



Note This Presentation Includes  
Not All Proposed Alternatives



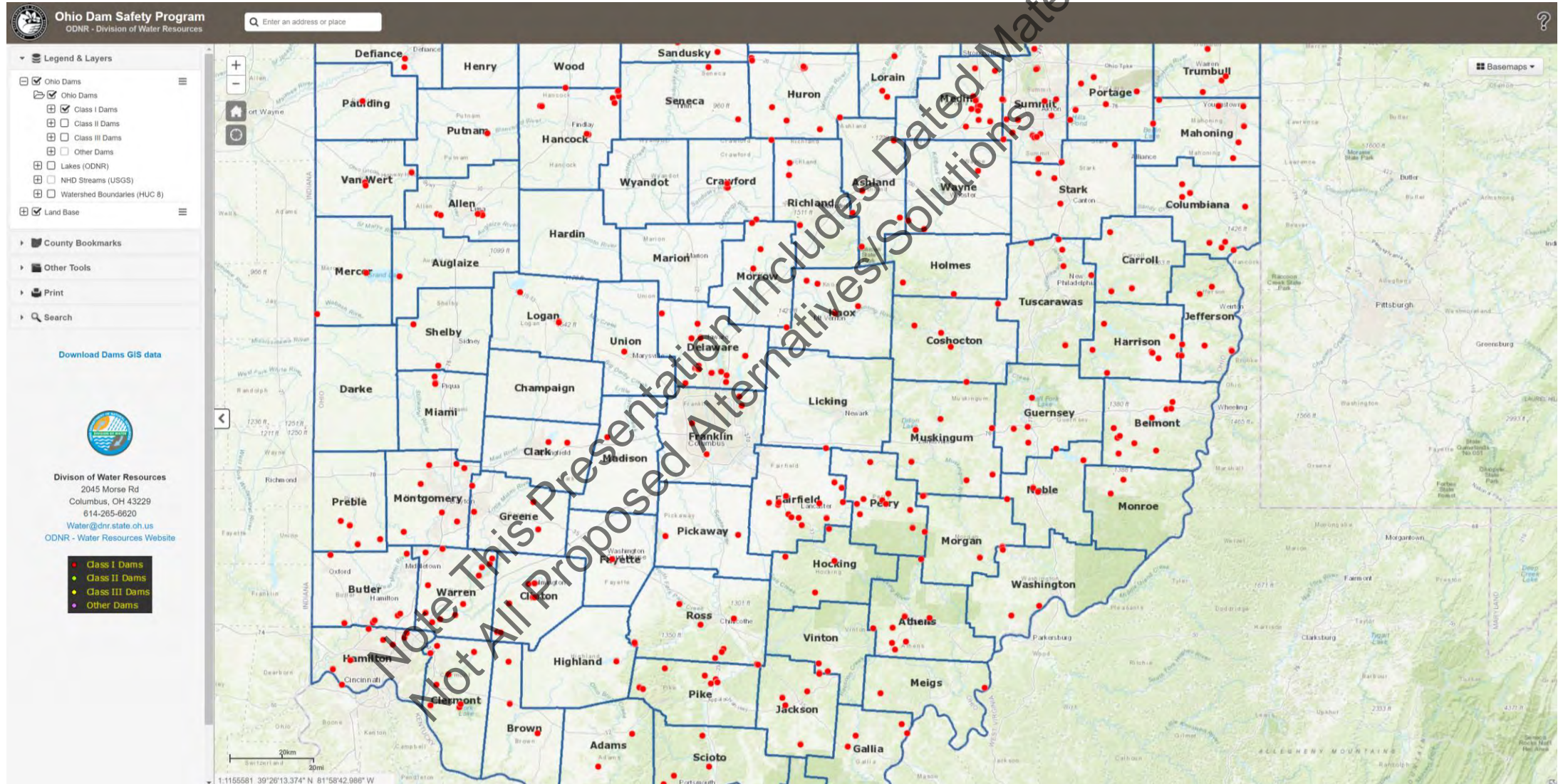
Stantec

## Piqua Hydraulic Canal and Dams Improvements

# System Overview for Piqua City Commission

10/11/2021

# Dams in Ohio (Class I)



# Agenda for the Hydraulic System Overview

1. ODNR Evaluations and Requirements
2. System Overview
3. Brief History of the Hydraulic System
  - Franz Lake Pond Dam – Class I
  - Echo Lake Dam – Class I
  - Swift Run Lake Dam – Class I
4. Previous Work
5. Current Work
6. Alternatives being evaluated

Note This Presentation Includes Dated Materials  
Not All Proposed Alternatives/Solutions

# ODNR Evaluations and Requirements

## 1. Evaluations:

- a) Performed every 5 years. Most recently in 2019.
- b) Current issues include:
  - i. Insufficient spillway capacity to pass design storm.
  - ii. Ongoing maintenance of dams and hydraulic canal.

## 2. Requirements (same as nationwide):

- a) Design Storm Events (based on Height, Storage and Hazard):
  - i. Class I (High Hazard) – 100% PMF (Probable Maximum Flood)
  - ii. Class II (Medium Hazard) – 50% PMF
  - iii. Class III (Low Hazard) – 25% PMF
  - iv. Class IV (Exempt)

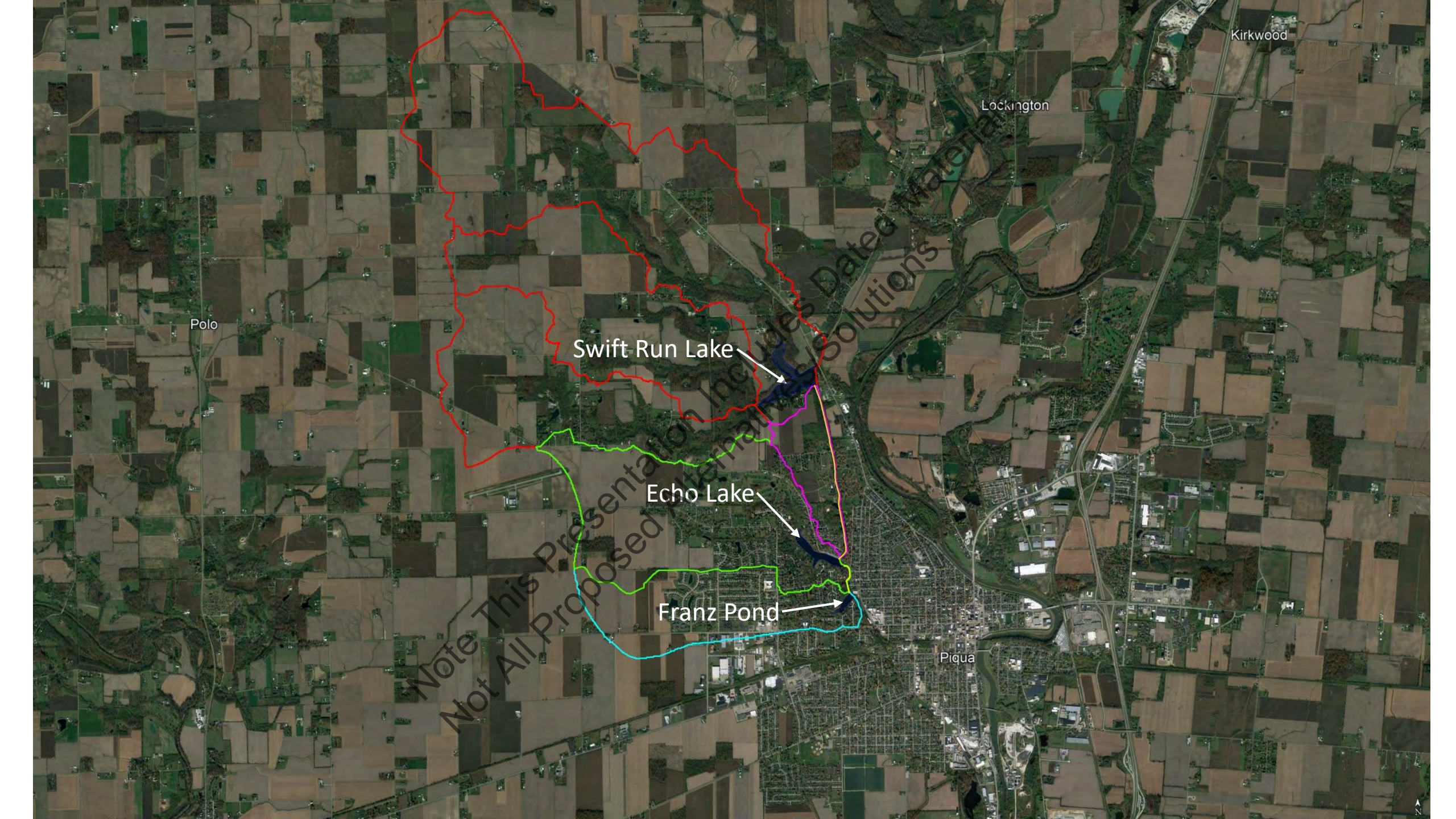
# System Overview

1. Length of canal from Franz Pond to Swift Run Lake is about 2 miles (10,000 feet).
2. Embankment heights vary from <5 feet to 30 feet.
3. Watersheds:
  - a) Swift Run Lake – 7.42 square miles.
  - b) Echo Lake – 1.95 square miles.
  - c) Franz Pond – 1.05 square miles.
  - d) Additional Canal – 0.37 square miles.
4. All dams are currently ODNR Class I dams (high hazard).
5. Drinking Water Sources:
  - a) Quarry and Great Miami River are used as options 1 and 2.
  - b) Only 2% to 5% from Swift Run Lake.

# Piqua Dam Classifications

1. All dams are currently ODNR Class I dams (high hazard).
  - a) Swift Run Lake Dam is being evaluated for reclassification to Class II.
2. Need to be able to pass the 100% PMF (Probable Max Flood) storm event.
  - a) Storm Event Comparison:
    - PMF/PMP (24-hours)  $\approx$  27 inches
    - Largest Storm Event at Lockington Dam (1995 over 48-hours) = 10.75 inches

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Kirkwood

Lockington

Polo

Swift Run Lake

Echo Lake

Franz Pond

Piqua

Note This Presentation Includes Dated Water Solutions



Swift Run Lake

Spillways #2 and #3

Spillway #1

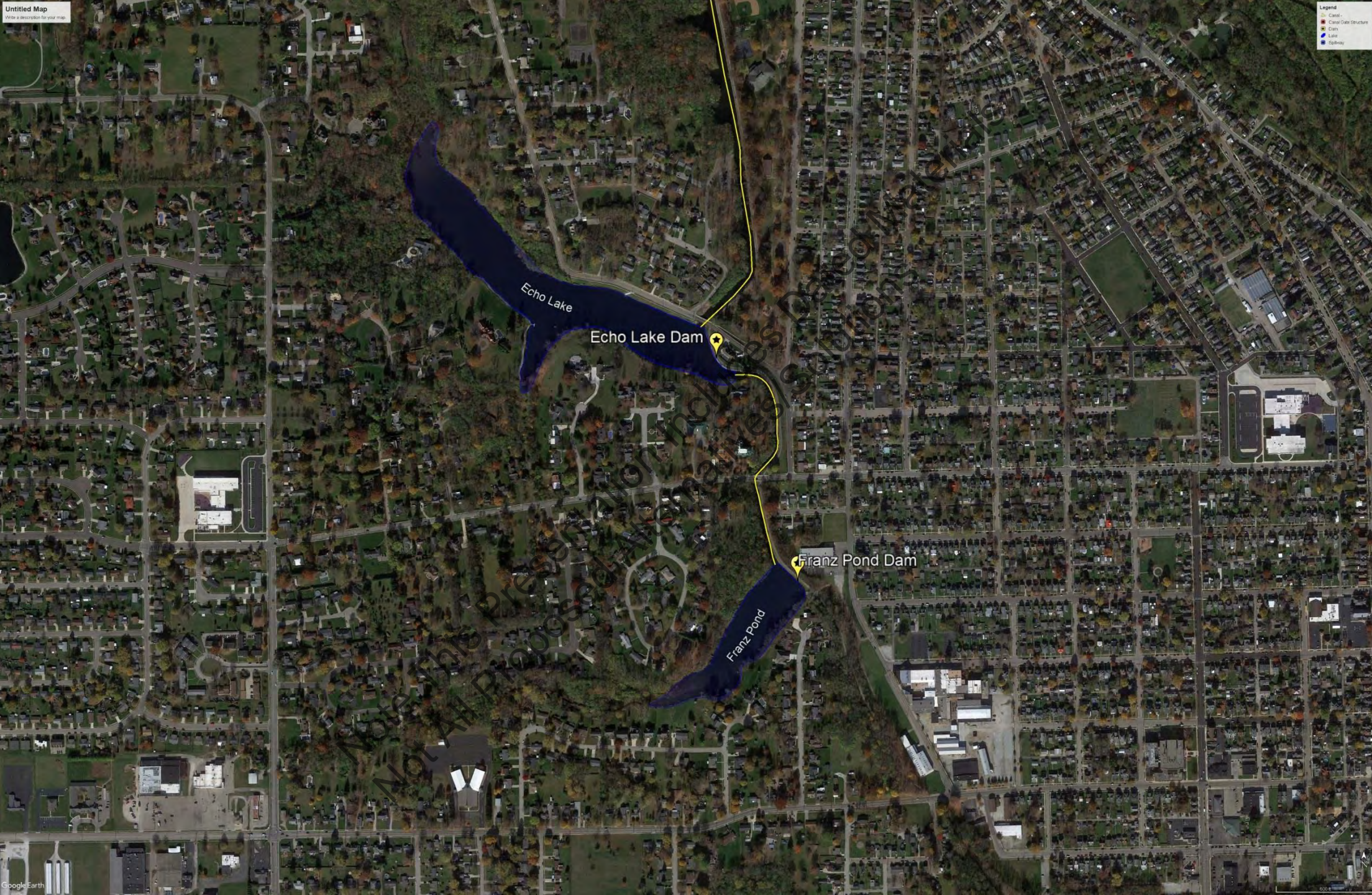
Echo Lake

Franz Pond





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Echo Lake

Echo Lake Dam

Franz Pond Dam

Franz Pond

# Spillways at Swift Run Lake Dam



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# Spillway #1 Near Cemetery



# Gate Structure at Swift Run Lake Dam



# Hydraulic Canal at Fountain Park



# Brief History of the Hydraulic System

- Precipitation runoff collects from west of Piqua and flows into the Great Miami River.
- 2-5% of source drinking water supply.
- Original construction around 1879.
- Historical Breaches:
  - 1924 Dam Failure
  - 1961 Dam Failure
  - 1976 Dam Failure
- Recent Evaluations/Coordination:
  - DLZ
  - Hull and Associates
  - ODNR
  - Miami County Hazard Mitigation Plan
  - Ohio Emergency Management Agency



Photo 8 - Forest Hill Cemetery Flooding (1976)

79th YEAR, No. 43      PHONE 773-2721      PIQUA, OHIO, THURSDAY, DECEMBER 7, 1961      32 PAGES      PRICE SEVEN CENTS

Cloudy, cold Friday.  
Low 20, high Friday 40.

**LEVEE BREAK BRINGS WATER SHORTAGE**

**Swift Run Lake Drained, Water Works Flooded**

**COLLAPSED DAM LEAVES 70-FOOT GAP** - This is a view, looking southeast, of what was once the Swift Run earthen dam after it collapsed Wednesday night. In the background is the municipal water works, the basement of which was flooded, knocking out several 150-hp pumping motors.

**AUTO BURIED IN FLOOD DEBRIS** - This automobile, owned by an employee of the company which is building the addition to the water works, was left buried in several feet of muck and mire by the water which rushed through the broken Swift Run dam, the remains of which can be seen in the background.

# Ongoing Maintenance

Items that are being performed to meet ODNR Dam Safety Requirements:

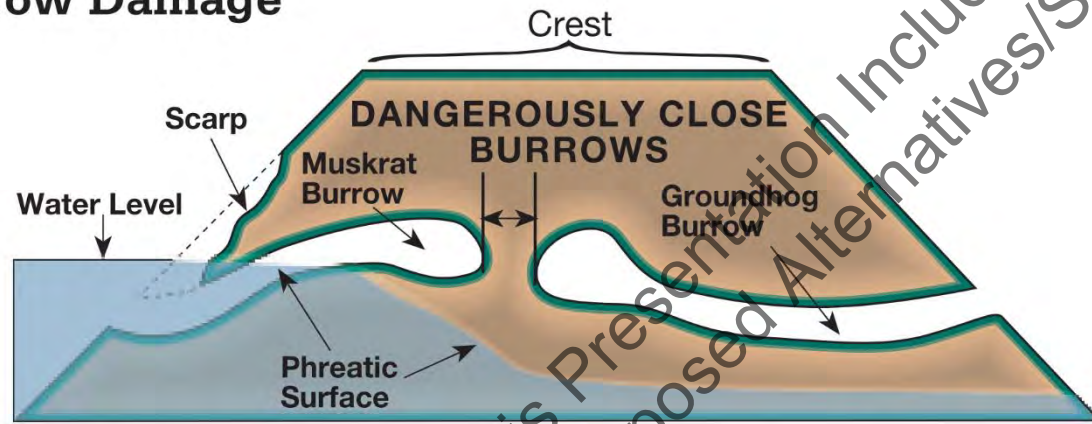
- Removal of decaying trees/stumps and root systems.
- Removal of brush (on dam and within rock shore protection).
- Mowing of grass.
- Repair of bare grass areas.
- Repair of animal burrows.
- Gate/Valve maintenance.
- Ziegler Road Bridge Culvert.
  - Widened / added flow capacity.
- New bridge at Spillway #3.
  - \$130,000





# Ongoing Maintenance

## Rodent Burrow Damage



R 2/2019

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# Ongoing Maintenance



# Updated Survey Info

1. Obtained using aerial photography (Flight in early April 2021).
2. Data Obtained:
  - Topographic survey (contours, spot elevations, etc.).
  - Structure locations.
  - LiDAR point cloud.
  - Digital Elevation Model (DEM).
  - Aerial photos (.tif and .sid).
3. Being used for the following:
  - Comparing to other survey data sources.
  - Improved accuracy in selected locations.
  - Future Design Drawings (Conceptual, preliminary and final).



# Geotechnical Evaluations

## Field evaluation sample findings:

1. Penetrations (pipes, utilities, borings, etc.) within Canal embankments.
2. Vegetation within dumped rock.
3. Debris accumulation at pipe inlets and spillways.
4. Large trees throughout earthen embankments.
5. Bare spots (limited vegetation) on embankments.
6. Foot traffic causing bare spots and erosion on embankments.
7. Decaying trees/stumps and root systems on embankments.
8. Variance of crest elevations at select locations.
9. Rutting from vehicle traffic.
10. Lake drain outlet with slight leak and rusty stem valve.
11. Pipe with flowing water in spillway wall. Unknown source.
12. Animal burrows at many locations (previously sent City locations).
13. Tall vegetation (unmowed) in selected areas.
14. Structure foundations at toe and within embankments.
15. Potential areas of previous instability (downstream and upstream slopes).
16. Potential areas of previous seepage.
17. Asphalt path cracking.



# Cultural Resources (Environmental)

1. Initiated preliminary review of potential environmental concerns:
  1. Bats – tree habitats.
  2. Fish – within waterways.
  3. Muscles – within waterways.
  4. Wetlands
2. Agency Coordination (Ohio EPA, ODNR, USACE, USFWS)
3. Areas Identified:
  - Waterways – Muscles and Fish.
  - Wetlands – Initial locations identified.
  - Trees – Indiana Bats

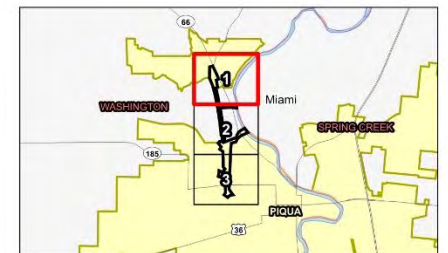




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Legend

- Project Area
- Parcel Boundary
- Photo Location
- Waterway
- Potential Emergent Wetland
- Potential Forested Wetland
- National Wetlands Inventory Feature
- National Hydrography Dataset
  - Perennial Stream
  - Intermittent Stream
  - Waterbody
- FEMA Flood Hazard Area
  - 100-year Floodplain
  - Floodway



Notes  
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet  
2. Data Sources: Stantec, City of Piqua, Miami Co., USGS, USFWS, FEMA, NADS  
3. Orthophotography: 2019 NAIP

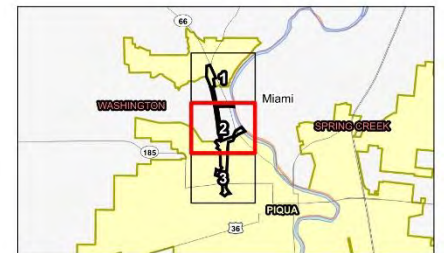


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Legend

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### Title

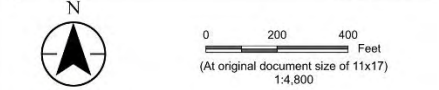
## Wetland and Waterbody Delineation Map

*Client/Project*  
City of Piqua  
Piqua Dams Project

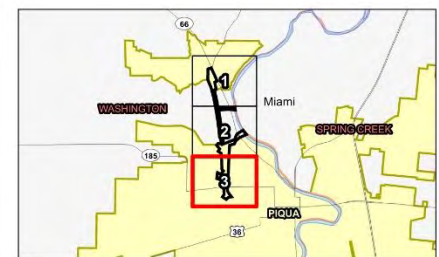
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*Project Location*  
Miami County, Ohio

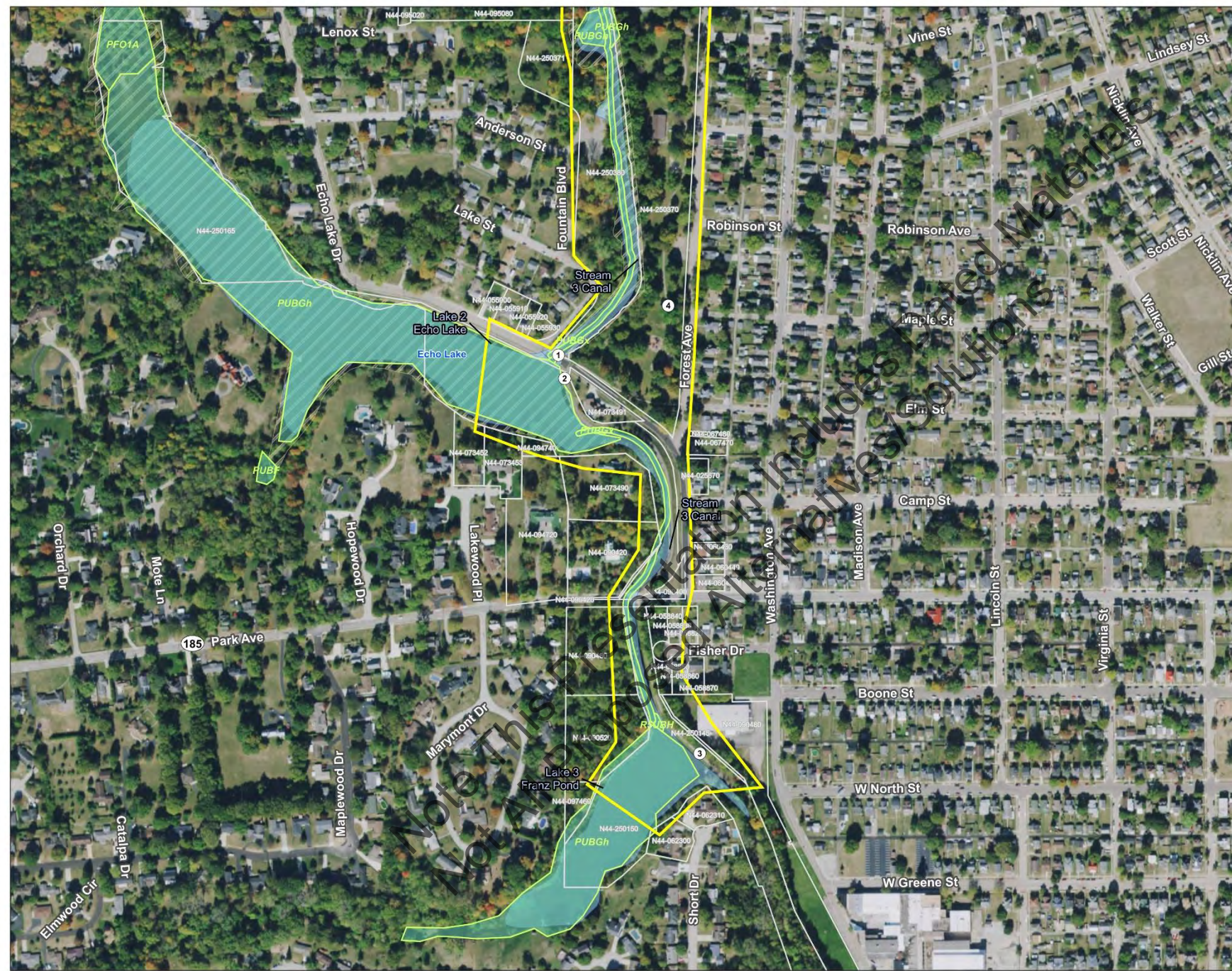
*Prepared by J.L.H. on 2021-07-02  
TR by XX on 2021-XX-XX  
RR by XX on 2021-XX-XX*



- #### Legend
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- Notes**
1. Coordinate System: NAD 1983 StatePlane Ohio South FIPS 3402 Feet
  2. Data Sources: Stantec, City of Piqua, USGS, USFWS, FEMA, NADS
  3. Orthophotography: 2019 NAIP



Note: This map includes National Wetland Inventory and FEMA Flood Hazard Areas. It is a technical drawing and does not represent a site plan. It is for informational purposes only. For more information, please contact Stantec.

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# Cultural Resources (Other)

1. Initiated preliminary review of potential historical features:
  1. Ohio Historic Inventory.
  2. National Register of Historic Places.
  3. State Historic Preservation Offices (SHPO).
  4. Ohio Archaeological Inventory.
  5. Genealogical and Cemetery Records.
2. Agency Coordination (SHPO, Ohio History Connection, etc.)
3. Areas Identified:
  - Phase I Records Review is currently in progress.

Note: This Presentation includes Dated Materials  
Not All Proposed Alternatives/Solutions

# Alternatives Evaluated

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## Swift Run Lake

Property Easements / Acquisition	Completed	Property purchased below dam. Majority of property downstream of dam is owned by the City.
Additional Spillway Capacity	Feasible	Allow for additional flow capacity to pass 100% PMF. May include replacement of existing spillways. Design could include a Labyrinth Spillway for optimal width.
New Auxiliary/Emergency Spillways	Feasible	Allow for additional flow capacity to pass 100% PMF.
Overtopping Protection (RCC)	Feasible	Likely would propose Roller Compacted Concrete (RCC).
Re-Classification of Dam	Feasible	Currently evaluating this possibility.

### Notes:

- Several alternatives for Swift Run that should be straight forward for design.
- Could be considered independent of Franz Pond and Echo Lake Dams and the Canal system.

**ALTERNATIVES**

**Echo Lake / Franz Pond (page 1 of 2)**

New Spillway(s) at Dam Location(s)	Not feasible	Due to downstream hazards. No flow paths available through city.
New Spillways at Alternate Locations	Feasible	Evaluating at multiple Park locations.
New Culvert System	Low Feasibility	Due to significant capacity required.
New Auxiliary/Emergency Spillways	May be feasible	Still have issue with downstream hazards. No optimal locations.
Raise Dam/Canal Embankments	Potentially Feasible	Modification of the hydraulic canals is a budget concern due to their lengths and heights.
Overtopping Protection (Roller Compacted Concrete)	Potentially Feasible	At selected locations as part of a combination of multiple improvements. Acceptable with ODNR Dam Safety. Reduces improvements to downstream flood inundation.

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**ALTERNATIVES**

**Echo Lake / Franz Pond (page 2 of 2)**

Short Wall (selected locations or entire)	Potentially Feasible	Still have concerns with stability of hydraulic canal embankments.
Control Inflow (large diversion ditches)	Potentially Feasible	Only solves part of the storage capacity issue.
Property Acquisition	Feasible	May not be public friendly. Includes home on Echo Lake Dam, Fountain Park, other downstream properties.
Upstream Lake Control (interior berm, supplemental dam, etc.)	Limited Feasibility	Design would contain small storm events. Additional inundation of upstream properties. Still need additional improvements at dams and canal.
Decommission Dam / Lower Pool Levels	Feasible	May not be public friendly. Lower dam significantly or remove to minimize/eliminate water storage.

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# ALTERNATIVES

Hydraulic Canal		
Flatten Canal Downstream Slopes / Modify Upstream Slopes	Limited Feasibility	Only feasible at limited locations due to existing features (property boundaries, cemetery, manufacturing, public parks, trees, etc.).
Conduit Canal System - Widening	Potentially Feasibility	Widening has limited feasible due to property boundaries. Potentially at selected locations. May adjust canal location to stay on City property more.
Conduit Canal System - Deepening	Potentially Feasible	Currently evaluating deepening of canal (to increase capacity). Will also require partial widening.
Crest Wall Installation	Potentially Feasible	Wall would replace at least a portion of the canal embankment due to stability concerns. Could restore original walking path. Trees would need to be removed.
Additional Flow Control (new gates, etc.)	Feasible	Evaluating how to use for control during emergencies and significant storm events. May need automated/remote operation. Isolate Swift Run Lake.
Overtopping Protection (RCC)	Limited Feasibility	Would require rebuilding of downstream hydraulic canal embankment. Trees would be removed.
Property Acquisition	Feasible	May not be public friendly. Needed to widen canal to allow significantly more flow transfer to spillways.

Note This Presentation Includes Drafted Materials  
Not All Proposed Alternatives/Options

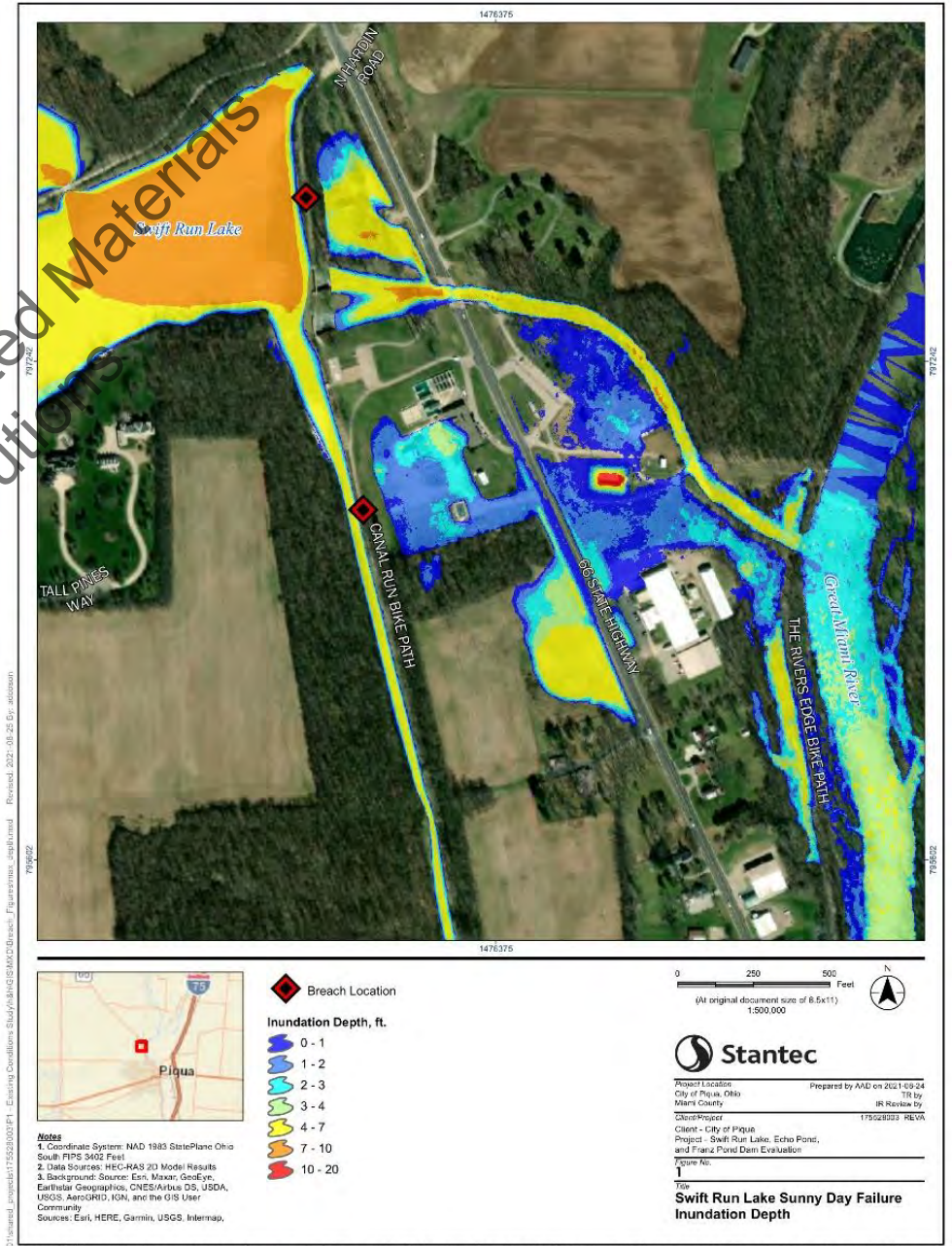
# Feasible Alternatives

Note This Presentation Includes Dated Materials  
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# Alternative Topics

1. Existing Conditions Results
2. Modeled Alternatives
3. Overtopping Breach Results

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# Existing Conditions Results

- Existing Conditions Simulations:

Storm Event	Precipitation (24 hour duration)
100-yr, 24-hr	5.9 in
500-yr, 24-hr	7.6 in
50% PMF, 24-hr	~14 in
PMF, 24-hr	~27 in

- Results presented in the following slides include breach results if the existing dam would overtop.
- Largest Storm Event at Lockington Dam (1995 over 48-hours) = 10.75 inches.

# Modeled Alternatives

## Alternative 1

- Lower normal pool of all lakes by ~2 ft.
- Replace and widen Swift Run Lake spillway.
- Raise Echo Lake and Franz Pond dam embankments.
- Construct new spillways just north of Echo Lake.
- Widen canal between Echo Lake and Franz Pond and north of Echo Lake to the new spillway.

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# Modeled Alternatives (continued)

## Alternative 2

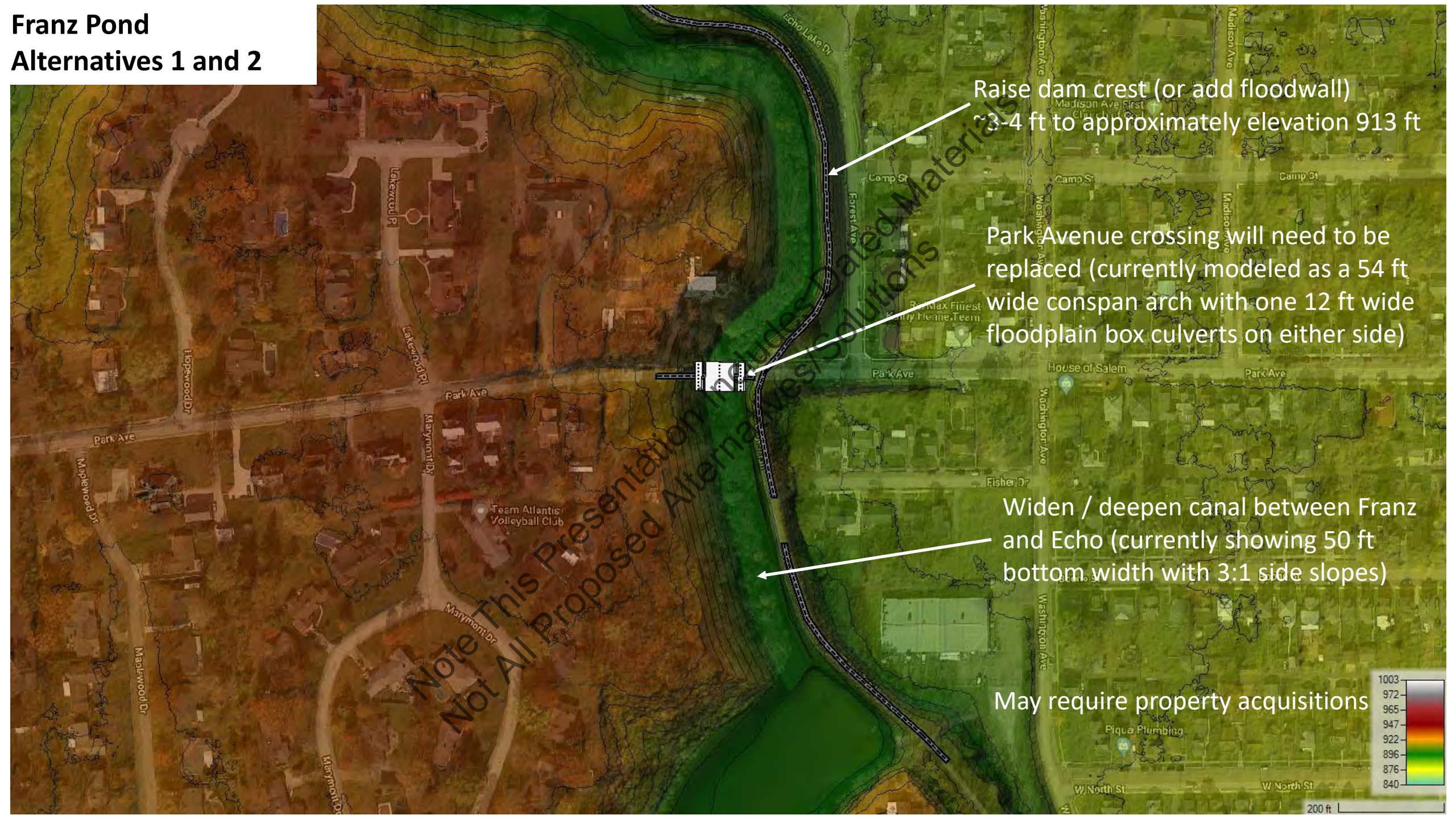
- Lower normal pool of all lakes by ~2 ft.
- Replace and widen Swift Run Lake spillway.
- Raise Echo and Franz dam embankments.
- Widen canal between Echo Lake and Franz Pond.
- Widen canal from Echo Lake to the existing standalone spillway (concrete rectangular channel through cemetery).
- Replace and widen standalone spillway and widen spillway discharge channel.

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# Swift Run Lake Alternatives 1 and 2



# Franz Pond Alternatives 1 and 2

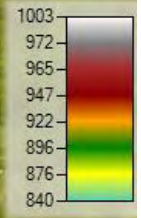


Raise dam crest (or add floodwall)  
~3-4 ft to approximately elevation 913 ft

Park Avenue crossing will need to be replaced (currently modeled as a 54 ft wide conspan arch with one 12 ft wide floodplain box culverts on either side)

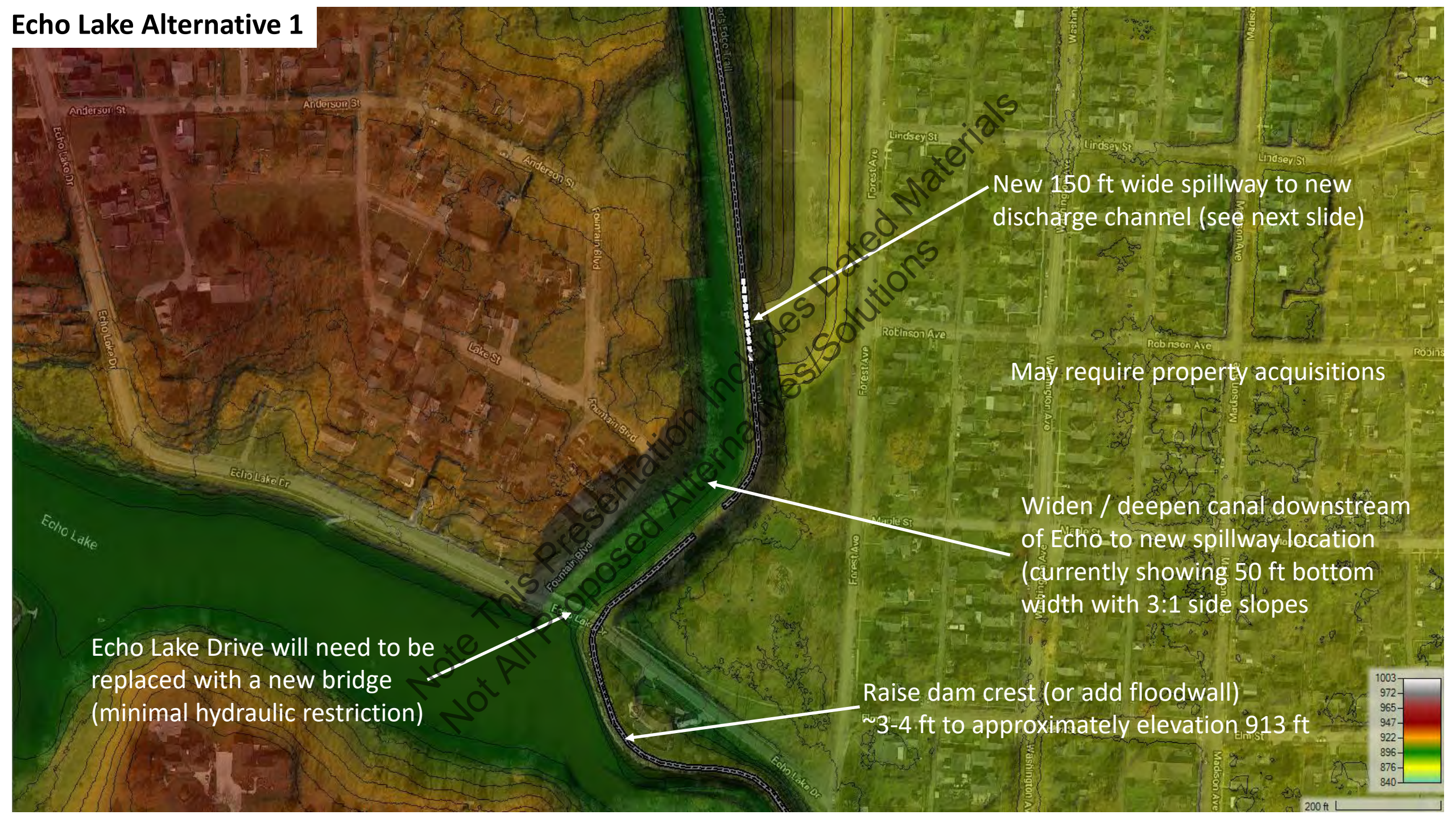
Widen / deepen canal between Franz and Echo (currently showing 50 ft bottom width with 3:1 side slopes)

May require property acquisitions



200 ft

# Echo Lake Alternative 1



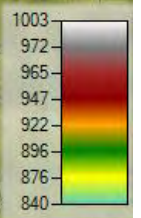
New 150 ft wide spillway to new discharge channel (see next slide)

May require property acquisitions

Widen / deepen canal downstream of Echo to new spillway location (currently showing 50 ft bottom width with 3:1 side slopes)

Raise dam crest (or add floodwall) 3-4 ft to approximately elevation 913 ft

Echo Lake Drive will need to be replaced with a new bridge (minimal hydraulic restriction)



200 ft

# Echo Lake Alternative 1 (continued)

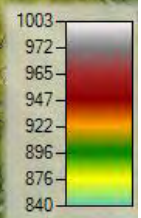


New 150 ft wide spillway to new discharge channel

New spillway channel to the Great Miami River, cutting through Fountain Park just south of the cemetery (shown as 60 ft bottom width with 3:1 side slopes and depth of approximately 15 ft)

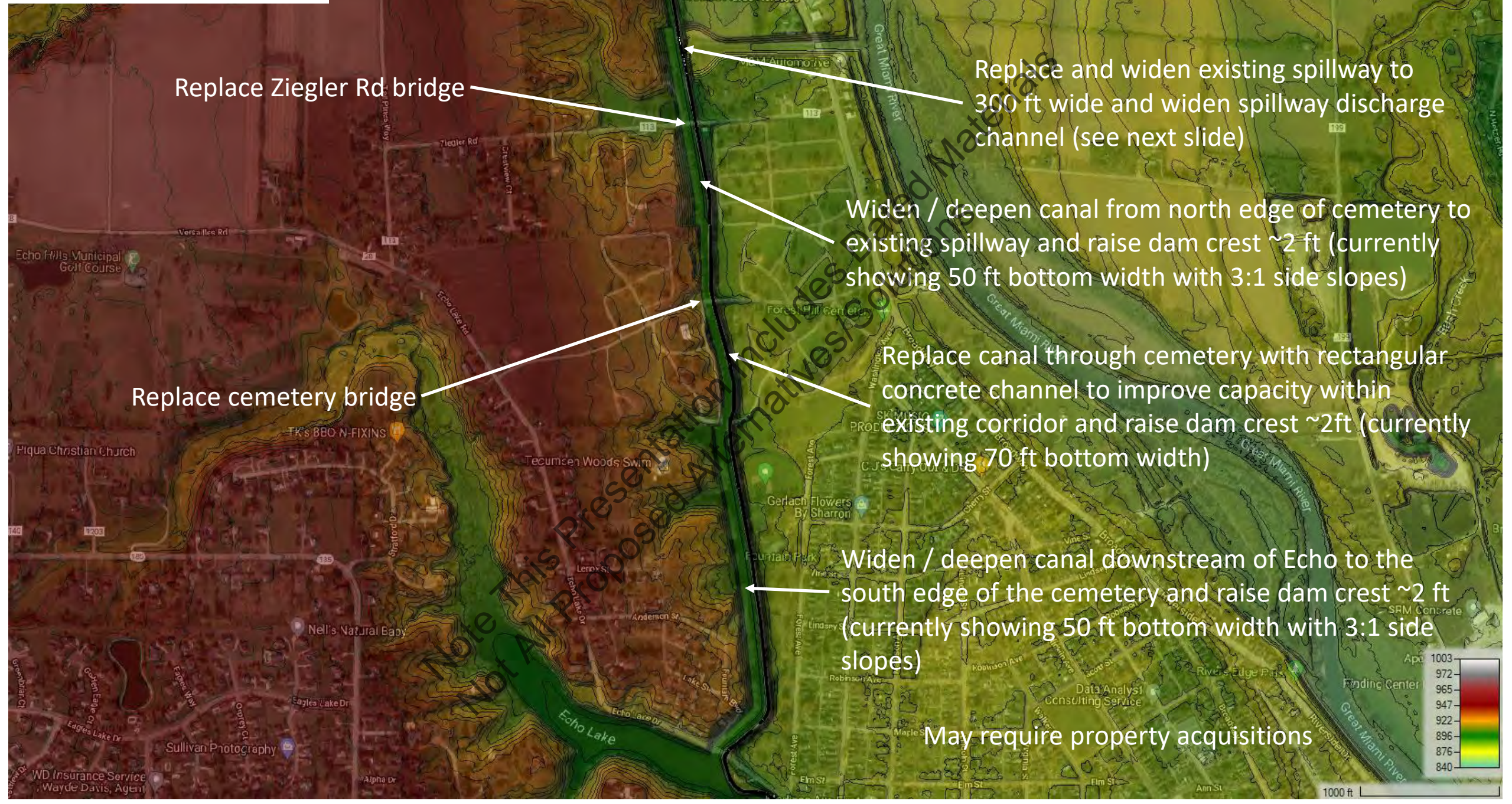
May require property acquisitions

New 150 ft wide spillway to new discharge channel



500 ft

# Echo Lake Alternative 2





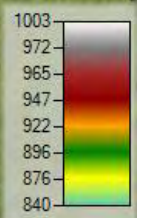
# Echo Lake Alternative 2 (continued)



Widen existing spillway channel to Great Miami River (shown as 50 ft bottom width with 3:1 side slopes and depth of approximately 20 ft)

Replace and widen existing spillway to 300 ft wide

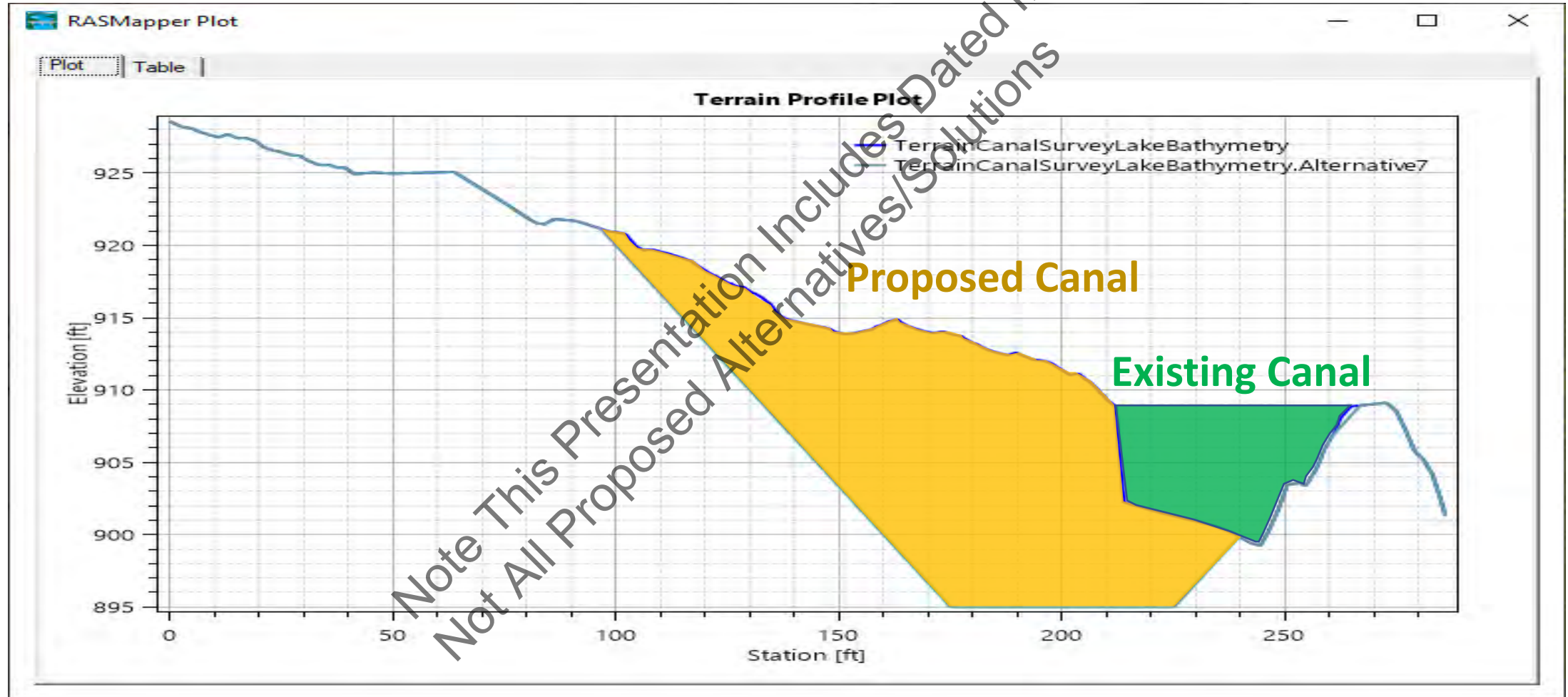
May require property acquisitions



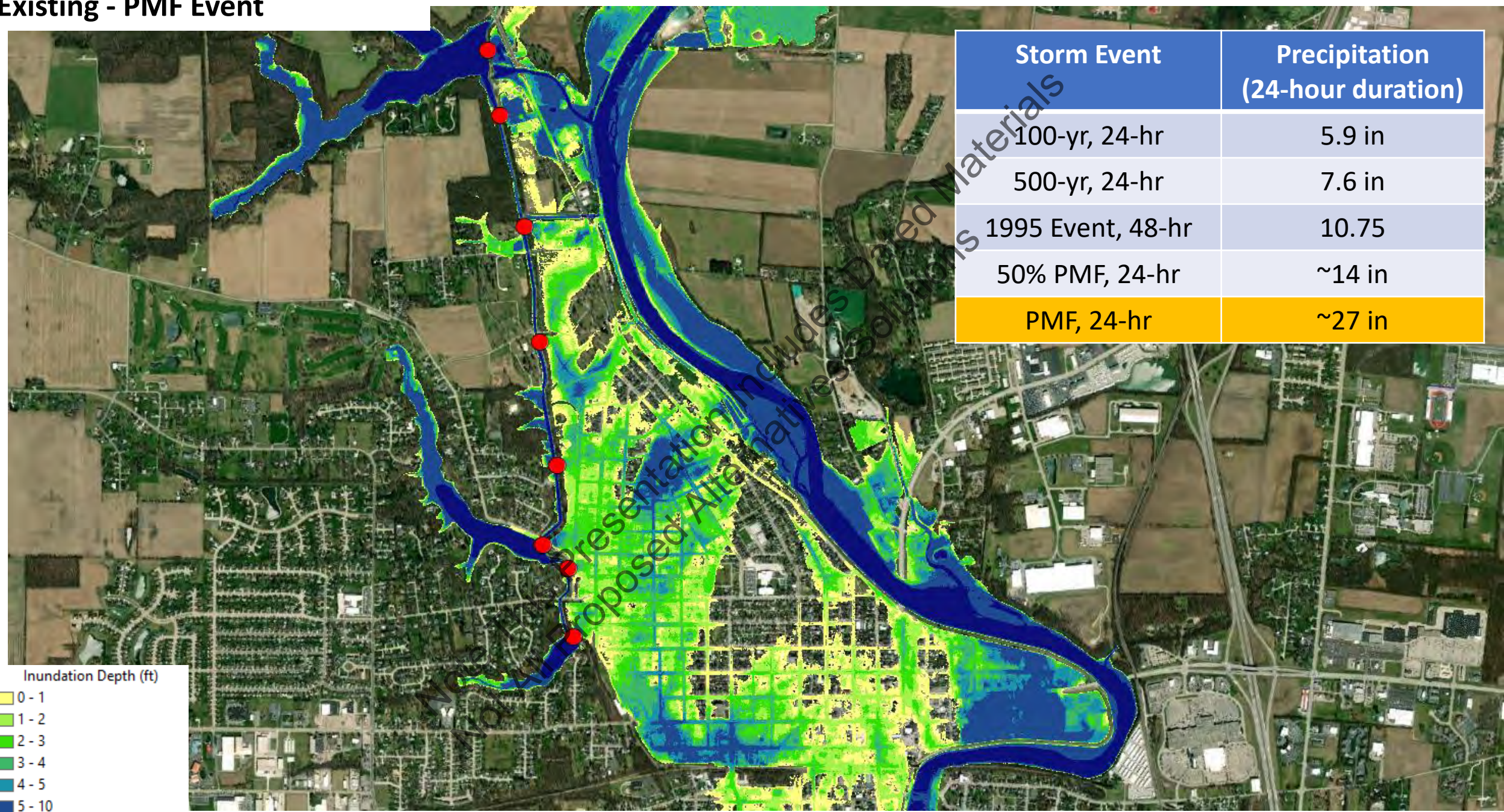
200 ft

# Conceptual Cross Sections

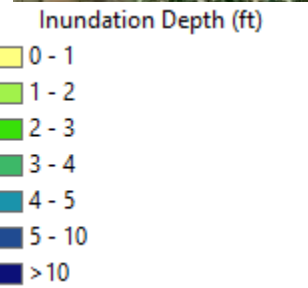
Hydraulic Canal between Franz Pond and Echo Lake



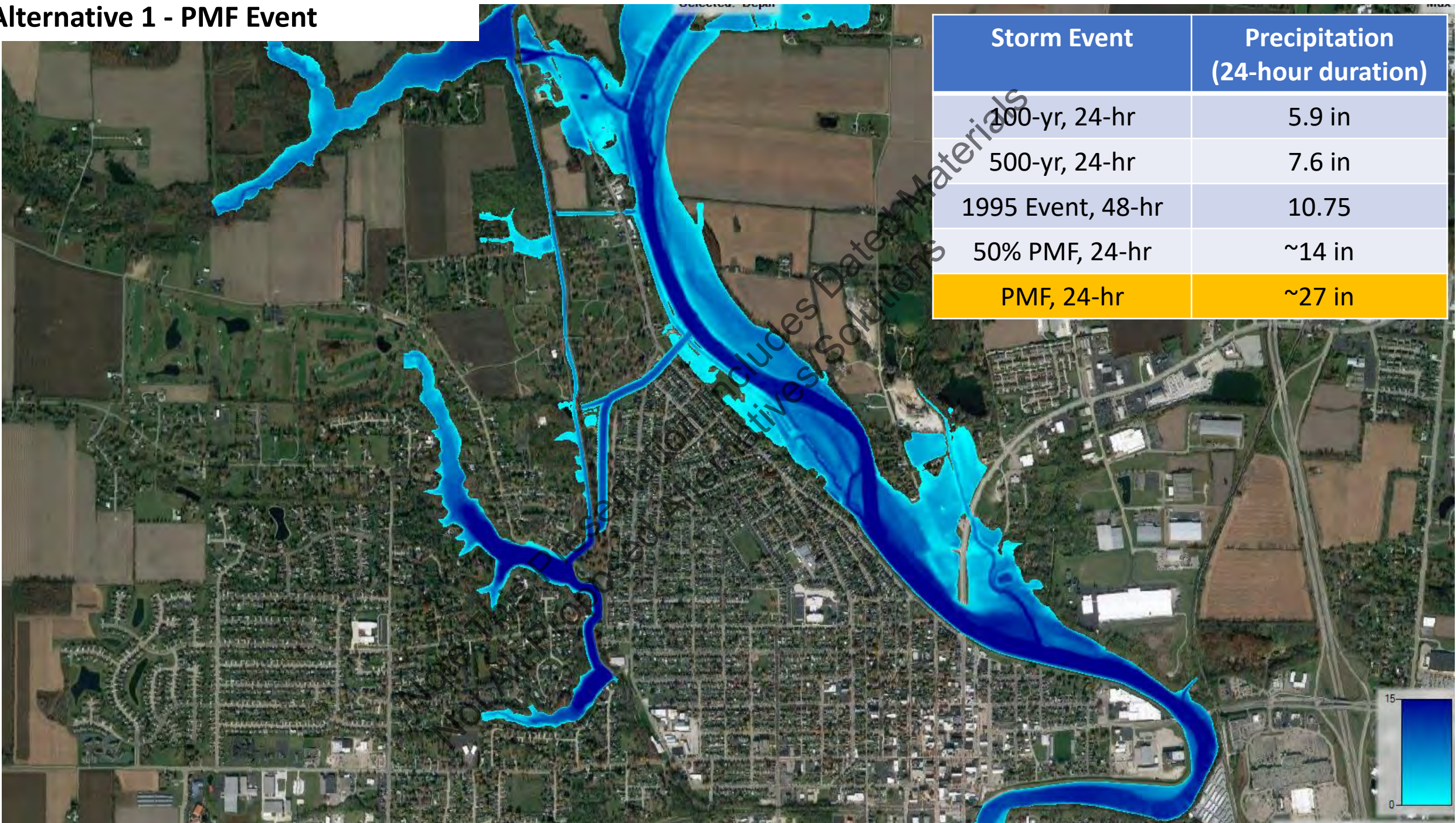
# Existing - PMF Event



Storm Event	Precipitation (24-hour duration)
100-yr, 24-hr	5.9 in
500-yr, 24-hr	7.6 in
1995 Event, 48-hr	10.75
50% PMF, 24-hr	~14 in
<b>PMF, 24-hr</b>	<b>~27 in</b>



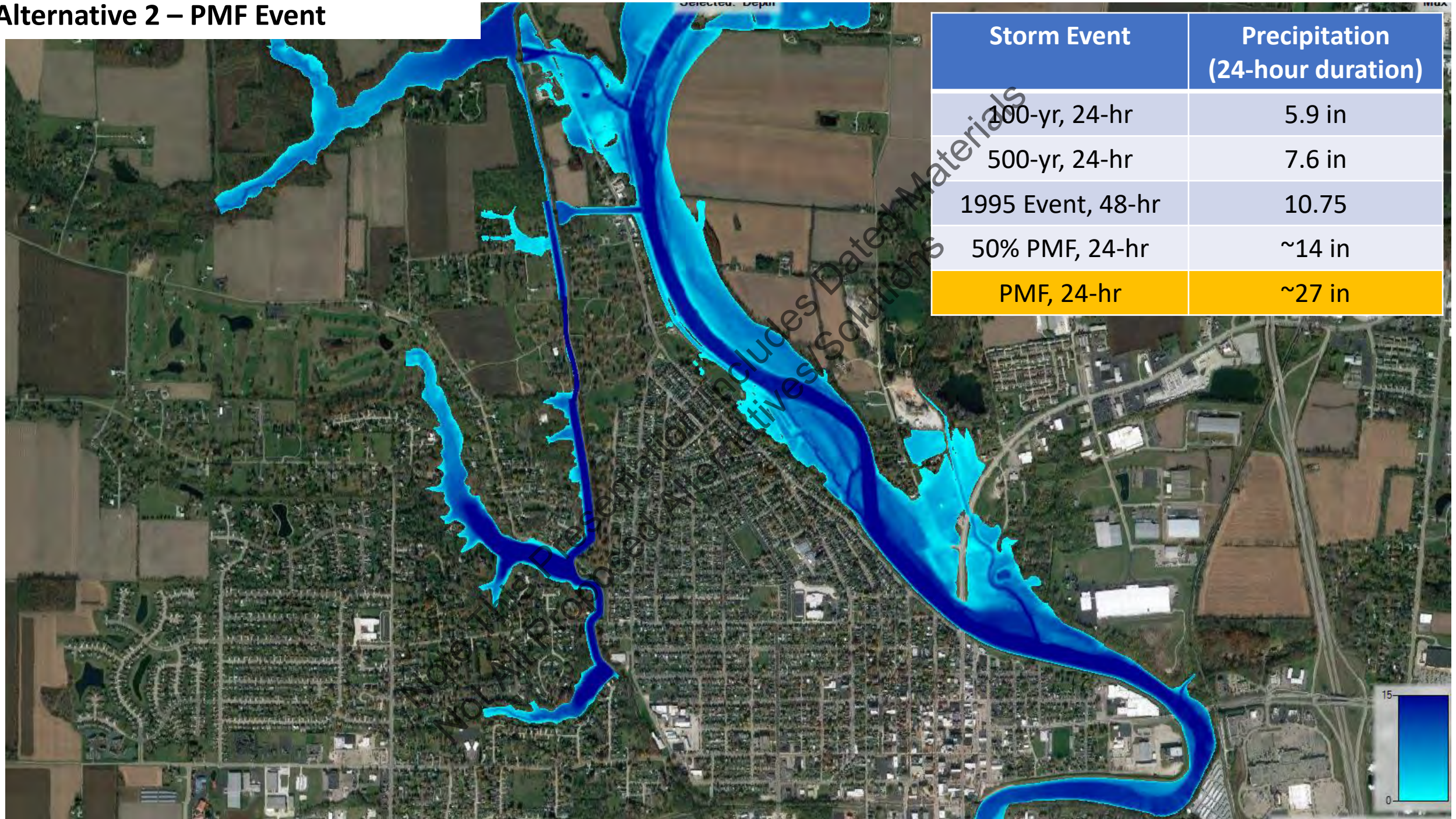
# Alternative 1 - PMF Event



Storm Event	Precipitation (24-hour duration)
100-yr, 24-hr	5.9 in
500-yr, 24-hr	7.6 in
1995 Event, 48-hr	10.75
50% PMF, 24-hr	~14 in
<b>PMF, 24-hr</b>	<b>~27 in</b>



# Alternative 2 – PMF Event



# Conceptual Alternatives Cost Estimates

Feature	Potential Improvements	Estimated Construction Costs
Franz Pond Dam	Raise dam and canal improvements (structural). New bridge crossing. Property acquisition.	\$ 6 – 12 M
Echo Lake Dam	Raise dam and canal improvements (structural). New bridge crossing. Property acquisition. New spillway constructed in Park.	\$ 15 – 25 M
Swift Run Lake Dam	Construct new spillway (may replace existing). Property acquisition.	\$ 4 – 8 M

- Additional Options include Decommissioning of the Hydraulic Canal Systems but keeping Swift Run Lake and Dam similar to existing conditions.

# Grant Funding

## 1. Grants Obtained:

- a) FEMA (High Hazard Potential Dam – HHPD) via ODNR (77.5% of Funding).
- b) FEMA (Advance Assistance – AA) via Ohio EMA (87.5% of Funding).

## 2. Applicable Work:

- a) Funding applied to the current work being performed.
  - i. Preliminary Design Report.
  - ii. Alternatives Analysis.
  - iii. Preliminary Environmental Studies.
  - iv. Benefit Cost Analysis.
  - v. Completion expected next year.

# Fountain Park Considerations

- Park used by local public.
- Baseball field and tennis courts.
- Significant water flow will occur during large storm events.
- Large trees would need to be removed.
- Historic structure.



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# Thoughts?

How does this affect me?

How do I get more info.?

Are there other options?

# Thoughts?

What is the timeline?

How can I ask more questions?

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What will the area look like in the future?

# Example of Alternatives

## Labyrinth Spillway



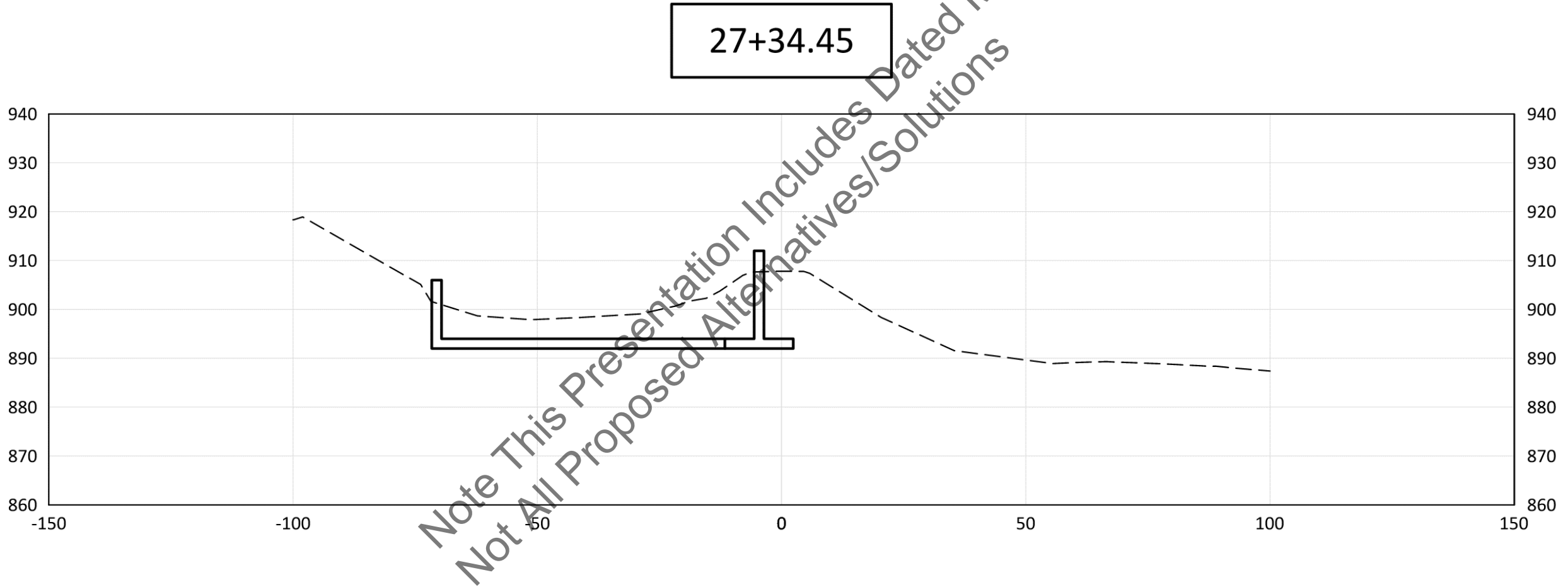
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# Example of Alternatives

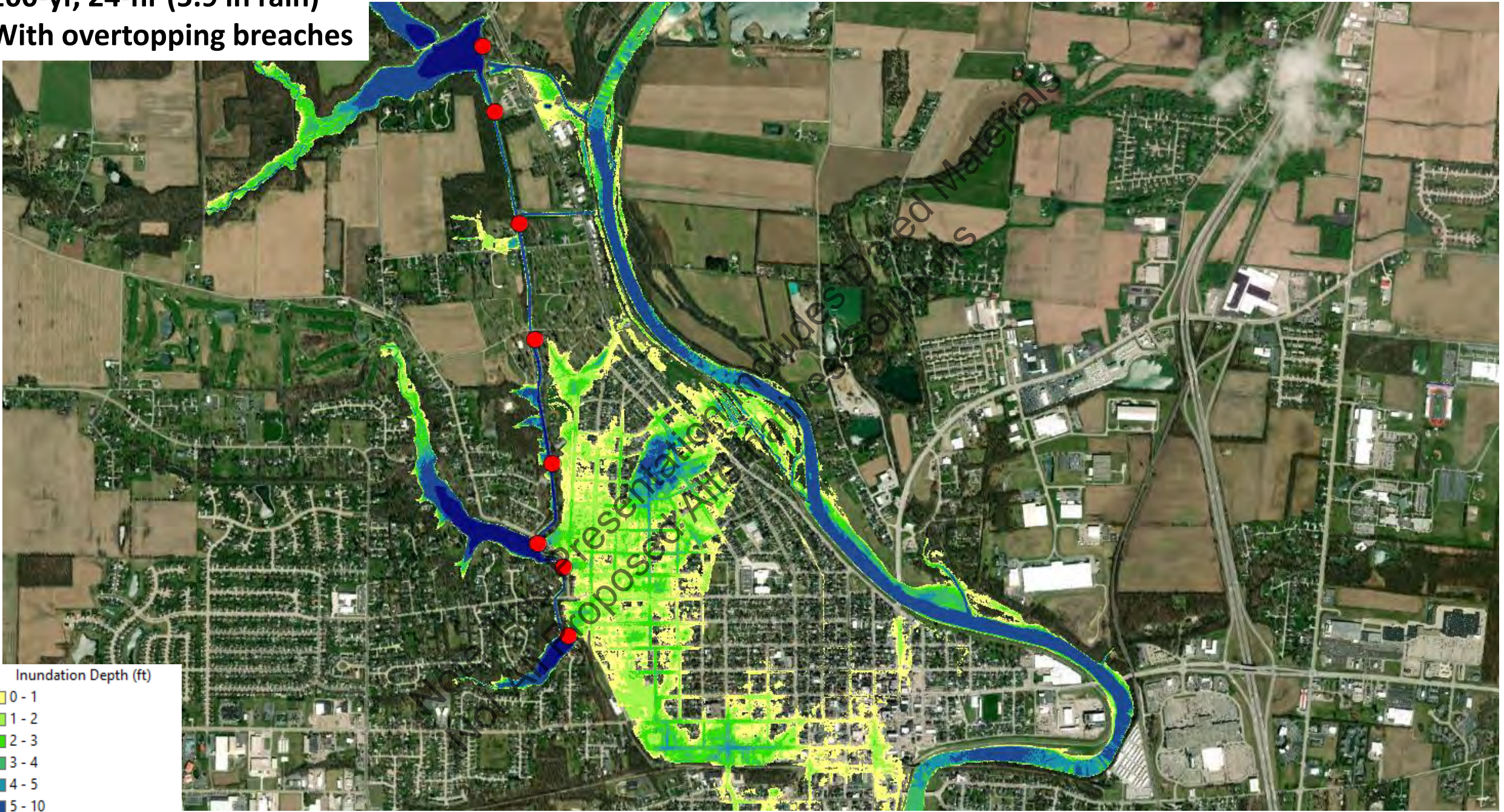
Roller Compacted Concrete (RCC) Overtopping Protection



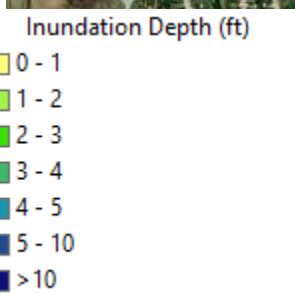
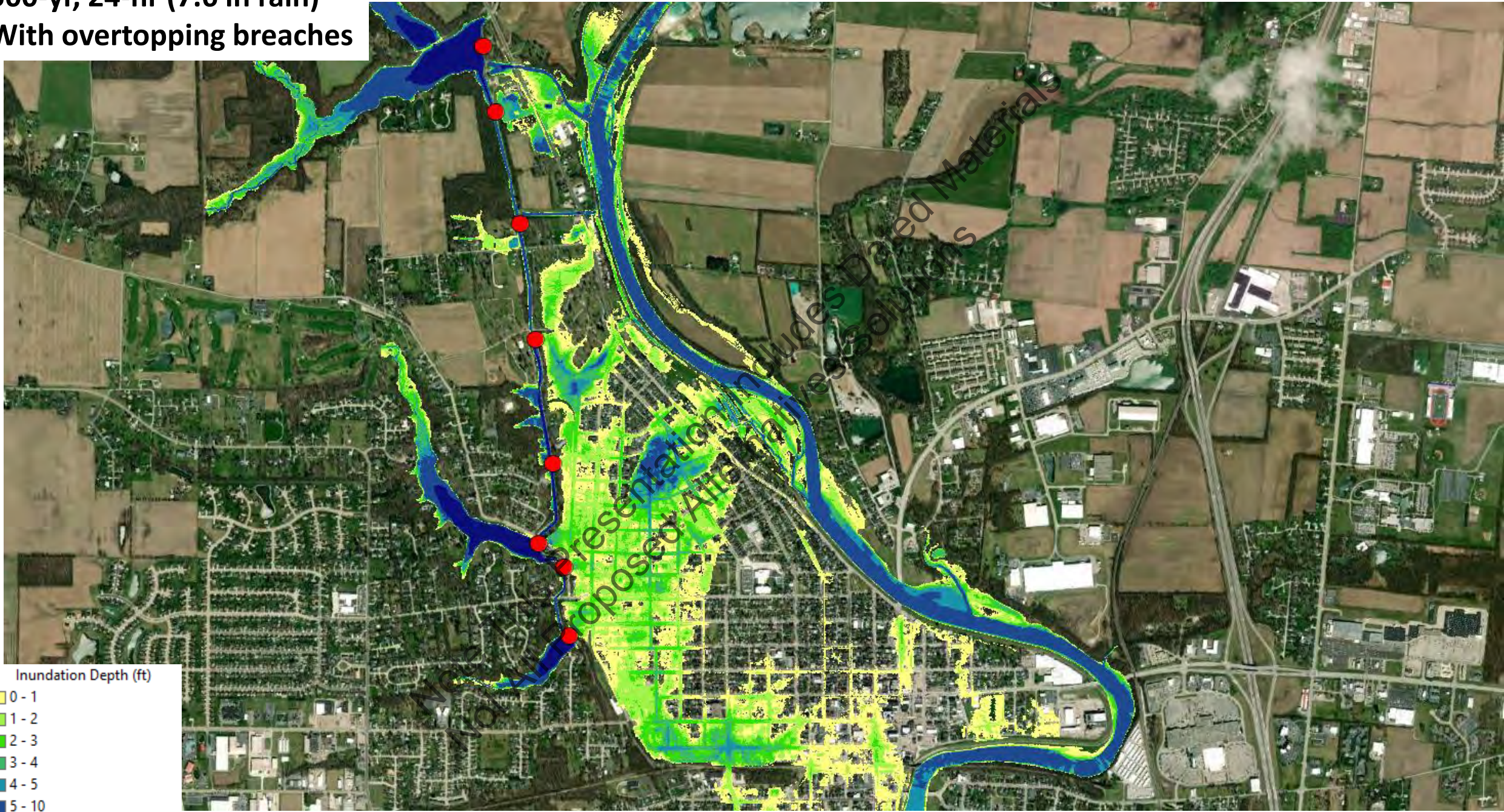
# Potential Canal Modification



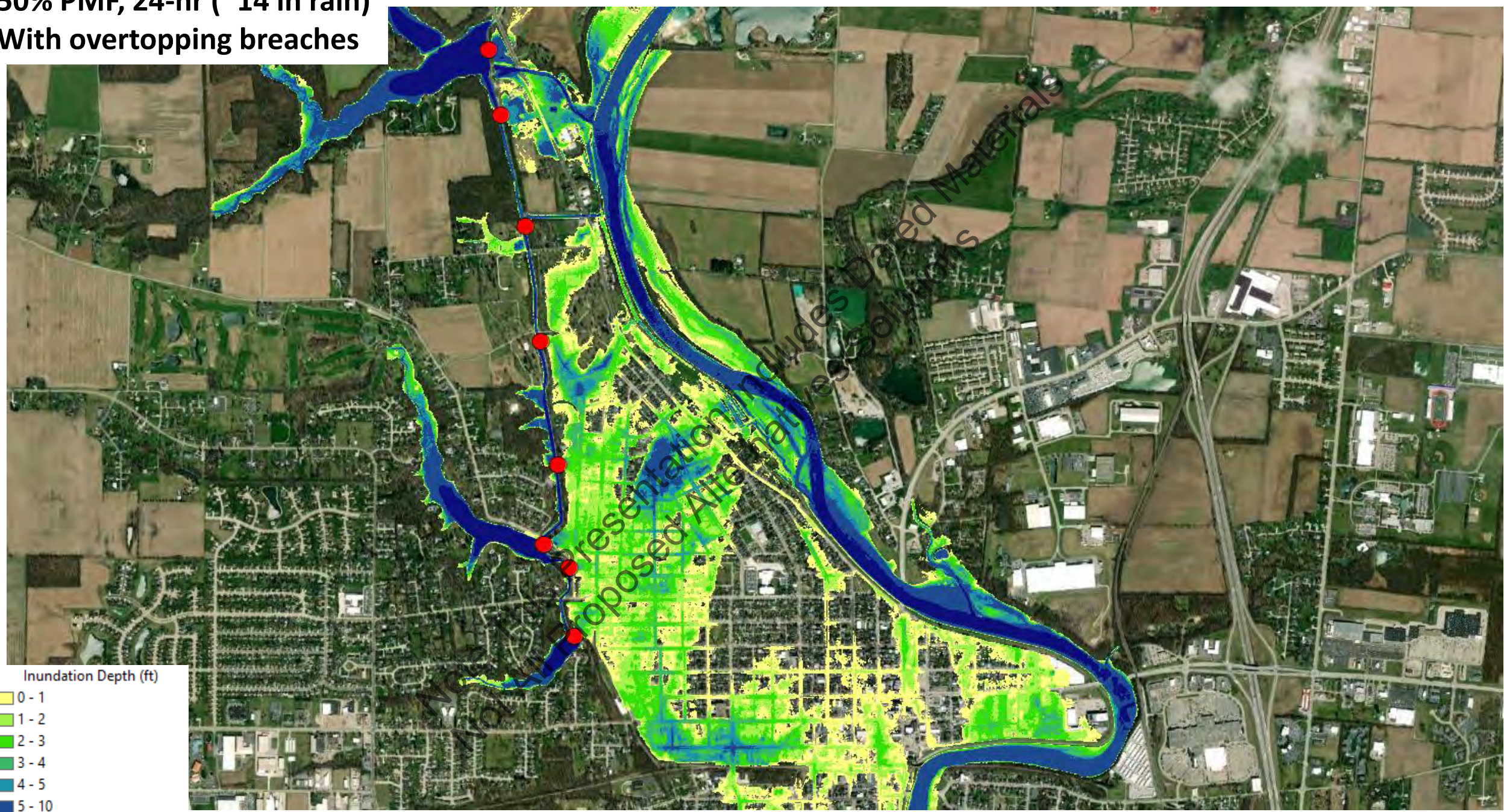
100-yr, 24-hr (5.9 in rain)  
With overtopping breaches



500-yr, 24-hr (7.6 in rain)  
With overtopping breaches

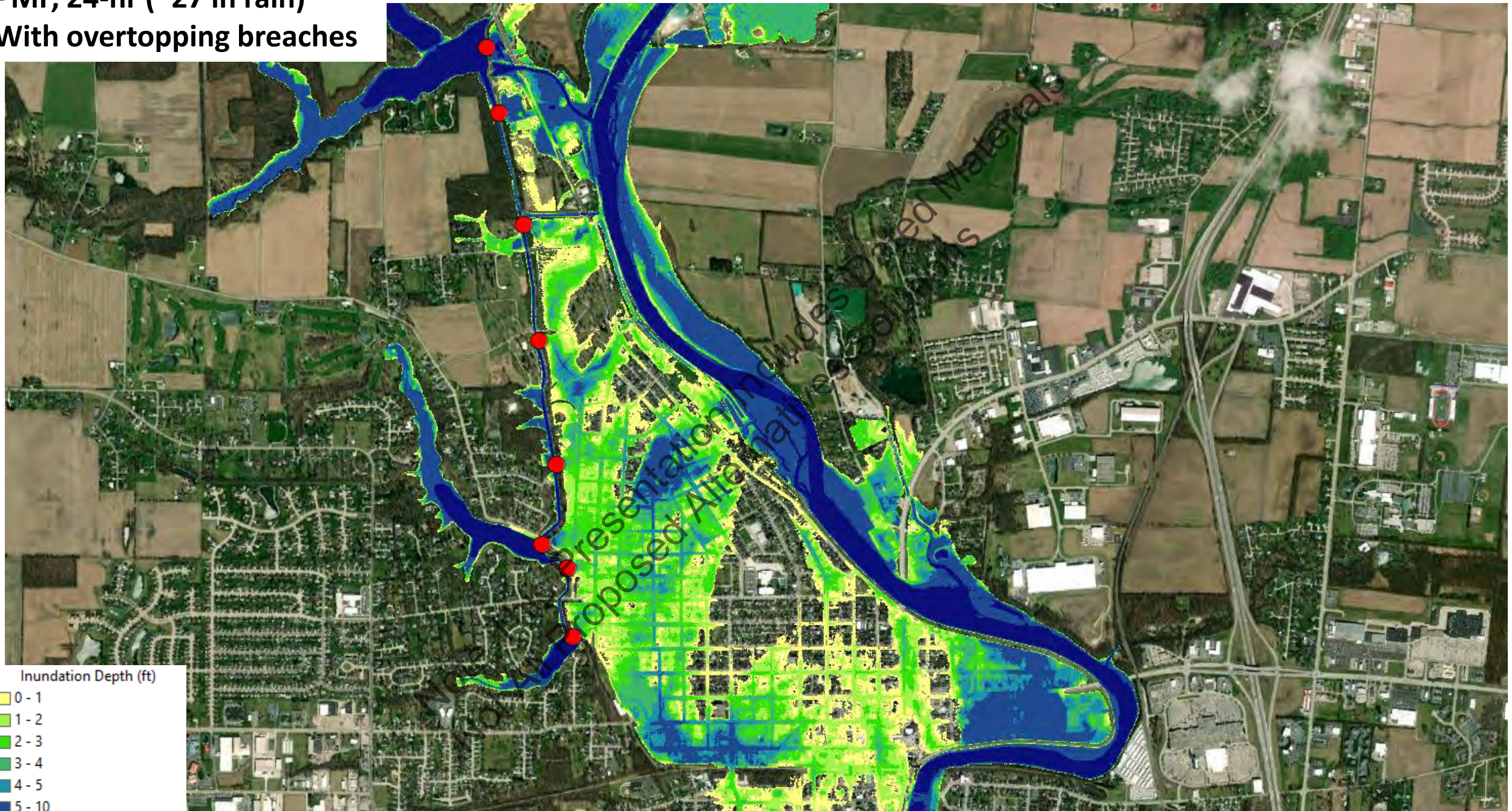


50% PMF, 24-hr (~14 in rain)  
With overtopping breaches



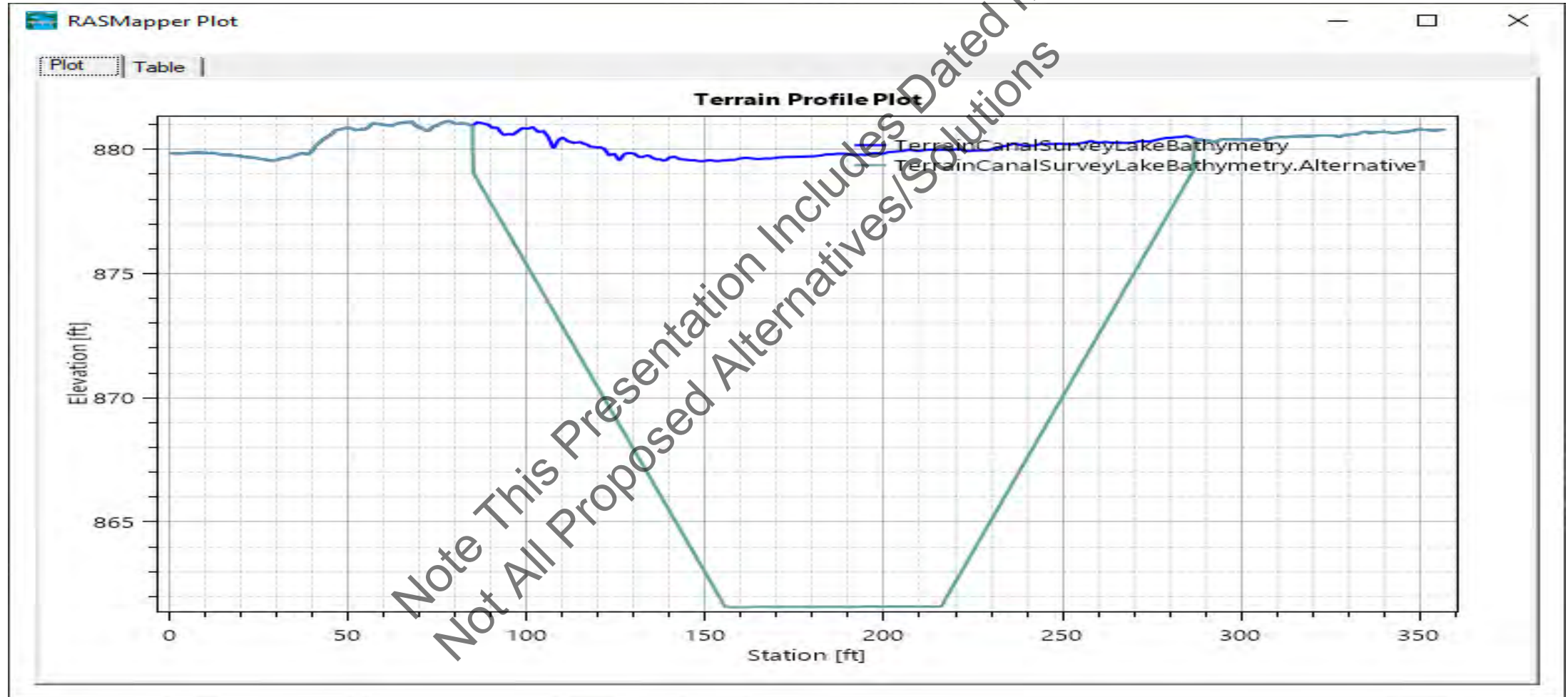


PMF, 24-hr (~27 in rain)  
With overtopping breaches



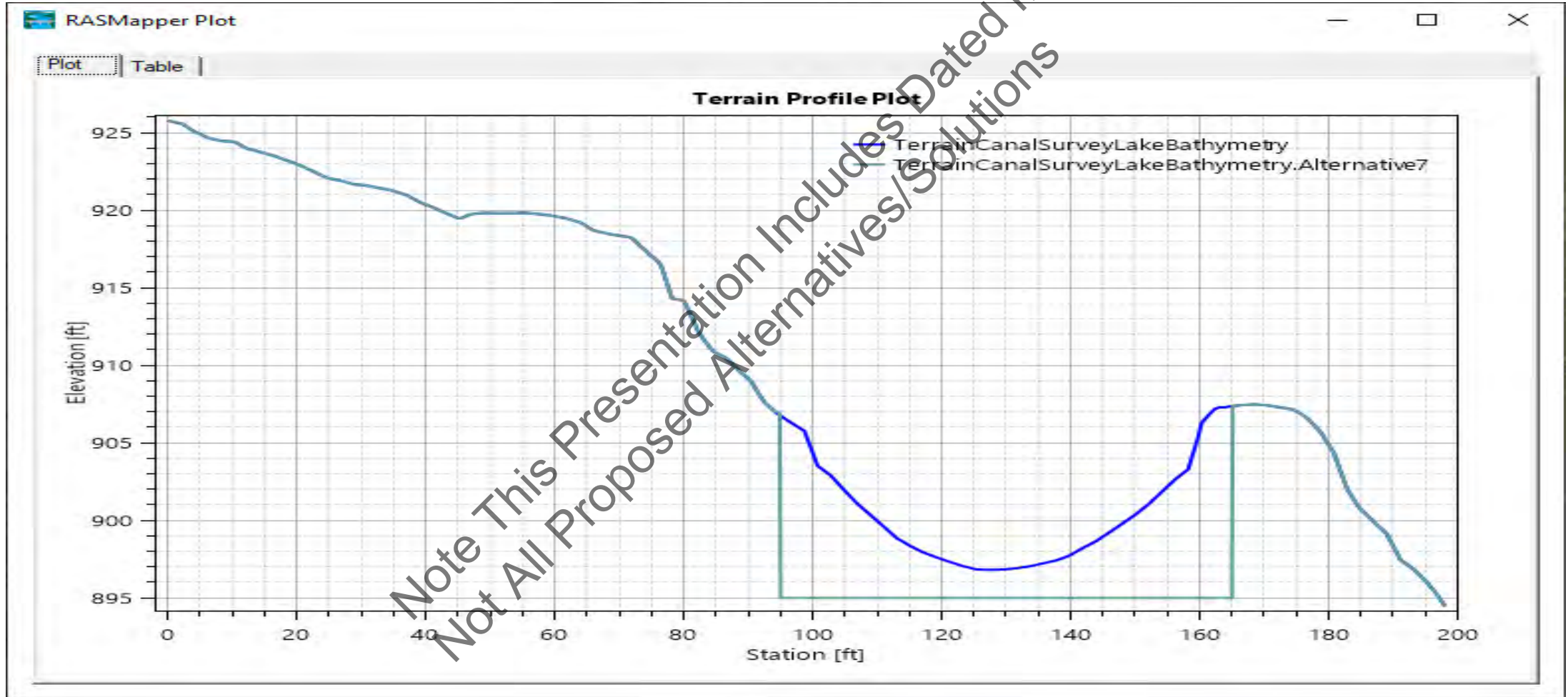
# Conceptual Cross Sections

Alternative 1 Spillway near HWY 66 (Broadway) Crossing



# Conceptual Cross Sections

Alternative 1 Spillway near HWY 66 (Broadway) Crossing



# Property Boundaries

Note This Presentation Includes Dated Materials  
Not All Proposed Alternatives/Solutions



Note This Project Includes Dated Materials  
Not All Proposed Solutions

