



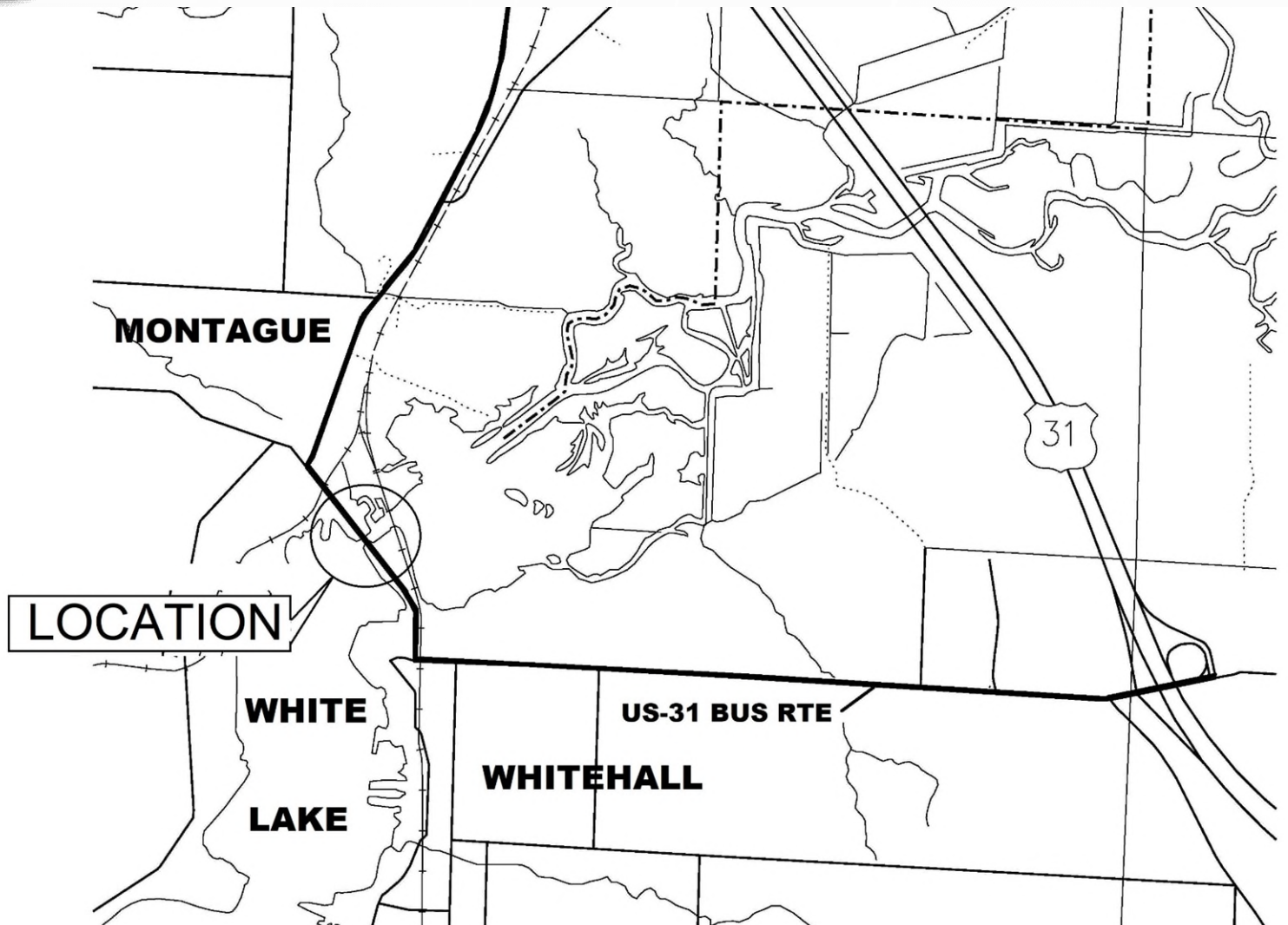
LAKE MICHIGAN SHORELINE FLOOD MITIGATION

MUSKEGON TSC

MARC FREDRICKSON



Whitehall-Montague – Flooding 2019/2020



SPRING 2019

Rising Lake Levels Force Intermittent Closures Of US-31 Business Route Between Whitehall And Montague Resulting In A 13 Mile Detour And A Disconnect For Two Communities

Summer 2017 - Early Signs of Flooding



Spring 2019

Significant Flooding and Road Closed



Solution - Water Filled Barriers



... With Pumps and Generators



Plus Team Effort !!



Supplier,
Contractor,
Municipal,
County and
MDOT – All
Working Together

All Dry *For Now*

Road reopens with
lane closures



Winter is coming, Lake is Still Rising



Fall 2019 –
Record rains came

Concerns –
Water-filled Barrier
durability to
withstand winter
weather

November 2019 - Sand Filled “Super Sacks” – a More Durable Solution

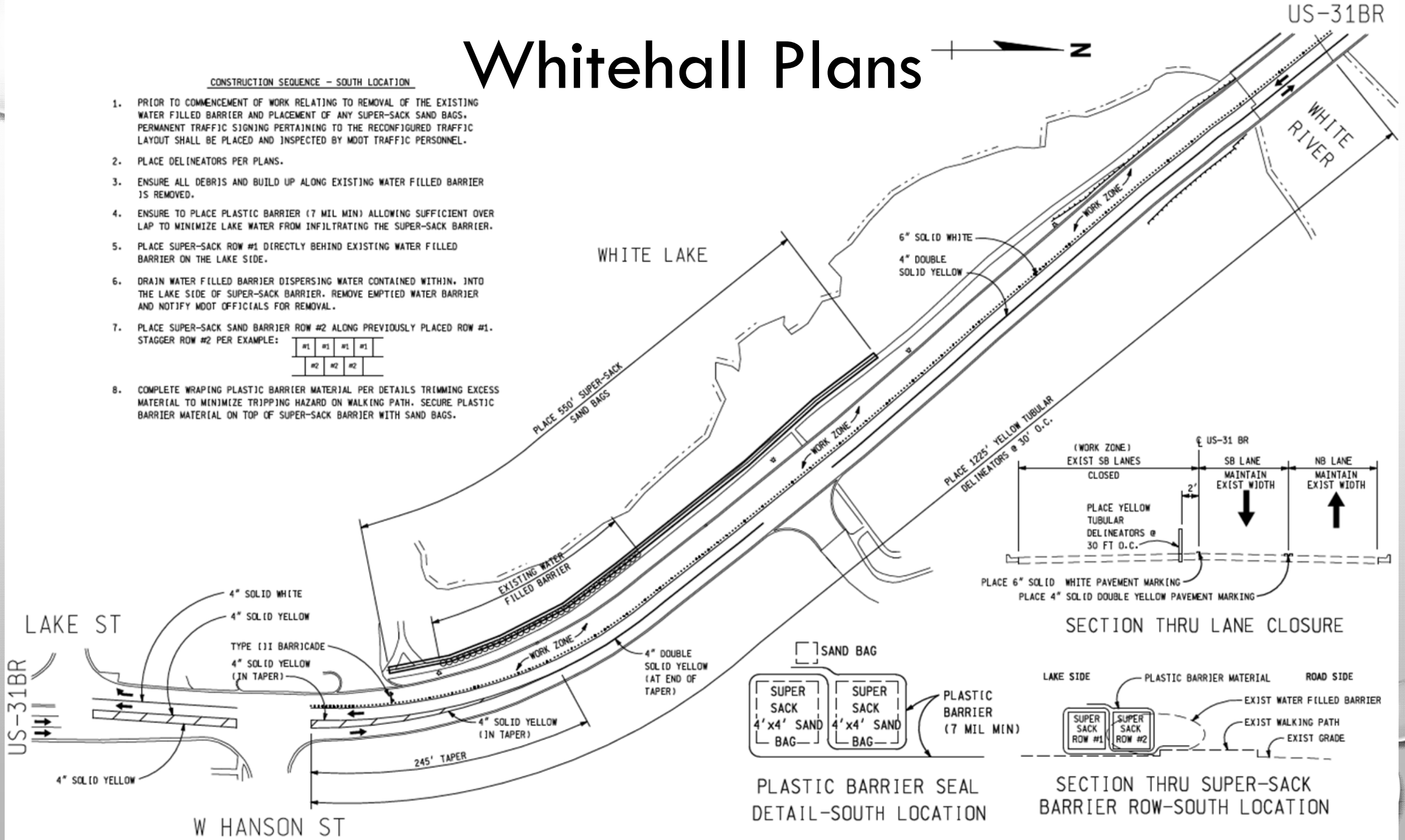


Whitehall Plans

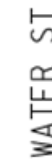
CONSTRUCTION SEQUENCE - SOUTH LOCATION

1. PRIOR TO COMMENCEMENT OF WORK RELATING TO REMOVAL OF THE EXISTING WATER FILLED BARRIER AND PLACEMENT OF ANY SUPER-SACK SAND BAGS, PERMANENT TRAFFIC SIGNING PERTAINING TO THE RECONFIGURED TRAFFIC LAYOUT SHALL BE PLACED AND INSPECTED BY MDT TRAFFIC PERSONNEL.
2. PLACE DELINEATORS PER PLANS.
3. ENSURE ALL DEBRIS AND BUILD UP ALONG EXISTING WATER FILLED BARRIER IS REMOVED.
4. ENSURE TO PLACE PLASTIC BARRIER (7 MIL MIN) ALLOWING SUFFICIENT OVER LAP TO MINIMIZE LAKE WATER FROM INFILTRATING THE SUPER-SACK BARRIER.
5. PLACE SUPER-SACK ROW #1 DIRECTLY BEHIND EXISTING WATER FILLED BARRIER ON THE LAKE SIDE.
6. DRAIN WATER FILLED BARRIER DISPERSING WATER CONTAINED WITHIN, INTO THE LAKE SIDE OF SUPER-SACK BARRIER. REMOVE EMPTIED WATER BARRIER AND NOTIFY MDT OFFICIALS FOR REMOVAL.
7. PLACE SUPER-SACK SAND BARRIER ROW #2 ALONG PREVIOUSLY PLACED ROW #1. STAGGER ROW #2 PER EXAMPLE:

#1	#1	#1	#1
#2	#2	#2	
8. COMPLETE WRAPING PLASTIC BARRIER MATERIAL PER DETAILS TRIMMING EXCESS MATERIAL TO MINIMIZE TRIPPING HAZARD ON WALKING PATH. SECURE PLASTIC BARRIER MATERIAL ON TOP OF SUPER-SACK BARRIER WITH SAND BAGS.



WATER ST



Sacks Being



Carefully Placed

Made it Thru Winter without Difficulty





2020
Then
Came
the
Spring
Rains...



Closures
Have Been
Less
Frequent

Whitehall/Montague - Project Summary



Costs

- \$155,000

Schedule

- 2 days (water barrier) – May 2019
- 2 weeks (sand bags) – Nov 2019

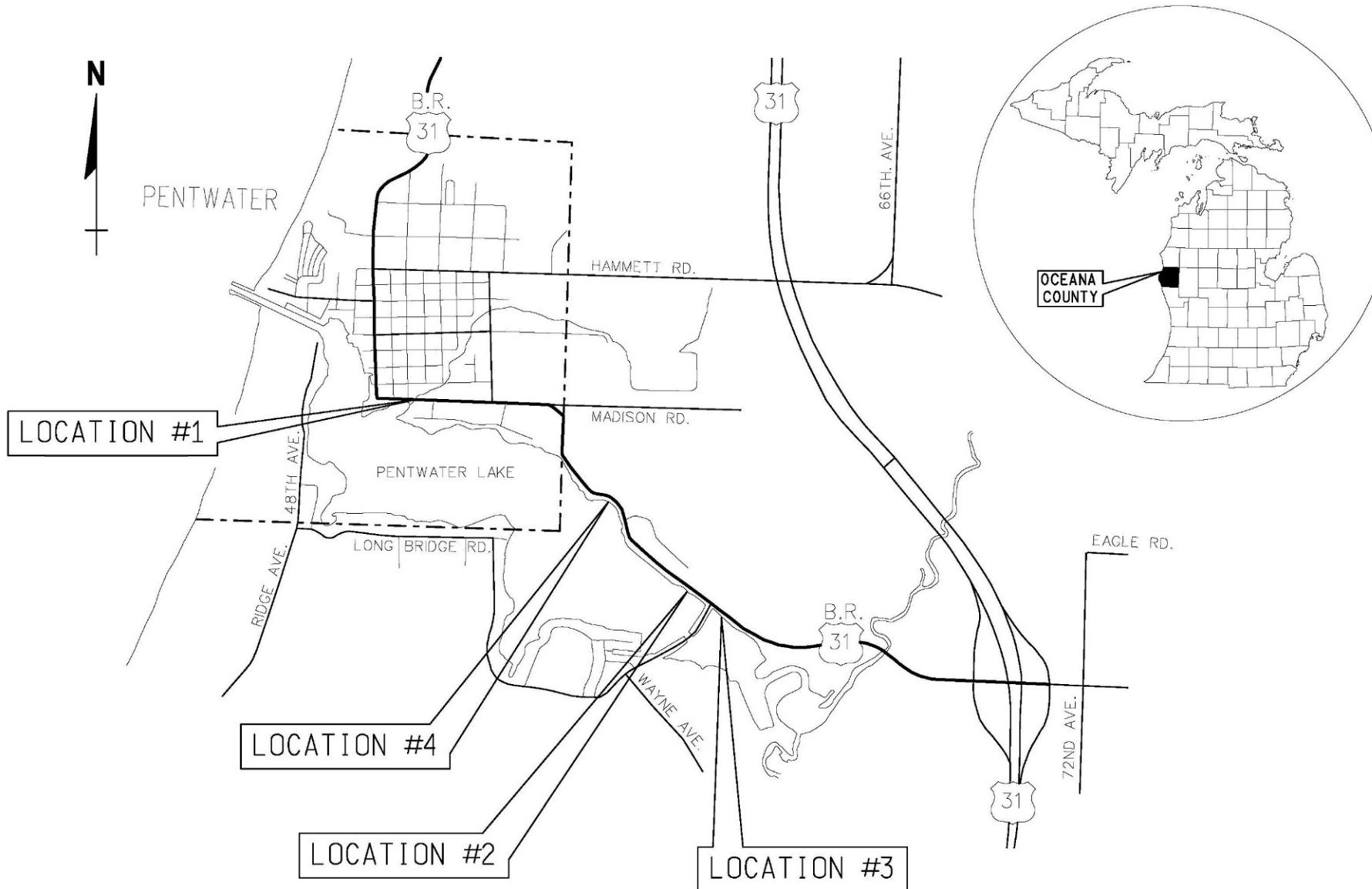
Materials

- Montague – 180 Sand Bags
- Whitehall – 320 Sand Bags

Labor

- Contract – Montague sand bags
- County – traffic control, place Whitehall sand bags
- Locals – Operating pumps and monitoring day-to-day impacts

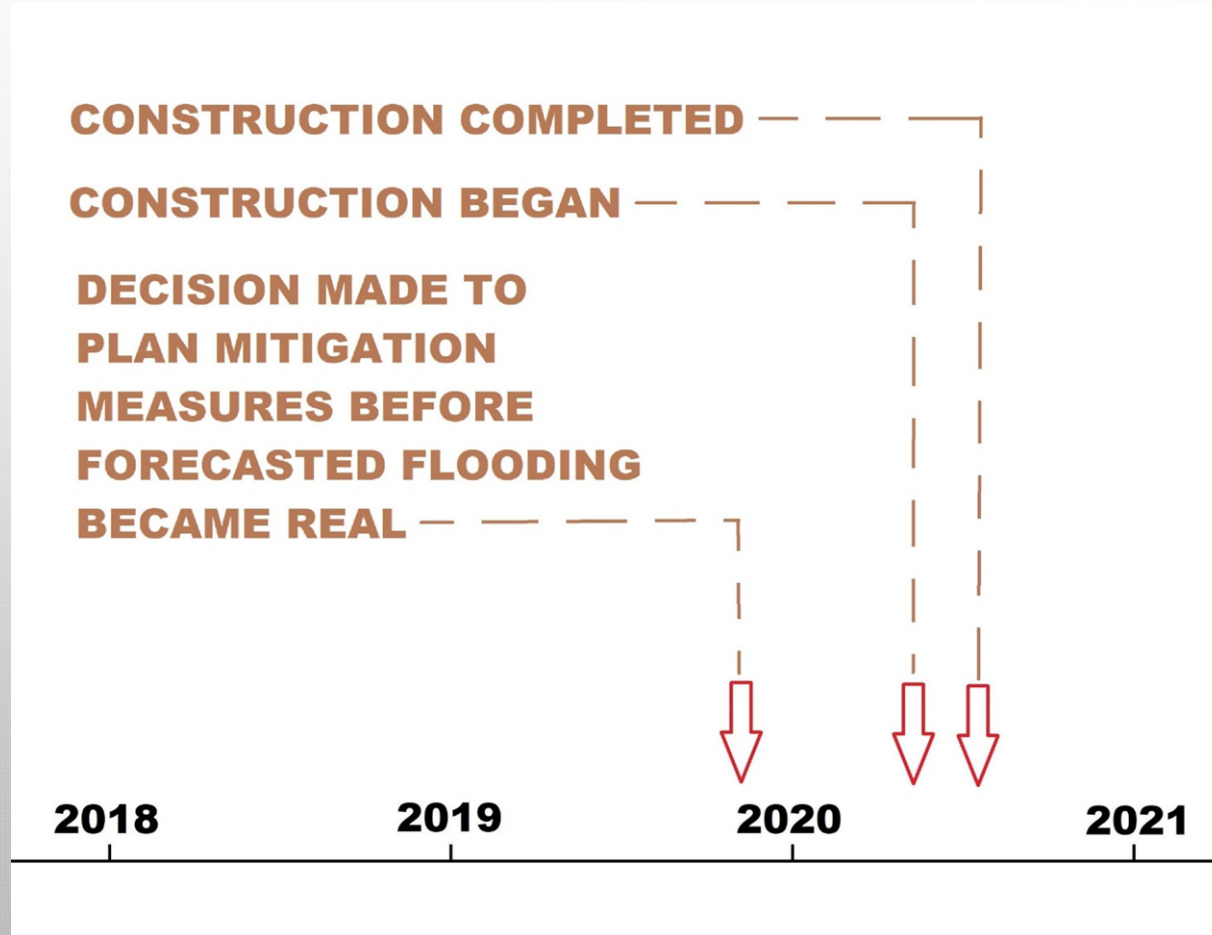
...Then Came Pentwater



SPRING 2020

Rising Lake Levels Force Intermittent Closures Of US-31 Business Route Between Pentwater And Residences/US-31 To The South Resulting In A 15 Mile Detour

Action plan for March 2020



- Met with local officials in February
- Detour location 1, temp measures at locations 2-4
- Public meeting March 9th
- Work in April announced
- Covid says “Nope!”
- Work delayed until late May and June



(Location 2)



(Location 3)



(Location 4)

Flooding Imminent – March 2020

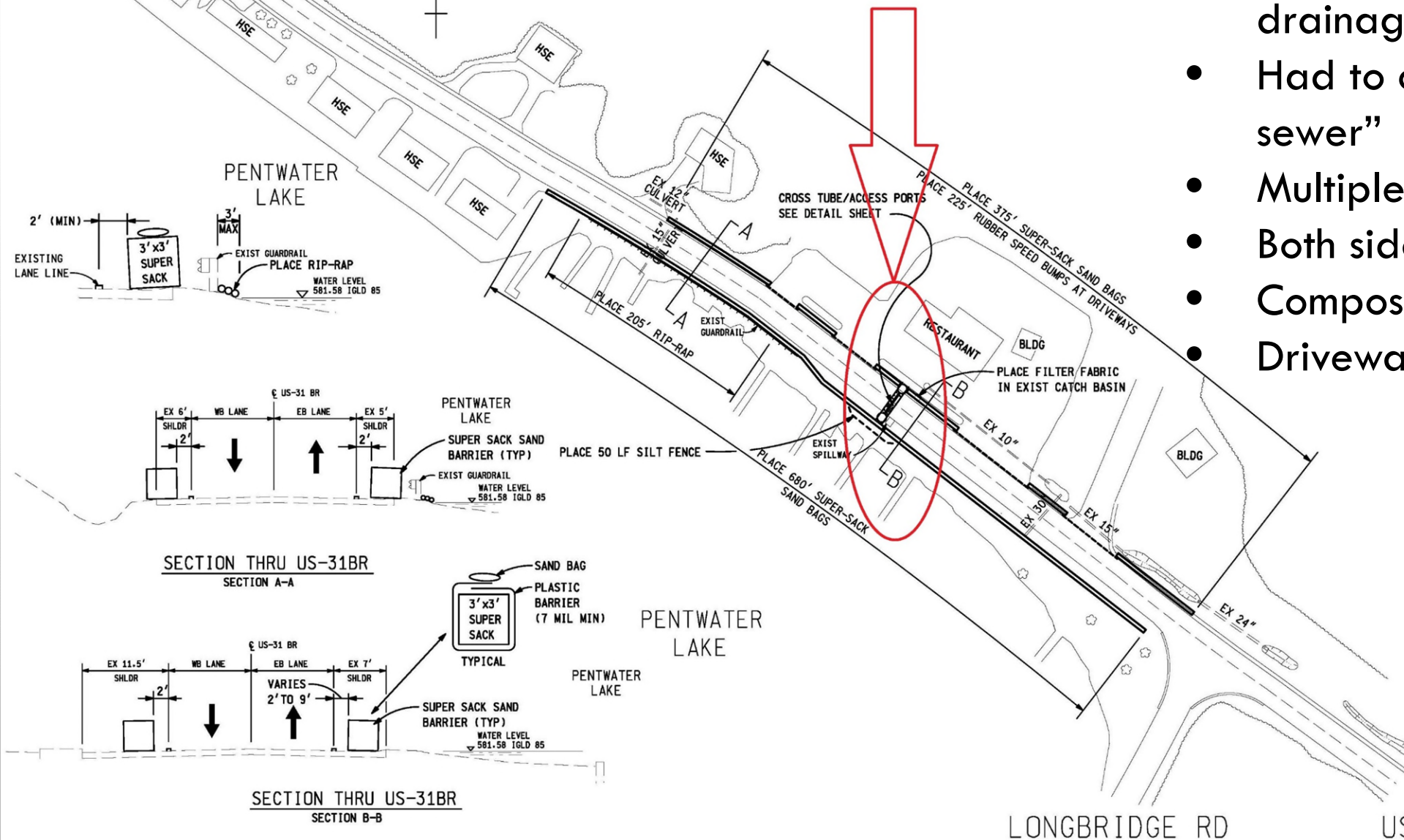
US-31BR



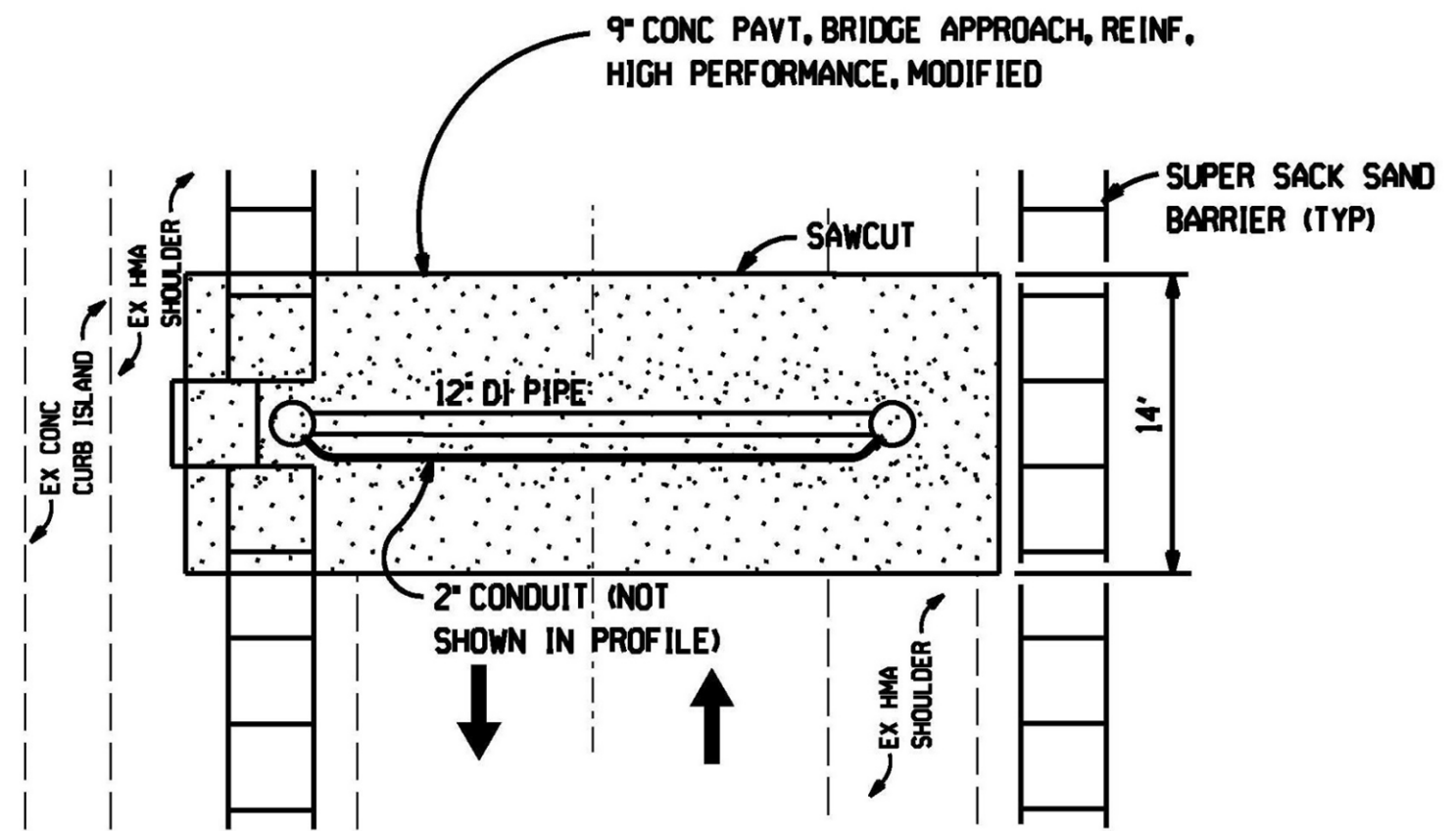
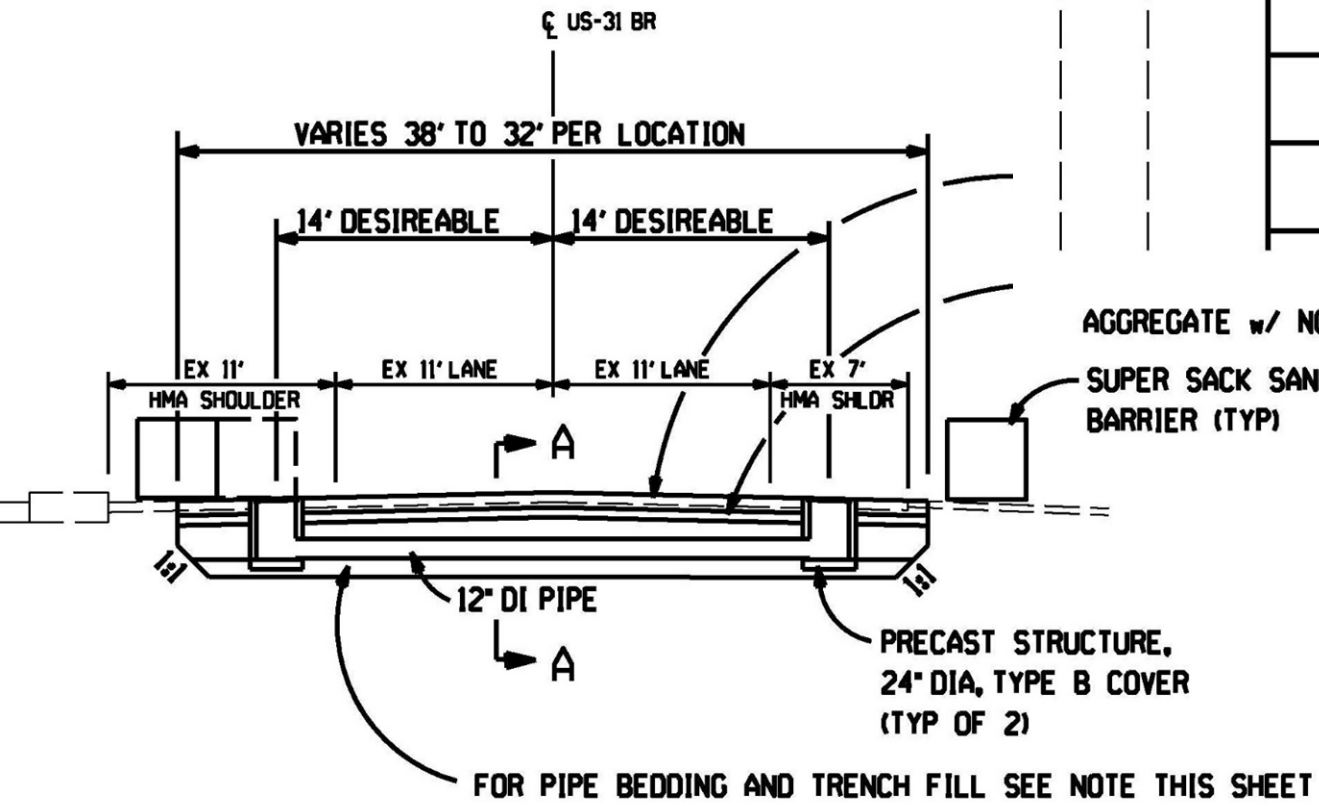
Challenges

- No existing on-street drainage
- Had to create “storm sewer”
- Multiple locations
- Both sides of the road
- Composite Pavement
- Driveways/Guardrail

“Cross Tube”



LOCATION 2



AGGREGATE w/ NO CRUSHED CONC)
SUPER SACK SAND
BARRIER (TYP)

Cross Tube Detail

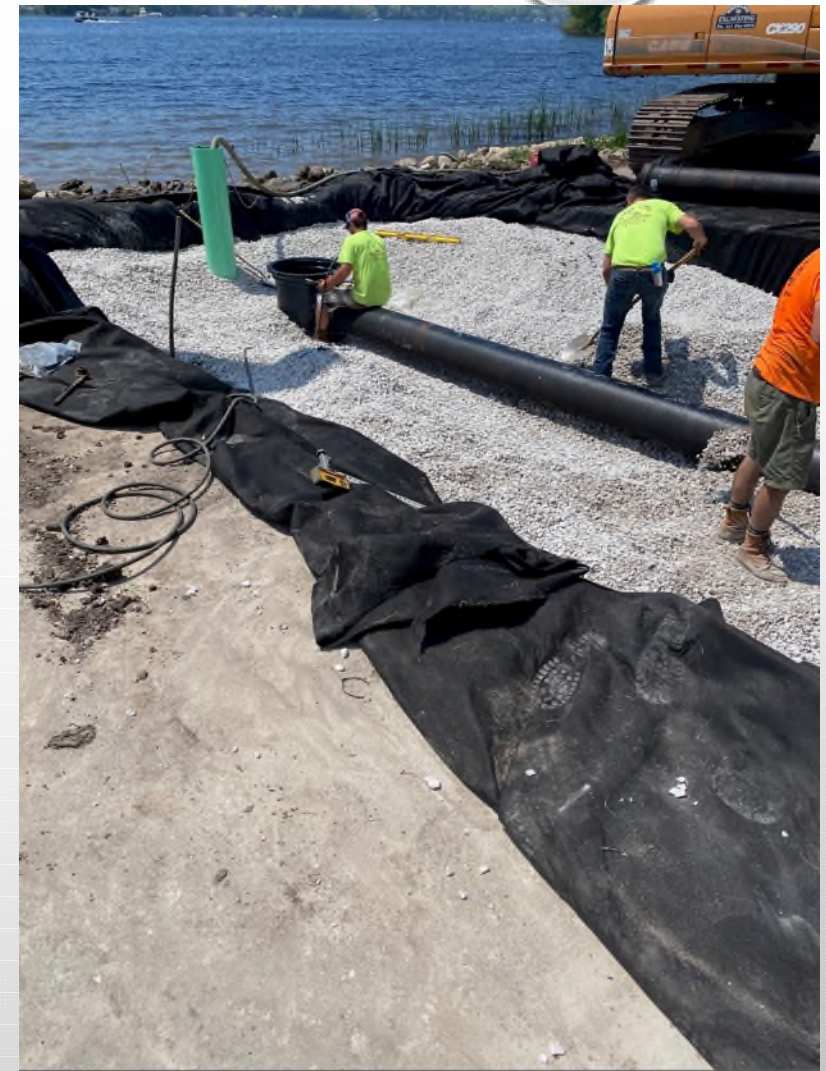




(Location 4)



(Location 4)



(Location 4)

Installing the Cross Tubes



(Location 3)



(Location 4 – awaiting top course)

Installing the Cross Tube Continued



(Foreground – Location 2
Background – Location 3)



(Location 2)

More Super Sacks



(Location 4)
and Yet More Super Sacks

Location 2 – During/After Construction



Location 3 – After Construction



Location 4 – After Construction



Pentwater - Project Summary



Costs

- \$706,000

Schedule

- 6 weeks total – 2 per location
- Late May – Early July 2020

Materials

- Loc 2 – 380 Sand Bags
- Loc 3 – 440 Sand Bags
- Loc 4 – 360 Sand Bags

Labor

- Contract – underground work and placing sand bags
- County – traffic control
- Locals – monitoring impacts

Questions ??



Special thanks for all
the great photos from
our folks in the field:

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Michael Eastman
Jared Gailitis
Sara Martin