MANCHESTER-BY-THE-SEA

GRANTS ADMINISTRATION
Manchester-by-the-Sea, Massachusetts 01944-1399
Telephone (978) 525-6427 Email: mary_reilly@comcast.net

Dear Resident or Property Owner:

You are invited to a meeting to discuss plans for the restoration of the Central Pond portion of Sawmill Brook. You may have heard that the Town has been studying Sawmill Brook for several years—assessing it for future flooding due to climate change impacts and potential opportunities to improve habitat for rainbow smelt and other fish species which used to be plentiful in the brook.

The Town recently completed a Massachusetts Environmental Trust (MET) grant to demonstrate the feasibility of implementing the restoration of Lower Sawmill Brook including removal of the tide gate at Central Street Bride. Additionally, the Town has just received two new grants—one to redesign and replace the Central Street culvert/bridge and the second, to evaluate alternative plans for the restoration of Central Pond. This meeting will focus on recommendations from the MET grant to include in the next steps for Central Pond restoration.

We would like you to join us for a presentation on the findings of the MET study, discussion and Q&A session to get feedback from you and answer any questions you may have. Please note that the plans for the pond are conceptual at this point. The ultimate goal for the Central Pond restoration project will be to address Sawmill Brook flooding, provide habitat and passage for fish species and create a beautiful public resource in the downtown area.

The meeting is open to the public but you're receiving a personal invitation since you are an abutter or own property that abuts Central Pond.

Where: **Town Hall, Selectman's Room (2nd floor)**
Date: **Thursday, June 21st**
Time: **6:30 pm – 8:00 pm**

Light refreshments will be served

Reservations are appreciated but not required.

For more information, please contact:
Mary Reilly, Manchester Grants Administrator
reillym@manchester.ma.us
978-525-6427

Thank you and hope to see you there!

MET Report Review CRAG Meeting
June 21, 2018

Name	*Affiliation*	*E-Mail*
Eric Hutchins	NOAA	Eric.Hutchins@NOAA.GOV
Wyntin Goodman	NOAA (intern)	wyntin.goodman@NOAA.GOV
C Bertoni	Town of Manchester	bertonic@manchester.ma.us
Mary Reily		
Gabrielle Belot	Tighe & Bond	gcbelfit@tighebond.com
Chuck Dam	MBTS	damc@manchester.ma.us
Barbara Warren	SSCW-	barbara.warren@salemsound.org
Sue Brown	Town Planner	brownes@manchester.ma.us
Greg Federspiel	Town Administrator	Federspielg@manchester.ma.us

Central Pond Restoration Meeting 6/21/18
Questions/Comments

- *Regarding the tide gate/dam – at what height does the tide go over the dam?*
  4.61 NAVD88 (vertical datum)
- *What was the tide gate installed in the first place?*
  To create a skating pond
- *Why is the gate open (now that fish spawning period is over)?*
  It has been left open to release the pressure on the roadway – the culvert and roadway is in dire need of repair. We're now seeing many leaks in the roadway walls on the downstream side of Central Street.
- *Explain the flow of saltwater into Sawmill Brook.*
  When the tide is coming in, it pushes the fresh water back (upstream)
- *Comment*: Important information in the slide entitled "25-year rainfall event…" Greg comments that this is an extremely important slide. It's showing MHH water at a very high tide; however, this is what will become normal in the future.
- *Would increasing the size of the culverts upstream make flooding better or worse?*
  Better since we need to allow the flood water to move out of the stream faster.
- *Can we assume that the effects of the bridge project and restoration will allow sediments to naturally clear out and that we won't have to dredge?*
  Most likely, it will; however, this is dependent on the final design that is selected.
- *Regarding the 2nd phase of the project (widening the culverts at School St and Norwood Ave) what is the impact of increasing the flow?*
  We expect that once the tide gate is removed that some flushing will occur but most will remain since it has reached an equilibrium over the years. Bedrock at the bridge will prevent the undercutting of the streambed which could occur otherwise.
- *Will the state pick up most of the cost of the project?*
  We're working with the state (through grants) to cover the costs as much as possible.
- *(In regard to replacing/repairing the walls on Central Pond)—What if some of the private properties refuse access to do the work?*
  This is an iterative process (working with the private property owners) which has not started yet and hopefully will not be problematic as there are only six private property owners which will need wall repairs on their properties.
- *What does public access mean? Where will people be able to access the pond?*
  There will be public access through the fire station parking lot. In addition, the Town owns property on the east side of Central Pond up to the top of the pond.
- *Do abutters, upstream of the pond, own any part of the stream? How will this work if homeowners do own part of the stream?*
  This could vary from property to property—some owners may own to the middle of the

stream. It's very expensive to research all properties to determine the exact boundaries; we prefer taking the approach of getting a Memorandum of Understanding (MOU) from each property owner give the town an easement for specific purposes.

- *Why isn't the town looking at a flood barrier at Central Street – this would protect all properties along Sawmill Brook that would be affected by rising tides (storm surge).*
  This particular project is addressing inland flooding which has been the major cause of flooding in the Sawmill Brook watershed—not storm surge. This project's primary purpose is to get water out of the stream as quickly as possible during extreme rain events.
  However, one of the potential projects (identified as part of an earlier grant to address sea level rise and storm surge) would include a storm surge barrier at the narrowest section of the harbor. This is something the town may consider in the future.
- *Has the town performed any modeling of pumping out flood waters?*
  No, not for this project.
- *Comment*: in addition to the 2006 Mother's Day Storm, there was a large storm that caused flooding in 1997.
- *Is there any way to keep water in the pond to make it more aesthetically pleasing?*
  This will be one of the considerations when we go through alternative designs for the pond.
- *Any plans to remove the debris in Central Pond (e.g., trash, old tires)?*
  We could certainly look into doing that.

Tighe&Bond
Engineers | Environmental Specialists

PROJECT SUMMARY

JUNE 2018

SAWMILL BROOK FLOOD MITIGATION AND RESTORATION

MASSACHUSETTS ENVIRONMENTAL TRUST

Manchester by the Sea has just completed the Sawmill Brook Flood Mitigation and Restoration Project with funding from an FY17 Massachusetts Environmental Trust Grant. The purpose of the grant was to complete the physical studies needed to demonstrate the feasibility of widening the Central Street Bridge, removing the Central Street tide gate, and ecologically restoring natural habitats to the Central Pond reach of Sawmill Brook. The Division of Ecological Restoration (DER) and NOAA Restoration Center staff served as technical advisors for this project.

The nine-month project included:

1. Monitoring the Sawmill Brook hydrologic regime for five months;
2. Surveying existing topography and delineating wetlands along the Brook from Central Street to Norwood Avenue;
3. Characterizing sediment in the Pond to satisfy future permitting requirements;
4. Hydrologic modeling to show the extent of inundation after proposed improvements to Central Street Bridge under present and future conditions with climate change;
5. Analyzing flushing within Central Pond and sediment transport along the Brook; and
6. Documenting areas of streambank erosion.

High Tide rising above tide gate - December 3, 2017

Flooding at the Manchester Town Hall - January 4, 2018

Installing HOBO water level pressure transducers in stream bed below Norwood Ave.

HYDROLOGIC ASSESSMENT

Together with Town Staff, volunteers, and staff from Tighe & Bond over nearly 260,000 water level measurements were recorded from five data loggers and two stream gages. The hydrologic data was collected from November 2017-April 2018 with record breaking high tide levels occurring in January of 2018, three back to back nor'easters in March, and 57 precipitation events. Measurements were taken with the Central Street tide gate opened and closed to compare the response to water levels under varying conditions. Hydrologic modeling confirmed that the Central Street Bridge can be widened and that the tide gate can be removed without causing adverse upstream impacts.

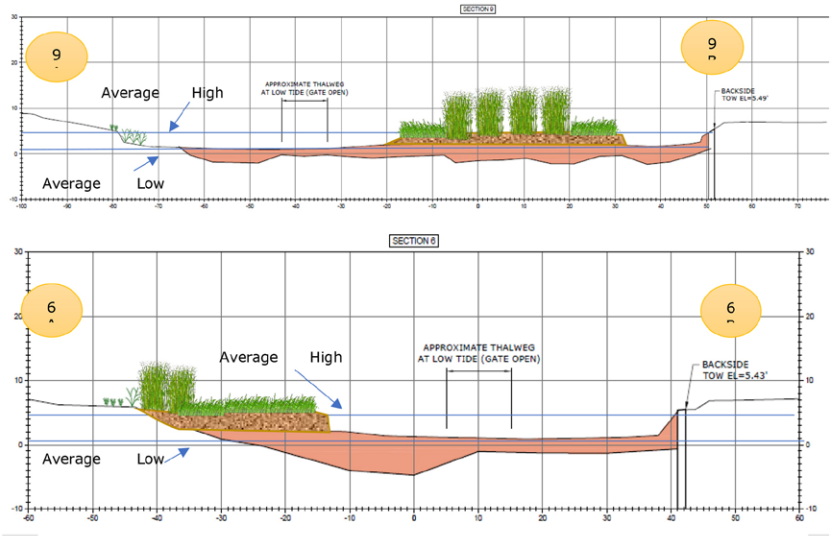


Photo 5
Conceptual Profile for Marsh Restoration- Transect 6 and 9

SEDIMENT CHARACTERIZATION AND EROSION SOURCES

Sediment profiling was completed across Central Pond, defining the depths of approximately 5,350 cubic yards of sediment accumulation and identifying potential sources. Over 80 probes were completed to define the contours of sediment accumulation. The sediment sample confirmed that Central Pond is a shallow impounded system, with variable depths of fine silt deposits overlying bedrock. The location of soft sediment in center of the Pond flanked by areas of cobble and gravel above and below the Pond are consistent with the history of dredging and impoundment of Central Pond in the late 19th and early 20th century. Historic accounts have described the area as once being salt marsh.

Sediment analysis from the Central Pond area identified metals (lead and mercury) and petroleum hydrocarbons above MassDEP screening levels for upland reuse of sediment as dredged material. The results would not prohibit instream reuse, but recommendations are to allow the natural stream flow to improve flushing and facilitate sediment transport before proposing any channel modifications.

Stream bank conditions from Central Street to Norwood Avenue documented areas of stream bank erosion from failed walls, low lying stream bank and stormwater runoff. The majority of the walls are on privately owned property, but around Central Street nearly half are on Town-owned property.

CENTRAL POND RESTORATION

The Central Pond restoration elements recommend stabilizing sources of stream bank erosion and restoring wetland and riparian ecosystems to the stream banks. The broad goal will be to restore marsh, riparian habitat, and fish habitat, reduce flooding, and enhance coastal resiliency for Manchester-by-the-Sea.

The restoration design will be optimized to maintain flood storage capacity after the tide gate is removed and the culvert is widened at the Central Street Bridge. The restoration design will consider hard and soft solutions for erosion control, evaluate options to retrofit a stormwater outfall, and improve habitat value within the Pond reach through a shift from the currently impounded water body to a tidally flushed riverine/marsh system.

After hydrologic restoration, freshwater is expected to override a weak saltwater wedge, meaning that freshwater and some minimally brackish-tolerant plants will be incorporated into the wetland restoration. One approach to consider would be to restore the wetland in two phases, the first phase would be populating experimental plots at areas representing variations in sediment size, organic matter content, and salinity. Observations from the plots would be used to populate the entire site in the second phase to improve wetland restoration success.

The restoration project must be permitted together with the tide gate removal and bridge improvements to avoid segmentation penalties by regulatory agencies. As the Central Street Bridge and Central Pond restoration plans are advanced, the hydrologic modeling will be refined again to make sure that the both designs are compatible.

Central Street Bridge Surface Water Level Gauge

NEXT STEPS

Restoration of Central Pond from an open water area to a stream channel and tidally-influenced wetland system is integral to achieving full flood mitigation after the tide gate is removed. Stream restoration will also improve fish passage for rainbow smelt, habitat improvements for multiple species and aesthetics in the downtown area. Potential restoration elements include removal of sediment and organic debris along the banks where the stream channel has aggraded, stabilizing the stream banks with vegetation, and potentially adding features such as rock riffles within the stream channel to improve aeration. The alternatives for the restoration design will require input from the Pond abutters, Town departments responsible for maintaining the area and State permitting agencies before a final plan is determined.

The Sawmill Brook Flood Mitigation and Restoration project has gained the support of State and Federal agencies, including the Massachusetts Department of Transportation (MassDOT), the Massachusetts Coastal Zone Management (CZM), the Massachusetts Division of Ecological Restoration (DER), the Massachusetts Division of Conservation and Recreation (DCR), the Massachusetts Division of Marine Fisheries (DMF), and the National Oceanic and Atmosphere Administration (NOAA) Restoration Center. This agency support and collaboration provided through technical assistance and input provided by Town staff, and citizens of Manchester-by-the-Sea will greatly benefit successful completion of this project.

PREPARED BY
Tighe&Bond
Engineers | Environmental Specialists

SAWMILL BROOK/CENTRAL POND RESTORATION FEASIBILITY STUDY

Manchester-by-the-Sea Town Hall – June 21, 2018

Gabrielle C. Belfit, CFM Senior Environmental Scientist

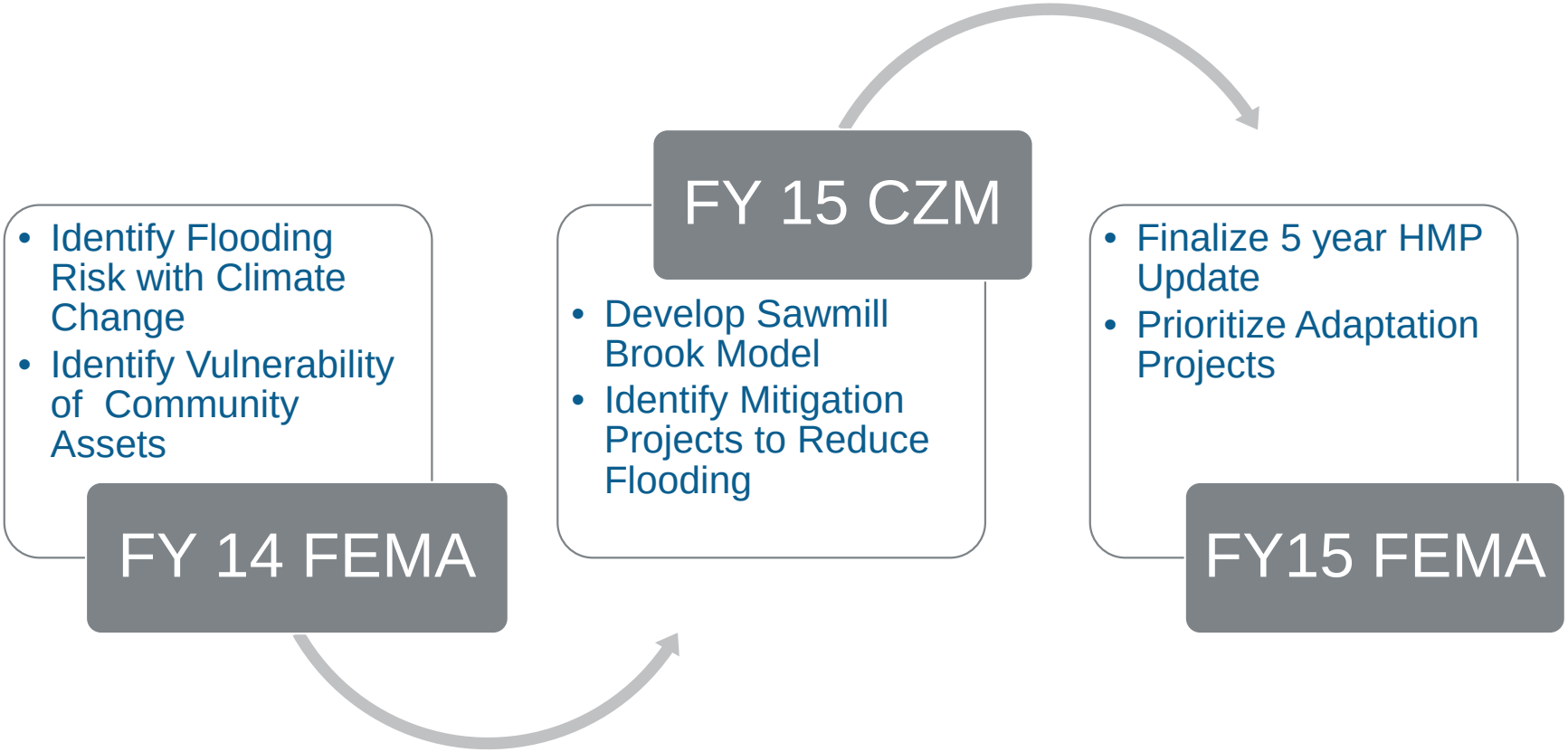
MASSACHUSETTS ENVIRONMENTAL TRUST

Tighe&Bond

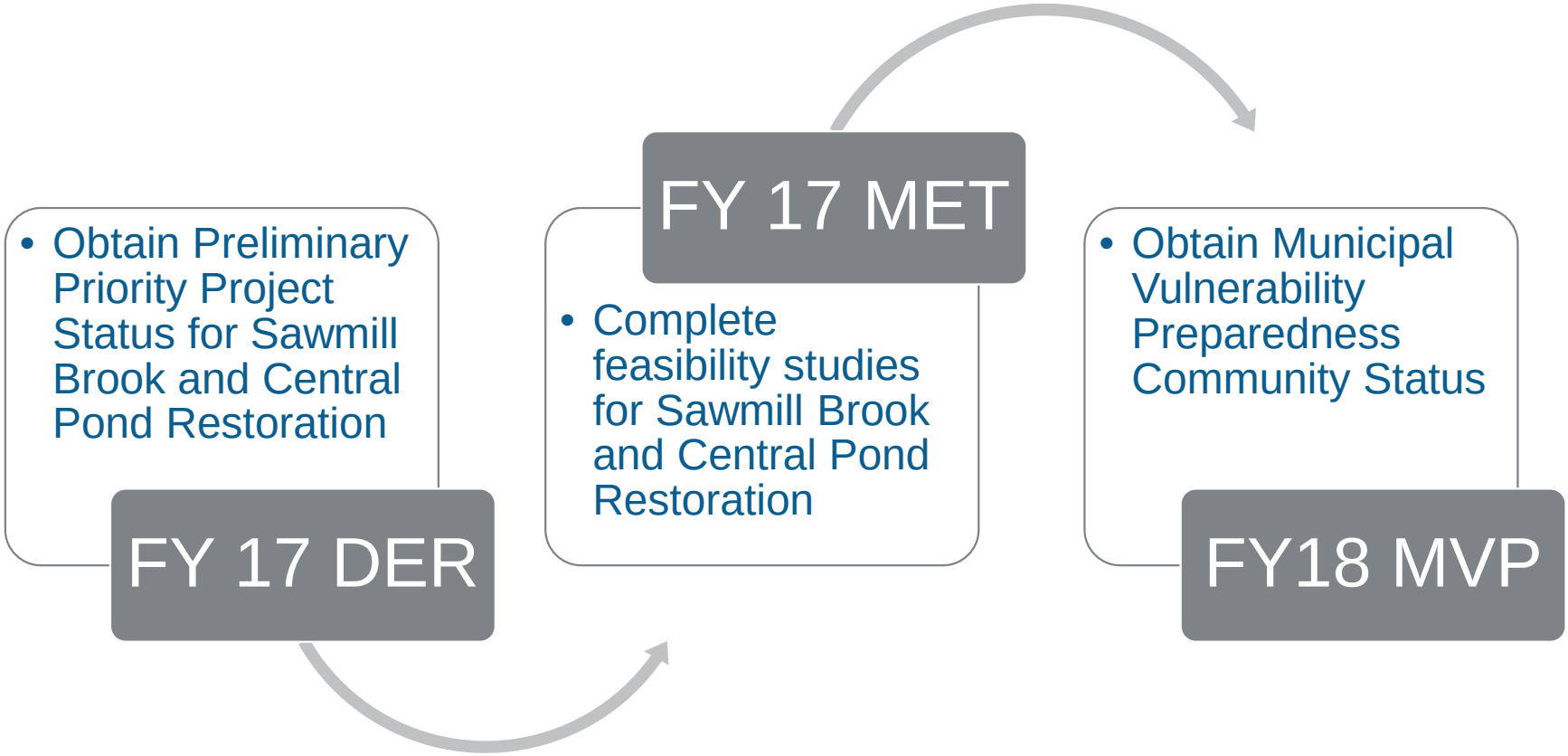
PRESENTATION TOPICS

- **History of Flood Mitigation and Restoration Planning Efforts**
- **MET Task Findings**
  - Hydrologic Monitoring Results
  - Sediment Characterization
  - Flood and Sediment Transport and Modeling
- **Sawmill Brook/ Central Pond Restoration Options**
- **Next Steps for Implementation and Coordination with Small Bridge Grant**

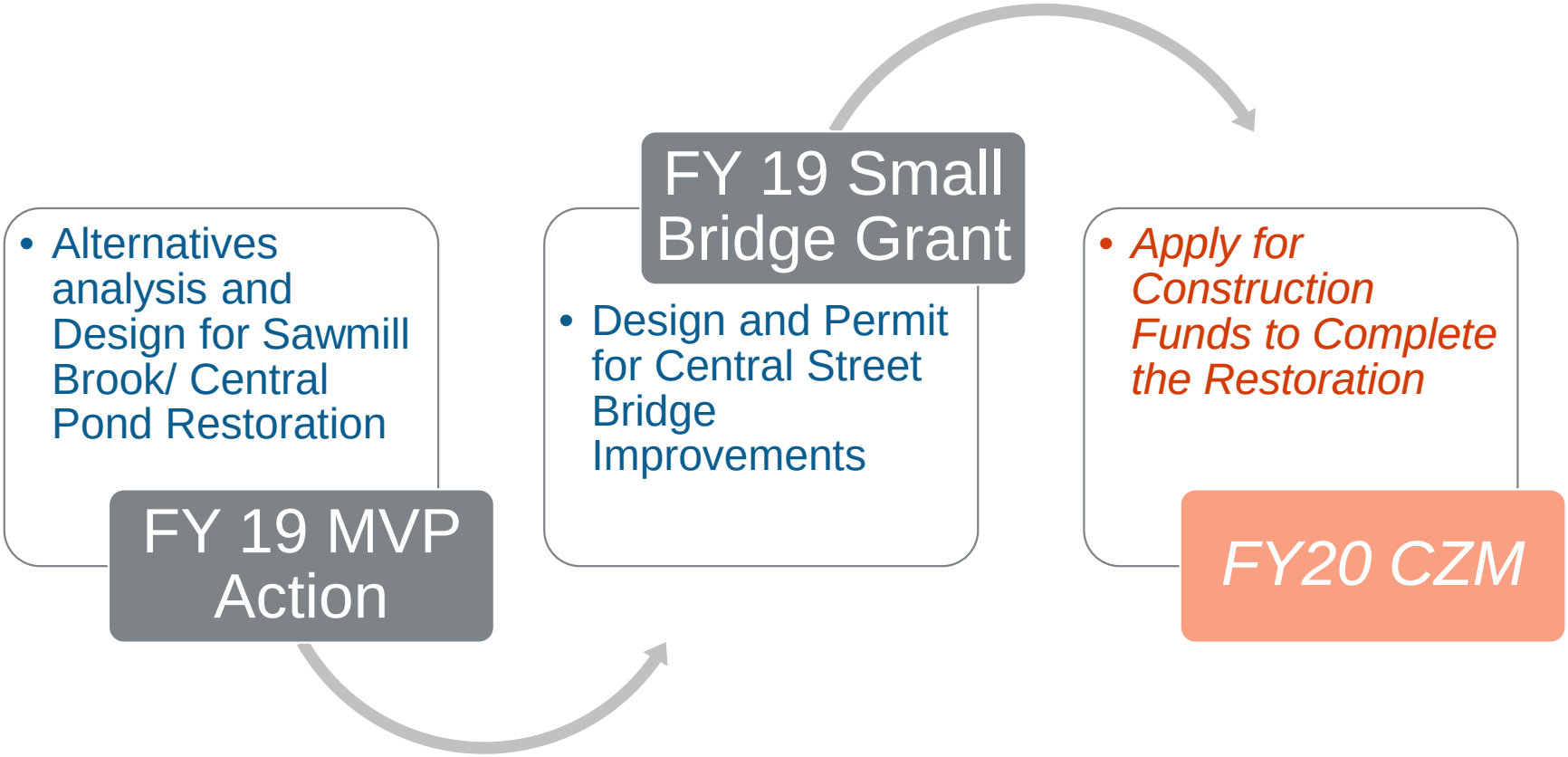
IDENTIFYING FLOOD MITIGATION SOLUTIONS



CONFIRMING FLOOD MITIGATION SOLUTIONS



IMPLEMENTING FLOOD MITIGATION SOLUTIONS



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Survey topography, wetlands and obtain hydrologic data to refine the Sawmill Brook Hydrologic Model

Characterize sediments within Central Pond to understand chemistry and transport

Establish the feasibility for removing the tide gate and restoring Central Pond to a wetland/riverine system

MASSACHUSETTS ENVIRONMENTAL TRUST

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PUBLIC PARTICIPATION AND OUTREACH

EXISTING CONDITIONS BY THE NUMBERS

- 2 stream gages installed
- 5 data loggers installed at stream crossings
- 6 months of precipitation data provided by MBTS WWTP
- 80 sediment probes completed at 13 cross sections
- 96 stream gage observations made by volunteers
- 762 chemical results reported on 6 sediment samples
- 2,850 feet of wetlands delineated
- 5,700 feet of stream corridor topography surveyed
- 259,200 water level measurements recorded

FINDINGS FROM SEDIMENT SURVEY

Central Pond

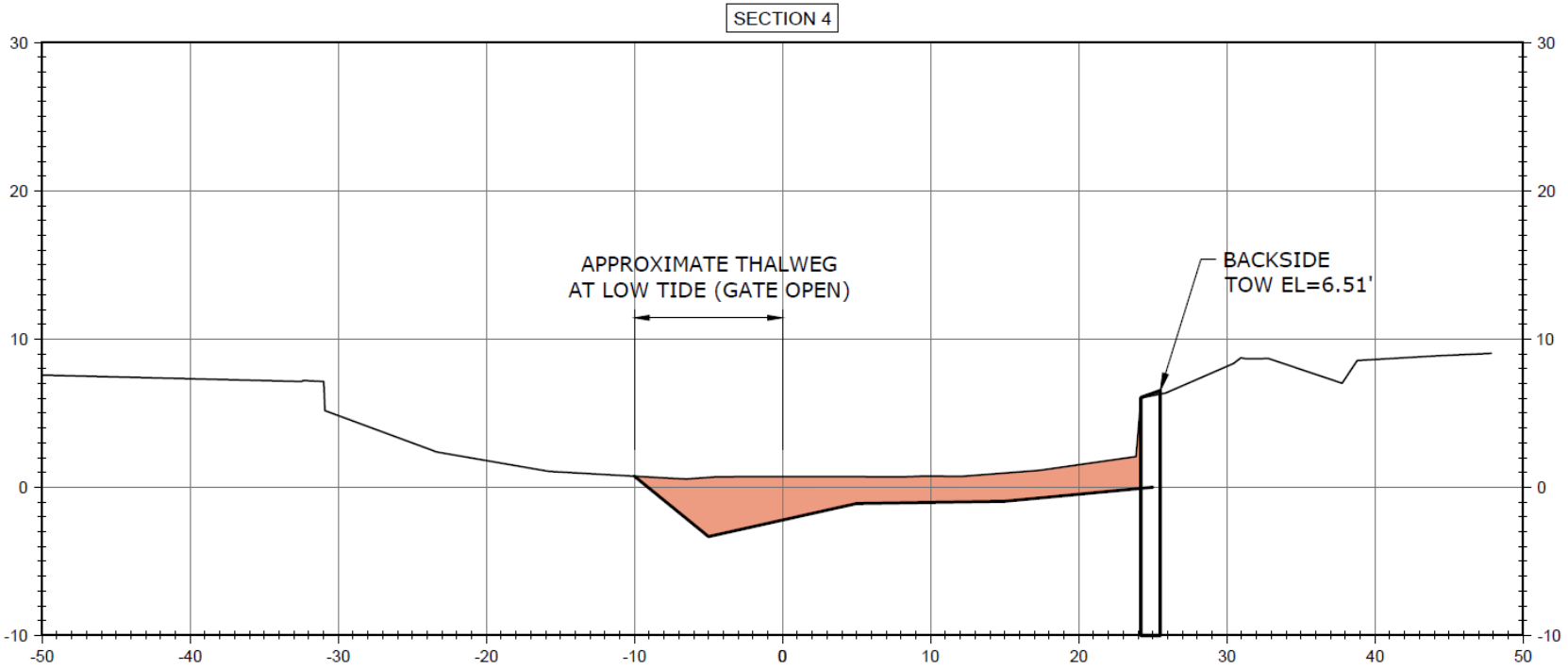
- 5,000 CY of soft sandy sediment
- East bank due to wall erosion
- West bank from stormwater runoff
- Lead, mercury and some petroleum hydrocarbons were found in sediments
- Allowing sediment to naturally flush may be preferred approach to dredging- subject to permitting with state and ACOE

Upstream Channel

- Gravel and sand substrate ideal for fish spawning

SEDIMENT CROSS SECTIONS

SEDIMENT PROFILES



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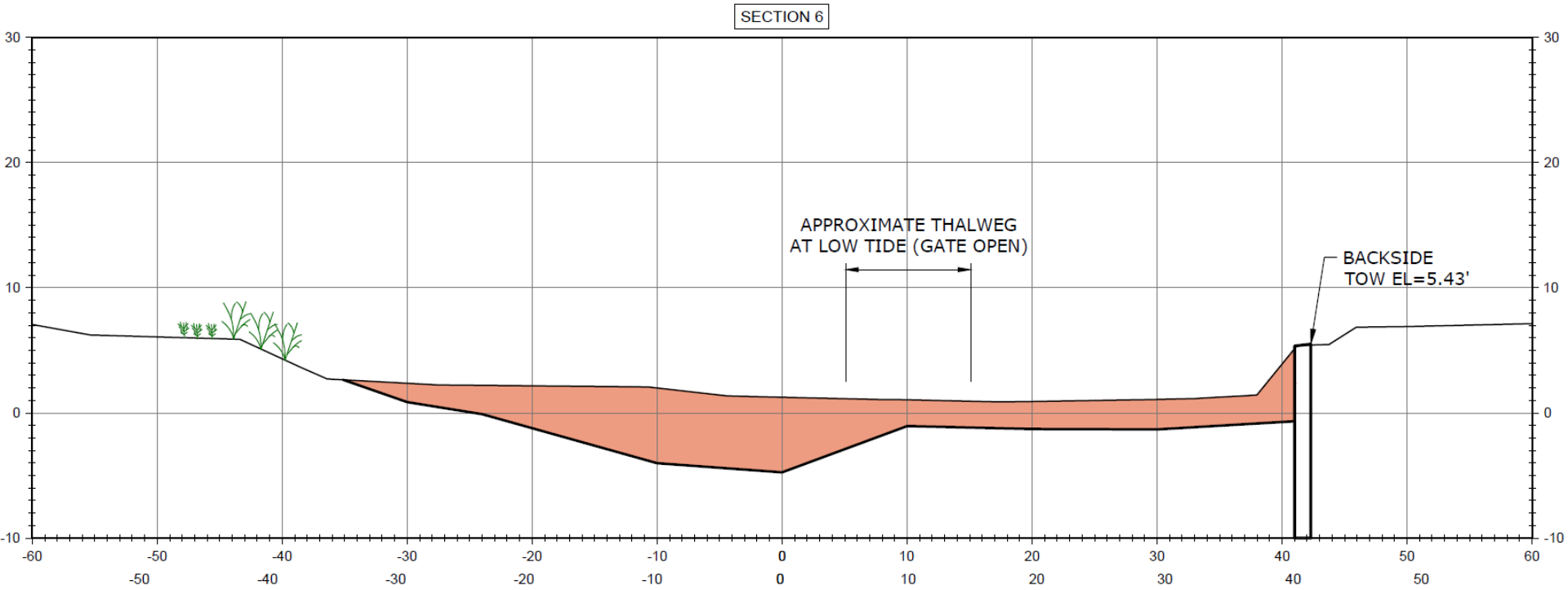

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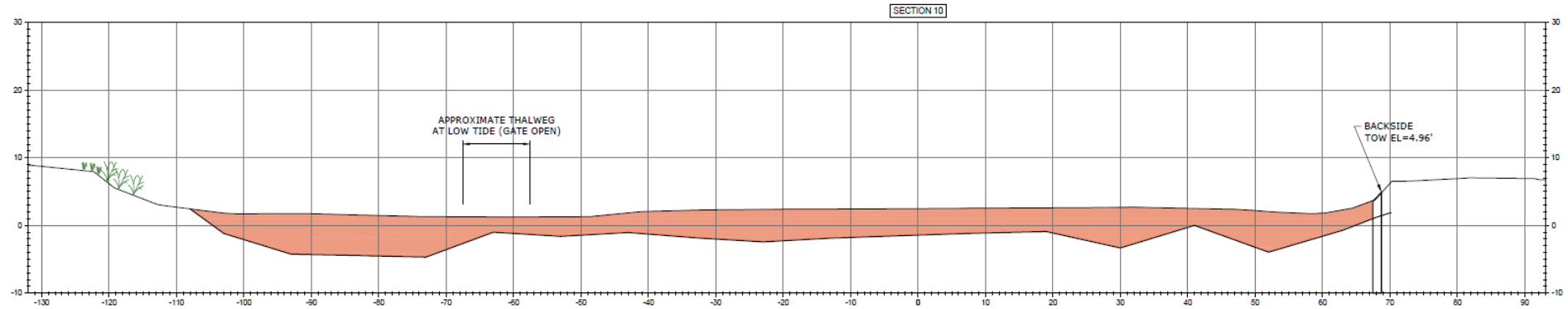

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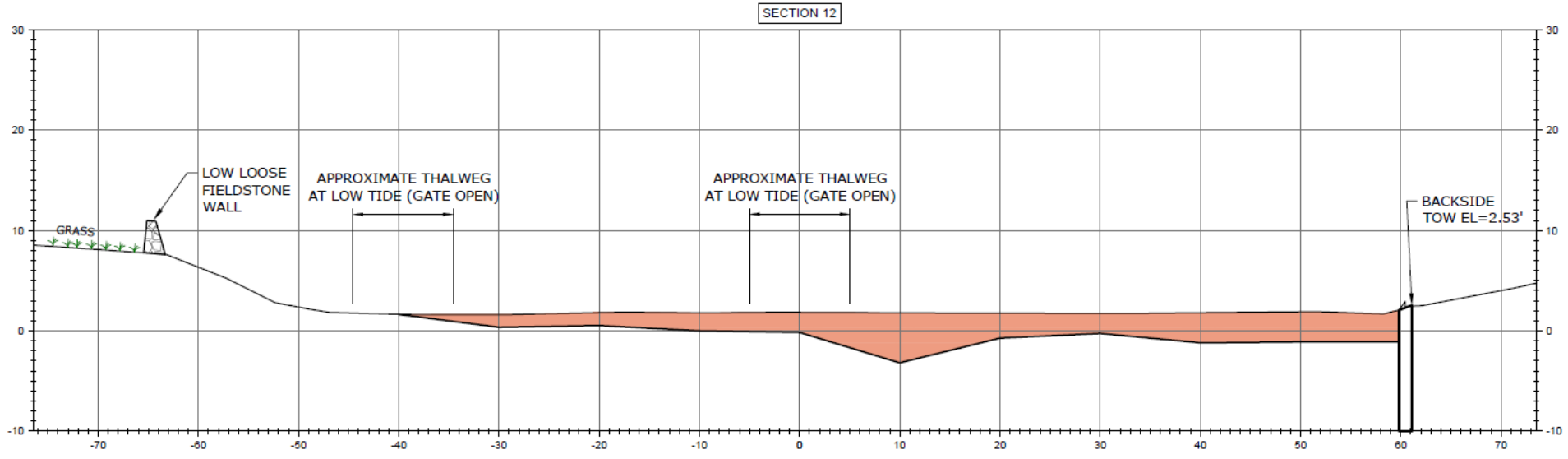

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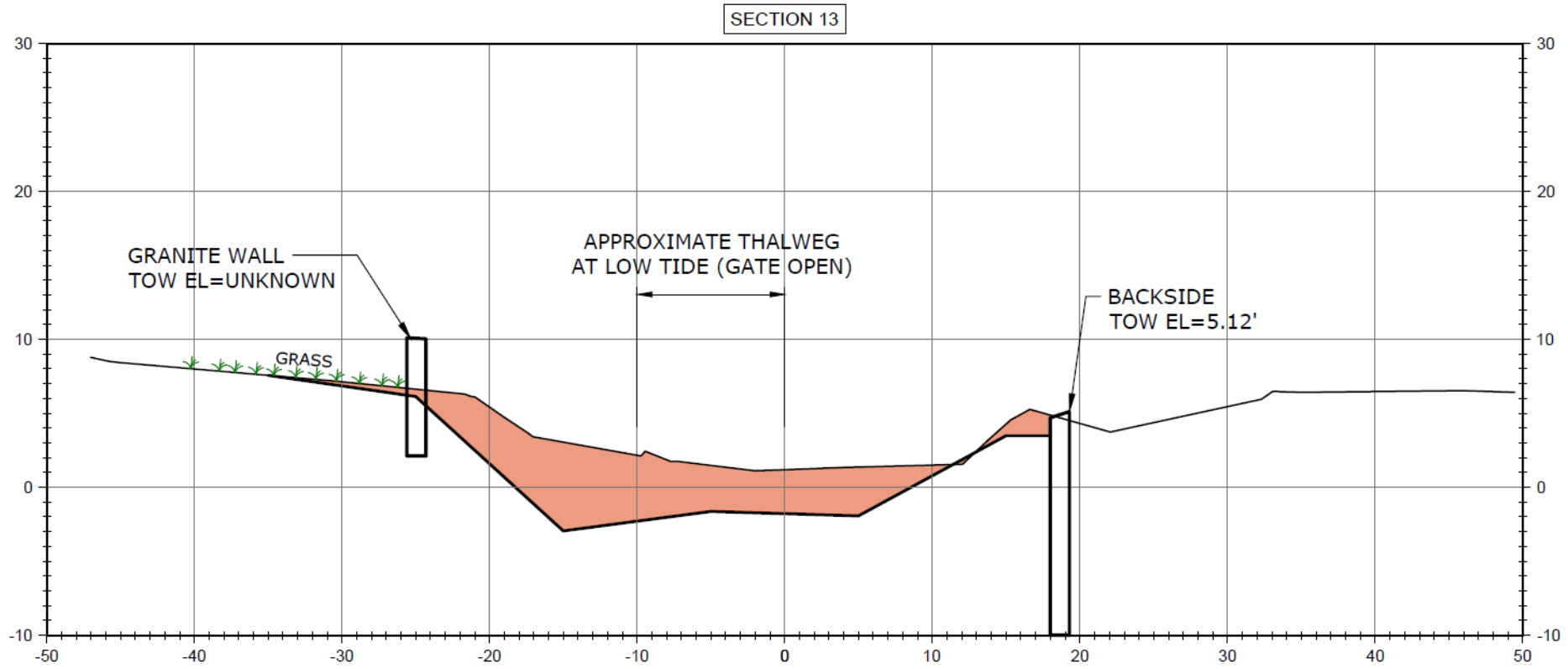
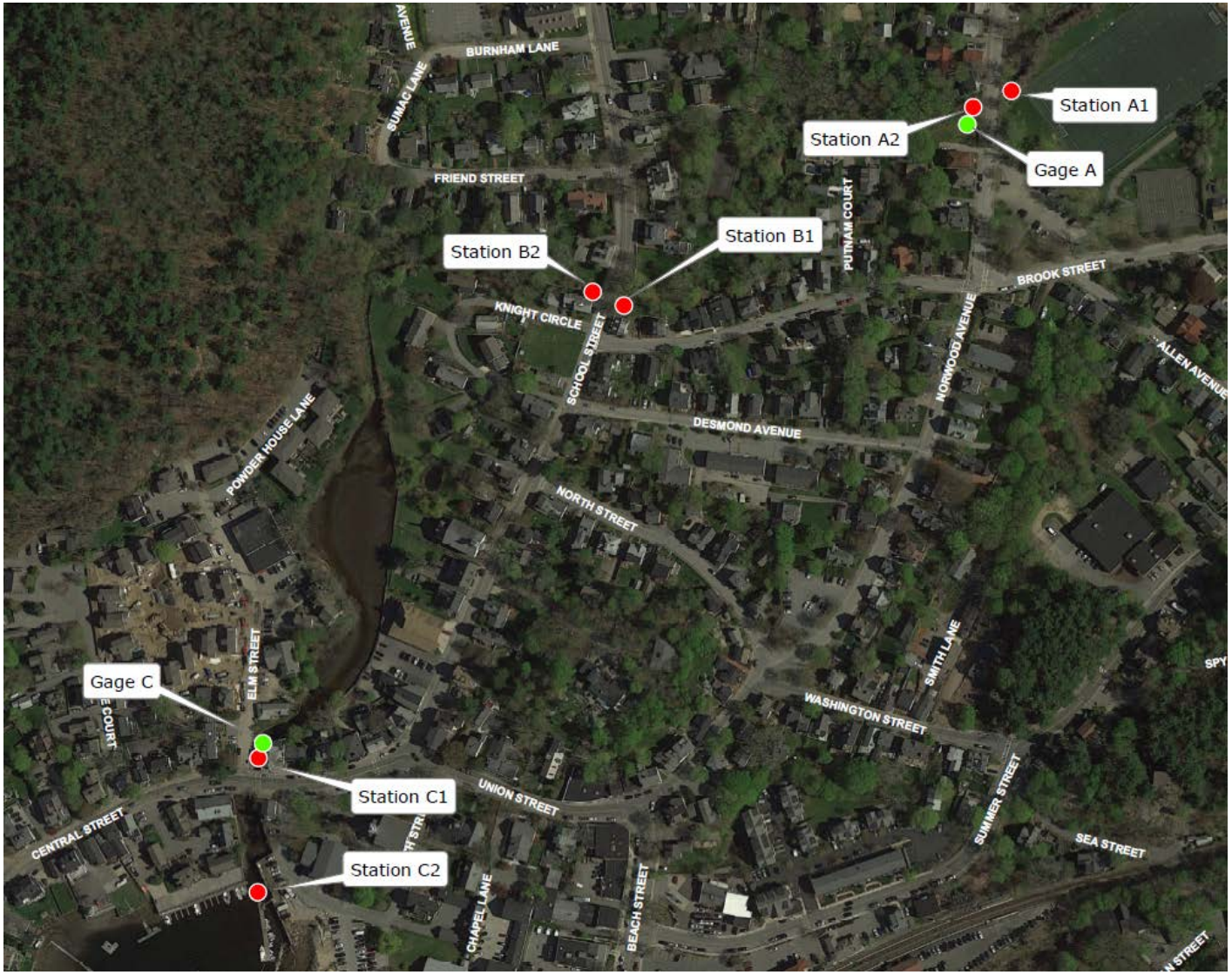


FINDINGS FROM HYDROLOGIC MONITORING

HYDROLOGIC MONITORING LOCATIONS



FINDINGS FROM HYDROLOGIC MONITORING

Central Pond-Tide Gate Closed

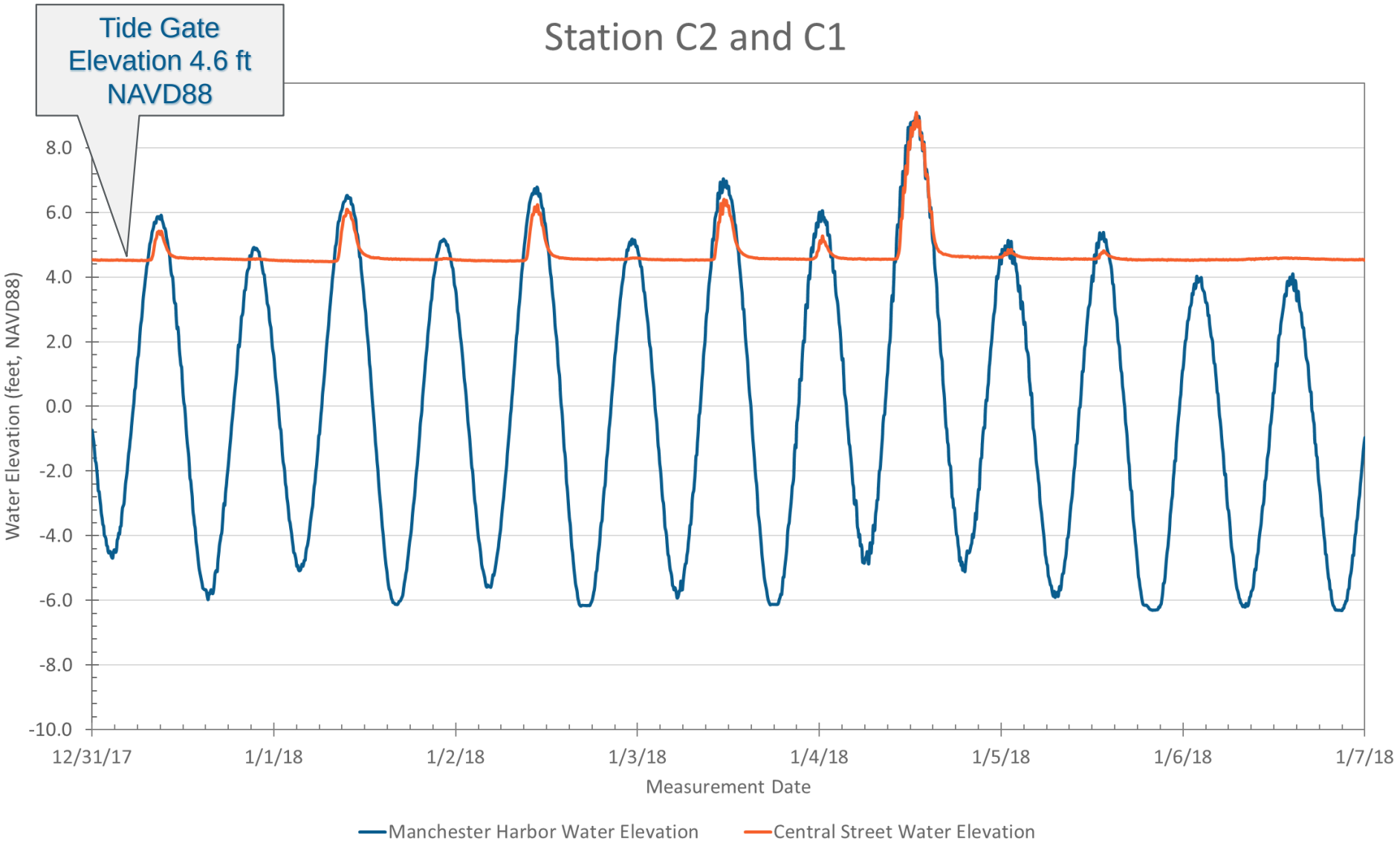
- **Gate overtops (4.61 ft) 66% of the time at high tide**
- **Average water depth fluctuates 0.65 ft from high to low tide**
- **Tidal backwater to School Street on regular basis and Norwood only once**

Central Pond-Tide Gate Open

- **Gate overtops 68% of the time at high tide**
- **Average water depth fluctuates 4.10 ft from high to low tide**
- **Tidal backwater only to School Street**

- Highest water level (Central Pond- 9.08 feet, 12:48 pm on 1/4/18, concurrent with record breaking high tide set in Boston.
- Lowest water level in Central Pond was 0.45 feet.
- Highest Precipitation recorded - 1.9 inches on 4/16/18

DEC 31, 2017 TO JAN 7, 2018 – TIDE GATE CLOSED



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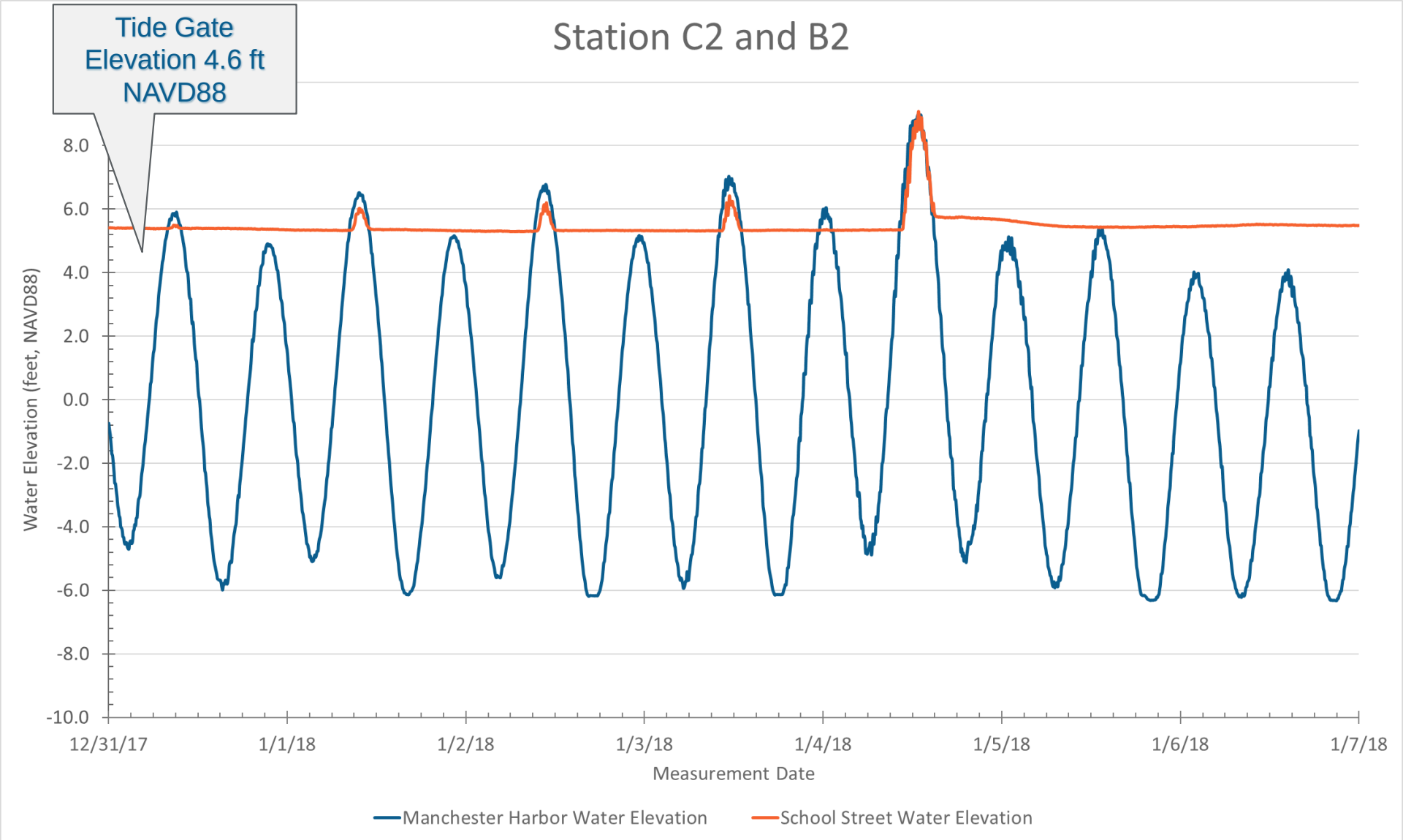

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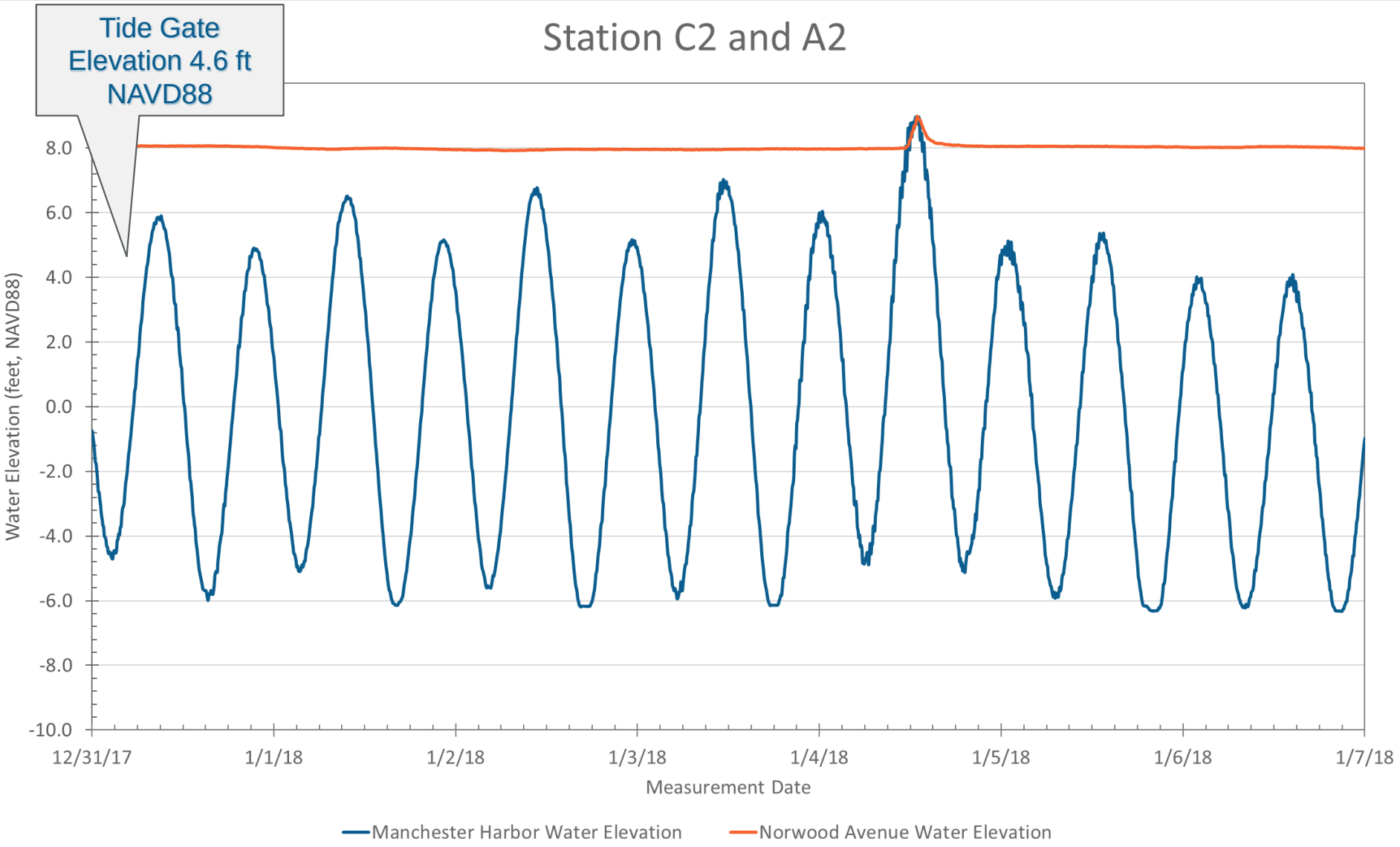
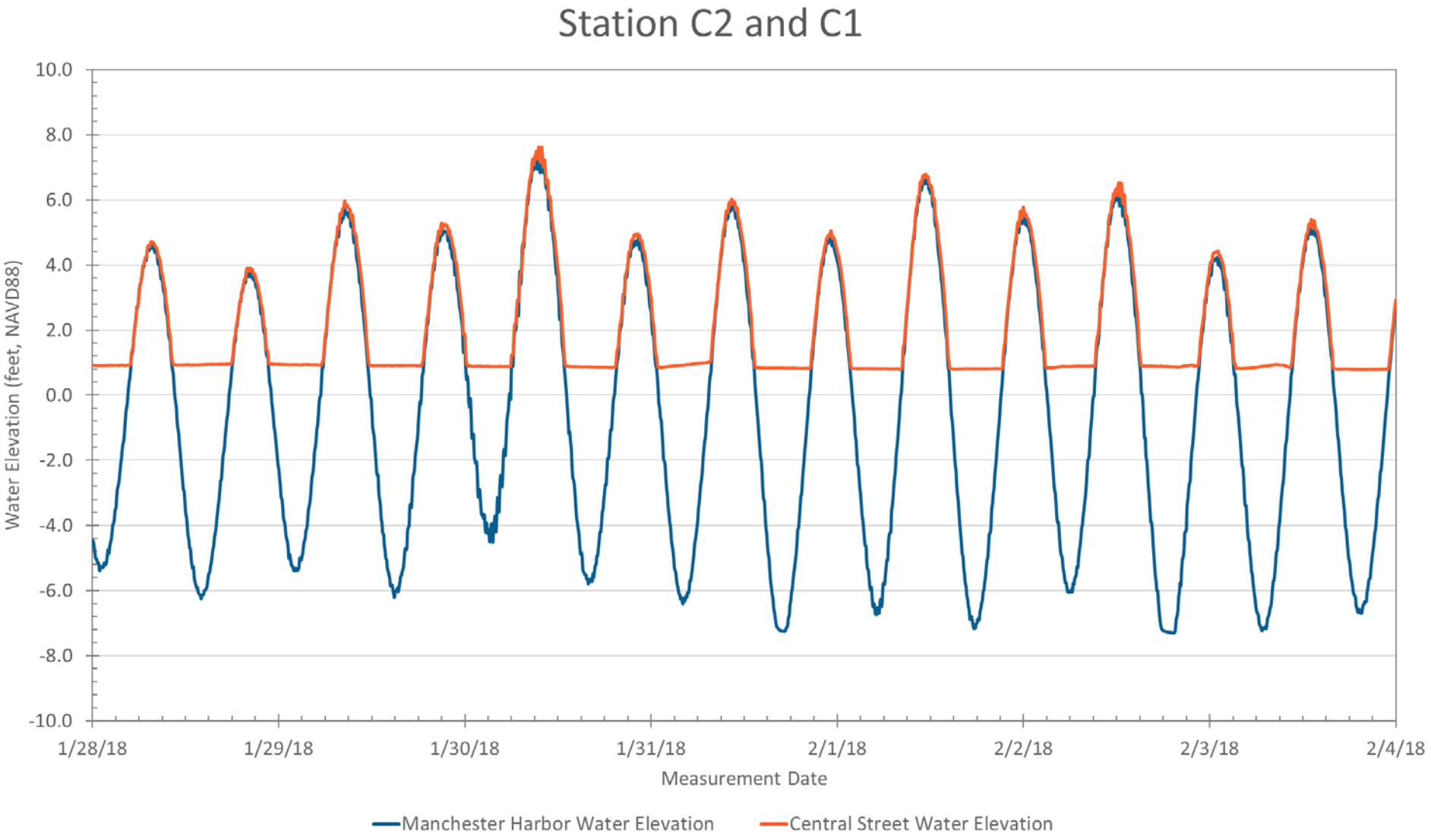


JAN 28, 2018 TO FEB 3, 2018 – TIDE GATE OPEN



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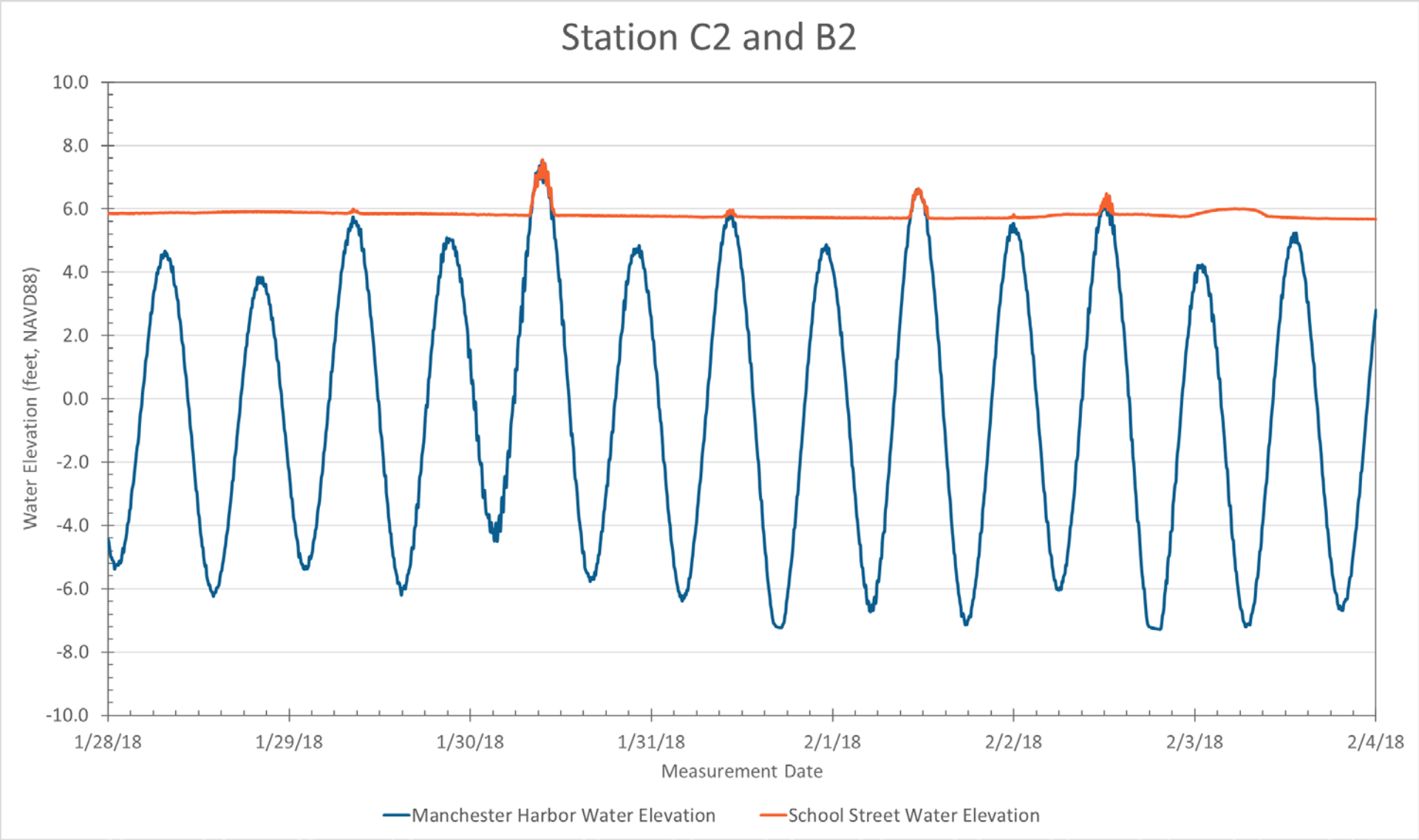

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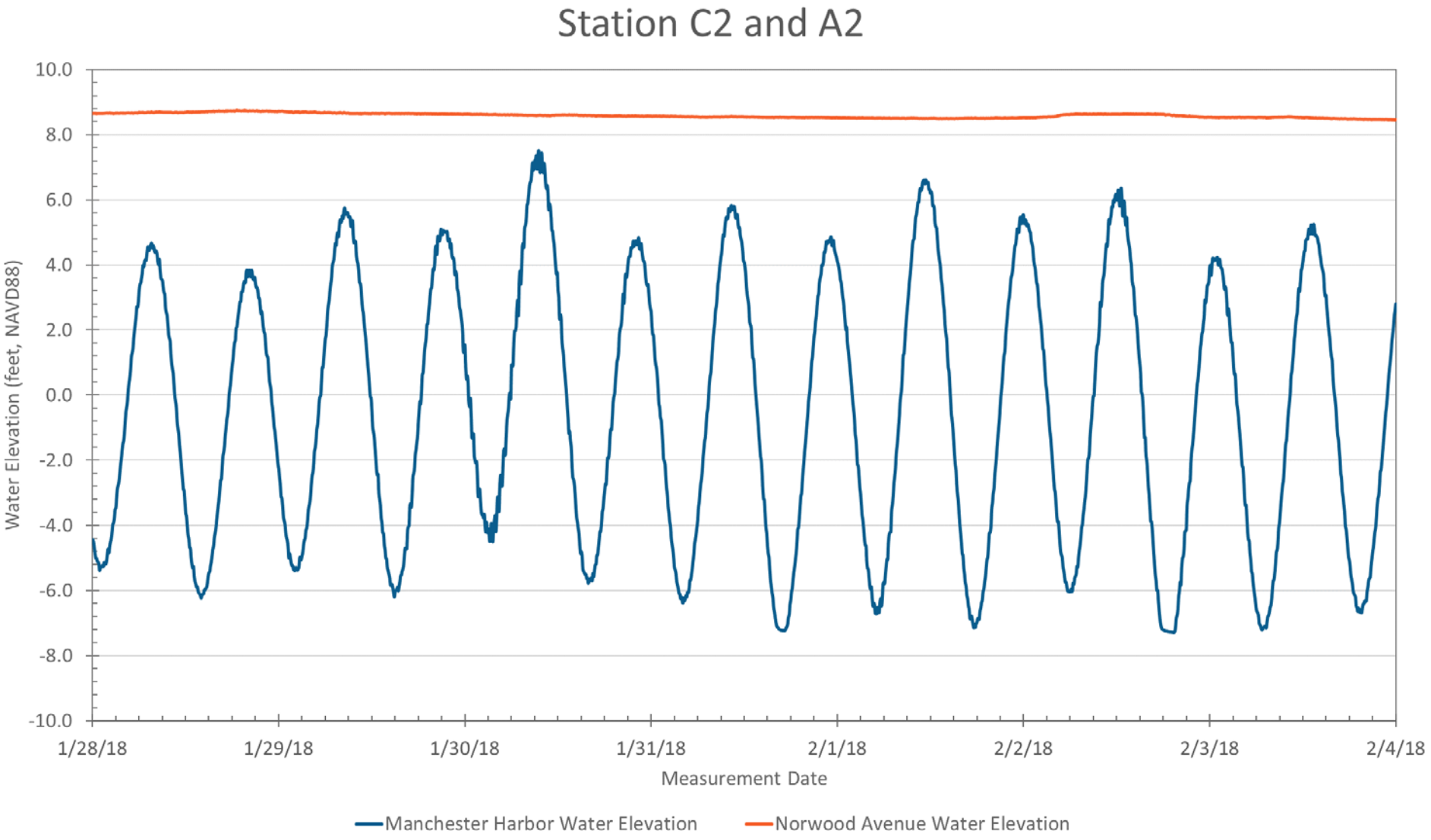
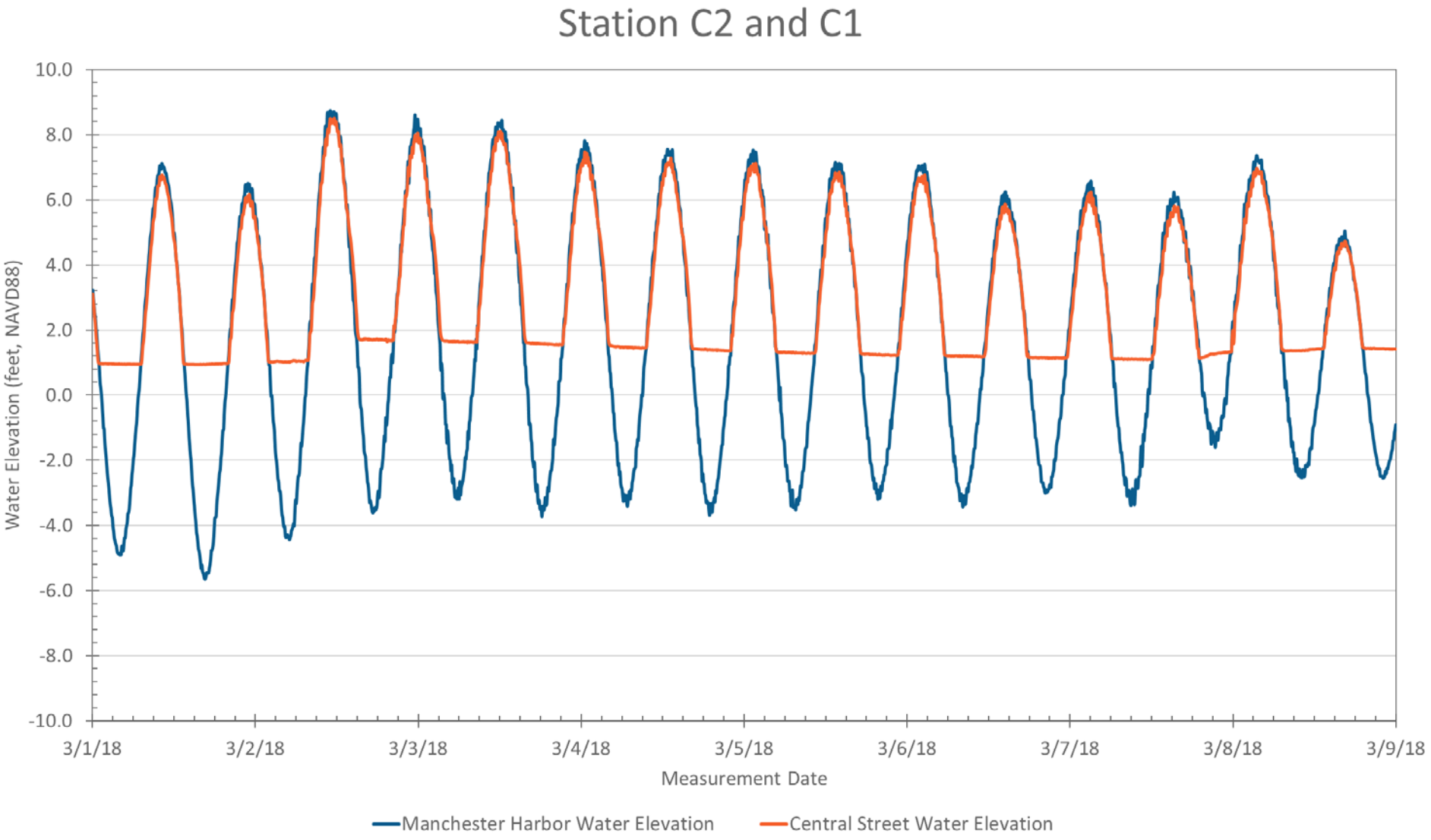


MAR 1, 2018 TO MAR 8, 2018 – TIDE GATE OPEN



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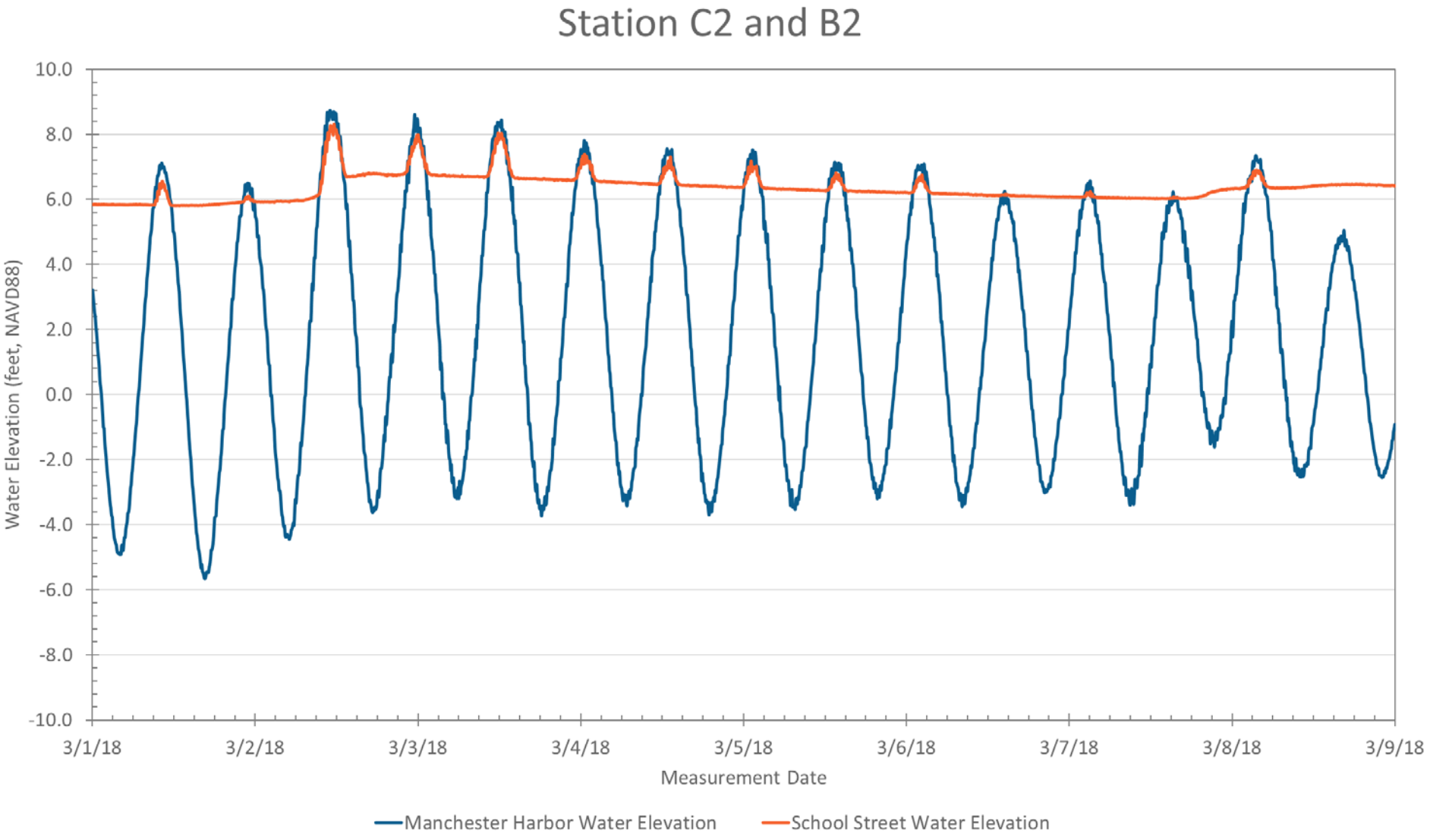

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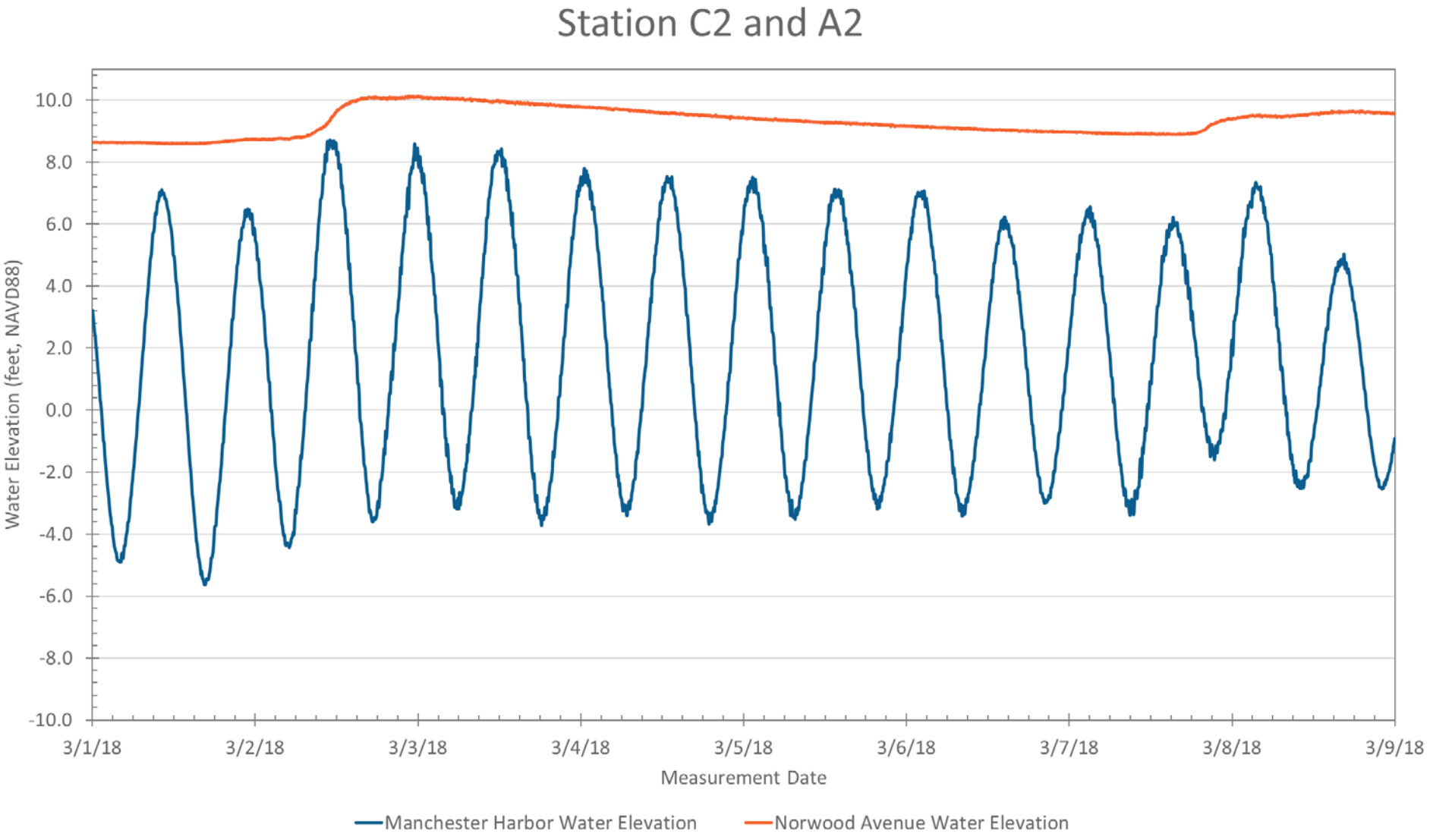
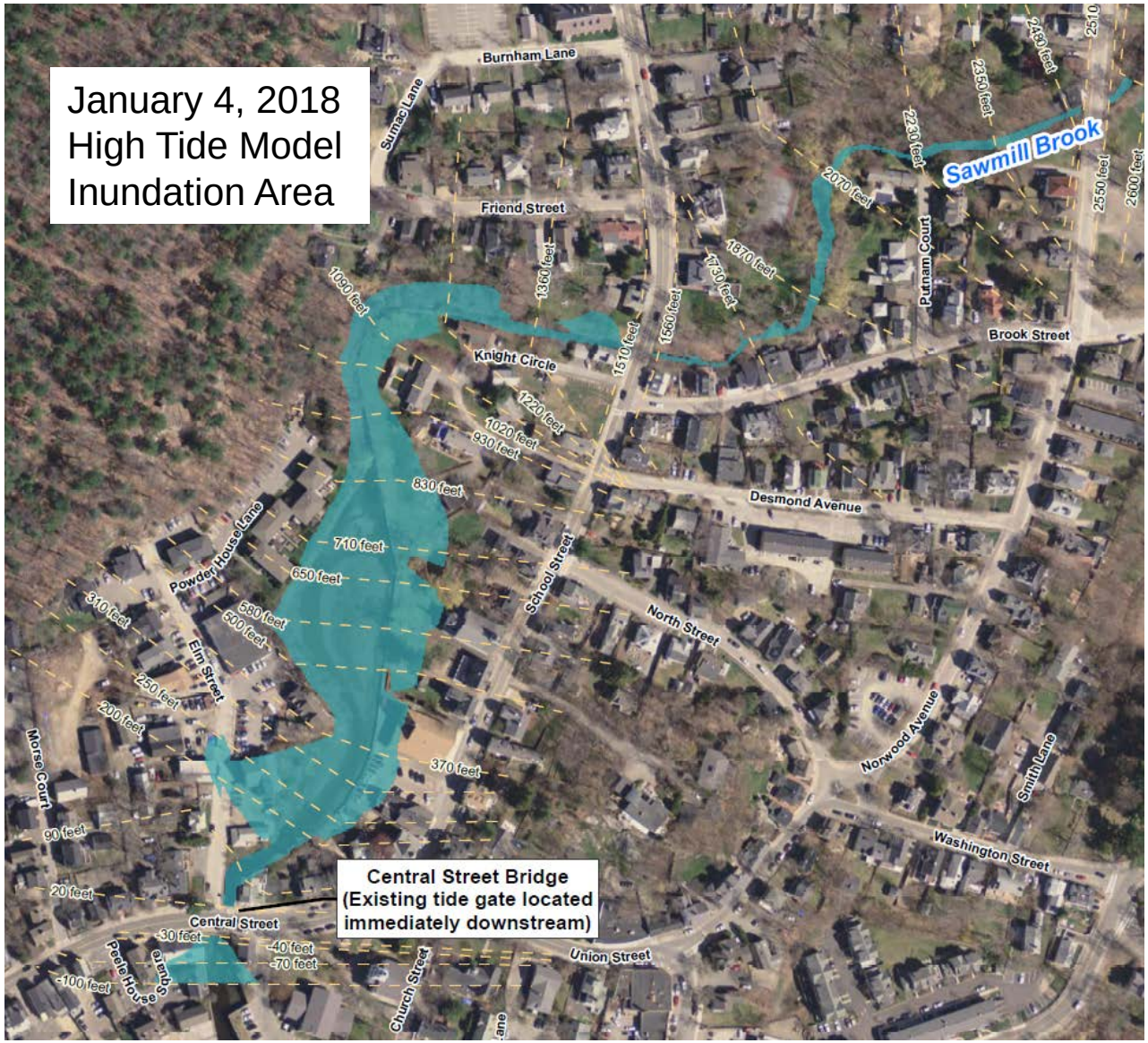


FINDINGS FROM HYDRAULIC MODELING



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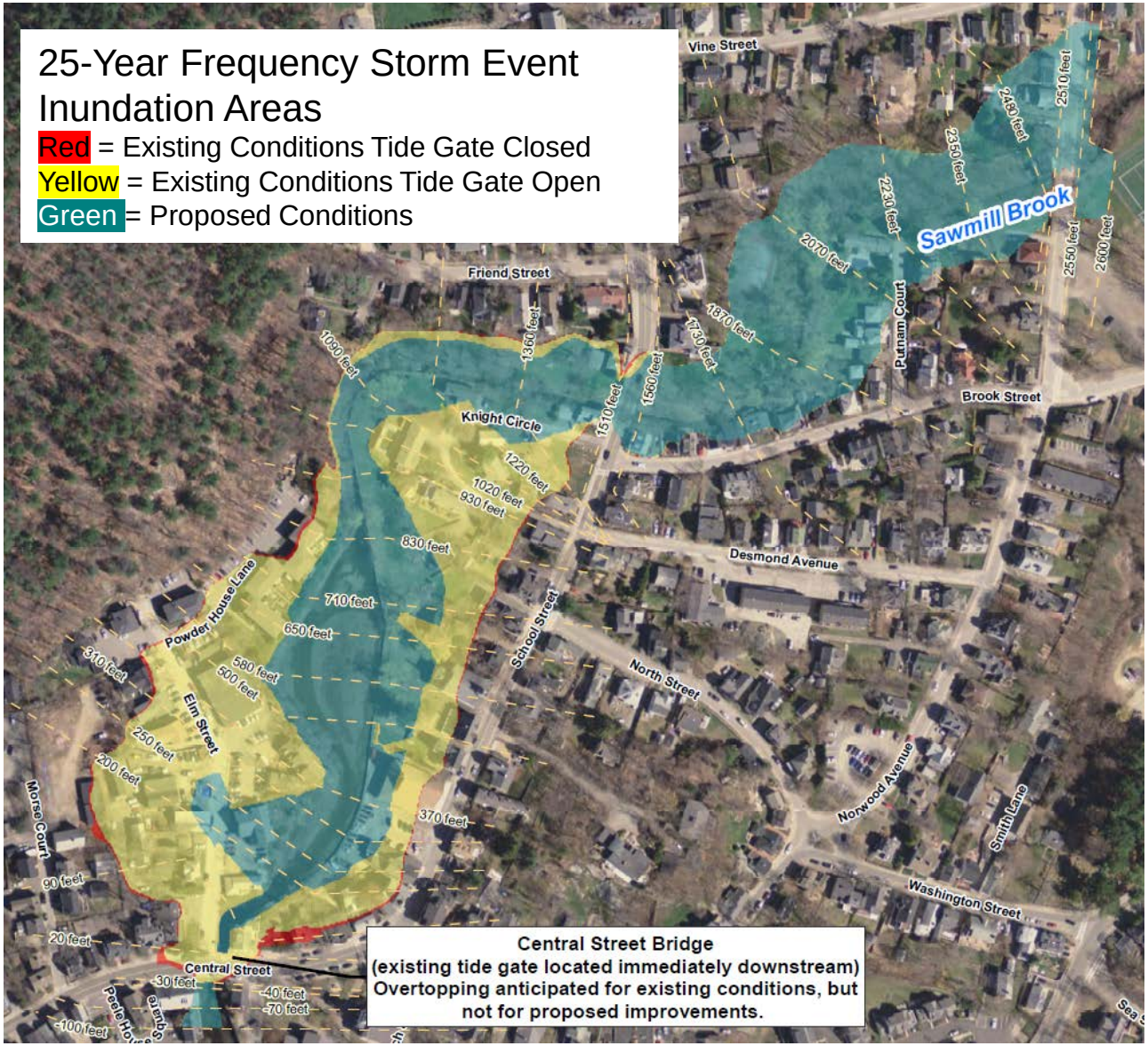
FINDINGS FROM HYDRAULIC MODELING



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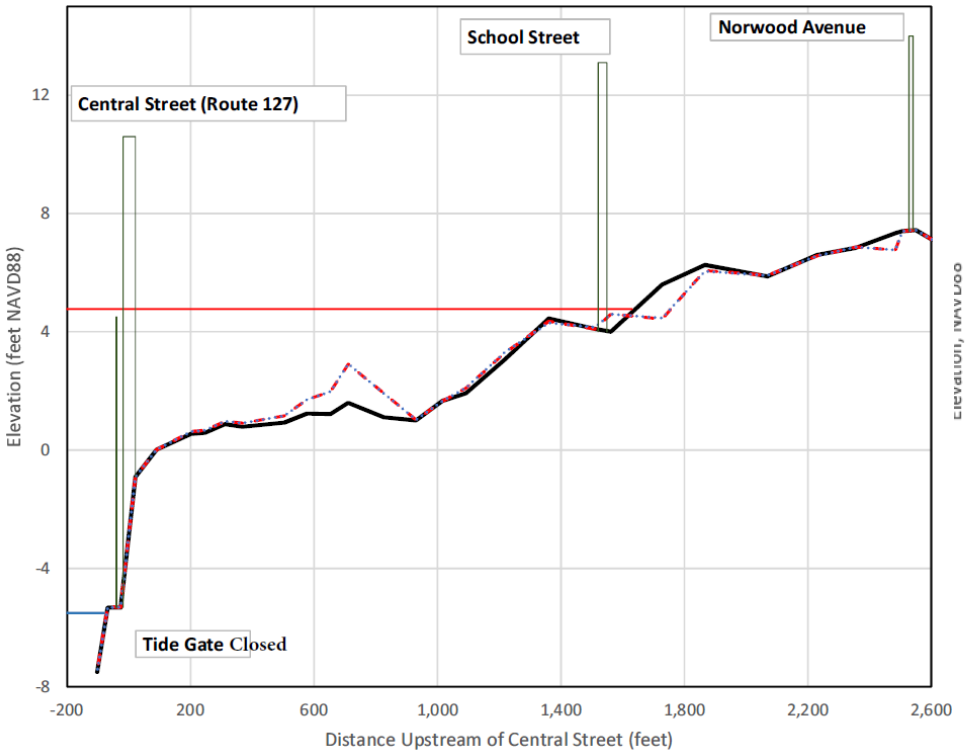
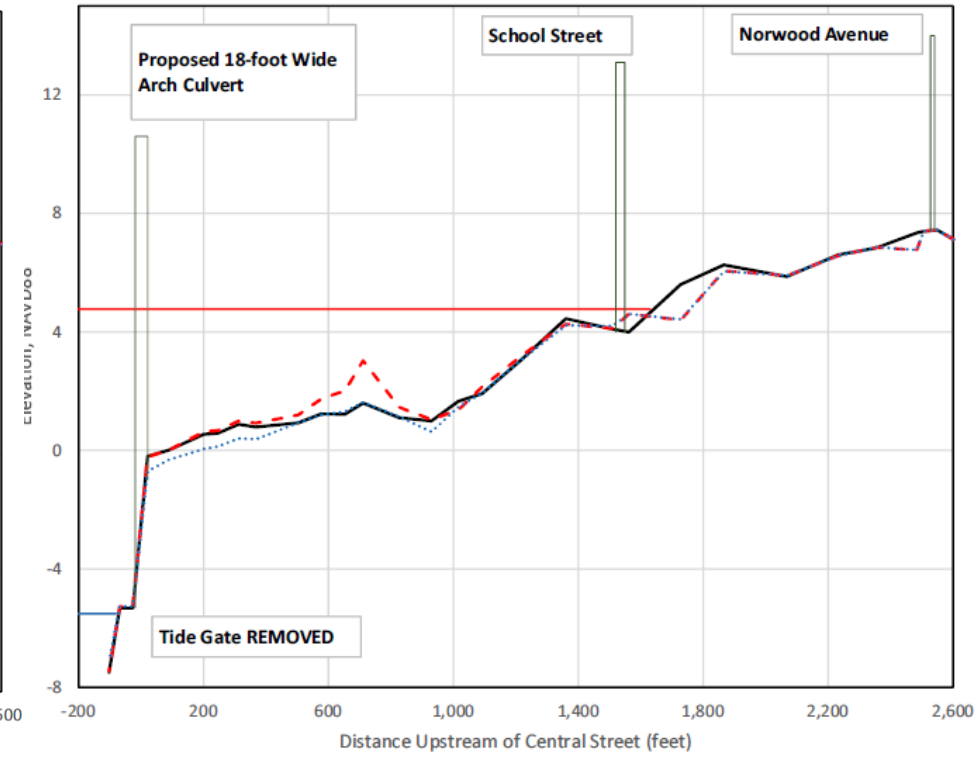
FINDINGS FROM SEDIMENT TRANSPORT MODELING





FINDINGS FROM WALL SURVEY

- Granite block, poured concrete, brick, field stone and shale revetment and combinations of the above are the dominant structures found around Central Pond.
- Granite block, field stone and combinations of the above are the dominant structures found along Sawmill Brook.
- Almost 50% of the walls arounds Central Pond are in need of maintenance. Over 60% of the shoreline of Central Pond is privately owned.
- Many locations can benefit from some type of bioengineering to stabilize banks using stone and plantings

SAWMILL BROOK/CENTRAL POND RESTORATION ELEMENTS TO CONSIDER

- Flood Mitigation
- Riverine/Wetland Habitat
- Fish Passage
- Stream Channel
- Wall Repairs
- Aesthetics
- Public Access

SAWMILL BROOK/ CENTRAL POND RESTORATION
CENTRAL STREE BRIDGE IMPROVMENTS

Tighe&Bond

VIEW OF CENTRAL POND LOW TIDE

WALL REPAIRS AND BANK STABILIZED

VIEW OF CENTRAL POND AT LOW TIDE

POTENTIAL RESTORATION ALONG EAST BANK AT LOW TIDE

RESTORATION IN SUMMER MID-TIDE

RESTORATION IN SUMMER HIGH TIDE

MET FEASIBLITY CONCLUSIONS

- Tide gate removal and bridge culvert expansion will improve tidal exchange, fish passage and upstream flooding
- Sediment deposits in the Pond has a few elevated concentrations of metals and PAH (typical of stormwater runoff)
- Sediment amounts are manageable, may naturally lessen over time as the system flushes
- Erosion around the Pond and upstream needs to be addressed by wall repairs, stormwater improvements and stream bank stabilization

MET FEASIBLITY CONCLUSIONS

- **The Pond area is freshwater dominant and riverine wetlands restoration will feature vegetation that is tolerant of minimally brackish conditions**
- **Restoration design will include an extensive alternatives analysis**
- **A phased approach to restoration will facilitate establishing the new wetland system**

IMPLEMENTING THE RESTORATION PROJECT

1. Access to private wall structures for survey, repairs and maintenance
2. Geophysical survey for engineering design
3. Ecological restoration alternatives analysis
4. Technical agency review
5. Permitting with Central Street Bridge improvements
6. Final restoration design