2 ALTERNATIVES

2.1 Introduction

A broad range of alternative technologies to control CSOs was considered in developing the LTCP; including source controls, inflow controls, sewer system optimization, sewer separation, storage technologies, treatment technologies, and receiving water improvements. Through analysis of individual technologies and various combinations of technologies, DC WASA determined that a deep tunnel system to provide storage capacity for CSO diversions and convey the excess volume to BPAWWTP through pumps and gravity flow would be the most practicable combination of technologies. DC WASA developed and screened several alternative tunnel alignments based on the following considerations. Alternative technologies and tunnel alignments are summarized below and are discussed in more detail in **Section 2.2**.

- **WMATA consent:** WMATA consent is required to allow under-crossings of its facilities. Some locations of the proposed crossings have higher risk and greater complexity, because of existing surface structures and difficulties with respect to improving the ground in these areas.
- **DDOT consent:** DDOT consent is required to allow its bridge structures to be under-crossed. Some locations of the proposed crossings could have higher risk and greater complexity, because of existing surface structures and difficulties with respect to improving the ground in these areas.
- **Depth of wet well:** This criterion considers the presence of identified subsurface obstructions and the protection of existing structures, which would force certain alternative alignments to be located deeper than others and result in a deeper wet well at the TDPS.
- **Ground conditions:** This criterion considered available geotechnical information along the WMATA Green and Blue Lines and at the 11th Street and Sousa Bridges.
- **Tunnel length:** This criterion considered the effect of the tunnel length.
- **Settlement risk:** This criterion considered the potential for settlement of existing surface and subsurface structures.
- **Utilities:** This criterion considered the impact of an alignment on existing utilities.
- **Potential presence of contamination:** This criterion considered the impacts associated with encountering contaminated materials during excavation. The potential impacts include safety concerns for workers and the public, as well as the costs and schedule impacts associated with handling and disposing of excavated contaminated material.
- **Access for ground improvement:** This criterion considered the availability of open space above and adjacent to the proposed alternative alignments, which would allow for potentially easy surface access to improve and monitor the ground below WMATA and DDOT structures at the potential tunnel crossings and connections. Without ready surface access for implementing ground improvement techniques and installing monitoring devices, the tunnel connection and settlement mitigation methods would become more difficult to implement.
- **Proximity to CSO outfall sewers:** This criterion considered the length of the drop shaft connection to the tunnel and surface conduit.
- **Right-of-way acquisition:** Easement rights or property purchase for tunnels and associated facilities would be easier to obtain in public right-of-way and on NPS property than in private or otherwise restricted property.

- **Construction impact to surrounding communities:** Dust, noise, vibration, and traffic impacts are all important aspects to consider and minimize at construction sites and drop shafts.
- **Construction risk:** Risk relating to the variability of ground conditions, depth of tunnel, clearance of existing structures, construction of shafts in soft ground, and the length and number of river crossings were all considered.

The Facility Plan (see **Appendix C**) and ARP-related public involvement materials (see **Appendix D**) refer to the project components by Contract Division, which were developed to segment the project components into individual construction projects, in order to complete and fund the entire project by 2025. This EA considers all project components as part of the proposed project; however, it focuses on the tunnel alignments and areas of surface disturbance, as described in **Section 2.2.2**. **Table 2.1-1** relates the Contract Divisions from the Facility Plan to their associated surface disturbance areas.

Table 2.1-1: Surface Disturbance Areas for Alternative B

Contract Division	Contract Division Name	Surface Disturbance Area(s)
A	Blue Plains Tunnel	• Blue Plains Advanced Waste Water Treatment Plant Facilities • Bolling Air Force Base Overflow and Diversion Facilities • Poplar Point Pumping Station • Main Pumping Station Diversion Facilities
B	Tingey Street Diversion Sewer for CSOs 013 & 014	Tingey Street Diversion Sewers
C	CSO 019 Overflow and Diversion Structures	CSO 019 Overflow and Diversion Facilities
D	Bolling Air Force Base Overflow and Potomac Outfall Diversion Sewer	Bolling Air Force Base Overflow and Diversion Facilities
E	M Street Diversion Sewer for CSOs 015, 016, & 017	M Street Diversion Facilities
F	CSO 018 Diversion Sewer	CSO 018 Diversion Facilities
G	CSO 005 & 007 Diversion Sewer	CSO 005 & 007 Diversion Facilities
H	Anacostia River Tunnel	• Poplar Point Pumping Station • CSO 005 & 007 Diversion Facilities • CSO 018 Diversion Facilities • CSO 019 Overflow and Diversion Facilities
I	Main Pumping Station Diversion	Main Pumping Station Diversion Facilities
Y	Blue Plains Tunnel Dewatering Pumping Station & Enhanced Clarification Facility	Blue Plains Advanced Waste Water Treatment Plant Facilities
Z	Poplar Point Pumping Station Replacement	Poplar Point Pumping Station

2.2 Descriptions of Alternatives

2.2.1 Alternative A – No-Action Alternative

The No-Action Alternative would maintain use of the existing combined sewer system. The combined sewer system conveys both stormwater and sewage to the BPAWWTP. During storm events, the excess sewage and stormwater runoff would continue to discharge into the Anacostia River. DC WASA currently utilizes, and would continue to employ, small-scale programs in an attempt to minimize some of the adverse impacts associated with CSOs. These small scale programs include:

- More efficient use of the Northeast Boundary Swirl Facility (NBSF). The NBSF is a treatment facility located near RFK stadium that can treat up to 400 million gallons per day of overflow liquids from the Northeast Boundary drainage area.
- Use of inflatable dams, known as fabridams, to reduce the amount of debris that reaches waterways. Fabridams are balloon-like devices that are installed in existing sewers that receive CSOs, in order to prevent overflows to receiving waters.
- Operation of skimmer boats to remove floating debris and trash from Anacostia River, thereby improving the quality of waterways within the DC WASA service area and beyond.
- More regular cleaning and maintenance of thousands of catch basins, which are the traps that catch debris and litter before they enter a storm drain.
- Public education and neighborhood initiatives that encourage and support Low Impact Development/Retrofit, rooftop greening, stormwater treatment, street storage of stormwater, rain gutter disconnections, and extending storm sewers to receiving waters.

The No-Action Alternative includes CSO controls. Under EPA mandate, the District previously conducted another facility plan for CSO abatement in 1983. Phase I of this plan was completed in 1991 and consists of a CSO treatment facility, called the Northeast Boundary Swirl Facility (NBSF), and the installation of inflatable dams at eight of the largest CSOs. This No-Action Alternative factors in the completion of the Phase I controls and the rehabilitation of existing pump stations, which are virtually complete. **Table 2.2-1** illustrates the predicted CSO overflow reductions resulting from these controls, which are already in place.

Table 2.2-1: Annual CSO Overflow Predictions for Average Year for Anacostia River

Scenario	Overflow Volume (million gallons per year)
Prior to CSO Phase I Controls	2,142
Phase I CSO Controls Implemented	1,485
Phase I CSO Controls and Pump Station Rehabs Implemented (**No-Action Alternative**)	1,282

Additionally, construction is underway on the federal CSO Nine Minimum Controls program. These projects are designed to reduce CSOs throughout the District by almost 36 percent.

2.2.2 Alternative B – Implementation of Long Term Control Plan (LTCP) (Preferred Alternative)

Alternative B consists of construction of the ARP facilities, largely as described in the Facility Plan (see **Appendix C**). Alternative B would include three major segments: the BPT, the Anacostia River

Tunnel (ART), and the Northeast Boundary Tunnel (NEBT). The design and construction of these components and their associated structures is described below. **Figure 2.2-1** shows the layout of Alternative B.

<u>Blue Plains Tunnel (BPT)</u>

The proposed BPT would be approximately 23,600 linear feet in length, beginning at the BPAWWTP and ending at the Main Pumping Station, located near the intersection of New Jersey Avenue SE and Tingey Street SE, in the southeast part of the District. Approximately 9,700 feet of the tunnel alignment would pass beneath the Potomac and Anacostia Rivers. The proposed tunnel would have a finished inside diameter of 23 feet and the invert of the tunnel would range from approximately 100 to 130 feet below ground surface. The BPT would have a permanent lining, composed of 1.5-foot thick precast concrete segments connected by bolts and gaskets to create watertight joints. The tunnel would be constructed using a pressurized face Tunnel Boring Machine (TBM). A total of five shafts would be constructed from the surface to the tunnel's depth, and would be used to both facilitate tunnel construction and to house permanent facilities (see **Figure 2.2-2**). Shafts would be located at each end of the tunnel, and at intermediate locations along the alignment, with internal diameters ranging between 50 and 116 feet. Shaft construction would involve slurry walls or ground freezing. In addition to the tunnel and the shafts, the BPT would include an overflow structure at BAFB; and a total of four diversion chambers at BAFB, Poplar Point, and Tingey Street; a junction structure at the Main Pumping Station; and diversion sewers at Tingey Street and Poplar Point to divert CSOs to the tunnel.

The BPT and its associated hydraulic structures would have four general areas of surface disturbance (see **Figure 2.2-3**). The four areas and their associated hydraulic structures are described below, by location, from the southern terminus of the BPT to the northern terminus:

- **BPAWWTP Facilities** (see **Figure 2.2-4**): This surface disturbance area is on the grounds of BPAWWTP, where the BPT would make landfall just south of the Blue Plains boundary with the Naval Research Lab, and would contain the Blue Plains Tunnel Dewatering Pumping Station (BPT-DPS) and a new enhanced clarification facility. The BPT-DPS would be housed in a shaft, designated as the Blue Plains Tunnel Drop Shaft (BPT-DS). A second shaft, the Blue Plains Tunnel Screening Shaft (BPT-SS) is planned to be 60 feet inside diameter and would enclose the screening and sluice gate equipment and provide capacity for surge storage volume. An inter-shaft tunnel would connect the BPT-SS with the BPT-DS, which is planned to be 116 feet in internal diameter and would house a rectangular wet-well and pumping facilities required for dewatering the CSO storage/conveyance tunnels. The shaft site would also include a new enhanced clarification facility. During construction of the BPT, the BPT-SS would be used as the mining shaft where all of the construction activities related to excavating the tunnel would take place, including removal of muck from the entire length of tunnel excavation. Construction of the BRT and associated shafts, which would require use of this surface disturbance area, is scheduled to occur between December 2011 and July 2015.

- **Bolling Air Force Base Overflow and Diversion Facilities** (see **Figure 2.2-5**): This surface disturbance area is located along the bank of the Potomac River within BAFB. A single shaft, 50 feet in diameter and designated as BAFB Drop Shaft (DS) would be constructed in this location. The BAFB-DS would contain combined drop/overflow hydraulic structures that would drop diverted flows from the existing Potomac Outfall Sewers on BAFB into the BPT and serve as one of two overflow points for the tunnel system. This overflow structure would be comprised of a rectangular concrete structure that would be constructed with the existing levee. (see **Figure 2.2-6**). All of the overflow structure, except for the outlet, is planned to be below grade. Its design has been coordinated with the appropriate BABF personnel. DC WASA would provide

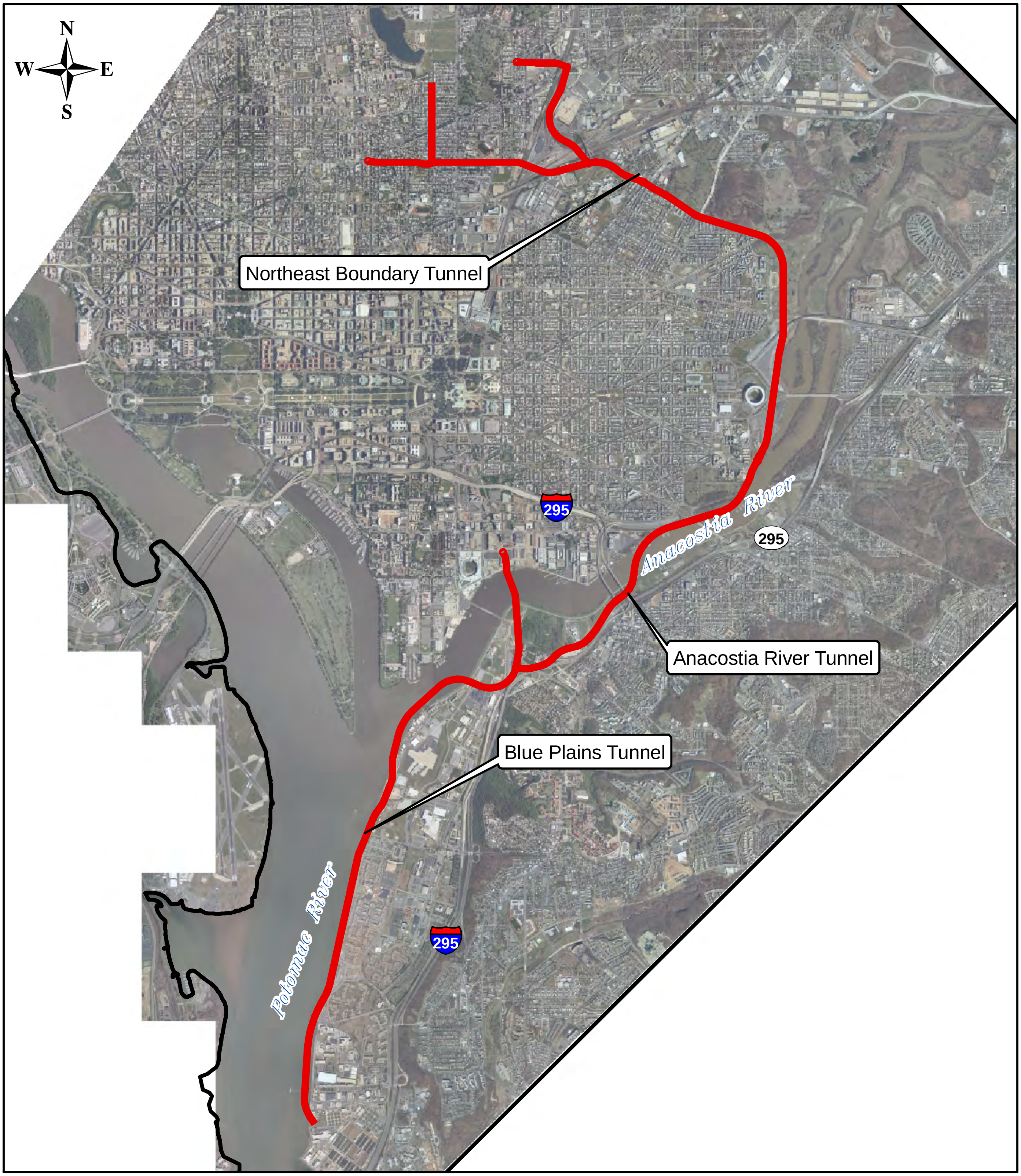

Figure 2.2-1:
Alternative B Alignment

Anacostia River Projects
Long-Term CSO Control Plan
Washington, D.C.

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Legend:
Preferred Tunnel Alignment
DC Boundary

Scale: 1 inch = 5,000 feet

0 2,500 5,000 10,000 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

Figure 2.2-2:
Shaft Construction

Anacostia River Projects, Long-term CSO Control Plan
Washington, D.C.

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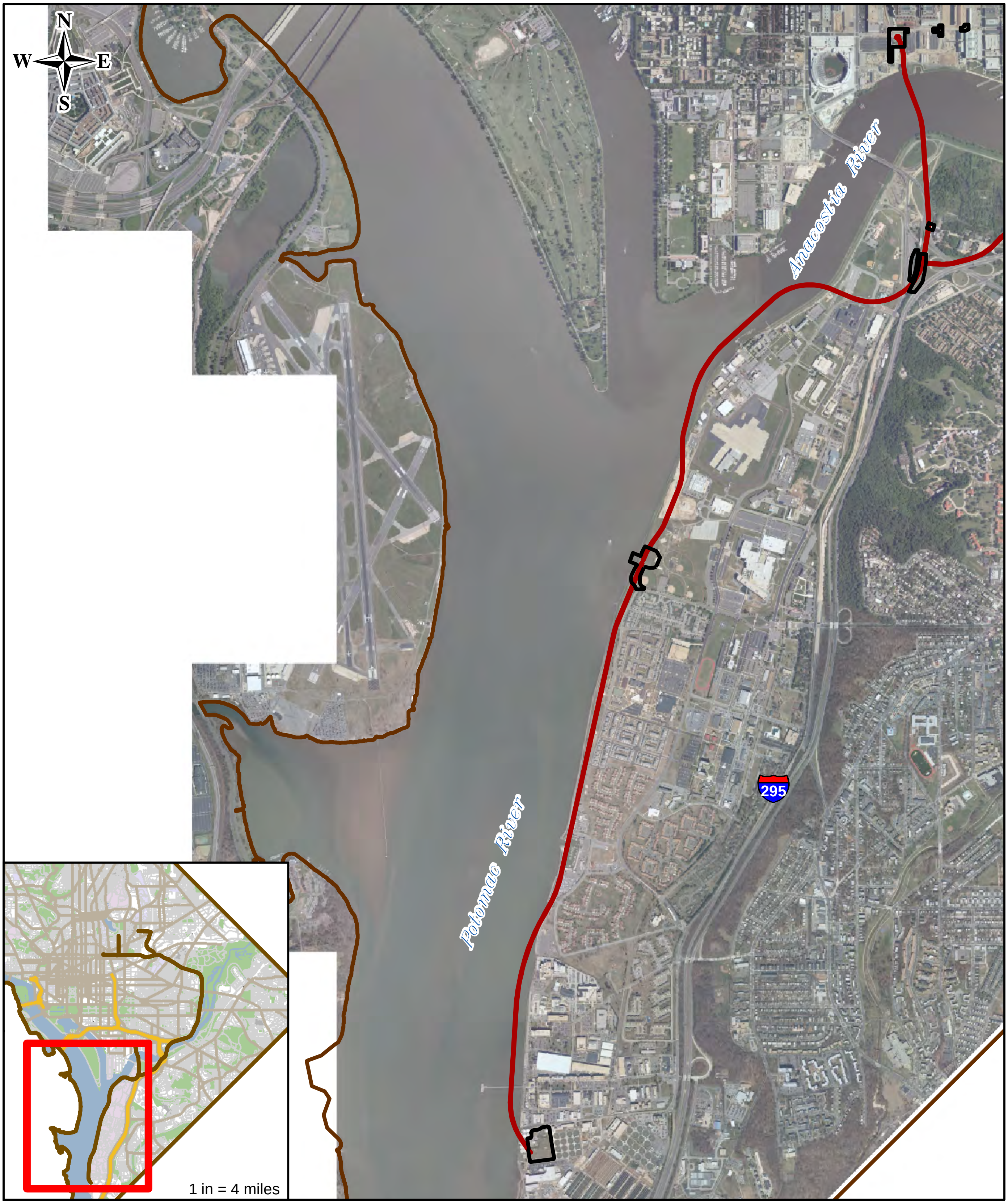

Figure 2.2-3:
Blue Plains Tunnel
Surface Disturbance Map

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
Surface Disturbance Area
Preferred Tunnel Alignment
City of DC Boundary

Scale: 1 in = 4 miles
0 2 4 8 Miles

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

Figure 2.2-4:
BPAWWTP Facilities Map

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
- Project Facility
- Surface Disturbance Area
- Preferred Tunnel Alignment

Scale: 1 inch = 200 feet

0 100 200 400 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

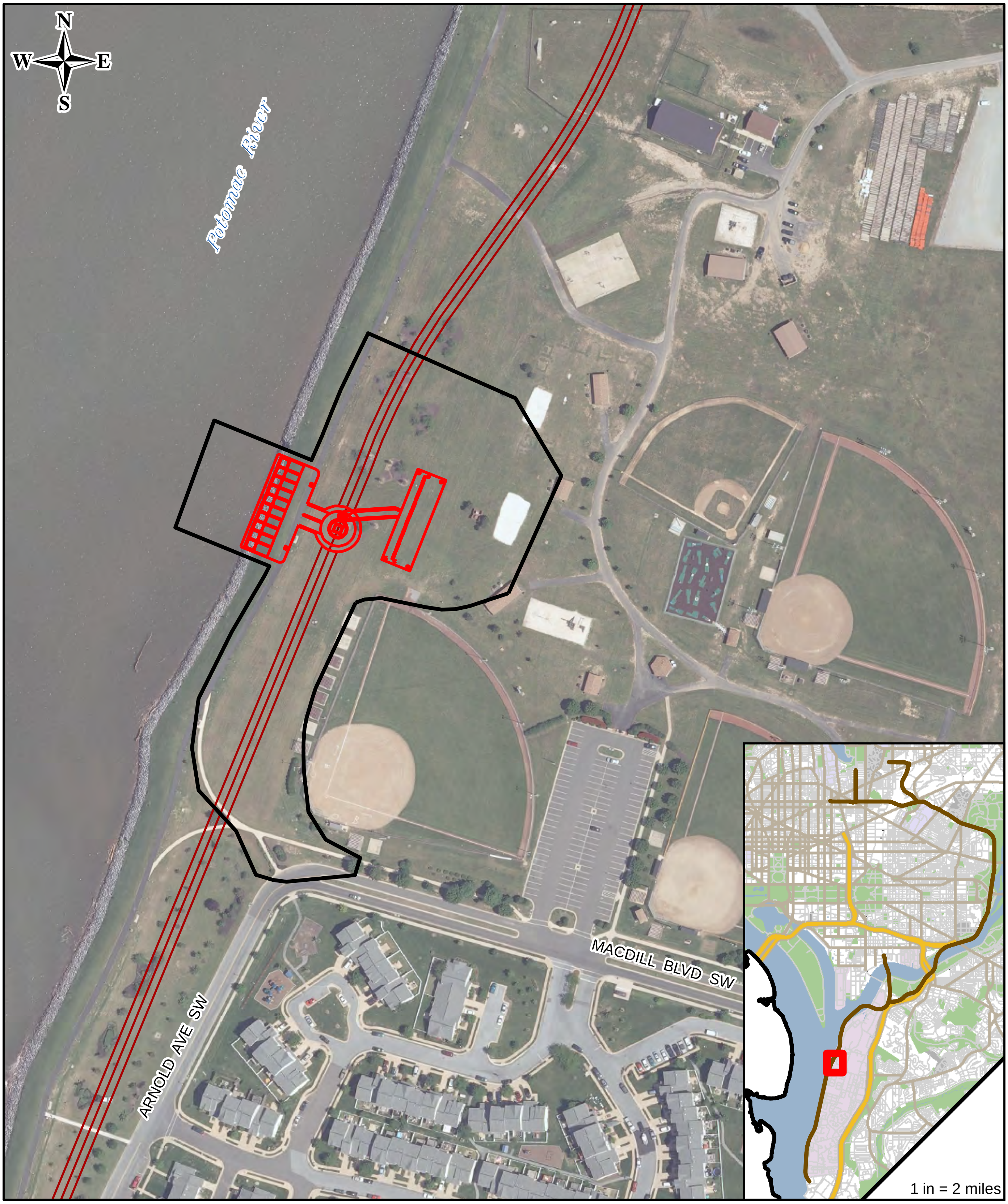

Figure 2.2-5:
Bolling Air Force Base
Overflow and Diversion Facilities

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
- Project Facility
- Surface Disturbance Area
- Preferred Tunnel Alignment

Scale: 1 inch = 200 feet
0 100 200 400 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

Figure 2.2-6:
BAFB Overflow Facility Location

Anacostia River Projects, Long-term CSO Control Plan
Washington, D.C.

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landscaping, a new parking area, and restroom facilities in this area. Prior to construction in this area, DC WASA would build a paved detour for an existing pedestrian trail around the construction area in order to maintain use during construction. Construction on BAFB would be shielded and contained within a gated area. Construction would occur between June 2015 and June 2017.

- **Poplar Point Pumping Station** (see **Figure 2.2-7**): This surface disturbance area is located at the intersection of South Capitol Street SE, Suitland Parkway SE, and I-295. The western section of this surface disturbance area is located in a paved lot currently used by the District Department of Motor Vehicles (DMV) for commercial drivers license testing. This surface disturbance area would include a diversion chamber for the Main Outfall Sewers, which would be located underground on the DMV lot. The diversion chamber would divert the required flow of 200 mgd from the existing Main Outfall Sewers into the BPT. Approximately 51,000 square feet of total surface disturbance would be associated with construction of the Main Outfall Sewers Diversion Chamber with approximately 185,000 cubic feet of total excavation.

  The eastern portion of the surface disturbance is located on an undeveloped lot between I-295 and South Capitol Street SE. A single shaft designated as Poplar Point Junction Shaft (PP-JS) would be located at this site and would be 60 feet in diameter. This shaft would serve as the junction point of the BPT and the ART and would also house permanent hydraulic structures that divert flows from the Main Outfall Sewers into the BPT. A new pumping station would also be built 1,000 feet south of the existing Poplar Point Pumping Station. Approximately 88,200 square feet of total surface disturbance would be associated with construction of the new Poplar Point Pump Station and PP-JS. Approximately 303,500 cubic feet of total excavation would be associated with the pump station and approximately 515,000 cubic feet of total excavation would be associated with the PP-JS.

  This surface disturbance area would also include a diversion chamber for the Anacostia Main Interceptor (AMI), which would be located underground at the intersection of Howard Road, SE and Suitland Parkway. Flow from the AMI, approximately 47 mgd, would be diverted to the new Poplar Point Pumping Station via a 54-inch diversion sewer approximately 1,000 feet in length, and pumped to the existing Main Outfall Sewers. Flows beyond pump station capacity would overflow into the BPT from a diversion manhole along the 54-inch diversion sewer. Approximately 11,200 square feet of total surface disturbance would be associated with construction of the AMI Diversion Chamber, with approximately 9,500 cubic feet of total excavation. Construction of the Poplar Point Pumping Station facilities would occur between March 2015 and March 2018.

- **Tingey Street Diversion Sewers and Main Pumping Station Diversion Facilities** (see **Figure 2.2-8**): This surface disturbance area is located at the northern terminus of the BPT. This area would contain the Main Pumping Station Drop Shaft (MPS-DS). This 55-foot-diameter shaft would be constructed prior to the TBM reaching this location and would serve as the TBM extraction point at the completion of the BPT excavation. The shaft would house permanent hydraulic structures to drop diverted flows into the BPT from several CSOs in the Tingey Street area.

  The Tingey Street Diversion Sewers would include two diversion chambers, a junction chamber, and microtunneling. These diversion facilities would be located underground. A total of approximately 78 million gallons per day (mgd) would be diverted from CSOs 013 and 014 to the BPT through the CSO 012 Diversion Chamber and on to the MPS-DS.

  The CSO 013 Diversion Chamber would be constructed upstream of the existing CSO 013 regulator on the existing outfall and would be located at the intersection of 4th Street SE and

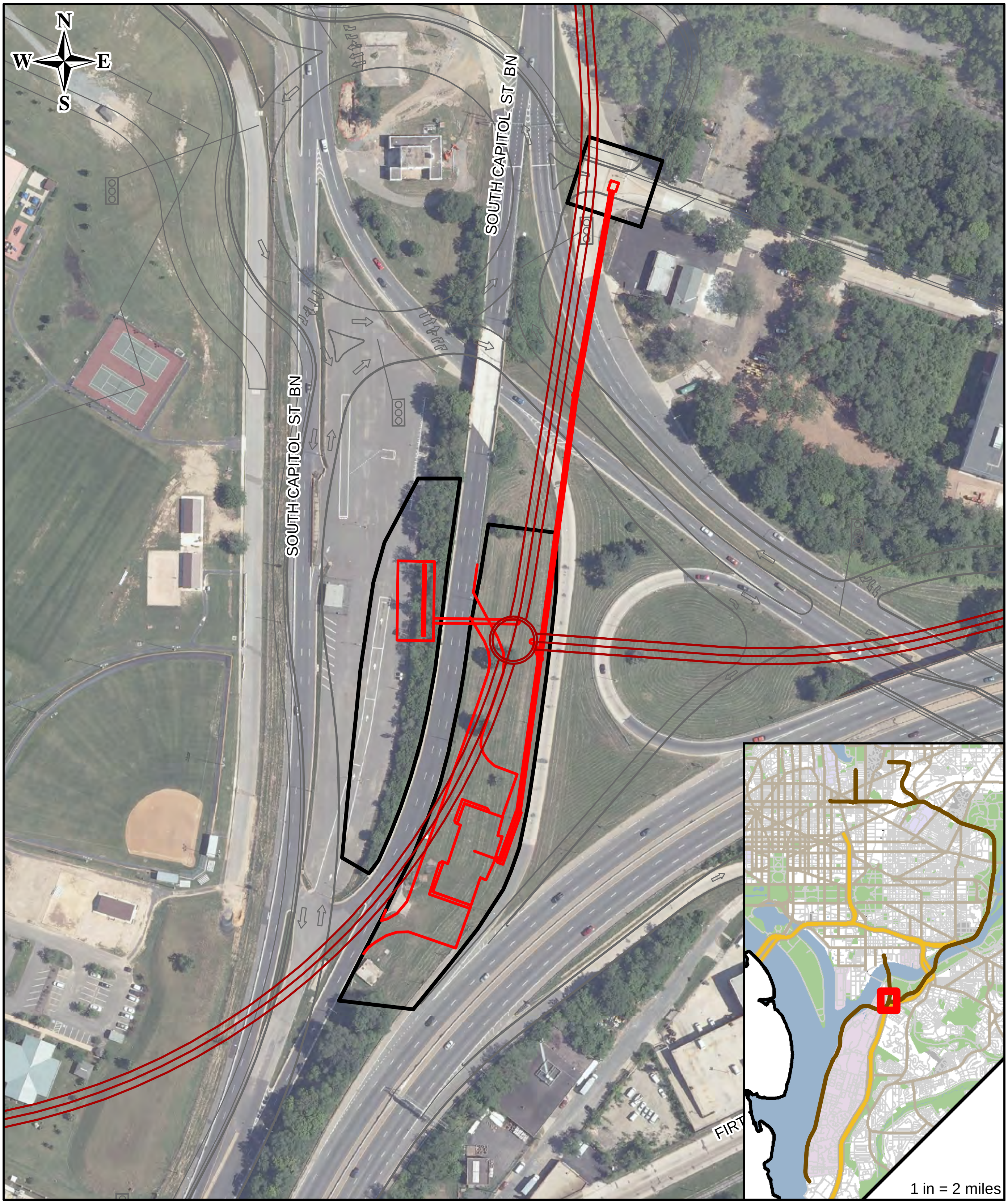

Figure 2.2-7:
Poplar Point
Pumping Station Map

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:

- Project Facility
- Surface Disturbance Area
- Preferred Tunnel Alignment
- New Road Alignment

Scale: 1 inch = 200 feet

0 100 200 400 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

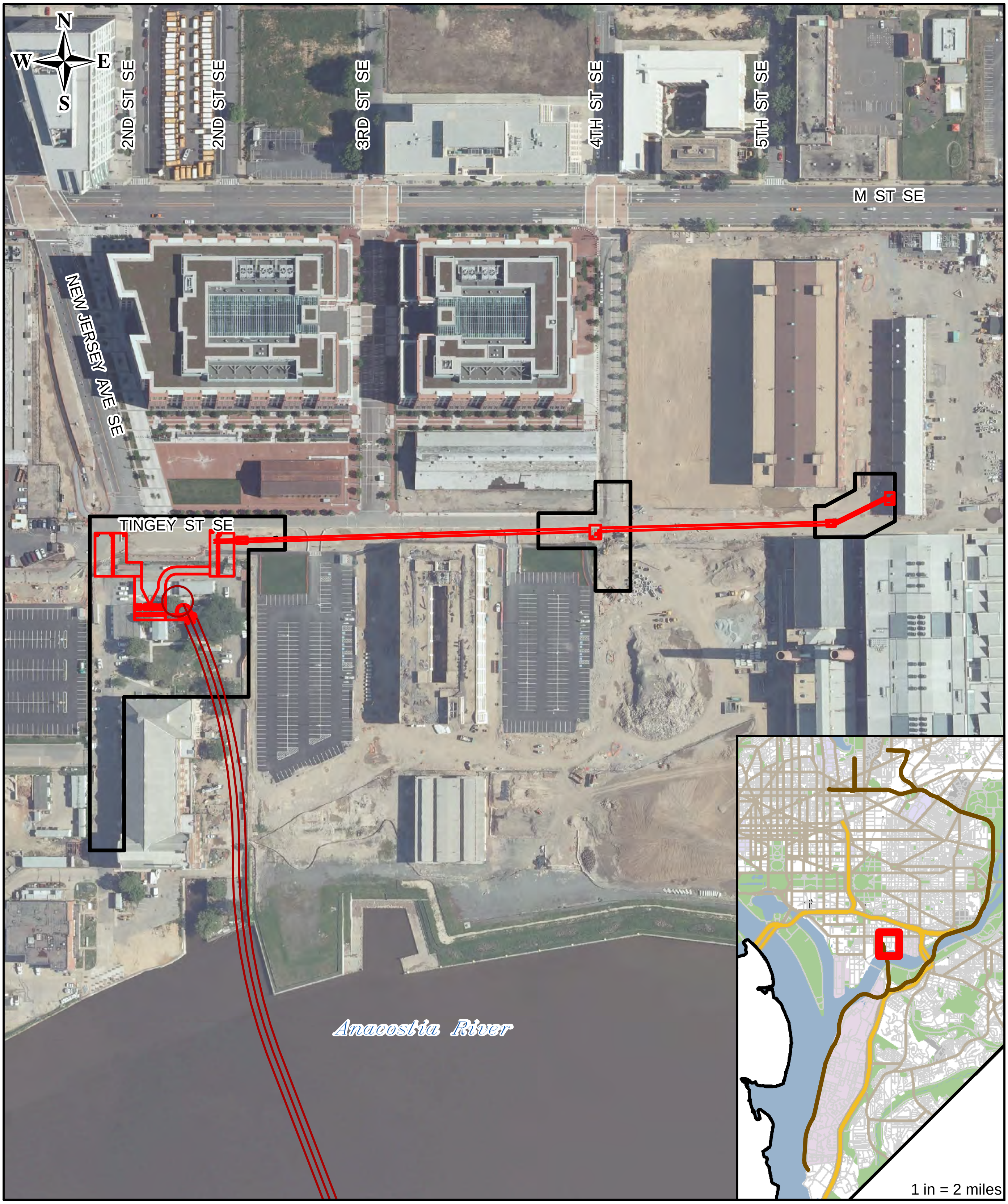

Figure 2.2-8:
Tingey Street Diversion Sewers and Main Pumping Station Diversion Facilities

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
- Project Facility
- Surface disturbance Area
- Preferred Tunnel Alignment

Scale: 1 inch = 250 feet

0 125 250 500 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

Tingey Street SE. It would include the construction of a new regulator upstream of where Outfall 013 crosses the East Side Interceptor. The diversion chamber would also serve as Junction Chamber 013/014, by combining the flow from Outfall 013 with the flow from the CSO 014 Diversion Chamber. Approximately 5,000 square feet of total surface disturbance would be associated with construction of the CSO 013 Diversion Chamber, with approximately 28,500 cubic feet of total excavation.

The CSO 014 Diversion Chamber would divert the required flow of 61 mgd from Outfall 014. The diversion chamber would be located on the outfall sewer for CSO 014 on Tingey Street SE, approximately 500 feet east of 4th Street SE and 300 feet west of Isaac Hull Avenue SE. The diversion chamber would be connected to CSO 012 Diversion Chamber and Junction Chamber 013/014 by approximately 1,130 feet of 66–inch diameter sewer. Approximately 5,000 square feet of total surface disturbance would be associated with construction of the CSO 014 Diversion Chamber, with approximately 28,500 cubic feet of total excavation.

The combined flow of 78 mgd from CSO 013 and 014 would be conveyed via a 66-inch pipe to a junction chamber on the east side of the Tiber Creek Sewer, just east of the previously constructed CSO 012 Diversion Chamber. This junction chamber would serve to either launch or remove the microtunnelling machine for construction of the conduit along the length of Tingey Street SE. Approximately 5,000 square feet of total surface disturbance would be associated with the construction of the Junction Chamber, with approximately 18,000 cubic feet of excavation. Approximately 15,000 square feet of total surface disturbance would be associated with the Tingey Street Diversion Sewer, with approximately 75,000 cubic feet of total excavation.

The Main Pumping Station Diversion Facilities would consist of two diversion chambers, a junction chamber, and a tide gate chamber. A total of approximately 500 mgd would be diverted to the BPT, including the contribution from the Tingey Street Diversion Sewers. The total diverted flow of 500 mgd would be dropped into the BPT through a vortex drop facility, a vortex drop pipe, and a circular deaeration facility, all of which would be contained within the 55-foot-diameter MPS-DS. The CSO 011A and 012 diversions would utilize weirs to divert the peak diversion rates from the respective CSO outfalls to the MPS-DS. The CSO 009/011A diversions would divert a total flow of 201 mgd from both CSO 009 and CSO 011A. This diversion chamber would be located on the north side of the Main Pumping Station, approximately at the intersection of Tingey Street, New Jersey Avenue SE, and N Street SE on the west side of the future Tingey Square. The CSO 012 Diversion Chamber would divert 221 mgd of flow from CSO 012. This diversion chamber would be located on the north side of the Main Pumping Station on the east side of the future Tingey Square. The CSO 012 diversion chamber would also serve as a junction chamber to receive 78 mgd from the Tingey Street Diversion Sewers for a total of 299 mgd from CSO 012, CSO 013, and CSO 014. A total flow of 299 mgd from the CSO 012 Diversion Chamber would be conveyed by an 8-foot wide conduit to the Tide Gate Chamber located on the north side of the Main Pumping Station.

Approximately 51,000 square feet of total surface disturbance would be associated with the Main Pumping Station Diversion Facilities, with approximately 860,000 cubic feet of total excavation. Construction of both the Tingey Street Diversion Sewers and the Main Pumping Station Diversion Facilities would occur between July 2012 and January 2018.

Anacostia River Tunnel (ART)

The proposed ART would extend approximately 12,600 feet, originating at the PP-JS described above and terminating at the CSO 019 overflow structure. This structure is proposed to be rehabilitated at its existing location on the west bank of the Anacostia River, south of RFK Stadium and Kingman Lake. Approximately 9,200 feet of the tunnel alignment would pass beneath the Anacostia River. The proposed tunnel would have a 23-foot finished diameter and would range from 90 to 100 feet below ground surface. The ART would have a permanent lining composed of 1.5-foot precast segments connected by bolts and gaskets. The tunnel would be constructed using a TBM. A total of five shafts would be constructed to tunnel depth and would be used to facilitate tunnel construction, as well as house permanent facilities.

The ART and its associated hydraulic structures would have several areas of surface disturbance (see **Figure 2.2-9**). Shafts would be located at each end of the tunnel and at two intermediate locations along the alignment, with internal diameters between 50 and 110 feet. Shaft construction methods would involve slurry walls, ground freezing, or other rigid excavation support systems. In addition to the ART and its associated shafts, three diversion sewers would be constructed to divert CSO volumes directly to the ART. The various facilities are described below, by location, from the southern terminus of the ART to the northern terminus:

- **Poplar Point Pumping Station** (see **Figure 2.2-7**): The previously described shaft designated as PP-JS, constructed as part of the BPT, would be utilized for launching the TBM for construction of the ART.

- **CSO 005 & 007 Diversion Facilities** (see **Figure 2.2-10**): This surface disturbance area, located on the east side of the Anacostia River along Anacostia River Park, would contain a drop shaft that would convey flow from the proposed diversion sewers for CSOs 005 and 007 to the ART. The proposed CSO 005 and 007 Drop Shaft would have an inside diameter of 50 feet and an overall depth of 110 feet from surface grade to the top or crown of the tunnel. A vortex drop pipe and deaeration facility would be contained within the drop shaft. Approximately 68,000 square feet of total surface disturbance would be associated with construction of the CSO 005 & 007 Drop Shaft, with approximately 36,000 cubic feet of excavation.

  This surface disturbance area would include the individual diversion chambers for CSOs 005 and 007, which would be at grade or located underground. They would divert a total flow of approximately 66 mgd to the ART. The CSO 005 Diversion Chamber would be located adjacent to I-295 in Anacostia River Park Section C (administered by NPS), near the extension of Chicago Street SE, and would divert required flows of up to 22 mgd from CSO 005 via a sump regulator. The regulator would require the complete removal of a portion of the existing outfall pipe and subgrade. Flows would be diverted to a 36-inch diameter diversion sewer and conveyed to the CSO 005 & 007 Drop Shaft/Vortex Facility. The 36-inch diameter diversion sewer would be constructed using open-cut methods. Approximately 84,000 square feet of surface disturbance would be associated with construction of the CSO 005 Diversion Chamber, with approximately 45,000 cubic feet of total excavation.

  The CSO 007 Diversion Chamber would be located just north of I-295, between the existing northbound and southbound 11th Street Bridges, and would divert the required flow of 44 mgd from Outfall 007 via a sump regulator. The regulator would require the complete removal of a portion of the existing outfall pipe and subgrade. Flow would be diverted from the sump into a 54-inch diameter diversion sewer, which would convey the diverted flow to the CSO 005 & 007 Drop Shaft/Vortex Facility. Approximately 65,000 square feet of surface disturbance would be associated with construction of the CSO 007 Diversion Chamber, with approximately 4,500 cubic feet of total excavation. Construction would occur between May 2012 and November 2013.

- **CSO 018 Diversion Facilities** (see **Figure 2.2-11**): This surface disturbance area, located on the west side of the Anacostia River south of Barney Circle, would contain a drop shaft that would convey flow from CSO 018 to the ART. The CSO 018 Drop Shaft would be 55 feet in

Figure 2.2-9:
Anacostia River Tunnel
Surface Disturbance Map

Anacostia River Projects
Long-Term CSO Control Plan
Washington, D.C.

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Legend:
- Surface Disturbance Area
- Project Facility
- Preferred Tunnel Alignment

Scale: 1 inch = 1,500 feet

0 750 1,500 3,000 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

**Figure 2.2-10:
CSO 005 & 007
Diversion Facilities Map**

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
- Project Facility
- Surface Disturbance Area
- Preferred Tunnel Alignment
- New Road Alignment

Scale: 1 inch = 300 feet

0 150 300 600 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

Figure 2.2-11:
CSO 018 Diversion Facilities Map

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
- Project Facility
- Surface Disturbance Area
- Preferred Tunnel Alignment

Scale: 1 inch = 200 feet

0 100 200 400 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

diameter and approximately 100 feet deep from grade to the invert of the 7.5-foot diversion sewer that would connect the drop shaft to the ART.

This surface disturbance area would include a diversion chamber and sewer for CSO 018, which would be located underground, and would divert approximately 347 mgd to the ART. The CSO 018 Diversion Chamber would be located at the existing CSO 018 Outfall, immediately west of Barney Circle on the north side of the Southeast Freeway. A 7.5-foot diameter diversion sewer would convey the flow southeast beneath the Southeast Freeway, passing beneath the existing railroad lines and connecting to the ART. Approximately 26,640 square feet of surface disturbance would be associated with construction of the CSO 018 Diversion Chamber, including approximately 26,400 cubic yards of excavation. Construction would occur May 2012 and November 2013.

- **M Street Diversion Facilities** (see **Figure 2.2-12**): This surface disturbance area, located along M Street SE near the 9th Street SE, 12th Street SE, and Water Street SE intersection, would include three diversion chambers, one for each CSO, connected by a series of microtunnels, a doghouse manhole, a drop shaft, and a vortex drop facility. All facilities would be located at grade or underground. Flows from CSOs 015, 016, and 017 would be diverted to the proposed CSO 015/016/017 Vortex Drop Facility located near the intersection of M Street SE and Water Street. The CSO 015 Diversion Chamber would divert up to 22 mgd from Outfall 015, the CSO 016 Diversion Chamber would consolidate up to 334 mgd from Outfall 016, and the CSO 017 Diversion Chamber would consolidate up to 311 mgd from Outfall 017 to the ART via the CSO 015/016/017 Vortex Drop Facility. Combined, these facilities would divert up to 667 mgd from Outfalls 015/016/017 to the ART.

  The proposed location for the CSO 015 Diversion Chamber is the intersection of 9th and M Streets SE. Approximately 22,300 square feet of surface disturbance would be associated with the construction of the CSO 015 Diversion Chamber, with approximately 39,000 cubic feet of excavation. A 36-inch diameter junction sewer, approximately 1,000 feet in length, would convey flow from the CSO 015 Diversion Chamber to the CSO 016 Diversion Chamber, located at the northwest corner of 12th and M Streets SE, near CSO 016. The CSO 015 Diversion Chamber would divert flows to the 36-inch diversion sewer up to its capacity. Flows beyond diversion capacity would bypass the structure and overflow to the Anacostia River at the existing CSO 015 outfall.

  The proposed location for the CSO 016 Diversion Chamber is the intersection of 12th and M Streets SE. Approximately 32,500 square feet of surface disturbance would be associated with the construction of the CSO 016 Diversion Chamber, including approximately 39,000 cubic feet of excavation. Consolidated flows from CSO 016 would be conveyed via a 96-inch diameter diversion sewer, approximately 1,200 feet in length, to the CSO 017 Diversion Chamber. Reservations 251, 128, and 129, which included land owned by NPS associated with the L'Enfant Plan, are not within the limits of disturbance for this area and would not be affected.

  The proposed location for the CSO 017 Diversion Chamber is near the intersection of M and 14th Streets SE. Approximately 78,000 square feet of surface disturbance and 377,000 cubic feet of excavation would be associated with the construction of the CSO 017 Diversion Chamber, Drop Shaft, and Vortex Drop Facility. The CSO 017 Diversion Chamber would convey combined diverted flows from CSOs 015, 016, and 017 to the Vortex Drop Facility via a 20-foot by 20-foot box culvert, approximately 300 feet in length. Flows would be dropped into the ART via a 45 foot diameter drop shaft that would extend approximately 110 feet below grade to the invert of the ART. Construction would occur between March 2012 and November 2013.

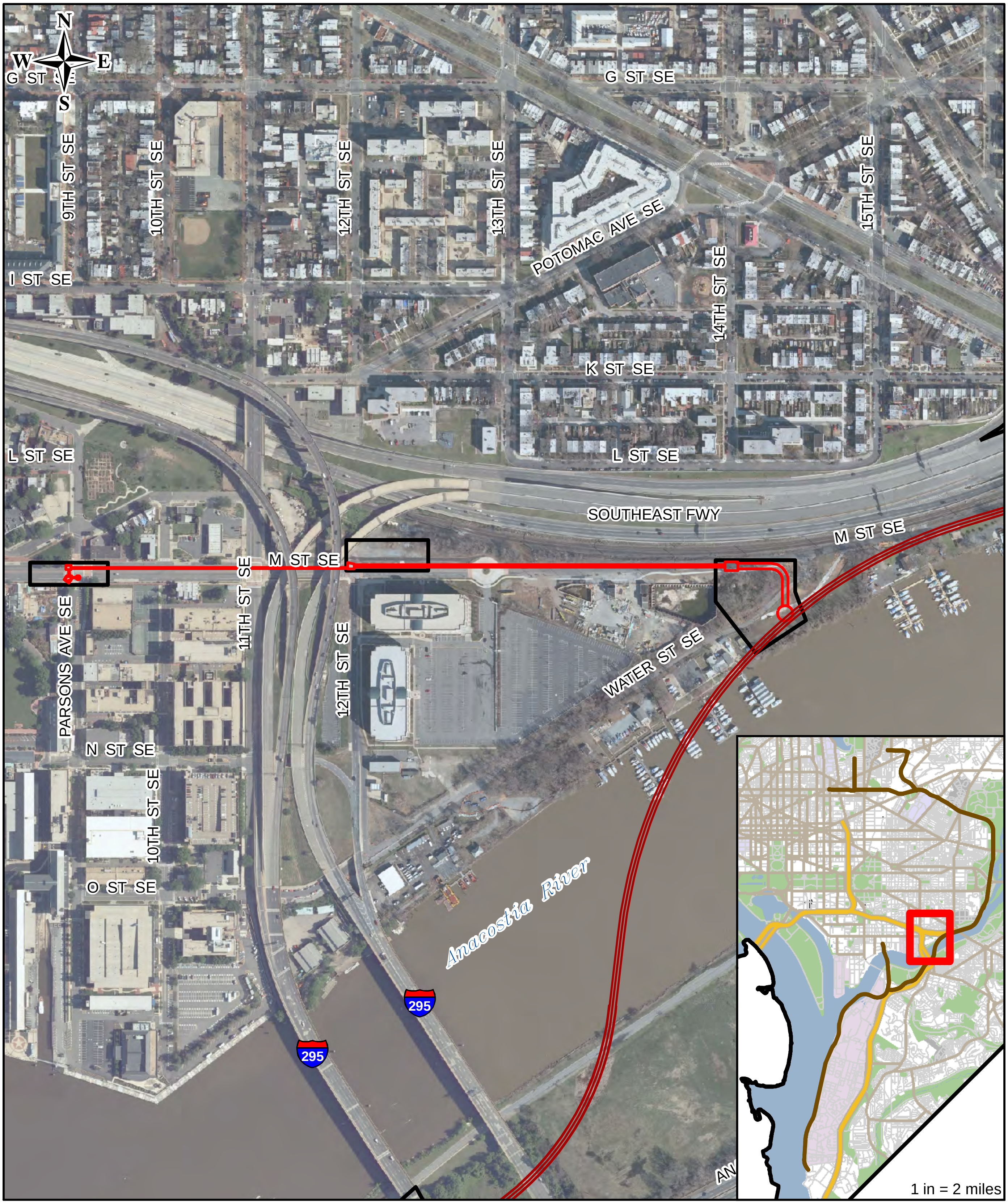

Figure 2.2-12:
M Street Diversion
Facilities Map

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
- Project Facility
- Area of Surface Disturbance
- Preferred Tunnel Alignment

Scale: 1 inch = 500 feet

0 250 500 1,000 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

CSO 019 Overflow and Diversion Facilities (see **Figure 2.2-13**): This surface disturbance area is bounded by Anacostia River to the east, Eastside Pumping Station and Northeast Boundary Swirl Facility to the north, and Water Street to the west. The RFK Stadium Access Road and the Anacostia Riverwalk trail run through this area. Because the facilities proposed at CSO 019 would be located on NPS property, several design alternatives were evaluated before gaining the concept agreement from NPS, the National Capital Planning Commission (NCPC) and the Commission of Fine Arts (CFA). The approved design alternative is shown on **Figure 2.2-14** through **Figure 2.2-16**.

The proposed facilities at CSO 019 would include:

1) A diversion structure to divert flows up to 1160 MGD from the NEB Trunk Sewer (NEBTS) to the ART. The surface exposure would include removable slabs over three tide gates and cast iron covers over a row of stop logs. All other portions of the structure with the exception of manhole frame and covers would be below grade.

2) Along the NEBTS at the location of the existing tide gates, two rows of cast iron covers would be uncovered and brought to grade along with the installation of some additional manhole frames and covers to house instrumentation.

3) An overflow structure, approximately 320 feet in length, would be constructed. The multiple access points along this structure have been carefully coordinated with NPS to be located along the existing road and trail in order to have minimum impact to the surrounding landscape. In addition, the overflow structure would match the stone wall of the existing seawall along the river.

4) Two mining shafts would be constructed in support of the ART and NEBT for construction and operation. The surface treatment of these shafts would include access hatches. The remainder of the structure would be below grade.

5) During construction of an overflow and diversion structure at the site, detours would be provided for the existing access road and trail. Prior to the construction of shafts and tunnel, the detours would be removed and the access road and trail would be restored to their original footprints.

Construction of the ART and the CSO 019 facilities would require the use of this surface disturbance area (see **Figure 2.2-13**). Work would occur between December 2011 and January 2018.

<u>Northeast Boundary Tunnel (NEBT)</u>

The preferred alignment for the NEBT (see **Figure 2.2-17**) would extend from the northern terminus of the ART at the CSO 019 Overflow Facility in a north-northwest direction, passing under the parking lots east of RFK Stadium and the elevated WMATA Blue/Orange Lines. The alignment would then cross Benning Road NE and continue north below the Langston Golf Course. At the north end of the golf course, the alignment would turn northwest and pass under the U.S. National Arboretum to Mount Olivet Road NE. The terminus of the NEBT would be at the Brentwood Reservoir, near the intersection of New York Avenue and 9th Street NE.

While a preferred alignment for the NEBT has been identified, preferred alternatives for the associated components (e.g., drop shafts and branch tunnels) are still under consideration. Project facilities associated with the NEBT may include a Mount Olivet Road Drop Shaft and associated facilities; Brentwood Reservoir Junction Shaft; Rhode Island Branch Tunnel and associated drop shafts and diversions; First Street Northwest Branch Tunnel and associated drop shafts and diversions; and the R Street Branch Tunnel and associated drop shafts and diversions. These

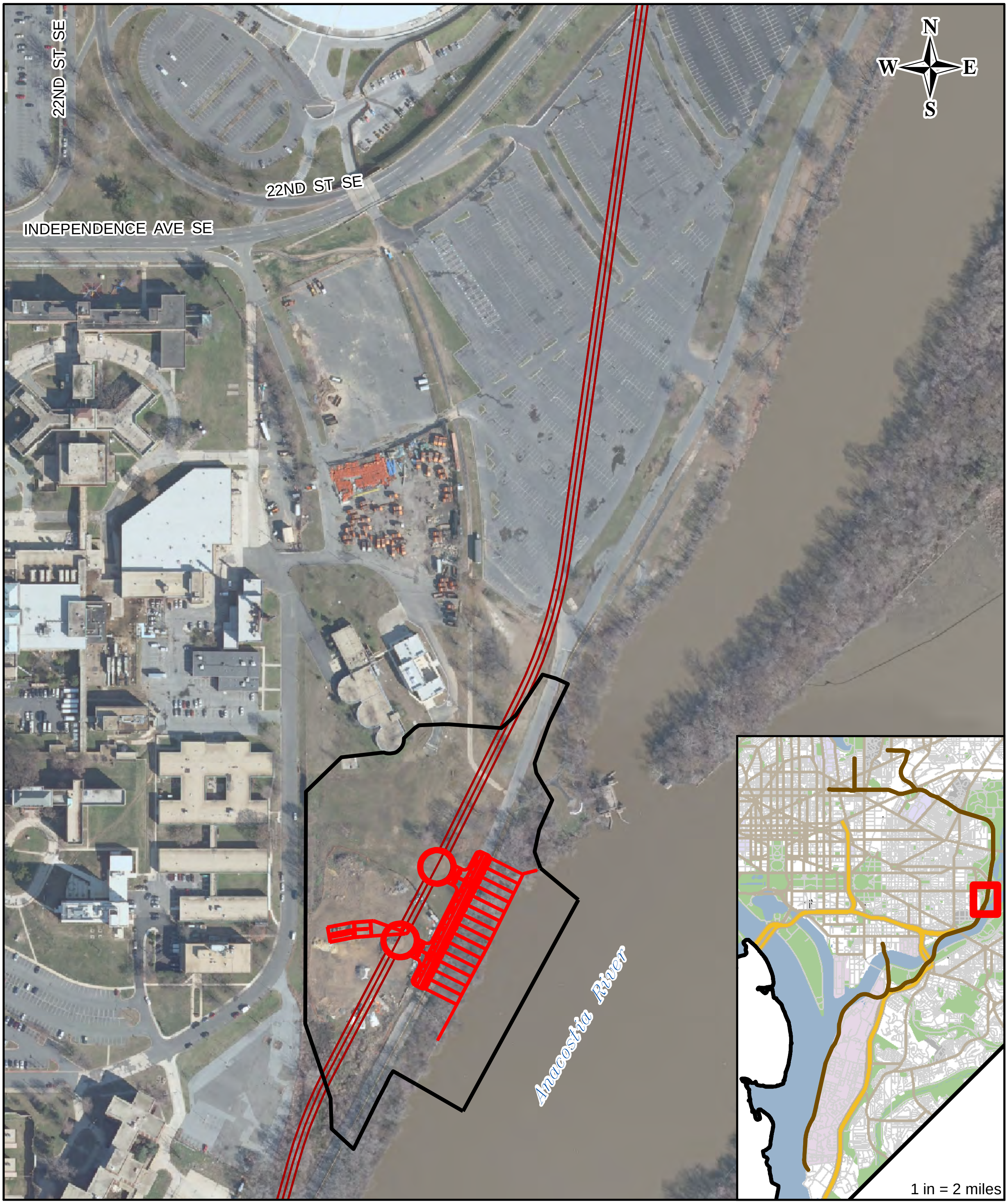

Figure 2.2-13:
CSO 019 Overflow and Diversion Facilities Map

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
- Project Facility
- Surface Disturbance Area
- Preferred Tunnel Alignment

Scale: 1 inch = 300 feet

0 150 300 600 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

Figure 2.2-14:
CSO 019 Overflow and Diversion Facilities
View From Above

Anacostia River Projects, Long-term CSO Control Plan
Washington, D.C.

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Surface Disturbance Area

Not to Scale

Figure 2.2-15:
CSO 019 Overflow and Diversion Facilities
View Towards Anacostia River

Anacostia River Projects, Long-term CSO Control Plan
Washington, D.C.

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Not to Scale

Figure 2.2-16:
CSO 019 Overflow and Diversion Facilities
View from the Anacostia River

Anacostia River Projects, Long-term CSO Control Plan
Washington, D.C.

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Not to Scale

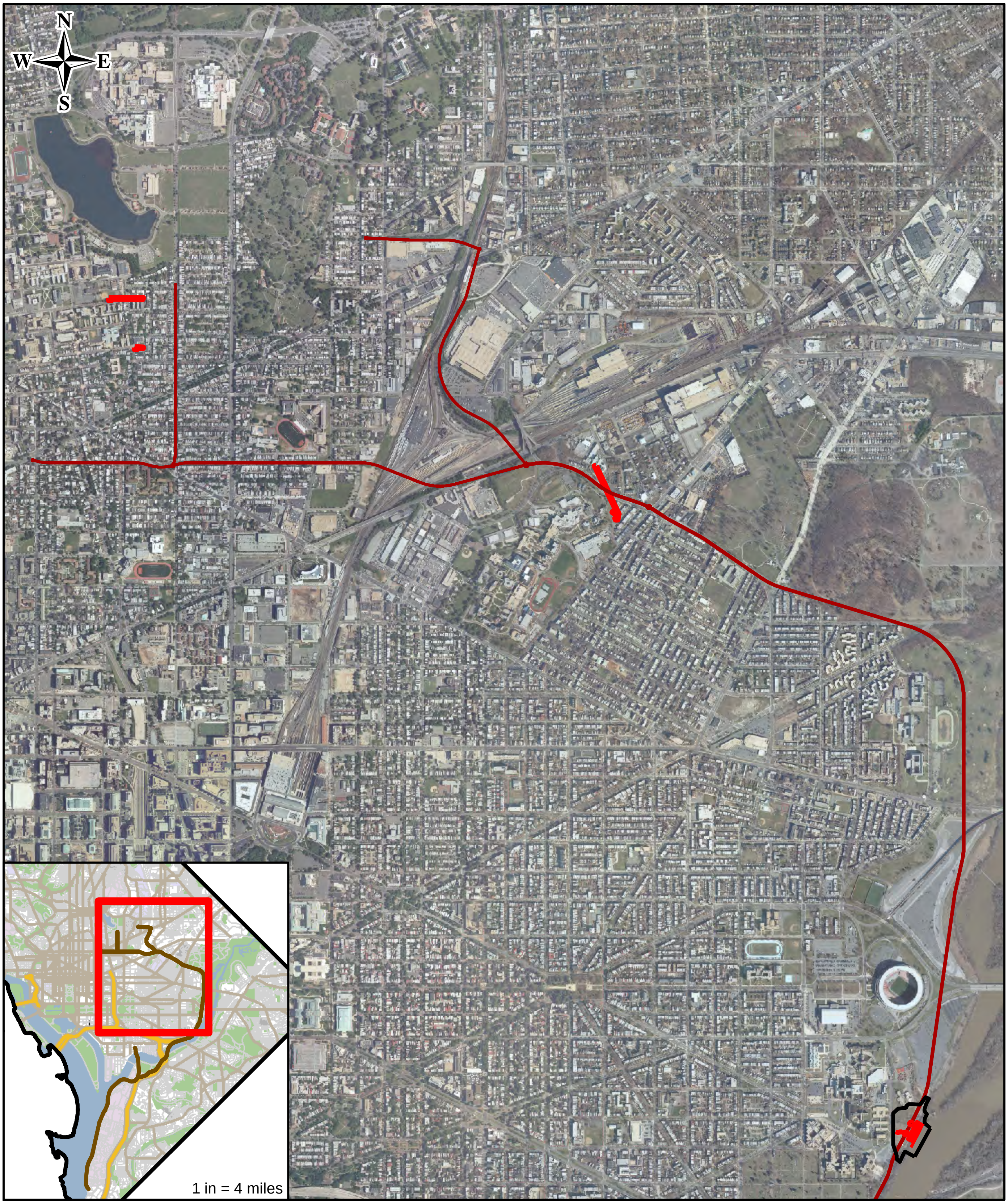

Figure 2.2-17: Northeast Boundary Tunnel Map

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:

- Surface Disturbance Area
- Project Facility
- Preferred Tunnel Alignment

Scale: 1 inch = 2,200 feet

Feet
0 1,100 2,200 4,400

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

facilities would provide the last increment of CSO storage capacity required by the Consent Decree, as well as a considerable increase in stormwater conveyance capacity from the District's Northeast Boundary Area to the Anacostia River. Preliminary engineering indicate that surface disturbance areas may affect additional NPS property (see **Figure 2.2-18** and **Figure 2.2-19**). The environmental effects of the NEBT will be assessed in detail in a subsequent environmental document.

<u>Right-of-Way Requirements</u>

For Alternative B, it would be necessary for DC WASA to purchase private property or obtain short-term or long-term easements for properties on which the proposed project is planned, including the properties that lie directly above the tunnel alignments. During tunnel construction, there may be a need to access areas adjacent to the tunnel for various reasons, such as settlement monitoring. Therefore, easements would be needed above the tunnel alignment, to include an area approximately one tunnel diameter on either side of the tunnel alignment. Additionally, easements would be required for the surface disturbance areas, including construction staging areas, areas needed for project construction, and for long-term access.

Property ownership information was obtained using District GIS data and the Recorder of Deed's Real Property Assessment Database. **Table 2.2-2** identifies the property owners along the BPT and ART alignments and within their surface disturbance areas.

Table 2.2-2: Property Owner Impacts	
	Area of (Sq Ft)
BPT	**1,548,812**
BAFB	272,971
Naval Support Facility	113,232
District of Columbia	183,957
United States of America (NPS)	50,831
United States of America (USACE)	378,905
United States of America	39,618
ART	**885,121**
District of Columbia	245,410
United States of America	319,886
United States of America (NPS)	308,448
Howard Academy Public Charter School Inc.	13
Christ Church Vestry Washington Parish	379
CSX	10,985
BPAWWTP Facilities	**240,451**
District of Columbia	240,451
BAFB Overflow and Diversion Facilities	**198,634**
Bolling Air Force Base	198,634
Poplar Point Pumping Station	**148,110**
District of Columbia	146,362
United States of America	1,742
Tingey Street Diversion Sewers and Main Pumping Station Diversion Facilities	**144,184**
District of Columbia & United States of America	113,256
District of Columbia	26,136
United States of America	4,792

Table 2.2-2: Property Owner Impacts	
	Area of (Sq Ft)
CSO 005 & 007 Diversion Facilities	**213,444**
United States of America (NPS)	213,444
CSO 018 Diversion Facilities	**26,572**
District of Columbia & United States of America	26,572
M Street Diversion Facilities	**132,945**
Consolidated Rail Corp	87
District of Columbia & United States of America	132,858
CSO 019 Overflow and Diversion Facilities	**387,248**
Unites States of America (NPS)	387,248

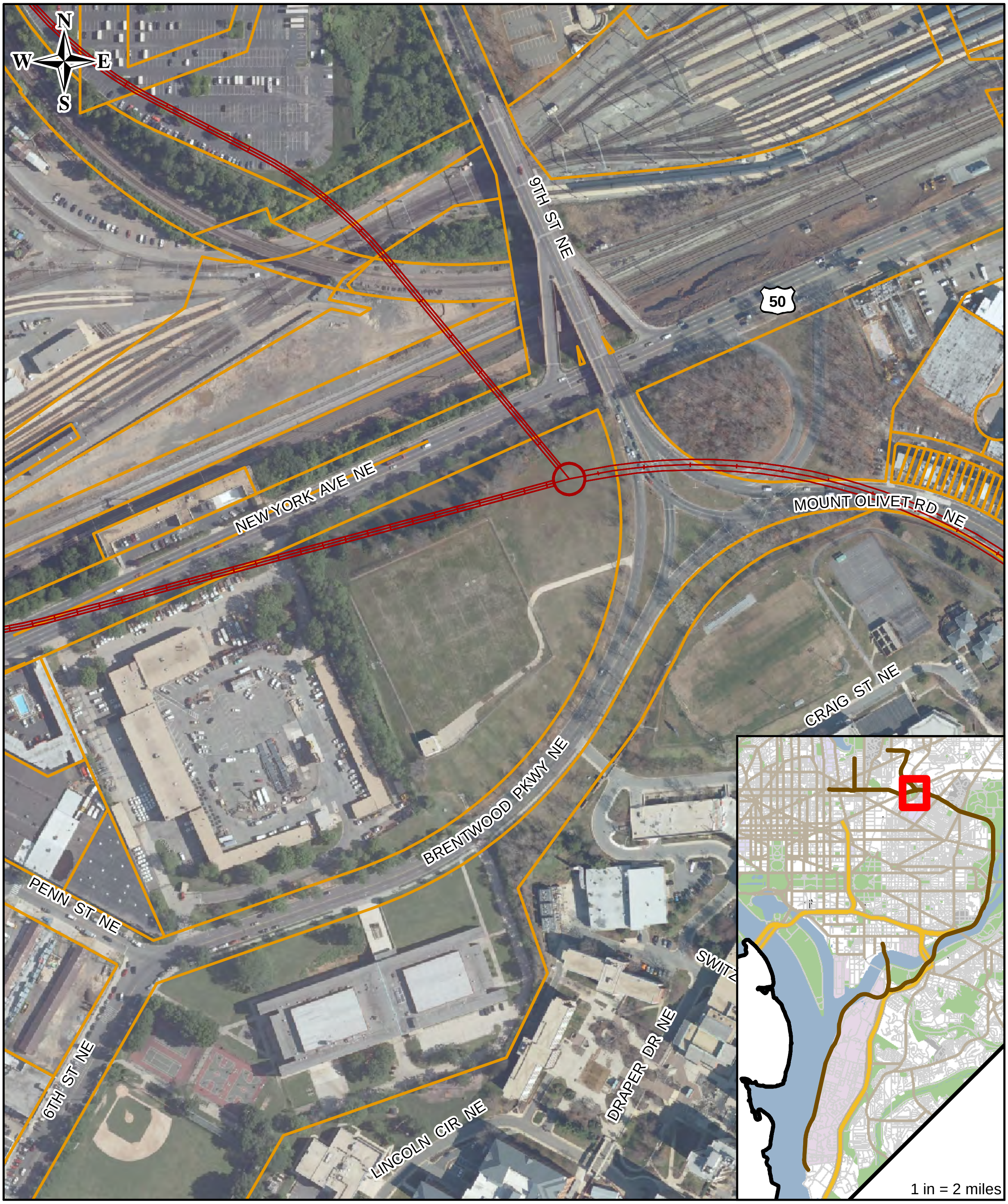

Figure 2.2-18:
National Park Service Property
New York Ave & 9th St NE

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
- Preferred Tunnel Alignment
- Parcel Boundary

Scale: 1 inch = 300 feet

Feet: 0 150 300 600

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

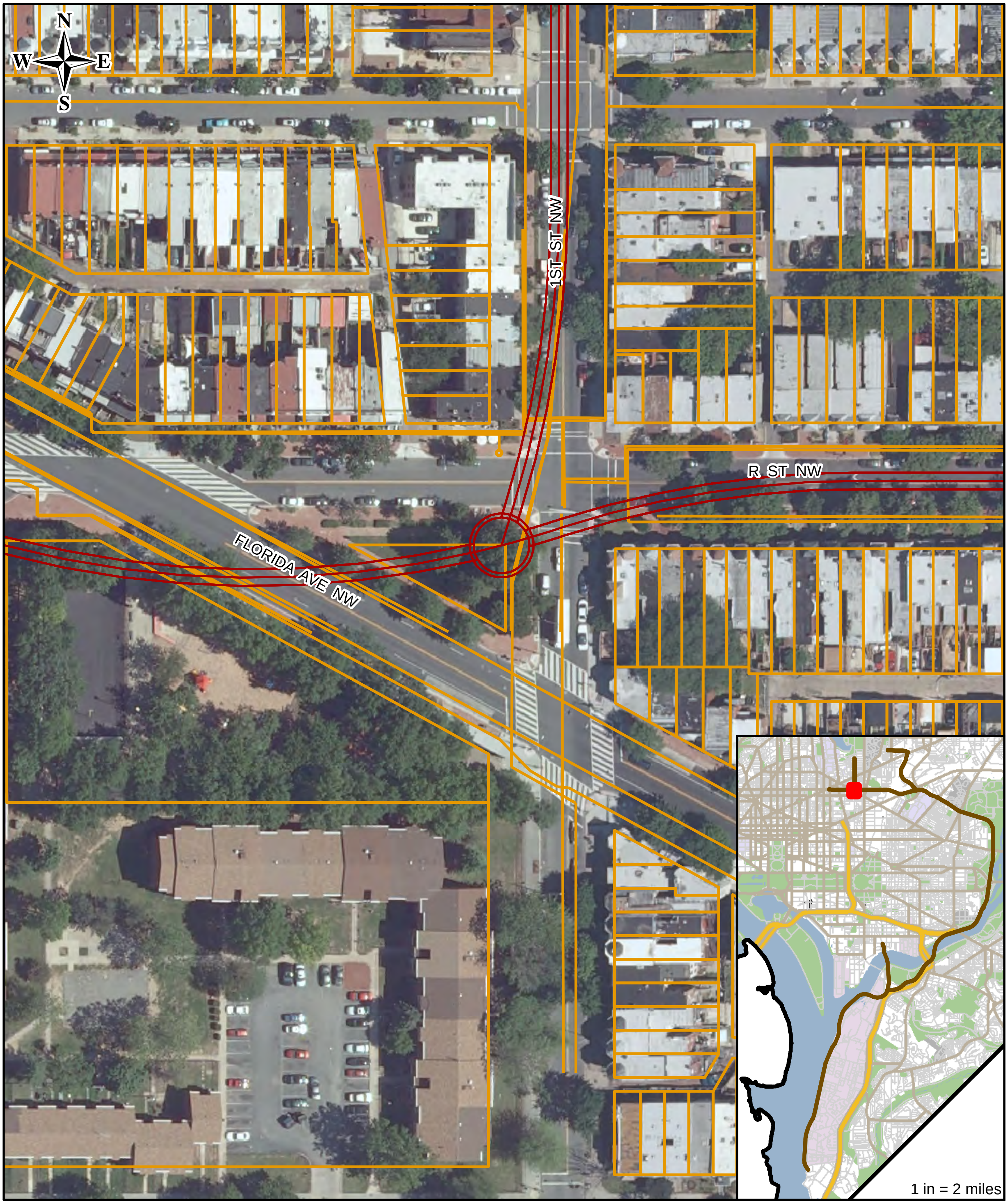

Figure 2.2-19:
National Park Service Property
Florida Ave & 1st St NW

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Legend:
Preferred Tunnel Alignment
Parcel Boundary

Scale: 1 inch = 100 feet

0 50 100 200 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

2.2.3 Alternatives Considered and Dismissed

CEQ regulations for implementing NEPA require that federal agencies explore and objectively evaluate all reasonable alternatives to the preferred alternative, and to briefly discuss the rationale for eliminating alternatives that were not considered in detail. This section describes those alternatives that were eliminated from further study and documents the rationale for their elimination. For more detailed information on the alternatives analysis, see Section 4 if the Facilities Plan in **Appendix C**.

During the course of internal scoping and preliminary engineering, several alternatives were considered, but were deemed insufficient to meet the project objectives, neither individually nor in various combinations, and were not carried forward for analysis in this EA. Many of these alternative techniques and technologies are currently being employed by DC WASA and will continue to be employed regardless of the selected alternative (see **Section 2.2.1**). The broad range of alternative technologies includes the following:

- **Source Controls:** Public education, a higher level of street sweeping, additional construction site controls, more frequent catch basin cleaning, garbage disposal bans, and combined sewer flushing;
- **Inflow Controls:** Low Impact Development/Retrofit, rooftop greening, stormwater treatment, street storage of stormwater, rain gutter disconnections, and extending storm sewers to receiving waters;
- **Sewer System Optimization:** Real time control, storing combined sewage in existing sewers, and revision to facility operations;
- **Sewer Separation:** Partial or complete separation;
- **Storage Technologies:** Retention basins and tunnels;
- **Treatment Technologies:** Screening, sediment filtering, high rate physical chemical treatment, swirl concentrators, and disinfection; and
- **Receiving Water Improvement:** Aeration and flow augmentation.

Each technology was evaluated for its ability to reduce CSO volume and the pollutants in CSO discharges, as discussed below.

- **Source Controls**: These are important elements of CSO control but on their own do not provide a comprehensive CSO control system solution.
- **Inflow Controls**: These are being looked at for reducing the size of the CSO facilities requires but do not allow for the basis for a larger scale CSO solution.
- **Sewer System Optimization**: This can be helpful in controlling CSOs, but is not sufficient for a larger CSO control system.
- **Sewer Separation**: This has been adopted as a partial CSO solution in some parts of DC WASA system. As a full solution on a major system, it has certain limitations. It is cost prohibitive to perform sewer separation on a large scale in congested urban areas. It also directs stormwater to waterways that would otherwise be treated. This can actually lead to a decrease in water quality.

- **Storage Technologies**: This is the solution of choice in large wastewater municipal systems. The CSO volume produced usually cannot be contained in retention basins and therefore, tunnels are required.
- **Treatment Technologies**: This is only effective in conjunction with another solution such as storage technologies. CSOs have to be captured and diverted to a central point as it would be cost prohibitive to provide treatment at each CSO outfall.
- **Receiving Water Improvement**: Aeration and flow augmentation alone would not provide an adequate resolution to a large scale CSO problem because it would not achieve the water quality-based requirements of the CWA.

After the initial screening, groups of technologies were assembled into individual control plans. The control plans were evaluated for regulatory compliance, cost effectiveness, reduction of Northeast Boundary Flooding, non-monetary factors, and public acceptance. DC WASA's LTCP (see **Appendix B**) provides detailed results regarding analysis of individual technologies and control plans. Justification for eliminating these options from further analysis was based on the following factors:

- Lack of technical feasibility,
- Inability to meet the project's purpose and need, and
- Economic infeasibility.

DC WASA's analysis during development of the LTCP concluded that a deep tunnel system that would provide storage capacity for CSO diversions and convey the excess volume to BPAWWTP through pumps and gravity flow would be the most practicable combination of technologies. DC WASA developed and screened several alternative tunnel alignments based on the factors stated in **Section 2.1**. Alternative tunnel alignments that were considered and dismissed are presented below.

<u>Blue Plains Tunnel</u>

Three alignments for the BPT were investigated and evaluated. The alternative alignments are shown on **Figure 2.2-20** and described briefly as follows:

- **Alternative No. 1** – This alignment starts at a terminal shaft on the east side of Blue Plains and parallels I-295. A branch tunnel at Malcolm X Drive is required to connect the existing Potomac Outfall Sewers to the tunnel and provide for a tunnel overflow to the Potomac River. Construction would require complex traffic detours at the I-295 – Malcolm X interchange and construction under or adjacent to Homeland Security facilities. Additionally, this alternative would result in loss of some existing primary clarification capacity at Blue Plains.

  This alignment was eliminated from further consideration for several reasons, including potential impact to bald eagle (*Haliaeetus* leucocephalus) nesting habitat, and potential conflicts with existing and planned utilities and infrastructure. With this alignment, an additional 2,000 linear feet of branch tunnel would be required to connect to the overflow and diversion chamber on the bank of the Potomac River on BAFB.

- **Alternative No. 2** – This alignment starts at the same terminal shaft location on Blue Plains as Alternative No. 1. The alignment then enters into BAFB and follows the riverbank through BAFB and the Naval Support Facility Anacostia. It also passes below an existing pile supported floodwall and two pile supported stormwater pumping station discharge lines on the Naval Support Facility Anacostia. As in Alternative No. 1, there would be a loss of some existing primary clarification capacity at Blue Plains.

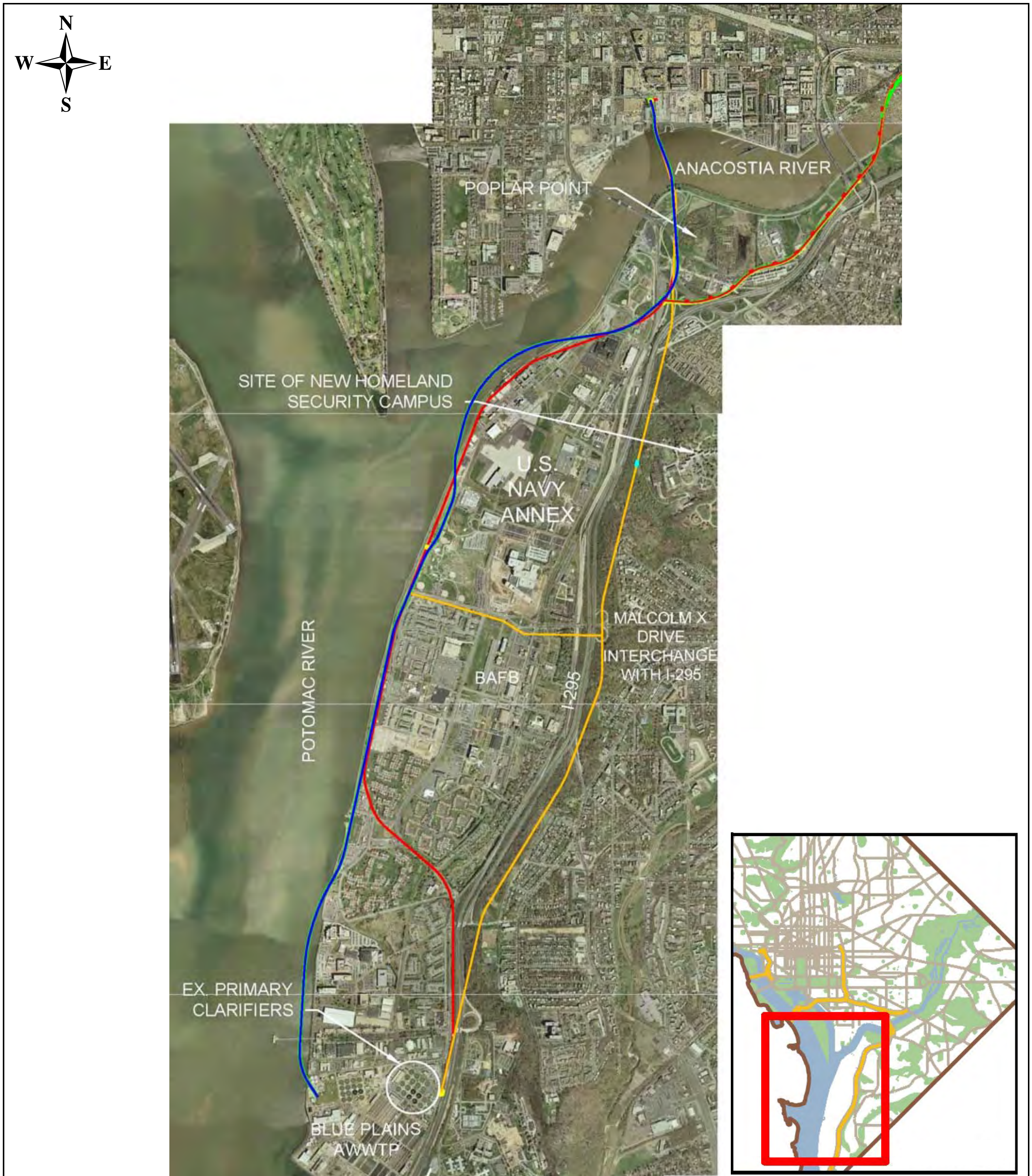

Figure 2.2-20:
Considered Alignments Map

Blue Plains Tunnel Alternatives
Washington, D.C.

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Not to Scale

Source: D.C. Water and Sewer Authority. 2009. *Long Term CSO Control Plan*. *Anacostia River Projects*. *Document II-3:4-FI, Facility Plan*. Washington, D.C.

This alignment was eliminated from further consideration due to concerns regarding effects of vibration on equipment in use at the Naval Research Laboratory and BAFB, the need for additional surface disturbance area, and hydraulic inefficiency.

- **Alternative No. 3** – The preferred BPT alignment, as described in **Section 2.2.2** and shown in **Figure 2.2-3**.

North of the existing Poplar Point Pumping Station, the surface disturbance areas would be the same for all alignments. Therefore, no discussion of the surface disturbance areas associated with the various alignments in this portion of the project is included.

Anacostia River Tunnel

Table 2.2-3 lists the 13 alternative alignments developed and evaluated for the ART. All of the alternative alignments start at the Poplar Point Pumping Station (or in its vicinity), which was the starting location originally established by the LTCP and Consent Decree. The termination points of the alternative alignments vary based on consideration of required storage volume and diameter of tunnel. These alignments are divided into two general corridors: west (or north) Anacostia River bank corridor and east (or south) bank corridor. These alternative alignments were developed gradually, and refined as additional information related to obstructions, utilities, and Right-of-Way (ROW) became available. **Figure 2.2-21** shows the alternatives considered for the ART and the NEBT. The following criteria were selected for the ART alternative screening process:

- **WMATA consent (required):** For the purposes of ranking, it was assumed that WMATA would provide its consent for all alternatives. Therefore, this criterion was assigned a "yes" value for all alternatives.
- **DDOT consent (required):** For the purposes of ranking, it was assumed that DDOT would provide its consent for all alternatives. Therefore, this criterion was assigned a "yes" value for all alternatives.
- **Depth of wet well:** This criterion ranked alternative alignments with respect to avoidance of known obstructions and with consideration of pumping costs, as understood at the time of the evaluation. Alternatives that did not avoid vertical and horizontal obstructions, such as the WMATA Green Line initial excavation support system or existing and former bridge foundation piles, received lower rankings as compared with those alternatives that avoided such obstructions. At the time of the evaluation, this criterion was related to the LTCP concept of the tunnel dewatering pumping station being located in the vicinity of Poplar Point. The subsequent addition of the BPT, with the tunnel dewatering pumping station located at Blue Plains, does not invalidate either the inclusion of this criterion in the evaluation process, nor does it alter the rankings for the various alternatives.
- **Ground conditions:** Alignment alternatives that were entirely located in, or that had tunnel crown elevations in the Cretaceous Potomac Group stratigraphic layer, received higher ranking, because this soil type does not contain bedrock.
- **Tunnel length:** The shortest alignment alternatives received the highest ranking, and the longest received the lowest. The lengths of the northeast branch tunnels, as developed at the time of the screening evaluation, were also included in the ART alternative lengths.
- **Settlement risk:** Risk of settlement increases for alignment alternatives in areas of development, resulting in lower rankings. Potentially greater risk in cost may exist in areas with commercial and business structures, as opposed to residential structures.

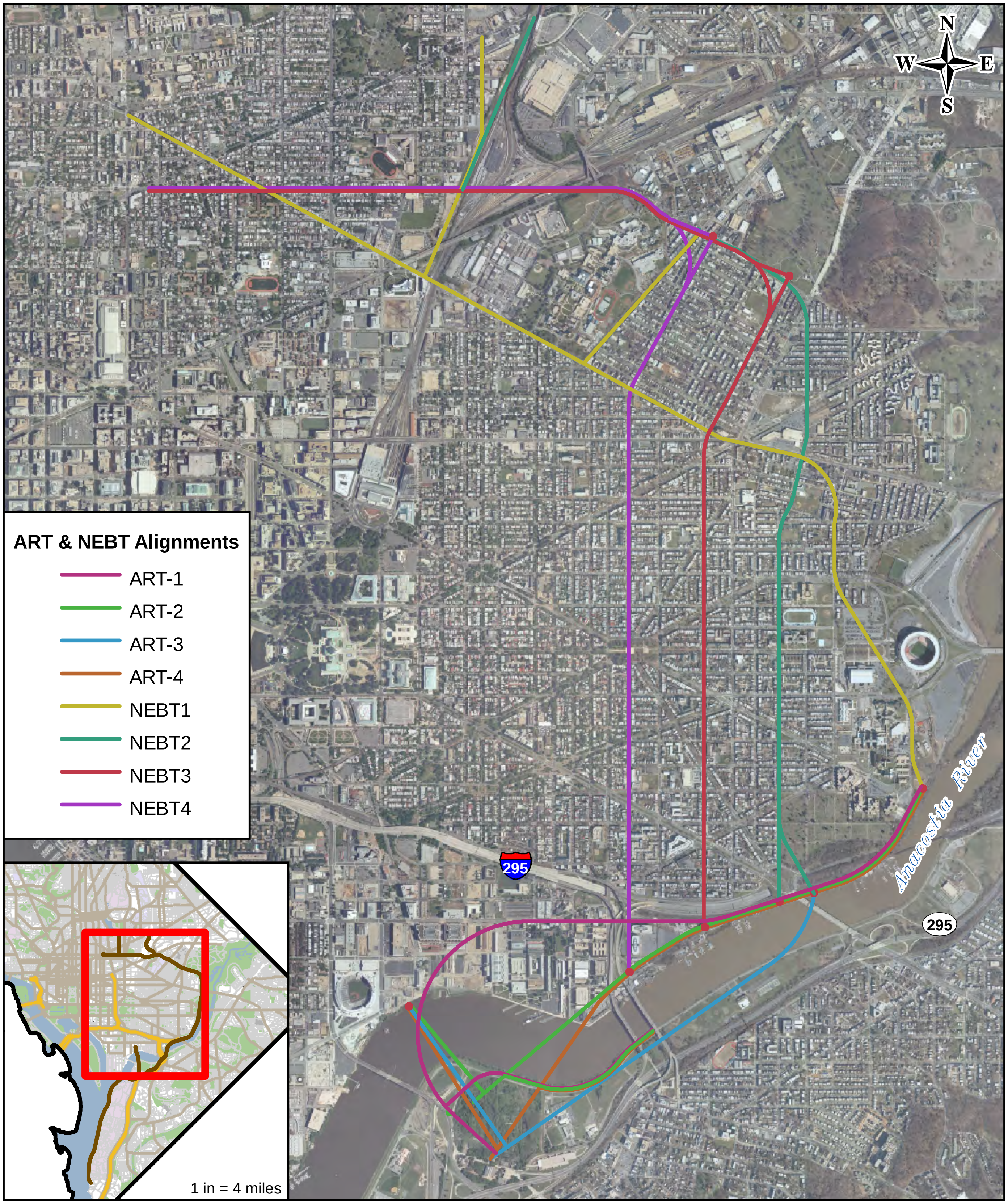

Figure 2.2-21:
Considered Alternatives Map

Anacostia River Projects
Long-term CSO Control Plan
Washington, D.C.

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Scale: 1 inch = 2,500 feet

0 1,250 2,500 5,000 Feet

Source: Office of the Chief Technology Officer. 2008. Raster Digital Data, 2008 Orthophoto. Washington, DC.

- **Utilities:** This impact would be similar for all the alternatives and was considered to be of low importance in the initial screening exercise.
- **Potential presence of contamination:** Low ranking was assigned for alignment alternatives that crossed areas of known or suspected contamination, while medium ranking was assigned to those crossing areas of unknown contamination risk. None of the alignment alternatives received a high ranking, because at the time of the evaluation only limited environmental information was available.
- **Access for ground improvement:** Higher rankings were assigned to areas with available open space over and adjacent to the proposed alternative alignments. This additional open space would allow for potentially easy surface access to improve and monitor the ground below WMATA and DDOT structures at the potential tunnel crossings and connections.
- **Proximity to CSO outfall sewers:** Cost and risk both increase with length; therefore, the longer the shaft, the lower the ranking. It should be noted that, although the conceptual design for the drop shaft connections to the CSO/storage tunnels evolved over time—from the more conventional drop shaft with connecting tunnel envisioned at the time of the screening exercise to the current concept, which places the shafts directly over the tunnel—the validity of this criterion and the rankings remain unchanged.
- **Right-of-way acquisition:** Easement rights for tunnels and associated facilities would be easier to obtain in public ROW, including park service land, than in private or otherwise restricted property.
- **Construction impact to surrounding communities:** Potential impacts could increase in areas of greater development; therefore, these areas were assigned a lower ranking.
- **Construction risk:** Risk was considered through a more rigorous process for the tunnels system alignments ultimately selected as part of the recommended plan.

The highest weighting factor of 10 was assigned to construction impact to local development, construction risk, and settlement. The lowest assigned weighting factor of 3 was applied to contamination risk. A summary of the advantages and disadvantages associated with each ART alternative is provided in **Table 2.2-3**. Alternative B is based on ART-6.

Table 2.2-3: Anacostia River Tunnel Alternative Alignments Advantages and Disadvantages

Alternative	Advantages	Disadvantages
ART-1	Proximity to CSOs 009 to 014 that eliminate the need for a branch tunnel	High risk of settlement to South East Federal Center and other existing structures
		No access for ground improvement at WMATA F Line crossing
		No access for emergency TBM removal
		Does not avoid future development at Poplar Point
		Requires Fort Stanton Interceptor
ART-2	Proximity to CSOs 015 to 019	Sub-aqueous WMATA crossing, making ground improvement and monitoring difficult
		Requires deep vertical alignment to clear WMATA F Line
		Intersects 11th Street Bridges pier pile foundations
		Does not avoid future development at Poplar Point
		Requires Fort Stanton Interceptor, crosses Naval Yard

Table 2.2-3: Anacostia River Tunnel Alternative Alignments Advantages and Disadvantages

Alternative	Advantages	Disadvantages
ART-3	Alignment follows park land along south bank Eliminates the need for Fort Stanton Interceptor	Sub-aqueous crossing of Sousa Bridge that makes ground improvement and monitoring difficult
		Horizontal alignment intersects Sousa Bridge pier pile foundations
		Requires deep vertical alignment to clear WMATA F Line excavation support system left in place
		Does not avoid future development at Poplar Point
		Requires Main and O branch tunnel
ART-4	Proximity to CSOs 015 to 019	Requires deep vertical alignment to clear excavation support system of WMATA F Line
		Potential clearance problems with Washington Navy Yard bulkhead
		Horizontal alignment intersects 11th Street Bridges pier pile foundations
		Requires Fort Stanton Interceptor
		Requires Main and O branch tunnel
		Does not avoid future development at Poplar Point
ART-5f	Proximity to CSOs 015 to 019	Horizontal alignment intersects 11th Street Bridge pier pile foundations
		Potential clearance problems with Washington Navy Yard bulkhead
		Requires Main and O branch tunnel
		Requires Fort Stanton Interceptor
		Does not avoid future development at Poplar Point
ART-6	Clears all known obstructions along its route	Requires Main and O branch tunnel
	Eliminates the need for Fort Stanton Interceptor	
	Minimal tunnel depth to clear under WMATA	
ART-7	Clears all known obstructions along its route	Sub-aqueous crossing of northern span of 11th Street Bridges, making ground improvement difficult
	Eliminates the need for Fort Stanton Interceptor	Requires Main and O branch tunnel
ART-8	Proximity to CSOs 015 to 019	Potential clearance problems with Washington Navy Yard bulkhead
		Requires deep vertical alignment depth to clear WMATA F Line
		Requires Main and O branch tunnel
		Requires Fort Stanton Interceptor
		Does not avoid future development at Poplar Point
ART-9	Clears all known obstructions along its route	Does not avoid future development at Poplar Point
	Eliminates Fort Stanton Interceptor	Requires Main and O branch tunnel
	Proximity to CSOs 015 to 019	
	Minimal tunnel depth to cross under WMATA	

Table 2.2-3: Anacostia River Tunnel Alternative Alignments Advantages and Disadvantages

Alternative	Advantages	Disadvantages
ART-10	Proximity to CSOs 015 to 019	Sub-aqueous crossing of 11^{th} Street Bridges, making monitoring, ground improvement difficult
	Minimal tunnel depth to cross under WMATA	Requires Main and O branch tunnel
		Requires Fort Stanton Interceptor
		Does not avoid future development at Poplar Point
ART-11	Alignment stays in the parklands along the south bank of river	Requires Main and O branch tunnel
	Clears all known obstructions along its route	Crosses Sousa Bridge between abutment and pier
	Minimal tunnel depth to cross under WMATA	Alignment curves under the river, which may increase construction risk
ART-12	Alignment stays in the parklands along the south bank of river	Sub-aqueous crossing of Sousa bridge makes any intervention for monitoring and ground improvement very difficult
	Clears all known obstructions along its route	Intersects Sousa Bridge pier pile foundations
	Eliminates the need for the Fort Stanton Interceptor	Requires Main and O branch tunnel
	Minimal tunnel depth to cross under WMATA F Line	
ART-13	Alignment stays in the parklands along the east (south) bank of river	Requires second branch tunnel to convey flows from CSO 015 to 018
	Clears all known obstructions along its route	Requires Main and O branch tunnel
	Eliminates the need for the Fort Stanton Interceptor	
	Crosses Sousa Bridge south of abutment	
	Minimal tunnel depth to cross under WMATA F Line	

<u>Northeast Boundary Tunnel</u>

A total of six tunnel alignments were considered for the NEBT. Criteria used during the screening process for the NEBT alignment alternatives were similar to those for the ART alternatives, except that the criteria for DDOT consent, proximity to the CSOs, and depth of wet well criteria were not used because they were not directly relevant to the NEBT evaluation. In place of these, a new criterion, acceptable risk to the NEBT, was added; which considers risk associated with tunneling underneath or parallel to the NEBTS along Florida Avenue NE. **Figure 2.2-21** shows the alternatives considered for the ART and the NEBT. **Table 2.2-4** details the advantages and disadvantages for each NEBT alignment alternative. No preferred alternative has been determined.

Table 2.2-4: Northeast Boundary Tunnel Alternative Alignments Advantages and Disadvantages

Alternative	Advantages	Disadvantages
NEBT-1	Provides ability to conveniently offload NEBTS at multiple locations	High risk of settlement to NEBT
		Very difficult to recover TBM, should failure occur
		Deep tunnel, due to undercrossing of WMATA D Line
		Impacts private property
NEBT-2	Stays within public ROW	High settlement risk in urban area
		Crosses Barney Circle
		Under-crosses NEBT in urban area, making ground improvement difficult and possibly requiring property acquisition
		Does not enable overflow at tunnel junction
		Deeper tunnel due to under crossing of WMATA D Line
		Additional conveyance required for flows from CSO 019
NEBT-3	Stays within public ROW	Under-crosses WMATA D Line Potomac Metro Station, requiring a deeper alignment
		High settlement risk in urban area
		Under-crosses NEBT in urban area, making ground improvement difficult and possibly requiring property acquisition
		Does not enable overflow at tunnel junction
		Additional conveyance required for flows from CSO 019
NEBT-4	Stays within public ROW	High settlement risk in urban area
		Crosses I-395 to I-295 ramp pile foundations
		Deeper tunnel due to under crossing of WMATA D Line
		Under-crosses NEBT in urban area, making ground improvement difficult and possibly requiring property acquisition
NEBT-5	Stays within public ROW	
	Stays within parkland	
NEBT-6	Provides ability to conveniently offload NEBT at multiple locations	High settlement risk as alignment parallels NEBTS
	Stays within public ROW	Under crosses WMATA D Line

2.2.4 Mitigation

DC WASA and the NPS place strong emphasis on avoiding, minimizing, and mitigating potentially adverse environmental impacts. The design of Alternative B was continually refined to avoid and minimize the effects to environmental resources. DC WASA has coordinated with various agencies to identify appropriate mitigation for environmental effects and has effectively integrated suggestions into the design. Also, DC WASA would use construction methods to minimize surface disturbance. To help ensure the protection of natural and cultural resources, DC WASA would implement an appropriate level of monitoring throughout construction to help ensure that protective measures are being properly implemented and to achieve their intended results.

DC WASA would used the mitigation actions listed in **Table 2.2-5** to mitigate potential environmental impacts associated with the construction and implementations of Alternative B.

Table 2.2-5: Mitigation

Environmental Resource	Mitigation Action
Soils	• Monitor ground movements and settlement on existing structures, foundations, and utilities • Protect exposed soil from precipitation and erosion • Disturbed soil or stockpiles would be covered • Erosion and sediment controls including silt fencing • Exposed soils would be stabilized and replanted with vegetation as soon as possible following completion of construction activities • DC WASA would ensure that the construction contracts would include requirements for the contractor to submit plans for the handling and disposal of contaminated dredge materials in upland locations or contained sites that have been approved for such use by the federal or local authorities having jurisdiction. Also, construction documents, which are required for construction permits, would include measures to control dust, protect exposed soil from precipitation and erosion, and protect workers and any nearby sensitive receptors from exposure to hazardous materials
Water Quality	• Best Management Practices - include the use of coffer dams and dewatering operations; use of construction fence, super siltfence, haybales, diversion channels and berms, and short-term stormwater basins for stormwater management and perimeter controls; proper disposal of dredged material; and the dedication of an environmental manager to monitor the project during construction
Wetlands	• Wetland 1:1 replacement ratio for area of impact to area of mitigation. Compensatory mitigation would be determined through future coordination with USACE, DDOE, and NPS
Vegetation	• Planting a quantity of saplings whose aggregated circumference equals or exceeds the circumference of the special trees to be removed • Paying into the Tree Fund a tree replacement fee of $35 per inch of circumference of each special tree to be removed • Restore vegetation according to NPS or other agency-specific criteria in areas where surface disturbance occurs • Restored vegetation areas would be monitored following construction to ensure successful establishment.
Wildlife and Wildlife Habitat	• Restore vegetation according to NPS or other agency-specific criteria in areas where surface disturbance occurs
Aesthetics	• New above ground structures would be designed to complement the existing or proposed surrounding landscape • Existing scenic resources that contribute to each area's visual quality that was impacted by the project would be restored to near pre-construction conditions • Restore vegetation according to NPS or other agency-specific criteria in areas where surface disturbance occurs

Table 2.2-5: Mitigation	
Environmental Resource	**Mitigation Action**
Land Use	• DC WASA would coordinate with DMV in the effort to maintain the operation of the Commercial Drivers License (CDL) Test Lot at the Poplar Point Facilities or relocate the facilities, if required • Areas of short term surface disturbance would be returned to their original conditions except near the Poplar Point Facilities
Human Health and Safety	• Disposal of excavated soils would be the responsibility of the contractors. However, DC WASA would ensure that the construction contracts include requirements for the contractor to submit plans for the handling and disposal of contaminated dredge materials in upland locations or contained sites that have been approved for such use by the federal or local authorities having jurisdiction. Also, construction documents, which are required for construction permits, would include measures to control dust, protect exposed soil from precipitation and erosion, and protect workers and any nearby sensitive receptors from exposure to hazardous materials • Protect workers and any nearby sensitive receptors from exposure to hazardous materials • Soil borings would be taken at representative excavation sites to determine if soil contamination is present • Groundwater samples would be taken at the representative excavation sites to determine if contamination is present at the construction site • Public information would be made available on the NPS website and on signs in the park to inform visitors of the project and its construction impacts • Construction workers would follow an approved health and safety plan • Barriers and signage would be used around construction sites
Visitor/Resident Use and Experience	• Rerouting of routes for hiker/biker trails that could potentially be impacted, including the Anacostia Riverwalk, would be developed before construction began • Maintenance of emission controls on all construction equipment and covering/wetting exposed soils to reduce fugitive dust • Odor control measures, such as a carbon absorption system, intake dampers, and adjustable exhaust dampers, where warranted • Near-surface construction would only be performed between the hours of 7 a.m. and 7 p.m. to limit potential noise impacts • Short term shielding of construction to reduce noise impacts • Areas of short term surface disturbance would be returned to their original conditions, except near the Poplar Point Facilities • Public information would be made available on the NPS website and on signs in the park to inform visitors of the project and its construction impacts
Topography	• Erosion and Sediment Control Plan • Monitor ground movements and settlement on existing structures, foundations, and utilities

Table 2.2-5: Mitigation	
Environmental Resource	**Mitigation Action**
Socioeconomics	• TCPs would be developed to define detours and changes in traffic patterns before construction begins • Rerouting of routes for hiker/biker trails that could potentially be impacted, including the Anacostia Riverwalk, would be developed before construction begins • Trucks that haul materials from construction sites would be covered • Maintenance of emission controls on all construction equipment and covering/wetting exposed soils to reduce fugitive dust • Odor control measures such as a carbon absorption system, intake dampers, and adjustable exhaust dampers, where warranted • Near-surface construction would only be performed between the hours of 7 a.m. and 7 p.m. to limit potential noise impacts. • Short term shielding of construction to reduce noise impacts • Areas of short term surface disturbance would be returned to their original conditions except near the Poplar Point Facilities • Public information would be made available on the NPS website and on signs in the park to inform visitors of the project and its construction impacts
Air Quality	• Trucks that haul materials from construction sites would be covered • Maintenance of emission controls on all construction equipment and covering/wetting exposed soils to reduce fugitive dust
Noise	• Near-surface construction would only be performed between the hours of 7 a.m. and 7 p.m. to limit potential noise impacts. • Short term shielding of construction to reduce noise impacts
Transportation	• TCPs would be developed, and be approved by DDOT and BAFB, to define detours and changes in traffic patterns before construction begins • Rerouting of routes for hiker/biker trails that could potentially be impacted would be developed, and be approved by DDOT, and BAFB prior to construction • DDOT construction notification policies would be followed, i.e. a TCP that would be established within the contract documents

2.2.5 Environmentally Preferred Alternative

The environmentally preferred alternative is defined by CEQ as the alternative that best meets the following criteria or objectives, as set forth in Section 101 of NEPA.

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Ensure for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
5. Achieve a balance between human population and resource use that would permit high standards of living and a wide sharing of life's amenities; and
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

The environmentally preferred alternative is the alternative that causes the least damage to the biological and physical environment and best protects, preserves, and enhances historic, cultural, and natural resources. DC WASA selected Alternative B, described in **Section 2.2.2** as the environmentally preferred alternative, because it best meets the definition established by CEQ.

After completing the environmental impact analysis, Alternative B has been identified as the environmentally preferred alternative. By building the tunnel using the TBM and by using microtunneling to construct most of the diversion sewers, as well as implementing a variety of mitigation measures, the environmental impacts are minimized and generally limited to relatively small surface disturbance areas, as identified in **Figures 2.2-3** and **2.2-9.** Furthermore, Alternative B would have a beneficial impact on water quality by eliminating over 1.4 billion gallons of CSO discharge to the Anacostia River on an annual basis. Due to its beneficial impacts, Alternative B is the environmentally preferred alternative.

Table 2.2-6: Summary of Impacts by Alternative

Affected Resource	Impacts of No-Action Alternative	Impacts of Alternative B
Soils	Under the No-Action Alternative, there would be no construction or excavation. This would result in negligible impacts to soils. Cumulative impacts to soils would occur under Alternative B as a number of additional projects within the study area are likely to occur in addition to Alternative B. As such, there would be a minor, adverse cumulative impact on soils.	Under Alternative B, extensive excavation and grading would be required. Impacts to soils would be long-term along the alignment and where drop shafts are planned because the soil would be permanently removed. Therefore, Alternative B would result in moderate, adverse, long-term impacts to soils. Short-term impacts to soils under Alternative B would include compaction by heavy machinery and erosion transport by both stormwater and winds during construction. Therefore, Alternative B would have an adverse, short-term, minor impact on soils. Cumulative impacts to soils would occur under Alternative B as a number of additional projects within the study area are likely to occur in addition to Alternative B. As such, there would be a moderate, adverse cumulative impact on soils.

Table 2.2-6: Summary of Impacts by Alternative		
Affected Resource	**Impacts of No-Action Alternative**	**Impacts of Alternative B**
Water Quality	Under the No-Action Alternative, CSO discharges would continue, contributing high concentrations of bacteria, total suspended solids (TSS), and other pollutants associated with untreated sanitary waste to the Anacostia and Potomac Rivers. This would result in adverse, long- and short-term moderate impacts. Under the No-Action Alternative, present and future development projects would likely increase impervious surface area and exacerbate runoff and pollutant loadings into the Anacostia and Potomac rivers. Therefore, there would be adverse, moderate cumulative impacts to water quality.	Minor short-term adverse impacts would result from construction activities. Under Alternative B, CSO discharges would be reduced by up to 98 percent There would be no long-term adverse impacts on water quality associated with Alternative B. However, there would be a long-term beneficial impact on water quality due to the reduced CSO discharges. Because other factors would continue to cumulatively affect the water quality of the Anacostia and Potomac Rivers the overall adverse cumulative impact for Alternative B would be minor.
Wetlands	The No-Action Alternative would result in continued CSO discharges to the Potomac and Anacostia rivers and would perpetuate the degraded condition of surface waters and wetlands. The continued CSO discharges would result in adverse, short and long-term minor impacts and cumulative adverse, minor impacts to the fish, shellfish, and wildlife habitat values of intertidal wetlands and waterways.	Alternative B would result in long-term, minor adverse impacts to wetlands in areas near CSO 019 and BAFB Overflow Facility, due to the placement of riprap. However, Alternative B would also reduce CSO discharges and would result in a net benefit to the habitat functions of wetlands and waterways. Therefore, the overall, long-term impact to wetlands would be negligible. Short-term construction-related impacts to wetlands and Waters of the U.S. would occur at the CSO 019 Overflow Facility (43,815 square feet) and the BAFB Overflow Facility (18,638 square feet). These construction impacts would be minimal and are required for control and containment of benthic sediments Cumulative impacts would include potential dredging, filling and conversion of wetlands and waterways associated with past, current, and future development. Although Alternative B would minimize CSO discharges and manage runoff associated with some pollutant loads, it would still have a minor, cumulative impact on wetlands.

Table 2.2-6: Summary of Impacts by Alternative		
Affected Resource	**Impacts of No-Action Alternative**	**Impacts of Alternative B**
Vegetation	The No-Action Alternative would involve no surface disturbance, resulting in negligible short-term and long-term impacts on vegetation Cumulative impacts to vegetation would include the removal or planting of vegetation for development projects and pollutant that would affect the integrity of vegetative communities, mostly aquatic. Therefore, the No-Action Alternative would have a minor, adverse, cumulative impact predominately on aquatic vegetation.	Alternative B would result in only minor, short-term, adverse impacts to vegetation. Construction of the project would result in the removal of some trees and vegetation, but no long-term impacts in plant community integrity or continuity would be anticipated. Although Alternative B would greatly reduce CSO discharge, the cumulative impact on vegetation, primarily aquatic, would be minor and adverse because of other sources of pollution to aquatic vegetation.
Wildlife and Wildlife Habitat	The No-Action Alternative would have both short and long-term, minor, adverse impacts on wildlife and wildlife habitat. Terrestrial wildlife and their habitat would not be impacted because there would be no construction related to the No-Action Alternative. However, aquatic wildlife and their habitat would still be subject to CSOs during storm events, which contribute to reduced water quality and associated adverse impacts to aquatic wildlife and wildlife habitat. The No-Action Alternative would have minor, adverse cumulative impacts on wildlife habitat, predominately on aquatic habitat, due to the continuation of CSOs during storm events.	Alternative B would result in minor, short and long-term, adverse impacts to terrestrial wildlife and wildlife habitat due to the removal of some trees and vegetation. Alternative B would contribute to beneficial impacts for fish and shellfish, by improving the water quality of the Anacostia River; therefore it would also result in long-term, beneficial impacts. Alternative B would have minor, adverse cumulative impacts on wildlife habitat considering the potential effect of reasonably foreseeable development.
Cultural Resources	The No-Action Alternative would have a negligible impact on archaeological resources. No construction would occur, resulting in no physical, visual, or auditory effects on archaeological resources. However, the cumulative impacts on archeological resources associated with the No-Action Alternative can be expected to be minor. The No-Action Alternative would have a negligible impact on architectural resources. Although construction of Alternative B would not occur, other development projects in the study area vicinity have potential to result in physical, visual, or auditory effects on architectural resources. Therefore, there would be minor cumulative	Alternative B would cause negligible impacts to six surface disturbance areas with no potential to contain resources. Alternative B would cause negligible to moderate, short and long-term impacts to each of the remaining surface disturbance areas. There would be an adverse, minor cumulative impact on archaeological resources. Alternative B would cause minor, short and long-term, adverse impacts to one surface disturbance area (the CSO 019 facilities) which contains a contributing element (the Anacostia Seawall) to Anacostia Park. Alternative B would cause negligible impacts to architectural resources at each of the remaining eight surface disturbance

Table 2.2-6: Summary of Impacts by Alternative		
Affected Resource	**Impacts of No-Action Alternative**	**Impacts of Alternative B**
	effects on historic resources.	areas. There would be a minor, adverse cumulative impact on historic structures, buildings, and districts. These impacts would not be severe enough to result in impairment to NPS resources
Aesthetics	Under the No-Action Alternative, there would be no surface disturbances or construction. Neither would there be any changes to the frequency or volume of CSOs; and therefore, no improvements to river aesthetics. This alternative would result in a short-term, long-term, and cumulative minor adverse impacts to aesthetics.	Under Alternative B, two overflow structures and a pumping station would be constructed, changing aesthetics in the study area. This would result in long-term, minor adverse impacts to aesthetics. During construction, there would be a short-term, moderate adverse impact on aesthetic resources from site-specific equipment that would be present during construction at the surface disturbance areas. Reduction of CSOs could have a long-term, moderate beneficial impact on the aesthetics of the rivers. Many of these projects are being designed to improve the aesthetics of corridor, and each design contains provisions for associated landscaping. Additionally, Alternative B would improve the long-term aesthetics of the Anacostia and Potomac Rivers due to reductions in visible pollutants resulting from decreased CSOs. Therefore, there would be a negligible adverse cumulative impact on aesthetics.
Land Use	Under the No-Action Alternative, no land acquisitions, construction, or changes to future land use would take place. This alternative would result in a negligible impact on existing and future land use.	Under Alternative B, private property would be purchased and short-term and long-term easements would be obtained This would result in a short-term minor, adverse impact on existing land use and a long-term minor direct and cumulative impact on future land use. Minor adverse long-term impacts would occur to land use at the Poplar Point Pumping Station area. After the construction of the pumping station, the current use of the land, as a CDL practice lot, would not be maintained. Minor cumulative impacts to future

Table 2.2-6: Summary of Impacts by Alternative		
Affected Resource	**Impacts of No-Action Alternative**	**Impacts of Alternative B**
		land use are also possible in other areas above the tunnel alignment where construction restrictions may apply.
Human Health and Safety	Under the No-Action Alternative, CSO discharges would not be reduced. The continued degradation of water quality would not change the current health risks associated with the Anacostia River. This would result in long-term, minor, adverse impacts and minor cumulative adverse impacts to human health and safety.	Under Alternative B, CSO discharges would be reduced by up to 98 percent. The reduction would decrease hazardous bacteria and improve water quality. This would result in a long-term, beneficial impact on human health and safety. With construction safety and mitigation measures in place, Alternative B would have a short-term, negligible impact on human health and safety during construction. There is potential for hazardous waste ramifications due to construction, particularly from exposure to hazardous materials and the release of existing soil or groundwater contamination. In addition to documented hazardous material contamination, the discovery of unrecorded or unidentified contamination and unexploded ordnance could pose additional complications for this project as well as other development projects within the District. This could result in cumulative, minor adverse impacts.
Visitor/Resident Use & Experience	Under the No-Action Alternative, there would be no change to park resources or values. This would have a negligible impact on visitor/resident use and experience. The reasonably foreseeable future development projects, including those on or adjacent to the park resources are generally intended to improve the quality of living within the District. Therefore, there would be a long-term, beneficial, cumulative impact on visitor/resident use and experience. However, there would be short-term nuisances associated with project construction, including noise, air quality, and aesthetics. So, there would be a minor, short-term, adverse	Alternative B would result in short-term adverse impacts on visitor/resident use and experience during construction. Any affected trails, paths, sidewalks, and roadways would be restored to full operational status by the end of construction. Odor control measures would be implemented, as needed, during construction. Additionally, Alternative B would have short-term minor, adverse air-quality and fugitive dust impacts associated with construction equipment. Alternative B would reduce CSOs and improve the long-term quality of the Anacostia and Potomac rivers. Therefore, Alternative B would potentially result in long-term, minor

Table 2.2-6: Summary of Impacts by Alternative		
Affected Resource	**Impacts of No-Action Alternative**	**Impacts of Alternative B**
	cumulative impact on visitor/resident use and experience.	beneficial impacts on visitor/resident use and experience. The reasonably foreseeable future development projects, including those on or adjacent to the park resources are generally intended to improve the quality of living within the District. Therefore, there would be a long-term, beneficial, cumulative impact on visitor/resident use and experience. However, there would be short-term nuisances associated with project construction, including noise, air quality, and aesthetics. So, there would be a minor, short-term, adverse cumulative impact on visitor/resident use and experience.