Project Name: Mill Creek Trunk Improvements and Equalization Facility

MWS Project Number: 11-SC-0151 Last Updated: November 8, 2019

The Mill Creek Trunk Improvements and Equalization Facility project merges two projects identified by Metro Water Services (MWS) in the *Corrective Action Plan / Engineering Report for Sanitary Sewer Overflows* (CAP/ER): the Mill Creek Trunk Improvements project and the Mill Creek/ Opryland Equalization Facility – Phase III project. The combined project scope includes the design and construction of approximately 13,800 linear feet (LF) of large diameter, wet-weather gravity sewer primarily installed in tunnels; a 100 million gallons per day (MGD) wet-weather pumping station with associated building; 60 million gallons (MG) of additional storage assumed through four 15 MG tanks; associated piping to route flows to/from the project site, including 6,200 LF of secondary drain line to the Browns Creek Pump Station at 720 Visco Drive; attenuation of peak flows from the Omohundro WTP; and associated site improvements.

The purpose of the improvements is to provide additional capacity to convey existing and future flows during wet-weather conditions to the new, expanded equalization facility where flows will be temporarily stored until peaks flows have receded. See the attached schematics.

Location

The Mill Creek Trunk Improvements and Equalization Facility project is located in the Central Wastewater Treatment Plant's (Central) service area. The project's existing sewer begins just upstream of Mud Island west of the intersection of Thompson Lane and Murfreesboro Pike at manhole 119-04-001. The existing sewer generally follows the northerly route of Mill Creek until it crosses the creek near Massman Drive. It then diverges from Mill Creek and shifts northwest via a tunnel towards the existing Mill Creek/ Opryland Equalization Facility near the Cumberland River. The proposed corridor for the conveyance improvements follows a more direct route west of Mill Creek and crosses two railroads owned by CSX, as well as Murfreesboro Pike (US 70S/41), Spence Lane, Lebanon Pike (US 70/24), and Interstate 40 (I-40).

The site of the proposed equalization facility improvements is south of Pumping Station Road and the existing Mill Creek/ Opryland Equalization Facility, which is located at 1130 Visco Drive. The northwestern corner portion of the property at 1450 Lebanon Pike is the planned location for the construction of the additional equalization tanks, wet-weather pumping station, and all site improvements.

The project is located within Council Districts 15, 16, and 19, although additional Council Districts may be impacted depending on the final route of the improvements.

Background/Purpose

The Mill Creek Trunk Improvements and Equalization Facility project was originally proposed as two separate projects in the development of the CAP/ER: the Mill Creek Trunk Improvements project and the

Mill Creek/ Opryland Equalization Facility – Phase III project. To minimize risk, MWS determined that the preferred option was to combine the two projects into a single design package. This combined project is intended to address Consent Decree Overflows 130 and 222, which are constructed outfalls located along Visco Drive and Barker Road, respectively. The project will also address sanitary sewer overflows (SSOs) observed from manholes near Bismark Drive, Wimpole Drive, Old Glenrose Avenue, and along Mill Creek.

The portion of the existing Mill Creek trunk sewer that has been identified for capacity conveyance improvements extends from manhole 19-04-001 just southwest of Mud Island to the site of the planned equalization and pump station facility. Due to risks and construction challenges within the existing sewer corridor, MWS has elected to have the capacity improvements follow a more direct, alternate route running west of Mill Creek. A general corridor for the alternate route is shown on the attached schematics; however, the Designer will finalize the route during preliminary design with input from the Construction-Manager-at-Risk (CMAR). Due to the depth of the sewer and surface features, the majority of the sewer is expected to be installed via tunneling methods.

The trunk improvements will be designed to convey high / wet-weather flow from two diversion locations along the existing Mill Creek trunk. For the purposes of modeling this conceptual route and flow option, it was determined that 13,800 LF of 66-inch diameter gravity sewer would be necessary to appropriately convey wet-weather flow from the existing sewer system. The final diameter(s) of the pipe will be determined by the Designer in conjunction with MWS, based on the resulting horizontal and vertical sewer alignment.

Variations in design related to pipe diameters, slopes, or route are allowed if the design flows listed in **Table 1** are adequately conveyed. Proposed designs will be evaluated by the Program Management Team using the hydraulic model to confirm that design flow rates are achieved. Diversion to the new trunk improvements is assumed to begin when the wastewater depth of flow in manhole 119-04-001 reaches 5.4 feet, and the diversion should be designed to limit the depth to no more than 6.9 feet under peak flow rates. At manhole 106-08-006, the diversion to the new trunk improvements is assumed to begin at a depth of flow of 3.5 feet, and the diversion should be designed to limit the depth to no more than 4.5 feet under peak flow rates.

Table 1 - Model-predicted Design Flow Rates, Mill Creek Trunk Conveyance Improvements

Location	Design Peak Flow
Diversion at manhole 119-04-001 to diversion near manhole 106-08-006	37 MGD
Near manhole 106-08-006 to equalization / pump station facility	61 MGD

As outlined in the CAP/ER, improvements to the existing Mill Creek/ Opryland Equalization Facility will include the construction of a new 100 MGD wet-weather pumping station and 60 MG of additional storage. For planning purposes, four 15 MG tanks were assumed. Future expansion of the new equalization facility for two additional equalization tanks should be considered during the preliminary layout of the site. Currently, the equalization facility operates with two storage tanks totaling 34 MG of storage and a 25 MGD wet-weather pumping station. The planning level configuration assumes that the new wet-weather pumping station will operate as a single system using all equalization tanks (the two existing plus the four planned). This assumption, although preferred by MWS to address upstream overflows, is reviewable by the Designer.

Wastewater conveyed through the new wet-weather gravity sewer will be diverted to the new 100 MGD, wet-weather pump station along with high (wet-weather) flows from the adjacent existing 78-inch diameter sewer. Diversion to the new pump station from the 78-inch diameter sewer is assumed to be designed such that the 78-inch sewer does not surcharge under peak flow conditions. The acceptable range of depths at the assumed diversion manhole (094-07-010) is 1 to 1.5 feet. This depth range for diversion provides for a system hydraulic grade line that addresses multiple upstream system overflows based on the modeled system under design storm conditions; however, the Designer is encouraged to provide MWS some flexibility to manually adjust the diversion elevation. The modeled system is sensitive to assumed hydraulic losses, the degree of attenuation of peak flows from the Omohundro WTP, and projected growth within the service area.

The Designer is also tasked with maximizing flows to the Browns Creek Pump Station at 720 Visco Drive. Pump and discharge piping improvements for the Browns Creek Pump Station are not part of this scope and are not envisioned for the future. For planning purposes, a secondary low pressure, tank drain line from the Mill Creek/ Opryland Equalization Facility to the Browns Creek Pump Station was assumed. It would maximize flows conveyed to the Browns Creek Pump Station during and following wet-weather events, reduce required storage sizing, facilitate draining of the tanks, and alleviate surcharge of the existing 84-inch diameter sewer along Visco Drive. This secondary drain line will be utilized in conjunction with a drain line from the tanks to the 84-inch diameter sewer in proximity to the equalization facility.

For the planning purposes, the conceptual secondary drain line was modeled as 6,200 LF of 36-inch diameter pressure pipe with capacity up to 30 MGD. The approach to maximizing flows to the Browns Creek Pump Station and resultant sizing will be determined by the Designer in conjunction with MWS.

The Designer is also tasked with evaluating and designing improvements to attenuate peak flows that are discharged from the Omohundro Water Treatment Plant (WTP). Currently, these flows may exceed 25 MGD during filter backwashing; the Designer should also consider peak flows following planned improvements at the WTP. Changes and/or improvements to the discharge location of the attenuated flows may also be considered.

The Designer shall work in collaboration with a CMAR during planning, design, bidding and construction phases of this project.

Project Scope

The Mill Creek Trunk Improvements and Equalization Facility project includes the design and construction of approximately 13,800 LF of large diameter, wet-weather gravity sewer primarily installed in tunnels; a 100 MGD wet-weather pumping station; 60 MG of additional storage, assumed via four tanks; 6,200 LF of secondary drain line to the Browns Creek Pump Station at 720 Visco Drive; attenuation of peak flows from the Omohundro WTP; associated piping to route flows to/from the project site; site improvements; all modifications to existing structures; electrical; instrumentation; HVAC; tunnel shafts; and all required appurtenances. The project scope includes the evaluation, design (including archeological, environmental, and geotechnical investigations), development of the *Geotechnical Baseline Report*, bidding assistance, and construction-phase tasks as described below:

Preliminary Engineering / Evaluation Tasks

The following items will require investigation to make determinations about the overall design approach. The Designer will evaluate the pros and cons of alternatives, including life cycle cost and benefits, and provide recommendations to MWS.

- Evaluation and selection of the route of sewer trunk conveyance improvements from near Mud Island / manhole 119-04-001 to the equalization / pump station facility, including evaluation of construction methods with input of the CMAR
- Evaluation of equalization / pump station facility site layouts to minimize costs, provide flexibility, and assess constructability with input of the CMAR
- Evaluation of potential equalization facility site layouts to integrate the existing tanks and maximize future expansion of storage capacity beyond the 60 MG additional planned for this project with input of the CMAR
- Evaluation of wet-weather pump station configurations, including station layout, number of pumps, pump sizing, pump selection, and force main configurations with input of the CMAR
- With input from the CMAR, evaluation of options for maximizing flows to the Browns Creek Pump Station, including a secondary drain pipeline directly to the Browns Creek Pump Station
- With input from the CMAR, evaluation of potential routes and preliminary design of all required gravity piping to connect the proposed facility to the existing 78-inch diameter sewer system
- With input from the CMAR, evaluation of potential routes and preliminary design of all required pressure pipes to connect the proposed facility to the planned tanks as well as to the 24-inch diameter force mains serving the two existing, equalization tanks
- With input from the CMAR, evaluation of potential routes and preliminary design of tank drain lines, including a drain pipeline to the existing, adjacent 84-inch diameter sewer and a secondary drain line to the Browns Creek Pump Station at 720 Visco Drive
- With input from the CMAR, evaluation and preliminary design of crossings for Browns Creek, the old Browns Creek channel, major water transmission lines, mainline railroads, highway crossings, and major utilities (both aerial and buried), including potential routes and forms of crossings
- With input from the CMAR, evaluation of potential solutions and preliminary design of alternatives for attenuation of existing peak flows and potential future flows from the Omohundro WTP, including evaluation and design of an improved point of entry, if needed
- Preliminary site investigations, environmental and archeological investigations, linear surveying, and topographic surveying to support the preliminary engineering phase and recommendation regarding the equalization and pump station facility, conveyance improvements, and tank drainage improvements
- Collaboration with the CMAR for constructability input for improvements
- Assistance to MWS with regulatory meetings to discuss the project, alternatives, potential impacts, and recommendations, including incorporation of feedback into the *Preliminary Engineering Report*
- Preparation of a *Preliminary Engineering Report* summarizing evaluations, preliminary costs, recommendations, and design criteria

Design and Bidding Tasks

The Designer will complete the design of the improvements selected by MWS during the preliminary engineering phase, including all associated disciplines (civil/site, geotechnical, electrical, instrumentation,

structural, etc.), and will provide permitting, easement, communications, and bidding assistance. The final level of effort and scope will be defined during contract negotiations for the design phase, following completion of the *Preliminary Engineering Report*. This includes:

- Design of gravity sewer trunk conveyance improvements along the selected alignment to convey required flow rates based on site constraints
- Design of two peak wet-weather flow diversion structures with critical elevation overflow weirs and maintenance isolation gates on the existing Mill Creek trunk sewer to route flow to the new gravity conveyance improvements
- Design of the probable tunnel methods and access shafts including odor control to the deep, trunk conveyance pipes
- Geotechnical investigation to support the design of the trunk conveyance improvements, assumed to be constructed primarily via tunneling methods
- Design of a peak wet-weather flow diversion structure with critical elevation overflow weirs and maintenance isolation gates on the 78-inch diameter sewer to route flow to the wet-weather pump station
- Design of a new wet-weather 100 MGD firm capacity, deep, reinforced concrete pumping station with non-mechanical pump protection screening, overflow weirs, wet well(s), dry well with 4 to 6 submersible or immersible dry-pit, fix-mounted pumps (optimized for minimization of pump head and integration with existing tanks elevations), VFD pump drives, and site improvements for maintenance, equalization/pumping station site access and security
- Design of the force main systems, drain systems, and multiple tank connections which integrate the fill, transfer, overflow, and drain piping and elevations of the existing tanks
- Design of four pre-stressed concrete, wire-wound, gravity-drained, covered storage tanks with a minimum design volume of 15 MG each. These are anticipated to be partially buried and include conceptual deep foundation design.
- Design of the solution for attenuation of existing and future peak flows from the Omohundro WTP and an improved point of entry as needed
- Geotechnical investigations for the foundation design of the tanks, wet-weather pump station, and miscellaneous structures
- Design of all tank influent and effluent pipelines and appurtenances, including design of cast-in-place concrete controlled-rate drain, metering, and valve vaults
- Design of the wet-weather pump station, including plumbing, HVAC, bridge crane, and a masonry/concrete superstructure compatible with and/or a complement to the historical buildings of the adjacent Omohundro Water Treatment Plant
- Design of all electrical/instrumentation for the site facilities, including connections to the Omohundro Campus Electrical Substation and integration with the existing facility
- Design of site drainage and all other stormwater best management practices (BMP) design requirements to conform with MWS Stormwater requirements
- Design of traffic control plans and project site public advisory notifications for construction
- Design of sediment and erosion control plans for facility and pipe conveyance improvements
- Design of landscaping for the equalization facility and development of re-vegetation plans for the equalization facility and the conveyance improvements

- Site investigations, environmental and archeological investigations, linear surveying, and topographic surveying and aerial surveying to support the design of the required equalization/pump station facility, conveyance, and tank drainage improvements
- Preparation of the project *Geotechnical Baseline Report* focusing on the sewer pipes constructed in tunnel
- Collaboration with the CMAR for constructability input and CMAR development of the Opinion of Probable Construction Costs (OPCC) at the 30%, 60%, and 90% design milestones
- Assistance to MWS with regulatory meetings to discuss the project's design, incorporate feedback into the design, and present the final design
- Assistance to MWS with community meetings to discuss the project's design, impacts to property owners and the community, incorporate feedback into the design, and present the final design
- Preparation of documents for land and easement acquisition, including temporary, permanent, and subterranean easements
- Preparation of documents for permits, addressing review comments received, and providing required public notifications
- Preparation of construction bid package(s) for the project
- Assistance during bidding including, but not limited to, preparation of addenda and revisions to drawings, specifications, or other documents as requested by MWS for procurement activities

Engineering Services During Construction

The Designer will provide engineering services during the construction phase. The level of effort will be defined during contract negotiations for the construction phase, following completion of the 60% design deliverable. During this negotiation, the division of duties and corresponding work responsibilities for the CWNOAP Construction Management Consultant staff and Designer's staff will be determined. The Designer's work effort may consist of the following tasks:

- Responding to contractor requests for information and requests for clarification
- Reviewing contractor submittals and shop drawings
- Reviewing contractor change requests as requested
- Providing engineering staff as appropriate for the work being performed at the site. More than one engineer may be necessary at any given time depending on the level of construction being performed.
- Providing startup and commissioning which may include any or all of the following:
    - Review of contractor startup and commissioning plans
    - Administering the startup schedule, including conducting any required meetings
    - Witnessing of field startup testing
    - Preparation of testing reports
    - Coordination and administration of the resolution of startup and commissioning issues that arise
- Performing project completion inspections, as requested
- Assisting MWS with regulatory meetings, as necessary during the construction phase to provide project updates, discuss regulatory concerns during construction, and incorporate required changes
- Assisting MWS with community meetings during the construction phase to provide project updates, discuss regulatory concerns during construction, and incorporate required changes

Feasibility / Risk Assessment / Critical Path Items

The following risk and feasibility items were identified during project planning and should be considered by the Designer as the project progresses:

- Coordination with Tennessee Department of Transportation (TDOT). Because the existing and proposed sewers for the conveyance improvements cross Murfreesboro Pike, Lebanon Pike, and I-40 (two state roads and a U.S. highway under the jurisdiction of TDOT), coordination with TDOT should occur early in the project.
- Stream Crossings. The project includes several stream crossings: two perennial or intermittent streams along the alternate corridor for the conveyance improvements and two within the project area of the proposed equalization facility and secondary tank drain corridor. The design of the improvements should consider maintenance requirements, MWS preferences, TDEC guidance, constructability, and permitability.
- Floodplain/Floodway. Several locations along the alternate conveyance route corridor and secondary tank drain corridor lie within the 100-year floodplain and within the floodway. Facility siting, cut/fill design, and floodplain ordinance requirements should be considered to minimize or avoid variance requests. Early discussions with MWS Stormwater are recommended.
- Wetlands: Based upon information from the Tennessee Water Resources Agency and the United States Fish and Wildlife Service, the project area does not cross any wetlands. However, the existing Mill Creek/ Opryland Equalization Facility lies in close proximity to a freshwater forested/shrub wetland along the Cumberland River and that should be taken into consideration during design.
- Threatened/Endangered Species. Based upon information provided by the Tennessee Department of Environment and Conservation's Division of Natural Areas, one endangered plant, the Water Stitchwort (*Stellaria fontinalis*); a rare/endangered species, the Nashville Crayfish (*Orconectus shoupi*); and a heron rookery have been identified along the banks of and within Mill Creek. It is assumed that any portion of the project along the banks of Mill Creek could potentially impact these species, particularly the Nashville Crayfish. It is also anticipated that the area may contain the roosting habitat of endangered or threatened bats. Design considerations should include minimal impact to the Nashville Crayfish and any additional threatened or endangered species identified by the Designer.
- Land/Easement Acquisition. Permanent easement acquisitions will be required along the route of the conveyance improvements and the secondary drain line, and temporary construction easements are also expected. The property at 1450 Lebanon Pike (the site of the new equalization facility) is owned by MWS.
- Coordination with property owners. Pipe installation and restoration in the affected properties will need to be coordinated with the adjacent and affected property owners. The alternate route corridor for the conveyance improvements crosses or runs adjacent to residential and commercial property and crosses or runs adjacent to cemeteries west of Spence Lane. Coordination for hours, activity type, construction and operational noise, and construction traffic issues will be required to respect the nature of the property.
- Maintenance of access along Visco Drive. The industrial and commercial facilities along the Visco Drive corridor operate 24 hours a day with consistent heavy truck traffic. Work along that corridor will need to be conducted in order to maintain access to the industrial and commercial facilities.
- Potential utility conflicts. Numerous utilities, including water, gas, gas transmission, communication, and petroleum transmission lines, have been identified along the alternate route

corridor for the conveyance improvements and the Visco Drive corridor. Selection of pipe routes will need to address risks associated with utilities.

- Coordination with CSX and C. J. Corman Railroads. The existing sewer and alternate route corridor for the conveyance improvements cross a CSX railroad twice. The equalization site is adjacent to the C. J Corman Railroad. The force main for filling the existing tanks, both the primary drain line to the 84-inch diameter sewer and the secondary drain line to Browns Creek Pump Station, and electrical connections would cross this commuter and service railroad. The corridor for the secondary tank drain would also cross several railroad spurs. Coordination and permitting with CSX Railroad, C. J. Corman Railroad, and possible private spur owners will be necessary.
- Geotechnical. The Designer will need to characterize soils and rock formations to assess potential challenges in design and construction of the conveyance improvements, the wet-weather pump station, and the equalization tanks.

Permitting

The following permits were identified as likely to be required for this project; however, further evaluation of the need to acquire these permits (and any other permits not listed below) will be conducted by the Designer:

- NPDES Stormwater Construction Permit (TDEC, Metro)
- Floodplain Variance (Metro)
- Grading Permit (Metro)
- Building Permit (Metro)
- Plans and specs approval/Authorization for Construction (TDEC)
- Erosion Prevention and Sediment Control – Inspection during Construction (TDEC, Metro)
- Aquatic Resource Alteration Permit (ARAP) for Mill Creek, Browns Creek, and other waterway crossings (TDEC)
- Post-construction submittal of Notice of Coverage for the NPDES Stormwater Permit (TDEC)
- *Stormwater Pollution Prevention Plan* (TDEC, Metro)
- TDOT Rights-of-Way encroachment and crossing permits
- CSX Railroad and C. J. Corman Railroad Rights-of-Way encroachment and crossing permits
- Section 10/404 Permit (US Army Corps of Engineers may obviate the need for either)

Public Outreach Efforts

A public *Communications Plan* will be developed by the Program to facilitate communication with affected property owners and nearby commercial/industrial facilities. This effort will primarily be coordinated through the Program with assistance provided by the Designer and the CMAR on an as-needed basis.

Reference Information

The following reference materials are available on the Mill Creek Trunk Improvements and Equalization Facility project page of the Clean Water Nashville website (https://www.cleanwaternashville.org/mill-creek-trunk-improvements-and-equalization-facility):

- *Limited Geotechnical Review of the Mill Creek Trunk Improvements Corridor*, prepared by Clean Water Nashville Overflow Abatement Program, dated December 2016

- *Browns Creek Pump Station – Hydraulic Capacity Analysis,* prepared by Clean Water Nashville Overflow Abatement Program, dated December 2016
- *Mill Creek Trunk Improvements and Equalization Facility Route Study,* prepared by Clean Water Nashville Overflow Abatement Program, dated June 2017
- *Study on Equalization Facility Draining,* prepared by Clean Water Nashville Overflow Abatement Program, dated June 2017
- *Supplemental Geotechnical Information, prepared by Clean Water Nashville Overflow Abatement Program*, dated June 2017
- *Mill Creek Trunk Improvements and Equalization Facility – Omohundro Water Treatment Plant Backwash Discharge,* prepared by Clean Water Nashville Overflow Abatement Program, dated October 2019

The following reference materials are available and will be provided to Designers at the Pre-Proposal Meeting:

- Record drawings for MWS Projects No. 62-S-41, 62-S-74, 62-S-78, 63-S-45, 66-S-41, 66-S-53D, 67-S-40, 76-SB-1, 91-SC-35A, 96-SG-110A, and 96-SG-110B which describe the existing gravity sewer for this site
- MWS Project No. 03-SC-136A: *Barker Road/Omohundro Equalization Basin*, record drawings, dated 2008
- MWS Project No. 11-SC-0102: *Mill Creek/Opryland Equalization Facility Phase II*, record drawings, dated 2013
- MWS Project No. 76-SB-0001: *Browns Creek Wastewater Pumping Station*, record drawings, dated 1977
- MWS Project No. 90-SC-06A1: *Browns Creek Pumping Station Expansion*, record drawings, dated 1993
- MWS Project No. 95-WG-92B3: *Omohundro WTP 24" Backwash Line Replacement*, design and record drawings, dated 1998
- Sewer Impact Study for the *Omohundro Water Treatment Plant Waste Discharge* (partial), prepared by Consoer Townsend, dated 2000
- *Omohundro South Electrical Substation* geotechnical investigation report for MWS prepared by Geotek, dated August 2015

Additional record drawings and GIS data (including, but not limited to, gravity sewers, wastewater force mains, manholes, parcels, and aerial photography) for the gravity sewers in the surrounding area will be available, as needed, to the selected Designer.

Map/Schematic

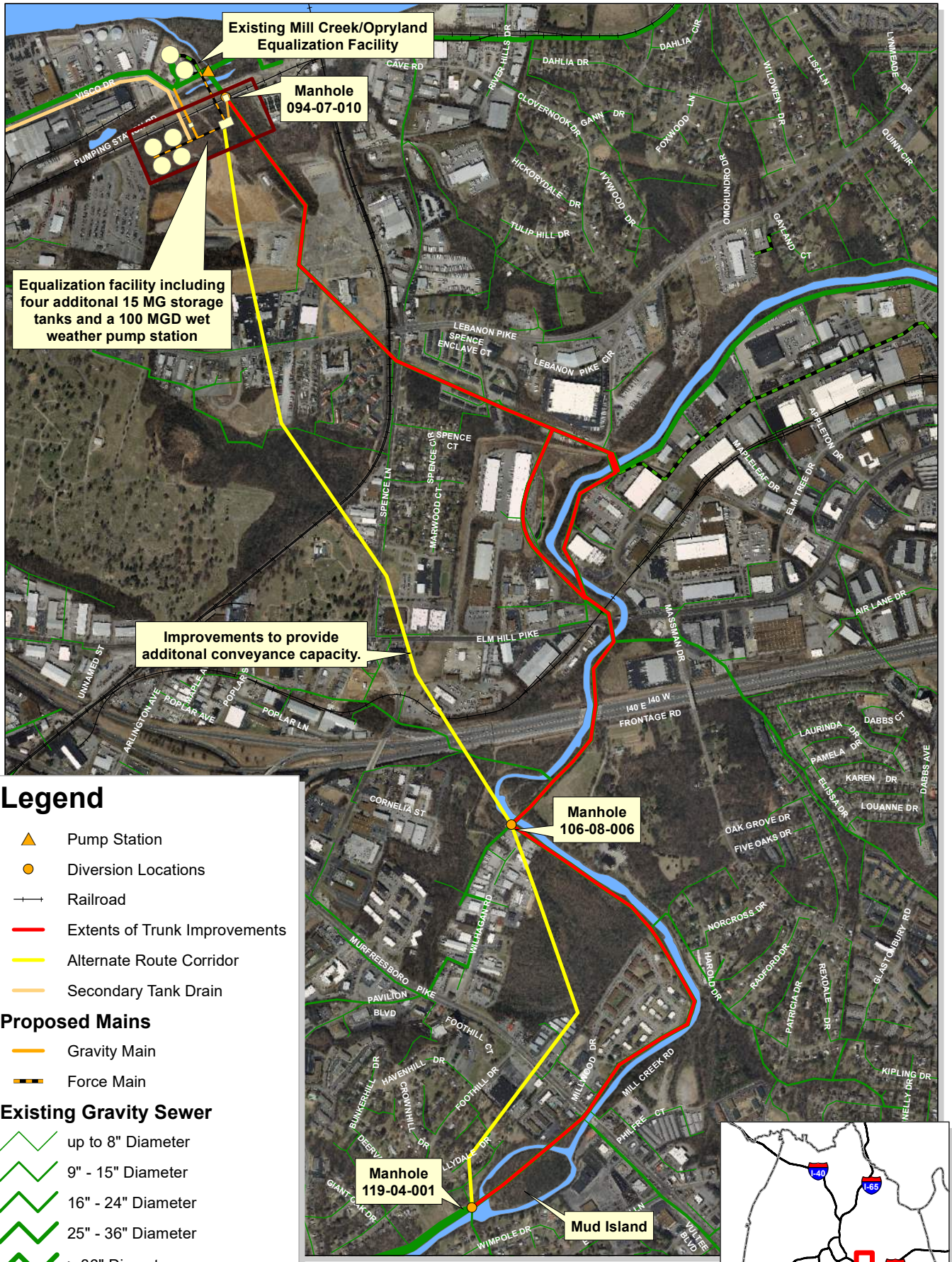
See the attached maps.

cleanwater NASHVILLE
OVERFLOW ABATEMENT PROGRAM

Mill Creek Trunk Improvements and Equalization Facility: Conveyance Improvements

0 1,000 2,000 4,000 Feet

MWS Project Number: 11-SC-0151



Legend

- Pump Station
- Diversion Locations
- Railroad
- Extents of Trunk Improvements
- Alternate Route Corridor
- Secondary Tank Drain

Proposed Mains

- Gravity Main
- Force Main

Existing Gravity Sewer

- up to 8" Diameter
- 9" - 15" Diameter
- 16" - 24" Diameter
- 25" - 36" Diameter
- > 36" Diameter
- Existing Force Main
- Target Property

N W E S

Note: Project footprint is shown as an example and has not been finalized through design.

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OVERFLOW ABATEMENT PROGRAM

Mill Creek Trunk Improvements and Equalization Facility: Equalization Facility Improvements

MWS Project Number: 11-SC-0151

0 1,000 2,000 4,000 Feet

Legend

- Pump Station
- Railroad
- Extents of Trunk Improvements
- Alternate Route Corridor
- Secondary Tank Drain

Proposed Mains

- Gravity Main
- Force Main

Existing Gravity Sewer

- up to 8" Diameter
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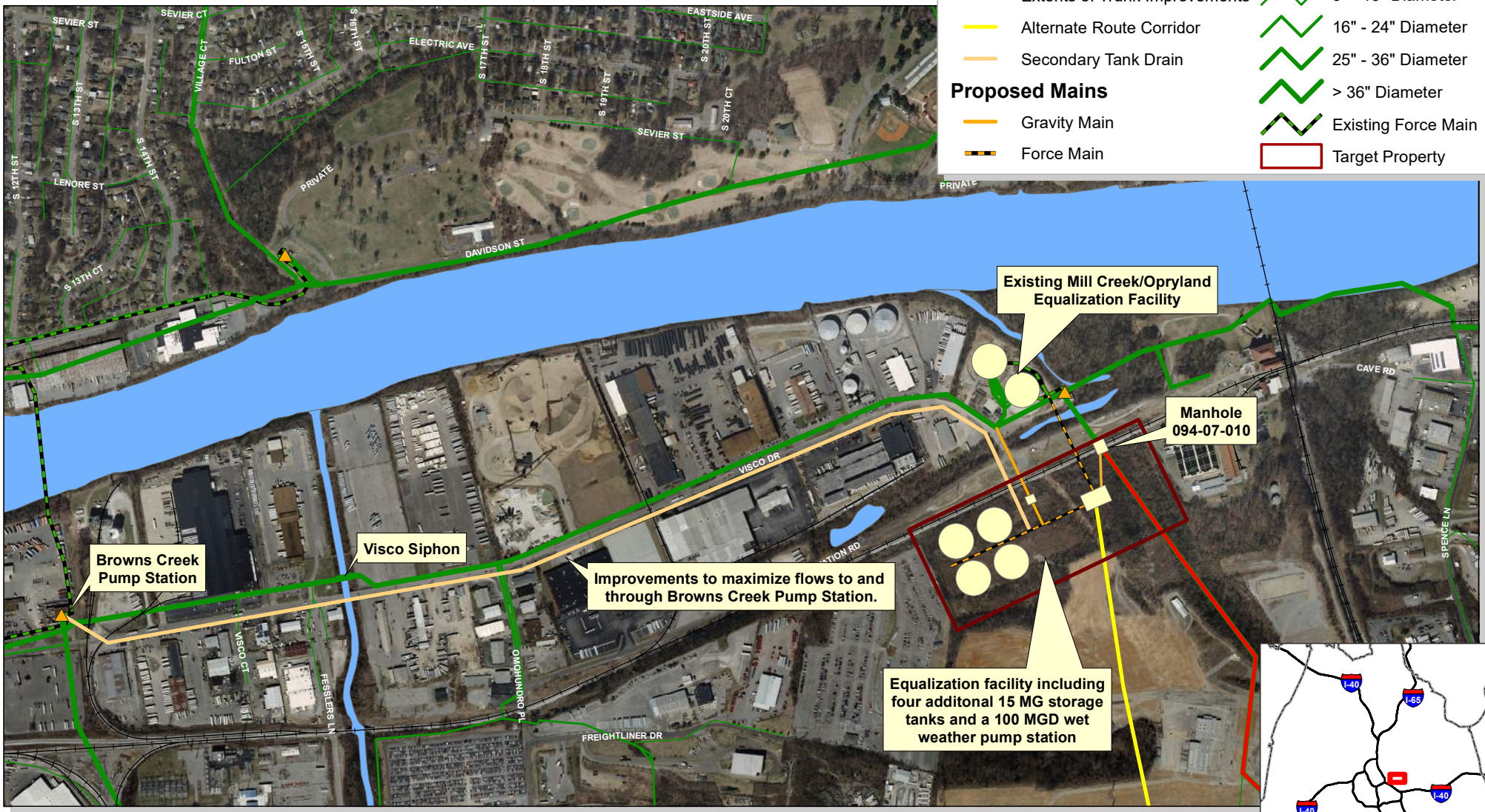
- Target Property



N W E S

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