WORK PLAN TO ASSESS OFFSITE ECOLOGICAL IMPACTS FROM CURRENT RELEASES FROM THE FIVE SPECIAL STUDY AREAS

Prepared for

Severstal-Sparrows Point, LLC
1430 Sparrows Point Boulevard
Sparrows Point, MD 21219

April 2010

URS Corporation
200 Orchard Ridge Drive, Suite 101
Gaithersburg, MD 20878

335 Commerce Drive, Suite 300
Fort Washington, PA 19034

Tables

Figures

Appendices

On October 10, 1997, the United States Environmental Protection (USEPA) and the Maryland Department of the Environment (MDE) filed a multimedia Consent Decree through the U.S District Court for the Court of Maryland seeking relief from alleged endangerment to public health, welfare, or the environment from contamination at and around the Sparrows Point facility (Site) in Sparrows Point, Maryland. Consistent with the requirements of the 1997 Consent Decree and in response to a MDE letter dated August 13, 2009 requesting a submission of a work plan to conduct an offsite Sediment Sampling Plan, URS Corporation (URS), on behalf of Severstal Sparrows Point (Severstal), prepared a work plan in October 2009 to assess potential impacts from current groundwater releases to the offshore environment (URS 2009a).

The current work plan presents a step-wise investigation strategy that has been developed to address USEPA and MDE concerns over offsite releases from the Site. Substantive modifications to the October 2009 work plan have been incorporated based on USEPA and MDE comments on the work plan dated February 3, 2010.

The scope of this work plan focuses on potential current offsite releases from the five Special Study Areas (SSAs) identified in Attachment B of the Consent Decree. To the extent that additional areas of the Site identified in the *Description of Current Conditions* report (Rust 1998) will need to be investigated to assess their potential current contribution of Site-related chemicals to the offshore environment, this work will be completed as a separate work plan. Severstal is proposing to implement and complete the investigation of the potential current groundwater and stormwater releases from the five SSAs prior to initiating any activities related to this additional, balance of Site work.

1.1 BACKGROUND

Site-Wide Investigation activities and environmental characterizations have been performed at the Site in accordance with the 1997 Consent Decree and have focused on characterizing the nature and extent of releases to on-site areas of the facility. Major submittals completed to date as part of the Site-Wide Investigation include:

- Description of Current Conditions, January 1998 (Rust 1998);
- Site-Wide Investigation Work Plan – Groundwater Study, June 2000 (CH2M Hill 2000);
- Site-Wide Investigation Groundwater Study Report, July 2001 (CH2M Hill 2001);
- Site-Wide Investigation Release Site Characterization Study, June 2002 (CH2M Hill 2002a);
- Site-Wide Investigation: Report of Nature & Extent of Releases to Groundwater From the Special Study Areas, International Steel Group, ISG Sparrows Point, Inc. Facility, Sparrows Point, Maryland, January 2005 (URS 2005a);
- CA725 Facility Investigation and Human Health Risk Evaluation (HHRE) Findings, ISG Sparrows Point, June 2005 (URS 2005b);
- Ecological Risk Assessment Strategy Document (URS 2006);
- Final Ecological Risk Assessment Work Plan for On-Site Areas (URS 2007a);

- Screening Level Ecological Risk Assessment Work Plan for On-Site Areas (URS 2009b); and
- Supplemental Report: County Lands Parcel 1B Ponds, Final (URS 2009c).

1.2 WORK PLAN OBJECTIVES

This work plan describes the initial and secondary phases of the investigation of potential offsite ecological impacts from current groundwater and stormwater releases from the five SSAs. Primary objectives of this work plan include:

- Developing a phased approach to the assessment of offsite risk to aquatic biota from SSA-related releases;
- Providing the framework and methodologies for determining where water exchange is taking place between groundwater and surface water;
- Providing the framework for locating potential SSA-related stormwater discharge points;
- Presenting the proposed methods for the collection of offshore physical, biological, and chemical data; and
- Presenting the context for the offsite ecological risk assessment.

2.1 SPECIAL STUDY AREAS

The Consent Decree designated five SSAs requiring environmental investigation and impact assessment. The five SSAs are Tin Mill Canal/Finishing Mills, Greys Landfill, Humphrey Impoundment, Coke Point Landfill, and Coke Oven Area (COA). A brief description of each SSA is provided below:

- The Tin Mill Canal/Finishing Mills SSA includes 1) the Tin Mill Canal, which is an engineered structure that bisects much of the central portion of the Site, and conveys industrial waste waters and stormwater from process areas to the facility Waste Water Treatment Plant, where treated waters are then discharged to Bear Creek via a NPDES permit; and 2) Finishing Mills, including the active Tin Mill and Coating Lines at the facility.
- The Greys Landfill SSA is located in the northwest corner of the Site and occupies approximately 40 acres. This area currently manages non-hazardous solid wastes from the Sparrows Point facility.
- The Humphrey Impoundment SSA is located in the interior portion of the Site and currently contains dense, monotypic vegetation. This land area formerly received wastewater from various steel processing areas and was then a sludge dewatering area for various slurry material and sludges, including Basic Oxygen Furnace (BOF) slurry, wastewater treatment plant sludge, and sinter plant slurry (Rust 1998).
- The Coke Oven Area SSA is located in the southwest portion of the facility and was the site for coke production. A total of 13 coke oven batteries were operated between the 1930s and 1991, at which time the coke ovens ceased operations (Rust 1998). The A and B Coal Chemical Plant Areas of the COA contained units that operated as part of a raw coke gas treatment processing system. The COA also includes the Benzene/Litol (Benzol) Processing Area, where light oil was purified into benzene, toluene, and xylene.
- The Coke Point Landfill SSA is a 41-acre parcel located along the southwestern edge of the Site. This landfill also currently manages non-hazardous solid wastes. The COA and Coke Point Landfill are both located within the approximate 300-acre portion of the site that typically is identified as the Coke Point Peninsula.

The locations of the five SSAs are presented in **Figure 1**. Potential transport pathways of site-related constituent releases from these SSAs to surrounding river systems are described in Sections 2.2 and 2.3 below.

2.2 GROUNDWATER DISCHARGE PATHWAY

Shallow groundwater is found within the upper unconfined slag unit and exhibits general flow characteristics typical for the SSAs described as follows:

- Shallow groundwater from the Humphrey Impoundment and Finishing Mills SSAs flows toward and discharges within the Tin Mill Canal;
- Shallow groundwater flows radially from the north-central region of the COA/Coke Point Landfill Area into surrounding surface water bodies, namely the Patapsco River, located

west and south of the Coke Point Peninsula, and the Turning Basin, located east of the Coke Point Peninsula.

- At the Greys Landfill SSA, groundwater generally flows offsite to Bear Creek to the west and northwest.

Given that groundwater releases from the COA/Coke Point Landfill and Greys Landfill SSAs discharge to adjacent river systems, surface water and sediments in these systems could be impacted by the current discharge of impacted groundwater.

The following sections further describe the groundwater flow paths and chemistry associated with SSAs that potentially contribute site-related chemicals to the offshore environment.

2.2.1 Particle Analysis Modeling

A computer model of groundwater flow (MODFLOW) was developed and calibrated for the Sparrows Point Site to generate a functional hydrogeologic model that provides an interpretation of the groundwater flow patterns across the Site (CH2M Hill 2001). A conceptual hydrogeologic model was initially created to provide a simplified interpretation of actual site conditions. Essential features such as the configuration and hydraulic properties of the water-bearing and less permeable stratigraphic units, characterization of sources and sinks that can drive groundwater flow, and estimates of groundwater recharge and discharge to surface water bodies were included in the stratigraphic conceptual model. A computational model grid discretized both vertically and horizontally was then constructed to form the basis of the numerical groundwater flow model. The model boundary conditions extend into the surrounding offsite water bodies to the east, west, and south.

Following calibration of the model through iterative adjustments to the hydraulic properties of the stratigraphic layers, particle tracking was applied to the calibrated model to predict the likely flow paths of groundwater originating in the SSAs. Imaginary particles were inserted in rectangular arrays at the water table in each SSA, and the flow trajectories of the particles were subsequently traced.

Based on the results of the particle analysis modeling, 97 percent of the particles released in the Humphrey Impoundment and Finishing Mill areas discharged to the Tin Mill Canal without penetrating below the Slag Unit over a period of 100 years (CH2M Hill 2001). At the Greys Landfill SSA, the majority of particles penetrated the Slag Unit, ostensibly from groundwater mounding that occurs beneath the landfill. Twenty-eight (28) of the 33 particles released at Greys Landfill reached Bear Creek following a 100-year period. At the COA/Coke Point Landfill Area, particles moved horizontally through the Slag Unit and generally discharged into the surrounding waters. Particle tracking from release points in the SSAs is presented in **Figure 2**. Plan and cross-sectional views of particle paths at the Coke Point Peninsula and at Greys Landfill are presented in **Figures 3** and **4**, respectively.

Results of the particle tracking study provide a defensible assessment of groundwater movement and discharge at the Site. Groundwater associated with the Tin Mill Canal/Finishing Mills SSA and Humphrey Impoundment SSA discharge to the Tin Mill Canal, where it mixes with process wastewaters, is treated, and is released to Bear Creek through a NPDES-permitted outfall. Most of the groundwater in the Greys Landfill and COA/Coke Point Landfill is transported through the slag and into the adjacent rivers. A conceptual model of groundwater migration to offsite groundwater through a slag landform is presented in **Figure 5**. A detailed description of the hydrogeologic model and particle tracking analysis is provided in the *Site-Wide Investigation Groundwater Study Report* (CH2M Hill 2001).

2.2.2 Perimeter Well Groundwater Chemistry

Existing groundwater chemistry results of perimeter wells sampled from 2001 to 2004 were evaluated in the *Screening Level Risk Assessment for On-Site Areas, Final* (URS 2009b) to characterize the onsite groundwater quality along or in the vicinity of the Site's border with adjacent river systems and to provide the initial basis for the assessment of ecological impacts to offsite water bodies from groundwater releases. Perimeter wells evaluated for the assessment of potential ecological impacts are located adjacent to Greys Landfill, Humphrey Impoundment, the Tin Mill Canal/Finishing Mill Areas, and in the Coke Point Peninsula.

Perimeter well locations at the COA/Coke Point Landfill and Greys Landfill Areas are presented in **Figures 6** and **7**, respectively. Additional groundwater data is now available from perimeter monitoring wells associated with the Greys Landfill SSA as a result of sampling programs conducted in 2009. More detailed discussions of environmental groundwater quality at the COA/Coke Point Landfill and Greys Landfill Areas is provided in Section 2.4.

2.3 SURFACE DISCHARGE PATHWAY

The ground surface at the Sparrows Point facility is relatively flat. Throughout most of the peninsula, the elevation of the ground surface is between 10 and 20 feet above mean sea level (msl), with a site-wide average elevation of 15 feet above msl (USGS 1969). Land reclamation and fill placement have occurred over much of the Site, particularly in the southern portion of the peninsula, along shorelines, and in areas that historically contained stream channels and tidal waters. The thickest deposits (up to 40 feet) occur in the historic stream channels and tidal waters and the Coke Point Area. Slag, a by-product of iron- and steel-making processes, is the primary source of fill used to expand and develop the Sparrows Point facility.

Surface water runoff is diverted and collected by a network of culverts, underground piping, and drainage ditches within the process areas of the facility. The stormwater is then discharged to Bear Creek, Jones Creek and Old Road Bay, and the Patapsco River under existing National Pollutant Discharge Elimination System (NPDES) permits. Since approximately 1970, stormwater runoff from the northern portion of the Site has discharged into the Tin Mill Canal, where it is then pumped into the facility Waste Water Treatment Plant for treatment prior to discharge. Runoff is minimized in slag-covered portions of the Site, as the porous slag entrains the majority of rainfall.

Figure 8 identifies potential stormwater drainage areas and associated shoreline outfalls at the Site.

2.4 IDENTIFICATION OF CONSTITUENTS OF POTENTIAL CONCERN

Perimeter well analytical results for the SSAs described in Section 2.2.2 were compared to USEPA Region 3 BTAG Marine Surface Water Benchmarks (or Freshwater Surface Water Benchmarks in the absence of marine benchmarks) to identify Constituents of Potential Concern

(COPCs) associated with the groundwater to offsite surface water pathway. Comparisons were conducted regardless of the elevation of the monitoring well screened interval; thus, both shallow and deep monitoring well chemistry results were included in the screening evaluation.

Appendix A presents tables of comparisons of groundwater concentrations from the perimeter monitoring wells with surface water benchmarks. The comparison of perimeter groundwater concentrations to surface water benchmarks is inherently conservative and not ecologically relevant given that aquatic organisms are not exposed directly to groundwater. Offsite aquatic biota may be exposed to groundwater-related constituents if impacted groundwater discharges into sediment/surface water associated with viable habitat areas. The potential for adverse effects from groundwater releases from the SSAs to offsite aquatic biota will be determined through the collection and chemical analyses of offsite media from viable habitat, and subsequent assessments of exposure and risk (see Section 4).

The results of the screening for the COA/Coke Point Landfill perimeter wells indicated exceedances of ecological surface water benchmarks by 22 chemicals (**Appendix A**). Concentrations of three total recoverable metals, six dissolved metals, cyanide, five polycyclic aromatic hydrocarbons (PAHs), the semivolatile organic compounds (SVOCs) bis(2-ethylhexyl)phthalate and phenol, and five volatile organic compounds (VOCs) were greater than surface water benchmarks. The greatest exceedances above ecological surface water benchmarks were for benzene, naphthalene, toluene, and xylenes. Locations of exceedances are indicated on **Figure 6**.

Detected site-related chemicals in perimeter wells at Greys Landfill include 14 metals, the SVOCs bis(2-ethylhexyl)phthalate and di-n-butylphthalate, and the VOCs 1,1-dichloroethane, cis-1,2-dichloroethene, and benzene (**Appendix A**). Thirteen (13) of the 14 metals detected had concentrations above ecological surface water benchmarks. Manganese and barium were the most common metals with concentrations exceeding screening levels. Total recoverable metals were analyzed during the 4th Quarter 2009 Greys Landfill groundwater monitoring event. Consequently, the screening for metals with benchmarks based on the dissolved fraction contains some uncertainty and may be conservative. Of the five organic compounds detected, only bis(2-ethylhexyl)phthalate (5 wells) and di-n-butylphthalate (1 well) exceeded ecological screening benchmarks. No VOCs exceeded their respective benchmarks in Greys Landfill groundwater. Locations of exceedances are indicated on **Figure 7**.

Although there were exceedances of a few Constituents of Potential Interest (COPIs) in wells at Humphrey Impoundment, groundwater at the Humphrey Impoundment SSA discharges to the Tin Mill Canal. Particle analysis modeling indicates that groundwater at this SSA flows toward and is released to the Tin Mill Canal, even near the Canal's confluence with Bear Creek (CH2M Hill 2001).

There are uncertainties inherent to the groundwater screening process. The greatest uncertainty may be the assumption that the groundwater chemistry observed at shoreline "perimeter wells" is representative of the groundwater chemistry at the shoreline. This uncertainty is due to the large distances between many of the perimeter wells and the actual shoreline.

The results of the perimeter groundwater well screening indicate that groundwater releases to the Patapsco River from Coke Point Peninsula and to Bear Creek from the Greys Landfill SSA contain levels of site-related constituents above ecological surface water screening levels. COPCs associated with SSA-related stormwater releases to habitable offshore areas will be determined following planned investigations of surface water runoff locations and corresponding sample analyses.

Activities associated with this initial phase of the offshore investigation include evaluations of groundwater and surface (stormwater) releases from the five SSAs.

3.1 GROUNDWATER DISCHARGE PATHWAY ASSESSMENT

Groundwater from the COA/Coke Point Landfill and Greys Landfill SSAs has been shown to discharge to adjacent river systems. Groundwater associated with the Tin Mill Canal/Finishing Mills and Humphrey Impoundment SSAs predominantly discharges to the Tin Mill Canal, where it mixes with water and process wastes in the Canal and is then treated and released to Bear Creek via permitted Outfall 014. Based on the screening level assessment and the general groundwater flow patterns that have been documented for the SSAs, the focus of the groundwater discharge pathway assessment is the area surrounding the Coke Point Peninsula and Greys Landfill. Proposed field activities to delineate the areas impacted by groundwater releases from the COA/Coke Point Landfill and Greys Landfill SSAs are described in the following sections.

3.1.1 Temperature and Conductivity Survey

Thermal profiling methods are routinely used to qualitatively determine the locations of groundwater discharge to surface water. Methods include in-situ temperature measurements, towed temperature probes, and thermal imagery. Additionally, specific-conductance probes are useful for determining locations where water exchange is taking place between surface water and groundwater. Typically, the probe is suspended from a boat with a cable connecting the probe to a specific-conductance meter on the boat. A housing on the probe is designed to maintain contact with bottom sediments as the probe is dragged along the river bottom. The efficacy of this method is dependent on the difference between the electrical conductivity of the groundwater and surface water being great enough to be detected by the probes and, therefore, to identify areas of groundwater discharge (USGS 2008). This is a reconnaissance-level method that will be coupled with measurements of temperature to attempt to identify locations of groundwater discharge.

Severstal proposes to conduct the temperature and conductivity survey along multiple transects offshore from both the COA/Coke Point Landfill and Greys Landfill that correspond with those paths identified in the particle tracking studies of these areas, as illustrated in **Figures 2** through **4**. A total of 15 transects are proposed for the COA/Coke Point Landfill surrounding area, and five transects are proposed for the area offshore of Greys Landfill. The survey will be conducted during periods of very warm weather (e.g., mid-late summer) to maximize the probability of detecting temperature and specific conductance differences between groundwater and surface water.

3.1.2 Benzene Surface Water and Pore Water Collection (Coke Point Peninsula)

The consistent presence of benzene in groundwater at the Coke Point Peninsula makes it a good “tracer” to track groundwater seepage into surrounding surface water and potentially into/through sediments. No such constituent associated with steelmaking operations is consistently present in Greys Landfill groundwater that would serve as a good tracer to track groundwater seepage into adjacent Bear Creek surface water and into/through sediments.

Positive tracer attributes are: 1) it is present in high concentrations in site groundwater, and 2) its potential presence in sediments is most likely a consequence of active groundwater seepage through the sediments due to the relative low environmental persistence of benzene. For the area offshore of the COA, the potential absence from sediment pore water of benzene, the most prevalent chemical in groundwater in this area, would provide a line of evidence that the migration pathway for groundwater constituents into surface water in this area is via direct groundwater discharge through the slag into surface water rather than by groundwater seepage through sediments. The groundwater-to-surface water flow regime is considered applicable to the entire shoreline of the COA/Coke Point Landfill Area, considering the similar genesis of the entire area and shoreline (slag, or "made land").

Severstal proposes to collect surface water and sediment pore water samples along seven 500-foot long transects, each extending outward from COA perimeter wells (**Figure 9**). The transects terminate adjacent to the perimeter wells where benchmark exceedances of benzene have occurred. Along each of the transects, the following five sampling stations are planned:

- Station 1 is at the shoreline
- Station 2 is at the mid-point of the Slag-River Interface
- Station 3 is at the Slag Toe
- Station 4 is 250 feet from the shoreline
- Station 5 is 500 feet from the shoreline

In-situ samplers will be inserted into the sediment at stations along each transect where sediment is anticipated to be present (Stations 3, 4, and 5). Samplers will be positioned at a depth of 6-12 inches below the sediment-surface water interface. Additionally, shallow, mid-depth, and near-bottom surface water samples will be collected at stations along each transect to determine potential benzene concentration trends in the water column along each transect. Pore water and surface water samples will be analyzed for benzene. Details on specific methods for obtaining surface water and pore water samples are provided below in Sections 3.3.2 and 3.3.3, respectively.

Although the benzene tracing model is restricted to the COA, the findings and conclusions regarding groundwater-surface water interaction from this assessment will be applicable to the entire Coke Point Peninsula. The Coke Point Peninsula consists entirely of slag fill, for which groundwater movement to surface water can be considered uniform for the entire area.

3.2 SURFACE DISCHARGE PATHWAY ASSESSMENT

3.2.1 Stormwater Conveyance Survey

As part of the surface discharge pathway assessment, a survey will be conducted of potential stormwater conveyances associated with the five SSAs. **Figure 8** indicates the locations of all known stormwater conveyance to offsite water bodies. The objective of the stormwater conveyance survey is to confirm the presence of identified surface discharge points and to verify that no additional drainage features associated with the five SSAs are present that could potentially direct stormwater runoff to offsite waters. If such features are identified, their locations will be recorded with a Trimble hand-held GeoXT Global Positioning System (GPS) unit. The existing stormwater drainage map will be modified to show potential stormwater release points associated with the five SSAs.

3.2.2 Stormwater Sampling

A sampling program will be established for stormwater discharge points associated with the five SSAs identified during the stormwater survey. Surface water samples will be collected from these drainage features to evaluate the potential contribution of SSA-related chemicals in stormwater to offsite areas with suitable habitat for supporting benthic macroinvertebrate and fish communities. Surface water samples will be analyzed for COPIs identified for the SSAs. The results of the stormwater sampling will provide critical information for determining the spatial extent of the sampling of offsite surface water, sediment, and sediment pore water (see Section 3.3).

3.3 BATHYMETRIC SURVEY AND SUB-BOTTOM PROFILING

A bathymetric and sub-bottom survey will be conducted to provide key characterization data on the physical nature of the offshore areas potentially influenced by the five SSAs. During the bathymetric survey, physical characterization of the ecologically relevant shoreline areas is planned to assess the:

- Offshore water depths;
- Offshore slag toe location (via physical sounding);
- Slag-river interface topography (via physical sounding);
- Areal extent and thickness of sediment; and
- Potential habitat available for benthic organisms.

Surveying using side scan sonar will help to define the morphology of the river bottom, to more closely evaluate the nature, distribution, and thickness of river bottom sediments, and to detect rocky outcrops, debris, and other underwater objects. For the COA/Coke Point Landfill and Greys Landfill SSAs, the extent of survey will be based on identified particle tracking routes established for these areas. The bathymetric survey and sub-bottom profiling is described in more detail in **Appendix B**.

3.4 ASSESSMENT OF POTENTIALLY IMPACTED OFFSITE AREAS

Physical, chemical, and biological data will be collected from offsite areas determined to be potentially impacted by releases from the five SSAs to support the development of an offsite ecological risk assessment. Offsite areas of study will be defined based on findings of the groundwater discharge pathway assessment and the surface discharge pathway assessment (Sections 3.1 and 3.2). Data collection activities will include the collection of surface water, sediment, and pore water samples. The details of the sampling program for the offsite data collection, including placement of sampling locations, sample quantity, and chemicals to be analyzed will be developed in an interim report that will also present the results of the groundwater and stormwater discharge pathways assessments (see Section 5).

3.4.1 Surface Water Sampling

Surface water sampling is planned to ascertain whether surrounding river system surface waters influenced by chemical releases from the five SSAs are impacted by these releases and, if so, whether the resulting levels in surface water can cause impairment of the community of pelagic biota (i.e., fishes). Sample locations and numbers of samples to be collected will be based on the results of the groundwater and stormwater assessments described in Sections 3.1 and 3.2. Surface water samples will be collected using a Kemmerer Bottle sampler composed of a stainless steel body and Teflon end seals.

At each surface water sampling station, water column samples will be collected from three different depths to assess potential vertical mixing, as follows:

- Shallow: upper one-foot of the water column;
- Mid-depth: water column midpoint; and
- Near-bottom: one foot above the sediment.

It is assumed that there will be sufficient total water depth at all sampling stations (greater than or equal to approximately three feet) to operate the sampler. If any stations at the time of sampling have a total water depth less than three feet, direct grabs will be collected at the mid-water interval. Samples will be collected during periods of low tide to maximize groundwater flux into the river (i.e., worst-case). Sampling locations will be recorded with a Trimble hand-held GeoXT GPS unit.

It should be noted that surface water analytical results may be influenced by regional contamination sources unrelated to the Sparrows Point Site. Therefore, future surface water sampling may include the collection of background surface water data.

3.4.2 Sediment/Pore Water Sampling

Broad categories for sampling sediment pore water include in-situ methods that use samplers that are inserted directly into the sediment, and ex-situ methods that remove the sediment and isolate the pore water elsewhere. For the area offshore of the COA/Coke Point Landfill and Greys Landfill Areas, viable approaches of each method type are as follows:

- Deployment of modified Hesslein in-situ pore water samplers (peepers) that can be inserted directly into unconsolidated sediments and are retrieved following a pre-set equilibration period (usually several weeks); and
- Bulk sediment collection and ex-situ pore water recovery by centrifugation or vacuum extraction.

Given the high-energy offshore environment near the Coke Point Peninsula and the unsafe conditions there (e.g., strong currents, waves, underwater obstructions, poor visibility water), manual insertion of passive diffusion bags (PDBs) or other in-situ sampling device via SCUBA is not feasible. Ex-situ methods have the drawback of potentially significant loss of VOCs from agitation and handling despite procedures to mitigate constituent loss. Consequently, Severstal proposes to install peepers from a boat in habitable areas offshore of the Coke Point Peninsula and Greys Landfill known or suspected to receive SSA-related groundwater.

To the extent that offsite sediment is being impacted by active discharges from the SSAs, sediment samples to be used in the assessment of offsite ecological risk will be collected via a coring device to a depth of six inches below the sediment-surface water interface. Deployment of the sampler will be done from a boat using extension rods, if possible. Alternatively, a petite Ponar grab sampler may also be used to collect sediment samples. Sampling locations will be recorded with a Trimble hand-held GeoXT GPS unit.

Similar to surface water, sediment analytical results may be influenced by regional contamination sources unrelated to the Sparrows Point Site. Future sediment sampling may therefore include the collection of background sediment data.

3.4.3 Qualitative Benthic Habitat Characterization

A qualitative survey of the benthic macroinvertebrate community will be conducted in habitable offsite areas potentially receiving current releases of groundwater and/or stormwater from the five SSAs. This effort will be used to: 1) document the abundance and diversity of the benthic macroinvertebrate community in offshore areas, 2) provide information to gauge the suitability of habitats for supporting biological communities in areas potentially influenced by the SSAs, and 3) verify the appropriateness of the receptors selected for risk evaluation. It is anticipated that benthic macroinvertebrates will be sampled from surficial sediments using a petite Ponar grab sampler that will be deployed along multiple transects extending out from the shoreline in areas determined to be impacted by groundwater and/or surface water releases from the SSAs.

.

All analytical data and relevant physical and biological information will be incorporated in a Screening Level Ecological Risk Assessment (SLERA), or "preliminary risk assessment", *sensu* Attachment B of the 1997 Consent Decree. The SLERA utilizes conservative assumptions related to ecological exposure and toxicity (e.g., maximum contaminant concentration, maximum area use, conservative ecological effects-based benchmarks) to determine if further ecological evaluation is warranted. No further action is indicated if the results and conclusions of the SLERA indicate absence of risk. If the results and conclusions of the SLERA suggest the potential for risk to offsite aquatic biota, additional risk evaluation will be conducted.

4.1 ECOLOGICAL CONCEPTUAL SITE MODEL

The ecological conceptual site model (CSM) describes the linkages between potential chemical stressors and the receptors representing endpoints considered important for protection. Potential environmental stressors at the Site include organic and inorganic constituents that may either be associated with Site practices and operations or as natural components of Site media. Site-related constituents include those chemicals utilized in the manufacturing of iron and steel (COPIs). The *Description of Current Conditions* document (Rust 1998) describes the chemicals that may be associated with each ecological study area based on historical site operations and practices. Constituents in relatively impermeable soils can be transported offsite by stormwater runoff and into shallow groundwater by percolation, and be subsequently released to the offshore estuarine environment.

For the offsite SLERA, potential fate and transport processes of constituents include:

- Desorption and/or erosion from soils and transport in surface runoff. As described in Section 3.2.1, a stormwater conveyance survey will be conducted to identify areas where SSA-related runoff could be transported to viable offsite habitat.
- Horizontal and potential vertical groundwater transport and infiltration to offsite sediment and sediment pore water.
- Percolation through the offsite sediment matrix into the overlying surface water column.
- Bioconcentration in offsite community-level receptors exposed to potentially impacted surface water and/or sediment pore water.
- Bioaccumulation in offsite community-level receptors exposed to potentially impacted offsite media and subsequent incorporation of COPCs into the aquatic food chain.

Aquatic biota may be exposed to site-related chemicals present in the surface water and sediment of offsite water bodies. Owing to the Site's location at the mouth of a highly urbanized watershed, its exposure to high energy wave action, and the hardened slag comprising much of the shoreline, the nearshore environment surrounding the Sparrows Point facility is generally unfavorable for the establishment of aquatic communities. Nonetheless, the following potential assessment endpoints related to the surrounding aquatic ecosystem will be evaluated in the SLERA:

- The protection of the abundance and diversity of the benthic macroinvertebrate community from bioconcentration and food chain exposure to Site-related chemicals.
- The protection of the abundance and reproduction of the finfish community from

bioconcentration and food chain exposure to Site-related chemicals.

Although various birds may occasionally fly over or rest in the waters in areas potentially impacted by groundwater and/or stormwater discharge, exposure to these individuals is anticipated to be minimal given the lack of suitable habitat for birds and the unfavorable foraging conditions offshore. Consequently, the offsite SLERA will focus on aquatic community-level receptors (benthic invertebrates, fish) that will have a high degree of exposure to Site-related chemicals in offshore media, and that thus are considered to be the most representative receptors for evaluating the nature and extent of offsite ecological impacts.

The preliminary CSM for habitable offshore areas is presented in **Figure 10**. The results of the bathymetric survey are anticipated to provide the necessary information for determining the presence and extent of ecological habitat: 1) offshore from the Greys Landfill and COA/Coke Point Landfill SSAs, and 2) in offshore areas that may receive stormwater runoff from outfalls or other drainage features associated with the five SSAs.

4.2 CONSTITUENTS OF POTENTIAL CONCERN

Constituents of potential concern (COPCs) for this initial phase of the offshore investigation are those chemicals in groundwater or stormwater associated with the five SSAs that exceed USEPA Region 3 BTAG Marine (or Freshwater) Surface Water Benchmarks. Based on the screening of analysis perimeter groundwater data at the COA/Coke Point Landfill, COPCs include 10 metals, eight SVOCs (including six PAHs), and five VOCs (**Table 1**). For Greys Landfill, COPCs include 13 metals and two SVOCs (**Table 1**). The overall COPC list for the offshore investigation will be augmented based on the stormwater conveyance survey and the analytical results from the subsequent stormwater sampling.

4.3 OFFSITE HABITAT ASSESSMENT

Risks may be posed to aquatic biota from the current releases of impacted groundwater and stormwater where offshore sediments represent viable habitat (e.g., sediment areas beyond the submerged slag areas that armor the perimeter of the Coke Point Peninsula). The bathymetric and sub-bottom survey will provide critical information for focusing the offsite ecological risk assessment effort on potentially impacted areas that contain suitable habitat for supporting benthic macroinvertebrates and fishes. Biological information obtained during the qualitative benthic macroinvertebrate survey will also be used to document the suitability of habitats for supporting offsite aquatic communities, and to verify the accuracy of the preliminary offsite ecological CSM.

4.4 OFFSITE DATA EVALUATION

Biological, bathymetric, and chemistry data collected from offshore areas potentially influenced by releases from the five SSAs will be integrated and evaluated to verify the accuracy of the preliminary CSM and to generate screening-level estimates of ecological risk for benthic macroinvertebrates and fishes. For the COA/Coke Point Landfill Area, surface water and sediment analytical data from the Maryland Port Administration's Site Assessment for this area (EA 2009) will be incorporated into the offsite SLERA as appropriate to facilitate the quantification of risks to offshore aquatic biota. Screening-level risks will be based on comparisons of offsite media concentrations to receptor-specific ecotoxicological effects-based endpoint concentrations. The results of the SLERA will be used to determine if further assessment of offsite ecological risk is warranted. The SLERA will be conducted in accordance with USEPA's *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (Interim Final)* (USEPA 1997).

An interim report will be prepared that presents the results of the groundwater discharge and surface discharge pathway assessments associated with the five SSAs (Sections 3.1 and 3.2). The report will also provide detailed plans for the secondary phase of the offshore investigation, which may include the collection of offsite surface water, sediment, and sediment pore water samples. These samples will be used to quantify exposure and risk in the offsite SLERA. The goal of the interim report is to present to USEPA and MDE the results of the initial phase of the offsite investigation such that the agencies have the opportunity to provide input to the planning for the subsequent phase of the investigation (i.e., offsite characterization assessment). As described in Section 4, the data collected during all phases of the offsite investigation will culminate in the development of the offsite SLERA report.

The proposed schedule for the initial phase of the offshore investigation is as follows:

Tasks	**# Months Following Approval of Work Plan**					
	1	2	3	4	5	6
Groundwater Discharge Pathway Assessment						
• Temperature and Conductivity Survey	x					
• Benzene Evaluation		x	x			
Surface Discharge Pathway Assessment						
• Stormwater Conveyance Survey	x					
• Stormwater Sampling and Analysis		x	x			
Bathymetric Survey	x					
Interim Report, Including Detailed Plan for Offsite Investigation			x	x	x	x

Future field activities supporting all phases of the offsite investigation will be conducted in accordance with the health and safety procedures provided in the March 2007 *Health and Safety Plan, Groundwater and NAPL Investigation and Recovery* (URS 2007b), with modifications. The Health and Safety Plan will be amended, as appropriate, to cover all field activities anticipated to be necessary to complete the offshore investigation.

CH2M Hill. 2000. Site-Wide Investigation (SWI) Work Plan. June 2000.

CH2M Hill. 2001. Site-Wide Investigation Groundwater Study Report. July 2001.

CH2M Hill. 2002a. Site-Wide Investigation Release Site Characterization Study. June 2002.

CH2M Hill. 2002b. Site-Wide Investigation/Work Plan to Evaluate the Nature and Extent of Releases to Groundwater from the Special Study Areas (SSAs). July 2002.

EA (EA Engineering, Science, and Technology, Inc.). 2009. Site Assessment for the Proposed Coke Point Dredged Material Containment Facility at Sparrows Point . Prepared for Maryland Port Administration. November 2009.

Rust Engineering & Infrastructure. 1998. Description of Current Conditions. Bethlehem Steel Corporation, Sparrows Point, MD.

SAIC. 2002. Addendum to SWI Work Plan to Evaluate the Nature and Extent of Releases to Groundwater from the Special Study Areas for BSC, Sparrows Point Division, Maryland. September 2002.

URS (URS Corporation). 2005a. Site Wide Investigation, Report of Nature & Extent of Releases to Groundwater from the Special Study Areas. International Steel Group, ISG Sparrows Point, Inc. Facility, Sparrows Point, Maryland.

URS. 2005b. CA725 Facility Investigation and Human Health Risk Evaluation (HHRE) Findings, ISG Sparrows Point, June 9, 2005.

URS. 2006. Ecological Risk Strategy Document: ISG Sparrows Point Facility, Sparrows Point, Maryland.

URS. 2007a. Final Ecological Risk Assessment Work Plan for On-Site Areas. ISG Sparrows Point Facility, Sparrows Point, Maryland. Prepared for ISG Sparrows Point, January 4, 2007.

URS. 2007b. Health and Safety Plan, Groundwater and NAPL Investigation and Recovery. Sparrows Point Facility, Sparrows Point, Maryland. Prepared for Mittal Steel, March 12, 2007.

URS. 2009a. Work Plan: Sediment, Surface Water, and Groundwater Sampling Plan to Assess Current Groundwater Discharge Impacts to the Offshore Environment. October 2009.

URS. 2009b. Screening Level Ecological Risk Assessment for Onsite Areas. ISG Sparrows Point Facility, Sparrows Point Maryland. Prepared for Severstal Sparrows Point, LLC. April 2009.

URS. 2009c. Supplemental Report: County Lands Parcel 1B Ponds, Final. ISG Sparrows Point Facility, Sparrows Point Maryland. Prepared for Severstal Sparrows Point, LLC. April 2009.

USEPA. 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. EPA 540-R-97-006. Office of Solid Waste and Emergency Response.

USGS (United States Geological Survey). 2008. Field Techniques for Estimating Water Fluxes between Surface Water and Ground Water. Techniques and Methods 4-D2.

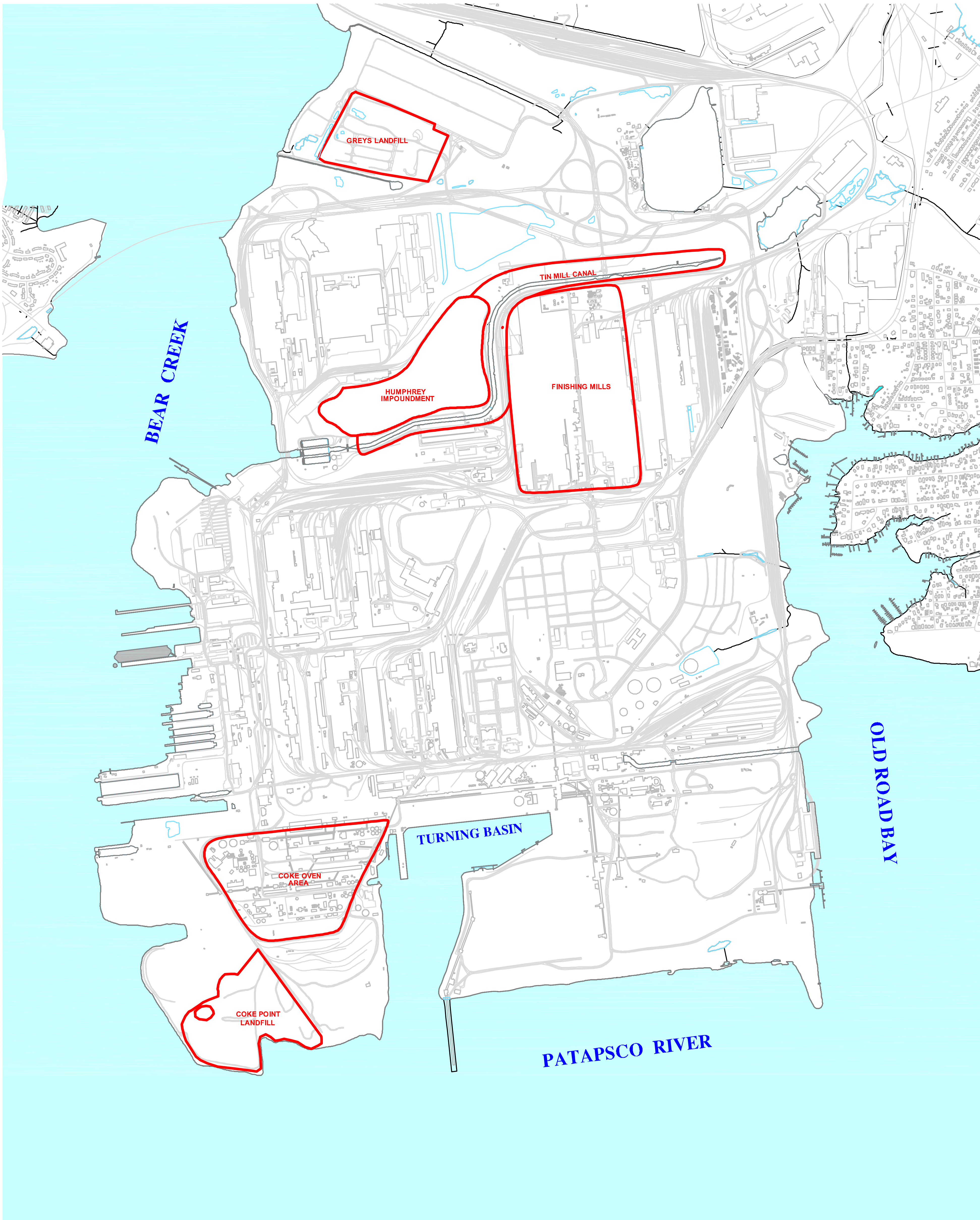
Tables

TABLE 1
Constituents of Potential Concern for the Groundwater Offsite Migration Pathway
Severstal Sparrows Point Site
Sparrows Point, Maryland

Special Study Area	
Coke Oven Area/Coke Point Landfill	**Greys Landfill**
Inorganics	
Arsenic	Arsenic
Barium	Barium
Cadmium	Beryllium
Copper	Cadmium
Cyanide, available	Chromium
Mercury	Cobalt
Nickel	Copper
Selenium	Lead
Tin	Manganese
Vanadium	Mercury
	Nickel
	Vanadium
	Zinc
Organic Compounds	
2-Methylnaphthalene	bis(2-Ethylhexyl) phthalate
Acenaphthene	di-n-butylphthalate
Benzene	
bis(2-Ethylhexyl) phthalate	
Carbon disulfide	
Ethylbenzene	
Fluoranthene	
Fluorene	
Naphthalene	
Phenanthrene	
Phenol	
Toluene	
Xylenes (total)	

Figures

Drawn By & Date/Time: joseph_shell Mar 25, 2010 - 1:26pm
Drawing Location & Name: K:\13810877 - ISG Sparrow's Pt\Fig-01 SPF_Special Study Areas.dwg



LEGEND

SPECIAL STUDY AREA BOUNDARY

SSA SPECIAL STUDY AREA

0 1500
SCALE 1" = 1500'

URS
335 COMMERCE DRIVE, SUITE 300
FORT WASHINGTON, PA 19034
PHONE: (215) 367-2500 FAX: (215) 367-1000

Job:	15302179.00001
Prepared by:	JES
Checked by:	MR
Date:	03/25/10

SPARROWS POINT FACILITY – SPECIAL STUDY AREAS
SEVERSTAL SPARROWS POINT, LLC

SPARROWS POINT, MARYLAND

FIGURE 1

File Path: V:\sparrowspt\documents\figures\section4-1.apr

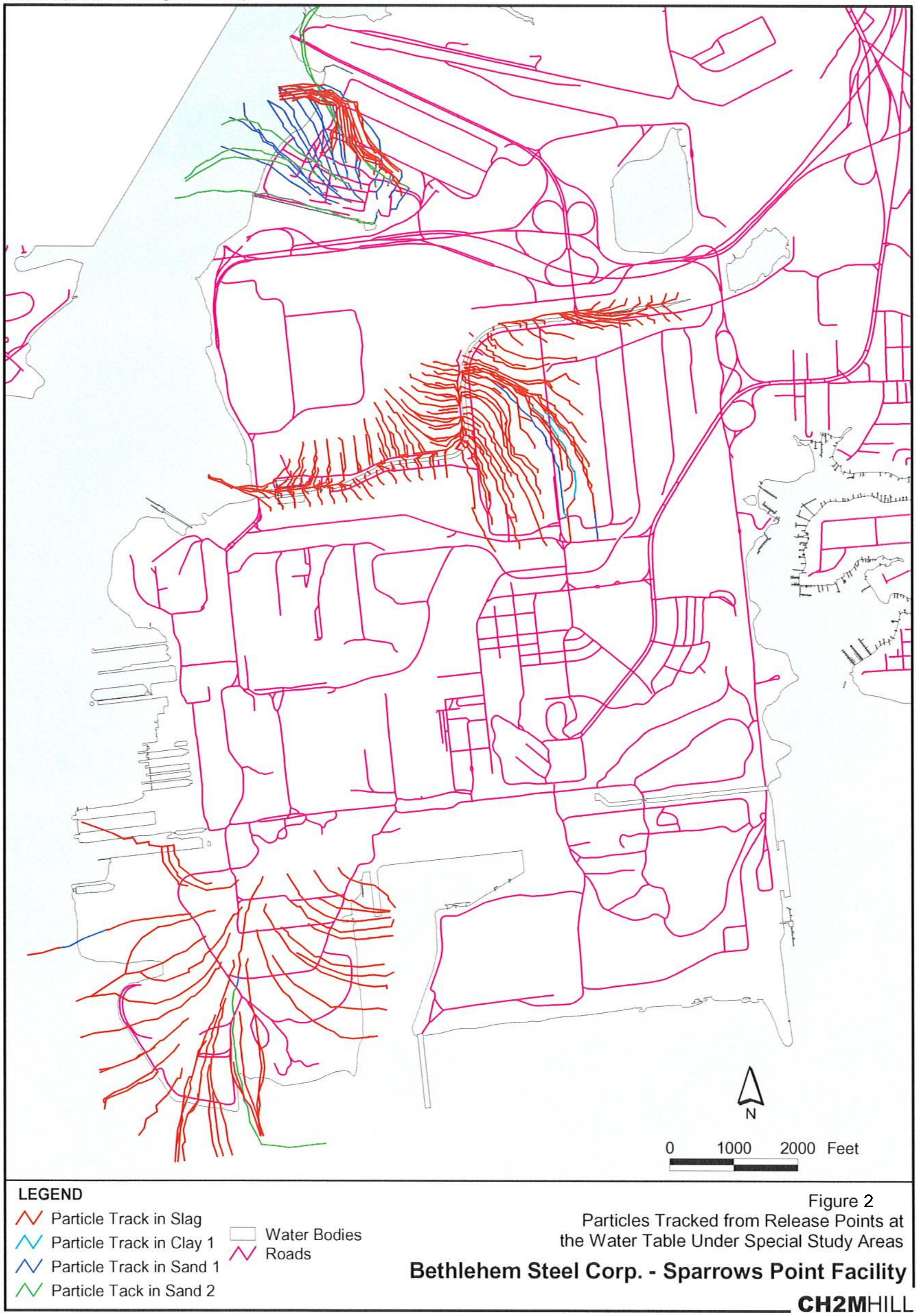
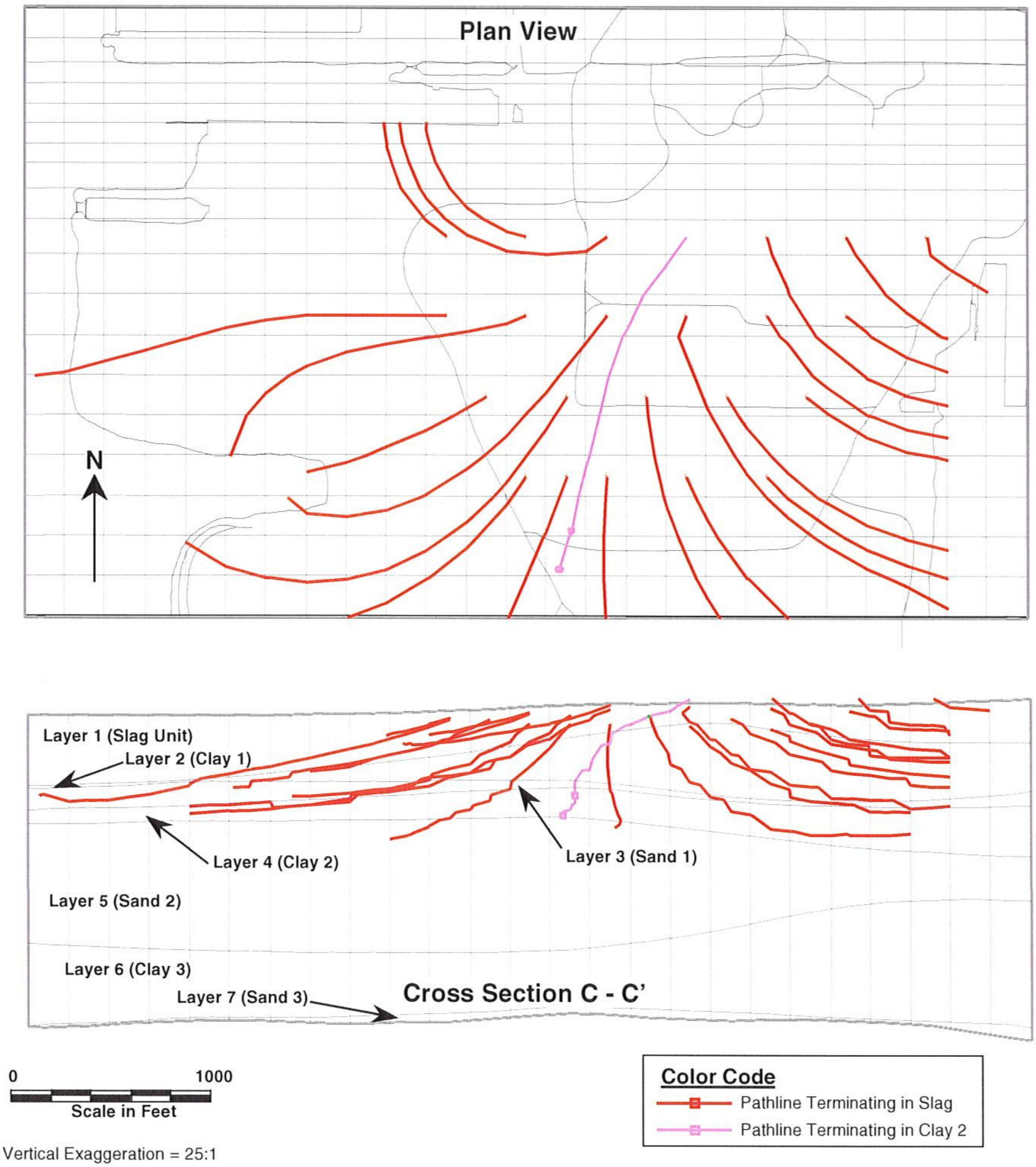


Figure 2
Particles Tracked from Release Points at the Water Table Under Special Study Areas

Bethlehem Steel Corp. - Sparrows Point Facility

CH2MHILL

Source: Figure 4.1-9 from CH2MHILL (2001)



Notes:

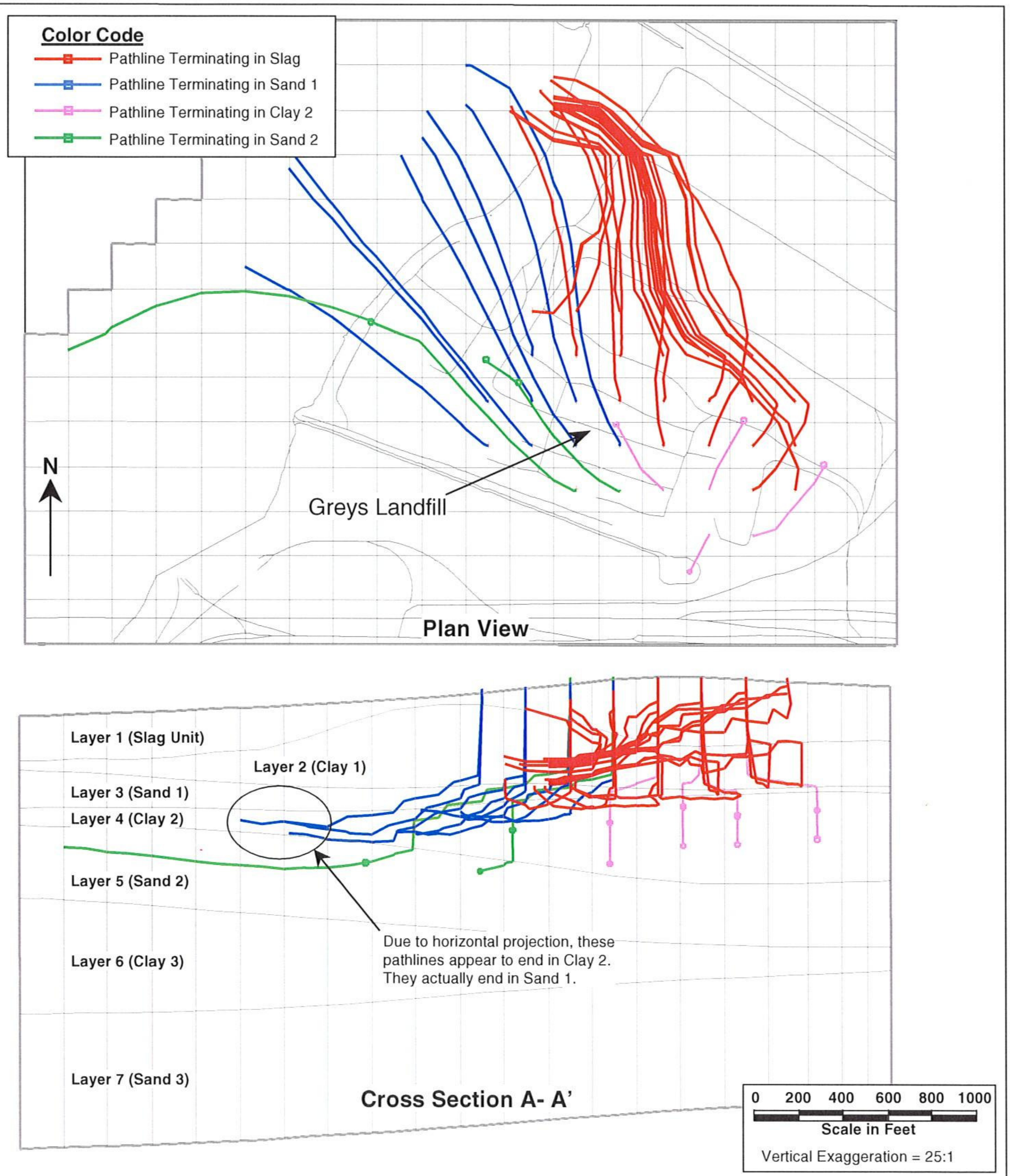
1) Pathlines are projected vertically in plan view and horizontally in cross section.
2) ▫ Symbol indicates 50 years of travel.
3) Pathlines stop after 100 years of travel.
4) Color coding identifies the layer in which the pathline ends after 100 years of travel.

Figure 3
Plan and Cross-Sectional Views Looking North Through Coke Point, Paths of Particles Released at the Water Table

Bethlehem Steel Corp. - Sparrows Point Facility

CH2MHILL

Source: Figure 4.1-12 from CH2MHILL (2001)



Notes:

1) Pathlines are projected vertically in plan view and horizontally in cross section.
2) ◘ Symbol indicates 50 years of travel.
3) Pathlines stop after 100 years of travel.
4) Color coding identifies the layer in which the pathline ends after 100 years of travel.

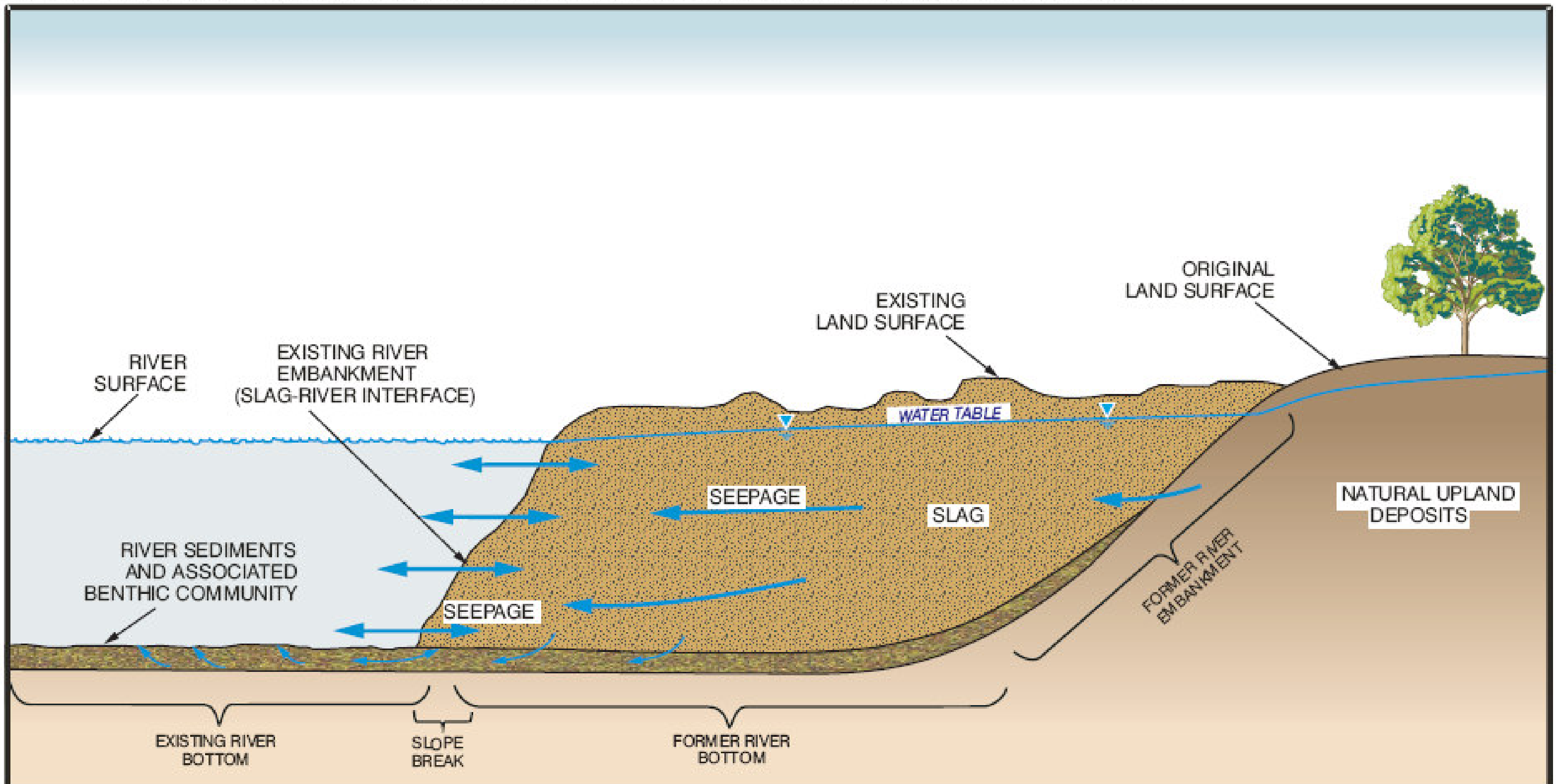
Figure 4
Plan and Cross-Sectional Views Looking North Through Greys Landfill, Paths of Particles Released at the Water Table

Bethlehem Steel Corp. - Sparrows Point Facility

CH2MHILL

Source: Figure 4.1-10 from CH2MHILL (2001)

P:\Gaithersburg\13808896 - ISG-Sparrow's Point\TRANSITION from Cleveland to Gaithersburg\Surface Water and Sediment Sampling Work Plan\Fig 2 Conceptual GW.cdr (04/11/07) SS



URS

Figure 5. Conceptual Groundwater to Surface Water Flow Model.

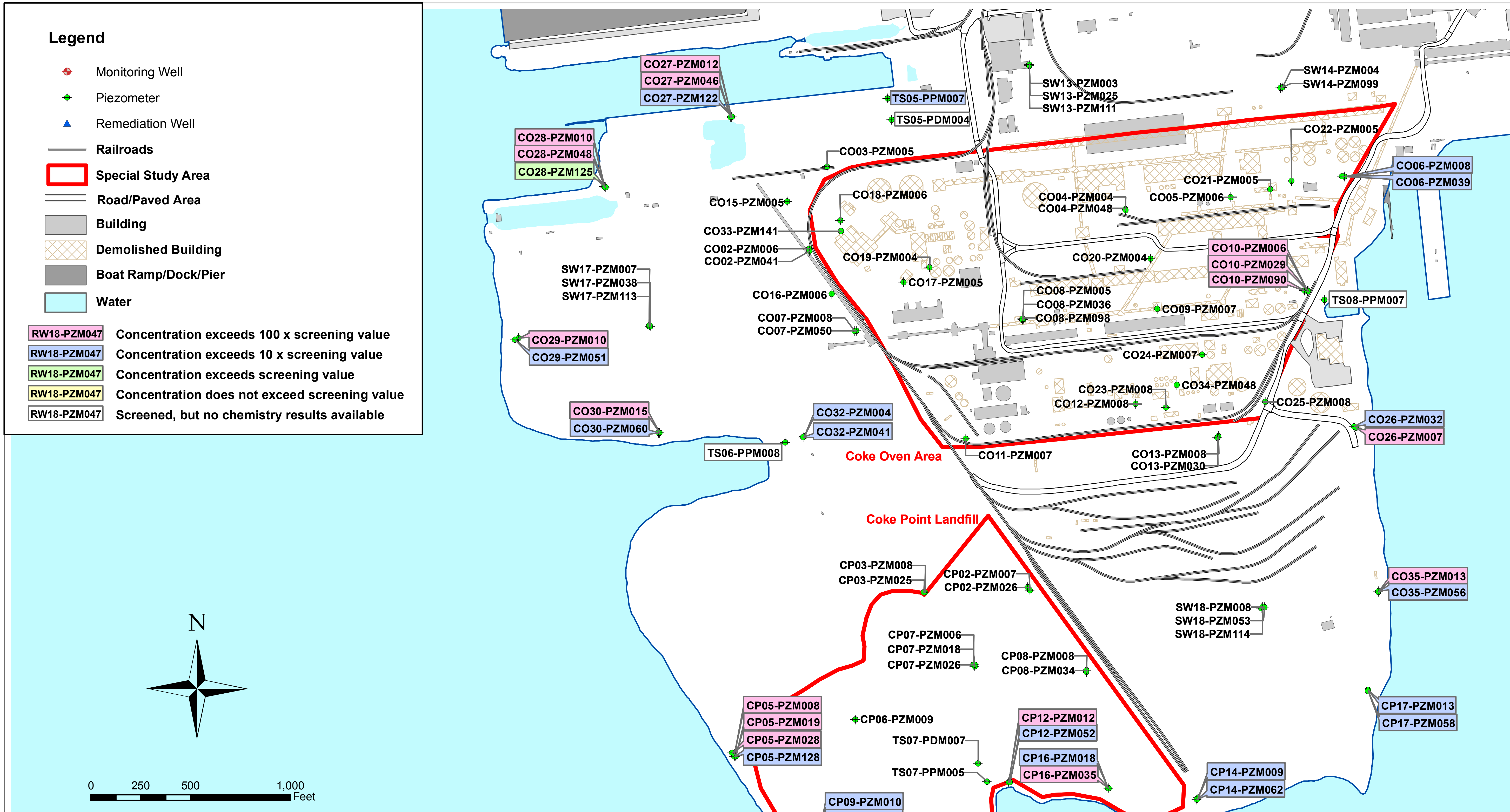


FIGURE 6

Comparison of Groundwater Concentrations in Perimeter Monitoring Wells to Ecological Surface Water Quality Benchmarks Coke Oven Area and Coke Point, Sparrows Point, MD

G:\Projects\SparrowsPoint\Projects\2010\CokeOven-and-CokePoint11x17_2007Exceeds.mxd 03/25/2010 aer

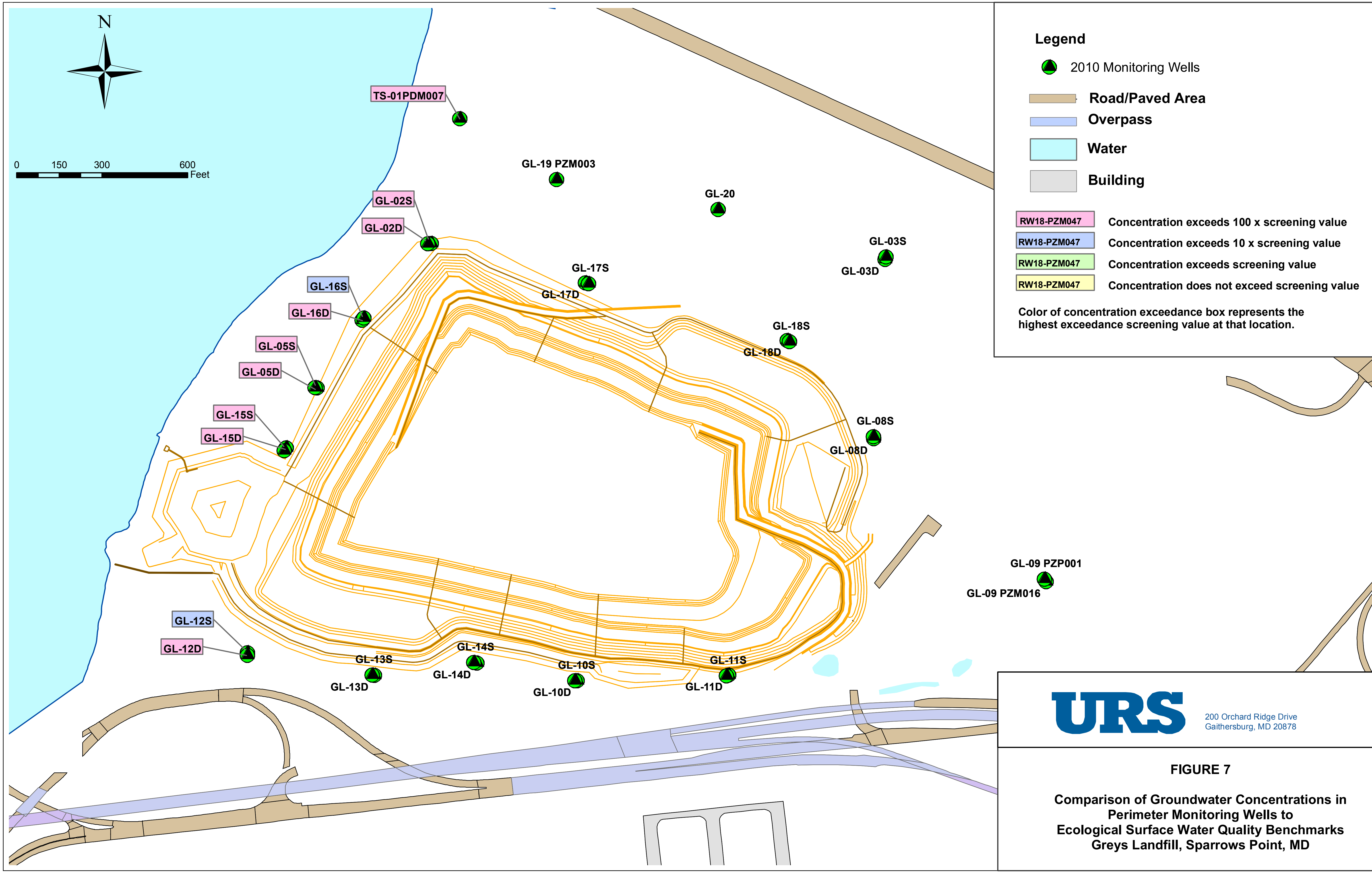
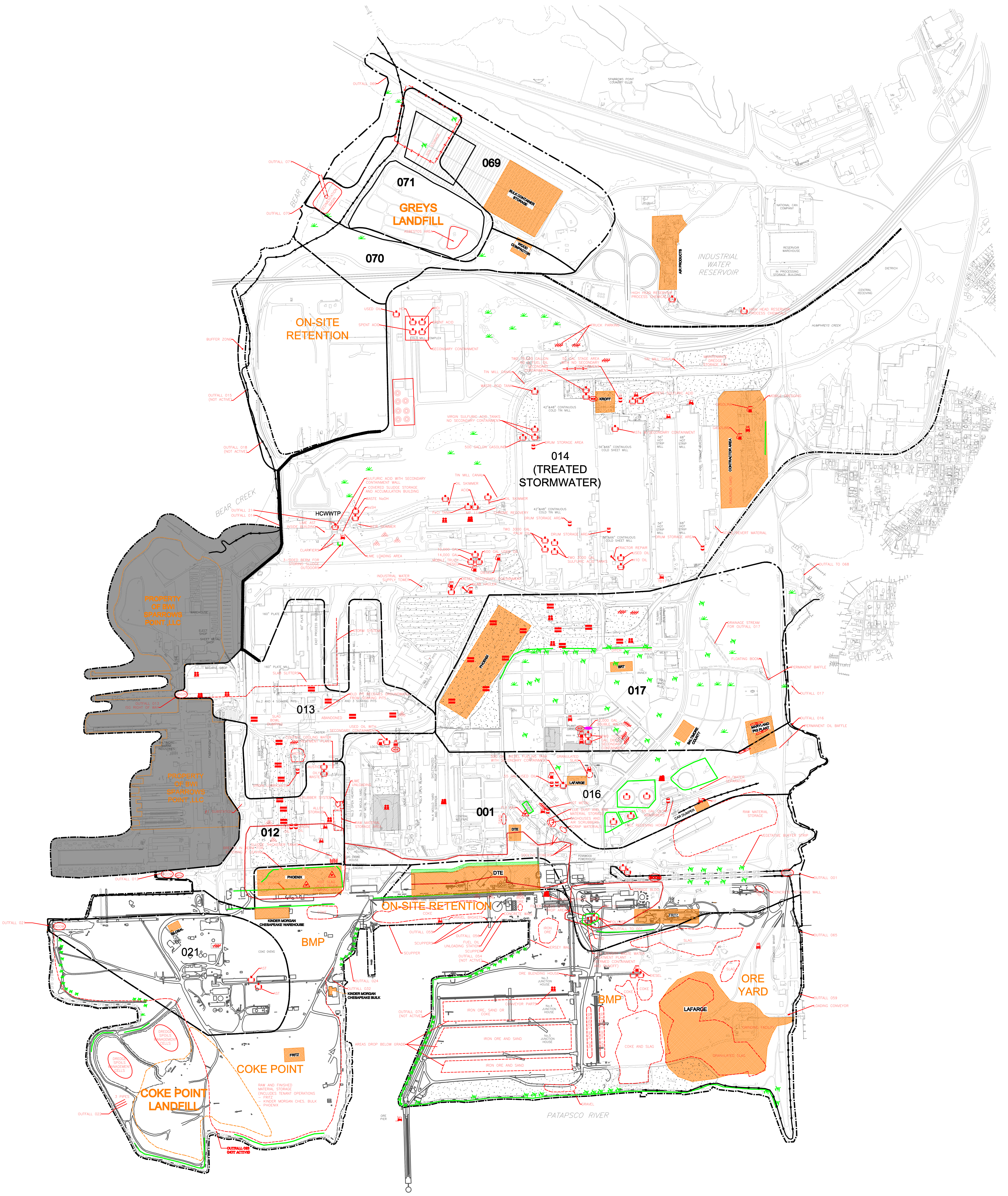


FIGURE 7

Comparison of Groundwater Concentrations in Perimeter Monitoring Wells to Ecological Surface Water Quality Benchmarks
Greys Landfill, Sparrows Point, MD

G:\Projects\SparrowsPoint\Projects\2010\SparrowsPointGreysLandfill11x17_Exceeds.mxd 03/25/10 aer



LEGEND

BMP BEST MANAGEMENT PRACTICE	MISC. STORAGE
DRAINAGE AREA BOUNDARY	STRUCTURAL BERM
SEVERSTAL SPARROWS POINT TENANTS	OIL RETENTION BOOM
BUFFER ZONE	OIL RENTENTION BASIN
GRAVEL FILTER BERM	NON-STORM WATER DISCHARGE
SPILL CONTAINMENT SEPARATOR	PARKING
STEEL COIL STORAGE	AIR POLLUTION CONTROL EQUIPMENT
PIG IRON STORAGE	RENTENTION POND
BERM	SCRAP METAL
AST	SILT FENCE
DRUM STORAGE	UST
FUELING AREA	VEHICLE AND EQUIPMENT WASH
DUMP SITE	VEHICLE AND EQUIPMENT MAINTENANCE
VEGETATIVE ZONE	EROSION
BY-PRODUCT	PONDING
GRAVEL	CONCRETE
LOAD / UNLOAD AREA	SLAB STORAGE
MARSH	RAW MATERIAL STORAGE
MUD	BAFFLE
SETTLING OR DEPOSITION OF PARTICULATE MATTER	

NOTE:

1. BASE MAP INTENDED FOR STORM WATER MANAGEMENT ONLY.
2. THIS MAP IS ALSO USED TO DELINEATE EMS SCOPE.

REVISION				
NUMBER	DATE	DESCRIPTION	COORDINATE	INITIAL
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

FINISHES ON THIS DRAWING CONFORM TO A.I.S.E. STANDARDS

DEPT

AREA

JOB: STORMWATER DRAINAGE AREAS

PART

DRAWN BY: | SCALE: DO NOT SCALE | SEVERSTAL SPARROWS POINT

CHECKED BY: | DATE: JAN 26, 2010 | FIGURE 8 | DRAWING NUMBER:

ACCOUNTING CHARGE/E.W.O.

ISG-ACAD-V

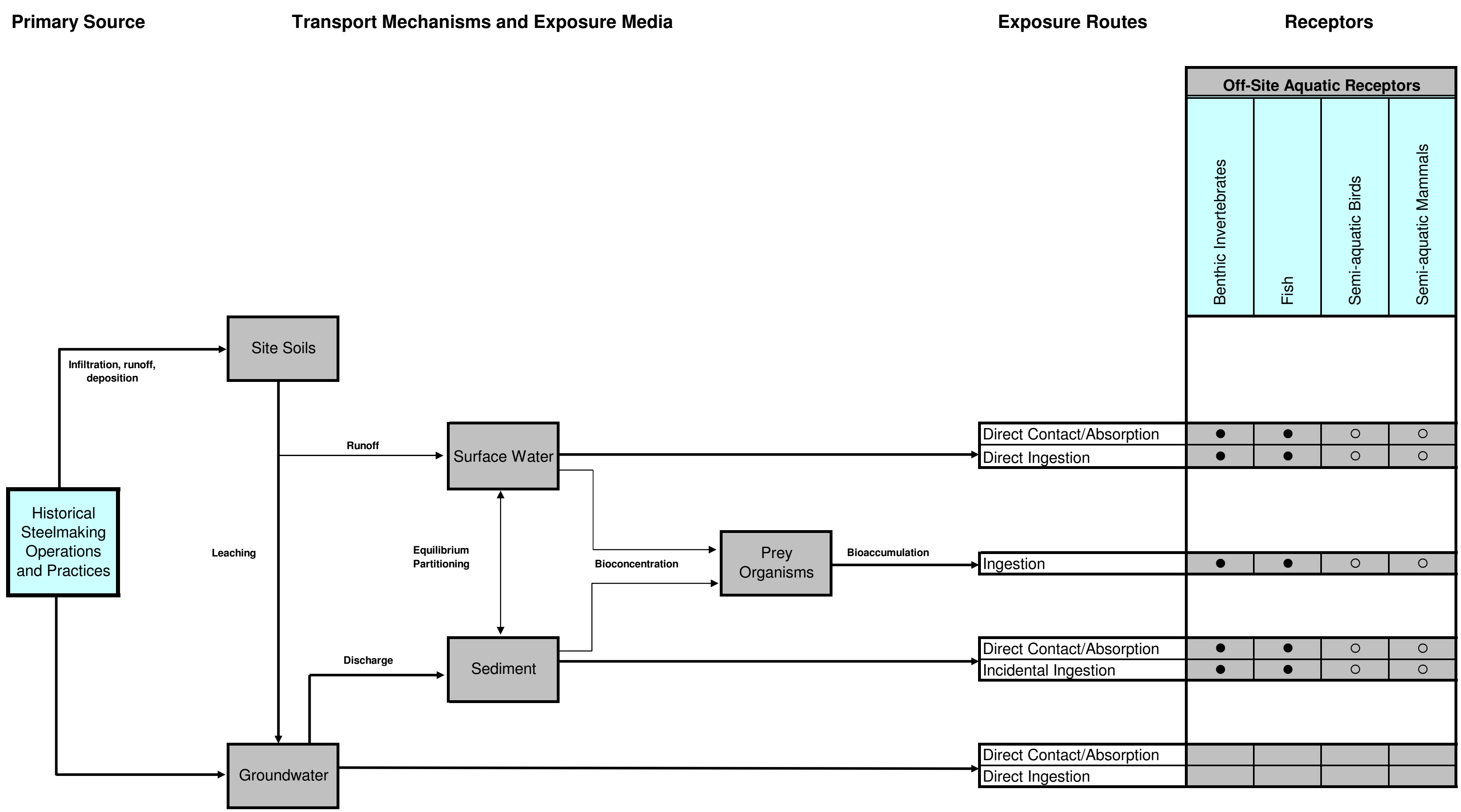
GIS: AER
CHECKED: BE
SENIOR: BE

URS 200 Orchard Ridge Drive Gaithersburg, MD 20878

Figure 9

Planned Benzene Tracing Transect Locations, Coke Oven Area

G:\Projects\SparrowsPoint\Projects\2010\CokeOven-and-CokePoint-TransectsMarch2010.mxd 03/31/10 aer rev2



LEGEND:

● = POTENTIALLY COMPLETE EXPOSURE PATHWAY
○ = INSIGNIFICANT PATHWAY; RECEPTOR DOSE EXPECTED TO BE MINIMAL BASED ON LOW INCIDENCE OF EXPOSURE
BLANK CELL = INCOMPLETE OR INSIGNIFICANT PATHWAY; RECEPTOR DOES NOT COME IN CONTACT WITH AFFECTED MEDIUM

FIGURE 10
OFFSITE ECOLOGICAL CONCEPTUAL SITE MODEL
Sparrows Point Site
Sparrows Point, Maryland

Appendix A

Comparison of Groundwater Concentrations to Ecological Surface Water Quality Benchmarks

Comparison of Groundwater Concentrations to Ecological Surface Water Quality Benchmarks – Coke Oven Area/Coke Point Landfill

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CO06-PZM008

METALS

7439-97-6	Mercury	12/31/2001	0.074	ug/L	J	0.016	ug/L	Marine	Yes

MISC

57-12-5	Cyanide, available	1/3/2002	21	ug/L	J	1	ug/L	Marine	Yes

CO06-PZM039

METALS

7440-38-2	Arsenic	1/11/2002	21.8	ug/L		12.5	ug/L	Marine	Yes

MISC

57-12-5	Cyanide, available	1/3/2002	29	ug/L	J	1	ug/L	Marine	Yes

SVOC

91-20-3	Naphthalene	1/7/2002	1.7	ug/L	J	1.4	ug/L	Marine	Yes

CO10-PZM006

DISS METALS

7440-39-3	Barium	6/18/2004	40	ug/L		4	ug/L	Fresh	Yes
7440-02-0	Nickel	6/18/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/18/2004	1100	ug/L		73	ug/L	Fresh	Yes
7440-62-2	Vanadium	6/18/2004	2200	ug/L		20	ug/L	Fresh	Yes

MISC

57-12-5	Cyanide, available	6/18/2004	2.6	ug/L		1	ug/L	Marine	Yes

SVOC

91-57-6	2-Methylnaphthalene	6/18/2004	22	ug/L		4.2	ug/L	Marine	Yes
86-73-7	Fluorene	6/18/2004	5.8	ug/L	J	2.5	ug/L	Marine	Yes
91-20-3	Naphthalene	6/18/2004	1100	ug/L	D	1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	6/18/2004	16	ug/L		1.5	ug/L	Marine	Yes

VOC

71-43-2	Benzene	6/18/2004	520	ug/L		110	ug/L	Marine	Yes
1330-20-7	Xylenes (total)	6/18/2004	86	ug/L		19	ug/L	Marine	Yes

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CO10-PZM029

DISS METALS

7440-39-3	Barium	6/21/2004	180	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	6/21/2004	5.3	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	6/21/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/21/2004	770	ug/L		73	ug/L	Fresh	Yes
7440-62-2	Vanadium	6/21/2004	170	ug/L		20	ug/L	Fresh	Yes

MISC

57-12-5	Cyanide, available	6/21/2004	8.1	ug/L		1	ug/L	Marine	Yes

SVOC

91-20-3	Naphthalene	6/21/2004	280	ug/L	D	1.4	ug/L	Marine	Yes
108-95-2	Phenol	6/21/2004	320	ug/L	D	58	ug/L	Marine	Yes

CO10-PZM090

DISS METALS

7440-39-3	Barium	6/18/2004	480	ug/L		4	ug/L	Fresh	Yes
7440-31-5	Tin	6/18/2004	400	ug/L		73	ug/L	Fresh	Yes

CO26-PZM007

DISS METALS

7440-39-3	Barium	6/21/2004	60	ug/L		4	ug/L	Fresh	Yes
7440-02-0	Nickel	6/21/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/21/2004	1500	ug/L		73	ug/L	Fresh	Yes
7440-62-2	Vanadium	6/21/2004	300	ug/L		20	ug/L	Fresh	Yes

SVOC

91-57-6	2-Methylnaphthalene	6/21/2004	230	ug/L	D	4.2	ug/L	Marine	Yes
83-32-9	Acenaphthene	6/21/2004	9.3	ug/L	J	6.6	ug/L	Marine	Yes
86-73-7	Fluorene	6/21/2004	39	ug/L		2.5	ug/L	Marine	Yes
91-20-3	Naphthalene	6/21/2004	4800	ug/L	D	1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	6/21/2004	35	ug/L		1.5	ug/L	Marine	Yes

VOC

71-43-2	Benzene	6/21/2004	540	ug/L		110	ug/L	Marine	Yes
108-88-3	Toluene	6/21/2004	260	ug/L		215	ug/L	Marine	Yes

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CO26-PZM007

VOC

1330-20-7	Xylenes (total)	6/21/2004	430	ug/L		19	ug/L	Marine	Yes

CO26-PZM032

DISS METALS

7440-39-3	Barium	6/21/2004	90	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	6/21/2004	10	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	6/21/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/21/2004	1200	ug/L		73	ug/L	Fresh	Yes

METALS

7440-38-2	Arsenic	6/21/2004	14	ug/L		12.5	ug/L	Marine	Yes

SVOC

91-20-3	Naphthalene	6/21/2004	31	ug/L		1.4	ug/L	Marine	Yes

CO27-PZM012

DISS METALS

7440-39-3	Barium	6/28/2004	30	ug/L		4	ug/L	Fresh	Yes
7440-31-5	Tin	6/28/2004	550	ug/L		73	ug/L	Fresh	Yes

MISC

57-12-5	Cyanide, available	6/28/2004	350	ug/L		1	ug/L	Marine	Yes

SVOC

91-57-6	2-Methylnaphthalene	6/28/2004	14	ug/L		4.2	ug/L	Marine	Yes
91-20-3	Naphthalene	6/28/2004	710	ug/L	D	1.4	ug/L	Marine	Yes

VOC

71-43-2	Benzene	6/28/2004	25000	ug/L		110	ug/L	Marine	Yes
108-88-3	Toluene	6/28/2004	3600	ug/L		215	ug/L	Marine	Yes
1330-20-7	Xylenes (total)	6/28/2004	520	ug/L		19	ug/L	Marine	Yes

CO27-PZM046

DISS METALS

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CO27-PZM046

DISS METALS

7440-39-3	Barium	6/28/2004	6.9	ug/L		4	ug/L	Fresh	Yes
7440-31-5	Tin	6/28/2004	250	ug/L		73	ug/L	Fresh	Yes

METALS

7440-38-2	Arsenic	6/28/2004	87	ug/L		12.5	ug/L	Marine	Yes

SVOC

91-57-6	2-Methylnaphthalene	6/28/2004	17	ug/L		4.2	ug/L	Marine	Yes
91-20-3	Naphthalene	6/28/2004	860	ug/L	D	1.4	ug/L	Marine	Yes
108-95-2	Phenol	6/28/2004	420	ug/L	D	58	ug/L	Marine	Yes

VOC

71-43-2	Benzene	6/28/2004	390000	ug/L	D	110	ug/L	Marine	Yes
100-41-4	Ethylbenzene	6/28/2004	600	ug/L		25	ug/L	Marine	Yes
108-88-3	Toluene	6/28/2004	49000	ug/L		215	ug/L	Marine	Yes
1330-20-7	Xylenes (total)	6/28/2004	9200	ug/L		19	ug/L	Marine	Yes

CO27-PZM122

DISS METALS

7440-39-3	Barium	6/28/2004	240	ug/L		4	ug/L	Fresh	Yes
7440-31-5	Tin	6/28/2004	110	ug/L		73	ug/L	Fresh	Yes

CO28-PZM010

DISS METALS

7440-39-3	Barium	6/16/2004	15	ug/L		4	ug/L	Fresh	Yes
7440-31-5	Tin	6/16/2004	110	ug/L	K	73	ug/L	Fresh	Yes

SVOC

117-81-7	bis(2-Ethylhexyl) phthalate	6/16/2004	47	ug/L		16	ug/L	Fresh	Yes
91-20-3	Naphthalene	6/16/2004	150	ug/L		1.4	ug/L	Marine	Yes

VOC

71-43-2	Benzene	6/22/2004	2000	ug/L	D	110	ug/L	Marine	Yes
1330-20-7	Xylenes (total)	6/22/2004	99	ug/L		19	ug/L	Marine	Yes

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CO28-PZM048

DISS METALS

7440-39-3	Barium	6/16/2004	59	ug/L		4	ug/L	Fresh	Yes
7440-31-5	Tin	6/16/2004	370	ug/L	K	73	ug/L	Fresh	Yes

METALS

7440-38-2	Arsenic	6/16/2004	190	ug/L		12.5	ug/L	Marine	Yes

SVOC

91-57-6	2-Methylnaphthalene	6/16/2004	23	ug/L		4.2	ug/L	Marine	Yes
117-81-7	bis(2-Ethylhexyl) phthalate	6/16/2004	72	ug/L		16	ug/L	Fresh	Yes
91-20-3	Naphthalene	6/16/2004	1900	ug/L	D	1.4	ug/L	Marine	Yes
108-95-2	Phenol	6/16/2004	930	ug/L	D	58	ug/L	Marine	Yes

VOC

71-43-2	Benzene	6/22/2004	350000	ug/L	D	110	ug/L	Marine	Yes
100-41-4	Ethylbenzene	6/22/2004	250	ug/L		25	ug/L	Marine	Yes
108-88-3	Toluene	6/22/2004	28000	ug/L	D	215	ug/L	Marine	Yes
1330-20-7	Xylenes (total)	6/22/2004	4600	ug/L		19	ug/L	Marine	Yes

CO28-PZM125

DISS METALS

7440-39-3	Barium	6/16/2004	38	ug/L		4	ug/L	Fresh	Yes
7440-31-5	Tin	6/16/2004	160	ug/L	K	73	ug/L	Fresh	Yes

CO29-PZM010

DISS METALS

7440-39-3	Barium	6/17/2004	280	ug/L		4	ug/L	Fresh	Yes
7440-02-0	Nickel	6/17/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/17/2004	1500	ug/L		73	ug/L	Fresh	Yes

SVOC

91-57-6	2-Methylnaphthalene	6/17/2004	26	ug/L		4.2	ug/L	Marine	Yes
91-20-3	Naphthalene	6/17/2004	580	ug/L	D	1.4	ug/L	Marine	Yes

VOC

1330-20-7	Xylenes (total)	6/22/2004	24	ug/L		19	ug/L	Marine	Yes

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
CO29-PZM051									
DISS METALS									
7440-39-3	Barium	6/17/2004	200	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	6/17/2004	10	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	6/17/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/17/2004	1200	ug/L		73	ug/L	Fresh	Yes
SVOC									
117-81-7	bis(2-Ethylhexyl) phthalate	6/17/2004	21	ug/L		16	ug/L	Fresh	Yes
CO30-PZM015									
DISS METALS									
7440-39-3	Barium	6/17/2004	120	ug/L		4	ug/L	Fresh	Yes
7440-02-0	Nickel	6/17/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/17/2004	710	ug/L		73	ug/L	Fresh	Yes
SVOC									
91-57-6	2-Methylnaphthalene	6/17/2004	43	ug/L		4.2	ug/L	Marine	Yes
86-73-7	Fluorene	6/17/2004	8.7	ug/L	J	2.5	ug/L	Marine	Yes
91-20-3	Naphthalene	6/17/2004	2100	ug/L	D	1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	6/17/2004	8.7	ug/L	J	1.5	ug/L	Marine	Yes
VOC									
71-43-2	Benzene	6/22/2004	54000	ug/L	D	110	ug/L	Marine	Yes
100-41-4	Ethylbenzene	6/22/2004	80	ug/L	J	25	ug/L	Marine	Yes
108-88-3	Toluene	6/22/2004	6300	ug/L		215	ug/L	Marine	Yes
1330-20-7	Xylenes (total)	6/22/2004	1700	ug/L		19	ug/L	Marine	Yes
CO30-PZM060									
DISS METALS									
7440-39-3	Barium	6/17/2004	260	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	6/17/2004	7.7	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	6/17/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/17/2004	540	ug/L		73	ug/L	Fresh	Yes

CO32-PZM004

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

CO32-PZM004

DISS METALS

CAS	Analyte	Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
7440-39-3	Barium	6/18/2004	60	ug/L		4	ug/L	Fresh	Yes
7440-31-5	Tin	6/18/2004	690	ug/L		73	ug/L	Fresh	Yes
7440-62-2	Vanadium	6/18/2004	210	ug/L		20	ug/L	Fresh	Yes

SVOC

CAS	Analyte	Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
91-20-3	Naphthalene	6/18/2004	140	ug/L		1.4	ug/L	Marine	Yes

CO32-PZM041

DISS METALS

CAS	Analyte	Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
7440-39-3	Barium	6/18/2004	390	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	6/18/2004	7.1	ug/L		3.1	ug/L	Marine	Yes
7440-31-5	Tin	6/18/2004	190	ug/L		73	ug/L	Fresh	Yes

SVOC

CAS	Analyte	Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
117-81-7	bis(2-Ethylhexyl) phthalate	6/18/2004	41	ug/L		16	ug/L	Fresh	Yes

CO35-PZM013

DISS METALS

CAS	Analyte	Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
7440-39-3	Barium	6/21/2004	50	ug/L		4	ug/L	Fresh	Yes
7440-02-0	Nickel	6/21/2004	9.9	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/21/2004	770	ug/L		73	ug/L	Fresh	Yes

SVOC

CAS	Analyte	Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
91-57-6	2-Methylnaphthalene	6/21/2004	21	ug/L		4.2	ug/L	Marine	Yes
91-20-3	Naphthalene	6/21/2004	940	ug/L	D	1.4	ug/L	Marine	Yes

VOC

CAS	Analyte	Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
71-43-2	Benzene	6/21/2004	180	ug/L		110	ug/L	Marine	Yes
1330-20-7	Xylenes (total)	6/21/2004	85	ug/L		19	ug/L	Marine	Yes

CO35-PZM056

DISS METALS

CAS	Analyte	Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
7440-39-3	Barium	6/21/2004	180	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	6/21/2004	6.1	ug/L		3.1	ug/L	Marine	Yes

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CO35-PZM056

DISS METALS

7440-02-0	Nickel	6/21/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	6/21/2004	1000	ug/L		73	ug/L	Fresh	Yes

SVOC

91-20-3	Naphthalene	6/21/2004	7.3	ug/L	J	1.4	ug/L	Marine	Yes

VOC

75-15-0	Carbon disulfide	6/21/2004	2.3	ug/L		0.92	ug/L	Fresh	Yes

CP05-PZM008

MISC

57-12-5	Cyanide, available	12/18/2001	77300	ug/L	J	1	ug/L	Marine	Yes

SVOC

91-20-3	Naphthalene	12/18/2001	31	ug/L		1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	12/18/2001	1.7	ug/L	J	1.5	ug/L	Marine	Yes

VOC

75-15-0	Carbon disulfide	12/13/2001	1.9	ug/L		0.92	ug/L	Fresh	Yes

CP05-PZM019

METALS

7439-97-6	Mercury	12/15/2001	0.11	ug/L	J	0.016	ug/L	Marine	Yes

MISC

57-12-5	Cyanide, available	12/18/2001	11900	ug/L	J	1	ug/L	Marine	Yes

SVOC

91-57-6	2-Methylnaphthalene	12/18/2001	5.9	ug/L	J	4.2	ug/L	Marine	Yes
83-32-9	Acenaphthene	12/18/2001	6.7	ug/L	J	6.6	ug/L	Marine	Yes
91-20-3	Naphthalene	12/18/2001	95	ug/L		1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	12/18/2001	1.9	ug/L	J	1.5	ug/L	Marine	Yes
108-95-2	Phenol	12/18/2001	120	ug/L		58	ug/L	Marine	Yes

VOC

75-15-0	Carbon disulfide	12/12/2001	1.2	ug/L		0.92	ug/L	Fresh	Yes

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CP05-PZM028

DISS METALS

7440-39-3	Barium	7/2/2004	580	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	7/2/2004	7.7	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	7/2/2004	50	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/2/2004	2400	ug/L	J	73	ug/L	Fresh	Yes

SVOC

91-57-6	2-Methylnaphthalene	7/2/2004	63	ug/L		4.2	ug/L	Marine	Yes
83-32-9	Acenaphthene	7/2/2004	58	ug/L		6.6	ug/L	Marine	Yes
86-73-7	Fluorene	7/2/2004	24	ug/L		2.5	ug/L	Marine	Yes
91-20-3	Naphthalene	7/2/2004	1300	ug/L	D	1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	7/2/2004	11	ug/L		1.5	ug/L	Marine	Yes
108-95-2	Phenol	7/2/2004	260	ug/L	D	58	ug/L	Marine	Yes

VOC

71-43-2	Benzene	7/2/2004	150	ug/L		110	ug/L	Marine	Yes
1330-20-7	Xylenes (total)	7/2/2004	28	ug/L		19	ug/L	Marine	Yes

CP05-PZM128

DISS METALS

7440-39-3	Barium	7/2/2004	200	ug/L		4	ug/L	Fresh	Yes

CP09-PZM010

DISS METALS

7440-39-3	Barium	7/2/2004	390	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	7/2/2004	7.6	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	7/2/2004	40	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/2/2004	2400	ug/L	J	73	ug/L	Fresh	Yes

SVOC

91-57-6	2-Methylnaphthalene	7/2/2004	8.4	ug/L	J	4.2	ug/L	Marine	Yes
91-20-3	Naphthalene	7/2/2004	99	ug/L		1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	7/2/2004	6	ug/L	J	1.5	ug/L	Marine	Yes
108-95-2	Phenol	7/2/2004	110	ug/L		58	ug/L	Marine	Yes

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CP09-PZM047

DISS METALS

7440-39-3	Barium	7/2/2004	200	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	7/2/2004	10	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	7/2/2004	10	ug/L		8.2	ug/L	Marine	Yes
7782-49-2	Selenium	7/2/2004	80	ug/L		71	ug/L	Marine	Yes
7440-31-5	Tin	7/2/2004	340	ug/L	J	73	ug/L	Fresh	Yes

METALS

7440-38-2	Arsenic	7/2/2004	29	ug/L		12.5	ug/L	Marine	Yes

SVOC

206-44-0	Fluoranthene	7/2/2004	5.9	ug/L	J	1.6	ug/L	Marine	Yes
86-73-7	Fluorene	7/2/2004	9	ug/L	J	2.5	ug/L	Marine	Yes
91-20-3	Naphthalene	7/2/2004	20	ug/L		1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	7/2/2004	23	ug/L		1.5	ug/L	Marine	Yes

CP11-PZM010

DISS METALS

7440-39-3	Barium	7/1/2004	1300	ug/L		4	ug/L	Fresh	Yes
7440-02-0	Nickel	7/1/2004	50	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/1/2004	2900	ug/L	K	73	ug/L	Fresh	Yes

SVOC

91-57-6	2-Methylnaphthalene	7/1/2004	13	ug/L		4.2	ug/L	Marine	Yes
91-20-3	Naphthalene	7/1/2004	95	ug/L		1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	7/1/2004	10	ug/L		1.5	ug/L	Marine	Yes
108-95-2	Phenol	7/1/2004	73	ug/L		58	ug/L	Marine	Yes

CP11-PZM040

DISS METALS

7440-39-3	Barium	7/1/2004	120	ug/L	J	4	ug/L	Fresh	Yes
7440-50-8	Copper	7/1/2004	10	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	7/1/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/1/2004	440	ug/L	K	73	ug/L	Fresh	Yes

METALS

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?
CP11-PZM040									
METALS									
7440-38-2	Arsenic	7/1/2004	19	ug/L		12.5	ug/L	Marine	Yes
CP12-PZM012									
MISC									
57-12-5	Cyanide, available	12/18/2001	170	ug/L	J	1	ug/L	Marine	Yes
SVOC									
91-57-6	2-Methylnaphthalene	12/18/2001	5.5	ug/L	J	4.2	ug/L	Marine	Yes
91-20-3	Naphthalene	12/18/2001	68	ug/L		1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	12/18/2001	2	ug/L	J	1.5	ug/L	Marine	Yes
VOC									
1330-20-7	Xylenes (total)	12/10/2001	22	ug/L		19	ug/L	Marine	Yes
CP12-PZM052									
MISC									
57-12-5	Cyanide, available	12/18/2001	17	ug/L	J	1	ug/L	Marine	Yes
CP14-PZM009									
DISS METALS									
7440-39-3	Barium	7/2/2004	240	ug/L		4	ug/L	Fresh	Yes
7440-02-0	Nickel	7/2/2004	40	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/2/2004	3600	ug/L	J	73	ug/L	Fresh	Yes
SVOC									
91-20-3	Naphthalene	7/2/2004	21	ug/L		1.4	ug/L	Marine	Yes
CP14-PZM062									
DISS METALS									
7440-39-3	Barium	7/6/2004	60	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	7/6/2004	4.9	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	7/6/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/6/2004	610	ug/L		73	ug/L	Fresh	Yes

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CP14-PZM062

SVOC

117-81-7	bis(2-Ethylhexyl) phthalate	7/6/2004	23	ug/L		16	ug/L	Fresh	Yes

CP15-PZM020

DISS METALS

7440-39-3	Barium	7/1/2004	1600	ug/L	J	4	ug/L	Fresh	Yes
7440-50-8	Copper	7/1/2004	6	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	7/1/2004	50	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/1/2004	2600	ug/L	K	73	ug/L	Fresh	Yes

SVOC

91-57-6	2-Methylnaphthalene	7/1/2004	17	ug/L		4.2	ug/L	Marine	Yes
86-73-7	Fluorene	7/1/2004	5.7	ug/L	J	2.5	ug/L	Marine	Yes
91-20-3	Naphthalene	7/1/2004	140	ug/L		1.4	ug/L	Marine	Yes
85-01-8	Phenanthrene	7/1/2004	12	ug/L		1.5	ug/L	Marine	Yes
108-95-2	Phenol	7/1/2004	370	ug/L	D	58	ug/L	Marine	Yes

VOC

75-15-0	Carbon disulfide	7/1/2004	1.6	ug/L		0.92	ug/L	Fresh	Yes

CP15-PZM042

DISS METALS

7440-39-3	Barium	7/2/2004	210	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	7/2/2004	10	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	7/2/2004	10	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/2/2004	220	ug/L	J	73	ug/L	Fresh	Yes

METALS

7440-38-2	Arsenic	7/2/2004	24	ug/L		12.5	ug/L	Marine	Yes

SVOC

117-81-7	bis(2-Ethylhexyl) phthalate	7/2/2004	32	ug/L		16	ug/L	Fresh	Yes

CP16-PZM018

DISS METALS

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CP16-PZM018

DISS METALS

7440-39-3	Barium	7/6/2004	170	ug/L		4	ug/L	Fresh	Yes
7440-02-0	Nickel	7/6/2004	50	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/6/2004	3500	ug/L		73	ug/L	Fresh	Yes

SVOC

91-20-3	Naphthalene	7/6/2004	28	ug/L		1.4	ug/L	Marine	Yes

CP16-PZM035

DISS METALS

7440-39-3	Barium	7/6/2004	680	ug/L		4	ug/L	Fresh	Yes
7440-02-0	Nickel	7/6/2004	70	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/6/2004	3400	ug/L		73	ug/L	Fresh	Yes

SVOC

117-81-7	bis(2-Ethylhexyl) phthalate	7/6/2004	210	ug/L	D	16	ug/L	Fresh	Yes
91-20-3	Naphthalene	7/6/2004	58	ug/L		1.4	ug/L	Marine	Yes
108-95-2	Phenol	7/6/2004	150	ug/L		58	ug/L	Marine	Yes

CP17-PZM013

DISS METALS

7440-39-3	Barium	7/1/2004	180	ug/L	J	4	ug/L	Fresh	Yes
7440-02-0	Nickel	7/1/2004	20	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/1/2004	1600	ug/L	K	73	ug/L	Fresh	Yes

METALS

7440-43-9	Cadmium	7/1/2004	0.8	ug/L	J	0.12	ug/L	Marine	Yes

SVOC

91-57-6	2-Methylnaphthalene	7/1/2004	7.3	ug/L	J	4.2	ug/L	Marine	Yes
91-20-3	Naphthalene	7/1/2004	140	ug/L		1.4	ug/L	Marine	Yes

CP17-PZM058

DISS METALS

7440-39-3	Barium	7/1/2004	200	ug/L	J	4	ug/L	Fresh	Yes

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

CP17-PZM058

DISS METALS

7440-50-8	Copper	7/1/2004	6.3	ug/L		3.1	ug/L	Marine	Yes
7440-02-0	Nickel	7/1/2004	20	ug/L		8.2	ug/L	Marine	Yes
7440-31-5	Tin	7/1/2004	1800	ug/L	K	73	ug/L	Fresh	Yes

TS05-PPM007

DISS METALS

7440-39-3	Barium	6/23/2004	100	ug/L		4	ug/L	Fresh	Yes

TS05-PPM007

DISS METALS

7440-31-5	Tin	6/23/2004	410	ug/L		73	ug/L	Fresh	Yes

MISC

57-12-5	Cyanide, available	6/23/2004	2.2	ug/L		1	ug/L	Marine	Yes

VOC

71-43-2	Benzene	6/23/2004	360	ug/L		110	ug/L	Marine	Yes

Comparison of Groundwater Concentrations to Ecological Surface Water Quality Benchmarks – Humphrey Impoundment

Sparrows Point Marine/Freshwater Benchmark Groundwater Hits Only

		Date	Amount	Units	Lab Flag	Screening Value 1X	Units	Standard Type	Exceeds?

HI08-PZM003

DISS METALS

7440-39-3	Barium	7/7/2004	30	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	7/7/2004	4.8	ug/L		3.1	ug/L	Marine	Yes
7440-31-5	Tin	7/7/2004	300	ug/L		73	ug/L	Fresh	Yes
7440-62-2	Vanadium	7/7/2004	170	ug/L		20	ug/L	Fresh	Yes

SVOC

117-81-7	bis(2-Ethylhexyl) phthalate	7/7/2004	28	ug/L		16	ug/L	Fresh	Yes

HI08-PZM060

DISS METALS

7440-39-3	Barium	7/7/2004	180	ug/L		4	ug/L	Fresh	Yes
7440-50-8	Copper	7/7/2004	3.3	ug/L		3.1	ug/L	Marine	Yes
7440-31-5	Tin	7/7/2004	460	ug/L		73	ug/L	Fresh	Yes

Comparison of Groundwater Concentrations to Ecological Surface Water Quality Benchmarks – Greys Landfill

APPENDIX A
2009 GREYS LANDFILL DATA - SCREENING OF DETECTED GROUNDWATER CONSTITUENTS
SEVERSTAL SPARROWS POINT SITE
SPARROWS POINT, MARYLAND

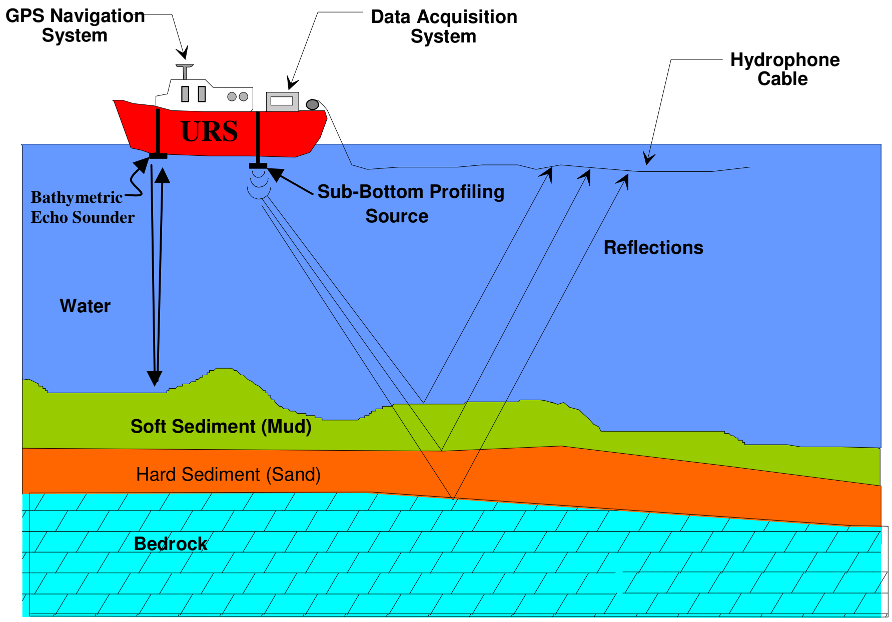
Analyte	CAS No.	Ecological Benchmark	Ref	Greys Landfill Wells											
				GL-02D	GL-02S	GL-05D	GL-05S	GL-12D	GL-12S	GL-15D	GL-15S	GL-16 D	GL-16 S	GL-16 S DUP	TS01 PDM007
Inorganics															
Arsenic	7440-38-2	12.5	a	5.2	6.2	--	**41**	--	--	**19**	5	**22**	--	--	**19**
Barium	7440-39-3	4	b	**94**	**37**	**92**	**200**	**31**	**21**	**77**	**72**	**74**	**19**	**21**	**33**
Beryllium	7440-41-7	0.66	b	--	--	--	--	--	--	--	--	--	**3**	**3.1**	--
Cadmium	7440-43-9	0.12	a	--	**1.5**	--	**1.4**	--	**1.2**	--	--	--	**1.4**	**1.2**	**1.5**
Chromium	7440-47-3	57.5	a	--	6	--	**140**	--	2.9	--	20	--	3.2	3.5	3.7
Cobalt	7440-48-4	23	b	--	--	--	**210**	--	**86**	--	**120**	--	**250**	**250**	--
Copper	7440-50-8	3.1	a	--	**8.2**	--	**85**	--	**3.3**	--	**9.5**	**18**	**5.3**	**4.5**	**3.3**
Lead	7439-92-1	8.1	a	--	**34**	--	**61**	--	3	--	4.6	--	4.2	4.2	**8.5**
Manganese	7439-96-5	120	b	**5,800**	**440**	**4,600**	**2,400**	**2,900**	**360**	**550**	**1,100**	**550**	**530**	**550**	14
Mercury	7439-97-6	0.016	a	--	--	--	--	--	--	--	--	**0.48**	--	--	--
Nickel	7440-02-0	8.2	a	--	**27**	--	**290**	--	**120**	5.4	**160**	--	**360**	**370**	**23**
Selenium	7782-49-2	71	a	17	13	10	6.8	--	--	34	--	41	5.4	6.1	42
Vanadium	7440-62-2	20	b	--	6	--	**180**	--	--	--	**23**	--	--	--	**68**
Zinc	7440-66-6	81	a	--	**400**	--	**620**	--	**340**	--	**240**	--	**750**	**750**	**44**
Organics															
1,1-Dichloroethane	75-34-3	47	b	--	11	--	--	--	--	--	--	--	--	--	--
Benzene	71-43-2	110	a	--	--	--	--	--	--	--	--	--	--	--	5.4
Bis(2-Ethylhexyl)phthalate	117-81-7	16	b	--	6.9	**40**	**28**	7.9	**110**	--	**88**	6.6	**24**	15	--
cis-1,2-Dichloroethylene	540-59-0	680	a	--	2	--	--	--	--	7.8	--	7.1	--	--	--
Di-n-butylphthalate	84-74-2	3.4	a	--	--	--	--	--	--	--	--	--	--	--	**9.1**

Notes:
All values presented in µg/L.
Bold values indicate exceedances of the ecological benchmark.
-- indicates the constituent was either not analyzed or not detected in that sample.
Refs:
a USEPA Region 3 BTAG Marine Screening Benchmarks (7/2006) http://www.epa.gov/reg3hscd/risk/eco/btag/sbv/marine/screenbench.htm
b USEPA Region 3 BTAG Freshwater Screening Benchmarks (7/2006) http://www.epa.gov/reg3hscd/risk/eco/btag/sbv/fw/screenbench.htm

Appendix B

Bathymetric and Sub-Bottom Survey

The geophysical investigation of the offshore areas potentially impacted by releases from the five SSAs will consist of a combination of bathymetric surveying and sub-bottom profiling. The bathymetric survey system consists of an echo sounder. The sub-bottom profiling survey utilizes a data collection system consisting of a survey boat, an acoustic energy source (transducer), an array of hydrophones (seismic streamer) and an acquisition and recording system as shown below.



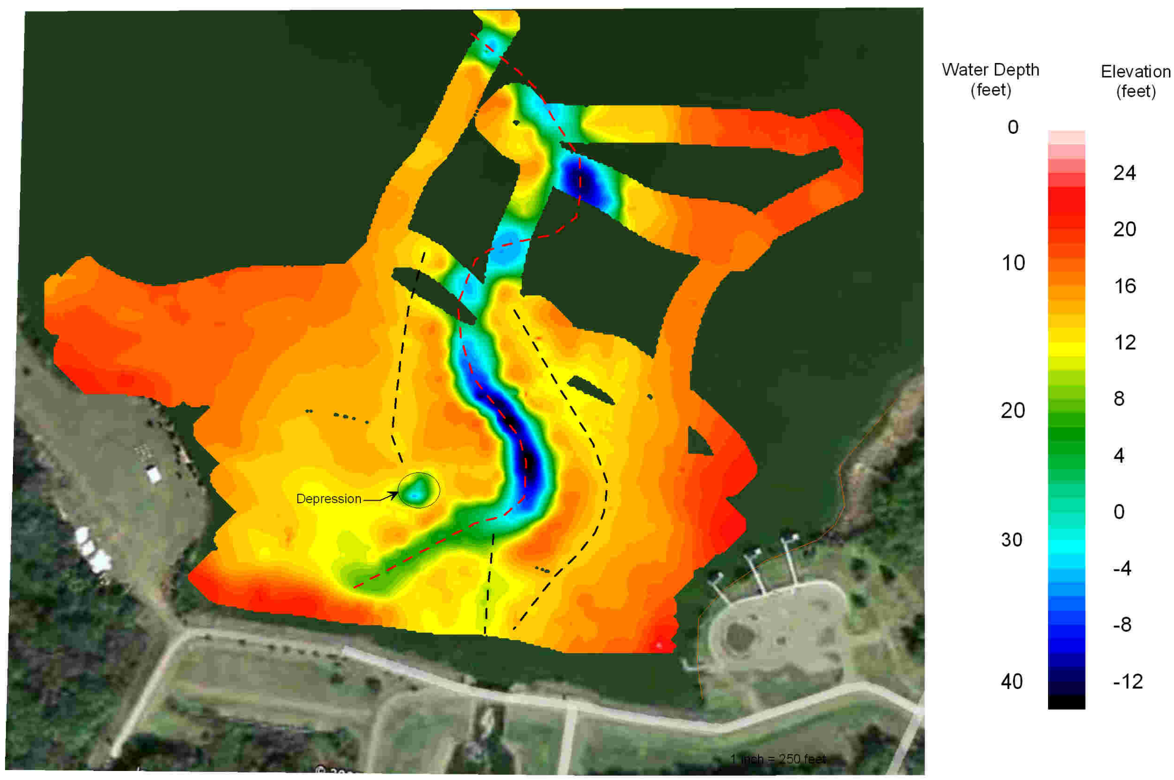
Bathymetric and Sub-bottom Profiling Methods

The acoustic source from the sub-bottom profiler emits seismic pulses into the water at a defined interval (typically in the range of 1 pulse per second). These pulses travel downward through the water column. At the seafloor some of the seismic energy is reflected upward toward the surface. The remaining energy penetrates the seafloor and is subsequently reflected off the relatively complex series of subsurface layers below the seafloor. The reflected pulses are detected by sensors in a seismic streamer cable towed along the water surface. The detected signals are then processed and recorded on a graphic or digital recorder.

The amplitudes of the reflected signals depend upon the impedance contrast between the various layers. The depths to the seismic interfaces can be computed from the travel times for the reflected waves by correlating the results with existing geologic data such as boring logs or through estimating the seismic velocities of the water and sub-bottom layers.

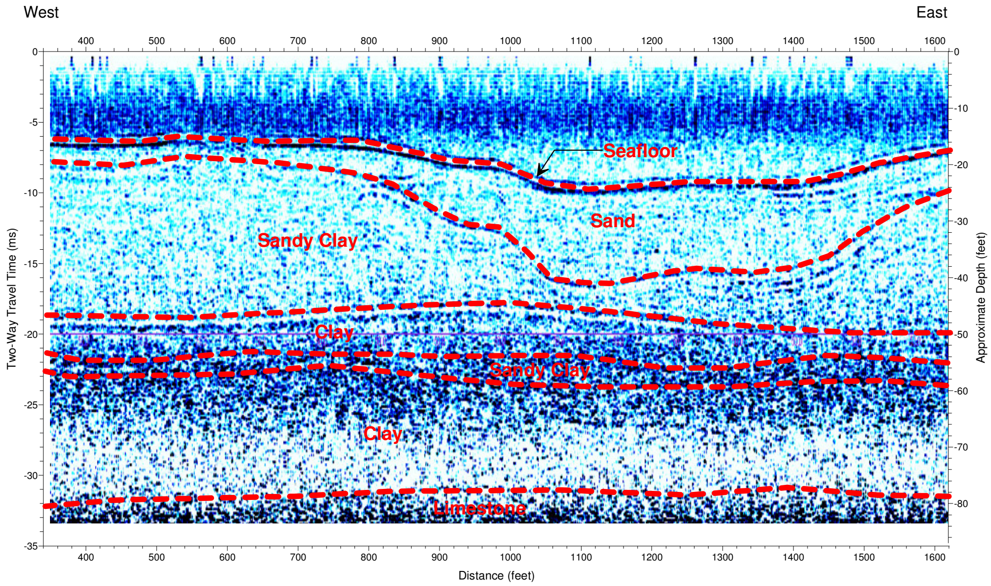
The geophysical investigation will consist of both bathymetric and sub-bottom profiling surveys. The bathymetry survey will be designed to provide high resolution mapping of the topography of the harbor bottom. Bathymetric data will be collected using a MIDAS Surveyor hydrographic survey system. The system includes a dual frequency echo sounder transducer consisting of a 210 kilohertz (kHz) high frequency sensor and a 33 kHz low frequency sensor. The high frequency sensor is optimized for high resolution mapping of the bottom in shallow water. The low frequency sensor is generally optimized for surveying in deeper water and the signal typically penetrates softer upper sediments. The combination of the two sensors can thus provide information on the thickness of soft sediments overlying a hard bottom, if present.

An example of a bathymetric survey URS recently completed marina area in Florida is provided below.



Example Bathymetric Survey Results

The sub-bottom data will be recorded using a single-channel seismic streamer towed at or near the sea surface behind the survey boat. The hydrophone streamer is comprised of multiple element amplifiers at regularly spaced intervals that act as a single receiving system. The acquisition parameters are determined by the user in the topside digital acquisition system, where the raw data is recorded for preliminary processing and interpretation. An example of processed results from a sub-bottom profiling survey URS recently completed for design of a tunnel along the Gulf Coast of Florida is provided below.



Example Sub-Bottom Profiling Results

Survey Design

The geophysical surveys will be completed using a small motorized survey vessel. Geophysical data will be collected along a series of profile lines along the accessible extent of the area of interest. The locations of the profile lines will be optimized during surveying based on observed variations in subsurface conditions as indicated by preliminary processing of the initial profiles.

The sub-bottom profiling data will be collected using an Applied Acoustics Engineering Geopulse System seismic energy source (800 Hz to 2 KHz), a GeoAcoustic amplifier and filter, and a marine hydrophone streamer. Positional data acquisition and navigation will be conducted using a Trimble ProXRS differential global positioning system (DGPS). Positioning and geophysical data will be recorded digitally using a Chesapeake Technology, Inc. Digital Acquisition System.

Recommended Side Scan Sonar Survey

URS recommends that side scan sonar surveying also be used to further characterize the areas of interest. The side scan sonar survey will provide detailed information relative to bottom conditions including the relative consistency of the bottom sediments and will aid in delineating potential man-made obstructions (submerged foundations, sunken vessels) and/or hard bottom features. The side scan sonar survey will also provide useful information for identifying other potential hazards including disturbed sediments, erosion channels, and slides.