

CHAPTER 8

SOIL AND GROUNDWATER CONDITIONS

INTRODUCTION

This section addresses impacts of the below-grade construction activities anticipated for the proposed Quincy Center redevelopment project. It discusses site soil and groundwater conditions, earthwork, and anticipated foundation construction methods based on available subsurface information. This section also addresses the known existing environmental conditions and potential impacts of contamination on proposed redevelopment activities.

The proposed redevelopment project includes a multi-phase, multi-use rejuvenation of a major portion of Quincy Center. Below-grade construction will include demolition of existing basement and subsurface structures, construction of new building foundations and basements, utility relocations and installations, roadway reconstruction, and relocation of a portion of Town Brook.

New building construction will occur immediately adjacent to some existing structures and across the street from other existing structures to remain. Some utility and roadway work, and relocation activities for Town Brook, will be closer to existing facilities. Areas surrounding the development consist primarily of commercial properties, with some limited residential sites. Town Brook is planned to be relocated outside (south of) the project limits.

MBTA train tracks traverse along the west side of the development area, about 15 ft below adjacent street grades. Cantilever concrete retaining walls provide the grade separation on either side of the tracks. A new bridge will be constructed approximately midway between Concourse Street and Granite Street, behind a two story building.

SUBSURFACE CONDITIONS

Subsurface conditions in the redevelopment area typically consist of miscellaneous fill materials overlying naturally-deposited glacial soils. The fill thickness is variable, and intermittent organic soils occur locally between the fill and glacial soils, especially near the center of the site in the vicinity of the existing and former Town Brook. Based on subsurface explorations, the redevelopment area has been divided into two zones of similar generalized subsurface conditions as shown on Figure 8.1: Exploration Locations plan. The following generalized subsurface profiles are anticipated in each zone:

| Generalized Stratum Description | Thickness (ft) | Depth to Top of Stratum (ft) | Top of Stratum Elevation (ft) |
|---------------------------------|----------------|------------------------------|-------------------------------|
| Fill | 1.5 to 9.7 | 0.2 to 1 | 17.4 to 33 |
| Organic Deposits | 0 to 1 | 6.5 | 11.4 |
| Glaciofluvial Deposits | 0 to >35 | 5.5 to 10 | 10 to 26 |
| Glacial Outwash Deposits | 0 to 11 | 6 | 22 |
| Glacial Till Deposits | - | 2 to 23 | 3.5 to 29 |

| Generalized Stratum Description | Thickness (ft) | Depth to Top of Stratum (ft) | Top of Stratum Elevation (ft) |
|---------------------------------|----------------|------------------------------|-------------------------------|
| Fill | 5.5 to 14 | 0 to 0.6 | 18.2 to 26 |
| Organic Deposits | 0.5 to 5 | 6.0 to 13.5 | -6 to 17 |
| Estuarine Deposits | 4 to 21.5 | 5 to 14 | 8 to 17.5 |
| Alluvial Deposits | 0 to 10.5 | 7.5 | -7.5 |
| Glaciolacustrine Deposits | 2 to 13 | 17.5 to 28 | -8.8 to 7.5 |
| Glaciofluvial Deposits | 2.5 to >22 | 13 to 40.5 | -21.8 to 14 |
| Glacial Outwash | - | 32.5 | -12.5 |
| Glacial Till | - | 19 to 38.5 | -28 to 4.5 |

Depending on location, one or more of the soil units may be absent at any specific location, and may vary in thickness across the redevelopment area. Subsurface conditions within the project area are consistent with the anticipated geology and development history of Quincy center.

GROUNDWATER CONDITIONS

Water levels in 12 groundwater observation wells, measured during May and June 2011, ranged from 7.4 to 19.9 ft below existing ground surface, corresponding to El. 9.1 and El. 18.1. Groundwater normally seeps in the general direction of declining topography or toward local surface water bodies. Water levels measured in the wells suggests a somewhat complex pattern of groundwater seepage directions in Quincy Center, which appears to be influenced by below-grade civil structures including the Town Brook Culvert, sewer and storm drain pipelines, and possibly the MBTA train track corridor.

EXCAVATION AND BUILDING FOUNDATION CONSTRUCTION

Excavation

Construction of 0 to 3 levels of below-grade space, new building foundations, and lowest floor levels will require excavations to depths ranging from 5 to 35 ft. Due to the urban environment, open cutting may not be possible for deeper excavations due to limited space and presence of groundwater. Where required, excavation support systems will be implemented to limit the lateral extent of the excavation, to protect adjacent structures and in some cases to control groundwater.

Excavation support systems anticipated for the Quincy Center redevelopment project include the following:

- Soldier piles with timber lagging
- Interlocking steel sheet piles
- Drilled-in secant pile walls

Systems will be selected and installed for the particular conditions, to enable the below-grade work and protect nearby facilities. Contractor performance criteria will be established and monitoring will be performed for protection of nearby facilities. To varying degrees, the excavation support systems will require removal of obstructions such as remnant foundations, basement walls and utilities prior to installation.

Underpinning

Protection of existing, abutting structures may be necessary during construction of selected new basements and possibly certain deeper utilities. When excavations encroach into the zones of influence of existing structures, underpinning or other special protection measures will be implemented based on case-by-case evaluations.

Foundation Support

Although details of the building foundation systems have not been finalized, it is anticipated that the new buildings will require either shallow or deep foundations depending on local subsurface conditions and building loadings. Foundation systems that may be utilized include reinforced concrete spread footings, reinforced concrete mats, expanded base piles, driven end-bearing piles, drilled shafts, drilled mini piles, as well as shallow foundations combined with ground improvement systems such as rammed aggregate piers or controlled modulus columns. These systems are commonly used in similar ground conditions throughout Massachusetts.



Construction Dewatering

For excavations that extend below groundwater, construction dewatering will be necessary to enable construction in-the-dry. Dewatering will likely be conducted using sumps, wells, or well points located inside the excavation, and recharged on-site or into municipal storm drains. Measures will be taken to assure that dewatering does not adversely impact nearby facilities, including establishing dewatering criteria and monitoring observation wells in the vicinity of the work.

Local storm drains typically discharge to the Town Brook, which eventually discharges into the Town River Bay. Discharge into storm drains would require construction dewatering permits. Effluent will be tested and discharged in compliance with the appropriate National Pollutant Discharge Elimination System (NPDES) Permit with treatment as may be required.

Dust

Dust mitigation measures will be implemented to prevent fugitive dust from leaving construction sites, and to conform to all regulatory requirements for dust control.

Noise

Noise generated by demolition and construction activities will be monitored and controlled in accordance with local and state regulations.

Project Plans and Specifications

Project design and construction will incorporate measures to avoid and detect potential adverse impacts to nearby structures and facilities. The project will coordinate with abutters prior to and during construction regarding construction methods, potential impacts, monitoring, communication, and mitigation.

Performance criteria will be established in construction contract documents relative to movements of nearby facilities and lateral excavation support systems, groundwater level maintenance, vibrations, dust control, noise and other items. The contractor will be required to conform to the performance criteria outlined in the specifications, and to take necessary steps during the work to protect nearby facilities and limit impacts. The contractors will be required to provide submittals in advance of the work, for review by the project team, to confirm conformance to the project requirements. The contractor will be required to submit contingency plans for remedial measures in the event that unacceptable performance occurs, which will be reviewed by the project team prior to construction.



A monitoring program, including the following, will be performed to establish compliance with performance criteria:

- Pre-construction condition surveys at abutting and nearby structures, as permitted by owners, to document existing conditions.
- Groundwater level monitoring during construction dewatering.
- Vibration monitoring during demolition, excavation support installation, pile driving and other vibration-generating activities.
- Noise monitoring.
- Dust monitoring.
- On-site monitoring by the Owner’s geotechnical consultant.

ENVIRONMENTAL CONDITIONS

History of Redevelopment Area

The redevelopment area was historically residential with a brook running through its center. Over time the area was redeveloped and the primary uses changed from industrial to commercial, with the number of residences decreasing. Today the brook is contained within the Town Brook Culvert located in the middle of the redevelopment area, with numerous buildings positioned over and near the culvert.

The historic site uses within the Quincy Center redevelopment area are typical for an urban setting. The table below presents the principal identified historic uses in the redevelopment area and typical potential contaminant types associated with the uses:

| Historic Use | Typical Potential Contaminants |
|---------------------------|---------------------------------------|
| Dry Cleaners | VOCs, SVOCs |
| Filling Stations | Petroleum |
| Auto Repair Shops | Petroleum, Metals |
| Machine Shops | Metals |
| Underground Storage Tanks | Petroleum |
| Coal Burning | PAHs |



MCP Reporting Obligations

Applicable reportable concentrations of contaminants in soil or groundwater are determined by the Massachusetts Contingency Plan (MCP, 310 CMR 40.0000). The applicable reportable concentrations for soils within 500 ft of a residential dwelling, residentially zoned property, school, playground, recreational area, or park are designated RCS-1. Otherwise, the applicable reportable concentrations are RCS-2. Quincy Center has been zoned as QCZD-10 and QCZD-15, zoned for mixed use or for both commercial and residential purposes. For this reason, the reportable concentrations applicable to this project are typically RCS-1. The applicable MCP reportable concentrations for groundwater are RCGW-2.

Analytical Testing of Soil and Groundwater

A limited, preliminary program of twenty-two test borings and eleven groundwater monitoring wells was conducted to collect soil and groundwater samples to assess environmental conditions throughout the redevelopment area. The locations of the sampling explorations were based on the proposed development (building location and planned below-grade construction), accessibility (sidewalks, parking lots, and alleys), and historic site use (for example, two wells were installed in areas of a former dry cleaners and a repair shop).

The preliminary testing program has detected contamination that is commonly found in urban settings. Additional testing and evaluations will be performed as appropriate for each block if off site disposition of soil is required or to comply with regulatory compliance requirements.

Historical Site Uses

Figure 8.2: Environmental Features Plan shows the findings of the environmental records review, which includes nine Massachusetts Contingency Plan (MCP) Release Tracking Number (RTN) sites found from the electronic database service Environmental Data Resources, Inc. (EDR) and MassDEP Review, and seven Sites Potentially Impacted Due to Historic Use (properties once used for industrial purposes) from review of Sanborn Maps. The RTN Sites are identified as numerical designations "1" through "9", while the Sites Potentially Impacted Due to Historic Use are identified alphabetically as "A" through "G". Based on the available information, regulatory closure has been achieved for the reported releases at RTN sites 1-9.

POTENTIAL IMPACTS OF CONTAMINATION ON PROPOSED REDEVELOPMENT ACTIVITIES

Excavated Soil Management

Excavations for basements, and building substructures, utilities, the Town Brook culvert, and other facilities will generate excess and possibly unsuitable soil that may need to be recycled or



disposed of off-site. Soils to be disposed off site will be managed within the framework of an Excavated Soil and Materials Management Plan (ESMMP), which will include a soil precharacterization program.

Demolition and Remnant Structures

Demolition of several types of structures is planned, including brick, wood frame and concrete structures (such as the parking garage), sidewalks, streets and utilities. Removal of below-grade building remnants is also anticipated. Asphalt, brick and concrete materials will be recycled and re-used as possible in the new construction in accordance with Mass DEP Guidelines and regulations.

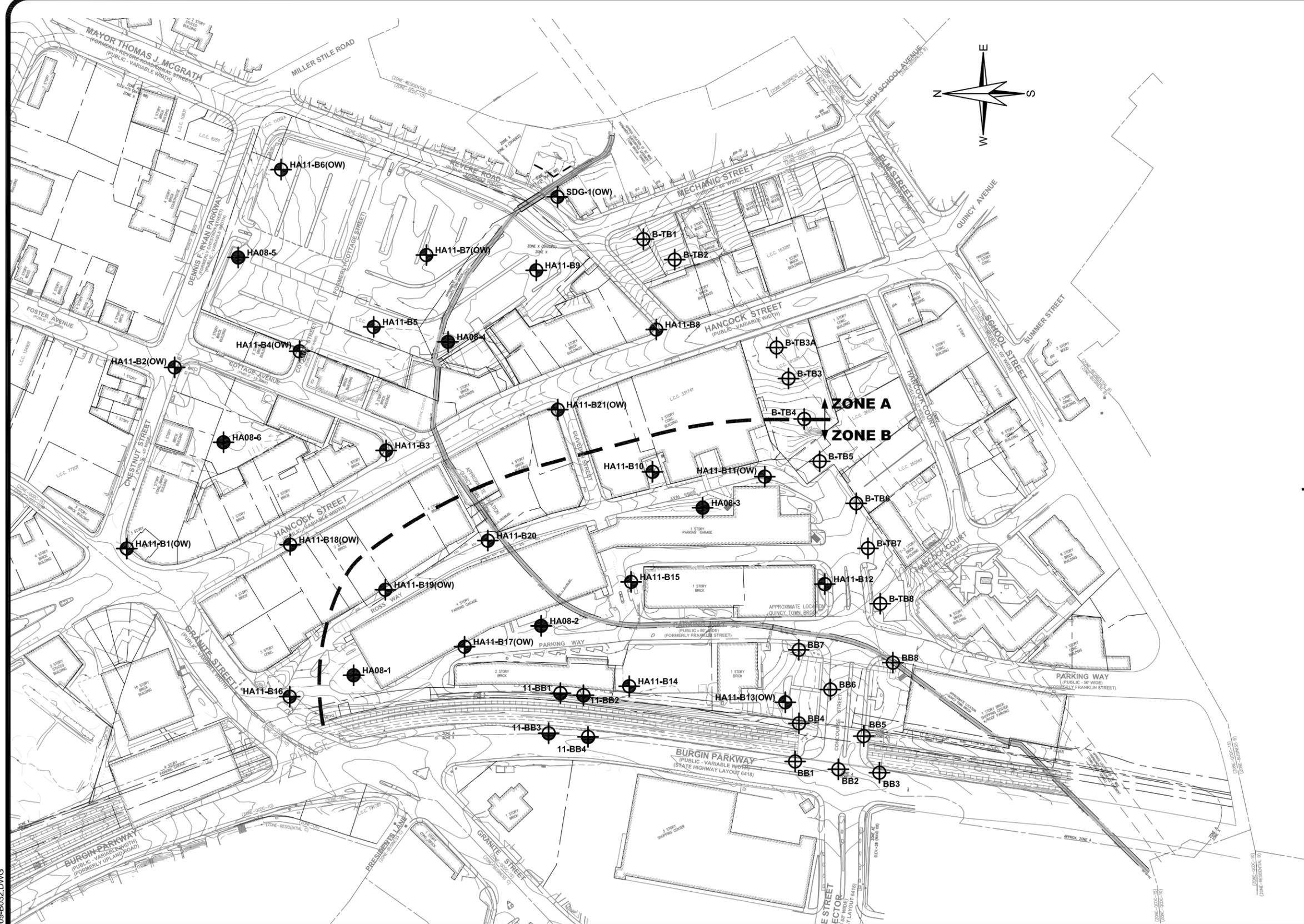
Vapor Intrusion

Based on historic uses of the redevelopment area, certain structures may require volatile organic vapor intrusion protection measures such as vapor barriers. The need for such protective measures will be determined by future testing on a site-specific basis.

SUMMARY

Based on available subsurface data and the proposed development plans, below-grade construction and earthwork activities are expected to be completed using conventional methods typical for similar construction projects in an urban environment. Appropriate controls and monitoring will be implemented to document compliance with project requirements.

Based on the available soil and groundwater analytical data and historic site uses, nominal subsurface contamination present in Quincy Center is typical of sites in urban centers. Appropriate measures including supplemental investigations, remediation if needed, soil and groundwater management during construction, as well as required regulatory compliance will be implemented to perform the work in accordance with all applicable regulations.



- LEGEND:**
- 11-BB1 DESIGNATION AND APPROXIMATE LOCATION OF BRIDGE BORINGS COMPLETED BY NEW HAMPSHIRE BORING, INC. FOR TEC ENGINEERING, INC. AND MONITORED BY HALEY & ALDRICH, INC. BETWEEN 20 JUNE AND JULY 2011.
 - HA11-B1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORING COMPLETED BY GEOLOGIC EARTH EXPLORATIONS, INC. AND MONITORED BY HALEY & ALDRICH, INC. IN MAY 2011
 - SDG-1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORING COMPLETED BY GEOLOGIC-EARTH EXPLORATIONS, INC. AND MONITORED BY HALEY & ALDRICH, INC. IN APRIL 2011
 - B-TB1 DESIGNATION AND REPORTED LOCATION OF TEST BORING COMPLETED BY CARR-DEE CORP. IN DECEMBER 2010
 - HA08-1 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORING COMPLETED BY NEW HAMPSHIRE BORING, INC. AND MONITORED BY HALEY & ALDRICH, INC. IN JUNE 2008.
 - BB1 DESIGNATION AND REPORTED LOCATION OF TEST BORING COMPLETED BY GUILD DRILLING CO., INC. BETWEEN FEBRUARY AND MARCH 1997
 - (OW) INDICATES OBSERVATION WELL INSTALLED IN COMPLETED BOREHOLE
 - ZONE A** DESIGNATION AND LIMITS FOR ZONES OF GENERALIZED SUBSURFACE CONDITIONS AS DESCRIBED IN THE TEXT OF THE REPORT
 - ZONE B**

- NOTES:**
1. BASE PLAN TAKEN FROM DRAWING ELECTRONIC FILE "10_006_EX.dwg" PROVIDED BY STEPHENSON DESIGN GROUP OF BRIGHTON, MASSACHUSETTS ON 28 JUNE 2011 .
 2. ELEVATION ARE IN FEET AND ARE REFERENCED TO NAVD 88.

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QUINCY CENTER REDEVELOPMENT
QUINCY, MASSACHUSETTS

SCALE: AS SHOWN

This Figure Prepared in Coordination With:



City of Quincy
City Hall
1305 Hancock Street
Quincy, MA 02169

Hancock Adams Associates

1400 Hancock Street
Quincy, MA 02169



465 Medford Street
Suite 2200
Boston, MA 02129



Stephenson
Design Group
51 Sleeper Street
Suite 600
Boston, MA 02210

Figure 8.1 April 30, 2012

Exploration Locations
Draft Environmental Impact Report
New Quincy Center Redevelopment
Quincy, Massachusetts



NOTES:

1. BASE PLAN TAKEN FROM DRAWING ELECTRONIC FILE "10_006_EX.dwg" PROVIDED BY STEPHENSON DESIGN GROUP OF BRIGHTON, MASSACHUSETTS ON 28 JUNE 2011.
2. ELEVATION ARE IN FEET AND ARE REFERENCED TO NAVD 88.
3. IMAGE, DATED 19 JUNE 2010, TAKEN ELECTRONICALLY FROM GOOGLE EARTH PRO/MAPS.

RTN SUMMARY TABLE

| Designation | RTN | Release Address | Notification Date | Compliance Status | Chemical Type | Site Description |
|-------------|---------|---|-------------------|----------------------|--|---|
| 1 | 3-6055 | 65-71 GRANITE ST. | 5/9/1994 | "RAO (A1) 1/27/1995" | Petroleum | FORMER GAS STATION, UNDERGROUND STORAGE TANK |
| 2 | 3-27352 | INTERSECTION OF BURGIN PKWY AND GRANITE ST. | 12/26/2007 | "URAM 12/26/2007" | MTBE (111 ppb) | ROADWAY |
| 3 | 3-11681 | 1445 HANCOCK ST. | 10/3/1994 | "RAO (A1) 5/22/2003" | #2 Fuel Oil (87 gal) | COMMERCIAL, ABOVEGROUND STORAGE TANK |
| 4 | 3-128 | 1415-1439 HANCOCK ST. | 4/15/1988 | "DPS 5/22/2003" | Unknown | COMMERCIAL, ABOVEGROUND STORAGE TANK |
| 5 | 3-22889 | 1445 HANCOCK ST. | 5/22/2003 | "DPS 5/22/2003" | C11-C22 Aromatic Hydrocarbons (83,000 ug/L); C19-C36 Aliphatic Hydrocarbons (46,000 ug/L); C9-C18 Aliphatic Hydrocarbons (130,000 ug/L); Phenanthrene (320 ug/L); TPH (26,000 mg/kg) | UNKNOWN (SITE DESCRIPTION WAS NOT FOUND ON MASSDEP WEBSITE) |
| 6 | 3-17930 | 1495 HANCOCK ST. | 2/1/1999 | "RAO (A2) 4/2/1999" | #2 Fuel Oil (180 ppm) | COMMERCIAL, ABOVEGROUND STORAGE TANK |
| 7 | 3-16616 | 1563 HANCOCK ST. | 3/20/1998 | "RAO (A2) 3/26/1999" | #2 Fuel Oil (250 ppmv) | COMMERCIAL, ABOVEGROUND STORAGE TANK |
| 8 | 3-18086 | 11 MCGRATH HWY | 3/10/1999 | "RAO (A2) 3/19/2001" | Benzo[a]anthracene (5.1 mg/kg); Benzo[a]pyrene (4.2 mg/kg); Benzo[b]fluoranthene (3 mg/kg); Dibenzo[a,h]anthracene (1.1 mg/kg); Indeno[1,2,3-cd]pyrene (2.7 mg/kg) | COMMERCIAL, ABOVEGROUND STORAGE TANK |
| 9 | 3-29081 | 1601 HANCOCK ST. | 2/19/2010 | "RAO (B1) 3/15/2010" | Benzo[a]anthracene (7.7 mg/kg); Benzo[a]pyrene (6.6 mg/kg); Nickel (24.5 mg/kg) | UNKNOWN (SITE DESCRIPTION WAS NOT FOUND ON MASSDEP WEBSITE) |

SITES POTENTIALLY IMPACTED DUE TO HISTORIC USE

| | Site Address | Sanborn Plate | Date(s) of Sanborn Plate | Site Description |
|---|---|---------------|--------------------------|--|
| A | 65-71 GRANITE ST. | 40 | 1950 | DRY CLEANING |
| | | | 1971 | SHEET METAL SHOP |
| B | INTERSECTION OF BURGIN PKWY AND GRANITE ST. | 40 | 1930 TO 1950 | FILLING STATION WITH GAS TANKS |
| C | ROSS WAY AND PARKING WAY PARKING GARAGE | 41 | 1896 TO 1901 | BAY STATE ALUMINUM COMPANY WITH MACHINE SHOP |
| D | 95-115 PARKING WAY | 50 | 1950 TO 1971 | DRY CLEANING AND LAUNDRY |
| E | 1424-1430 HANCOCK ST. | 41 | 1930 TO 1950 | TIN SHOP |
| F | 14-32 COTTAGE AVE. | 41 | 1885 TO 1901 | INK MANUFACTURING AND METAL REFINING |
| | | | 1885 TO 1906 | EXTRACT MANUFACTURING |
| | | | 1930 | AUTO REPAIR SHOP |
| G | PARKING LOT | 41 | 1930 | AUTO REPAIR SHOP |



QUINCY CENTER REDEVELOPMENT
QUINCY, MASSACHUSETTS

SCALE: AS SHOWN

This Figure Prepared in Coordination With:



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Figure 8.2

April 30, 2012

Environmental Features Plan
Draft Environmental Impact Report
New Quincy Center Redevelopment
Quincy, Massachusetts