

Duncan Lake Intercounty Drain Hearing of Necessity September 22, 2022

Duncan Lake Intercounty Drain Drainage Board

Michigan Department of Agriculture & Rural Development
Allegan County Drain Commissioner
Barry County Drain Commissioner
Kent County Drain Commissioner



Presentation Overview

- Current Petition(s)
- Drain Overview
- Duncan Lake Overview
- Study Purpose
- Drainage Issues (Existing Conditions)
- Evaluation of Potential Alternatives
- Next Steps

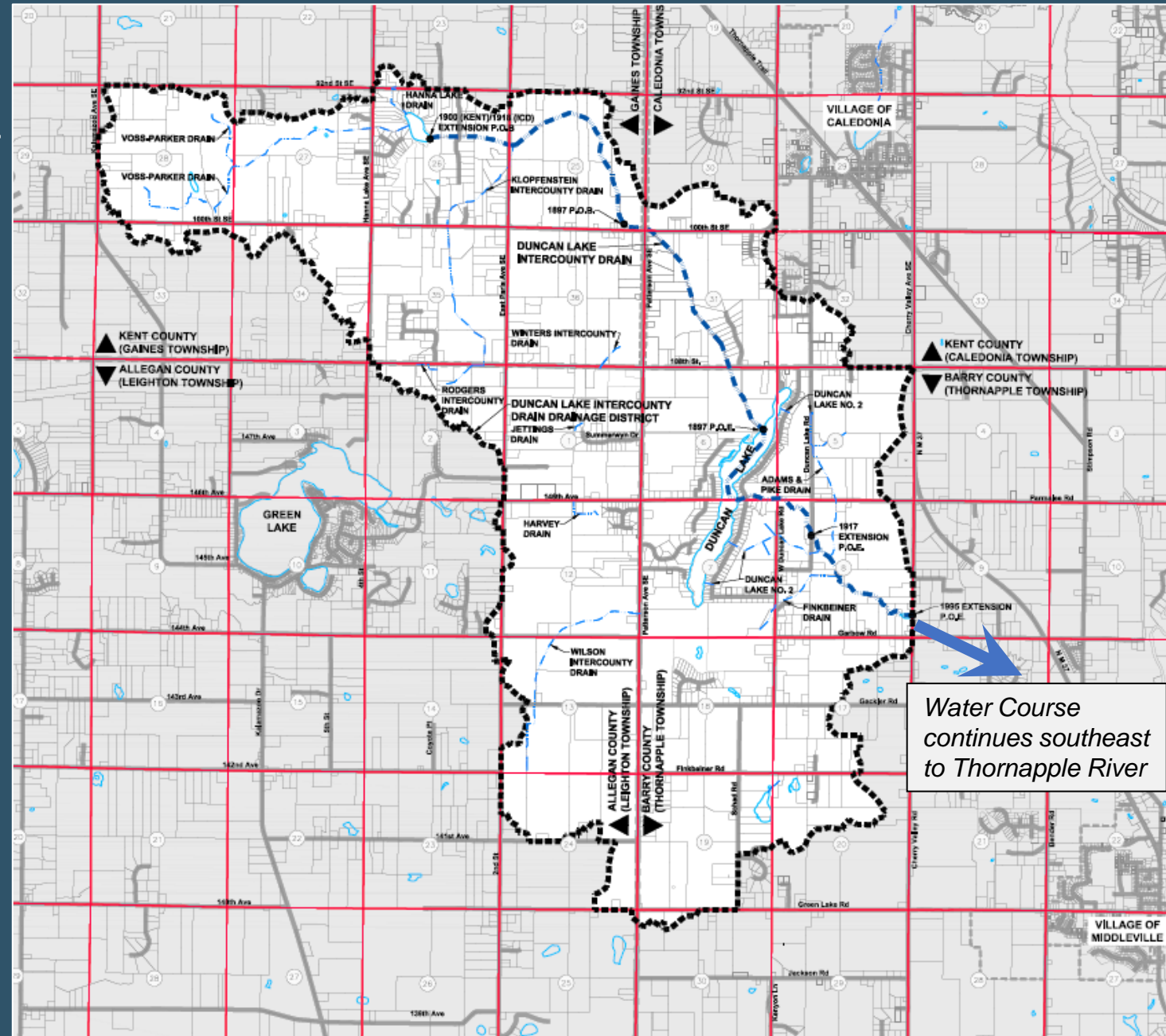


Current Petition(s)

- Duncan Lake Intercounty Drain Drainage Board received 3 Petitions, which were determined practicable on 12/7/21:
 - Freeholders of land within Thornapple Township, Barry County
 - Thornapple Township (Barry County)
 - Barry County Board of Road Commissioners
- Comments from Hearing of Practicality:
 - Chronic flooding / roadway overtopping of 108th Street
 - Flashy hydrology that spike water levels in Duncan Lake and cause flooding of adjacent properties
 - Water quality concerns within Duncan Lake
 - Conveyance restrictions at Drain outlet from Duncan Lake

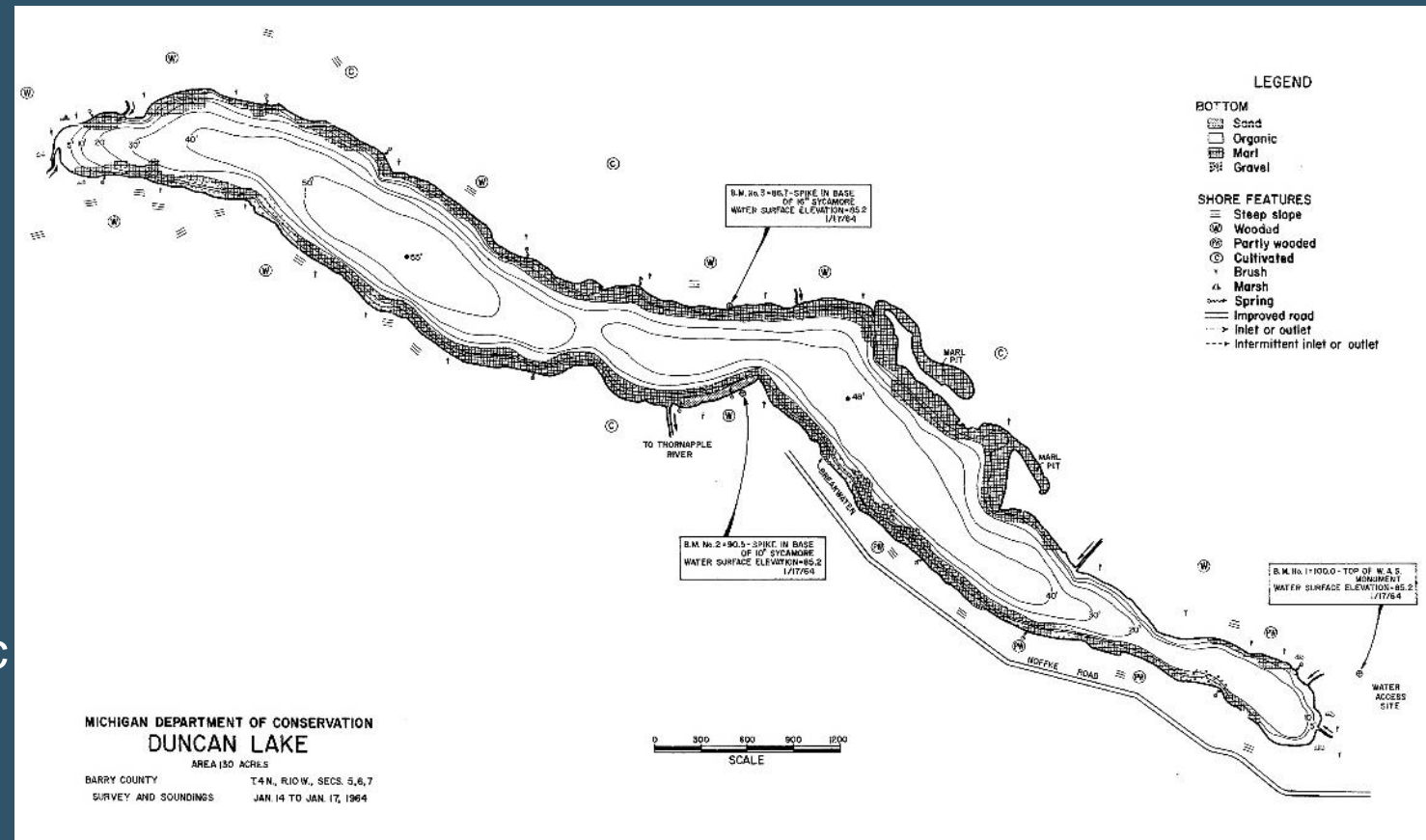
Drain Overview

- Duncan Lake Intercounty Drain Established in 1897
- Tributary to Thornapple River
- Drain Length – 6.6+/- miles
- 11,539+/- Acre Watershed
- Leighton Twp. (Allegan County), Thornapple Twp. (Barry County), Caledonia & Gaines Twp. (Kent County)
- Includes Duncan Lake & Hanna Lake
- Loam/Sand Soils
- Predominately Agriculture & Lakefront Residential



Duncan Lake Overview

- Area – 130+/- acres
- Max Depth – 55+/- feet
- No legal lake level. Water levels controlled by Noffke Drive culvert (763.52' NAVD 88)
- Contributing watershed area ~ 80 times lake area
- EGLE estimated 100-year floodplain 770.4' NGVD 29.
- Slightly eutrophic lake (nutrient enriched, turbid, abundant aquatic vegetation)
- *E. Coli* sampling from 2017-2021 met WQS for total body contact



Study Purpose

- Investigate Flooding Issues
- Identify Impairments / Deficiencies within Drain System
- Evaluate Improvement Alternatives to:
 - Prevent overtopping (flooding) of 108th Street
 - Reduce “Flashiness” / flooding in/around Duncan Lake

Drainage Issues

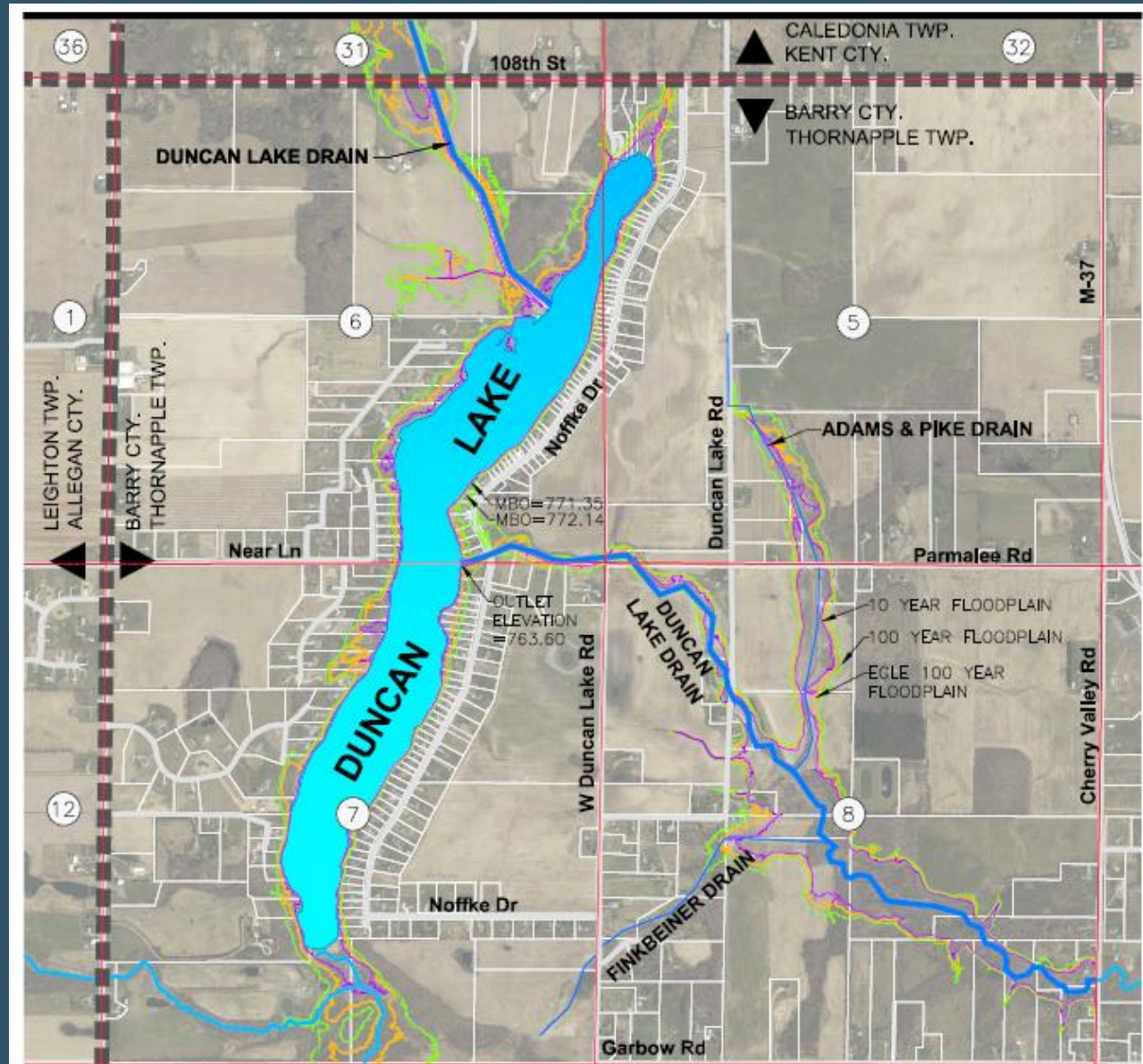
Public Health, Convenience or Welfare Issues:

- Flooding / property damage around Duncan Lake
- Frequent overtopping (flooding) of 108th Street creates a safety hazard to drivers and may hinder emergency access

Drainage Issues

Duncan Lake:

- Extreme water level fluctuations (2-8 feet) during heavy rainfall events (2-year to 100-year)
- LRE calculated 100-year floodplain at 772.32' NAVD 88 (2-feet +/- higher than estimated by EGLE), which may be above a few MBOs around the Duncan Lake



NOTE

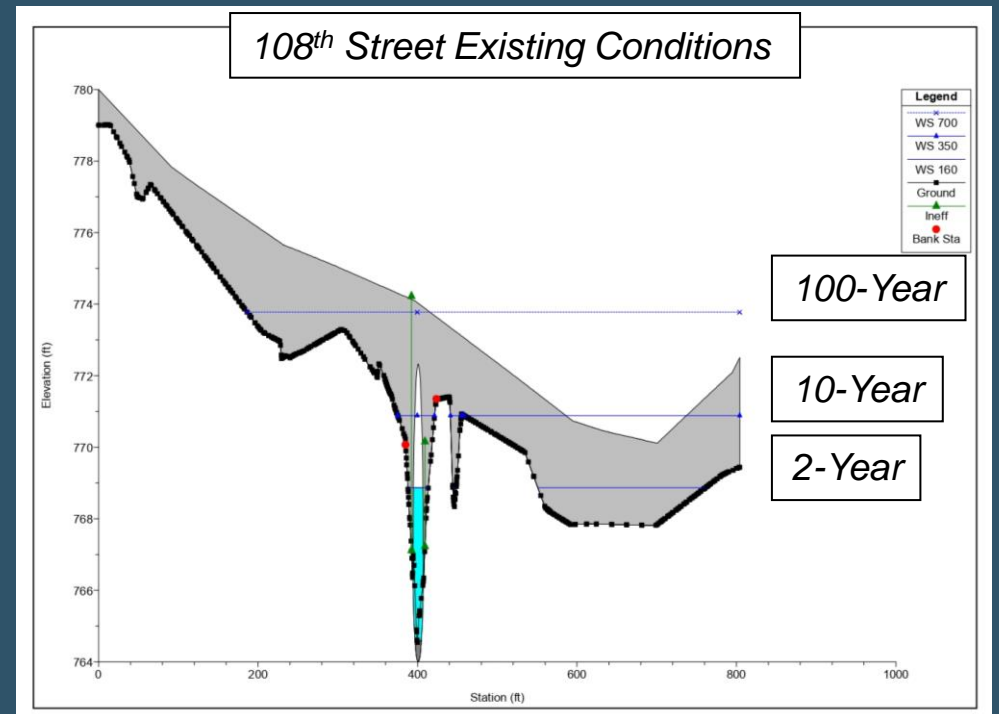
10 YEAR FLOODPLAIN = 768.49 (NAVD 88)
100 YEAR FLOODPLAIN = 772.32 (NAVD 88)
EGLE 100 YEAR FLOODPLAIN = 770.40 (NGVD 29)



Drainage Issues

108th Street 154" x 100" CMP Arch:

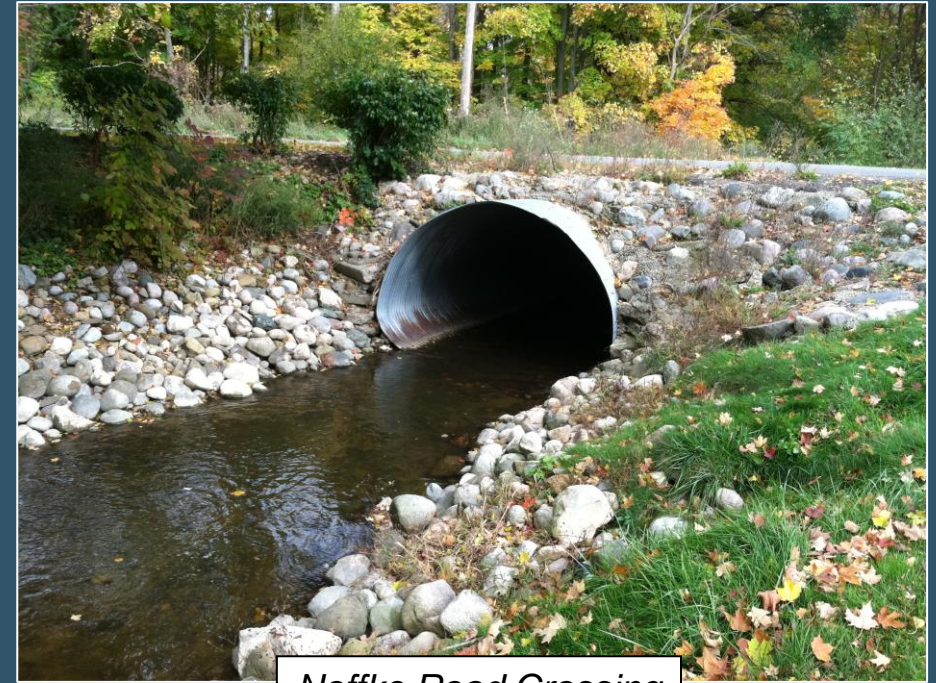
- Hydraulic capacity: 2-year storm (less than 200 CFS)
- Low point in road (770.26' NAVD 88) frequently overtopped
- Invert elevation of 108th Street culvert (763.8' NAVD 88) is essentially same as Nofke Drive (763.52' NAVD 88)
- Duncan Lake causes backwater conditions



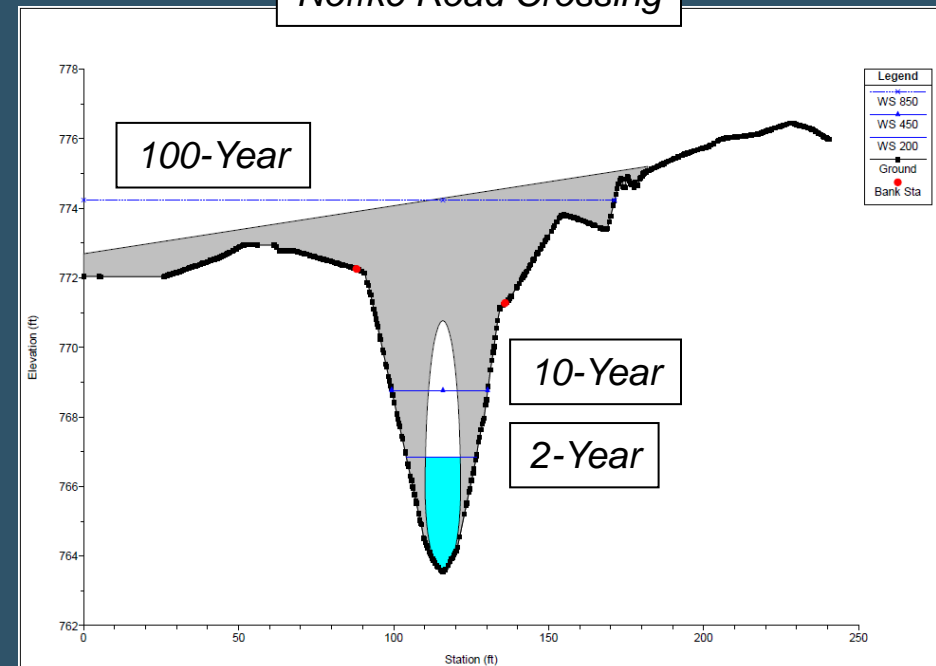
Drainage Issues

Downstream of Duncan Lake:

- Noffke Road 138" x 96" CMP Arch serves as Duncan Lake Control Structure
- Slightly undersized
- Could be lowered to better regulate upstream water levels (both Duncan Lake and 108th Avenue).



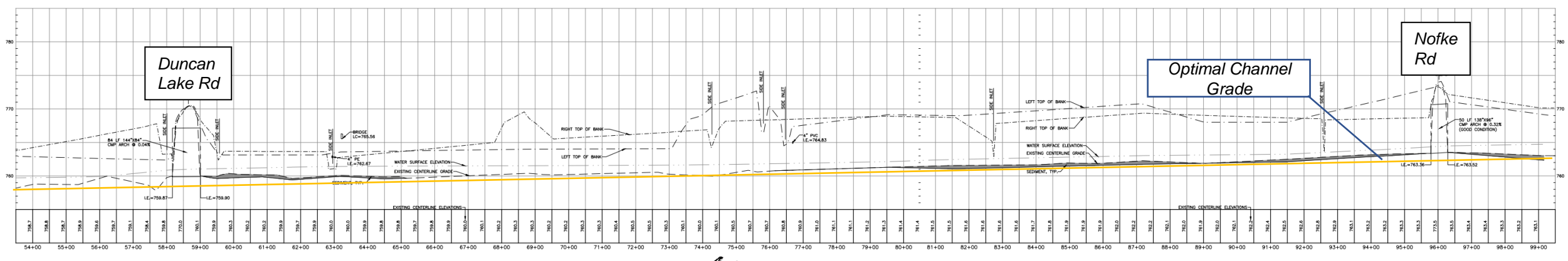
Noffke Road Crossing



Drainage Issues

Downstream of Duncan Lake:

- Gradient of Drain downstream of Duncan Lake could be improved (lowered up to 2-feet).



Drain Profile – from Duncan Lake to Duncan Lake Road



Evaluation of Alternatives

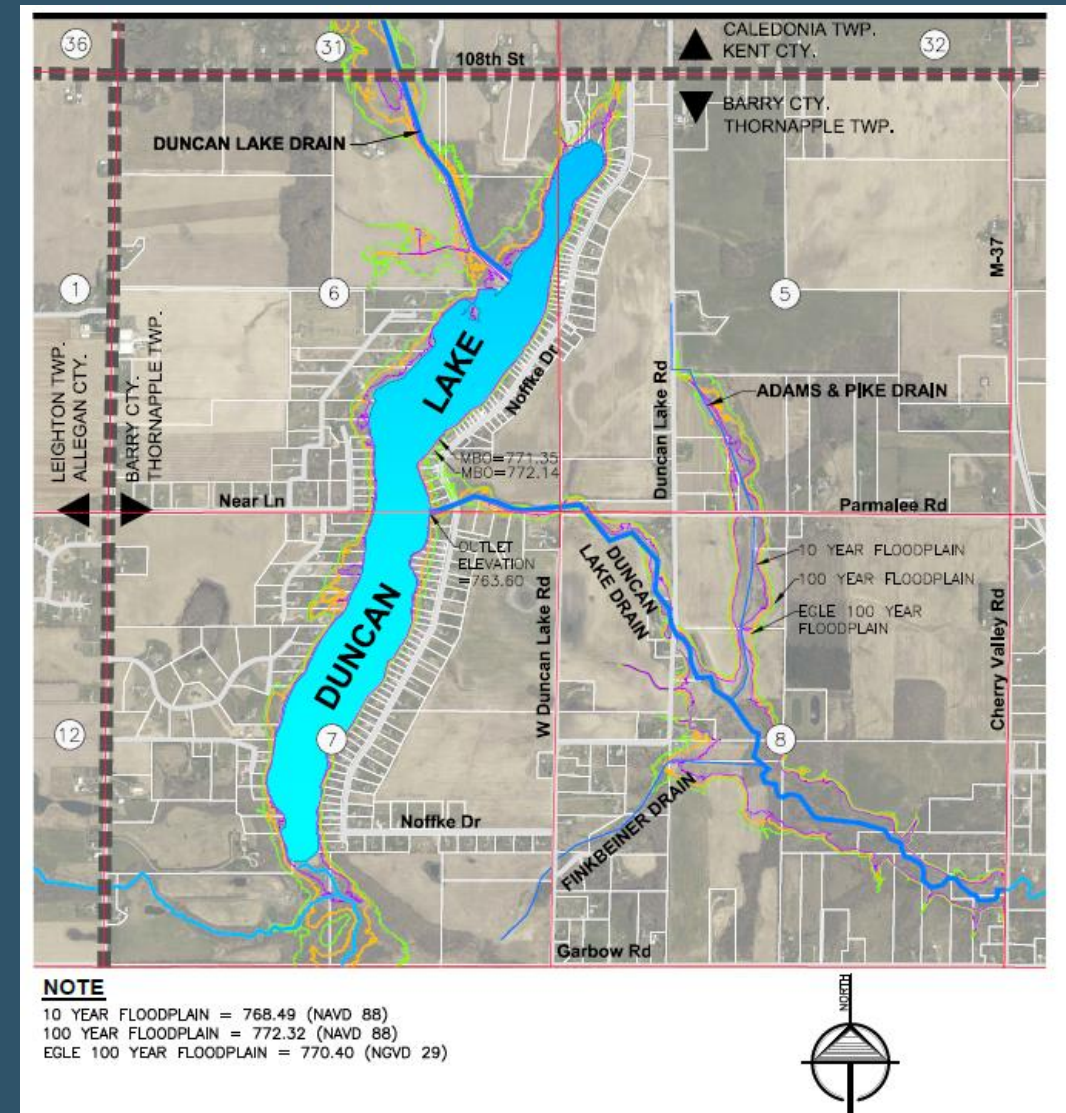
Evaluate Improvement Alternatives to:

- Reduce potential for roadway overtopping at 108th Street
- Attenuate water level fluctuations in Duncan Lake
- Ensure all properties surrounding Duncan Lake have a MBO (minimum building opening) above the 100-year floodplain

Evaluation of Alternatives

Do Nothing

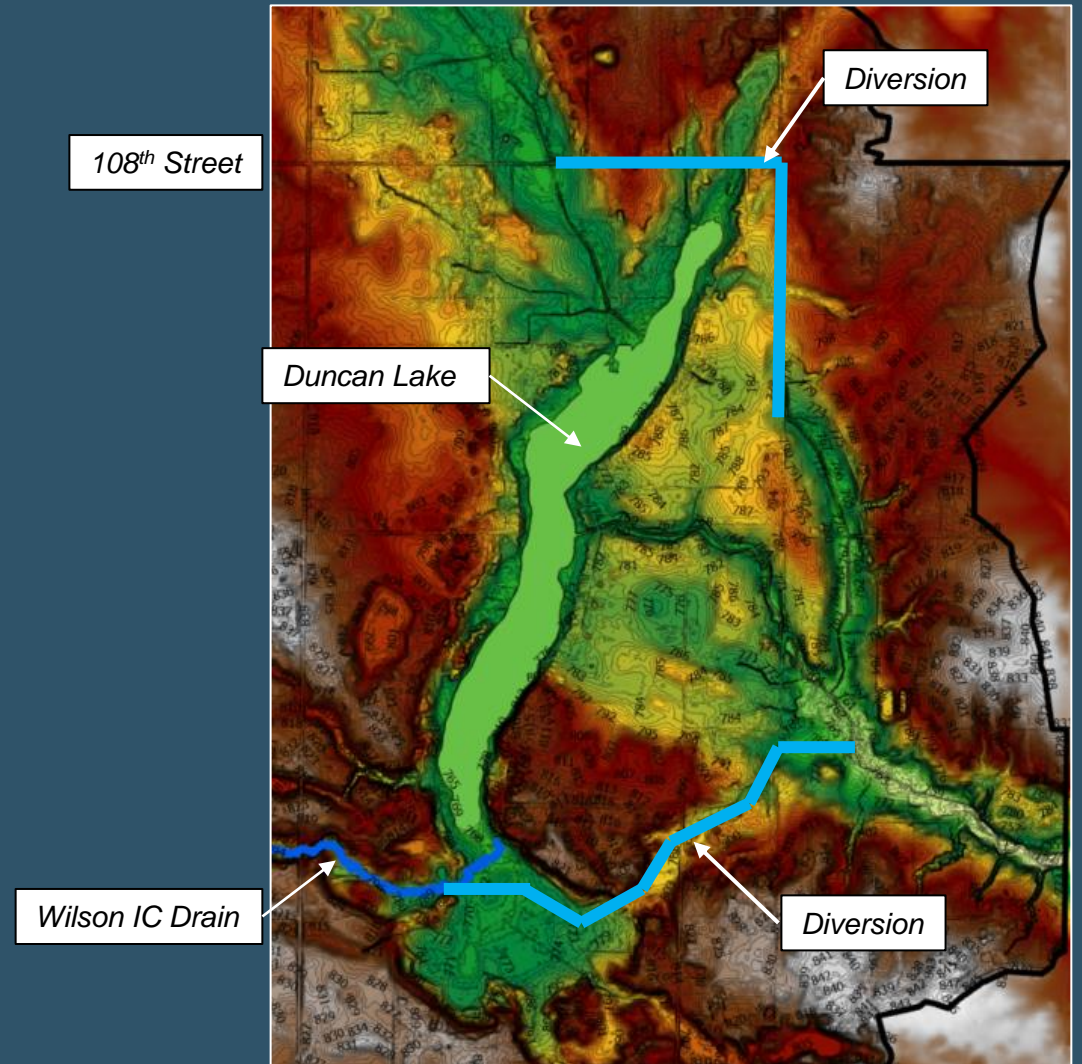
- 108th Street crossing of the Drain is capable of conveying peak discharges from storm events up to the 2-year storm event
- Water surfaces elevations in Duncan Lake may rise as much as 8-feet during a 100-year storm event



Evaluation of Alternatives

Diversion

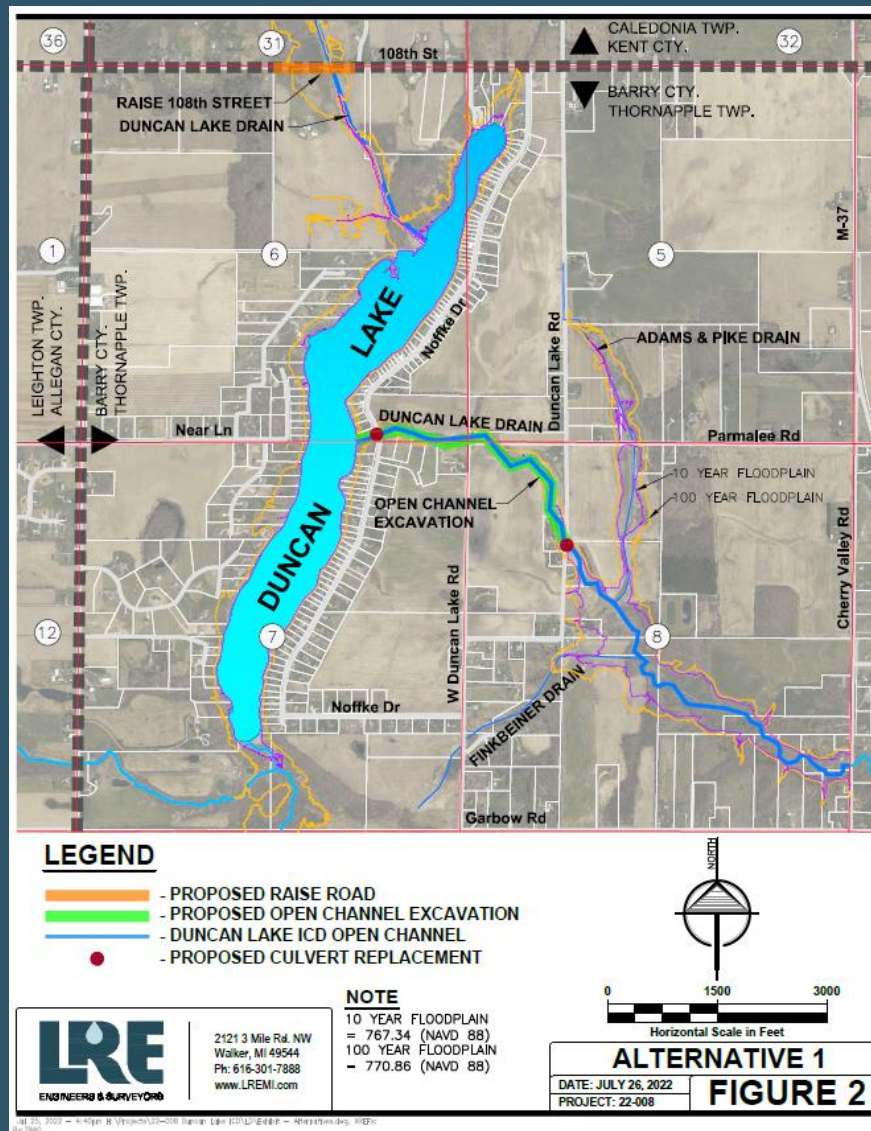
- Not evaluated in detail, LRE investigated several alternatives to divert / reroute stormwater around Duncan Lake
- Biggest issues:
 - Lack of grade to convey the drainage over longer route
 - Substantial cost (greater than \$5M)
 - Disturbance to environmentally sensitive areas



Evaluation of Alternatives

Alternative 1: Conveyance Improvements

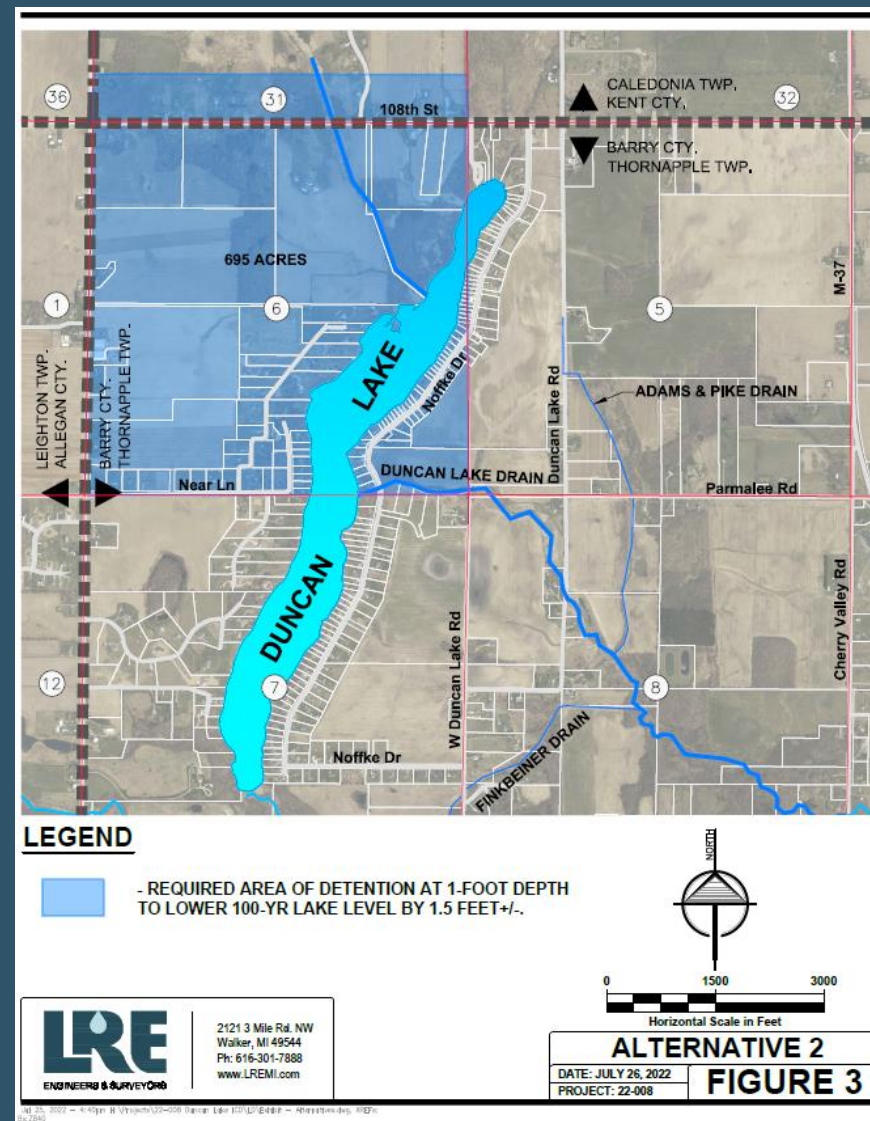
- Optimize hydraulic capacity of the Drain downstream of Duncan Lake (ensure all homes around Duncan Lake have MBO above 100-year floodplain)
 - Open channel excavation from Duncan Lake to Duncan Lake Road (lower channel up to 2-feet)
 - Noffke Drive and Duncan Lake Road culvert replacements
 - Install water level control structure in Duncan Lake
- Increase the hydraulic capacity of 108th Street to convey 100-year storm event
 - Install Additional 154"x100" CMPA culvert
 - Raise 108th Street ~2.5-feet
- Upstream of 100th Street
 - Construct 2-Stage channel to improve drainage and provide additional floodplain storage
- Preliminary Estimate of Project Cost: \$1.5M +/-



Evaluation of Alternatives

Alternative 2: Retention / Detention

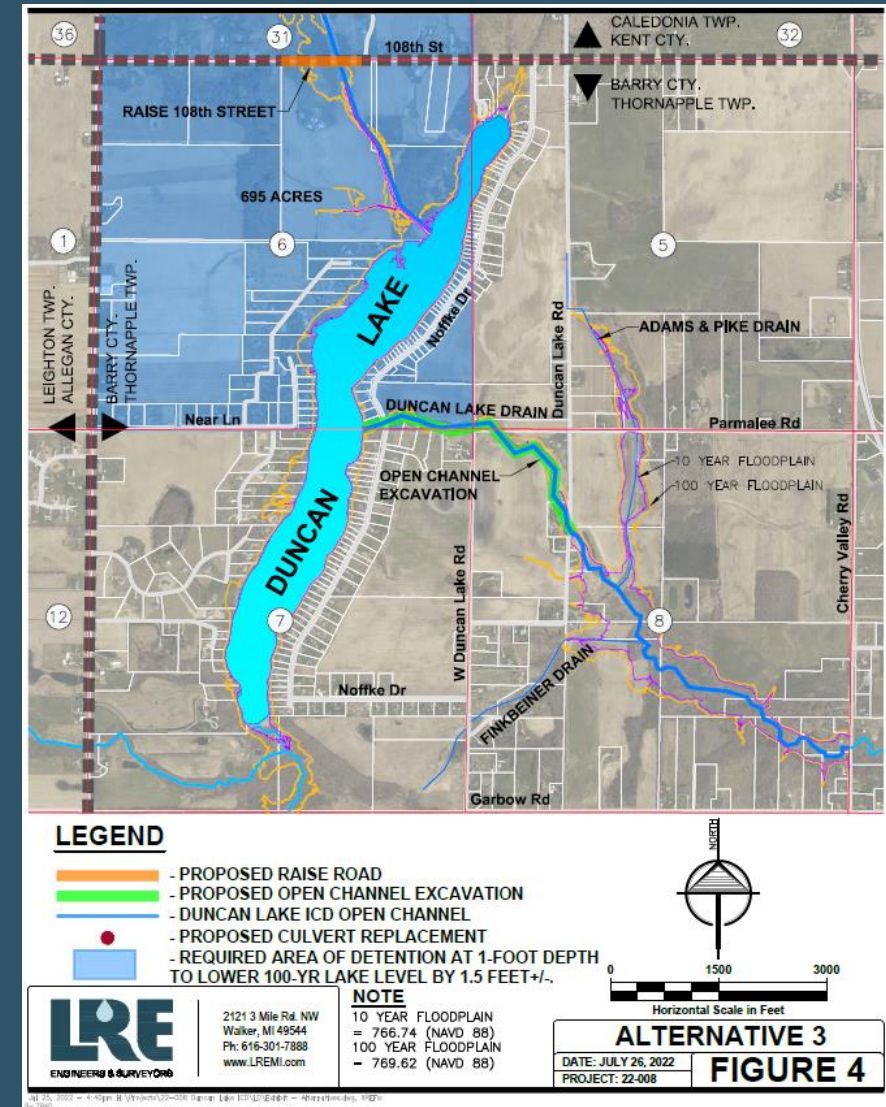
- Goal is to reduce peak water surface elevations similar to Alternative 1, but through detention / retention
- An additional 695-acre feet (>1.1 million cubic yards) of storage would be required
- Preliminary Estimate of Project Cost: \$10M +/-



Evaluation of Alternatives

Alternative 3: Combination of Alternatives 1 & 2

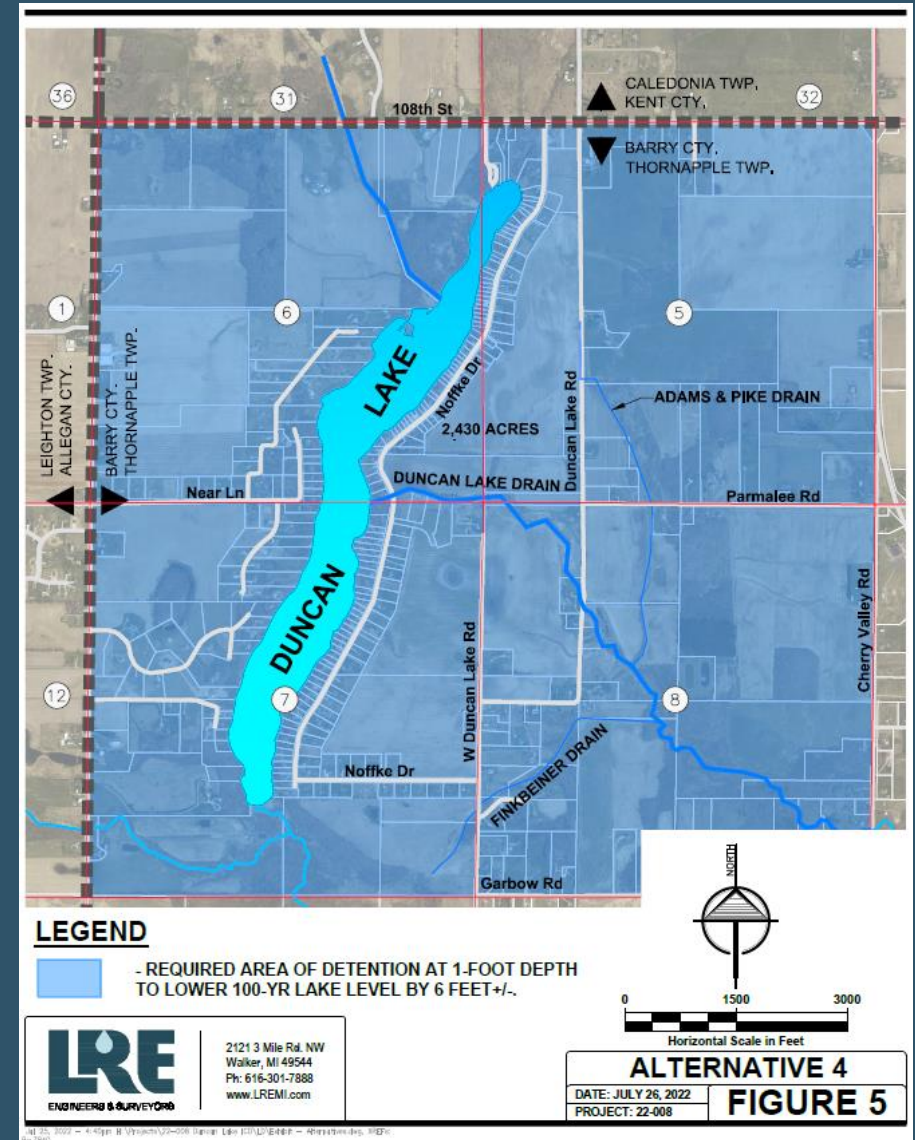
- Includes the following:
 - Downstream Improvements – open channel excavation and culvert replacements
 - 108th Street Improvements – Raise and Install additional culvert
 - 695-acre feet of detention
- Preliminary Estimate of Project Cost: \$11.5M +/-



Evaluation of Alternatives

Alternative 4: Maximum Retention

- Goal is to reduce the water surface elevations from the current 100-year storm to the 2-year storm elevation
- Requires 2,430 acre-feet of additional storage
- Preliminary Estimate of Project Cost: \$40M +/-



Next Steps

Board to decide if petition is necessary:

- If the Board finds that the petition is not necessary, the project ceases immediately and no petition can be heard for the same project until 12 months have passed.
- If the Board finds that the petition is necessary based on health, welfare or convenience, the Board proceeds with a project (the scope of which will be defined later). Each project is unique, however, in accordance with the Drain Code, the following tasks must be completed:
 1. Complete Engineering Design
 2. Obtain Easements (if necessary)
 3. Apply for Permits (if necessary)
 4. Bid Project
 5. Hold “Day of Review”
 6. Construct Project

The End

THANK YOU

LRE