



# UPPER STRAITS LAKE LEVEL CONTROL STRUCTURE

TOWNSHIP OF WEST BLOOMFIELD, OAKLAND COUNTY, MI.

**PREPARED FOR:**

OAKLAND COUNTY WATER RESOURCES  
COMMISSIONER  
JIM NASH

**PREPARED BY:**

SPICER GROUP, INC.

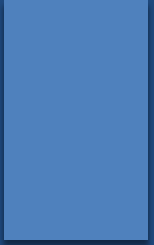
January 23, 2018

# CONTENTS

- ▶ ESTABLISHMENT OF LEGAL LAKE LEVEL
- ▶ ASSESSMENT DISTRICT
- ▶ PROJECT HISTORY
- ▶ PROJECT LOCATION & BACKGROUND
- ▶ SITE INVESTIGATION
- ▶ PROPOSED ALTERNATIVES
- ▶ SOIL BORINGS & GEOTECHNICAL REPORT
- ▶ NEXT STEPS
- ▶ QUESTIONS

# ESTABLISHMENT OF LEGAL LAKE LEVEL

- ▶ The legal lake levels were established by the Oakland County Circuit Court by the authority of the Inland Lake Level Act, Act 146 of P.A. of 1961, which was later superseded by Part 307 of Public Act 59 of 1995.
- ▶ Middle and Lower Straits Lake
- ▶ Date Petitioned – August 18, 1960 (Upper, Middle & Lower Straits Lakes)
- ▶ Date Established – August 14, 1963 Legal Lake Level – 930.70 feet above mean sea level
- ▶ Upper Straits Lake
- ▶ Date Petitioned – June 21, 1963
- ▶ Date Established – January 27, 1964
- ▶ Legal Lake Level – 930.80 feet above mean sea level



Petitions were submitted to the Oakland County Board of Supervisors (now the Board of Commissioners). The Water Resource Commissioner is the delegated authority as an agent for the County of Oakland.

The Water Resource Commissioner is responsible to the Circuit Court for maintaining the court-ordered lake level.

Since the establishment of the legal lake level in 1964, several lake access developments have occurred necessitating that the assessment district be updated.

The Circuit Court for Oakland County will ask to approve the revised assessment district.

Circuit Court hearing date will be advertised in the newspaper and also by first class mail.

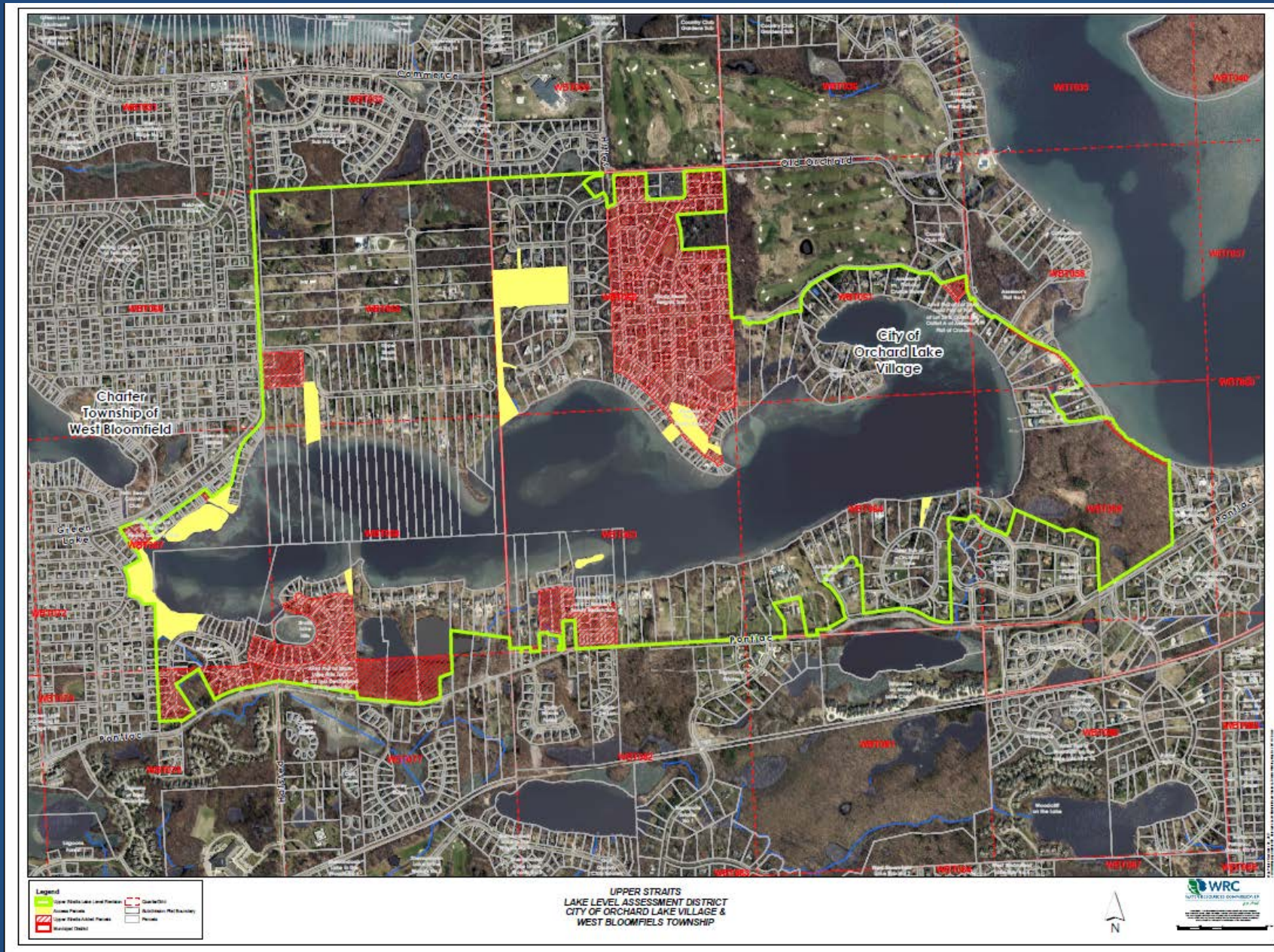
The legal lake level was initially created under Act 146 of P.A. of 1961. Public Act 146 required that the level be surveyed using a datum based on sea level, also called National Geodetic Vertical Datum (N.G.V.D. 1929).

This act was superseded by Part 307 of Public Act 59 of 1995. P.A. 59 requires that the level be surveyed using North American Vertical Datum (N.A.V.D. 1988) We will need to use the datum required by the current statute when we go to Circuit Court. N.G.V.D. and N.A.V.D. are not exactly the same, so the number associated with the water level will be slightly different.

$$930.80' \text{ (N.G.V.D.)} = 930.50' \text{ (N.A.V.D.)}$$



# REVISED ASSESSMENT DISTRICT



# PROJECT HISTORY

- ▶ August 24, 2007- Spicer Group, Inc. (SGI) performed an inspection of the Upper Straits Lake Level Control Structure and a survey was completed.
- ▶ April 2008- Spicer Group, Inc. submitted an engineering report for the Upper Straits Lake Level Control Structure
- ▶ December 4, 2008- Request for Proposal released by Oakland County Water Resources Commissioner
- ▶ January 29, 2009- Spicer Group, Inc. submitted Upper Straits Lake Level Control Structure proposal.
- ▶ January 10, 2017- Draft of Geotechnical Report of soil boring results from CTI and Associates, Inc.
- ▶ CTI and Spicer Group developed concepts and cost estimates based on geotechnical report and findings



# PROJECT LOCATION & BACKGROUND

- ▶ 1964 structure was built by Harry White & Sons using steel sheet piling.
- ▶ Original construction cost of the structure was \$5,917.98
- ▶ The structure is located in the Township of West Bloomfield, Oakland County, MI., between Middle Straits Lake and Upper Straits Lake at Green Lake Road.
- ▶ The existing structure consists of two “L” shaped steel sheet pile retaining wall abutments with an adjustable weir that uses wooden stop logs and a steel cap.
- ▶ Weir length of the existing structure is approximately 23 ft.
- ▶ Downstream of the weir structure is a 64”x43” corrugated metal pipe arch culvert that passes beneath Green Lake Road into Upper Straits Lake..
- ▶ Original steel sheeting was only driven 10 feet. Settlement of the sheeting was first noticed in the early 1980’s and has continued to settle.



# SITE INVESTIGATION

## Easterly L-Shape Abutment

The steel sheet piling is severely rusting at the waterline with advanced section loss. There are localized areas of sheeting with holes rusted through.

Average reduction in bending capacity due to deterioration is estimated at 50%.

The wall is presently considered stable based on no overall structural shifting being served.



## Westerly L-Shaped Abutment

The westerly end of the wall is 6 inches lower than the rest of the weir due to settlement.

Lower portion of the fixed crest weir is lower than the summer level. This can allow water to bypass the structure and flow behind the abutment.

Sheet piling has advanced rusting and scaling above the water line. However, no holes in the sheet piling were observed.





▶ Weir

- ▶ Wooden stop logs seem to be in fair condition.
- ▶ Horizontal joints between wooden stop logs are allowing water to pass through.
- ▶ The center 4 inch vertical I-beam post supporting the stop logs is structurally deficient. It is currently deflected over 2 inches.
- ▶ The web of the I-beam is rusted through at the waterline.





- ▶ No scouring of the embankments was observed; embankments appear stable.
- ▶ Entire upstream face of the structure could not be walked in waders at observed water levels due to localized scour holes existing on both sides.
- ▶ Water was flowing from Middle Straits Lake (downstream) to Upper Straits Lake (upstream).





The outlet culvert under Green Lake Road was completely underwater and could not be visually observed. No holes in the corrugated metal pipe were identified. This culvert is maintained by the Road Commission for Oakland County.

# PROPOSED ALTERNATIVES

1. Remove Existing Dam
2. Natural Rock Riffle with Fish Passage
3. Concrete Structure
4. Steel Sheet Piling



*Example- Natural Rock Riffle Structure in Grand Traverse County.*



*Example- Steel Sheet Pile Structure at Great Oaks Country Club in Rochester, MI.*



*Example- Concrete structure in Lenawee County.*

# ALTERNATIVE 1- REMOVE EXISTING DAM

Remove the existing structure and do not replace it. The Circuit Court would have to amend the legal lake level to be the same as the Middle Straits Lake.

## ▶ Benefits:

- ▶ No long term operational maintenance

## ▶ Detriments:

- ▶ Upper Straits lake level would be 0.10' lower and be the same level as Middle and Lower Straits Lakes.
- ▶ Lake level would be controlled by the Middle and Lower Straits control structure
- ▶ Requires a petition or County resolution to create a new assessment district combining both existing districts
- ▶ May require a study per Lake Level Control Act
- ▶ May require improvements to the Lower & Middle Straits Lakes augmentation pump to increase pump capacity
- ▶ Augmentation is expensive and operating costs are ongoing
- ▶ Various permits will be required



# ALTERNATIVE 2- NATURAL ROCK RIFFLE WITH FISH PASSAGE

Remove select portions of the existing steel sheeting above the ground, install a rock fish passage system, conceal a steel sheet pile structure with stop logs for lake level adjustability.

## ▶ Benefits:

- ▶ Allows for potential of fish passage
- ▶ Natural rock is visually pleasing
- ▶ Rehabilitation at end of design life may be less costly

## ▶ Detriments:

- ▶ Requires significant property acquisition
- ▶ Canal lots would no longer have boat access to lake.
- ▶ Rock riffle structures require maintenance
- ▶ Sedimentation occurs in pools due to slower water movement requiring additional maintenance
- ▶ Control of lake level would be less precise
- ▶ Rock could settle over time due to poor soils
- ▶ Various permits will be required



# ALTERNATIVE 3- CONCRETE STRUCTURE

Remove the existing steel sheeting above the ground and construct a concrete lake level control structure with a stop log system or fixed weir drawdown gate for lake adjustment.

## ▶ Benefits:

- ▶ Able to adjust lake level
- ▶ Longer design life than sheet pile structure
- ▶ Better aesthetics can be achieved and remain for decades
- ▶ May be rehabilitated at end of design life

## ▶ Detriments:

- ▶ Requires property acquisition
- ▶ Will require helical pier or pile foundation in addition to concrete structure.
- ▶ Longer construction sequence than steel sheeting and natural rock riffle
- ▶ More construction administration and testing required than with steel sheet piling



# RECOMMENDED ALTERNATIVE 4- STEEL SHEET PILE STRUCTURE

Remove portions of existing steel sheeting above ground and construct a new steel sheet piling lake level control structure similar to the original.

## ▶ Benefits:

- ▶ Works well in poor soils
- ▶ Able to adjust lake level
- ▶ Shorter construction schedule than the natural rock riffle and concrete structure
- ▶ Less costly than pile supported concrete structure

## ▶ Detriments:

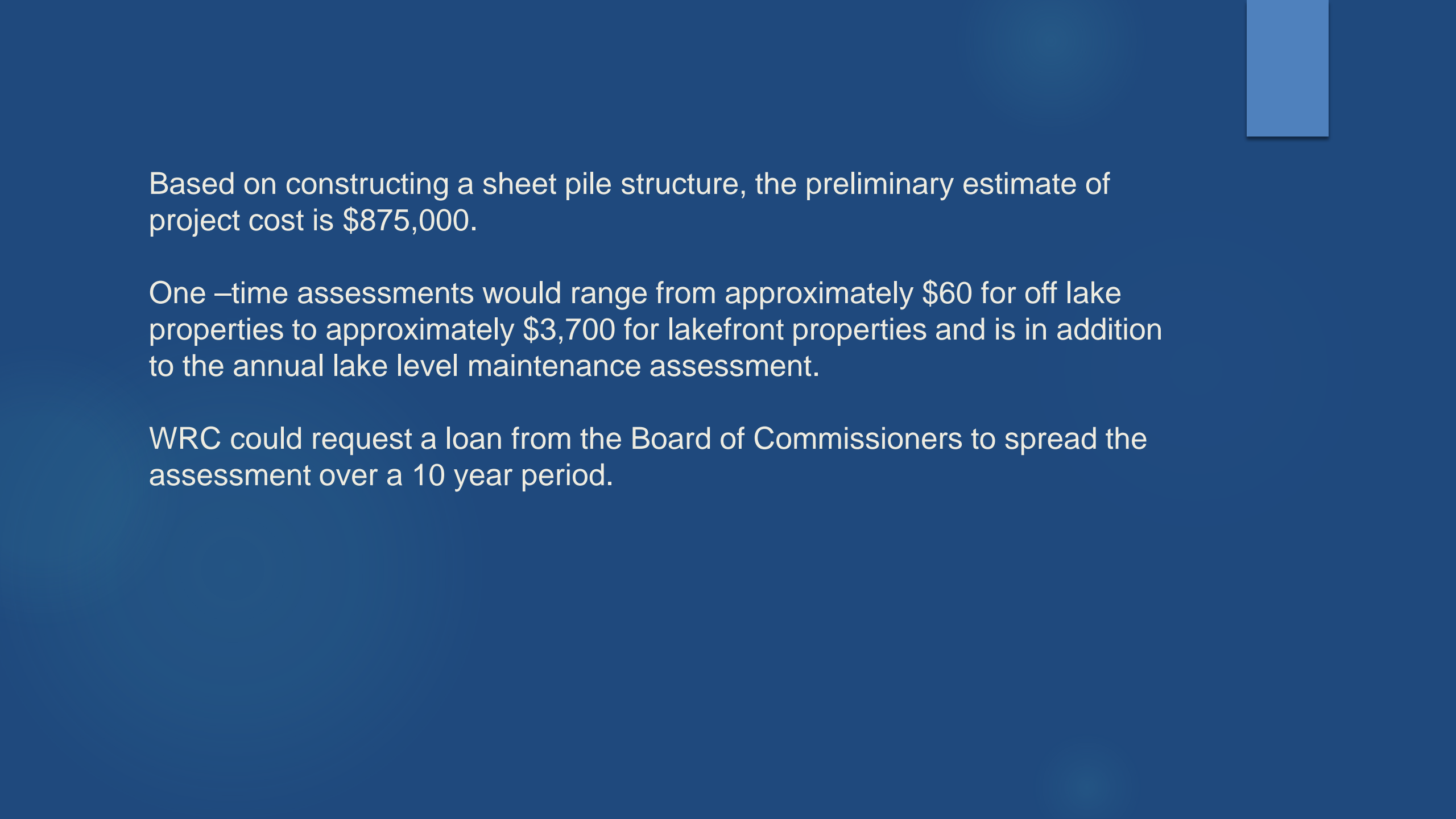
- ▶ Requires some property acquisition
- ▶ Shorter design life than concrete
- ▶ Aesthetically not as good as concrete structure or natural rock riffle
- ▶ Not cost effective to rehabilitate at end of design life



# SOIL BORINGS & GEOTECHNICAL REPORT

- ▶ In December 2016 CTI and Associates, Inc. conducted a geotechnical investigation of the Upper Straits Lake Level Control Structure.
  - ▶ Two (2) soil borings performed to 50 ft. and 55 ft. depths.
  - ▶ Soil determined to have minimal load carrying ability with low blow count (1 to 3 hammer blows per vertical foot.)
  - ▶ Soils consisted mainly of silty clays with organics/ peat extending 25 to 50 feet in depth.
- ▶ Recommendation based on geotechnical report is to use 50 ft. lengths of sheet piling to construct the new lake level control structure.





Based on constructing a sheet pile structure, the preliminary estimate of project cost is \$875,000.

One –time assessments would range from approximately \$60 for off lake properties to approximately \$3,700 for lakefront properties and is in addition to the annual lake level maintenance assessment.

WRC could request a loan from the Board of Commissioners to spread the assessment over a 10 year period.

Typical loan:

Payment based on interest rate set by the Board of Commissioners

Loan must be paid in full if property is sold or refinanced.

Loan can be paid off early if homeowner chooses.

# NEXT STEPS

- ▶ Circuit Court hearing to approve district
- ▶ Final design phase:
  - ▶ Constructability review
  - ▶ ROW acquisition
  - ▶ MDEQ permit
  - ▶ West Bloomfield Township Wetland Permit
  - ▶ RCOC permit
  - ▶ Finalize plans
  - ▶ Bidding
  - ▶ Computation of project costs based on bids receive
  - ▶ Assessment Hearing
  - ▶ Financing
  - ▶ Start construction

- ▶ Providing all the necessary approvals are obtained in a timely manner, construction could commence in the fall-winter of 2018/2019



QUESTIONS?