AREA 1, PHASE 1 DETAILED DEVELOPMENT PLAN

Baltimore Works Site
Baltimore, Maryland

REVISED

November 2013

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1.0 INTRODUCTION

Harbor Point Development LLC (HPD) and its consultants have prepared this Detailed Development Plan (DDP) for Phase 1 of development on Area 1 of the former AlliedSignal Baltimore Works Site (or "Site"), located in Baltimore, Maryland. This Phase of the development project consists of the Exelon Tower and Trading Floor Garage, the Central Plaza Garage, modifications to the existing Transfer Station, general site development (streets, sidewalks, etc.) and utilities, foundations, roadways, and other related site development elements and remedy restorations for development.

The Site is located on a peninsula on the northeast shore of the Patapsco River of the Inner Harbor in the Fells Point section of Baltimore City. The Site consists of three Areas. Area 1 is the principal site of Honeywell's (formerly AlliedSignal) Baltimore Works Facility which included chromium processing production and support buildings on an area that covered approximately 14 acres. Prior to acquisition by Honeywell, Areas 2 and 3 were used for various industrial and warehousing operations, including chromate ore storage (Area 2) and brass foundry casting, oil blending and storage, coating/plastics production, lumber storage and foundry (Area 3). Areas 2 and 3 currently include the Thames Street Wharf Office Building, and its associated parking lots, constructed in 2010 to the east. The Site is surrounded by water on the north, west and south and the Living Classrooms campus to the north.

The majority of planned construction will occur in the northeast region of Area 1, located west of Wills Street and south of Dock Street. The Living Classroom educational facility is located north of Dock Street. The development to the east of Area 1 is the Thames Street Wharf Office Building and parking lots owned by HPD. Drawing DDP-C1.00 is an existing conditions plan showing Area 1, Area 2 and Area 3, the existing Environmental Remediation System (ERS), and other pertinent Site features.

The principal contaminant of concern in Area 1 is hexavalent chromium (CrVI). An Environmental Remediation System (ERS) is maintained and operated by Honeywell International Inc. (Honeywell) to contain CrVI-impacted groundwater in Area 1 and control the potential for human exposure to affected soil. The ERS consists of a Multimedia cap (MMC), Hydraulic barrier, Head Maintenance System (HMS), a groundwater storage and transfer system, and Outboard Embankment. The HMS maintains an inward groundwater gradient to mitigate the migration of chromium-impacted groundwater from the Site.

The Site development must not interfere with the efficacy of the corrective measures or Honeywell's ability to comply with the performance standards defined in the Consent Decree between Honeywell, the U.S. Department of Justice, USEPA and the MDE, the Groundwater Gradient Monitoring Plan, the Surface Water Monitoring Plan, and the Environmental Media Monitoring Plan. This DDP describes the redevelopment improvements and the means and methods that will be implemented to meet the requirements established in the Consent Decree and its appendices, as amended, as well as the Owner/Developer covenants. Honeywell retains responsibility for operating the ERS and monitoring environmental media to demonstrate continued attainment of Consent Decree performance criteria.

Phase 1 Development on Area 1 is the first of multiple phases of construction/development planned for the property. The schedule for Phase 1 Development is aggressive, with the Certificate of Occupancy milestone of June 2015. The ground floor space consists of the residential lobby, retail spaces, plaza garage entry, service docks and the Honeywell transfer station and offices.

The planned foundations include driven, environmental concentric closed-end pipe piles filled with concrete and with concrete pile caps on top of them. The one-story Central Plaza Garage, Dock Street deck, and Point and Wills Street elevated deck structures will be supported on pipe piles constructed concentric with column locations so that pile caps are not required. After piles are driven, a new geomembrane will be sealed to the pile wall below the pile caps.

The planned site utility systems include storm water drainage, sanitary sewer, domestic water, natural gas, electric, and telecommunications. Storm water will be discharged to Baltimore Harbor, or will be allowed to infiltrate into the soils to the east of Area 1 to facilitate recharge of shallow sand strata. Utilities will generally follow the proposed roadway network, or be suspended from the ceiling of the parking garage connecting the proposed structures to the existing infrastructure in Block Street, Caroline Street and future Central Avenue Bridge.

2.0 PROJECT TEAM / ROLES

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3.0 EXISTING ENVIRONMENTAL REMEDIATION SYSTEM (ERS)

The ERS consists of the following components (collectively referred to herein as "ERS Components"):

1. Multimedia cap (MMC) in Area 1;
2. Layered Soil Cap (LSC) – Area 2;
3. Soil Cap (SC) – Area 3;
4. Hydraulic Barrier;
5. Head Maintenance System (HMS);
6. Groundwater Storage (Tank Room);
7. Transfer Station; and
8. Outboard Embankment.

3.1 MULTIMEDIA CAP (AREA 1)

3.1.1 Cap Function and Features

The MMC is designed (i) to mitigate upward migration of contaminants and limit the potential for direct exposure to contaminated soils or groundwater and (ii) to reduce infiltration to the groundwater within Area 1. Multimedia Cap components are illustrated in Drawing DDP-F1.30 Detail 1 (see DDP Appendix A, Table A for analysis of cap features).

The MMC was constructed in 1998 using both a synthetic geomembrane liner (60 mil [0.06-inch thick] Linear Low Density Polyethylene [LLDPE]) and a geosynthetic clay liner (GCL). An underlying granular capillary break was installed to prevent upward migration of chromium. High-density polyethylene (HDPE) drainage net was placed above the geomembrane liner to collect and convey infiltration to the Harbor. The drainage net and membranes are protected by a thick non-woven geotextile cushion above and below. These synthetic layers are covered with 24 inches or more of granular cover soil cover and six inches of crushed stone (30 inches total cover) to protect against mechanical damage and to reduce thermal changes at the synthetic layers. Some areas of the Area 1 multimedia cap are covered with asphalt pavement.

The geomembrane is crowned at the center of the Site and slopes down towards the perimeter. The drainage net conveys collected water to a collection pipe at the land perimeter and to the embankment at the waterfront perimeter of Area 1 outboard of the hydraulic barrier. The MMC grades were established to promote runoff by placing a controlled fill below the cap over the abandoned foundations and asphalt cover. The planned development places roof and independent storm water control structures over the crown of the geomembrane.

3.1.2 Ground Conditions Below Cap

Much of Area 1 Phase 1 development area that is underlain by compressible clay of Stratum O (Drawing DDP F1.11 for Stratum O locations) was pre-loaded to support the MMC and existing structures without pile foundations. Vertical drains and surcharge fill techniques were used to consolidate the compressible clay to allow construction of the cap and Transfer Station with minimal settlement. These ground improvement areas are illustrated in Drawing DDP F1.12.

3.1.3 Methane Gas Venting System

The organic clay of Stratum O may generate methane gas as decomposition of the organic components continues over time. A vent pipe was placed in the capillary break gravel, at the high point of the multimedia cap, to vent methane gas which may collect below the geomembrane.

3.1.4 Perimeter Drain (Toe Drain)

The perimeter toe drain is perforated polyvinyl chloride (PVC) pipe on the landward perimeter and HDPE drain tubing or stone infiltration without pipe at the waterfront perimeter. The pipes were placed in a stone-filled infiltration trench at the perimeter of the geomembrane outboard of the hydraulic barrier. The perimeter drain allows storm water infiltration within the cap drainage layer (i.e., above the geomembrane layer of the cap) to drain into the embankment outboard of the Perimeter hydraulic barrier.

3.2 AREA 2 SOIL CAP

The Layered Soil Cap (LSC) in Area 2 was designed and constructed to limit exposure pathways by preventing the generation of airborne particulates, dermal contact with underlying soil, ingestion of surface soils, and storm water erosion of soil. The cap components from bottom to top are a non-woven geotextile, capillary break layer, non-woven geotextile, a crushed stone sub-base, and an asphalt surface. The major elements of the cap are described further below:

Capillary Break Layer - A capillary break layer is the bottom layer of the LSC. The capillary break minimizes the potential for upward migration of chromium contaminated water potentially present in the capillary fringe above groundwater. Groundwater is located at a depth of greater than 5 feet below the LSC. The capillary break consists of a layer of coarse gravel, which limits capillary action. This layer has a minimum thickness of 6 inches. AASHTO No. 5 stone is used for the capillary break. To protect the capillary break from the intrusion of fine-grained soils, a non-woven geotextile filter was installed on the prepared sub-grade under the capillary break stone. An upper geotextile was installed prior to the placement of any dissimilar soil material on the capillary break surface.

Asphalt Surface - The LSC surface is comprised of an aggregate base overlain by bituminous asphalt. A 6-inch thick course of RC-6 aggregate base material was placed above the capillary break upper geotextile to form the support for the asphalt surface. The asphalt was placed over the RC-6 base. The asphalt was installed consistent with Baltimore City Specification Article 20.12. Bituminous asphalt constitutes a hydrophobic layer that further inhibits capillary rise.

Sediment and Erosion Control Structures - Storm water flows across the asphalt surface of the LSC and is directed toward the harbor. The asphalt and the stone revetment at the harbor edge are non-erosive and therefore no additional erosion control structures are necessary.

3.3 AREA 3 SOIL CAP

Area 3, also referred to as "Silver North" and "Silver South", is capped with two feet of clean fill that overlies a synthetic visual warning layer. Area 3 is divided by Block Street and is also currently asphalt paved and used as parking lots.

3.4 *HYDRAULIC BARRIER*

The Consent Decree requires Honeywell to maintain an inward gradient in the coarse sand and gravel of Stratum S-4 and in the shallow S-1, S-2, and S-3 sand strata along Wills Street. The inward gradient is intended to prevent the release of hexavalent chromium from Area 1 to the groundwater and surface water surrounding the site. The inward gradient is maintained by extraction of groundwater by the Head Maintenance System (HMS).

The hydraulic barrier was placed at the perimeter of Area 1 to isolate groundwater below Area 1 from Harbor surface water and the surrounding groundwater. The hydraulic barrier reduces the amount of groundwater that must be extracted by the HMS to maintain an inward hydraulic gradient.

The hydraulic barrier is a soil-bentonite backfilled slurry trench. It was constructed by excavating a 36-inch wide trench to the top of decomposed rock (between 60 and 85 feet below construction grade), and placing low permeability backfill in the trench as the permanent barrier. The backfill was prepared from the trench excavation spoils, bentonite slurry, and dry bentonite addition. Laboratory testing demonstrated low permeability of the backfill before placement. The designed top of the hydraulic barrier is at an Elevation +5 at the waterside perimeter, and is Elevation +7 and at Elevation +12 at the land perimeter (Wills Street).

Trench excavation, cleaning, and backfill placement for the hydraulic barrier were carefully controlled to exclude excavation debris and thickened slurry from the backfill profile. Backfill was placed at a slump of 4 to 5 inches. Because the backfill is confined within a narrow trench and is protected from evaporation, it is expected to have the same physical characteristics today as when it was placed.

HPD understands that during hydraulic barrier installation, the side wall of a portion of the slurry wall in Wills Street sloughed during installation. Additionally, the wall in the area of the Dock and Wills Street intersection settled under pre-load in the area of the Transfer Station. Any impact that this may have on the installation of the proposed sheet pile is discussed in Section 6.1.

At the embankment perimeter, the backfill contains a substantial amount of crushed stone from the embankment portion of the excavation spoils. As much as 50 percent of the backfill material, by dry weight, was allowed to be gravel size. However, the trench was first constructed on Wills Street (starting at the Block Street intersection) so that the Wills Street portion of the barrier has lower gravel content than does the embankment at the waterside perimeter. The higher gravel content will reduce backfill compressibility, reducing settlement potential of the backfill.

3.5 HEAD MAINTENANCE SYSTEM

The HMS withdraws groundwater from within Area 1 to maintain a groundwater level within the hydraulic barrier that is lower than the water table outside of the hydraulic barrier (i.e., maintain an inward groundwater gradient). The HMS is comprised of (i) the Extraction System, (ii) the Monitoring and Control System, (iii) the Conveyance System, (iv) the Transfer Station and (v) the Transfer Station Truck Pad. The Groundwater Gradient Monitoring Plan (GGMP) documents the means and methods used by Honeywell to monitor compliance with the Groundwater Gradient Performance Standard and assess the performance of the HMS.

Paired piezometers measure the water levels inboard and outboard of the perimeter barrier and activate the adjacent extraction wells to maintain the inward gradient if the outboard water levels drop relative to inboard levels. The quantity of groundwater extracted is controlled by changes in the outboard water levels, which are influenced by the tidal, seasonal and wind-blown tide effects. The extracted groundwater is conveyed to the storage tanks located at the Transfer Station for periodic loading into tanker trucks for off-site treatment and disposal at a licensed hazardous waste treatment facility, currently the Environmental Quality (EQ) Company of Baltimore, Maryland.

3.5.1 Extraction System

The groundwater extraction system consists of 12 deep and 4 shallow extraction wells installed at approximately equal spacing around the perimeter of Area 1. The extraction wells are housed inside concrete vaults and contain pneumatic pumps and water level measurement devices. Single and double well vaults exist at the Site below the MMC synthetic layers. The inside dimensions for the double extraction well vaults vary from 11 feet long by 7 feet wide by 7 feet high to 14 feet long by 7 feet wide by 9 feet high. The single well vaults have dimensions of 8 feet long by 8 feet wide by 7 feet high.

The extraction wells include 12 deep wells designated DW1 through DW12. The remaining 4 extraction wells are shallow wells designated as SWl through SW4. The shallow wells are located on the land perimeter

(Wills Street) of Area 1. The well and piezometer locations are shown in Drawing DDP- EN1.01. Soil profiles are shown in Drawing DDP-F1.11.

The deep wells are screened in the Cretaceous Sand (designated as Stratum S-4 in the project documents) at a depth of approximately 50 to 80 feet below ground surface (bgs). The shallow wells are screened in the Pleistocene Sands (designated as Strata S-2 and S-3 in the project documents) at a depth of approximately 20 to 40 feet bgs.

All extraction wells consist of 6-inch diameter well screens and casing. Each well includes a filter piezometer that is intended to allow for a method to assess the condition and maintain the filter pack of the well.

Each extraction well contains a water level transducer and a pneumatic pump. The transducers are used to monitor the level of water in the well to prevent damage to the pump during operation. Compressed air is supplied to the pneumatic pumps through l-inch inside diameter pipe. The air supply is provided by a compressor located in the Transfer Station loading dock.

Electric sump pumps are located in each extraction well vault. The sumps extend below the bottom of the vault to extract shallow groundwater from immediately below the vault. Rainwater that may enter the vault access hatches is also managed by these sump pumps. The pumps are actuated by a water level indicator in the sump. The sumps primarily maintain the vault in a dewatered condition and provide contingency control of shallow water level in the fill beneath the vaults. In addition, the HMS conduit sub-grade fill drains to the sumps so that the perimeter HMS pipe trenches function as collectors and act as a contingency for shallow groundwater control at the perimeter of the Site.

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3.5.2 *Monitoring and Control System*

The HMS monitoring and control system provides a means to remotely check and execute HMS system controls. The system includes remote intelligent controllers (RIC) or nodes in the vaults for input/output connections. The system is monitored with the Master Supervisory Station (MSS) located in the Transfer Station.

The system includes twin paired piezometers (one inside and one outside of the hydraulic barrier) for measurement of water levels across the hydraulic barrier. The piezometers are located approximately 10 feet away from the hydraulic barrier. The piezometer pairs are located at midpoints between extraction wells and are screened in the same stratum pumped by the extraction wells. The pairs are numbered 1 through 12 and 1S through 4S (shallow), similar to the extraction well numbering.

When the gradient measured at any piezometer pair is above the minimum inward gradient criteria and an additional factor of safety, the RIC in the vault activates the pumps on either side of that piezometer pair, until the measured gradient meets the established criteria. The RIC controller sends signals to solenoid valves that control the pumps.

This MSS enables Honeywell to record and view the hydraulic gradient and pumping activity at each extraction well real-time. The MSS can activate alarms related to maintenance and operational needs.

3.5.3 Conveyance System

Head maintenance system piping connecting the pumping vaults was placed below the MMC synthetic layers. Oversized 8-inch conduits were installed between the vaults to house the groundwater conveyance pipes. The 8-inch conduits and pipes are below the MMC geomembrane. The groundwater conveyance pipes are comprised of three 1 ½-inch diameter HDPE continuous pipes, placed within the 8-inch diameter HDPE pipe which provides secondary containment. Three additional conduits, two 4″ and one 3″ are provided to allow a 480V electrical supply loop, a 1″ compressed air supply loop and several low voltage lines allowing communication between the RICs and the MSS and security systems wiring.

The conduit and pressurized force main design allows some differential settlement of the HMS force main pipes.   Redundant conduit capacity allows replacement of the air and electrical lines between the vaults, if required.

3.5.4 Transfer Station

The Transfer Station handles storage of extracted groundwater with two 10,000-gallon storage tanks, and includes the air compressor, filters, a desiccant dryer, air storage tank which supply the pneumatic extraction pumps. The two groundwater storage tanks are used to provide excess storage capacity and to facilitate maintenance. The storage tanks are located in a concrete secondary containment basin to contain spills. The inside dimensions of the containment basin are 28 feet by 30 feet by 3 feet high. The volume within the containment area is 12,000 gallons, having the ability to safely contain the entire contents of one-10,000 gallon storage tank.

The conveyance system consists of a duplicate system of header pipes around the perimeter for contingency and maintenance purposes. Water from the two header pipes can be separated into different tanks. Separation by water quality is possible with the existing vault pipe valve system. This option is used if site conditions arise that may require separation of water flows based on chromium concentration, pH, or other water quality criteria.

Water levels in the storage tanks are remotely monitored. The monitoring and control system generate an alarm at high water levels in the storage tanks and stop pumping if the maximum water level is reached in the active storage tank.

A clean water supply is used to periodically flush the conveyance pipes and remove any precipitation buildup. Water is pumped into the pipes from the Transfer Station. The water supply has adequate pressure for flow around the perimeter and back to the storage tank location. Process water from pipe flushing is discharged to a storage tank. The piping system is constructed to allow flushing of alternate conveyance pipes while the other is in use to convey extracted groundwater.

3.5.5 Transfer Station Truck Pad

Extracted groundwater stored at the Transfer Station is transferred into tanker trucks for off-site treatment and disposal. Tanker-truck loading activities occur in an outdoor containment area (i.e., Truck Pad) adjacent to the Transfer Station. Within the containment area, concrete curbing and steel bollards protect aboveground process piping and tank fittings.

For loading trucks, a hose from the vacuum tank truck is attached to a port at the unloading station and groundwater is pulled from the storage tanks to the tank truck. During transfer operations, containers are placed beneath pipe and valve joints to collect small volume spillage. Authorized and trained Honeywell personnel supervise the truck filling and emptying of the storage tanks. A warning sign is posted in the area to prevent vehicular departure before complete disconnection of the transfer lines.

The Truck Pad is furnished with a trench drain and sump for spill containment and conveyance purposes outside of the building. In the event of a spill, flow is collected via the trench drain to a sump pit. From there, a sump pump directs the water to either one of the 10,000 gallon storage tanks within the Transfer Station.

The frequency with which groundwater is transported from the facility is based on the groundwater extraction rate, which is somewhat dependent on the seasonal tidal elevations. Shipments for off-site treatment occur when a tanker truck volume of water is accumulated and before the regulatory 90-day storage limit is exceeded.

3.6 OUTBOARD EMBANKMENT AND WATERSIDE PERIMETER

The north, west, and south perimeters of the Site were defined by bulkhead structures along the Patapsco River and the Inner Harbor. These structures were part of the original construction, dating from 1890's to 1950's.

The north and west bulkheads were comprised of timber piles at low water supporting granite block gravity headwalls, with timber pile dead-men and timber ties for lateral restraint. These bulkhead structures were left in place below the MMC. To protect against failure of these original perimeter structures during or after installation of the ERS described above, a section of fill was placed to the water side of those structures.

Soft compressible Stratum O clay was dredged for embankment fill placement. The embankment fill was placed in organized lifts. "Wall Zone" fill placed against the bulkhead was sand and gravel sized crushed stone blend designed to enable construction of the hydraulic barrier Larger sized "Core Stone" was placed outboard to construct the bulk of the embankment volume.

Rip rap was placed for erosion control above Elevation -10 feet mean sea level (msl), in the wave zone. The embankment fill included a coarse filter stone gradation to separate fine gravel sized Wall Zone fill from coarse core stone in the tidal region. The embankment is generally west of the planned Exelon development area. The planned Central Avenue Bridge crosses over the embankment just west of the Living Classrooms' Center Pier structure.

The former Back Basin is north of the planned Exelon Tower and Garage development. The Back Basin contains a thick deposit of Stratum O clay below low tide. These soft compressible deposits were isolated from the Harbor by a steel sheet pile retaining wall, visible today, aligned with the west end of the Center Pier retaining wall. The compressible deposits were stabilized with vertical wick drains and pre-loading.

Compressible Stratum O deposits below the existing Transfer Station and adjacent areas were stabilized with vertical wick drains and pre-loading prior to MMC construction. The timber 1890's Dock Street bulkhead was abandoned in place below the interim cap. HMS Vaults V11, V12, and MJ1 were supported on the 1890's era timbers, and the HMS conveyance pipes were placed above these structures.

3.7 MONITORING OF REMEDIAL COMPONENTS AND ENVIRONMENTAL MEDIA

The integrity of the remedial components is demonstrated through routine monitoring of remedial components and testing of environmental media, i.e., air, surface water, groundwater and sediment, and drainage layer effluent samples. The monitoring program is designed to demonstrate that the performance goals of the MMC, the HMS, and the Hydraulic Barrier are maintained. The performance goals are summarized below.

1. The MMC serves two major purposes: (1) to prevent upward migration of contaminants and limit the potential for direct exposure to contaminated soils or groundwater; and (2) to reduce infiltration to the groundwater table.

2. The HMS monitoring program maintains an inward hydraulic gradient as determined by monthly average head gradients based on hourly water level measurements at each piezometer pair around the site perimeter. Automated monitoring and control by the HMS enables these criteria to be met with minimal groundwater extraction. Data collection and control signals are coordinated as part of the control logic to alert the site personnel if malfunctions occur in the system.

3. The Hydraulic Barrier was placed at the perimeter of Area 1 to isolate site groundwater from the Harbor surface water and surrounding groundwater. The hydraulic barrier effectively reduces the amount of groundwater that must be extracted by the HMS to maintain an inward hydraulic gradient. Hydraulic barrier performance is monitored by observation of the quantity of groundwater extracted to maintain the inward gradient.

3.7.1 Environmental Media Monitoring Plan

The Environmental Media Monitoring Plan (EMMP) defines the monitoring program for air, surface water, groundwater and sediment.

The current monitoring program consists of the following:

- Air sampling for total chromium, hexavalent chromium, total dust and asbestos whenever the synthetic layers of the MMC are penetrated.

- Surface water is sampled quarterly at the top, middle (where depths are sufficient) and bottom of the water column at 18 locations around the perimeter of the site and two background locations. The Consent Decree, Section V, Part 12, establishes the Surface Water Performance Standard: "The surface water performance standard […] for total chromium shall be 50 parts per billion (ppb), calculated for each sample location by arithmetically averaging the samples taken at all depths over 4 consecutive days." In October of 2002 the sample frequency was amended to be 1 day of sampling at each sampling location per quarter. In addition, the EMMP states that Honeywell will review analytical data for results greater than 11 ppb of dissolved hexavalent chromium.

- Groundwater is sampled semi-annually and analyzed for chromium and, in specific locations, for cyanide.

- Sediment continued to be sampled every three years after the completion of remedial construction until the requirements for this monitoring period were met. The results of the sampling rounds are compared to data reported from prior sampling events.

3.7.2 Surface Soil Monitoring Plan

The Surface Soil Monitoring Plan (SSMP) documents the methodology used to monitor the MMC performance, and its ability to prevent the upward migration of contaminants. Monitoring areas include the MMC, drainage layer sampling points, drainage layer, settlement points, surface covers, and cap penetrations.

The SSMP does not address the post-development cap foundations and pile penetrations, but allows the Plan to be revised to address development (see drawing DDP-F1.60 for development cap locations).

The SSMP inspections of the cap at penetrations focus on soil discoloration, seepage, erosion, and settlement. Soil discoloration is a sign of upward migration of contaminants (chromium would impart a yellow color and crystallize at the moisture drying front). Seepage, erosion, and settlement all indicate a migration of soil particles by piping mechanism.

MMC Cap Components: Restoration of GCL. The SSMP describes the base functions of each component of the Area 1 MMC. The geomembrane and GCL are defined as an infiltration barrier: "The two components of this composite barrier layer are considered to function as one system in minimizing infiltration into the underlying contaminated soil" (P. 8, Part 2.1.2).

Settlement Monitoring. Settlement is monitored by repeat elevation survey of defined points (settlement monitoring plates). The Plan requires corrective action if settlement monitoring determines that the slope of the geomembrane/drainage layer is less than 1% outward from the center of the site.

Drainage Layer Sampling. Water from within the drainage layer is observed and sampled at four locations around the perimeter. Each location is examined for flow and examined for the presence of sediment. The water samples are tested for chromium and cyanide.

3.7.3 Groundwater Gradient Monitoring Plan

The Groundwater Gradient Monitoring Plan (GGMP) prepared by Black & Veatch Waste Science, Inc. August 1993, Revised June, 1995, and Addendum 1, August 10, 2001 describes the methods used to monitor compliance with the Groundwater Gradient Performance Standard and assess the performance of the deep vertical hydraulic barrier and head maintenance system (HMS). The principal components of the GGMP are described below.

Groundwater Monitoring Piezometers. Shallow and deep piezometers are used to monitor water levels inboard and outboard of the hydraulic barrier. Piezometers ISP1, OSP1, ISP2, OSP2, IP1, OP1, IP2, OP2, IP11, OP11, IP12, and OP12 are within the planned development area.

Groundwater level monitoring is performed by acoustic electronic sensor reading of the level water in the piezometers. Manual readings are periodically taken to confirm the electronic sensor readings and for purposes of calibration. The elevations of the piezometer casings are periodically confirmed by survey.

The Groundwater Gradient Performance Standard requires that for each pair of piezometers for a thirty day period, the average hydraulic head measured at the inside of the barrier shall be lower than the average hydraulic head measured outside of the barrier, and the absolute value of the average hydraulic head differential shall be greater than a value which represents the sum of 0.01 feet plus two times the maximum potential error of measurement of the hydraulic head in any one piezometer. The present performance calculation has been progressively refined over time and the current performance standard for the installed ultrasonic water level devices equals [0.01 foot + (2 × 0.031 measurement error)] = 0.072 foot.

4.0 DEVELOPMENT PLAN AND SCHEDULE

4.1 SCOPE OF PROJECT

The project on the Baltimore Works Site includes the Exelon Tower, the Plaza Parking Garage, modifications to the existing Transfer Station, general site development (plaza, streets, sidewalks, etc.), a new bridge connecting Central Avenue to the Site and related utilities, foundations, and other ancillary elements supporting the development as further described below.

4.1.1 Exelon Tower and Trading Floor Garage

The planned Exelon Tower is a 23-story structure with a footprint of approximately 70,249 square feet (sf) and top of the building projected at 364 feet above mean sea level (msl). Its footprint will comprise a full block on the northern edge of the Site (Drawings C.400 and A1.00.01). The ground floor of the building will be at Elevation +13 to +17 msl and includes the residential lobby, retail spaces, plaza garage entry, service docks and the Honeywell transfer station and offices. The second level will be at Elevation +28 with an office lobby and retail spaces opening onto the new Plaza on the south side and at Elevation +30 msl with mechanical and support spaces on the north side. Floors 3 to 7 will contain an enclosed parking garage with adjacent residential apartments on the west and south sides on each of these levels, and floors 8 to 23 will be commercial office space.

4.1.2 Plaza Parking Garage

Directly adjacent to the south of the Exelon building will be a new single level parking garage of approximately 71,000 sf with a structural deck supporting the new landscaped plaza, roads and sidewalks (Drawing DDP -A1.00.02). The garage will be at Elevation +13.75 msl on the northern edge sloping up to Elevation +14.75 msl on the southern end.

4.1.3 Transfer Station Revisions

The existing tank room and maintenance room of the Transfer Station will be retained, modified as required, and incorporated into the design of the new Exelon Trading floor garage structure. The support sections (i.e., office, conference rooms, etc.) of the existing building will be demolished during construction and new spaces will be reconstructed within the first floor level of the new structure (Drawing DDP- A1.31.00). A dedicated indoor loading dock for the Transfer Station will be constructed in the lower level of the building on Dock Street. New, double walled piping will be installed connecting the new loading dock to the existing storage tanks.

4.1.4 *Roadways & Plaza*

This first phase will include the design and construction of new roadways, sidewalks, site utilities and related amenities (landscaping, signage, street furniture) along with the new pile supported elevated Central Plaza (see Drawing DDP-C4.00). Utilities from Central Avenue Bridge and Caroline Street access the site from the Dock Street and Wills Street. Dock Street and Wills Street grades are constructed of earth fill to provide for utility burial.

The MMC and Hydraulic Barrier remedial components underlie the south half of future Dock Street. Because compressible materials underlie Dock Street, a pile supported platform will be constructed to support the MMC, HMS, and earthwork fill. A retaining wall and platform structure will be constructed at the north side of Dock Street to retain fill and allow raised grades at the Point Street intersection with Dock Street. Point Street sloping up from the new Central Avenue Bridge to the new Central Plaza will be a structural deck above the Central Plaza Garage. Wills Street south of Dock Street will transition from earthwork fill to a structural deck above the Central Plaza Garage. Trees in the Dock Street and Wills Street fill will be planted in concrete planters to restrict root migration to the underlying MMC.

Shallow cutoff sheeting will be placed at the north edge of the Dock Street pile supported platform. The sheets will be connected to the platform for vertical and lateral restraint. The cutoff sheeting will retain soil surrounding the soil-bentonite barrier and provide embankment stability during utility excavations and pile driving for the new Central Avenue Bridge.

4.1.5 *Central Avenue Bridge*

A new vehicular bridge will be constructed connecting Harbor Point with Central Avenue to the north. The bridge will be completed under a Baltimore City Department of Transportation (BCDOT) Design/Build contract. The proposed bridge will land on Harbor Point at a bridge abutment off Site with a roadway connection to the Site at the intersection of the new Dock Street and Point Street. The bridge will also include the extension of the Promenade connecting the existing Promenade on Lancaster Street to the planned Promenade on the Site, which will be designed and constructed in a future phase. A temporary promenade connection will be constructed as required by Baltimore City around the west end of the Site. Although the limits of the bridge are off Site, the Design/Build RFP will include historical and regulatory documentation for the bridge contractor to understand controls and standards applicable to working within the vicinity of the ERS.

Future Central Avenue Bridge construction requires foundation construction outboard of the HMS deep hydraulic barrier and former Honeywell bulkhead structure. The use of closed-end driven high capacity pipe piles has been recommended, but this work will be produced under City jurisdiction, and cannot be controlled by the development. The Exelon project will implement three key features to isolate the bridge foundation construction from the HMS and MMC:

1. First, a sheet pile barrier will be installed to augment the existing Soil Bentonite (SB) Barrier (i.e., the Hydraulic Barrier component of the ERS) to prevent pile driving energy from influencing barrier performance.
2. Second, a cutoff sheet pile will be placed outboard of the SB Barrier to support the existing SB barrier during pile driving.
3. Third, a structural platform will be placed to support the existing HMS Vault 11, Vault 12, MJ-12, and conveyance lines, and a new structurally supported MMC. The existing HMS conveyance and pumping systems are inboard of the former bulkhead, so that they are isolated from the bridge foundation construction.

These features isolate future Central Avenue Bridge construction from the remedy and provide independent support for the HMS and MMC; future bridge construction will not impact the HMS or MMC.

4.2 SCHEDULE

The targeted date for occupancy of the Exelon trading floor is June 1, 2015. The construction schedule is found in Appendix D. Project milestones through this date are listed below:

- Pile Load Test – May, 2013 ("Off-Cap" and completed);
- Detailed Design Plan (i.e., the DDP) – Revision submitted to Agencies on November 12, 2013;
- Engineering Evaluation – Revision submitted to Agencies on November, 12 2013;

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- Agency Approval of the DDP – November 18, 2013;
- Submit Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP) as required by the Air Monitoring Plan (Appendix B of the DDP) – November 20, 2013;
- Agency Approval of the SAP and QAPP for the Air Monitoring Plan – November 26, 2013;
- Commence Approved SAP and QAPP for the Pre-Construction Baseline Air Monitoring – December 2, 2013;
- Submit revised Air Monitoring Plan, incorporating the results of the Pre-Construction Baseline Air Monitoring – December 23, 2013;
- Relocation of temporary Transfer Station – January 2014;
- Commence foundation construction – January 2014;
- Commence Garage/Tower superstructure – May 2014;
- Commence Roads, Utilities, Site Garage – October 2014;
- Commence Tenant Interior Construction – May 2015;
- Construction of new Transfer Station Office – June 2015;
- Completion of roads, Central Plaza Garage, Central Ave. Bridge – September 2015;
- Exelon Trading Floor occupancy – December 2015.

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5.0 DEVELOPMENT IMPLEMENTATION ACTIVITIES

5.1 EARTHWORK

5.1.1 Excavations

The synthetic layers that comprise the MMC will be opened within the pile cap excavation zone. The MMC synthetic layers will not be disturbed between the new pile caps. The new pile caps and slab will have a new geomembrane sealed at each pile pipe penetration. The exposed MMC geomembrane will be protected while piles are installed. A new geomembrane will be placed after the piles are installed. The existing cover soil will remain in place to protect the MMC synthetic layers.

Tower cranes will be supported on independent pile foundations separate from the building piles. Crane foundation loads have not been developed. However, a common feature of tower crane foundations is the development of tension capacity in the foundations. The number of piles needed has not yet been developed. Tower crane pile construction and cap interface will most likely be identical to building piles. Potential tower crane pad locations shown are shown on Drawing DDP F1.15. The tower cranes will be supported on independent pile foundations separate from the building piles. Tower crane piles and pile caps will be left in place; their construction and cap interface will be identical to building piles. Crane Loads will determine pile pattern. Crane to be used in construction has not yet been determined. The typical pile cap detail (as shown on Drawing DDP F1.50) for the appropriate number of piles will be used.

If the final crane pad location ends up over some portion of the existing HMS, the pad will be designed to bridge over the HMS and the pad support piles will be located so that they maintain a minimum distance of 3 feet from the HMS. The piles will be left in place after the tower crane is dismantled (see Drawing F1.15 for crane pad location).

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Excavation of the MMC cover soil will be required in all areas where foundations are constructed. Excavation will be performed with machine and labor methods to protect the synthetic layers.

Below the planned Exelon Trading Floor Garage, the MMC will be removed at individual pile cap locations. Below the Exelon Tower the cap will be excavated over a larger area where the future shear wall foundations will be constructed below the tower. Excavation will include demolition and removal of abandoned historic foundation and concrete floors that were left in place below the MMC. See Drawing DDP - F1.13 for obstruction locations and obstruction management requirements. Excavations will extend where necessary for obstruction demo or removal to drive piles and place pile caps below the MMC.

Suitable excavated materials may be used for backfill to fill voids left from obstruction removal below the repaired/restored MMC. Excavated clean cover soil from above the existing MMC will be temporarily stockpiled and covered daily in a controlled area for subsequent testing and beneficial re-use as "clean" fill above the MMC. Excavated materials from below the MMC will be direct loaded into lined, sealed containers for off-site disposal at an approved RCRA facility per the Material Management and Handling Plan (Appendix B). Workers engaged in these activities will follow the project-specific health and safety plan.

The excavations will be performed with a sequence and process designed to minimize storm water runoff and accumulation in excavations, to protect against dust generation, and to control exposure of Cr(VI) impacted soil from below the MMC to workers and clean materials above the MMC. The excavated surfaces will be covered with suitable excavated cover soil to reduce the potential for human contact and dust generation from impacted soil. The excavation slope will be covered with a geotextile for stability and protection.

Piles will be driven through the clean cover soil work surface. The clean soil will be left in place below the new development cap synthetic layers, capillary break layer and structural slab. See detailed pile cap construction sequence on Drawings DDP-F1.30. Other dust controls, such as wetting, will be used to manage and mitigate dust as appropriate.

5.1.2 *Dewatering (Groundwater and Surface Water)*

EE Memorandum No. 2 provides an analysis of storm water management under existing conditions, during construction, and post development. Surface water runoff will be diverted away from the excavations using diversion berms during construction (Drawings DDP-F1.30 and F1.31). Direct rainfall on disturbed construction sites will be contained from adjacent areas using containment berms. Suitable excavated cover soil may be used for berm construction per the Material Management and Handling Plan (Appendix B).

Storm water infiltration into the cap is collected in the synthetic drainage net above the geomembrane. The drainage net layer will be dammed on all faces along excavation perimeters (temporary and permanent details on Drawing DDP-F1.30). After the MMC geomembrane is removed, storm water collected in excavations will be managed to control water that contacts soil beneath the membrane from rising above the membrane. Storm water in the excavation will be collected, stored, and tested to determine disposal criteria pursuant to EE Memorandum 2.

Calculations for storm water collection for several open excavation scenarios required for the pile foundations as a result of a 25-year storm and 100 year flood are provided in the EE Memorandum No. 2. Water collected during construction storm events will be stored in tanks for testing to determine if it meets discharge criteria or must be managed as a waste requiring off-site transport and disposal. Separate tanks will be used for storm water collected above temporary membranes and storm water collected below the MMC synthetic layers. A general construction discharge permit will be obtained from MDE to establish discharge requirements for applicable constituents.

A storm drain outfall to the Baltimore Harbor will be constructed just east of the future Central Avenue Bridge landing at the elevation of low tide. The storm drain pipe is intended to carry storm water from the Central Plaza elevated deck and Trading Floor Garage roof. The storm drain will cross the hydraulic barrier at the intersection of Wills Street and Dock Street, and will continue to the west, outboard of the hydraulic barrier, in the Dock Street right of way. Compressible clay below the future Dock Street cannot support the planned fill and storm drain utility. A low level structural platform will be constructed east of the Point Street intersection to support fill and utilities. The low platform construction area will be within a sheet pile enclosure. Pumping will be required for platform and pipe construction. The perimeter sheeting will close with the underlying clay to provide ground water cutoff from the shallow Harbor water, but will not penetrate Stratum M. HMS outboard piezometer OP-11 is within the planned dewatering sheeting. This piezometer is isolated in Stratum S-4 below Stratum M. Dewatering for outfall construction may reflect in the piezometer, and trigger HMS pumping in this area. However, the pumping is anticipated to be a short-term construction need and not a permanent condition.

5.1.3 *Obstruction Removal*

Concrete floor slabs, footings, and asphalt are expected below the existing MMC at many new foundation locations. These obstructions will be removed at pile locations, and where they interfere with pile cap geometry. Otherwise, abandoned foundations will be left in place below the future structures. Pit excavations will be used to determine the presence of obstructions to pile driving at the time of excavation. MDE-approved erosion and sediment control procedures will be followed to provide containment of open excavations.

At the planned Exelon Tower and Garage foundations, piles may be moved a few feet to avoid obstructions, but the pile cap may require enlargement to accommodate the wider spacing and provide column support without eccentric loading. At every pile cap location the MMC will be removed to allow obstruction demolition. See note on Drawing DDP F1.13. At the Plaza Garage, obstructions will be demolished or removed to provide for pile placement at the garage structure plan location.

Anticipated deep obstructions are indicated on Drawing DDP F1.13. Soil removal will be performed to manage displacement of the MMC surrounding each planned Plaza Garage pile as a consequence of pile penetration. The soil will be managed as described in the Material Management and Handling Plan in Appendix B.

Shallow obstructions will be broken up and left in place or removed to an approved off-site disposal facility at the time of excavation. Abandoned groundwater wells exposed during the excavation that present an open annulus (i.e., wells not previously abandoned in place) will be properly abandoned in-place or removed, as required, following Maryland's COMAR 26.04.04.11 – Abandonment Standards. Dynamic hoe-ram or spud driving will be used to demolish obstructions encountered during pile driving. Excavation and removal will be used where necessary and will be performed with a sequence and process organized to protect against dust generation and cross-contamination of the cover soil as shown in Drawings DDP EN1.01.

5.1.4 *Fill Placement / Raised Grades*

The building structures and ground floor slabs of both the planned Exelon Tower and the Trading Floor Garage will be pile supported so that future settlement is mitigated. Estimated settlement due to raised grades is provided in the EE Memorandum No. 1.

Construction sequence and details for the "new MMC" referenced are detailed in Drawings DDP F1.23 and 24, citations and clarifications have been added to the DDP text. The "new MMC" is connected to the existing MMC at the Valley Drain using Detail 4 on Drawing DDP F1.24. Foundation piles and pile caps will connect to the existing MMC as detailed in Drawings DDP F1.30 and 31, clarification has been added to the DDP text.

Fill may be placed to raise grades in a few areas, including Wills Street and Dock Street. Fill materials may be recycled cover soil or imported clean soil or special aggregate. Imported fill materials placed above the synthetic layers must be deemed suitable and acceptable by the Field Engineer prior to placement. HMS components (vaults and piezometers) affected by the new grades will be modified or replaced to ensure access (Drawings DDP EN1.05, EN1.06 and EN1.06.01. Documentation requirements of imported soil are described in the Material Management and Handling Plan provided in Appendix B.

The historic waterfront perimeter of the former Baltimore Works site was constructed in the late 1800's by placing fill over compressible sediment to make land. Compressible soils and timber bulkhead structures are present at the site perimeter, outboard of the historic shoreline. The location of compressible soils is illustrated on Drawing DDP F1.12.

In the vicinity of the existing Transfer Station and Dock Street, surcharge fill was used to pre-load the compressible deposits and the bulkhead structure to reduce settlement of the HMS system, MMC and Transfer Station. The extent and magnitude of preloading are provided on Drawing DDP F1.12. The HMS and MMC were placed after the pre-loading. The pre-loading allows for fill placement for development with minimal risk of differential settlement if the development fill load is below the pre-load (EE Memorandum No. 1).

Arching of soil overburden to the timber bulkhead frame may have prevented consolidation of Stratum O clay present below the bulkhead as discussed in the EE Memorandum No. 1. Degradation of the timber frame with time would result in compression of the clay and settlement of the HMS, MMC, utilities and street. A pile-supported concrete slab is proposed above the abandoned Dock Street Bulkhead to support the HMS and MMC and development infrastructure (Drawing DDP F1.40; EE Memorandum No. 9). The pile-supported concrete slab will be constructed above the existing MMC synthetic layers, which will be abandoned in place. The HMS and a new MMC will be supported on the new structure, the construction sequence for abandonment of MMC in this area, construction of the pile supported concrete slab and construction of replacement MMC is detailed on Drawings DDP F1.23 and 24 . This design prevents sheet flow runoff from the drainage layer along the Dock Street perimeter as discussed in EE Memorandum No. 3. A new "valley drain" will be constructed up slope of the new Dock Street platform to replace/augment the existing "toe drain" which discharges infiltration to the embankment at sampling point SSMP-4. A new SSMP-4A will be established west of HMS Vault 11 to allow sampling of water collected in the valley drain (see Drawing DDP EN1.01 and Section 6.3.2, below).

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Existing settlement monitoring point MP-1 at the intersection of Dock Street and Point Street will be abandoned, as the HMS and MMC structures will be supported on the new Dock Street platform in this area. A new settlement monitoring point MP-1A will be added below the Wills Street fill.

Observations for settlement of remedy features will be performed during construction. Up to two-to-four inches of settlement will be allowed, as long as the geomembrane or HMS conveyance piping is not compromised and positive slope is maintained for drainage within the synthetic drainage layer above the geomembrane (see EE Memorandum No. 3 for analysis). Where differential settlement occurs the synthetic layers will be exposed for inspection or repair, or addition of new synthetic layers in localized areas as appropriate (see Section 7.2.5 for settlement monitoring).

5.1.5 Cap Settlement Estimates and Importance to Cap Function

Fill placed in street areas of the proposed development reaches Elevation +18 msl (9 ft. of fill) at the intersection of Dock Street and Point Street and to Elevation +15 msl (4 ft. of fill) at the intersection of Dock Street and Wills Street. Utilities will connect to existing systems at Caroline and Dock Street, and new services will be provided at Dock Street and Point Street from the new Central Avenue Bridge. Significant portions of the Site are underlain by compressible clay deposits. In some areas of Dock Street and Wills Street, the compressible deposits were improved by pre-loading before MMC construction. The pre-load areas and grades are outlined on Drawing DDP-F1.12. The HMS and MMC at Dock Street were placed over an abandoned 1890's era low water timber bulkhead structure. The SSMP requires settlement monitoring in this area. Where the raised grades are below the maximum pre-load elevation, the settlement will be negligible. Where the raised grades are higher than the pre-load or where there was no pre-load constructed, settlement under the planned grades will be unacceptable. If the abandoned timber bulkhead were to degrade with continued aging, settlement is estimated to range from 1 ft. to 2.5 ft. (EE Memorandum No. 1).

The development will use structural decks or will support fill on pile supported platforms where the pre-loading was not performed and where pre-load grades were lower than the proposed new grades:

1. See drawing DDP-F1.43 for location and DDP-F1.52 for Sections and Details of retaining wall and protective slab.

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2. A pile-supported concrete slab will be constructed above the abandoned Dock Street Bulkhead from Vault 11 to MJ1 (Drawing DDP F1.40). The Dock Street structure will support fill at the Dock Street and Point Street intersection and will be the foundation for retaining walls at the edge of the fill. HMS vaults V11 and V12, and junction manhole MJ1 will be supported on this structure. HMS conveyance lines from vault V11 to MJ1 will also be supported on this structure. Synthetic layers of the MMC will be placed on top of the slab, and cover soil will provide the development street grades. This improvement reduces the risk of settlement to the HMS and MMC remedy components. Settlement monitoring point MP1 will be abandoned (Dock and Point St), and a new settlement monitoring point will be established over the HMS conveyance lines below the Wills Street fill. The new structure will be constructed above the existing membrane, and will obstruct MMC drainage net discharge to the toe drain. A collection pipe will be placed upslope of the new Dock Street structure to convey drainage net water to the perimeter toe drain or the embankment. A new sampling point for toe drain discharge will be constructed west of vault V11 (SSMP4A). See Drawing EN-1.01.

3. Lightweight Fill to Reduce Settlement

   Lightweight expanded shale aggregate or geofoam polystyrene block materials may be used to raise grades and reduce the weight of fill. Lightweight materials will be used above the elevated deck of the Plaza Garage, but are not contemplated in the present design for foundations and fill placement on the MMC.

5.2 FOUNDATIONS

Foundation selection was dependent on the subsurface conditions. Geologic sections are provided in Drawing DDP F1.11 and boring locations on Drawing F1.10.

Cap penetrations are needed for piles and pile caps. The developed cap below buildings and pile caps will be constructed in accordance with the feature requirements found in Table A of Appendix A.

5.2.1 Pile Selection

Piles will be closed-end pipe piles filled with concrete and capped with epoxy filler or steel plates, similar to the environmental piles utilized for the Thames Street Wharf structure on adjacent Area 2. Piles will be driven in clusters below columns, and large groups of piles will be placed below shear walls. Pipe piles are also proposed for the one-story Plaza Garage a single pile will be located at each column (concentric pile) to alleviate the need for pile caps, to reduce excavation below the geomembrane. A pile load test was performed to determine the most technically suitable and cost efficient pile. The pile driving and static load test program was performed to determine the performance of two pipe pile options (diameters, 16 inches and 18 inches with 0.5 inch wall). Dynamic PDA tests and static load tests demonstrated the 16 inch pipe pile can support allowable loads up to 250 tons and the 18 inch pipe pile can support allowable loads up to 287 tons.

Pipe piles will bear in Stratum M clay or the underlying Stratum S-4 sand and gravel. Penetration of Stratum M clay is not of environmental significance in Area 1, which is enclosed by the hydraulic barrier and is managed by pumping to maintain an inward gradient. However, the closed-end environmental pipe pile will allow the clay to seal the penetration due to high smooth wall and earth pressure resulting from soil displacement during pile driving.

Pipe piles will be filled with concrete for structural purposes. The concrete fill also prevents vertical conductance of water, which may penetrate the casing wall. High Strength Epoxy or steel plates will be placed as an evaporation barrier at the top of each pipe pile to reduce evaporation and the potential for capillary uptake of chromium from the pile to the concrete pile cap.

The Honeywell HMS piezometers and pumps will be used to control the water table, which will prevent a general rise in the water table as piles are placed. Water table control will be provided with the standard inward gradient algorithm for operation of the pumps. In addition, construction pumps will be available to dewater open excavations to remove storm water and construction water to prevent a water level rise to the MMC (DDP §7.2.3). Each pipe pile will displace soil and ground water, causing a temporary rise in the water surface local to the pile. Fill material at the ground surface is relatively permeable, so that the elevated water surface rise will be mild, and will dissipate rapidly after a pile is driven. The lowest pile cap subgrade is 3.5 ft above the ground water level managed by the HMS system.

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5.2.2 *Pile Caps*

Reinforced Concrete Pile caps will be placed below columns at the interior and perimeter of the planned Exelon Tower and Trading Floor Garage. The bottom of the majority of the pile caps is below the general membrane elevation surrounding the pile cap. Pile caps will be protected against potential chromium uptake by a new geomembrane and underlying capillary break. Infiltration in the drainage net will be permanently isolated from the pile cap depression.

5.2.3 Shear Wall Foundations

Shear wall pile caps will be placed below the planned Exelon Tower core and by the east wall of the Trading Garage to provide overturning resistance for the tower. The shear wall pile caps will be as thick as 8 feet. The elevator pits will be within the cap thickness. (For plans and sections of shear wall foundations see Drawings F1.50 and F1.51.)

Pile penetrations will be sealed with geomembrane boots. The boots will be mechanically clamped to the pipe pile wall with a gasket material between the pile and the boot. The boots will be welded to the geomembrane sheet by extrusion welding. The geomembrane will be supported on grade. Settlement is not anticipated to create a concern because the excavation required for shear wall pile cap construction substantially unloads the underlying clay. For more detailed construction sequence see Drawing DDP-F1.30.

5.2.4 Slab on Grade

The one story deck of the Central Plaza Garage and the platform structures on Point Street and Wills Street will be supported on "concentric" pipe piles. Equipment used to construct these elevated structures will be constructed using the existing cover soil thickness to support construction equipment. After the upper deck is completed, the cover soil will be removed for construction of the garage floor. The reinforced slab will provide mechanical protection and management control against geomembrane damage. The garage floor will be a 5-inch thick, 5,000 psi reinforced concrete slab on grade. The 5-inch thick slab has been demonstrated to be capable of supporting the rear axle of a tow truck with automobile in tow, with a significant margin of safety against punching. Larger loads are not feasible because the garage space has a 7 ft. high headroom limitation. With reinforcing bar, the slab will perform to distribute wheel loads even with cracking. A 1-inch thick polystyrene insulation board will be placed below the slab on grade to protect the geomembrane against thermal expansion and contraction. For a detailed construction sequence see Drawing DDP F1.31.

EE Memorandum No. 6 provides an assessment of the Slab-on-Grade Development Cap at Central Plaza Garage.

5.2.5 *Shallow Foundations Above the Cap Synthetic Layers*

Shallow foundations may be constructed above the synthetic layers of the cap to support light-weight structures (with maximum bearing stress of 2,000 pounds per square foot (psf)), at the drainage net). The cover soil will also support pipes and conduits, with the protective concrete slab below.

5.2.6 *Structural Ground Floor Slabs*

Ground floor slabs in the Exelon and Trading Floor Garage structures will be supported on the pile caps and shear wall foundations, which support the overlying structure.

5.3 *UTILITIES*

5.3.1 *Site Utilities (General)*

The site utility systems include storm drains, sanitary sewer, domestic water, natural gas, electric and telecommunications. Their alignments will generally follow the proposed roadway network, connecting the planned building/garage to the public infrastructure in Caroline Street, Central Avenue, or discharging to the Inner Harbor (Patapsco River). A detailed utility plan is provided (Drawing DDP – C5.10) showing the planned utility network connecting the planned on-site utilities between the development parcel and existing utilities adjacent to the Site.

The first phase of the development will provide service to Area 1 and includes utility infrastructure that will serve future development parcels as well. The DDP utility profile design is focused on minimizing disturbance below the existing MMC geomembrane. The potential for disturbance below the existing MMC geomembrane is anticipated for the proposed site utilities. As such, contingency details are provided for modifying the geomembrane layer where the utility vertical profile will require a "clean" corridor under roadways for future maintenance or repair. Clean utility corridor(s) will be constructed (Drawing DDP-F1.32) where utilities are placed below the existing MMC geomembrane.
The utility design elevation at the soil bentonite (SB) wall crossing is Elevation +5 msl. No proposed utilities will be installed beneath the existing or reconstructed MMC geomembrane layer.

The majority of utility work required for this phase of development is within 30 feet of the centerline of the hydraulic barrier. All utilities will have service connections crossing over the hydraulic barrier and the HMS system. The vaults provide access for maintenance and replacement of HMS and wiring components, which are under the geomembrane (Drawing DDP-EN1.05). Protective slabs and concrete bridge over the S-B Barrier for utility crossings are shown on Drawing DDP F1.20 and sections and details on DDP F1.21 and DDP F1.22.

5.3.2 Sanitary Sewer

The sanitary sewer will discharge into a force main in the parking garage. The site sanitary sewer line will pick up at the east wall of the planned garage. Under this phase, the Exelon building sanitary sewer service will be routed through the garage to the intersection of Block/Wills Street. The sanitary line will then connect into the existing sanitary sewer in Block Street. In the future, a 12-inch sanitary line will collect additional service connections and direct all flow through a gravity system east on Block Street to an existing 12-inch sanitary line at Caroline Street). The projected Master Plan sewer demand has been submitted to Baltimore City so that they can evaluate the capacity of the downstream public sanitary sewer system.

5.3.3 Storm Drain

A storm water management analysis was completed in 2007 and approved by Baltimore City Department of Public Works. An updated storm water management analysis was completed in 2013, which has been submitted to Baltimore City for review. The quantity control goal of the storm water management plan is to discharge storm water, to the greatest extent possible, directly to the Harbor in lieu of discharging to the Caroline Street storm drain system. For the portion of Harbor Point that must drain to Caroline Street, the goal is to maintain runoff levels at existing conditions or no greater than a 10% increase.

Storm drainage will be collected in catch basins above the Central Plaza portion of the planned parking garage and pumped to the northwest and southeast outlet points. From there, the 24-inch to 30-inch site storm drain lines will carry the drainage north and south, respectively to the Northwest Branch of the Patapsco River. Also added to this discharge volume will be runoff from the proposed building and portions of Dock and Wills Streets. New storm drain outfalls will be constructed through the existing sheet pile wall at the south end of Wills Street and the new Central Avenue Bridge bulkhead to the north to accommodate the 24-inch and 30-inch lines.

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A storm drain outfall to the Baltimore Harbor will be constructed just east of the future Central Avenue Bridge landing at the elevation of low tide. The storm drain pipe is intended to carry storm water from the Central Plaza elevated deck and Trading Floor Garage roof. The storm drain will cross the hydraulic barrier at the intersection of Wills Street and Dock Street, and will continue to the west outboard of the hydraulic barrier in the future Dock St right of way. Compressible clay below the future Dock Street cannot support the planned fill and storm drain utility. A low level structural platform will be constructed east of the Point Street intersection to support fill and utilities. The low platform construction area will be within a sheet pile enclosure. Pumping will be required for platform and pipe construction.

Storm drainage will be collected in catch basins above the Future Pad Site portion of the planned parking garage and pumped to the southeast corner. From there a temporary 8-inch site storm drain will discharge the runoff at grade on the existing asphalt parking lot.

The majority of the site storm water will be discharged to proposed outfalls into the Harbor at the Point/Dock Street intersection and at the south end of Wills Street. The remaining portion of the site (Dock Street east of Wills Street) discharges to an existing 30-inch storm drains in Caroline Street, which outfalls into the Harbor to the north of Caroline/Dock Street intersection. The proposed 30" storm drain line, east of the perimeter barrier, discharging at the south foot of Wills Street is a temporary line that will be replaced when Wills Street south of the Central Plaza is constructed in the future. This temporary line will be perforated to allow storm water runoff collected from the Central Plaza area to recharge groundwater levels east of the SB wall (Area 2).

As the grading plan Drawing DDP-C5.20 shows, runoff will sheet flow away from the open faces of the temporarily above-grade parking garage. This will be achieved by installing temporary low (1 to 3 feet) mechanically stabilized earth walls along the edge of the garage to transition from existing cap grade outside the garage (i.e., Elevation +15 msl) down to the proposed garage grade (typical Elevation +13 msl), see Drawing DDP-F1.40 for plan and DDP-F1.54 for section. Storm drainage collection basins and eight water-tight sumps with pumps will be located within the garage as shown on Drawing DDP-A1.00.01. The sumps will be sealed within a small depression below the MMC geomembrane. Details for the construction of the sump will follow pile cap penetration details on Drawing DDP-F1.30.

5.3.4 Domestic and Fire Water

A 12-inch fire/domestic water loop is proposed off the existing 12-inch line in Caroline Street, making connections at the Dock Street/Caroline Street intersection. An extension across the proposed Central Avenue Bridge was also requested by Baltimore City. The proposed on-site water main loop will continue up Dock Street to the planned Central Avenue Bridge, up Point Street, up Wills Street and run the entire loop of the Central Plaza roadway. Service connections will be made as necessary. The line requires a minimum 4 feet of clean cover; however, if this cover cannot be maintained, alternate measures will be proposed such and heat tracing and/or insulation. The water main will also feed fire hydrants positioned around the site in accordance with Baltimore City standards.

5.3.5 Gas

A gas main extension will serve the development from the public main in Caroline Street with connections at the Dock Street intersection. The gas main extension in Dock Street will serve the northern half of the Site. A future Block Street extension will serve the south half of the Site. Service connections will be made as future development parcels are completed.

5.3.6 Electric and Telecommunications Conduits

Electric and telecommunications conduits will be looped through the Site from Baltimore City and Verizon duct banks at the intersections of Caroline Street with Block and Dock Streets. An additional duct bank extension across the planned Central Avenue Bridge is being considered that would connect with existing utilities in Central Avenue.

5.3.7 Diesel Fuel Storage During Construction

Fuel storage for construction equipment will be performed in accordance with regulations for containment and management. Construction equipment will be re-fueled within secondary containment as described in the Spill Prevention and Response Plan (SPRP). This secondary containment is shown as a portable "collapse-a-tainer" system described as a Temporary Loading Dock on Drawing DDP-EN1.03.

5.4 *ROADS, STREETS AND PARKING*

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The proposed roadway network connects to the surrounding existing roadway network. The proposed roadway network will also provide access to the ERS components below grade in these areas (i.e., hydraulic barrier and HMS System). All proposed roadways are 2-lane, 2-way except around the Central Plaza and the Central Avenue Bridge. The loop around the Central Plaza will be a 2-lane, 1-way road. The Central Avenue Bridge will be a 4-lane, 2-way road, facilitating traffic flow in and out of the Site. Parking will be provided via parallel parking spaces at street level and in proposed/future parking garages (Central Plaza Garage and Exelon Trading Floor Garage under Phase 1 Area 1).

The anticipated everyday users of the Site are vehicles as large as HS-20 delivery trucks down to passenger vehicles. A truck route will be proposed which excludes the loop around the Central Plaza.

Although the loads imposed by everyday vehicles are not a concern, extraordinary loading, such as from construction vehicles is an important consideration for the roadway construction. Record drawings indicate that portions of Wills Street and Dock Street already have protective concrete bridge slabs constructed over the hydraulic barrier. These slabs will be demolished during sheet pile wall installation and then reconstructed as shown in drawing F1.22 (see Drawing DDP-F1.20 for plan view). Extensions to the existing protective slab are required in select areas shown on the Development Cap Plan (Drawing DDP-F1.60) and the Civil Plan (Drawing DDP-C4.00) to provide further stress relief for the MMC, the hydraulic barrier, and the HMS system.

5.5 *STRUCTURES*

The existing tank room and maintenance room of the Transfer Station will be retained, modified as required, and incorporated into the design of the new Exelon Tower (Drawing DDP-A100.01). The support sections (i.e., office, conference rooms, etc.) of the existing building will be demolished during construction and new spaces will be reconstructed within the first floor level of the new Exelon Trading Floor Garage (Drawing DDP-A1.31.00). See drawings DDP-F1.16 and DDP-F1.17 for demolition of transfer station office building, foundations and truck pad.

5.5.1 *Honeywell Office Building Demolition*

The Honeywell Transfer Station consists of a two-story office building, a one-story section containing a Tank Room and a Mechanical Room and a Transfer Pad. The building is of steel frame construction, and is supported on spread foundations and slabs and a mat on grade. The foundation elements bear on cover soils over the MMC synthetic layers. HMS lines pass from vault V1 in the sidewalk of Wills Street above the geomembrane through the cover soil beneath the office portion of the building to the Tank Room.

As further discussed in Section 6.3.1, the office building will be demolished while the Tank Room, Mechanical Room and Transfer Pad will be protected and maintained. Demolition will be performed selectively, with caution to avoid damage to the building portions to remain, the HMS lines, and MMC. Transfer pad demolition will be performed within the sequence of foundation construction, so that the existing transfer pad can continue to function until the final transfer pad location is available for construction.

5.5.2 *Existing Structural Foundations*

The foundations consist of shallow strip footings, shallow isolated column footings and slabs on grade, all of which are founded above the multimedia cap synthetic layers. All demolition work will be performed above the multimedia cap and the synthetic layers will not be exposed. The bottom of existing footing elevations are approximately Elevation +11 and the elevation of synthetic layers vary from Elevation 8 to Elevation 10. The synthetic layers in this area of the site are protected by a concrete mud mat overlain by structural backfill.

5.5.3 *Stages of Foundation Demolition and Effect on Use of Transfer Pad*

Portions of the foundations to remain will be protected by using saw cuts to separate from the demolition areas. Partial Demolition will be carried out in two stages to minimize effect on loading dock use.

Stage 1 Demolition will commence after temporary relocation of select HMS components is complete. Stage 1 consists of saw cutting and removing all portions of the HMS in conflict with Trading Floor Garage foundations. The existing Transfer Pad will remain functional during Stage 1 demolition.

Stage 2 Demolition will commence after pile installation in the adjacent area is complete. Stage 2 consists of removing the existing Transfer Pad. Based upon the construction schedule and sequence, Stage 2 Demolition will be performed during the winter months when the Transfer Pad use for groundwater transfer occurs more frequently. Operation of the Transfer Station during construction is discussed further in Section 6.3.3 and in the Contingency Plan provided in Appendix B. Upon demolition completion, proposed piles, pile caps, grade beams, slabs and new loading containment area will be constructed.

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5.5.4 Pile Driving Adjacent to Existing Groundwater Storage Tanks and Equipment

The Trading Floor Garage structure is founded on pile foundations. The proposed piles and pile caps will be constructed adjacent to the Tank room. See Section 6.3 for the design and contingency plans regarding water storage during selective demolition and foundation construction.

Prior to pile installation, the MMC at the pile cap area will be excavated and the synthetic layers removed for obstruction demolition. After pile installation the synthetic layers will be repaired. The process of cutting and repair of synthetic layers is described in detail on drawing DDP-F1.31.

5.5.5 New Loading Dock

A dedicated indoor loading dock for the Transfer Station will be constructed on Dock Street adjacent to the transfer station (Drawing DDP-A1.31.00). New double-walled piping within conduits will be installed connecting the new loading dock to the existing storage tanks (Drawing DDP-EN1.07). The loading dock will be designed with similar features as the existing Transfer Pad to capture and contain spills or leaks, including secondary containment, trench and sump (Drawing DDP-F1.42). It should be noted that since the new loading dock will be indoors, the capacity of the trench and sump does not need to include provisions for precipitation.

The new loading dock slab will be constructed after completion of demolition of the existing loading dock and after installation of new piles and pile caps adjacent to the HMS. The new loading dock will be constructed to provide secondary containment for 5,790 gal, which is greater than the capacity of the transport tank truck (5,000 gal), see EE Memorandum No. 5 for analysis.

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The new loading dock will be a structural concrete slab (approximately 57 feet long x 15 feet wide) supported on the Trading Floor Garage pile caps and grade beams. The slab will be 12 inches thick at the interface with sump pit and 15 inches deep at the perimeter providing a slope towards the sump pit to facilitate flow of potential spillage into the sump pit.

A collection sump pit 45 feet long x 6 feet wide x 2.5 feet deep will be constructed at the east side and below the loading dock. The new sump pit dimensions are shown on Drawing DDP F1.44. The sump pit provides 5,050 gallons of storage. The sloped slabs and drainage trough provide additional storage for 740 gallons.

The top of the loading dock slab slopes up from Elevation +13 at the sump pit to Elevation +13.25 at the perimeter on all four sides. The loading dock is enclosed on the east, west and south ends by walls that connect to adjacent floor slabs. On the North end the loading dock slab connects to the street. The walls on the three sides and the sloped slab in addition to the sump pit will contain a potential spill during transfer of groundwater from the tanks.

The sump pit and drainage trough will be covered with a series of metal gratings (similar to the one used at the Transfer Pad to be demolished) which allow access to the pit for cleaning and inspection. The sump pit base slab and the sump pit walls will be placed in one pour, and the loading dock slab will be constructed in a second pour to reduce the number of cold joints. Water stops will be used at all joints. In addition, the concrete for the slabs and walls will contain fiber reinforcement to control shrinkage cracking and the concrete mix design will be specified for shrinkage control. The hardened concrete will be coated with a corrosion inhibitor such as Silane Sealer or approved equal.

As substantiated by Calculation 1 in EE Memorandum No. 5, the total volume available for spill containment, including the sump pit and available storage volume above loading dock slab is more than adequate for the design spill of 5,000 gallons.

6.0 DESIGN MEASURES TO PROTECT THE ENVIRONMENTAL REMEDIATION SYSTEM

6.1 HYDRAULIC BARRIER

The perimeter hydraulic barrier (soil bentonite wall) effectively increases the efficiency for Honeywell to maintain its inward gradient obligation. To reduce vibration-related densification settlement of the S-B backfill, Honeywell requires monitoring and construction controls to curtail vibrations above 2 inches/second at the ground surface above the barrier. These same requirements prohibit installation of driven piles within 30 feet of the barrier. Other requirements include the measurement of ground surface above the barrier before and after pile driving to assess possible settlement occurrence.

The project design places piles closer than 30 feet to the barrier, and requires construction of permanent structures above the barrier alignment. Honeywell requires repair of the hydraulic barrier in the event pumping quantities increase with time. The preemptive repair designed for the redevelopment consists of driving a steel sheet pile to augment the barrier. The alignment proposed for sheet pile placement is indicated in Drawing DDP-F1.20. Details and Sections for sheet pile wall installation are provided on Drawings DDP-F1.21 and DDP-F1.22.

Steel sheet pile should be well protected against corrosion in the hydraulic barrier backfill which typically has a pH between 8 and 10, and burial in the barrier below the water table should prevent oxygen to access the steel. A corrosion rate of 0.05 millimeters per year (mm/yr.) is anticipated (Eurocode 3), which computes to complete corrosion loss of section in 170 years for standard carbon steel. An analysis of potential corrosion rates is presented in the EE Memorandum No. 4. Sheet pile joints will be sealed using a hydrophilic expansive rubber water stop. It is possible that sheet pairs will be shop welded to simplify installation and reduce the number of joints sealed on placement (EE Memorandum No. 4).

6.2 MULTIMEDIA CAP (AREA 1)

The MMC was designed to protect against storm water infiltration, and human exposure. In the planned developed Site, overlying building structures, roadways and storm drains will remove much of the storm water load from the Area 1 cap. Overlying hard structures and management control provided by development will protect against human exposure and errant excavation.

Where the MMC is removed for foundation construction, a new geomembrane will be placed below the concrete foundations, and sealed to the pile penetrations and existing geomembrane (Drawing DDP- F1.60 for membrane replacement locations). The existing MMC geomembrane will be connected to the geomembrane at the pile caps and the new membrane will be booted to each pile. Some synthetic layers such as the GCL, which is a backup to the geomembrane protection against infiltration and the drainage net, will not be replaced beneath the new pile caps (EE Memorandum No. 3)

The complete MMC, with all synthetic layers, will be maintained or replaced outside of the footprint of development structures. Excavation of cover soil below the warning layer will be performed with labor assistance where the synthetic layers are intended to survive construction. The synthetic layers will be protected by cutting without tension stress or tearing. Repairs will be made by extrusion welding new geomembrane sections.

The MMC will be pile supported at Dock Street above the abandoned timber bulkhead and where the underlying clays were not preloaded. This work is illustrated on Drawing DDP-F1.43. A pile-supported concrete platform will extend from the new sheet pile barrier to the inboard extent of the bulkhead frame. The existing MMC synthetic layers will be abandoned in place below the new concrete structure. The new MMC will incorporate the existing capillary break gravel and new synthetic layers (drainage net / geomembrane / GCL) with a protective concrete cover below future Dock Street.

- Construction equipment, including dozers, excavators, trucks, cranes, and other traditional redevelopment equipment, will be traversing the Area 1 cap throughout construction activities. Equipment loads will controlled so that after the load is spread through soil cover, a maximum bearing stress of 2,000 psf will be applied to the drainage net. Computations indicate the existing soil cover will spread loads from an HS-20 truck load (rated truck for Baltimore City Streets) are permitted to operate on areas where the existing 30-inch soil cover remains in place (Drawing DDP-F1.15 and EE Memorandum No. 7). A minimum soil thickness of 24 inches will be in place to protect the geosynthetic materials against mechanical damage by construction equipment. Mats and additional fill will be placed to spread construction loads to meet the 2,000 psf restriction. In some areas, asphalt will be placed to reduce rutting to prevent thinning of the existing soil cover and control dust.

6.2.1 *Excavation of Impacted Soil*

Excavation of impacted soils from below synthetic layers will follow a protocol for protection of the cover soil against chromium cross-contamination, and dust generation (Material Handling and Management Plan-Appendix B). The temporary storage areas for the excavated material are shown in Drawings EN1.01 and EN1.06.01 and discussed below in Section 7.2.9.1. Soil and obstruction debris removed from below the membrane will be managed for disposal off Site. Obstructions will be broken and sized in the excavation zone to allow loading directly to lined, sealed roll-off container boxes. Suitable, non-hazardous excavated soils may be stockpiled for use to fill areas where obstruction debris are removed, or where coarse stone is placed below new membranes for construction work platforms.

6.2.2 *Foundation Penetrations and Repair*

A complete MMC, equal to or thicker than the MMC design section, will be provided outside of any area not covered by a development structure. Where possible, the existing MMC will be protected and used for the development cap. Connections at pile penetrations and the perimeter of pile caps will only be made to the geomembrane layer (Drawing DDP-F1.60 for locations of replacement cap).

The geomembrane will be protected against mechanical damage by providing adequate soil cover/thermal insulation (EE Memorandum No. 6). The geomembrane will also be protected by cushion geotextiles for abrasion control, mud mat for structural and puncture control, or additional geomembrane thickness. Where street Right Of Way are located on fill above the MMC, a protective concrete slab will be placed above the drainage layer to protect the MMC synthetic layers against potential damage caused by excavation for installation or maintenance of utilities (Drawing DDP F1.32).

Pile penetrations will be sealed using a geomembrane “skirt”, extrusion welded to the MMC geomembrane layer, and sealed using a mechanical boot to the pile. The purpose of the skirt is to allow oversized openings in the geomembrane necessary for geomembrane replacement or resulting from construction disturbance. The boot seal for each pile penetration placed will be tested using the vacuum box method. Materials and Quality Control/Quality Assurance requirements are provided on Drawing DDP-F1.01.

6.3 HEAD MAINTENANCE SYSTEM

6.3.1 *Transfer Station Design*

Transfer station functional operations shall be uninterrupted during selective demolition and construction. The design provides two levels of operation. Level 1 elements are required prior to the start of construction and are maintained during construction. Level 2 elements are designed to be implemented on an as-need-basis. The sequencing and modifications for each Level are provided on Drawing DDP-EN1.02.

Level 1 describes using the existing water storage tanks located in the Tank Room by making minor modifications to the existing system, e.g. providing positive pressure inside the Tank and Mechanical rooms during potential dust generating activities immediately adjacent to these rooms. Water stored in the exiting tanks will be transferred for off-site disposal using the existing 3-inch "Kamlock" connection located on the western wall of the Tank room. Double-wall flexible hose will be connected from the Kamlock to a portable, temporary loading secondary containment system. The "collapse-a-tainer" containment system provides the portability needed to ensure water transfer operations by vacuum truck are uninterrupted.

Level 2 describes as-needed measures, e.g., during selective demolition of the offices, the water storage tanks will be kept in a "near-empty" (one-foot to tank drain pipe) bypass status. Double wall conveyance pipe will be connected from the existing Vault 1 to one of two 16,000-gallon double wall portable storage ("Frac") tanks (Drawing DDP EN1.04). The design provides 50% greater water storage capacity than the (2) existing 10,000-gallon tanks. The portable containment system described above will be utilized for transferring water from the Frac tanks by vacuum truck.

To minimize interruption and enable maximum integration, selective demolition will be conducted on the existing transfer station (Drawings DDP EN1.02, DDP F1.16 and DDP F1.17). The storage tank and maintenance rooms will remain, including walls, floor and roof. The Trading Floor Garage will be built around the tank and maintenance rooms. The loading dock will be relocated adjacent to the garage entrance for the building. It will be an isolated, dedicated loading dock, complete with walls, trench drain and secondary containment. New conveyance piping will be installed using dual contained pipe (Drawing EN1.04).

Loading dock access to the tank room is designed to allow for the handling of larger equipment through two new 4′ x 8′ doors to the existing bay door to be retained on the Tank room west wall. A set of administrative controls have been designed to segregate employees from this area during those infrequent occasions when equipment replacement is necessary. All decontamination procedures will be performed within the Tank room secondary containment.

The existing air receiver located in the existing loading dock will be relocated to the existing Mechanical Room (see Drawing EN1.07). The HVAC system on the roof will be relocated and rerouted to the exterior of the proposed Exelon Building in order to maintain the exhaust fan and other existing HVAC systems within the preserved portions of the Transfer Station. Electric service will also be relocated.

During construction, the tank and maintenance rooms will remain operational and accessible and HPD will provide temporary office, conference room, and additional support space in a mobile trailer to be located adjacent to the Site (Drawing DDP-EN1.01). A portable, temporary loading containment area will be available on the Site in the event that access to the existing loading dock becomes restricted during construction (Drawing DDP-EN1.04).

Groundwater storage will be limited to 2,500 gallons in either tank located in the Tank room during demolition and pile driving activities. Portable, 16,000-gallon capacity, double-walled water storage containers ("Frac" tanks) will be placed to the west of the existing tank room. Double-wall conveyance piping will be installed from the Vault 1 to these Frac tanks to bypass the Tank room (Drawing DDP EN1.03).

Once potentially disruptive work is completed, the Tank room will be restored to full functionality by re-routing the groundwater from Vault 1 back to the Tank room as the permanent condition.

Offices, conference room, storage rooms, and other transfer station support areas will be relocated and integrated into the first floor of the trading garage Drawings A1.00.01 and A1.31.00.

6.3.2 HMS Design Changes

To avoid disruption to the HMS system during construction, and to maintain continuous operation and access to all HMS components post-construction, modifications have been designed for certain components of the HMS system including vaults, piezometers, junction boxes and conveyance piping and electrical conduits. The specific HMS components to be affected by the development are shown on Drawing EN1.01, and presented in the table below. Details for modification of these HMS components are shown on Drawings DDP EN1.01, EN1.05, EN1.06, EN1.06.01 and EN1.09.

HMS Components	**Conflict**	***Resolution***
<u>Vaults:</u>		
V1	Elevation	*Extend access riser to new road elevation*
V2	Elevation	*Reduce vault (wall) height to new road elevation*
V11	Timber Piles and Bulkhead/ Elevation	*Support vault on pile supported platform. Extend access riser to new road elevation*
V12	Timber Piles and Bulkhead/ Elevation	*Support vault on pile supported platform./Extend access man-way riser to new sidewalk elevation*
<u>Manhole Junction:</u>		
MJ1	Timber Piles and Bulkhead/ Elevation	*Support MJ1 on pile supported platform. Extend access riser to new road elevation*
<u>Piezometers (PZ):</u>		
IP-1, IP-1S, OP-1, OP-1S	Elevation	*Reduce PZ height, adjust conduits and cables*
IP-2, IP-2S, OP-2, OP-2S	Elevation	*Reduce PZ height, adjust conduits and cables*
IP-11 and OP-11	Elevation	*Extend PZ height, adjust conduits and cables*
IP-12 and OP-12	Elevation	*Reduce IP-12 and extend OP-12*
<u>Junction Boxes:</u>		
JB-1	Elevation	*Replace box, adjust cable and conduits*
JB-2	Elevation	*Replace box, adjust cable and conduits*

HMS Components	Conflict	*Resolution*
JB-11	Elevation/ Curb	*Replace box, adjust cable and conduits/Relocate outside curb*
JB12	Elevation	*Replace box, adjust cable and conduits*

Vault 11 (V11), Vault 12 (V12), and Manhole Junction 1 (MJ1) will be supported by the pile supported platform. The existing conveyance lines between these structures will also be supported from the new pile supported platform (Drawings DDP F1.43 and DDP EN1.09). These HMS modifications are designed to provide long-term stability to the existing systems.

Vault 2 and piezometers IP-1/OP-1, IP-1S/OP-1S, IP-2/OP-2 and IP-2S/OP-2S will be located below the Wills Street platform. Access will be maintained at the Vault 2 man-way, Vault 2 service access ports and both sets of piezometers on street level. DOT rated access ports will be installed in Wills Street ramp immediately above these locations for equipment and piezometer maintenance or replacement in the future (Drawing DDP EN1.05). The existing SSMP-4 sampling point will be abandoned and relocated to the east of the current location to provide drainage net sampling during construction. A new sampling point, SSMP-4A will be installed west of Vault 11 (Drawings DDP EN1.01 and DDP EN1.06.01)

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The existing methane gas vent will be relocated to avoid conflict with new construction (Drawings EN1.01 and EN 1.06.01). The vent is situated outside the Plaza Garage south wall and generally within the highest elevation area. The elevation of the geomembrane at the new vent location is slightly lower than the geomembrane elevation at the current location (Elevation +13 msl). The underlying capillary break will facilitate conveyance of any gas toward the vent. The vent is constructed as a 3-foot high standpipe with perforations at the top of the pipe that will be incorporated into an architectural feature.

6.3.3 Transfer Station and HMS Operations During Construction

The preserved portion of the Transfer Station (TS), will contain all critical operating systems necessary to store impacted groundwater conveyed by the HMS and will remain in operation throughout all phases of construction (Drawing DDP-EN1.02). In the event that the tanks are damaged or the impacted groundwater needs to be routed away from the TS, the piping in vault V1 will be modified to divert all flow from V1 to one of two double-walled water storage tanks as detailed on Drawing

DDP-EN1.04. The piping outside of V1 will be flex pipe with secondary containment.

The HMS system contains a redundant discharge pipe network. The tank storage and discharge control also have redundant capacity that will allow a high degree of operational flexibility during construction. The temporary loading dock with secondary containment and temporary conveyance pipe, which is described in Section 6.3.1, will be provided prior to construction activities in the vicinity of the Transfer Station to maintain loading operations at all times (Drawing DDP-EN1.03 and EN1.04).

As discussed in Section 6.3.1, the construction presents potential risks from dust and vibration that may impact the conveyance, electrical, monitoring and control systems of the facility. A detailed Contingency Plan (Appendix B) has been developed to address these issues and sets forth an increasing level of action based on potentially increasing levels of system inoperability. The plan takes a practical approach to mitigate operational impacts, maintain system controls, maintain data logging and minimize the risk of system downtime. It also provides a level of flexibility to adapt to changing construction requirements.

The piezometers and vaults will be operated continuously to the extent possible during construction. It is anticipated that power and controls will be severed when making the necessary height and other adjustments to the piezometer wells as detailed in Section 6.3.2 and as shown on the Drawings DDP-EN1.05 and 1.06. The downtime will be coordinated with Honeywell. Further, the downtime will be localized. In other words, only a specific set of piezometers that is being modified (and the corresponding remedial system components such as associated extraction wells) will be nonoperational, while the remaining HMS system will be operational. As such, the piezometers height adjustment will not have a significant impact on the overall HMS operation. Alternative or temporary controls and power will be provided for both the piezometers and vaults in the event that power/controls will be out of service for more than one day. Design aspects of the Contingency Plan involving the Transfer Station are shown on Drawings DDP- EN1.02, EN1.03 and EN1.04. Those items involving the HMS are shown on Drawings EN1.05, EN1.06, EN1.06.01 and EN1.09.

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6.4 OUTBOARD EMBANKMENT AND WATERSIDE PERIMETER

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The Outboard Embankment is intended to provide structural support of the former bulkhead structures, now abandoned in place, and to prevent erosion of the perimeter barrier. The embankment receives discharge from the MMC drainage layer to the perimeter drain.

Shallow cutoff sheeting will be placed at the north edge of the Dock Street pile supported platform. The sheets will be connected to the platform for vertical and lateral restraint. The cutoff sheeting will retain soil surrounding the soil-bentonite barrier and provide embankment stability during utility excavations and pile driving for the new Central Avenue Bridge (see Drawing DDP-F1.43 for plan locations).

Above Elevation 10 the embankment is protected from erosion by a layer of rip rap stone. Rip rap will be removed to facilitate pile driving through the embankment. Rip rap will be replaced and chinked around the new piles to restore the integrity of the rip rap layer. Rip rap in the area of development will be visually inspected and replenished where necessary to maintain its original thickness.

The embankment receives discharge from the MMC drainage layer perimeter pipe. This discharge mechanism shall be protected during construction, and restored, as required. Outfall water sampling point SSMP4 will be modified as discussed in Section 6.3.2 and presented on Drawing EN1.06.01.

7.0 PROJECT-SPECIFIC ENGINEERING, CONSTRUCTION AND ENVIRONMENTAL CONTROLS AND MONITORING

7.1 CONSTRUCTION QUALITY ASSURANCE/ QUALITY CONTROL

The contract drawings and specifications will identify work items that require contractor Quality Control (QC) and items that require developer/owner Quality Assurance (QA). The Contractor will be required to prepare CQC/CQA Work Plans for operations that encounter the Environmental Remediation System (ERS). The Work Plan system will allow the Contractor to determine detailed means and methods for developer approval, and for the developer to control the work that protects the MMC and other ERS elements. QA/QC activities include inspections, testing, monitoring, and reporting. This subsection presents the QA activities related to inspections, testing and monitoring; reporting and documentation are further described in subsection 7.3.

The Developer's CQA team will solely participate in the quality assurance function and will not be involved in any other aspect of the construction effort. This team will, however, possess all of the credentials, capabilities, and experience of an independent design/construction oversight team. The number of interested parties involved in the Area 1 development will require separate HPD and Honeywell CQA organizations. The Contactor's CQC and the Developer's CQA team will be comprised of the positions listed below.

- Project Manager: The Contractor's project manager is responsible for overall implementation and management of QC activities.

- CQC Manager: The Contractor's CQC Manager will report to the project manager. The CQC manager will perform and/or oversee all CQC activities; coordinate CQC activities with the developer; and, maintain copies of all CQC records and test results. The CQC Manager should not have any other duties other than CQC.

- CQC Laboratory: The laboratory is an entity independent of the owner, developer and contractor located either on or off-site that is responsible for conducting tests on materials, i.e., soil, water, air and geosynthetics, to document conformance with the contract plans and specifications.

- Developer Field CQA Inspectors: Inspectors will report to the Developer's CQA Manager and will inspect major construction activities for conformance with the Contract Plans and

Specifications. Inspectors will visually observe imported materials for conformance with the specifications; obtain QC samples; observe CQC sampling; and, observe work performed on ERS components, observe CQC testing, record observations, and prepare daily reports.

HPD will provide resident QA field staff to manage, inspect and monitor construction on a daily basis throughout work that is conducted at or below ground surface, i.e., work that potentially affects the ERS. Specific QA activities are summarized below:

- Inspect the work to confirm that construction complies with the Contract Documents and Specifications. Primary work elements that will be inspected include but are not limited to the following:
    - exposure, removal or repair of any component of the MMC, including geosynthetics and soil materials; including pile penetration boot assembly and geomembrane field welds;
    - installing, modifying or relocating elements of the HMS;
    - selective demolition of the transfer station;
    - installation and operation of the temporary measures for the HMS;
    - gas vent relocation;
    - sheet wall installation through the existing slurry wall;
    - installation of infrastructure that may affect the ERS, i.e., utilities and roadways;
    - excavation within 2 feet of the MMC geosynthetics to remain;
    - installation of new MMC drainage;
    - other construction activities that directly affect the ERS.
- Prepare daily construction reports to document the work, including photographs;
- Attend progress meetings;

- Review construction submittals to confirm compliance with the design;

- Collect and coordinate QA sampling and testing;

- Review QA/QC test results, including soil compaction, geosynthetic materials testing, concrete testing, and testing of other construction materials and completed portions of the project;

- Document materials management activities, including on- and off-site operations. Confirm that hazardous, non-hazardous, and clean materials are managed separately, profiled appropriately, and verify waste manifest procedures. The quantity of waste materials (i.e., water and soil) removed from the site will be documented;

- Verify conformance with the project control plans, such as the Air Monitoring and Material Handling and Management Plans; and

- Confirm that vibration and settlement monitoring is being performed appropriately during construction activities.

Honeywell, or its designee, has the right to review and comment on Contractor's Work Plans, inspect the work, conduct inspections with EPA and MDE, submit required reports to the Agencies, and participate in progress meetings with the Agencies during construction. Honeywell, or its designee, will also have the right to issue a Stop Work notification for work that may significantly impact the ERS in a manner that is not consistent with this DDP. A Stop Work notification may be issued immediately upon learning of the potential for any significant impact to the ERS. MDE's Field Representative will be notified by the Developer's Field Representative at the time a Stop Work notification is issued to Contractors in the field. MDE's Field Representative will then contact and relay the information to EPA's and MDE's Project Coordinators as deemed appropriate by the agency's field representative. The Stop Work procedures will include the following:

- *Stop Work Notification*: written notification to stop work with a description of the issue and requirements (requirements may include time frames and/or actions associated with mitigating further impacts on the ERS);

- *Stop Work Compliance Response*: written response that describes the planned corrective measures to address the issues described in the Stop Work Notification and a schedule for implementation; and,

- *Stop Work Completion*: written notification that the corrective measures have been completed, including a description of any deviations from the Compliance Response.

Specifically, Honeywell will independently inspect the work, coordinate with the resident QA staff regarding construction activities and QA/QC results, and document the activities, accordingly. Honeywell will communicate with the developer and QA staff and document any deficiencies, potential changes, and corrective actions required to meet the performance function of the ERS and the intent of this DDP. As noted above, Honeywell may review any submittals, test results, changes, or other engineering or QA/QC documentation issued for the project.

7.2 CONSTRUCTION AND ENVIRONMENTAL CONTROLS

7.2.1 Air Monitoring and Dust Control

A project-specific Air Monitoring Plan has been prepared for the Area 1 development (Appendix B). The Plan establishes the monitoring effort, station locations, site-specific action levels, and responses to action levels to be implemented during the current Area 1 development project.

The Air Monitoring Plan also provides a description of the methods to be utilized for real-time particulate and weather data collection, air sample collection, laboratory analytical methods, data evaluation and reporting demonstrating the effectiveness of the dust control measures implemented during intrusive activities. For the purpose of the Air Monitoring Plan, "intrusive activities" occur any time there is disturbance of the surface immediately below the MMC synthetic layers in Area 1. Air monitoring will be implemented at the initiation of intrusive activities and will continue through the completion of all intrusive activities, restoration of the caps and removal of all controlled soil and debris from the Site.

Best management practices for soil/debris handling that reduce dust generation and prevent excavation spoil deposition onto the adjacent surfaces will be implemented. The potential for dust emissions will be further controlled by misting with potable water during excavation and obstruction removal activities as needed to keep exposed soil surfaces moist. The potable water misting operation is also an effective means to control and/or intercept the migration of airborne particulates. The erection of particulate-capturing barrier fences, curtailing activities, or use of temporary coverings (tarps, fabrics, or plastic) over exposed soils, debris, and other potential particulate-generating sources may also be implemented. Installation of dust control components will not penetrate the MMC synthetic layers in areas not designed for repair or replacement.

Dust control measures will be implemented during intrusive activities. Should real-time aerosol monitoring detect the unlikely occurrence of particulate concentrations above Site-specific action level at the work zone limits, additional dust control measures as appropriate will be triggered. The Field Engineer will have stop-work authority should the work conditions observed at the time require immediate mitigation.

A sufficient quantity of potable water will be maintained on the Site for dust control use. Watering equipment shall be used to minimize the potential for elevated airborne particulate concentrations and consist of wet, vacuum-sweeper trucks, water tank trucks, or other devices that are capable of applying a uniform spray of water over the asphalt paved temporary construction road surface.

The use of spray-applied foam to seal the exposed soil surface may be utilized in difficult locations to cover with construction plastic or geotextile fabric. These temporary measures will be replaced during construction by installing mudmat across the bottom and up the slopes of the excavation as shown in drawing DDP-F1.30. This more permanent condition will provide protection from potential direct contact with soil or inhalation of dust by pile driving and concrete work crews.

7.2.2 *Erosion and Sediment Control and Storm Water Management*

Erosion and sediment control at the Site and during construction will be addressed with conventional best management practices, which include silt fence/super silt fence, perimeter berms/swales, stabilized construction entrances, and inlet protection (Drawings C8.00, C8.10 and C8.20). Super silt fence will not be installed within Area 1 to avoid potentially penetrating the MMC synthetic layers with the required depth of the fence posts. Prior to the initiation of any intrusive activities, the erosion and sediment controls and storm water management features will be installed in accordance with the permit drawings to be prepared and submitted to the City of Baltimore under separate cover, and in accordance with the General Permit to Discharge Storm Water associated with Construction Activities, to be submitted to MDE Water Management Division under separate cover.

The Site is considered redevelopment per Baltimore City Code Division 2 Section 23-7 (a) and, therefore, recharge volume, channel protection storage volume, and overbank flood protection volume requirements are anticipated to be waived. Per the latest storm water management regulations, a combination of impervious area reduction and storm water management implementation must be utilized to provide qualitative control for at least 50% of the Site's impervious area. Preliminary analysis of the post-construction surface conditions suggests that the storm water management requirements will be met via a combination of impervious area reduction, green roof, and rainwater harvesting.

The above storm water management (SWM) summary was prepared while MDE's 2000 Maryland Storm Water Design Manual and the Baltimore City's February 2003 supplement to the MD SWM manual were in effect. In 2009 the MDE manual and the SWM requirements were updated. However, as of May 2012, the City's SWM supplement has yet to be updated and it is unclear if the new MDE regulations will be fully adopted. If they are, the SWM approach will be re-evaluated.

Additionally, erosion and sediment controls as detailed on Drawing DDP-C8.10 will be applied to individual excavations made for sheet pile, pile cap, shear wall foundation installation. Erosion and sediment controls will include the construction of temporary decontamination pads for loading excavated soil from below the MMC. The erosion and sediment controls will also include the construction of a temporary storage area that will include the ability to collect rainwater that could potentially leak from a lined, sealed roll-off container. An asphalt pad and perimeter asphalt berm will be constructed with a shallow perimeter drain to direct run-off to a sealed collection sump installed at the low point in the asphalt surface (Drawings EN1.01 and EN1.06.01).

Run-off water collected in the sealed sump will be pumped to a nearby portable, 16,000-gallon double-wall, closed-top container ("Frac" tank). Further discussion on water handling and disposal is provided in the Materials Handling and Management Plan in Section 5 – Water Management.

7.2.3 *Storm Water Pollution Prevention*

A Storm Water Pollution Prevention Plan has been prepared outlining the controls for erosion, sediment and storm water during construction (Appendix B).

The storm water management plan was examined for the 25-year storm event and 100-year storm event, however the storage requirements were determined based primarily on the 25-year storm event (EE Memorandum 2). When a storm event occurs, the only water that will come in contact with soil below the membrane will be storm water falling directly into an excavation. All water that falls outside of the

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excavations is treated as surface runoff because it will be deflected away from open excavations by diversion berms. Infiltration through the cover soil into the drainage net was assumed to not occur because the drainage net is dammed at the perimeter of each excavation. The bottom of each excavation is open to soil below membrane, so that any storm water collected in the excavation is defined as "impacted".

A sump pump will be installed in each excavation to collect storm water which does not infiltrate into the ground, to prevent it from rising to the capillary break gravel at the down-slope side of the MMC. The entire footprint of the excavation, including the sloped sidewalls, was considered to catch storm water in the excavation. Contact and non-contact water handling and testing and proper disposal procedures are described in the Material Handling and Management Plan project control document.

The sump pumps will convey water to storage tanks sized to contain 24 hours of a 25 year storm (Drawing EN1.01). A second tank will be placed to collect a second 24 hours to enable testing and disposal of the first tank. Double wall pipes will be provided for sump pump discharge.

7.2.4 *Spill Prevention and Response Plan*

A project-specific Spill Prevention and Response Plan (SPRP) for Area 1 has been prepared to meet the requirements of construction for this development phase (Appendix B).

In general, the handling of liquids shall be done in a manner such that contaminated material will be contained on the construction site and not allowed to flow onto on-site areas where existing environmental protections will not be disturbed, onto completed work, or off the Site as surface water discharge. Liquids include groundwater, seeps, decontamination liquids, liquids generated from subsurface dewatering activities, liquid that may have come in contact with site soils beneath the existing environmental protections exposed by the work, or liquids that may have come in contact with other potentially contaminated material.

Direct discharge of collected liquids to adjacent surface waters, ground surface, or public storm or sanitary sewer will not be allowed until appropriate characterization has been performed, including testing. Proper disposal of captured and stored liquids will be performed in accordance with the Material Handling and Management Plan (Appendix B).

Surface water monitoring will continue during and following construction per the approved EMMP. There are currently 18 monitoring locations and two background locations, which are sampled quarterly by Honeywell at low tide and analyzed for total dissolved chromium. The Consent Decree establishes a surface water performance standard of no more than 50 parts per billion of total chromium.

7.2.5 *Optical Survey*

<u>Preconstruction Survey</u>

A Preconstruction Survey documenting existing conditions of the Transfer Station tank pad, tanks and connections, mechanical room, and mechanical connections shall be performed prior to demolition and pile installation.

<u>Hydraulic Barrier</u>

Early in the project implementation a new steel sheet pile barrier will be installed along the centerline of the S-B barrier. This construction may cause settlement of the S-B backfill, which is desirable. As a result, the S-B barrier will not be monitored for settlement because installation of the new sheet pile barrier along the entire effected perimeter precludes the need to observe deformation of the S-B barrier.

<u>Vaults</u>

Masonry Survey Nails (PK Nails) shall be placed at each corner of vaults V-1, V-2, V-11, and V-12 once exposed.

<u>Honeywell Transfer Station</u>

The existing Transfer Station tank pad and equipment room will be optically monitored (see Monitoring Notes on DDP-F1.01) for lateral and vertical movement (Northing, Easting and Elevation) as follows:

- Monitor two points on each side of the tank pad, and monitor floor areas at 25 ft. spacing or closer;

- Monitor at two different levels on exterior walls to determine slope of wall;

- Reference readings to a stable horizontal control. Survey accuracy shall be 1/16" accuracy or better. Install crack monitoring gages on any cracks observed on the inside walls or floor of the tank pad.

- Take three baseline readings prior to demolition or pile installation within 50 ft.

7.2.6 *Vibration Monitoring*

Vibrations caused by pile driving will be monitored using seismographs. Vibration monitoring will be performed at the transfer station maintenance room and tank room, and HMS vaults/manholes within 50 ft. of pile driving (see Monitoring Notes Drawing DDP-F1.01).

Seismographs will record maximum peak particle velocities in three mutually perpendicular planes and its associated zero-crossing frequencies. Seismographs will be equipped with a wireless broadband modem which enables remote communication with the seismograph and allows automatic alerts to designated field personnel when vibrations exceed the pre-established threshold value.

Based on site specific vibration data collected during the test pile program, it was determined that production piles will induce vibrations on structures within 50 feet of pile driving. Pile driving must be performed within close proximity of the HMS vaults and conveyance lines in order to pile support those structures (note that the HMS conveyance lines are flexible pipes within oversized conduits, and at present grades the vault structures are lightly loaded). Pile driving will be performed adjacent to the Transfer Station in order to incorporate that structure within the footprint of the development. A "threshold value" of 1.0 in/sec and a "limiting value" of 2.0 in/sec shall be established for the HMS structures. A "threshold value" of 0.5 in/sec and a "limiting value" of 1.0 in/sec shall be established for the Transfer Station tank pad and mechanical room. Where limiting values are exceeded, performance of the structure will be observed and evaluated, and performance of utilities may be tested. Peak particle velocities above the limiting values will be permitted if structure/ utility performance is deemed acceptable.

7.2.7 *Settlement Monitoring*

HMS Conveyance Pipe Alignment

Existing settlement plate MP1 will be made obsolete by the new Dock Street platform which will support the MMC and HMS systems in Dock Street on piles. A new settlement plate, MP-1A, will be placed above the HMS conveyance pipes on Wills Street where permanent fill thickness is greater than 8 ft. (Drawing DDP EN1.01).

New settlement plates will be constructed and placed with details similar to the existing settlement monitoring plates, and protected with flush mount covers at the finished grade. Construction settlement observations will be made during construction of the fill and monthly for 12 months after fill placement is completed.

7.2.8 Head Maintenance Pumping Quantity Monitoring

The water pumped from each of the 16 HMS extraction wells is monitored by a magnetic flow meter installed proximal to the well head for each location. A flow meter is connected to a Programmable Logic Controller (PLC) by a 4-20 million pulse per second analog connection and a digital pulse. This volume of groundwater extracted is reported to the EPA and MDE in the Honeywell Baltimore Inner Harbor Quarterly Report.

The volume of water removed from the tanks is logged in the MSS. In addition, the operator of the vacuum truck measures the volume of water in the tank of the truck. The resulting volume is recorded on the Hazardous Waste Manifest and in a spreadsheet maintained by plant personnel. The volume from the truck operator and the volume reported by the MSS are compared to check the accuracy of the tank level monitors and to confirm the volume removed. These procedures will continue during and after construction.

7.2.9 Material Handling & Management Plan

The Material Handling & Management Plan (MHMP) addresses the handling and management of solids (asphalt, stone aggregates, concrete and wood debris and soil) and liquids (storm water and groundwater) that may be encountered during the intrusive activities at the Site. For the purpose of this plan, "intrusive activities" occur any time there is disturbance of the surface immediately below synthetic layers of the MMC in Area 1 or below the LSC in Area 2. There is an orange plastic warning layer 12 inches above the MMC synthetic layers and LSC. Additional provisions for the proper handling of fuels and other controlled liquids are provided in the project-specific Spill Prevention and Response Plan (SPRP) in Appendix B.

7.2.9.1 Handling and Disposal of Regulated Construction Materials

Direct-loading of excavated soil/debris into lined, sealed roll-off containers is the preferred excavation and transportation method; a controlled, temporary storage area will be constructed for use in the event that excavated material cannot be transported daily off-Site disposal

(Drawings EN.01 and EN1.06.01). Conditions that might prompt the use of this temporary storage area, as a contingency, are:

- Volume limit to the daily capacity of the primary and alternate off-site disposal facilities;

- Off-site disposal facility hours of operation; and

- Limited availability of long-haul trucks.

The controlled storage/decontamination area will be located in close proximity to the excavation zone required for construction of the moment slab to reduce the distance for moving containers on the dedicated, temporary construction roads (Drawing DDP-F.15). The controlled area will be an approximately 2,500 square feet asphalt 3-inch pavement section with construction mats to displace the container loading on the MMC synthetic layers. The location of the controlled storage area is not in an area where the compressible clay stratum has been identified.

The controlled area will provide a storage capacity of ten 25-cubic yard lined and sealed roll-off containers, approximately 150 cubic yards of containerized soil/debris storage. Further discussion regarding soil/debris transportation and disposal is provided in Section 4 – Soil/Debris Handling and Management.

7.2.9.2 Imported Soil/Materials Control

In order to minimize the potential of introducing unacceptable materials onto the Site, it will be necessary to verify through documentation that imported materials are being provided from locations with a known history of the material source area. Imported materials will be provided by commercial suppliers only. Commercial suppliers shall provide a certification letter stating the environmentally acceptable historical use(s) of the material source property.

Fill documentation should include detailed information on the previous use of the land from where the fill is taken, whether an environmental site assessment was performed and its findings, and the results of any testing performed as described in the MDE Voluntary Cleanup Program (VCP) *Clean Imported Fill Material* guidance document (MHMP, Appendix B).

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If there are no analytical results from testing performed by the commercial supplier, and prior to importing soil from any source, the material will be sampled and tested based on the requirements of the MDE VCP *Clean Imported Fill Material* guidance document Tables 1 and 2 (MHMP, Appendix B).

7.2.9.3 Handling and Re-Use of Site Soil

Clean soil/aggregate removed from above the synthetic layers of the MMC will be segregated from contaminated soil removed from below. Clean soil will be temporarily stockpiled within a designated stockpile area for cover soil (Drawing EN1.01). Aggregates and clean soil removed from above the MMC synthetic layers may be used below the new MMC synthetic layers. However, aggregates and granular soil removed from above the MMC synthetic layers will be sampled and analyzed prior to beneficial re-use above the MMC synthetic layers as provided in the MHMP, Appendix B. Air monitoring will be conducted at the Cover Soil Stockpile Area 24 hours per day/7 days a week. No controlled material will be stockpiled.

7.2.9.4 Transportation and Off-site Disposal

Based upon the review of the historical analytical soil data and the prior waste profile classification as D007 for materials below the MMC, it is anticipated that contaminated soil/debris generated during excavation will be disposed of at an approved RCRA Landfill. Materials will be transported off-site for disposal following written approval of acceptance from the RCRA landfill facility's representative.

Honeywell maintains a list of their approved Subtitle C landfill facilities and as such the addition of alternative, proposed disposal facilities must be pre-approved.

There are four categories of water anticipated to be managed during intrusive work, including:

- Non-Contact: Storm water diverted from contact with contaminated material below the MMC synthetic layers;
- Contact: Storm water that comes into contact with contaminated material below the MMC synthetic layers;
- Contact: Equipment decontamination water; and
- Groundwater generated by the HMS and construction dewatering.

Should storm water that has not come into contact with contaminated material below the MMC synthetic layers pond on a controlled surface (e.g., mudmat, cover soil aggregate); the standing water will be pumped to a double-walled Frac tank (Drawings EN1.01 and EN1.04). This non-contact water will be held for analytical testing results to determine proper disposal as required by the City of Baltimore.

Storm water that inadvertently comes in contact with contaminated soil below the MMC synthetic layers will be collected in a sealed sump and pumped to a separate, double-walled Frac tank.

Equipment decontamination water will be temporarily stored in the same double-walled Frac tank provided for contact water and while the Tank room is isolated during selective demolition and pile driving activities.

Off-site transportation and disposal of HMS generated groundwater to Environmental Quality, Baltimore, MD will continue uninterrupted by construction.

7.3 PROGRESS SUBMISSIONS AND REPORTING

7.3.1 Documentation

As described in Section 7.1, the Contractors QC staff and Developer's field inspection /QA engineer will prepare field records to document construction, QC, and QA activities. Weekly reports will be prepared to summarize the major work activities, work approvals, construction issues, and corrective actions. Digital construction photographs will be included in weekly progress reports in the form of CD-ROMs and posted on the Project website for public access. A schedule update will be prepared monthly. From a geotechnical perspective, field staff will document the following elements:

1. Vibration monitoring;
2. Ground and instrument settlement monitoring;
3. Pipe pile driving records;
4. Fill compaction testing; and
5. Multimedia Cap reconstruction and QA inspection of contractor's vacuum/spark QC testing for geomembrane field welds and boot penetration seals.

From an environmental perspective, field staff will document the following:

1. Perimeter and work zone real-time air monitoring data and laboratory analytical results;

2. Source(s) of clean fill/aggregates, type of material, and documentation used to certify that the material is suitable and "clean" for on-site use;

3. Waste characterization laboratory analytical results;

4. Waste profile and facility acceptance of all materials to be transported and disposed off-Site;

5. Waste manifests;

6. Approved work plans; and

7. Approved material submittals.

Collectively, the geotechnical, environmental, and QA field staff will prepare the daily and weekly logs. At a minimum, the logs will identify the following:

- work performed;
- changed conditions;
- QA elements and deficiencies;
- monitoring results;
- corrective actions;
- design and construction modifications; and,
- other relevant design or construction activities.

Honeywell's Engineer will review weekly progress reports and monthly schedule updates. The weekly report will summarize the results of daily logs and visual inspections, any deficiencies and corrective actions, design changes, QA/QC activities, and work progress.

7.3.2 Modifications to the DDP or Consent Decree Work Plans

As discussed in Section 3.7.2, the current SSMP does not address the post-development cap foundations and pile penetrations, but allows the Plan to be revised to address development. Minor modifications to the SSMP that will be necessary during the active phase of construction are identified in Section 9. Honeywell will submit a formal request for the minor modification to address SSMP activities during construction under separate cover. Upon completion of construction, a revised Surface Soil Monitoring Plan will be submitted by Honeywell for agency review and approval.

During the course of construction, if field conditions or construction activities warrant a modification to the elements presented in this DDP or any other minor modification to the Consent Decree Work Plans, HPD and Honeywell will notify USEPA and MDE, accordingly. The modification will be submitted to USEPA and MDE for review and approval.

7.3.3 Construction Completion Report

A Construction Completion Report will be prepared and submitted to USEPA, MDE and Honeywell. The report will be assembled and submitted upon completion of construction, construction-related monitoring, and receipt of all QA/QC test results. The report will document construction activities, compliance with the DDP, and any modifications. Specifically, the report will include the following information:

- construction activities;
- QA/QC documentation;
- documented deviations from the DDP;
- As-Built drawings related to the ERS components;
- Construction photographs;
- monitoring data;
- selected correspondence; and,
- other relevant construction and design information related to the modifications or restoration of the ERS.

8.0 PROJECT-SPECIFIC HEALTH AND SAFETY

ERM has prepared a *Health and Safety Plan, Area1, Phase 1 Development*, dated August 2013 (Appendix B). The purpose of this Health and Safety Plan (HASP) is to establish general personal protection standards and safety practices and procedures to be used as guidelines for the work at the Site. The HASP guidance is not intended to be and shall not be used as a Contractor-Specific Health and Safety Plan (HASP); rather, the contractor will be required to prepare their own HASP that meets or exceeds the requirements specified in the guidance plans.

Also, these documents are not intended to be inclusive of all Health and Safety issues that may be encountered at the Site, such as those associated with general construction activities. Rather, these documents are solely intended to provide guidance to Contractors by identifying environmental issues and constraints that Contractors at a minimum should include in their own HASPs.

Contractors will be required to prepare and implement and comply with their own HASP in accordance with all applicable federal, state and local regulations and standards of care. All Contractor-prepared HASPs will be approved by the General Contractor, or its designee, prior to their personnel mobilizing to the Site.

9.0 REMEDY PERFORMANCE MONITORING DURING AND AFTER CONSTRUCTION

As discussed previously in Section 3.7, the development design provides that all ERS components will remain operable and accessible following construction. This will allow Honeywell to meet the requirements of currently established monitoring programs.

Honeywell will continue to implement all monitoring requirements established in the Environmental Media Monitoring Plan and the Groundwater Gradient Monitoring Plan. As discussed in Section 7.3.2, a minor modification of the Surface Soil Monitoring Plan (SSMP) is required for the construction phase of the redevelopment, and a revised SSMP must be submitted for agency review and approval following construction. A summary of minor modifications for purposes of construction and revisions to the SSMP following construction are indicated below:

- The design proposes to terminate existing settlement monitoring point MP-1 because it is below the planned Dock Street platform which will structurally support the HMS and MMC. A new MP1A will be installed above the Wills Street HMS conveyance alignment below the Wills Street fill (The SSMP requires a minimum of six settlement monitoring points).

- Construction of the planned Dock Street platform will prevent sheet flow in the MMC drainage net from entering the toe drain on Dock Street. The design proposes to construct a new drain at the low point (Valley Drain) of the drainage net created by the Dock Street platform to convey water at the east end of Dock Street to the existing toe drain. This water will be sampled at the relocated SSMP-4 during construction. Water at the west side of Dock Street will be conveyed to a new infiltration point west of the Dock Street platform. A new sampling point SSMP-4A will be installed for sampling of drainage net water from the west portion of the development site and a new sampling point SSMP-4 will be installed (relocated) for sampling of drainage net water from the east portion of the development site.

- A 30″ storm drain in Wills Street crosses Dock Street at the east end of the Dock Street platform. This storm drain interrupts the toe drain at the east end of Dock Street. The Dock Street platform also obstructs flow to the toe drain. The design proposes to capture drainage net water from 90% of the development area for discharge to a new drain along Dock Street inboard of the Dock Street platform (Valley Drain). This water will be discharged through relocated SSMP-4 (east Valley Drain-65%) and a new SSMP-4A (west Valley Drain-25%) west of the Dock Street platform. The 10% of the development area cap which will not pass through SSMP-4 is at the east edge of the MMC along Wills Street. The design proposes to allow drainage net water to infiltrate into the ground outside of the barrier by subdividing the existing toe drain into 50 ft long segments and creating infiltration points at each segment. Distribution of the infiltration along Wills Street will prevent collection of toe drain water at the intersection of Dock and Wills Streets. Design calculations and summary is presented in EE Memorandum No. 3.

- Construction of the pile supported platform for the HMS and MMC over the abandoned Dock Street bulkhead obstructs flow in the drainage net at the north perimeter. This pile support improvement requires revision of the SSMP requirement for the geomembrane to have a minimum slope of 1% at the perimeter. A collection pipe (new "valley drain") will be added up-slope of Dock Street to convey water off of the MMC. New sampling locations will be added for sampling of drainage net discharge. The substantial reduction in storm water loading provided by the building roof and streets and their storm drainage systems permits flatter slopes to be employed for MMC drainage net discharge.

Honeywell will submit a formal request for the minor modification to address SSMP activities during construction under separate cover. Upon completion of construction, a revised Surface Soil Monitoring Plan will be submitted by Honeywell for agency review and approval.

There are no revisions required in the Groundwater Gradient Monitoring Plan or the Environmental Media Monitoring Plan.