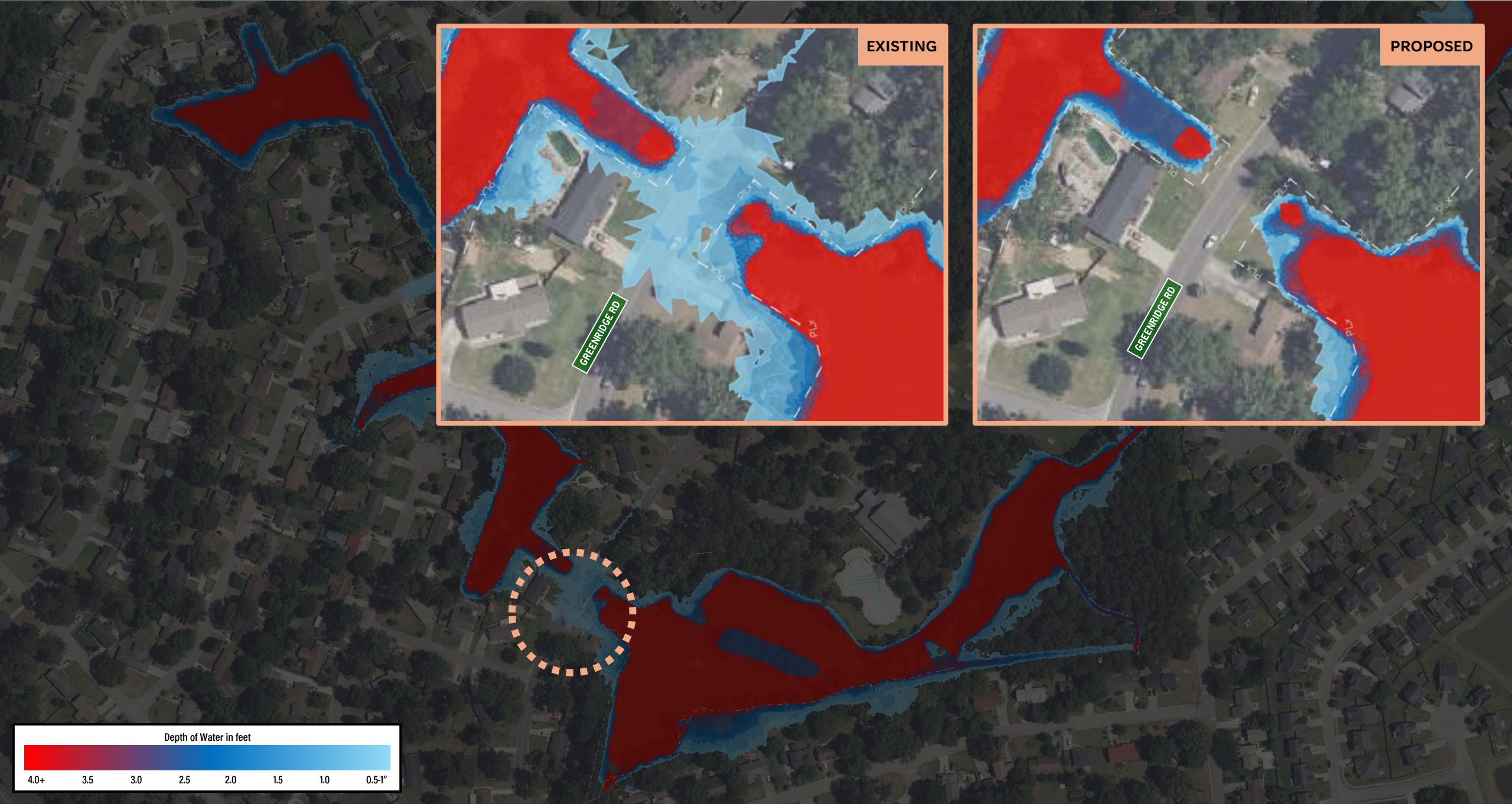
AREA 3

- Replace crossing with double 48" RCP
- Replace roadway inlets
- Selective dredging

AREA 4

- Replace pipes & structure with single 24" RCP





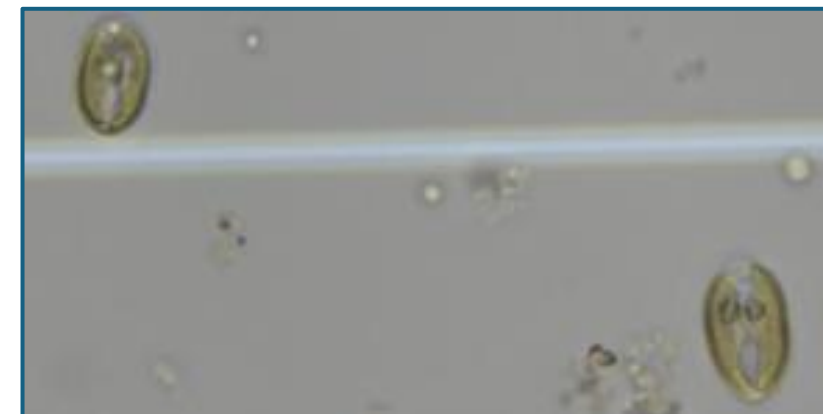
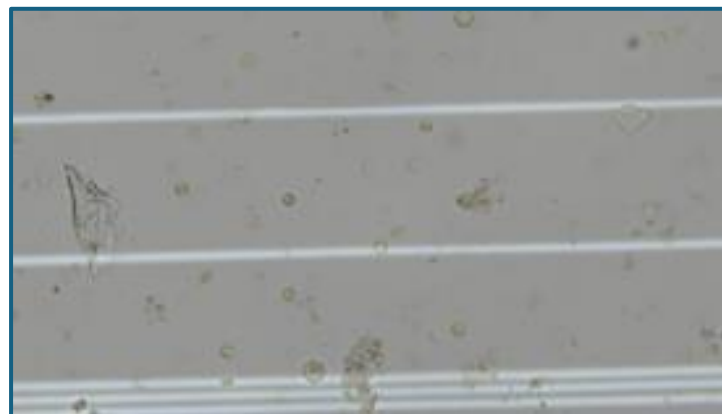
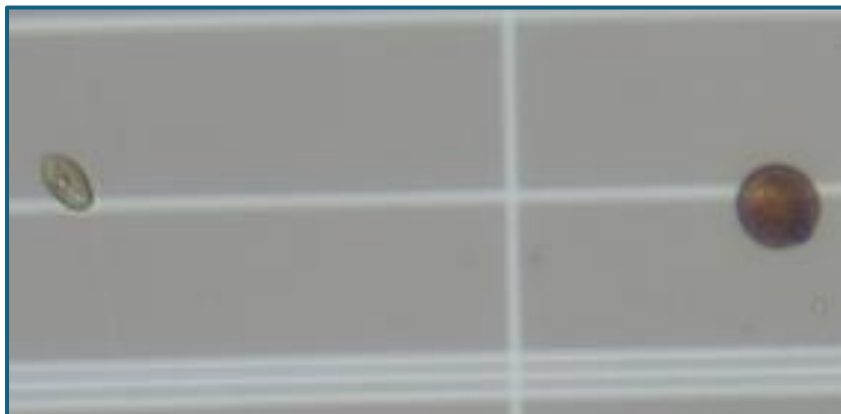
Water Quality Testing Results:

- pH: Borderline - Low
- Phosphorus: High
- Orthophosphate: High (Pond 1)
- Alkalinity: Low
- Turbidity: High (Pond 3)
- Hardness: Low
- Nitrogen, Conductivity, Chlorophyll a: Healthy

Algae Testing Results:

- *Cryptomonas* sp.
- *Trachelomonas* sp.
- *Chromulina* sp.

POND 1			
Test	Desired Range	Result	This lake is
pH Reading	6.5 - 8.5	6.1	Low
Phosphorus, Total (ppb)	< 30	152	High
Orthophosphate (ppb)	< 30	90	High
Nitrogen, Total (ppb)	< 1,200	490	Healthy
Nitrogen, Total Kjeldahl (ppm)	< 1,200	490	Healthy
Nitrate (ppb)	< 600	< 20	Healthy
Nitrite (ppb)	< 600	< 20	Healthy
Conductivity (uS/cm)	< 1,200	106	Healthy
Alkalinity, Total (ppm)	> 80	13	Low
Turbidity (NTU)	< 5	4.2	Healthy
Chlorophyll a (ppb)	< 40	14	Healthy
Hardness, Total	> 80	34	Low



DREDGING

A selective dredging program to improve the flow of water and clear vegetation – flow channel, highly impacted areas, vegetation cutback & removal



AERATION

Upgrade the system's aeration system with bubblers



		Solitude Lake Management Northwoods Pond 2	
HF 3 Plus			
HF 3+ XL2			
Legend Compressor Cabinet Air Station Bottom Line Tubing			
Optional Equipment Shoreline Valve Box 1" PVC Pipe			
Site and System Specifications			
Surface Acres:	2.1		
Perimeter Feet:	2,140		
Lake Volume, Gal.:	3,241,216		
Total Acre Feet:	9.9		
# of Air Stations:	4		
CFM / Air Station:	1.3		
GPM / Air Station:	1,479		
Daily Pumpage:	8,518,211		
Turnovers/Day:	2.63		
System HP:	4.9		
Date:	7/27/23		

CHEMICAL TREATMENT

Continue chemical treatment, removal, and inspection for the system's aquatic growth



RESIDENT PREVENTION

Prevent fertilizer & sediment from entering the system

Use biodegradable and phosphate-free detergents when washing cars

Remove yard waste to prevent build-up in gutters, storm drains, or ditches

Clean up after pets

Do not feed fish, ducks, or geese

City willing to approve permits & work with homeowners to complete their own bank stabilization activities



Item	Cost
Stormwater Improvements	\$622,314
Selective Dredging	\$403,707
Aeration System	\$38,500
Contingency + Engineering	\$212,904
Total	\$1,277,425
Continual Maintenance (<i>annually</i>)	\$7,680

cost estimate based on 2024 pricing

Resident-funded improvements consist of bank stabilization activities that must be approved by the City and professionally installed. Examples include:

- Riprap (\$147/LF)
- Establishing living shoreline (\$39/LF)
- Shoreline restoration services (\$175/LF)
- Installing walls (\$300/LF)



Complete pond dredging was evaluated but will only improve aesthetics, not flooding

The cost of dredging the complete system is estimated at \$7,689,200

Access issues require special water-based equipment for dredging

