New York City
Department of Environmental Protection

REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

ENVIRONMENTAL ASSESSMENT STATEMENT SUPPLEMENTAL REPORT

CEQR NO. 07DEP008Y

October 2009

HydroQual

Environmental
Engineers & Scientists

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

Page

LIST OF FIGURES

Page

LIST OF FIGURES
(Continued)

Page

LIST OF TABLES

Page

LIST OF TABLES
(Continued)

Page

1.0 PROJECT DESCRIPTION

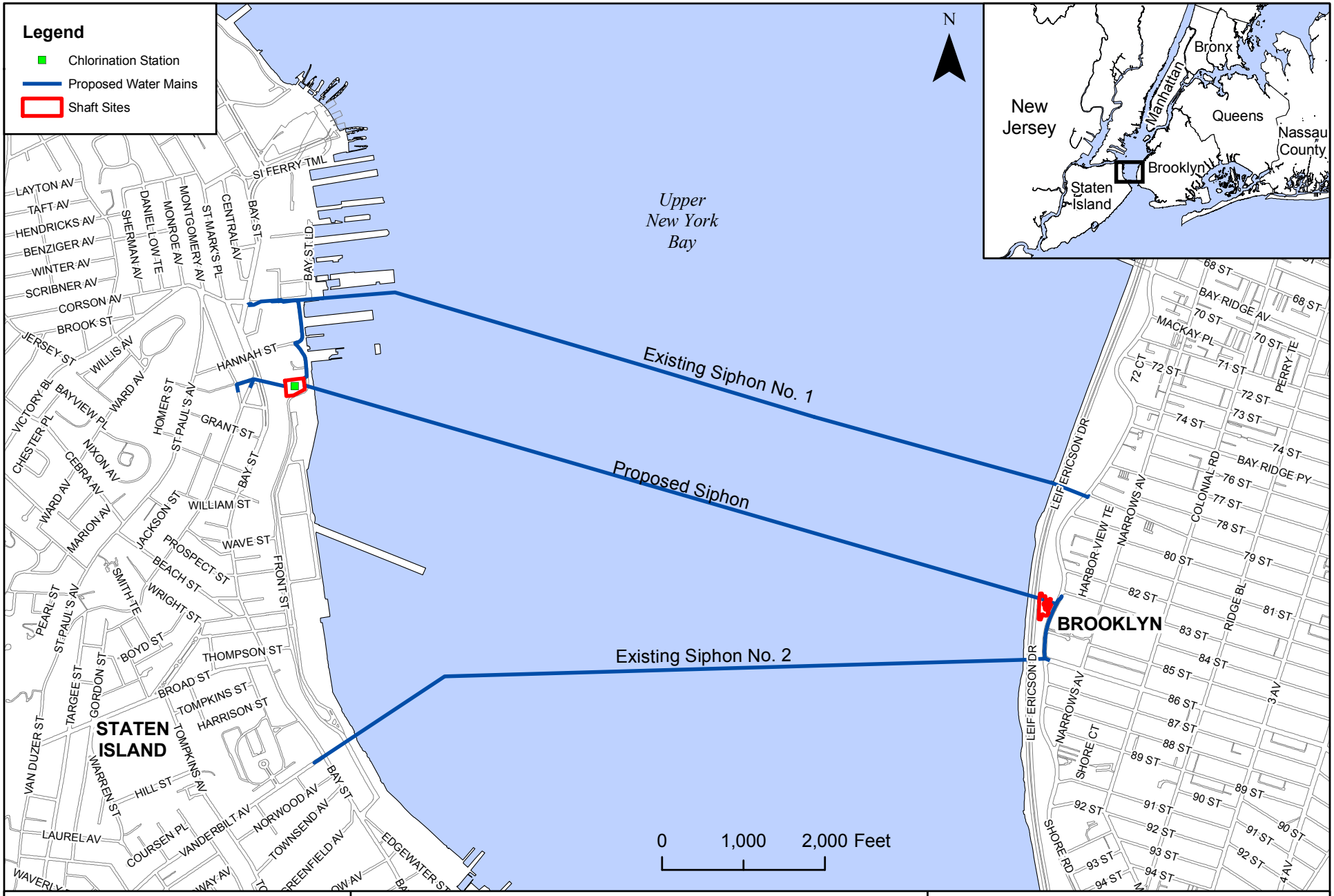
1.1 INTRODUCTION

This Environmental Assessment Statement (EAS) has been prepared to assess the potential environmental effects of the proposed replacement of two existing water siphons between Brooklyn and Staten Island, New York. The two existing siphons would be replaced through the construction of one new siphon through a tri-venture of the New York City Economic Development Corporation (NYCEDC), the New York City Department of Environmental Protection (NYCDEP) and the Port Authority of New York and New Jersey (PANYNJ).

The proposed action would involve the construction of a new potable water transmission main (siphon) within a bored tunnel beneath the Upper New York Bay between the boroughs of Brooklyn and Staten Island (see Figure 1-1). In addition to the construction of a new siphon across the Upper New York Bay, the proposed action would also include the construction of shafts, water transmission mains, and other related infrastructure improvements to connect the new system to the existing distribution network in Brooklyn and Staten Island. The action would also include the construction of a new chlorination station on Staten Island. Minor sewer line replacement activities would also occur incidental to the installation of the new required water transmission mains.

The new siphon is required in order to replace the two existing water siphons which currently serve as a secondary, or backup potable water supply system for Staten Island, thereby maintaining the reliability of the overall water supply system when the two existing siphons are decommissioned and abandoned. The new siphon would also be utilized to supplement the existing primary water supply service to the Borough of Staten Island. The two existing siphons require replacement primarily due to their relatively shallow depth in relation to ongoing and future dredging activities in New York Harbor that are associated with the Harbor Deepening Project currently being undertaken by the United States Army Corps of Engineers (USACE) in cooperation with the PANYNJ. The new siphon would be placed at a sufficient depth that would not be affected by this dredging.

The bored tunnel that would house the new siphon beneath the harbor would require the construction of two shafts, one in Brooklyn within Shore Road Park near 86th Street, and the other in the Stapleton section of Staten Island near Front Street. The shafts would allow access for tunnel boring during construction and would contain riser pipes to connect the completed siphon to the existing water supply network. In addition, a new chlorination station would be



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 1-1 Project Location

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

constructed adjacent to the Staten Island shaft, which would be used to chlorinate the new siphon. The current project calls for construction to begin in May 2010 with completion anticipated in June 2013.

1.2 BACKGROUND

The Port of New York and New Jersey is one of the most heavily used transportation arteries in the world, handling nearly 40 percent of the North Atlantic shipping trade and directly providing nearly 230,000 jobs to the local economy. In 2004, $100 billion worth of consumer goods ranging from cocoa and orange juice, to automobiles and machinery moved through the Port. In order to accommodate future cargo volumes in the port that are expected to double over the next decade and possibly quadruple in 40 years, deeper shipping channels are needed to provide access for a new generation of cargo mega-ships with drafts exceeding 45 feet when loaded. Current channels within the Harbor range in depth up to 45 feet, thus preventing carriers from using these larger ships, or requiring significant reductions in cargo in order to achieve lesser drafts to operate safely within the Harbor.

Under Section 101(a)(2) of the Water Resources Development Act of 2000 (P.L. 106-541), Congress authorized the deepening of a number of channels in the New York/New Jersey Harbor, including the Anchorage Channel, which extends from the Verrazano-Narrows Bridge to its confluence with the Port Jersey Channel. As part of the Harbor Deepening Project, the Anchorage Channel would be deepened to 50 feet below mean low water (MLW), for a length of 19,000 feet. In 2006, the PANYNJ, in cooperation with the USACE began these dredging operations between Brooklyn and Staten Island.

1.3 PROJECT PURPOSE AND NEED

The primary source of potable water to Staten Island is the existing 10-foot diameter Richmond Tunnel. Two existing siphons (36- and 42-inch diameters) currently run under the Anchorage Channel portion of the Upper New York Bay and serve as the secondary/backup water supplies from Brooklyn to Staten Island. Siphon No. 1 is a 36-inch diameter cast iron water main that was constructed circa 1917. This siphon crosses the Upper New York Bay from Shore Road at 79th Street in Brooklyn to Victory Boulevard in Staten Island. This siphon connects to an existing 48-inch water main in 79th Street in Brooklyn, a 66-inch water main within Shore Road in Brooklyn, and a 36-inch main in Victory Boulevard on Staten Island. Siphon No. 2 was constructed circa 1925 and extends from Shore Road at 86th Street in Brooklyn to Bay Street at Vanderbilt Avenue in the Stapleton section of Staten Island. Siphon No. 2 connects to a 72-inch main in 86th Street within Brooklyn, a 66-inch water main in Shore Road within Brooklyn, and a 20-inch main in Front Street in Staten Island.

As part of the Harbor Deepening Project, the USACE will dredge the Anchorage Channel to a depth of 50 feet below MLW. This dredging would expose and/or potentially impact the two existing siphons as they are not situated at a sufficient depth that would be protective of their continued use. Therefore, a new siphon is needed to maintain and provide the necessary secondary/backup water supply to Staten Island from Brooklyn.

The proposed siphon would be located within a tunnel with the top depth of the tunnel at least 95 feet below MLW where it crosses below the Anchorage Channel, the adjacent Stapleton Anchorage area and Bay Ridge Channel. This depth was selected by giving consideration to current and reasonably anticipated future dredging requirements; geotechnical conditions beneath the harbor; and the need to allow gravity drainage for the siphon. The new siphon along with the new and improved infrastructure (i.e., the water mains and the chlorination station) would also provide a greater level of reliability in the transmission of potable water between Brooklyn and Staten Island. In addition, the new siphon would serve as a supplemental supply of water for Staten Island. Under normal operations, the existing water distribution system would be supplemented with an average of approximately five (5) million gallons per day (mgd) of potable water from the new siphon. In emergency situations, the new siphon would average 50 mgd, with a peak flow of 150 mgd. In addition, during an emergency, the siphon could also be used in reverse to distribute water stored at Silver Lake Park in Staten Island to Brooklyn. The scheduling of the new siphon construction is also important to allow the Harbor Deepening Project and associated Port activities, to continue as planned.

1.4 DESCRIPTION OF THE PROPOSED ACTION

The proposed action would involve the construction of a new water siphon, which would replace two existing water siphons that provide a secondary/back-up water supply from Brooklyn to Staten Island. The proposed action would be comprised of several major components. These include the following:

- Construction of tunnel shafts within Staten Island and Brooklyn to allow for the construction of the bored tunnel beneath the harbor;
- Construction of an approximately 9,400 foot long, new 72-inch steel pipe water siphon within a 12-foot 4-inch diameter bored tunnel;
- Construction of water main trunk and distribution improvements to provide for connection of the new siphon to the existing water supply system in both Brooklyn and Staten Island;

- Development of a dedicated, new chlorination station within Staten Island that would treat all potable water conveyed by the new siphon; and

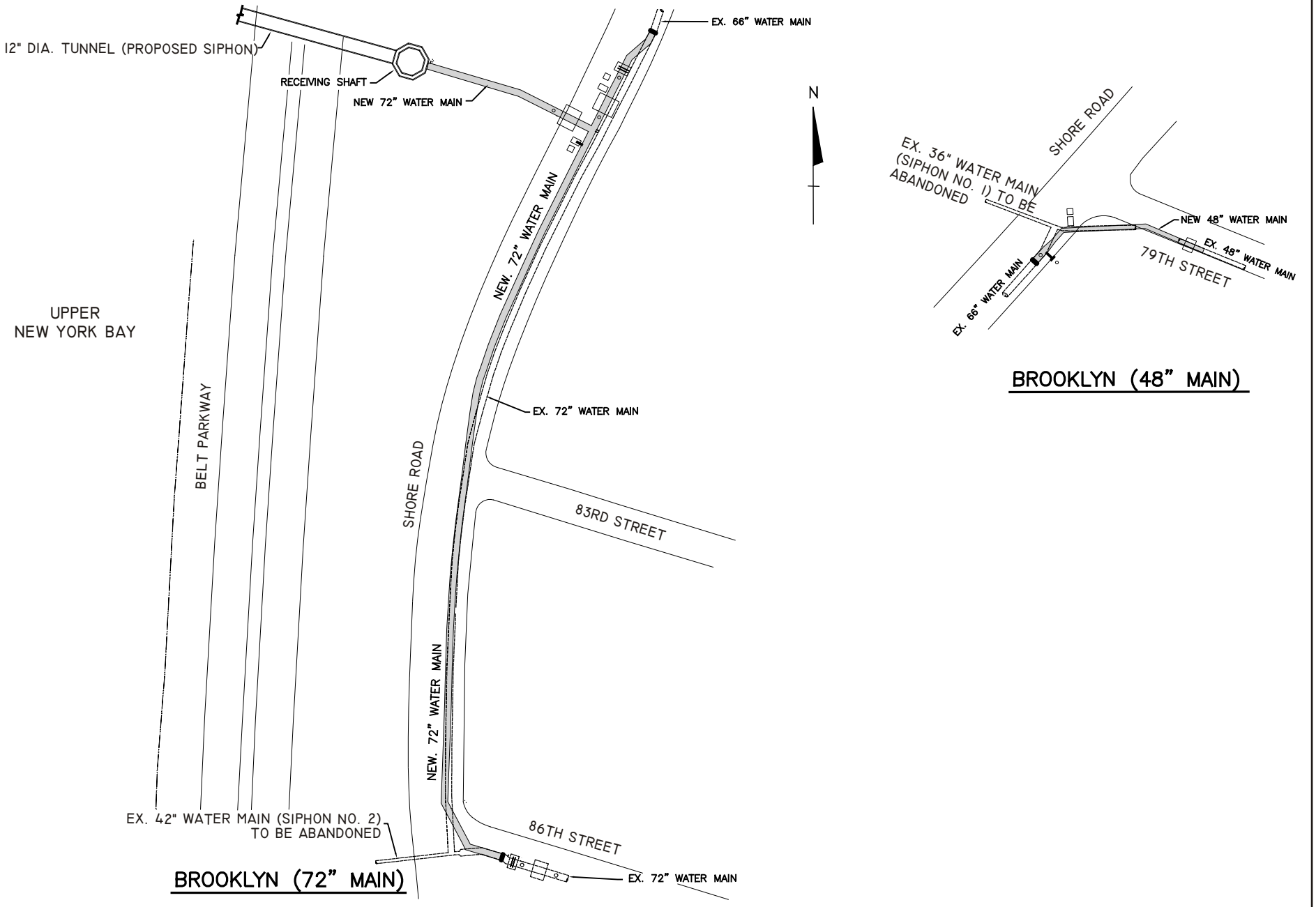
- Abandonment of the existing 36- and 42-inch diameter siphons within Upper New York Bay and their associated venturi meter chambers and appurtenances. The portions of the existing siphons located on land would be abandoned in place by hydraulically filling the lines with an excavatable flowable fill.

Additional detail for each of the major project components is provided below and the general layout of the land-side components are depicted in Figures 1-2 through 1-4. A description of the disposal of excavated material and sewer line replacements which would be incidental to the new water main construction is also provided.

1.4.1 Shaft Sites

Prior to the construction of the bored tunnel beneath Upper New York Bay, two shafts will need to be developed – a receiving shaft in Brooklyn (see Figure 1-5) and a launching shaft on Staten Island (see Figure 1-6). Their initial purpose would be to enable the construction of the bored tunnel beneath the Upper New York Bay. The shafts would have an approximately 24 foot internal diameter in Brooklyn and an approximately 28 foot internal diameter in Staten Island. Depths of the shafts would range from approximately 151 feet in Brooklyn to approximately 89 feet in Staten Island. The Staten Island shaft would serve as the launching shaft for the tunnel boring machine (TBM) and would also be the primary location for the removal of excavated materials from the tunnel, the staging of materials for tunnel and siphon construction and the location for support facilities (e.g., ventilation, lighting, water) and electrical supply for the TBM and other needs. The Staten Island shaft site would be located on a city-owned parcel (Block 487, Lot 100) that is characterized by old, asphalt paved areas and invasive vegetation. The site is generally bounded by the Staten Island Rapid Transit (SIRT) on the west, Front Street to the east and south, and light industrial buildings to the north, and is roughly 500 feet south of Hannah Street. The overall shaft site would encompass approximately 48,700 square feet including areas for the staging of equipment and materials. A NYCEDC-owned parking lot that is situated south of Front Street (southeast of the shaft site) will serve as the primary staging site. In addition, an alternate site further south along Front Street near Wave Street may also serve as an alternative staging area for siphon and chlorination station construction. The Staten Island shaft site would also serve as the site for the proposed chlorination station.

The proposed Brooklyn shaft site would serve as the receiving shaft for the TBM and would be located in Shore Road Park (Block 6140, Lot 8), between the Belt Parkway to the west and Shore Road to the east. The shaft would be located in the northwest corner of a grassy

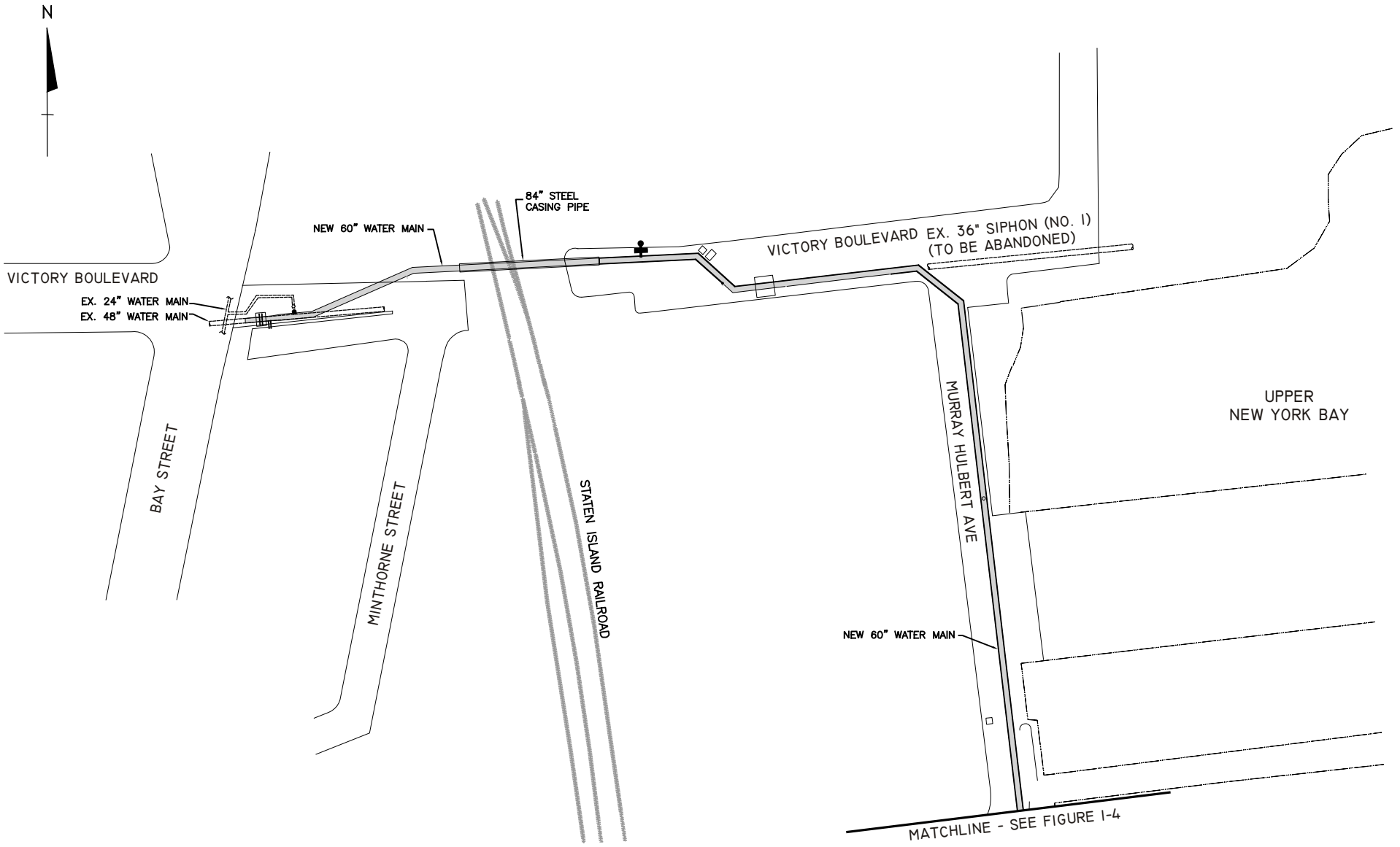


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 1-2 Proposed General Land Piping Layout - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

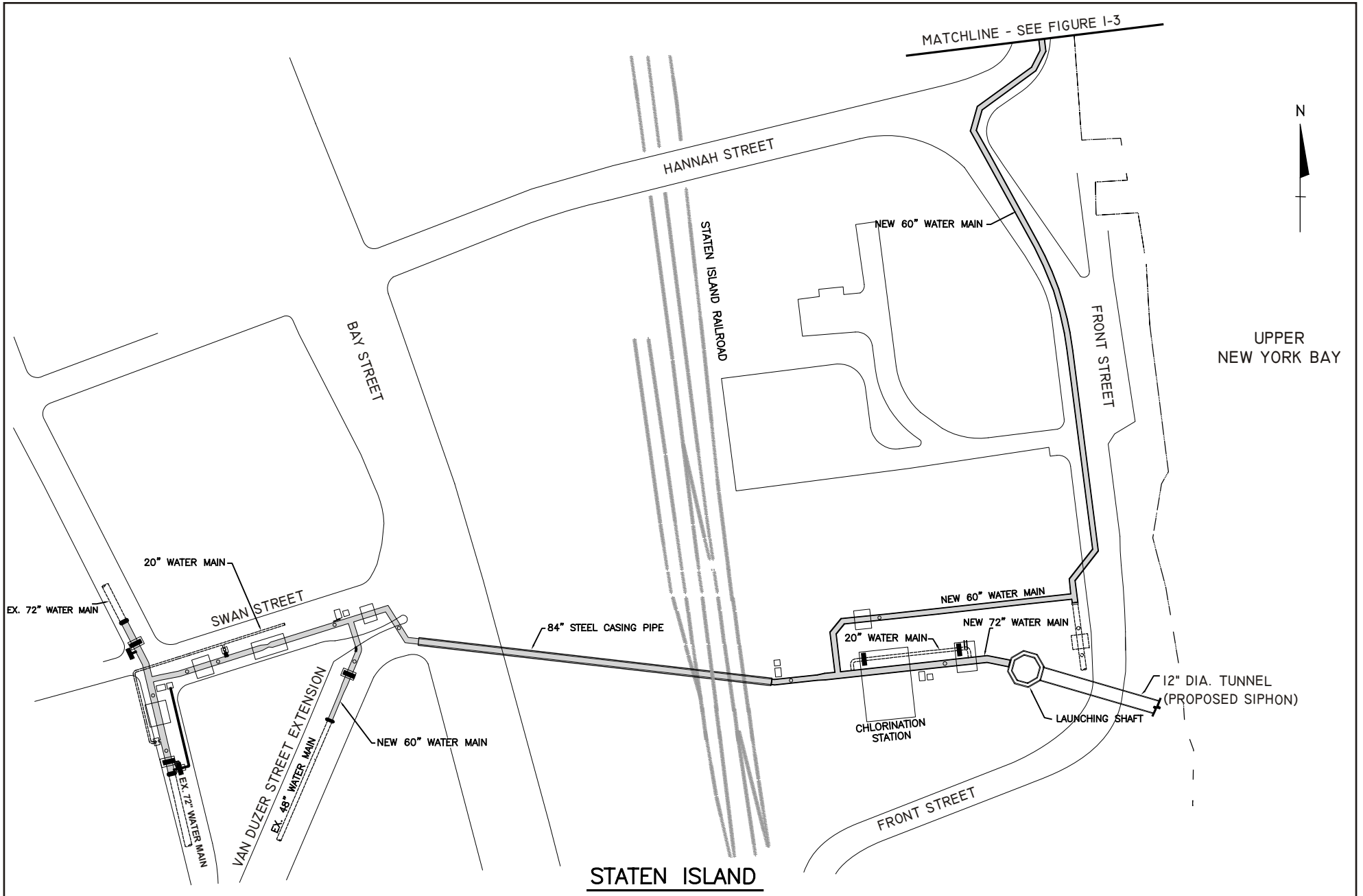


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 1-3 Proposed General Land Piping Layout - Victory Boulevard, Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

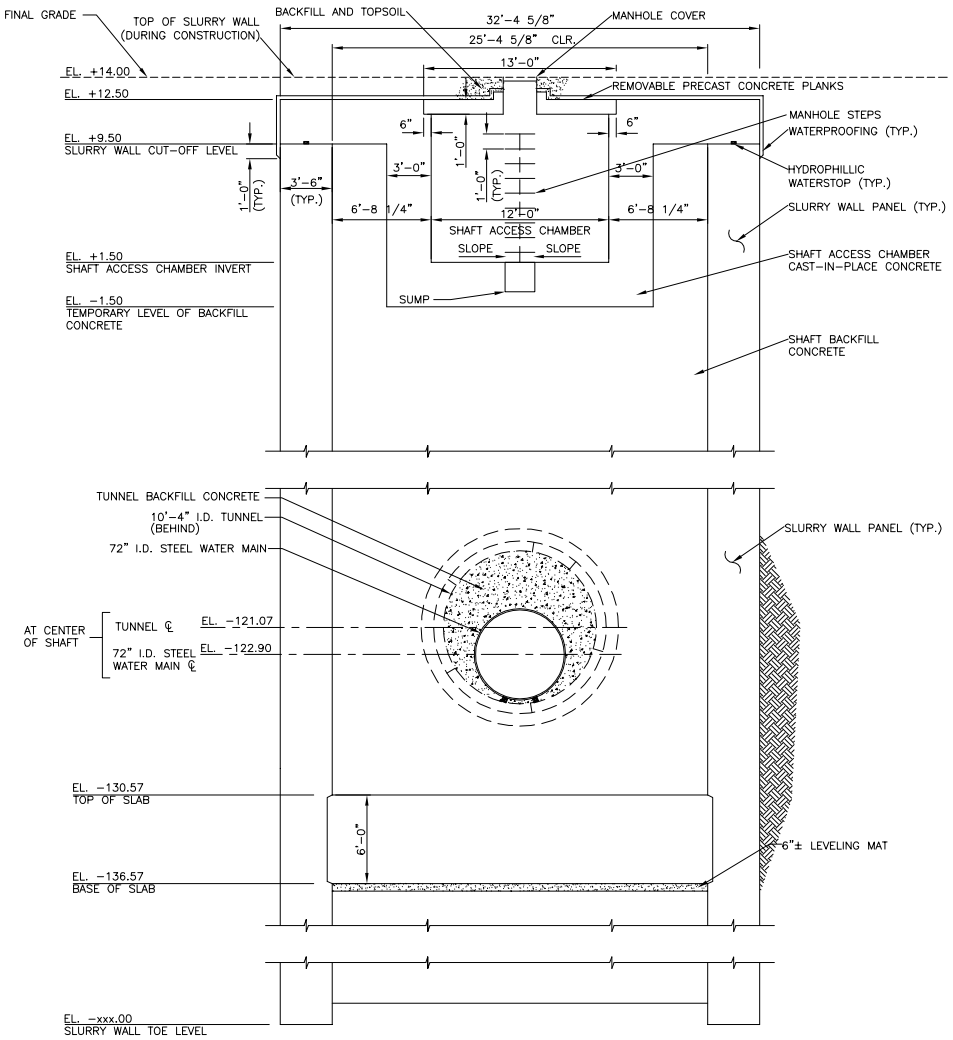


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

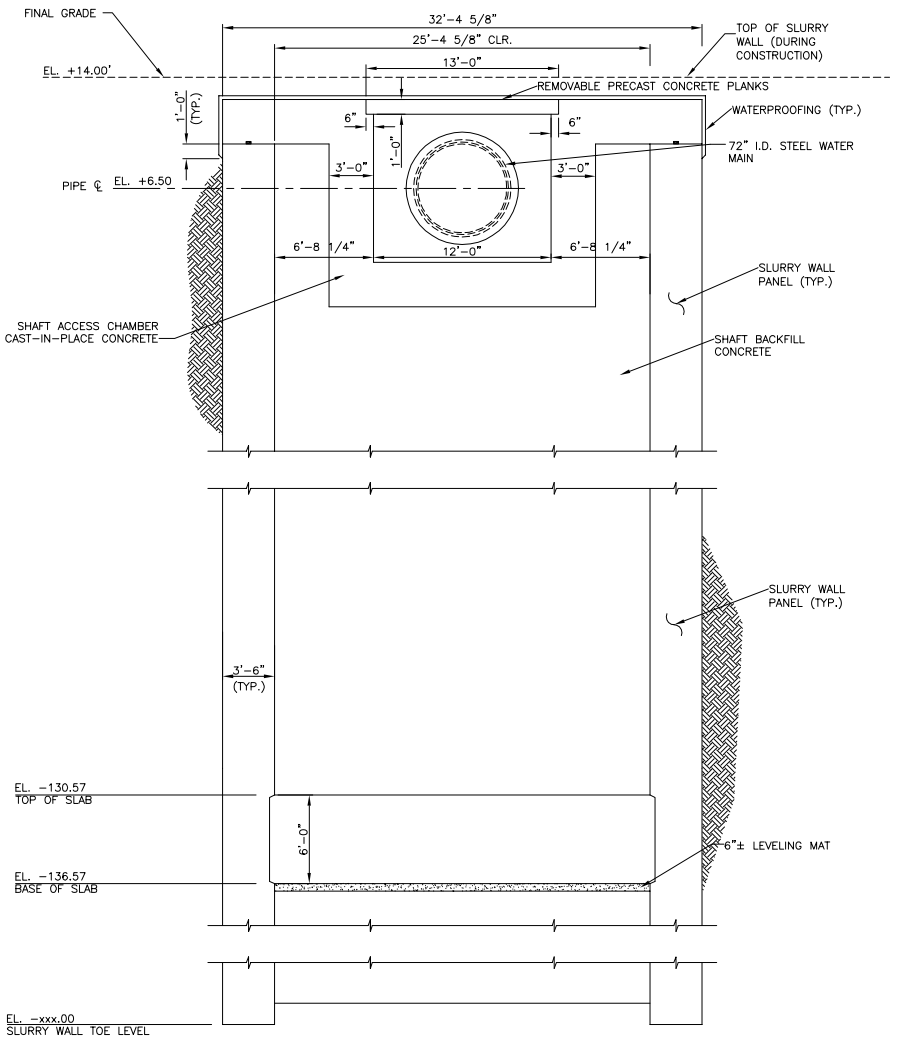
Figure 1-4 Proposed General Land Piping Layout - Shaft Site, Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



SECTION 1
(FIGURE 1-7)



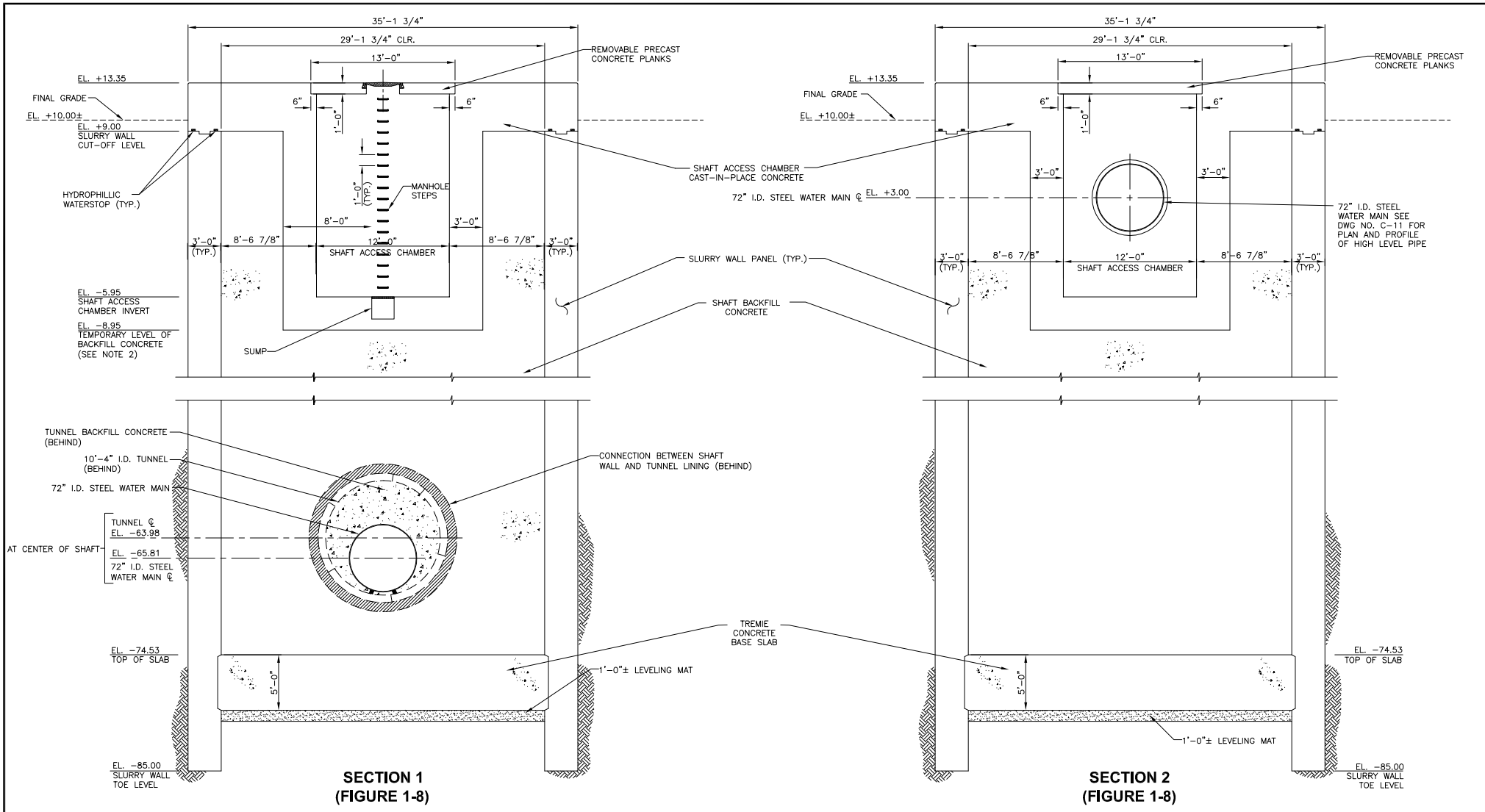
SECTION 2
(FIGURE1-7)

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-5 Brooklyn Receiving Shaft - Typical Cross Sections

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation



SECTION 1
(FIGURE 1-8)

SECTION 2
(FIGURE 1-8)

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-6 Staten Island Launching Shaft - Typical Cross Sections

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

triangle formed by park asphalt pathways located west of Fort Hamilton High School, between 83rd Street and Shore Road Lane. The site is primarily covered with grass and paved pathways. Several existing trees are present within Shore Road Park at this location.

In order to limit potential impacts to the use of Shore Road Park and the surrounding land uses in proximity to the Brooklyn shaft site, the receiving shaft would be developed over an approximately six month period and then deactivated and covered while the subaqueous tunnel is bored under the Bay. The approximately 28,600 square foot Brooklyn shaft construction zone would then be re-opened when the bored tunnel nears completion. The temporary cover installed at the top of the Brooklyn receiving shaft after the launch of the TBM in Staten Island and during the tunnel boring would consist of the placement of a temporary structural cover over the shaft. The immediate location of the shaft and an approximately five foot buffer surrounding it would be fenced to prohibit access to this location. The remainder of the area affected by the construction of the shaft would be temporarily restored through seeding and/or selected plantings and the existing path at this location would be reconnected and re-opened to the public. No less than 21 calendar days prior to break through of the TBM at the Brooklyn receiving shaft, the temporary cover would be removed and the shaft would be made ready. After the retrieval of the TBM and the completion of construction work within the shaft and surrounding area, the park would be restored consistent with the requirements of a restoration plan developed by the NYCDEP and the New York City Department of Parks and Recreation (NYCDPR).

Shaft construction at both locations would involve the excavation of the site and the temporary support of the shaft excavation. The main shaft excavation would be accomplished through the use of traditional soil excavation techniques, such as the use of an excavator to remove soil and overburden. As the excavation depth increases, a crane with a clamshell attachment would likely be used to advance the shaft excavation. Excavated materials would be removed from the site through the use of dump trucks.

Temporary ground support of the shaft sidewalls, within the soils horizons, would be accomplished through slurry wall construction methods. The selected contractor, however, may also choose to utilize ground freezing techniques in lieu of slurry walls for construction of the shafts. The objectives of temporary ground support include stabilizing the ground to prevent collapse of the excavation, to provide a safe working environment; and limiting groundwater infiltration into the shaft.

For the slurry wall shaft construction alternative, a controlled excavation of narrow trenches would be constructed around the perimeter of the shaft excavation and kept full with an engineered fluid or slurry. The slurry would provide confinement by exerting a hydraulic

pressure against the trench walls and acting as shoring to minimize the risk of collapse of the trench.

Following the completion of the desired trench depth, prefabricated, steel-reinforcement cages would be lowered into the trench, and then concreted in place, from the bottom up, using tremie pipes to displace the slurry fluid. The slurry fluid would be pumped out and stored for re-use. The walls would extend below the elevation of the final excavation for stability and water cutoff. The slurry wall panels would be constructed in an alternating pattern with a suitable joint system between panels to ensure the watertight integrity of the shaft structure. The main shaft excavation would then take place within the slurry walls, which will provide ground support. Glass Fiber Reinforced Polymer (GFRP) bars would be substituted for the traditional steel reinforcement in the slurry wall panels at the tunnel eye zone, where the TBM would break into the shaft. The use of GFRP bars would allow for ease of excavation of this section of the slurry wall panels.

As noted above, the use of ground freezing for construction of the shafts may be employed by the contractor. The use of ground freezing would involve installing a network of heat extraction pipes around the shaft excavation. The resultant freezing of water in the soil would generate a solid wall of frozen ground in the saturated soil stratum around the excavation perimeter and thereby serve as structural support. Effective ground freezing would also provide a groundwater barrier in saturated ground by preventing the flow and seepage of groundwater from entering the excavation. The ground freeze would be established prior to excavation. As the excavation proceeds, the shaft walls would be lined with shotcrete to provide ground support.

Ground freezing at the shaft sites would be achieved by using either large portable refrigeration plants or liquid nitrogen. Liquid nitrogen is normally used for relatively small and quick freezing and can be used at the TBM break-in location at the Brooklyn receiving shaft. A chilled brine medium, which is used as a coolant, would flow through the freeze pipe network to extract the heat from the soil. Initially, the frozen soil forms a column around each freeze pipe. With continued heat extraction, the frozen soil columns expand in diameter until adjacent columns merge and form a frozen wall. After the initial freeze has been established and a continuous frozen wall closure has been achieved around the shaft excavation perimeter, the required refrigeration capacity would be significantly reduced to maintain the frozen barrier. The freeze equipment would require continuous electrical power supply throughout construction. It is anticipated that this power would normally be drawn from a temporary service from Consolidated Edison. This would be available from an existing substation within the Homeport in Staten Island. In Brooklyn, a verifiable source of power would need to be identified.

For practical purposes, steel pipes would be generally used for freeze pipes. However, for the TBM break-out/break-in, high-density polyethylene (HDPE) pipes may be utilized which would be drained and removed in advance so that the TBM can exit the launching shaft and enter the receiving shaft. An alternative method may also be used whereby the steel pipes are heated and lifted clear of the TBM when required.

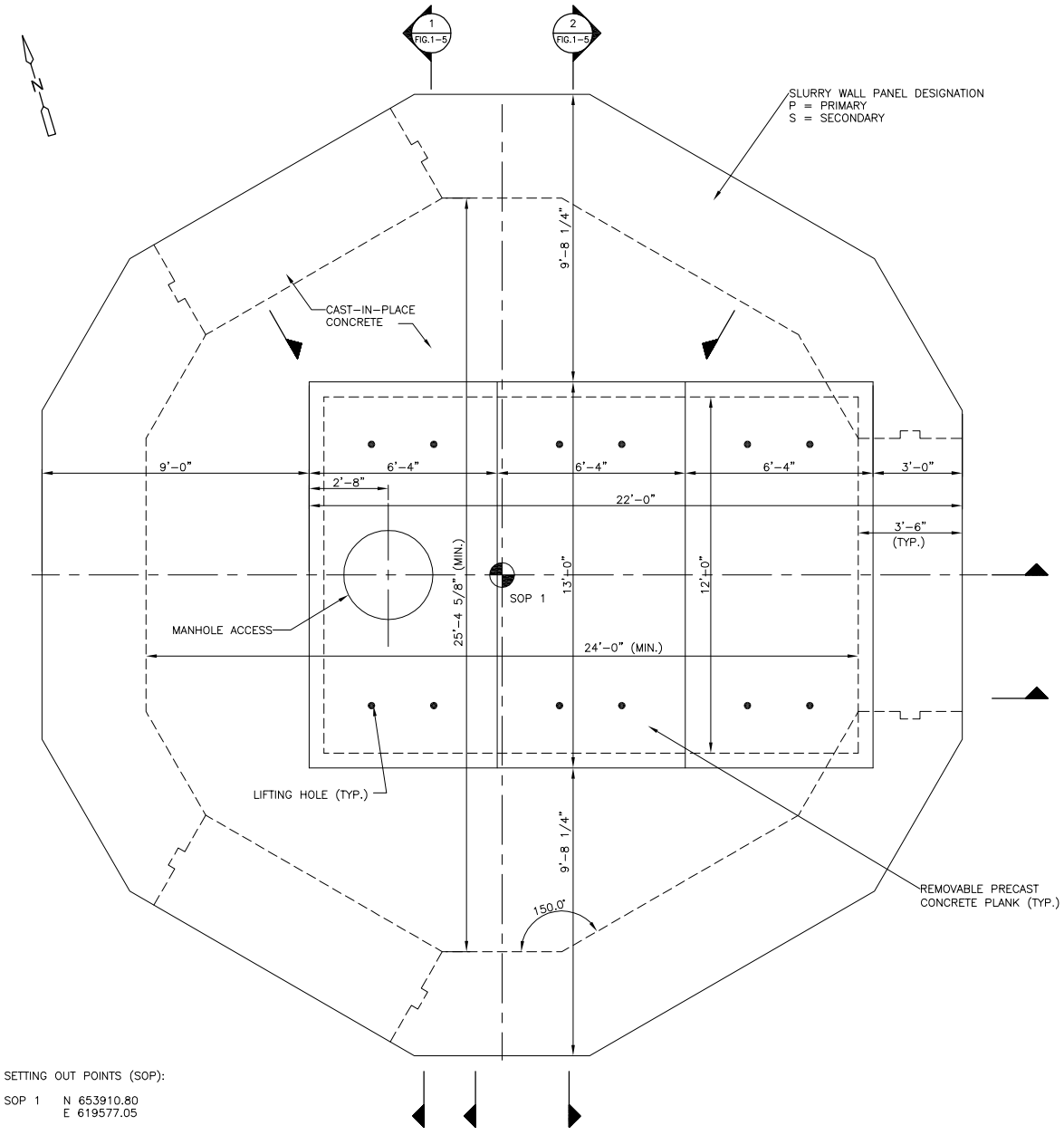
Upon completion of the tunneling work, the un-staffed, underground facilities at both shaft locations would contain the potable steel water supply pipe risers, covered by a chamber that would contain valves that control water flow from the risers in the shaft to and from the trunk mains in Brooklyn and Staten Island. Additional site modifications at the Staten Island shaft site would include the construction of a new chlorination station, an access road for the delivery of disinfection chemicals and the maintenance of shaft and chlorination facilities, underground piping and valve structures to connect the shaft risers with existing water mains, landscaping, and perimeter security fencing. Except for the riser pipes and the valve chambers near the ground surface, the full depth and cross-sectional area of both shafts would be backfilled with concrete.

As depicted in Figures 1-5 and 1-6, the roofs of both shafts would be covered by backfill and topsoil, except for the manhole access cover in Brooklyn. Beneath the ground cover, removable precast concrete planks would be installed to allow for periodic shaft maintenance, as shown on Figures 1-7 and 1-8. The riser pipes would be fully encased in backfill concrete below the shaft chamber floor elevation. In Staten Island the top of the access chamber would be approximately three to four feet above existing grade.

1.4.2 Tunnel and Siphon Construction

The new 72-inch diameter, approximately 9,400-foot long siphon would be contained within a bored, subaqueous tunnel of approximately 12-feet 4-inches in excavated diameter, to be constructed beneath the Upper New York Bay. A general section view of this tunnel is provided in Figure 1-9, and plan and profile views of the proposed tunnel alignment are provided in Figures 1-10 through 1-18. The tunnel would be constructed through the use of a TBM, which would start from the base of the Staten Island shaft and advance towards the Brooklyn receiving shaft. Electricity would be required to operate the TBM, ventilation equipment, lighting and other construction-related equipment. This would be provided from an existing NYCEDC electrical substation within the former Homeport. The TBM would bore its way eastward over the course of approximately 13 months. Currently, tunnel boring operations are scheduled to begin in June 2011 and are anticipated to be completed in July 2012.

Tunnel construction would involve placement of reinforced precast concrete liner segments installed as the TBM advances. These liner segments would be gasketed and grouted



PLAN AT ELEVATION +12.50

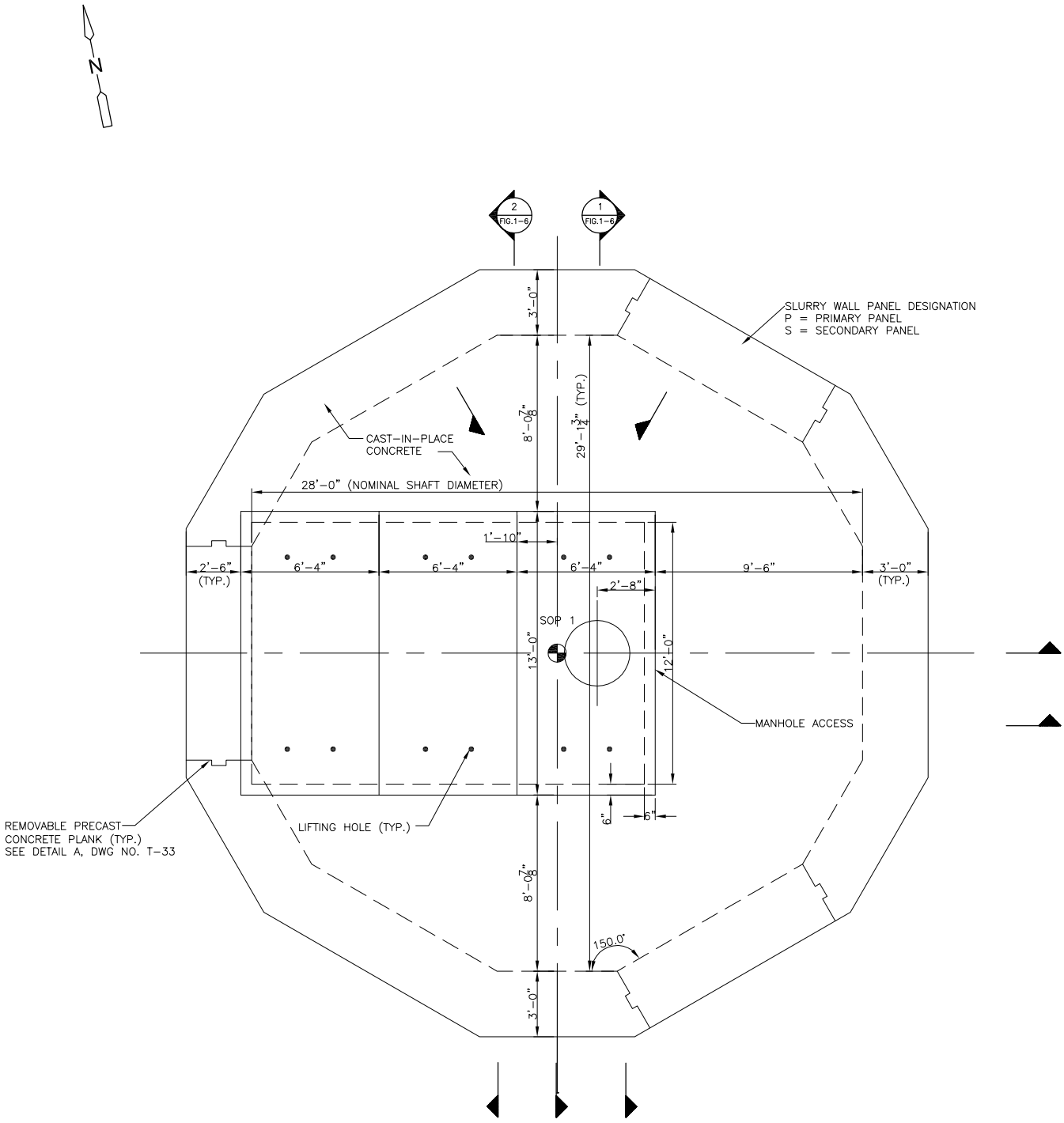
1/2" = 1'-0"

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-7 Brooklyn Receiving Shaft - Roof Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



PLAN AT ELEVATION +8.50

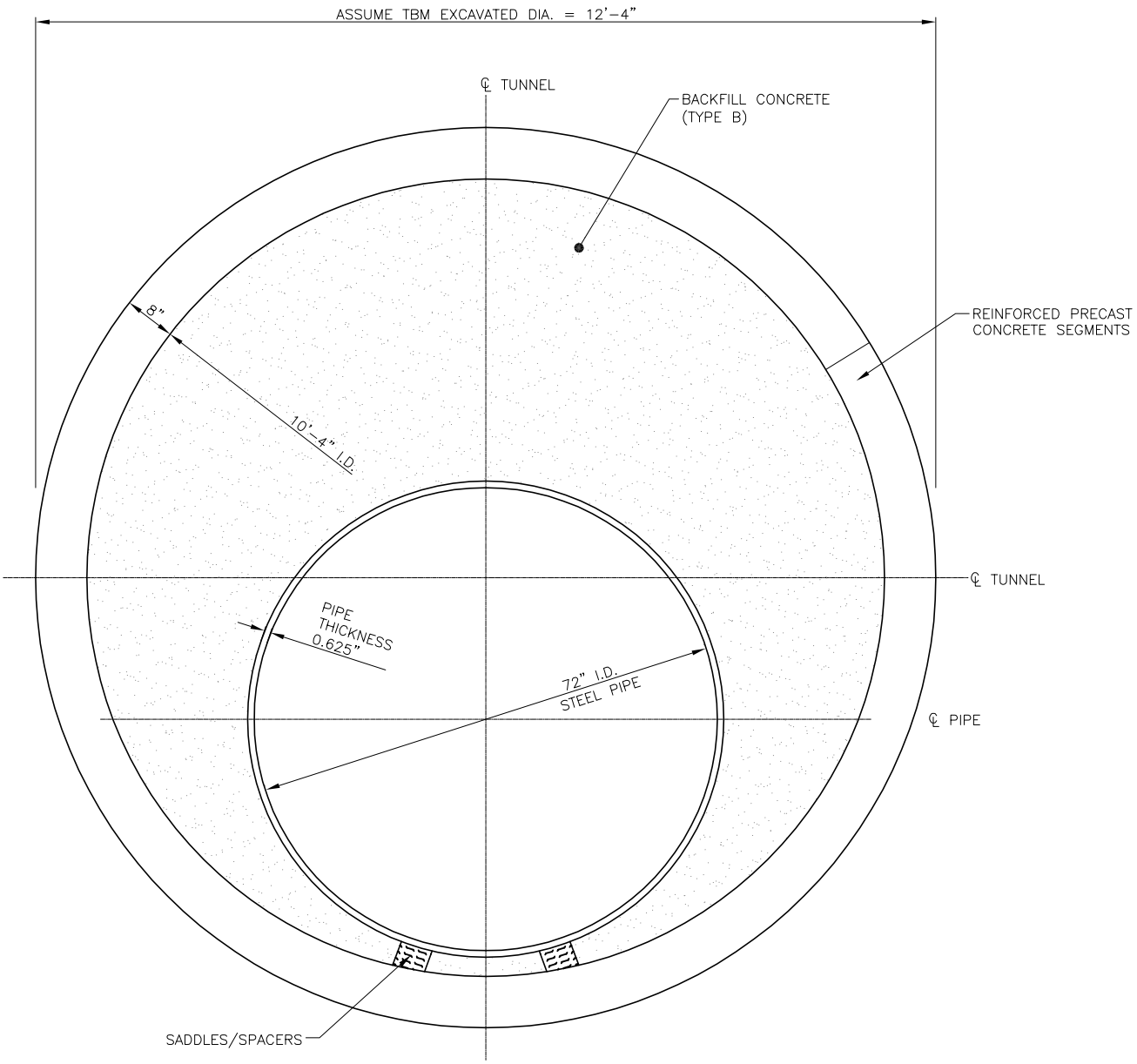
3/8"=1'-0"

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-8 Staten Island Launching Site - Roof Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation



TUNNEL DETAIL

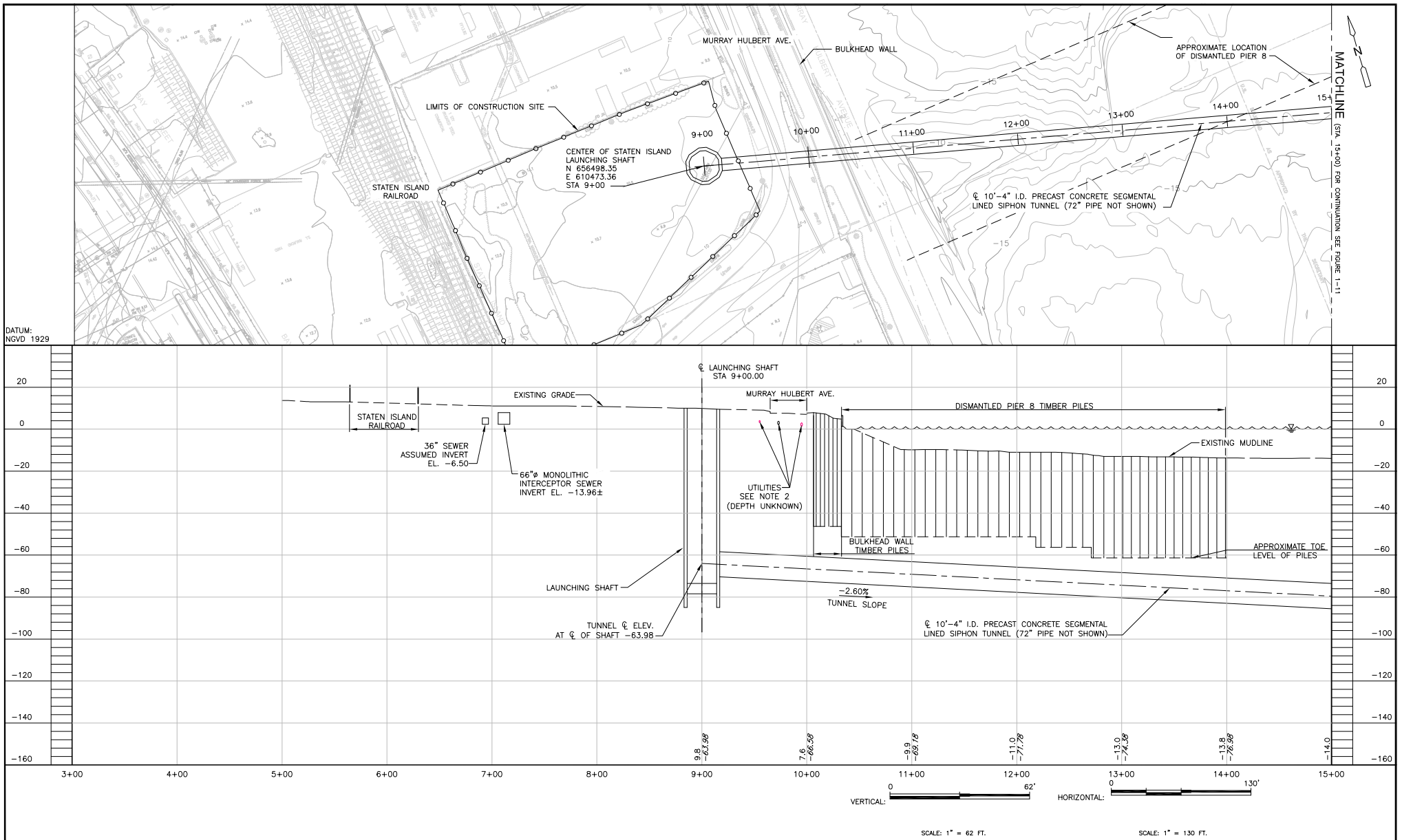
N.T.S.

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-9 General Tunnel Section

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



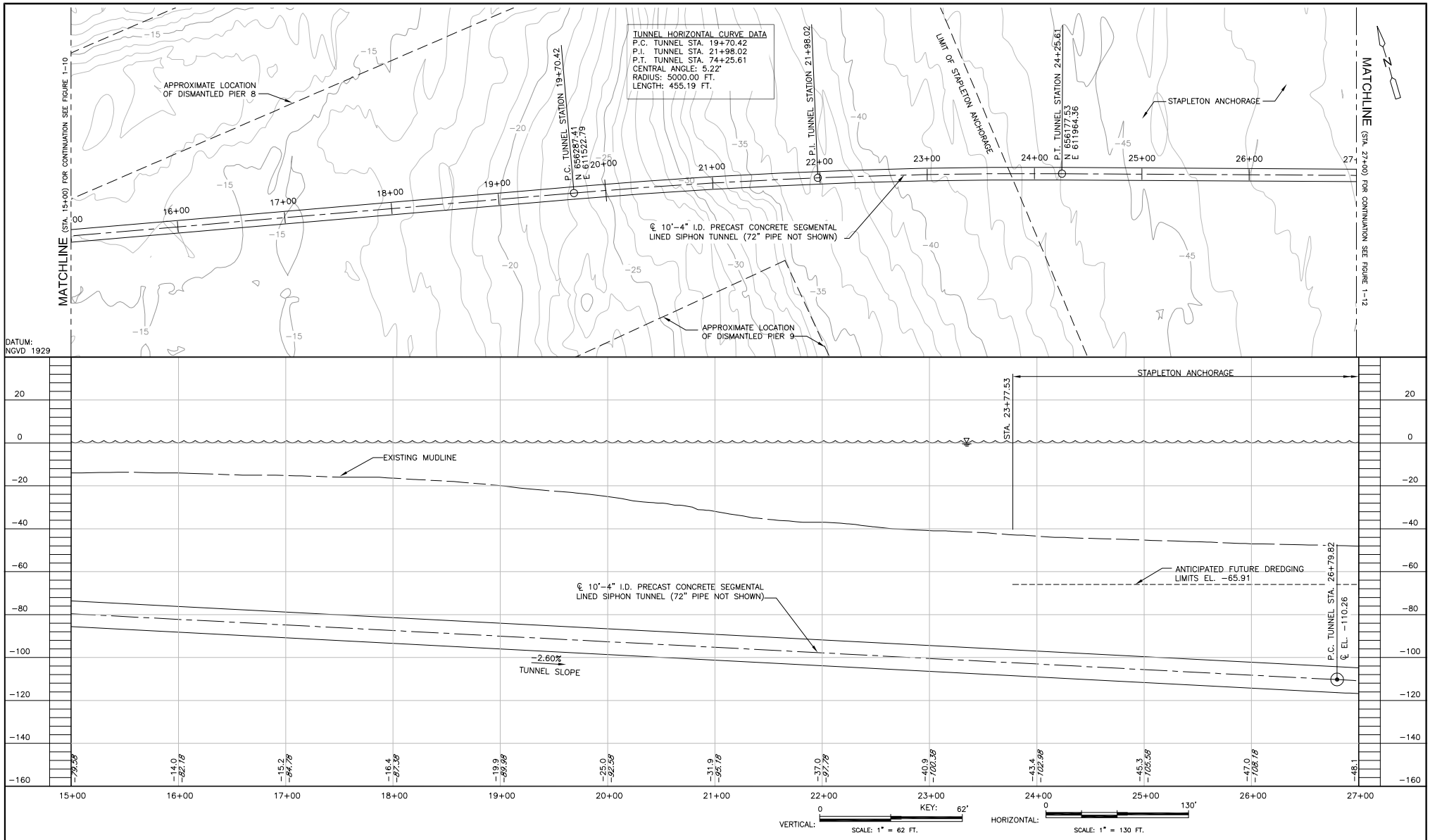
HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-10 Harbor Crossing Plan and Profile - Staten Island Launching Shaft (1 of 9)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION

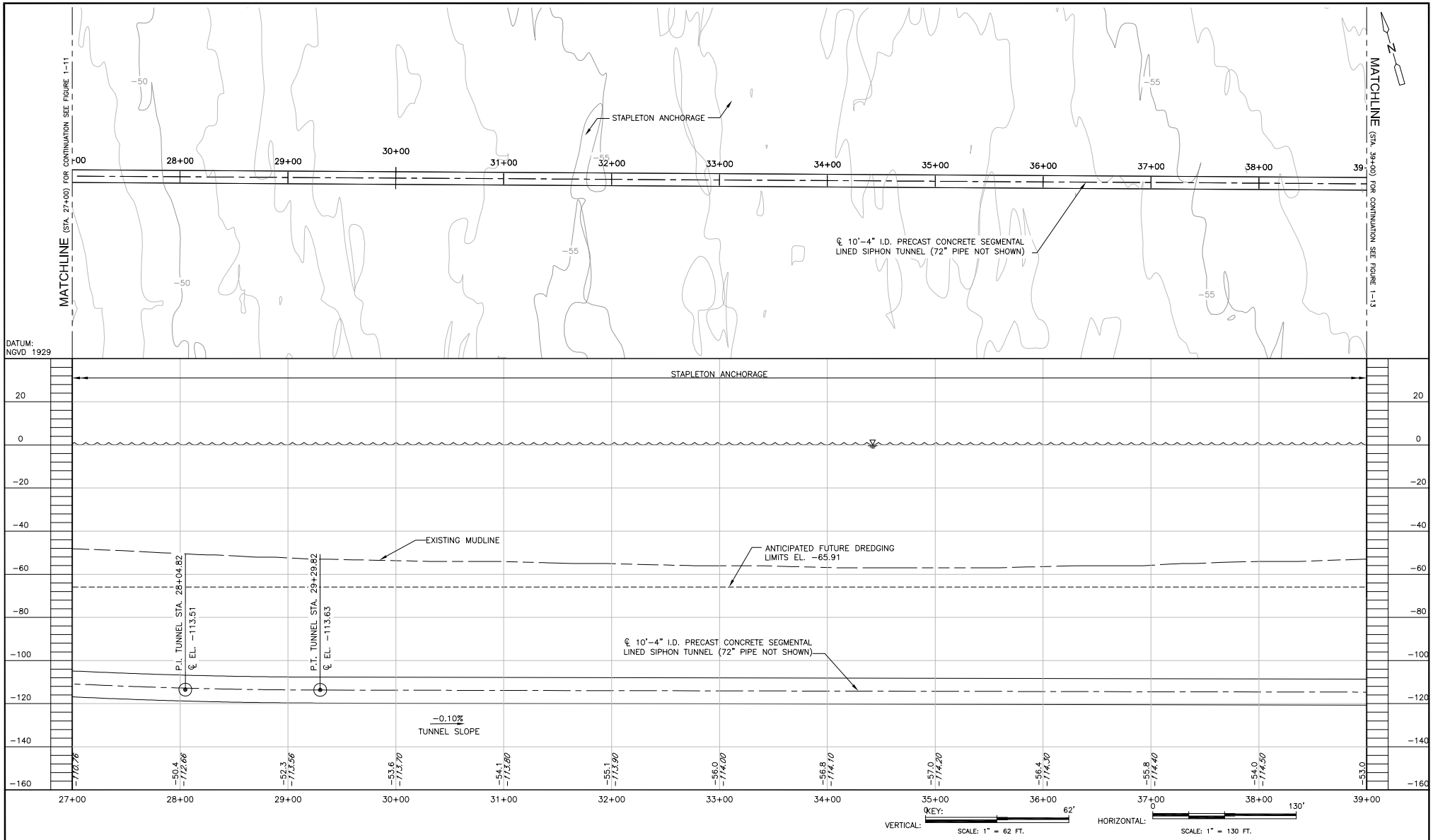


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-11 Harbor Crossing Plan and Profile (2 of 9)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

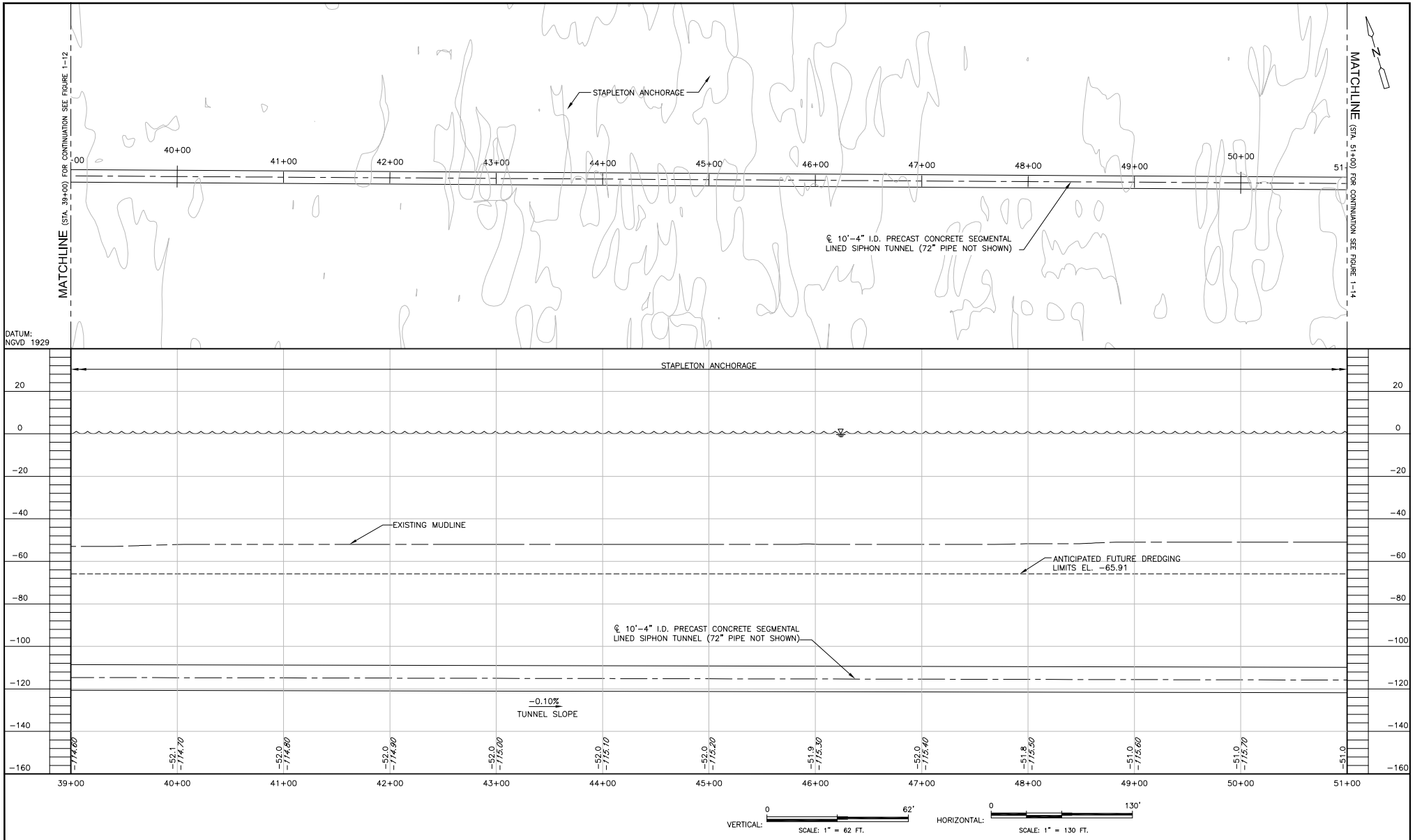


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-12 Harbor Crossing Plan and Profile (3 of 9)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

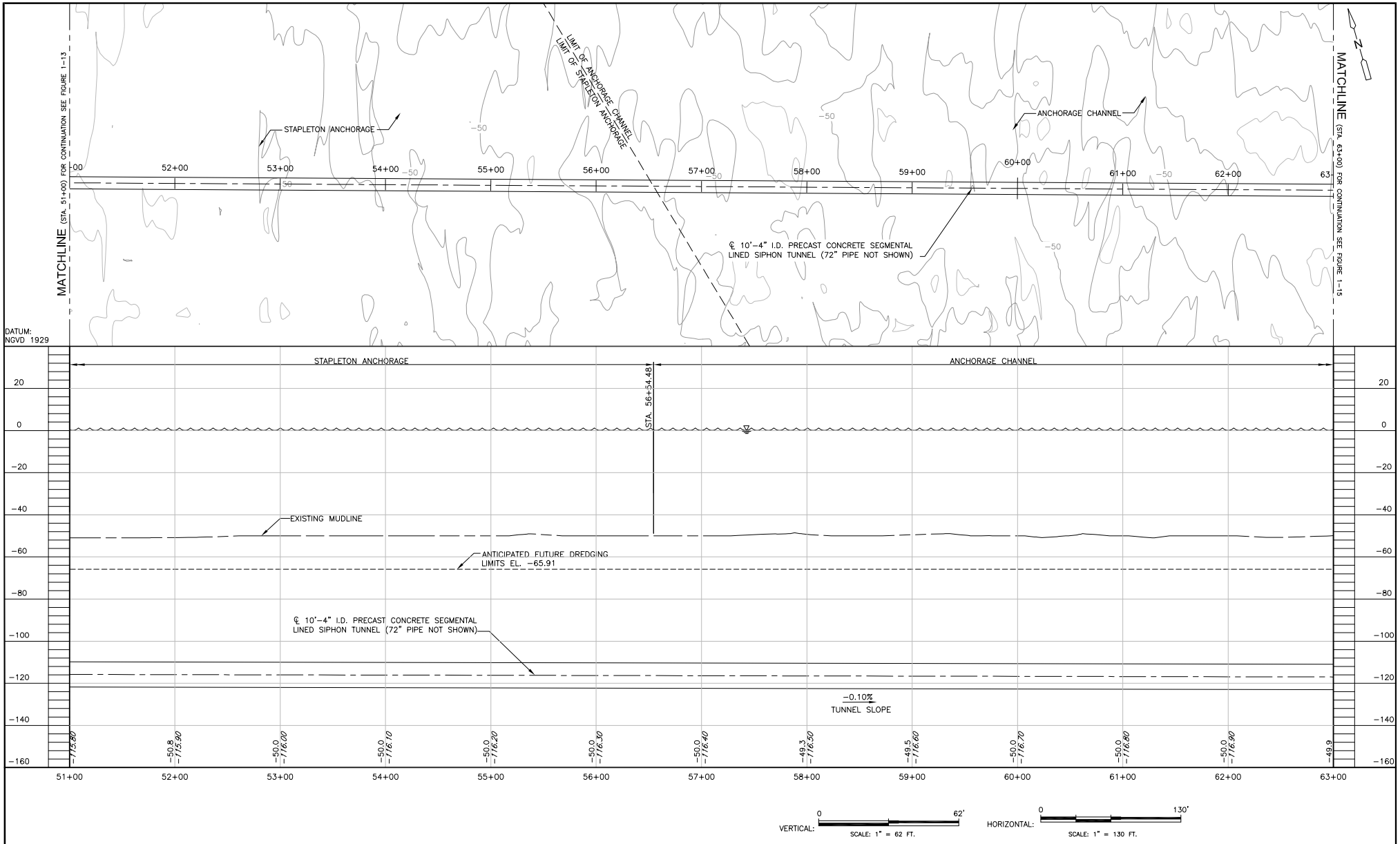


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-13 Harbor Crossing Plan and Profile (4 of 9)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

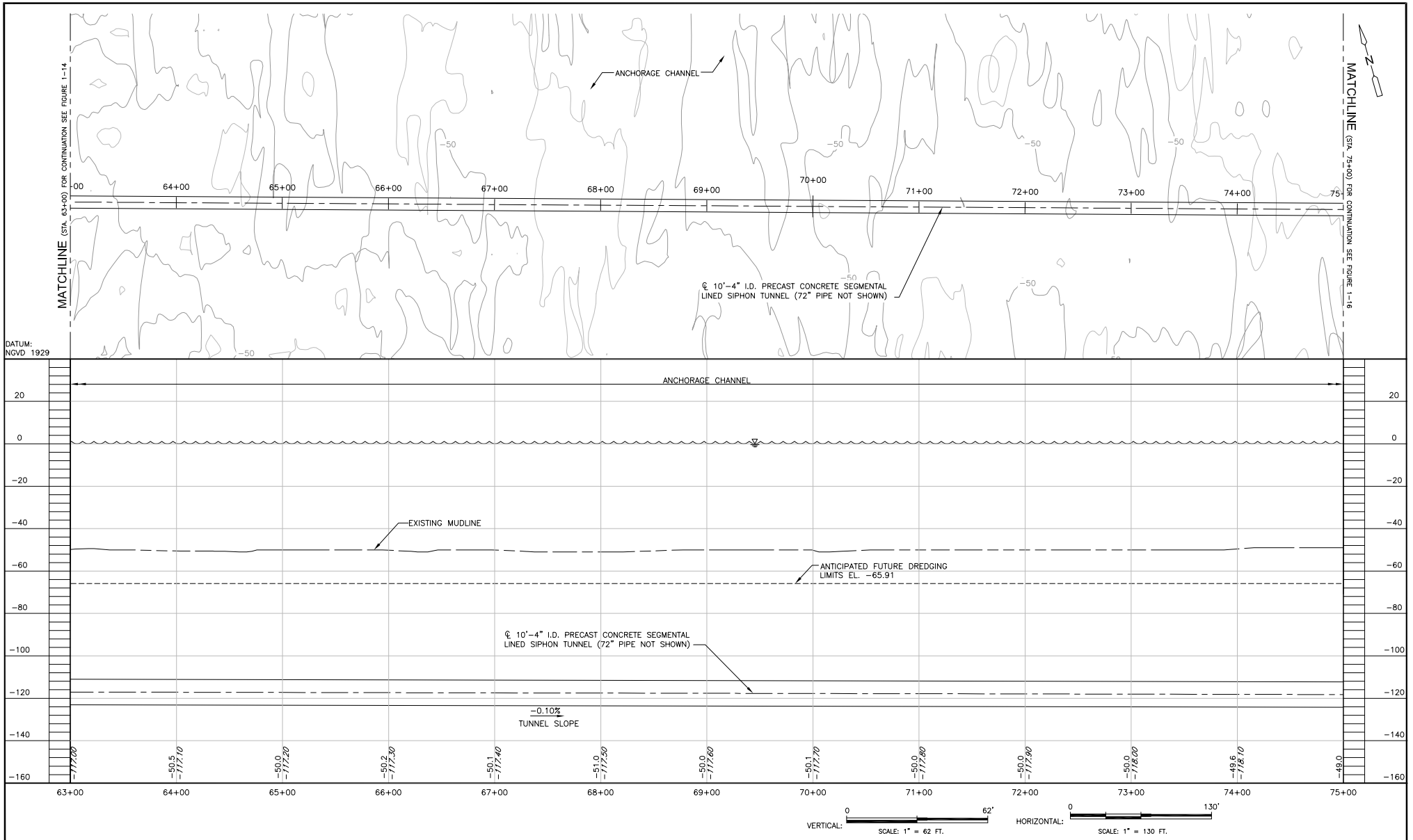


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-14 Harbor Crossing Plan and Profile (5 of 9)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

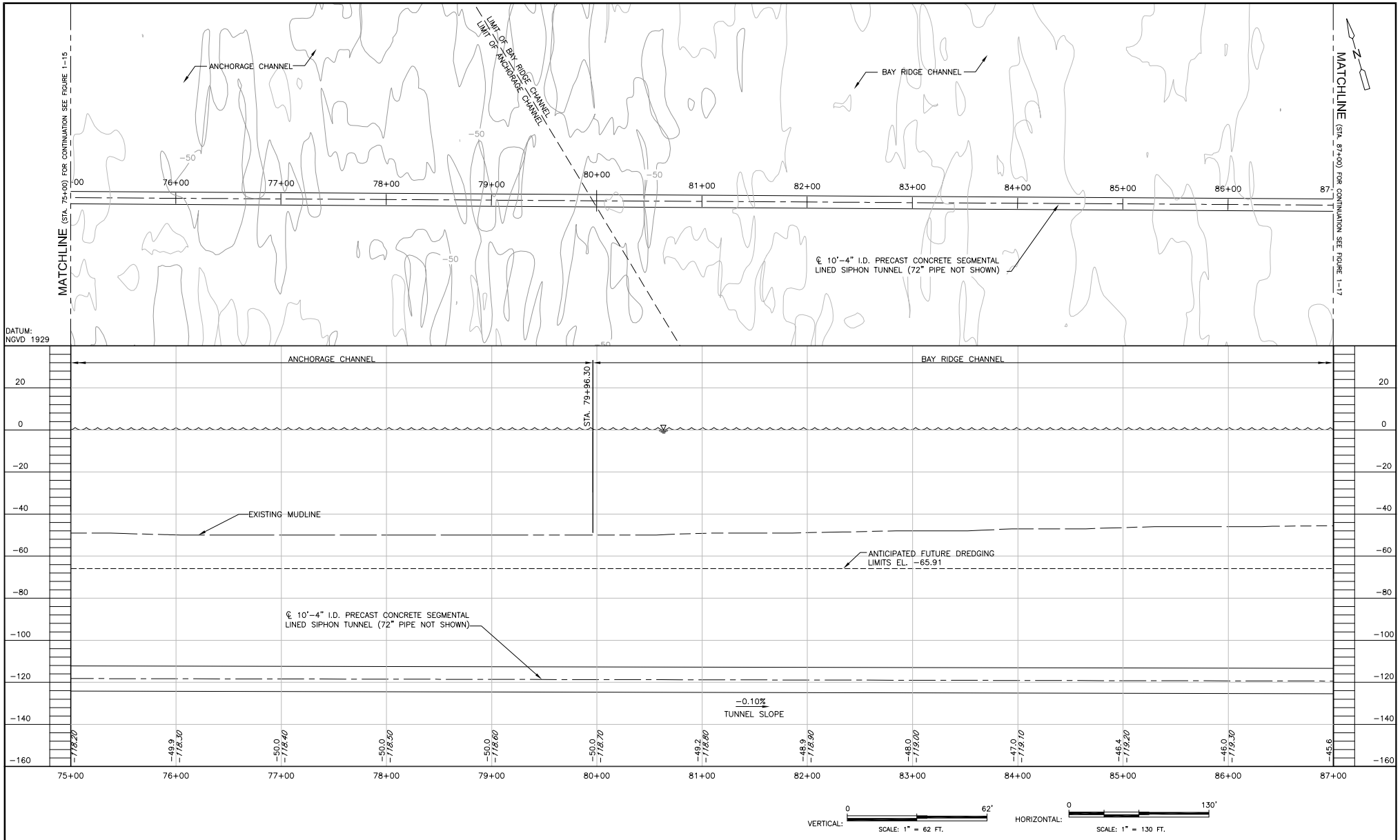


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-15 Harbor Crossing Plan and Profile (6 of 9)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

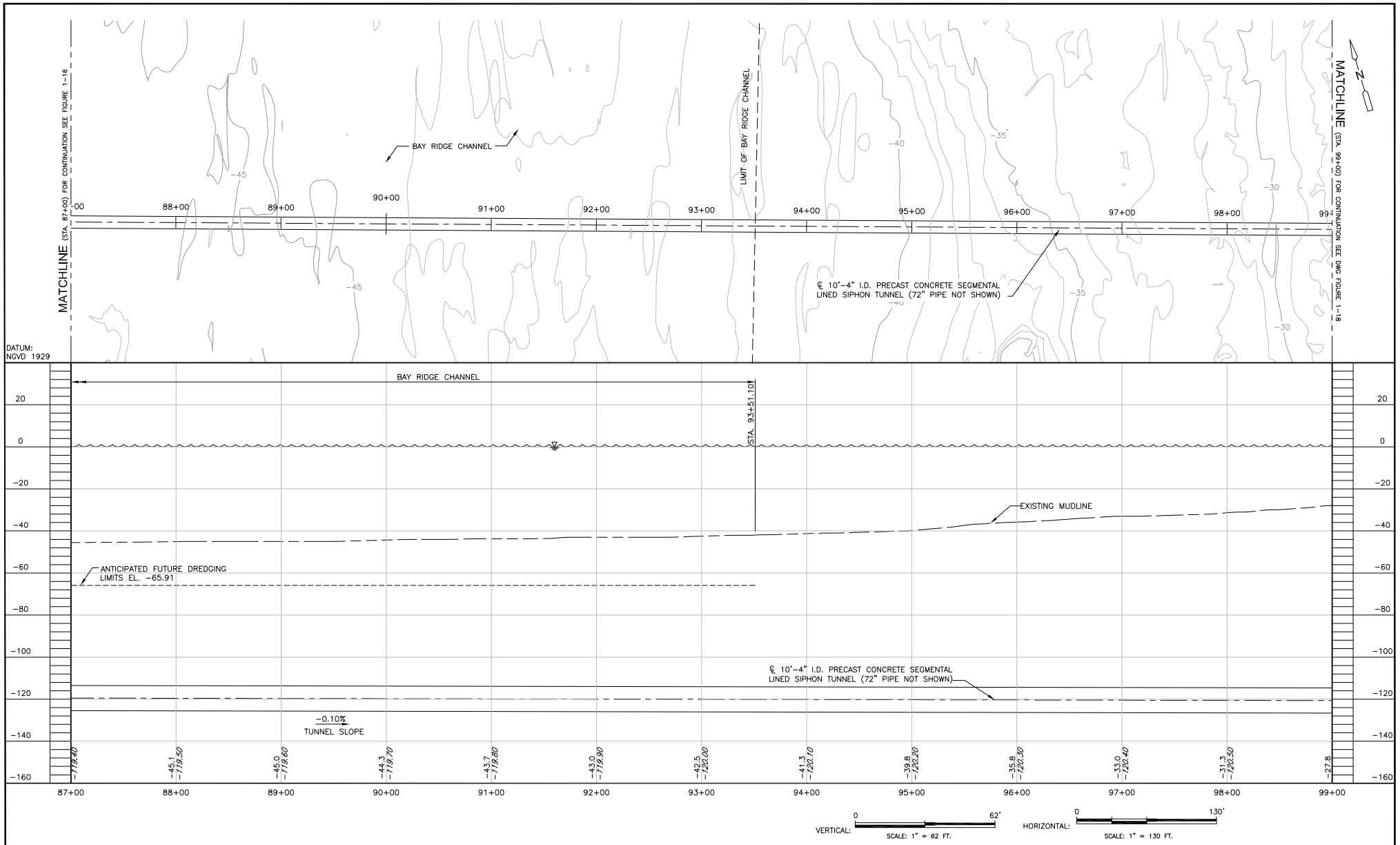


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-16 Harbor Crossing Plan and Profile (7 of 9)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

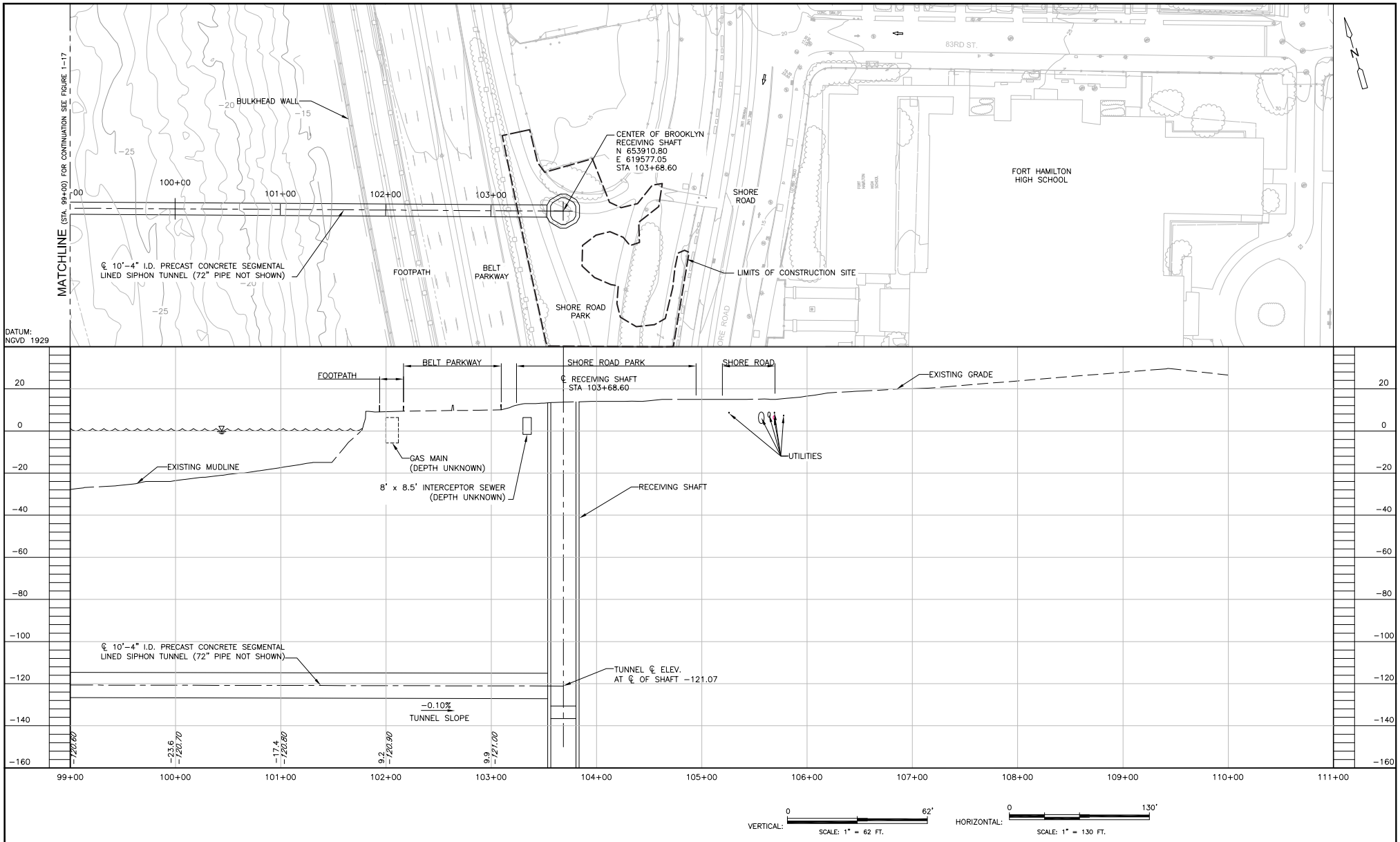


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-17 Harbor Crossing Plan and Profile (8 of 9)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-18 Harbor Crossing Plan and Profile - Brooklyn Receiving Shaft (9 of 9)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

in place to minimize the risk of water ingress. Precast liner segments would be delivered to the TBM from the Staten Island shaft site. The completed bored tunnel would have an inner diameter of 10-feet 4-inches after placement of the precast liner segments. Upon completion of the bored tunnel, a 72-inch diameter steel pipe would be placed within the tunnel. The steel pipe would be placed in sections within the bored tunnel and the joints between sections would be welded in place. The remaining annular space between the 72-inch steel pipe and the bored tunnel lining would be filled with grout.

In Brooklyn, the tunnel would continue under the Belt Parkway and terminate at the Brooklyn shaft site located within Shore Road Park in the Bay Ridge section of Brooklyn. All materials required for the ongoing construction of the tunnel would be delivered and staged at the Staten Island shaft site and an additional temporary construction staging area located either immediately southeast of the shaft site or within the Stapleton Homeport area along Front Street. Primary materials that would be staged at this location would include tunnel liner segments, temporary stockpiles of excavated material, grout materials and batching facilities, TBM components, steel pipe, and other required materials.

Muck from the tunnel construction, estimated at nearly 41,770 cubic yards, would be removed from the tunnel on a recurring basis through the Staten Island shaft. Muck materials would be removed from the tunnel via the shaft for temporary, short-term stockpiling and/or placement within dump trucks for removal. It is possible that some of the tunnel material may qualify for a Beneficial Use Determination (BUD) from the New York State Department of Environmental Conservation (NYSDEC) and would be utilized in a beneficial manner. This will be investigated by the construction contractor, and would be contingent upon the characteristics of these materials and the success of any appropriate site-specific BUD application. Materials that cannot be beneficially reused would be transported to an appropriately licensed disposal facility.

1.4.3 Water Mains

In addition to the tunnel and shaft construction, a related element of the project in both boroughs would involve the connection of the water mains from the proposed shaft sites to the existing trunk and water main distribution systems.

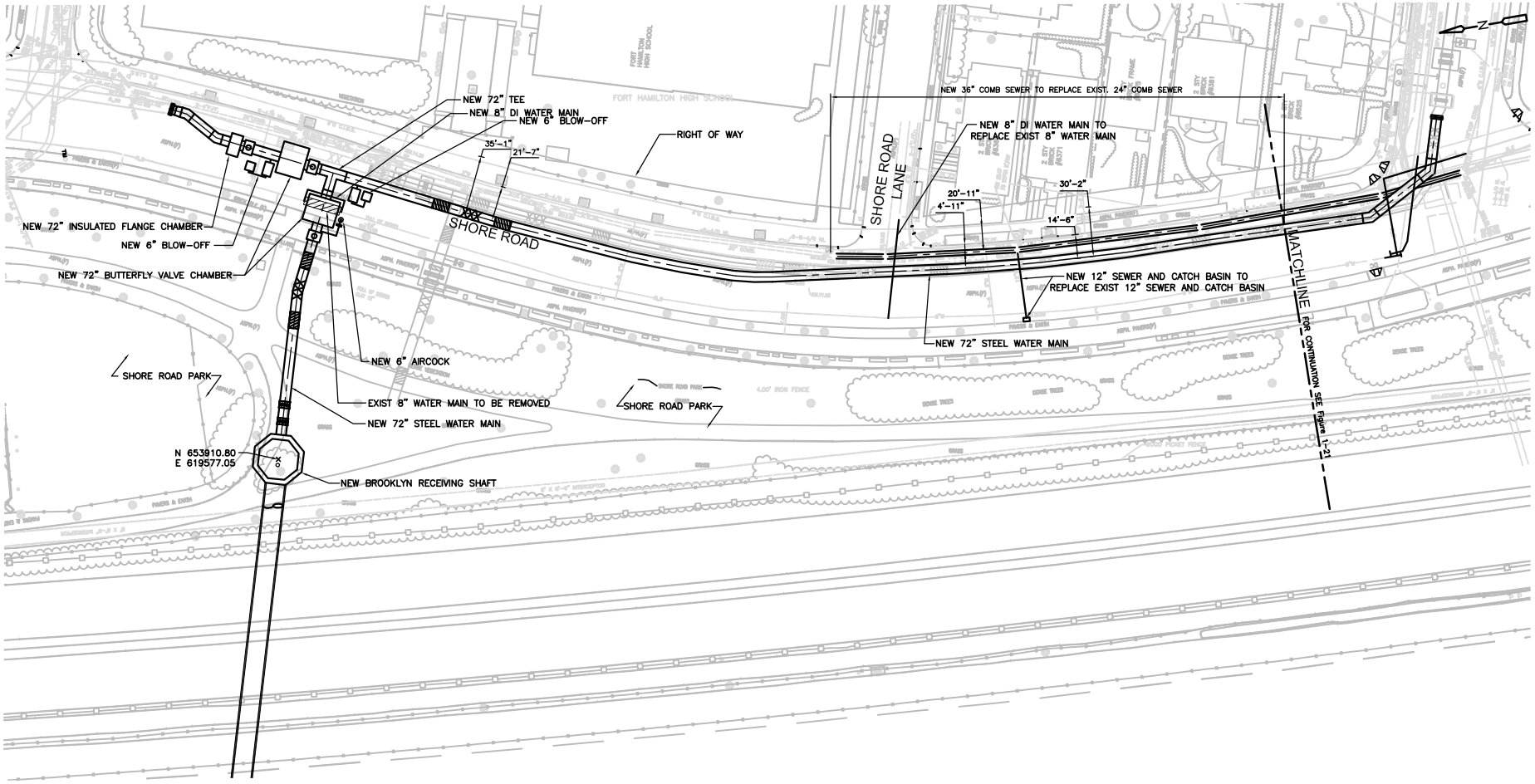
In Brooklyn, the proposed shaft site would be situated in Shore Road Park, opposite Fort Hamilton High School. A 72-inch transmission main that would connect the shaft to the existing main will be constructed along Shore Road. The proposed connection would be to an existing 72-inch water main in 86th Street located approximately 1,050 linear feet south of the shaft site. The water main construction would include the replacement of several existing lengths of

smaller diameter water mains along Shore Road, as well as the construction of appurtenances such as valve chambers, aircocks, flange chambers, and other elements necessary to ensure proper flow and distribution within the water supply lines. Abandonment of the existing 36-inch Siphon No. 1 water main, venturi chamber, and accompanying infrastructure at the intersection of Shore Road and 79th Street would also take place, as would the abandonment of the 42-inch Siphon No. 2 water main, venturi chamber, and related appurtenances at the intersection of Shore Road and 86th Street (see Figures 1-19 through 1-21). This is discussed in additional detail in Section 1.4.6. Construction of the majority of these infrastructure improvements would involve open cut construction within Shore Road and Shore Road Park.

On Staten Island there would be two proposed connections of the new siphon to existing water mains: one north of the proposed shaft site at an existing water main located at Victory Boulevard; and the other west of the shaft site near an existing distribution chamber in Van Duzer Street Extension (approximately 1,500 linear feet from the shaft) (see Figures 1-22 through 1-25). The abandonment of the existing 42-inch Siphon No. 2 shaft structure in the vicinity of Bay Street and Vanderbilt Avenue would also occur and is discussed in further detail in Section 1.4.6.

Within the Staten Island shaft and chlorination station site, new water mains and valve structures would be constructed (see Figure 1-26). Water from the siphon riser pipe would enter the 72-inch water main connecting the shaft to the chlorination station. A valve chamber containing a 72-inch butterfly valve and a 20-inch gate valve would be located downstream of the shaft and upstream of the chlorination station and would split the flow into a 72-inch main and a 20-inch main. The 72-inch water main would be utilized during emergency conditions and the 20-inch main would be utilized during normal operating conditions. Each of these mains would run parallel into the chlorination station where they would be injected with sodium hypochlorite for disinfection and metered via a venturi flow meter before leaving the chlorination station. Downstream of the chlorination station the 72-inch and 20-inch mains would combine into a common 72-inch main before being split into two 60-inch water mains. One new 60-inch water main would then connect to the existing water distribution system to the west of the SIRT tracks in the vicinity of Van Duzer Street Extension and Swan Street. The other 60-inch water main would run in Murray Hulbert Avenue/Front Street towards Victory Boulevard.

The proposed connection in the vicinity of Van Duzer Street would involve installation of a new 60-inch water main leading from the new siphon shaft structure/chlorination station and the construction of the 60-inch water main connections at the intersections of Bay Street/Swan Street, Swan Street/Van Duzer Street Extension, and Swan Street/Van Duzer Street. The water



PLAN

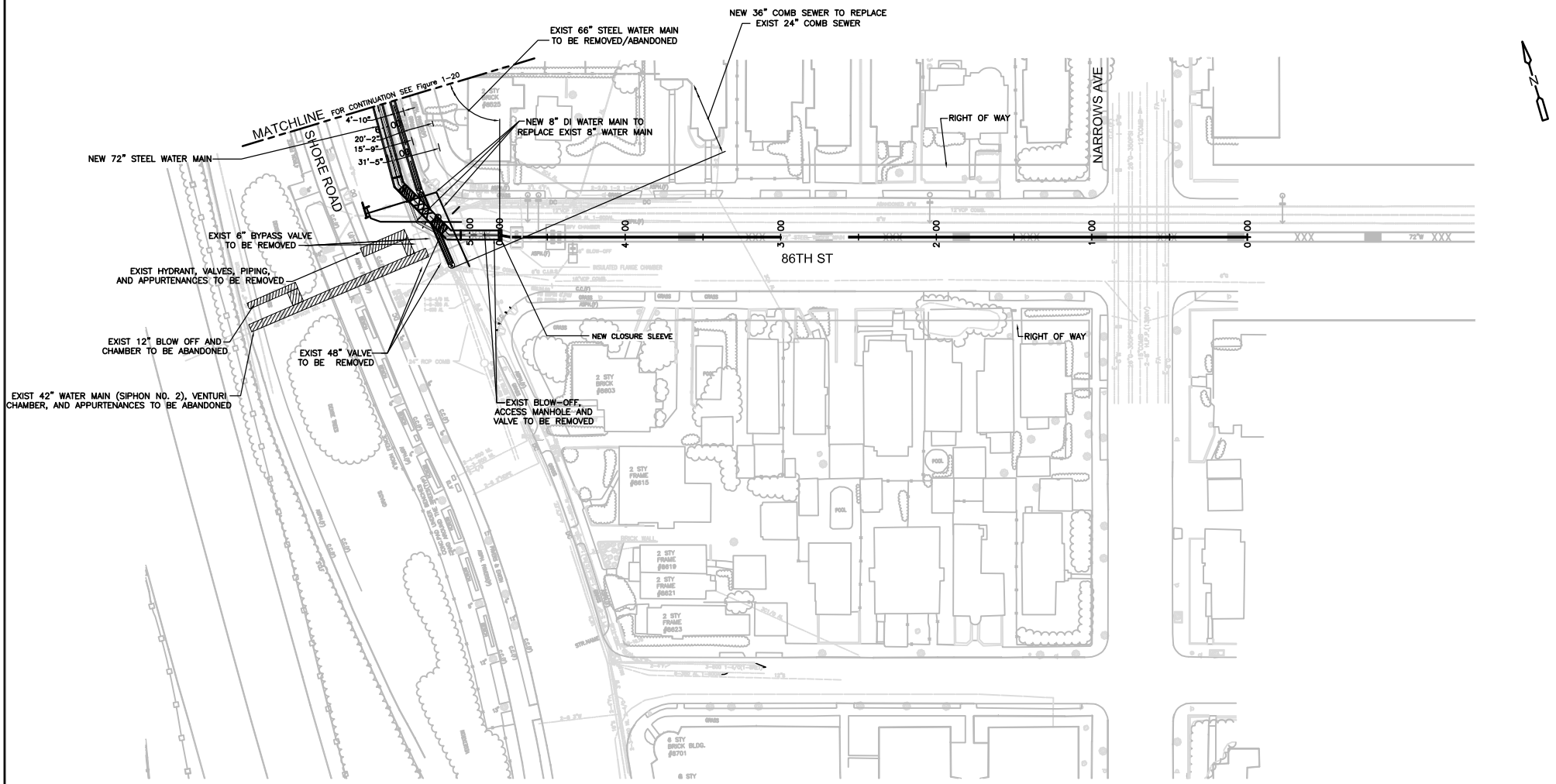
N.T.S.

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-19 Shore Road - General Water Main Plan (1 of 2)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



PLAN

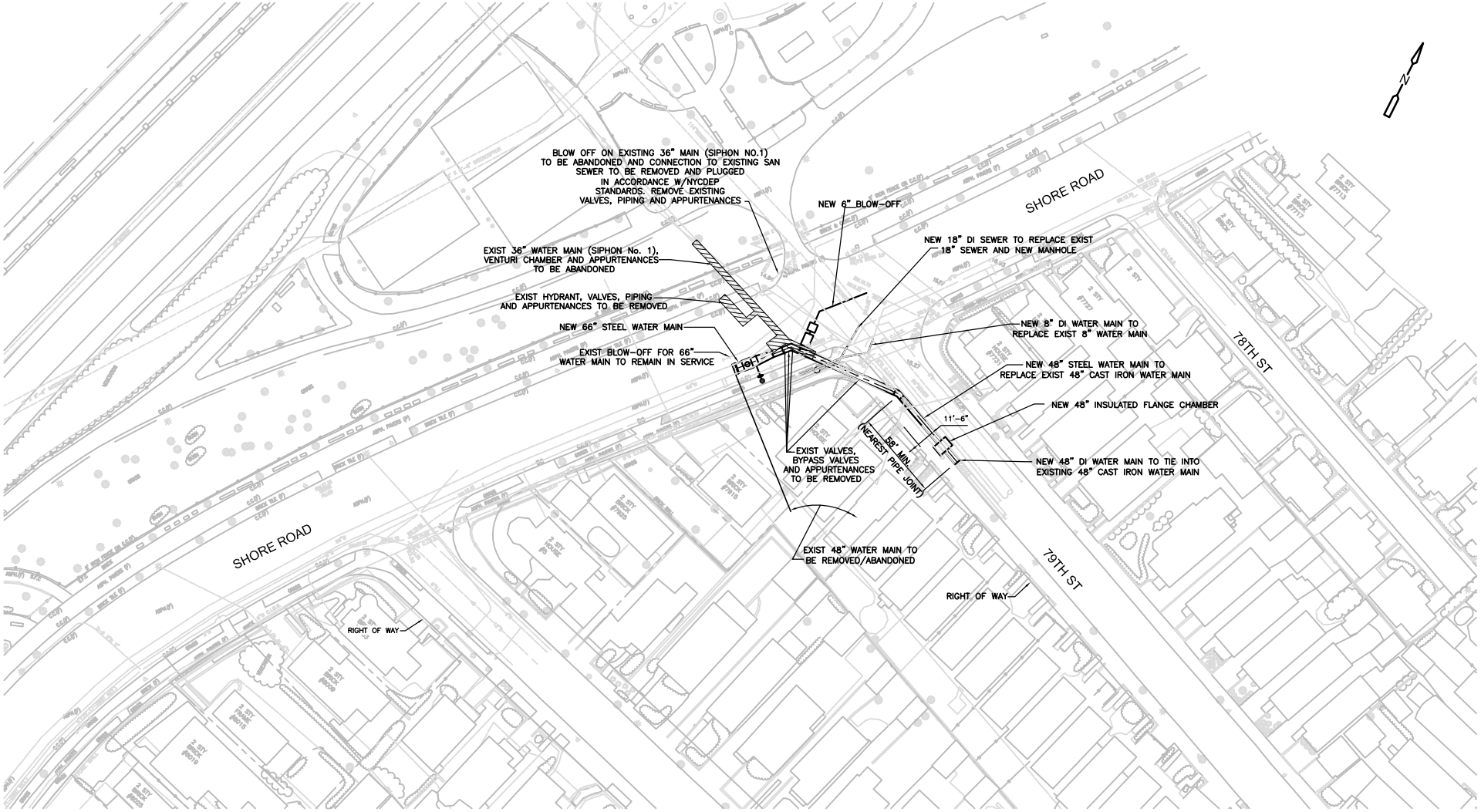
SCALE: 1" = 100'

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-20 Shore Road - General Water Main Plan (2 of 2)

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



PLAN

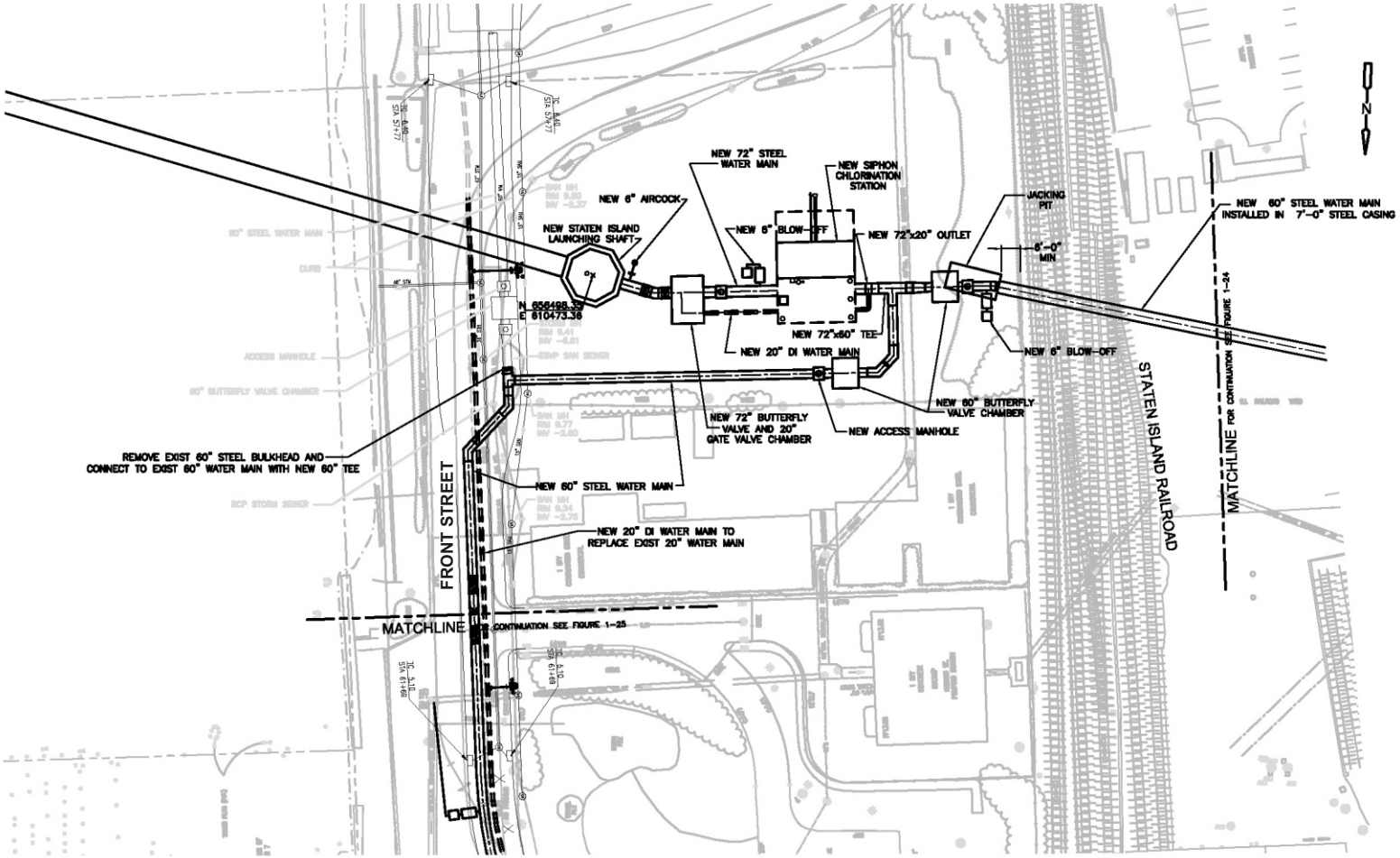
SCALE: 1" = 100'

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-21 79th Street - General Water Main Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



PLAN

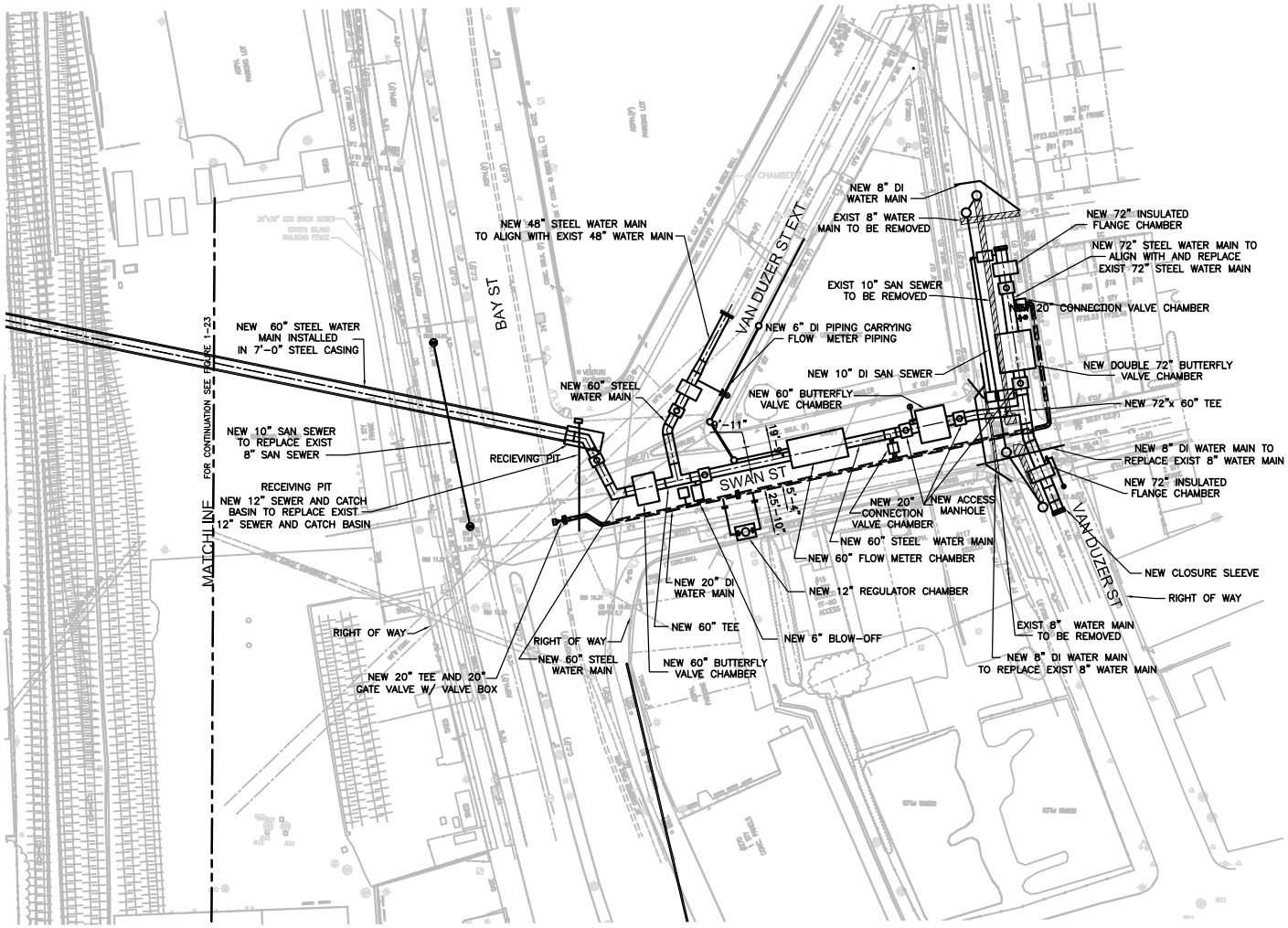
SCALE: 1" = 50'

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201)529-5728

Figure 1-22 Front Street General Water Main Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



PLAN

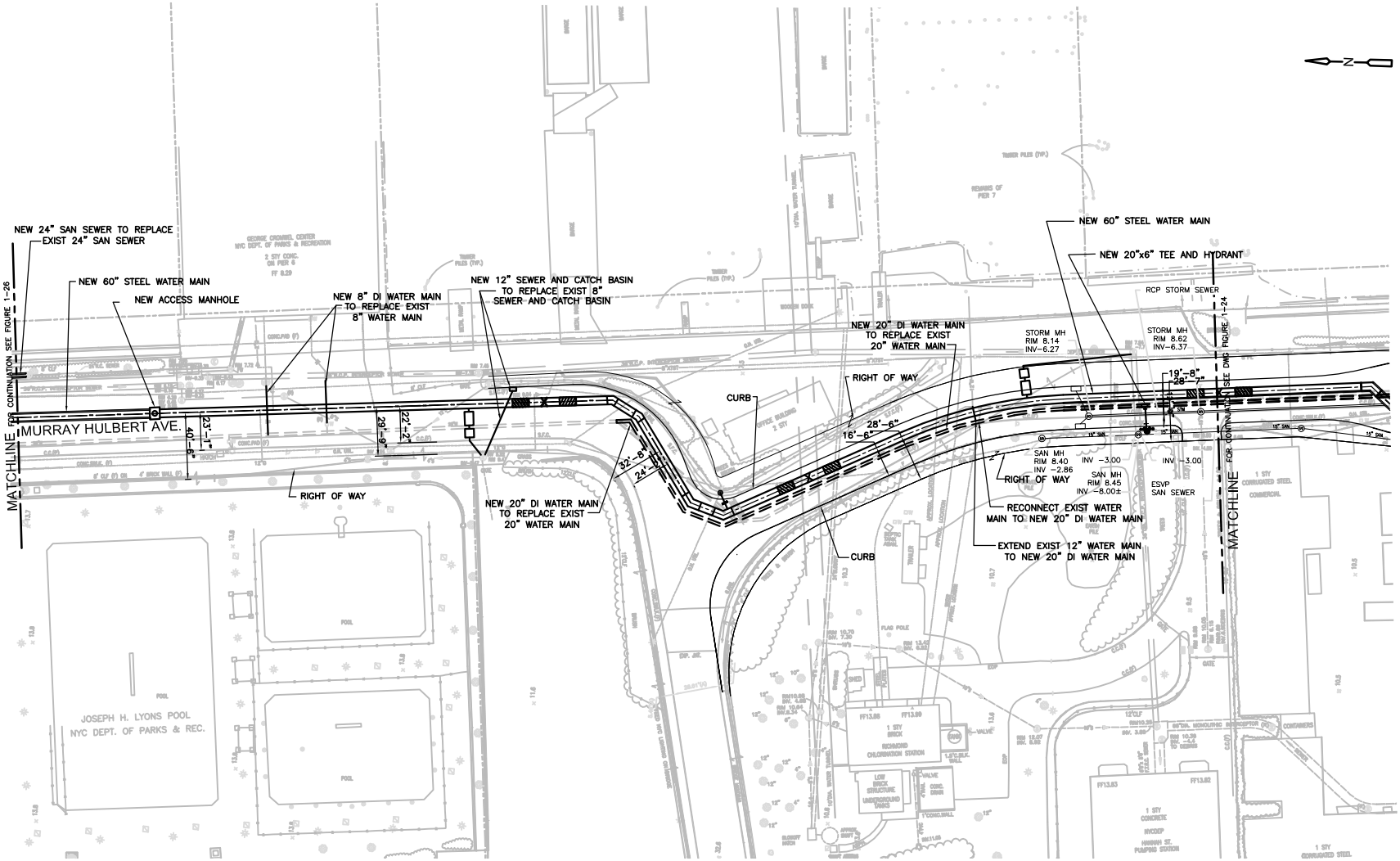
SCALE: 1" = 100'

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-23 Bay St. / Swan St. / Van Duzer St. - General Water Main Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



PLAN

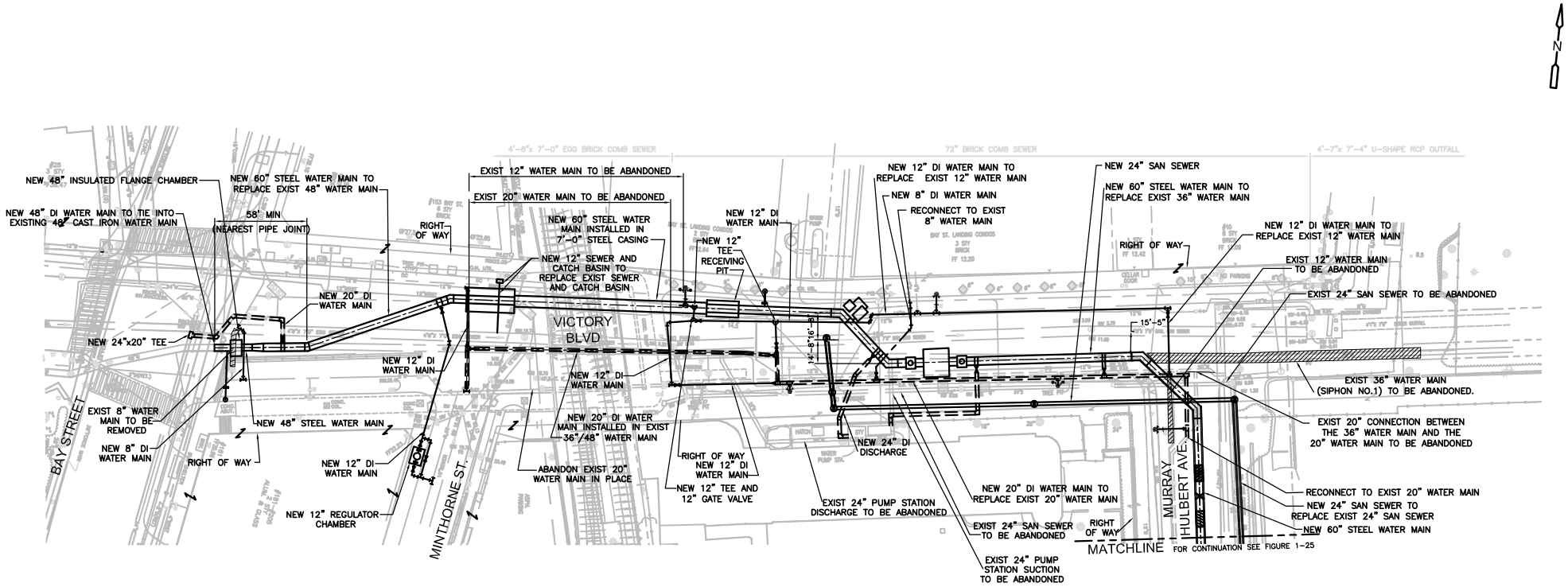
SCALE: 1" = 100'

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-24 Murray Hulbert Avenue/Front Street - General Water Main Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



PLAN

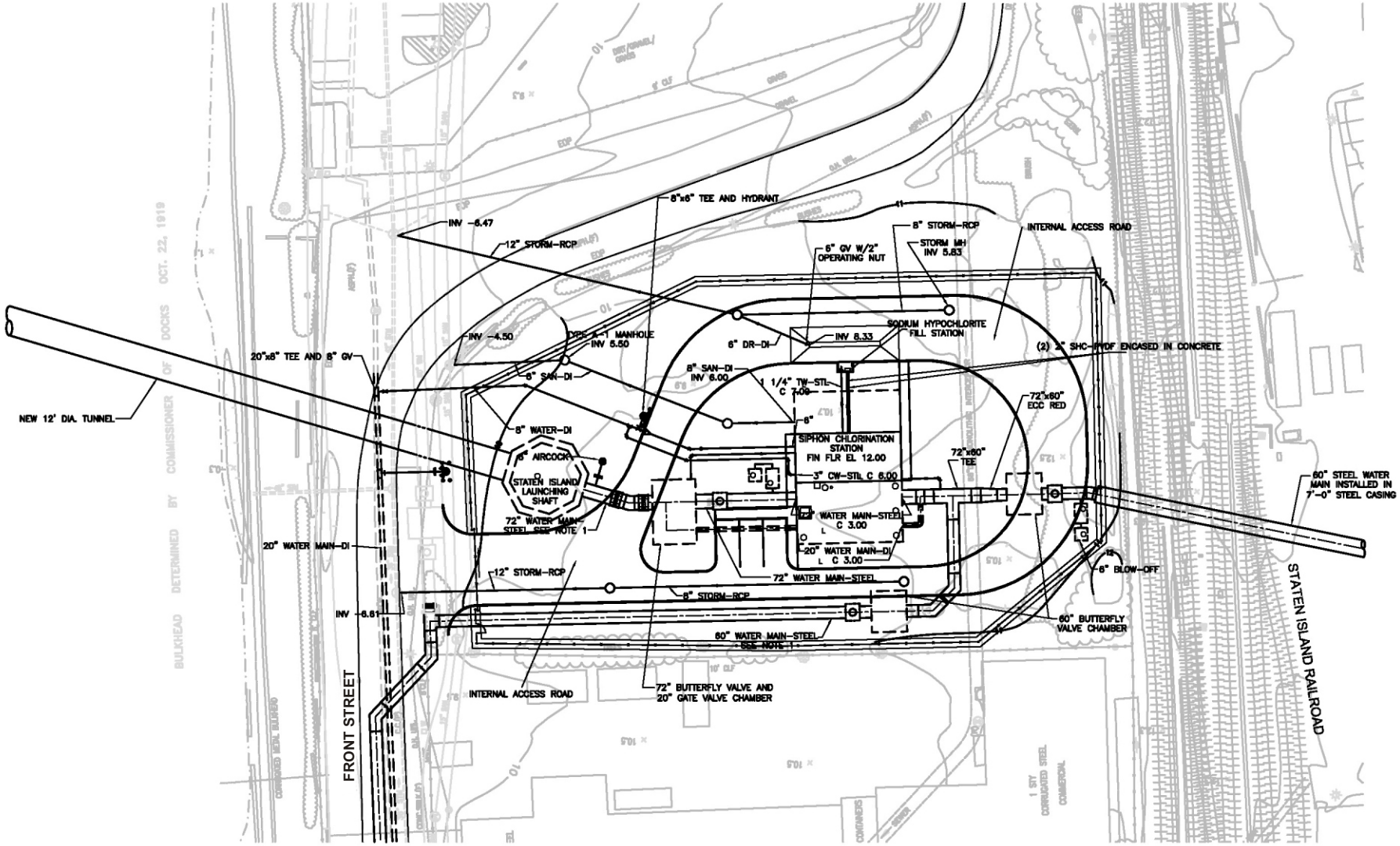
SCALE: 1/8" = 1'

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-25 Victory Boulevard - General Water Main Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



PLAN

SCALE: 3/16" = 1'

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201)529-5728

Figure 1-26 Siphon Chlorination Station - General Site Layout

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

main construction would also include the installation of various flow meter chambers, valve chambers, access manholes, flange chambers, pressure regulating chambers and blow offs, and the replacement of a smaller diameter water main. All of these would be necessary for proper operation of the water supply network.

Along Front Street/Murray Hulbert Avenue to the east and north, respectively of the shaft site, a new 60-inch water main would be constructed that would extend to Victory Boulevard, where additional water main connections would be installed to tie the new siphon into the existing water supply network. A new 20-inch water supply line would also be installed parallel to the 60-inch line along Murray Hulbert Avenue/Front Street. Along Victory Boulevard, the new 60-inch line would replace the existing 36-inch Siphon No. 1 and include various valve chambers, hydrants, and access manholes. Several 8, 12 and 20-inch diameter water main sections would also be replaced along this stretch of Victory Boulevard. Finally, the existing 36-inch siphon water main at the intersection of Victory Boulevard and Murray Hulbert Avenue would be abandoned.

The transmission mains in both boroughs would be installed via open cut ("cut and cover"), with the exception of two proposed trenchless crossings which would cross under the SIRT tracks. One of these trenchless crossings would cross under the SIRT tracks and an SIRT maintenance yard and would then continue under Bay Street until its completion at the intersection of Swan Street and Van Duzer Street Extension. The second trenchless crossing of the SIRT would occur along Victory Boulevard with the launching pit at the intersection of Minthorne Street and Victory Boulevard. The receiving pit would be located in Victory Boulevard immediately east of the SIRT. Water main construction in Staten Island would take approximately three months, while in Brooklyn, this work would require approximately one to two months. This water main work can be scheduled to occur at any time during the period that the siphon is under construction with some exceptions as noted in Section 2. Following completion of the siphon and the land-side water mains, there would be a period of about two months during which new piping would be connected to the existing mains; testing would be conducted; and the existing siphons abandoned.

As noted above, water main and sewer (see Section 1.4.4) construction efforts would be completed through two techniques, open cut trenching and trenchless methods. Open cut construction techniques for the construction of water mains would generally involve four components. These would typically include the following:

- Pavement cutting and excavation – Existing pavement, when present, would be cut and a trench would be excavated for the placement of new water mains and other infrastructure.

The sides of the excavation would be supported by steel sheeting, timber planks or other supporting measures.

- Maintenance of existing utilities – Existing utilities that may traverse excavated areas or that could potentially be undermined by the open trench would be supported, protected and/or relocated, as necessary. This effort would involve coordination with utility owners.

- Placement of bedding and water mains/sewers – "Bedding" materials (e.g., select fill, such as gravel or sand that would support new infrastructure) would be placed in the trench to support new water mains and/or sewers. Water mains and/or sewers would be placed into this bedding, aligned and welded or otherwise connected as appropriate.

- Backfill and repaving – Upon completion of pipe placement, the trench would be backfilled and supporting materials would be removed and the street repaved.

Trenchless methods would be required to pass under the SIRT facilities and Bay Street between Victory Boulevard and Minthorne Street, and the SIRT facilities and the intersection of Swan Street and Van Duzer Street Extension. This would be accomplished through the development of a launching and a receiving pit for each trenchless crossing location. Initial efforts would likely involve the driving of sheet piling at these pit locations and the subsequent excavation of soils. Excavation equipment would then be put in place for the tunneling efforts. An initial support system would be installed followed by placement of the steel water mains. The steel water mains would then be tested and the remaining annular space between them and the initial support system would be filled with flowable grout. The final connection of the new water main with existing infrastructure would then be completed.

1.4.4 Sewer Replacement

Sewer replacement incidental to the water main connections in both Brooklyn and Staten Island would also be part of the project. In Brooklyn, the existing 24-inch combined sewer along Shore Road from Shore Road Lane to 86th Street would be replaced by a new 36-inch combined sewer line. Smaller, lateral connections to the sewer and related catch basins along Shore Road in the project area would also be replaced, as would one small section of an 18-inch sewer line at the corner of Shore Road and 79th Street.

On Staten Island, an existing 10-inch sanitary sewer line would be replaced with a new 10-inch line on Van Duzer Street in conjunction with the construction of the water main connection. Likewise, a new 24-inch sanitary sewer line would replace a 24-inch sewer line along Victory Boulevard between Minthorne Street and Murray Hulbert Avenue that would be

abandoned. Several small sections of lateral sewer line connections would also be replaced along this stretch of Victory Boulevard.

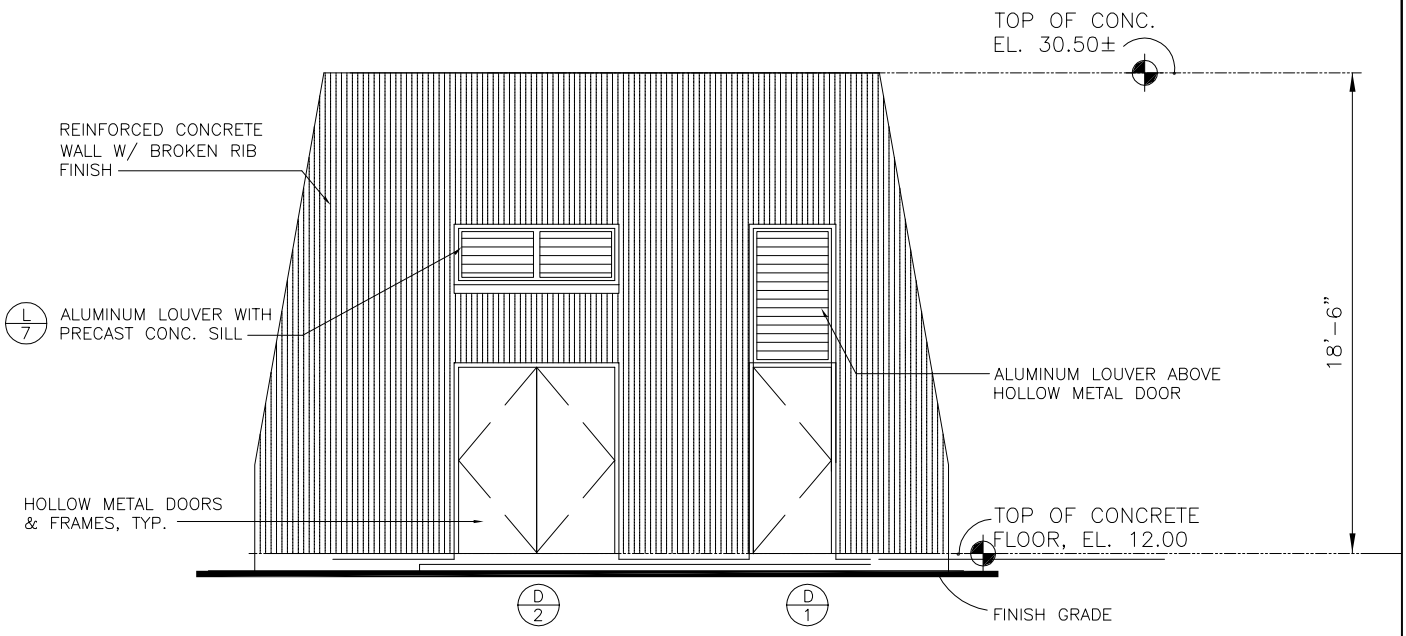
1.4.5 Chlorination Station

Chlorination of the water delivered by the new 72-inch diameter siphon would be required to maintain sufficient chlorine residual in the distribution system on Staten Island. Chlorination would be accomplished by the injection of sodium hypochlorite solution into the water mains leaving the Staten Island shaft of the proposed siphon. The general location of the chlorination station relative to the water mains is illustrated in Figure 1-26, along with the location of ancillary structures, such as site perimeter fencing and an access road.

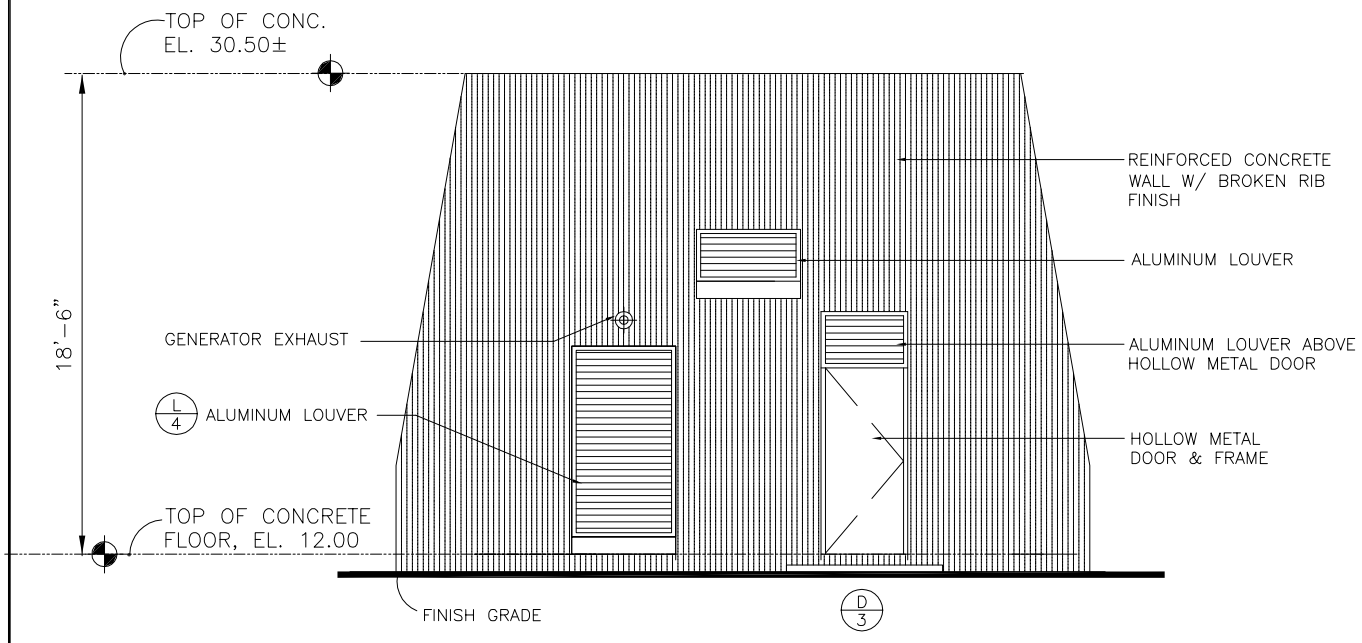
The chlorination facilities would be located in a one story building with an underground, reinforced concrete vault (see Figures 1-27 through 1-32). The ground level would include:

- Electrical/Instrumentation Room: This room would contain the instrumentation and electrical equipment necessary to control the chlorination station.
- Generator Room: A backup generator for use during electric system outages would be located on the ground level, as well. The backup generator would be powered by diesel fuel. On-site fuel storage would be provided for 400 gallons of diesel. It is expected that the generator would be used less than 500 hours per year.
- Entrance vestibule.
- Closet
- Stairway to the underground vault.

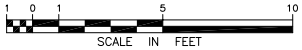
The aboveground, trapezoidal building would be constructed using sustainable technology, including a green roof and green walls (Figure 1-33).The facility would occupy a footprint of approximately 945 square feet (i.e., 21 feet by 45 feet). The height of the building would be 18.5 feet, including height added by extending the building walls above the roof surface to create a parapet that avoids the need for roof handles. The building's flat roof would be vegetated on top and the northern and southern walls would include an inclined green wall planting system consisting of planter trays on top of a galvanized steel frame. Grey water from the chlorination station would be used to maintain the green walls and roof. Aluminum louvers would be located on all four sides of the building and outlets for generator exhaust would be located on the eastern and western sides of the building. Access to the building would be obtained through metal doors on the eastern and western sides of the building.



EAST ELEVATION



WEST ELEVATION

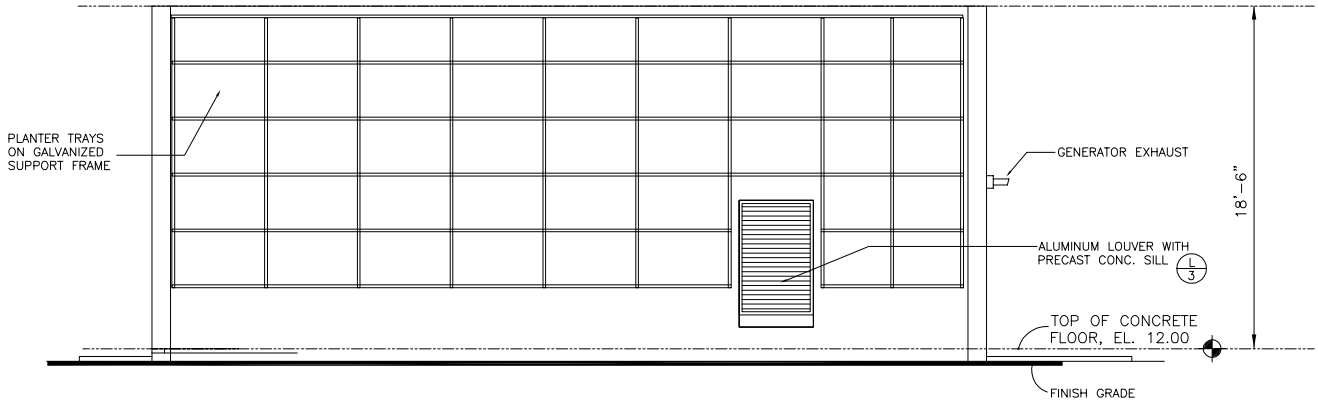


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

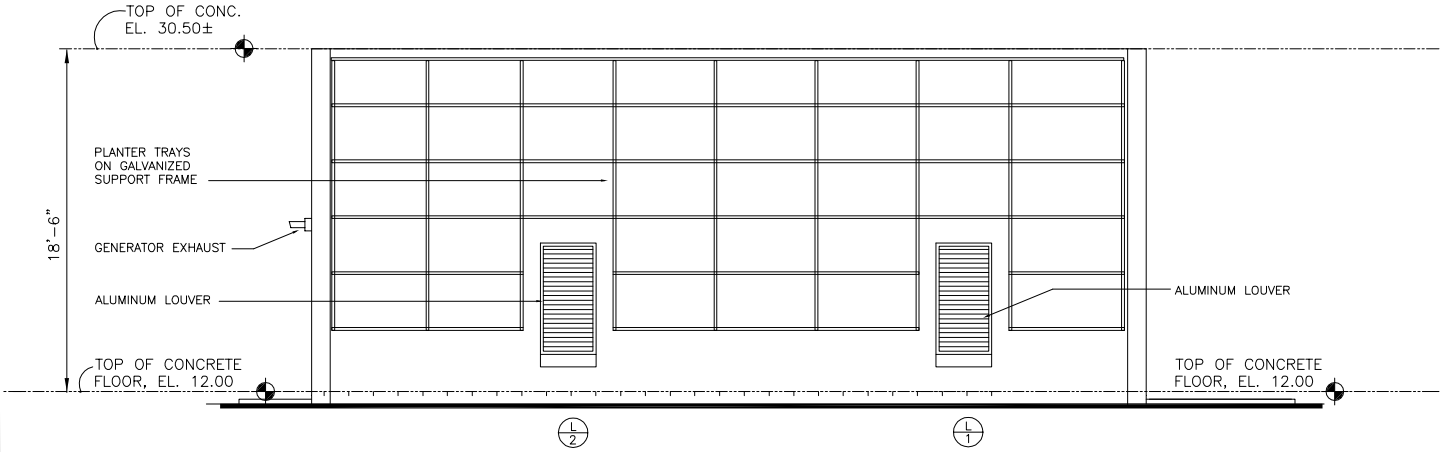
Figure 1-27 Siphon Chlorination Station
East and West Building Elevations

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

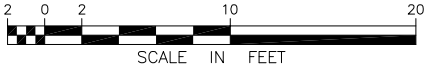
New York City Economic Development Corporation



NORTH ELEVATION



SOUTH ELEVATION

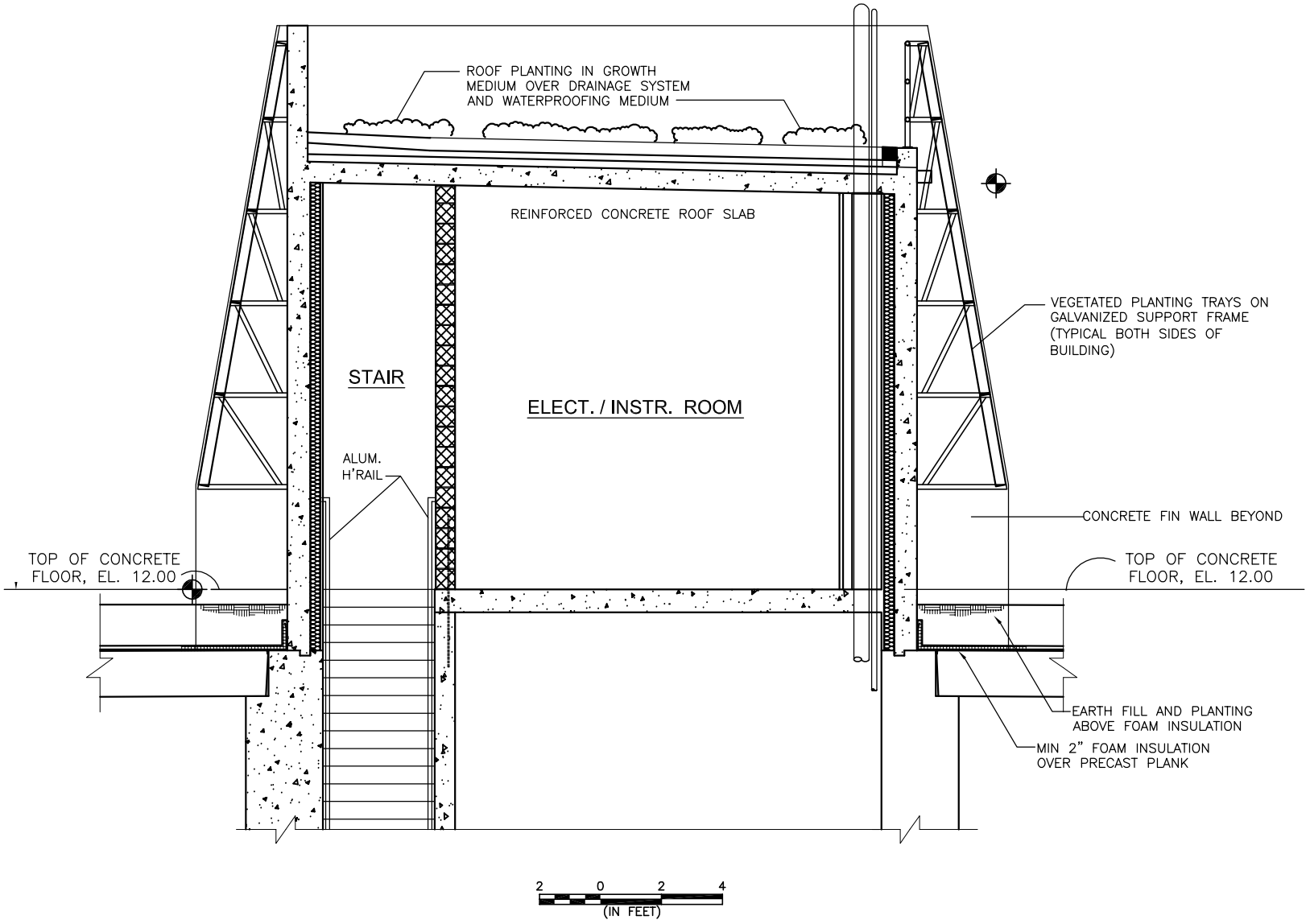


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-28 Siphon Chlorination Station
North and South Building Elevations

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

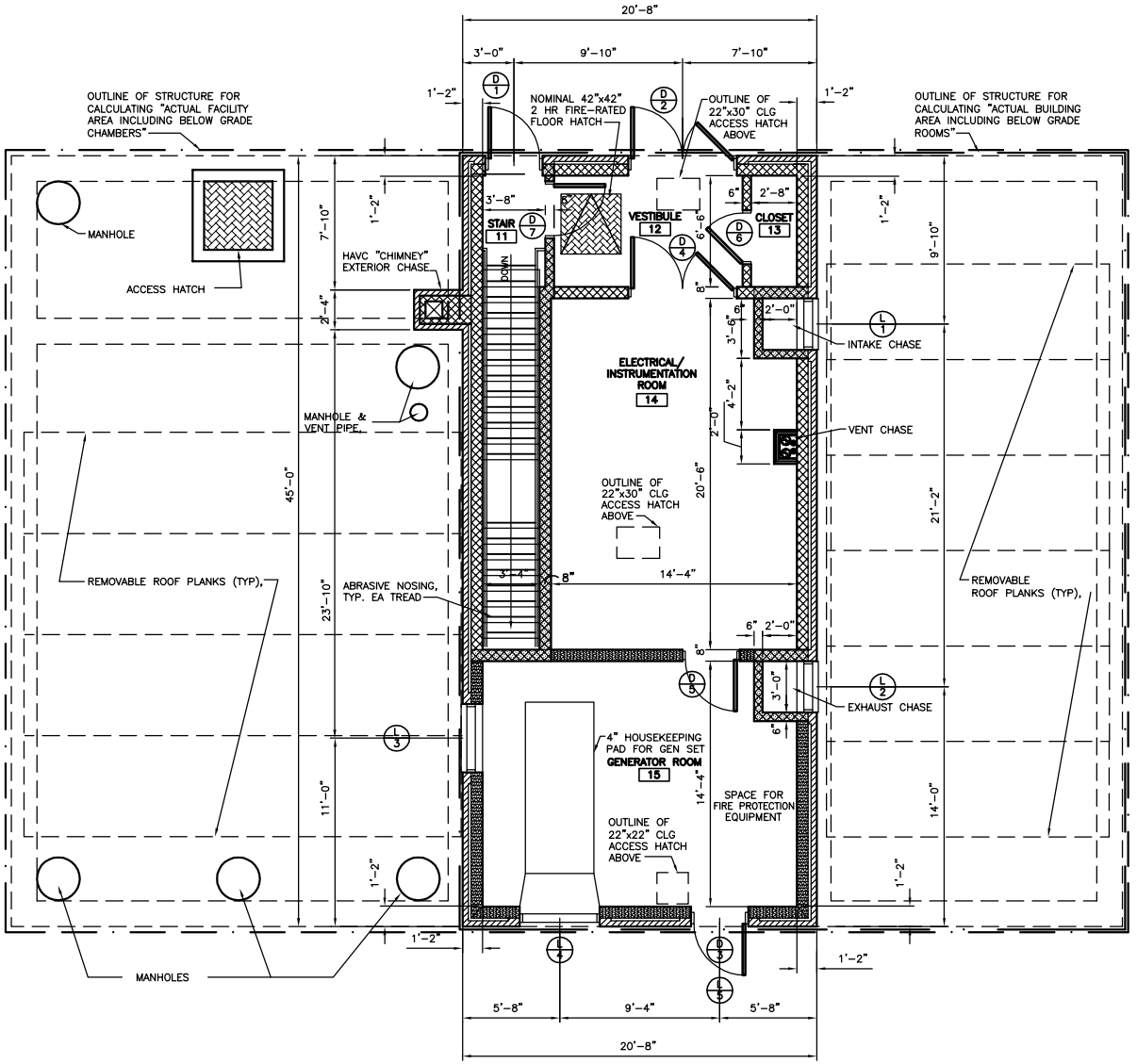


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-29 Siphon Chlorination Station - Partial General Section

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation



GROUND LEVEL PLAN

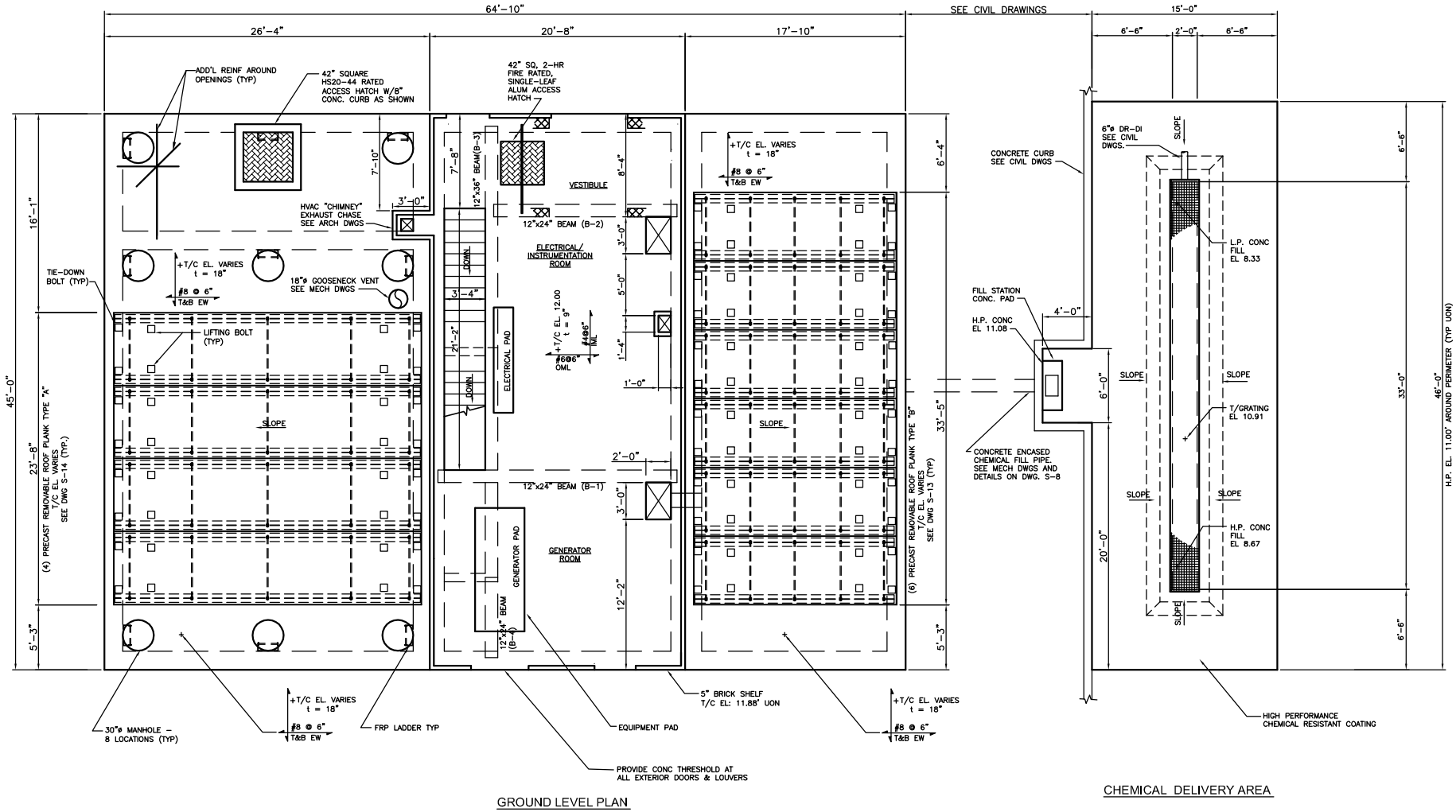
SCALE: 3/32" = 1'20'

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-30 Siphon Chlorination Station - General Ground Floor Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

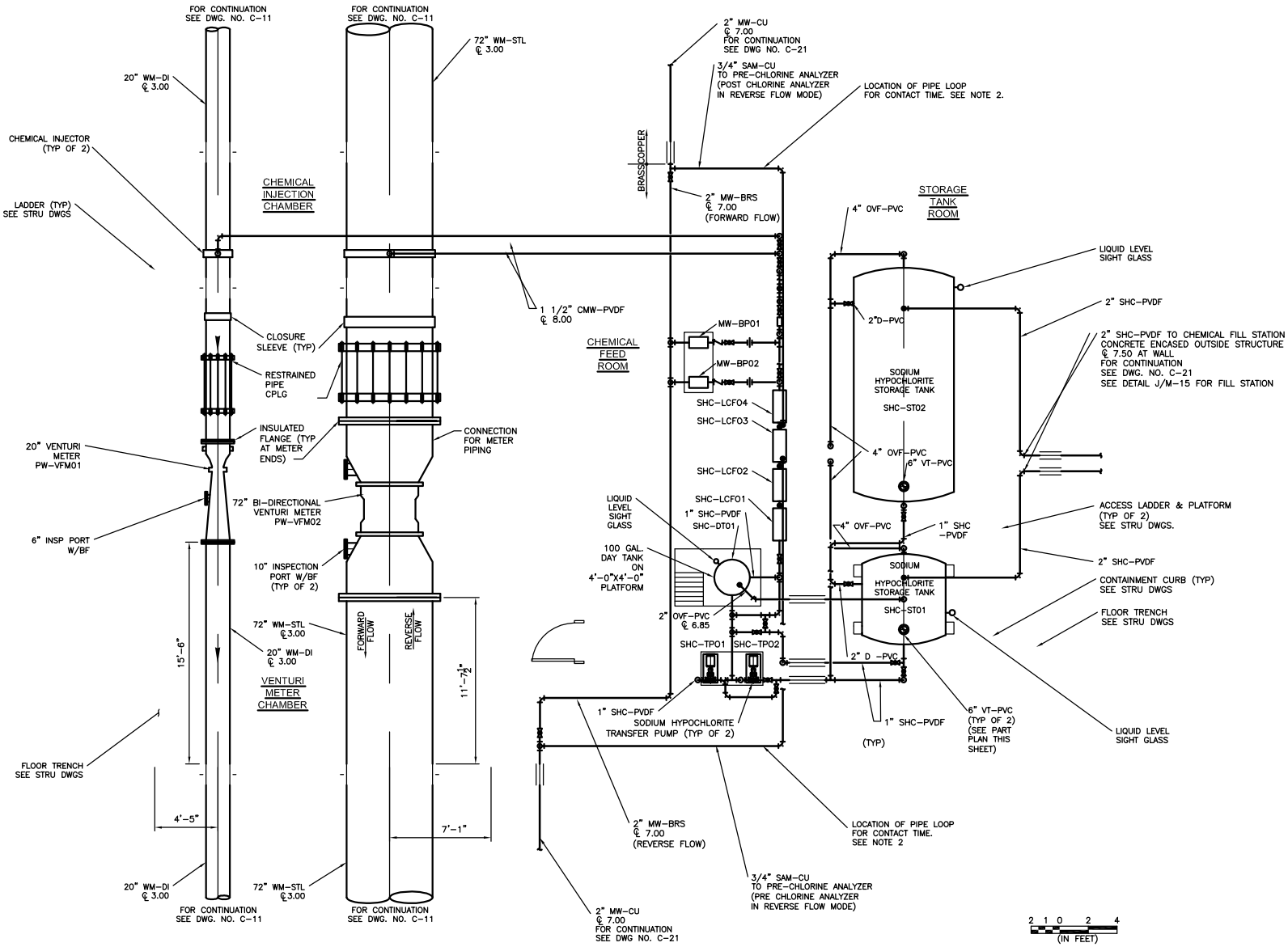


HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-31 Siphon Chlorination Station - General Lower Level Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation



HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
t:(201) 529-5151 f:(201) 529-5728

Figure 1-32 Siphon Chlorination Station - General Lower Level Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

View facing northwest showing vegetated wall and roof of the chlorination station.

View facing southwest showing the entrance to the chlorination station on Front Street.

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201)529-5728

Figure 1-33 Rendering of Chlorination Station

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

The underground, reinforced concrete vault would include the following four chambers:

- Storage Tank Room: Two storage tanks for sodium hypochlorite would be located in this room. A 1,000-gallon tank would be maintained for normal chemical feed operations, and a 4,000-gallon tank would be maintained for emergency operation conditions, in the event that maintenance or other factors cause the Richmond Water Tunnel to become temporarily inoperable.

- Chemical Feed Room: A single, 100-gallon day tank would be located in this room, fed by the two chemical transfer pumps from the storage tanks. Two vacuum feeders for normal chemical feed operations and an additional two feeders for emergency operations would be maintained to provide for the injection of sodium hypochlorite from the day tank into the water supply.

- Chemical Injection Chamber: In this chamber, upstream of the venturi meters, the chemical injection diffusers would be located to introduce the sodium hypochlorite into the water supply. One injection point would be on the 20-inch and one on the 72-inch lines entering the facility.

- Venturi Meter Chamber: Two venturi meters, a 20-inch and a 72-inch, would be located in this room. The meters would serve to measure water supply flow from the siphon into the distribution network.

The underground vault would occupy a rectangular footprint of approximately 2,918 square feet (i.e., 64 feet 10 inches by 45 feet), with the aboveground structure located directly on top of the center of the vault.

Access into the Chemical Storage Room and Chemical Feed Room would be via a stairway from the building above. Access into the Venturi Meter Chamber and the Chemical Injection Chamber would be via above-grade hatches and/or manholes. The vault roof over the Chemical Storage Tank Room and the Venturi Meter Chamber would utilize removable precast concrete planks to allow for future replacement of equipment.

The chlorination station would also include an aboveground chemical fill containment area on the west side of the building. The approximate 667 square foot containment area (i.e., 14 feet 6 inches by 46 feet) would surround the piping structure to which sodium hypochlorite delivery trucks would connect to fill the 1,000 and 4,000 gallon storage tanks in the vault. The containment area would be sloped to facilitate the control of any spillage during storage tank filling and would act as a containment area for any spilled sodium hypochlorite allowing for proper collection and appropriate disposal.

The perimeter of the site would be surrounded by a 10-foot high chain link fence, with the entrance to the site from Front Street. Proposed landscaping along the eastern side of the building and along the interior and exterior of the proposed fence would minimize views of the chlorination structure from the road. The lawn surrounding the proposed building would consist of native grasses and wildflowers.

Stormwater from the site would be conveyed to the 42-inch storm sewer along Front Street with a discharge to the Upper New York Bay via a new 48-inch diameter outfall that would be located east of the site and constructed as part of the proposed action. The new outfall would be located immediately east of the shaft and chlorination site constructed within the existing sheet pile bulkhead (Figure 1-34). On the site, 8-inch storm lines would be located within the access road, one to the north of the building and one to the south. The 8-inch lines would connect to 15-inch lines near the perimeter of the facility, which would be connected to the 42-inch storm sewer. A 6-inch storm sewer line running east from the fill containment area would also be present to convey stormwater from the containment area to the 15-inch on-site stormwater line.

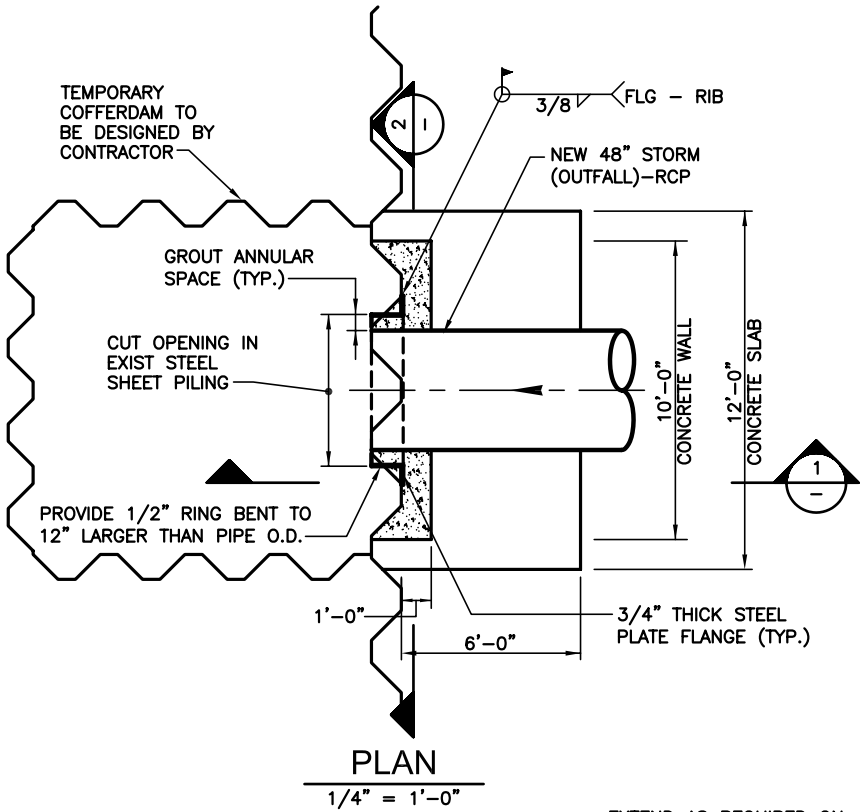
1.4.6 Abandonment of Existing Venturi Chambers and Siphons

The existing siphon facilities, both the 36- and 42-inch water mains, would be decommissioned and abandoned in place as part of the proposed action. The venturi meter chambers would be demolished and removed after appropriate closure procedures, inclusive of electrical and instrumentation equipment removal, hazardous waste investigations and removal, if necessary, and appropriate disconnection of the existing siphons from the water supply distribution network.

In the case of the subaqueous water supply lines, the existing siphons would be disconnected from the upland water supply distribution network, and abandoned in place. Any disturbance of the under-harbor lines by ongoing harbor dredging would likely cause the pipes to break and then fill with harbor water and sediments.

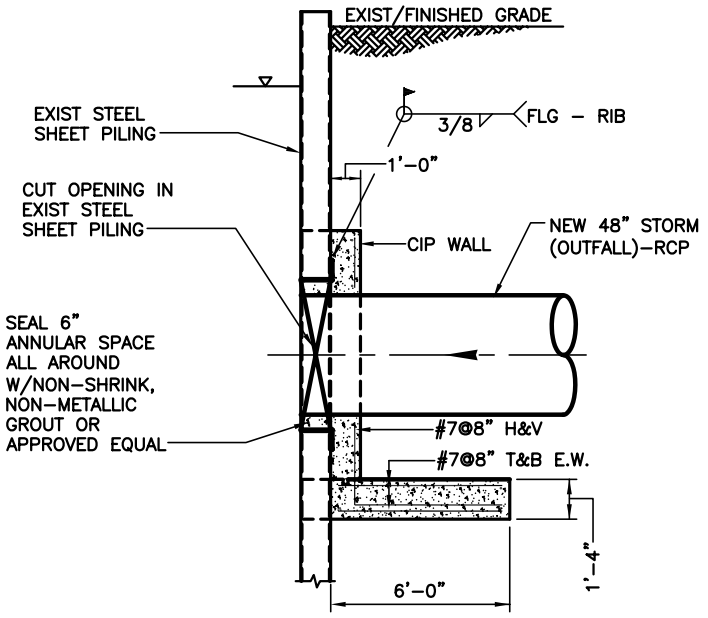
Abandonment of existing upland siphon-related structures would occur at the following locations.

- Siphon No. 1 (36-inch siphon) - Existing water main, venturi chambers, and appurtenances to be abandoned.
    - Brooklyn: Intersection of Shore Road and 79th Street
    - Staten Island: Intersection of Victory Boulevard and Murray Hulbert Avenue

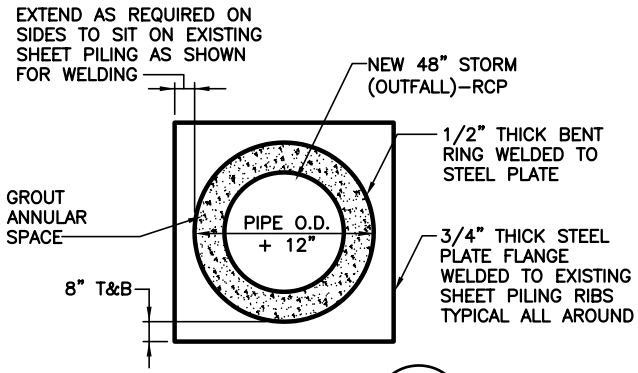


PLAN

1/4" = 1'–0"



SECTION 1 / 1/4" = 1'–0"



SECTION 2 / 1/4" = 1'–0"

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201)529-5728

Figure 1-34 New Stormwater Outfall Plan and Details

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

- Siphon No. 2 (42-inch siphon) - Existing water main, venturi chamber, and appurtenances to be abandoned.

    - Brooklyn: Intersection of Shore Road and 86th Street
    - Staten Island: Intersection of Bay Street and Vanderbilt Avenue (this venturi chamber was previously abandoned under another project by the NYCDEP).

The portions of the existing siphons located on land would be abandoned in place by hydraulically filling the lines with an excavatable flowable fill.

In Brooklyn, Siphon No. 1 (36-inch) would be disconnected from the existing active water mains at 79th Street. The remainder of the existing 36-inch Siphon No. 1, from the intersection of Shore Road and 79th Street to the water-side of the existing seawall, would be abandoned in place by hydraulically filling the lines with an excavatable flowable fill. The existing blow-off connection for Siphon No. 1 to an existing 90-inch sewer would be abandoned and the connection to this sewer would be removed and plugged.

Siphon No. 2 (42-inch) in Brooklyn, would be disconnected from the existing active water mains at 86th Street. A new steel water main would be installed in its place within Shore Road, which would connect to a new 72-inch water main in Shore Road and to the existing 72-inch water main in 86th Street. The remainder of the 42-inch siphon, from the intersection of Shore Road and 86th Street to the water side of the existing seawall, would be abandoned in place and hydraulically filled with flowable fill. All existing valves piping and appurtenances associated with this section of the siphon would also be abandoned.

In Staten Island, Siphon No. 1 (36-inch) would be abandoned along Victory Boulevard between Murray Hulbert Avenue and the SIRT. The existing 36-inch siphon piping between the abandonment point and Murray Hulbert Avenue/Front Street would be replaced with a 60-inch main that would extend from the proposed new siphon. Portions of the abandoned existing siphon piping in Victory Boulevard would be removed to accommodate new piping, and other portions would be abandoned in place by hydraulically filling the lines with a flowable fill. From Front Street to the water-side of the existing bulkhead, the siphon would also be abandoned in place by filling.

In Staten Island, Siphon No. 2 (42-inch) would be abandoned in two phases. In the Stapleton Homeport area, the first phase would include hydraulic filling from the abandonment point along Front Street to the water-side of the bulkhead. Once that project is complete, the existing Siphon No. 2 would be disconnected from the existing active water mains at the

intersection of Bay Street and Vanderbilt Avenue, and the remainder of the siphon, from Bay Street, under the SIRT, to Front Street, will be abandoned through hydraulic filling.

In the case of the existing venturi chambers (two in Brooklyn and one in Staten Island), the chambers would be demolished and the resulting holes would be backfilled with clean fill material. Prior to any demolition, the chambers would be tested for hazardous material, such as mercury that may have leaked from meters and instrumentation, and any hazardous material would be removed and disposed, as appropriate and in accordance with local, state and federal regulations.

1.4.7 Excavated Material

Construction of the overall project would require a significant amount of excavation. Excavation would be associated with the development of the two shafts, the harbor crossing and other components (e.g., land piping and chlorination station) of the proposed action. Excavated material, including that bored from the tunnel and removed from the land-based water main, sewer replacement, shaft and chlorination facility construction activities is expected to total approximately 82,290 cubic yards (see Table 1-1 for a summary of estimated quantities). The contractor would be required to properly handle, store (if required) and provide for the disposal of all excavated material at appropriate, licensed facilities

Table 1-1. Summary of Anticipated Volume of Excavated Materials (In-Situ)

Construction Activity	Quantity (cubic yards)
Brooklyn Water Main	6,625
Brooklyn Sewer Replacement	1,495
Staten Island Water Main	20,510
Staten Island Sewer Replacement	1,115
Chlorination Facility	2,775
Launching Shaft – Staten Island	3,260
Receiving Shaft – Brooklyn	4,740
Harbor Tunnel	41,770
Total Estimate	**82,290**

1.5 CONSTRUCTION SCHEDULE

Construction of the proposed action would require approximately 37 months for the completion of all phases of the proposed project. Major phases include the subaqueous crossing, Brooklyn and Staten Island land piping, and construction of the new chlorination station in Staten Island.

Presented within Table 1-2 is a summary of the major components and sub-components, as applicable, for the proposed action and the current estimated durations of these activities based upon an assumed start of construction activities in May 2010.

Table 1-2. Anticipated Schedule for Major Construction Activities

Construction Activity	Estimated Duration (months)	Dates
Subaqueous Crossing	34	May 2010 – February 2013
Launching Shaft – Staten Island	4	July – November 2010
Reception Shaft – Brooklyn	6	November 2010 – May 2011
Tunnel Drive	13	June 2011 – July 2012
TBM Removal, Pipe Installation, Shaft Completion	7	July 2012 – February 2013
Land Piping – Brooklyn		
Install 72-inch Water Main - Shore Rd. to 86th St.	2	June – July 2011
Tie-in at Shore Road Park	1	January 2013
Abandon Siphon No.1 at 78th Street	1	February 2013 – March 2013
Abandon Siphon No 2 at 86th Street	1	February 2013 – March 2013
Land Piping – Staten Island		
Tunnel – Launching Shaft to Van Duzer Street	4	March – August 2011
Tunnel – Victory Boulevard & Minthorne Street	4	November 2010 – March 2011
Other Land Piping	3	April – July 2011
Chlorination Facility	10	August 2012 – June 2013
Testing, Cleanup and Closeout	5	January – June 2013
Total Anticipated Construction Duration	**37**	**May 2010 – June 2013**

1.6 OPERATION AND MAINTENANCE

Once construction of the shaft and water mains has been completed, an activation procedure would be implemented prior to operation of the system. The conceptual activation procedure would consist of the following:

- Tunnel and riser pipe filling – filling of the pipeline within the tunnel and shafts with water.

- Tunnel and riser pipe flushing – flushing of the pipeline using water from the existing water distribution system and the discharge of this water to the municipal sewer.

Under normal daily operation as a secondary potable water supply, the siphon would supplement the existing Staten Island water supply with an average daily demand of 5 mgd and a demand range of 2.5 to 7.5 mgd. The majority of Staten Island water supply needs would continue to be distributed through the existing Richmond Tunnel (i.e., the primary water supply

line) and the associated Richmond Chlorination Station. Under emergency conditions, or when the existing Richmond Tunnel or Richmond Chlorination Station is off-line for maintenance, the proposed siphon and associated chlorination station could deliver and disinfect all of Staten Island's water supply, at an average daily rate of 50 mgd and a peak flow of 150 mgd.

The chlorination system would be designed for automated operations using a compound loop control (flow and residual), similar to the existing Richmond Chlorination Station. Instrumentation would be located in the aboveground building and would include flow transducers for each venturi meter, a pre-chlorination residual analyzer, and a post-chlorination residual analyzer. A programmable logic controller would be provided. Communication of data and alarms to the Richmond Chlorination Station would also be provided.

On rare occasions, the siphon and its associated facilities may be dewatered to allow for maintenance to occur. In such instances, the appropriate section of the system would be isolated and dewatered, with dewatering discharged to the sewer. Reactivation would involve the following steps.

- Tunnel and riser pipe (or water main) filling – filling of the pipeline within the tunnel and shafts with water.

- Tunnel and riser pipe (or water main) flushing – flushing of the pipeline using water from the existing water distribution system.

- Tunnel piping and shaft piping (or water main) disinfection – chlorinating with discharge to the local system.

- Periodic dewatering of the tunnel – dewatering of the tunnel via portable pumping from the Brooklyn shaft to an existing sewer within Shore Road. If dewatering was required, it would be anticipated that these would be discharged to a combined sewer identified by NYCDEP maps as having a 30-inch diameter. Under these conditions, a discharge rate of 700-1,400 gallons per minute would be anticipated, which would require approximately one to two days to complete dewatering of the siphon (proposed siphon, including shaft and risers, has a capacity of 1.2 million gallons). This would not be anticipated to adversely affect normal operating conditions.

1.7 PERMITS AND APPROVALS

Numerous permits and approvals are necessary for the construction and operation of the proposed project. The NYCEDC and NYCDEP would acquire the permits and approvals necessary to allow for the construction activities associated with replacement of the existing

water siphons and the operation of proposed facilities. Permits and approvals that may be required are listed below.

- **U. S. Army Corps of Engineers**
  - Nationwide Permit No. 12 – Utility Line Activities
  - Section 10 Permit (Individual)
- **New York State Department of Health**
  - Approval of Plans for Public Water Supply Improvements
- **New York State Department of Environmental Conservation**
  - SPDES Construction Dewatering Discharge Permit
  - Long Island Well Permit
  - General Permit for Stormwater Associated with Construction Activities
  - Chemical Bulk Storage Permit Application
  - Tidal Wetlands or Protection of Waters Permit
  - Section 401 Water Quality Certificate
- **New York State Office of General Services**
  - Public Lands Law, Article Section 75 - Riverbed Utility Easement
- **New York State Department of State, Coastal Management Program**
  - Coastal Zone Management Plan Consistency Assessment Concurrence
- **Metropolitan Transit Authority / NYC Transit**
  - Memorandum of Understanding for Pipeline Installation
- **New York City Department of City Planning**
  - Local Waterfront Revitalization Program Consistency Certification Concurrence
  - Uniform Land Use Review Procedure
- **New York City Department of Environmental Protection – Bureau of Environmental Planning and Assessment**
  - CEQR – Environmental Assessment Statement
- **New York City Department of Environmental Protection - Bureau of Water and Sewer Operations**
  - Site Connection Application
  - Bureau of Customer Service - Water Service Permit Application

- **New York City Department of Transportation**
    - Roadway Construction Permit
- **New York City Department of Buildings**
    - Plan/Work Approval Application
    - Work Permit Application
    - Electrical Permit Application
    - Equipment Use Application
    - Certificate of Occupancy (C/O)
    - Emergency Response Agencies C/O Notification Affidavit
    - Technical Report
- **New York City Department of Small Business Services**
    - Work Notice/Permit Application
- **New York City Fire Department**
    - Application for Plan Examination for Fire Alarm Approval
- **New York City Parks Department**
    - Tree Removal Permit
    - Memorandum of Understanding for Pipeline Installation
- **New York Public Design Commission**
    - Design Review

2.0 ENVIRONMENTAL ASSESSMENT

2.1 INTRODUCTION

As discussed within Section 1, the proposed action would involve the replacement of two existing, subaqueous water siphons (Siphons 1 and 2) located beneath the Upper New York Bay between Bay Ridge, Brooklyn and Stapleton and Tompkinsville, Staten Island. The existing siphons provide a secondary/backup water supply from Brooklyn to Staten Island. The current upland connections for Siphon 1 are located in the vicinity of Shore Road and 79th Street in Brooklyn and Bay Street and Victory Boulevard in Staten Island. The land-based connections for Siphon 2 are located in the vicinity of Shore Road and 86th Street in Brooklyn and Bay Street and Vanderbilt Avenue in Staten Island. Upon the completion of the new siphon, the existing siphons would be abandoned in place. The new siphon would replace the two existing siphons and serve primarily as a secondary water supply for Staten Island, but would also provide limited supplemental water supply to a small section of northern Staten Island.

A new 72-inch siphon, approximately 9,400 feet in length would be constructed beneath the Upper New York Bay and would be contained within a 12-foot 4-inch excavated diameter bored tunnel with the top of the tunnel located at a depth of at least 95 feet below Mean Low Water (MLW). In addition to the installation of the new siphon, the proposed project would also involve the construction of shafts on both the Brooklyn and Staten Island sides of the harbor, water transmission mains and other related infrastructure improvements to provide for connection to the existing water supply systems already in place.

In addition to the development of a shaft to allow for the launching of the TBM in the Stapleton section of Staten Island (Block 487, Lot 100), a new chlorination station would also be constructed. This chlorination station would be located within the same City-owned property as the shaft. Development of the chlorination station would also require the construction of a new 48-inch outfall to drain uncontaminated stormwater from the chlorination station and immediately surrounding area. The Brooklyn shaft site would be located within the Bay Ridge section of Brooklyn within the NYCDPR Shore Road Park (Block 6140, Lot 8).

The following sections of the Environmental Assessment Statement (EAS) are intended to supplement information provided within the EAS Questionnaire and provide additional information for those environmental parameters where potential effects were anticipated or considered possible due to the proposed action. Due to the nature of the proposed action, limited impacts are expected due to the future operation of the proposed siphon, however, anticipated

construction activities associated with the proposed shaft sites, the new water mains and the development of a new chlorination station were evaluated.

2.2 LAND USE, ZONING AND PUBLIC POLICY

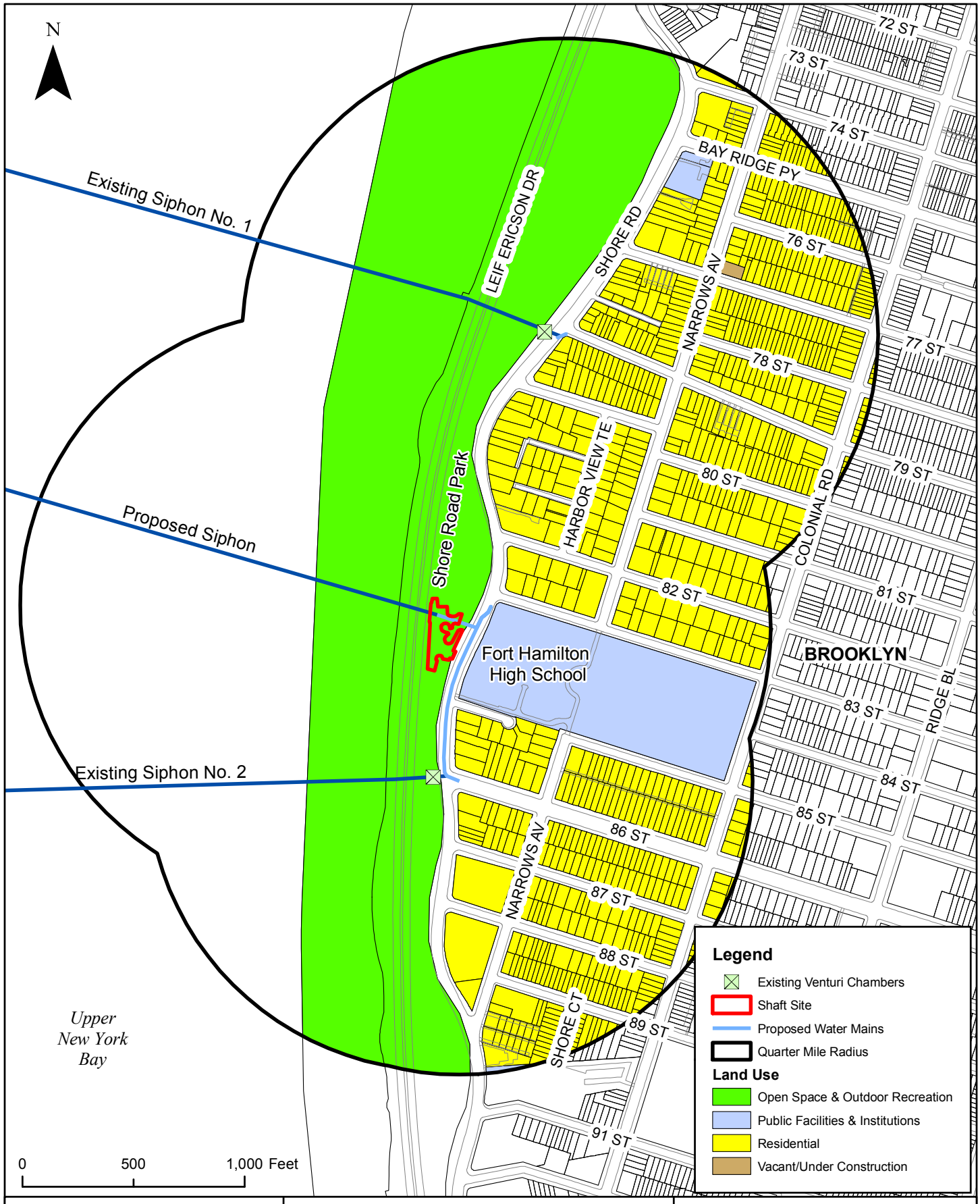
2.2.1 Land Use

The proposed action would be largely located within the Bay Ridge and Stapleton communities of Brooklyn and Staten Island, respectively. For the purposes of this analysis, the study area within Brooklyn was considered to include those locations within a one-quarter mile radius of the proposed Brooklyn shaft site, associated water mains and the two existing venturi chambers that would be demolished at 79th Street and 86th Street. This area is predominantly characterized by open space and outdoor recreation, institutional and residential land uses. The Staten Island study area, likewise, included an area within a one-quarter mile radius of the proposed site of the Staten Island shaft and chlorination station and associated infrastructure (e.g., water mains and new sewers) and is generally characterized by areas of transportation and utility uses, public facilities, residential, and commercial land uses. Land uses within the Brooklyn and Staten Island study areas are discussed in further detail below.

Brooklyn

The proposed shaft site would be located within Shore Road Park at a location between Shore Road Lane to the south and 83rd Street to the north. Shore Road Park is a 58-acre park, which is managed by the NYCDPR. The proposed shaft site and associated infrastructure, which would be constructed primarily within Shore Road, would be located within Community District 10 in the Bay Ridge section of Brooklyn.

Land uses within a one-quarter mile radius of the proposed action are dominated by residential, institutional and open space and outdoor recreation (Figure 2-1). Land uses immediately adjacent to the proposed shaft site consist of the open space and outdoor recreation uses associated with Shore Road Park. Shore Road Park is bounded by Shore Road to the east, the Belt Parkway to the west, Owls Head Park to the north, and John Paul Jones Park to the south. East of the proposed shaft site, across Shore Road, are Fort Hamilton High School, athletic fields and the Russell Pederson Playground, which encompasses the entire block bordered by 85th Street to the south, Shore Road to the west, Colonial Road to the east and 83rd Street to the north. In addition to Fort Hamilton High School, additional land uses located along the east side of Shore Road from 86th Street to the south and 79th Street to the north consist almost exclusively of residential uses comprised of single-family detached houses. Single- and two-family residential houses dominate most of the area generally located to the east of the



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-1 Land Use - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

proposed action from Shore Road east to Colonial Road, and from 74th Street south to 88th Street. Two apartment complexes are located within the study area. Colonnades Apartment Complex is located approximately 1,350 feet south-southeast of the proposed action within the block bounded by the intersection of Shore Road and Narrows Avenue to the south and the intersection of 88th Street and Shore Road to the north. An additional apartment complex is located in close proximity to the intersection of Shore Road and 74th Street, which is located approximately 2,700 feet northeast of the proposed action. The Redemptorists of the Baltimore Province religious facility and office is located on the corner of Bay Ridge Parkway and Shore Road at 7503 and 7509 Shore Road. In addition, the Shore Road Family Health Center, a medical facility, is located within the one quarter-mile radius on Shore Road just north of 91st Street at 9000 Shore Road. Little Dreams, a licensed day care and after school program is located at 41 Bay Ridge Parkway, approximately 2,600 feet northeast of the subject property. Three private medical offices are located within the study area. Family Medicine is located at 8701A Shore Road, approximately 1,000 feet south-southeast of the subject property, and Advanced Sleep Testing is located at 8801 Shore Road, approximately 1,300 feet south-southeast of the subject property.

West of the proposed action is the Belt Parkway, a major arterial highway that runs north-south at this location. Further west is a waterfront promenade or park that runs the length of the Upper New York Bay in this location and is located parallel and adjacent to the Belt Parkway. A public access pier that provides commuter ferry service is located at the Brooklyn Army Terminal located at 58th Street and 1st Avenue. Commuter ferry service at the 69th Street Pier, which is located approximately 4,200 feet north of the proposed action, was previously suspended due to marine borer damage and the ferry service to the Brooklyn Army Terminal replaced this service in 1997.

Construction of the proposed action would cause some temporary disruption to existing areas of Shore Road Park and land uses in the surrounding area. However, these disruptions would be temporary in nature and the hours of construction would be regulated by the New York City Department of Transportation (NYCDOT) and other applicable City requirements. Construction within the park would require the use of an approximately 28,600 square foot construction and laydown area where access would be temporarily limited. Access to and use of the remainder of Shore Road Park would be maintained during construction and north-south access within the park would also be maintained. Portions of Shore Road Park located adjacent to the project area would be available for public use throughout construction.

Construction vehicles would access the shaft site across from Fort Hamilton High School via two temporary access locations that would be developed as part of the proposed action. Impacts to Fort Hamilton High School would be limited to the extent possible. Initial shaft

construction would be approximately six months. After construction of the shaft has been completed, the shaft would be temporarily covered and fenced with an area of approximately 3,250 square feet. Access to this area by the public would be temporarily limited during siphon construction. Areas of Shore Road Park would be restored through seeding or selective plantings and public access re-established, with the exception of the actual shaft location and immediately surrounding area (an approximately five foot buffer around the limits of the shaft would be maintained). No less than 21 days prior to the arrival of the TBM, the Brooklyn shaft would be prepared and the surrounding area would be re-established as a construction and laydown area.

It is anticipated that construction vehicles would utilize 86th Street, an existing designated-local truck route, and Shore Road to access the construction locations. Impacts to land uses along Shore Road resulting from construction activities would be minimal and of a short duration. Water main construction activities within Shore Road would require approximately two months and would be conducted in accordance with a NYCDOT Maintenance and Protection of Traffic (MPT) plan.

The proposed action would result in limited or no impact to surrounding land uses upon its completion. The new siphon would replace two existing siphons that are currently located in close proximity to the new 72-inch siphon and which traverse Shore Road Park at 79th and 86th Streets. No significant aboveground structures would remain upon completion of the proposed action. At grade structures would be limited to access manholes and valve covers. Upon completion of the installation of steel pipe in the tunnel, vertical steel pipe risers would be installed in the shaft. The shaft would then be backfilled, and chambers constructed just below the ground surface to house valves and provide access to the riser pipes.

Infrastructure improvements within Shore Road would be located below grade upon completion. In addition, the two existing venturi chambers at 79th and 86th Streets would be demolished as part of the proposed action and these areas would be restored to their pre-existing conditions. Park areas disturbed by the proposed action would be restored consistent with the requirements of a restoration plan developed by the NYCDEP and the NYCDPR. Restoration of the construction area would involve soil decompaction and lawn restoration. Asphalt paths and curbs would be restored. A new fence and concrete curb and pavers outside the existing Little League field would also be completed within the construction area. Site restoration after construction would be coordinated with the Brooklyn Director of Forestry. In addition to addressing the temporary loss of usage of the parkland by the public during construction activities, the following restoration activities would include improvements along the existing sidewalk edge between 84th and 87th Streets in the project area. These improvements would

include reconstruction of the sidewalk, repair/replacement of benches and refurbishment of cast iron fences.

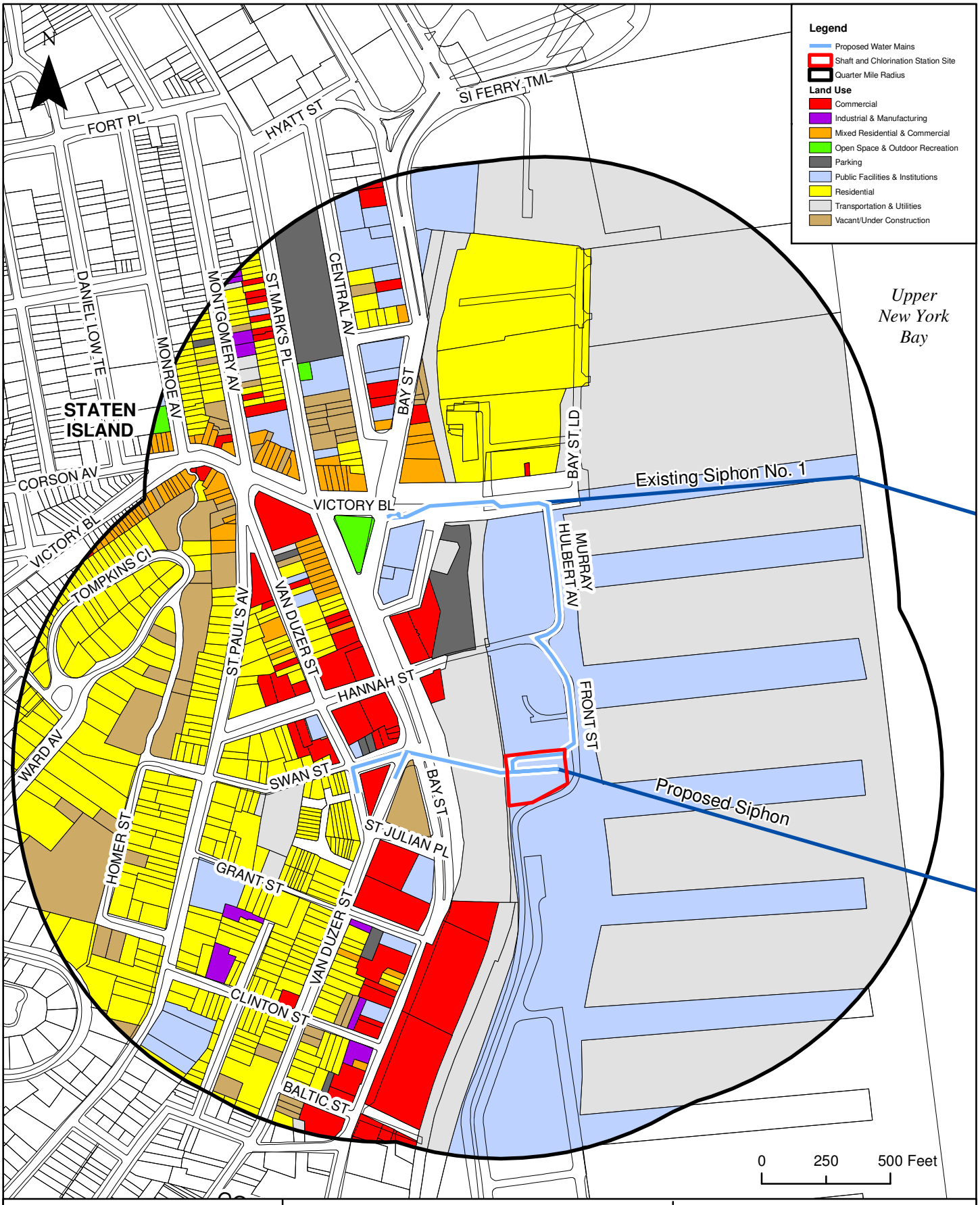
Staten Island

The proposed shaft and chlorination station site would be situated within an approximately 1.1-acre vacant City-owned lot located on Front Street. The site is bounded by the NYCDOT Staten Island Ferry maintenance yard to the north, Front Street to the east and south and the SIRT railway to the west. The shaft, chlorination station and associated infrastructure efforts would be located within Community Board 1 in the Tompkinsville and Stapleton communities of Staten Island.

The one-quarter mile study area generally extends north to the Staten Island Ferry Terminal, east to the Upper New York Bay, south to Baltic Street and west to Victory Boulevard. Land uses within this study area are dominated by public facilities and institutions, transportation and utility, commercial, residential, mixed residential and commercial and open space and outdoor recreation uses (Figure 2-2).

North of Victory Boulevard and west of Bay Street, land uses consist of public facilities and institutions including the Seaman's Society for Children and Families, Covenant House – Staten Island Community Resource Center, and Up and Field Office – Staten Island Workforce 1 Career Center, vacant land and mixed residential and commercial uses. A municipal parking lot is located between St. Mark's Place and Central Avenue. East of Bay Street, land uses are dominated by residential and transportation and utility including the SIRT railway, which runs in a north-south direction through the study area.

East of the SIRT railway and south of Victory Boulevard, land uses are dominated by public facilities and institutions and transportation and utility. The proposed water main connections and the abandonment of existing Siphon No. 1 are located at Victory Boulevard between Bay Street and Murray Hulbert Avenue. The U.S. Navy's former Stapleton Homeport occupies the waterfront south of the proposed site. The George Cromwell Recreation Center and Joseph H. Lyons Pool are located immediately south of Victory Boulevard, approximately 700 feet, north-northeast of the site. The SIRT Tompkinsville train station and associated parking are located immediately west of the Joseph H. Lyons Pool. James Miller Marine Service, Inc., a commercial shipping service and boat storage business, is situated on the waterfront, south of the recreation center. Immediately south of Hannah Street is the existing NYCDEP Richmond Chlorination Station and the Hannah Street Pump Station. Between the proposed shaft and chlorination site and these existing NYCDEP facilities is a NYCDOT yard for the Staten Island Ferry.



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-2 Land Use - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

Land Use modified based on field verification, February, 2009

South of the proposed site and Front Street, land uses are dominated by the former Homeport and the Richmond County Supreme Court. A parking lot is situated south of Front Street (southeast of the shaft site) and approximately 1.5 acres of this site would be used as the primary staging area for siphon and chlorination station construction. The lot is currently used for the storage of equipment, such as large tires, wood pallets and heavy duty rubber tubing.

West of the SIRT, land uses are dominated by commercial uses with a few public facilities and institutions along Bay Street and St. Paul's Avenue, including P.S. 15 and St. Paul's Memorial Church and Rectory. The SIRT Maintenance of Way Shop and Crew Headquarters is situated immediately west of the proposed shaft and chlorination station site. Commercial uses, including an Auto Zone and Bottalico Brothers car dealership are situated adjacent to the proposed water main connections on Swan Street and Van Duzer Street Extension. A large vacant parcel is located on Bay Street between Swan Street and St. Julian Place. The portion of Bay Street from Hannah Street to Grant Street is designated as a NYCDPR Greenstreet. Between Victory Boulevard and Hannah Street, Bay Street has a mixture of public facilities and institutions, mixed residential and commercial, open space, residential and commercial land uses. Tompkinsville Park is located approximately 950 feet northwest of the proposed site at the junction of Victory Boulevard and Bay Street. Residential uses dominate the area west of Van Duzer Street with a strip of vacant properties along Homer Street.

The proposed action would primarily be constructed within vacant, City-owned property and existing roadway right-of-ways. Development of the proposed shaft and chlorination station site would result in minimal aboveground structures with the exception of the chlorination station, which would be an as-of-right use and has been designed to be compatible with surrounding existing land uses, and various at-grade access manholes and valve covers.

Required construction beneath the SIRT, the SIRT Maintenance facilities and Bay Street would be through the use of micro-tunneling techniques, thereby minimizing aboveground impacts. Likewise construction of water main and connection work between Victory Boulevard and Minthorne Street beneath the SIRT would also be accomplished through this technology. Open cut construction for additional water mains and sewer improvements would be primarily conducted along Murray Hulbert Avenue, Front Street, Victory Boulevard, Van Duzer Street Extension and Swan Street, and would require approximately two months. Work efforts within Murray Hulbert Avenue/Front Street would be consistent with a NYCDOT MPT Plan and would also be coordinated with the proposed development of the North Shore Esplanade by the NYCEDC. The NYCEDC is proposing the implementation of streetscape improvements between Victory Boulevard and Hannah Street and additional waterfront improvements in this

area. Streetscape work, however, would not occur prior to the completion of required work for the proposed action in this location.

The NYCDEP/NYCEDC are pursuing ULURP approval for site selection for the development of the proposed chlorination station in Staten Island. The proposed action would not result in significant long-term impacts to existing land uses at or in the vicinity of the site. No changes in land use designations would be required for the construction and operation of the proposed siphon and chlorination station.

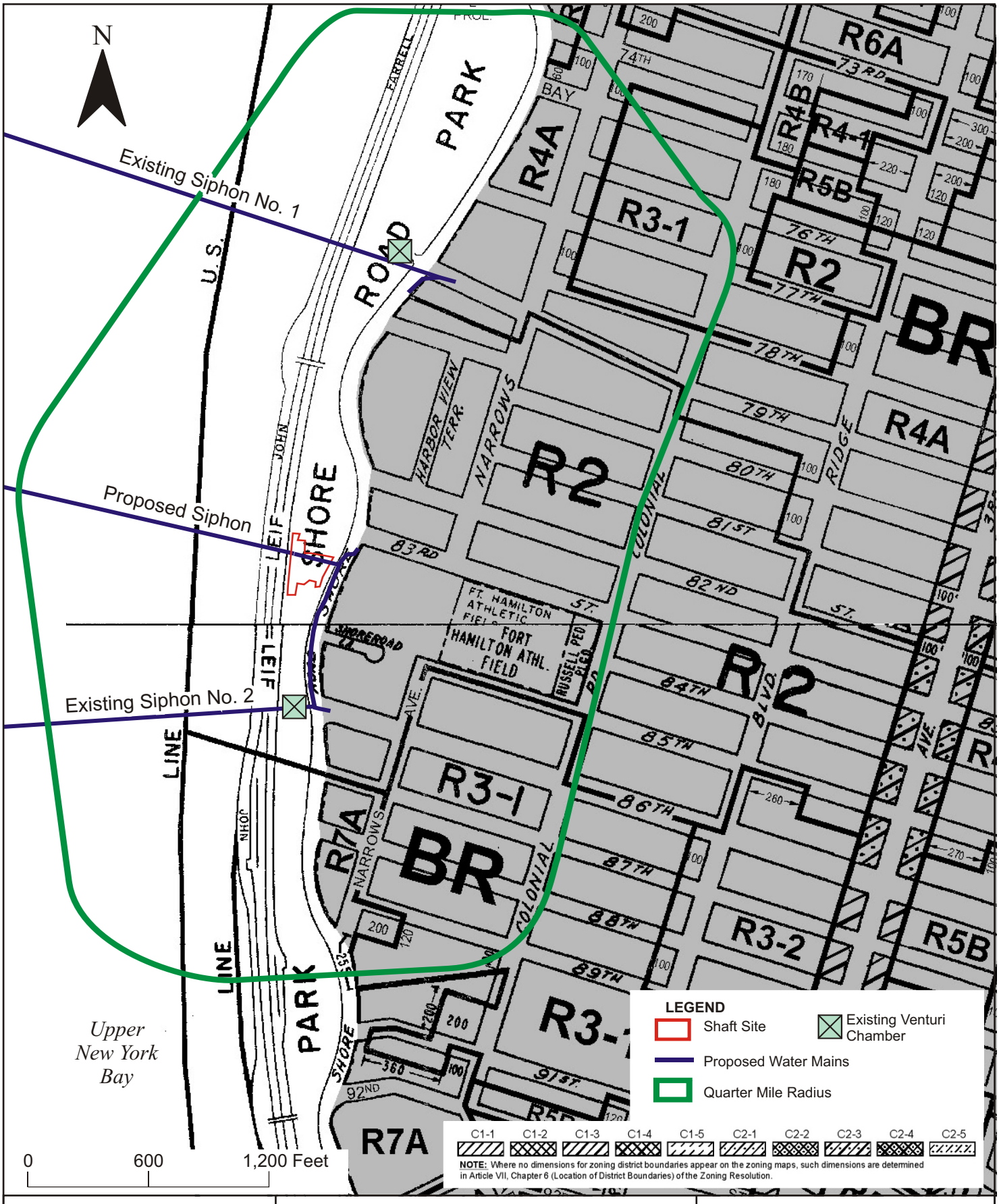
2.2.2 Zoning

The proposed action would be located in the Bay Ridge and Stapleton and Tompkinsville communities of Brooklyn and Staten Island, respectively. The Brooklyn study area is comprised of residential and parkland districts. Residential and commercial districts dominate the Staten Island study area.

Brooklyn

The zoning districts within one-quarter mile of the proposed action are dominated by residential districts and parkland (Figure 2-3). The proposed shaft site would be located within Shore Road Park west of Fort Hamilton High School between Shore Road Lane to the south and 83rd Street to the north. The associated infrastructure improvements would be located primarily within Shore Road between 86th Street and 79th Street. East of Shore Road, zoning within a one-quarter mile radius are exclusively residential districts that are a part of the Special Purpose District Bay Ridge (BR), which runs north from the Verrazano Narrows Bridge to 64th Street, east from Shore Road to the Gowanus Expressway and south to Shore Road. The purpose of the BR is to preserve the existing scale and character of the Bay Ridge community. The district contains limitations on the height of community facilities and maximum floor area ratios (FAR) and provides requirements for street tree planting and maintenance in all zoning districts that permit residential use.

East of the site along Shore Road, from north to south are residential districts (R4A, R2 and R7A, respectively). The proposed water main connection at 79th Street and Shore Road would be adjacent to an R4A district. This area allows for low-density residential uses consisting of single-family and two-family detached homes. East of Narrows Avenue, the R4A district becomes an R3-1 district and is comprised of semi-detached one- and two-family and detached homes.



HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-3 Zoning - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

Fort Hamilton High School, located immediately east of the proposed site on Shore Road is located in an R2 district, which extends east beyond the limits of the study area and south from 79th Street to 87th Street. Single family detached homes dominate this district. The proposed water main connection in Shore Road and at 86th Street would be located immediately west of this R2 district. An R7A district, which allows for high-density residential is situated southeast of the location between 87th and 89th Streets. The Colannades Apartment Complex and Colonial Gardens are located within this district. East of the R7A district and Narrows Avenue is an R3-1 district.

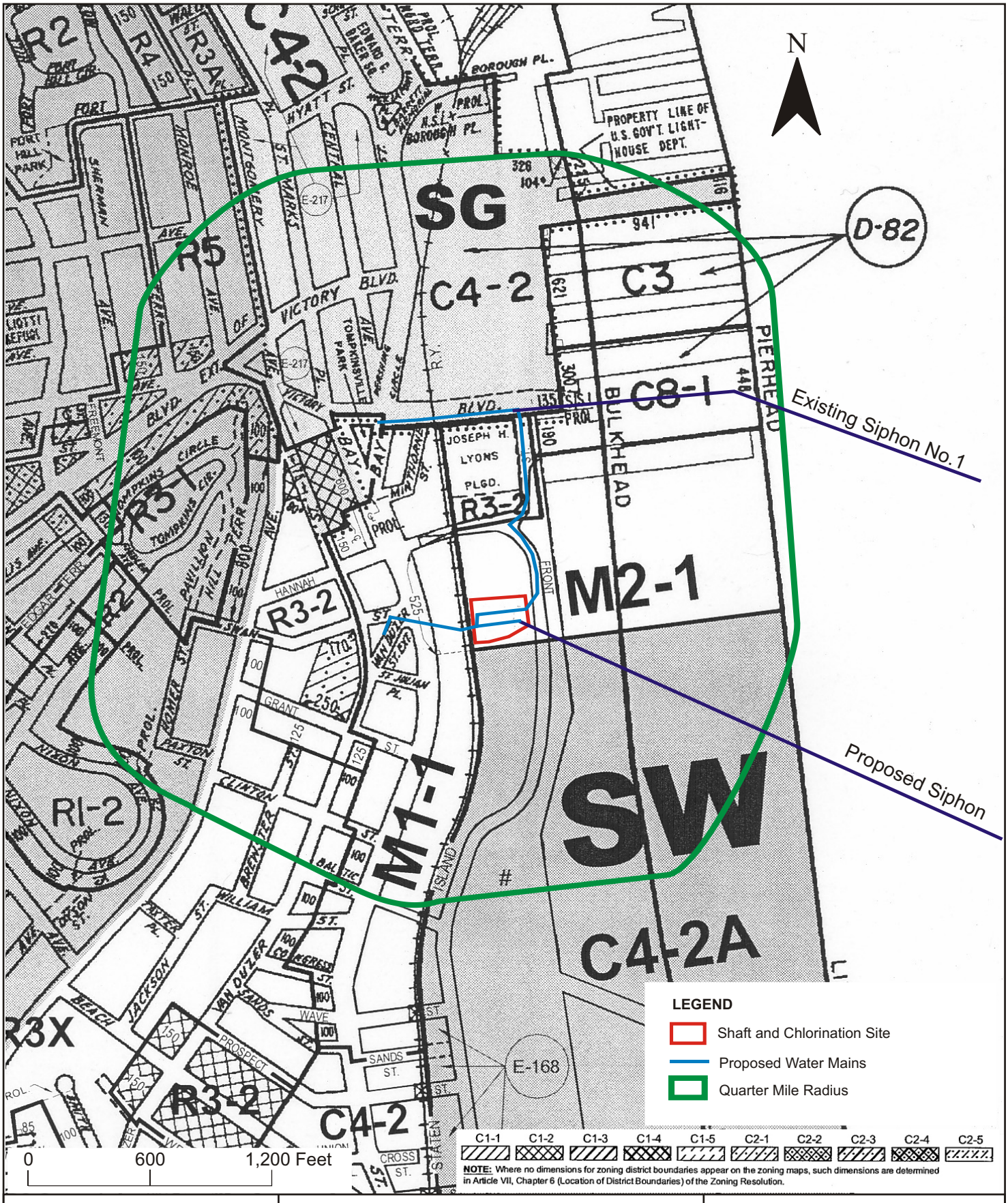
A R2 district is located south of 78th Street and north of 87th Street between Shore Road and Narrows Avenue and south of 79th Street and north of 85th Street between Narrows Avenue and the edge of the quarter mile study area. An R2 zoning district only allows for detached single-family residences and has a maximum FAR of 0.5.

Southeast of the proposed shaft site is a R3-1 district, located east of Narrows Avenue and south of 85th Street. A R7A district, which has a maximum FAR of 4.0, is generally situated east of Shore Road, south of 87th Street, west of Narrows Avenue and north of the intersection of Shore Road and Narrows Avenue.

The infrastructure improvements, demolition of the two existing venturi chambers at 79th and 86th Streets and construction of the shaft within Shore Road and Shore Road Park would be located below-grade and the areas would be restored in accordance with the requirements of a mutually agreed upon restoration plan between the NYCDEP and NYCDPR once construction is complete. The proposed action would not have a significant impact upon zoning in the vicinity of the site. No changes in zoning designations would be required due to the construction or operation of the proposed siphon and associated infrastructure. The proposed action would involve the replacement of two existing siphons that are located beneath Shore Road Park with one new siphon. Little or no significant aboveground structures would be constructed as part of the proposed action within Shore Road Park or the surrounding area.

Staten Island

Zoning within a one-quarter mile radius of the Staten Island site is generally comprised of manufacturing, commercial and residential uses (Figure 2-4). The proposed shaft site and chlorination station would be located within a manufacturing (M2-1) district, which would be consistent with the proposed use. This M2-1 district extends east of the SIRT railway from just south of Victory Boulevard to immediately south of the proposed site at Front Street.



HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-4 Zoning - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

North of the proposed site and north of Hannah Street, zoning is comprised of residential (R3-2, R3-1 and R5) and commercial (C4-2, C8-1 and C3) districts. The R3-2 district includes the Joseph H. Lyons Pool. The commercial districts are located between Montgomery Avenue and extend east to the U.S. Pierhead Line. North of Victory Boulevard is the Special Purpose St. George District (SG). The SG District generally extends north from Victory Boulevard and west from Montgomery Avenue. This special district promotes a higher-density, pedestrian-oriented, mixed-use community by requiring commercial uses on certain streets that have continuous retail frontage, wider sidewalks, more windows and at least 70 percent of the building façades located within eight feet of the sidewalk; allowing rules that promote tall, slender buildings that maintain waterfront vistas from the harbor and upland community; permitting the re-use of existing vacant office buildings by allowing them to be easily converted to residential uses; and appropriate parking regulations to ensure adequate and visually appealing off-street parking that encourages new retail development. This SG District was formally approved in 2008.

Residential districts with commercial overlays are located west of Montgomery Avenue. South of Victory Boulevard, between Montgomery Avenue and the SIRT railway, are a residential (R3-2) and a manufacturing (M1-1) district. The M1-1 district bounds the proposed site to the west and generally extends from the SIRT west to Van Duzer Street and south beyond the limits of the study area. The proposed water main connection on Bay Street would be located within this district. Generally, M1-1 districts serve as a buffer between residential communities and heavier manufacturing districts.

The southern portion of the study area consists of commercial districts (C4-2 and C4-2A). In addition, starting immediately south of the proposed shaft and chlorination building site is the Stapleton Waterfront (SW) Special Purpose District, which extends south along the waterfront to the area generally east of the intersection of Front Street and Edgewater Street and is generally situated west of the SIRT. In an effort to revitalize the Stapleton District in Staten Island and to redevelop the former Navy Homeport site, the M2-1 and M3-1 zoning districts were rezoned to a C4-2A district. The rezoning was formally approved in 2006 and a redevelopment plan was created. A request for proposals to redevelop the site was issued in 2007 by the NYCEDC. The development of two parcels (B2 and B3) that are located a few blocks south of the proposed action, will be initiated soon. A developer has recently been selected who will be developing 800 residential units approximately one-half mile south of the proposed site at Front Street and Prospect Street. This area was previously used as the U.S. Navy's Homeport, but was decommissioned in 1995. The Navy continues to retain limited access to some of the piers along the waterfront.

The majority of the proposed action would involve below-grade activities, with the exception of the chlorination station, which would be an as-of-right use. No change of zoning designations would be required for the construction or operation of the proposed action. The proposed action would be consistent and compatible with existing zoning within the study area and would not result in significant adverse impacts to zoning.

2.2.3 Public Policy

The proposed action would consist of the construction of a replacement water siphon between Brooklyn and Staten Island. Construction activities would involve the development of two proposed shaft sites, one within Shore Road Park in Brooklyn and the other on a City-owned vacant lot in the Stapleton section of Staten Island; the installation of new water mains along Shore Road in Brooklyn and within Victory Boulevard, Murray Hulbert Avenue, Front Street, Bay Street and Swan Street in Staten Island; the development of a new chlorination station, and the proposed removal and/or abandonment of three existing venturi chambers located near the intersections of Shore Road and 79th Street and Shore Road and 86th Street in Brooklyn and at Victory Boulevard in Staten Island. Construction staging areas would be located adjacent to each shaft site and an additional staging area would be located in Staten Island, at a site located immediately southeast of the shaft site on the opposite side of Front Street. An alternative staging site would be located south-southwest of the proposed shaft and chlorination building site at the corner of Front and Wave Streets. Both of these sites are under the jurisdiction of the NYCEDC. This section presents a summary of current public policy for the study area relating to land use and zoning of the area within a one-quarter mile radius of the project area and discusses the applicability of these to the proposed action.

Waterfront Revitalization Program/Coastal Zone Management

The New York City Local Waterfront Revitalization Program (WRP) is authorized under New York State's Coastal Management Program (CMP). The federal Coastal Zone Management (CZM) Act of 1972 was enacted to protect the characteristics of waterfront areas and established polices regarding development within the coastal zone. The New York City WRP was originally adopted in 1982 and revised in 1999, and is included as part of New York State's CMP. The New York State Department of State (NYSDOS) administers the CMP at the state level and the NYCDCP administers the WRP for the City. The CMP and WRP encourage government coordination to advance waterfront planning and require an evaluation of consistency of applicable proposed actions with the coastal zone policies. The WRP establishes policies for the use and development of the waterfront within the City of New York and provides a framework for evaluating the consistency of discretionary actions in the coastal zone with those policies.

The proposed shaft locations and the majority of additional upland infrastructure, including the chlorination station would be located in the designated coastal zone of New York City. Section 2.13 - Waterfront Revitalization Program provides a more detailed discussion of the proposed action and its consistency with the WRP and its policies.

Citywide Statement of Needs for Fiscal Years 2009-2010

The proposed action is not listed in the "Citywide Statement of Needs for Fiscal Years 2009-2010" for either Brooklyn or Staten Island.

Community Board 10 of Brooklyn has not petitioned any needs within the community district for improved municipal services according to the "Citywide Statement of Needs for Fiscal Years 2009 and 2010."

Community Board 1, which represents Staten Island's North Shore neighborhoods, has petitioned in the "Citywide Statement of Needs for Fiscal Years 2009 and 2010" for the replacement of the Department of Sanitation District 1 Garage currently located at 539 Jersey Street.

The Department of Sanitation District 1 Garage would not be located at or in close proximity to the proposed siphon shaft and chlorination station site, nor would the construction have any impact on the water mains connecting to the proposed siphon. Therefore, since there are no plans for development in the area of the site, the replacement of the water siphon between Brooklyn and Staten Island would not conflict with identified proposed needs made by the community.

Community District Needs Fiscal Year 2009

Community Board 10 in Brooklyn presented a "District Needs Statement for Fiscal Year 2009," which outlined needs including additional senior citizen housing, the need for tree maintenance and expediting the replacement of water mains. Street undermining and collapse due to water leaks is an ongoing problem especially on 86th Street between Shore Road and Fort Hamilton Parkway and 6th Avenue between 84th Street and 65th Street. Repairs on 86th Street are scheduled to occur this fiscal year. Other capital commitments included in the Board's 10-year plan included the replacement and extension of trunk and distribution mains, upgrading cement pipe sewers, preventative maintenance programs for catch basins to prevent overflow and flooding and refurbishing the sewer and wastewater systems.

Community Board 1 of Staten Island also presented a "District Needs Statement for Fiscal Year 2009," which outlined needs such as a lack of funding from the Health and Hospitals

Corporation to fund hospital emergency rooms, the need to develop and finance transportation alternatives to ease traffic congestion, allocation of funds to build a high school on the North Shore, additional funding for the New York Public Library to meet population growth and the need for further funds for the NYCDPR to develop areas in need of remediation.

The proposed action was not identified in the "District Needs Statement for Fiscal Year 2009" for either Community Board 10 in Brooklyn or Community Board 1 in Staten Island. The construction of the siphon, however, would not have an adverse impact on the needs of the community described and would involve the construction of new or replacement water mains and sewer, which is one of the needs identified by Community Board 10.

Stapleton Waterfront District

In an effort to revitalize the Stapleton District in Staten Island, the NYCDCP and the NYCEDC created a plan for development of the waterfront on the former Staten Island Homeport site that was previously occupied by the United States Navy. This process began with the creation of Mayor Bloomberg's Homeport Task Force in 2003, which was comprised of key City officials, local elected representatives, businesses and community leaders to develop a workable plan for the Homeport that was beneficial to the community and Staten Island as a whole. In May 2004, a development plan was presented to the public, which called for a mixed-use development, inclusive of a waterfront esplanade, open space, roadway reconstruction and demolition of the existing buildings on the Homeport site. In order for this development to be possible, it was necessary to change the existing M2-1 and M3-1 zoning districts in the area to a C4-2A zoning district. The rezoning area is generally bounded by the approximate extension of St. Julian Place to the north, the SIRT tracks to the west, the continuation of Greenfield Avenue to the south and the United States pierhead line to the east. This rezoning was formally approved in 2006 and a request for proposals to redevelop the site was issued in 2007. A developer has been selected for two parcels (B2 and B3) that are located a few blocks south of the proposed action. Approximately 800 residential units will be developed approximately one-half mile south of the proposed site at Front Street and Prospect Street.

Special St. George District Rezoning

In recent decades, many parts of Staten Island have experienced commercial and residential growth; however, investment in St. George has not experienced the same growth as the rest of Staten Island. In an effort to cultivate development and outline requirements for future development in St. George, the City Planning Commission and City Council approved the creation of the Special St. George District Rezoning. The new special district would promote a

higher-density, pedestrian-oriented, mixed-use community by requiring commercial uses on certain streets that have continuous retail frontage, wider sidewalks, more windows and at least 70 percent of the building façade located within eight feet of the sidewalk; allowing rules that promote tall, slender buildings that maintain waterfront vistas from the harbor and upland community; permitting the re-use of existing vacant office buildings by allowing them to easily convert to residential uses; and appropriate parking regulations to ensure adequate and visually appealing off-street parking that encourages new retail development. This special district was formally approved in 2008.

Staten Island Growth Management

From 1990 to 2000, Staten Island was one of the fastest growing counties in New York State. In response to the high growth rate and concerns about overdevelopment, Mayor Bloomberg created the Staten Island Growth Management Task Force in July 2003. The Growth Management Task Force was tasked with identifying short-term solutions, possible legislative changes and long-term planning initiatives that would prevent overbuilding and overdevelopment in Staten Island.

In December 2003, the Growth Management Task Force published the "Staten Island Growth Management Task Force Final Report", which outlined recommendations for improving residential development, promoting appropriate commercial development and identifying long-term planning needs. The City Council adopted the Lower Density Growth Management Text Amendments proposed by the Growth Management Task Force in August 2004. These regulations are intended to decrease inappropriate development and manage future growth in Staten Island. The Growth Management Task Force also changed or eliminated 21 commercial overlay districts, which was approved by the City Planning Commission in September 2005. By removing or changing the commercial overlays within Staten Island, inappropriate residential and commercial development is no longer permitted and the lower density growth management regulations would apply. In December 2005, the City Council adopted zoning map and text amendments to ensure that future development is consistent with the existing character and also with the commercial zoning regulations that prohibit residential-only development in commercial overlays and districts.[1]

[1] New York City Department of City Planning. "Staten Island Growth Management" Accessed on October 19, 2007 from http://www.nyc.gov/html/dcp/html/sigrowth/index.shtml.

North Shore Empire Zone

The Empire Zones Program is a part of New York State's efforts to revitalize and expand the economy. Empire Zones are designated areas that offer tax benefits and other incentives to encourage economic development, business investment and the creation of jobs. The program was designed to create jobs and encourage private investment in local businesses to stimulate business growth in economically distressed areas. A local Zone Administrative Board, made up of representatives from City agencies and local community, business and government officials, is responsible for the oversight, assessment and coordination of incentives awarded under the Empire Zones Program.

Located within the Staten Island study area, the North Shore Empire Zone is overseen by the Staten Island Economic Development Corporation. The North Shore Empire Zone was designated in July 1994 and includes 1,280 acres of land along the northern shore of Staten Island stretching from Howland Hook in Port Ivory to Edgewater Street in Clifton. A portion of the siphon study area is located within the North Shore Empire Zone, including all areas situated east of Van Duzer Street. Commercial districts, maritime and industrial sites receive support from the North Shore Empire Zone Program.[2]

The Harbor Loop Ferry System

Upper New York Bay is an important geographic and economic resource in the region that houses several historic landmarks, including the Statue of Liberty and Ellis Island. It is also the center of a $70 billion international trade and shipping network. Within the Upper New York Bay waterfront, many development projects have taken place in lower Manhattan, Brooklyn, Staten Island, Bayonne and Jersey City. In addition, the redevelopment of the largest areas of land, Governor's Island (172 acres), Homeport/Stapleton Yards (35 acres), the Military Ocean Terminal Bayonne (over 350 acres) and Ellis Island (70 acres) has been hindered by poor transportation access. To remedy this, the Metropolitan Waterfront Alliance developed a transportation plan that would create a ferry network to connect waterfront communities between lower Manhattan, Brooklyn, Staten Island, Bayonne and Jersey City.

The Harbor Loop Proposal recommended that 15 new ferry stops be created along the Upper New York Bay that would enhance regional mobility, improve the quality of life in communities lacking public transit and create new work, living and recreational opportunities for the present and future residents and visitors.[3]

---

[2] New York State Office of the State Comptroller. March 16, 2004. "North Shore Empire Zone Report 2003-D-5." Accessed on October 19, 2007 from http://www.osc.state.ny.us/press/releases/mar04/empirezonenshore.pdf

PlaNYC

The proposed siphon would be consistent with Mayor Bloomberg's "PlaNYC: A Greener, Greater New York" that focuses on five key dimensions of the City's environment: land, air, water, energy and transportation. The proposed action is specifically listed as one of the Plan's water initiatives and states the need for the proposed project to ensure a continued reliable water supply for Staten Island. The proposed action would represent a modernization of infrastructure and in addition to providing a valuable backup water supply to Staten Island, the proposed chlorination station may also provide a back-up to the existing Richmond Chlorination Station in the event of a power outage or other occurrence that may render the existing station inoperable. If this were to occur, water supply would be shifted from the Richmond Tunnel to the new siphon and this supply would be treated at the new chlorination station.

In addition, development of the only above-ground structure, the proposed chlorination station, would utilize sustainable development techniques. This would include green walls and a green roof and the recycling of grey water for the maintenance of these.

The proposed action would be consistent with the current and proposed public policy initiatives and plans within the study area which were discussed above. The construction of the proposed water siphon between Brooklyn and Staten Island and associated infrastructure would not be anticipated to conflict with or preclude any of the overall goals of these policies and plans. The proposed action would, therefore, be consistent with existing public policy and plans and would not result in significant adverse impacts to these as a result of the construction or operation of the water siphon.

2.3 SOCIOECONOMICS

The *CEQR Technical Manual* generally defines socioeconomic conditions as impacts that may occur from an action that would, "directly or indirectly change population, housing stock, or economic activities in the area." Direct displacement is the involuntary displacement of residents, employees and businesses from a site resulting from a proposed action, while indirect displacement is the uncontrolled displacement of residents, employees, or businesses because of changes in living conditions, costs or other factors caused by a proposed action. A significant adverse socioeconomic impact, under the *CEQR Technical Manual*, would only occur if a proposed project would displace local residents, businesses or employees; result in substantial new development that is markedly different than existing; changes in real estate conditions; or, harm to specific industries.

---

[3] The Metropolitan Waterfront Alliance. "Proposed Harbor Loop Ferry System for Upper New York Bay." Accessed on October 19, 2007 from http://www.waterwire.net/FerryMap/Harborloop.doc.

Brooklyn

The Brooklyn shaft site would be located in Shore Road Park, a City-owned park. Access to portions of Shore Road Park would be limited during the initial construction of the shaft and when the TBM reaches Brooklyn and is removed from the shaft, however, the park would be restored upon the completion of construction in accordance with the requirements of the NYCDPR (a formal Memorandum of Understanding would be entered into between the NYCDEP and NYCDPR). Restoration of the construction area would include soil decompaction and lawn restoration. Asphalt paths and curbs would also be restored. A new fence and concrete curb and pavers outside the Little League field would also be completed within the construction area. Site restoration after construction would be coordinated with the Director of Brooklyn Forestry and tree protection during construction would be in accordance with NYCDPR standards.

Access to the park would not be precluded at any point in time and the proposed action would not result in the long term loss of parkland. In order to limit potential impacts to the use of Shore Road Park and the surrounding land uses in proximity to the Brooklyn shaft site, the receiving shaft would initially be developed over a six month period and then deactivated and covered while the subaqueous tunnel is bored under the Upper New York Bay. The approximately 28,600 square foot Brooklyn shaft construction zone would then be reopened when the bored tunnel nears completion. The location of the shaft would be temporarily covered and an area immediately adjacent to the shaft would be fenced (approximately a five foot buffer from the limits of the actual shaft). The remaining construction zone would be seeded and reopened to public access. No less than 21 calendar days prior to break through of the TBM at the Brooklyn receiving shaft, the temporary cover would be removed, the construction zone would be re-established and the shaft would be made ready. After the retrieval of the TBM and the completion of construction work within the shaft and surrounding area, the park would be restored. No long term loss of existing parkland uses would occur as part of the proposed action. Likewise in order to address the temporary loss of park usage by the public during construction activities, restoration activities would include improvements along the existing sidewalk edge between 84th and 87th Streets in the project area. These improvements would include reconstruction of the sidewalk, repair/replacement of benches and refurbishment of cast iron fences.

Upon completion, little or no aboveground features would be present within Shore Road Park. All structures at the shaft site would be located below grade. The only at-grade structures would be two approximately three-foot diameter manholes, at ground surface level, that would

allow access to the distribution chamber and two valve covers to allow operation of the valves within the chamber.

Staten Island

The Staten Island shaft and chlorination station would be located within vacant City-owned property. Staging areas used during construction of the shaft and chlorination building would also be located within vacant City-owned lots (the primary staging area site would be located immediately southeast of the site along Front Street and an alternative, secondary site would be located near Front and Wave Streets) and would not result in a displacement of residents, employees or businesses from the sites. Both of these sites are currently under the jurisdiction of the NYCEDC. A one-story chlorination building would represent the only visible aboveground features. Additional various access manholes and valve covers would be located at-grade. The construction and operation of the water mains in Brooklyn and Staten Island would result in no potential significant adverse impacts associated with the displacement of residents, employees or businesses due to changes in living conditions, costs or other factors resulting from the proposed action. The proposed action would not increase growth or affect the quantity of housing or housing costs in either Brooklyn or Staten Island as it would primarily serve as a secondary backup supply of potable water for Staten Island. There would be no permanent increases in employment resulting from the construction or operation of the water siphon, shafts, chlorination station or water mains.

Construction activities at both locations would not result in the long-term, direct displacement of businesses, transportation, utilities, public facilities or residential uses situated in the areas adjacent to the proposed water siphon, shafts or water mains. During construction, there would be a temporary increase in employment and economic activity within each study area, but these would be short in duration and employment would return to prior levels once construction has been completed. There would be no increase in the existing water supply system to areas not already served by the system, therefore no induced growth would be anticipated. No long-term, adverse impacts to existing socioeconomic conditions would occur due to the proposed action. Implementation of the proposed action would facilitate the Harbor Deepening Project. This would serve to maintain and increase the transport of goods through the use of larger cargo vessels after the deepening is complete.

2.4 COMMUNITY FACILITIES

Community facilities are defined in the *CEQR Technical Manual* as, "public or publicly funded facilities, such as schools, hospitals, libraries, day care centers, and fire and police protection." The purpose of a community facilities' analysis is to evaluate potential impacts that

may result from a proposed action on services generally provided by facilities that are public or publicly-funded within the community. An evaluation of potential affects upon community facilities can be made by looking at direct and indirect impacts resulting from the proposed action. Direct impacts would physically alter the community facility and indirect impacts would increase population in a given area, which would result in greater demand for community services and potential impacts on the delivery of such services to the community.

Brooklyn

Five existing community facilities are situated within a one-quarter mile radius of the proposed action in Brooklyn. These facilities are shown in Table 2-1. Fort Hamilton High School is located immediately east of the proposed shaft site. This educational facility provides public education to neighborhood children in grades 9 through 12 and has an enrollment of approximately 4,195 students. Shore Road Family Health Center is another community facility within the study area that is located approximately 2,000 feet southeast of the proposed action at the intersection of Shore Road and 91st Street. In addition, two buildings used by the Redemptorists of the Baltimore Province located at 7503 and 7509 Shore Road are approximately 2,200 feet north-northeast of the proposed action.

Table 2-1. Community Facilities Within a One-Quarter Mile Radius of the Proposed Action in Brooklyn

Name	Use	Location	Capacity	Oversight Agency
Primary and Secondary Schools				
H.S. 490 - Fort Hamilton High School	High School – Public	8301 Shore Road	4,195 Enrollment	NYS Department of Education
Hospitals, Nursing Homes and Ambulatory Programs				
Shore Road Family Health Center	Health Center	9000 Shore Road	N.A.	NYS Department of Health
Recreational and Cultural Facilities				
The Redemptorists of the Baltimore Province	Religious Facility	7503 Shore Road	N.A.	N.A.
The Redemptorists of the Baltimore Province	Religious Facility	7509 Shore Road	N.A.	N.A.
Licensed Day Care and After School Programs				
Little Dreams	Day Care/After School Program	41 Bay Ridge Parkway	Unknown	Unknown

Construction and operation of the proposed water siphon, shaft and water mains would not adversely affect the ability of the New York City Police Department (NYPD) or the New York City Fire Department (FDNY) to provide services to the study area. The study area is within the 68th Precinct of the NYPD, which serves an area east of the Upper New York Bay and

generally bounded by 14th Avenue and 62nd Street to the east, the intersection of the Belt Parkway and the Gowanus Expressway to the north and the Belt Parkway to the south. The FDNY's Engine 241, Ladder 109, located at 6630 Third Avenue, also serves the study area in Brooklyn. None of these public safety facilities are located within the one-quarter mile study area.

There would be no direct or indirect impacts to community facilities in Brooklyn due to the proposed action. No increase in population would occur as the result of the construction and operation of the water siphon, shaft and water distribution mains. These facilities would serve primarily as a secondary/backup water supply for Staten Island and would replace two existing siphons. No increased demand for community facilities would be required and no existing community facilities within the study area would be directly impacted. During construction, short-term effects upon traffic, noise and air quality may impact these community facilities, however, these are anticipated to be minimal. Any potential impacts resulting from increased traffic, noise and air quality would not have a significant impact on community facilities, as construction vehicles would utilize designated-truck routes, these effects would be temporary, and they would only occur during the brief construction period. Potential effects upon Fort Hamilton High School, Shore Road Park and the surrounding area would be minimized through the initial construction of the shaft, its temporary closure during the tunnel construction and its reopening upon the arrival of the TBM. In addition, two-way traffic along Shore Road would be maintained during the duration of required water main construction activities, in accordance with a NYCDOT MPT Plan. This work would require approximately two months, which would also minimize potential impacts to community facilities and access to these areas by NYPD and FDNY. In addition, work within Shore Road would be subject to a School Construction Embargo, which would require work to occur between July 1 and September 1.

Staten Island

The proposed action would not physically alter or displace any community facilities in Staten Island. There are 22 community facilities located within a one-quarter mile radius of the proposed action. These facilities are shown in Table 2-2. Community facilities within this area are predominantly religious and social service facilities that assist the needs of children, including day care facilities, a residential facility and a child welfare office. The nearest community facility to the proposed action is the New York City Human Resources Administration Department of Social Services/Richmond Job Center/Richmond Food Stamp Office, located at 201 Bay Street, which is located approximately 250 feet west of the proposed water main connection on Victory Boulevard.

Table 2-2. Community Facilities Within a One-Quarter Mile Radius of the Proposed Action in Staten Island

Name	Use	Location	Capacity	Oversight Agency
Primary and Secondary Schools				
The St. George Auxiliary Services for High Schools	GED, Literacy, Resource Room	450 St. Mark's Place	200 Enrollment	NYS Department of Education
P.S. 15	Elementary School – Public	161 St. Paul's Avenue	Under Construction	NYS Department of Education
Religious and Cultural Facilities				
Masjid Al-Ihsan Mosque	Religious Facility	406 St. Mark's Place	N.A.	N.A.
Bethel Community Church	Religious Facility	51 Van Duzer Street	N.A.	N.A.
St. Paul's Memorial Church	Religious Facility	225 St. Paul's Place	N.A.	N.A.
The Redeemed Christian Church of God	Religious Facility	402 Bay Street	N.A.	N.A.
St. Paul's Memorial Church Rectory	Religious Facility	219 St. Paul's Place	N.A.	N.A.
Centro Cristiano	Religious Facility	8 Grant Street	N.A.	N.A.
Public Safety and Criminal Justice Facilities				
NYC Department of Probation Adult Services	Public Safety Facility	340 Bay Street	N.A.	NYC Department of Probation
Homeless Facilities				
Project Hospitality	Homeless Drop-In Center	25 Central Avenue	40	NYC Department of Homeless Services
Project Hospitality – Hospitality House	Family Homeless Facility	100 Central Avenue	150	NYC Department of Homeless Services
Health Care Facilities				
Staten Island University Hospital - Bay Street Health Center	Hospital-Affiliated Health Center	51 Bay Street	N.A.	NYS Department of Health
Non-Residential Alcohol and Substance Abuse Facilities				
St. Vincent's Services	Outpatient Services for Alcohol/Substance Abuse	148 Bay Street	70 Cert. Caseload	NYS Office of Alcoholism and Substance Abuse Services
Facilities for Seniors				
Community Agency for Senior Citizens/ Senior Housing Resources Corporation/New Land Senior Center	Senior Center	56 Bay Street	1860 Av. Meals/Month	NYC Department for the Aging
Day Care Facilities for Children				
Over the Rainbow Day Care	Group Day Care – Private	34 Central Avenue	20	NYC Department of Health and Mental Hygiene
Up and Growing Day Care	Group Day Care – Private	80 Bay Street	30	NYC Department of Health and Mental Hygiene
Staten Island Early Childhood Center Education	Group Day Care – Private	467 St. Mark's Place	65	NYC Department of Health and Mental Hygiene

Table 2-2. Community Facilities Within a One-Quarter Mile Radius of the Proposed Action in Staten Island

Name	Use	Location	Capacity	Oversight Agency
Residential Facilities and Child Welfare Services for Children				
Seamen's Society for Children and Families	Child Welfare Services	50 Bay Street	50 Cert. Caseload	New York State Office of Alcoholism and Substance Abuse Services
Covenant House	Adolescent Care Agency	70 Bay Street	N.A.	Private
Employment Programs				
Staten Island Workforce 1 Career Center	Social Service Field Operations	60 Bay Street	N.A.	NYS Department of Labor
NYC Human Resources Administration Department of Social Services/MICSA/MAP Staten Island Medical Office/MICSA CASA IV/APS, Staten Island Borough Office	Social Services Field Operations	209 Bay Street	N.A.	NYC Human Resources Administration
NYC Human Resources Administration Department of Social Services/Richmond Job Center/Richmond Food Stamp Office	Social Services Field Operations	201 Bay Street	N.A.	NYC Human Resources Administration

Construction activities and the operation of the shaft, chlorination station and water mains would not adversely affect the ability of the NYPD and the FDNY to provide services to the study area and an MPT plan has been developed in coordination with NYCDOT. The project area and the surrounding area are serviced by the NYPD's 120th Precinct. The Precinct's command covers all areas of Staten Island that are situated north of the Staten Island Expressway/Interstate 278. FDNY Engine 153, Ladder 77, is located at 74 Broad Street and serves the study area. Neither of these public safety facilities is located within the one-quarter-mile study area.

No direct or indirect impacts to local community facilities would occur due to the proposed action. No increase in the population would occur as the result of the construction and operation of the siphon, shaft, chlorination station and water distribution mains in Staten Island. Therefore, no increased demand for community facilities and services would occur as a result of the proposed action. Temporary increases in traffic, noise and air quality may potentially affect these community facilities for a short duration during the construction of the proposed action. The proposed action, however, would not result in additional population growth and the concomitant need for public services. Effects upon Murray Hulbert Avenue/Front Street would occur, but would be temporary and would not impact access to existing community facilities or impact NYPD and FDNY access to these areas. All proposed facilities would be unmanned and would not result in increased need for public services or the use of community facilities.

2.5 OPEN SPACE

The *CEQR Technical Manual* defines open space, "as publicly or privately-owned land that is publicly accessible and has been designated leisure, play or sport or land set aside for the protection and/or enhancement of the natural environment." This section evaluates the potential effects of construction and operation of the proposed water siphon between Brooklyn and Staten Island on open space resources. The study area for this analysis was a one-quarter mile radius.

Brooklyn

The proposed action would involve the installation of a new water siphon between Brooklyn and Staten Island that would replace two existing siphons. To facilitate the construction of a subaqueous tunnel for the proposed siphon, shaft sites on the Brooklyn and Staten Island sides of the Upper New York Bay would be required. The receiving shaft for the TBM would be located in the Bay Ridge section of Brooklyn within Shore Road Park, between 83rd and 85th Streets. Shore Road Park is a 58-acre park that is owned and operated by the NYCDPR, which runs along Shore Road from Fort Hamilton Parkway to Bay Ridge Avenue.

The park has two baseball fields immediately north of the proposed shaft site, which are used as open space and for recreation.

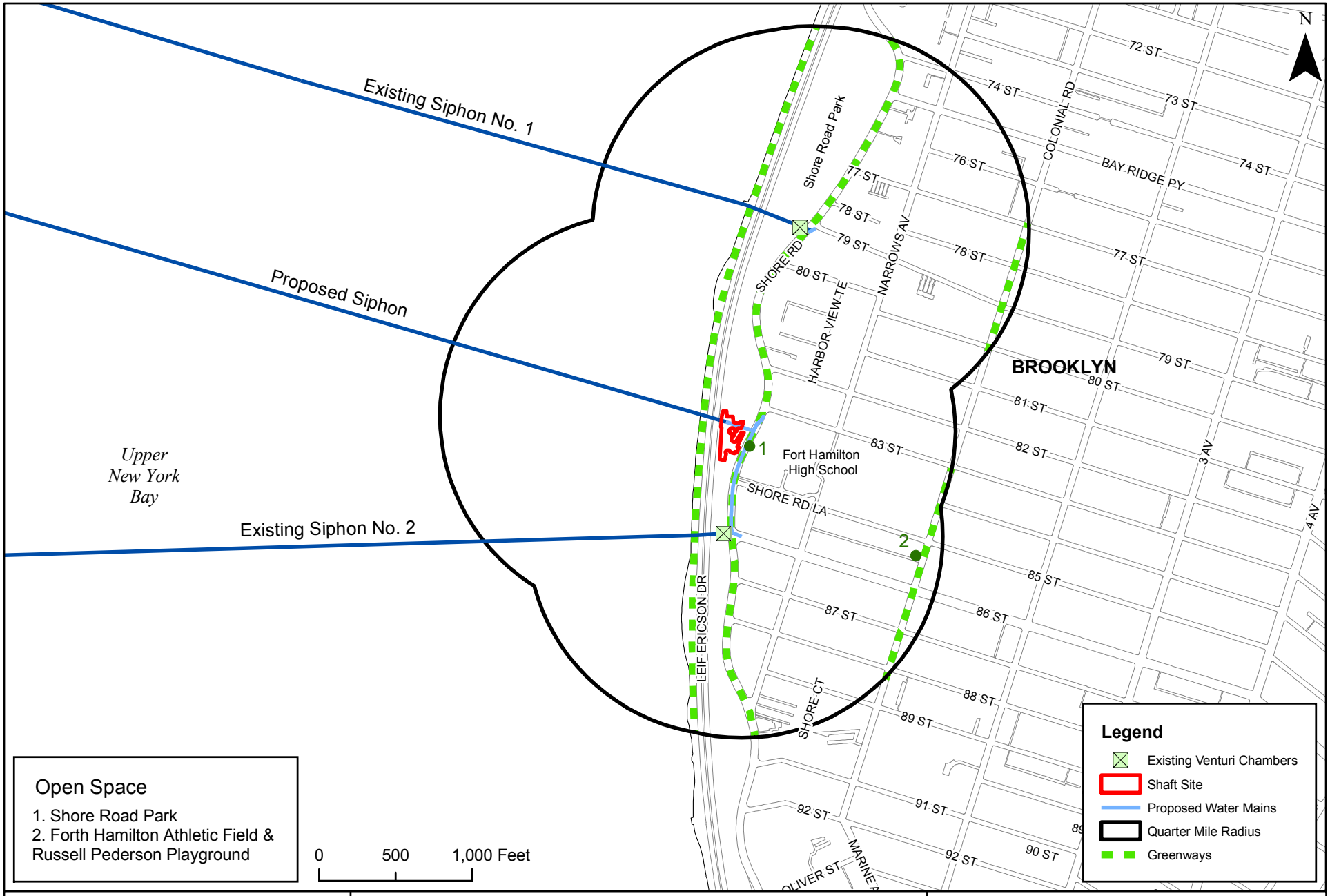
In addition to Shore Road Park, there are two additional open space resources located within one-quarter mile of the proposed shaft location (Figure 2-5). Immediately east of the proposed shaft site is Fort Hamilton High School's Athletic Fields and the Russell Pederson Playground. These are located east of the High School along Colonial Road. A list of existing open space facilities within a one-quarter mile radius of the proposed Brooklyn shaft site is provided in Table 2-3.

Table 2-3. Open Space Facilities Within a One-Quarter Mile Radius of the Proposed Action in Brooklyn

Map ID	Facility Name	Location
1	Shore Road Park	Running from Ft Hamilton Pkwy to Bay Ridge Avenue between Shore Road and the Belt Parkway.
2	Fort Hamilton Athletic Field and Russell Pederson Playground	Shore Road between 83rd Street and 85th Street.

The duration of construction within Shore Road Park is expected to be limited. Access to the park would not be precluded during construction activities and access north and south of the proposed shaft and staging areas would be maintained. Likewise, in order to further limit potential impacts to the park, after completion of shaft construction within Shore Road Park, the shaft would be covered and the shaft location and a buffer of approximately five feet would be temporarily fenced. This would encompass an area of approximately 3,250 square feet. The remaining area would be seeded and public access restored. No less than 21 days prior to the anticipated arrival of the TBM, the shaft location and surrounding area would then be re-opened.

Upon completion of all construction activities, those areas that are disturbed would be restored in accordance with the requirements of a Memorandum of Understanding that would be entered into by the NYCDPR and NYCDEP. Site restoration after construction would be coordinated with the Director of Brooklyn Forestry. Protection of trees and landscape during construction would be done in accordance with the NYCDPR standards and would involve crown lifting, fencing, wooden tree guards, wood chips spread over tree roots and pruning where appropriate. Restoration would involve soil decompaction and lawn restoration. Asphalt paths and curbs would be restored. A new fence and concrete curb and pavers outside the Little League field would also be completed within the former construction area. No long term loss of existing parkland uses would occur as part of the proposed action. In order to address the short-term loss of usage of the park by the public during construction activities, restoration activities would



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
201) 529-5151 f:(201) 529-5728

Figure 2-5 Open Space - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

include improvements along the existing sidewalk edge between 84th and 87th Streets in the project area. These improvements would include reconstruction of the sidewalk, repair/ replacement of benches and refurbishment of cast iron fences.

No significant aboveground facilities would be present at the conclusion of construction. Due to the short duration of construction activities, approximately six months for initial construction of the shaft and seven months for the TBM removal, water main installation and shaft completion, and the lack of aboveground features, the use of Shore Road Park is not considered to be significant.

The proposed location for the Brooklyn shaft would also not have a direct, long-term effect on other open space surrounding the site. The construction activities and the operation of the proposed action would not adversely affect the utilization of existing open space areas, nor would it introduce a substantial new user populations to the area that could potentially create or exacerbate an over-utilization of open space resources in the area. Temporary construction activities would occupy a small portion of Shore Road Park of approximately 28,600 square feet for a short-term period. However, other portions of the park would continue to be available for public use throughout the construction of the siphon and associated infrastructure. Once construction of the water siphon is complete, the shaft location would be backfilled and covered by a distribution chamber, returning the park to previous existing conditions. No permanent fencing of this area is proposed. In addition, as part of the proposed action, the two existing siphons that currently traverse the park would be abandoned.

There are also several Greenways located within the one-quarter mile study area. Greenways are linear open spaces, such as a path or trail, that link parks and communities around the City, providing public access to green spaces and the waterfront.[4] Within the study area, Greenways exist along Colonial Road, Shore Road and within Shore Road Park west of Leif Ericson Drive. These would not be affected by the proposed action. No permanent loss of open space or change in the use of the open space within a one-quarter mile radius would occur as the result of the construction or operation of the proposed action.

Staten Island

The proposed action would involve the construction of a shaft site in Staten Island to allow for the launching of the TBM. In addition to the development of a shaft in Staten Island, a new chlorination station would also be constructed within the same City-owned property as the

[4] New York City Department of Parks and Recreation. "Parks Locator Interactive Map." Accessed on March 4, 2009 from http://gis.nyc.gov/parks/lc/NYCParkMapIt.do.

shaft. The shaft and chlorination station site would be located within the Stapleton section of Staten Island on a City-owned vacant lot (Block 487, Lot 110) located between Front Street and the SIRT.

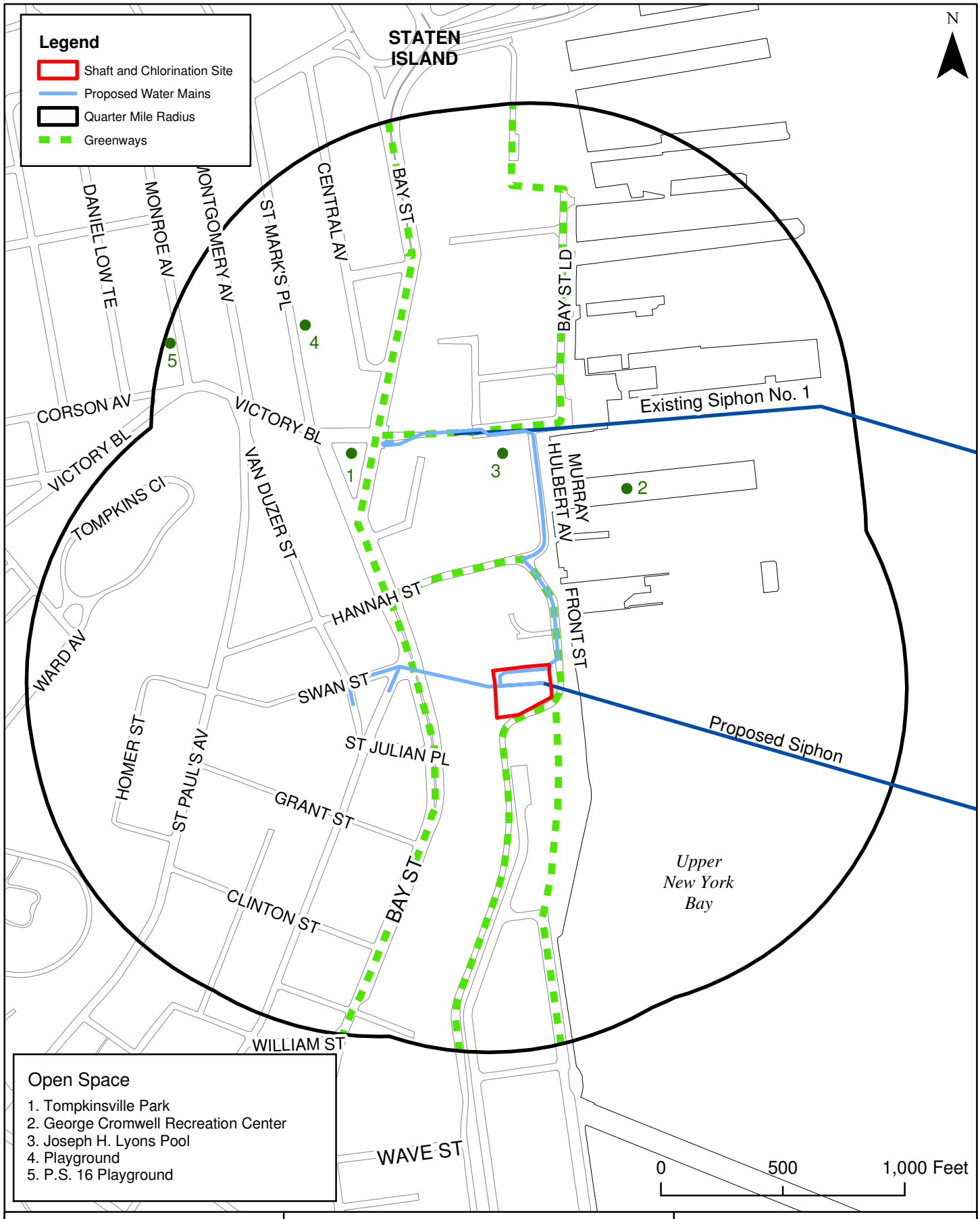
There are a number of open space uses within a one-quarter mile radius of the proposed action in Staten Island (Figure 2-6). Northeast of the proposed shaft site and immediately south of the proposed water transmission lines near Victory Boulevard at Pier 6 on Murray Hulbert Avenue is the George Cromwell Recreational Center and the Joseph H. Lyons Pool. Immediately south of Victory Boulevard and west of proposed infrastructure associated with the construction of the siphon is Tompkinsville Park (Block 497, Lot 50), which is a 0.36-acre open space facility, located at the intersection of Victory Boulevard and Bay Street.

In addition to these open spaces, there are several Greenstreets and Greenways located within the one-quarter mile study area. Greenstreets are traffic medians or islands that have been landscaped as the result of a joint venture between the NYCDPR and the NYCDOT. Greenstreets exist along the traffic median in the center of Bay Street from Barrett Triangle south to Slosson Terrace and from Hannah Street south to Grant Street. One Greenstreet landscaped island is also located at the intersection of Ward Avenue, Tompkins Circle and Fiedler Avenue. An additional Greenstreet is located at the intersection of Van Duzer Street and St. Paul's Avenue. Within the study area Greenways exist along Bay Street, Victory Boulevard east of Bay Street, Bay Street Landing and connecting to Borough Place near the Staten Island Ferry Terminal, along Hannah Street east of Bay Street, Front Street south of Hannah Street, Front Street and through the Navy's former Homeport site.

A list of the open space uses within a one-quarter mile radius of the proposed Staten Island shaft and chlorination station site is presented in Table 2-4.

Table 2-4. Open Space Facilities Within a One-Quarter Mile Radius of the Proposed Action in Staten Island

Map ID	Facility Name	Location
1	Tompkinsville Park	Bay Street & Victory Boulevard
2	George Cromwell Recreation Center	Pier 6 at the Foot of Victory Boulevard
3	Joseph H. Lyons Pool	Pier 6 and Murray Hulbert Avenue
4	Playground	Central Avenue
5	P.S. 16 Playground	Daniel Low Terrace



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-6 Open Space - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

Construction activities would be located within a City-owned vacant lot and additional temporary construction staging areas would be located at one or two locations along Front Street under the jurisdiction of NYCEDC as part of the proposed action. One lane on Murray Hulbert Avenue/Front Street would be closed for a short period during construction hours to allow for the construction of new water transmission lines that would be connected to the existing water mains. Access to the George Cromwell Recreation Center and the Joseph H. Lyons Pool would still be available during construction. In addition, the Greenway located along Murray Hulbert Avenue/Front Street would be accessible during construction.

The Greenstreet located on Bay Street between Hannah and Grant Streets and Greenway along Bay Street would not be affected during construction. Tunneling and construction of new water transmission lines at this location would be through the use of micro-tunneling techniques. This tunneling would occur beneath the SIRT right-of-way, the SIRT Operating Authority's Maintenance of Way Shop and Crew Quarters and Bay Street, where the water siphon would be connected to the existing water main at the intersection of Bay and Swan Streets. As construction of this portion of the new water mains would be through the use of micro-tunneling, no direct impact on the Greenstreet or Greenway is anticipated.

The proposed action within Staten Island would not be expected to have any direct, long-term effects on the existing open space uses located within a one-quarter mile radius. In addition, the proposed action would not introduce substantial new user populations to this area of Staten Island that could potentially create or exacerbate an over-utilization of open space resources in the area. Therefore, no permanent loss of open space or changes in the use of the open space within a one-quarter mile radius would occur as a result of the construction or operation of the proposed action.

2.6 SHADOWS

A shadow is "the circumstance in which a building or other built structure blocks the sun from the land." The proposed action would not result in any building or structure that would result in significant shadows. The only major aboveground structure developed as part of the proposed action would be the construction of a new, one-story chlorination facility at the proposed Staten Island site. However, any shadows created as a result of the proposed structure would not have an adverse affect on any significant resources as the immediately surrounding area consists primarily of industrial uses. No shadow impacts are anticipated as part of the proposed action.

2.7 HISTORIC RESOURCES

A review of the New York City Landmarks Preservation Commission (LPC) database, and correspondence with the LPC, indicated that no known architectural or archeological resources exist at or within 400 feet of the proposed action within Brooklyn or Staten Island. Copies of correspondence received from the LPC are included within Appendix A. Likewise, a review of the proposed action by the New York State Office of Parks, Recreation and Historic Preservation, State Historic Preservation Office (SHPO) indicated that no cultural resources that are in, or eligible for inclusion in, the National Registers of Historic Places would be affected by the proposed action (see Appendix A) in either Brooklyn or Staten Island.

Within Staten Island, the northeastern corner of the St. Paul's – Stapleton Heights Historic District, near Clinton and Paxton Streets, is located approximately 750 feet southwest of the proposed water main connection at the corner of Swan and Van Duzer Streets. The limited construction disturbance to the surrounding area, coupled with the use of NYCDOT-designated truck routes to accommodate the proposed temporary increase in construction-related traffic resulting from the proposed action, would limit or eliminate potential significant impacts to the Historic District. No additional historic resources were noted at or in close proximity to the proposed action. Therefore, the proposed action would not result in any significant effects upon archeological or historical resources.

2.8 URBAN DESIGN/VISUAL RESOURCES

The proposed action would not involve construction of structures or a building arrangement that would be substantially different from the prevailing structures in the surrounding neighborhoods. In all instances, with the exception of the proposed chlorination station, no significant new aboveground structures would be constructed. No activity associated with the proposed action would alter the arrangement of blocks or streets, through either demapping of active streets or the mapping of new streets. The proposed action would not add to, eliminate, or alter a critical feature of the existing streetscapes, and would not change the street hierarchy in a manner that would visually change the area in a significant manner. The proposed action would not alter the aspect of land use that defines the urban design character.

The proposed action would not obstruct important views or vistas, or result in significant changes to natural or historical resources currently enjoyed by the community, including features designated as special resources in the zoning regulations. Waterfront views would not be significantly affected as a result of the proposed action. No impacts to visual resources are expected to result from the implementation of the proposed action. In addition, the design of the chlorination station has undergone review by the Public Design Commission for consistency

with applicable standards and guidelines and to ensure that the proposed station is compatible with the surrounding land uses.

2.9 NEIGHBORHOOD CHARACTER

Neighborhood character can be defined as, "a blend of the various elements that give neighborhoods their distinct 'personality'…and can include land use, urban design, visual resources, historic resources, socioeconomics, traffic and noise." CEQR requires the consideration of how these elements combine to create the context and feeling of a neighborhood. A significant adverse impact on neighborhood character may occur if one of more of the defining features of neighborhood character would be significantly affected, or if there are moderate impacts on a number or defining features that cumulatively may produce a significant adverse impact.

Brooklyn

The neighborhood surrounding the proposed action in Brooklyn is dominated by residential uses and parkland. Within the one-quarter mile study area, there are two buildings associated with the Redemptorists of the Baltimore Province, located at 7503 and 7509 Shore Road, as well as the Shore Road Family Health Center, located at 9000 Shore Road. The majority of the residences within the study area are single-family attached and detached houses. However, high-rise apartment buildings are located in the northern and southern portions of the study area along Shore Road. Fort Hamilton High School, associated athletic fields and the Russell Pederson Playground are located on Shore Road between 83rd Street and 85th Street. The shaft site will be located within Shore Road Park, a 58-acre park operated by the NYCDPR that is used by the public as open space and for active and passive recreation.

No historic resources are located at, or in the immediate vicinity, of the proposed action. Existing socioeconomic conditions of the surrounding area would not be significantly altered. Traffic on local roads and noise would only be affected for a short period of time, while active construction is underway, primarily associated with the construction of new water mains. Once completed, the proposed action would be almost entirely below grade, the park would be restored and little or no long term alterations to the park would occur once construction is completed. As this would not affect building bulk, height, setbacks, density, use, the placement and orientation of public and private space, geography or the history of the neighborhood, it is unlikely that the construction and operation of the proposed action would have a significant effect on the major components that contribute to neighborhood character. The proposed action would, therefore, not have a significant impact on neighborhood character in the study area surrounding the shaft site in Brooklyn.

Staten Island

The immediate neighborhood surrounding the proposed action in Staten Island is dominated by vacant, transportation, utility, commercial, open space and recreation, and residential land uses. The one-quarter mile study area surrounding the shaft and chlorination station site and associated infrastructure are inclusive of public and community facilities, schools, religious facilities, vacant land, commercial and mixed commercial, residential, transportation, automotive, utility and open space and recreation land uses. The majority of the commercial, automotive and transportation land uses are located east of Bay Street and St. Mark's Place and also along Victory Boulevard.

The built character of the study area is somewhat varied. The majority of residences within the study area are detached single and two-family homes, which are one or more stories high. Multiple apartment buildings with several stories are located in proximity to Bay Street. Mixed residential and commercial uses within the study area are often three or more floors in height. Schools located within the study are also multiple stories. Most of the commercial, mixed commercial and residential, transportation, automotive and utility land uses are built to the street line. However, the residences located west of Bay Street and St. Mark's Place have yards that increase in size as the western boundary of the study area is reached.

No historic resources are located at, or in the immediate vicinity of the proposed action in Staten Island. Socioeconomic conditions would not be impacted by the construction and operation of the proposed water siphon. Traffic on local roads and noise would only be affected during construction of the shaft, chlorination station and water mains. Once construction was completed, the proposed action would be located almost entirely below grade, except for the chlorination station and an access manhole. The chlorination station would be similar in function to the existing Richmond Chlorination Facility, which is located approximately 250 feet north of the proposed site on City-owned property. Since it would not affect building bulk, height, setbacks, density, use, the placement and orientation of public and private space, geography or the history of the neighborhood, the proposed action would not have a significant effect on the major components that contribute to neighborhood character in Staten Island.

Implementation of the Stapleton Waterfront District would change the character of the neighborhood surrounding the proposed shaft and chlorination site to the south. The zoning of this area was changed to C4-2A and was approved in 2006. However, response to the request for proposals for the development of the area has been small and plans for redevelopment are still ongoing. A developer has recently been selected who will be developing 800 residential units approximately one-half mile south of the proposed site at Front Street and Prospect Street

(Parcels B2 and B3). The shaft and chlorination station site would be located immediately north of the Stapleton Waterfront District. Although these changes in the future would alter the neighborhood character of the area immediately adjacent and south of the proposed action, the chlorination station would represent the only major aboveground feature upon completion of the proposed action. The design of the chlorination station would, however, be consistent with surrounding uses and zoning and would incorporate sustainable design components, such as green walls and a green roof. The proposed action would be consistent with proposed future changes expected as part of the development of the Stapleton Waterfront, would be an as-of-right use and would be consistent with the existing industrial uses located immediately west and north of the proposed site.

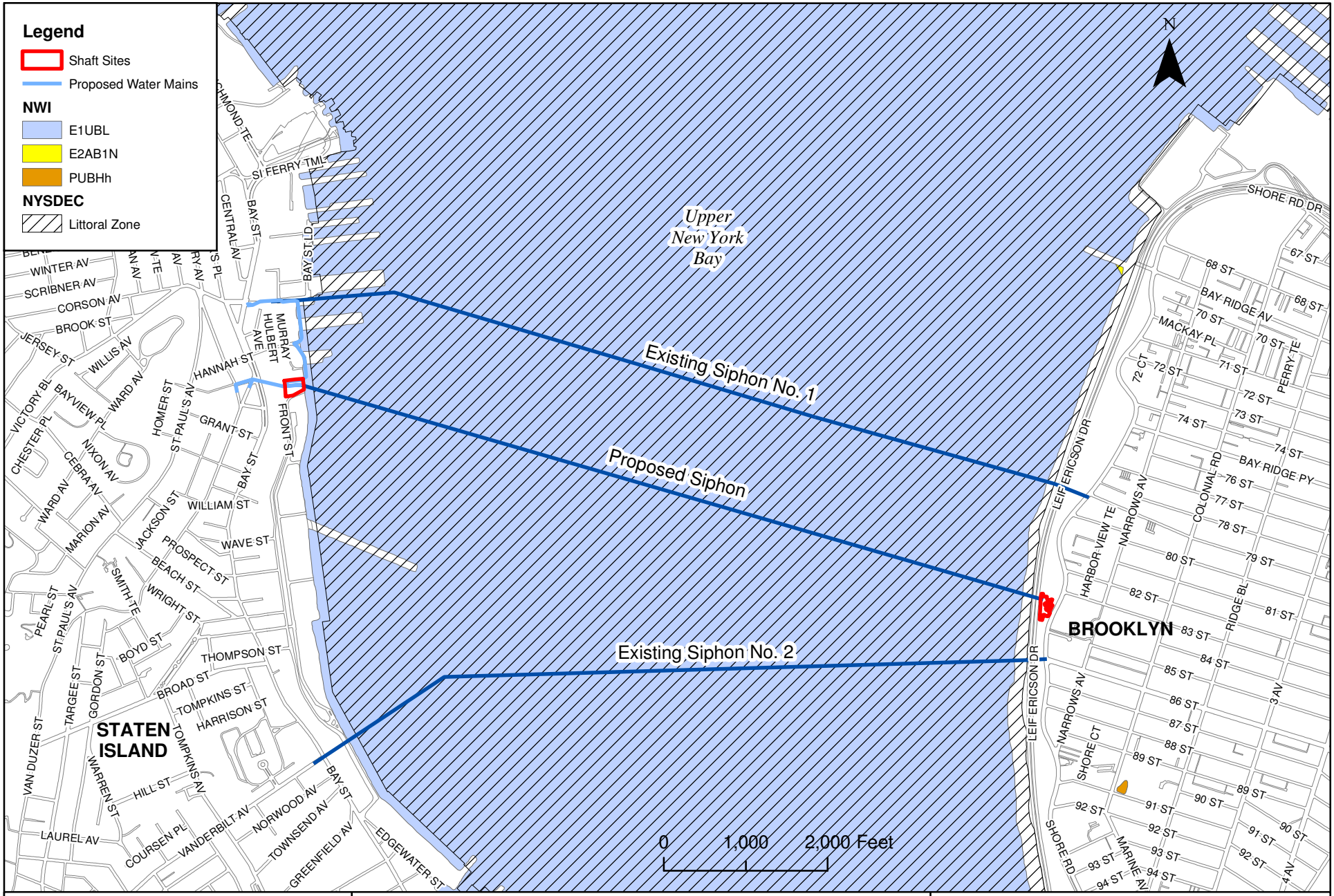
2.10 NATURAL RESOURCES

The *CEQR Technical Manual* identifies natural resources "as plant and animal species and any area capable of providing habitat for plant and animal species or capable of functioning to support ecological systems and maintain the City's environmental balance." Natural resources are considered to be resources including, but not limited to, surface and groundwaters, wetlands, woodlands, landscaped areas, gardens, parks and built structures used by wildlife.

The proposed action, with the exception of the chlorination station in Staten Island, would be located below-grade within existing right-of-ways, undeveloped vacant property or parkland. The proposed action would not significantly impact areas possessing significant natural resources as generally defined above. The upland portions adjacent to the proposed action and the surrounding neighborhood areas are developed and possess limited habitat value, with the exception of Shore Road Park, which would be the location of the proposed Brooklyn shaft. Potential effects to on-site trees, wetlands and other natural resources are discussed in more detail below.

2.10.1 Wetlands and Terrestrial Resources

Wetland resources, including NYSDEC tidal and freshwater wetlands maps and U.S. Fish and Wildlife Services (USFWS) National Wetland Inventory (NWI) maps were evaluated to determine the presence/absence of wetlands within or immediately adjacent to the proposed action. The new siphon would be located beneath the Upper New York Bay, which is designated by NYSDEC as littoral zone and an estuarine, subtidal, unconsolidated bottom (E1UBL) wetland by NWI (Figure 2-7). No wetlands would be impacted as the proposed siphon would be constructed within a tunnel through the use of a TBM and would be situated at a top depth of at least 95 feet below MLW. Two shafts, one in Brooklyn and one in Staten Island, would be constructed above the mean high water (MHW) line to allow construction of the siphon.



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-7 Wetlands

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

A new 48-inch stormwater outfall, however, would be constructed in Staten Island that would drain uncontaminated stormwater from the proposed chlorination station site and surrounding area to the Upper New York Bay (Figure 2-8). Stormwater from the site would be conveyed to a 42-inch storm sewer along Front Street with a discharge to the new outfall, which would be located immediately east of the shaft and chlorination site at the existing sheet pile bulkhead. Construction of the outfall would involve temporary activities within wetlands, specifically NYSDEC-designated littoral zone.

In addition, a tree survey was conducted between July and September 2007 and January and February 2009 to identify tree species located at or immediately adjacent to the proposed action. The tree survey assessed the number, location and diversity of trees that could potentially be affected by the proposed action, including shaft footprints and staging areas. Any tree with at least one trunk with a diameter at breast height (dbh) of at least two inches was identified to the lowest possible taxa. Other parameters recorded during the assessment included extent of crown cover and general health. Crown cover was determined by measuring the distance from the trunk of the tree to the dripline, the perimeter of the canopy and the area directly below the branches of the tree. Crown cover was not determined for new trees surveyed in 2009 due to the lack of foliage. The health of a tree was recorded as "H" for healthy, "S" for impaired and "D" for dead. A combination "H/S" was used to identify healthy trees that displayed wounds or other impacts that could potentially affect the overall health of the tree. Stressed trees that may die in the future were designated by a "S/D". The location of each tree was recorded using a Global Positioning System (GPS). The tree survey was conducted to identify those trees that were located within or in close proximity to proposed construction activities. This included trees that were within the footprint of proposed construction, as well as those that could be indirectly affected by the proposed action, such as those along the location of proposed water main construction.

Brooklyn

The receiving shaft would be located within Shore Road Park near 83rd Street in Brooklyn. The shaft would be located in the northwest corner of a grassy triangle formed by park asphalt pathways located between 83rd Street and Shore Road Lane, west of Fort Hamilton High School. The water main connections, as discussed in Section 1, would occur within existing developed roadways. There are no mapped wetlands within the footprint of the shaft location or the location of the water main connections. The Upper New York Bay is located approximately 150 feet west of the site and is separated from the site by the four-lane Leif Ericson Drive (Belt Parkway).

HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-8 Proposed Stormwater Outfall Location - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

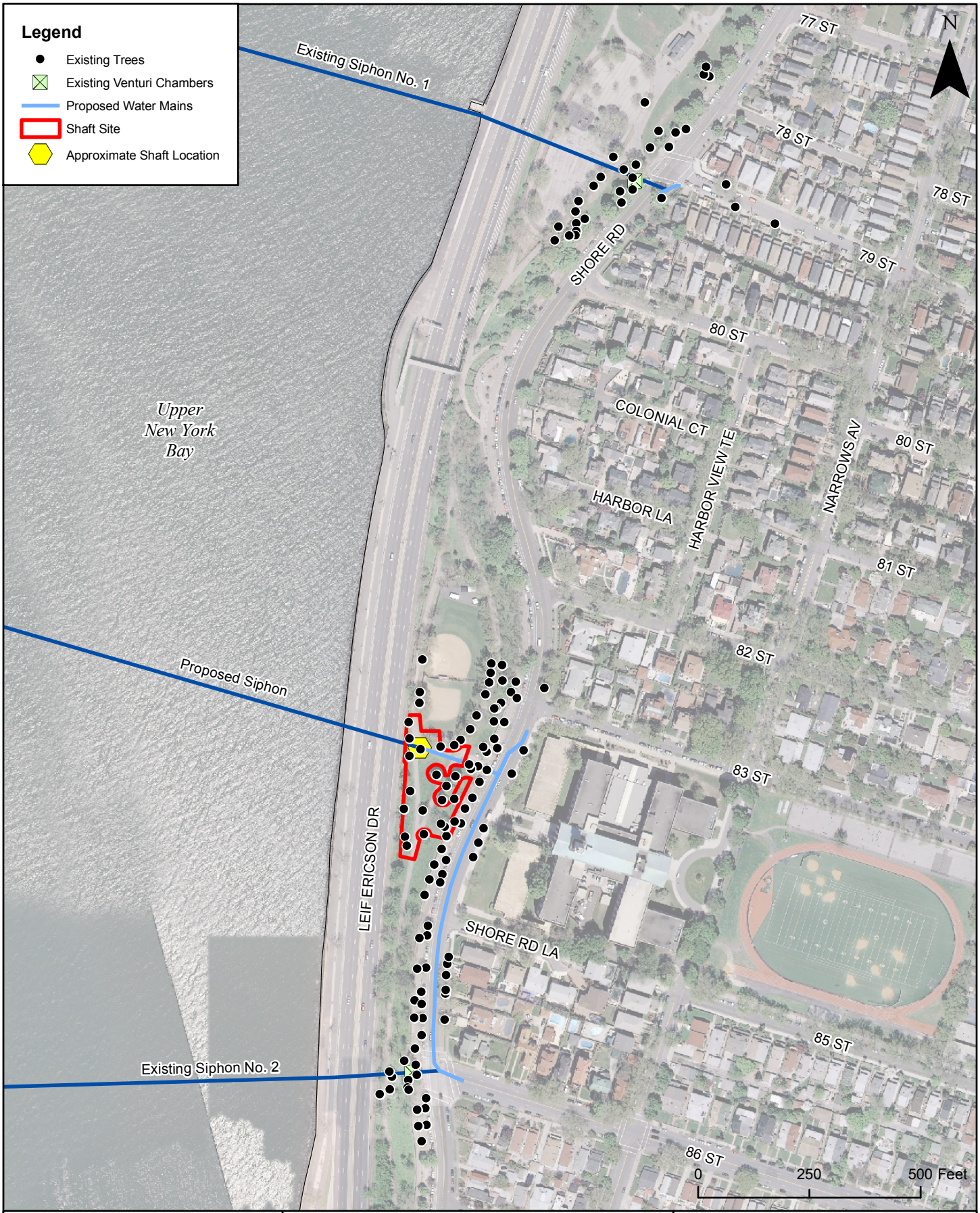
New York City Economic Development Corporation

The shaft construction and staging area would encompass approximately 28,600 square feet and is characterized by paved pathways, maintained lawn and mature trees. Dominant herbaceous cover of the lawn area includes grass sp. (*Poa sp*.) common dandelion (*Taraxacum officinale*), lady's thumb (*Polygonum persicaria*), common mugwort (*Artemisia vulgaris*), garlic mustard (*Alliaria petiolata*) and clover species (*Trifolium sp*.). Trees were identified within the shaft construction footprint as well as adjacent to the water main connections (Figure 2-9). The tree survey identified 14 trees located within the proposed shaft footprint (Figure 2-10, Table 2-5). The dominant species of tree in this area were pin oak (*Quercus palustris*) and elm species (*Ulmus sp.*). Development of the water main connections would occur within existing right-of-ways that are characterized by roadways with tree plantings along stone covered sidewalks. A total of 26 trees are located adjacent to the location of the proposed water main connections (Figures 2-10 through 2-12). These trees are dominated by pin oaks, which make up nearly half of the street trees. Near the intersection of the water main connection at 86th Street and Shore Road, trees are dominated by pin oak, Japanese zelkova (*Zelkova serrata*), London plane (*Platanus acerifolia*), ginkgo (*Ginkgo biloba*), honey locust (*Gleditsia triacanthos*) and Norway maple (*Acer platanoides*). In the vicinity of the 79th Street water main connection, trees are comprised of pin oak, American sweetgum (*Liquidambar styraciflua*), Japanese zelkova, London plane and white oak (*Quercus alba*).

Staten Island

The launching shaft and chlorination station would be located within a vacant City-owned lot on Front Street in Staten Island. There are no mapped wetlands within the construction footprint or along the paths of the water main connections. The Upper New York Bay is located approximately 75 feet east of the lot and is separated from the site by Front Street. A majority of the lot is previously impacted with gravel, large areas of debris and exposed soil in which herbaceous species dominate. The northern, southern and western borders have dense vegetation with trees along the perimeter. Construction of a new 48-inch stormwater outfall from the chlorination station would be located within NYSDEC-designated littoral zone. This would be located immediately east of the shaft and chlorination site at the existing sheet pile bulkhead.

Herbaceous cover includes opportunistic species, such as aster (*Aster sp.*), goldenrod (*Solidago sp.*), common dandelion, common mugwort, common ragweed (*Ambrosia artemisiifolia*), poison ivy (*Toxicodendron radicans*), Queen Anne's lace (*Daucus carota*), clover (*Trifolium sp.*), and switchgrass (*Panicum virgatum*). Trees were identified at the shaft and chlorination site, as well as adjacent to the locations of proposed water main connections (Figure 2-13). At the shaft and chlorination station site, tree-of-heaven (*Ailanthus altissima*) and black locust (*Robinia pseudoacacia*) comprise the 46 trees located along the perimeter of the site

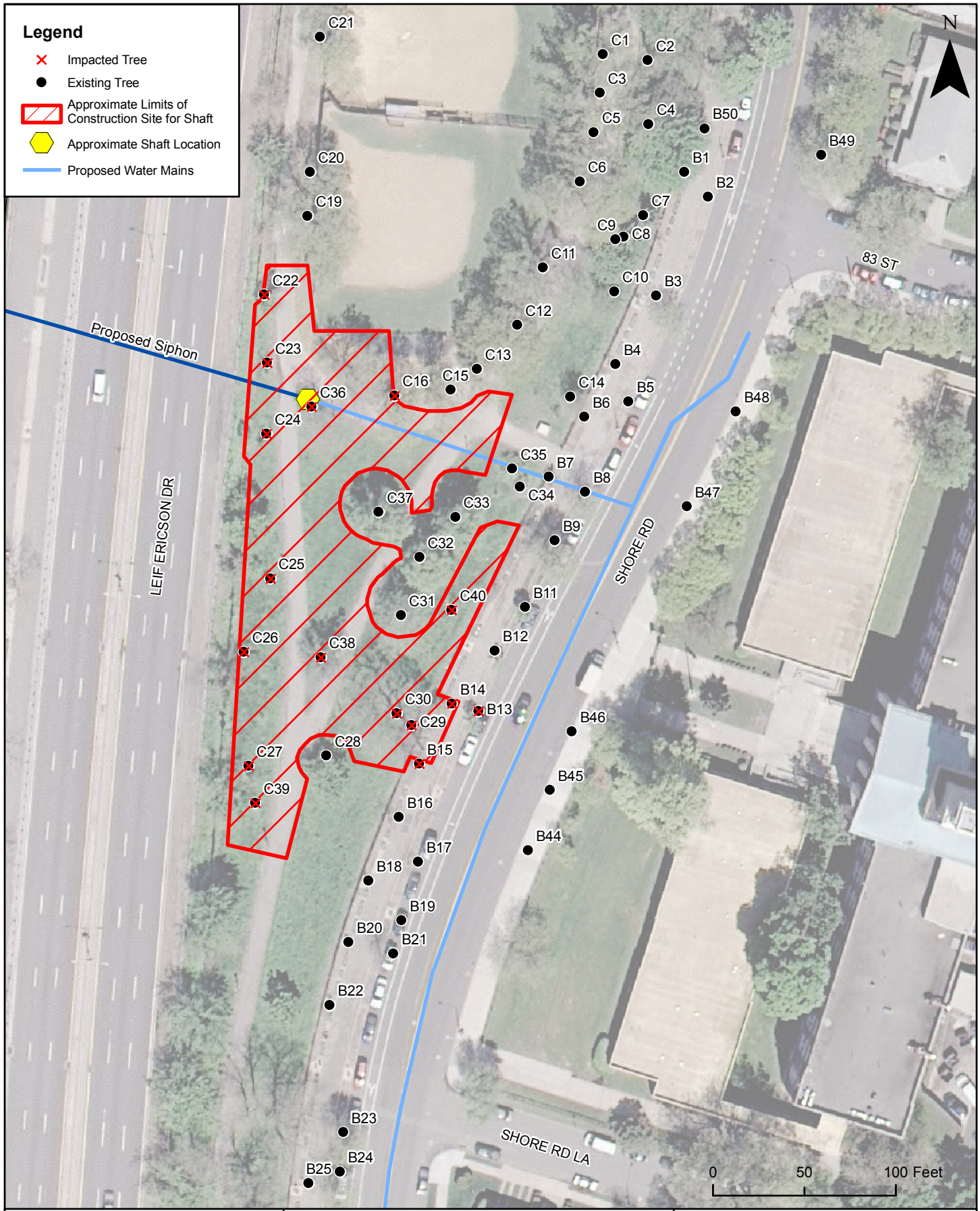


HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-9 Tree Survey - Existing Conditions - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-10 Tree Survey -
Shaft Site and Shore Road - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

Table 2-5. Trees Identified Within Proposed Project Areas in Brooklyn, July-September 2007 and January-February 2009

ID Code	dbh [1,2] (in.)	Tree Species		Crown Cover (ft.)	Health
		Common Name	Scientific Name		
Venturi Chamber - Shore Road and 79th Street					
A1	18.2	Red Oak	*Quercus rubra*	15	H
A2	15.0	Black Cherry	*Prunus serotina*	22	H
A3	24.3	Red Maple	*Acer rubrum*	15	S
A4	9.6	Crab Apple	*Malus sp.*	10	H
A5	7.2, 7.2, 11.8	Crab Apple	*Malus sp.*	15	H
A6	26.7	Pin Oak	*Quercus palustris*	22	H
A7	8.6, 9.8	Crab Apple	*Malus sp.*	12	H
A8	7.6	Crab Apple	*Malus sp.*	13	H
A9	6.8	Crab Apple	*Malus sp.*	9	H
A10	11.8	Black Cherry	*Prunus serotina*	14	H
A11	13.4, 14.0	Norway Maple	*Acer platanoides*	24	H/S
A12	8.3	Norway Maple	*Acer platanoides*	15	H
A13	18.7	Silver Maple	*Acer saccharinum*	26	H
A14	10.5	Black Cherry	*Prunus serotina*	20	H
A15	22.1	Tree-of-Heaven	*Ailanthus altissima*	11	H
A16	18.6	Norway Maple	*Acer platanoides*	20	H
A17	20.0	American Basswood	*Tilia americana*	32	H
A18	24.7	Pin Oak	*Quercus palustris*	17	H
A19	28.3	Pin Oak	*Quercus palustris*	21	H
A20	25.6	Pin Oak	*Quercus palustris*	19	H
A21	24.6	Pin Oak	*Quercus palustris*	12	H
A22	22.9	Pin Oak	*Quercus palustris*	22	H
A23	20.2	Pin Oak	*Quercus palustris*	15	S
A24	15.7	Pin Oak	*Quercus palustris*	17	H
A25	3.6	Sweetgum	*Liquidambar styraciflua*	6	H
A26	17.3	Norway Maple	*Acer platanoides*	16	S
A27	22.6	Norway Maple	*Acer platanoides*	30	H
A28	7.8	Green Ash	*Fraxinus pennsylvanica*	20	H
A29	22.9	Norway Maple	*Acer platanoides*	21	H/S
A30	21.9	Red Oak	*Quercus rubra*	19	H
A31	7.0	Japanese Zelkova	*Zelkova serrata*	7	H
A32	24.5	London Planetree	*Platanus acerifolia*	28	H
A33	4.1	White Oak	*Quercus alba*	6	H
A34	10.4	Green Ash	*Fraxinus pennsylvanica*	14	H/S
A35	8.2	White Oak	*Quercus alba*	7	H

Table 2-5. Trees Identified Within Proposed Project Areas in Brooklyn, July-September 2007 and January-February 2009

ID Code	dbh [1,2] (in.)	Tree Species		Crown Cover (ft.)	Health
		Common Name	Scientific Name		
Shore Road, 83rd Street to 86th Street					
B1	5.3	American Basswood	*Tilia americana*	9	H
B2	2.5	Pin Oak	*Quercus palustris*	5	H
B3	11.3	Pin Oak	*Quercus palustris*	13	H
B4	5.6	Amur maackia	*Maackia amurensis*	10	H
B5	4.1	Pin Oak	*Quercus palustris*	6	H
B6	6.5	Amur maackia	*Maackia amurensis*	13	H
B7	6.4	Swamp White Oak	*Quercus bicolor*	9	H
B8	13.4	Pin Oak	*Quercus palustris*	11	H
B9	18.3	Pin Oak	*Quercus palustris*	13	H
B11	6.9	Green Ash	*Fraxinus pennsylvanica*	8	H
B12	5.4	Green Ash	*Fraxinus pennsylvanica*	6	H
B13	7.5	Green Ash	*Fraxinus pennsylvanica*	7	H
B14	7.4	Hackberry	*Celtis occidentalis*	11	H
B15	6.5	Pin Oak	*Quercus palustris*	12	H/S
B16	7.6	Honey Locust	*Gleditsia triacanthos*	14	H
B17	6.3	Honey Locust	*Gleditsia triacanthos*	12	H
B18	4.2	Ginkgo	*Ginkgo biloba*	5	H
B19	2.5	Pin Oak	*Quercus palustris*	4	S
B20	3.2	Ginkgo	*Ginkgo biloba*	5	H
B21	9.1	Pin Oak	*Quercus palustris*	11	H
B22	3.7	Ginkgo	*Ginkgo biloba*	5	H
B23	15.3	Pin Oak	*Quercus palustris*	14	H
B24	13.2	Pin Oak	*Quercus palustris*	16	H
B25	2.5	Japanese Zelkova	*Zelkova serrata*	4	H
B26	15.1	Pin Oak	*Quercus palustris*	15	H
B27	2.8	Pin Oak	*Quercus palustris*	5	H
B28	9.7	Pin Oak	*Quercus palustris*	10	H
B29	8.4	Pin Oak	*Quercus palustris*	14	S
B30	2.6	Pin Oak	*Quercus palustris*	3	H
B31	16.2	Pin Oak	*Quercus palustris*	15	H
B32	2.2	Japanese Zelkova	*Zelkova serrata*	3	H
B33	11.9	Pin Oak	*Quercus palustris*	16	H
B34	6.8	Japanese Zelkova	*Zelkova serrata*	13	H
B35	10.8	Norway Maple	*Acer platanoides*	14	H
B36	9.0	Norway Maple	*Acer platanoides*	13	H

Table 2-5. Trees Identified Within Proposed Project Areas in Brooklyn, July-September 2007 and January-February 2009

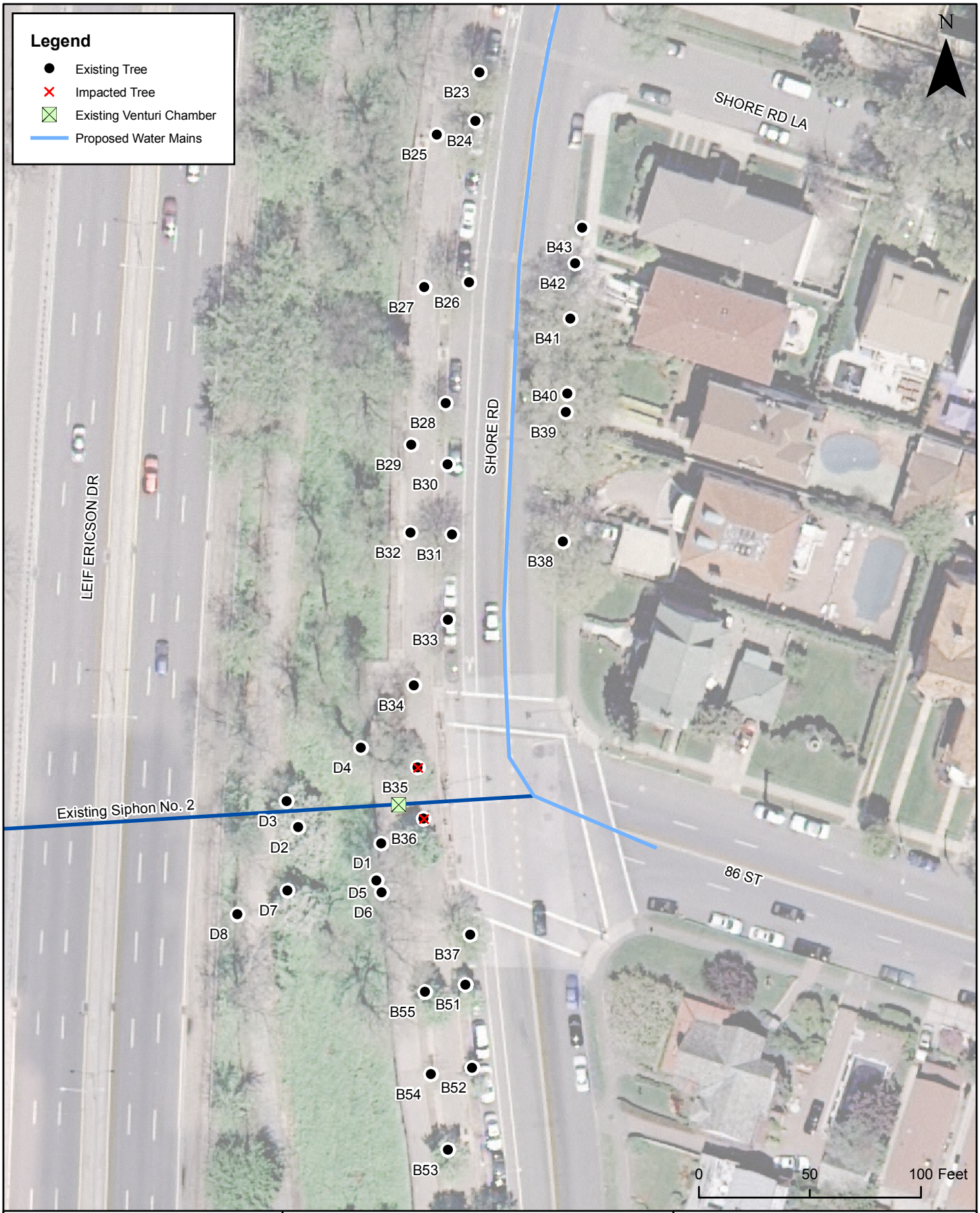
ID Code	dbh [1,2] (in.)	Tree Species		Crown Cover (ft.)	Health
		Common Name	Scientific Name		
B37	10.6	Green Ash	*Fraxinus pennsylvanica*	14	S
B38	21.4	London Planetree	*Platanus acerifolia*	28	H
B39	22.0	London Planetree	*Platanus acerifolia*	19	H
B40	21.0	London Planetree	*Platanus acerifolia*	20	H
B41	20.0	London Planetree	*Platanus acerifolia*	21	H
B42	2.1	Callery Pear	*Pyrus calleryana*	5	H
B43	2.6	Callery Pear	*Pyrus calleryana*	4	H
B44	2.2	Bald Cypress	*Taxodium distichum*	3	H
B45	2.3	Bald Cypress	*Taxodium distichum*	4	H
B46	2.2	Bald Cypress	*Taxodium distichum*	4	H
B47	2.1	Bald Cypress	*Taxodium distichum*	4	H
B48	2.3	Bald Cypress	*Taxodium distichum*	4	H
B49	18.7	London Planetree	*Platanus acerifolia*	15	H
B50	3.3	American Basswood	*Tilia americana*	9	H
B51	6.2	Norway Maple	*Acer platanoides*	8	H/S
B52	6.0	Norway Maple	*Acer platanoides*	11	H/S
B53	9.9	Norway Maple	*Acer platanoides*	12	S
B54	6.0	Honey Locust	*Gleditsia triacanthos*	14	H
B55	9.9	Norway Maple	*Acer platanoides*	13	H
Proposed Brooklyn Shaft Site					
C1	21.9	Pin Oak	*Quercus palustris*	24	H
C2	25.6	Black Locust	*Robinia pseudoacacia*	15	S
C3	36.7	Pin Oak	*Quercus palustris*	31	H
C4	17.7	American Elm	*Ulmus americana*	34	H
C5	20.8	Pin Oak	*Quercus palustris*	11	S
C6	29.1	Pin Oak	*Quercus palustris*	23	H
C7	6.5	Sycamore Maple	*Acer pseudoplatanus*	10	H
C8	7.8	Cherry	*Prunus sp.*	13	H
C9	11.6	Cherry	*Prunus sp.*	19	H
C10	8.5	Crab Apple	*Malus sp.*	12	H
C11	31.3	Pin Oak	*Quercus palustris*	27	H
C12	29.7	Pin Oak	*Quercus palustris*	22	H
C13	16.0	Pin Oak	*Quercus palustris*	16	H
C14	12.8	Willow Oak	*Quercus phellos*	11	H
C15	23.0	Pin Oak	*Quercus palustris*	24	H
B7	6.4	Swamp White Oak	*Quercus bicolor*	9	H

Table 2-5. Trees Identified Within Proposed Project Areas in Brooklyn, July-September 2007 and January-February 2009

ID Code	dbh [1,2] (in.)	Tree Species		Crown Cover (ft.)	Health
		Common Name	Scientific Name		
C16	21.1	Pin Oak	*Quercus palustris*	25	H
C19	31.8	Pin Oak	*Quercus palustris*	22	H
C20	18.2	Pin Oak	*Quercus palustris*	14	H/S
C21	19.7	Pin Oak	*Quercus palustris*	15	H
C22	10.9	American Elm	*Ulmus americana*	20	H
C23	4.2	Red Oak	*Quercus rubra*	7	S
C24	4.7	Hackberry	*Celtis occidentalis*	11	H
C25	4.3	Sycamore Maple	*Acer pseudoplatanus*	7	H
C26	4.3	American Elm	*Ulmus americana*	10	H
C27	7.4	Bald Cypress	*Taxodium distichum*	7	H/S
C28	9.9	Cherry	*Prunus sp.*	18	H
C29	14.4, 22.8, 29.4	Black Locust	*Robinia pseudoacacia*	21	H/S
C30	21.4	Black Locust	*Robinia pseudoacacia*	21	H
C31	16.8	Elm	*Ulmus sp.*	26	H
C32	16.5	Elm	*Ulmus sp.*	23	H
C33	17.9	Elm	*Ulmus sp.*	22	H
C34	2.2, 2.7, 2.9	Sweetbay Magnolia	*Magnolia virginiana*	7	H
C35	2.8, 3.3, 3.6	Autumn Olive	*Eleaganus umbellata*	11	H
C36	17.1	Pin Oak	*Quercus palustris*	26	H/S
C37	20.4	Elm	*Ulmus sp.*	23	H
C38	17.5	Pin Oak	*Quercus palustris*	20	H
C39	4.0, 6.0	Sweetbay Magnolia	*Magnolia virginiana*	-	H
C40	>2.0, >2.0	Sweetbay Magnolia	*Magnolia virginiana*	-	H
Venturi Chamber - Shore Road and 86th Street					
D1	13.2	Black Locust	*Robinia pseudoacacia*	20	H
D2	10.4	Crab Apple	*Malus sp.*	19	H
D3	11.7	Crab Apple	*Malus sp.*	18	H
D4	37.9	Black Locust	*Robinia pseudoacacia*	22	H
D5	16.5	Black Locust	*Robinia pseudoacacia*	15	H
D6	19.9	Black Locust	*Robinia pseudoacacia*	23	H
D7	14.1	Crab Apple	*Malus sp.*	14	H
D8	11.4	Black Locust	*Robinia pseudoacacia*	16	H/S

[1] Multiple dbh values indicate multiple stems.
[2] Entries with no dbh values indicate that certain conditions prohibited the measurement of dbh, including full stem coverage by Poison Ivy or stems were entwined in nearby fences.

H = Healthy H/S = Impaired that may affect health of tree
S = Impaired S/D = Stressed
D = Dead



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-11 Tree Survey -
86th Street Venturi Chamber - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-12 Tree Survey -
79th Street Venturi Chamber - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-13 Tree Survey - Existing Conditions - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

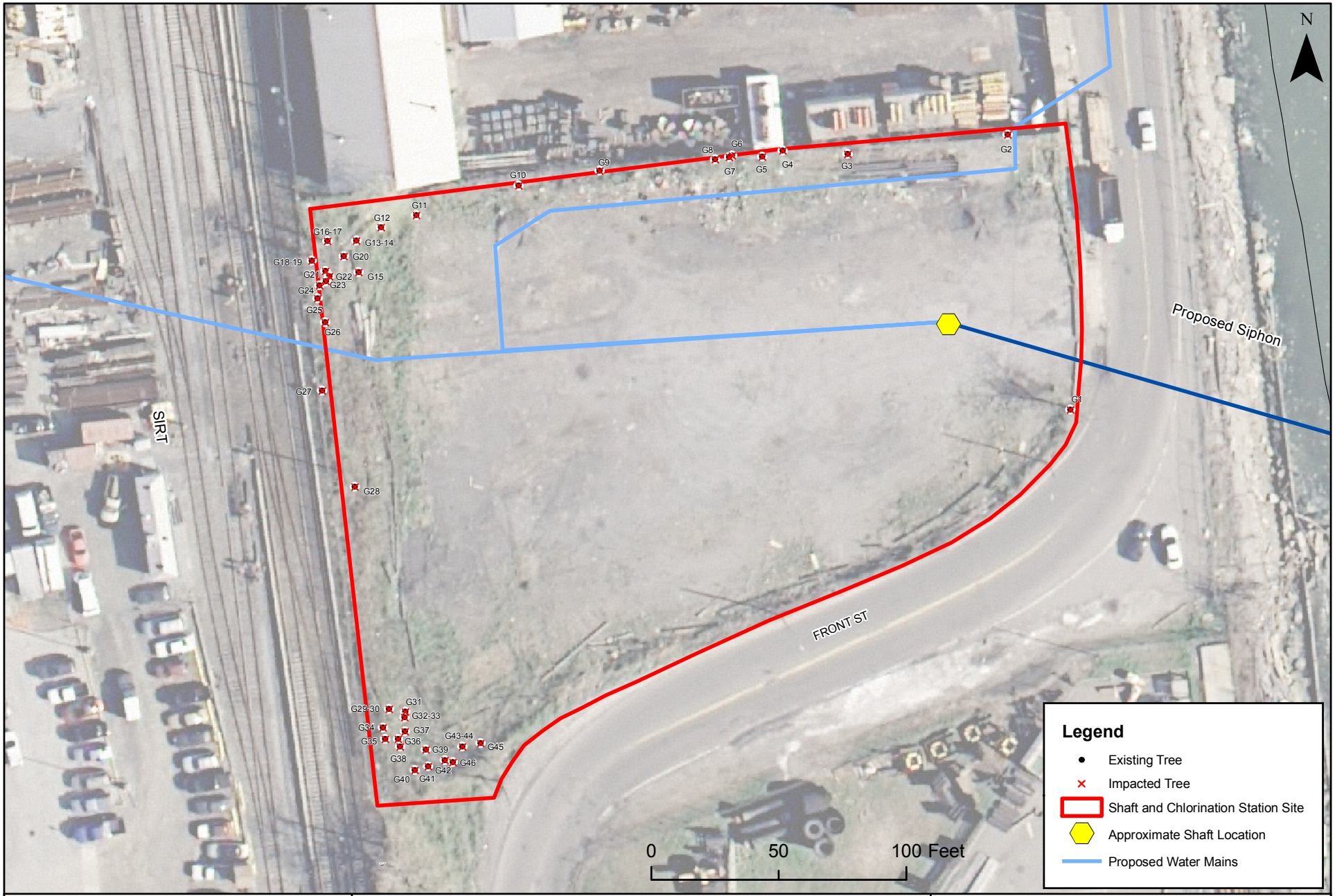
New York City Economic Development Corporation

(Figure 2-14, Table 2-6). The water main connection along Murray Hulbert Avenue and Victory Boulevard is characterized by existing right-of-ways with trees and vegetation located adjacent to the roadway (Figures 2-15 and 2-16, Table 2-6). Honey locust dominates the trees along Front Street, south of Hannah Street with pin oaks bordering the eastern fence of the Joseph H. Lyons Pool. Red oak (*Quercus rubra*), Japanese zelkova and London plane comprise the majority of tree species along Bay Street, between Hannah Street and St. Julian Place (Figure 2-17, Table 2-6). A NYCDPR Greenstreet is located on Bay Street in the medians between Hannah Street and St. Julian Place and consists of red oak and Japanese zelkova trees.

The primary construction staging and laydown area would be located immediately southeast of the siphon shaft and chlorination station site along Front Street. This area is currently a fenced parking lot that contains large tires, wood pallets, heavy duty rubber tubing and other materials. The area is covered in concrete with a small vegetated area located in the northwest corner of the lot. Herbaceous cover in this area included common mugwort, goldenrod, Japanese honeysuckle (*Lonicera japonica*), clover and wild grape (V*itis sp*.). There are no trees located within the site. Tree-of-heaven and Eastern cottonwood (*Populous deltoides*) trees are scattered along the perimeter of the lot, but are outside the fence line. An alternative staging area, if required, is located approximately one-quarter mile south of the site on Front Street near Wave Street. This area is largely covered in concrete and consists of herbaceous cover and trees that are concentrated along a fence that separates the site from the SIRT railway. Herbaceous cover includes common mugwort, common reed (*Phragmites australis*), clover species and Japanese knotweed (*Polygonum cuspidatum*). Trees at this location are dominated by sassafras (*Sassafras albidum*) (Figure 2-18, Table 2-6).

2.10.2 Assessment of Potential Impacts to Wetlands and Terrestrial Resources

No wetland impacts would result from construction of the proposed siphon, shafts or chlorination station. A new 48-inch stormwater outfall would be constructed to drain uncontaminated stormwater from the chlorination station site, as well as the surrounding area. This outfall would be located east of the site within the existing sheet pile and would discharge to the Upper New York Bay. During construction of the stormwater outfall, a temporary cofferdam measuring approximately 12 foot by 12 foot would be placed within the Upper New York Bay for approximately one week, which would temporarily impact wetlands within the limits of this structure. This area of potential impact is estimated at approximately 150 square feet. These impacts would be short term, temporary and limited in extent. It is expected that these areas would return to their pre-construction condition within a short period of time after the completion of construction. Based upon existing and currently available information, some removal of sediments may be required and dewatering with discharge to the Upper New York



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-14 Tree Survey - Proposed Shaft and Chlorination Station Site - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-15 Tree Survey -
Murray Hulbert Avenue - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

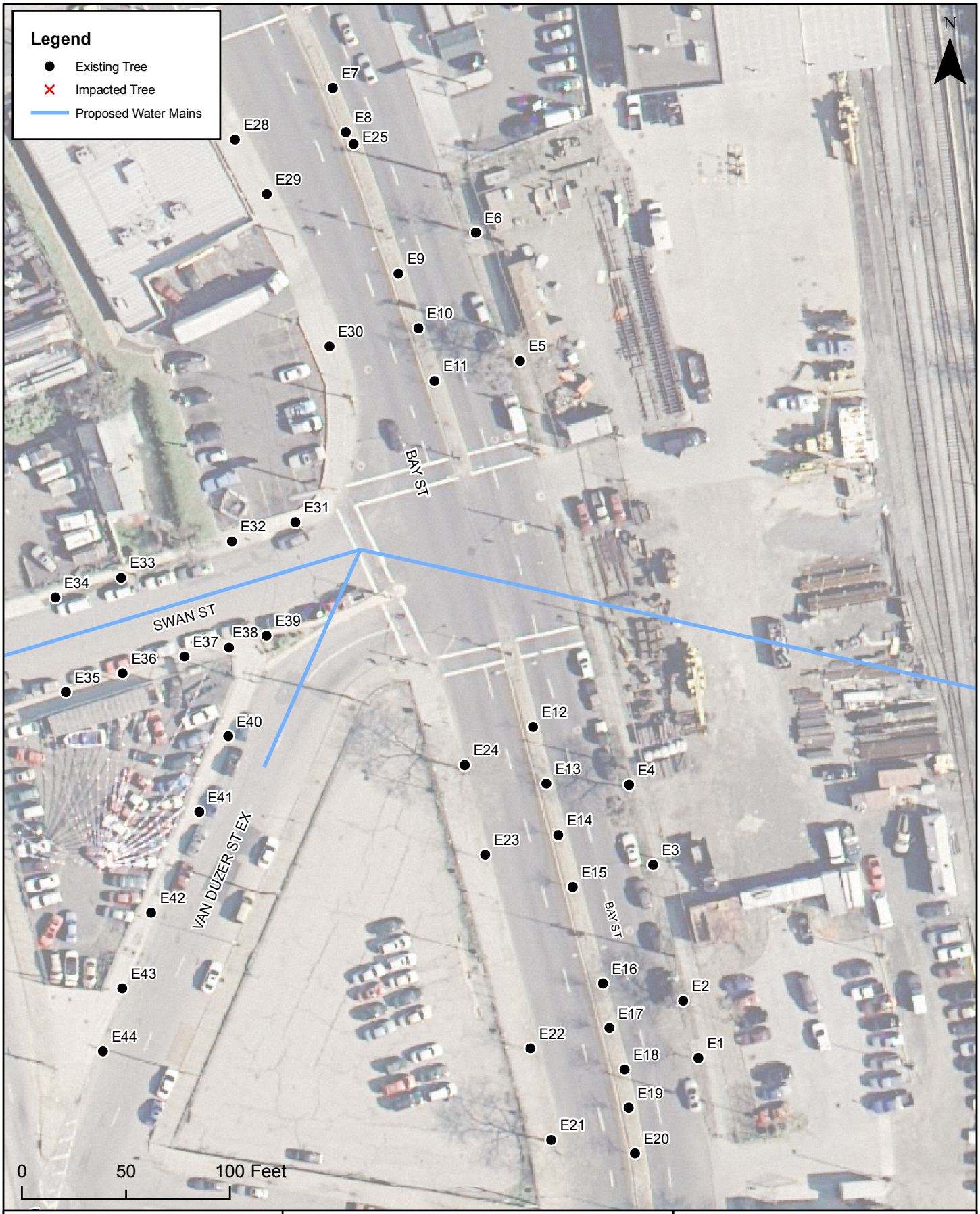
New York City Economic Development Corporation

HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-16 Tree Survey -
Victory Boulevard - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

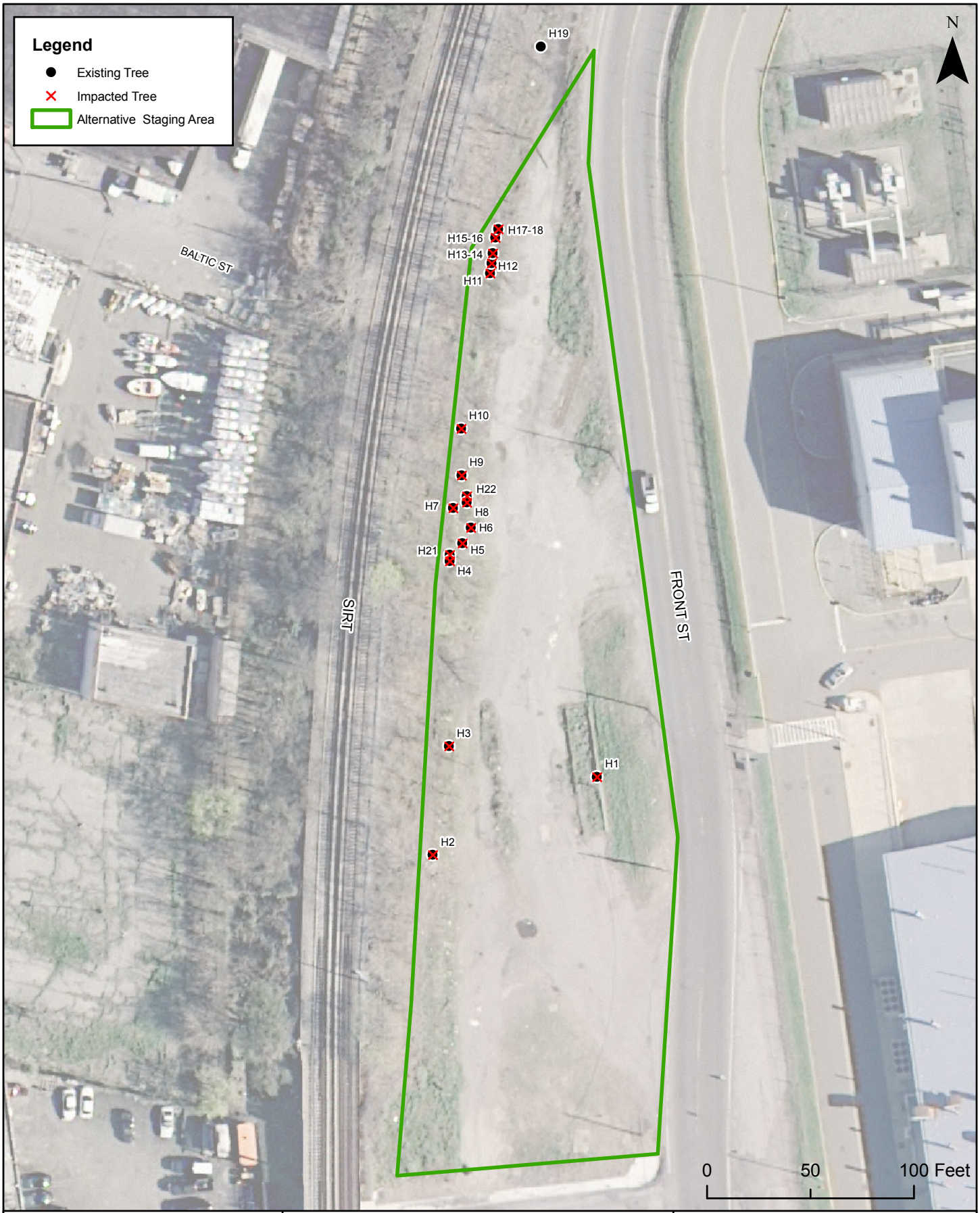


HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-17 Tree Survey - Bay Street - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-18 Tree Survey - Staging Area - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

Table 2-6. Trees Identified within Proposed Project Areas in Staten Island, July-September 2007 and January-February 2009

ID Code	dbb[1,2] (in.)	Tree Species		Crown Cover (ft.)	Health
		Common Name	Scientific Name		
Bay Street					
E1	9.2	Honey Locust	*Gleditsia triacanthos*	16	H
E2	17.3	London Planetree	*Platanus acerifolia*	19	H
E3	3.1, 3.3	Honey Locust	*Gleditsia triacanthos*	9	H
E4	15.6	London Planetree	*Platanus acerifolia*	17	H
E5	18.4	London Planetree	*Platanus acerifolia*	23	H
E6	9.8	Honey Locust	*Gleditsia triacanthos*	12	H
E7	2.4	Amur Maple	*Acer ginnala*	3	H
E8	3.4	Red Oak	*Quercus rubra*	5	S
E9	2.9	Red Oak	*Quercus rubra*	6	H
E10	6.0	Japanese Zelkova	*Zelkova serrata*	-	H
E11	5.9	Japanese Zelkova	*Zelkova serrata*	-	H
E12	5.3	Japanese Zelkova	*Zelkova serrata*	-	H
E13	2.5	Japanese Zelkova	*Zelkova serrata*	5	H
E14	3.3	Japanese Zelkova	*Zelkova serrata*	7	H
E15	4.4	Japanese Zelkova	*Zelkova serrata*	7	H
E16	4.0	Japanese Zelkova	*Zelkova serrata*	6	H
E17	4.9	Japanese Zelkova	*Zelkova serrata*	8	H
E18	5.2	Japanese Zelkova	*Zelkova serrata*	9	H
E19	4.2	Japanese Zelkova	*Zelkova serrata*	9	H
E20	5.2	Japanese Zelkova	*Zelkova serrata*	10	H
E21	20.1	London Planetree	*Platanus acerifolia*	26	H
E22	8.3	Honey Locust	*Gleditsia triacanthos*	13	H
E23	8.1	Sweetgum	*Liquidambar styraciflua*	8	H
E24	22.1	London Planetree	*Platanus acerifolia*	27	H
E25	6.0	Japanese Zelkova	*Zelkova serrata*	-	H
E26	8.0	Yoshino Cherry	*Prunus x yedoensis*	-	H
E27	8.0	Yoshino Cherry	*Prunus x yedoensis*	-	H
E28	7.5	Yoshino Cherry	*Prunus x yedoensis*	-	H
E29	8.0	Yoshino Cherry	*Prunus x yedoensis*	-	H
E30	8.0	Yoshino Cherry	*Prunus x yedoensis*	-	H
E31	5.5	Yoshino Cherry	*Prunus x yedoensis*	-	H
E32	6.0	Yoshino Cherry	*Prunus x yedoensis*	-	H
E33	5.5	Japanese Zelkova	*Zelkova serrata*	-	H
E34	5.9	Japanese Zelkova	*Zelkova serrata*	-	H
E35	6.0	Japanese Zelkova	*Zelkova serrata*	-	H
E36	6.5	Japanese Zelkova	*Zelkova serrata*	-	H

Table 2-6. Trees Identified within Proposed Project Areas in Staten Island, July-September 2007 and January-February 2009

ID Code	dbb[1,2] (in.)	Tree Species		Crown Cover (ft.)	Health
		Common Name	Scientific Name		
E37	6.5	Japanese Zelkova	*Zelkova serrata*	-	H
E38	6.0	Japanese Zelkova	*Zelkova serrata*	-	H
E39	8.0	Japanese Zelkova	*Zelkova serrata*	-	H
E40	6.0	Japanese Zelkova	*Zelkova serrata*	-	H
E41	6.0	Japanese Zelkova	*Zelkova serrata*	-	H
E42	7.0	Japanese Zelkova	*Zelkova serrata*	-	H
E43	5.9	Japanese Zelkova	*Zelkova serrata*	-	H
E44	6.0	Japanese Zelkova	*Zelkova serrata*	-	H
Victory Boulevard and Murray Hulbert Avenue					
F1	9.0	Honey Locust	*Gleditsia triacanthos*	12	H
F2	8.4	Honey Locust	*Gleditsia triacanthos*	10	H
F3	6.6	Honey Locust	*Gleditsia triacanthos*	10	H
F4	8.5	Honey Locust	*Gleditsia triacanthos*	14	H
F5	10.4	Honey Locust	*Gleditsia triacanthos*	15	H
F6	12.9	Austrian Pine	*Pinus nigra*	12	H
F7	13.4	Austrian Pine	*Pinus nigra*	13	H
F8	10.2	Honey Locust	*Gleditsia triacanthos*	14	H
F9	11.5	Honey Locust	*Gleditsia triacanthos*	16	H
F10	8.0	Honey Locust	*Gleditsia triacanthos*	11	H
F11	8.1	Honey Locust	*Gleditsia triacanthos*	9	H
F12	8.9	Honey Locust	*Gleditsia triacanthos*	12	H
F13	8.7	Honey Locust	*Gleditsia triacanthos*	9	H
F14	11.7	Honey Locust	*Gleditsia triacanthos*	12	H
F15	10.6	Honey Locust	*Gleditsia triacanthos*	12	H
F16	11.9	Honey Locust	*Gleditsia triacanthos*	15	H
F17	17.3	Pin Oak	*Quercus palustris*	15	H
F18	13.5	Pin Oak	*Quercus palustris*	19	H
F19[3]	26.0	Pin Oak	*Quercus palustris*	28	H
F20	17.5	Pin Oak	*Quercus palustris*	25	H
F21	19.4	Pin Oak	*Quercus palustris*	25	H
F22[3]	24.4	Pin Oak	*Quercus palustris*	17	H
F23	20.4	Pin Oak	*Quercus palustris*	19	H
F24	18.8	Pin Oak	*Quercus palustris*	16	H
F25	13.8	Pin Oak	*Quercus palustris*	14	H
F26[3]	20.8	Pin Oak	*Quercus palustris*	16	H/S
F27[3]	20.7	Pin Oak	*Quercus palustris*	17	H/S
F28	16.8	Pin Oak	*Quercus palustris*	18	H
F29	21.7	Pin Oak	*Quercus palustris*	19	H

Table 2-6. Trees Identified within Proposed Project Areas in Staten Island, July-September 2007 and January-February 2009

ID Code	dbb[1,2] (in.)	Tree Species		Crown Cover (ft.)	Health
		Common Name	Scientific Name		
F30	16.5	Pin Oak	*Quercus palustris*	18	H
F31	18.8	Pin Oak	*Quercus palustris*	20	H
F32	7.5, 7.5	Tree-of-Heaven	*Ailanthus altissima*	17	H
F33	6.5	Tree-of-Heaven	*Ailanthus altissima*	10	H
F34	-	Hackberry	*Celtis occidentalis*	11	S
F35	-	White Mulberry	*Morus alba*	15	S
Proposed Staten Island Shaft Site					
G1	14.7	Tree-of-Heaven	*Ailanthus altissima*	15	H/S
G2	7.9	Tree-of-Heaven	*Ailanthus altissima*	11	H
G3	3.2	Tree-of-Heaven	*Ailanthus altissima*	9	H
G4	12.1	Black Locust	*Robinia pseudoacacia*	15	H
G5	6.6	Black Locust	*Robinia pseudoacacia*	17	H
G6	2.5	Red Mulberry	*Morus rubra*	10	H
G7	3.8	Black Locust	*Robinia pseudoacacia*	12	H
G8	3.0	Black Locust	*Robinia pseudoacacia*	11	H
G9	3.7	Black Locust	*Robinia pseudoacacia*	12	H
G10	2.9	Tree-of-Heaven	*Ailanthus altissima*	6	H
G11	3.8	Black Locust	*Robinia pseudoacacia*	9	H
G12	4.4	Black Locust	*Robinia pseudoacacia*	13	H
G13	3.9	Black Locust	*Robinia pseudoacacia*	11	H
G14	7.8	Black Locust	*Robinia pseudoacacia*	12	H
G15	4.0	Tree-of-Heaven	*Ailanthus altissima*	11	H
G16	7.4	Tree-of-Heaven	*Ailanthus altissima*	10	H
G17	10.0	Tree-of-Heaven	*Ailanthus altissima*	13	H
G18	12.2	Tree-of-Heaven	*Ailanthus altissima*	12	H
G19	8.5	Tree-of-Heaven	*Ailanthus altissima*	7	S
G20	5.5	Tree-of-Heaven	*Ailanthus altissima*	9	H
G21	2.2	Tree-of-Heaven	*Ailanthus altissima*	7	H
G22	2.6	Tree-of-Heaven	*Ailanthus altissima*	-	D
G23	3.3	Tree-of-Heaven	*Ailanthus altissima*	-	D
G24	2.6	Tree-of-Heaven	*Ailanthus altissima*	6	S
G25	4.3	Tree-of-Heaven	*Ailanthus altissima*	9	S
G26	2.4	Tree-of-Heaven	*Ailanthus altissima*	7	H
G27	2.6	Tree-of-Heaven	*Ailanthus altissima*	4	H
G28	3.8	Tree-of-Heaven	*Ailanthus altissima*	10	H
G29	4.9	Tree-of-Heaven	*Ailanthus altissima*	12	H
G30	6.2	Tree-of-Heaven	*Ailanthus altissima*	13	H
G31	2.5	Tree-of-Heaven	*Ailanthus altissima*	10	H

Table 2-6. Trees Identified within Proposed Project Areas in Staten Island, July-September 2007 and January-February 2009

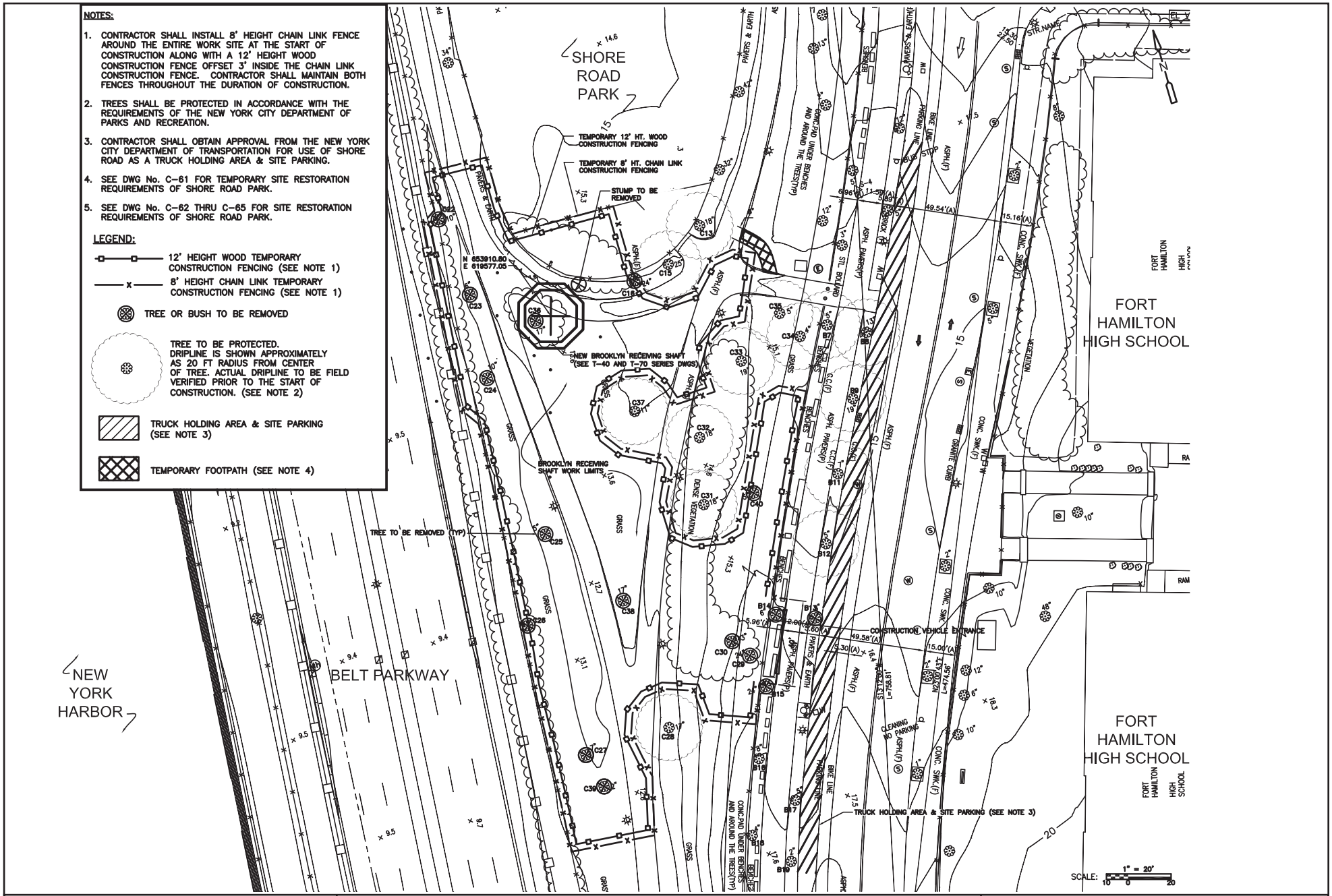
ID Code	dbb[1,2] (in.)	Tree Species		Crown Cover (ft.)	Health
		Common Name	Scientific Name		
G32	2.5	Tree-of-Heaven	*Ailanthus altissima*	13	H
G33	3.7	Tree-of-Heaven	*Ailanthus altissima*	14	H
G34	4.0, 4.3, 4.5	Tree-of-Heaven	*Ailanthus altissima*	12	H
G35	2.1	Tree-of-Heaven	*Ailanthus altissima*	9	H
G36	3.1, 3.3	Tree-of-Heaven	*Ailanthus altissima*	10	H
G37	4.4	Tree-of-Heaven	*Ailanthus altissima*	10	H
G38	2.8, 2.8	Tree-of-Heaven	*Ailanthus altissima*	14	H
G39	2.2	Tree-of-Heaven	*Ailanthus altissima*	7	H
G40	3.0	Tree-of-Heaven	*Ailanthus altissima*	7	H
G41	2.1	Tree-of-Heaven	*Ailanthus altissima*	7	H
Alternative Staging Area					
H1	6.3	Black Locust	*Robinia pseudoacacia*	9	H/S
H2	6.9, 10.2, 12.3, 12.5	White Ash	*Fraxinus americana*	23	H
H3	11.1	Sassafras	*Sassafras albidum*	15	H/S
H4	10.8	Sassafras	*Sassafras albidum*	15	H
H5	9.3	Sassafras	*Sassafras albidum*	14	H
H6	7.4	Sassafras	*Sassafras albidum*	16	H
H7	5.3, 6.3	Black Cherry	*Prunus serotina*	10	H/S
H8	7.9	Black Cherry	*Prunus serotina*	9	H
H9	5.0	Black Cherry	*Prunus serotina*	12	H
H10	10.2	Pin Cherry	*Prunus pensylvanica*	13	H/S
H11	4.8	Sassafras	*Sassafras albidum*	12	H
H12	7.1	Sassafras	*Sassafras albidum*	12	H/S
H13	8.1	Sassafras	*Sassafras albidum*	15	H
H14	8.4	Sassafras	*Sassafras albidum*	15	H/S
H15	5.6	Sassafras	*Sassafras albidum*	12	H
H16	5.0	Sassafras	*Sassafras albidum*	11	H
H17	8.3	Sassafras	*Sassafras albidum*	12	H
H18	3.0	Sassafras	*Sassafras albidum*	7	H
H19	9.0	Sycamore Maple	*Acer pseudoplatanus*	10	H
H20	6.6, 6.8, 7.3	White Mulberry	*Morus alba*	20	H
H21	3.7	Sassafras	*Sassafras albidum*	2	S/D
H22	5.7	Black Cherry	*Prunus serotina*	-	D

[1] Multiple dbh values indicate multiple stems.
[2] Entries with no dbh values indicate that certain conditions prohibited the measurement of dbh, including full stem coverage by Poison Ivy or stems were entwined in nearby fences.
[3] Trees were removed after the 2007 tree survey.
H = Healthy H/S = Impaired that may affect health of tree
S = Impaired S/D = Stressed
D = Dead

Bay may also be necessary. Required sampling would be conducted as applicable, actual quantities and flows would be estimated and permits would be acquired for all activities. The proposed stormwater outfall would be constructed in accordance with all necessary permits and approvals obtained from the appropriate agencies prior to the commencement of activities. Control measures, such as silt curtains or a floating boom around the cofferdam, as well applicable best management practices would be implemented during construction of the new outfall. This outfall was originally discussed as part of the FEIS for the redevelopment of the Stapleton Homeport (September 2006). Discharge of uncontaminated stormwater after construction is complete would not be anticipated to result in significant impacts to water quality or littoral zone wetlands.

Trees identified within the proposed shaft and chlorination station sites would be directly impacted by construction activities (Figures 2-14 through 2-15). An approximately 28,600 square foot area would be required for the construction and laydown areas at the Brooklyn shaft site. Construction activities at the Brooklyn shaft would impact 15 trees and the existing lawn area as part of the development of the shaft and associated construction staging and laydown areas (see Figure 2-19, Table 2-7). Fourteen additional trees in close proximity to the proposed shaft and construction area would be protected as part of the proposed action, as well as curb side trees along the limits of construction. Trees protected within the construction area would have their crowns raised and a fence installed around them to prevent potential damage from construction vehicles. Protection of all trees would adhere to the NYCDPR's specifications for tree protection. Site restoration after construction would be coordinated with the Director of Brooklyn Forestry. Potential indirect impacts to trees outside of the construction area from the possible use of a ground freezing method at the Brooklyn shaft site would not be anticipated as the area of influence would only extend approximately 10 feet from the ground freeze area and no trees that would be maintained are located within this area. Upon completion of all construction, the location would be restored in accordance with a Memorandum of Understanding that would be entered into between the NYCDPR and NYCDEP. Restoration of the construction area would involve soil decompaction and lawn restoration. Asphalt paths and curbs would be restored and a new fence and concrete curb and pavers outside the Little League field would also be completed within the former construction area.

No more than the 14 trees identified in Figure 2-18 and Table 2-7 would be directly impacted (i.e., damaged or removed) by the proposed shaft construction and construction staging area in Brooklyn. Additional indirect impacts to one tree located at the proposed temporary access road into the park (Figure 2-19) may also occur due to the potential for soil compaction and potential damage from construction equipment entering and leaving the proposed shaft



HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-19 Brooklyn Shaft - Tree Replacement and Removal Plan

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

Table 2-7. Protected and Impacted Trees Within the Brooklyn Shaft Site

ID Code	dbh [1,2] (in.)	Tree Species		Crown Cover (ft.)
		Common Name	Scientific Name	
Protected				
B7	6.4	Swamp White Oak	*Quercus bicolor*	9
B8	13.4	Pin Oak	*Quercus palustris*	11
B9	18.3	Pin Oak	*Quercus palustris*	13
B11	6.9	Green Ash	*Fraxinus pennsylvanica*	8
B12	5.4	Green Ash	*Fraxinus pennsylvanica*	6
C13	16.0	Pin Oak	*Quercus palustris*	16
C15	23.0	Pin Oak	*Quercus palustris*	24
C28	9.9	Cherry	*Prunus sp.*	18
C31	16.8	Elm	*Ulmus sp.*	26
C32	16.5	Elm	*Ulmus sp.*	23
C33	17.9	Elm	*Ulmus sp.*	22
C34	2.2, 2.7, 2.9	Sweetbay Magnolia	*Magnolia virginiana*	7
C35	2.8, 3.3, 3.6	Autumn Olive	*Eleaganus umbellata*	11
C37	20.4	Elm	*Ulmus sp.*	23
Direct Impacts				
B14	7.4	Hackberry	*Celtis occidentalis*	11
B15	6.5	Pin Oak	*Quercus palustris*	12
C16	21.1	Pin Oak	*Quercus palustris*	25
C22	10.9	American Elm	*Ulmus americana*	20
C23	4.2	Red Oak	*Quercus rubra*	7
C24	4.7	Hackberry	*Celtis occidentalis*	11
C25	4.3	Sycamore Maple	*Acer pseudoplatanus*	7
C26	4.3	American Elm	*Ulmus americana*	10
C27	7.4	Bald Cypress	*Taxodium distichum*	7
C29	14.4, 22.8, 29.4	Black Locust	*Robinia pseudoacacia*	21
C30	21.4	Black Locust	*Robinia pseudoacacia*	21
C36	17.1	Pin Oak	*Quercus palustris*	26
C38	17.5	Pin Oak	*Quercus palustris*	20
C39	4.0, 6.0	Sweetbay Magnolia	*Magnolia virginiana*	-
C40	>2.0, >2.0	Sweetbay Magnolia	*Magnolia virginiana*	-
Indirect Impacts				
B13	7.5	Green Ash	*Fraxinus pennsylvanica*	7

location. This includes a green ash (*Fraxinus pennsylvanica*) located immediately east of the shaft site north and south of the proposed entrances (see Figure 2-10).

Additional impacts to existing vegetation would occur at the location of the existing venturi chambers at 79th Street and 86th Street along Shore Road. As part of the proposed action, these two venturi chambers would be removed and the areas backfilled. The extent of potential impact would depend on the area required by the contractor. At 79th Street, it is anticipated that a sweetgum (A25) would be potentially impacted by proposed construction activities. At 86th Street, two Norway maples (B35 and B36) would potentially need to be removed. Upon the completion of construction activities, these locations would be restored in coordination with the NYCDPR and the Brooklyn Director of Forestry. This restoration would include the repair and replacement of existing fencing and sidewalk areas that may be affected by the removal of these two chambers.

Construction at the Staten Island shaft and chlorination station location would require the removal of a majority of the existing vegetation on the lot, including the removal of 46 trees (see Figure 2-14). It is not anticipated that the removal of this vegetation would result in significant impacts to natural resources as the area has been previously disturbed and is comprised of invasive and opportunistic species. The 46 trees that would be removed, however, would consist of tree-of-heaven, considered an invasive species by the U.S. Department of Agriculture (USDA) Natural Resource Conservation Services (NRCS) and honey locust which can be considered a weedy species. Upon the completion of all construction activities, the shaft and chlorination site would be landscaped with herbaceous and tree species. No tree impacts would result from the use of the primary staging area. The alternative staging area, if utilized, would result in the removal of 15 trees (Figure 2-18) if this lot had to be completely cleared. These would primarily consist of the removal of sassafras trees.

Construction of water main interconnections within Brooklyn and Staten Island would be largely completed within existing street right-of-ways. Cut and cover or micro-tunneling techniques would be used for this construction. Little or no direct impacts to street trees identified as part of the survey efforts would occur. Indirect impacts, such as the potential for impacts to root systems, would be possible, however it is unlikely as the majority of work would occur within existing roadway right-of ways. If potential impacts were identified, the NYCDEP would coordinate with applicable parties to address these issues, as appropriate.

Development and subsequent operation of the proposed action would not result in significant adverse impacts to natural resources as the action would occur below-grade, with the exception of the chlorination station and within previously disturbed areas or right-of-ways.

Impacts to trees and other plant species would be addressed through the development of site specific restoration plans, as appropriate. Stormwater discharges from the proposed new outfall would not be anticipated to result in significant impacts to littoral zone wetlands as these would be intermittent and the volume of these discharges would be small in comparison to the receiving waters. In addition, it is anticipated that the small area of impact due to the construction of the outfall would return to its pre-existing condition in a short period of time. Therefore, the proposed action is not expected to result in significant impacts to natural resources.

2.10.3 Significant Habitats and Endangered and Threatened Species

A review of the NYSDOS, Division of Coastal Resources and Waterfront Revitalization, the NYSDEC Natural Heritage Program (NHP) and the NYCDCP databases determined the presence or absence of significant habitats and/or threatened and endangered species at or in the vicinity of the proposed action. The potential exists for the presence of the endangered shortnose sturgeon (*Acipenser brevirostrum*) in the waters of the Upper New York Bay, however, the proposed siphon would be constructed below the existing mudline and would not impact the Upper New York Bay. Development of a new stormwater outfall for the proposed chlorination station would also not be expected to adversely affect this species. An evaluation of the proposed project conducted by the NHP indicated no known occurrences of rare or state-listed animals or plants, significant natural communities, or other significant habitats within the vicinity of the proposed action. Copies of agency correspondence are provided in Appendix A.

Construction and subsequent operation of the water siphon would not result in any significant impacts to threatened or endangered species or significant habitats. There are no Special Natural Area Districts, Special Natural Waterfront Areas, Wildlife Refuges and Sanctuaries or Significant Coastal Fish and Wildlife Habitats within close proximity of the proposed action. Development of the proposed sites would largely occur within a previously disturbed upland area in Staten Island, and a continuously maintained upland area in Brooklyn, and would not result in adverse effects to significant habitats.

2.11 WATER RESOURCES

Surface Waters

The proposed action would involve the construction of a subaqueous tunnel beneath the bed of the Upper New York Bay. In addition, all upland work would be conducted above the MHW line. The one exception would be the development of a new stormwater outfall in Staten Island that would drain to the Upper New York Bay. This outfall would not be anticipated to adversely affect water quality as the volume of the discharge from the chlorination station and

surrounding area would be low, intermittent and the discharge would consist of uncontaminated stormwater runoff. No adverse effects upon existing surface water quality within the Upper New York Bay would be expected as part of the proposed action. Development of the subaqueous tunnel would be initiated from proposed shafts located upland in Brooklyn and Staten Island and the top of the tunnel would be located at a depth of at least 95 feet below MLW. No dredging within surface waters would be anticipated as part of the proposed action.

During construction of the shafts, tunnel, water mains and chlorination station, dewatering and/or pumping will likely be required. Water removal within the shafts and tunnel would be accomplished through pumping. These waters will either be discharged to the municipal sewer system or to the Upper New York Bay. In Staten Island, discharge to the Bay would be either directly to surface waters or potentially through the proposed 48 inch stormwater outfall if the contractor decided to construct this early in the project. The estimated dewatering or pumping volumes that may be required by major construction phase is presented within Table 2-8.

Table 2-8. Summary of Estimated Dewatering/Pumping Volumes by Major Construction Phase

Major Construction Activity	Estimated Dewatering/Pumping Volume (gallons/day)
Water Mains/Sewer Replacement	
Brooklyn	2 gpm (2,880 gpd) per foot of open trench
Staten Island	10 gpm (14,400 gpd) per foot of open trench
Chlorination Station	300 gpm (432,000 gpd)
Shaft Construction	
Launching Shaft – Staten Island	25 gpm (36,000 gpd)
Receiving Shaft – Brooklyn	20 gpm (28,800 gpd)
Harbor Tunnel	50 gpm (72,000 gpd) from miscellaneous leaking sources

Dewatering and/or pumping would be accomplished through the use of pumps and the quality and volume of any potential discharge would be determined prior to initiation of these activities. Discharge of dewaters to the municipal sewer system and/or the Upper New York Bay would be conducted in accordance with all local, state and federal requirements. Discharge to the municipal sewer system would require the review and approval of the NYCDEP. This review would involve an assessment of the quality and estimated volumes of the discharge. Based upon initial discussions with the NYCDEP, Bureau of Water and Sewer Operations, no adverse impacts to those sewers in Brooklyn or Staten Island that may receive dewaters would occur as pumping volumes can be adjusted. Likewise, if dewaters would be discharged to surface waters, either directly or indirectly through a storm sewer, a permit would be required from the

NYSDEC and appropriate upstream measures and controls, such as an erosion and sediment control plan, would be implemented.

All construction activities would also be conducted in accordance with applicable state and federal requirements for the control of stormwater runoff and erosion at the individual construction sites. Coverage under the statewide general permit for stormwater discharges associated with construction activities (GP-0-08-001) would be required and a stormwater pollution prevention plan (SWPPP) would be prepared in order to be protective of water quality. Separate SWPPPs would be required for activities located within Brooklyn and Staten Island that would result in the disturbance of one or more acres. The SWPPPs would address the procedures that would be implemented to limit potential stormwater contamination from construction activities, the storage of petroleum-based materials and other chemicals and additional protective measures that would be implemented for the protection of water resources.

Upon completion of all construction activities, the operation of the new siphon, the chlorination station and the new water mains would result in no impact to water quality within the Upper New York Bay. As part of the chlorination station's sustainable design, water from the discharge waste stream from the chlorine residual analyzers would be recycled and used to maintain the plantings of the green roof and walls. Storage of diesel fuel (400 gallons) and sodium hypochlorite (5,000 gallons) would be required at the new chlorination station for the on-site backup generator and the disinfection of potable water, respectively. These materials, however, would be stored in accordance with applicable federal, state and local requirements for the storage and use of petroleum-based materials and hazardous substances.

The construction and operation of the proposed action would, therefore, not result in any adverse impacts upon surface water quality.

Groundwaters

Portions of the proposed action within Brooklyn would be located within the limits of USEPA-designated Sole Source Aquifer, specifically the Brooklyn-Queens Aquifer. A Sole Source Aquifer is defined as an area determined by the Administrator of the USEPA on his/her own initiative or upon petition, to have an aquifer which is the sole or principal drinking water source for the area and, which if contaminated would create a significant hazard to public health. In June 1979, the Jamaica Water Supply Company petitioned the USEPA Administrator to declare the portion of the Long Island Aquifer defined in the petition and occurring in the service area as a sole source aquifer. At that time, the Jamaica Water Supply Company supplied water from 69 wells located in or near the water supply franchise area to approximately 650,000 people in the southern portion of Queens County. In 1996, New York City purchased the Queens

portion of the Jamaica Water Supply Company and took responsibility for the delivery of drinking water to those communities served by the groundwater wells and renamed the group of wells "the Groundwater System". In 2006, the Groundwater System supplied an average of 1.3 million gallons per day of drinking water from one well, less than one percent of the City's total usage. This well, located in Hollis, Queens is 275 feet deep and is in the Magothy or Cretaceous Aquifer and services southeastern Queens. The Magothy Aquifer, which has a thickness that ranges from 0 to 500 feet, is primarily made up of coarse to fine sand of moderate permeability, and contains gravel of high permeability and abundant silt and clay of low to very low permeability.

The Brooklyn shaft location would be within the limits of the Brooklyn-Queens Sole Source Aquifer in western Brooklyn adjacent to New York Harbor. During construction of the shaft and the construction of new water mains dewatering will be necessary. Construction activities associated with the installation of new water mains is not anticipated to result in potential impact to groundwaters or the Sole Source Aquifer as excavation would be limited to no more than 15-20 feet below grade. Excavation within the shaft will be conducted to a maximum depth of approximately 151 feet below grade. Shaft construction techniques that do not rely on dewatering to lower the groundwater table would be utilized. The only dewatering that would be required would be to remove water from the shaft excavation and from any potential leaks in the shaft support system. Shaft leakage criteria would be defined in the contract documentation to ensure that groundwater inflows into the shaft would be kept within acceptable limits. Water will be pumped from the excavation using sump pumps. The groundwater removed from the excavation will be discharged to the City sewer system or the Upper New York Bay. All required permits would be obtained prior to the discharge of any groundwaters to these locations and any potential adverse effects of the discharge would be addressed as appropriate.

The pumping rates used during dewatering are not expected to impact the water level in the Sole Source Aquifer or the water supply well in Hollis, Queens. In addition, any potential contaminants that may be used within the shaft or tunnel within Brooklyn or Staten Island (e.g., fuel oil for diesel equipment, soil-improvement materials, etc.) will be conducted in accordance with applicable federal, state and local requirements. Appropriate spill prevention, contingency and countermeasure plans, as applicable and appropriate, will be developed and implemented in order to address potential spills that may occur during the construction of the siphon.

No impacts to groundwaters or alteration of the hydrological properties of the Sole Source Aquifer would be anticipated upon completion and operation of the siphon replacement.

2.12 HAZARDOUS MATERIALS

The proposed action would result in the removal of materials under Upper New York Bay during the tunneling process and the disturbance and excavation of underlying soils during the construction of the siphon shafts and water mains in Brooklyn and Staten Island. In addition, the construction of a chlorination station in Staten Island would also necessitate the excavation of underlying soil. The proposed siphon would be located below Upper New York Bay and the water transmission lines would be located below grade, largely within the street beds in Brooklyn and Staten Island. Shafts for the siphon would be located in both Brooklyn and Staten Island.

This section addresses the potential for the presence of hazardous materials resulting from previous and existing uses at the project and adjacent areas, as well as potential storage of hazardous materials during the construction and operation of the siphon and associated infrastructure. In support of the proposed development of the new siphon and associated infrastructure, a Phase I Environmental Site Assessment (ESA) was performed for the proposed project areas in both Brooklyn and Staten Island. In addition, soil sampling was conducted in accordance with a work plan approved by the NYCDEP. Soil samples were collected where excavation would be necessary for the proposed shaft locations and water transmission mains in both Brooklyn and Staten Island and at the location of the proposed chlorination station in Staten Island. This study was conducted in order to evaluate the potential for the presence of hazardous materials within the area of the proposed action and to determine potential disposal options for the excavated materials. In addition, sediment samples were also collected from Upper New York Bay within the proposed tunnel alignment.

Hazardous materials are defined as any substances that pose a potential threat to human health or the environment. Under CEQR, the potential for significant impacts from hazardous materials occurs when: hazardous materials exist on a site and a) an action would increase pathways to their exposure, or b) an action would introduce new activities or processes using hazardous materials.

2.12.1 Surface Topography and Hydrogeologic Conditions

Brooklyn

The site topography at the proposed shaft location in Brooklyn is approximately 12 feet above sea level. Areas to the east and south generally have a higher elevation than the shaft location; areas to the west and north generally decrease until they are at sea level.

According to information gathered in a database search conducted by Environmental Data Resources, Inc. (EDR), in the vicinity of the shaft location (available from NYCDEP-BEPA upon request), the natural soil surface has a variable soil texture that consists of silty loam, loamy sand, sandy loam and fine sandy loam. Deeper there is unweathered bedrock, very gravelly-loamy sand and stratified sandy loam. The rock stratigraphic unit is within the Mesozoic Era (180 to 65 million years ago) and within the Upper Cretaceous rock series.[5]

The regional groundwater flow direction for the study area is to the west towards Upper New York Bay.

Staten Island

The site topography of the shaft location in Staten Island is approximately seven feet above sea level. Areas to the north and south generally have comparable elevations to the shaft location. However, areas to the west have significantly higher elevation than the siphon shaft and chlorination station site. East of the shaft location, elevations decrease until Upper New York Bay.

Based upon EDR data, the natural soil surface has a variable soil texture that consists of sandy loam. Deeper soils consist of unweathered bedrock, very gravelly-sandy loam and stratified gravelly-sandy loam. The rock stratigraphic unit is within the Paleozoic Era and is within the Ultramafic rocks series.[6]

Groundwater in this area of Staten Island flows to the east.

2.12.2 Historical Land Use of Site and Surrounding Area

Brooklyn

Sanborn Fire Insurance maps from 1926, 1950, 1969, 1977, 1981, 1987, 1993 and 1995 were utilized to identify historical uses of the Brooklyn shaft, water main locations and surrounding areas. Historical aerial photographs from 1954, 1966, 1975, 1985 and 1995, as well as historical topographic maps from 1900, 1905, 1947, 1955, 1966, 1967, 1981 and 1998 were also reviewed to supplement the information provided by the Sanborn maps.

[5] Environmental Data Resources, Inc. July 18, 2007. The EDR Radius Map with GeoCheck Report for "Shore Road/83rd Street, Brooklyn, NY, 11209."

[6] Environmental Data Resources, Inc. July 18, 2007. The EDR Radius Map with GeoCheck Report for "Front Street/Murray Hulbert Avenue, Staten Island, NY, 10301."

The area where Shore Road Park is located is listed on Sanborn maps as an embankment. The maps do not define specifically when the park came into existence. However, according to the NYCDPR website, Shore Road Park, otherwise known as the Shore Park Greenway, was constructed in the 1940's to complement the Belt Parkway. A Greenway is defined by NYCDPR as, "a linear open space, such as a path or trail, which links parks and communities around the City, providing public access to green spaces and the waterfront."[7] Consistent with the NYCDPR, Sanborn maps show that between 1926 and 1950, Shore Parkway was constructed immediately west of the proposed shaft location within Shore Road Park. The area has remained consistent with the 1950 Sanborn with the exception that between 1981 and 1987 Shore Parkway also became known as Leif Ericson Drive.

In 1926, the area to the east of the siphon shaft between 86th Street and 83rd Street consisted of the Crescent Athletic Club and a number of residences. The Crescent Athletic Club contained a large field that extended from Shore Road to Colonial Road, which included a stable and two buildings, possibly used as garages, and an additional building that was used as a shed. A two-story dwelling with a stable, tool shed and one other building were located on the property immediately adjacent to the southwestern portion of the Crescent Athletic Club property. South of 86th Street, the area was predominantly residential, with a higher density of residences on the eastern side of Narrows Avenue than on the western side. Fort Hamilton High School, associated athletic fields and the public playground located adjacent to Colonial Road were constructed between 1926 and 1950. There was an increase in the number of residential units south of 86th Street and west of Narrows Avenue prior to 1950. The Colonnades Apartments were constructed on the block bounded by Shore Road, Narrows Avenue and 88th Street. Between 1950 and 1969, Shore Road Lane was constructed immediately adjacent to the southern boundary of the lot containing Fort Hamilton High School and additional residential dwellings were constructed in the area. The area east of the proposed water mains from the intersection of Shore Road and Narrows Avenue to 83rd Street remained relatively unchanged to the present with the exception of an addition that was added to Fort Hamilton High School in 1992. Historical topographic maps and aerial photographs were also reviewed and were consistent with the Sanborn maps.

Staten Island

Sanborn Fire Insurance maps from 1898, 1937, 1977 and 1996 were utilized to identify historical uses of the Staten Island siphon shaft, chlorination station and water main locations. Historical aerial photographs from 1943, 1954, 1966, 1975, 1985 and 1995, as well as historical

[7] New York City Department of Parks and Recreation website located at http://www.nycgovparks.org/sub_newsroom/press_releases/press_releases.php?id=19914

topographic maps from 1900, 1947, 1955, 1967 and 1981 were also reviewed to supplement the information provided by the Sanborn maps.

In 1898, the proposed shaft and chlorination building site were a part of Upper New York Bay. Present day Victory Boulevard was referred to as "Arrietta" according to the 1898 Sanborn map. The area to the north of the proposed water mains consisted of vacant land, tenements and sheds. South of Arrietta, there was a boat storage and repair yard and the H.M.S. Coal, Wood, Lime and Brick Yard. The westernmost extension of the proposed water main was in the general vicinity of the K. Feist Stone Works and stores. Between 1898 and 1937, a bulkhead was erected, which expanded the shoreline and allowed for the construction of the existing Murray Hulbert Avenue and Front Street. The 1937 Sanborn map does not show anything located on the proposed siphon and chlorination station site, however, New York City Municipal Piers Numbers 6 through 10 and the George Cromwell Center were constructed along the waterfront north of the site. In addition, a railroad was constructed adjacent to the western edge of the shaft and chlorination station site. North of Hannah Street, the City of New York Tompkinsville Play Center, which included a swimming pool, wading pool, diving pool, dressing rooms and storage for pool equipment, was constructed between 1898 and 1937. North of Victory Boulevard there were stores and buildings used for miscellaneous storage. The area west of the proposed site consisted of the Tompkinsville Freight and Filling Station. Monumental Works, storefronts, storage and auto repair facilities characterize the area immediately west of Bay Street until Van Duzer Street.

The Sanborn map for 1977 shows a few minor changes to the study area. South of Hannah Street, water pollution control facilities were constructed between 1937 and 1977. City of New York Municipal Piers Number 9 and 10 no longer appear on the Sanborn map. The Bureau of Marine and Aviation Division of Marine Repair used Pier 7 in 1977. West of the proposed site, Van Duzer Street Extension was constructed starting at the intersection of Van Duzer Street and St. Julian Street and ending at Bay Street. The lots immediately east and west of the new road appeared to be vacant according to Sanborn maps. All other descriptions of the study area were consistent with development that had occurred prior to 1937.

In 1996, the site of the proposed shaft and chlorination station appeared to have three warehouses on the property and Front Street had been constructed immediately south of the site. The United States Navy used Murray Hulbert Avenue and the area east of Front Street. East of the shaft site, between 1977 and 1996, Pier 6 was removed. The water pollution control facilities, the George Cromwell Center and the City of New York Tompkinsville Play Center remained the same according to the Sanborn map. Bay Street Landing Apartments, a Yoga Center and a Health Club lined the northern side of Victory Boulevard. Immediately west of the

proposed site and the SIRT is a maintenance facility and yard operated by the SIRT. In addition, the property located between Bay Street and Van Duzer Street Extension was used to sell previously-owned automobiles.

2.12.3 Regulatory Agency List Review

As part of the Phase I ESA, multiple databases were accessed to obtain existing and historical information for each of the proposed sites. The USEPA Superfund Information System was used and contains the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS), Resource Conservation and Recovery Act Information (RCRAinfo), Brownfields Management System and the National Priorities List (NPL) databases. In addition to these federal databases, several databases managed by the NYSDEC were also reviewed, including the NYSDEC Spill Incident Database and the Environmental Site Remediation Database, which allows searches of the NYSDEC Brownfield cleanup, state Superfund (inactive hazardous waste disposal sites), environmental restoration and voluntary cleanup programs.

Brooklyn

The proposed location for the siphon shaft and associated infrastructure was not listed on any of the searched federal, state and local databases.

The records search indicated that no federal National Priority List (NPL), CERCLIS, CERCLIS No Further Remedial Action Planned, Correction Action Report (CORRACTS), Resource Conservation and Recovery Information System (RCRIS) - Treatment, Storage and Disposal (TSD) Facilities Subject to Corrective Action, Resource Conservation and Recovery Act (RCRA) Large Quantity Generators (LQG), Emergency Response Notification System (ERNS), Brownfields or Toxic Chemical Release Inventory System (TRIS) sites were located within the prescribed search radius.

The records search found no state or local Facility Register, Registered Recycling Facilities, Registered Waste Tire Storage Facilities, Chemical Bulk Storage, Major Oil Storage Facilities, Hazardous Substance Waste Disposal Sites, Inactive Hazardous Waste Disposal Sites, Registry of Engineering Controls, Registry of Institutional Controls, Voluntary Cleanup Program, Brownfields, New York State SPDES or Air Emissions Data sites located within the prescribed radius of the proposed shaft location.

Results from the record search identified four RCRA Small Quantity Generator (SQG) sites within a one quarter-mile radius of the proposed shaft location, all of which were located at an equal or higher elevation than the proposed site.

A review of the Leaking Storage Tank Incident Reports database revealed eight LTANKS sites within a one half-mile radius of the proposed site. All of the spills were reported as closed by the NYSDEC, meaning that there are no ongoing remediation activities or continued regulatory involvement.

Results from the records search recognized seven Underground Storage Tank (UST) locations within a one-quarter mile radius of the shaft location, all of which were located at an equal or higher elevation. The storage capacity of these USTs ranges from 550 to 13,000 gallons and stored No. 2 or 6 fuel oil or diesel. According to the regulatory records, all of the tanks were reported as being active.

Results from the records search recognized three Aboveground Storage Tank (AST) locations within a one-quarter mile radius of the shaft location, all of which were located at an equal or higher elevation than the proposed site. Storage tank capacities range from 4,000 to 15,000 gallons. All of the tanks were reported as being active.

The record search also identified four Spills Information Database (SPILLS) sites within a one-eighth mile radius of the shaft location, all of which were located at an equal or higher elevation. All but one site were closed by the NYSDEC, meaning that there are no ongoing remediation activities or continued regulatory involvement. Spill No. 9515656 occurred on March 6, 1996 at the intersection of 83rd Street and Shore Road in Brooklyn, approximately 250 feet upgradient of the shaft location when an equipment failure caused 20 gallons of transformer oil to spill into the nearby sewer. It is unknown whether soil or groundwater was impacted as the result of this spill.

Staten Island

The results of the records search indicated that the proposed shaft and chlorination station site is not listed on any of the searched federal, state and local databases.

The records search indicated that no federal NPL, CERCLIS, CORRACTS, RCRA - TSD Facilities Subject to Corrective Action, ERNS, Brownfields or TRIS sites were located within the prescribed radius of the proposed site.

The records search found no state or local Hazardous Substance Waste Disposal, Registered Recycling Facilities, Registered Waste Tire Storage and Facilities, Registry of

Engineering Controls, Registry of Institutional Controls, Voluntary Cleanup Program, Brownfields, SPDES or Air Emissions Data sites located within the study radius for the proposed shaft and chlorination site.

The records search found one State Hazardous Waste Site (NY SHWS) site within approximately a one-mile radius of the target property. Parcel P15 – Front Street is located up-gradient at 44 Canal Street in Staten Island, New York between one-half and one mile south of the proposed site. The site description in the records search indicates that the site was formerly used as an auto repair shop and has a vacant two-story building on site. Heavy staining was observed on the first floor as well as on the ground surface to the rear of the building. On-site soil and groundwater were both contaminated with lead. The levels of lead remaining on-site, however, have been deemed non-hazardous after a Removal Action was undertaken in the spring/summer of 1996, which consisted of soil removal, sump removal, power washing of the building walls and general debris removal. The extent of groundwater contamination is unknown, but drinking water is supplied by upstate reservoirs, and no other uses have been documented. Due to the nature of this site, Parcel P15 – Front Street is also found on the State Registry of Inactive Hazardous Waste Disposal Sites (NY DEL SHWS).

The records review indicated that there are two Solid Waste Facilities/Landfill Sites within a one-half mile radius of the target property. Both sites are located at a higher elevation than the proposed site. Thomas J. Manzo, Inc., a transfer station located at 320 Front Street, is within one quarter-mile and one half-mile south of the proposed site. In addition, A. Jofi's Auto Body, Inc., a vehicle dismantling facility, is located at 33 Wave Street and is also within one-quarter mile and one-half mile south of the shaft and chlorination station site.

A review of the LTANKS database revealed 31 LTANKS sites within a one-half mile radius of the proposed site, all of which were located at an equal or higher elevation. All but six of these spills were reported as closed by the NYSDEC, meaning that there are no ongoing remediation activities or continued regulatory involvement. Information regarding the six open spills is provided in Table 2-9 below.

Results from the records search also recognized 14 UST sites within a one-quarter mile radius of the proposed action, all of which were located at an equal or higher elevation than the proposed site. Storage tank capacities ranged between 250 and 10,000 gallons and stored No. 2 fuel oil, diesel, gasoline, waste oil/used oil or other.

Table 2-9. LTANKS Sites Located Near Proposed Siphon Shaft, Chlorination Building and Associated Infrastructure in Staten Island

Name and Address	Spill Date	Substance	Quantity	Resource Affected	Remarks
Cromwell Center Pier 6 – Bay Street/Hannah Street	01/22/1999	No. 2 Fuel Oil	Not Specified	Soil	Tank Test Failure. Spill Open.
Staten Island Transit - NYCT 293 Bay Street	03/29/2000	Gasoline	Not Specified	Soil	Tank Test Failure. Spill Open.
260 Bay Street	04/14/1997	Gasoline	Not Specified	Soil	Tank Failure. Spill Open.
Chaudhry Corporation/Gulf Station 149 Victory Boulevard	10/27/1999	Gasoline	Not Specified	Soil	Tank Failure. Spill Open.
157 Daniel Lou Terrace	06/12/1998	No. 2 Fuel Oil	Not Specified	Soil	Tank Test Failure. Spill Open.
Staten Island 01 DOS 539 Jersey Street	06/20/2001	No. 2 Fuel Oil	Not Specified	Soil	Tank Test Failure. Spill Open.

The record search results revealed one Chemical Bulk Storage Database (CBS) underground storage tank site within a one-quarter mile radius of the proposed site. The NYCDEP Richmond Chlorination Plant, situated at a lower elevation than the subject property, is located at 2 Murray Hulbert Avenue and is within one eighth-mile of the proposed action. The record search indicated that there are two closed, in-place tanks at this location, each previously contained 4,600 gallons of sodium hypochlorite.

The record search results also identified one Major Oil Storage Facility Database (MOSF) UST site within a one-half mile radius of the proposed site. The NYCDOT, Division of Ferries Oil, situated at a lower elevation than the subject property, is in service and is located at St. George Ferry Terminal in Staten Island and is within one-quarter mile to one-half mile of the proposed site. Storage tank capacities range from 1,000 to 15,000 gallons.

Finally, results of the records search recognized 12 AST sites within one-quarter mile of the proposed shaft and chlorination station location, all of which were located at an equal or higher elevation. Storage tank capacities ranged from 250 to 281,497 gallons and contained waste oil; used oil; lube oil; No. 2, 4, and 6 fuel oil; other materials; and products that were not identified.

2.12.4 Site Reconnaissance

In addition to a review of regulatory records and databases, site reconnaissance visits were made to both the Brooklyn and Staten Island location on August 13, 2007 to observe and

confirm present uses and conditions at the proposed shaft, chlorination station and water main locations.

Brooklyn

During the site reconnaissance, there was no visual indication of any hazardous materials at the proposed shaft or water main locations.

Staten Island

The site reconnaissance revealed several indications of potential hazardous materials at the proposed site. One metal 55-gallon drum was observed on the northern portion of the site approximately 40 feet south of the chain link fence bordering the adjacent property to the north. The drum contained mostly construction and household debris, including pieces of cement, cement bags, coffee cups and plastic bags. The original contents of the drum and the disposal of the contents are unknown. There was no evidence, such as staining or stressed vegetation, in the vicinity of the drum. Sixteen plastic empty one-quart automobile fluid (motor oil, transmission fluid and unknown) containers were observed in close proximity to the fence on the northern, southern and western portions of the proposed shaft and chlorination site. One unlabelled, empty plastic five-gallon automobile fluid container was observed in the southern portion of the site. All automobile containers observed on site were located in areas that did not have stressed vegetation. Therefore, it does not appear that the automobile fluids had been released at these locations.

Throughout the proposed site, there was evidence of illegal dumping. In areas adjacent to the northern and western boundaries of the subject property, multiple mounds of fill were observed. These mounds contained construction debris, broken pieces of concrete, gravel, asphalt and fill material and indicated possible dumping activities on the site. Other evidence of dumping consisted of an assortment of household debris located throughout the site, including plastic and glass bottles, plastic bags, aluminum cans, clothing, coffee cups, beverage lids and styrofoam. Green and black plastic garbage bags were also observed along the northern and western boundaries of the proposed shaft site. Many of these were filled with construction debris. Plastic-coated pipes, as well as wooden poles, were also observed throughout the northern and western portions of the property. Railroad rail debris were observed adjacent to the fence on the western side of the property.

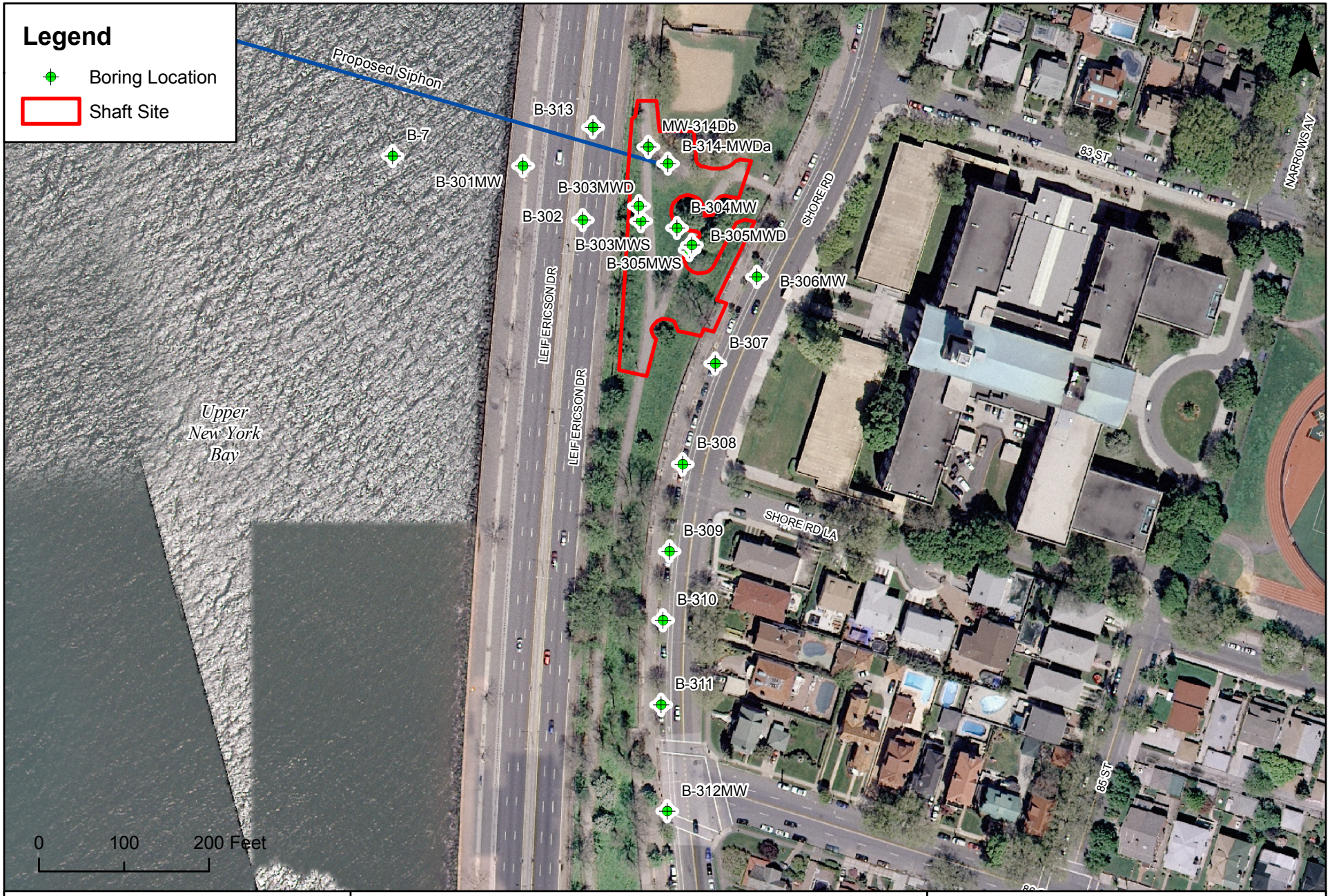
There was no evidence of hazardous materials identified in the path of the proposed water main locations during the site reconnaissance efforts.

2.12.5 Soil Sampling

Soil samples were also collected in Brooklyn and Staten Island from borings at the proposed location of the shafts, chlorination station site and along the path of the water mains. Samples were collected following the procedures presented within the "Land Subsurface Environmental Work Plan" approved by the NYCDEP – Bureau of Environmental Planning and Assessment. These samples were collected to screen the materials to be excavated, to identify gross contamination, and to identify any health and safety concerns that would need to be addressed during excavation and construction activities. Samples from each boring were submitted to a New York State-certified analytical laboratory for target compound list (TCL) volatile organics, TCL semivolatile organics, TCL pesticides, chlorinated herbicides, polychlorinated biphenyls (PCBs), and target analyte list (TAL) metals analyses. The results of the soil samples were compared to the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) #4046, which provides soil cleanup objectives based on direct contact exposure and protection of groundwater quality for unrestricted use. The metal concentrations were compared to the TAGM #4046 Eastern U.S. Background concentrations. The cleanup objectives are used by NYSDEC to eliminate all significant threats to human health and/or the environment and are used in selecting alternatives for remediation of inactive hazardous waste sites.

Brooklyn

A total of 13 borings at the locations shown on Figure 2-20 were completed with 32 soil samples submitted for the analyses identified above. Samples were collected over the planned excavation depths at the seawall, the Belt Parkway, the shaft location and along the path of the proposed water mains. A summary of the detected analytical results for the samples are presented in Attachment 1 Appendix B. No volatile organics, herbicides or PCBs exceeded the TAGM recommended soil cleanup objectives in any of the samples collected in Brooklyn. One arsenic, one copper, four magnesium, two mercury, five nickel and three zinc concentrations exceeded the TAGM #4046 Eastern U.S. Background concentrations. These samples are highlighted in Attachment 1 in Appendix B. Calcium and magnesium are naturally occurring and are not indicative of contamination. Borings B-303 and B-304 were located at the original proposed shaft location, however during the design process the shaft location was changed and an additional boring B-314 was completed. No metals exceeded TAGM at the new shaft location. TAGM exceedances occurred at various locations throughout the proposed water main path.



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-20 Soil Boring Locations - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

Semivolatile organics were detected above the TAGM #4046 in several of the samples. Three benzo[a]anthracene, three benzo[a]pyrene, one benzo[b]fluoranthene and two chrysene concentrations exceeded the TAGM recommended soil cleanup objectives. The semivolatile organics that exceeded the TAGM recommended cleanup objective were polycyclic aromatic hydrocarbons (PAHs) which often enter the environment as releases to air as a byproduct of incomplete combustion of oil, coal, gas and other organic substances and are, therefore, generally ubiquitous. Fill material may also contain PAHs and the concentrations detected in the Brooklyn soil samples may be considered to be consistent with the fill materials which were observed. None of the PAHs exceeded TAGM concentrations at the proposed shaft location. The PAH exceedances were located throughout the proposed water main alignment. In addition, the pesticide dieldrin exceeded the TAGM recommended soil cleanup objective in one soil sample within Shore Road Park immediately west of the shaft.

Prior to disposal of any excavated material, additional analyses including Toxicity Characteristic Leaching Procedure (TCLP), ignitability, corrosivity, reactivity (cyanide), reactivity (sulfide), sulfides, asbestos fiber and total petroleum hydrocarbons may be required. Estimates of reasonable worse case TCLP concentrations were made using a dilution factor of 20 used by the analytical laboratory for the TCLP procedure. Using this conservative TCLP calculation, one soil sample (Boring B-305 at a depth of 0 to 16 feet) collected at Shore Road would have the potential to exceed the maximum allowable TCLP lead concentration. All other TCLP parameters are expected to be below the regulatory levels based on the bulk soil concentrations and applying the dilution factor of 20.

Staten Island

A total of 30 borings at the locations shown on Figure 2-21 were completed with 74 soil samples submitted for analyses. Samples were collected at the seawall, shaft location, in the vicinity of the proposed SIRT crossing, the location of the chlorination station, and along the path of the proposed water mains over the planned excavation depths. A summary of the detected analytical results for the samples are presented in Attachment 2 of Appendix B. No volatile organics, herbicides, pesticides or PCBs exceeded the TAGM recommended soil cleanup objectives in any of the samples collected in Staten Island. Four arsenic, seven calcium, nine chromium, one cobalt, 15 copper, four lead, 62 magnesium, 25 mercury, 65 nickel, and 38 zinc concentrations exceeded the TAGM #4046 Eastern U.S. Background concentrations. These samples are highlighted in Attachment 2 of Appendix B. Calcium and magnesium occur naturally and are not indicative of contamination. The TAGM exceedances occurred at the shaft location, the SIRT crossing, and along the path of the proposed water mains.

HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-21 Soil Boring Locations - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

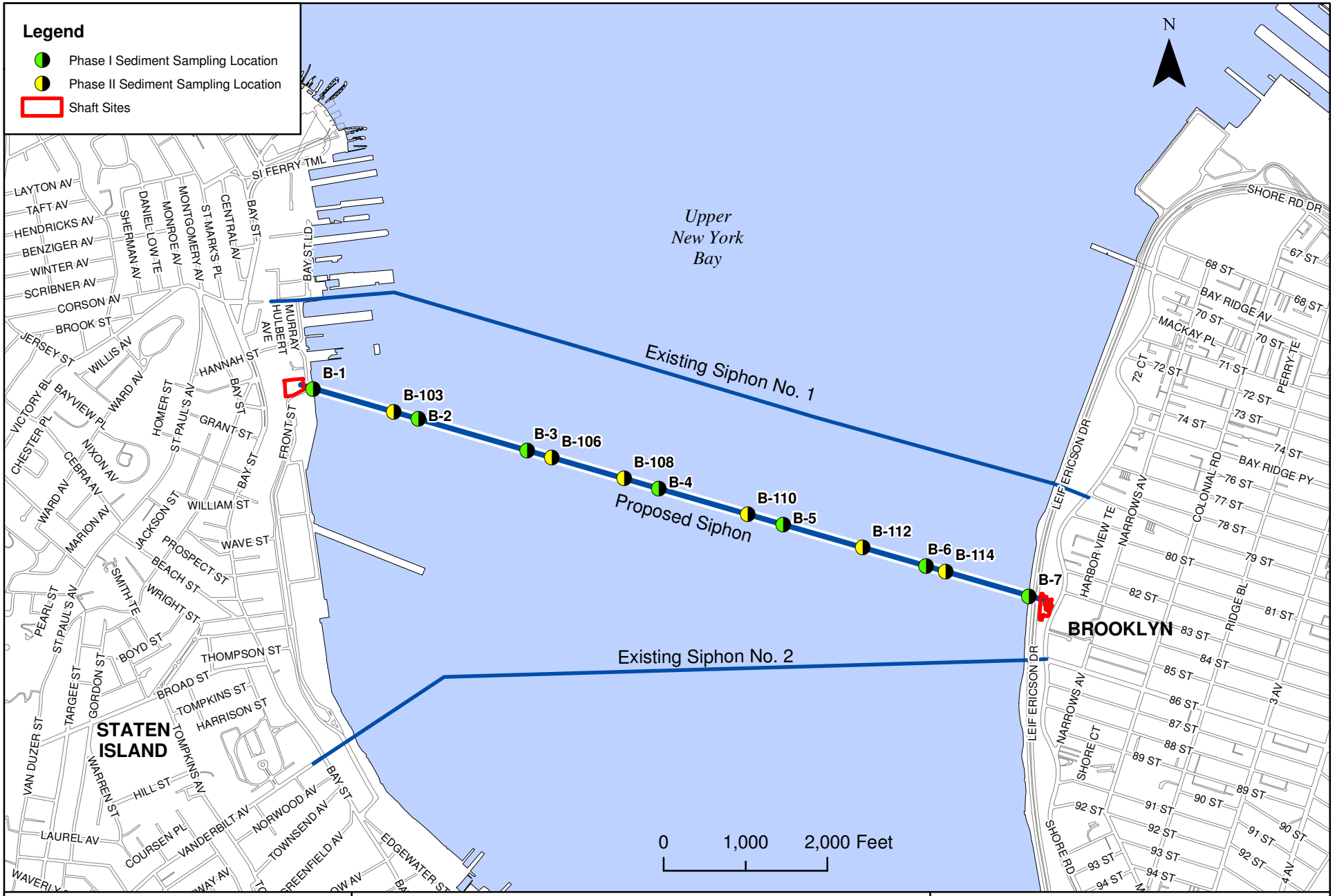
New York City Economic Development Corporation

Twenty eight benzo[a]anthracene, 27 benzo[a]pyrene, 20 benzo[b]fluoranthene, eight benzo[k]fluoranthene, 31 chrysene, one dibenzofuran, one fluoranthene, four indeno[1,2,3]pyrene and three phenanthrene concentrations exceeded the TAGM recommended soil cleanup objectives. These samples are highlighted in Attachment 2 of Appendix B. The semivolatiles that exceeded the cleanup levels were PAHs which, as noted previously, often enter the environment as releases to air as the byproducts of incomplete combustion of oil, coal, gas and other organic substances and are therefore, generally ubiquitous. Urban fill material will often also contain PAHs and the concentrations detected in the samples collected in Staten Island may be considered consistent with the fill materials which were observed. The TAGM exceedances occurred at the shaft location, the SIRT crossing, and along the path of the proposed water mains on Murray Hulbert Avenue, Front Street and Swan Street.

Estimates of the worse case TCLP concentrations were made as discussed previously. Using this conservative TCLP calculation, 22 soil samples collected in Staten Island would have the potential to exceed the maximum allowable TCLP lead concentration. The locations of these exceedances were at the shaft location, the SIRT crossing, along Front Street, and along Van Duzer Street. One sample collected at the SIRT crossing would potentially exceed the maximum allowable TCLP chromium concentration based on the worst case calculation. All other TCLP parameters are expected to be below the regulatory levels based on the bulk soil concentrations and applying the dilution factor of 20. During construction activities, any excavated material would need to be appropriately sampled and analyzed to determine applicable reuse or disposal alternatives that would be suitable for these materials.

2.12.6 Sediment Sampling

In addition to the sampling of upland locations associated with the proposed action, samples were also collected along the siphon alignment in New York Harbor. Samples were collected within or in the general vicinity of the proposed tunnel horizon to identify potential areas of contamination, if any, and to determine potential reuse and disposal options for the materials that would be removed. The location of the sediment samples are shown on Figure 2-22. Seven Phase I borings were completed and environmental samples were collected from three of these boring locations for analysis of the metals arsenic, copper and lead, total PCBs, and PAHs. No PCBs or PAHs were detected above the detection limit in any of the samples. Arsenic was detected in one of the samples and copper and lead were detected in all three samples. Applying the conservative TCLP calculation described above, none of the sediment samples would be expected to exceed TCLP regulatory limits. An additional six sediment samples were collected during the Phase 2 boring program (Figure 2-22) also along the path of the proposed siphon for analysis for TCL volatile organics, PAHs, TCL pesticides, PCBs and



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-22 Sediment Sampling - Upper New York Bay

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

TAL metals. A summary of the detected analytical results for the samples are presented in Attachment 3 of Appendix B. No PAHs, pesticides or PCBs were detected in any of the samples above the detection limit. The metals aluminum, arsenic, barium, beryllium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, sodium, vanadium, and zinc were detected in at least one of the samples. The volatile organics, acetone, carbon disulfide and methylene chloride, common laboratory contaminants, were detected in at least one of the samples at low concentrations. Applying the conservative TCLP calculation described above, none of the sediment samples would be expected to exceed TCLP regulatory limits. As with upland excavation activities, additional sampling and analyses would be conducted to determine appropriate and applicable reuse and/or disposal alternatives for tunnel "muck" during actual construction.

2.12.7 Venturi Chamber Sampling

Three venturi chambers service the two existing siphons between Brooklyn and Staten Island. Two existing chambers are located in Brooklyn at 86th Street and Shore Road and 79th Street and Shore Road. An additional chamber is located in Staten Island at Victory Boulevard. These chambers previously contained mercury-containing meters for the measurement of the water flow rate through the existing siphons. The mercury-containing flow meters have been removed by NYCDEP and replaced with modern electronic, differential-pressure transducers connected to the original venturi tubes. As part of the construction of the new siphon, the existing venturi chambers would be abandoned. The past use of mercury-containing equipment and the suspicion that mercury may have leaked from the equipment led to the need to assess whether a potential public health issue existed and to provide guidance with regard to potential remedial actions that may be required to abandon the chambers appropriately.

Samples were collected from the three chambers following a Work Plan and Health and Safety Plan (HASP) approved by the NYCDEP. The concrete in the chambers was sampled for mercury using wipe samples and also through the collection of chips of concrete. The results of the sampling indicated levels of mercury that exceeded the health-based benchmark developed by the USEPA. Results of this sampling are shown in Table 2-10. Due to the presence of mercury, additional action beyond abandonment in place to decommission the chambers will be required, including the potential for additional sampling.

Table 2-10. Results of Venturi Chamber Sampling

Sample ID	Location	Jerome Reading (mg/m^3)	Wipe Sample Concentration ($\mu g/m^2$)	Chip Sample (mg/kg)
86th Street, Brooklyn				
Location 1	On wall next to metering equipment	0.006	13,000	N/A
Location 2	On floor below metering equipment	0.005	34,000	N/A
Location 3	On furthest adjacent wall	0.003	13,000	N/A
Location 4	On nearest adjacent wall	0.003	21,000	N/A
Location 5	Beneath metering equipment in lower chamber	0.003	8,700	N/A
Blank		0	6.5	N/A
79th Street, Brooklyn				
Location 1	Floor SE corner of chamber 12" from each wall	0.003	4,500	11
Location 2	West wall next to metering equipment; above waterline	0.007	8,100	N/A
Location 3	South wall above waterline	0.006	36,000	N/A
Location 4	South wall below waterline	0.014	100,000	57
Blank		0.005	ND	N/A
Victory Boulevard, Staten Island				
Location 1	West wall; 18" above floor and 18" back from north wall	0.010	48,000	56
Location 2	North wall next to metering equipment; above waterline	0.006/0.010	5,500	N/A
Location 3	East wall; 12" above floor and 12" back from north wall	0.007	18,000	N/A
Location 4	Floor wipe; 8" from West wall, 25" from North wall	0.003	6,700	50
Blank			ND	N/A

Note: ND Not Detected
N/A Not Applicable

2.12.8 Conclusions

Brooklyn

The open spill of 20 gallons of transformer oil that affected the sewer located at the intersection of 83rd Street and Shore Road occurred at a higher elevation, approximately 250 feet from the shaft location. Although this spill has not yet been closed by the NYSDEC, due to the volume of the spill and the indication that it only affected the sewer it does not present a potential environmental concern for the proposed action.

Based upon the sampling completed, the materials to be excavated in Brooklyn are not grossly contaminated. There are exceedances of the TAGM #4046 guidance concentrations, but it is not anticipated that the material will have to be handled as hazardous materials based on the screening calculations that were conducted using the bulk chemistry concentrations to predict estimated TCLP levels. A worker HASP would need to be prepared to address dust control in order to protect workers and the public during excavation activities. These materials will be handled during excavation and transport in compliance with state and local regulations. Material disposal will be in compliance with state and local regulations and additional sampling and analyses that may be required to allow reuse and/or disposal of the materials will be necessary, as applicable and appropriate.

Staten Island

Two Solid Waste Facilities/Landfill sites are located in close proximity to the shaft location. These sites may be a potential recognized environmental condition since both the Thomas J. Manzo transfer station and A. Jofi's Auto Body, Inc., a vehicle dismantling facility, are located at a higher elevation than the proposed site. In addition, the six open LTANKS, the spill volumes of which are unknown, were also identified and are located at a higher elevation than the proposed action and may represent a possible environmental concern. Soil sampling conducted at the proposed locations of the shaft, chlorination station and along the path of the water main, however, did not indicate contamination by petroleum products.

The materials to be excavated in Staten Island are not grossly contaminated and are consistent with the characteristics of urban fill. There were exceedances of the TAGM #4046 guidance concentrations. Based on screening calculations using the measured bulk chemistry concentrations to predict TCLP levels, lead levels at several locations and chromium at one location may potentially result in these materials having to be handled as hazardous materials. Further testing of the excavated materials would be conducted during active construction to determine and/or confirm if these soils may need to be handled as hazardous. Due to the levels

of contamination identified, a HASP that addresses dust control would be prepared in order to protect workers and the public during excavation activities. Materials will be handled during excavation and transport in compliance with state and local regulations. Material reuse and/or disposal will be conducted in compliance with all state and local regulations and additional testing will be completed as required.

Sediment Samples

The materials to be removed during tunneling did not indicate any gross contamination. It is expected based on the sampling conducted, that the materials removed during the construction of the tunnel will not need to be handled as hazardous materials. The material will be handled, transported and disposed of in compliance with all state and local regulations and additional testing will be conducted, as required, to confirm the disposition of these materials.

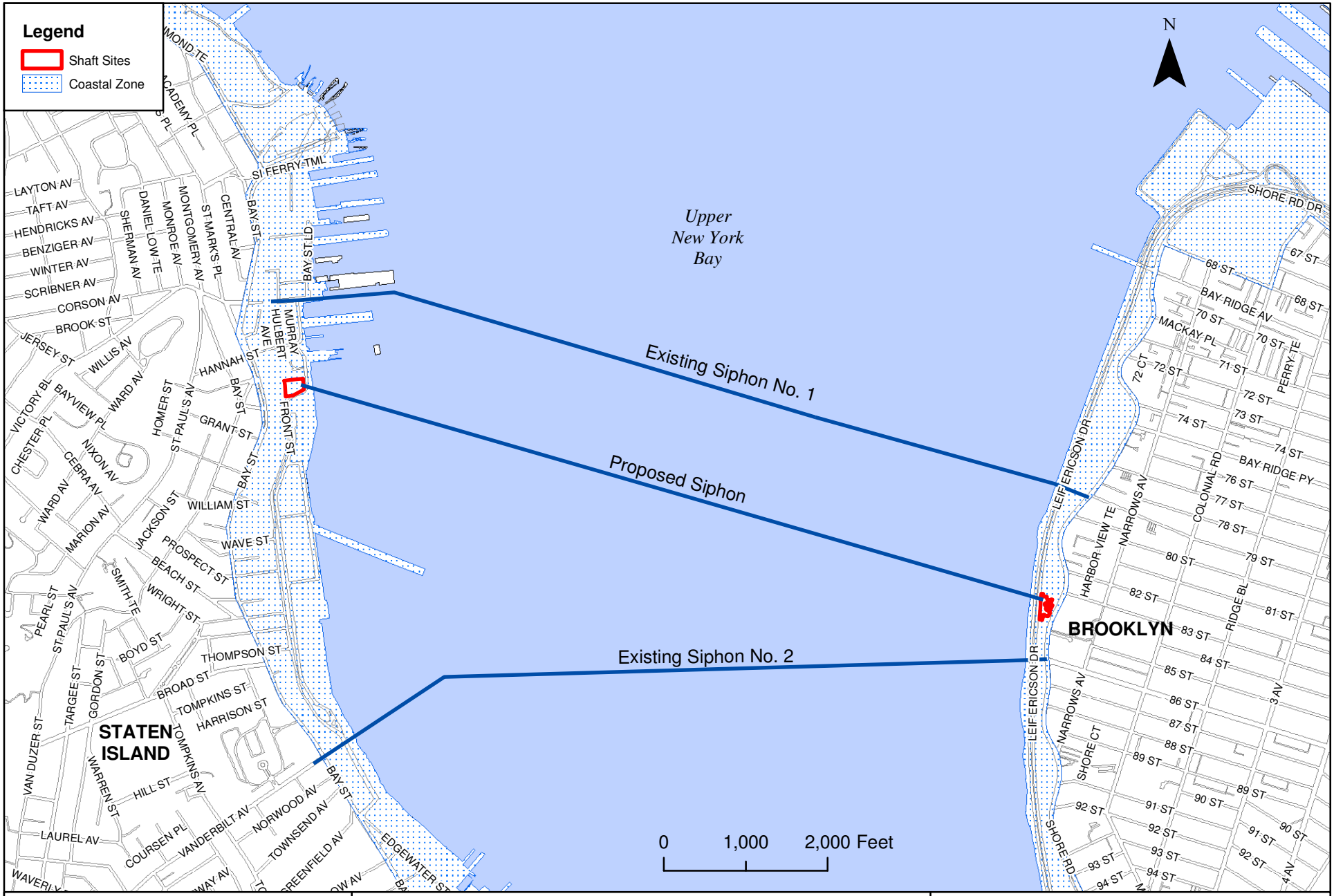
Venturi Chambers

The existing venturi chambers will be abandoned upon completion of the new siphon. As part of this effort, the existing venturi chambers will be demolished, the debris will be removed and the previous locations will be backfilled with clean fill. Based on prior sampling of the venturi chambers, mercury contamination exists within these chambers. As part of the demolition efforts, additional sampling will be required. Concrete samples will be collected from each chamber prior to demolition and analyzed for TCLP parameters in order to determine disposal requirements. Once the concrete is demolished, it will be removed from the chambers and disposed of in compliance with applicable federal, state and local regulations. Samples of the soil surrounding and underlying the chambers will also be collected to ensure that these soils have not been impacted by mercury. If additional contamination is noted, appropriate remedial measures would be implemented in order to address this. In addition, a site-specific HASP that addresses the protection of workers and the public during the sampling and demolition of the chambers and during the subsequent removal of materials from the chambers will be prepared.

2.13 WATERFRONT REVITALIZATION PROGRAM

2.13.1 Introduction

The Federal Coastal Zone Management Act of 1972 established coastal zone management programs to preserve, protect, develop and restore the coastal zone of the United States. The proposed replacement siphon between Brooklyn and Staten Island, their respective shaft sites and the new chlorination station, would be located within the designated coastal zone boundary of New York City (Figure 2-23). The proposed action would be located within



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-23 Coastal Zone Boundary

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

Reaches 15 and 18, as indicated within the "Plan for the Brooklyn Waterfront" and "Plan for the Staten Island Waterfront", respectively. The proposed action is not located within a NYCDCP-designated Special Natural Waterfront Area (SNWA) or Significant Maritime and Industrial Area (SMIA). The proposed replacement of the existing water siphons is, therefore, subject to review under the 10 primary policies and the 32 subpolicies identified within the City's Waterfront WRP. The policies and subpolicies of the WRP address important natural, recreational, industrial, commercial, ecological, cultural, aesthetic, and energy resources of the waterfront.

The proposed action was reviewed to determine its general consistency with each of these policies and subpolicies. This review identified several subpolicies that were not applicable, which included subpolicies 1.2, 2.1, 2.2, 2.3, 3.1, 4.4, 5.2, 6.2, 6.3 and 9.2. In instances where a component of the proposed action required clarification or was potentially inconsistent with a specific policy or subpolicy, further discussion is provided below.

2.13.2 Consistency Assessment

Policy 1: Support and facilitate commercial and residential redevelopment in areas well-suited to such development.

1.1 Encourage commercial and residential redevelopment in appropriate coastal zone areas.

The proposed siphon was designed to provide a secondary/back-up water supply between Brooklyn and Staten Island in addition to providing a small supplemental flow to the existing water supply system in Staten Island. The new siphon would replace two existing siphons that currently traverse Upper New York Bay, which would be abandoned upon completion of the new siphon. Upon its completion, it would represent the only backup water supply for Staten Island and would also provide supplemental flow to the daily water supply (an average of 5 mgd). The proposed shaft site location in Brooklyn and the shaft and chlorination station site in Staten Island would be located within city-owned property, specifically within Shore Road Park and a vacant lot, respectively. A new chlorination station would also be constructed adjacent to the proposed shaft in Staten Island. Upon completion, the new siphon would have no significant aboveground features with the exception of the new chlorination station in Staten Island, which would be an as-of-right use and has been designed to be compatible with the surrounding existing land uses. The proposed action would not directly involve, nor preclude

the development of commercial and residential uses in the area. Therefore, the proposed project would be consistent with this subpolicy.

1.2 Encourage non-industrial development that enlivens the waterfront and attracts the public.

Not applicable.

1.3 Encourage redevelopment in the coastal area where public facilities and infrastructure are adequate or will be developed.

The proposed project would involve the replacement of two existing water siphons that provide a secondary/backup water supply for Staten Island. The proposed action would not significantly increase the volume of water transported, nor would it extend its availability to new areas. Construction of the new siphon would require connection to the existing water mains and infrastructure in the area, as well as the development of a new chlorination station adjacent to the Staten Island shaft site. During construction, temporary infrastructure connections (e.g., electric and water) would be needed and would be adequate for the development of the proposed project. During construction operations, additional electricity would be required to operate the TBM, ventilation equipment, lighting and other construction-related equipment which would be provided from an existing electrical substation within the former Homeport. However, once construction activities are completed, a minimal amount of electric power would be required to maintain the operation of the new chlorination station. No significant permanent changes in energy use are anticipated from the implementation of the new siphon. In addition, there would be no impacts to existing public facilities as the proposed siphon and associated infrastructure would be largely below-grade, unmanned facilities once construction is completed. The proposed action would also represent a replacement of existing infrastructure. The proposed project would be consistent with this subpolicy.

Policy 2: Support water-dependent and industrial uses in New York City coastal areas that are well-suited to their continued operation.

2.1 Promote water-dependent and industrial uses in Significant Maritime and Industrial Areas.

Not applicable.

2.2 Encourage working waterfront uses at appropriate sites outside the Significant Maritime and Industrial Areas.

Not applicable.

2.3 Provide infrastructure improvements necessary to support working waterfront uses.

Not applicable.

Policy 3: Promote use of New York City's waterways for commercial and recreational boating and water-dependent transportation centers.

3.1 Support and encourage recreational and commercial boating in New York City's maritime centers.

Not applicable.

3.2 Minimize conflicts between recreational, commercial, and ocean-going freight vessels.

The proposed siphon would not result in conflicts with recreational, commercial or ocean-going freight vessels, as it would be constructed below the bed of the Upper New York Bay. The new siphon would replace two existing siphons that currently cross the Upper New York Bay. Due to proposed dredging activities within the Anchorage Channel by the USACE, the existing siphons would need to be replaced, as they are currently at a depth that compromises their safety and continued operation.

The proposed siphon would involve the construction of a bored tunnel below the bed of the Upper New York Bay. A TBM would be used to construct a 12-foot 4-inch excavated diameter tunnel that would then be lined with precast concrete liner segments. The 72-inch diameter siphon would then be placed within this bored tunnel and the annulus backfilled with grout. Vertical shafts constructed within upland sites on either side of the harbor would be used as launching (Staten Island) and receiving (Brooklyn) locations for the TBM. Construction of the shafts, water main connections and chlorination station would all occur above the MHW line. The only structure that would be located within the Upper New York Bay would be the siphon, which would be located beneath the bed of the Bay. Replacement of the existing siphons would remove a potential conflict to

anticipated commercial shipping within the harbor complex. Therefore, the proposed project would be consistent with this subpolicy.

3.3 Minimize impact of commercial and recreational boating activities on the aquatic environment and surrounding land and water uses.

The proposed project would not impact commercial or recreational boating activities. Therefore, this subpolicy is not applicable.

Policy 4: Protect and restore the quality and function of ecological systems within the New York coastal area.

4.1 Protect and restore the ecological quality and component habitats and resources within the Special Natural Waterfront Areas, Recognized Ecological Complexes, and Significant Coastal Fish and Wildlife Habitats.

Based upon a review of SNWAs as described in "The New Waterfront Revitalization Program," as well as Recognized Ecological Complexes and Significant Coastal Fish and Wildlife Habitat (SCFWH) information, the proposed action would not be located within a designated area. The proposed siphon would be constructed within a tunnel with the top of the tunnel at least 95 feet below MLW or within areas that are located above the MHW with the exception of a new stormwater outfall that would drain the proposed chlorination station and additional surrounding areas. The new outfall would be located east of the shaft and chlorination station within the existing sheet pile bulkhead. The proposed siphon and associated upland improvements would represent the replacement of an existing use. Development of the new outfall would result in temporary impacts to wetlands, specifically littoral zone, from the development of a temporary cofferdam that would be utilized for the construction of the outfall structure. Approximately 150 square feet of littoral zone would be temporarily impacted for approximately one week. Control measures, such as silt curtains or a floating boom around the cofferdam, as well applicable best management practices (e.g., sediment and erosion control plans) would be implemented during construction of the new outfall. These impacts would be short term, temporary and limited in extent. It is expected that these areas would return to their pre-construction condition within a short period of time after the completion of construction. No adverse impacts due to the discharge of uncontaminated stormwater would be anticipated. The proposed action would not result in any

long-term impacts to natural resources and would, therefore, be consistent with this subpolicy.

4.2 Protect and restore tidal and freshwater wetlands.

A review of NYSDEC tidal wetland and the USFWS NWI maps was conducted to determine the presence or absence of wetlands within or in close proximity to the proposed project locations. The new siphon would cross the Upper New York Bay, which is a NYSDEC-designated littoral zone (LZ). In addition, the USFWS designates the bay as an estuarine, unconsolidated bottom, subtidal wetland (E1UBL) in vicinity of the project. The new siphon, however, would be constructed entirely beneath the bed of the Upper New York Bay within a tunnel that would be located at a depth of at least 95 feet below MLW. No upland activities associated with the construction or operation of the siphon would occur below the MHW line or within regulated tidal wetland adjacent areas with the exception of a proposed stormwater outfall that would drain the new chlorination station, as well as the surrounding area, and would discharge to the Upper New York Bay. In addition, no wetlands were identified within or immediately adjacent to the upland shaft locations or proposed construction staging and laydown areas.

During construction of the proposed stormwater outfall, a temporary cofferdam would be placed within the Upper New York Bay, which would temporarily impact wetlands (i.e. littoral zone) within the limits of this temporary structure, estimated at approximately 150 square feet. The cofferdam would be placed within the Upper New York Bay for approximately one week to allow for construction activities to occur in dry conditions. Control measures, such as silt curtains or a floating boom around the cofferdam, as well applicable best management practices (e.g., sediment and erosion control plan, stormwater pollution prevention plan) would be implemented during construction of the new outfall. The proposed outfall would drain uncontaminated stormwater from the proposed chlorination site and surrounding area. This outfall was originally evaluated as part of the FEIS for the New Stapleton Waterfront Development Plan, which was completed in September 2006. The proposed stormwater sewer would be constructed in accordance with all necessary permits and approvals. The proposed action would not result in any significant impacts to existing wetlands and would be consistent with this subpolicy. Construction impacts would be

temporary. Excavation volumes from the outfall construction would be minimal and therefore no impacts are anticipated.

4.3 Protect vulnerable plant, fish and wildlife species, and rare ecological communities. Design and develop land and water uses to maximize their integration or compatibility with the identified ecological community.

The USFWS threatened and endangered species list for Kings and Richmond counties identified the potential presence of the endangered shortnose sturgeon (*Acipenser brevirostrum*), which occurs primarily in the Hudson River, in proximity to the proposed site. Development of the proposed siphon would involve little or no activities within the Upper New York Bay, as the siphon would be located below the bed of the bay. Construction of the portions of the siphon within the Upper New York Bay would be through the use of a TBM launched from Staten Island. Development of a new stormwater outfall that would drain uncontaminated stormwater from the proposed chlorination station would also not affect this species.

The NYSDEC NHP reviewed the proposed action and concluded that the proposed development and operation of the new siphon, the upland shafts, chlorination station and new water main connections would not result in any significant effects on threatened and endangered species. The majority of the upland portions of the proposed development would occur within previously developed and/or disturbed areas that possess vegetative species typical of disturbed environments and which provide limited habitat value. The proposed action would, therefore, not be anticipated to result in impacts to protected species and would be consistent with this subpolicy.

4.4 Maintain and protect living aquatic resources.

Not applicable.

Policy 5: Protect and improve water quality in the New York City coastal area.

5.1 Manage direct or indirect discharges to waterbodies.

Operation of the new siphon would not result in direct or indirect discharges to the Upper New York Bay with the exception of a new stormwater outfall associated with the proposed chlorination station and surrounding areas. All other construction operations would occur within upland areas. Construction of the

shafts, however, could potentially involve pumping of accumulated water or some limited dewatering activities. These waters would either be directed to the municipal sewer system or to the Upper New York Bay. All dewatering and pumping activities would be conducted in accordance with applicable rules and regulations and waters would be treated as appropriate prior to being discharged. Development of the new chlorination station would include the development of a new stormwater outfall to the Upper New York Bay, which would drain the area surrounding the chlorination station and portions of the area comprising the New Stapleton Waterfront Development Plan. The potential effect of this outfall upon the Upper New York Bay was assessed as part of the FEIS for the Stapleton Waterfront Plan, which determined that there would be no adverse impact. No potential contamination of this stormwater would be anticipated as all process activities would occur within the chlorination station structure. Appropriate permits and approvals would be acquired prior to commencement of these activities.

5.2 *Protect the quality of New York City's waters by managing activities that generate nonpoint source pollution.*

No nonpoint source pollution would be associated with the operation of the proposed siphon. All upland construction activities would be conducted in accordance with applicable federal, state and local regulations and SWPPPs would be developed and implemented as appropriate to minimize potential sources of nonpoint pollution during construction.

5.3 *Protect water quality when excavating or placing fill in navigable waters and in or near marshes, estuaries, tidal marshes, and wetlands.*

No excavation or filling within wetlands or adjacent surface waters would occur as part of the proposed action. Excavation of the shaft sites would be located within upland areas in Brooklyn and Staten Island above the MHW line. Construction of the siphon beneath the Upper New York Bay would be accomplished through tunneling and would also result in no impacts to water quality. A new outfall would be constructed that would drain uncontaminated stormwater from the proposed chlorination station and other areas to the Upper New York Bay. Temporary impacts to littoral zone wetlands would result from the placement of a temporary cofferdam during the construction of this outfall. Control measures, such as silt curtains or a floating boom around the cofferdam,

as well applicable best management practices (e.g., soil and erosion control plans) would be implemented during construction of the new outfall Proposed construction activities would comply with applicable regulations and would not result in long-term adverse effects to water quality, wetlands or other natural resources. The proposed project would be consistent with this subpolicy.

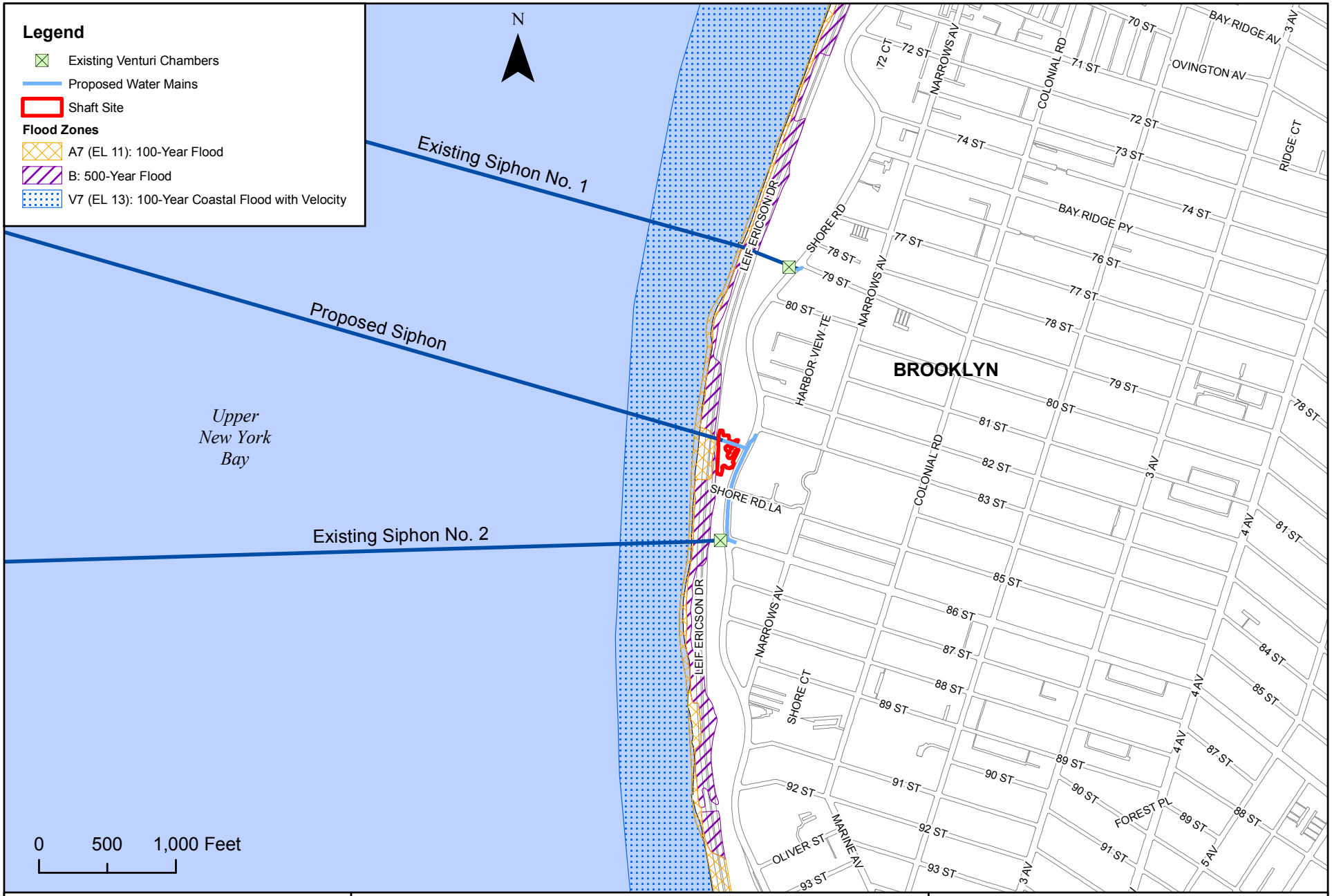
5.4 Protect the quality and quantity of groundwater, streams, and the sources of water for wetlands.

Development and operation of the new siphon would not directly impact the quality or quantity of streams or sole sources of water for wetlands. As part of the construction of the siphon, shafts would be constructed within upland parcels on opposite sides of Upper New York Bay. The proposed Brooklyn shaft site, however, and a portion of the proposed siphon would be located within the limits of a USEPA – designated Sole Source Aquifer, specifically the Brooklyn-Queens Aquifer. Construction of the Brooklyn shaft would involve the excavation of a vertical hole approximately 151 feet deep. Pumping of accumulated water or limited dewatering activities may be required during construction, however, this is not expected to affect existing groundwater elevations due to the relatively low pumping rates anticipated. Proposed construction activities at this location would comply with applicable regulations and would not be anticipated to affect the integrity of the aquifer. Appropriate measures would be put in place to limit potential adverse affects to the aquifer from the use and/or temporary storage of petroleum or hazardous substances during construction activities.

Policy 6: Minimize loss of life, structures and natural resources caused by flooding and erosion.

6.1 Minimize losses from flooding and erosion by employing non-structural and structural management measures appropriate to the condition and use of the property to be protected and the surrounding area.

A review of Federal Emergency Management Agency (FEMA) National Flood Insurance Program maps indicates that the proposed Brooklyn shaft site and the venturi chambers that would be demolished and removed would be outside any mapped floodplain (Figure 2-24). However, the proposed shaft and chlorination station site in Staten Island would be located partially within Zone AE, the 100-year floodplain, and the remainder within Zone X, the 500-year floodplain (Figure 2-25). The proposed shaft would essentially be a temporary excavation. Upon completion of the siphon, the vertical riser piping would be installed and covered

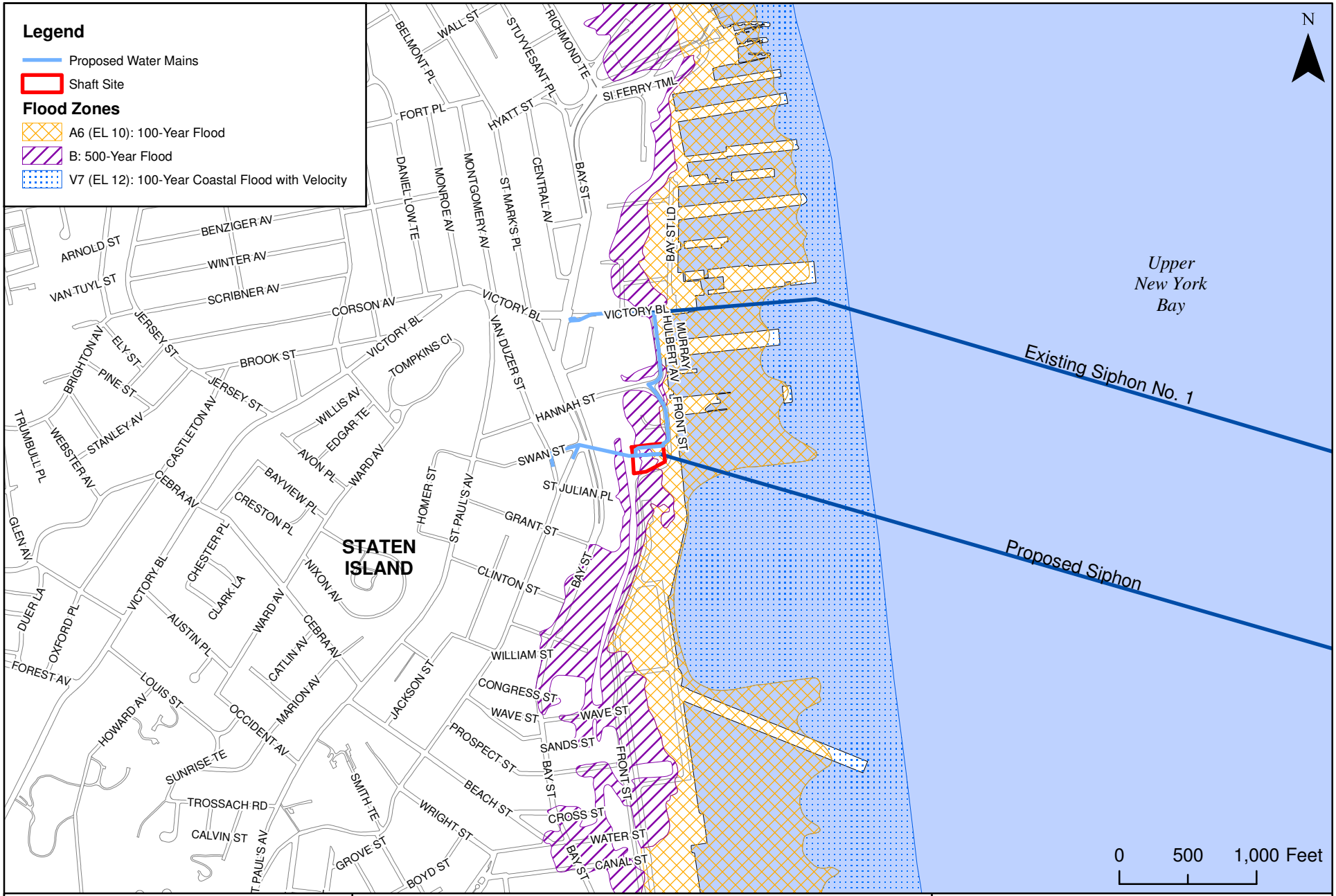


HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-24 Floodplains - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation



HydroQual, Inc
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201) 529-5728

Figure 2-25 Floodplains - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

by a chamber that would contain valves that control water flow from the risers in the shaft to and from the transmission mains in Brooklyn and Staten Island. The remainder of the previously excavated shaft area would then be backfilled. Likewise, the finished floor of the chlorination station would be situated at 12 feet (NGVD 1929 datum) and would not require any additional flood management measures. Any valve chambers within the 100-year floodplain will either have proposed access openings at an elevation greater than 12 feet (NGVD 1929 datum) or have a watertight cover. Proposed construction activities associated with replacement of the existing water siphon would not be anticipated to result in an increase in flooding or erosion and would comply with applicable federal, state and local requirements. The proposed action would be consistent with this subpolicy.

6.2 Direct public funding for flood prevention or erosion control measures to those locations where the investment will yield significant public benefit.

Not applicable.

6.3 Protect and preserve non-renewable sources of sand for beach nourishment.

Not applicable.

Policy 7: Minimize environmental degradation from solid waste and hazardous substances.

7.1 Manage solid waste material, hazardous wastes, toxic pollutants, and substances hazardous to the environment to protect public health, control pollution and prevent degradation of coastal ecosystems.

During operation, the new siphon would not result in the generation of waste. Operation and maintenance of the chlorination station would be expected to generate a minimal amount of typical solid waste, as the station would largely operate as an unmanned facility. However, during construction activities, muck, overburden and rock would be excavated from the bored marine tunnel, shafts and water transmission mains. This material would be removed from these sites by trucks and reused, if appropriate, or disposed of at an appropriate and licensed upland facility. Materials removed from the tunnel would be conveyed to the Staten Island shaft site for removal and management. Prior to disposal and removal from the shaft site, excavated materials would be tested, as necessary. Depending on the characterization of these materials, material would be disposed

of at a permitted solid waste facility or soil recycling facility in accordance with federal, state and local regulations and requirements. If materials were to exhibit characteristics of a hazardous material they would be disposed of at a permitted RCRA hazardous waste disposal facility.

Operation of a new chlorination station in Staten Island would involve the storage and use of sodium hypochlorite for chlorinating potable water from the new siphon. Approximately 5,000 gallons of this material would be located at the new station. Quantities of this material are currently stored at the existing Richmond Chlorination Facility located immediately to the north of the proposed chlorination station site. This facility, as well as the new chlorination station, will be owned and operated by the NYCDEP. Storage of this material would be in accordance with applicable rules and regulations, such as the NYSDEC chemical bulk storage requirements. In addition, a standby, ultra-low sulfur diesel powered generator would be located at the proposed chlorination facility. Diesel fuel storage for this would be approximately 400 gallons, but would also be consistent with applicable federal, state, and local environmental requirements and fire codes.

In addition, during construction of the new siphon and associated infrastructure, the Staten Island and Brooklyn shaft sites would require the use of a standby diesel-operated generator for lighting, ventilation, and other purposes in the event of a loss of power. Petroleum for these generators would be stored temporarily on-site and would be managed and handled according to all applicable regulations. Once construction activities are completed, the operation of the new siphon would not require the management, storage or use of petroleum products with the exception of the chlorination station discussed previously.

The construction staging areas would be located upland. Appropriate sediment and erosion controls would be put in place. The proposed construction and operation of the siphon and associated infrastructure would not result in degradation or impacts to the surrounding environments and would be consistent with this subpolicy.

7.2 Prevent and remediate discharge of petroleum products.

See response to Subpolicy 7.1.

7.3 Transport solid waste and hazardous substances to site solid and hazardous waste facilities in a manner that minimizes potential degradation of coastal resources.

See response to Subpolicy 7.1.

Policy 8: Provide public access to and along New York City's coastal waters.

8.1 Preserve, protect and maintain existing physical, visual and recreational access to the waterfront.

The proposed siphon would be a subaqueous pipeline and would therefore not result in impacts to visual resources. The Staten Island shaft and chlorination station site would be located within a vacant lot in an industrial area of Stapleton that currently does not support physical or recreational access to the waterfront. Front Street and a chain link fence currently separate the site from the bay. Situated immediately south of the site is the Stapleton Waterfront Special Purpose District. This area has been proposed for redevelopment by the NYCEDC and NYCDCP as part of the proposed Stapleton Redevelopment Plan efforts and would incorporate large areas of public waterfront and recreational access. Development of Phase I of the proposed plan is the only component that is currently moving forward. In addition, streetscape improvements along Murray Hulbert Avenue as part of the North Shore Esplanade would not be implemented until siphon-related work in this location is completed.

The Brooklyn shaft site would be situated within a NYCDPR-operated park; specifically Shore Road Park located on Shore Road in Brooklyn. The site is physically separated from the waterfront by the Leif Ericson Drive (Belt Parkway). During construction of the Brooklyn shaft, portions of the park would be temporarily affected. However, this would be short-term and would not preclude access to other portions of the park. Upon completion of the shaft construction, the shaft would be covered and the shaft area and a buffer of approximately five feet would be temporarily fenced, while the remainder of the park impacted by construction would be seeded and public access restored. No less than 21 days before the expected breakthrough of the TBM, the shaft and construction area would be reopened and re-established and utilized as the receiving shaft for the TBM. In addition, a temporary pedestrian entrance and path between the southern edge of the construction zone and Shore Road Lane would be constructed to allow for continued access to the north and south of the

site during construction. The path would link the existing asphalt path with the park sidewalk, through a temporary hole in the park fence if appropriate. Upon the completion of all construction, the location would be fully restored in accordance with NYCDPR requirements and a Memorandum of Understanding that would be entered into between the NYCDPR and the NYCDEP.

Therefore, the proposed project would not affect the public's ability to access the waterfront.

8.2 Incorporate public access into new public and private development where compatible with proposed land use and coastal location.

The proposed action would involve the replacement of existing water supply infrastructure and would represent the sole secondary/backup water supply to Staten Island from Brooklyn. The proposed siphon would be located beneath the Upper New York Bay with two upland shaft locations, one in Staten Island and the other in Brooklyn. The shaft site in Staten Island would be located within a vacant city-owned lot, while the Brooklyn shaft site would be located in Shore Road Park.

The Staten Island site is located immediately north of the proposed Stapleton redevelopment area, which when complete, would offer several areas of waterfront access and recreational uses, including a sports complex and a mile-long waterfront esplanade. In Brooklyn, Shore Road Park offers multiple locations for viewing the waterfront and recreational uses. The proposed project would not preclude the future development of public access along the bay.

8.3 Provide visual access to coastal lands, waters and open space where physically practical.

Proposed construction activities would involve the installation of a new siphon, access shafts, distribution chambers and water transmission mains. The majority of these components would be underground. At the Staten Island shaft location, a new chlorination station would also be constructed as part of the proposed action. It is, however, not anticipated that the new station would impede visual access to coastal lands and waters as a majority of this structure would be located below grade in an underground, reinforced concrete vault. The single story, above-ground building, occupying an area of less than 1,000 square feet, would consist of a two-room structure containing electrical switchgear, instrumentation and a

standby generator. The Brooklyn site would have limited aboveground structures once construction activities are completed. At-grade structures at both shaft sites would include access manholes and valve covers. It is not anticipated that the proposed project would significantly obstruct or impair visual access to coastal lands, waters or open space. Therefore, the proposed project would be consistent with this subpolicy.

8.4 Preserve and develop waterfront open space and recreation on publicly owned land at suitable locations.

There is currently limited waterfront open space available in the vicinity of the Staten Island shaft location. However, as discussed in Subpolicy 8.2, the Stapleton Waterfront Development project, located immediately south of the site, would incorporate new waterfront open space and recreation. The Brooklyn shaft site would be located within a small area of Shore Road Park. The temporary use of a small portion of the park (approximately 28,600 square feet) during construction would not deprive the public from use of the remainder of the park. In addition, once construction is complete the site would be restored and returned to park use.

The proposed project would be consistent with this subpolicy.

8.5 Preserve the public interest in and use of lands and waters held in public trust by the state and city.

The proposed siphon would be located in the Upper New York Bay within lands under water currently owned by New York State. Therefore, as part of the proposed project, the NYCDEP would seek a pipeline or utility easement (River Bed Easement) from the State to allow for construction and operation of the siphon. However, it should be noted that the easement from the State would not remove the property from public ownership since the easement would be to permit the City of New York to place the siphon under the Upper New York Bay. The proposed subaqueous siphon would extend across the bay for approximately 1.75 miles. The granting of this easement would, in no way, diminish or affect other public lands and waters, therefore, the proposed project would be consistent with this subpolicy.

Policy 9: Protect scenic resources that contribute to the visual quality of the New York City coastal area.

9.1 Protect and improve visual quality associated with New York City's urban context and the historic and working waterfront.

Development of the new siphon is not anticipated to have an adverse impact on visual resources within the surrounding neighborhoods of Stapleton and Bay Ridge. The proposed action would involve the replacement of two existing siphons, the development of a new chlorination station and associated upland infrastructure (i.e., water mains and a new stormwater sewer). The replacement of the existing water siphons would only involve the construction and installation of infrastructure to ensure a continued and reliable transport of potable water between Brooklyn and Staten Island. A majority of the proposed action would be underground. The proposed action would not result in significant impacts to the existing urban context or the historic and working waterfronts of the Upper New York Bay, as the coastlines and waterfronts would remain unchanged. The proposed action would not result in any additional impact to visual quality. The proposed project would be consistent with this subpolicy.

9.2 Protect scenic values associated with natural resources.

The proposed project would pose no new significant impacts to surrounding natural areas. This subpolicy would not be applicable.

Policy 10: Protect, preserve and enhance resources significant to the historical, archaeological and cultural legacy of the New York City coastal areas.

10.1 Retain and preserve designated historic resources and enhance resources significant to the coastal culture of New York City.

A review of the proposed action by the SHPO indicated that no known historical resources exist at or within 400 feet of the proposed shaft sites. The SHPO concluded that the proposed construction of the replacement water siphon, including the access shafts, chlorination station, distribution chambers, and water transmission mains, would not be expected to result in any significant impacts to designated historic resources significant to the coastal culture.

10.2 Protect and preserve archaeological resources and artifacts.

A review of the LPC database and available publications indicated that no known archaeological resources exist at or within 400 feet of the proposed shaft sites or other components of the proposed action, nor are the proposed sites located within

any known Historic District. The LPC concluded that the proposed construction of the replacement water siphon, including the access shafts, chlorination station, distribution chambers, and water transmission mains, would not be anticipated to result in any significant impacts to archaeological resources and artifacts.

2.14 INFRASTRUCTURE

Infrastructure is defined as "physical systems that support its population – water supply; wastewater; sanitation; energy; even roadways, bridges, tunnels and public transportation." The proposed action and subsequent completion of the new siphon and related water supply infrastructure would not result in a significant additional need for potable water, nor would it result in a significant increase in sanitary sewage and stormwater disposal needs. The proposed action would not create any significant new infrastructure demands.

Proposed water main excavation activities would not result in significant impacts to adjacent sewer systems. The proposed action would require the removal of portions of the sewer infrastructure in proximity of, and incidental to, the proposed excavations to accommodate the new water mains. During the course of the proposed construction activities, the impacted sewer lines, respective catch basins and associated infrastructure would be replaced in kind, with two exceptions where the sewer line diameters would be increased. A new 36-inch combined sewer line would replace the 24-inch sewer line between the intersection of Shore Road and 86th Street and the intersection of Shore Road and Shore Road Lane in Brooklyn. In Staten Island, a new 24-inch sewer line would replace the existing 24-inch sewer line in the vicinity of Victory Boulevard and Murray Hulbert Avenue/Front Street.

The scheduled dredging activities of the harbor deepening project for this reach of the Upper New York Bay would likely result in adverse structural impacts to the two abandoned, existing siphons between Brooklyn and Staten Island. The land-side locations of the two existing siphons in Brooklyn and Staten Island would be sealed off prior to siphon abandonment. Potential impacts associated with the *in situ* demolition would not be significant or result in any adverse affects to the biota along the floor of the bay.

2.15 SOLID WASTE AND SANITATION SERVICES

No significant new solid waste would be generated from the proposed action during the operation of any proposed facilities. The facilities would be unmanned, requiring minimal solid waste disposal or sanitation services. During the construction phases of the proposed action, all excavated materials would either be beneficially utilized, if possible, or would be transported by a contracted, licensed hauler to appropriate waste management facilities and disposed of in

accordance with all federal, state and local regulations. Potential beneficial uses could be as a clean fill material, landfill cover material or other similar uses. All materials would be managed at private facilities and the proposed action would not result in any significant effect upon existing solid waste and sanitation services within the City of New York.

Construction of the overall project would involve a significant amount of excavation. Significant excavation would be associated with the development of the two shafts, the harbor crossing and other components (e.g. land piping and chlorination station) of the proposed action. Excavated material, including materials generated from the development of the subaqueous tunnel and removed from the land-based water main, sewer replacement, shaft and chlorination facility construction activities is expected to total approximately 82,290 cubic yards. Estimated quantities by major construction activity are presented within Table 2-11.

Table 2-11. Summary of Anticipated Volume of Excavated Materials

Location	Quantity (cubic yards)
Brooklyn Water Main	6,625
Brooklyn Sewer Replacement	1,495
Staten Island Water Main	20,510
Staten Island Sewer Replacement	1,115
Chlorination Facility	2,775
Launching Shaft – Staten Island	3,260
Receiving Shaft - Brooklyn	4,740
Harbor Tunnel	41,770
Total Estimate	**82,290**

The City is committed to the beneficial reuse of as much of this material as feasible. Material will be delivered to sites where a Beneficial Use Determination (BUD), if in New York State, can be obtained prior to removal from the project sites or other beneficial use of these materials may be possible. Such beneficial use of excavated material will be contingent upon additional environmental testing that will be conducted upon removed materials. Acceptability of materials will be based upon chemical and physical (e.g., grain size, moisture content) characteristics. Material that cannot be reused will be disposed of at appropriate and licensed facilities. It is not expected that the expected quantity of materials to be removed during construction would result in a significant impact to existing solid waste and sanitation services.

2.16 ENERGY

The proposed action would require energy during construction and upon full operation of the proposed facilities. Energy requirements associated with the operation of the proposed facilities would be minimal and largely only associated with the operation of the proposed chlorination station in Staten Island. During construction of the proposed shafts and the subaqueous tunnel more significant amounts of electricity will be required. These would be associated with the maintenance of "life-support" facilities (e.g. ventilation, lighting, dewatering, etc.) required for the shaft and tunnel construction. The most significant need for electrical power, however, would be the TBM. A dedicated electrical service would be required for the operation of the TBM over the duration of the tunnel drive, a period of approximately 13 months. Electrical service will be provided from an existing substation located at the Homeport and under the jurisdiction of the NYCEDC. It is estimated that the total electric usage for the TBM during construction will be approximately 4,000,000 kilowatt-hours.

Temporary ground support of the shaft sidewalls would be accomplished through slurry wall construction methods; however, the selected contractor may also choose to utilize ground freezing techniques in lieu of slurry walls for construction of the shafts. The ground freezing method would require electrical power; however, this method would not be used if a verification of electrical power availability is not confirmed. In addition, low horsepower equipment (e.g. bentonite mixers, water pumps, etc.) that would be used during the construction of the slurry wall shaft alternative would also be electric powered. Based upon the use of the existing Homeport substation, sufficient electrical power is available for the Staten Island shaft site, however this has not been verified for the Brooklyn shaft site.

Upon completion of construction activities, electricity would be required for operation of the chlorination station. The electricity will be used for heaters, exhaust fans, dehumidifiers and the chlorination process itself. It is estimated that the total electric usage per year will be approximately 190,587 kilowatt-hours. No other components of the proposed action would utilize significant amounts of electricity on an ongoing basis.

The proposed action would not result in any unusual, long-term energy requirements and would conform to standards set by the New York State Energy Conservation Code (NYSECC). Although a substantial amount of electrical power would be required to operate the TBM, this need is not expected to have an adverse impact on the ability of local utilities to meet this requirement and it would represent a short-term need. Consolidated Edison (Con Ed) and other local utilities regularly conduct assessments of their infrastructure and schedule appropriate upgrades to accommodate increasing use and needs. The proposed action and its subsequent

operation are not expected to impact the ability of local utilities to meet electrical needs within the region.

2.17 TRAFFIC AND PARKING

2.17.1 Introduction

The purpose of this traffic assessment is to qualitatively evaluate the effects of replacing the two existing water siphons between Brooklyn and Staten Island, New York. Upon completion, the proposed action is not expected to result in significant long-term traffic and transportation impacts. The siphon, water supply shafts, distribution chambers and other components of the proposed action would be largely below grade with the exception of the proposed chlorination station in Staten Island. These facilities would not be permanently staffed. Periodic inspections and/or maintenance will occur (e.g., 0 to 5 visits per week). Consequently, additional traffic would not be generated and existing traffic patterns, volumes and parking would not be affected by the proposed action. However, traffic conditions during construction need to be assessed to determine if the *CEQR Technical Manual* threshold of 50 vehicle trips per hour would not be exceeded for construction-related worker and truck trips. This assessment is discussed in additional detail below.

2.17.2 Existing Conditions

Traffic volumes in the Brooklyn and Staten Island areas are described below in order to characterize general background conditions. These volumes were determined by 24-hour Automatic Traffic Recorder (ATR) machine counts obtained at four locations (two each in Staten Island and Brooklyn) along roadways near each shaft site adjacent to noise receptors deployed for noise assessment purposes during the weekday AM and PM peak periods. For the two Staten Island locations, the counts were obtained from the Stapleton Waterfront Development FEIS (September 2006) along with additional ATR counts performed in June 2007 along Bay Street between Hannah and Minthorne Streets and also at Vanderbilt Avenue between Bay Street and Errington Street. For the two locations in Brooklyn, ATR counts were performed in June 2007 along Shore Road between 86th Street and Shore Road Lane and also at 86th Street between Shore Road and Narrows Avenue.

Staten Island

As shown in Figures 1-3 and 1-4, construction is expected to occur at the proposed shaft and chlorination station site between Bay and Front Streets and at the proposed connections to the existing water mains at Victory Boulevard and Van Duzer Street Extension.

The primary north-south access streets are Bay Street and Front Street. Bay Street extends north-south inland within the local community, while Front Street bypasses Bay Street along the waterfront. Some key east-west routes include Hylan and Victory Boulevards, Swan/Van Duzer Street, and Vanderbilt Avenue. Presented below is a discussion of some of the key roadways in the vicinity of the study area:

- *Bay Street* is a north-south arterial that extends between the Staten Island Ferry Terminal to the north and School Road (in the vicinity of the Verrazano-Narrows Bridge) to the south. Bay Street consists of two to three travel lanes in each direction with street parking available at times on both sides. The majority of vehicles that access the waterfront travel along or across Bay Street at some point along their route.

- *Victory Boulevard* is an east-west arterial that provides local and regional access. It extends from Bay Street and connects with the Staten Island Expressway/Route I-278 (SIE) and the West Shore Expressway (Route 440) on the western end of Staten Island. Victory Boulevard consists of two lanes in each direction in the vicinity of the study area. Parking is available at times on both sides.

- *Front Street* is a north-south roadway that intersects with Bay and Edgewater Streets at its southern end and with Hannah Street at the northern end. Front Street is generally characterized by one wide travel lane in each direction. Direct access to the proposed shaft location would be from Front Street.

The traffic data identified 8:00-9:00 AM and 4:30-5:30 PM as the weekday AM and PM peak hours, respectively. Overall, traffic flow is moderate along the key commuter routes during the weekday AM and PM peak hours, and the more local streets carry much lower volumes.

Typical weekday peak hour vehicular volumes along Bay Street between Hannah and Edgewater Streets vary from approximately 350 to 500 vehicles per hour (vph) in the northbound direction and approximately 450 to 650 vph in the southbound direction. Along Front Street, the volumes range from approximately 200 to 300 vph in each direction during the peak hours. Most of this volume is traffic that uses Front Street as an alternative to the more heavily traveled Bay Street based on information obtained from the Stapleton Waterfront Development FEIS. Along the east/west approaches, volumes range from approximately 150 to 400 vph on Victory Boulevard, approximately 60 to 160 vph on Van Duzer Street, and approximately 70 to 370 vph on Vanderbilt Avenue.

The project vicinity experiences low to moderate pedestrian activity mainly along Bay Street. Pedestrian activity is moderate in the vicinity of Victory Boulevard due to the presence of bus stops and the SIRT station.

Brooklyn

As shown in Figure 1-2, construction is expected to occur at the proposed shaft site just west of Shore Road between Shore Road Lane and 83rd Street, at the location of proposed water main construction within Shore Road between 83rd and 86th Streets, and at the proposed connections to the existing water main at 86th Street.

The key commuter routes are 86th Street and Fourth Avenue. 86th Street travels in an east-west direction, while Fourth Avenue travels north-south. Shore Road travels parallel to Fourth Avenue and provides local access. It should be noted that Fort Hamilton High School and adjacent athletic fields are located at the intersection of 83rd Street and Shore Road in close proximity to the project site. Provided below is a discussion of some of the key roadways in the study area vicinity:

- *86th Street* is an east-west arterial that extends from Shore Road past the project shaft site and provides access to the Brooklyn-Queens Expressway (I-278). It consists of two travel lanes in each direction with curbside parking on both sides. The intersection of 86th Street and Fourth Avenue serves as a transit hub providing connection to the subway system and several local and express buses.

- *Fourth Avenue* is a key north-south arterial east of the project site that extends from Flatbush Avenue to the north and Shore Road to the south. It provides access to I-278 and the Prospect Expressway and consists of two travel lanes in each direction south of 65th Street. Parking is allowed on both sides of the roadway.

- *Shore Road* travels north-south and extends from Colonial Road in the north and Fourth Avenue in the south. It travels parallel to the Belt Parkway from the Verrazano-Narrows Bridge exit to the merge with I-278. Shore Road consists of one travel lane in each direction along with an exclusive bike lane along the west curb. Parking is allowed on both sides of the street.

The traffic data identified 7:45-8:45 AM and 4:45-5:45 PM as the weekday AM and PM peak hours, respectively. Overall, traffic flow along 86th Street is generally low to moderate in the vicinity of the proposed project site (near Shore Road), carrying approximately 60 to 180 vph during the weekday AM peak hour and 40 to 90 vph during the weekday PM peak hour. 86th

Street carries approximately 240 to 540 vph in each direction near its intersection with Fourth Avenue.

Along Shore Road, the volumes range from approximately 200 to 300 vph in each direction during the weekday AM peak hour and are approximately 190 vph in each direction during the weekday PM peak hour. Volumes exiting onto 83rd Street from Shore Road are approximately 110 vph during the weekday AM peak hour and approximately 60 vph during the weekday PM peak hour.

Along Fourth Avenue, volumes range from approximately 410 to 450 vph in the northbound direction. Southbound Fourth Avenue volumes are approximately 250 vph in the weekday AM peak hour and 510 to 560 vph in the weekday PM peak hour.

The vicinity of the project site has a relatively low volume of pedestrian traffic utilizing sidewalks and crosswalks during the peak hours with the exception of the intersection of 86th Street and Fourth Avenue, which experiences heavy pedestrian activity due to the presence of the subway station and bus lines.

2.17.3 Future Conditions During Construction

Construction of the proposed shafts, chlorination site and the connections to existing water mains on Staten Island and in Brooklyn is not expected to have extensive or long-term impacts on traffic or parking conditions within the surrounding area.

The proposed construction activity is expected to commence in May 2010 and end in June 2013. It would generate worker trips traveling to and from the sites, as well as the movement of goods and equipment. The estimated average number of construction workers on each site at any one time would vary depending on: construction of the shafts; construction of the tunnel; construction of the water mains; and construction of the chlorination station. Construction is generally not expected to occur concurrently during any of these construction stages (three in Brooklyn and four in Staten Island) within each borough.

Construction traffic would primarily involve the delivery of construction materials and the removal of excavated soil and muck as part of the development of the shafts, siphon and chlorination station. These activities would involve truck traffic at both sites. As the Staten Island site is located in close proximity to Upper New York Bay and the majority of construction activities for the development of the tunnel would occur at this location, an evaluation of the potential use of barges for the removal and delivery of materials was also conducted. Potential barge transportation alternatives were evaluated in close proximity to the proposed site and also

at the former Homeport pier. Further evaluation of barges as an alternative to truck transport indicated that the Homeport was not suited for these activities in its present configuration. In addition, development of a temporary facility adjacent to the Staten Island site was also deemed unacceptable due to the need to acquire additional permits that would potentially impact the overall construction schedule, the potential need to dredge to provide suitable water depths for barges, the need for receiving facilities that could offload shaft and tunnel spoils and initial concerns raised by regulatory agencies about this alternative. As a result, trucks will transport materials to and from the Brooklyn, as well as the Staten Island sites.

Construction worker travel would typically take place during the hours before and after the work shift. While construction truck trips would be made throughout the shift, most trucks would remain in the area for short durations. NYCDEP has, however, committed to limiting truck traffic between 11 PM and 7 AM. During this time period, no trucks would enter or leave the site. This will be achieved through specific requirements that will be imposed upon the selected contractor as part of the construction contract for the proposed project. For the assessment performed as part of this study, each truck trip was assumed to result in two truck trips (one entering and one exiting) during the same hour. Furthermore, in accordance with the *CEQR Technical Manual*, each truck was assumed to have a passenger car equivalent (PCE) of two (2). Hence, a truck trip to the project site would result in an equivalent of four (4) vehicle trips (two entering and two exiting) during the same analysis hour.

Construction Worker Modal Splits

According to the U.S. Census reverse journey-to-work data, commuting to work via auto in New York City is more prevalent among construction and excavation personnel than for workers in most occupations. According to the census data for Staten Island, approximately 68 percent of construction workers commute to project sites via auto, with an average auto occupancy of 1.23. The census data for Brooklyn indicated that approximately 38 percent of construction workers commute to project sites via auto, with an average auto occupancy of 1.92.

For construction at the Staten Island site, an auto share of 90 percent was assumed. This is a conservative estimate since the proposed site is in close proximity to Victory Boulevard. Numerous bus lines converge at the intersection of Victory Boulevard and Bay Street. In addition, the Tompkinsville station of the SIRT is located at the eastern end of Victory Boulevard near the proposed project site. There would also be a small percentage of construction workers that would avail themselves of carpooling opportunities and commute together with other workers. An auto occupancy of 1.23 was therefore assumed based on the Census tract information.

For construction at the Brooklyn site, an auto share of 80 percent was assumed. This is also considered a conservative estimate since the construction site is in close proximity to the intersection of 86th Street and Fourth Avenue, which serves as an important transit interchange serving the R subway line and several local and express buses. The R subway line travels west through Queens into midtown Manhattan, and then through lower Manhattan into Brooklyn and terminates in the Bay Ridge area. Also, a conservative estimate of auto occupancy of 1.23 (similar to that of Staten Island) was assumed.

Staten Island

The occurrence of construction activities would vary based upon the specific component or phase of the project. At certain locations, construction is expected to occur between the nighttime hours of 8 PM to 5 AM on weekdays, between 8 AM to 6 PM on Saturdays, and between 9 AM to 4 PM on Sundays. At other locations, construction would occur between 7 AM to 6 PM on weekdays. In addition, there could also be other construction activity which may occur during the intermittent hours, but lane narrowings/closures associated with construction would be in effect only during the hours mentioned. Given these construction hours, worker trips would be concentrated in off-peak hours and would not represent a substantial increment during peak travel periods. The number of estimated construction workers and truck trips (in passenger car equivalents, or PCEs) associated with each major stage for the construction on Staten Island would be as shown in Table 2-12

These activities would generally not occur simultaneously. For construction workers, the majority (80 percent) of the arrival and departure trips would take place during the hour before and after each shift. Depending on the location, arrivals and departures would occur at 7 to 8 PM and 5 to 6 PM, respectively, on weekdays; 7 to 8 AM and 6 to 7 PM, respectively, on Saturdays; 8 to 9 AM and 4 to 5 PM, respectively, on Sundays; or 6 to 7 AM and 6 to 7 PM, respectively, on weekdays. It was conservatively assumed that 25 percent of the truck trips would occur during the peak hour overlapping with the construction worker arrival trips.

A preliminary estimate indicates that the maximum number of worker auto trips and truck trips in PCEs would result during Weeks 121 to 124 and would be approximately 63 to 64 PCEs per hour. This estimate is slightly higher than the *CEQR Technical Manual* threshold of 50 vehicles (or PCEs) per hour that would require detailed traffic analysis. During Weeks 134 to 136, the projected 54 to 55 PCEs would also slightly exceed the CEQR threshold. However, it should be noted that these conditions would occur only for a temporary duration of four weeks, and then three weeks, out of a nearly three-year construction schedule, and would therefore not require a more detailed traffic analysis. Moreover, the peak hours for construction would not

Table 2-12. Peak Hour Worker Trip and Truck Estimates for Construction on Staten Island

Construction Activity	Week Number[(1)]	Number of Workers	Worker Auto Trips Per Hour	Number of Truck Trips in PCEs Per Hour[(2)]	Number of PCEs Per Hour
Site Mobilization	Week 1 to 8	13	8	6	14
Shaft Construction	Week 9 to 11	31	18	3	21
	Week 12 to 18	31	18	7	25
	Week 19 to 22	31	18	10	28
	Week 23 to 24	31	18	4	22
	Week 25 to 27	31	18	22	40
Tunnel Construction	Week 53 to 58	33	19	7	26
	Week 59 to 113	45	26	19	45
Tunnel/Chlorination Station Construction	Week 114 to 115	53	31	19	50
	Week 116 to 118	14	8	3	11
	Week 119 to 120	42	25	6	31
	Week 121 to 122	64	37	27	64
	Week 123 to 124	64	37	26	63
	Week 125 to 133	40	23	24	47
	Week 134	52	30	24	54
	Week 135 to 136	52	30	25	55
	Week 137	42	25	25	50
	Week 138	42	25	20	45
	Week 139	42	25	19	44
	Week 140 to 142	12	7	2	9
	Week 143	30	18	3	21
	Week 144 to 145	30	18	4	22
Chlorination Station Construction	Week 146	12	7	7	14
	Week 147 to 148	5	3	6	9
	Week 149	5	3	0	3

(1) This column represents the periods when substantive construction activities at the Staten Island shaft site are anticipated.
(2) This column represents average truck estimates for the weeks indicated.

overlap with the peak commuting hours. The shafts may be constructed using either a slurry wall or ground freezing alternative. The slurry wall is the preferred alternative and all calculations and findings presented earlier are based on this alternative. If the ground freezing alternative will be used instead, it would occur during Weeks 12 to 18 and result in 24 truck trips per hour (in PCEs) and 18 worker auto trips per hour. Thus the total number of trips would be 42 PCEs per hour during Weeks 12 to 18. The calculations and findings for all other weeks would be identical for both the slurry wall and ground freezing alternatives.

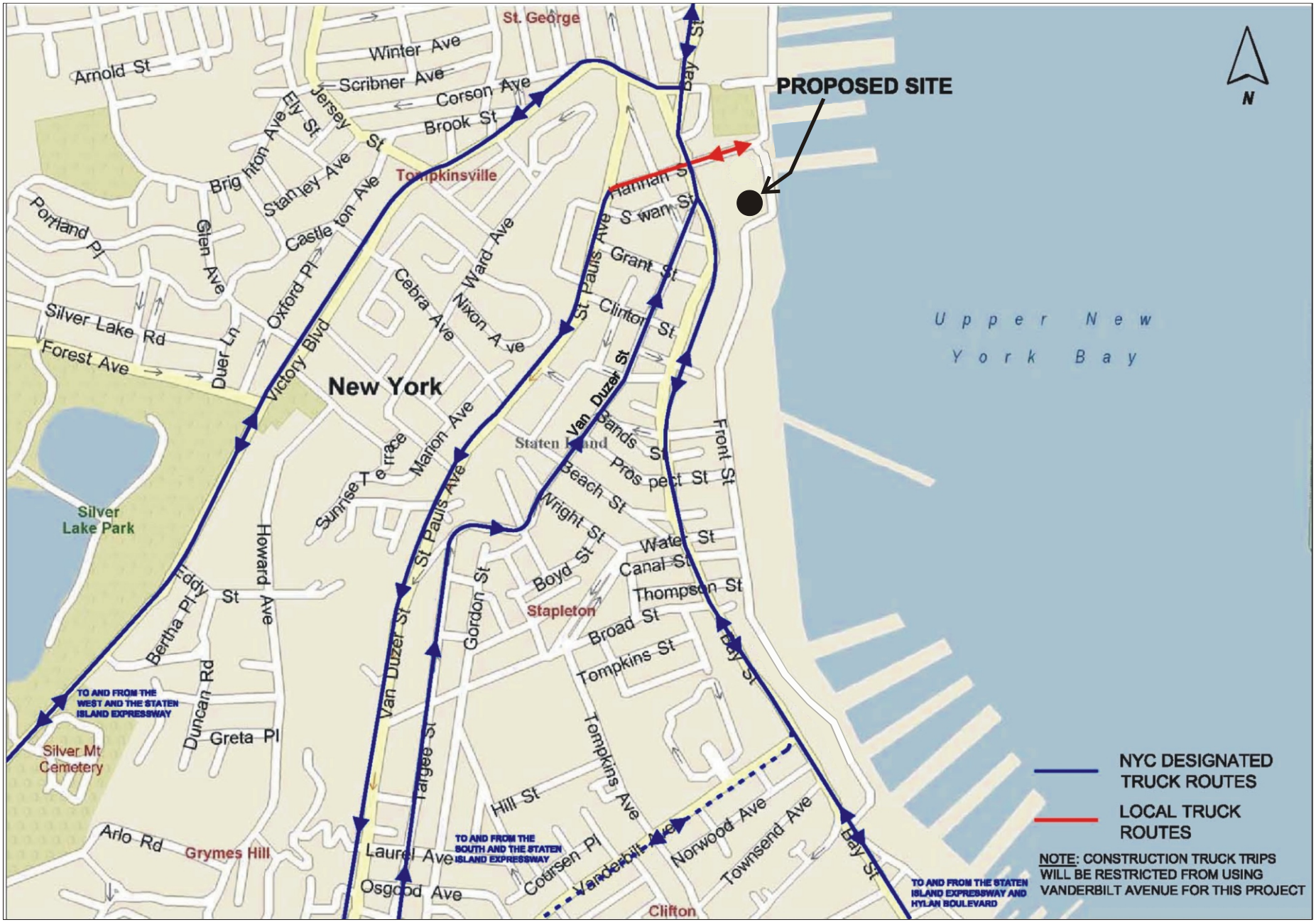
The construction worker trips expected to originate from outside Staten Island, such as New Jersey, Long Island, Manhattan and upstate New York, would likely approach the construction site via the SIE leading to Hylan Boulevard and then to Bay Street. Trips expected to originate from within Staten Island would also approach the site via east-west routes such as Richmond Terrace, Victory Boulevard, Broad Street, and Vanderbilt Avenue eventually leading to Bay Street from both directions. Local traffic would also use Swan/Van Duzer, Prospect, Water, and Canal Streets. Vehicles would also use Edgewater and Front Streets as alternative routes to Bay Street.

Truck trips would use NYCDOT-designated truck routes, which include the SIE, Hylan Boulevard, Vanderbilt Avenue, Van Duzer Street, Victory Boulevard and Bay Street (see Figure 2-26), but the contractor would be restricted from allowing construction trucks to use Vanderbilt Avenue. This would be accomplished through the formal incorporation of this restriction within the construction contract for the proposed action.

Brooklyn

Major construction would involve development of the shaft and is expected to occur from November 2010 to May 2011, a period of six months, and would occur between the hours of 7 AM to 6 PM on weekdays. The number of estimated construction workers and truck trips associated with each stage for the construction in Brooklyn are provided in Table 2-13.

Major activities in Brooklyn would not occur simultaneously. For construction workers, the majority (80 percent) of the arrival and departure trips would take place during the hour before and after each shift. These would occur at 6 to 7 AM and 6 to 7 PM, respectively, on weekdays. It was conservatively assumed that 25 percent of the truck trips would occur during the peak hour overlapping with the construction arrival trips.



HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201)529-5728

Figure 2-26 Potential Truck Routes for Proposed Staten Island Site

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

Table 2-13. Peak Hour Worker Trip and Truck Estimates for Construction in Brooklyn

Construction Activity	Week Number[(1)]	Number of Workers	Worker Auto Trips Per Hour	Number of Truck Trips in PCEs Per Hour [(2)]	Number of PCEs per Hour
Site Mobilization	Week 1 to 8	5	3	3	6
Shaft Construction	Week 28 to 30	31	16	2	18
	Week 31 to 42	31	16	6	22
	Week 43 to 46	31	16	14	30
	Week 47 to 50	31	16	21	37
	Week 51 to 52	31	16	3	19
Tunnel Construction	Week 116 to 118	20	10	5	15
	Week 137 to 139	10	5	12	17
Shaft Construction	Week 140 to 142	18	9	2	11

[(1)] This column represents the periods when substantive construction activities at the Brooklyn shaft site are anticipated.
[(2)] This column represents average truck estimates for the weeks indicated.

A preliminary estimate indicates that the maximum number of worker auto trips and truck trips in PCEs would result during Weeks 28 to 52 and would be approximately 37 PCEs per hour. This estimate is less than the *CEQR Technical Manual* threshold of 50 vehicles (or PCEs) per hour, therefore a detailed traffic analysis is not required. As mentioned earlier, the shafts could be constructed using either a slurry wall or ground freezing alternative. The slurry wall is the preferred alternative and all calculations and findings presented earlier are based on this. If the ground freezing alternative will be used instead, it would occur just during Weeks 31 to 42 and result in 24 truck trips per hour (in PCEs) and 16 worker auto trips per hour. Thus the total number of trips would be 40 PCEs per hour during Weeks 31 to 42. The calculations and findings for all other weeks would remain the same for both the slurry wall and ground freezing alternatives.

The construction worker trips expected to originate from outside Brooklyn, such as Staten Island and New Jersey would likely access the construction site via the Verrazano-Narrows Bridge and the Gowanus Expressway (I-278). These vehicles would eventually travel on 86th Street and Shore Road to access the site. Trips expected to originate from points north, such as Manhattan, upstate New York, northern New Jersey, the Bronx, Downtown Brooklyn, and Queens would travel along I-278, Fort Hamilton Parkway, and Fourth Avenue. These vehicles would access the site via 86th Street. Vehicles traveling from Long Island or points east

within Brooklyn would access the site via the Shore/Belt Parkway's Fourth Avenue exit and travel on 86th Street.

Truck trips would travel on designated truck routes to the site. These include I-278 and its service roads, Third Avenue, 65th Street and 86th Street (see Figure 2-27).

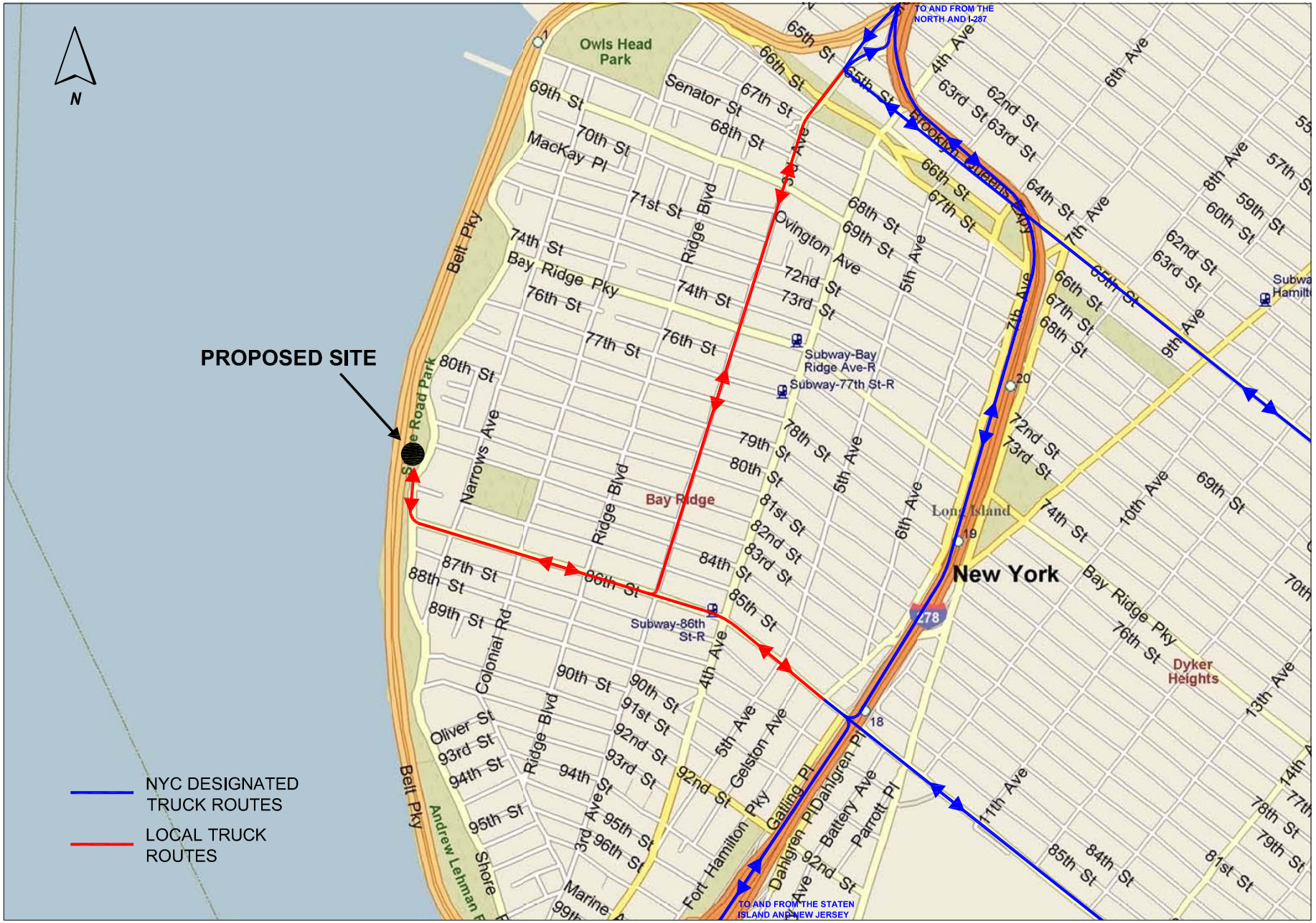
Parking will be provided on-site at the shaft sites for construction workers in Brooklyn and on Staten Island. In addition, on the Brooklyn side, the section of Shore Road between 83rd Street and 86th Street would be used for construction staging (see Figure 2-18) initially for approximately six months during the construction of the shaft and then an additional one to two months once the TBM arrives at the shaft site. Staging would occur along the west curb of Shore Road. Presently, curb parking is prevalent for the entire section of Shore Road between 83rd and 86th Streets amounting to approximately 30 spaces. The construction staging would result in a dislocation of these 30 spaces and vehicles would have to park elsewhere in the area. A preliminary survey performed in April 2009 within a one-quarter mile radius (five minute walking distance) from the site indicated that there is sufficient parking in the area and about 130 spaces were available within a one-quarter mile radius. The temporary loss of these spaces due to construction is not expected to result in any parking shortfalls.

MPT plans have been developed for all anticipated lane and sidewalk closures. Approval of these plans and implementation of all temporary sidewalk and lane closures during construction would be coordinated with NYCDOT's Office of Construction Mitigation and Coordination (OCMC), as necessary and appropriate.

2.17.4 Conclusion

No traffic impacts associated with the operation of the proposed siphon and the new chlorination site in Staten Island would occur. As noted previously, upon completion, the proposed facilities would not be permanently staffed. Periodic visits to the chlorination station, approximately 0-5 per week, would occur, but these would not result in significant adverse impacts to traffic and transportation.

Construction-related traffic impacts were assessed in accordance with *CEQR Technical Manual* procedures. Over the nearly three year construction period, construction work at the Staten Island site would generate approximately 63 to 64 PCEs per hour during Weeks 121 to 124, and approximately 54 to 55 PCEs per hour during Weeks 134 to 136. These estimates are slightly higher than the *CEQR Technical Manual* threshold of 50 vehicles (or PCEs) per hour. However, it should be noted that this condition would be associated with construction activities



HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201)529-5728

Figure 2-27 Potential Truck Routes for Proposed Brooklyn Site

THE REPLACEMENT OF THE EXISTING WATER SIPHONS
BETWEEN BROOKLYN AND STATEN ISLAND

New York City
Economic Development
Corporation

and would only occur for a temporary duration of four weeks and three weeks, respectively. Moreover, the peak hours for construction would not overlap with the peak commuting hours.

The extent of construction activities at the Brooklyn site would not be sufficient to exceed the *CEQR Technical Manual* threshold. It is estimated that the maximum number of worker auto trips and truck trips in PCEs would be approximately 37 vph. The duration and phasing of construction is presented in Section 1.5. Since projected vehicle trips would be lower than the CEQR impact threshold for the entire duration of construction on the Brooklyn site and for the majority of the duration of construction activities on the Staten Island site, the potential for significant impacts can be "screened out" and detailed intersection level of service analyses are not needed.

2.18 TRANSIT AND PEDESTRIAN

The proposed action would not result in any adverse affect upon public transportation facilities and services. Although the proposed action would involve construction within City streets and the short-term closure of single lanes of some roadways during construction periods identified by NYCDOT in the MPT Plan (e.g. Murray Hulbert Avenue and Front Street), no impacts to existing transit facilities, such as buses are anticipated. Construction activities required to pass under the SIRT would also not be expected to adversely effect SIRT operations. The proposed action would not result in impacts to public transportation facilities and services.

2.19 AIR QUALITY

The purpose of the air quality analysis is to evaluate the potential effects of replacing the two existing water siphons between Brooklyn and Staten Island. This analysis is intended to evaluate the potential impacts to air quality associated with the operation and construction of the proposed action and to assess if these may affect compliance with applicable air quality standards and guidance. Provided within this section is a discussion of the proposed action, the methodology utilized for this assessment and the potential effects of the proposed action upon existing air quality.

2.19.1 National Ambient Air Quality Standards

The USEPA, under the requirements of the 1970 Clean Air Act (CAA), as amended in 1977 and 1990, has established National Ambient Air Quality Standards (NAAQS) for six contaminants (Table 2-14), referred to as criteria pollutants (40 CFR 50). These are ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter (PM_{10} and $PM_{2.5}$), lead (Pb), and sulfur dioxide (SO_2). Areas that meet the NAAQS standard for a criteria pollutant are

designated as being "in attainment." Areas where a criteria pollutant level exceeds the NAAQS are designated as being "in non-attainment." O_3 non-attainment areas are categorized based on the severity of their pollution problem--marginal, moderate, serious, severe, or extreme. CO and PM_{10} non-attainment areas are categorized as moderate or serious. When a non-attainment area is redesignated as an attainment area, the CAA requires that a maintenance plan be put in place to ensure continued compliance with the corresponding NAAQS. Therefore, a former non-attainment area is also defined as a maintenance area. Where insufficient data exist to determine an area's attainment status, an area is designated unclassifiable (or in attainment).

Table 2-14. National and New York Ambient Air Quality Standards

Pollutant and Averaging Time	Primary Standard		Secondary Standard	
	μg/m[3]	ppm	μg/m[3]	ppm
Carbon Monoxide				
8-hour concentration	10,000[1]	9[1]	Same as primary	
1-hour concentration	40,000[1]	35[1]		
Nitrogen Dioxide				
Annual Arithmetic Mean	100	0.053	Same as primary	
Ozone				
8-hour concentration	147[2]	0.075[2]	Same as primary	
Particulate Matter				
$PM_{2.5}$:				
Annual Arithmetic Mean	15[3]	-		
24-hour Maximum	35[4]	-	Same as primary	
PM_{10}:				
24-hour concentration	150[5]	-		
Lead				
Quarterly Arithmetic Mean	1.5	-	Same as primary	
Sulfur Dioxide				
Annual Arithmetic Mean	80	0.03	-	-
24-hour concentration	365[1]	0.14[1]	-	-
3-hour concentration	-	-	1300[1]	0.50[1]

Notes:
(1) Not to be exceeded more than once per year.
(2) 3-year average of the 4th highest 8-hour concentration may not exceed 0.075 ppm.
(3) Based on 3-year average of annual averages.
(4) Based on 3-year average of annual 98th percentile values.
(5) Not to be exceeded more than once per year on average over 3 years.

Source: 40 CFR 50.

2.19.2 Existing Conditions

The shaft construction and chlorination station sites are located in Brooklyn and Staten Island, which are currently designated as:

- Moderate non-attainment area for the 8-hour O_3.
- Non-attainment area for $PM_{2.5}$.
- CO maintenance area.
- Attainment area for all other criteria pollutants.

Table 2-15 presents the representative existing ambient concentration levels monitored in those stations that are in close proximity to each construction site.

Table 2-15. Existing Ambient Criteria Pollutant Concentrations

Pollutant	Averaging Time	Location	Monitored Background
PM_{10}	24-hour Highest (ug/m^3)	Canal Street, Manhattan	63
CO	1-hour Highest (ug/m^3) 8-hour Highest (ug/m^3)	PS59 Manhattan	2,860 1,720
SO_2	Annual (ug/m^3) 24-hour Highest (ug/m^3) 3-hour Highest (ug/m^3)	PS59 Manhattan	37 123 228
NO_2	Annual (ug/m^3)	College Point P.O Queens and IS 52, Bronx	56

2.19.3 Future Without the Proposed Action

Under the future without the proposed action condition, the proposed shafts and chlorination station construction and its associated activities would not occur and therefore there would be no adverse stationary and mobile source air quality impacts.

2.19.4 Future With the Proposed Action

2.19.4.1 Facility Operation

After the completion of construction, limited aboveground facilities with the exception of the proposed chlorination station in Staten Island would exist. None of the proposed facilities would be permanently manned, nor would they result in significant increases in traffic or increased emissions. As a result, no adverse impacts associated with air quality would result from the operation of the proposed siphon and chlorination station.

2.19.4.2 Construction

During the shaft (including water mains and chlorination station in Staten Island) construction periods, potential air quality impacts could result from the operation of stationary sources such as on-site equipment and mobile sources such as trucks traveling along truck routes. Therefore, a detailed analysis of both stationary and mobile source emissions and associated concentrations was conducted for the preferred slurry wall option, as well as the ground freezing option.

The analysis of potential localized criteria pollutant impacts due to the proposed construction activities was conducted in accordance with the following regulatory guidance and documents:

- *New York City Environmental Quality Review Technical Manual* (October 2001).
- Interim Guidance for $PM_{2.5}$ Analyses (developed in conjunction with NYSDEC) (NYCDEP, March 3, 2008).

The anticipated air quality emissions associated with the proposed construction activities at both the Brooklyn and Staten Island sites were predicted. Mobile air pollutant sources included engine exhaust emitted from vehicular traffic within the construction zone and off-road construction equipment such as loaders, excavators, backhoes, etc. On-road mobile sources were evaluated and determined to fall below the mobile source screening thresholds (i.e., 100 or more vehicle trips for CO impact and 23 heavy duty diesel truck (HDDV) trips for $PM_{2.5}$ impact that are applicable for principal and minor arterial roadways such as Shore Road at the Brooklyn site and/or Bay Street at the Staten Island site that may be used as the main truck routes) according to *CEQR Technical Manual*, Chapter 3Q, §210 and Interim Guidance for $PM_{2.5}$; thus, no additional analysis is provided for these insignificant on-road mobile sources. Fugitive particulate (dust) sources included excavation activities, material handling and transfer, etc. The methodologies, as well as the pollutants of concern, the applicable air quality standards, and the potential impact criteria are presented in this section.

The analysis for each pollutant involved a two step process. First, the pollutant emission rates were estimated; then a dispersion model was run using the calculated emission rate for localized pollutants (i.e., CO, PM, NO_2 in terms of NO_x, and SO_2 in terms of SO_x). The emission rates predicted for O_3 precursors are disclosed for informational purposes, since they are of regional concern, but are typically not addressed on a project basis. The two step analysis is described below:

Emission Calculations

The following on-site emission sources were considered in the impact analysis:

- Truck (haul and delivery) and construction equipment (loader, excavator, crane, etc., as applicable) diesel engine exhausts.
- Surface dust resulting from the movement of trucks and construction equipment.
- Dust from material handling.

Specific construction information used to calculate emissions generated from the construction process included the following:

- Estimated number and type of construction equipment to be used;
- Fuel type of construction equipment (diesel- or gasoline-powered);
- Equipment usage (hours per day) rates;
- Equipment load (a percentage of the maximum horsepower) factors;
- Excavation and processing rates on a typical peak day;
- Average speed of all construction equipment and delivery vehicles; and
- Average vehicle miles traveled (VMTs) on-site by diesel construction equipment.

The first step in the air quality analysis determined what the potential emission generating activities would be and when they would occur. Next, emission factors were applied to determine the specific emission rates (e.g., lbs/hr, lbs/day, and tons per year) for each activity.

The number, type, and emission duration of construction equipment were based on the project's estimated resource demands and the anticipated schedule of construction activities. A screening analysis was conducted to determine which construction period was anticipated to have the greatest activity (i.e. most pieces of equipment), as well as the highest potential emissions (e.g. exhaust, fugitive dust). The screening analysis showed that 2011 and 2012 represented the peak construction period depending on the site location and construction method, with lower emissions anticipated in subsequent years. The two-shift (20 hours) and one-shift (10 hours) construction would occur at the Staten Island site and Brooklyn site, respectively.

Emission factors (grams per brake-horsepower hour) relative to the combustion of fuel for on-site construction equipment (excluding delivery trucks/ heavy vehicles) for NO_x, volatile organic compounds (VOC), CO, PM_{10}, $PM_{2.5}$, and SO_x were predicted using the USEPA NONROAD Model with county-applicable registration data. The emission rates for on-site delivery trucks/heavy vehicles for NO_x, VOC, CO, and PM (SO_x emissions were negligible

because ultra low sulfur diesel is now in use) were obtained from the USEPA MOBILE6.2 emission factor model. Emission factors associated with fugitive dust emissions from mobile equipment were derived from equations presented in the USEPA's AP-42 "A Compilation of Air Pollution Emission Factors." Given the geometry of the proposed work sites, including tight turning radii, construction equipment is not anticipated to exceed on-site speeds of five (5) miles per hour (mph). Load factors were also applied to the construction equipment. The load factor is the power level that an engine is operating at relative to its rated capacity. Engines typically operate at a variety of speeds and loads, and operation at a rated capacity for extended periods is rare. For example, at a 0.6 (or 60 percent) load factor, an engine rated at 100 horsepower (hp) would be producing an average of 60 hp over the course of normal operation. The load factors were based on USEPA-provided default values (December 30, 2008).

In addition, an engine usage factor was applied, recognizing that certain pieces of equipment are not used continuously over the course of a 10-hour construction shift. For example, a bulldozer may be present on-site, but is anticipated to be operational (engine running) for 40 percent of the construction day. The engine usage factors, which were applied for the air quality analysis, were the same as those applied for the noise analysis (Section 2.20), and are provided in the New York City Noise Control Code (Chapter 28, §28-109 Appendix).

Emissions (engine exhaust and fugitive dust) were estimated for each of the construction areas for the peak period of each key emission source. For total annual emission estimates, all activities scheduled to occur within the peak year (i.e., 2011 or 2012) were included in the calculation. For short term (hourly, daily) emission calculations, all activities scheduled to occur within the peak period were included with the exception of select activities, which would not reasonably occur at the same time. The overall reasonable worst-case emissions were determined for three intervals (hourly, daily, and annually).

Emission Control Strategies

On December 22, 2003, New York City adopted Local Law 77, which mandated the use of Ultra Low Sulfur Diesel (ULSD) fuel and Best Available Technology (BAT) by non-road vehicles in city construction. This law has two main parts. First, it requires that all diesel engines greater than 50 hp used on City construction projects operate on ULSD with a sulfur content no greater than 15 parts per million (ppm). Second, it requires that these same diesel engines incorporate BAT to reduce emissions. The law applies to "any diesel-powered, non-road vehicle that is owned by, operated by or on behalf of, or leased by a City agency". These requirements were phased in, starting in lower Manhattan in June 2004 and expanded to include the entire city of New York by December 2004.

because ultra low sulfur diesel is now in use) were obtained from the USEPA MOBILE6.2 emission factor model. Emission factors associated with fugitive dust emissions from mobile equipment were derived from equations presented in the USEPA's AP-42 "A Compilation of Air Pollution Emission Factors." Given the geometry of the proposed work sites, including tight turning radii, construction equipment is not anticipated to exceed on-site speeds of five (5) miles per hour (mph). Load factors were also applied to the construction equipment. The load factor is the power level that an engine is operating at relative to its rated capacity. Engines typically operate at a variety of speeds and loads, and operation at a rated capacity for extended periods is rare. For example, at a 0.6 (or 60 percent) load factor, an engine rated at 100 horsepower (hp) would be producing an average of 60 hp over the course of normal operation. The load factors were based on USEPA-provided default values (December 30, 2008).

In addition, an engine usage factor was applied, recognizing that certain pieces of equipment are not used continuously over the course of a 10-hour construction shift. For example, a bulldozer may be present on-site, but is anticipated to be operational (engine running) for 40 percent of the construction day. The engine usage factors, which were applied for the air quality analysis, were the same as those applied for the noise analysis (Section 2.20), and are provided in the New York City Noise Control Code (Chapter 28, §28-109 Appendix).

Emissions (engine exhaust and fugitive dust) were estimated for each of the construction areas for the peak period of each key emission source. For total annual emission estimates, all activities scheduled to occur within the peak year (i.e., 2011 or 2012) were included in the calculation. For short term (hourly, daily) emission calculations, all activities scheduled to occur within the peak period were included with the exception of select activities, which would not reasonably occur at the same time. The overall reasonable worst-case emissions were determined for three intervals (hourly, daily, and annually).

Emission Control Strategies

On December 22, 2003, New York City adopted Local Law 77, which mandated the use of Ultra Low Sulfur Diesel (ULSD) fuel and Best Available Technology (BAT) by non-road vehicles in city construction. This law has two main parts. First, it requires that all diesel engines greater than 50 hp used on City construction projects operate on ULSD with a sulfur content no greater than 15 parts per million (ppm). Second, it requires that these same diesel engines incorporate BAT to reduce emissions. The law applies to "any diesel-powered, non-road vehicle that is owned by, operated by or on behalf of, or leased by a City agency". These requirements were phased in, starting in lower Manhattan in June 2004 and expanded to include the entire city of New York by December 2004.

for more than 48 hours before being hauled away from the site, no significant fugitive dust would result during muck material handling process.

Emission Estimates

Table 2-16 summarizes the worst-case year emission estimates for the construction activities under both the slurry wall and ground freezing options at both Brooklyn and Staten Island sites.

For the Brooklyn site, the ground freezing option would generally result in less than half of the emissions under the slurry wall option during the shaft construction period.

For the Staten Island site, the tunnel driving/chlorination station construction activities would result in greater emissions as compared to the shaft construction. Because the emissions resulting from both the ground freezing and slurry wall options are comparable during the tunnel driving/chlorination station construction period, the differences in the worst-case year emissions are minimal between the ground freezing and the slurry wall options.

Dispersion Modeling

Atmospheric dispersion modeling was conducted to calculate potential air quality impacts from construction activities at off-site receptors, applying the USEPA-refined dispersion model, AERMOD. AERMOD is a steady-state plume model that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain. Off-site receptors were designated at the fence line, on the sidewalk (if present) surrounding each proposed shaft site, and at sensitive neighborhood receptors such as schools, playgrounds, and residences within close proximity to the proposed construction activities.

The emissions from construction activities (Table 2-16) were input to the AERMOD dispersion model, assuming construction emissions between the hours of 7 AM and 5 PM at the Brooklyn site and 24 hours at the Staten Island site. A 12-foot high noise barrier would circumscribe each site. The emission source release height for each site would correspond to the height of the barrier (i.e., 12-feet). This barrier would consist of a chain-link fence with privacy slats and a 12-foot high wooden fence in Brooklyn. In Staten Island, only a 12-foot high wooden fence would be provided. Therefore, the model was run with each construction activity assigned as a ground level area source within the 12-foot enclosed noise barrier.

Table 2-16. Emission Summary and Comparison Between the Slurry Wall and Ground Freezing Scenarios

Slurry Wall Scenario	NOx TPY	CO lbs/hr	SOx lbs/hr	SOx lbs/day	SOx TPY	PM_{10} lbs/day	$PM_{2.5}$ lbs/day	$PM_{2.5}$ TPY
Staten Island								
Emission Estimates for 2012								
Non-Road Construction Equipment Exhaust	10.20	2.33	0.00	0.09	0.01	0.44	0.43	0.05
On-Road Construction Equipment Exhaust	0.08	0.10	-	-	-	4.12	0.07	0.00
Fugitive	-	-	-	-	-	0.02	0.00	0.00
Total:	**10.28**	**2.43**	**0.00**	**0.09**	**0.01**	**4.57**	**0.50**	**0.05**
Brooklyn								
Emission Estimates for 2011								
Non-Road Construction Equipment Exhaust	0.98	1.56	0.00	0.03	0.00	0.30	0.29	0.01
On-Road Construction Equipment Exhaust	0.01	0.41	-	-	-	3.35	0.14	0.00
Fugitive Dust	-	-	-	-	-	0.13	0.02	0.00
Total:	**0.99**	**1.97**	**0.00**	**0.03**	**0.00**	**3.78**	**0.45**	**0.01**
Ground Freezing Scenario	**NOx TPY**	**CO lbs/hr**	**SOx lbs/hr**	**SOx lbs/day**	**SOx TPY**	**PM_{10} Lbs/day**	**$PM_{2.5}$ lbs/day**	**$PM_{2.5}$ TPY**
Staten Island								
Emission Estimates for 2011								
Non-Road Construction Equipment Exhaust	10.20	2.33	0.00	0.09	0.01	0.44	0.43	0.05
On-Road Construction Equipment Exhaust	0.08	0.11	-	-	-	4.11	0.07	0.00
Fugitive Dust	-	-	-	-	-	0.02	0.00	0.00
Total:	**10.28**	**2.44**	**0.00**	**0.09**	**0.01**	**4.56**	**0.50**	**0.05**
Brooklyn								
Emission Estimates for 2011								
Non-Road Construction Equipment Exhaust	0.20	0.74	0.00	0.01	0.00	0.18	0.18	0.00
On-Road Construction Equipment Exhaust	0.00	0.09	-	-	-	1.49	0.03	0.00
Fugitive Dust	-	-	-	-	-	0.10	0.01	0.00
Total:	**0.21**	**0.83**	**0.00**	**0.01**	**0.00**	**1.77**	**0.22**	**0.00**

Five year representative, hourly, sequential, pre-processed meteorological data for the period 2002 through 2006 were applied, utilizing data from LaGuardia Airport to characterize surface winds and the Brookhaven National Weather Service (NWS) station to characterize upper level air movements, to estimate concentrations for selected averaging times from one hour to one year.

Three types of receptors were placed in the model based on their location: fence line (project perimeter), sidewalk (existing walkways adjacent to the project sites), and neighborhood (closely located sensitive land uses). Fence line and sidewalk receptors were placed in the model at approximately 25-meter intervals for those immediately adjacent to individual construction sites. Neighborhood receptors were placed to correspond with the location of existing schools, playgrounds, and residential houses. Maximum impacts from ground-level area sources typically are anticipated at the nearest receptors, with concentrations attenuating with distance. "Flagpole" receptors with an elevation of 1.5 meters were used to represent an average adult along the sidewalk. Elevated receptors were also depicted in the model to represent different floors in the adjacent multi-story educational buildings and residential apartment buildings.

SO_x emission rates were conservatively used to predict SO_2 concentration levels without conversions performed. The NO_2 concentration levels were predicted using NO_x emission rates in association with the City-wide applicable factor of 62.2 percent to convert NO_x to NO_2. The predicted microscale reasonable worst-case concentrations of NO_2, SO_2, CO, and PM_{10} contributed from on-site sources, plus the ambient background levels, obtained from the most recent five (5) years of NYSDEC monitoring data[8] (see Table 2-15), were compared to the corresponding NAAQS to determine whether potential exceedances would occur from the proposed action. The assessment of potential $PM_{2.5}$ impacts was based on the incremental impacts (maximum concentrations contributed from the construction activities) with comparison to the NYCDEP-established thresholds within the Interim Guidance for $PM_{2.5}$ Analyses (March 3, 2008).

2.19.4.3 Air Pollutant Modeling Results

The analysis of localized criteria pollutant impacts included NO_2, SO_2, CO and PM (PM_{10} and $PM_{2.5}$).

[8] See http://www.dec.ny.gov/chemical/27443.html for information concerning air monitoring sites in New York City.

NO_2, SO_2, CO and PM_{10}

The dispersion modeling for NO_2, SO_2, CO and PM_{10} indicated that under both the slurry wall and ground freezing options, the proposed construction activities at both shaft sites would not result in exceedances of the applicable NAAQS. Results for the proposed Brooklyn site for the slurry wall and ground freezing alternatives are presented within Tables 2-17 and 2-18, respectively. Results for the proposed Staten Island site for the slurry wall and ground freezing alternatives are presented within Tables 2-19 and 2-20, respectively.

For the Brooklyn site, because the ground freezing option would result in much lower worst-case emissions as compared to the slurry wall option during the shaft construction year, the ground freezing option would result in less air quality impacts as compared to the slurry wall option. However, for the Staten Island site, the predicted worst-case concentration levels would occur during the tunnel driving/chlorination station construction period and these are comparable under both the ground freezing and slurry wall options.

$PM_{2.5}$ 24-hour Average Level

- *Brooklyn Slurry Wall Scenario*. The dispersion modeling results for the slurry wall option showed that all levels are below the 5 $\mu g/m^3$ significant threshold. A total of six (6) receptors have the potential to exceed the 2 $\mu g/m^3$ threshold, The six (6) receptors consist of four (4) fence line receptors and one (1) sidewalk receptor and one sensitive receptor. In any of the modeled years at these receptors, the frequency of exceedances would be one (1) per year with an exception at one (1) fence line receptor located on the north side of the construction site with two (2) predicted exceedances per one modeled year. No exceedances of the 2 $\mu g/m^3$ threshold would occur at any other neighborhood sensitive receptors, which represent Fort Hamilton High School and the nearest residential locations. The predicted maximum $PM_{2.5}$ incremental concentration levels predicted for three different receptor groups are summarized in Table 2-21.

- *Brooklyn Ground Freezing Scenario*. The dispersion modeling results for the ground freezing option showed that no exceedances of both the 2 $\mu g/m^3$ threshold and the 5 $\mu g/m^3$ significant threshold would occur (Table 2-22).

- *Staten Island Slurry Wall Scenario*. The dispersion modeling results for the slurry wall scenario showed that all levels are below the 2 $\mu g/m^3$ and 5 $\mu g/m^3$ significant thresholds with the exception of one fence line receptor, located at southeast part of fence line, which has the potential to exceed 2 $\mu g/m^3$. Among the five (5) modeled years, the exceedance was predicted to occur only once for one modeled year. The predicted

Table 2-17. Predicted Concentrations for PM_{10}, CO, SO_2 and NO_2 at Brooklyn for Slurry Wall Option

Averaging Time	Monitored Background	Construction Contributions	Total	NAAQS
PM_{10}				
24-hour Highest (µg/m3)	63[(1)]	20.3	83	150
CO				
8-hour Highest (µg/m3)	1,720[(2)]	269.1	1,989	10,000
1-hour Highest (µg/m3)	2,860[(2)]	691.9	3,552	40,000
SO_2				
Annual (µg/m3)	37[(2)]	0.009	37	80
24-hour Highest (µg/m3)	123[(2)]	0.155	123	365
3-hour Highest (µg/m3)	228[(2)]	0.70	229	1,300
NO_2				
Annual (µg/m3)	56[(3)]	5.0	61	100

[(1)] Canal Street, New York
[(2)] PS59, New York
[(3)] College Point P. O,. Queens and IS 52, Bronx

Table 2-18. Predicted Concentrations for PM_{10}, CO, SO_2 and NO_2 at Brooklyn for Ground Freezing Option

Averaging Time	Monitored Background	Construction Contributions	Total	NAAQS
PM_{10}				
24-hour Highest(µg/m3)	63[(1)]	9.5	73	150
CO				
8-hour Highest (µg/m3)	1,720[(2)]	114.2	1,834	10,000
1-hour Highest (µg/m3)	2,860[(2)]	293.5	3,154	40,000
SO_2				
Annual (µg/m3)	37[(2)]	0.002	37	80
24-hour Highest (µg/m3)	123[(2)]	0.071	123	365
3-hour Highest (µg/m3)	228[(2)]	0.32	228	1,300
NO_2				
Annual (µg/m3)	56[(3)]	1.1	57	100

[(1)] Canal Street, New York
[(2)] PS59, New York
[(3)] College Point P. O., Queens and IS 52, Bronx

Table 2-19. Predicted Concentrations for PM_{10}, CO, SO_2 and NO_2 at Staten Island for Slurry Wall Option

Averaging Time	Monitored Background	Construction Contributions	Total	NAAQS
PM_{10}				
24-hour Highest ($\mu g/m^3$)	63[(1)]	18.4	81	150
CO				
8-hour Highest ($\mu g/m^3$)	1720[(2)]	393.2	2,113	10,000
1-hour Highest ($\mu g/m^3$)	2860[(2)]	947.2	3,807	40,000
SO_2				
Annual ($\mu g/m^3$)	37[(2)]	0.044	37	80
24-hour Highest ($\mu g/m^3$)	123[(2)]	0.34	123	365
3-hour Highest ($\mu g/m^3$)	228[(2)]	0.93	229	1,300
NO_2				
Annual ($\mu g/m^3$)	56[(3)]	33.8	90	100

(1) Canal Street, New York
(2) PS59, New York
(3) College Point P. O., Queens and IS 52, Bronx

Table 2-20. Predicted Concentrations for PM_{10}, CO, SO_2 and NO_2 at Staten Island for Ground Freezing Option

Averaging Time	Monitored Background	Construction Contributions	Total	NAAQS
PM_{10}				
24-hour Highest ($\mu g/m^3$)	63[(1)]	18.4	81	150
CO				
8-hour Highest ($\mu g/m^3$)	1720[(2)]	394.0	2,214	10,000
1-hour Highest ($\mu g/m^3$)	2860[(2)]	948.9	3,809	40,000
SO_2				
Annual ($\mu g/m^3$)	37[(2)]	0.044	37	80
24-hour Highest ($\mu g/m^3$)	123[(2)]	0.34	123	365
3-hour Highest ($\mu g/m^3$)	228[(2)]	0.93	229	1,300
NO_2				
Annual ($\mu g/m^3$)	56[(3)]	33.8	90	100

(1) Canal Street, New York
(2) PS59, New York
(3) College Point P. O., Queens and IS 52, Bronx

Table 2-21 Predicted Maximum $PM_{2.5}$ Incremental Concentrations at Brooklyn for Slurry Wall Option

Averaging Time	Proposed Incremental Level	Interim Guidance Criteria
Fence Line		
Annual ($\mu g/m^3$)	0.085	0.3
24-hour Highest ($\mu g/m^3$)	2.25	2 and 5
Sidewalk		
Annual ($\mu g/m^3$)	0.065	0.3
24-hour Highest ($\mu g/m^3$)	2.40	2 and 5
Bench Sensitive Receptors Adjacent to Site		
Annual ($\mu g/m^3$)	0.067	0.3
24-hour Highest ($\mu g/m^3$)	2.39	2 and 5
Neighborhood Sensitive Receptors		
Annual ($\mu g/m^3$)	0.048	0.3
24-hour Highest ($\mu g/m^3$)	1.55	2 and 5

Table 2-22. Predicted Maximum $PM_{2.5}$ Incremental Concentrations at Brooklyn for Ground Freezing Option

Averaging Time	Proposed Incremental Level	Interim Guidance Criteria
Fence Line		
Annual ($\mu g/m^3$)	0.023	0.3
24-hour Highest ($\mu g/m^3$)	1.174	2 and 5
Sidewalk		
Annual ($\mu g/m^3$)	0.018	0.3
24-hour Highest ($\mu g/m^3$)	1.20	2 and 5
Neighborhood Sensitive Receptors		
Annual ($\mu g/m^3$)	0.013	0.3
24-hour Highest ($\mu g/m^3$)	0.78	2 and 5

maximum $PM_{2.5}$ incremental concentration levels for three different receptor groups are summarized in Table 2-23.

- *Staten Island Ground Freezing Scenario*. The dispersion modeling results for the ground freezing scenario showed that all levels are below the 2 μg/m^3 and 5 μg/m^3 significant thresholds with exception of one fence line receptor, located at southeast part of the fence line, which has the potential to exceed 2 μg/m^3. Among the five modeled years, the exceedance was predicted to occur only once for one modeled year. The predicted maximum $PM_{2.5}$ incremental concentration levels for three different receptor groups are summarized in Table 2-24.

As shown in Tables 2-21, 2-23, and 2-24, the proposed construction would not result in a $PM_{2.5}$ increment exceeding the 24-hour 5 μg/m^3 significant threshold under both the slurry wall and ground freezing options at both the Brooklyn and Staten Island sites. In addition, none of the receptors representing schools, playground, and residences are anticipated to exceed the 24-hour 2 μg/m^3 threshold. However, some of the fence line and sidewalk receptors located immediately adjacent to the proposed construction sites would have the potential to exceed 2 μg/m^3 over a 24-hour period. These receptors are limited to those immediately adjacent to the site perimeter. Since there is the potential for the 24-hour period concentrations to exceed the 2 μg/m^3 threshold, the frequency, duration, and location of the receptors where the threshold may be exceeded were examined further.

For the Brooklyn construction site under the slurry wall option, the model predicted that at four (4) fence line receptors, the construction emissions would exceed 2 μg/m^3 for a maximum of two (2) times a year at only one fence line receptor and one (1) time a year at the remaining three (3) fence line receptors, with the highest 24-hour $PM_{2.5}$ increment of 2.25 μg/m^3. The only affected sidewalk receptor and bench sensitive receptor are located immediately across from the east side perimeter barrier. The predicted concentration from the proposed construction at these two receptors would exceed 2 μg/m^3 for a maximum of one (1) time a year for only two (2) of the five (5) modeled years, with the highest 24-hour $PM_{2.5}$ increment of 2.40 μg/m^3. None of the project's construction emission increments would exceed 2 μg/m^3 at Fort Hamilton High School, the playground, or residences.

For the Staten Island site under both the slurry wall and ground freezing options, concentration above the 2 μg/m^3 threshold was predicted only once among the five (5) modeled years at one (1) fence line receptor location. The model predicted maximum concentration shows 2.01 μg/m^3 for the slurry wall option and 2.02 μg/m^3 for ground freezing option, respectively at a fence line receptor.

Table 2-23. Predicted $PM_{2.5}$ Incremental Concentrations at Staten Island for Slurry Wall Option

Averaging Time	Proposed Incremental Level	Interim Guidance Criteria
Fence Line		
Annual ($\mu g/m^3$)	0.287	0.3
24-hour Highest ($\mu g/m^3$)	2.01	2 and 5
Sidewalk		
Annual ($\mu g/m^3$)	0.127	0.3
24-hour Highest ($\mu g/m^3$)	1.27	2 and 5
Neighborhood Sensitive Receptors		
Annual ($\mu g/m^3$)	0.023	0.3
24-hour Highest ($\mu g/m^3$)	0.39	2 and 5

Table 2-24. Predicted $PM_{2.5}$ Incremental Concentrations at Staten Island for Ground Freezing Option

Averaging Time	Proposed Incremental Level	Interim Guidance Criteria
Fence Line		
Annual ($\mu g/m^3$)	0.287	0.3
24-hour Highest ($\mu g/m^3$)	2.02	2 and 5
Sidewalk		
Annual ($\mu g/m^3$)	0.127	0.3
24-hour Highest ($\mu g/m^3$)	1.28	2 and 5
Neighborhood Sensitive Receptors		
Annual ($\mu g/m^3$)	0.023	0.3
24-hour Highest ($\mu g/m^3$)	0.39	2 and 5

Moreover, for the Brooklyn site, because the ground freezing option would result in much lower worst-case emissions as compared to the slurry wall option during the shaft construction year, the ground freezing option would result in less air quality impacts as compared to the slurry wall option. However, for the Staten Island site, the predicted worst-case concentration levels would occur during the tunnel driving/chlorination station construction period and they would be comparable under both the ground freezing and slurry wall options.

$PM_{2.5}$ Annual Average Level.

The maximum predicted $PM_{2.5}$ annual average concentrations at three receptor groups (fence line, sidewalk, and sensitive) are summarized in Tables 2-21 through 2-24 for each construction option at both sites. These levels at all receptors indicate that the annual average interim guidance criteria of 0.3 $\mu g/m^3$ would not be exceeded.

However, because the maximum annual levels predicted for both the slurry wall and ground freezing options at the Staten Island site exceed the 0.1 $\mu g/m^3$ neighborhood impact analysis threshold, a neighborhood impact analysis is warranted at the Staten Island site. The neighborhood analysis results, summarized in Table 2-25, clearly show that the worst case annual neighborhood $PM_{2.5}$ concentrations fall below the NYCDEP significance threshold of 0.1 $\mu g/m^3$.

Table 2-25. Predicted Neighborhood $PM_{2.5}$ Concentrations at Staten Island Site

Averaging Time	Proposed Level	Interim Significant Threshold
Slurry Wall Option		
Annual ($\mu g/m^3$)	0.01	0.1
Ground Freezing Option		
Annual ($\mu g/m^3$)	0.01	0.1

2.19.5 Conclusions

For both construction options, the modeling results showed that the proposed construction activities would not result in exceedances of NAAQS for NO_2, SO_2, CO, and PM_{10}. The emission rates predicted for O_3 precursors are disclosed for informational purposes since they are of regional concern and are typically not addressed on a project basis.

The maximum annual impacts and the applicable neighborhood scale annual impacts of $PM_{2.5}$ emissions at all modeled receptors are below the significance thresholds. The proposed construction would not result in $PM_{2.5}$ increment exceeding the 24-hour 5 $\mu g/m^3$ threshold; none

of the construction impacts on the schools, playgrounds, and residences would exceed 2 $\mu g/m^3$. The potential for the 24-hour period concentrations to exceed the 2 $\mu g/m^3$ threshold is limited to the fence line and sidewalk receptors immediately adjacent to the construction sites. The frequency, duration and location of these impacts were examined in further detail.

At the Brooklyn site under the slurry wall option the model predicted that at a total of six (6) receptors the construction emissions would exceed 2 $\mu g/m^3$ with total of 13 exceedances during the five-year modeled period. In any of the modeled years at these receptors, the frequency of exceedances would be one per year with an exception at one fence line receptor with two per one modeled year predicted exceedances. The predicted maximum concentration from the proposed construction is 2.40 $\mu g/m^3$. However, the number of exceedances and value concentrations are based on modeling the peak emissions from the proposed construction for five years that corresponds to the construction of the Brooklyn receiving shaft in the six (6) month period from November 2010 to May 2011. Apparently these peak emissions would not last for the entire construction period, i.e., the shaft construction work is scheduled to be completed in five months. Also, the use of new diesel equipment (Tier II or newer) and aftermarket pollution controls will reduce emissions substantially. Therefore, the maximum construction impact and the number of occurrences where the 2 $\mu g/m^3$ threshold would be exceeded are expected to be much lower than the modeled results. Furthermore, the impacts at the fence line and sidewalk receptors are transient in nature; it is unlikely for a person to stay at these locations for a continuous 24-hour period especially during the colder seasons.

At the Staten Island site, the 2 $\mu g/m^3$ threshold was exceeded only once with a concentration of 2.01 $\mu g/m^3$ under the slurry wall option and 2.02 $\mu g/m^3$ under the slurry wall option. However, these concentrations are based on modeling the peak emissions from the proposed construction for five years, but these peak emissions are not expected to last for the entire construction period. Therefore, the maximum construction impact and the occurrences where the 2 $\mu g/m^3$ threshold would be exceeded are expected to be negligible. Furthermore, the impacts at the fence line receptor are transient in nature; it is unlikely for a person to stay at this fence line location for a continuous 24-hour period.

Based on the discussion above, the proposed siphon construction activities would not have a significant impact on air quality.

2.20 NOISE

2.20.1 Noise Fundamentals

Noise impacts may occur from numerous sources. Some noise is caused by activities essential to the health, safety, and welfare of a community, such as emergency vehicle sirens, garbage collection operations, and construction and maintenance equipment. Other sources of noise, such as traffic and aircraft, stem from the movement of people and goods, activities essential to the viability of a community as a place to live and do business. Although these and other noise-producing activities are necessary to modern life, the noise they produce is sometimes undesirable and may detract from the quality of the living environment. Noise levels of common sounds are presented in Table 2-26.

Table 2-26. Noise Levels of Common Sources

Noise Source	Level (dBA)
Air Raid Siren at 50 Feet	120
On Platform by Passing Subway	100
On Sidewalk by Passing Heavy Truck or Bus	90
On Sidewalk by Typical Highway	80
On Sidewalk by Passing Automobiles with Mufflers	70
Typical Urban Area	60-70
Typical Suburban Area Background	50-60
Quiet Suburban Area at Night	40-50
Typical Rural Area at Night	30-40
Source: City of New York Environmental Quality Review Technical Manual.	

A number of factors affect sound, as it is perceived by the human ear. These include the actual level of the sound (or noise), the frequencies involved, the period of exposure, and changes or fluctuations in the noise levels during exposure. Levels of noise are measured in units called decibels (dB). Since the human ear cannot perceive all pitches or frequencies equally well, these measures are adjusted or weighted to compensate for the human lack of sensitivity to low-pitched and high-pitched sounds. This adjusted unit is known as the A-weighted decibel, or dBA. The A-weighted network de-emphasizes both very low- and very high-pitched sounds, so the measured levels correlate well with the human perception of loudness.

Human response to changes in noise levels depends on a number of factors, including the quality of the sound, the magnitude of the changes, the time of day at which the changes take place, whether the noise is continuous or intermittent, and the individual's ability to perceive the changes. Human ability to perceive changes in noise levels varies widely with the individual, as

does response to the perceived changes. Generally, changes in noise level less than three (3) dBA will be barely perceptible to most listeners, whereas a 10 dBA change normally is perceived as a doubling (or halving) of a noise level. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

2.20.2 Noise Impact Criteria and Methodology

According to the noise impact assessment guidelines provided in the *CEQR Technical Manual*, a three (3) dBA L_{eq} increase over the no action condition, although just noticeable to most listeners, is considered an indicator of noise impact significance when the daytime levels are at or above 62 dBA and for all nighttime levels as well. This is the criterion used in the noise analysis for the proposed action.

Stationary Source

The estimate of the potential noise resulting from the operation of on-site construction equipment during shaft or shaft and chlorination station construction at the closest sensitive receptor was based on the fundamental acoustic principle recommended in *Highway Construction Noise: Measurement, Prediction and Mitigation* (FHWA, 1976) with the following equation:

$$L_{eq} = L_{eq}\,(ref) - 20 \log D/D_{ref}$$

where L_{eq} (ref) is the peak noise emission level of each applicable equipment;

D is the distance from receptor to each equipment;

D_{ref} is the reference distance at which L_{eq} (ref) is measured. D_0 = 50 ft (15.2 m);

L_{eq} is the sound level resulting from operation of each equipment.

The equipment noise reference levels were primarily obtained from Title 15, Chapter 28 of Rules of the City of New York and some of levels were based on those established from prior projects.

Mobile Source

The CEQR screening methodology for predicting future noise levels is based on the assumption that existing noise levels are dominated by, and are a function of, existing traffic volumes adjacent to individual receptors, and that future noise levels can be determined based on the proportional increase in hourly traffic associated with a project. For example, if the existing

volume on a street is 100 vehicles per hour (vph), and the future volume were increased by 50 vph for a total of 150 vph, the noise levels would increase by approximately 1.8 dBA. If future traffic were increased by 100 vph to a total of 200 vph, noise levels would increase by 3 dBA. However, given different emission levels from a different vehicle mix, CEQR recommends using Passenger Car Equivalents (PCEs) to conservatively estimate noise from traffic. The PCE conversions are summarized below:

- One automobile or one light truck = 1 PCE.
- One medium truck = 13 PCEs.
- One heavy truck = 47 PCEs.

2.20.3 Existing Conditions

Existing noise levels in the vicinity of the each site are typical of those normally associated with the nearby land uses and the overall level of development in the area and the primary source of noise near each site is vehicular traffic.

The representative ambient background noise levels around each site and the designated truck routes were collected between June 6 and June 12, 2007 prior to the end of the school year. The adjacent traffic volume and classification data were also collected concurrently with the noise measurements.

In Brooklyn, ambient noise and traffic data were collected mostly around the quiet hours when ambient levels are considered low as noted below:

- Traffic data and short-term measurements were collected near Fort Hamilton High School along Shore Road (Figures 2-27 and 2-28, respectively).
- Hourly ambient noise levels were recorded continuously during 1-2, 3-4, and 5-9 AM.
- The concurrent traffic volume and classification data along Shore Road were collected for the entire hour from 1-2 and 3-4 AM and for a 20-minute duration for each hour between 5-9 AM.

In Staten Island, ambient noise and traffic data were collected as noted below:

- 24-hour continuous noise measurements were collected near the George Cromwell Recreation Center and Bayley Seton Hospital (Figure 2-29).

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201)529-5728

Figure 2-28 Noise Monitoring and Receptor Locations - Brooklyn

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

HydroQual, Inc.
1200 MacArthur Boulevard
Mahwah, New Jersey 07430
(201) 529-5151 f:(201)529-5728

Figure 2-29 Noise Monitoring and Receptor Locations - Staten Island

THE REPLACEMENT OF THE EXISTING WATER SIPHONS BETWEEN BROOKLYN AND STATEN ISLAND

New York City Economic Development Corporation

- Short-term measurements were collected along Bay Street between Grand Street and Clinton Street and along Vanderbilt Avenue.

- Short-term hourly noise and traffic volume and classification data were collected concurrently for each AM hour between 1-2, 3-4 and 5-8 AM.

These measured ambient levels are further used as the basis in determining potential worst-case construction noise impacts around shaft sites, as well as along some potential truck routes particularly during more sensitive nighttime periods. Based on the nighttime noise levels measured along Vanderbilt Avenue, this route has been eliminated as a potential truck route and the contractor will be restricted from using this route.

2.20.4 Future Without the Proposed Action

Under the future without the proposed action condition, the proposed shaft construction and its associated activities would not occur and therefore there would be no adverse stationary and mobile source noise impacts.

2.20.5 Future With the Proposed Action

Facility Operation

After the completion of construction, limited aboveground facilities with the exception of the proposed chlorination station in Staten Island would exist. None of the proposed facilities would be permanently manned, nor would they result in significant increases in traffic or increased noise. As a result, no adverse impacts associated with noise would result from the operation of the proposed siphon and chlorination station.

Construction

During shaft (and the chlorination station in Staten Island) construction periods, potential noise impacts could result from the operation of stationary sources such as on-site equipment and mobile sources such as trucks traveling along truck routes. Therefore, a detailed analysis of both stationary and mobile source noise was conducted for the preferred slurry wall option using the methodologies described above.

Brooklyn

A total of four receptors located in the immediate vicinity of the proposed shaft site were analyzed. These four sites are shown in Figure 2-28 including a baseball field (#1), two residences (#2 and 4), and Fort Hamilton High School (#3).

Stationary Sources

Among the various proposed construction phases, it was predicted that the initial slurry wall installation stage would result in the highest stationary source noise levels during the daytime shift. However, during the two-shift period, the activity associated with carrier pipe and grouting of the tunnel and shafts would contribute nighttime noise around the site. In predicting on-site operational equipment noise, two specific time periods were selected to evaluate the worst-case levels in comparison to the CEQR threshold. These included the 7 to 8 AM hour representing the daytime hour and the 1 to 2 AM hour for the nighttime hour. The predicted worst-case noise levels at each of the selected noise sensitive receptors including park, school and residential locations are summarized in Table 2-27 for the slurry wall option and Table 2-28 presents this data for the ground freezing option. Since a 12-foot noise barrier will be constructed along the site fence line that would attenuate on-site equipment noise contributions to those adjacent noise receptors, an approximate insertion loss of 10 dBA from the noise barrier was employed in the calculation. The worst-case noise conditions would occur during the daytime shaft construction period which would last approximately six (6) months. At nighttime hours during the backfill shaft process, which would last approximately one (1) month, noise levels were also analyzed.

Mobile Sources

Truck traveling noise at both selected analysis daytime periods based on the truck trips associated with those specific construction phases were also predicted based on CEQR PCE comparison with the existing traffic counts collected during ambient noise monitoring. The worst-case truck trips defined include:

- 7 – 8 AM: 10 peak hour trips during slurry wall construction.
- 1 – 2 AM: no truck trips would occur.

Table 2-27. Brooklyn Shaft Site Slurry Wall Worst-Case Noise Impacts (Leq(1))

Receptor	Time Period			Maximum Construction Noise (dBA)	Noise Barrier Insertion Loss (dBA)	Construction Noise with Barrier (dBA)	Truck Noise Level During Peak Construction Time (including ambient monitored level) (dBA)	Cumulative Impact Noise Level (dBA)	Existing Monitored Noise Level (dBA)	Noise Impact Increment (dBA)
	Time of Day	Starting Week #	Ending Week #							
1	7-8 AM 1-2 AM	31 131	42 136	75.3 67.3	10.0	65.3 57.3	68.0 n/a-	69.9 60.3	63.3 57.2	**6.6** **3.1**
2	7-8AM 1-2 AM	31 131	42 136	71.3 63.2	10.0	61.3 53.2	68.0 n/a-	68.8 58.7	63.3 57.2	**5.5** 1.5
3	7-8 AM 1-2 AM	31 131	42 136	74.7 66.7	10.0	64.7 56.7	68.0 n/a-	69.7 60.0	63.3 57.2	**6.4** 2.8
4	7-8 AM 1-2 AM	31 131	42 136	68.7 60.7	10.0	58.7 50.7	68.0 n/a-	68.5 58.1	63.3 57.2	**5.2** 0.9

Table 2-28. Brooklyn Shaft Site Ground Freezing Worst-Case Noise Impacts (Leq(1))

Receptor	Time Period			Maximum Construction Noise (dBA)	Noise Barrier Insertion Loss (dBA)	Construction Noise with Barrier (dBA)	Truck Noise Level During Peak Construction Time (including ambient monitored level) (dBA)	Cumulative Impact Noise Level (dBA)	Existing Monitored Noise Level (dBA)	Noise Impact Increment (dBA)
	Time of Day	Starting Week #	Ending Week #							
1	7-8 AM 1-2 AM	31 131	32 136	60.0 67.3	10.0	50.0 57.3	68.0 n/a-	68.1 60.3	63.3 57.2	**4.8** **3.1**
2	7-8AM 1-2 AM	31 131	32 136	55.9 63.2	10.0	45.9 53.2	68.0 n/a-	68.0 58.7	63.3 57.2	**4.7** 1.5
3	7-8 AM 1-2 AM	31 131	32 136	59.3 66.7	10.0	49.3 56.7	68.0 n/a-	68.1 60.0	63.3 57.2	**4.7** 2.8
4	7-8 AM 1-2 AM	31 131	32 136	53.3 60.7	10.0	43.3 50.7	68.0 n/a-	68.0 58.1	63.3 57.2	**4.7** 0.9

Cumulative Noise Increase

To assess the construction period noise impacts from both stationary equipment and truck traffic around the shaft site, the loudest projected hourly noise level in any given week due to construction activity was combined with the corresponding truck traffic noise. The monitored existing baseline noise levels were further added in order to determine the worst-case potential noise impacts at various receptor locations. The incremental noise resulting from the proposed action was then determined by subtracting the existing baseline level from the calculated cumulative level. Given the close proximity of noise sensitive receptors locations to the shaft site, construction noise around the shaft site (Table 2-29 for the slurry wall option and Table 2-30 for the ground freezing option) would exceed the CEQR 3 dBA impact threshold during both the daytime and nighttime hours. However, the nighttime hour exceedances predicted would only occur at the receptors in either the park or the school (#1 and #3), within which no nighttime hour activities are anticipated. Therefore no noise sensitive receptors would be impacted during those nighttime hours. Moreover, given the relatively short duration of the actual construction around the Brooklyn shaft site, the daytime noise increase is considered temporary and not significant.

Staten Island

A total four receptors located in the close proximity to the shaft and chlorination site were analyzed. These four sites are shown in Figure 2-29 and included three residences along Bay Street (#1 through #3) and the George Cromwell Recreation Center (#4).

In addition, truck traffic noise impact was predicted along the anticipated main truck routes, particularly along Bay Street where the existing ambient noise data was collected.

Stationary Sources

The worst-case construction equipment noise within both the daytime and nighttime hours would generally occur during the two-shift tunnel driving process over an approximately one (1) year duration. The overlapping of chlorination station construction with the tunnel driving activity would add a slight increase to the tunnel driving period noise over a very short duration during the daytime period and the greatest cumulative equipment noise increase during this short duration are summarized in Table 2-29 for the slurry wall option and Table 2-30 for the ground freezing option. The prediction was made using the same methodologies used at the Brooklyn site. However, the noise from equipment to be used inside the tunnel, such as locomotives, the TBM, etc. is considered negligible and was not included in the noise impact analysis.

Table 2-29. Staten Island Shaft and Chlorination Station Site Slurry Wall Worst-Case Noise Impacts (Leq(1))

Receptor	Time Period			Maximum Construction Noise During Peak Truck Hour (dBA)	Noise Barrier Insertion Loss (dBA)	Construction Noise with Barrier (dBA)	Maximum Truck Noise w/ Monitored Level (dBA)	Cumulative Impact Noise Level (dBA)	Existing Monitored Noise Level (dBA)	Noise Impact Increment (dBA)
	Time of Day	Starting Week #	Ending Week #							
1	7-8 AM 1-2 AM	119 59	119 115	63.4 64.7	10.0	53.4 54.7	69.1 n/a	69.2 59.7	66.6 58.1	2.6 1.6
2	7-8 AM 1-2 AM	119 59	119 115	65.9 67.2	10.0	55.9 57.2	69.1 n/a	69.3 60.7	66.6 58.1	2.7 2.6
3	7-8 AM 1-2 AM	119 59	119 115	62.3 63.7	10.0	52.3 53.7	69.1 n/a	69.2 59.5	66.6 58.1	2.6 1.4
4	7-8 AM 1-2 AM	119 59	119 115	64.3 65.7	10.0	54.3 55.7	69.1 n/a	69.2 60.1	66.6 58.1	2.6 2.0

Table 2-30. Staten Island Shaft and Chlorination Station Site Ground Freezing Worst-Case Noise Impacts (Leq(1))

Receptor	Time Period			Maximum Construction Noise During Peak Truck Hour (dBA)	Noise Barrier Insertion Loss (dBA)	Construction Noise with Barrier (dBA)	Maximum Truck Noise w/ Monitored Level (dBA)	Cumulative Impact Noise Level (dBA)	Existing Monitored Noise Level (dBA)	Noise Impact Increment (dBA)
	Time of Day	Starting Week #	Ending Week #							
1	7-8 AM 1-2 AM	119 59	119 115	63.8 64.7	10.0	53.8 54.7	69.1 n/a	69.2 59.7	66.6 58.1	2.6 1.6
2	7-8 AM 1-2 AM	119 59	119 115	66.3 67.2	10.0	56.3 57.2	69.1 n/a	69.3 60.7	66.6 58.1	2.7 2.6
3	7-8 AM 1-2 AM	119 59	119 115	62.7 63.7	10.0	52.7 53.7	69.1 n/a	69.2 59.5	66.6 58.1	2.6 1.4
4	7-8 AM 1-2 AM	119 59	119 115	64.7 65.7	10.0	54.7 55.7	69.1 n/a	69.2 60.1	66.6 58.1	2.6 2.0

Mobile Sources

Truck traveling noise at both selected analysis daytime periods based on the truck trips associated with those specific construction phases were also predicted based on the CEQR PCE comparison method described previously. Since the truck haul route could occur along the roadway segments where the sensitive receptors around the shaft site are located, particularly along the potential main route of Bay Street, cumulative truck traveling noise was conservatively considered in the noise impact assessment at these receptors. No trucks would leave this shaft site during the 11 PM to 7 AM period and this would be incorporated as a requirement into the contractor specifications.

The worst-case truck trips used in the prediction include:

- 7 – 8 AM: 15 peak hour trips during slurry wall construction.
- 1 – 2 AM: no truck trips would occur.

Cumulative Noise Increase

To assess the construction period noise impacts from both stationary equipment and truck traffic around the shaft site, the loudest projected hourly noise level in any given week due to construction activity was combined with the corresponding truck traffic noise. The monitored existing baseline noise levels were further added in order to determine the worst-case potential noise impacts at various receptor locations. The incremental noise resulting from the proposed action was then determined by subtracting the existing baseline level from the calculated cumulative level.

The combined noise levels from the operation of stationary equipment and truck traffic and existing ambient noise calculated and presented in Tables 2-29 and 2-30 indicate that the net noise incremental resulting from construction noise around the shaft and chlorination site would not exceed the CEQR 3 dBA impact threshold during both daytime and nighttime hours.

2.20.6 Conclusions

Potential noise impacts due to shaft construction and truck traffic at both the Brooklyn and Staten Island sites were analyzed at sensitive receptors in the vicinity of each site. The predicted worst-case increase in the daytime and nighttime hour noise levels were compared to the 3 dBA noise significance threshold for the Future With the Project.

Potential noise impacts resulting from the use of on-site equipment during construction activities were determined for four sensitive receptors proximate to each shaft site. The

maximum projected daytime and nighttime hourly noise level from construction activities including truck traffic noise was added to the monitored existing baseline noise levels at each site in order to determine the potential noise impacts at the various receptors as a result of the construction activity.

Noise levels predicted to occur at the Brooklyn site as a result of the daytime shaft construction and backfill shaft activity were anticipated to exceed the *CEQR Technical Manual* 3 dBA threshold used to evaluate impact. These increased daytime noise levels would be intermittent and would persist for approximately a total of six (6) months, and therefore were considered temporary and not significant.

The potential worst-case noise levels predicted for both the daytime and nighttime hours to occur at the Staten Island site as a result of the tunnel driving activity were anticipated to be in compliance with the *CEQR Technical Manual* 3 dBA threshold used to evaluate impact. Therefore the predicted intermittent noise would not be significant.

2.21 PUBLIC HEALTH

2.21.1 Introduction

This section addresses the potential public health impacts associated with the construction and operation of the proposed siphon replacement and chlorination station. For the purposes of this evaluation, public health was defined as those activities that society carries out in order to create and maintain an environment in which people can be healthy. According to the *CEQR Technical Manual*, the elements that combine to influence public health include air quality, hazardous materials, construction and natural resources (e.g. water quality impacts). These elements have been analyzed in other sections of this environmental assessment and the conclusions of those chapters have been used to determine if impacts to public health due to the proposed action would be anticipated.

2.21.2 Air Quality

The public health assessment considers whether the localized increment of air emissions from mobile sources (vehicular traffic) and stationary sources associated with the proposed action would cause a significant air quality impact or the exceedance of air quality standards established for the protection of human health. Section 2.19, Air Quality provides additional information on the air analyses conducted for the proposed action.

Facility Operation

After the completion of construction for the proposed action, limited aboveground facilities with the exception of the proposed chlorination station in Staten Island would exist. None of the proposed facilities would be permanently manned, nor would they result in significant increases in traffic or increased emissions. As a result, no adverse impacts associated with air quality would result from the operation of the proposed siphon and chlorination station.

Facility Construction

As discussed within Section 2.19, the proposed construction activities would not result in exceedances of NAAQS for NO_2, SO_2, CO, and PM_{10}.

The maximum annual impacts and the applicable neighborhood scale annual impacts of $PM_{2.5}$ emissions would be below the significance thresholds. The proposed construction would not result in a $PM_{2.5}$ increment exceeding the 24-hour 5 $\mu g/m^3$ threshold; none of the construction impacts on the schools, playgrounds, and residences would exceed 2 $\mu g/m^3$. The potential for the 24-hour period concentrations to exceed the 2 $\mu g/m^3$ threshold would be limited to the fence line and sidewalk receptors immediately adjacent to the construction sites. At the Brooklyn site under the slurry wall option, at a total of six (6) receptors the construction emissions would exceed 2 $\mu g/m^3$ with a total of 13 exceedances during the five-year modeled period. In any of the modeled years at these receptors, the frequency of exceedances would be one per year with an exception at one fence line receptor with two per one modeled year predicted exceedances. The predicted maximum concentration from the proposed construction would be 2.40 $\mu g/m^3$. However, the number of exceedances and value concentrations are based on modeling the peak emissions from the proposed construction for five years that corresponds to the construction of the Brooklyn receiving shaft in the six (6) month period from November 2010 to May 2011. These peak emissions would not last for the entire construction period, i.e., the shaft construction work is scheduled to be completed in five months. In addition, the use of new diesel equipment (e.g., Tier II) and aftermarket pollution controls will also reduce emissions substantially. Therefore, the maximum construction impact and the number of occurrences where the 2 $\mu g/m^3$ threshold would be exceeded are expected to be much lower than the modeled results. Furthermore, the impacts at the fence line and sidewalk receptors would be transient in nature and it is unlikely that a person would stay at these locations for a continuous 24-hour period especially during the colder seasons.

At the Staten Island site, the 2 $\mu g/m^3$ threshold would be exceeded only once with a concentration of 2.01 $\mu g/m^3$ under the slurry wall option and 2.02 $\mu g/m^3$ under the ground freezing option. However, as previously noted for the Brooklyn site, these concentrations are based on modeling the peak emissions from the proposed construction for five years, but these

peak emissions would not be expected to occur over the entire construction period. The maximum construction impact and the occurrences where the 2 $\mu g/m^3$ threshold would be exceeded are expected to be negligible. Likewise, the impacts at the fence line receptor are transient in nature; it is unlikely for a person to stay at this fence line location for a continuous 24-hour period.

The operation and construction of the proposed siphon and chlorination station would not result in a significant impact on air quality. Adverse impact upon human health would therefore also not be anticipated.

2.21.3 Hazardous Materials

Shaft, Chlorination Station and Water/Sewer Main Construction

Based upon the sampling completed, the materials to be excavated in Brooklyn are not grossly contaminated. There are exceedances of the TAGM #4046 guidance concentrations, but it is not anticipated that the material will have to be handled as hazardous materials based on the screening calculations that were conducted using the bulk chemistry concentrations to predict estimated TCLP levels.

Soil sampling conducted at the proposed locations of the shaft, chlorination station and along the path of the water main in Staten Island did not indicate contamination by petroleum products. The materials to be excavated are not grossly contaminated and are consistent with the characteristics of urban fill. There were exceedances of the TAGM #4046 guidance concentrations. Based on screening calculations using the measured bulk chemistry concentrations to predict TCLP levels, lead levels at several locations and chromium at one location may potentially result in these materials having to be handled as hazardous materials. Further testing of the excavated materials would be conducted during active construction to determine and/or confirm if these soils may need to be handled as hazardous.

Due to the levels of contamination identified, a worker HASP would need to be prepared to address dust control in order to protect workers and the public during excavation activities. These materials will be handled during excavation and transport in compliance with state and local regulations. Material disposal will be in compliance with state and local regulations and additional sampling and analyses that may be required to allow reuse and/or disposal of the materials will be necessary, as applicable and appropriate.

Tunnel Construction

Likewise, the materials to be removed during tunneling did not indicate any gross contamination. It is expected based on the sampling conducted, that the materials removed during the construction of the tunnel will not need to be handled as hazardous materials. The material will be handled, transported and disposed of in compliance with all state and local regulations and additional testing will be conducted, as required, to confirm the disposition of these materials.

Venturi Chambers

The existing venturi chambers will be abandoned upon completion of the new siphon. As part of this effort, the existing venturi chambers will be demolished, the debris will be removed and the previous locations will be backfilled with clean fill. Based on sampling, mercury contamination exists within these chambers. As part of the demolition efforts, additional sampling will be required. Concrete samples will be collected from each chamber prior to demolition and analyzed for TCLP parameters in order to determine disposal requirements. Once the concrete is demolished, it will be removed from the chambers and disposed of in compliance with applicable federal, state and local regulations. Samples of the soil surrounding and underlying the chambers will also be collected to ensure that these soils have not been impacted by mercury. If additional contamination is noted, appropriate remedial measures would be implemented in order to address this. In addition, a site-specific HASP that addresses the protection of workers and the public during the sampling and demolition of the chambers and during the subsequent removal of materials from the chambers will be prepared and implemented.

No potential significant impacts to public health from hazardous materials would be anticipated during construction based upon prior sampling efforts and the protective measures (e.g. HASPs, dust control) that would be implemented as part of the overall construction efforts.

2.21.4 Noise

Potential noise impacts due to shaft construction and truck traffic at both the Brooklyn and Staten Island sites were analyzed at sensitive receptors in the vicinity of each site. The predicted worst-case increase in daytime and nighttime hour noise levels were compared to the 3 dBA noise significance threshold. Noise is discussed in more detail within Section 2.20.

Noise levels predicted to occur at the Brooklyn site as a result of the daytime shaft construction and backfill shaft activity were anticipated to exceed the *CEQR Technical Manual* 3 dBA threshold used to evaluate impact. These increased daytime noise levels, however, would be

intermittent and would persist for a total of approximately six (6) months, and therefore were considered temporary and not significant.

The potential worst-case noise levels predicted for both the daytime and nighttime hours that would occur at the Staten Island site as a result of the tunnel driving activity were anticipated to be in compliance with the *CEQR Technical Manual* 3 dBA threshold used to evaluate impact. Therefore the predicted intermittent noise would not be significant.

Based upon the results of the noise analyses, no adverse impact to public health would be expected.

2.21.5 Water Quality

Operation of the siphon and chlorination station would result in no impacts to water quality. Construction of the proposed siphon and chlorination station would include the development of stormwater pollution prevention plans and/or soil erosion and sediment control plans. In addition, during construction of the proposed outfall in Staten Island, these measures as well as the placement of floating boom and silt curtains would be used to minimize potential impacts to water quality.

3.0 REFERENCES

American Society for Testing and Materials (ASTM). Phase I Environmental Site Assessment (ESA). (ASTM E 1527-05).

City of New York. 2001. "City Environmental Quality Review (CEQR) Technical Manual."

City Facilities/Citywide Statement of Needs for Fiscal Years 2007, 2008, 2009 and 2010.

Cooperative Extension Service. Forest Resources Bulletin FOR 96-39. University of Georgia. Available at: http://warnell.forestry.uga.edu/warnell/service/library/for96-039a/for96-039a.pdf.

Environmental Data Resources, Inc. July 18, 2007. The EDR Radius Map with GeoCheck Report for "Front Street/Murray Hulbert Avenue, Staten Island, NY, 10301."

Environmental Data Resources, Inc. July 18, 2007. The EDR Radius Map with GeoCheck Report for "Shore Road/83rd Street, Brooklyn, NY, 11209."

The Louis Berger Group. September 2006. "New Stapleton Waterfront Development Plan Final Environmental Impact Statement."

The Metropolitan Waterfront Alliance. "Proposed Harbor Loop Ferry System for Upper New York Bay." Accessed on October 19, 2007 from http://www.waterwire.net/FerryMap/ Harborloop.doc.

New York City Department of City Planning. 2006. "Zoning Handbook: A Guide to New York City's Zoning Resolution."

New York City Department of City Planning. October 23, 2008. "Zoning Map." Map No. 21c.

New York City Department of City Planning. October 25, 2007. "Zoning Map." Map No. 21d.

New York City Department of City Planning. August 22, 2007. "Zoning Map." Map No. 22b.

New York City Department of City Planning. July 25, 2007. "Zoning Map." Map No. 22a.

New York City Department of City Planning. "Staten Island Growth Management" Accessed on October 19, 2007 from http://www.nyc.gov/html/dcp/html/sigrowth/index.shtml.

New York City Department of City Planning. "Staten Island Growth Management" Accessed on October 19, 2007 from http://www.nyc.gov/html/dcp/html/sigrowth/index.shtml.

New York City Department of Education. 2009. Fort Hamilton High School. Available at http://schools.nyc.gov/SchoolPortals/20/K490/default.htm.

New York City Department of Environmental Protection. 2007. Standard Water Main Specifications. The City of New York. Department of Environmental Protection. Bureau of Water and Sewer Operations.

New York Natural Heritage Program. 2002. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State (Draft for review). Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (eds). New York State Department of Environmental Conservation. Albany, NY.

Personal Communication Tara Seoane, New York State Department of Environmental Conservation, New York Natural Heritage Program Letter of July 24, 2007 to Ariusz Kornacki, of HydroQual, Inc.

Personal Communication. Ruth Pierpont, New York State Office of Parks, Recreation and Historic Preservation, Historic Preservation Field Services Bureau. Letter of July 23, 2007 to Ariusz Kornacki of HydroQual, Inc.

Personal Communication. Gina Santucci, The City of New York Landmarks Preservation Commission Letter of July 11, 2007 to Ariusz Kornacki of HydroQual, Inc.

Rasinya, Dean and Josephine Beckman. "Brooklyn Community Board 10 District Needs Statement Fiscal Year 2009" located on February 4, 2009 from http://www.bkcb10.org/neighborhoods/.

Sweeney, Sean and Terry Player. February 12, 2008, Staten Island Community Board 1 "Statement of Needs" located on February 5, 2009 from http://www.nyc.gov/html/sicb1/html/about/needs.shtml.

APPENDIX A

AGENCY CORRESPONDENCE

Environmental
Engineers & Scientists

THE CITY OF NEW YORK LANDMARKS PRESERVATION COMMISSION
1 Centre St., 9N, New York, NY 10007 (212) 669-7700

ENVIRONMENTAL REVIEW

DEP/LA-CEQR-R — PROJECT NUMBER

07/07/07 — DATE RECEIVED

PROJECT B 487 L 110: NEW WATER SIPHON

[X] No architectural significance

[X] No archaeological significance

[ ] Designated New York City Landmark or Within Designated Historic District

[ ] Listed on National Register of Historic Places

[ ] Appears to be eligible for National Register Listing and/or New York City Landmark Designation

[ ] May be archaeologically significant; requesting additional materials

COMMENTS

Gina Santucci — SIGNATURE

07/11/07 — DATE

1 of 2

THE CITY OF NEW YORK LANDMARKS PRESERVATION COMMISSION
1 Centre St., 9N, New York, NY 10007 (212) 669-7700

ENVIRONMENTAL REVIEW

DEP/LA-CEQR-K — PROJECT NUMBER

07/07/07 — DATE RECEIVED

PROJECT B 6140 L 1: NEW WATER SIPHON

[X] No architectural significance

[X] No archaeological significance

[ ] Designated New York City Landmark or Within Designated Historic District

[ ] Listed on National Register of Historic Places

[ ] Appears to be eligible for National Register Listing and/or New York City Landmark Designation

[ ] May be archaeologically significant; requesting additional materials

COMMENTS

Gina Santucci — SIGNATURE

07/11/07 — DATE

OFFICE OF PARKS · RECREATION · HISTORIC PRESERVATION
NEW YORK STATE

Eliot Spitzer
Governor

Carol Ash
Commissioner

New York State Office of Parks, Recreation and Historic Preservation

Historic Preservation Field Services Bureau • Peebles Island, PO Box 189, Waterford, New York 12188-0189
518-237-8643
www.nysparks.com

July 23, 2007

Ariusz H. Kornacki
Hydro Qual, Inc.
1200 MacArthur Blvd.
Mahwah, New Jersey 07430

Re: CORPS PERMITS, DEC
Replacement of Existing Water Siphon betw. Brooklyn & Staten Island
Upper New York Bay betw. Bay Ridge in Brooklyn & Stapleton in Staten Island
BROOKLYN, Kings
STATEN ISLAND, Richmond County
07PR03702

Dear Mr. Kornacki:

Thank you for requesting the comments of the State Historic Preservation Office (SHPO). We have reviewed the project in accordance with Section 106 of the National Historic Preservation Act of 1966.

Based upon this review, it is the SHPO's opinion that your project will have No Effect upon cultural resources in or eligible for inclusion in the National Registers of Historic Places.

If further correspondence is required regarding this project, please be sure to refer to the OPRHP Project Review (PR) number noted above.

Sincerely,

Ruth L. Pierpont

Ruth L. Pierpont
Director

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, Albany, New York 12233-4757
Phone: (518) 402-8935 • **FAX:** (518) 402-8925
Website: www.dec.state.ny.us

Alexander B. Grannis
Commissioner

July 24, 2007

Ariusz H Kornacki
Hydro Qual Environmental
1200 Mac Arthur Blvd
Mahwah, NJ 07430

Dear Mr. Kornacki:

In response to your recent request, we have reviewed the New York Natural Heritage Program databases with respect to an Environmental Assessment for the proposed Construction - Water Siphon within Tunnel under upper NY Bay - Brooklyn to Staten Island; plus two shaft sites - Brooklyn and Staten Island, sites as indicated on the map you provided.

We have no records of known occurrences of rare or state-listed animals or plants, significant natural communities, or other significant habitats, on or in the immediate vicinity of your site.

The absence of data does not necessarily mean that rare or state-listed species, natural communities or other significant habitats do not exist on or adjacent to the proposed site. Rather, our files currently do not contain any information which indicates their presence. For most sites, comprehensive field surveys have not been conducted. For these reasons, we cannot provide a definitive statement on the presence or absence of rare or state-listed species, or of significant natural communities. This information should not be substituted for on-site surveys that may be required for environmental assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

This response applies only to known occurrences of rare or state-listed animals and plants, significant natural communities and other significant habitats maintained in the Natural Heritage Data bases. Your project may require additional review or permits; for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, at the enclosed address.

Sincerely,

Tara Seoane

Tara Seoane, Information Services
New York Natural Heritage Program

cc: Reg. 2, Wildlife Mgr.
Reg. 2, Fisheries Mgr.

APPENDIX B

ANALYTICAL RESULTS

Environmental
Engineers & Scientists

Attachment 1
Brooklyn Environmental Boring Program Analytical Results (units mg/kg)

Sample Name	TAGM 4046 Eastern USA Background (mg/kg)	B-301	B-302		B-303				B-304				B-305					B-306		B-307	B-308				B-309	B-310	B-311	B-312		B-314			
Sample Date		10/4/06	10/25/06	10/25/06	9/26/06	9/26/06	9/27/06	9/28/06	9/26/06	9/27/06	9/27/06	9/28/06	9/29/06	10/2/06	10/2/06	10/2/06	10/4/06	9/25/06	9/25/06	9/21/06	9/7/06	9/7/06	9/7/06	9/7/06	9/26/06	9/20/06	9/26/06	9/7/06	9/7/06	7/19/07	7/19/07	7/19/07	7/19/07
Sample Depth		74-90	70-80	80-90	0-6	14-24	46-54	72-80	0-25	35-41	47-59	71-81	0-16	30-44	30-40	52-64	72-80	0-20	0-20 D	0-20	0-4	0-4 D	16-20	16-20 D	0-21	0-20	0-20	0-4	16-20	1-3	29-31	59-61	97-99
Metals																																	
Aluminum	33,000	3400	2100	2900	3700	3700	3900	2400	3600	5400	2300	2800	7000	3700	4500	2700	3300	5500	5900	4000	5200	3900	5600	8600	5300	3800	4600	3800	3400	4500	4100	3000	2700
Arsenic	3 - 12	ND	ND	ND	3.4	15	ND	ND	3.6	ND	ND	ND	10	ND	ND	ND	ND	3.2	ND	ND	ND	ND	ND	ND	ND	4.1	3.3	ND	ND	3.4	2.4	ND	ND
Barium	15 - 600	14	21	28	27	25	42	20	44	48	24	24	82	34	40	28	21	54	30	27	22	16	40	44	41	76	33	23	30	29	33	31	20
Calcium	130 - 35,000	ND	ND	ND	ND	2700	2100	ND	2500	ND	ND	ND	6600	ND	ND	ND	ND	1700	16000	1100	23000	24000	1800	2100	ND	8800	12000	14000	1200	1400	1500	ND	ND
Chromium	1.5 - 40	9.9	8.3	8	9.1	11	11	8.8	11	14	9.4	8.2	18	11	13	9.5	9.6	13	9.5	13	12	7.3	19	30	17	13	12	8.8	10	10	10	8.4	6.7
Cobalt	2.5 - 60	4.6	3.5	5	ND	3.3	5	3.2	4	6.3	3.6	3.6	6.7	4.6	5.5	4	4.1	6.9	12	5.7	5.4	4.6	6.2	8.2	6.9	5	5.6	4	5.2	3.4	5.3	4.1	3.3
Copper	1 - 50	11	8.8	11	19	24	24	9.4	20	24	11	10	56	24	23	14	11	26	27	21	19	33	24	31	20	23	17	15	19	17	16	13	8.7
Iron	2,000 - 550,000	11000	7200	9700	6900	9000	11000	8900	9100	14000	8800	9100	15000	9900	12000	11000	11000	14000	15000	11000	9900	9000	13000	15000	13000	22000	12000	7100	10000	8700	11000	9300	8400
Lead	200 - 500	ND	ND	ND	60	22	ND	ND	19	6.4	ND	ND	130	ND	6.4	ND	ND	98	46	6.5	14	8.9	6.9	ND	31	56	14	6.9	ND	26	9.2	ND	ND
Magnesium	100 - 5,000	2400	1200	1700	1300	2500	2500	1400	2000	3100	1800	1400	3200	2100	2500	1500	1900	2700	15000	2000	10000	11000	3100	4400	2300	3000	7200	2400	2100	1700	3200	1900	1500
Manganese	50 - 5,000	220	250	300	160	190	200	260	150	330	260	220	250	260	270	260	220	290	230	230	210	160	330	350	200	320	280	200	290	160	300	210	280
Mercury	0.001 - 0.2	ND	ND	ND	0.54	ND	ND	ND	ND	ND	ND	ND	0.98	ND	ND	ND	ND	0.32	0.13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	0.5 - 25	13	9.1	10	8.8	14	12	9.2	26	15	12	9.4	26	12	13	9.1	11	29	61	17	25	19	29	57	51	18	18	10	34	14	8.8	7.7	9.4
Potassium	8,500 - 43,000	ND	ND	ND	ND	1400	780	ND	800	1200	ND	ND	1500	820	1000	ND	ND	850	860	820	ND	ND	750	610	720	700	1000	810	660	630	1100	ND	ND
Sodium	6,000 - 8,000	630	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	590	790	ND	ND	610	ND	ND	ND	ND	ND	ND
Vanadium	1 - 300	16	ND	14	14	17	18	ND	14	24	14	13	25	16	20	17	14	22	26	23	19	26	24	24	24	18	20	13	16	16	14	13	ND
Zinc	9 - 50	15	ND	16	40	34	25	13	32	32	15	14	84	25	30	16	13	39	60	25	27	25	35	34	29	84	44	29	30	33	45	18	15
Sample Name	TAGM 4046 Recommended Soil Cleanup Objectives (mg/kg)	B-301	B-302		B-303				B-304				B-305					B-306		B-307	B-308				B-309	B-310	B-311	B-312		B-314			
Sample Date		10/4/06	10/25/06	10/25/06	9/26/06	9/26/06	9/27/06	9/28/06	9/26/06	9/27/06	9/27/06	9/28/06	9/29/06	10/2/06	10/2/06	10/2/06	10/4/06	9/25/06	9/25/06	9/21/06	9/7/06	9/7/06	9/7/06	9/7/06	9/26/06	9/20/06	9/26/06	9/7/06	9/7/06	7/19/07	7/19/07	7/19/07	7/19/07
Sample Depth		74-90	70-80	80-90	0-6	14-24	46-54	72-80	0-25	35-41	47-59	71-81	0-16	30-44	30-40	52-64	72-80	0-20	0-20 D	0-20	0-4	0-4 D	16-20	16-20 D	0-21	0-20	0-20	0-4	16-20	1-3	29-31	59-61	97-99
SVOCs																																	
Acenaphthene	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.21 J	ND	ND	ND	ND	ND	0.14 J	ND	ND	ND	ND	ND	ND	0.49	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	41	ND	ND	ND	ND	ND	ND	ND	0.042 J	ND	ND	ND	0.25 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	50	ND	ND	ND	ND	0.058 J	ND	ND	0.084 J	ND	ND	ND	0.53 J	ND	ND	ND	ND	ND	0.053 J	ND	ND	ND	ND	ND	ND	0.58	ND	ND	ND	ND	ND	ND	ND
Benzo_a_anthracene	0.224 of MDL	ND	ND	ND	0.092 J	0.25 J	ND	ND	0.43	ND	ND	ND	1.5	ND	ND	ND	ND	ND	ND	ND	0.039 J	0.15 J	ND	ND	ND	0.85	ND	ND	ND	0.071 J	ND	ND	ND
Benzo_a_pyrene	0.061 or MDL	ND	ND	ND	0.067 J	0.22 J	ND	ND	0.39	ND	ND	ND	1.4	ND	ND	ND	ND	ND	ND	ND	0.061 J	ND	ND	ND	ND	0.72	ND	ND	ND	0.11 J	ND	ND	ND
Benzo_b_fluoranthene	1.1	ND	ND	ND	0.11 J	0.26 J	ND	ND	0.39	ND	ND	ND	1.3 J	ND	ND	ND	ND	ND	ND	ND	0.073 J	ND	ND	ND	ND	0.92	ND	ND	ND	0.14 J	ND	ND	ND
Benzo_g,h,i_perylene	50	ND	ND	ND	0.048 J	0.07 J	ND	ND	0.16 J	ND	ND	ND	0.78 J	ND	ND	ND	ND	ND	ND	ND	0.058 J	ND	ND	ND	ND	0.41	ND	ND	ND	0.096 J	ND	ND	ND
Benzo_k_fluoranthene	1.1	ND	ND	ND	0.052 J	0.082 J	ND	ND	0.17 J	ND	ND	ND	0.41 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.24 J	ND	ND	ND	0.051 J	ND	ND	ND
Bis(2-Ethylhexyl)phthalate	50	0.055 J	0.44	0.091 J	0.38 JB	0.16 JB	0.086 J	0.21 J	0.14 JB	0.045 J	0.14 J	0.25 J	0.3 J	0.21 JB	0.058 JB	0.2 JB	0.12 J	0.094 J	0.14 J	ND	0.1 J	0.15 J	ND	0.06 JB	0.11 JB	0.54	0.29 JB	ND	0.052 JB	0.074 J	ND	0.18 J	0.098 J
Butylbenzylphthalate	50	ND	0.083 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.042 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.14 J	ND	ND	ND	ND	ND	ND	ND
Carbazole	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.24 J	ND	ND	ND	ND	ND	ND	ND
Chrysene	0.4	ND	ND	ND	0.073 J	0.29 J	ND	ND	0.38	ND	ND	ND	1.6	ND	ND	ND	ND	ND	0.043 J	ND	0.096 J	ND	ND	ND	ND	0.84	ND	ND	ND	0.080 J	ND	ND	ND
Dibenzo_a,h_Anthracene	0.014 or MDL	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.35 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.12 J	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.21 J	ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	8.1	ND	ND	0.041 J	0.046 JB	0.07 JB	ND	ND	0.096 JB	ND	ND	0.041 J	ND	0.067 JB	0.069 JB	ND	ND	ND	ND	ND	0.085 JB	ND	0.091 JB	0.17 JB	0.081 JB	ND	ND	ND	0.12 JB	0.067 J	0.052 J	0.070 J	ND
DI-n-octylphthalate	50	ND	ND	ND	ND	ND	ND	ND	0.063 J	ND	0.1 J	0.14 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.087 J	0.19 J	ND	ND	ND	ND	ND	ND
Fluoranthene	50	ND	ND	ND	0.16 J	0.32 J	ND	ND	0.44	ND	ND	ND	2.1	ND	ND	ND	ND	ND	0.044 J	ND	0.043 J	ND	ND	ND	ND	2.1	ND	ND	ND	0.10 J	ND	ND	ND
Fluorene	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.27 J	ND	ND	ND	ND	ND	0.11 J	ND	ND	ND	ND	ND	ND	0.44	0.039 J	ND	ND	ND	ND	ND	ND
Indeno_1,2,3-cd_pyrene	3.2	ND	ND	ND	ND	0.083 J	ND	ND	0.12 J	ND	ND	ND	0.62 J	ND	ND	ND	ND	ND	ND	ND	0.04 J	ND	ND	ND	ND	0.37 J	ND	ND	ND	0.077 J	ND	ND	ND
Naphthalene	13	ND	ND	ND	ND	ND	ND	ND	0.046 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.19 J	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	50	ND	ND	ND	0.062 J	0.15 J	ND	ND	0.19 J	ND	ND	ND	1.7	ND	ND	ND	ND	ND	0.14 J	ND	ND	ND	ND	ND	ND	2.4	0.075 J	ND	ND	0.051 J	ND	ND	ND
Pyrene	50	ND	ND	ND	0.14 J	0.45	ND	ND	0.8	ND	ND	ND	2.6	ND	ND	ND	ND	ND	0.093 J	ND	0.071 J	ND	ND	ND	ND	2.3	0.061 J	ND	ND	0.12 J	ND	ND	ND
PCBs, Pesticides, Herbicides																																	
Dieldrin	0.044	ND	ND	ND	0.51	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
P,P'-DDE	2.1	ND	ND	ND	0.11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
P,P'-DDT	2.1	ND	ND	ND	0.14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0076	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VOCs																																	
Acetone	0.2	ND	ND	ND	ND	ND	ND	0.019 J	ND	ND	0.026 J	0.018 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.023 J
Carbon disulfide	2.7	ND	ND	ND	ND	ND	ND	0.0022 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.1	0.0091 B	0.034 B	0.035 B	0.025 B	0.029 B	0.028 B	0.033 B	0.029 B	0.026 B	0.034 B	0.034 B	0.017 B	0.012 B	0.012 B	0.019 B	0.015 B	0.0074 B	0.019 B	0.0058 B	0.012 B	0.013 B	0.015 B	0.01 B	0.029 B	0.013 B	0.024 B	0.012 B	0.013 B	0.017 B	0.0064 JB	0.0096 JB	0.0065 JB
% Solids																																	
% Solids		85	82	86	84	81	87	85	89	85	87	85	72	90	90	79	80	85	87	90	89	89	87	88	85	89	92	91	89	87	88	83	81

All units are mg/kg
ND = indicates non-detect
B = Detected in the blank
J = Indicates an estimated value when a compound is detected at less than the specified detection limit
Shading signifies that sample exceeds TAGM 4046 Eastern US Background or TAGM 4046 Recommended Soil Cleanup Objectives

Attachment 2
Staten Island Land Environmental Boring Program Analytical Resutls (units mg/kg)

Sample Name	TAGM 4046 Eastern USA Background (mg/kg)	B-201		B-203				B-204				B-205			B-206			B-207		B-208		B-209		B-210		B-211		B-212		B-213	
Sample Date		9/1/06	9/1/06	10/11/06	10/12/06	10/12/06	10/13/06	9/14/06	9/14/06	9/15/06	9/15/06	9/14/06	9/14/06	9/15/06	9/18/06	9/18/06	10/17/06	9/19/06	9/19/06	9/19/06	10/25/06	8/30/06	8/30/06	8/31/06	8/31/06	9/18/06	9/18/06	9/18/06	9/18/06	8/24/06	8/24/06
Sample Depth		69-75	83-87	6-26	28-50	54-64	70-80	5-21	27-41	61-73	61-73 D	5-21	29-41	61-77	0-4	12-15	17-39	0-4	22-27	0-4	10-20	0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16
Metals																															
Aluminum	33,000	1800	3300	3800	3000	2500	4600	3900	2500	3700	3500	4900	2700	4700	4300	5200	2700	6300	4100	5800	4600	5300	2500	4100	5100	4500	5500	4600	3700	5500	3500
Antimony	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	3 - 12	ND	ND	4.1	2.5	ND	2.8	ND	ND	ND	ND	3.1	ND	ND	5.7	4.2	ND	7.3	3.9	5.1	ND	21	ND	2.9	4.7	2.3	4.2	4.1	3.1	3.7	3.2
Barium	15 - 600	18	15	36	19	17	19	63	14	24	32	75	15	24	59	82	16	290	27	130	30	170	16	36	48	58	99	66	95	87	76
Cadmium	0.1 - 1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.9	ND	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	130 - 35,000	ND	1500	7000	3200	ND	2000	7300	2500	ND	ND	14000	4500	1200	14000	13000	ND	6300	4800	10000	ND	48000	1800	8400	3600	24000	14000	12000	7500	21000	5700
Chromium	1.5 - 40	10	ND	12	24	8.3	31	8.3	23	12	11	12	12	15	18	20	20	42	45	28	17	150	12	40	28	16	15	17	9.3	16	11
Cobalt	2.5 - 60	4.8	ND	7.6	19	7	20	4.3	16	7.2	6.6	5.9	9.2	7.1	9.9	9.4	19	30	28	15	8.8	160	8.5	20	15	11	7.3	9.5	4.5	6.7	4.2
Copper	1 - 50	6.6	ND	22	13	8.8	12	17	14	11	11	76	19	13	65	43	16	49	20	98	16	40	10	24	36	33	24	32	21	81	38
Iron	2,000 - 550,000	6800	6600	10000	12000	7100	15000	8600	13000	10000	10000	11000	9900	9700	21000	15000	17000	23000	23000	19000	13000	43000	10000	17000	16000	16000	14000	12000	12000	17000	14000
Lead	200 - 500	ND	9.2	55	ND	ND	ND	62	ND	ND	ND	210	11	ND	170	210	32	48	16	420	20	500	14	22	64	67	73	110	910	120	98
Magnesium	100 - 5,000	2400	2500	9900	39000	8900	12000	3100	32000	3600	3600	5200	16000	3800	8100	10000	17000	32000	30000	11000	7700	14000	9800	31000	18000	17000	6100	7200	2700	8800	3300
Manganese	50 - 5,000	170	160	230	420	150	250	140	300	160	170	190	230	110	230	250	120	370	420	210	320	1700	120	260	250	340	270	200	180	210	210
Mercury	0.001 - 0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.61	ND	ND	0.4	0.33	ND	ND	ND	0.31	ND	0.53	ND	ND	0.14	0.85	0.52	0.29	ND	0.17	0.59
Nickel	0.5 - 25	35	18	91	450	99	240	14	320	54	75	43	150	65	110	120	330	740	760	250	120	1100	130	410	270	150	45	97	19	24	16
Potassium	8,500 - 43,000	ND	1200	1000	950	ND	ND	1400	760	ND	ND	1400	970	ND	770	1100	630	810	860	670	1700	620	690	850	990	720	1500	690	930	1500	780
Selenium	0.1 - 3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	6,000 - 8,000	ND	1100	ND	ND	ND	690	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	810	ND	590	ND	1600	ND	620	ND	950	ND	ND	ND	ND	ND
Vanadium	1 - 300	ND	ND	13	ND	ND	13	ND	13	13	13	14	13	15	22	21	15	22	18	35	22	19	14	16	19	24	18	22	ND	19	19
Zinc	9 - 50	ND	14	48	20	15	27	56	21	22	22	180	24	28	130	120	25	94	37	410	30	230	24	38	55	130	61	89	86	120	150

Sample Name	TAGM 4046 Recommended Soil	B-201		B-203				B-204				B-205			B-206			B-207		B-208		B-209		B-210		B-211		B-212		B-213	
Sample Date	Cleanup Objectives	9/1/06	9/1/06	10/11/06	10/12/06	10/12/06	10/13/06	9/14/06	9/14/06	9/15/06	9/15/06	9/14/06	9/14/06	9/15/06	9/18/06	9/18/06	10/17/06	9/19/06	9/19/06	9/19/06	10/25/06	8/30/06	8/30/06	8/31/06	8/31/06	9/18/06	9/18/06	9/18/06	9/18/06	8/24/06	8/24/06
Sample Depth	(mg/kg)	69-75	83-87	6-26	28-50	54-64	70-80	5-21	27-41	61-73	61-73 D	5-21	29-41	61-77	0-4	12-15	17-39	0-4	22-27	0-4	10-20	0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16
SVOCs																															
2-Methylnaphthalene	36.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.26 J	ND	ND	ND	0.76	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4 J	ND	0.17 J	ND	18
Acenaphthene	50	ND	ND	0.29 J	ND	ND	ND	0.058 J	ND	ND	ND	0.42	ND	ND	0.22 J	0.93	ND	1.1 J	ND	0.047 J	ND	ND	ND	ND	ND	0.23 J	8.1 J	0.14 J	0.6	ND	1.8 J
Acenaphthylene	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.17 J	ND	ND	0.15 J	0.2 J	ND	0.32 J	ND	0.2 J	ND	0.051 J	ND	ND	ND	ND	ND	ND	0.042 J	ND	0.62 J
Anthracene	50	ND	ND	0.41 J	ND	ND	ND	0.08 J	ND	ND	ND	0.58	ND	ND	0.38 J	1.3	ND	2.4	ND	0.13 J	ND	0.079 J	ND	ND	0.096 J	0.52 J	24	0.47 J	1.3	0.12 J	6.6
Benzo_a_anthracene	0.224 or MDL	ND	ND	0.7	ND	ND	ND	0.21 J	ND	ND	ND	0.92	ND	ND	0.99 J	2.8	ND	3.5	ND	0.59	ND	0.42	ND	ND	0.2 J	1.1 J	23	1.5	1.8	0.69	11
Benzo_a_pyrene	0.061 or MDL	ND	ND	0.5	ND	ND	0.13 J	0.17 J	ND	ND	ND	0.77	ND	ND	0.85 J	2.2	ND	2.7	ND	0.6	ND	0.39	ND	ND	0.2 J	0.88 J	16	1.4	1.4	0.64	9
Benzo_b_fluoranthene	1.1	ND	ND	0.62	ND	ND	ND	0.18 J	ND	ND	ND	0.91	ND	ND	0.98 J	2.7	ND	3.8	ND	0.81	ND	0.58	ND	ND	0.18 J	1.1	19	1.6	1.8	0.8	10
Benzo_g,h,i_perylene	50	ND	ND	0.26 J	ND	ND	ND	0.089 J	ND	ND	ND	0.44	ND	ND	0.54 J	1.2	ND	1.4 J	ND	0.73	ND	0.36 J	ND	ND	ND	0.57 J	7 J	0.91 J	0.83	0.45	5.2
Benzo_k_fluoranthene	1.1	ND	ND	0.19 J	ND	ND	ND	0.077 J	ND	ND	ND	0.33 J	ND	ND	0.35 J	0.95	ND	1 J	ND	0.3 J	ND	0.17 J	ND	ND	0.054 J	0.43 J	6.9 J	0.62 J	0.64	0.23 J	3.1
Bis(2-Ethylhexyl)phthalate	50	0.16 J	0.18 J	0.13 J	0.057 J	0.17 J	0.1 J	0.22 J	0.17 J	0.11 J	0.094 J	0.39 J	0.19 J	0.058 J	0.42 J	0.073 J	0.1 J	ND	ND	ND	0.098 J	0.12 JB	0.092 JB	0.056 J	0.073 J	0.37 J	ND	0.32 J	ND	0.066 J	ND
Butylbenzylphthalate																															
Carbazole	NA	ND	ND	0.18 J	ND	ND	ND	ND	ND	ND	ND	0.19 J	ND	ND	0.12 J	0.4	ND	0.98 J	ND	0.043 J	ND	0.069 J	ND	ND	ND	0.17 J	5.6 J	0.13 J	0.53	ND	0.56 J
Chrysene	0.4	ND	ND	0.7	ND	ND	ND	0.21 J	ND	ND	ND	0.83	ND	ND	0.96 J	2.6	ND	3.5	ND	0.6	ND	0.49	ND	ND	ND	0.2 J	1.1	19	1.4	1.8	0.69	9.8
Dibenzo_a,h_Anthracene	0.014 or MDL	ND	ND	0.091 J	ND	ND	ND	ND	ND	ND	ND	0.12 J	ND	ND	0.17 J	0.35 J	ND	0.42 J	ND	0.13 J	ND	0.13 J	ND	ND	ND	0.17 J	ND	0.25 J	0.23 J	0.14 J	1.4 J
Dibenzofuran	6.2	ND	ND	0.12 J	ND	ND	ND	ND	ND	ND	ND	0.25 J	ND	ND	ND	0.53	ND	0.96 J	ND	ND	ND	ND	ND	ND	ND	ND	8.9 J	ND	0.45	ND	1.2 J
Diethylyphthalate																															
Di-n-butylphthalate	8.1	0.072 JB	ND	0.093 J	ND	ND	ND	0.05 J	0.061 J	ND	ND	ND	ND	0.049 J	ND	ND	ND	ND	ND	ND	ND	0.064 JB	0.082 JB	0.098 JB	0.061 JB	ND	ND	ND	0.066 JB	0.037 JB	ND
Fluoranthene	50	ND	ND	1.5	ND	ND	ND	0.46	ND	ND	ND	2.4	ND	ND	1.9	5.1	0.046 J	9.7	0.052 J	0.8	ND	0.82	0.038 J	0.042 J	0.35 J	2.4	58	2.8	5.2	1.2	23
Fluorene	50	ND	ND	0.28 J	ND	ND	ND	0.062 J	ND	ND	ND	0.57	ND	ND	0.26 J	0.9	ND	0.98 J	ND	0.049 J	ND	ND	ND	ND	ND	0.22 J	14	0.17 J	0.7	ND	3.8
Indeno_1,2,3-cd_pyrene	3.2	ND	ND	0.24 J	ND	ND	ND	0.07 J	ND	ND	ND	0.4 J	ND	ND	0.46 J	1.1	ND	1.3 J	ND	0.44	ND	0.26 J	ND	ND	0.045 J	0.53 J	6.1 J	0.66 J	0.72	0.37	4.4
Naphthalene	13	ND	ND	0.11 J	ND	ND	ND	ND	ND	ND	ND	0.38 J	ND	ND	0.71 J	5.7	ND	0.96 J	ND	0.15 J	ND	ND	ND	ND	ND	ND	12	0.16 J	0.37 J	ND	9.9
Phenanthrene	50	ND	ND	1.8	ND	ND	ND	0.43	ND	ND	ND	2.5	ND	ND	1.6	4.3	0.045 J	9.8	ND	0.31 J	ND	0.48	ND	ND	0.33 J	2.1	75	1.9	5.3	0.52	16
Phenol		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	50	ND	ND	1.5	ND	ND	ND	0.53	ND	ND	ND	2.3	ND	ND	2.1	6.1	0.048 J	8	0.048 J	1	ND	0.96	0.061 J	0.078 J	0.58	2.5	49	3.5	4.5	1.4	25
PCBs, Pesticides, Herbicides																															
Aroclor-1248	1.0 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1254	1.0 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.54	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.016	ND	ND	ND	ND	ND	ND	0.026	ND	ND	ND	0.022	ND	ND	ND	ND	ND
Dieldrin	0.044	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0073 D	ND	0.016 D	ND	ND	ND	ND	ND	0.016 D	ND	0.037	ND	ND	ND
P,P'-DDD	2.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.076	ND	ND	ND	ND	ND	ND	0.031	ND	ND	ND	0.0082	ND	0.015	ND	ND	ND
P,P'-DDE	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0063	ND	ND	ND	ND	ND	ND	0.0087	ND	ND	ND	ND	ND	ND	ND	ND	ND
P,P'-DDT		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silvex		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VOCs																															
Acetone	0.2	ND	ND	ND	ND	ND	0.044	ND	ND	ND	ND	ND	ND	ND	0.053	ND	ND	0.021 J	0.02 J	0.033	ND	0.02 J	0.043	ND	ND	ND	0.027 J	0.034	ND	ND	ND
Benzene	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.016	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	2.7	ND	ND	ND	ND	ND	0.0013 J	ND	ND	ND	ND	ND	ND	ND	0.0035 J	0.011 J	ND	ND	0.0014 J	ND	ND	ND	ND	ND	0.002 J	ND	ND	ND	ND	ND	0.033
Ethylbenzene	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.006	0.037	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.028
M&p-Xylenes	1.2 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0016 J	0.024	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0016 J	0.0013 J	ND	ND	ND
Methylene chloride	0.1	0.018 B	0.025 B	0.017 B	0.02 B	0.022 B	0.026 B	0.014 B	0.012 B	0.013 B	0.014 B	0.013 B	0.013 B	0.014 B	0.011 B	0.069 B	0.032 B	0.014 B	0.019 B	0.016 B	0.035 B	0.045 B	0.051 B	0.015 B	0.014 B	0.013 B	0.013 B	0.013 B	0.011 B	0.016 B	0.096 B
O-Xylene	1.2 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.01	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.018	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
% Solids																															
% Solids		84	75	81	87	87	83	81	85	84	85	82	85	84	88	83	86	87	88	87	85	87	90	91	87	91	79	86	85	92	82

All units are mg/kg
ND = indicates non-detect
J = Indicates an estimated value when a compound is detected at less than the specified detection limit
B = Detected in the blank
Shading signifies that sample exceeds TAGM 4046 Eastern US Background or TAGM 4046 Recommended Soil Cleanup Objectives

Attachment 2
Staten Island Land Environmental Boring Program Analytical Resutls (units mg/kg)

Sample Name	TAGM 4046 Eastern USA Background (mg/kg)	B-214		B-215		B-216		B-217		B-218		B-219		B-220		B-221		B-222				B-223		B-224		B-225				
Sample Date		8/24/06	8/24/06	8/24/06	8/24/06	8/25/06	8/25/06	8/25/06	8/25/06	8/25/06	8/25/06	8/25/06	8/25/06	8/29/06	8/29/06	8/29/06	8/29/06	8/29/06	8/29/06	8/29/06	8/29/06	8/30/06	8/30/06	8/31/06	8/31/06	9/5/06	9/5/06	9/5/06	9/5/06	9/6/06
Sample Depth		0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16	4-8	11-13	8-12	12-16	0-4	0-4 D	12-16	12-16 D	0-4	12-16	0-4	12-18	0-4	0-4 D	16-20	16-20 D	19-25
Metals																														
Aluminum	33,000	4000	2600	6300	2800	4300	6700	5500	1100	4400	6600	2400	5700	3500	2100	2100	5300	2300	4700	4900	6400	5200	9000	2900	7800	5100	5500	4400	2300	13000
Antimony	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	3 - 12	5.4	9.9	3	2.6	3.9	2.7	4.4	6	3.9	4.1	ND	22	3.9	26	8.8	8.9	ND	3.9	9.2	6.6	3.9	4.8	ND	4.9	3	4.1	2.8	2.4	ND
Barium	15 - 600	59	110	120	58	41	63	33	35	46	40	20	150	19	26	41	46	32	36	45	41	29	24	17	34	35	38	25	17	180
Cadmium	0.1 - 1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	130 - 35,000	31000	2000	37000	21000	26000	4200	4200	15000	20000	2700	28000	6100	11000	14000	2200	2700	6800	11000	2200	2700	8300	ND	5600	2000	68000	36000	1600	1300	1300
Chromium	1.5 - 40	15	9.3	15	15	22	20	20	6.6	17	22	11	70	18	34	33	32	10	22	20	20	56	35	11	32	26	28	24	27	48
Cobalt	2.5 - 60	4.9	4	5.8	ND	15	7.1	12	ND	9.4	14	7.2	20	4.4	24	20	16	5.9	20	7.4	8.4	31	21	3.2	19	15	9.8	25	25	23
Copper	1 - 50	71	42	30	31	34	33	28	18	24	26	19	100	23	59	46	40	21	54	28	36	43	17	8.9	20	40	47	30	28	45
Iron	2,000 - 550,000	12000	14000	15000	8100	14000	14000	13000	5600	12000	15000	6000	19000	5900	21000	24000	19000	8100	17000	15000	16000	23000	21000	7200	20000	15000	17000	20000	16000	23000
Lead	200 - 500	210	360	410	900	93	120	44	69	71	15	28	280	210	650	220	220	24	73	290	160	35	17	ND	40	25	19	ND	ND	ND
Magnesium	100 - 5,000	8300	1300	11000	2900	26000	6200	11000	3700	11000	8200	14000	6400	8800	30000	24000	15000	7500	28000	5900	5700	37000	15000	1500	16000	46000	11000	40000	44000	29000
Manganese	50 - 5,000	160	120	230	200	290	190	230	84	270	320	140	390	270	220	830	840	100	300	180	220	400	250	95	220	290	230	320	260	170
Mercury	0.001 - 0.2	0.33	0.14	0.31	0.23	0.32	0.25	0.12	ND	0.1	ND	ND	3.1	0.16	0.46	0.43	0.6	0.14	1	0.29	0.27	0.14	ND	ND	0.16	ND	ND	ND	ND	ND
Nickel	0.5 - 25	41	16	26	14	360	57	200	44	170	180	140	120	28	400	280	230	96	420	100	93	630	310	15	350	300	140	480	640	250
Potassium	8,500 - 43,000	600	ND	2000	ND	700	920	ND	ND	610	790	ND	1100	ND	ND	ND	1100	ND	1100	910	1100	1100	1000	930	940	1200	1000	1200	600	2800
Selenium	0.1 - 3.9	ND	ND	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	6,000 - 8,000	570	710	ND	ND	1000	940	ND	ND	740	ND	ND	1800	ND	ND	940	1400	ND	560	1000	1200	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	1 - 300	18	ND	21	ND	18	19	20	ND	18	22	11	27	ND	15	ND	20	14	22	17	19	23	23	ND	22	25	28	19	ND	28
Zinc	9 - 50	95	240	98	120	65	81	46	75	52	36	24	270	54	220	100	84	22	52	36	45	40	34	16	34	37	39	25	20	27

Sample Name	TAGM 4046 Recommended Soil	B-214		B-215		B-216		B-217		B-218		B-219		B-220		B-221		B-222				B-223		B-224		B-225				
Sample Date	Cleanup Objectives	8/24/06	8/24/06	8/24/06	8/24/06	8/25/06	8/25/06	8/25/06	8/25/06	8/25/06	8/25/06	8/25/06	8/25/06	8/29/06	8/29/06	8/29/06	8/29/06	8/29/06	8/29/06	8/29/06	8/29/06	8/30/06	8/30/06	8/31/06	8/31/06	9/5/06	9/5/06	9/5/06	9/5/06	9/6/06
Sample Depth	(mg/kg)	0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16	0-4	12-16	4-8	11-13	8-12	12-16	0-4	0-4 D	12-16	12-16 D	0-4	12-16	0-4	12-18	0-4	0-4 D	16-20	16-20 D	19-25
SVOCs																														
2-Methylnaphthalene	36.4	ND	2.7 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	6.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	50	0.95 J	6.9	0.63 J	0.39 J	0.29 J	0.35 J	ND	ND	0.36 J	ND	0.36 J	5.7	ND	0.2 J	0.049 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	41	ND	ND	ND	ND	0.24 J	0.063 J	ND	ND	ND	ND	0.26 J	1.1 J	ND	0.052 J	0.096 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Anthracene	50	2.7	13	1.6	0.51	0.85 J	0.94	ND	ND	0.92 J	ND	1.2 J	10	ND	0.63	0.37 J	0.15 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo_a_anthracene	0.224 or MDL	8.3	19	3.6	1.2	2.9	1.9	0.17 J	0.11 J	3.3	0.063 J	5.2	15	0.12 J	1.4	0.78	0.52	0.05 J	0.069 J	0.058 J	0.064 J	0.068 J	ND	ND	ND	0.081 J	0.1 J	ND	ND	ND
Benzo_a_pyrene	0.061 or MDL	6.3	15	2.8	0.99	2.4	1.6	0.16 J	0.098 J	3	ND	5	12	0.1 J	1.2	0.63	0.42 J	0.054 J	0.054 J	ND	ND	0.058 J	ND	ND	ND	ND	0.075 J	ND	ND	ND
Benzo_b_fluoranthene	1.1	8.1	19	3.6	1.2	3.4	2	0.23 J	0.14 J	3.7	ND	6.3	15	0.13 J	1.5	0.75	0.51 J	0.073 J	0.074 J	ND	ND	0.068 J	ND	ND	ND	ND	0.1 J	ND	ND	ND
Benzo_g,h,i_perylene	50	3.8	8.7	1.9	0.63	1.5	0.79 J	0.07 J	0.069 J	2 J	ND	3.2	7.1	0.067 J	0.78	0.32 J	0.2 J	0.039 J	ND	ND	ND	0.041 J	ND	ND	ND	ND	0.05 J	ND	ND	ND
Benzo_k_fluoranthene	1.1	2.8	5.3	1.3	0.41 J	1 J	0.55	0.081 J	0.059 J	1.6	ND	2	4.5 J	0.042 J	0.48	0.25 J	0.17 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.043 J	ND	ND	ND
Bis(2-Ethylhexyl)phthalate	50	ND	ND	ND	0.12 J	ND	ND	ND	0.064 J	ND	0.059 J	ND	ND	0.11 JB	0.16 JB	0.082 JB	0.085 JB	0.1 JB	0.072 JB	0.076 JB	0.073 JB	0.093 J	ND	0.057 JB	ND	0.11 J	0.056 J	0.097 J	0.081 J	0.44
Butylbenzylphthalate																														
Carbazole	NA	0.48 J	3.5 J	0.32 J	0.16 J	0.27 J	0.24 J	ND	ND	0.32 J	ND	0.22 J	3.1 J	ND	0.25 J	0.08 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	0.4	7.6	16	3.3	1.2	2.8	1.5	0.17 J	0.11 J	3	ND	5.1	14	0.11 J	1.3	0.7	0.47 J	0.066 J	0.067 J	0.062 J	0.059 J	0.066 J	ND	ND	ND	0.082 J	0.1 J	ND	ND	ND
Dibenzo_a,h_Anthracene	0.014 or MDL	1.2 J	2.4 J	0.54 J	0.17 J	0.46 J	0.21 J	ND	ND	ND	ND	0.8 J	1.8 J	ND	0.19 J	0.095 J	0.068 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran	6.2	0.47 J	5.1	0.39 J	0.2 J	ND	0.29 J	ND	ND	ND	ND	ND	5 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylyphthalate																														
Di-n-butylphthalate	8.1	ND	ND	ND	0.071 JB	ND	ND	ND	ND	ND	0.053 J	ND	ND	ND	ND	0.071 JB	0.2 JB	0.063 JB	0.089 JB	ND	ND	0.13 J	0.081 J	ND	ND	ND	0.054 J	0.041 J	0.046 J	ND
Fluoranthene	50	18	50	8.5	2.8	6.8	3.5	0.31 J	0.21 J	5	0.11 J	11	40	0.23 J	3.2	1.6	0.8	0.083 J	0.12 J	0.076 J	0.082 J	0.13 J	ND	ND	ND	0.1 J	0.17 J	ND	ND	ND
Fluorene	50	0.8 J	6.3	0.65 J	0.27 J	0.43 J	0.45	ND	ND	0.28 J	ND	0.25 J	8.2	ND	0.21 J	0.16 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno_1,2,3-cd_pyrene	3.2	3.7	7.9	1.7	0.54	1.4	0.66 J	0.06 J	0.05 J	1.6 J	ND	2.9	6.1	0.061 J	0.67	0.3 J	0.19 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.043 J	ND	ND	ND
Naphthalene	13	ND	3.7 J	0.2 J	0.35 J	ND	0.14 J	ND	ND	ND	ND	ND	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	50	13	52	6.5	2.2	4.5	3.2	0.12 J	0.14 J	4.6	0.094 J	5.7	53	0.14 J	2.6	1.2	0.48 J	0.057 J	0.086 J	0.095 J	0.059 J	0.1 J	ND	ND	ND	0.11 J	0.11 J	ND	ND	ND
Phenol		ND	ND		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene	50	17	44	7.8	3	6.3	4	0.32 J	0.2 J	11	0.13 J	11	39	0.25 J	3.6	1.6	0.86	0.098 J	0.13 J	0.1 J	0.1 J	0.14 J	ND	ND	ND	0.26 J	0.19 J	ND	ND	ND
PCBs, Pesticides, Herbicides																														
Aroclor-1248	1.0 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1254	1.0 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlordane	0.54	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dieldrin	0.044	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
P,P'-DDD	2.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
P,P'-DDE	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
P,P'-DDT		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silvex		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
VOCs																														
Acetone	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.042	ND	ND	ND	ND	ND	ND	0.026 J	0.039	ND	0.046	ND	ND	ND	ND	ND
Benzene	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0038 J	ND	0.0043 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0021 J	ND	ND	ND	ND	ND
Ethylbenzene	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M&p-Xylenes	1.2 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.1	0.012 B	0.031 B	0.015 B	0.021 B	0.019 B	0.024 B	0.02 B	0.024 B	0.012 B	0.014 B	0.015 B	0.018 B	0.042 B	0.045 B	0.046 B	0.044 B	0.04 B	0.039 B	0.055 B	0.047 B	0.045 B	0.049 B	0.036 B	0.046 B	0.0096 B	0.0096 B	0.012 B	0.012 B	0.011 B
O-Xylene	1.2 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
% Solids																														
% Solids		91	72	91	78	87	82	86	87	87	83	89	67	81	72	70	65	90	90	66	67	90	81	98	77	86	90	88	88	88

All units are mg/kg
ND = indicates non-detect
J = Indicates an estimated value when a compound is detected at less than t
B = Detected in the blank
Shading signifies that sample exceeds TAGM 4046 Eastern US Background

Attachment 2
Staten Island Land Environmental Boring Program Analytical Resutls (units mg/kg)

Sample Name	TAGM 4046 Eastern USA Background (mg/kg)	B-226			B-227		B-228		B-229		B-230				B-231		
Sample Date		9/6/06	9/6/06	10/23/06	8/31/06	8/31/06	8/31/06	8/31/06	9/18/06	9/18/06	7/9/07	7/9/07	7/9/07	7/9/07	7/10/07	7/10/07	7/10/07
Sample Depth		0-4	12-17	17-29	0-4	8-10	0-4	12-14	0-4	12-16	0-2	8-12	8-12 D	12-20	0-3	8-10	18-20
Metals																	
Aluminum	33,000	2800	3900	2200	5200	3000	3500	2900	3900	6800	3800	7200	6800	4000	8300	7300	3400
Antimony	NA	ND	ND	ND	ND	ND	ND	ND	ND	3.9	ND	ND	ND	ND	ND	ND	ND
Arsenic	3 - 12	ND	ND	ND	3.7	7.7	2.6	2.7	3.9	2.8	17	3.6	ND	4.9	4.2	3.6	4.7
Barium	15 - 600	12	20	15	58	65	15	24	75	400	61	130	120	30	110	110	ND
Cadmium	0.1 - 1	ND	ND	ND	ND	ND	ND	ND	ND	1.3	ND	ND	ND	ND	ND	ND	ND
Calcium	130 - 35,000	22000	24000	1400	36000	8200	11000	1300	38000	7800	62000	13000	13000	1700	35000	17000	ND
Chromium	1.5 - 40	27	19	13	47	48	15	77	22	16	20	20	19	32	22	19	18
Cobalt	2.5 - 60	6.1	8.3	12	17	72	7.5	23	9	7.2	4.7	6.9	6.8	23	9.1	6.8	18
Copper	1 - 50	96	23	75	21	42	12	56	150	75	73	17	18	16	57	24	12
Iron	2,000 - 550,000	11000	12000	8600	18000	40000	11000	22000	15000	19000	15000	17000	16000	24000	16000	18000	17000
Lead	200 - 500	ND	ND	ND	85	25	20	48	180	580	130	36	25	13	120	150	ND
Magnesium	100 - 5,000	7600	23000	7000	25000	51000	16000	41000	21000	3100	36000	6900	6600	29000	25000	6000	32000
Manganese	50 - 5,000	160	230	110	320	580	110	300	310	220	200	390	390	280	130	330	390
Mercury	0.001 - 0.2	ND	ND	ND	0.36	1.6	ND	ND	0.21	0.13	0.096	0.1	ND	ND	ND	1.8	ND
Nickel	0.5 - 25	77	100	130	270	1100	170	550	110	20	37	29	28	490	75	29	410
Potassium	8,500 - 43,000	1500	1300	ND	800	970	ND	ND	720	2200	1100	2500	2400	1000	3400	2000	630
Selenium	0.1 - 3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	6,000 - 8,000	ND	ND	ND	ND	780	ND	ND	ND	ND	490	740	760	540	ND	ND	ND
Vanadium	1 - 300	12	19	15	17	14	18	21	21	19	30	22	20	20	66	20	ND
Zinc	9 - 50	20	19	14	52	58	34	190	160	1000	260	110	72	35	70	89	21
Sample Name	TAGM 4046 Recommended Soil	B-226			B-227		B-228		B-229		B-230				B-231		
Sample Date	Cleanup Objectives	9/6/06	9/6/06	10/23/06	8/31/06	8/31/06	8/31/06	8/31/06	9/18/06	9/18/06	7/9/07	7/9/07	7/9/07	7/9/07	7/10/07	7/10/07	7/10/07
Sample Depth	(mg/kg)	0-4	12-17	17-29	0-4	8-10	0-4	12-14	0-4	12-16	0-2	8-12	8-12 D	12-20	0-3	8-10	18-20
SVOCs																	
2-Methylnaphthalene	36.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	50	ND	ND	ND	ND	ND	ND	ND	ND	0.21 J	0.25 J	0.11 J	2.4	ND	0.11 J	0.53	ND
Acenaphthylene	41	ND	ND	ND	ND	ND	ND	ND	0.12 J	0.082 J	ND	ND	ND	ND	ND	ND	ND
Anthracene	50	ND	ND	ND	ND	ND	ND	ND	0.22 J	0.42	0.53 J	0.2 J	4.6	ND	0.21 J	1.4	ND
Benzo_a_anthracene	0.224 or MDL	0.046 J	ND	ND	0.073 J	ND	0.096 J	0.52	0.61 J	1.5	1.5	0.35 J	4	ND	0.78 J	2.8	ND
Benzo_a_pyrene	0.061 or MDL	0.052 J	ND	ND	0.081 J	ND	0.085 J	0.51	0.6 J	1.3	1.2	0.28 J	2.8	ND	0.6 J	2	ND
Benzo_b_fluoranthene	1.1	0.059 J	ND	ND	ND	ND	0.13 J	0.69	0.76 J	1.4	1.9	0.34 J	2.9	ND	0.82 J	2.7	ND
Benzo_g,h,i_perylene	50	0.04 J	ND	ND	ND	ND	0.081 J	0.24 J	0.42 J	0.76	1.1 J	0.19 J	1.5 J	ND	0.45 J	1.3	ND
Benzo_k_fluoranthene	1.1	ND	ND	ND	ND	ND	ND	0.18 J	0.31 J	0.52	0.74 J	0.088 J	1.1 J	ND	0.2 J	0.67	ND
Bis(2-Ethylhexyl)phthalate	50	0.091 J	0.11 J	0.16 J	0.069 JB	0.074 JB	0.08 J	ND	0.19 J	0.046 J	0.63 J	0.043 J	ND	0.13 J	0.3 J	ND	ND
Butylbenzylphthalate											0.13 J	ND	ND	ND	ND	ND	ND
Carbazole	NA	ND	ND	ND	ND	ND	ND	ND	ND	0.098 J	0.23 J	0.058 J	1.3 J	ND	ND	0.14 J	ND
Chrysene	0.4	0.061 J	ND	ND	0.086 J	ND	0.11 J	0.43	0.64 J	1.3	1.9	0.33 J	3.5	ND	0.68 J	2.6	ND
Dibenzo_a,h_Anthracene	0.014 or MDL	ND	ND	ND	ND	ND	ND	ND	0.13 J	0.23 J	0.25 J	0.054 J	0.46 J	ND	0.12 J	0.39 J	ND
Dibenzofuran	6.2	ND	ND	ND	ND	ND	ND	ND	ND	0.082 J	ND	ND	1.7 J	ND	ND	0.21 J	ND
Diethylyphthalate											ND	ND	ND	ND	ND	ND	ND
Di-n-butylphthalate	8.1	ND	ND	0.038 J	0.051 JB	0.064 JB	0.05 J	ND	ND	ND	ND	0.051 J	ND	ND	ND	ND	0.055 J
Fluoranthene	50	0.075 J	ND	ND	0.12 J	ND	0.095 J	0.76	1.1 J	2.8	2.8	0.57	9.2	ND	1.1 J	5.9	ND
Fluorene	50	ND	ND	ND	ND	ND	ND	ND	0.16 J	0.18 J	0.21 J	0.1 J	2.6	ND	ND	0.6	ND
Indeno_1,2,3-cd_pyrene	3.2	0.039 J	ND	ND	ND	ND	0.057 J	0.28 J	0.36 J	0.62	0.93 J	0.18 J	1.4 J	ND	0.41 J	1.2	ND
Naphthalene	13	ND	ND	ND	ND	ND	ND	ND	ND	1.4	ND	0.083 J	3.5	ND	ND	0.069 J	ND
Phenanthrene	50	0.049 J	ND	ND	0.059 J	ND	ND	0.18 J	0.71 J	1.2	1.5	0.64	15	ND	ND	4.2	ND
Phenol		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.74J	ND	ND
Pyrene	50	0.088 J	ND	ND	0.23 J	ND	0.12 J	0.88	1.2	2.9	3.2	0.8	11	ND	1.3	6.6	ND
PCBs, Pesticides, Herbicides																	
Aroclor-1248	1.0 (total)	ND	ND	ND	ND	ND	ND	ND	1	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor-1254	1.0 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.038	ND	ND	ND	ND	ND
Chlordane	0.54	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.036	ND	ND	ND	0.075	ND	ND
Dieldrin	0.044	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
P,P'-DDD	2.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.012	ND	ND	ND	0.029	ND	ND
P,P'-DDE	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.033	ND	ND
P,P'-DDT		ND	ND	ND	ND	ND	ND	ND	ND	ND	0.009	ND	ND	ND	0.025	ND	ND
Silvex		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0049	ND	ND	ND	ND	ND
VOCs																	
Acetone	0.2	ND	ND	ND	ND	ND	ND	0.022 J	0.027 J	0.029 J	0.04	0.053	0.045	0.063	0.03	0.066	0.057
Benzene	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	5.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M&p-Xylenes	1.2 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.1	0.0089 B	0.01 B	0.032 B	0.021 B	0.017 B	0.046 B	0.051 B	0.0099 B	0.02 B	0.0056	0.0061	0.03	0.028	0.028	0.039	0.042
O-Xylene	1.2 (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.018	ND	0.0019	ND
% Solids																	
% Solids		92	89	90	89	81	97	84	88	83	89	82	80	86	89	79	84

All units are mg/kg
ND = indicates non-detect
J = Indicates an estimated value when a compound is detected at less than t
B = Detected in the blank
Shading signifies that sample exceeds TAGM 4046 Eastern US Background

Attachment 3
Marine Boring Program Phase II Analytical Results (units mg/kg)

Sample Name	SB-103	B-106	B-108	B-110	B-112	B-114
Sample Date	8/17/06	9/21/06	9/28/06	9/27/06	10/2/06	10/4/06
Sample Depth (feet below mudline)	60 - 80	49 - 61	43 - 65	47 - 59	42 - 56	46 - 60
Metals						
Aluminum	13000	16000	8800	5100	5100	4200
Arsenic	7.9	7.8	6.5	3.6	4	3.2
Barium	36	34	19	14	14	ND
Beryllium	ND	1.1	ND	ND	ND	ND
Calcium	3200	5900	5300	5100	3400	3000
Chromium	29	32	20	13	14	11
Cobalt	12	13	7.3	4.1	4.3	3.7
Copper	19	24	16	8.8	9.8	9.2
Iron	32000	34000	20000	12000	13000	11000
Lead	9.1	11	ND	ND	ND	ND
Magnesium	7600	9500	5800	3400	3500	2900
Manganese	1400	460	300	170	180	160
Nickel	29	31	17	12	12	9.9
Potassium	2900	3800	2300	1400	1400	1200
Sodium	4900	8300	5500	3400	3500	2200
Vanadium	36	41	24	17	17	ND
Zinc	74	81	45	27	26	25
SVOCs						
Benzo_a_pyrene	0.15 J	0.096 J	ND	0.12 J	0.14 J	0.087 J
VOCs						
Acetone	0.04	ND	ND	0.051	ND	0.024 J
Carbon disulfide	ND	0.0039	0.0023 J	0.0061 J	ND	0.0022 J
Methylene chloride	0.025 B	0.02 B	0.0056 JB	0.033 B	0.006 JB	0.013 B
% Solids						
% Solids	63	57	70	75	74	73

All units are mg/kg
ND = indicates non-detect
J = Indicates an estimated value when a compound is detected at less than the specified detection limit
B = Detected in the blank