

AGENDA
Cascade Charter Township
Thornapple River SAD Ad-Hoc Committee
Monday, February 12, 2024
5:30 pm
5920 Tahoe Dr. SE

- | | | |
|----------------|------------|--|
| ARTICLE | 1. | Call the meeting to order |
| ARTICLE | 2. | Approval of the Agenda |
| ARTICLE | 3. | Acknowledge Visitors & Public Comment
(Limited to five minutes per speaker.) |
| ARTICLE | 4. | Approval of the Minutes of the August 7, 2023 Meeting |
| ARTICLE | 5. | Approval of the Minutes of the December 4, 2023 Meeting |
| ARTICLE | 6. | Review Draft Annual Report |
| ARTICLE | 7. | Website Update |
| ARTICLE | 8. | Safety/Navigational Marking Project by Viking Marine |
| ARTICLE | 9. | Any Other Business |
| ARTICLE | 10. | Roundtable/Q&A |
| ARTICLE | 11. | Public Comment
(Limited to five minutes per speaker.) |
| ARTICLE | 12. | Adjournment |

MINUTES

Cascade Charter Township
THORNAPPLE RIVER SAD AD-HOC COMMITTEE MEETING
August 7, 2023 at 5:30pm
Cascade Charter Township Hall
5920 Tahoe Dr. SE
Grand Rapids, MI 49546

ARTICLE 1. The meeting was called to order at 5:29pm.

Members Present: Members Scott Rissi, Chuck Whitley, Leann Rowland, Thomas Keith, Jeff Carpenter, Michael Wiegand, and Trustee Shipley

Others Present: Parks & Recreation Director Melanie Manion (Director Manion)

ARTICLE 2. Approve the current Agenda

Director Manion thanked Member Rissi for being willing to take her out on a boat to view the river and share history of the committee.

Motion was made by Member Rissi to approve the agenda as written. Supported by Member Rowland. Motion carried.

ARTICLE 3. Approve the Minutes of the June 19, 2023 Meeting

Motion was made by Member Rissi to approve the minutes of the June 19, 2023 meeting as written. Supported by Member Keith. Motion carried.

ARTICLE 4. Acknowledge Visitors & Public Comment

There weren't any visitors who wished to comment at that time.

ARTICLE 5. Safety & Navigational Marking Plan RFP Response Review

They completed three dives for a depth survey. This is the first thing the company had to complete before they could apply for the permit. They are now applying for the permit on behalf of the SAD. The assumption is that it will make 60-180 days for the permit to be approved or denied.

Director Manion discussed the Thornapple River SAD budget and how much money they have. There was discussion as to the amount of money that was collected thus far from the SAD, how much had been spent, and how the Township can better track their funds in the future. The new Township Manager was chosen due to his finance skills and Treasurer Korstange is working to bring in a new financial reporting software that would increase accessibility of financial information to the public.

ARTICLE 6. Aquatic Weed Management Plan Update

The weeds were treated and it worked. Since the river is technically township property and the milfoil is considered an invasive species, the Township determined that the single property that did not want weed treatment in the river along their property

would still receive treatment. The harvesting was set to occur the next week in the shallow area. The launch spot was unclear as the Caledonia position wouldn't work when the water level is low.

ARTICLE 7. Large Debris Removal Project

Director Manion spoke with some members of the DNR and EGLE about wood in the water, muscles, and permitting. They said Cascade would need a permit if it alters the water pattern or if it is in the sediment. Director Manion believes that the debris is floating in the water and have come downstream. The members concurred that the debris is buoyant and, while some debris is in the sediment, that is not the debris they are looking to remove/relocate. The committee discussed where they could move the debris that it wouldn't float back out into the river. They suggested areas that were shallower, such as in front of the golf course. They will monitor the debris to see if it stays in place or floats back into the buoyant areas of the river.

Motion was made by Member Rissi to hire Larry's Tree Service for up to two eight-hour days, one on each side of the railroad bridge. Supported by Member Carpenter. Motion carried.

ARTICLE 8. Any Other Business

Members discussed river access points and the Township reaching out to the Maracaibo association for access.

ARTICLE 9. Roundtable Q & A

Members discussed information sharing and how to make sure information surrounding the SAD is preserved for future residents.

ARTICLE 10. Adjournment

Motion was made by Member Rissi to adjourn. Supported by Member Wiegand. Motion carried. The meeting was adjourned at 6:28 p.m.

Approved by the Thornapple River SAD Ad-Hoc Committee - TBD

MINUTES

Cascade Charter Township
THORNAPPLE RIVER SAD AD-HOC COMMITTEE MEETING
December 4, 2023 at 5:30pm
Cascade Charter Township Hall
5920 Tahoe Dr. SE
Grand Rapids, MI 49546

- ARTICLE 1.** The meeting was called to order at 5:31pm.
- Members Present: Members Scott Rissi, Leann Rowland, Jeff Carpenter, Trustee Shipley, Chuck Whitley
Absent: Thomas Keith, Michael Wiegand
Others Present: Parks & Recreation Director Melanie Manion, Township Manager Jade Smith, Management Office Administrative Assistant Jessica Stine
- ARTICLE 2. Approve the current Agenda**
- Motion was made by Member Rissi to approve the agenda as written. Supported by Member Rowland. Motion carried.**
- ARTICLE 3. Acknowledge Visitors & Public Comment**
- The leader from the Thornapple River Watershed Council introduced herself as did Renee VanHouten. Clarence Maring introduced himself as the Vice President of the CTRA (Cascade Thornapple River Association).
- ARTICLE 4. Approve the Minutes of the September 18, 2023 Meeting**
- Motion was made by Member Carpenter to approve the minutes as written with the addition of Supervisor Lesperance to the attendance. Supported by Member Rissi. Motion carried.**
- ARTICLE 5. Finances- *Jade Smith, Township Manager***
- Manager Smith included the 2024 budget in the packet and explained that there was a healthy fund balance. The budget was significantly under what they had anticipated for 2023. Manager Smith will continue to provide financial reports at meetings showing what is spent between meetings going forward.
- ARTICLE 6. Debris Relocation by Larry's Tree Service- *Member Rissi***
- Member Rissi explained that they were happy with the relocation of the mobile obstacles Larry's Tree Service was able to complete and will wait until after the spring floods to see if more show up. He only completed work on the North side of the railroad bridge as South side access was unavailable. They rejected the locations the Township was able to offer the on the South side and said he would only use the Kilmer ramp or a private residence ramp. Member Rissi asked Beaverwood and they may be willing to launch from their ramp and use their less sophisticated barge to clear mobile objects from the South side in future years. Depending on the quantity and location of

floating debris in the spring, the committee may employ both Beaverwood and Larry's Tree Service to each clean up debris on the side of the river they have access to. There were some problems this year with a lack of communication but the Township will be taking over communications contractors and potential ramps going forward.

ARTICLE 7. Safety/Navigational Marking Project by Viking Marine Construction- *Member Carpenter*

Member Carpenter talked about the updated water depth survey data and explained that they have all the survey data and information available for permitting. The raw data and professional mapping are both available to both the committee as well. Viking Marine Construction has subcontracted the permitting to Peterson Vandenburg. The permits for the navigational marking were originally rejected due to missing information but they are currently in the process of resubmitting the information to EGLE. They expect approval by Christmas. The committee will need to value engineer the design and award the bid to place the markings in the winter. They are currently looking to get signed permission from two to three homeowners because the marking would be in waterway that is on their property, rather than township property like the rest of them, and Manager Smith is reaching out to those residents.

ARTICLE 8. Aquatic Vegetation Control and Harvesting by PLM- *Melanie Manion, Parks & Rec Dir.*

Director Manion went through PLM's annual report and explained that while all the water quality test results appeared to be within acceptable ranges, other than nitrates, there is cause for some concern due to the amounts of PFAS and heavy metals in the river. She shared information from the Kent County Health Department related to fish and how many it is safe to eat from the river due to mainly mercury and PFOS in the water. It is likely residential septic fields and lawncare are at fault for elevated nitrates in the water. It is recommended that residents in the SAD be educated about these risks from eating excessive amounts contaminated fish in the future. There will be further discussion, when the next contract is written, as to if some of the data being collected is adding value or not worth the additional costs.

ARTICLE 9. Contractor Access- *Member Rissi*

Member Rissi said that his wife had originally be the contact with Maracaibo Shores but he will be connecting Director Manion and Manager Smith with them going forward. Member Rissi will still serve as an emergency contact, but the township should be responsible for receiving communication related to the SAD. Maracaibo Shores may be used for contractor access in this way but will only work for contractors with low height boats/barges. Member Rissi will still allow contractors to use his ramp that can safely turn around on his property without having to back in from across the street as that can cause an unsafe stoppage of traffic. The Township also has access at the Goodwood ramp but this may only be for emergency services.

ARTICLE 10. Communications- *Manager Smith and Member Carpenter*

Manager Smith discussed how the channels of communication are currently under township control and are interested in what types of communication the committee is looking for. They discussed an eblast schedule for summer swimming restrictions and setting up a communications meeting with Communication Specialist Lakeberg after the new year to plan out what they want for 2024.

ARTICLE 11. 3-5 Year TRSAD Strategic Plan Introduction- *Member Carpenter*

Member Carpenter recommended holding work sessions to create a more long-term plan for how the SAD would spend their funds. It was suggested these take place in some of the months when there wasn't a regular meeting scheduled.

ARTICLE 12. February 2024 Board of Trustees Deliverables- *Manager Smith*

Manager Smith said he will be bringing the report included in this meetings packet to the Board of Trustees meeting in February 2024 and presenting them with the same information he had tonight.

ARTICLE 13. Any Other Business

The meetings will move to a bi-monthly frequency, taking place on the first Monday of each month on Friday, at the township office.

ARTICLE 14. Roundtable Q & A

Trustee Shipley shared that the Thornapple River is a large part of the surrounding ecosystem of rivers that the citizens must work hard to protect.

ARTICLE 15. Public Comment

VanHouten asked additional questions about the movement of buoyant objects in the river and the results of depth testing. Members agreed to meet with her later and share the information they have gathered.

Commissioner Bujack stated that he believes that Cascade has some of the best stewardship related he has seen in his years working with the Thornapple River Watershed Council.

Trustee Shipley shared that he appreciates that Commissioner Bujack is very supportive and takes to heart what the residents of his area really want.

ARTICLE 16. Adjournment

Motion was made by Member Rissi to adjourn. Supported by Member Carpenter. Motion carried. The meeting was adjourned at 6:47 p.m.

Approved by the Thornapple River SAD Ad-Hoc Committee - TBD



**THORNAPPLE RIVER
SPECIAL
ASSESSMENT
DISTRICT**

**ANNUAL
REPORT**

2023

MEMBERS

THORNAPPLE RIVER SAD COMMITTEE MEMBERS

John Shipley, Trustee
Jeff Carpenter, Cascade Thornapple River Assoc. Rep
Thomas Keith
Scott Rissi
Leann Rowland
Chuck Whitley
Michael Wiegand

TOWNSHIP STAFF ASSISTING THE COMMITTEE

Jade Smith, Township Manager
Melanie Manion, Parks Director
Aric Thorne, Township Engineer
Jessica Stine, Management Office Administrative Assistant

SAFETY & NAVIGATIONAL MARKING PROJECT

The Thornapple River SAD Committee kicked off 2023 with the creation of an RFP to select a contractor to aid in developing and implementing a Safety & Navigational Marking Plan for the SAD section of the Thornapple River. Viking Marine Construction won the bid and took lead on obtaining permits to mark hazards on the river. Permitting was subcontracted to Peterson Vandenburg. Marking of objects/the channel will primarily be between the I-96/M-6 bridges and the CSX railroad bridge. This project is currently awaiting state approval from EGLE and will likely move forward in the next one to two years, depending on how long it takes for permit approval and availability of a contractor to place the navigational markers. The permit will be open for 5 years once approved. More markers were requested than will be placed as it will be easier for the committee to make modifications to the placement as necessary, without requiring additional permits. The committee intends to limit the number of markers so site lines to the water remain scenic. The locations of markers requested in the permit are included in the appendix of this report.

In preparation for the permitting process, Viking Marine Construction surveyed river depths and provided the Township with both the raw data and professional mapping of the SAD portion of the river. While this information was obtained for permitting, the committee hopes to use it for other SAD related tasks in the future, such as updating the river map.

AQUATIC VEGETATION CONTROL & WATER TESTING

This year marked the second successful season of weed treatments and water quality testing of the river by PLM Lake & Land Management Corp. Water Quality results, including tests for E. coli, conductivity, total dissolved solids, pH, alkalinity, total phosphorus, nitrates, and chlorophyll are included in the appendix. The 2023 milfoil harvest, the cutting and removal of the exotic and highly invasive species, Eurasian watermilfoil, went much more smoothly than the 2022 harvest. In 2022, large quantities of weeds floating down stream. The committee recommended a change to PLM's harvesting process and that appears to have greatly reduced the amount of weeds floating downstream. While both the committee and Township received complaints related to this in 2022, neither received negative feedback from residents related to the harvesting of weeds in 2023.

Fewer acres of the river were weed treated in 2023 than in previous years, since fewer areas of invasive species were present; this suggests that the weed treatments are working. The committee hopes this trend continues, but are ready to act if new problems arise. In fall of 2023, there was an extensive algae bloom in Ada Township and, while Cascade Township has not experienced anything similar, the situation is being closely monitored.

SAD FUNDS

The SAD committee received an unexpected and welcome visit at its September meeting from Supervisor Lesperance and Treasurer Korstange. They explained the process in which funds are collected, processed, and set aside in a SAD. They also answered questions and assured the committee that they would have accurate financial information moving forward. The committee was confident in their financial outlook after the meeting

FLOATING DEBRIS RELOCATION

During the fall of 2023, Larry's Tree Service was contracted to their barge to relocate several large floating trees and logs that the spring rains washed into the navigable waterway. These objects were successfully removed from the channel and securely laid at the edge of the river to provide bank stabilization in designated areas. Moving these objects has made for a much safer environment as these objects would frequently drift with the wind, many floating even with the water's surface, making them hard to spot in certain conditions. In the first part of 2024, the committee intends to create a multi-year plan.

The committee appreciates the boards continued support of their efforts to improve and protect the quality of the Thornapple River.

APPENDIX

Pages 7-8 Channel Markers

Pages 9- 18 Hazard Markers

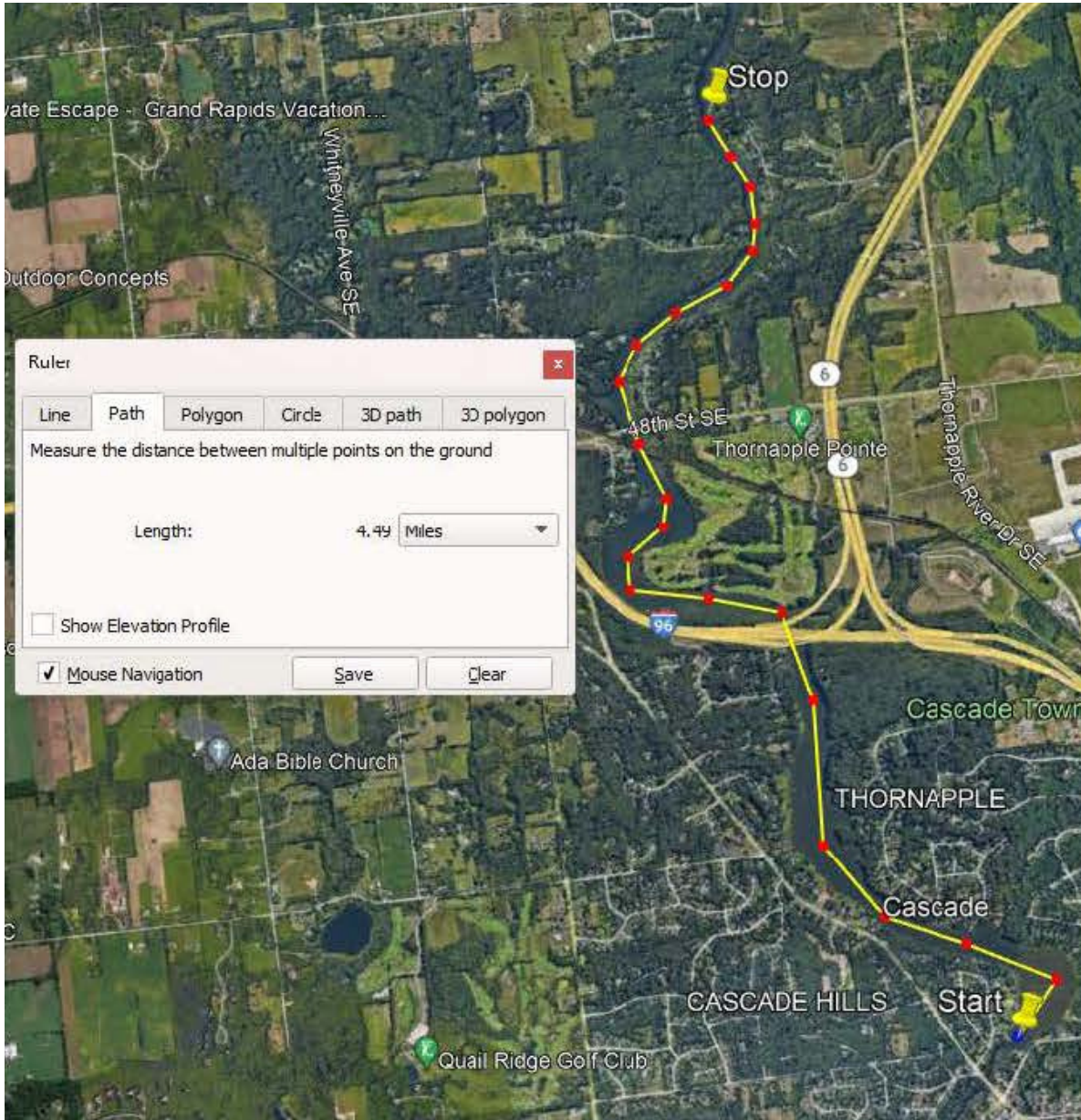
Pages 19-20 2023 Water Quality Report: Test Site #1

Pages 21-22 2023 Water Quality Report: Test Site #2

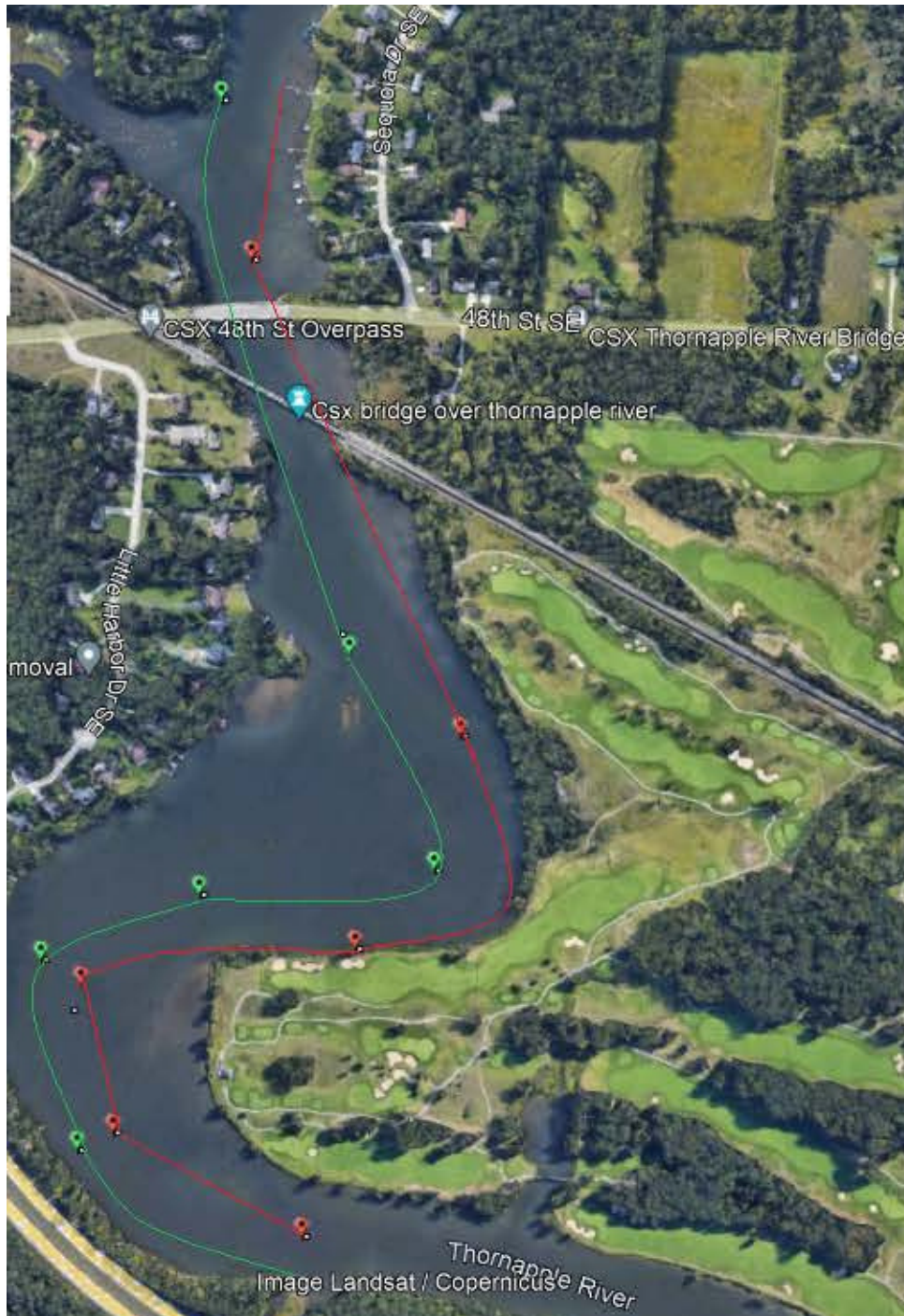
Page 23 2023 Bacteria Sampling Report

Pages 24-25 2023 Overall Water Quality Measurements

CHANNEL MARKERS

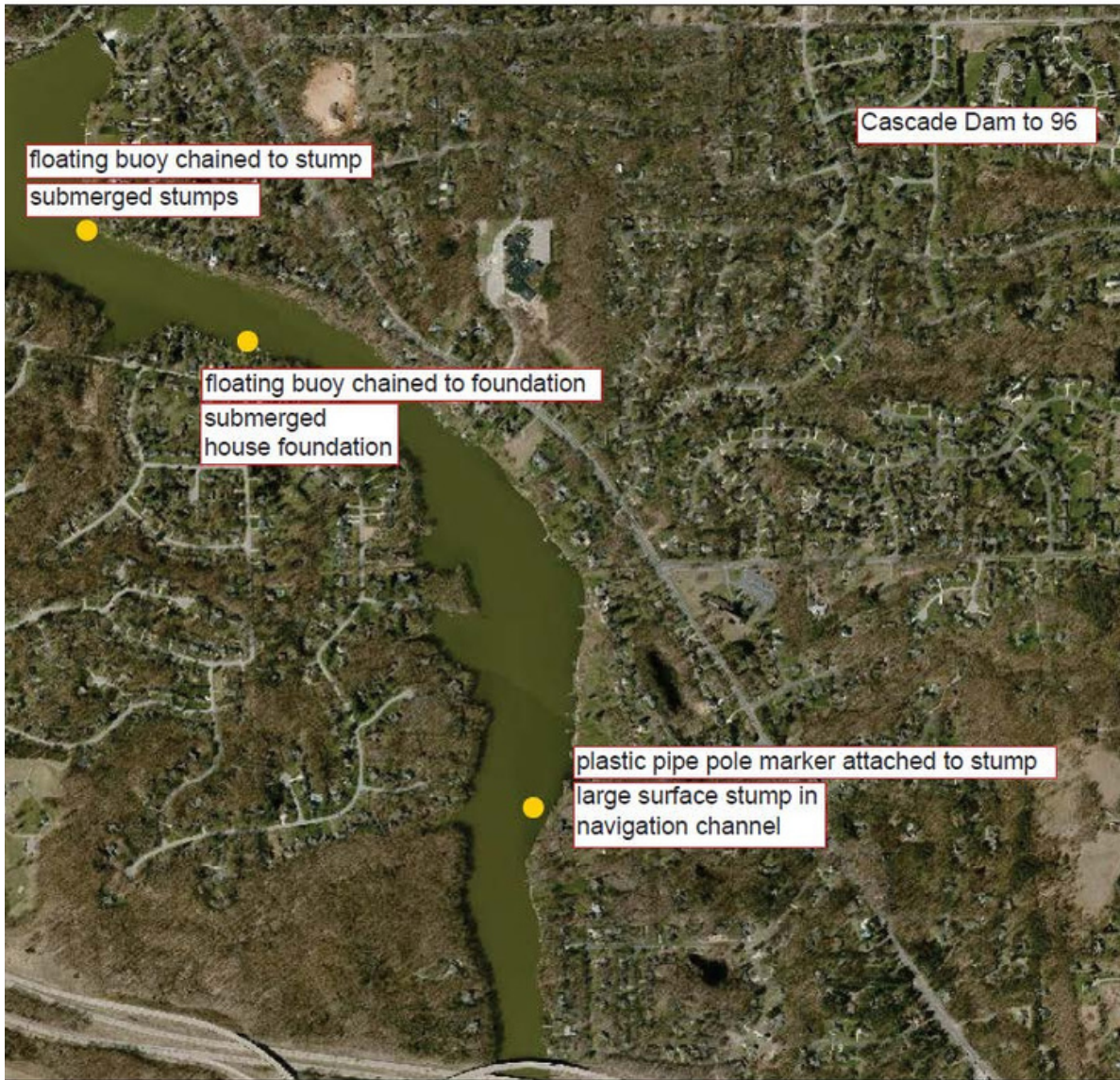


CHANNEL MARKERS



Please Note: The location of the channel markers on this drawing are not to scale. They are located in an appropriate area. Final channel marker placement will be based off of a hydrographic survey and GPS positioning.

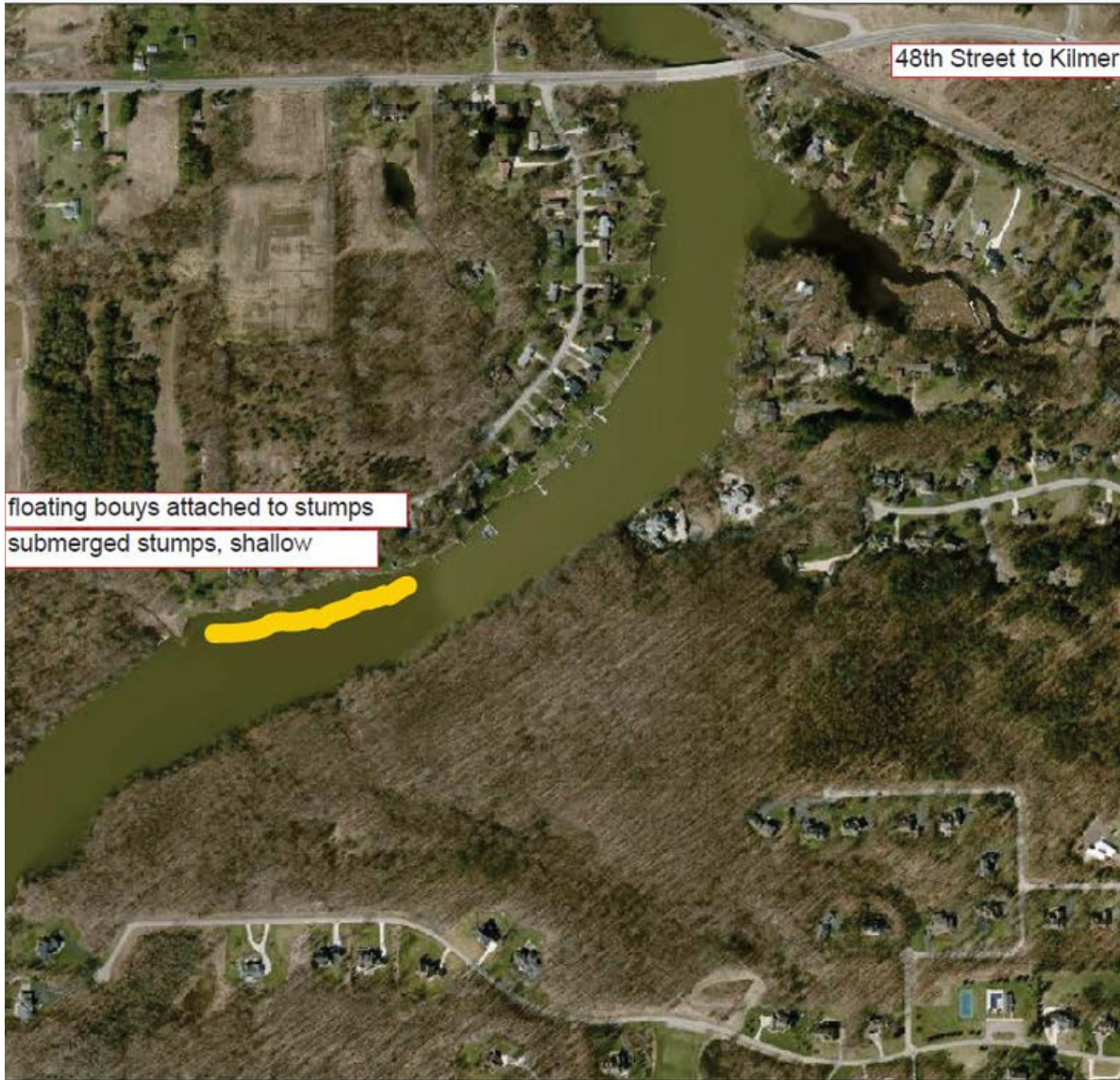
HAZARD MARKERS



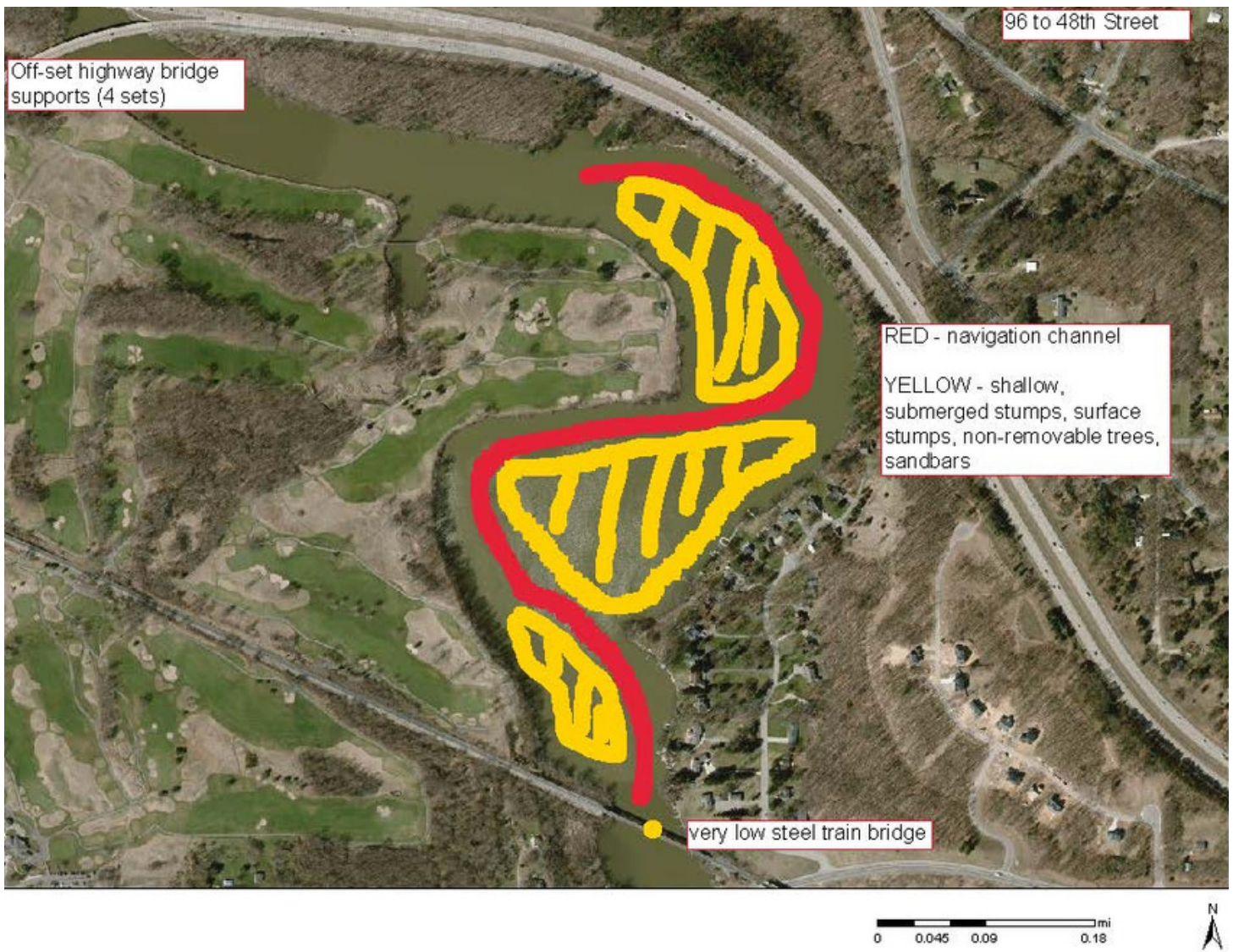
HAZARD MARKERS



HAZARD MARKERS



HAZARD MARKERS



HAZARD MARKERS



HAZARD MARKERS



0 0.005 0.01 0.02 mi

HAZARD MARKERS



HAZARD MARKERS



HAZARD MARKERS



HAZARD MARKERS



0 0.005 0.01 0.02 mi



2023 WATER QUALITY REPORT: TEST SITE #1

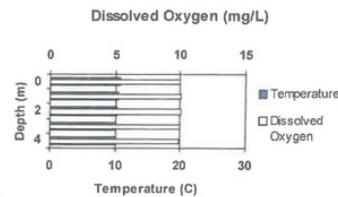


2023093

Customer	Waterbody	Sample Information
Thornapple River Cascade	Thornapple River Cascade	Date: 4/20/2023
		Site: #1

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen	
		mg/L	%
0	10.7	10.0	90
1	10.4	10.0	90
2	10.2	10.0	89
3	10.1	10.0	89
4	10.0	9.9	88



Secchi Disk Depth	0.8 meters
Thermocline Depth	meters

Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli)		CFU/100 mL	N/A
Conductivity	331	uS/cm	
Total Dissolved Solids	297	mg/L	Moderate concentration of dissolved salts
pH	8.3	S.U.	Water is slightly alkaline
Alkalinity	234	mg CaCO3/L	Water is very hard
Total Phosphorus	7	ug/L	Slightly phosphorus enriched
Nitrates	1490	ug/L	Nitrogen enriched
Chlorophyll		N/A	

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	64	hypereutrophic
Based on Total Phosphorus	28	oligotrophic
Based on Chlorophyll	N/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Sample is nitrogen enriched. Consider nutrient abatement measures.
- Repeat LakeCheck in Fall.

- WARNING, condition requires immediate attention.
- CAUTION, condition requires further evaluation.
- OK, condition within acceptable limits.
- NEUTRAL, condition neither good nor bad.

2023 WATER QUALITY REPORT: TEST SITE #1

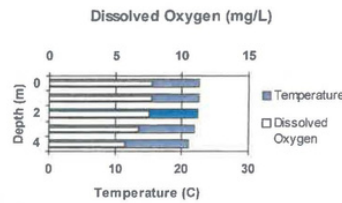


2023094

Customer	Waterbody	Sample Information
Thornapple River Cascade	Thornapple River Cascade	Date: 9/5/2023 Site: #1

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen	
		mg/L	%
0	22.6	7.7	90
1	22.6	7.7	90
2	22.4	7.5	87
3	21.9	6.8	77
4	21.0	5.7	64



Secchi Disk Depth	1.0 meters
Thermocline Depth	meters

Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli)		CFU/100 mL	N/A
Conductivity	528	uS/cm	
Total Dissolved Solids	344	mg/L	Moderate concentration of dissolved salts
pH	8.6	S.U.	Water is slightly alkaline
Alkalinity	251	mg CaCO ₃ /L	Water is extremely hard
Total Phosphorus	9	ug/L	Slightly phosphorus enriched
Nitrates	1520	ug/L	Nitrogen enriched
Chlorophyll	N/A		

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	60	eutrophic
Based on Total Phosphorus	31	meso-oligotrophic
Based on Chlorophyll	N/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Sample is nitrogen enriched. Consider nutrient abatement measures.
- REPEAT LakeCheck NEXT YEAR!

- WARNING. condition requires immediate attention.
- CAUTION. condition requires further evaluation.
- OK. condition within acceptable limits.
- NEUTRAL. condition neither good nor bad.

2023 WATER QUALITY REPORT: TEST SITE #2



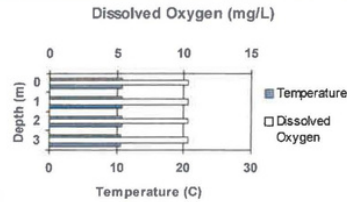
Water Quality Monitoring Report

2023095

Customer	Waterbody	Sample Information
Thornapple River Cascade	Thornapple River Cascade	Date: 4/20/2023
		Site: #2

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen	
		mg/L	%
0	10.7	10.3	93
1	10.7	10.3	93
2	10.7	10.3	93
3	10.5	10.3	93



Secchi Disk Depth	0.8 meters
Thermocline Depth	meters

Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli)		CFU/100 mL	N/A
Conductivity	535	uS/cm	
Total Dissolved Solids	300	mg/L	Moderate concentration of dissolved salts
pH	8.4	S.U.	Water is slightly alkaline
Alkalinity	241	mg CaCO ₃ /L	Water is very hard
Total Phosphorus	7	ug/L	Slightly phosphorus enriched
Nitrates	1500	ug/L	Nitrogen enriched
Chlorophyll		N/A	

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	64	hypereutrophic
Based on Total Phosphorus	28	oligotrophic
Based on Chlorophyll	N/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Sample is nitrogen enriched. Consider nutrient abatement measures.
- Repeat LakeCheck in Fall.

- WARNING. condition requires immediate attention.
- CAUTION. condition requires further evaluation.
- OK. condition within acceptable limits.
- NEUTRAL. condition neither good nor bad.

2023 WATER QUALITY REPORT: TEST SITE #2

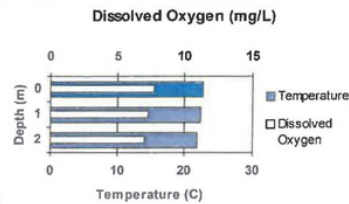


2023096

Customer	Waterbody	Sample Information
Thornapple River Cascade	Thornapple River Cascade	Date: 9/5/2023 Site: #2

On-Site Results

Depth (m)	Temperature (degrees C)	Dissolved Oxygen	
		mg/L	%
0	22.7	7.8	90
1	22.4	7.3	84
2	21.9	7.0	80



Secchi Disk Depth	1.0 meters
Thermocline Depth	meters

Analytical Results

Parameter	Result	Units	Interpretation
Fecal Bacteria (E. coli)		CFU/100 mL	N/A
Conductivity	535	uS/cm	
Total Dissolved Solids	344	mg/L	Moderate concentration of dissolved salts
pH	8.5	S.U.	Water is slightly alkaline
Alkalinity	257	mg CaCO ₃ /L	Water is extremely hard
Total Phosphorus	13	ug/L	Moderately phosphorus enriched
Nitrates	1540	ug/L	Nitrogen enriched
Chlorophyll	N/A		

Trophic State Evaluation

	TSI	Trophic Status
Based on Secchi Disk Depth	60	eutrophic
Based on Total Phosphorus	37	meso-oligotrophic
Based on Chlorophyll	N/A	

Conclusions

- Conditions are good for fish growth.
- Minimum dissolved oxygen is adequate for good fish production.
- pH is within acceptable limits.
- Sample is somewhat nutrient (N and P) enriched. Adopt appropriate lakeshore landscaping and lawn care practices.
- REPEAT LakeCheck NEXT YEAR!

- WARNING. condition requires immediate attention.
- CAUTION. condition requires further evaluation.
- OK. condition within acceptable limits.
- NEUTRAL. condition neither good nor bad.

2023 BACTERIA SAMPLING REPORT



Bacteria Sampling Report

Waterbody:
Thornapple River Cascade

Thornapple River Cascade

Date Sampled:
7/19/2023

Location	<i>E. coli</i>	Total Coliforms	Interpretation
1	28		● Water meets bacteriological standards for safe swimming.
2	88		● Water meets bacteriological standards for safe swimming.
3	56		● Water meets bacteriological standards for safe swimming.

Bacterial counts are expressed as the number of Colony Forming Units per 100 milliliters (CFU/100mL).

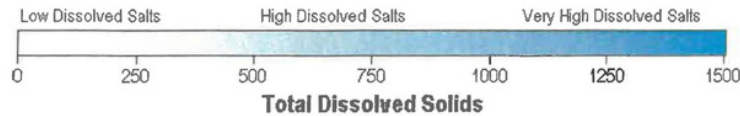
For full body contact recreation (including swimming) counts of *E. coli* should not exceed 130 (CFU/100mL) as a monthly geometric mean of at least five samples per the State of Michigan standard, or single samples should not exceed 298 (CFU/100mL) [235 CFU/100mL in a designated bathing beach area] per Federal (EPA) guidelines.

Current recreational water quality standards do not rely on Total Coliform counts.

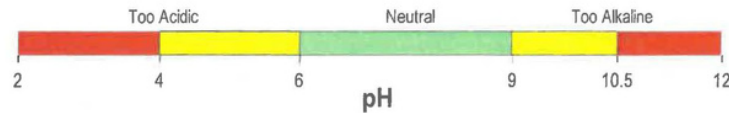
2023 OVERALL WATER QUALITY MEASUREMENTS



Conductivity and Total Dissolved Solids (TDS) measure the total amount of material dissolved in the water. Higher values indicate potentially richer, more productive water, whereas lower values indicate potentially cleaner, less productive water. Localized increases in conductivity and TDS may indicate inputs of groundwater or other nutrient-enriched water. [Note: Human activities that result in nutrient pollution (e.g., fertilizer runoff) can increase the productivity of algae and other organisms without raising conductivity/total dissolved solids very much. If nutrient pollution is occurring, the total phosphorus concentration is a much better indicator of potential productivity.]



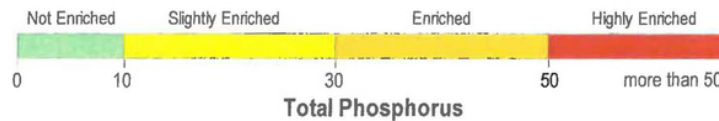
pH describes the balance between acids and bases in the water. Neutral values of pH (between 6 and 9) are desirable. Low pH values typically result either from the growth of bog vegetation (such as peat moss), acid precipitation (“acid rain”), or acid runoff (as in acid mine drainage). Excessive growth of certain plants and algae can raise pH values above 9.0 or 10.0.



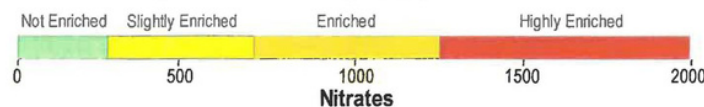
Alkalinity measures the concentration of carbonates and bicarbonates in the water. These compounds and other ions associated with them make water “hard”. High alkalinity lakes are hardwater lakes, while low alkalinity lakes are softwater lakes. Different kinds of plants, algae, and other aquatic organisms live in hardwater than in softwater. Alkalinity also influences the effectiveness of some herbicides and algicides. Alkalinity is a basic characteristic of water, but is neither inherently good nor bad.



Total Phosphorus measures the total (organic and inorganic, dissolved and particulate) amount of phosphorus in the water. Phosphorus is usually the plant nutrient (i.e., fertilizer) that controls the amount of algal growth in lakes and ponds. Most Midwestern lakes have more phosphorus and more algae than is desirable, so lower values are generally better, though very unproductive water bodies typically support little fish production.

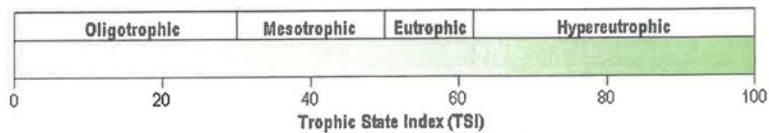


Nitrate measures the total inorganic amount of nitrogen in the water. Nitrogen is the plant nutrient (i.e., fertilizer) most likely to control the amount of rooted plant growth in lakes and ponds. Most Midwestern lakes have more nitrogen and more rooted plant growth than is desirable, so lower values are generally considered better

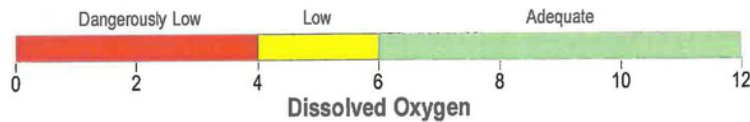


2023 OVERALL WATER QUALITY MEASUREMENTS

Trophic State Indices calculate the trophic status of the waterbody. Waterbodies are classified as oligotrophic, mesotrophic, eutrophic or hypereutrophic depending on the overall amount of plants, algae and other organisms the waterbody supports. Lakes of different trophic states vary in a number of chemical characteristics and support different types of organisms (see the enclosure “Lake Trophic States and Eutrophication”). Thus the trophic state of a waterbody provides a wealth of information concerning the types of organisms living in the waterbody, the processes likely to occur there and the kinds of problems to be expected. Trophic State Index values can be calculated from a number of variables. LakeScan calculates Carlson’s Trophic State Index (TSI) from total phosphorus, Secchi disk depth and chlorophyll (separate TSI values are calculated for each of the variables that was measured as part of your LakeCheck package).

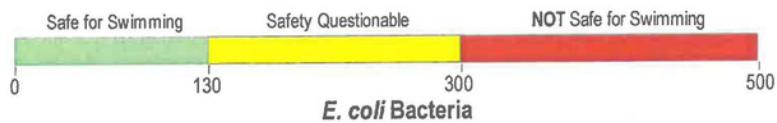


Dissolved Oxygen is a measure of the amount of oxygen dissolved in the water. Oxygen is needed by fish and other aquatic organisms to allow them to “breathe” underwater. Plants and algae produce oxygen by photosynthesizing during the day and use oxygen for respiration at night.



Temperature provides information about the kinds of fish that can grow in a lake, information necessary for interpretation of other parameters, and information about the extent to which a lake is stratified into layers having water of different temperatures. If the lake is stratified, the **thermocline depth** tells how deep the surface layer of warm water is.

Fecal Indicator Bacteria (*E. coli*) measurements count the number of live fecal indicator bacteria in the sample. These bacteria are considered reliable indicators of fecal contamination—when they are found in a pond or lake, it is very likely that the water is being contaminated by animal feces. Contamination can potentially be derived from a number of sources, including failed septic systems, agricultural runoff, or waterfowl or wildlife droppings.



- *E. coli* counts of 300 (CFU/100 mL) and above in a single sample are considered to represent conditions that are UNSAFE for swimming and other body contact recreation.
- *E. coli* counts of 130 (CFU/100 mL) and above averaged (using a geometric mean) over measurements made during a 30-day period are considered to represent conditions that are UNSAFE for swimming and other body contact recreation. When values of 130 (CFU/100 mL) or higher but less than 300 are encountered, LakeCheck rates the safety of the water for swimming as questionable.
- *E. coli* counts below 130 are considered safe for swimming and other body-contact recreation

We recommend prompt retesting whenever Fecal Indicator Bacteria counts exceed 100 (CFU/100 mL) to determine whether contamination is an ongoing problem. If frequent contamination is detected, steps to identify and eliminate the source of contamination are highly recommended.

1/18/2024

TRSAD Cascade Township RFP (Issued March 2023)

Thornapple River Safety and Navigation Marking Plan

Awarded to Viking Marine Construction

Phase 1: Permitting

Phase 2: Hydrographic Survey

Phase 1 and 2 cost: \$13,258.68 (Complete)

Phase 3: Installation on 19 buoys (see maps)

Phase 4: Staging site cleanup

Phase 3 and 4 cost: \$31,631.22 (Pending)

Process:

Offload a mini excavator on tracks from a gooseneck trailer at the Maracaibo Shores private boat launch. We will then back a trailer full of the assembled channel markers down to the mini excavator and use it to load them onto the barge/workboat. Upon loading the channel markers, the barge will follow the survey boat out to proper locations and place them in the water. The survey boat will be loaded with target files based off the hydrographic survey which will designate the proper area to place the channel markers in the water. We will then mark all designated caution areas with the orange and white “danger” buoys. The Buoys will be held in place with 5/16” marine grade chains and 150-pound blocks of concrete. The survey boat and work barge/work boat will be launched at the boat ramp as well. In total, we will launch 2 vessels. Duration is 1-2 days.

Equipment:

- **Work boat/work barge**
- **Survey boat**
- **GMC 3500 Dually**
- **GMC 1500**
- **Gooseneck trailer**
- **Mini Excavator**
- **Assembled materials**
- **Two Boat trailers, unless the work barge is brought. It will be hauled on the gooseneck.**

Specs for Red and Green buoys:

- Taylor Made Sur-Mark, Green and Red:
 - Height: 49"
 - Col. Diameter: 10"
 - Large Ring Diameter: 18"
 - Approx. Buoyancy: 40 lbs
 - Visibility Height Above Waterline: 39"

Picture of Green and Red Buoys:



Specs of Orange Caution buoys:

- Taylor Made Sur-Mark
- Visible 39 inches above waterline
- One-piece seamless construction
- Molded from tough UV protected polyethylene
- Approximate buoyancy: 40 lbs.
- Three-Year Flotation Warranty
- Labels options must be chosen in advance

46171 Shallow Area 46183 Danger
46173 No Boats 46184 Danger Rocks
46175 Keep Out 46185 Swim Area Hazard
46180 Slow 5 MPH 46187 Hazard Area
46181 Slow No Wake 46188 Idle Speed
46182 No Swimming 46191 Danger Keep Out

Picture of Orange/White without chosen label:





SUR-MARK MARKER BUOYS

- Internal concrete ballast helps buoy remain stable during inclement weather conditions
- Tough, UV-protected polyethylene stands up to the rugged marine elements
- One-piece seamless construction is filled with closed cell foam to positively displace water
- Galvanized, recessed eye (chain and hardware not included)
- Labels and LED warning lights sold separately



46103



46104



950400



950410

Part #	Style	Color	Height	Column Diameter	Base Diameter	Approximate Buoyancy	Water Line Visibility
46103*	Sur-Mark marker buoy	White	61"	8"	--	40 lbs.	37"
46104*	Sur-Mark marker buoy	White	49"	10"	18"	40 lbs.	39"
950400	Sur-Mark can buoy (port side)	Green	49"	10"	18"	40 lbs.	39"
950410	Sur-Mark can nun (starboard side)	Red	49"	10"	18"	40 lbs.	39"

* Orange marking tape included. Labels sold separately.

SUR-MARK BUOY LABELS

- Self-adhesive vinyl is fade-resistant and brightly colored for high visibility day and night
- Each label is 13" wide x 24" long
- Compatible with either Sur-Mark marker buoys (#46103, #46104)
- Includes two labels per package
- Five-year warranty against weathering or fading

Part #	Style
46171	Shallow area
46173	No boats
46175	Keep out
46180	Slow 5 MPH
46181	Slow no wake
46182	No swimming
46183	Danger
46184	Danger rocks
46185	Swim area
46187	Hazard area
46188	Idle speed
46191	Danger keep out



Peterson and Vandenberg Environmental is not liable for activities associated with this drawing.







Bathymetry data is sourced from others.

Dam to 96 Bridges

H1: (1) Orange caution buoy - submerged stumps

H2: (1) Orange caution buoy - submerged house foundation

H3: (1) Orange caution buoy - surface stump

- Legend**
-  Floating Buoys
 - Surveyed Depths (ft)**
 -  -22.7 - -13.4
 -  -13.4 - -10.3
 -  -10.3 - -7.7
 -  -7.7 - -5.2
 -  -5.2 - -1.6



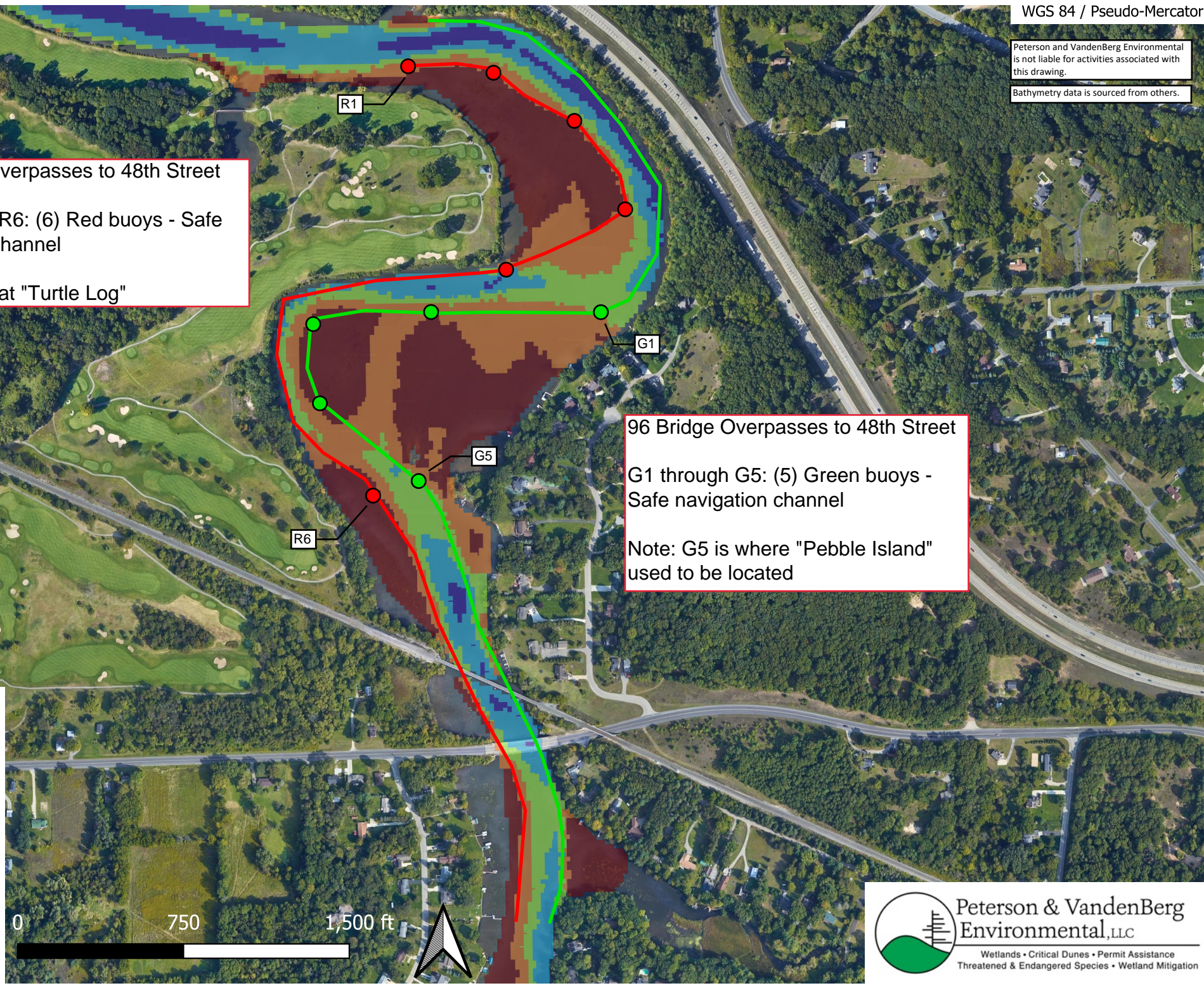
Peterson and Vandenberg Environmental is not liable for activities associated with this drawing.

Bathymetry data is sourced from others.

96 Bridge Overpasses to 48th Street
R1 through R6: (6) Red buoys - Safe navigation channel
Note: R6 is at "Turtle Log"

96 Bridge Overpasses to 48th Street
G1 through G5: (5) Green buoys - Safe navigation channel
Note: G5 is where "Pebble Island" used to be located

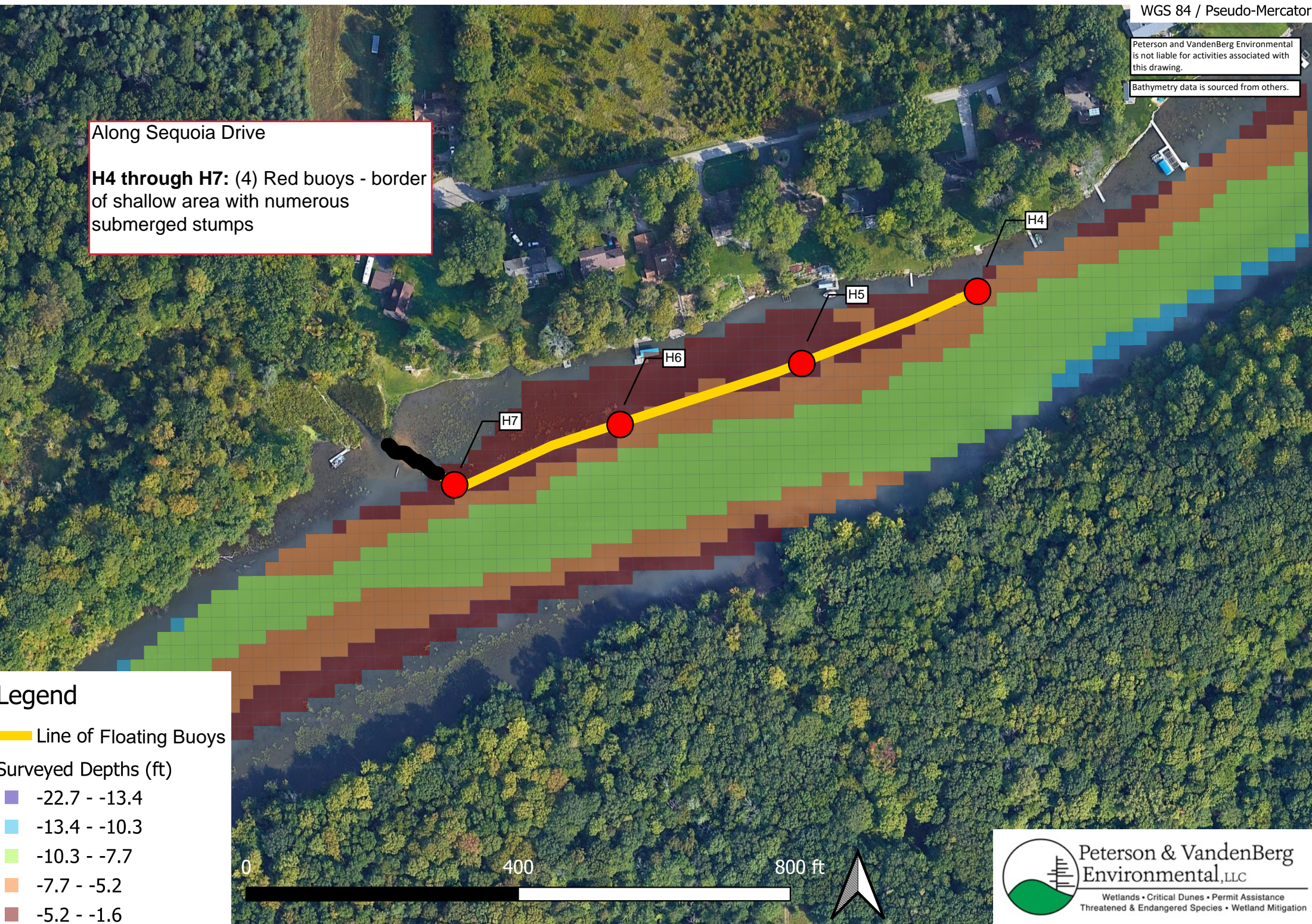
- Legend**
- Red Buoys
 - Green Buoys
- Surveyed Depths (ft)**
- -22.7 - -13.4
 - -13.4 - -10.3
 - -10.3 - -7.7
 - -7.7 - -5.2
 - -5.2 - -1.6



Peterson and Vandenberg Environmental is not liable for activities associated with this drawing.

Bathymetry data is sourced from others.

Along Sequoia Drive
H4 through H7: (4) Red buoys - border of shallow area with numerous submerged stumps



Legend

Line of Floating Buoys

Surveyed Depths (ft)

- 22.7 - -13.4
- 13.4 - -10.3
- 10.3 - -7.7
- 7.7 - -5.2
- 5.2 - -1.6

Peterson and Vandenberg Environmental is not liable for activities associated with this drawing.







Bathymetry data is sourced from others.

Kilmer Drive

H8: (1) Orange caution buoy - submerged rock and end of deeper-water navigation

H8

Legend

-  Floating Buoys
- Surveyed Depths (ft)**
-  -22.7 - -13.4
-  -13.4 - -10.3
-  -10.3 - -7.7
-  -7.7 - -5.2
-  -5.2 - -1.6

