Manchester's Ongoing CSO Mitigation Program 1995 to 2021

NEWEA Combined Sewer Overflow & Wet Weather Issues Conference

Portsmouth, NH • September 29, 2021

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Manchester's Ongoing CSO Mitigation Program

Agenda

- Background
- Wastewater system
- CSO history
  - Phase I
  - "Limbo" years
  - Phase II
  - Future work
- Conclusions
- Questions

City of Manchester's History

- Settled in 1725
- Evolved from agricultural to industrial 1725 to 1810
- Amoskeag Mills—largest single mill in the world 1915
- Post industrial depression 1930 to 1980's

City of Manchester Today

- Largest city north of Boston
  - 109,000 population
- Revitalization
  - 1990s to present
- Civic center
- Baseball park
- High tech industries
- “ManchVegas”

Environmental Protection Division

- Created in 1975 – City's wastewater utility
- Division of Manchester's Department of Public Works
- An "enterprise"
- Staff of 44
- 15 acre campus at 300 Winston Street
- 10 buildings
  - Administration
  - Operations
  - Maintenance

Wastewater Infrastructure – WWTP

- 1975: 26 mgd
- 1994: upgrade to 34 mgd
- 2016: upgrade to 42 mgd
- Serves four communities
  - Bedford (4.37%)
  - Goffstown (4.11%)
  - Londonderry (10.16%)
  - Manchester (81.36%)
- Metro population 172,000
- Investing $75 million over 15 years

Wastewater Infrastructure – Pipelines

- 390 miles of sewer
  - 50% “combined” system
  - 11,000 SMHs
  - 15 CSO outfalls
- 100 miles of pipe over 100 years old
- Robust CMOM program ongoing

Stormwater Infrastructure – Pipelines

- 190 miles of drains
  - 14,000 CBs
  - 3,000 DMHs
  - Miles of open channel
  - Robust MS4 program ongoing

Wastewater Infrastructure – Pump Stations

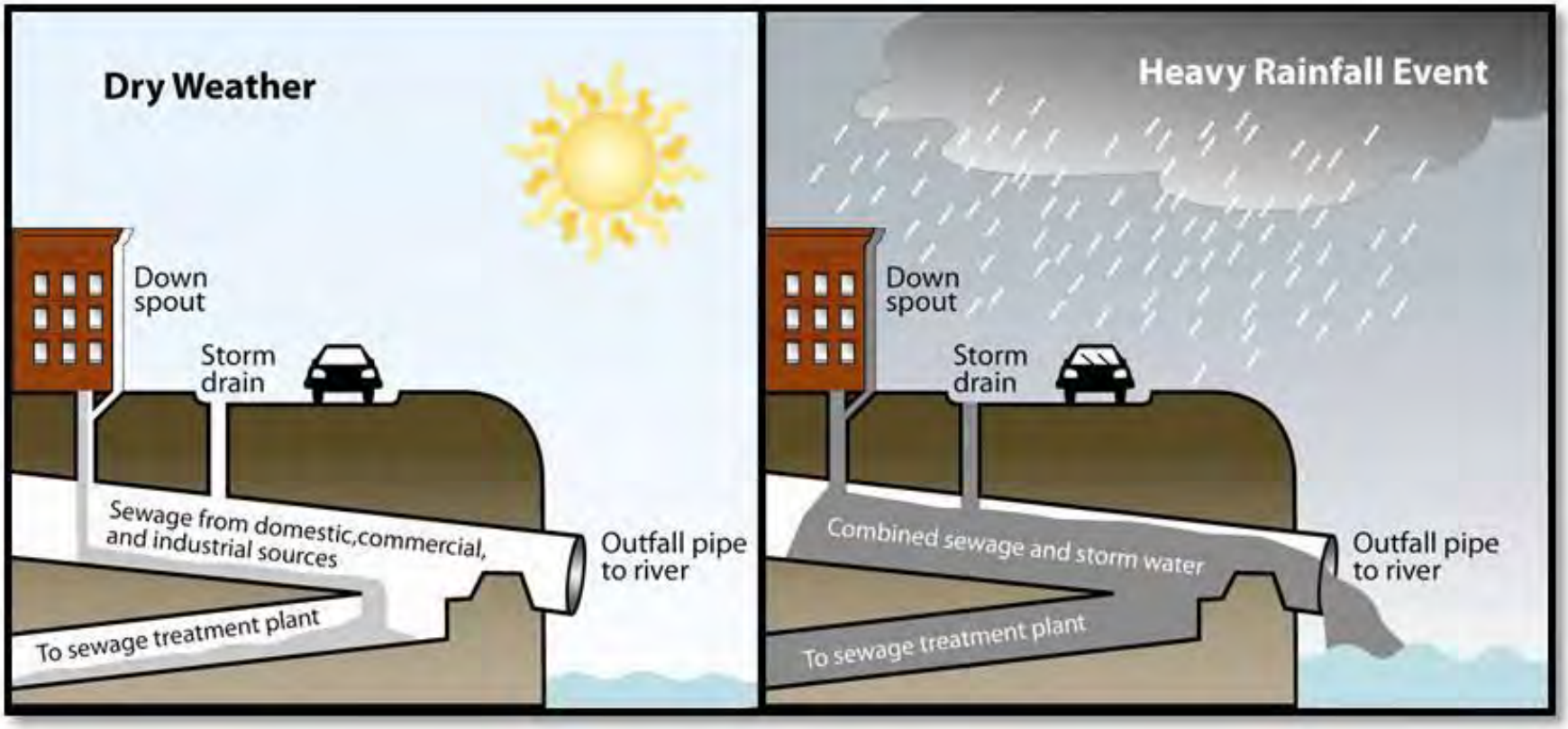
- 12 pump stations
- Constructed from 1973 to 2014
- 68 to 6,000 GPM

Manchester's Urban Waterways

- Lakes / ponds / streams within our urbanized area
  - Crystal Lake
  - Dorrs Pond
  - Nutt Pond
  - Pine Island Pond
  - Stevens Pond
  - Miles of open channel streams

- Water quality impairments in our waterways
  - Chloride
  - Phosphorous
  - Dissolved oxygen
  - Bacteria
  - Mercury

What is a Combined Sewer Overflow (CSO)?



CSO Outfall

Manchester's CSO History

- 1994: Federal Clean Water Act CSO Control Policy
- Mid 1990s: Various engineering studies
- 1999: CSO Consent Order issued
  - Two phase program
  - West side of Merrimack River first ten years
  - East side of Merrimack River to follow

Phase I: 1999 – 2009 “Nuts and Bolts”

- 10 year $58 million program
- Fully separated 15 basins
- 8 construction contracts
- Over 53 miles of new or rehabilitated piping up to 60” diameter
  - New drainage system
  - Existing “combined” system used for sewer

Phase I: Very Successful!

- 99% annual CSO reduction
- 53.2 to 0.2 mgd annually
- Goal was three month level of CSO control, program achieved two year level of control
- Merrimack River water quality increases
- Ten year program was completed on schedule and on budget

“Concrete” Benefits

- Road reconstruction (26 miles)
- Other utility construction
  - Water (9 miles)
  - Gas (14 miles)
- Surface reconstruction
  - Curbing (8 miles)
  - Sidewalks (6 miles)
  - Pedestrian ramps

“Social” Benefits

Not just improved water quality…

- Social justice
- Urban revitalization
  - ADA compliant
  - Green infrastructure
- Positive economic impact to local economy

Phase II

- March 2010 - Submitted updated Long-term Control Plan
  - Two 20 year phases
  - Phase II - $165 million
  - Phase III - $220 million
- Carried successful themes of Phase I
  - Infrastructure upgrades
  - Urban revitalization
  - Social justice

The “Limbo” Years: 2010 to 2020

- March 2010 submitted updated Long-term Control Plan
- Minimal initial interaction with EPA
- City takes pro-active approach and continue with Phase II CSO projects
  - Chestnut Street Project: $6.6 million
  - North Chestnut Street Project: $10 million
  - WWTP Capacity Upgrade: $23 million

Contract 1
Chestnut Street Sewer Separation Project

- Valley St. to Merrimack St.
- Construction 2013 to 2014
  - 4,400 LF of new drain (12 – 60”)
  - 1,640 LF of new sewer (6 – 12”)
  - 2,670 LF of new water main (6 – 20”)
- Total project costs $6.6 million

Contract 1
Big Pipe and Deep Cuts in Urban Areas

- 60” ID, 72” OD
- 8’ long sections
- Up to 24’ deep

Phase II – Contract No. 2
North Chestnut Street Sewer Separation Project

- Merrimack to Bridge Street
- Construction 2014 to 2017
  - 12,000 LF of new drain (12 – 60”)
  - 3,000 LF of new sewer (6 – 12”)
  - 2,000 LF of new water main (6 – 20”)
- Total project costs $10 million

Leveraging Chestnut Street Projects

- First bike lanes in the City
- Reclaimed and reconstructed all roadways
- Complete infrastructure upgrade
  - Water
  - Gas
  - Fiber optics
- Decorative crosswalks
- “Green infrastructure”
  - Bio-retention islands

WWTP Upgrade: Increased Capacity

- Project Completed 2016
- Project Cost $22.5 Million
- Project Description
  - Increase WWTP's secondary capacity to 42 mgd
  - The aeration system was modified from two trains of six basins to four trains of three basins with selector basins for TP removal
  - New fine bubble technology diffusers
  - New blower building housing four 300 HP blowers

Phase II: Negotiations

- 2010: Long-term control plan
- 2011: EPA initiates negotiations
- 2015: Resume negotiations
- 2016: Legal counsel becomes involved
- 2018: Resume negotiations
  - First draft of Consent Decree
- September 28, 2020 – Phase II Consent Decree executed and in effect

Phase II: 2020 – 2040

- East side of city
  - 7 CSO basins
  - 15 outfalls
- Phase II: $231 million over 20 years
  - $84 million for removal of Cemetery Brook
  - $80 million in sewer separation
  - $31 million for removal of Christian Brook
  - $22 million for WWTP phosphorous removal
  - $6 million in program assessment / reporting
  - $5 million in post construction monitoring
  - $3 million in system optimization

Where are we today after year No. 1?

- Cemetery Brook Tunnel—basis of design report to be completed at end of 2021
- Christian Brook—bidding $15 million main drain construction contract this fall
- WWTP phosphorous removal—$22 million three year construction contract ongoing
- CSO real time notification—FAS starting this fall
- System optimization—study completed
- Other—signs, reporting, etc.

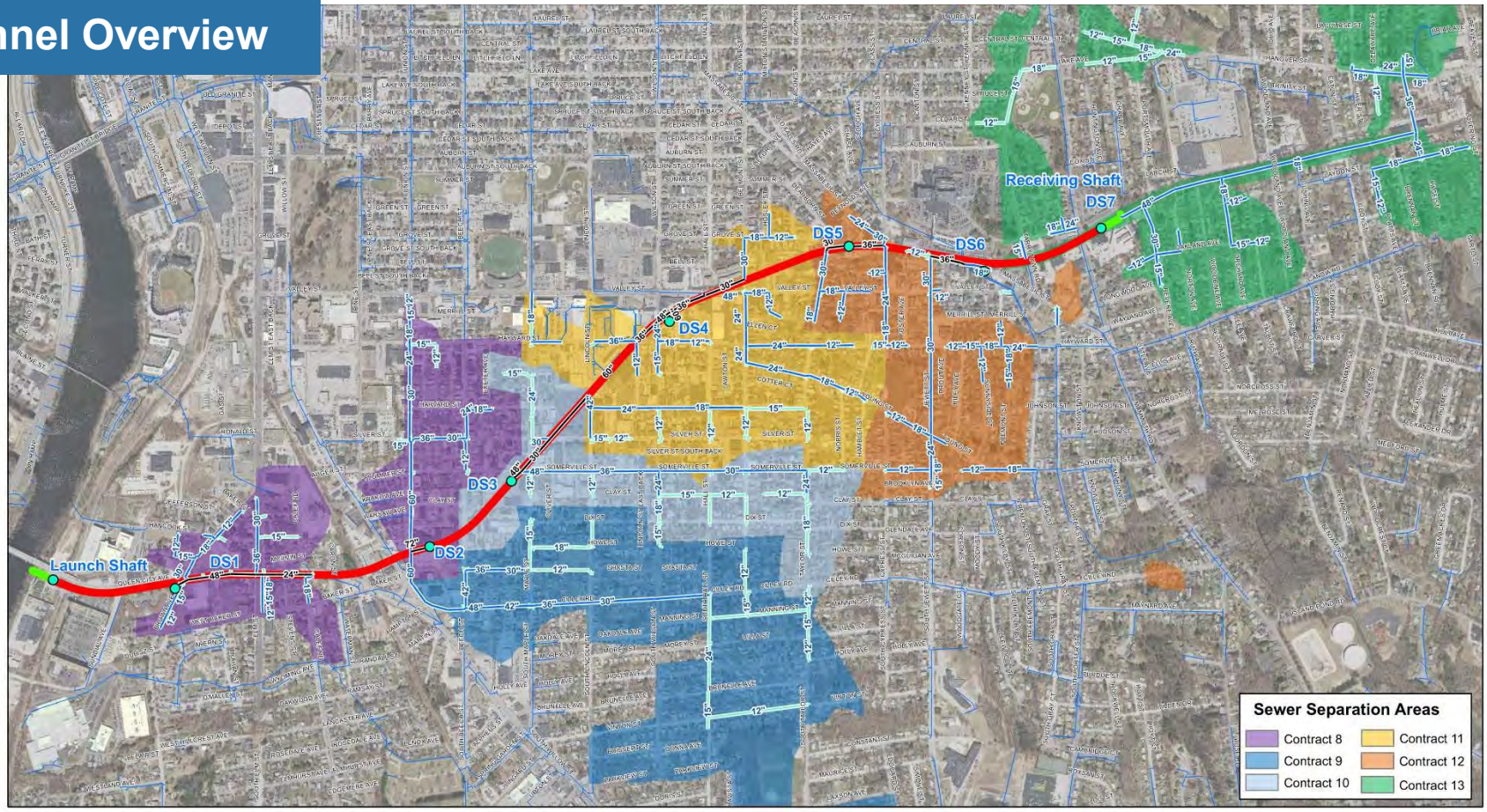
Cemetery Brook

- Largest drainage basin
  - 4,500 acres
  - 3,000 acres served by combined system
  - 50% of remaining combined system
  - Oldest portions of the city's system
- Contributes 70% of the CSO discharges
- Contributes about 3.2 mgd of dry weather flow to WWTP

Cemetery Brook

- Originally proposed “open cut” construction
  - 4 construction contracts
  - 10’ x 12’ box culverts 25’’ deep
  - 13.5 years
  - $85 million
- “Open cut” would require complete utility relocations and be extremely disruptive to residents
- Switch to tunneling technology

Tunnel Overview



CDM Smith

N

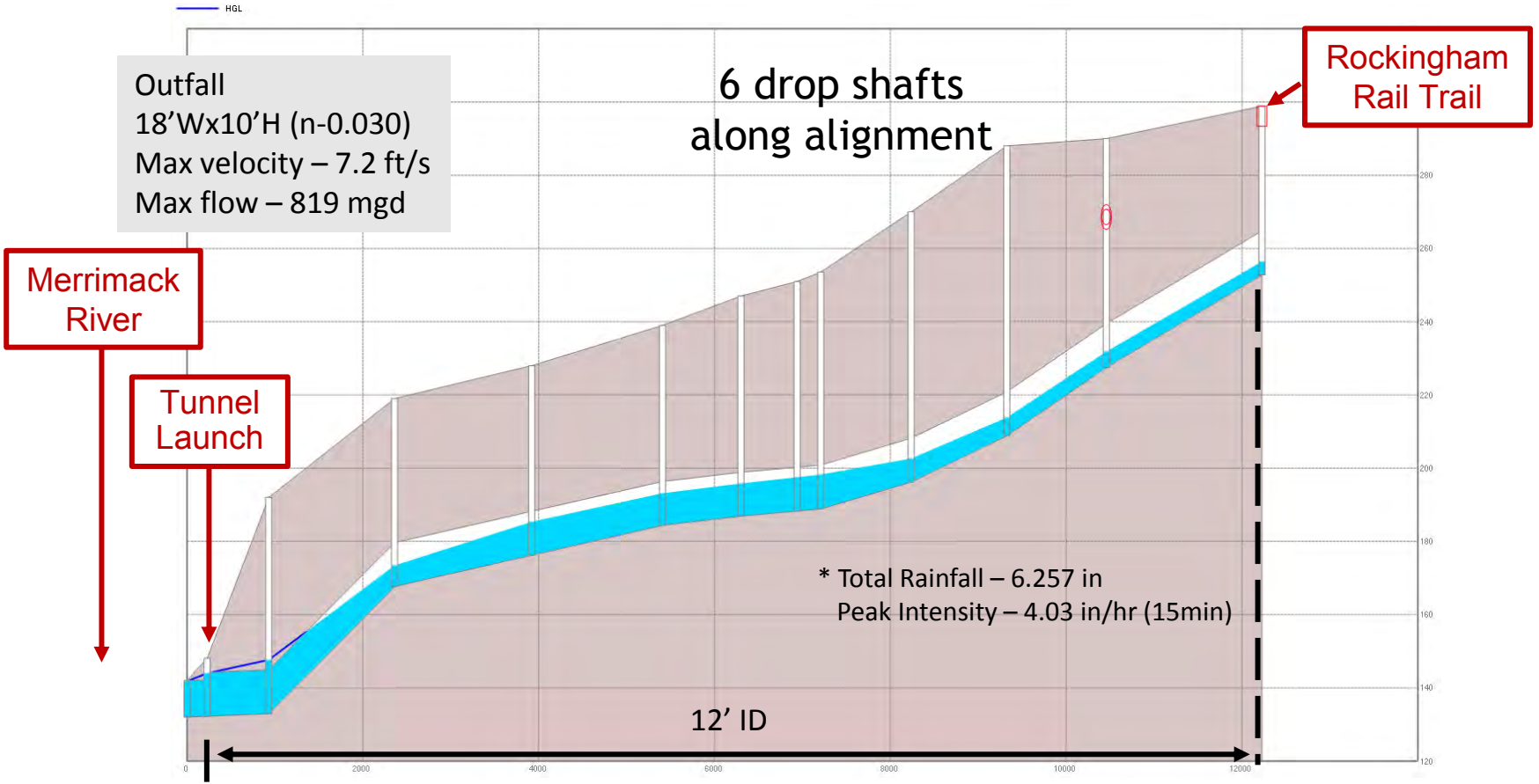
0 500 1,000 Feet

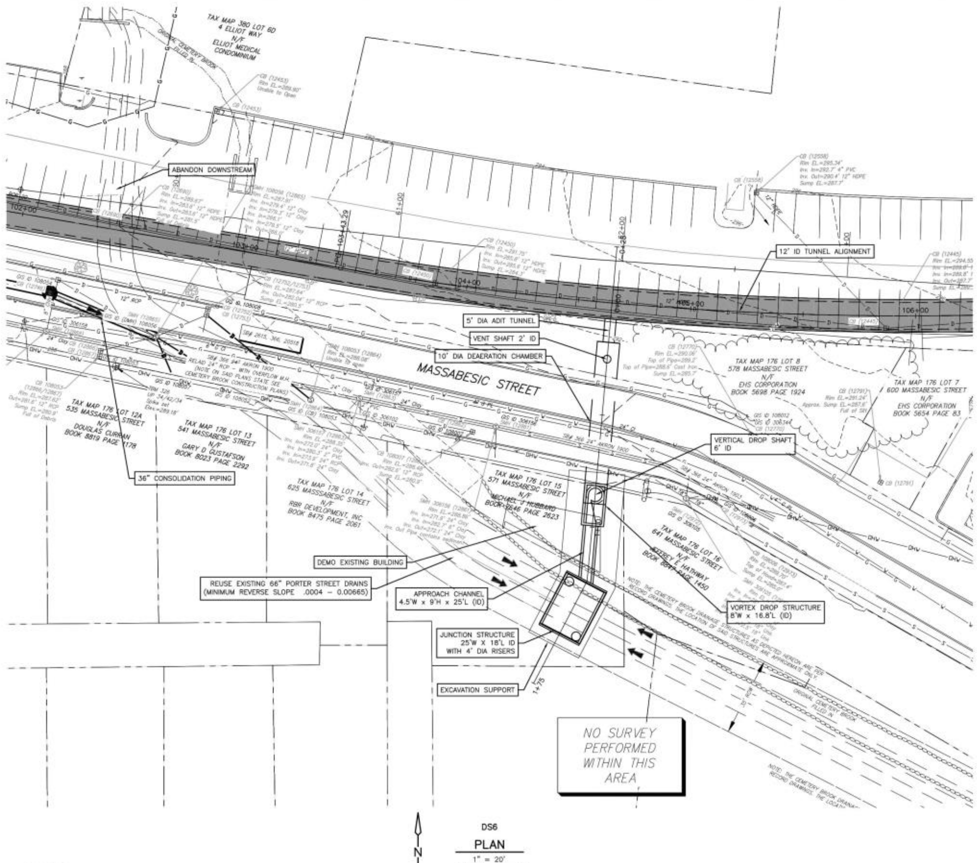
LEGEND

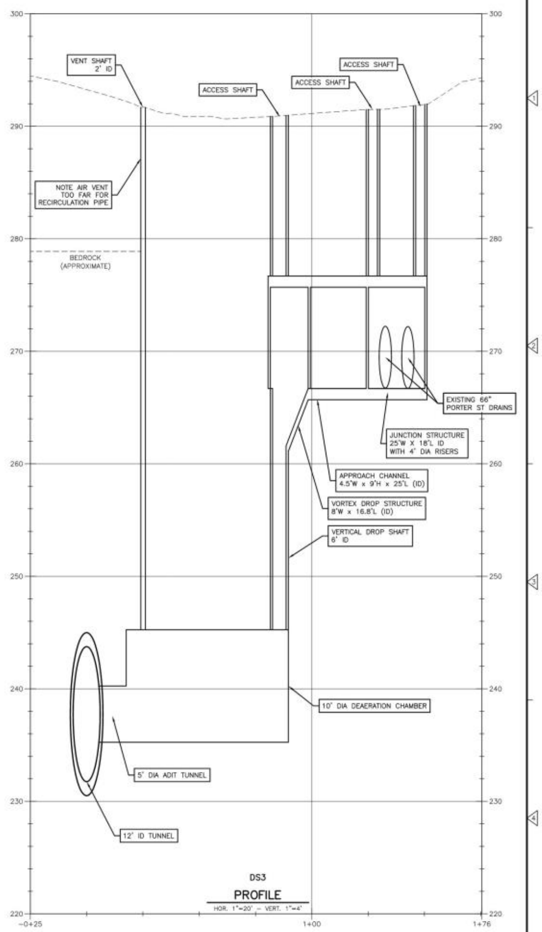
- Cemetery Brook Drain (Tunnel)
- Cemetery Brook Drain (Open Cut)
- Tunnel Shafts (Launch, Receiving, Drop for Collector Drains)
- Consolidation Piping of Future Drains To Drop Shaft
- Future Drain
- Future Small Diameter Drain

City of Manchester
Cemetery Brook CSO Preliminary Design
Tunnel Development Overview
8/24/2021

Tunnel Peak HGL Profile—25-yr Design Storm*







NOTES

1. DROP SHAFT COMPONENTS AND DIMENSIONS ARE ESTIMATED USING 25-YEAR DESIGN STORM FLOWS AND THE IOWA INSTITUTE OF HYDRAULIC RESEARCH (IIHR) REPORT 264 DESIGN SCALING SUGGESTIONS. MODIFICATIONS WILL BE REQUIRED TO MEET SITE LIMITATIONS FOR SOME COMPONENTS SUCH AS VENT SHAFT LOCATION AND DEAERATION.
2. PHYSICAL MODELS TO VERIFY AND FINALIZE DIMENSIONS/CONFIGURATION IS RECOMMENDED.
3. SUPPORT OF EXCAVATION IS DEPENDENT OF ACTUAL SOIL CONDITIONS NEAR SHAFT. ADDITIONAL FIELD INVESTIGATIONS WILL BE NECESSARY.
4. ACCESS SHAFTS WILL BE SECURED WITH BOLTED COVERS. AIR VENTS WILL BE PLACED OUTSIDE PATH OF TRAVEL AND HAVE A 180° ELBOW "GOOSENECK" FITTING AT GRADE.

REV. NO.	DATE	DRWN	CHKD	REMARKS

DESIGNED BY: S. LAVOIE
DRAWN BY: S. LAVOIE
SHEET CHK'D BY: X
CROSS CHK'D BY: X
APPROVED BY: X
DATE: SEPTEMBER 2021

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670 North Commercial Street, Suite 208
Manchester, NH 03101
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CITY OF MANCHESTER, NEW HAMPSHIRE
PHASE II CSO ABATEMENT PROGRAM
CEMETERY BROOK CSO PRELIMINARY DESIGN
CONCEPT FEASIBILITY STUDY

CEMETERY BROOK DRAIN - TUNNEL
VORTEX DROP SHAFT STRUCTURE

PROJECT NO. 0186-243837
FILE NAME: DS_Overviews
SHEET NO. DS6

DRAFT 10% CONCEPTUAL DESIGN - NOT FOR CONSTRUCTION

Christian Brook

- Separation of about 25 acre drainage basin
- Two contracts
  - Main drain construction (2022 to 2024)
  - Laterals construction (2024 to 2026)
- Basis of design
  - 10 year storm
  - Climate change factor
  - 25 year storm performance indicator

Other Phase II CSO Projects

- Real time CSO notification
  - Web based
- System Optimization and real time controls
  - Optimize interceptor capacity with gate construction
- Closure of existing outfalls
  - Keep most open due to possible climate change flooding
- Signage
- Reporting

Phase III: 2040 – 2060

- Completion of east side of city
  - 5 CSO basins
  - 4 outfalls
  - $200 million?
  - Future regulations?
  - Who is going to pay for all this?

How do we pay for all this work? - Rates

- Two sets of rates increase to support CSO program
- 2007 – Implemented four year rate increases
  - 2007 – 25%
  - 2008 – 20%
  - 2009 – 20%
  - 2010 – 15%
  - 2011 – 7% rate decrease
- 2020 - Five years of 4% increases
- Today Manchester's average rate is $439, below the state's average of $712

Federal Assistance?

- Phase I – yearly “earmarks”
- “Limbo years” – no federal assistance
- Phase II – no federal assistance at this time
- Chesapeake Bay – $73 million 2020
- Long Island Sound – $14 million 2020
- How about Merrimack River Basin?
  - Infrastructure bill
  - ARPA

Conclusions

- Not just improved water quality…….
- Urban revitalization
  - New sewer, drainage, water, gas,
  - New roads, curbs, and sidewalks
  - ADA compliant
  - Green infrastructure
- Positive impact to local economy
- Social justice

Conclusions

- Manchester is investing over $300 million in CSO mitigation
- 2020 CSO discharge = 154 million gallons
- 2020 River Flows = 1.087 trillion gallons
- This equals less than 1/100 of 1% of annual flows
- Minimum recreational activity ongoing during these storm events
- Downstream WTPs have technology to treat the water
- Is this a cost effective method to address water quality improvements?

Questions???

Thank You