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REMEDIAL DESIGN WORK PLAN

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

OPERABLE UNIT 1 – PHASE 1 REMEDIAL ACTION

Prepared for:

Martin Aaron Superfund Site Settling Performing Defendants

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1.0 INTRODUCTION

1.1 Overview

This Remedial Design Work Plan (RDWP) was prepared on behalf of the Martin Aaron Superfund Site Settling Performing Defendants (Group) by Golder Associates Inc. (Golder) for Operable Unit 1 (OU1) of the Martin Aaron Superfund Site (Site) located in the City of Camden, Camden County, New Jersey.

On September 30, 2005, the United States Environmental Protection Agency (USEPA) issued a Record of Decision (ROD) for OU1 that identified the Selected Remedy to address Site soil and groundwater associated with primarily volatile organic compounds (VOCs) and arsenic (USEPA, 2005). As described in the ROD, the Selected Remedy was chosen by the USEPA in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

In the ROD, USEPA bifurcated the remedial action into two phases - Phase 1 remedial action (RA) and Phase 2 RA. The Phase 1 RA incorporates the soil remedy, groundwater monitoring, and establishment of certain institutional and engineering controls for the site. The subsequent Phase 2 RA will address groundwater and additional institutional/engineering controls. The Phase 2 RA is not addressed by this RDWP.

A Consent Decree lodged on November 8, 2007, addresses the design and implementation of the Phase 1 RA by the Group. This RDWP has been prepared pursuant to the Consent Decree and presents the Group's plans and schedules to complete the design of the Phase 1 RA as described in the ROD (Appendix A of the Consent Decree) and the Statement of Work (SOW; Appendix B of the Consent Decree). A description of the Phase 1 RA and the Phase 1 RA design tasks are provided in Sections 1.3 and 1.4 of this document, respectively.

In accordance with the SOW, this RDWP also includes the following:

- Pre-Design Investigation Work Plan (PDI Work Plan; see Appendix A);
- Quality Assurance/Quality Control Project Plan (QAPP; see Appendix B); and,
- Health and Safety Contingency Plan (HSCP; see Appendix C).

1.2 Site Regulatory Background

In May 1997, the New Jersey Department of Environmental Protection (NJDEP) initiated a Remedial Investigation/Remedial Alternatives Analysis (RI/RAA) to determine the nature and extent of residual constituents in soil and groundwater associated with the former Martin Aaron operations. The Site was placed on the USEPA National Priorities List (NPL) on August 23, 1999, concurrent with NJDEP RI activities were underway. Upon completion of the NJDEP's RI in June 2000, the USEPA became the lead agency for the Site, and determined that additional characterization of the Site was required to advance a potential remedy.

The USEPA completed its Remedial Investigation/Feasibility Study (RI/FS) in June 2005. The results of the USEPA RI are described in the *Remedial Investigation Report* dated December 2004 (CH2MHill, 2004) (see Section 2.3.2), and the results of the USEPA FS are described in the *Draft Final Feasibility Study Report* dated July 2005 (CH2MHill, 2005).

On August 12, 2005, the USEPA published its Proposed Remedial Action Plan (PRAP) for the Site. The USEPA provided an opportunity for written and oral comments from the public on the PRAP. Following review of public comments, the USEPA's decision on the remedial action was embodied in the Record of Decision (ROD), executed on September 30, 2005. NJDEP concurred with the ROD in a letter dated September 29, 2005.

Subsequently, from December 2005 to January 2006, the USEPA conducted a two-phased assessment concentrating on the Ponte Equities Property portion of the Site. The Ponte Equities Property was not included in the RI that led to USEPA's selected remedy. The results of the additional assessment are described in *Soil Investigation of the Ponte Equities Site* dated May 2006 (Lockheed Martin, 2006), and *Final Sampling and Analysis Report, Surface Soil and Building Interior Sampling, Ponte Equities Site* dated March 2006 (Weston Solutions, 2006) (see Section 2.3.3). The results of the Ponte Equities investigations provided new information for the Site which has been incorporated in this RDWP.

Qualifications, including a *Quality Management Plan*, for the Group's proposed Supervising Contractor were provided to USEPA on December 6, 2007. The USEPA approved the Group's selection of Golder Associates Inc. as the Supervising Contractor by letter dated January 14, 2008. The Group's selection of *de maximis* as its Project Coordinator was embodied in the Consent Decree.

As required in the SOW, the RDWP was initially submitted to USEPA on February 28, 2008. The RDWP has since been revised to address comments received from USEPA on April 21, 2008 and June 9, 2008. Once approved by the USEPA, the Group will implement the RDWP in accordance with the Consent Decree and the procedures and projected schedules contained herein.

1.3 Description of the Phase 1 RA

As defined in the SOW (Section I., Work To Be Performed), the major soils remediation and institutional controls components of the Phase 1 RA are summarized below:

- Demolition and removal of the Rhodes Drum Building on the Martin Aaron Property, the one-story building on the Ponte Equities Property (and any structure attached thereto other than the three-story building on the Ponte Equities Property);
- Sampling and analysis to further determine the levels and extent of contamination of soils within the Limits of Soil Remediation;
- Excavation of soils within the Limits of Soil Remediation such that all soils containing arsenic at concentrations greater than 300 parts per million (ppm) and/or total volatile organic compounds (VOCs) at concentrations greater than 1 ppm are excavated;
- Off-site transportation and disposal of contaminated soil and debris, with treatment of all Resource Conservation and Recovery Act (RCRA)-hazardous wastes prior to land disposal, as necessary;
- Backfilling and grading of all excavated areas with clean fill;
- Capping of the residual soil contamination at the Site located within the Limits of Soil Remediation that exceeds one or more of the Direct Contact Cleanup Goals set forth in Appendix II, Table 6 of the ROD (see Table 1);
- Groundwater monitoring of certain existing Site wells designated by USEPA during the period of the Phase 1 RD/RA;
- Implementation of institutional controls with respect to areas within the Limits of Soil Remediation, including but not limited to, Deed Notices and a Classification Exception Area (CEA) to, *inter alia*, prevent exposure to residual soils that may exceed levels that will allow for unrestricted use and to restrict the installation of wells and the use of groundwater in the area of groundwater contamination;
- Operation and maintenance of the soils remedy, including monitoring and maintenance of the cap, and activities to maintain the institutional controls; and,
- All activities necessary to the implementation of the foregoing response actions.

1.4 Remedial Design Tasks

This RDWP has been prepared pursuant to the requirements set forth in the SOW and establishes a framework for activities related to the remedial design of the Phase 1 RA as described above. Specifically, in accordance with the SOW, this RDWP includes the proposed methods and procedures for completing the following Phase 1 RA design tasks as described in the SOW:

- Conduct soil sampling within the Limits of Soil Remediation to characterize the extent of contaminated material therein that needs to be removed or capped to satisfy the Remedial Action Objectives and the Performance Standards. The sampling shall include areas within the Limits of Soil Remediation adjacent to the three-story Ponte Equities Building, adjacent to the buildings on the Comarco Property, and adjacent to the building on the Scrapyard Property, along with the other areas within the Limits of Soil Remediation. The sampling will include testing for RCRA-characteristic wastes, as well as contaminants for which the USEPA has established cleanup goals in the ROD;

- Conduct an evaluation of what measures are necessary, if any, to assure that excavation will not adversely affect the structural integrity of the three-story building on the Ponte Equities Property, the buildings on the Comarco Property, and the building on the Scrapyard Property;

- Develop plans and specifications to excavate contaminated surface and subsurface soils within the Limits of Soil Remediation which exceed cleanup goals specified in the ROD;

- Develop plans and specifications to transport excavated soil to an off-site facility for disposal. Plans should anticipate shipment of RCRA-characteristic waste to a RCRA facility when encountered;

- Develop plans and specifications to backfill excavated areas;

- Develop plans and specifications for site preparation and placement of a cap within the Limits of Soil Remediation over the areas that exceed one or more of the Direct Contact Cleanup Goals listed in the ROD;

- Develop plans and specifications for the performance of air monitoring during construction/remedial activities at the Site to ensure that air emissions resulting from the activities meet applicable or relevant and appropriate requirements (ARARs) air emission requirements;

- Develop plans to implement institutional controls that will protect future Site users from contamination left on-site, including deed notices and a CEA; and,

- Develop plans and specifications for the demolition of the Rhodes Drum Building on the Martin Aaron Property and the one-story building on the Ponte Equities Property and any structure attached thereto other than the three-story building on the Ponte Equities Property, including the disposal of any material therefrom.

1.5 Implementation of Phase 1 RA, Phase 2 RA, and the Interim Monitoring Plan

As discussed in Section 1.1, the OU1 remedy is to be phased, with the soil remediation portion of the remedy (Phase 1 RA) initiated before the groundwater portion of the remedy (Phase 2 RA). However, periodic rounds of groundwater monitoring are to be conducted prior to and after implementation of the Phase 1 RA to assess the effectiveness of the soil remedy. As stated in the SOW (Section XII. Interim Monitoring Plan), a groundwater Interim Monitoring Plan (IMP) will be developed during the Phase 1 RA so that it can be implemented to meet the above monitoring objectives.

As described in the ROD, changes in remedial costs are likely to occur as a result of new data collected during the design of the Phase 1 RA. Major changes may be documented in the form of a Technical Memorandum in the Administrative Record file, an Explanation of Significant Difference, or a ROD Amendment (discussed in the ROD under Section *SELECTED REMEDY*). Also, as discussed in the ROD, there are a number of uncertainties associated with the implementation of the Phase 2 RA (groundwater) which may be resolved through the implementation of treatability studies during and after the soil remedy.

The sequencing of the OU1 remedy (soil remediation followed by groundwater remediation) provides sufficient time to implement further groundwater investigation and treatability studies to evaluate in-situ treatment options. In addition, after completion of the soil remedy, the groundwater conditions may have improved and natural attenuation processes may address the remaining constituents. Pending the results of additional groundwater treatability studies (discussed in the ROD under Section *DOCUMENTATION OF SIGNIFICANT CHANGES*), the USEPA has agreed it will consider in-situ treatment in lieu of the selected groundwater remedy.

2.0 SITE DESCRIPTION AND BACKGROUND

2.1 Site Definition and Description

The Site address is 1542 S. Broadway, Camden, New Jersey (as shown on Figure 1). As defined in the Consent Decree, the Site includes the following areas on the tax map of Camden County for the City of Camden:

- Block 460, Lot 1 (Martin Aaron Property) – a property used since 1968 by various companies, including Martin Aaron, Inc;
- Block 460, Lots 2 and 4 (Scrapyard Property) - a scrapyard north of the Martin Aaron Property situated between Broadway and 6th Street on Everett Street, including a vacant brick building, and owned by Mr. George P. Ackerle and Ms. Calogera C. Ackerle;
- Block 460, Lots 3 and 26 (Comarco Property) - an active meat-processing plant located at 501 Jackson Street, south of the Martin Aaron Property, and owned by Mr. Thomas Hoversen and Ms. Karen G. Hoversen;
- Block 460, Lot 29 (Ponte Equities Property) - an abandoned warehouse located south of the Martin Aaron Property on 6th Street, and owned by Ponte Equities, Inc.; and,
- Various adjacent right-of-way locations, including the areas between the above named properties and Broadway, 6th, Jackson, and Everett Streets.

The Site is situated on relatively level land in an area of mixed-industrial and residential properties. The general layout of the Site is shown on Figure 2 and is roughly coincident with the approximately 6.5 acre area defined as the "Limits of Soil Remediation" in the Consent Decree (Figure 2). The Limits of Soil Remediation represents the physical area wherein the Group is required to implement the Phase 1 RA, with the exception of the following areas:

- The area beneath the three-story brick building currently existing on Block 460, Lot 29 (the Ponte Equities Property), including demolition of that building, subsurface soils remediation under that building, and any investigation or remediation within that building;
- The area beneath the building currently existing on Block 460, Lot 4 (portion of the Scrapyard Property), including demolition of that building, investigation of any soil contamination beneath that building and the subsurface soils remediation under that building; and,
- The area beneath the buildings currently existing on Block 460, Lots 3 and 26 (the Comarco Property), including investigation or remediation of any soil conditions beneath these buildings.

Access to the Martin Aaron Property (and most of the Site) is restricted by a chainlink fence with three locked gates, one on Broadway and two on 6th Street. The superstructure of the former main Martin Aaron Building located in the southwestern corner of the Site was demolished and removed by the City of Camden in 1998 (concrete slab remains in place). The only surface structures within the Site to be addressed by the RA are the one-story Rhodes Drum Building and the one-story Ponte Equities Building, both located in the southeastern portion of the Site. Both buildings will be demolished as part of the Phase 1 RA.

The Martin Aaron Property and adjacent commercial properties are zoned for industrial use. As described in the ROD, residential re-use of the Site is not contemplated and will be further restricted with the recording of certain institutional/engineering controls.

The Site and surrounding area is located within the New Jersey Coastal Plain and are underlain by highly permeable, unconsolidated sediments comprised primarily of sands and gravels. The Site is within the outcrop area of the Potomac-Raritan-Magothy (PRM) Aquifer System, the aquifer used by the City of Camden to supply potable water. As noted in the USEPA's Proposed Plan (USEPA, 2005), there are no known drinking water or industrial production wells near the Site or the surrounding properties. The Camden County Municipal Utilities Authority (CCMUA) provides drinking water to the City of Camden using water supply wells. The nearest CCMUA well, which was sampled during the NJDEP Remedial Investigation (NJDEP RI) (see Section 2.2.1) is located approximately 1.75 miles east-northeast of the Site. As discussed in the NJDEP RI, the only parameters measured at concentrations exceeding NJDEP Groundwater Quality Standards were iron and manganese, and this well (City Well #7) is used as an emergency water supply well only (CH2MHill, 2004).

2.2 Site History and Operations

Historical records indicate that the properties within the Site have been used for light industrial activities as early as 1886. From 1887 to 1908, a majority of the Site was used as a tannery by Kifferty Morocco Manufacturing Company, which specialized in the tanning and glazing of hides and leathers. During that time period, the tannery tripled in size.

In 1908, the property was purchased by the Castle Kid Company and was used to produce mat and glazed kid leathers. By 1921, the Castle Kid Company facility had developed into a large scale manufacturing complex. Facility expansion included a substantial amount of building construction,

and the addition of a railroad spur. Expansion included the construction and use of the buildings on the current Ponte Equities property. By 1926, however, the tannery operation was on the decline, and the facility was noticeably downsized.

During tanning operations, animal skins are converted into leather. As described in the *Summary of Historical Ownership and Uses of the Martin Aaron Superfund Site and Select Nearby Properties* (*de maximis*, 2005), tanning operations during that time period used tannin, derived from ground tree bark, as the principle component of the tanning of leather. However a number of other constituents were needed to complete the entire process. The hides were first washed in water for cleansing and softening, and then prepared for depilation (unhairing) by soaking the hides in a lime vat. The hides were often treated with an arsenic solution to enhance the hair-removal process. The hides were then taken from the lime and/or arsenic solution, washed with water, and the hair and flesh scraped off. The resulting leather was softened prior to the tanning process by bating, in which the hide was placed in a bath with water and various compounds, including fermented bran and muriate of ammonia. The hide was then placed into vat containing tannin for a variable time period. When taken out of the vat, the hide was washed, hung to dry, rolled until smooth, hung to dry again, and when thoroughly dry, was ready for market. During the approximate 40 year time period that the property was used for leather tanning operations, the property was impacted with tannery and hide processing wastes.

In 1940, following cessation of tannery operations, the property was seized by the City of Camden due to tax delinquency and sold to Benjamin Schmerling. It was subsequently leased to H. Preston Lowden Company (Preston) and American Chain and Cable Company - Pennsylvania Lawn Mower Division (AC&C). Preston leased building space in the southwestern corner, and operated a hair-and-wool blending business. AC&C leased building space in the southeastern corner for use as the physical plant area of its manufacturing facility.

Martin Aaron, Incorporated (Martin Aaron) purchased its property from Benjamin Schmerling in 1968, and is currently the owner of record. From 1968 to 1987, Martin Aaron operated a drum recycling business on its property. In 1985, Drum Service of Camden, a joint venture, began operating at the Site. In or about 1986, the joint venture purportedly dissolved and Drum Service of Camden continued drum recycling operations as a DBA for Westfall Ace Drum Company (WADCO). Rhodes Drum Incorporated (Rhodes) also operated at the site from around 1985 until it ceased business in 1998. WADCO occupied the main on-site building (the Martin Aaron building),

while Rhodes Drum operated from a smaller building in the southeast corner of the property (Rhodes Drum building). WADCO was liquidated in bankruptcy proceedings in 1994.

2.3 Previous Investigations

2.3.1 NJDEP Remedial Investigation

The NJDEP conducted a three-phased Remedial Investigation (NJDEP RI) between May 1997 and March 2000 for both soil and groundwater to determine the nature and extent of contamination. NJDEP's investigation activities included site mapping, a geophysical investigation to identify buried drums, a stability investigation of the buildings on-site, and soil and groundwater sampling. The investigation was conducted primarily on the Martin Aaron Property and on the South Jersey Port Corporation Property (SJPC) located across the street to the west of the Martin Aaron Property. On the Martin Aaron Property, surface and subsurface soil samples were collected inside and outside of buildings, in underground storage tank (UST) areas, test pits and trench excavations. Surface and subsurface soil samples were collected from the SJPC property. Groundwater samples were collected from 14 monitoring wells installed during the investigation, as well as from the nearest municipal supply well.

The results of the NJDEP RI determined that surface and subsurface soils at the Martin Aaron Property contained levels of organic and inorganic constituents in excess of the published NJDEP Non-Residential Soil Cleanup Criteria (SCC). The NJDEP RI identified the presence of various constituents in surface and subsurface soil samples. The results of the NJDEP RI also showed that shallow groundwater was impacted above the NJDEP Ground Water Quality Standards (GWQS). The results of the NJDEP RI are described in the *Draft Remedial Investigation Report* dated June 2000 (Kimball, 2000).

It was subsequently determined that there were quality assurance/quality control (QA/QC) issues associated with some of the NJDEP data. Further, substantial interim response measures (including excavation and regrading) were completed during and following the NJDEP RI (Section 2.4). These actions suggest the soil sampling results collected during the NJDEP RI are not representative of current Site conditions.

2.3.2 USEPA Remedial Investigation

As stated in the ROD (page 5),

> *"Response actions during 1999 to 2001 were performed partly in response to NJDEP's RI results, and resulted in considerable changes in conditions at the site, with the removal of known contaminated soil areas, along with USTs, above-ground tanks, piping and process equipment. In addition to documenting the conditions after the removal action, EPA's study evaluated data gaps on neighboring properties, collected data that could be used for a human health risk assessment, and supplemented the groundwater investigation performed by NJDEP."*

Concurrent with the NJDEP RI activities, the regulatory lead for Site remedial activities was transferred to USEPA in 1999 when the Site was listed on the NPL. The USEPA conducted an additional RI between October 2001 and September 2002 on the Martin Aaron, SJPC, Scrapyard, Comarco, and the Ponte Equities properties, as well as on the Everett and 6th Street rights-of-way. Surface soil samples were collected from 60 locations, and subsurface soil samples were collected at 72 sampling intervals at depths ranging from greater than two feet below ground surface (bgs) to approximately 21 feet bgs. Groundwater samples were collected from the additional 24 monitoring wells installed as part of the USEPA RI, as well as from 10 of the monitoring wells installed during the NJDEP RI.

The results of the USEPA RI confirmed the presence of previously identified constituents in soil and groundwater (along with some SVOCs, pesticides, PCBs) on both the Martin Aaron Property and surrounding properties. Details of the USEPA investigation activities are presented in the *Remedial Investigation Report*, dated December 2004 (CH2MHill, 2004).

2.3.3 USEPA Assessment of Ponte Equities Property

After the ROD was executed in September 2005, USEPA conducted an assessment of the Ponte Equities Property in December 2005 and January 2006. The assessment was conducted in two parts:

- An investigation of subsurface soil beneath and around the one-story and three-story buildings, as described in the report titled *Soil Investigation of the Ponte Equities Site* dated May 2006 (Lockheed Martin, 2006); and,

- An investigation of potential asbestos containing material (PACM), wall and support column paint chips, dust/floor sweepings, and chimney ash from within Ponte Equities Buildings, as well as surface soil from the alleyway located behind (south) of the building. Air monitoring and a radiation survey were also conducted within the building. Results of the assessment are described in the report titled *Final Sampling and Analysis Report, Surface Soil and Building Interior Sampling, Ponte Equities Site* dated March 2006 (Weston Solutions, 2006).

The investigation primarily identified elevated concentrations of metals within soil/fill beneath and adjacent to the Rhodes Drum Building and the one-story building on the Ponte Equities Property. Additionally, tannery waste was identified beneath the one-story Rhodes Drum Building and the one-story Ponte Equities Building extending northward onto the Martin Aaron Property and eastward towards South 6th Street. The tannery waste was described as very soft, green to black clay with hair and fragments of animal hide and has elevated metal concentrations.

2.4 Previous Enforcement and Remedial Activities

NJDEP conducted several interim remedial measures from 1995 to 1999. NJDEP removed soil, approximately 700 drums of chemical wastes, 10,000 empty drums, dumpsters filled with mixed wastes, several USTs, and several basins used for the discharge of drum residue, rinsate runoff, steam blowdown, and other wastes. In 1998, concurrent with the NJDEP's actions, the City of Camden demolished the superstructure of the Martin Aaron Building (the main building used for drum reconditioning operations) as it was in danger of collapsing.

The USEPA became the lead regulatory agency when the Site was placed on the NPL in 1999. The USEPA undertook additional removal actions, ending in 2001, to remove contaminated soil, USTs, above ground tanks, piping, and process equipment. USEPA also removed 68 drums of hazardous waste, several hundred empty drums, several buried drums, and debris from the vicinity of the Rhodes Drums Building. The property was also fenced to prevent trespassing.

3.0 CONCEPTUAL SITE MODEL (CSM) AND DATA GAPS

As part of the scoping of this RDWP, Site background information, as summarized in Sections 2.3.1 and 2.3.2, was reviewed. Data gaps have been identified to define what additional data are required to update the CSM in support of the remedial design. The following discusses key components of the CSM and the associated data gaps that need to be filled to complete the remedial design, including preparation of the groundwater IMP.

3.1 Summary of RI/FS CSM

The CSM considered in the ROD was prepared by USEPA as part of the Remedial Investigation (CH2MHill, 2004) and the Feasibility Study (CH2MHill, 2005) (RI/FS CSM). The CSM presents an overview of property conditions, potential contaminant migration pathways for the constituents of interest, and potential exposure pathways with an emphasis on volatile organic chemicals likely related to historic drum recycling operations. USEPA's CSM identified the presence of historic fill that has been placed across the Site as part of the Site's early development in the late 1800's. Former tannery operations and potential impacts from these operations were not evaluated by USEPA as sources of historic arsenic contributions to soil and groundwater. Following the RI/FS, USEPA undertook additional Site investigations focusing on former tannery related impacts in the vicinity of the one-story Rhodes Drum and Ponte Equities buildings.

3.2 Updated Remedial Design CSM (RD CSM)

The following discusses updates to key components of the RI/FS CSM for the Site that will be used as part of the technical basis for the remedial design. The RI/FS CSM has been updated based on data from the Weston Solutions report, Final Sampling and Analysis Report, Surface Soil and Building Interior Sampling, Ponte Equities Site, 1565-1575 South 6th Street, Camden, Camden County, New Jersey, March 1, 2006, which was not available at the time the RI/FS CSM was developed. Additional information was also obtained from Camden Public Library (Site document depository), documents available at the Camden Historical Society Library, and selected historic areal photographs (circa 1940, 1957, 1967, 1981 and 1992) and topographic maps (1891 and 1898), which were considered in the RI/FS CMS. The updated CSM is referred to as the remedial design CSM (RD CSM).

Data gaps identified from the RD CSM are also discussed below and will be addressed by the PDI activities outlined in the PDI Work Plan (Appendix A). Figure 3A (Conceptual Site

Geologic Model) and Figure 3B (Conceptual Site Arsenic Model) provide an interpreted RD CSM diagram for use during design of the Phase 1 RA, which was developed based on the current understanding of the Site data including the post-ROD USEPA investigation data.

3.2.1 Surficial Geological and Hydrological Setting

The Site has been used for industrial activities since at least 1886. Historical topographic maps (e.g., U.S. Geological Survey) show that prior to industrial development, a large portion of this area of Camden was drained by a tidal embayment that opened into the Delaware River (Figure 4). During the latter part of the 1800s, many of these tidal embayments were reclaimed by backfilling with assorted fill materials, including dredge materials from the Delaware River. As such, and as documented by USEPA, the Site is underlain by historic fill placed above the former natural estuarine deposits, which occurred prior to land development and continued to occur through the historic use of the Site. This filling included additional placement of assorted fill material including construction and demolition (C&D) fill. As a result of potential emplacement of different fill materials, it is hypothesized, as part of the RD CSM, that Site impacts, particularly arsenic, may be present in discrete historic fill horizons that may be coincident with former surface or near surface soil/fill. This concept will be investigated during PDI activities. It is also hypothesized that the upper portion of the historic fill is more heterogeneous than the lower portions due to the suspected surficial placement of C&D fill. This concept will also be examined during the PDI.

With respect to the current Phase 1 RA design, the most important geologic units on-site are related to surficial and near surface materials, as follows:

- Mixed fill material that has been used as the land surface following Site development[1]. Recent C&D debris (approximately 1 to 2 feet) overlies the mixed fill material on Site except for the southern and southeastern portions of the Site[2] beneath the contiguous Ponte Equities Property one-story and three-story buildings. The surface C&D debris is expected to be more heterogeneous than the majority of the underlying fill material, which is expected to be mostly dredged material from the Delaware River.

- Meadow Mat / Estuarine Marsh Unit defined by highly organic layer consisting of reeds, roots and wood matter, which is typically from 1 to 2 feet thick over most of the Site but up to 4 feet thick in the western portion of the Site near Broadway. Meadow Mat

[1] The mixed fill ranges in thickness from 0 feet to 17 feet across the Site. Generally, fill is thickest in the northwestern portion of the Site and thinnest in the southeastern portion of the Site, with an average thickness over the central portion of the Site of approximately 10 feet.
[2] USEPA Investigation of the Ponte Equities Site, 2006.

generally occurs at elevations from about 8 feet bgs to about 10 feet bgs. The Meadow Mat is a distinct organic layer consisting of fibrous organic matter (peat) interbedded with a glauconitic silty clay and clayey horizon assigned to the Estuarine Marine marsh unit.

The updated interpretation of the surficial geologic setting, however, results in several data gaps which need to be addressed during the design. The Meadow Mat/Estuarine Marsh may be a significant unit in that it potentially serves as a geochemical barrier between the surficial water within the fill material and the groundwater in the underlying units of the Upper PRM Aquifer system. The continuity and character of the Meadow Mat, its potential to serve as a geochemical barrier, and the associated uncertainty in the hydraulic connection between water in the fill material and in groundwater in the Upper PRM Aquifer will be investigated during PDI activities for use in the design of the Phase 1 RA and in developing an effective groundwater IMP.

The Meadow Mat's potential as an important geochemical barrier is based on the geochemical principles which govern the solubility/stability of arsenic in the dissolved phase. The presence of the Meadow Mat was identified following the ROD during the Ponte Equities Investigation (USEPA Investigation of the Ponte Equities Site, 2006). Several geochemical factors determine the speciation of arsenic in groundwater and, therefore, determine the solubility/stability of arsenic (potential impact to groundwater)[3]. These include the redox state of groundwater, pH, dissolved oxygen and mineralogy (specifically iron oxide, iron sulfide and manganese oxide minerals). It is widely recognized that reducing conditions favor arsenite (As^{3+}) species and the presence of iron oxide and iron sulfide minerals act as a sink for arsenic under these same conditions[3]. The Meadow Mat Unit is the historical bottom sediments of a marsh setting containing highly organic materials (e.g. grasses and plant matter) and is generally considered a reducing environment. These same environments are known to contain concentrations of sulfate and sulfide and the presence of iron oxide minerals. Therefore, it is hypothesized that geochemical conditions generated by the presence of the Meadow Mat are conducive to the sequestration of arsenic in the subsurface. Based on this concept, PDI activities and subsequent RA activities should minimally disturb the Meadow Mat Unit to maintain the current geochemical and geologic conditions that may be acting as a barrier between impacted shallow groundwater and the Upper PRM aquifer below. This concept is consistent with the USEPA Monitored Natural Attenuation of Inorganic Contaminants in Ground Water, 2007 where long-term stability of arsenic is shown to depend on prevailing geochemical conditions. This concept

[3] See articles by Nordstrom and Archer, 2003; Clarke and Helz, 2000; Wilkin et al., 2003 and others.

is also central to the development of a successful monitoring program that is designed to consider the potential impacts of changes in Site geochemistry that may alter the stability of arsenic in the subsurface.

It is also important to highlight that regional recharge of the Upper PRM Aquifer is thought to provide increased levels of dissolved oxygen (DO) and generally oxic conditions in the Upper PRM (as reported by USEPA). However, limited geochemical data is available (e.g., oxidation/reduction potential). Understanding the Site groundwater geochemistry is critical as oxic conditions below the Meadow Mat may form a redox boundary with depth in the groundwater system that naturally attenuates arsenic migration. Specifically, there may be material changes in groundwater geochemical conditions immediately below the Meadow Mat unit. As discussed in Section 4.3.3, groundwater geochemistry will be further evaluated during PDI activities for use in developing an appropriate groundwater IMP.

3.2.2 Nature and Extent of Constituents in Soil (Arsenic and VOCs)

The following discussion of the nature and extent of constituents in soil focuses on key data gaps and on those chemicals which have Source Area Cleanup Goals presented in the ROD.

Arsenic

As reported by USEPA, concentrations of arsenic up to approximately 300 milligrams per kilogram (mg/kg) can be attributed to historic fill placed at the Site[4]. This conclusion is supported by the results from the USEPA post-ROD investigations (see Section 2.3.3).

The distribution of arsenic suggests a “top down” release of arsenic from the former tannery operations likely related to operations within the “Beam House”, located initially in the northeastern portion of the Site and then later within the currently named Ponte Equities Property. The introduction of arsenic has primarily affected surficial and near surface materials in this area (which was likely a lower ground surface than exists today, possibly due to settlement and the subsequent placement of surficial historic fill, including C&D materials). A “bottom up” placement of tannery waste in a former depression or basin below and east of the Rhodes Drum Building resulted primarily in subsurface conditions in that area. Limited detections of arsenic above USEPA Source Area Cleanup Goals (> 300 mg/kg) have been detected in “historic fill” in

[4] More specifically, USEPA determined (ROD, page 17) that arsenic concentrations in historic fill could be as high as 339 mg/kg on and off the Site. It was further concluded by USPEA that arsenic concentrations greater than 300 are probably associated with historic operations.

other areas of the Site. These limited detections of arsenic are generally concentrated in the areas defined by USEPA as Arsenic Source Areas Nos. 1 and 2. The horizontal delineation of arsenic to concentrations above 300 mg/kg attributable to historic site operations is a data gap that will be addressed during the PDI for use in completing the Phase 1 RA design.

In addition, the vertical distribution of arsenic is variable and may be concentrated in certain layers or material within the historic fill that could have been, at one time, near the surface during former tannery operations. The PDI will assess the vertical distribution of arsenic within historic fill to assess Phase 1 RA excavation depths and possible segregation of materials for disposal.

Tannery waste was identified during the USEPA post-ROD investigation[5] beneath the Rhodes Drum Building and the existing one-story portion of the Ponte Equities Property in the east-central portion of the Site. The tannery waste, described as a very soft, green to black clay with hair and fragments of animal hides, reaches a thickness of approximately 5 feet (discrete area of thickest portion) and appears to directly overlie the Meadow Mat. Based on a review of the geologic sections provided in the Ponte Equities Property Report (Weston Solutions, 2006), it appears that the tannery waste was disposed of in a depression or basin. Characterization and delineation of the extent of the tannery waste is a data gap and will be evaluated in the PDI for use in completing the Phase 1 RA design.

VOCs

VOCs were detected above the ROD Source Area Cleanup Goals in samples collected from the Martin Aaron Property, but not the surrounding properties. This is consistent with an on-site source of VOC contribution related to former drum recycling operations. VOCs commonly found in subsurface soil on the Martin Aaron Property include tetrachloroethylene (PCE), trichloroethylene (TCE), and vinyl chloride (VC). Delineation of both the vertical and horizontal limits of VOCs within the Source Areas defined by USEPA will be a focus of the PDI.

3.2.3 Contaminant Fate and Transport

The following discussion of fate and transport focuses on key data gaps associated with the development of the RD CSM and on chemicals that have Source Area Cleanup Goals presented in the ROD.

[5] Borings performed by - Roy F. Weston, Lockheed Martin Report, USEPA Investigation of the Ponte Equities Site, 2006.

Arsenic

The fundamental properties that control arsenic mobility and toxicity are geochemical conditions (e.g., pH and ORP) that affect speciation and physical geologic properties (e.g., confinement) that impede mass transfer. While the arsenic contributions probably occurred nearly 50 years prior to VOC contributions on-site, the lateral extent of the arsenic plume is limited. This observation suggests that arsenic is being naturally attenuated both laterally and vertically. As observed in the existing data, arsenic concentrations decrease rapidly in groundwater below 10 feet bgs (mostly confined to the S-series wells). Thus, these data indicate that the Meadow Mat potentially acts as a geochemical barrier, i.e., a zone where geochemical conditions are suitable for the sequestration of arsenic and/or physical mass transfer barrier (see Figures 3A and 3B). Therefore, a groundwater sampling event for arsenic analyses (as well as VOCs[6]), field and laboratory tested geochemical parameters (as well as natural attenuation parameters), will be performed during the PDI activities to evaluate the foundation of the Meadow Mat relative to fate and transport of arsenic that will be used to develop an effective groundwater IMP.

VOCs

Historically, VOCs (mainly PCE and TCE) were reportedly introduced into the soil from historic drum recycling operations, from leaking and/or buried wastes. As discussed in Section 2.4, interim remedial activities have removed many of the VOC sources (drums, tanks, pipelines, impacted soil, etc.). However, remnant source concentrations of VOCs in soil/fill may exist. Many VOCs (e.g., especially PCE and TCE) do not strongly adsorb to soil, and/or organic matter, and may be transported both vertically and laterally, with groundwater flow away from source areas.

The time-series VOC data from Site wells reported in the RI indicate that parent chlorinated VOC compounds (e.g., trichloroethene) are being intrinsically degraded to reduced daughter products (e.g., cis-1,2-dichloroethene and vinyl chloride). These data provide an indication that natural attenuation is occurring, the groundwater conditions are stable and indeed improving following the initial source removal actions. This observation is supported by the USEPA RI in Section 6.5, Conceptual Site Model, which stated that the groundwater contaminant plume is “not only stable, but may be decreasing” due mainly to natural attenuation. Therefore, during the PDI activities a full baseline groundwater sampling event, including VOCs and natural attenuation parameters, will be performed to assess the current state of VOC distribution and natural attenuation that will be used to develop an effective groundwater IMP.

[6] The VOC analyte list is defined in the Quality Assurance/Quality Control Project Plan (QAPP; Appendix B).

As stated above, and consistent with the SOW, a groundwater IMP is to be developed to monitor pre-RA and post-RA conditions. These data will be used to establish the effectiveness of the Phase 1 RA and to enable the assessment for Phase 2 RA activities. One of the significant data gaps established during the RD-CSM is the need to assess the current monitoring well network as it has not been fully sampled since 2002. In addition, recent Site reconnaissance has indicated that the integrity of certain monitoring wells may be impaired and other wells may be damaged. To develop an effective groundwater IMP, utilizing a thorough and representative monitoring well network, a monitoring well assessment and full sampling event will be performed as part of the PDI. Based on the results of this PDI activity a recommendation regarding the adequacy of the monitoring well network, potential well decommissioning and potential new well installation will be made.

4.0 REMEDIAL DESIGN APPROACH

4.1 Access and Other Approvals

Section V.C.1 of the SOW requires the identification, description, and a schedule for obtaining approvals that the Group will need to comply with the Consent Decree, with the exception of those approvals needed from the USEPA. This includes the consent of the owners of record for the properties within the Area of Site Remediation, which include:

- Martin Aaron Property identified as Block 460, Lot 1 on the Tax Map of the City of Camden, County of Camden, New Jersey, owned by Mr. Martin Aaron;
- Comarco Property identified as Block 460, Lots 3 and 26 on the Tax Map of the City of Camden, County of Camden, New Jersey, owned by Mr. Thomas Hoversen and Ms. Karen G. Hoversen;
- Pontes Equities Property identified as Block 460, Lot 29 on the Tax Map of the City of Camden, County of Camden, New Jersey, owned by Ponte Equities, Inc.; and,
- Scrapyard Property identified as Block 460, Lots 2 and 4 on the Tax Map of the City of Camden, County of Camden, New Jersey, owned by Mr. George P. Ackerle and Ms. Calogera C. Ackerle.

The SOW further states that,

> *"Such approvals shall include the consent of owners or property at or near the Site regarding access to conduct sampling, monitoring, remediation, restoration or other activities, in accordance with the Consent Decree, and approval from any off-site facility accepting waste materials from the Site."*

As of the date of this RDWP, the Group has secured appropriate access agreements with the owners of the Martin Aaron Property, Comarco Property, and the Scrapyard Property. The Group is currently in discussions with the owner of the Ponte Equities Property. It is anticipated that the remaining access agreement will be in-place prior to the implementation of this RDWP. The Group will advise USEPA if that expectation changes and may request assistance from USEPA in obtaining access if delays result in unacceptable scheduling amendments.

As discussed in Section 4.5.3, (Transport of Soil for Off-Site Disposal), written approvals from off-site disposal facilities will be obtained prior to shipment of remediation wastes off-site. Once soil characterization is completed during the PDI, off-site disposal facilities will be contacted during design to assess the various disposal options discussed in Section 4.5 (Soil Management).

Final property access and disposal site approval requirements will be dependent upon the findings of the PDI and remedial design decisions. Thus, the access and approvals discussed above will be updated as necessary.

4.2 Building Demolition

The ROD requires that the Rhodes Drum Building on the Martin Aaron Property and the one-story building on the Pointe Equities Property (and attached structures) be demolished and removed from the Site. To address existing data gaps relevant to the design of the Phase 1 RA, additional investigation of the materials beneath these existing buildings is necessary. Several borings are planned as part of the Pre-Design Investigation (see Appendix A) within and adjacent to the one-story Ponte Equities Building and the Rhodes Drum Building. However, due to the dilapidated condition of these existing buildings, additional investigation within these structures will expose workers to unsafe working conditions. A partial roof collapse occurred after the 2004-2005 USEPA investigation of this area and additional roof collapse could occur at any time.

Therefore, demolition and removal of the unstable superstructure (roof and walls) of the one-story Ponte Equities Building and the Rhodes Drum Building will be conducted as an initial PDI task (see Figure 2). The building substructures (floor slabs and foundations) will be left in place leaving the material below them unexposed. Depending on their condition, the remaining slabs may then be used for equipment staging and storage and for locating temporary decontamination facilities during the PDI.

As discussed in greater detail in the PDI Work Plan (Appendix A), the demolition of these buildings is expected to be a straightforward and routine building demolition project. Requests for utility service disconnections will be made to PSE&G (gas and electric) and Verizon (telecommunications). A licensed plumber will disconnect water and sewer under a City-issued permit. Upon utility removal/disconnection, a request for demolition permit will be made to the City of Camden Building Bureau. Separate requests for utility disconnection and application for demolition permits are required for each property owner (i.e., for the Rhodes Drum Building on the Martin Aaron Property and the one-story building on the Ponte Equities Property).

Asbestos containing materials (ACM) or lead-based paint is not anticipated to be present within the buildings based upon the findings of the Weston Solutions report entitled, “Final Sampling and Analysis Report, Surface Soil and Building Interior Sampling, Ponte Equities Site, 1565-

1575 South 6th Street, Camden, New Jersey" dated March 2006. However, exterior sampling was not performed previously, and the only potential material of concern is the roofing given the bare masonry exterior. As outlined in the PDI Work Plan, pre-demolition sampling of the roofing materials will be performed to determine if ACM are present.

Reasonable care and precautions will be taken during demolition of the one-story Ponte Equities Building to maintain the existing condition of the three-story Ponte Equities Building and the immediately adjacent Comarco Building. A structural evaluation and a pre-demolition, baseline conditions survey of the adjacent three-story Ponte Equities building will be completed to document existing physical conditions by a professional engineer licensed to practice in the State of New Jersey. Upon completion of demolition, the three-story Ponte Equities Building will be re-surveyed by the professional engineer, and the results of the post-demolition conditions survey compared to the baseline to assess if damage has occurred that would comprise the structural integrity of the building.

4.3 Pre-Design Investigation

In accordance with the SOW (Section I. Work To Be Performed), sampling and analysis to further determine the extent of soil/fill impacts within the Limits of Soil Remediation is required to be performed prior to the design of the Phase 1 RA. In addition, Section 3.0 of this RDWP discussed data gaps that need to be filled during the PDI to provide data for completing the Phase 1 RA design and developing an effective IMP.

PDI sampling and analysis is primarily needed to design the horizontal and vertical limits of the source area excavations. In addition, the PDI will also obtain the following additional information needed to complete the detailed design of the Phase 1 RA:

- Analytical results of surficial soil/fill samples (if necessary) to determine the areal extent of the cap (engineering controls);
- Geotechnical information related to design of excavation sideslopes and protection of buildings, utilities, and roadways adjacent to excavations;
- Geotechnical information related to potential processing and handling of excavated materials, and the compaction of excavation backfill; and,
- Chemical/RCRA characterization of soil/fill to allow development of a site-wide soil management plan that will address excavated soil/fill from source areas, off-site disposal of soil/fill, backfilling the source area excavations, and on-site consolidation of soil/fill.

Furthermore, as discussed in Section 3.0 of this RDWP, the PDI will also obtain the following information needed to develop an effective IMP for groundwater:

- Groundwater monitoring well inventory and well condition survey;
- Groundwater monitoring well surveying and groundwater level evaluation; and,
- Baseline groundwater field testing, sampling, and laboratory analysis.

The PDI Work Plan describes the design data acquisition activities and is presented in Appendix A of this RDWP. Activity-specific field procedures and laboratory methods and quality control criteria are presented in the Quality Assurance Project Plan (QAPP) included as Appendix B of this RDWP. Implementation of the PDI will be conducted in accordance with the Site Health and Safety Contingency Plan presented in Appendix C of this RDWP. Specific issues associated with the implementation and sequencing of certain PDI activities are discussed below.

4.3.1 Site Preparation

Site preparation activities need to be performed prior to conducting the PDI Site characterization activities and geotechnical evaluation. These Site preparation activities include the following:

- Clearing of brush, saplings, some trees, and surficial debris in areas required to provide unrestricted physical access for Site characterization and related activities;
- Utility markouts and geophysical survey to assess locations of underground utilities; and,
- Staging/clearing of debris from scrap yard should be performed by the property owner to provide access for characterization sampling in this area.
- Site Security – inspect and provide necessary repairs or additions to fence and lighting for site control.

4.3.2 Staged PDI Soil Characterization Approach

The PDI soil characterization will be implemented in two stages. Stage 1 of the PDI will provide a better understanding of the current Source Area delineation and the distribution of chemicals within the Source Areas. Stage 2 of the PDI will complete the Source Area delineation and allow focused collection and analysis of RCRA characterization samples within the Source Areas. While it is anticipated that the delineation of the Source Areas will be complete after Stage 2, the results of Stage 2 will determine the need for additional delineation. Details of the Stage 1 and

Stage 2 soil delineation and RCRA characterization programs are discussed in the PDI Work Plan (see Appendix A).

4.3.3 Groundwater PDI Activities and Groundwater Interim Monitoring Plan

As discussed in the SOW (Section I. Work To Be Performed), the groundwater component of the Phase 1 RA includes groundwater monitoring during the period of the Phase 1 RD/RA. The SOW further specifies that an Interim Monitoring Plan (IMP) for groundwater be developed and submitted to USEPA within 90 days following USEPA's Authorization to Proceed, which was given on January 16, 2008. However, as discussed in Section 3.0 of this RDWP, there are a number of technical reasons why an initial assessment of the existing groundwater monitoring network should be completed during the PDI prior to preparing the IMP. These reasons were reviewed with USEPA during a project meeting on February 6, 2008, during which USEPA concurred that the submittal of the IMPA could be deferred until completion of the groundwater PDI. This concurrence was memorialized in a letter from *de maximis* (Project Coordinator) to USEPA on February 26, 2008.

Therefore, a monitoring well condition survey, well redevelopment (as needed), and an initial round of groundwater field testing and sampling and analyses (including arsenic, VOCs, geochemical and natural attenuation parameters) will be performed during the PDI prior to the IMP being submitted to USEPA. This information will allow refinement of key components of the CSM (as discussed in Section 3.0) and will allow development of a more effective IMP. The results of the groundwater PDI activities and possible recommendations to upgrade the existing groundwater monitoring system (e.g., abandon existing wells and install new wells) will be presented and discussed in the PDI Report/Preliminary Design Report for review by USEPA. The IMP will then be prepared following receipt of USEPA's comments on the PDI Report. This sequence of activities will allow the implementation of the IMP during design (as a Pre-Phase 1 RA baseline) and after the Phase 1 RA has been implemented (Post-Phase 1 RA monitoring) in accordance with the SOW. As mentioned above, USEPA has concurred with this approach.

4.3.4 Geotechnical Investigation

Additional geotechnical data is required to develop an implementable design for the Source Area excavation components of the remedy. A series of geotechnical soil borings and test pits will be performed at the Site as discussed in the PDI Work Plan (Appendix A).

Geotechnical borings will be performed within and adjacent to soil excavation areas. Particular attention will be paid to subsurface soils along 6th Street and adjacent to the three-story building to remain on the Ponte Equities Property, where subsurface soil excavation is likely. The emphasis on these two boundaries results from the need to maintain ground stability during soil excavation to avoid damage to the building and uninterrupted use of the roadway. Standard Penetration Tests will be performed in all geotechnical borings to obtain N-values for correlations to be used in geotechnical analyses, and to collect disturbed samples for laboratory index testing to confirm soil classifications made in the field. Where soft, compressible soils are encountered, relatively undisturbed sampling will be attempted to obtain samples for laboratory strength and consolidation testing. Refer to the PDI Work Plan (Appendix A of this RDWP) for additional sampling details.

Test pits will be excavated immediately outside of the footprints for the Rhodes Drum Building and both buildings on the Ponte Equities Property in an attempt to observe the depth, type and thickness of the building foundations. This information is needed to evaluate the potential affect of excavation immediately adjacent to the three-story Ponte Equities Building. Test pits will also provide additional general information about the historic fill material encountered at the Site, including its composition, classification(s) and consistency. The test pits may also provide experience with potential odor concerns from the Source Area excavations.

4.4 Soil Excavation Design

The following subsections discus a number of design issues associated with the Source Area excavations.

4.4.1 Source Area Delineation and Cleanup Goals

The boundaries of the excavation areas will be based on the delineation of arsenic and VOCs to the Source Area Cleanup Goals in Table 6 of the ROD (presented as Table 1 in this RDWP). Further clarification with respect to delineation to the VOC Source Area Cleanup Goals is presented below.

The ROD also defines VOC Source Areas as potential threats to groundwater quality, and states that remediation of soils/fill containing greater than 1 ppm total VOCs (TVOC) will reduce this issue. The ROD, however, does not define a specific method for calculating the TVOC value. Table 6 in the ROD provides Source Area Cleanup Goals for six compounds listed as VOCs,

including: benzene, bis-2-chloroethyl ether (BCEE)[7], chloroform, tetrachloroethylene (PCE), trichloroethylene (TCE), and vinyl chloride. With the exception of chloroform, these VOCs are the same as those listed in ROD, Table 7 (presented as Table 2 of this RDWP), which provides Cleanup Goals for Groundwater (benzene, BCEE (not a VOC), PCE, TCE, and vinyl chloride). Soil source area remediation is based on the same VOCs that have been identified by USEPA as a concern in groundwater, therefore, the calculation of TVOCs and the subsequent delineation of the VOC source areas will be based on the sum of the VOCs listed in ROD Table 6 (i.e., the same VOCs that have groundwater cleanup goals). For non-detected results for ROD Table 6 VOCs, one-half (1/2) of the method quantitation limit as listed in the QAPP (Appendix B) will be used in the TVOC summation.

Detections of other VOCs[8] that may cause a VOC summation at the Source Area boundary to exceed the 1 ppm target concentration will be evaluated and discussed with USEPA on a case-by-case basis. Furthermore, ½ of the non-detected results for these other VOCs will not be included in the summation since they have not been specifically identified as a concern in soil or groundwater.

4.4.2 Excavation Boundaries

Excavation boundaries will be determined by the two-stage delineation approach outlined in the PDI Work Plan. This approach will be consistent with New Jersey Technical Requirements (N.J.A.C. 7:26E). The PDI delineations will form the basis for developing hard line excavation boundaries during design such that post-excavation sampling will not be necessary during the RA. The PDI Work Plan provides greater detail regarding the delineation approach.

It should be noted that consistent with the Consent Decree, the design excavation boundaries will also reflect potential limitations imposed by geotechnical and structural constraints, as indicated by the discussion of the engineering challenges in Section 4.4.3 below. In particular, the design must reflect a reasonable approach to maintaining the stability of 6th Street and the three-story Ponte Equities Building, and if necessary, other adjacent roadways and buildings. Results of the structural evaluation of the buildings to remain and the results of geotechnical analyses conducted

[7] There is no precedence for grouping BCEE as a VOC as BCEE was reported as an SVOC in the USEPA RI and it is analyzed using current SVOC methods. Therefore, BCEE is not considered a VOC.
[8] Other VOCs are those VOCs not listed in ROD Table 6 but reported as part of the sample VOC analysis results.

after obtaining pertinent subsurface data during the PDI are critical to the determination of these constraints.

4.4.3 Geotechnical Engineering Challenges

The ROD remedy for soil presents several, notable geotechnical engineering challenges based on the general understanding of subsurface conditions and the potential extents of excavation. These challenges include:

- Bottom stability (i.e., boiling, heaving) of excavations to be carried out below groundwater;
- Groundwater control/dewatering, including drawdown effect (e.g., settlement) on adjacent structures;
- Stability of open-cut excavations with sloped sidewalls;
- Excavation along the curbline of South 6th Street while maintaining the existing level-of-service of the roadway; and,
- Excavation against existing buildings (e.g., three-story Ponte Equities Building; Comarco buildings) while maintaining structural integrity of the buildings.

As previously suggested in Section 4.4.2, excavation of soil impacted at concentrations greater than the cleanup goals immediately adjacent to the curbline of 6th Street and the three-story Ponte Equities Building may not be reasonable based upon geotechnical and structural considerations. Results of the pre-demolition structural evaluation of this building and the results of geotechnical analyses that will be made as part of the PDI Report/Preliminary Design Report will be used to evaluate these challenges with respect to the concerns discussed below.

Based upon observations made during Site visits, 6th Street is heavily traveled by large commercial trucks. It exhibits severely deteriorated bituminous pavement underlain by historical Belgium block paving, which cannot tolerate settlement without compromising performance of the roadway. Settlement can occur as a result of dewatering or lateral movement of soils toward the face of a vertical excavation, even with a shored excavation.

Similarly, it may be difficult or impossible to maintain the existing condition and integrity of the dilapidated, abandoned concrete and masonry three-story Ponte Equities Building with a vertical excavation against the building. No information exists regarding the foundations for the building.

Also, prior investigation activities penetrated the floor slab of this building and discovered a void space below, which could also impact foundation stability during excavation of surrounding soils.

4.5 Soil Management

Design of the Phase 1 RA involves several soil management decisions and the need to develop a Soil Management Plan in order to effectively implement the Phase 1 RA. The Soil Management Plan will address the following design considerations:

- Segregation and stockpiling of soils excavated from Source Areas and/or produced from other Phase 1 RA construction activities;
- On-Site consolidation of non-Source Area soils[9] within source area excavations;
- Off-Site disposal of excavated Source Area soils as:
    - Solid (non-hazardous) waste and
    - RCRA-characteristic hazardous waste; and,
- In-situ preconditioning of Source Area soil and off-site disposal as a solid (non-hazardous) waste.

The Soil Management Plan will be consistent with applicable regulations for the management of solid and hazardous waste and will be presented in the Preliminary Design Report. General descriptions of the key concepts that will be presented in the Soil Management Plan are described in the following subsections.

4.5.1 On-Site Soil Management

The presence of historic fill across the Site and the Site's long and varied history of industrial use have resulted in the presence of arsenic, VOCs, and other constituents across the Site that exceed the Direct Contact Cleanup Goals in ROD Table 6, but are below the Source Area Cleanup Goals. The Phase 1 RA is anticipated to produce substantial quantities of these "non-source area soils" from the following construction activities:

- Excavation of source areas and segregation of non-source area soils from soils exceeding Source Area Cleanup Goals;
- Cap construction;

[9] "Non-Source Area Soils" are those having arsenic and VOC concentrations below Source Area Cleanup Goals.

- Site grading; and,
- Surface water management system construction.

Since the concentrations of arsenic and VOCs in these soils would be less than the Source Area Cleanup Goals, the Soil Management Plan will describe how these soils will be consolidated on-site for use as fill material within the source area excavations. These materials would be capped as with other soils requiring capping in accordance with the ROD. On-Site soil consolidation will be consistent with the ROD since soil having arsenic and VOCs exceeding Source Area Cleanup Goals will be removed and disposed of off-site and soils having concentrations that exceed Direct Contact Cleanup Goals will be capped.

4.5.2 Off-Site Soil Disposal Management

In accordance with the SOW, excavated soils having arsenic and VOC concentrations above the ROD Source Area Cleanup Goals will be disposed of off-site. As described in the PDI Work Plan (Appendix A of this RDWP), areas of the Site exceeding Source Area Cleanup Goals will be analyzed for RCRA toxicity characteristics (TCLP) and full inorganics and organics analyses (see QAPP; Appendix B) during the PDI to determine the RCRA characteristics and to assess the presence of potential underlying hazardous constituents, respectively. This data will be used to assess soil disposal alternatives (including potential pre-treatment requirements) and determine whether in-situ soil pre-conditioning options will be considered during the design. Notably, USEPA has determined that the soil contaminants are not listed hazardous waste (ROD, page 32).

Several options for the off-site disposal of excavated source area soils will be considered during design and include (but not limited to) the following:

- Excavation and disposal in a permitted solid waste landfill;
- In-situ soil conditioning, excavation, and disposal in a permitted solid waste landfill;
- Excavation and disposal in a permitted RCRA hazardous waste landfill; and,
- Excavation and off-site pre-treatment prior to disposal in a permitted RCRA hazardous waste landfill.

A detailed description of the soil disposal characterization program, including, but not limited to, sample collection procedures, frequencies, and analytical methods to characterize excavated soils

prior to disposal will be provided in the detailed design. Written confirmations from off-site disposal sites will also be obtained during design contingent upon final material characterization.

Given the anticipated large quantities of soil that may need to be disposed of off-site and the wide range of potential disposal costs, it is imperative that the design consider cost-effective and regulatory compliant off-site disposal options. Thus, a cost-benefit analysis will be performed on a number of available disposal options. A bench-scale soil conditioning study, discussed in Section 2.6.3.4 of the PDI Work Plan, will be conducted during the PDI to allow evaluation of the in-situ soil conditioning option during design and provide information required for the cost-benefit analysis.

4.5.3 Transport of Soil for Off-Site Disposal

The Soil Management Plan will also discuss plans and specifications (to the extent necessary) to properly manage the off-site transportation of soils to the disposal facilities. Written approval from the off-site disposal facilities will be obtained prior to shipment of waste soil/fill off-site. Shipments of hazardous waste will be accompanied by a Uniform Hazardous Waste Manifest in accordance with 40 CFR Parts 260, 261, 262, 263, 264, 265 and 271 and 70 FR 10776, as corrected by 70 FR 35034. Transportation routes will be defined in the Soil Management Plan and the Group will avoid using residential portions of the City of Camden to the extent practicable.

4.6 Capping

4.6.1 Limits of Cap

The Limits of Soil Remediation defines the area within which a cap may need to be installed to mitigate future direct contact exposures to soil/fill having chemical concentrations exceeding the ROD Table 6 Direct Contact Cleanup Goals. In addition, the ROD (based on FS Figure 4-5) approximated the areal extent of the cap within the Limits of Soil Remediation as shown on Figure 2 of this RDWP. As shown on Figure 2, USEPA has concluded that all four properties that constitute the Site will have areas that require capping.

The data from the PDI Stage 1 and Stage 2 Source Area delineation soil borings will be used to further evaluate the limits of capping on the Martin Aaron, Scrapyard and Ponte Equities properties. The evaluation may conclude that it is necessary to conduct additional sampling to

more fully define the limits of capping in these areas. The result of this evaluation will be discussed with USEPA at that time. No Source Area delineation is planned for the Comarco Property and therefore the small unpaved areas will be capped. Similarly, no Source Area delineation is planned for the small open area south of the three-story Ponte Building and this area will also be capped.

The ROD Direct Contact Cleanup Goals are the established criteria for determining the limits of capping. In addition, an order of magnitude evaluation of the NJDEP Non-Residential Direct Contact Soil Remediation Standards published in N.J.A.C. 7:26D will also be considered when determining the limits of capping.

4.6.2 Capping Materials

The objective of the capping remedial component is to mitigate future direct contact exposures to soil/fill that exceed the Direct Contact Cleanup Goals in the ROD. Reduction of infiltration is not a remedial objective of the cap. As stated in the ROD (page 21) *"Asphalt capping has been specified, for cost-estimation purposes, though a redevelopment plan including a combination of building foundations and other ground covers could be designed that would be protective."* As such, the design will evaluate various types of permeable capping materials with consideration given to factors including: performance, drainage requirements, maintenance, use, and meeting the exposure pathway control objective as well as future development. Consideration will be given to the use of new asphalt or concrete pavement systems (including pervious concrete and other porous pavements), soil, gravel, or recycled materials possibly underlain by a geotextile separator/marker layer. Combinations of these systems and materials along with existing paved surfaces at the Site will be considered for the cap. In addition, it will be beneficial to provide a cap that is amenable to the future Site redevelopment, as discussed below.

4.6.3 Coordination of Capping Component with Site Redevelopment

The ROD objective of controlling direct contact exposures can be achieved using a variety of capping approaches and materials. Furthermore, it will be more suitable and economically beneficial to future Site redevelopment to design a cap that can be easily adapted to possible cover and grade changes associated with the future Site redevelopment. As such, it would be impractical during the implementation of the remedial action to attempt to design final Site grading; surface water management features and facilities; and, a permanent capping element (e.g., pavement across the Site) without considering future Site redevelopment needs.

Instead, an adaptable design that implements rough grades and uses easily altered and re-used cap materials (e.g., soils, gravel, recycled material), would be more appropriate and will also minimize the need for surface water management infrastructure that might limit how the Site could be redeveloped. The proposed approach will provide a cap that can achieve the stated objective of direct exposure pathway elimination. The approach will also provide a high level of flexibility to economically accommodate future Site redevelopment.

4.6.4 Institutional/Engineering Controls

Institutional and/or engineering controls on the various properties within the Limits of Soil Remediation are required. These properties include:

- Martin Aaron Property owned by Mr. Martin Aaron;
- Comarco Property owned by Mr. Thomas Hoversen and Ms. Karen G. Hoversen;
- Pontes Equities Property owned by Ponte Equities, Inc.; and,
- Scrapyard Property owned by Mr. George P. Ackerle and Ms. Calogera C. Ackerle.

As discussed in Section 4.1 above, the Group has obtained access agreements and agreements for the imposition of institutional controls from Martin Aaron and Comarco, and is in the process of securing similar agreements from the other two property owners. Information from existing investigations and/or the PDI will be used to document the conditions of surface soil/fill for the institutional controls. The design will continue to track the progress of establishing these institutional controls.

A Classification Exception Area (CEA) proposal will be submitted to NJDEP, as required, following the implementation of the initial baseline round of IMP groundwater monitoring.

5.0 REMEDIAL DESIGN DELIVERABLES

In accordance with the SOW, the following remedial design deliverables will be submitted to the USEPA and NJDEP for review and approval:

- Preliminary (35%) Remedial Design Report;
- Pre-Final (95%) Remedial Design Report; and,
- Final Remedial Design (100%) Report.

In addition to the Remedial Design Reports, the results of the Pre-Design Investigation (discussed in Section 4.0 and Appendix A) will be submitted to the USEPA and NJDEP in a Pre-Design Investigation Report, discussed below.

Pursuant to the SOW, each Remedial Design Report will include the following:

- Discussion of the design criteria and objectives, with emphasis on the capacity and ability to meet design objectives successfully; and,
- Plans and specifications that have been developed at that point in time, along with a design analysis. The design analysis will provide the rationale for the plans and specifications, including results of all sampling and testing performed, supporting documentation of how the plans and specifications meet the requirements of the ROD and shall provide a discussion of any impacts the findings have on the Remedial Design.

Each Remedial Design Report will also include the following, to the extent that work has been performed regarding the items:

- Technical specification for photographic documentation of the remedial construction work;
- Discussion of the manner in which the Remedial Action will achieve the Performance Standards;
- Plan for establishing institutional controls; and,
- Draft schedule for Remedial Action activities, and a preliminary schedule for operation and maintenance activities.

Additional requirements for specific reports are described below.

5.1 Pre-Design Investigation Report (PDI Report)

The PDI Report will describe the activities conducted during the Pre-Design Investigation, including building demolition, site clearing, utility clearance, environmental soil investigation, geotechnical soil investigation, and monitoring well conditions study and groundwater monitoring. The PDI Report will also present the results from these activities. The PDI Report will be provided as an appendix to the Preliminary Design Report, as discussed below.

5.2 Preliminary Remedial Design Report (35% Design)

The Preliminary Remedial Design Report (PRD) will represent approximately 35% of the overall design effort. A conceptual design of the various elements of the remedy developed in this design phase will serve as the basis for the final design, pending USEPA approval, and so the PRD will include appropriate scoping calculations presenting the basis for the design and an accompanying narrative.

In accordance with the SOW, the PRD will include:

- The design criteria;
- Discussion and evaluation of the required Remedial Design activities (i.e., soil sampling, evaluation of building integrity, etc.), and their results;
- Preliminary design drawings showing general arrangement of all Remedial Action work planned;
- To the extent available, a discussion of the manner in which the design components (i.e. plans and specifications for building demolition[10]; excavation, transportation and disposal of contaminated soil; backfilling excavations; site preparation and placement of cap; air monitoring during construction; and plans for institutional controls) are considered in the design; and
- To the extent available, a Table of Contents for the specifications, including a listing of items from the Construction Specifications Institute (CSI) MasterFormat™ 1995 edition that are expected to be included in the construction specifications.

As discussed above, the PDI Report will be included as an appendix in the PRD.

[10] As discussed in Section 4.2 of this RDWP, the superstructure of the Rhodes Drum Building and the one-story Ponte Equities Building is proposed to be demolished during the PDI. To the extent necessary, demolition of the substructure will be incorporated into the design.

USEPA comments on the PRD will be incorporated in the Pre-Final Design Report. Following receipt of USEPA comments, a letter will be prepared by the Group describing the manner in which the comments on the Preliminary Remedial Design Report will be addressed in the Pre-Final Design Report (i.e., a revised Preliminary Remedial Design Report will not be submitted).

5.3 Pre-Final Remedial Design Report (95% Design)

The Pre-Final RD will constitute a complete design submittal. In addition to the requirements listed above, the Pre-Final RD report will include the following final documents:

- Engineering plans representing an accurate identification of existing Site conditions and an illustration of the work proposed. Typical items to be provided on such drawings include, at a minimum, the following:

  - Title sheet including at least the title of the project, a key map, the name of the designer, date prepared, sheet index, and USEPA/NJDEP Project identification;
  - All property data, including owners of record to all properties within 200 feet of the Site;
  - A site survey including the distance and bearing of all property lines that identify and define the project site;
  - All easements, right-of-ways, and reservations;
  - All buildings, structures, wells, facilities, and equipment (existing and proposed) if any;
  - A topographic survey, including existing and proposed contours and spot elevations for all areas that will be affected by the remedial activities, based on U.S. Coast and Geodetic Survey data;
  - All utilities, existing and proposed;
  - Location and identification of all significant natural features including, *inter alia*, wooded areas, water courses, wetlands, flood hazard areas, and depressions;
  - Flood hazard data and 100-year and 500-year flood plain delineation;
  - North arrow, scale, sheet numbers and the person responsible for preparing each sheet;
  - Decontamination areas, staging areas, borrow areas and stockpiling areas;
  - Miscellaneous detail sheets;
  - Definitions of all symbols and abbreviations; and,
  - A specification for a sign at the site. The sign should describe the project, the name of the contractor performing the RD/RA work or the Group, state that the project is being performed under USEPA oversight, and provide an USEPA contact for further information.

- Survey work that is appropriately marked, recorded and interpreted for mapping, property easements and design completion;

- Drawings of all proposed equipment, improvements, details and all other construction and installation items to be developed in accordance with the current standards and guidelines of the State of New Jersey. Drawings shall be of standard size, approximately 24" x 36". A list of drawing sheet titles will be provided;

- Engineering plans (as necessary) indicating, at a minimum, the following:

  - Site security measures;
  - Roadways; and,
  - Electrical, mechanical, structural, as required.

- Construction Specifications in CSI MasterFormat™;

- Any value engineering proposals;

- A Construction Quality Assurance Project Plan (CQAPP), which shall detail the approach to quality assurance during construction activities at the Site, shall specify a quality assurance official (QA Official), independent of the Remedial Action Contractor, to conduct a quality assurance program during the construction phase of the project. The CQAPP shall address sampling, analysis, and monitoring to be performed during the remedial construction phase of the Work. Quality assurance items to be addressed include, at a minimum, the following:

  - Inspection and certification of the Work;
  - Measurement and daily logging;
  - Field performance and testing;
  - As-built drawings and logs; and
  - Testing of the Remedial Action work to establish whether the design specifications have been attained.

- A report describing those efforts made to secure access and institutional controls and to obtain other approvals and the results of those efforts. Legal descriptions of property or easements to be acquired shall be provided, along with final engineer's construction cost estimate. Draft Deed Notices and Classification Area Exception documents, and if requested, draft access and/or land/water use restriction easements, shall be provided;

- A plan for implementation of construction and construction oversight;

- A method for selection of the construction contractor(s);

- A final engineer's construction cost estimate; and,

- A proposed schedule for implementing all of the above.

USEPA comments on the Pre-Final RD will be incorporated in the Final Design Report. Following receipt of USEPA comments, it is anticipated that a letter will be prepared by the Group describing the manner in which the comments on the Pre-Final RD will be incorporated into the Final Design Report (i.e., a revised Pre-Final RD will not be submitted).

5.4 Final Remedial Design Report (100% Design)

The Final Remedial Design Report shall include all of the above, including agreed-to changes requested by the USEPA on reviewing the Pre-Final RD report. The Final Report will include the revised design drawings, specifications and schedule for Remedial Action.

6.0 PERFORMANCE STANDARDS

6.1 Remedial Action Objectives

The Phase 1 Remedial Action will be designed to achieve compliance the following Performance Standards, which include the Remedial Action Objectives set forth in the ROD:

- Reduce or eliminate the direct contact threat associated with contaminated soil to levels protective of a commercial or industrial use and protective of the environment. This will be performed by achieving the cleanup levels found in Appendix II, Table 6 of the ROD. Soil/fill remaining on-site in excess of Direct-Contact Cleanup Goals (Commercial/Industrial) will be capped to eliminate potential exposure pathways;
- Prevent erosion and off-site transport of contaminated soils;
- Reduce or eliminate the migration of Site contaminants from soil to groundwater and surface waters;
- Prevent public exposure to contaminated groundwater that presents a significant risk to human health and the environment; and,
- Minimize or eliminate organic vapor migration from groundwater into future indoor environments that may be built on the Site.

The remaining two Remedial Action Objectives will be addressed during Phase 2 of the Remedial Action for the Site and will therefore not be addressed during the design of the Phase 1 Remedial Action:

- Remediate groundwater to the extent practicable and minimize further migration of contaminants in groundwater; and,
- Restore groundwater to drinking water standards within a reasonable time frame.

6.2 Applicable or Relevant and Appropriate Requirements (ARARs)

Phase 1 of the Remedial Action will be designed to achieve compliance with those potential applicable or relevant and appropriate requirements (ARARs) identified in the ROD that are relevant and appropriate to the remedial design of the Phase 1 RA. The Phase 1 RA will also be designed to comply with the substantive requirements promulgated under the Resource Conservation and Recovery Act (RCRA), the New Jersey Technical Requirements for Site Remediation (N.J.A.C. 7-26E et seq.), the New Jersey Brownfield and Contaminated Site Remediation Act (N.J.A.C. 58:10B), and applicable local requirements. For state and local

requirements, only those substantive requirements that are more stringent than federal requirements and that do not conflict with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, are considered ARARs.

Chemical-Specific ARARs

The Source Area Cleanup goals established in ROD Table 6 will be used to define the boundaries of the soil excavation as discussed herein. The Direct Contact Cleanup Goals (Commercial/Industrial) established in the ROD will be used to determine the limits of capping. In addition, an order of magnitude evaluation of the NJDEP Non-Residential Direct Contact Soil Remediation Standards published in N.J.A.C. 7:26D will also be considered when determining the limits of capping.

Action- and Location-Specific ARARs

Action and location specific ARARs will be identified during remedial design. The Action- and Location-Specific ARARs to be considered during design will include, but are not limited to:

- National Emission Standards for Hazardous Air Pollutants (40 CFR Part 61);
- NJ Administrative Code (N.J.A.C.) 7:26E *et seq*, New Jersey Technical Requirements for Site Remediation. Note: The substantive requirements of the Technical Requirements may qualify as ARARs where they are more stringent than federal requirements and where they do not conflict with CERCLA or the ROD requirements. This distinction is relevant, for example, where the Technical Requirements require deliverables inconsistent with the NCP or where they require permits that conflict with provisions of CERCLA or the NCP;
- National Ambient Air Quality Standards (40 CFR Part 50);
- RCRA – Identification and Listing of Hazardous Wastes (40 CFR Part 261);
- RCRA - Land Disposal Restrictions for off-site disposal (40 CFR Part 268);
- RCRA - Generator Requirements for Manifesting Waste for off-site Disposal (40 CFR Part 263);
- RCRA - Transporter Requirements for off-site Disposal (40 CFR Part 270);
- DOT - Rules for Hazardous Materials Transport for off-site disposal (49 CFR Parts 107, 171, 173);
- E.O. 11988 – “Floodplain Management”;
- N.J.A.C. 7:13 – flood hazard and stream encroachment;

- USEPA – "Statement of Policy on Floodplains Management and Wetlands Protection";
- OSHA 29CFR 1910, 1904, 1926 – Worker Health & Safety;
- CCMUA Sewer Ordinance – discharge to POTW;
- N.J.A.C. 7:14A – Treatment Works Approval;
- N.J.A.C. 7:26G-1 – Solid and Hazardous Waste;
- Camden Construction & Building Bureau;
- Camden Flood Zone Determination; and,
- Federal National Historic Preservation Act (16 USC 469 et seq. and 40 CFR 6301(c) – applicable if historical or archaeological data is encountered during Remedial Action.

7.0 REMEDIAL DESIGN SCHEDULE / DRAFT REMEDIAL ACTION SCHEDULE

A schedule for implementation of the Remedial Design tasks is provided in a Gantt (bar) Chart format as Figure 5. The major RD task in the schedule include preparation of the RDWP, completion of the Pre-Design Investigation, preparation of the Remedial Design Reports, and preparation of the Interim Groundwater Monitoring Plan.

Figure 5 also reflects a draft schedule for implementation of the Remedial Action tasks. It is currently assumed that the major RA tasks include Remedial Action Contract Bidding, preparation of Remedial Action Work Plan, completion of the Remedial Action, Pre-Final and Final Inspections, preparation of the Remedial Action Report, Interim Groundwater Monitoring, and Operation and Maintenance of the OU1 Remedy.

The SOW requires that the Remedial Design schedule provide for completion and submittal to the USEPA of the Final Remedial Design Report within 9 months of USEPA's written notification of approval of this RDWP. However, the additional data collected by the USEPA following execution of the ROD (see Section 2.3.3) necessitates an expanded Pre-Design Investigation, which in turn requires demolition of the Rhodes Drum Building and the one-story Ponte Equities Building prior to mobilization (see Section 4.2). The Remedial Design schedule shown on Figure 5 takes this additional work into consideration. It should also be noted that there are a number of items that may affect the proposed Remedial Design schedule, which include:

- USEPA's review of project deliverables;
- Regulatory approval of required permit equivalences (as necessary);
- Potential community actions;
- Weather-related delays during the field work;
- Results of the Stage 1 and Stage 2 PDI, which may necessitate additional work to complete the source area delineation; and,
- Securing access from Ponte and the Scrap Yard.

The remedial action components of the schedule are preliminary and will be refined throughout the remedial process, and may be revised.

8.0 PROJECT ORGANIZATION

The following discusses the roles and responsibilities of the key members of the Group's project team for the Phase 1 RA design. Lines of communication are summarized in the diagram below.

de maximis Project Coordinator – Geoffrey Seibel

Mr. Geoffrey Seibel is the Group's Project Coordinator and is the primary liaison between the Group and USEPA. Mr. Seibel is also the primary liaison between the Group and the Group's Supervising Contractor (Golder Associates Inc.).

Golder Associates Project Manager – Randolph S. White

Mr. Randolph S. White is Golder's Project Manager for Phase 1 RA design. Mr. White is an engineer and Principal in Golder's Mt. Laurel, NJ office. Mr. White is responsible for the overall project direction, providing for appropriate technical input and reviews for design-related deliverables, and will review major design reports.

Golder Design Manager – Robert S. Valorio

Mr. Robert Valorio, P.E. is a licensed Professional Engineer in the State of New Jersey and Senior Engineer at Golder's Mt. Laurel, New Jersey office. Mr. Valorio is responsible for technical direction and details of the design with emphasis on geotechnical and building demolition issues.

Golder Health and Safety Coordinator – James Valenti

James Valenti is the Golder Mt. Laurel office's Health and Safety Coordinator. Mr. Valenti is responsible for overall direction and evaluation of Health & Safety issues related to building demolition and implementation of the PDI.

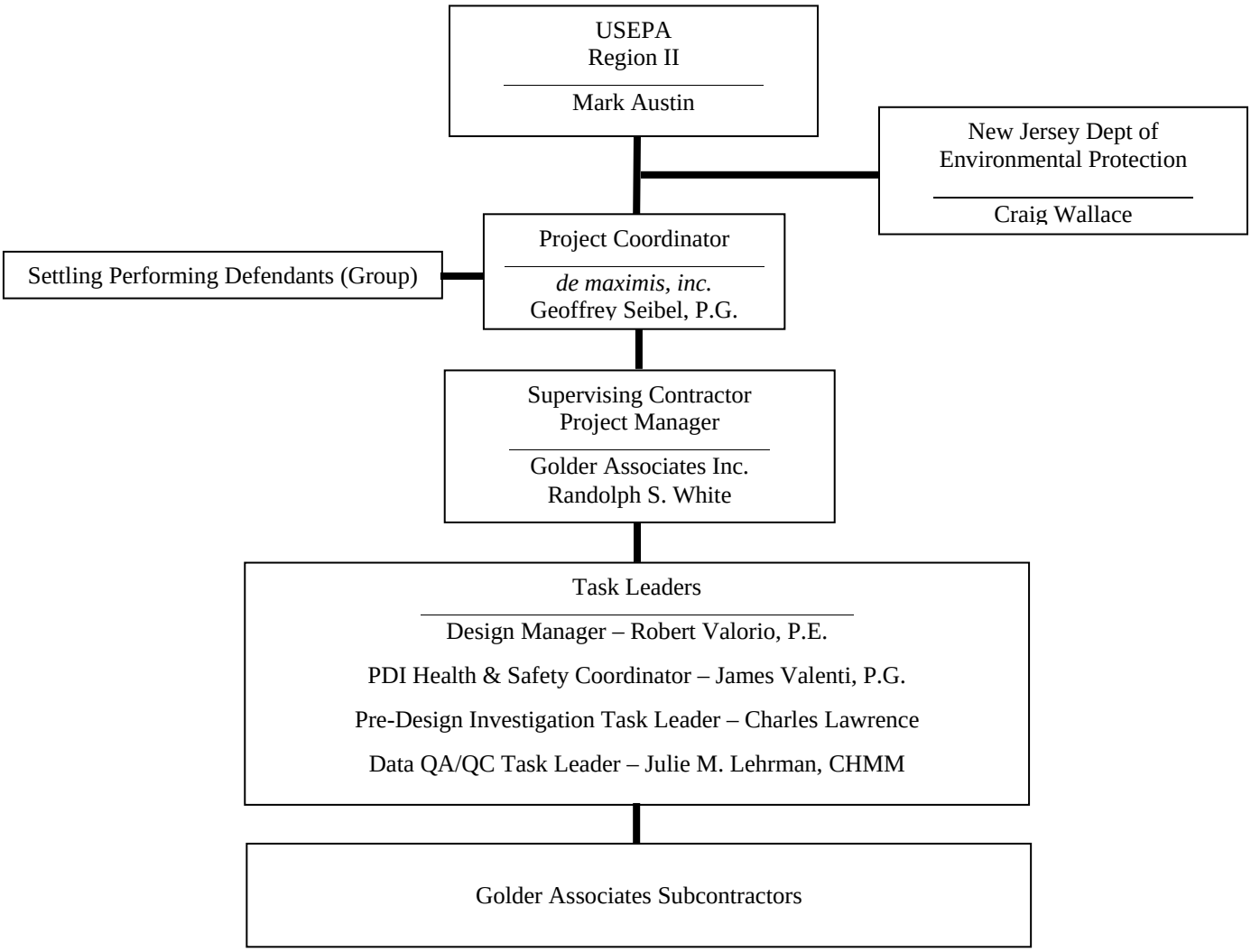
Golder Pre-Design Investigation Field Task Leader – Charles Lawrence

The field task leader for the PDI will be Mr. Charles Lawrence, a Project Geologist at Golder's Mt. Laurel, New Jersey office. Mr. Lawrence is responsible for the day to day coordination of all environmental PDI field activities. Mr. Lawrence will also be the in-field Health and Safety Officer during the PDI and is responsible for implementation of the QAPP requirements for field activities.

Golder Data QA/QC Task Leader – Julie Lehrman

The project chemist for this work will be Ms. Julie Lehrman. Ms. Lehrman is a project chemist at Golder's Mt. Laurel, New Jersey office. Ms. Lehrman will be responsible for the coordination and review of laboratory sample analyses, the validation of analytical results, and for documenting compliance with the requirements and objectives of the QAPP.

An Organization Chart showing the relationship and primary lines of communication between the key personnel for the overall project is shown below.



9.0 REFERENCES

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TABLE 1

APPENDIX II, TABLE 6
Cleanup Goals for Soil
Martin Aaron Site

Chemical	Direct-Contact Cleanup Goals (Commercial/Industrial)	Source Area Cleanup Goals
Metals		
Arsenic	20	300
VOCs		
Benzene	1.4	1
Bis(2-chloroethyl)ether	0.58	
Chloroform	0.47	1
Tetrachloroethylene	1.3	1
Trichloroethylene	0.11	1
Vinyl Chloride	0.75	10
SVOCs		
Benzo[a]anthracene	2.1	
Benzo[a]pyrene	0.21	
Benzo[b]fluoranthene	2.1	
Benzo[k]fluoranthene	21	
Dibenzo[ah]anthracene	0.21	
Indeno[123-cd]pyrene	2.1	
Pesticides		
Aldrin	0.10	
Dieldrin	0.11	
PCB - Aroclor 1254	10	
PCB - Aroclor 1260	10	

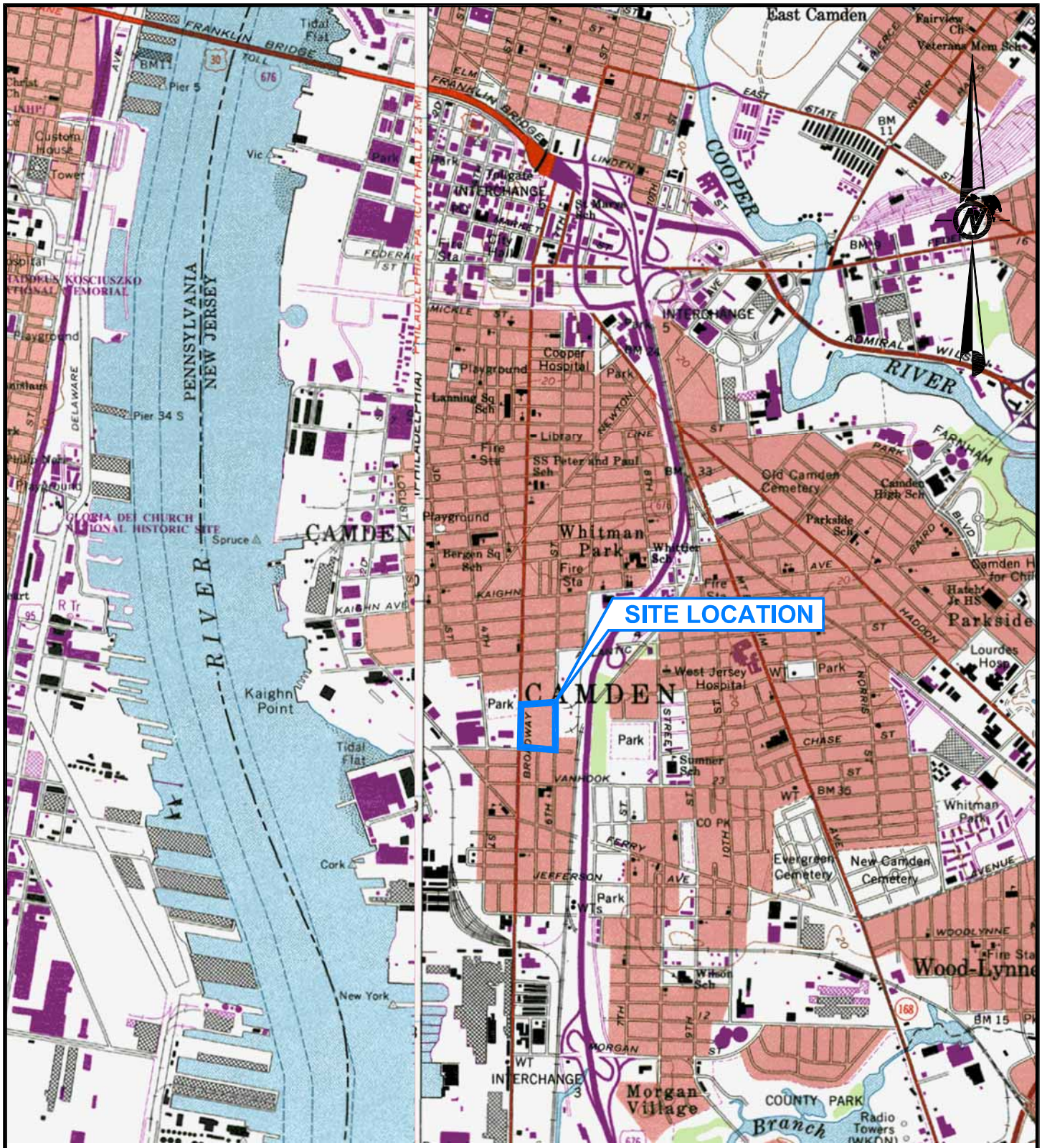
Notes:
1. All goals expressed as parts per million (ppm).

TABLE 2

APPENDIX II, TABLE 7
Cleanup Goals for Groundwater
Martin Aaron Site

Chemical	EPA MCL	NJ MCL	NJ GWQS
Metals	—		
Arsenic	10	50	8
VOCs			
Benzene	5	1	1
Bis(2-chloroethyl)ether	NA	NA	10
Tetrachloroethylene	5	1	1
Trichloroethylene	5	1	1
Vinyl Chloride	2	2	5
Pesticides			
Dieldrin	NA	NA	0.03

1. The lowest values of the promulgated cleanup goals shown above, shall be used.
2. All goals expressed as parts per billion (ppb).



REFERENCE

1.) BASE MAP TAKEN FROM USGS 7.5 MINUTE SERIES QUADRANGLES OF CAMDEN, NJ–PA., DATED 1994 AND PHILADELPHIA, PA–NJ., DATED 1994.

2000 0 2000
SCALE FEET

NJ Authorization #24GA28029100

Golder Associates
Philadelphia USA

FILE No.	07386114A013	SCALE	AS SHOWN
PROJECT No.	073–86114	REV. 0	DATE 02/28/08
		DESIGN	SDM
		CADD	RG
		CHECK	MJB
		REVIEW	RSW

TITLE

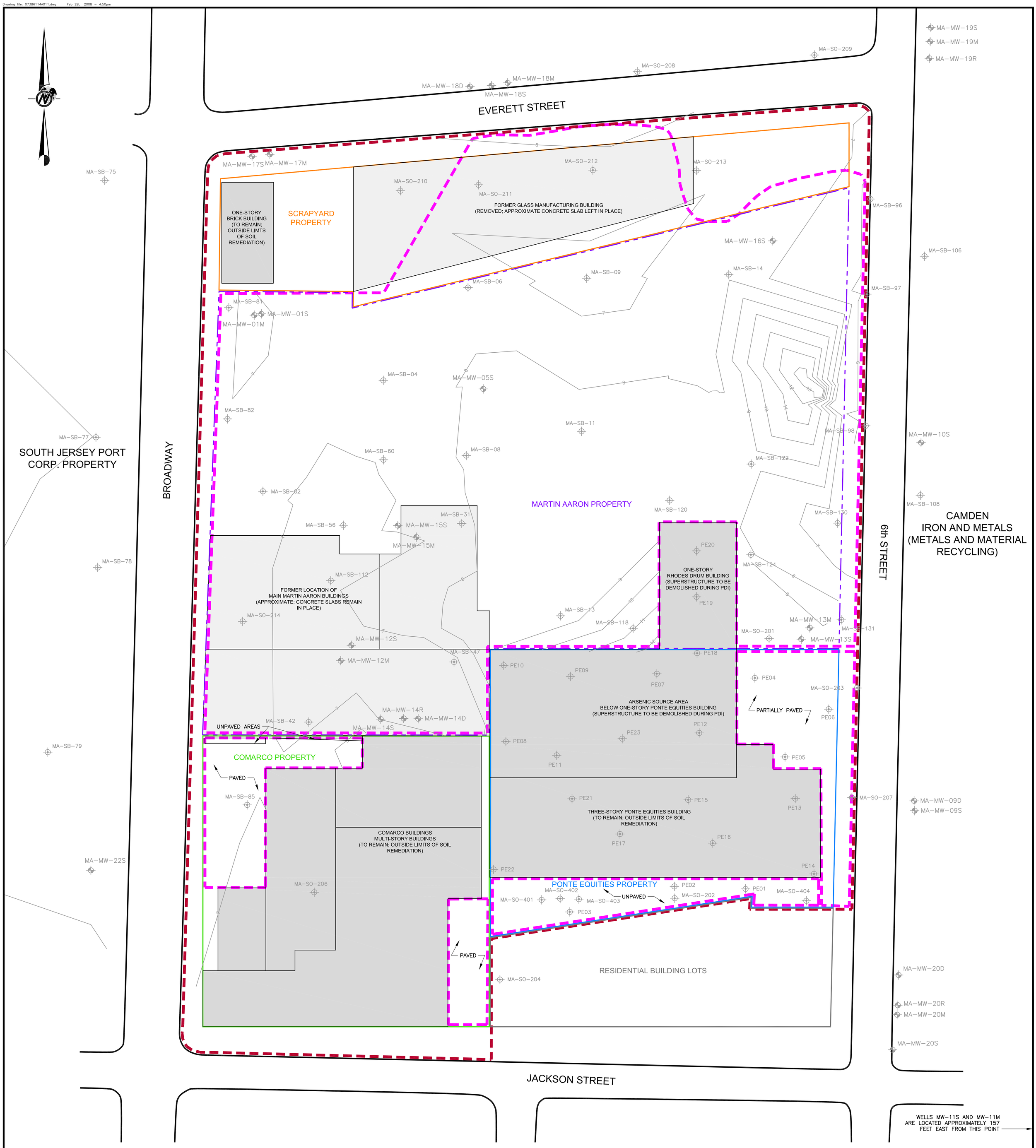
SITE LOCATION MAP

MARTIN AARON SUPERFUND SITE

FIGURE 1

Drawing file: 07386114A013.dwg Feb 28, 2008 – 4:51pm

Drawing file: 07386114A011.dwg Feb 28, 2008 – 4:50pm



LEGEND

- LIMIT OF SOIL REMEDIATION
- APPROXIMATED EXTENT OF DIRECT CONTACT BARRIER (CAP)
- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- PONTE EQUITIES PROPERTY (OWNED BY PONTE EQUITIES, INC.)
- COMARCO PROPERTY (OWNED BY MR. THOMAS HOVERSEN AND MRS. KAREN G. HOVERSEN
- SCRAPYARD PROPERTY (OWNED BY MR GEORGE P. ACKERLE AND MS. CALOGERA C. ACKERLE)
- RESIDENTIAL BUILDING LOTS
- 10 GROUND ELEVATION (FT–MSL)
- EXISTING MONITORING WELL
- MA–SB–31 FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- EXISTING BUILDING
- FORMER BUILDING (APPROXIMATE)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS (OTHER THAN PONTE EQUITIES PROPERTY BOREHOLES) FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC. PONTE EQUITIES PROPERTY BOREHOLE LOCATIONS DIGITIZED FROM FIGURE 2 OF THE MAY 2006 EPA INVESTIGATION REPORT, TITLED "SOIL BORING LOCATIONS AND CROSS–SECTION LINES PONTE EQUITIES SITE," PREPARED BY LOCKHEED MARTIN.

3.) APPROXIMATE AERIAL EXTENT OF CAP DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL. THE CAP AREA HAS BEEN MODIFIED ON THIS DRAWING TO REFLECT CHANGES TO THE BUILDING OUTLINES.

4.) FORMER GLASS MANUFACTURING BUILDING DIGITIZED FROM HARD COPY OF FIGURE 4, 1926 SANBORN MAP OF BLOCK 460.

25 0 25 50
SCALE FEET

FIGURE 2

PROJECT No.	073–86114
FILE No.	07386114A011
REV. 0	SCALE AS SHOWN
DESIGN	SDM 02/28/08
CADD	AM 02/28/08
CHECK	KFM 02/28/08
REVIEW	RSW 02/28/08

TITLE

SITE BASE MAP

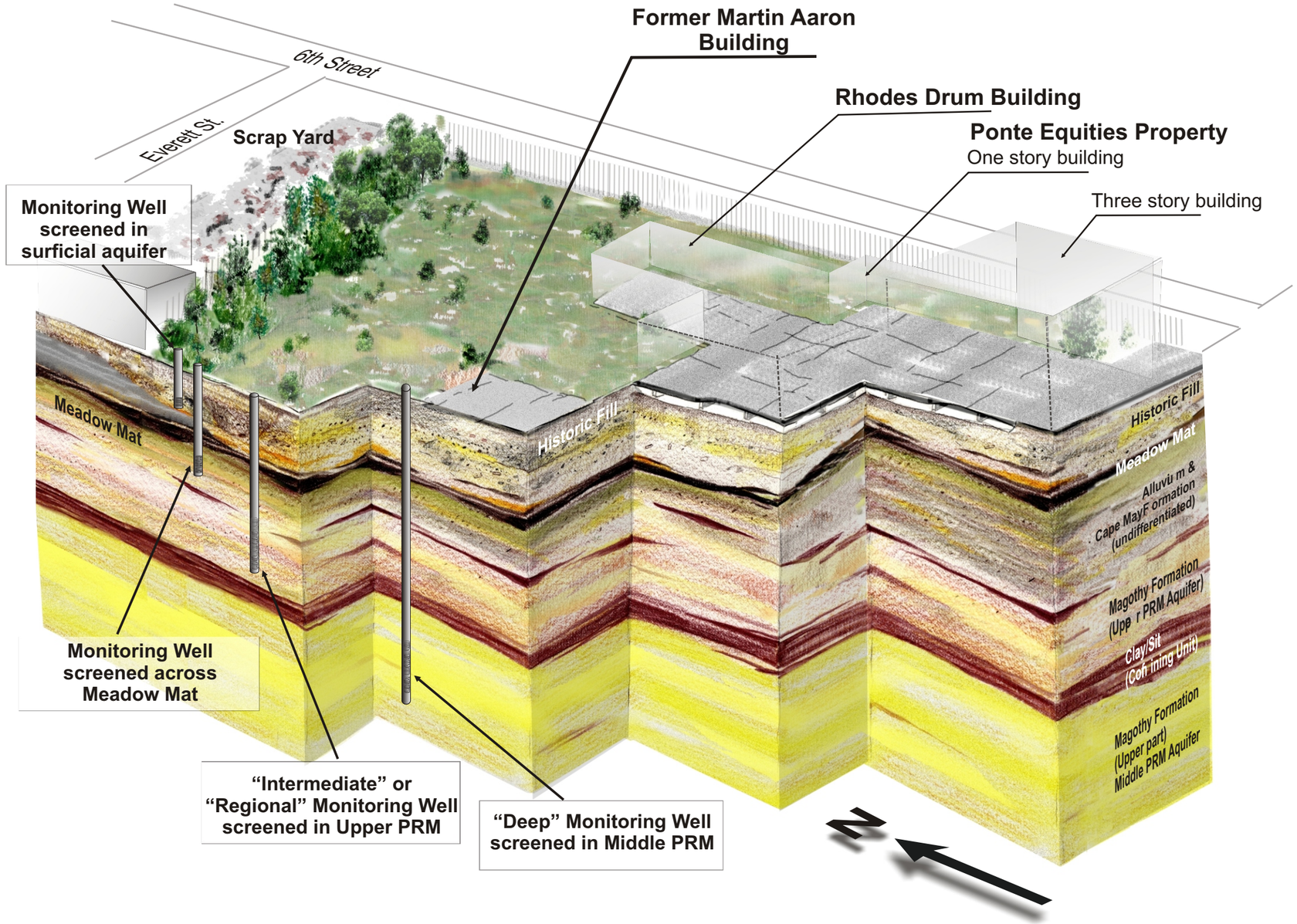
PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

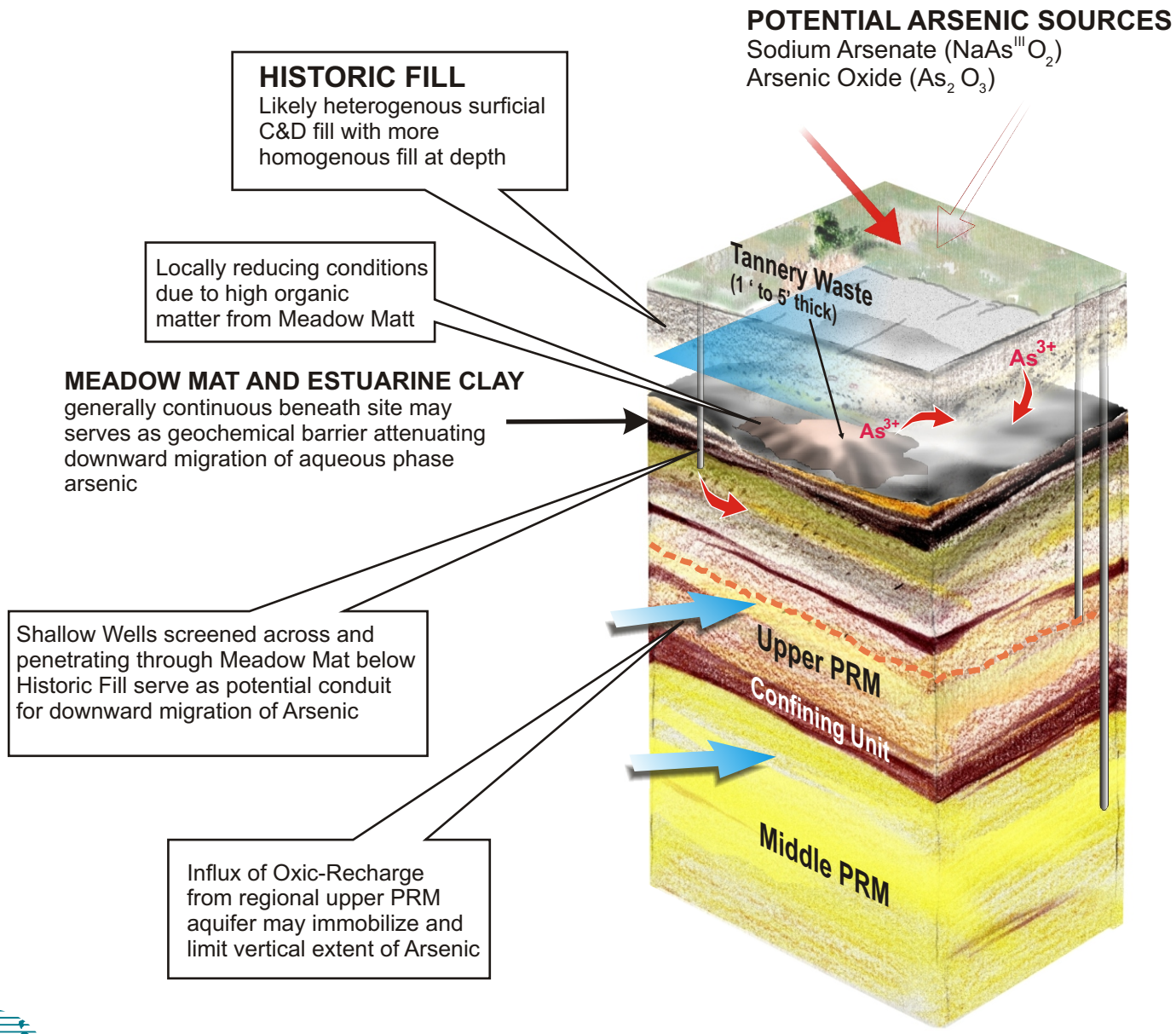
NJ Authorization #24GA28029100

Golder Associates
Philadelphia USA



Golder Associates

FIGURE 3A
CONCEPTUAL SITE GEOLOGIC MODEL
Martin Aaron Superfund Site
Camden, New Jersey



Golder Associates

FIGURE 3B
CONCEPTUAL SITE ARSENIC MODEL
Martin Aaron Superfund Site
Camden, New Jersey

Drawing file: 07386114A012.dwg Feb 28, 2008 – 4:51pm

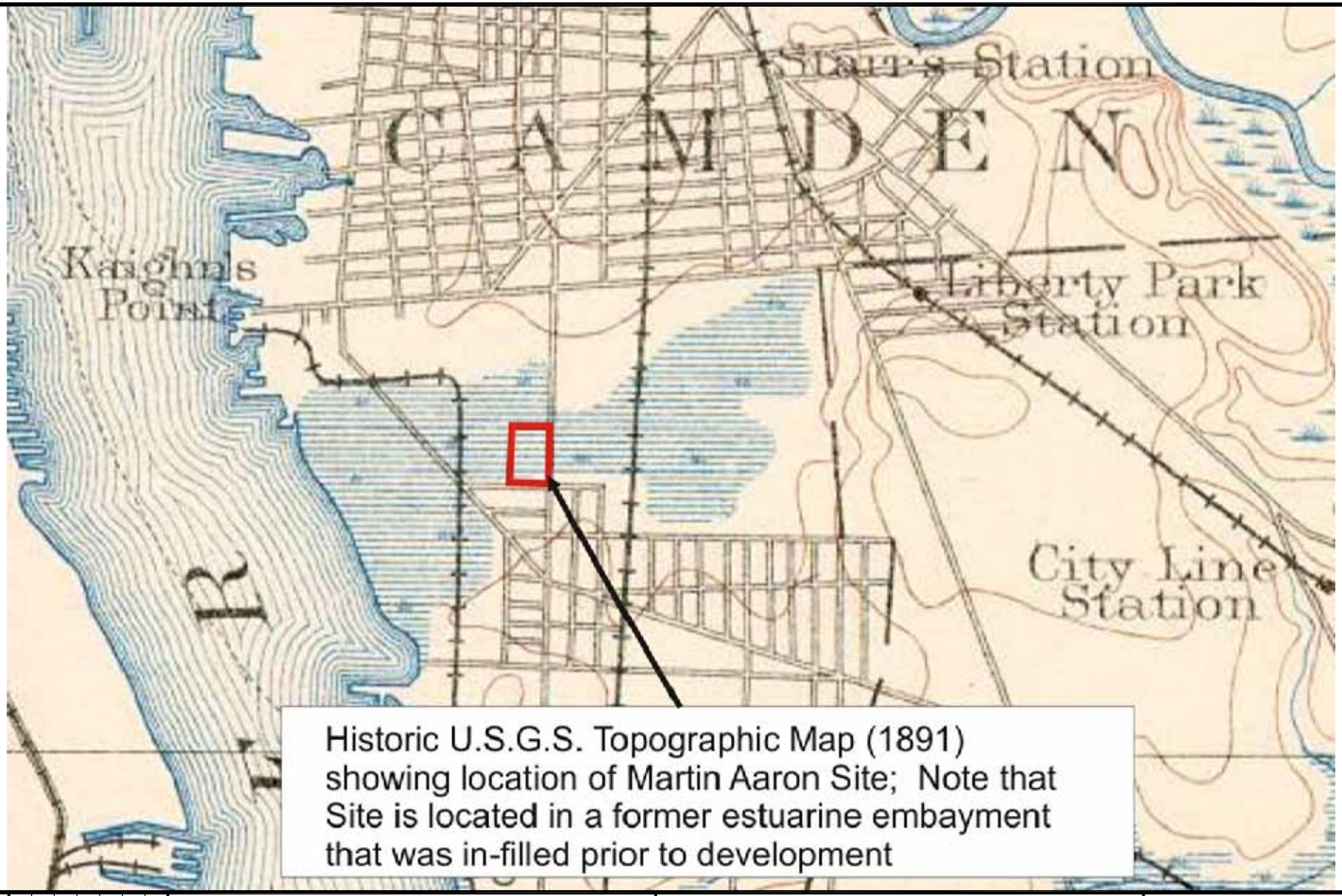


FIGURE 4

REVIEW	RSW	02/28/08
CHECK	MJB	02/28/08
CADD	AM	02/28/08
DESIGN	MJB	02/28/08
REV. 0	SCALE AS SHOWN	
FILE No.	07386114A012	
PROJECT No.	073-86114	

TITLE

1891 USGS
HISTORIC SITE LOCATION MAP

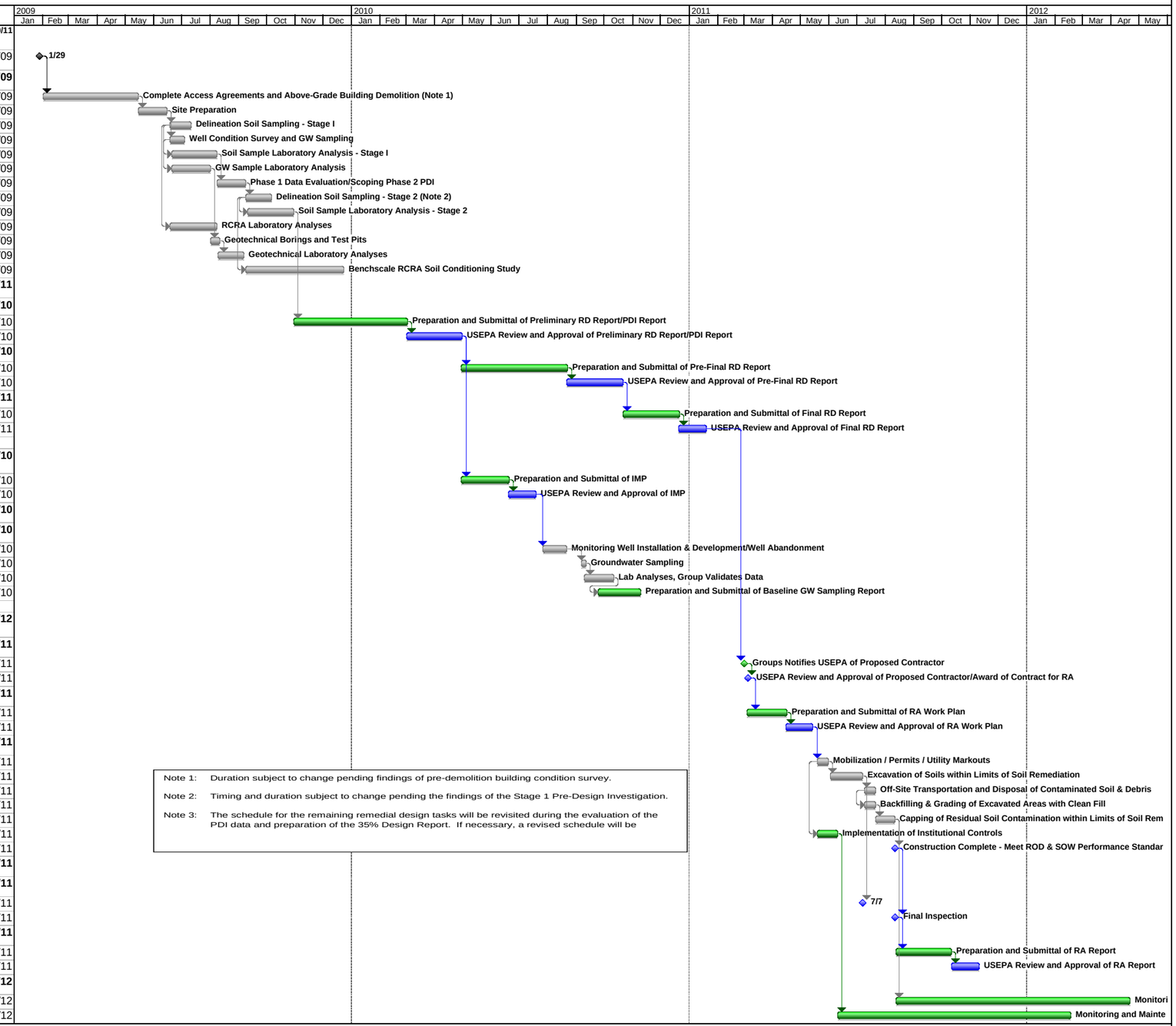
PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Golder Associates
Philadelphia USA

OPERABLE UNIT 1, PHASE 1 REMEDIAL ACTION
MARTIN AARON SUPERFUND SITE, CAMDEN, NJ

ID	Task Name	Duration	Start	Finish
1	**REMEDIAL DESIGN**	**714 days**	**Thu 1/29/09**	**Wed 1/19/11**
2	**USEPA APPROVAL OF RDWP/ PDI**	0 days	Thu 1/29/09	Thu 1/29/09
3	**BUILDING DEMOLITION AND PRE-DESIGN INVESTIGATION**	**320 days**	**Mon 2/2/09**	**Wed 12/23/09**
4	Complete Access Agreements and Above-Grade Building Demolition (Note 1)	103 days	Mon 2/2/09	Fri 5/15/09
5	Site Preparation	30 days	Sat 5/16/09	Mon 6/15/09
6	Delineation Soil Sampling - Stage I	22 days	Fri 6/19/09	Sat 7/11/09
7	Well Condition Survey and GW Sampling	15 days	Fri 6/19/09	Sat 7/4/09
8	Soil Sample Laboratory Analysis - Stage I	48 days	Sun 6/21/09	Sat 8/8/09
9	GW Sample Laboratory Analysis	41 days	Sun 6/21/09	Sat 8/1/09
10	Phase 1 Data Evaluation/Scoping Phase 2 PDI	30 days	Sun 8/9/09	Tue 9/8/09
11	Delineation Soil Sampling - Stage 2 (Note 2)	28 days	Wed 9/9/09	Tue 10/6/09
12	Soil Sample Laboratory Analysis - Stage 2	50 days	Fri 9/11/09	Fri 10/30/09
13	RCRA Laboratory Analyses	50 days	Fri 6/19/09	Sat 8/8/09
14	Geotechnical Borings and Test Pits	10 days	Sun 8/2/09	Tue 8/11/09
15	Geotechnical Laboratory Analyses	28 days	Mon 8/10/09	Sun 9/6/09
16	Benchscale RCRA Soil Conditioning Study	104 days	Wed 9/9/09	Wed 12/23/09
17	**REMEDIAL DESIGN (Note 3)**	**442 days**	**Sat 10/31/09**	**Wed 1/19/11**
18	**Preliminary Remedial Design Report (35% Design) & PDI Report**	**178 days**	**Sat 10/31/09**	**Fri 4/30/10**
19	Preparation and Submittal of Preliminary RD Report/PDI Report	119 days	Sat 10/31/09	Tue 3/2/10
20	USEPA Review and Approval of Preliminary RD Report/PDI Report	60 days	Tue 3/2/10	Fri 4/30/10
21	**Pre-Final Remedial Design Report (95% Design)**	**175 days**	**Fri 4/30/10**	**Thu 10/21/10**
22	Preparation and Submittal of Pre-Final RD Report	115 days	Fri 4/30/10	Sun 8/22/10
23	USEPA Review and Approval of Pre-Final RD Report	61 days	Sun 8/22/10	Thu 10/21/10
24	**Final Remedial Design Report (100% Design)**	**90 days**	**Fri 10/22/10**	**Wed 1/19/11**
25	Preparation and Submittal of Final RD Report	61 days	Fri 10/22/10	Tue 12/21/10
26	USEPA Review and Approval of Final RD Report	30 days	Tue 12/21/10	Wed 1/19/11
27				
28	**INTERIM GW MONITORING PLAN**	**194 days**	**Fri 4/30/10**	**Tue 11/9/10**
29	Preparation and Submittal of IMP	52 days	Fri 4/30/10	Sun 6/20/10
30	USEPA Review and Approval of IMP	30 days	Sun 6/20/10	Mon 7/19/10
31	**INTERIM GROUNDWATER MONITORING**	**106 days**	**Tue 7/27/10**	**Tue 11/9/10**
32	**Baseline GW Sampling**	**106 days**	**Tue 7/27/10**	**Tue 11/9/10**
33	Monitoring Well Installation & Development/Well Abandonment	26 days	Tue 7/27/10	Sat 8/21/10
34	Groundwater Sampling	5 days	Tue 9/7/10	Sat 9/11/10
35	Lab Analyses, Group Validates Data	32 days	Fri 9/10/10	Mon 10/11/10
36	Preparation and Submittal of Baseline GW Sampling Report	46 days	Sat 9/25/10	Tue 11/9/10
37				
38	**REMEDIAL ACTION (Tentative Schedule)**	**417 days**	**Tue 3/1/11**	**Sat 4/21/12**
39	**REMEDIAL ACTION CONTRACTING**	**4 days**	**Tue 3/1/11**	**Sat 3/5/11**
40	Groups Notifies USEPA of Proposed Contractor	0 days	Tue 3/1/11	Tue 3/1/11
41	USEPA Review and Approval of Proposed Contractor/Award of Contract for RA	0 days	Sat 3/5/11	Sat 3/5/11
42	**REMEDIAL ACTION WORK PLAN**	**71 days**	**Sat 3/5/11**	**Sat 5/14/11**
43	Preparation and Submittal of RA Work Plan	43 days	Sat 3/5/11	Sat 4/16/11
44	USEPA Review and Approval of RA Work Plan	29 days	Sat 4/16/11	Sat 5/14/11
45	**REMEDIAL ACTION**	**84 days**	**Fri 5/20/11**	**Thu 8/11/11**
46	Mobilization / Permits / Utility Markouts	12 days	Fri 5/20/11	Tue 5/31/11
47	Excavation of Soils within Limits of Soil Remediation	35 days	Fri 6/3/11	Thu 7/7/11
48	Off-Site Transportation and Disposal of Contaminated Soil & Debris	12 days	Sun 7/10/11	Thu 7/21/11
49	Backfilling & Grading of Excavated Areas with Clean Fill	12 days	Sun 7/10/11	Thu 7/21/11
50	Capping of Residual Soil Contamination within Limits of Soil Remediation	21 days	Fri 7/22/11	Thu 8/11/11
51	Implementation of Institutional Controls	22 days	Fri 5/20/11	Fri 6/10/11
52	Construction Complete - Meet ROD & SOW Performance Standards	0 days	Thu 8/11/11	Thu 8/11/11
53	**INSPECTIONS & REMEDIAL ACTION REPORT**	**126 days**	**Thu 7/7/11**	**Thu 11/10/11**
54	**Inspections**	**35 days**	**Thu 7/7/11**	**Thu 8/11/11**
55	Pre-Final Inspection	0 days	Thu 7/7/11	Thu 7/7/11
56	Final Inspection	0 days	Thu 8/11/11	Thu 8/11/11
57	**Remedial Action Report**	**90 days**	**Sat 8/13/11**	**Thu 11/10/11**
58	Preparation and Submittal of RA Report	60 days	Sat 8/13/11	Tue 10/11/11
59	USEPA Review and Approval of RA Report	30 days	Wed 10/12/11	Thu 11/10/11
60	**OPERATION & MAINTENANCE**	**316 days**	**Sat 6/11/11**	**Sat 4/21/12**
61	Monitoring and Maintenance of Soils Remediation Components	253 days	Sat 8/13/11	Sat 4/21/12
62	Monitoring and Maintenance of Institutional Controls	252 days	Sat 6/11/11	Fri 2/17/12



Note 1: Duration subject to change pending findings of pre-demolition building condition survey.

Note 2: Timing and duration subject to change pending the findings of the Stage 1 Pre-Design Investigation.

Note 3: The schedule for the remaining remedial design tasks will be revisited during the evaluation of the PDI data and preparation of the 35% Design Report. If necessary, a revised schedule will be

Work responsibilities are color coded:
Group (including demaximis and Golder)-green; USEPA-blue; and Contractors and Subcontractors-gray.

Golder Associates
Mt. Laurel, New Jersey

FIGURE 5
PROJECTED REMEDIAL DESIGN SCHEDULE
TENTATIVE REMEDIAL ACTION SCHEDULE (Revised Mon 3/9/09)

APPENDIX A

PRE-DESIGN INVESTIGATION WORK PLAN

Golder Associates Inc.

200 Century Parkway
Mount Laurel, NJ 08054
Tel: (856) 793-2005
Fax: (856) 793-2006
www.golder.com

PRE-DESIGN INVESTIGATION WORK PLAN
MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

OPERABLE UNIT 1 – PHASE 1 REMEDIAL ACTION

Prepared for:

Martin Aaron Superfund Site Settling Performing Defendants

Prepared by:

Golder Associates Inc.
200 Century Parkway, Suite C
Mount Laurel, New Jersey 08054

DISTRIBUTION:

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1 Copy	Martin Aaron Settling Performing Defendants
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2 Copies	Golder Associates Inc.

August 2008 Project No.: 073-86114

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A.1.0 INTRODUCTION

This Pre-Design Investigation Work Plan (PDI Work Plan) was prepared on behalf of the Martin Aaron Superfund Site Settling Performing Defendants (Group) by Golder Associates Inc. (Golder) for the Martin Aaron Superfund Site (Site) Operable Unit 1 (OU1) Phase 1 Remedial Action (Phase 1 RA). The Site is located at 1542 South Broadway in the City of Camden, Camden County, New Jersey, as shown on Remedial Design Work Plan (RDWP) Figure 1. RDWP Figure 2 shows the layout of the Site (base map).

This PDI Work Plan is an appendix of the RDWP for the Phase 1 RA. The Phase 1 RA is described in the USEPA Record of Decision (USEPA, date September 2005) and the Consent Decree Statement of Work (SOW) and the associated design tasks are summarized in Sections 1.3 and 1.4 of the RDWP. This PDI Work Plan describes activities necessary to acquire data needed to complete the remedial design of the Phase 1 RA. The projected schedule for completing these activities is presented on RDWP Figure 5.

A more detailed description of the Site, historical operations, previous investigations, previous remedial activities, and a summary of the Phase 1 RA requirements are presented in Section 2.0 of the RDWP. Key components of the Conceptual Site Model (CSM), and the associated data gaps needed to complete the Phase 1 RA design and prepare the groundwater Interim Monitoring Plan (IMP), are provided in RDWP Section 3.0. Design approaches and other data needed to complete the design are discussed in RDWP Section 4.0.

This PDI Work Plan describes the rationale and specific procedures for collection of information needed to complete the design of the Phase 1 RA. This PDI Work Plan is supported by a Quality Assurance Project Plan (QAPP), which was prepared in accordance with the SOW and is presented as Appendix B of the RDWP. The QAPP documents project quality objectives and measurement performance criteria, specifies the laboratories and analytical SOPs to be utilized for each analytical parameter, details the frequency of QC sample collection, and describes the process for data verification and validation. The QAPP follows the format and guidance presented in the *Uniform Federal Policy for Quality Assurance Plans*, (EPA 505-B-04-900A, March 2005), which incorporates and supersedes the USEPA *Requirements for Quality Assurance Project Plans for Environmental Data Operations* (USEPA, QA/R-5, March 2001). The Health and Safety Contingency Plan (HSCP) that will be used during on-site activities is presented as Appendix C of the RDWP.

A.2.0 SITE PREPARATION TASKS

As discussed in Section 4.0 of the RDWP, there are a number of important Site preparation activities that need to be completed to allow safe and unimpeded access to the Site to implement the PDI. These Site preparation activities are discussed in detail below.

A.2.1 Above-Grade Building Demolition

As discussed below in Sections 2.4 through 2.7, several borings are to be advanced within and adjacent to the Rhodes Drum Building and the one-story Ponte Equities Building. Due to the unsafe working conditions, the unstable superstructure (roof and walls) will be demolished and removed as an initial PDI task prior to performing subsurface investigations. The building substructures (floor slabs and foundations) will be left in place during the PDI leaving the material below them unexposed. The remaining slabs may be used for equipment staging and storage and for locating temporary decontamination facilities during the PDI.

W. Hargrove Demolition Company, Inc. (Hargrove) of Camden, New Jersey, will be the demolition contractor. Hargrove has completed numerous demolitions within the City of Camden, including those previously performed on the Martin Aaron and adjacent properties. Hargrove's involvement will be under direct subcontract to Golder.

A.2.1.1 Evaluation of ACM and Lead-Based Paint

The presence of asbestos containing materials (ACM) or lead-based paint is not anticipated within the buildings based upon the findings of the Weston Solutions report entitled, "Final Sampling and Analysis Report, Surface Soil and Building Interior Sampling, Ponte Equities Site, 1565-1575 South 6th Street, Camden, New Jersey" dated March 2006. Visual observations made by Golder during previous Site reconnaissance noted the buildings are stripped shells of masonry wall construction with partially collapsed wood-framed roofs. Given the interiors are devoid of finishes and items such as insulation, wiring, plumbing, and heating, the findings of the prior interior sampling are reasonable.

Exterior sampling of the buildings has not been conducted. The bare masonry exterior walls are not considered to be of concern for ACM or lead-based paint. Visual observation of the roofing materials made by Golder suggest the materials are relatively modern and not expected to be ACM. However, pre-demolition sampling of the roofing materials will be performed for a

positive determination of whether the roofing materials are ACM or not as part of typical demolition procedures and demolition debris removal and disposal. It is important to understand whether or not the roofing materials are ACM for selection of demolition techniques, to establish appropriate precautions for worker safety, and to determine appropriate disposal.

Although composite roofing materials manufactured with asbestos are considered non-friable ACM because the asbestos is held within a binder matrix, there is some potential concern if the binder has deteriorated and dust could be generated by typical demolition techniques rendering the material friable. Though this is not expected during demolition of the former Rhodes Drum Building and one-story Ponte Equities Building based on visual observation, if roofing materials are ACM then demolition procedures would be implemented in a manner to avoid rendering to materials friable. For example, careful removal techniques that yield large, un-torn sections of roofing and maintaining a wetted condition throughout removal will preserve the non-friable state. Therefore, advance knowledge of ACM would facilitate planning for and execution of wetting these materials during their removal, and techniques for removal.

In addition, non-friable asbestos containing materials are not regulated and can be disposed of as ID 13C Construction and Demolition Waste under the regulations of N.J.A.C. 7-26. However, if the roofing materials are ACM and become friable, then disposal would require disposition as a regulated asbestos containing material (RACM) under N.J.A.C. 7-26-2.12.

In order to make a positive determination, grab samples of roofing materials will be obtained from each structure to be demolished by the demolition contractor (Hargrove). From each structure, one grab sample will be collected from flashing elements and one grab sample collected from the base roofing material. Hargrove will submit the samples for laboratory analysis to determine if they are ACM. The laboratory, International Asbestos Testing Laboratory (IATL) of Mount Laurel, New Jersey, participates in the National Voluntary Laboratory Accreditation Program (NVLAP Lab Code 101165-0), and is accredited for bulk asbestos fiber analysis per ISO/IEC 17025:1999. IATL follows USEPA Method 600/R-93/116 (Polarized Light Microscopy), which provides a composite asbestos concentration of the analyzed sample based on visual estimation. The SOP provided by the laboratory is included in the QAPP (Appendix B of the RDWP).

A.2.1.2 Existing Building Condition Surveys

Reasonable precautions will be taken during demolition of the one-story Ponte Equities Building to maintain the structural integrity of the existing three-story Ponte Equities Building and the immediately adjacent Comarco Building, both of which will remain. The demolition of the above-grade portion of the one-story Ponte Equities Building is expected to be straightforward. Preliminary observations by an engineer from Golder indicate that there is no rigid structural connection of the one-story building roof or walls to the three-story building that will remain. Roof beams appear to be only set into pockets created in the former exterior wall of the three-story building. In addition, the masonry walls of the one-story appear to only abut the walls of the three-story building without lacing of the brickwork between the two structures. However, a more in-depth structural evaluation will be performed before demolition, and a pre-demolition baseline survey of the physical condition of the adjacent three-story building will be completed by an engineer licensed to practice in the State of New Jersey.

The baseline condition surveys will document the condition of the three-story Ponte Equities Building and Comarco Building prior to performance of any demolition activity. Documentation will include an inspection report describing existing defects observed (e.g., cracks, broken masonry, broken windows, etc.) and photographic documentation of those conditions. Because of limited exterior access due to safety concerns associated with the one-story Ponte Equities Building, the conditions survey of the three-story building will be primarily based upon observation of interior conditions.

Upon completion of demolition, the physical condition of the three-story Ponte Equities Building will be re-surveyed, and the results of the post-demolition condition survey compared to the baseline to assess if any damage has occurred that would compromise structural integrity of the building.

A.2.1.3 Demolition Permits

Obtaining the appropriate permits for demolition from the City of Camden is expected to be straightforward. Hargrove has performed demolition at the Site, including submittal of all necessary requests for utility disconnections to obtain the demolition permit from the City. Separate requests for utility disconnection and application for demolition permits will be required for each property owner (i.e., Martin Aaron and Ponte Equities, Inc.).

Hargrove will submit requests for service disconnection to PSE&G (electric and gas), Verizon (telecommunications), and will apply for plumbing permits (U.C.C F130 form) so that Hargrove's licensed plumber can disconnect water and sewer. Evidence of utility removal/disconnection is then required to be submitted with each completed application (U.C.C. F110 form) for demolition.

A.2.1.4 Building Demolition

Hargrove will access the Site through the existing Site gates on 6th Street and on Broadway Avenue. Upon mobilization to the Site, Hargrove will implement 24-hour surveillance to secure the Site. Appropriate signage will also be posted to warn the public of the demolition zone/work area. Public access will be strictly prohibited.

The demolition will be conducted with a top-down approach with the partially collapsed roofs pulled down first. For the one-story Ponte Equities Building, the roof beams resting in the masonry pockets of the three-story building will be temporarily supported and cut several feet from the wall, thereby releasing the one-story roof structure from the three-story building. After the remaining roof and existing supports are demolished and removed, the remaining beam ends will be removed from the wall pockets. Materials associated with the roofs will be separated and staged on-site for loading and transportation off-site. Once the wood framing and roofing materials are taken from the building footprints, the masonry walls will be demolished and the material stockpiled for loading and transportation off-site. Given the location of the Site near residential dwellings and an operating food processing business (Comarco), dust control is a priority. Monitoring and controls for dust during demolition are identified in the project HSCP (see RDWP, Appendix C).

Based on Site reconnaissance of the condition and nature of these buildings, it is unlikely that there is sufficient brick or concrete material to warrant recycling or reuse of any of the demolition materials. While some of the old brick may be recycled, it is anticipated that the waste generated will be ID 13C Construction and Demolition Waste. The demolition materials will be handled pursuant to solid waste regulations N.J.A.C. 7:26. To keep haul traffic away from residential neighborhoods to the extent practicable, materials will be hauled from the Site by way of Broadway (County Route 551).

Upon completion of the demolition and removal of the one-story Ponte Equities Building, open portals (i.e., windows, doorways) on the ground-floor level of the three-story building will be sealed with masonry. New chain link fence may also be installed as necessary to minimize unauthorized access to the Site after demolition.

A.2.2 Site Clearing

Prior to beginning the field pre-design investigation, Site clearing will be performed to improve worker safety and facilitate equipment access during fieldwork. Clearing the existing vegetation will expose the uneven ground and debris thereby reducing tripping and vehicular hazards.

Vegetation across the Site will be close-cut using brush cutters and mowing equipment. To the extent necessary, trees will be removed to provide access to boring or test pit locations. A skid steer or similar machine will be used to remove any debris or level uneven terrain within planned investigation areas. Miscellaneous debris will be stockpiled on-site for disposition during the Phase 1 RA. There are a number of drums at the Site from prior investigations. These will be characterized for off-site disposal along with the other investigation derived waste (IDW) developed during the PDI (see Section 5.0).

A.2.3 Utility Mark Outs

Public and private utilities that may be affected by the Phase 1 RA will be located and identified during the PDI. In addition, it is important to locate existing and abandoned utilities as they may also create a hazard during PDI activities with respect to soil borings/probes, test pits, and building demolition. The potential disruption of utility services to surrounding properties is also a concern. Therefore, reasonable efforts will be made to locate existing utilities (i.e., electric, gas, water, sewer and telecommunications) to determine if these utilities will need to be avoided during the PDI or temporarily supported, protected, removed or rerouted during the implementation of the Phase 1 RA.

The assessment of utility locations will begin by requesting and reviewing any drawings available from public utilities, City of Camden Division of Engineering and Construction Management, Camden County Municipal Utilities Authority (CCMUA), and other sources or repositories of current and historical utility drawings. Golder will also review previous reports and Agency documents relating to prior Site investigation activities.

As required by law, the New Jersey One Call (One Call) will be notified at least three days, but not more than ten days, prior to intrusive activities at the Site. Utility mark outs will be requested within all public right-of-ways surrounding the Site to facilitate and understand where utilities may enter the Site and their potential alignment within the Site. One Call cannot provide detailed utility layout within private property, so the location of on-site utilities will rely on interpolation between utility demarcations in the public right-of-ways and the results of the on-property geophysical surveys (electromagnetic (EM) survey and ground penetrating radar (GPR). The geophysical investigation will be performed by Advanced Geological Services, Inc. of Malvern, Pennsylvania.

Shallow excavations dug by hand or machine may be required to visually identify anomalies reported by the geophysical investigation, or to confirm and document utilities located within proximity to building foundations or along roadways within areas to be excavated. Exposed utilities will be photographed and utilities identified will be field-located by survey (or measurements from a surveyed reference) and incorporated into the site plan developed for the PDI report.

Three to four weeks before beginning intrusive PDI field work activities Golder will initiate utility mark-out activities. In that context, Golder will review the available drawings and documents, coordinate the One Call utility mark-out, and conduct the geophysical investigation. Golder will evaluate the utility information to determine if intrusive PDI activities may impact identified utilities and require refinements to the PDI. USEPA will be notified if major changes to the PDI boring locations are required. The One Call notification will be renewed as required.

A.2.4 Site Surveying

The following survey tasks will be performed during the PDI in order to produce a design level base map for the Site:

- Site Property Boundary Survey;
- Survey of located utilities;
- Pre-Survey of PDI Stage 1 soil boring locations;
- Survey of geotechnical boring and test pit locations;

- Survey of monitoring well locations and casing elevations; and,
- Site-wide Topographic Survey (1-foot contours).

The surveying activities will be performed by Vargo Associates of Franklinville, New Jersey, a New Jersey licensed Professional Land Surveyor. All survey information will be provided in North American Datum of 1983 (NAD 83) and North American Vertical Datum of 1988 (NAVD 88) format.

Stage 2 PDI soil boring locations that define limits of Source Area excavations will be surveyed upon completion by a New Jersey Licensed Professional Land Surveyor and/or using Global Positioning System (GPS) technology.

Golder will also request the Site survey data generated by the New Jersey Department of Environmental Protection (NJDEP) during its Remedial Investigation/Remedial Alternatives Analysis. This information will be useful in preparing remedial design drawings.

A.3.0 PDI – SOIL /FILL INVESTIGATION

As discussed in Section 4.3 of the RDWP, further characterization and delineation of the soil/fill is needed to support the design of the major remediation components of the Phase 1 RA. As defined in the ROD, Source Areas are areas of contaminated soil at concentrations exceeding the Source Area Cleanup Goals (ROD Appendix II, Table 6). Specific objectives of the soil/fill PDI, relative to assessing environmental conditions, consist of the following:

- *Delineation of five USEPA soil/fill Source Areas for both arsenic (two areas) and for VOCs (three areas) as shown on Figure 4-5 of the USEPA FS (CH2M HILL, 2005) –* This figure was referenced in the ROD (ROD Figure 2) as an approximation of the Source Areas requiring excavation. As discussed below, data collected during the USEPA RI were used as a starting point to develop the PDI delineation approach in these areas The Source Area Cleanup Goals, as defined in ROD Appendix II, Table 6 (RDWP Table 1), will be used to complete the delineation of the Source Areas as described in Section 4.4.1 of the RDWP;

- *Delineation of impacted soil/fill beneath and around the one-story Rhodes Drum Building and the one-story Ponte Equities Building* – Data collected by the USEPA (Lockheed Martin, 2006; Weston Solutions, 2006), subsequent to the issuance of the ROD, within and adjacent to these buildings have also been considered along with the USEPA RI data to develop the PDI delineation approach. The Source Area Cleanup Goals, as defined in ROD Appendix II, Table 6 (RDWP Table 1), will be used to complete the delineation of the Source Areas as described in Section 4.4.1 of the RDWP;

- *Delineation of Arsenic Source Area Cleanup Goal exceedances on the Scrapyard Property* – Data collected by the USEPA during the RI showed exceedances at two locations in the Scrapyard.

- *RCRA characterization of soil/fill* – Soil/fill within Source Areas will be evaluated for RCRA characteristics in order to develop a soil management plan during design for the proper management of potential RCRA waste material (see RDWP Section 4.5); and,

- *Acquisition of data needed to verify key components of the RD CSM and to develop an effective IMP* – Soil borings used to further delineate of the Source Areas/locations will also be used to collect information on the physical characteristics of historic fill and the Meadow Mat. The PDI will also include groundwater investigation activities as discussed in Section 4.0 of this PDI Work Plan.

The USEPA states in the ROD (Appendix V, Page 60) that the estimated lateral extent of the five Source Areas are approximate and were developed during the FS to provide a basis to estimate remedial costs.

The USEPA also reported arsenic greater than the Source Area Cleanup Goal of 300 ppm (mg/kg) in subsurface soils samples from two separate locations on the Scrapyard property. These locations were not included in a Source Area identified by USEPA. In addition, two areas from USEPA's post-ROD investigation of the Ponte Equities Property reported arsenic concentrations greater than 300 ppm (the Tannery Waste Area and an area beneath the one-story Ponte Equities building).

In summary, the following eight areas/locations will be investigated during the PDI to comply with the ROD requirements:

- Arsenic Source Area No. 1 (identified by the USEPA in the FS/ROD);
- Arsenic Source Area No. 2 (identified by the USEPA in the FS/ROD);
- Area of arsenic exceedances of Cleanup Goals below the one-story Pontes Equities building (based on Post-ROD investigation);
- Tannery Waste Area (based on Post-ROD investigation);
- Two locations of arsenic exceedances of cleanup goals on the Scrapyard property;
- VOC Source Area No. 1 (identified by the USEPA in the FS/ROD);
- VOC Source Area No. 2 (identified by the USEPA in the FS/ROD); and,
- VOC Source Area No. 3 (identified by the USEPA in the FS/ROD).

Golder proposes to delineate these areas/locations in two stages. The first stage of investigation (Stage 1) consists of a comprehensive evaluation of each of the areas/locations described above and the RCRA characterization in the Tannery Waste Area. The second stage of investigation (Stage 2) will be developed based on the results of Stage 1 and will provide a refined delineation of each area/location. Stage 2 of the PDI also will allow the targeted collection of additional RCRA characterization samples within each of the areas/locations (as needed) after delineation is better understood. This focused Stage 2 effort will provide important data to develop the soil management plan.

A.3.1 Stage 1 Soil Investigation Approach

This section discusses the Stage 1 PDI activities that, in general, consist of the following:

- Source area delineation assessment;
- RCRA characterization; and,
- Portable FPXRF data correlation program.

The following subsections describe the Stage 1 assessment approach for each of the eight areas/locations. Detailed procedures with respect to borehole installation, sample collection, and laboratory analyses are presented in Section 3.2 below and in the QAPP (Appendix B of the RDWP). A sample analysis summary table is presented as Table PDI-1. Figure PDI-1 shows the location of USEPA's Source Areas and the previous USEPA borings (highlighted to indicate exceedances of the Source Area Cleanup Goals) along with the proposed Stage 1 PDI soil boring locations.

A.3.1.1 Arsenic Source Area No. 1

Arsenic Source Area No. 1 is located northeast of the former Rhodes Drum Building as shown on Figure PDI-2. In this Source Area, data from only one sample in each of three USEPA borings exhibited an exceedance of the USEPA Source Area Cleanup Goals for arsenic of 300 ppm. The results from these three borings are listed below:

- MA-SB-98 (66.8 mg/kg @ 0.5 to 1.0 foot below ground surface (bgs), and **1,780** mg/kg @ 5.0 to 5.5 feet bgs);
- MA-SB-130 (179 mg/kg @ 0.5 to 1.0 foot bgs, and **3,390** mg/kg @ 5.0 to 5.5 feet bgs); and,
- MA-SB-122 (217 mg/kg @ 0.5 to 1.0 foot bgs, and **4,470** mg/kg @ 8.0 to 8.5 feet bgs).

Stage 1 borings have been located to assess the extent of arsenic impacts around these three locations, as well as to provide general coverage of the Source Area as depicted by the USEPA. A total of twelve borings (borings 20, 24, and 25 through 34) will be advanced in this area to delineate the arsenic impacts observed in borings MA-SB-98, MA-SB-122, and MA-SB-130, as well as to provide general coverage of the area, as shown on Figure PDI-2. Four of the twelve borings (27, 28, 29, and 34) will be advanced along 6th Street to provide further delineation of this area due to the anticipated geotechnical challenges associated with excavating soils up to the curb line, as discussed in RDWP Section 4.4.3. Boring 24 is being use to both delineate impacts in Arsenic Source Area 1, and also the Tannery Waste Area, as described in Section 3.1.4.

Two of these borings (borings 28 and 34) will also be used for geotechnical sampling and analyses.

In summary for Arsenic Source Area No. 1:

- Twelve borings will be advanced within or immediately adjacent to Arsenic Source Area No. 1 during the Stage 1 PDI;
- A minimum of three samples will be collected from each boring for a total of a minimum of thirty-six samples for arsenic analysis; and,
- Each arsenic sample will be analyzed in accordance with the QAPP (Appendix B of the RDWP).

A.3.1.2 Arsenic Source Area No. 2

Arsenic Source Area No. 2 is located in the northwest portion of the Site as shown on Figure PDI-3. Soil samples from three USEPA borings in or immediately adjacent to this area exhibited exceedances of the USEPA cleanup goal:

- MA-SB-60 (**766** mg/kg @ 1.5 to 2.0 feet. bgs and **23,000** mg/kg @ 6.5 to 7.0 feet bgs);
- MA-SB-06 (90.2 mg/kg @ 0.5 to 1.0 foot bgs, and **920** mg/kg @ 5.0 to 5.5 feet. bgs); and,
- MA-SB-08 (**457** mg/kg @ 1.0 to 1.5 feet bgs and **4,340** mg/kg @ 6.0 to 7.0 feet bgs).

Eleven borings (borings 35 through 41, and 65 through 68) will be advanced in this area to delineate the arsenic impacts observed in borings MA-SB-60, MA-SB-08, and MA-SB-06, as well as to provide general coverage of the area.

One boring (boring 35) will also be used for geotechnical sampling and analyses.

In summary for Arsenic Source Area No. 2:

- Eleven borings will be advanced within or immediately adjacent to Arsenic Source Area No. 2 during the Stage 1 PDI;
- A minimum of three samples will be collected from each boring for a total of a minimum of thirty-three samples for arsenic analysis; and,
- Each arsenic sample will be analyzed in accordance with the QAPP (Appendix B of the RDWP).

A.3.1.3 Arsenic Area Below One-Story Ponte Equities Building

The USEPA post-ROD investigation of subsurface materials below the one-story Ponte Equities building identified concentrations of arsenic in soil/fill greater than the Source Area Cleanup Goal (300 mg/kg) at several locations as shown on Figure PDI-4. Based on the Post-ROD USEPA investigation results (Lockheed Martin, 2006 and Weston, 2006), VOCs are not an issue in this area. The USEPA post-ROD investigation provides useful information for characterization of much of the area (as well as characterization of the underlying tannery waste that is further described in Section 3.1.4 below). However, certain data gaps need to be addressed to complete the horizontal and vertical delineation of arsenic in this area. A summary of the reported detections of arsenic within and adjacent to this area are presented below.

- PE-07 (150 mg/kg @ 1.0 to 1.5 feet bgs, **4,660** mg/kg @ 5.0 to 5.5 feet bgs, **888** mg/kg @ 6.0 to 6.5 feet bgs, and 66.2 mg/kg @ 12.0 to 12.5 feet bgs);
- PE-09 (**803** mg/kg @ 4.0 to 4.5 feet bgs and 23.2 mg/kg @ 7.0 to 7.5 feet bgs);
- PE-11 (5.8 mg/kg @ 3.0 to 3.5 feet bgs and **1,310** mg/kg @ 5.0 to 5.5 feet bgs);
- PE-12 (17.4 mg/kg @ 2.0 to 2.5 feet bgs, **791** mg/kg @ 6.0 to 6.5 feet bgs, and 3.5 mg/kg @ 9.0 to 9.5 feet bgs); and
- PE-23 (**20,300** mg/kg @ 4.0 to 4.5 feet bgs, 47 mg/kg @ 5.0 to 5.5 feet bgs, and 4.6 mg/kg @ 6.0 to 6.5 feet bgs).

Once the one-story Ponte Equities Building superstructure is demolished as discussed in Section 2.1, a total of twelve borings (1 through 12) will be advanced within or immediately adjacent to the its former location.

Five of these borings (borings 1 through 5) will be advanced along the southern-most boundary of the former 1-story portion of the building to complete the horizontal and vertical delineation adjacent to the 3-story building (see Figure PDI-4). In addition, elevated arsenic concentrations appear to be limited to near-surface materials (once subsurface void space below the slab is subtracted from sample depth) in the western portion of the area as shown by data from borings PE09, PE11, and PE23. Vertical delineation in this area will assess the depth of soil/fill requiring excavation. The near-surface arsenic impacts to soil in this area likely resulted from of a “top down” release consistent with the use of the building as a “Beam House” as opposed to the “bottom up” placement of tannery waste northeast of this area. Three borings (borings 6 through

8) will be advanced in this area as shown on Figure PDI-4 to further assess the vertical delineation.

Three borings will also be advanced along the west and north sides of the one-story building (borings 9 through 11) as shown on Figure PDI-4 to further assess the horizontal and vertical delineation in this area. Boring No. 12 (which is primarily targeted to assess the extent of subsurface tannery waste) will further assess the delineation toward the east side of this area.

Three borings (borings 1 through 3) from this source area will also be used for geotechnical sampling and analyses.

In summary, the following sampling will be performed for the arsenic area below the one-story Ponte Equities Building:

- Twelve borings will be advanced within or immediately adjacent to the one-story Ponte Equities Building during the Stage 1 PDI;
- A minimum of three samples will be collected from each boring for a total of a minimum of thirty-six samples for arsenic analysis; and,
- Each arsenic sample will be analyzed in accordance with the QAPP (Appendix B of the RDWP).

A.3.1.4 Tannery Waste Area

During the USEPA post-ROD investigation of the Ponte Equities Property, tannery waste was found beneath and east of the Rhodes Drum Building, as shown on Figure PDI-5 (Lockheed Martin, 2006). The USEPA describes the waste material as very soft, green to black clay with hair and fragments of animal hide, and estimated its thickness to range up to approximately 5 feet (Lockheed Martin, 2006). The USEPA post-ROD investigation cross sections show the tannery waste to lie above the Meadow Mat and associated glauconitic clays (see RDWP Section 3.2).

Twenty-two borings (borings 12 through 27, and 55 through 60) will be advanced during the PDI to further characterize and assess the delineation of the tannery waste and other arsenic impacts to soil/fill in this area, as shown on Figure PDI-5. The specific objectives of this characterization/delineation are outlined below:

- Delineate the lateral extent, depth, and thickness of tannery waste and physical/odorous nature of the materials;

- Characterize arsenic concentrations in soil/fill materials above the tannery waste to enable segregation of Source Area versus non-Source Area soils. It is notable that the USEPA data showed limited arsenic impacts in shallow soil/fill which could be segregated from underlying impacted materials. This distribution is consistent with the "bottom up" placement of tannery waste and less impacted historic fill placed above it;

- Complete an initial RCRA characterization of the tannery waste. Three samples of tannery waste will be collected for RCRA characterization (full TCLP). These same samples will also be analyzed for full TAL inorganics and TCL organics to assess the presence of potential underlying hazardous constituents. These data will provide an initial assessment of RCRA disposal requirements for the tannery waste. A more thorough RCRA characterization sampling and analysis program will be conducted for all of the Source Areas/locations during the Stage 2 PDI; and,

- Several of these 22 borings will also serve a dual purpose and be used to delineate adjacent Source Areas (VOC Source Area No. 1 and Arsenic Source Area No. 1) as shown on Figure PDI-5.

- Four of these borings (14, 19, 21, and 60) will also be used for geotechnical sampling and analyses.

In summary for the Tannery Waste Area:

- Twenty-two borings will be advanced within or immediately adjacent to the Tannery Waste Area during the Stage 1 PDI;

- A minimum of three samples will be collected from each boring for a total of a minimum of seventy-two samples for arsenic analysis; and,

- Each arsenic sample will be analyzed in accordance with the QAPP (Appendix B of the RDWP).

A.3.1.5 VOC Source Area No.1

VOC Source Area No. 1 is a small area immediately east of the Rhodes Drum Building, as shown on Figure PDI-6. Total VOCs above the Source Area Cleanup Goal of 1 mg/kg were detected in only one boring MA-SO-201 (**17.5** mg/kg @1.5 to 2.0 feet bgs, and **105** mg/kg @ 4.5 to 5.0 feet. bgs) in this area.

The Stage 1 PDI for this area consists of one boring (boring 55) to confirm the VOC detections at MA-SO-201 and four borings (borings 16 and 18; and borings 56 and 57) to further assess the

delineation of VOCs in this area (as shown on Figure PDI-6). As described above, borings 16 and 18 and borings 56 and 57 will also be used as part of the Stage 1 PDI assessment of the nearby tannery waste. In summary for VOC Source Area No. 1:

- Five borings will be advanced within or immediately adjacent to VOC Source Area No. 1 during the Stage 1 PDI;
- A minimum of three samples will be collected from each boring for a total of a minimum of 15 samples for VOC analysis; and,
- Each VOC sample will be analyzed for the full TCL in accordance with the QAPP (Appendix B of the RDWP).

A.3.1.6 VOC Source Area No. 2

The approximated extent of this VOC Source Area appears to be based on two discrete boring locations (MA-SB-11 and MA-SB-14,as shown on Figure PDI-7). Only one of these two borings exhibited concentration of VOC above the Source Area Cleanup Goals (boring MA-SB-11; **630.48** mg/kg, primarily TCE [630 mg/kg]). Individual or Total VOCs in excess of 1 mg/kg were not detected in MA-SB-14.

Based on these data, the interpretation of the lateral limit of VOC Source Area No. 2 should not have been extended to include MA-SB-14 (since VOC concentrations are less than 1 mg/kg). Therefore, the delineation of this Source Area is focused on delineating the extent of VOC impacts observed at MA-SB-11. Toward this end, four soil borings will be advanced (borings 42, 51, 52, and 53) to delineate the exceedance of the ROD Source Area Cleanup Goal at boring MA-SB-11, and one soil boring will be advanced (boring 74) at the approximate location of MA-SB-11 as shown on Figure PDI-7.

In summary for VOC Source Area No. 2:

- Five borings will be advanced within or immediately adjacent to VOC Source Area No. 2 during the Stage 1 PDI;
- A minimum of three samples will be collected from each boring for a total of a minimum of 15 samples for VOC analysis; and,
- Each VOC sample will be analyzed for the full TCL in accordance with the QAPP (Appendix B of the RDWP).

A.3.1.7 VOC Source Area No. 3

This area is located south of Arsenic Source Area No. 2 and north of the Comarco Property as shown on Figure PDI-8. VOCs were detected in three out of four borings within this area during the USEPA RI at the following concentrations exceeding the Source Area Cleanup Goals:

- MA-SB-60 (chlorinated ethenes of about **5** mg/kg and primarily xylenes, of about **54** mg/kg);
- MA-SB-31 (chlorinated ethenes of about **110** mg/kg); and,
- MA-SB-47 (chlorinated ethenes about **140** mg/kg).

Thirteen borings (borings 35 through 38, 41, and 43 through 50) will be advanced during the Stage 1 PDI to delineate the VOC impacts observed in the above borings as well as to provide general coverage of the area, as shown on Figure PDI-8. Five of these borings (borings 35 through 38, and 41) will also be used to delineate arsenic in Arsenic Source Area No. 2.

One boring (boring 35) from this Source Area will also be used for geotechnical sampling and analyses.

In addition, one existing boring located just west of this area (MA-MW-12S) exhibited chlorinated ethane concentrations (about 1.3 mg/kg) that are marginally above the Source Area Cleanup Goal. One additional boring (boring 54) will be advanced near MA-MW-12S to confirm this historic detection. If total VOCs are detected at a concentration above 1 mg/kg, then additional delineation borings will be considered in this area during the Stage 2 PDI as described in Section A.3.3.

In summary for VOC Source Area No. 3:

- Fourteen borings will be advanced within or immediately adjacent to VOC Source Area No. 3 during the Stage 1 PDI;
- A minimum of three samples will be collected from each boring for a total of a minimum of forty-two samples for VOC analysis; and,
- Each VOC sample will be analyzed for the full TCL in accordance with the QAPP (Appendix B of the RDWP).

A.3.1.8 Scrapyard Locations

Arsenic exceedances of the Source Area Cleanup Goal occurred at the following two USEPA RI borings in the Scrapyard Property:

- MA-SO-210 (0.5 mg/kg @ 0.0 to 0.5 feet bgs and **1,240** mg/kg @ 5.0 to 5.5 feet. bgs); and,
- MA-SO-213 (7.7 mg/kg @ 0.5 to 1.0 feet bgs and **479** mg/kg @ 5.5 to 6.0 feet. bgs).

Although not identified by USEPA as potential arsenic Source Areas in the ROD, these two locations will be evaluated during the Stage 1 PDI. Eight borings (borings 61 through 64 and 69 through 72) will be advanced to evaluate these exceedances as shown on Figure PDI-9.

In summary for the Scrapyard Locations:

- Eight borings will be advanced in the Scrapyard Property;
- A minimum of three samples will be collected from each boring for a total of a minimum of twenty-four samples for arsenic analysis; and,
- Each arsenic sample will be analyzed in accordance with the QAPP (Appendix B of the RDWP).

A.3.1.9 Stage 1 RCRA Characterization

The Stage 1 PDI RCRA characterization will determine potential RCRA characteristics and Underlying Hazardous Constituents (UHCs) associated with the tannery waste. Three samples of tannery waste will be analyzed for RCRA toxicity characteristics (TCLP) and the full suite of TAL and TCL analytes. The results of the Stage 1 PDI will provide a better understanding of the areas/locations and will thus allow the Stage 2 PDI RCRA characterization to be targeted in specific portions of the currently approximated Source Areas.

A.3.1.10 Field Portable X-Ray Fluorescence Data Correlation Assessment

Field Portable X-Ray Fluorescence (FPXRF) is a proven field sample analysis method (USEPA Test Methods for the Evaluation of Solid Waste, SW-846 Method 6200) capable of accurately and precisely measuring concentrations of arsenic (as well as other metals) in soil samples. The use of FPXRF provides rapid near real-time data and thus can be used to make rapid field

delineation decisions. Standard fixed laboratory analysis of soil samples may show some variability in soil analytical results in large part due to the heterogeneity of the sample matrix. This variability is expected due to the widespread presence of historic fill. While FPXRF is subject to the same potential sample variability as the fixed laboratories method, it provides an ability to conduct multiple analysis of a sample and thus assess and address sample variability through the averaging of multiple sample results.

Although the FPXRF is an Agency-approved method, it is susceptible to some potential interference (e.g., moisture) which needs to be evaluated at the Site in order to properly utilize the method for the Stage 2 PDI Source Area delineation program. To understand Site specific variability and interferences, a FPXRF data correlation assessment will be performed during the Stage 1 PDI to assess the following:

- Arsenic concentration variability associated with the soil/fill sample matrix;
- Potential interferences from moisture; and,
- Usability of the FPXRF for Stage 2 PDI implementation.

It is important to note that FPXRF is only intended to be used during the Stage 2 PDI to allow rapid screening level decisions regarding the need for additional delineation borings. As further discussed in Section 3.2.1, FPXRF results will not replace fixed laboratory results that will be used to confirm the boundaries of the Source Area excavations.

The FPXRF/fixed laboratory correlation assessment will be conducted using splits from homogenized samples collected during the Stage 1 PDI. A minimum of 30 soil/fill samples, 3 samples from 10 borings (borings 7, 8, 18, 21, 30, 32, 38, 40, 58, and 62), will be collected and thoroughly homogenized in the field (in a manner identical to fixed laboratory preparation). Approximately 40 to 50 grams of soil/fill sample will be placed in a clear plastic bag. For each of the 30 samples, the following three step processes will be used to provide data for the correlation assessment:

- Step 1 – Analyze by FPXRF in the field (4 sample results per sample) generating one data set;
    - This analysis will consist of performing four 30 second measurements on the bagged sample using FPXRF. The results of these four measurements will be averaged (arithmetic mean) to obtain one result per sample. Averaging the four

results over the entire sample (40 to 50 grams) is intended to produce a result representative of the properties of the soil/fill matrix for that sample location;

- Step 2 – The sample will be homogenized and split; and one part of the split sample will be placed into the appropriate laboratory sample container and shipped to a fixed laboratory for analysis of arsenic, barium, chromium, and lead, generating a second data set;
    - These fixed laboratory results will be used with the FPXRF results from Step 1 to assess the correlation between the arsenic analyses. Barium, chromium, and lead FPXRF results will also be compared to the fixed laboratory analyses results to provide some assessment of the comparability of the FPXRF data for those metals during the Stage 2 PDI RCRA characterization; and,
- Step 3 – The other part of the split sample will be dried in ovens at a maximum temperature of 150 degrees Fahrenheit, then analyzed by FPXRF following the same procedures as in Step 1;
    - These results will be used to assess the effects of moisture on the FPXRF results. Sample moisture content will be determined by the initial fixed laboratory analyses of the sample collected from the Source Area PDI Stage 1 samples.

Additional details regarding the sample, collection, preparation, and FPXRF field analysis are described in Section 3.2.3.

Two borings within each arsenic Source Area that are expected (based on the existing USEPA data) to generate arsenic results that range from approximately less than 100 mg/kg to greater than 1,000 mg/kg will be used for this correlation assessment. Additionally, because samples from these borings will be collected from above and below the water table at different areas of the Site, they will allow an assessment of impacts on the field results from the heterogeneity and moisture of the soil/fill materials.

The results of the FPXRF data set from Step 1 and the fixed laboratory analyses from Step 2 will then be compared using a regression analysis, which is a common measure of correlation. The regression analysis will be used to correlate the field FPXRF results to the fixed laboratory results. In a similar manner, the FPXRF results from Step 1 will be correlated to the FPXRF results from Step 3 (dried) to assess moisture effects. These two assessments will provide an understanding of the results the FPXRF is providing in the field thus guiding the usage of FPXRF during the Stage 2 Soil PDI. Importantly, this assessment will allow an estimation of what fixed laboratory results can be expected based on the FPXRF measurements, and an understanding of

the effects of moisture on the FPXRF results (i.e., whether the results may be biased high, low, or not at all).

The correlation assessment will be used to identify decision thresholds (using the arsenic concentrations measured by FPXRF) that will determine the need for step-in or step-out borings and what samples should be sent to the fixed laboratory for confirmatory analysis during the Stage 2 PDI. For example, if the decision threshold for arsenic concentrations were set at 275 mg/kg:

- It may be determined that a FPXRF result of 275 mg/kg or less from a field homogenized sample is indicative of a compliant sample (arsenic does not exceed 300 mg/kg) with a high degree of confidence. In this case, no further step-outs will be necessary and the sample may be sent to the fixed laboratory for analytical confirmation of whether it can be used to determine the limits of an excavation boundary; and,

- It may be determined that an FPXRF result of 275 mg/kg or greater on a field homogenized sample will be indicative of a non-compliant sample (arsenic exceeds 300 mg/kg) with a high degree of confidence. In this case, an additional step-out boring(s) will be installed and the investigation will continue as appropriate.

Depending on the results of the correlation assessment, decision thresholds of more or less than 300 mg/kg (FPXRF result) may be determined.

A.3.2 PDI Field Procedures

A.3.2.1 Environmental Soil Borings

The majority of borings to acquire environmental data (chemistry, soil/fill stratigraphy, physical conditions, etc.) at the Site will be advanced using a Geoprobe® rig. The remaining borings for environmental data and all of the geotechnical borings will be advanced using a hollow-stem auger (HSA) rig. Each of the Stage 1 PDI boring locations will be pre-surveyed by a Professional Land Surveyor licensed in the State of New Jersey. Certain Geoprobe® borings are in areas where concrete slabs exist, and therefore, these borings will require penetration of existing concrete slabs. Uni-Tech Drilling Co., Inc. of Franklinville, New Jersey, will be used to perform the Geoprobe® and HSA borings.

The water table at the site is approximately 4 feet bgs, and the Meadow Mat and the associated glauconitic clay unit is anticipated to be approximately 8 to 10 feet bgs, if present. As such, environmental borings will be advanced to the underlying Meadow Mat and associated

glauconitic clays, or to a maximum depth of 16 feet bgs, whichever is shallower. Therefore, it is expected that a maximum of four, 4-foot long Geoprobe® cores will be collected and logged in all borings. Samples collected from borings in VOC Source Areas will also be field screened using a calibrated photoionization detector (PID). Samples will be collected from pre-determined depths within each borehole as described below.

Based on work performed by USEPA, it is expected that advancing the Geoprobe® borings to a maximum depth of 16 feet bgs will encounter the Meadow Mat. If the Meadow Mat is not encountered at depths to 16 feet bgs, the geologist will evaluate the stratigraphic data and make a decision whether to continue drilling or to conclude that the Meadow Mat is not present at that location. All HSA borings will be installed to approximately 35 feet bgs and continuous split spoon samples will be collected. Thus, the information from the HSA borings will also be used to evaluate the presence of the Meadow Mat.

Geotechnical borings are discussed in Section A.3.4. Following completion, all borings will be sealed with a cement/bentonite grout. The grout will be placed into the borehole by the tremie method, to the extent possible.

A.3.2.2 Environmental Soil Sampling and Analyses

At least three soil/fill samples will be collected for laboratory analysis from each boring. In the context of designing a soil excavation remedy, sampling intervals of up to 2 feet in length will be adequate. Following the removal of large particle size material and debris, soil/fill from these 2-foot intervals will be thoroughly homogenized prior to laboratory sample extraction in order to address the expected variability of the soil/fill.

Based on the analytical results presented in the RI, Source Area excavations are not anticipated to be deeper than 10 feet bgs. Therefore, unless field observations indicate otherwise, samples for laboratory analyses will be obtained to represent the following pre-determined depth intervals: 0 to 2 feet bgs, 4 to 6 feet. bgs, and the 2-foot interval just above the Meadow Mat and associated glauconitic clay unit or 8 to 10 feet bgs, whichever is shallower. A fourth sample from the boring will be collected from 12 to 14 feet bgs should the Meadow Mat be encountered below 14 feet bgs. As discussed in RDWP Section 3.0, the Meadow Mat and associated glauconitic clays potentially act as an important geochemical barrier and thus will not be excavated as part of the Source Area remediation (i.e., the top of the Meadow Mat would represent the base of any Source

Area excavation when arsenic impacts >300 mg/kg extend to the Meadow Mat). As a result, samples of the Meadow Mat are not intended to be collected for laboratory analyses during the PDI. However, the PDI borings will confirm the depth and thickness of the Meadow Mat at several locations.

Where field observations indicate (e.g., visual differences in historic fill types, field screening for VOCs, strong odor, or visual identification of impacted soil/fill), additional samples may be collected from distinct lithologic zones encountered during drilling, such as ash layers. These samples, including splits of samples identified for laboratory analyses, and other samples not selected for laboratory analyses, will be shipped to the laboratory to be archived for future analytical consideration.

A minimum of three samples will be collected from VOC Source Area borings at approximately the same depth intervals described above. However, field screening of the Geoprobe® cores and HSA split spoon samples with a field photo-ionization detector (PID) will be used to identify the discrete interval to be sampled in each boring. Additional samples for VOC analyses may be collected depending on the field screening results. None of the samples for VOC analyses will be homogenized. Samples collected for VOC analysis will be grab samples from the identified discrete interval collected in dedicated or decontaminated small-diameter core sampler (EnCore® sampler). Samples are not expected to be collected and archived for VOC analysis.

Appendix B (QAPP) of the RDWP provides SOPs for the sample collection and analysis procedures associated with the PDI activities discussed in this PDI Work Plan.

A.3.2.3 Stage 1 FPXRF Data Correlation Program –Field Procedures

As discussed in Section 3.1.10, data correlation assessments between FPXRF results and fixed laboratory results and between moist FDXRF and dried FPXRF results will be performed during the Stage I PDI. A minimum of 30 soil/fill samples will be collected following procedures described in the QAPP. These samples will be collected in the same manner as fixed laboratory samples (i.e., will have large particle size material and debris removed and thoroughly homogenized in the field). After homogenization, the sample will be placed in a plastic bag and analyzed four times by the FPXRS. This initial FPXRF analysis will consist of four 30 second measurements by the FPXRF generating four results per sample. These four results will be averaged and the arithmetic mean will represent the FPXRF result for each sample.

After the initial field FPXRF analysis is completed, the sample will again be homogenized and split with one part being sent to a fixed laboratory for analysis and the other part will be dried in an oven at a temperature not exceeding 150° Fahrenheit. After these samples have been dried, they will be analyzed again by FPXRF in the same manner as the previous FPXRF field sample analysis described above.

A.3.3 Stage 2 Soil Investigation - Environmental

The Stage 2 Soil PDI will be based on the Stage 1 results and will focus on completing the following:

- Delineation of Source Areas; and,
- RCRA characterization including a soil pre-conditioning study.

The following sections describe the Stage 2 PDI program.

A.3.3.1 Scoping of Stage 2 PDI

The scope of the Stage 2 PDI (i.e., number and location of borings and vertical sampling intervals) will be defined following receipt and evaluation of the Stage 1 laboratory analyses results. The Stage 1 results will be tabulated, compared to the Source Area Cleanup Goals, and preliminary Source Area/locations excavation boundaries (both horizontal and vertical) will be prepared. Stage 2 boring locations will be selected to verify the preliminary Source Area boundaries and to focus the collection of samples within these boundaries for RCRA characterization and other parameters needed to evaluate various disposal options. The ultimate objective of the Stage 2 PDI program is to utilize FPXRF to complete the Source Area boundary delineation (both horizontally and vertically) and to then provide fixed laboratory analytical results that will confirm the boundary of the Source Area excavations. In addition, the Stage 2 PDI will provide RCRA/disposal characterization of the materials, as discussed below. The preliminary Source Area excavation boundaries will also allow refinement of the geotechnical investigation that is discussed in Section 3.4 below.

A.3.3.2 Stage 2 Source Area Delineation

Objectives

As discussed above, the objectives of the Stage 2 Source Area delineation are to provide sufficient analytical results to define:

- The lateral and vertical extent of soil/fill excavations in substantial compliance with N.J.A.C. 7:26E "Technical Requirements for Site Remediation"; and,
- Volumes and boundaries of non-Source Area soil/fill within the excavations (i.e., those soil/fill that have arsenic and/or VOC concentrations less than the Source Area Cleanup Goals) which would be segregated for possible on-site consolidation as discussed in RDWP Section 4.5.1.

General Approach

The number, location, and vertical sampling intervals of the initial Stage 2 borings will be based on the preliminary source area boundaries developed from the Stage 1 PDI data. Subsequent Stage 2 borings (step-in or step-out borings) will be advanced to refine the boundaries. During Stage 2, step-in borings will be advanced where the results from a previous boring are below the Source Area Cleanup Goals. Step-out borings will be advanced where the results from the previous boring are above the Source Area Cleanup Goals. Step-in/step-out borings will be off-set from the previous borings anywhere from 10-30 feet depending on a number of factors including, but not limited to, data from adjacent locations, magnitude of previous results, and accessibility of sampling equipment. Sample depths in the Stage 2 borings will focus on vertically delineating exceedances noted in the Stage 1 borings and the USEPA RI borings. Also during Stage 2, a sample will be collected from the 2-foot interval below any exceedance noted in the Stage 1 boring/USEPA RI boring for which the Stage 2 boring is a step-in/step-out location.

Schedule of VOC and Arsenic Delineations

Samples collected from the Stage 2 VOC Source Area delineation will be analyzed using standard fixed laboratory methods. Arsenic Source Area delineation will be accomplished using FPXRF methods and confirmatory laboratory analyses from split samples. Therefore, VOC Source Area delineation activities will be implemented prior to the arsenic Source Area delineation to allow for additional time to complete the VOC laboratory analyses.

If it is determined by the Stage 1 FPXRF data correlation assessment that FPXRF will not be appropriate for use in some areas of the Site (e.g., tannery waste), then samples will be collected

and sent for fixed laboratory analysis.. In addition, delineation of Source Areas will be a dynamic process and depending on the Stage 1 data obtained and level of effort required to complete the Stage 2 delineation, the schedule of the PDI activities, as shown in Figure 5 of the RDWP, may change.

VOC Source Area Delineation

VOC Source Area soil/fill samples will be collected from Geoprobe® borings following the procedures and SOPs identified above for the Stage 1 PDI. Samples collected for VOCs during Stage 2 will be analyzed within an approximately 5-day turnaround time to rapidly determine whether additional borings/sampling are necessary to complete the delineation. Delineation of the VOC Source Areas will be considered complete when horizontal and vertical results are substantially compliant with Source Area Cleanup Goals and the recommended sampling frequencies stated in N.J.A.C. 7:26E summarized above. There may be instances where anomalous data, borderline data, or exceedances of the TVOC goal due to VOCs that do not have specified Source Area Cleanup Goals would not be considered in the final Source Area delineation. In these instances, the data will be discussed with USEPA prior to completing the Stage 2 PDI.

Arsenic Source Area Delineation

The FPXRF data correlation assessment will also assist in determining which samples should be sent for fixed laboratory confirmation. Following NJDEP "Technical Requirements for Site Remediation", N.J.A.C. 7:26E-2.1(b), 100 percent of samples used to identify clean boundaries (e.g., arsenic concentrations less than 300 mg/kg) will be submitted for laboratory confirmation. Additionally, a portion (up to 10%) of the FPXRF samples collected from the interior of the excavations may be submitted for laboratory confirmation to determine the distribution of arsenic within the Source Area. As discussed for the VOC delineation, there may be specific instances where anomalous, borderline, or random results (possibly from historic fill interference) may not be considered when defining the Source Area boundary. These instances will be discussed with USEPA prior to the completion of the Stage 2 PDI

Samples collected in arsenic Source Areas for FPXRF analysis will be thoroughly homogenized in the field, and split with one split sample placed in a laboratory container and the other split sample placed in a labeled clear plastic bag prior to FPXRF analysis. Split samples (and other samples of potential interest) placed in laboratory containers will be shipped to the laboratory and

archived for future analytical consideration. Stage 2 PDI Source Area sampling and analyses will be conducted in accordance with the same procedures identified in Section 3.2 and Appendix B (QAPP) of the RDWP.

A.3.3.3 Stage 2 RCRA Characterization

The objectives of the Stage 2 PDI RCRA characterization are to:

- Collect samples from a range of concentrations and material types within the Source Areas to provide data that would support the potential segregation of waste streams and assist in determining post-excavation disposal requirements;
- Identify potential waste stream(s) to perform soil/fill pre-conditioning studies on; and,
- Evaluate potential in-situ treatment methods for pre-conditioning soil/waste prior to excavation and disposal.

During Stage 2 PDI RCRA characterization, up to 24 additional samples will be collected from the Source Areas and analyzed for full TCLP analysis. These same samples will also be analyzed for full TAL inorganics and TCL organics to assess the presence of potential underlying hazardous constituents. Actual number of samples collected, sample location and depths will be determined based upon the results of the Stage 1 PDI soil/fill investigation.

The RCRA characterization samples will be from borings advanced as part of the Stage 2 Source Area delineation or from additional borings. Archived samples collected during the Stage 1 PDI may also be used to provide the RCRA characterization data. The number and depth intervals of samples from each Source Area during the Stage 2 RCRA Characterization will be based on the preliminary Source Area boundaries defined by the analytical results of the Stage 1 PDI. Sampling will be conducted in accordance with the procedures identified in Sections 3.2 of this Work Plan and Appendix B (QAPP) of the RDWP.

A.3.3.4 Soil/Fill Pre-Conditioning Study

Based on the results of the first and second stage delineation and RCRA characterization sampling and analyses, additional samples may be collected and laboratory testing may be performed on one or more soil/fill/waste types from the arsenic Source Areas to determine a means of pre-conditioning the soil/fill and/or tannery waste in-situ prior to excavation and off-site

disposal. This testing would be performed by KEMRON Environmental Services, Inc. Pre-conditioning testing performed on each soil/waste type will involve the following four phases:

- **Phase 1 – Characterization of Untreated Material**: Material will be homogenized and one sample would then be collected and characterized for total RCRA metals and TCLP RCRA metals;

- **Phase 2 – Preliminary Stabilization**: Samples of the homogenized material will be collected and 10 mixtures using various reagents or combinations of reagents will be developed. Following development of the mixtures, samples from each mixture will be collected and analyzed for TCLP arsenic (and possibly other metals based on Phase 1 results);

- **Phase 3 – Optimization Stabilization**: Given the results of the Phase 2 testing, one reagent mixture will be selected and reagents will be added at up to four different ratios to determine optimum dosage to economically stabilize the material. Samples from each mixture will be collected and then analyzed for TCLP arsenic (and possibly other metals). The relative unconfined compressive strength of each mixture will also be tested using a pocket penetrometer; and,

- **Phase 4 – Verification Stabilization**: Two duplicate samples of the selected mixtures from Phase 3 will be selected and testing will be performed to verify the Phase 3 results. Samples from each mixture will be collected and analyzed for TCLP RCRA metals.

Following testing, an evaluation will be performed to determine if there is an economically preferred means for effectively managing off-site disposal of soil/fill and/or tannery waste. As discussed in RDWP Section 4.5.2, management options will likely include off-site disposal at a permitted solid waste landfill; off-site treatment, as required, and disposal at a permitted RCRA landfill; and in-situ conditioning followed by excavation and off-site disposal at a permitted solid waste landfill.

If the latter alternative is preferred, areas proposed for in-situ conditioning will be identified in the Remedial Design Report. Excavated soil and/or tannery waste would be characterized at the point of generation, using the sample collection methodologies and frequencies defined in the Remedial Design Report, to verify that the excavated material does is not a RCRA characteristic hazardous waste, and disposed of off-site at a permitted solid waste landfill. As with all off-site shipments of remediation wastes, written approvals would be obtained from the permitted solid waste landfill prior to shipment.

The PDI proposes to gather data that will allow a determination of the flexibility and approximate cost of performing in-situ soil conditioning (prior to excavation and disposal) as one soil

management options. This approach will allow a cost-benefit analysis of various disposal options, which will be presented in the Soil Management Plan.

A.3.4 Geotechnical Investigation

A.3.4.1 Objectives

Soil Excavation

As discussed in Section 4.0 of the RDWP, the required soil excavation remedy under the ROD presents several geotechnical engineering challenges, which include:

- Potential excavation in the wet;
- Bottom stability (i.e., boiling, heaving) of excavations carried below groundwater;
- Groundwater control/dewatering, including drawdown effect on adjacent structures;
- Stability of open-cut excavations with sloped sidewalls;
- Excavation along the curbline of South 6th Street while maintaining the existing level-of-service of the roadway; and,
- Excavation against existing buildings to remain (e.g., three-story Ponte Equities Building; Comarco building) while preventing damage to the structural integrity and function of the buildings.

To obtain appropriate geotechnical information and data to address these design considerations, including samples for laboratory index, strength, and consolidation testing, Golder will advance eleven geotechnical soil borings (borings 1, 3, 5, 14, 19, 21, 28, 34, 35, 60, and 73and nine test pits (TP-1 through TP-9 at the Site in the locations depicted on Figure PDI-1 and as discussed in the following sections.

Building Foundations

Once the above-grade portions of the existing Rhodes Drum Building and one-story Ponte Equities Building are demolished as discussed previously in Section 2.1, attempts will be made to obtain additional information regarding the building foundations (substructures). This information will be used to evaluate excavation immediately adjacent to the three-story Ponte Equities Building (and possibly the Comarco Building) and for potential demolition of the substructure elements of the Rhodes Drum Building and one-story Ponte Equities Building. During the PDI, three test pits (TP-1, TP-2 and TP-3; see Figure PDI-1) will be excavated outside

of, and immediately adjacent to, the exposed building footprints in an attempt to observe the depth, type and thickness of foundations.

In addition, three geotechnical borings (borings 1, 3 and 5; see Figure PDI-1) will be advanced through the floor slab of the one-story Ponte Equities Building (once the superstructure is demolished). The purpose of these borings will be to investigate the thickness and geotechnical properties of the underlying fill material, and to investigate the presence and potential depth of the void space which may extend below both buildings. Both items are relevant to the evaluation of excavation adjacent to the building that will remain on-site.

Historic Fill and Tannery Waste

The PDI geotechnical borings and test pits will also be used to provide additional information about the historic fill material at the Site. Fill material will be observed and classified during performance of the borings and test pits by Golder personnel who will also record the depth of any debris such as bricks, blocks, scrap metal, wood fragments, pipe, ash, coal or other material encountered and characterize particle size distribution on a macro-scale. Determination of the presence of oversized particles (larger than cobble-size) and their frequency of occurrence is significant with regard to consideration of the in-situ soil condition option prior to excavation and off-site disposal (discussed in Section 4.5.2 of the RDWP and 3.3.2 above).

Test pits (TP-2 and TP-3; see Figure PDI-1) will also provide insight into the potential for odor from the tannery waste. Dust and odor controls will be implemented during the test pit excavations according to thresholds identified within the HSCP provided as Appendix C of the RDWP. If required, water spray and/or foam controls will be implemented during the PDI test pit activities to evaluate their effectiveness and provide data for consideration in preparing controls for construction during subsequent design.

A.3.4.2 Procedures

Geotechnical Soil Borings

Target depths for the geotechnical borings will range from 20 to 30 feet bgs, which is necessary to evaluate bottom stability and lateral support options of Source Area excavations. All borings will be advanced using a truck-mounted geotechnical drilling rig with 4¼-inch inside diameter hollow-stem augers. Because the borings will extend beneath the groundwater table and within sandy deposits, it may be necessary to use a thick bentonite slurry (drilling mud) within the

augers to minimize potential disturbance due to running sands. All borings will be continuously sampled via split-spoon sampler to termination depth in accordance with American Society for Testing and Materials (ASTM) Standard Test Method D1586. Standard Penetration Test (SPT) N-Values will be recorded and soil samples from the split-spoon sampler will be collected. Each recovered sample will be visually classified by a geologist or geotechnical engineer from Golder following the Unified Soil Classification System (USCS) in accordance with ASTM D2487 following the visual-manual procedure in general accordance with ASTM D2488. Where soft, compressible soils are encountered during the course of the boring investigations, Shelby tube or thin-walled piston samples will be collected in accordance with ASTM D1587 for laboratory strength, consolidation, and hydraulic conductivity testing. Uni-Tech Drilling Co., Inc. of Franklinville, New Jersey, will be utilized to perform the geotechnical investigations.

A calibrated PID will be used to monitor for the presence of VOCs from the open borehole during advance, from the collected split-spoon sample, and in the breathing zone (for safety reasons). Detected concentrations, if any, will be noted on the boring logs. Action Levels and Personal Protective Equipment (PPE) are outlined in the HSCP included as Appendix C of the RDWP.
Boreholes will be abandoned with cement-bentonite grout placed via tremie to a level approximately equal to the ground surface adjacent to each borehole. Excess drill cuttings will be containerized in sealed, 55-gallon DOT 17H drums labeled in accordance with procedures for handling investigation derived waste (IDW) as discussed in Section 2.8. As-completed boring locations will be surveyed by a Professional Land Surveyor licensed in the State of New Jersey.

Geotechnical Laboratory Testing

Representative soil samples from select strata intercepted by the borings will be tested in accordance with ASTM Standard Methods to confirm visual classifications and determine strength, consolidation, and hydraulic conductivity parameters of soft, compressible soils (Meadow Mat). The geotechnical soils laboratory testing program is anticipated to consist of the following tests:

- Twenty wet sieve without hydrometer analyses (ASTM D422);
- Six wet sieve with hydrometer analyses (ASTM D422);
- Four specific gravity determinations (ASTM D854);
- Twenty six moisture content determinations (ASTM D2216);

- Six Atterberg limits determinations (ASTM D4318);
- Two unconfined compression tests (ASTM D2166);
- Two one-dimensional consolidation tests (ASTM D2435);
- Two unconsolidated-undrained (UU) triaxial shear strength tests (ASTM D2850);
- Two consolidated-undrained (CU) triaxial shear strength tests (ASTM D4767); and,
- Two hydraulic conductivity determinations (ASTM D5084).

Soil samples to be tested will be determined by the PDI Geotechnical Manager based upon engineering judgment following the review and consideration of boring location, sample depth, and information obtained during boring advance (e.g., SPT N-value, USCS classification, recovery, etc.). In general, strength testing will focus on samples recovered from borings performed along the boundaries of 6th Street and the three-story Ponte Equities Building for consideration in excavation design. Consolidation tests are targeted for samples obtained from planned Source Area excavations where engineer backfill will be placed and could induce additional consolidation within the underlying Meadow Mat.

Test Pits

Test pits will be excavated utilizing a small, rubber tire backhoe outfitted with a telescoping boom. Test pit excavation will be conducted to a depth limited by the reach of the backhoe or where excavation below the groundwater table causes sloughing of the excavation sidewalls and inhibits visual observation. Excavated material will be temporarily stockpiled on a barrier (e.g., plastic sheet, tarpaulin, geotextile material, etc.) placed immediately adjacent to the excavation. The ground surface will be slightly graded such that any free water removed drains back to the trench. The existing surface soil/fill (up to 6 inches) will be scraped from the test pit footprint and stockpiled separately from materials below.

A Golder geologist or geotechnical engineer will prepare a field log for each test pit based on visual observation and classification of the excavated material consistent with the USCS. All observations will be made from the ground surface immediately adjacent to the excavation and at no time will anyone enter an excavation over 3 feet in depth. A calibrated PID will be utilized to monitor for the presence of VOCs from the open excavation during advance. Detected

concentrations, if any, will be noted on the test pit logs. Action Levels and PPE are outlined in the HSCP included as Appendix C of the RDWP.

Each test pit will be backfilled with the materials excavated from the test pit in lifts compacted with the backhoe bucket. The surficial soil/fill layer will then be replaced and seeded to stabilize the surface. Two opposing corners of the as-completed test pit locations will be surveyed by a Professional Land Surveyor licensed in the State of New Jersey.

A.4.0 PDI FOR GROUNDWATER

The primary objective of the groundwater PDI is to provide data essential to the development of an effective groundwater IMP. The data needed for the development of the IMP are related to understanding the following:

- Current location, integrity and conditions of existing monitoring well network;
- Confirm well survey elevation data and assessing current groundwater levels;
- Current distribution of arsenic and VOCs in groundwater (the last complete round of groundwater samples was collected in September 2002); and,
- Distribution of geochemical parameters, including natural attenuation parameters, to assist in the understanding of chemical fate and transport (little, if any, geochemical, data is currently available).

Figure PDI-1 presents the current monitoring well network which consists of the thirty-one existing monitoring wells. It is possible that meaningful changes in the groundwater geochemistry (arsenic, VOCs, and NAPs) may have occurred since the last groundwater sampling event conducted in 2002. Therefore, it is critical that the existing monitoring well network be assessed and sampled early in the PDI so that an appropriate monitoring well network can be identified in the IMP. The location and integrity of wells will be evaluated along with cross-referencing of PDI collected geologic information to evaluate the location and interval sampled by the monitoring wells.

Monitoring wells found to be damaged may be recommended for replacement, repair, or abandonment depending on the severity of damage and the need for the well. Wells with substantial silt accumulation, (i.e., which exhibit reduced depth based on construction logs) will be re-developed and re-assessed to determine their usability. If wells are deemed to be unusable they will be recommended for replacement or abandonment. The results of the groundwater PDI will be used to determine whether existing wells should be abandoned and whether new wells should be installed in order to provide an appropriate monitoring well network to assess the effectiveness of the Phase 1 RA.

A.4.1 Well Condition Survey

A pre-well condition survey was conducted by Golder as part of preparing this PDI Work Plan (January 23, 2008) and indicated the need to conduct a more thorough survey during the PDI. During the PDI, existing wells will be assessed for location, integrity and condition including visual inspection, depth to water measurements and well sounding for depth. Wells may be redeveloped if substantial silt buildup is observed.

A.4.2 Well Survey / Water Levels

Following well repairs, if needed, each monitoring well will be surveyed to provide elevations data relative to mean sea level for the ground surface, top of outer casing, and top of inner casing. All surveying will be conducted by a Professional Land Survey licensed in the State of New Jersey. Following surveying, water levels will be measured and contoured to provide a current assessment of groundwater flow directions and gradients.

A.4.3 Baseline Groundwater Sampling and Analyses

Samples will be collected from the thirty-one existing monitoring wells (if in usable condition) to provide an updated assessment of groundwater chemistry conditions throughout the Site area. The wells identified for the PDI monitoring are summarized in Table PDI-2. Each sample collected from the wells will be analyzed for VOCs, metals, and natural attenuation parameters including field parameters (dissolved oxygen, ORP, specific conductance, pH, temperature, turbidity, and ferrous iron) and laboratory parameters (TOC, chloride, alkalinity, sulfate, sulfide, nitrate, nitrite, phosphate, TSS, methane, ethane, and ethene). Groundwater sampling will be conducted using low-flow sampling techniques in accordance with Standard Operating Procedure (SOP) GFP-4 of the QAPP, NJDEP “Low Flow Purging and Sampling Guidance” and USEPA Region II “Ground Water Sampling Procedure - Low Stress (Low Flow) Purging and Sampling.”

The groundwater sampling data will provide an assessment of the effectiveness of the current monitoring well network for use in the groundwater IMP. In particular, the integrity of the shallow groundwater monitoring wells (S-series) wells will be evaluated. This information may be used to recommend abandonment of wells which do not discretely sample either shallow groundwater (above the Meadow Mat unit) or deeper groundwater (directly below the Meadow Mat unit). The information may also be used to recommend installation of new wells, including new wells discretely screened directly above or below the Meadow Mat.

A.5.0 INVESTIGATION DERIVED WASTE

Investigation Derived Waste (IDW) will be handled in accordance with SOP GFP-1 of the QAPP and will be grouped in the following categories:

- Drill Cuttings (including excess soil generated from soil sampling and drilling activities that is not returned to the sampling/drilling location);
- Groundwater Sampling Purge Water (including well development water);
- Spent Decontamination Liquids; and,
- Personal Protective Equipment.

Drill cuttings will be containerized in DOT-approved 55-gallon drums and labeled as "Drill Cuttings." Once a drum has been filled, it will be sealed, dated, and numbered and recorded in the field notebook. Any free-liquids will be decanted from the drums and handled in the same manner as groundwater sampling purge water.

Groundwater sampling purge water and well development water will be containerized in DOT-approved 55-gallon drums and labeled as "Purge Water." Once a drum has been filled, it will be sealed, dated, and numbered and recorded in the field notebook.

Decontamination liquids will be containerized in DOT-approved 55-gallon drums and labeled as "Decon Water." Once a drum has been filled, it will be sealed, dated, and numbered and recorded in the field notebook.

Personal Protective Equipment will be containerized in DOT-approved 55-gallon drums and labeled as "PPE." Once a drum has been filled, it will be sealed, dated, and numbered and recorded in the field notebook.

A.6.0 REFERENCES

CH2M HILL, 2004. "Remedial Investigation Report, Martin Aaron Superfund Site, Camden, New Jersey". December 2004.

CH2M HILL, 2005. "Draft-Final Feasibility Study Report, Martin Aaron Superfund Site, Camden County, New Jersey". July 2005.

Lockheed Martin, 2006. "Soil Investigation of the Ponte Equities Site, WA #0-183, Final Trip Report". May 5, 2006.

Weston Solutions, 2006. "Final Sampling and Analysis Report, Surface Soil and Building Interior Sampling, Ponte Equities Site, 1565-1575 South 6th Street, Camden, Camden County, New Jersey". March 1, 2006.

Table PDI-1
Soil/Fill Sampling Program
Martin Aaron NPL Site
Camden, New Jersey

Source Area	Boring ID	Parameters Analyzed	
		VOCs SW8260B	Metals SW 6010B
Arsenic Source Area No. 1	20[3]		X[1]
	24[3]		X[1]
	25[3]		X[1]
	26[3]		X[1]
	27[3]		X[1]
	28		X[1]
	29		X[1]
	30		X[2]
	31		X[1]
	32		X[2]
	33		X[1]
	34		X[1]
Arsenic Source Area No. 2	35[3]		X[1]
	36[3]		X[1]
	37[3]		X[1]
	38[3]		X[2]
	39		X[1]
	40		X[2]
	41[3]		X[1]
	65		X[1]
	66		X[1]
	67		X[1]
	68		X[1]
Pontes Equities Building	01		X[1]
	02		X[1]
	03		X[1]
	04		X[1]
	05		X[1]
	06		X[1]
	07		X[2]
	08		X[2]
	09		X[1]
	10		X[1]
	11		X[1]
	12[3]		X[1]
Tannery Waste/Sludge[4]	12[3]		X[1]
	13		X[1]
	14		X[1]
	15		X[1]
	16[3]		X[1]
	17		X[1]
	18[3]		X[2]
	19		X[1]
	20[3]		X[1]
	21		X[2]
	22		X[1]
	23		X[1]
	24[3]		X[1]
	25[3]		X[1]
	26[3]		X[1]
	27[3]		X[1]
	55[3]		X[1]
	56[3]		X[1]
	57[3]		X[1]
	58		X[1]
	59		X[1]
	60		X[1]

Table PDI-1
Soil/Fill Sampling Program
Martin Aaron NPL Site
Camden, New Jersey

Source Area	Boring ID	Parameters Analyzed	
		VOCs SW8260B	Metals SW 6010B
VOC Source Area No. 1	16(3)	X	
	18(3)	X	
	55(3)	X	
	56(3)	X	
	57(3)	X	
VOC Source Area No. 2	42	X	
	51	X	
	52	X	
	53	X	
	74	X	
VOC Source Area No. 3	35(3)	X	
	36(3)	X	
	37(3)	X	
	38(3)	X	
	41(3)	X	
	43	X	
	44	X	
	45	X	
	46	X	
	47	X	
	48	X	
	49	X	
	50	X	
	54	X	
Scrapyard	61		X(1)
	62		X(1)
	63		X(1)
	64		X(1)
	69		X(1)
	70		X(1)
	71		X(1)
	72		X(1)

Notes
(1) Total Arsenic Only
(2) Total Arsenic, Total Barium, Total Chromium, and Total Lead Only
(3) Boring will be used to delineate multiple Source Areas
(4) RCRA waste characterization samples will be collected from 3 borings in this source area. Determination of sample locations will be made in the field when waste is encountered. RCRA waste characterization parameters include VOCs (SW8260B), SVOCs (SW8270C), PCBs (SW8082), Pesticides (SW8081A), Metals (SW6010B), and Full TCLP (SW 1311/8260B 8270C/8081A/8151A 6010B/7470A).

Table PDI-2
Baseline Groundwater Sampling Program
Martin Aaron NPL Site
Camden, New Jersey

Well ID	Parameters Analyzed			Depth to Top of Screen	Depth to Bottom of Screen
	VOCs	Metals	NAPs(1)	ft bgs	ft bgs
MW-01M(2)	X	X	X	50	60
MW-01S(2)	X	X	X	4	14
MW-05S(2)	X	X	X	6	16
MW-09D(2)	X	X	X	39.5	54.5
MW-09S(2)	X	X	X	14	24
MW-10S(2)	X	X	X	8	18
MW-11M(3)	X	X	X	46	56
MW-11S(3)	X	X	X	11	21
MW-12M(3)	X	X	X	38.1	48.1
MW-12S(3)	X	X	X	5.4	15.4
MW-13M(3)	X	X	X	48.35	58.35
MW-13S(3)	X	X	X	6.6	16.6
MW-14D(3)	X	X	X	178	188
MW-14R(3)	X	X	X	109.5	119.5
MW-14S(3)	X	X	X	10	20
MW-15M(3)	X	X	X	59.4	69.4
MW-15S(3)	X	X	X	6.8	16.8
MW-16S(3)	X	X	X	6.5	16.5
MW-17M(3)	X	X	X	41.82	51.82
MW-17S(3)	X	X	X	8	18
MW-18D(3)	X	X	X	142	152
MW-18M(3)	X	X	X	31.77	41.77
MW-18S(3)	X	X	X	7.8	17.8
MW-19M(3)	X	X	X	41.8	51.8
MW-19R(3)	X	X	X	103	113
MW-19S(3)	X	X	X	5.05	15.05
MW-20D(3)	X	X	X	128	133
MW-20M(3)	X	X	X	38.5	48.5
MW-20R(3)	X	X	X	113	123
MW-20S(3)	X	X	X	7.9	17.9
MW-22S(3)	X	X	X	11	21

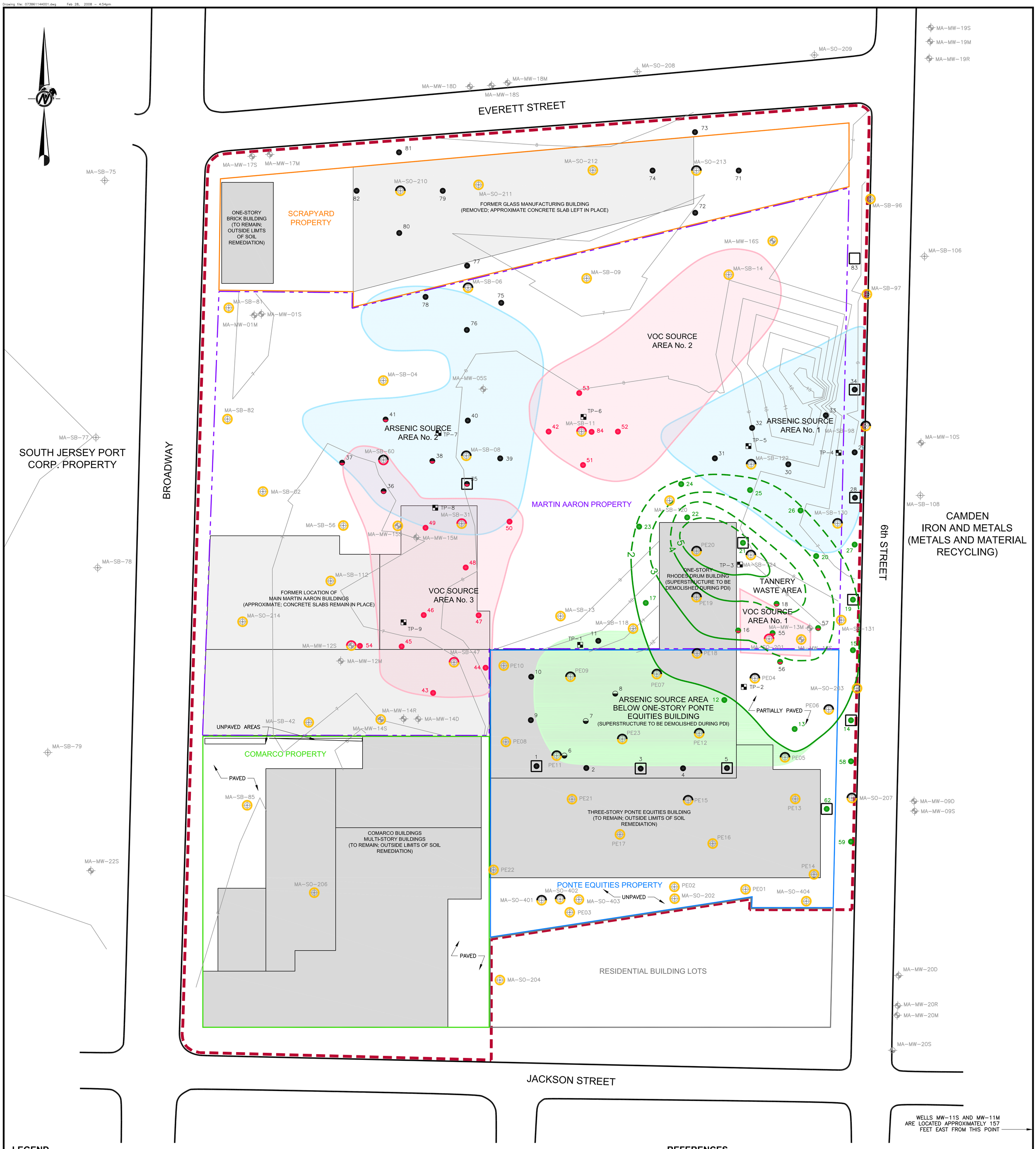
Notes

(1) Parameters included in Natural Attenuation Parameters (NAPs) analysis are:
Field Parameters - Dissolved Oxygen, Redox, Specific Conductance, pH, Temperature, Turbidity, and Ferrous Iron
Laboratory NAPs - Total Organic Carbon, Chloride, Alkalinity as $CaCO_3$, Sulfate, Total Sulfide, Nitrate, Nitrite, Total Phosphate, Total Suspended Solids, Methane, Ethane, and Ethene.

(2) Screen depths from NJDEP Draft Remedial Investigation Report June 2000.

(3) Screen depths from USEPA Remedial Investigation Report December 2004.

Drawing file: 07386114A001.dwg Feb 28, 2008 – 4:54pm



LEGEND

- LIMITS OF SOIL REMEDIATION
- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- PONTE EQUITIES PROPERTY (OWNED BY PONTE EQUITIES, INC.)
- COMARCO PROPERTY (OWNED BY MR. THOMAS HOVERSEN AND MRS. KAREN G. HOVERSEN
- SCRAPYARD PROPERTY (OWNED BY MR GEORGE P. ACKERLE AND MS. CALOGERA C. ACKERLE)
- 5 — APPROXIMATE TANNERY WASTE THICKNESS (FT)
- RESIDENTIAL BUILDING LOTS
- 10 — GROUND ELEVATION (FT–MSL)
- EXISTING BUILDING
- FORMER BUILDING (APPROXIMATE)
- APPROXIMATE ARSENIC SOURCE AREA > 300 PPM (AS ESTIMATED BY USEPA)
- APPROXIMATE VOC SOURCE AREA > 1 PPM (AS ESTIMATED BY USEPA)
- ESTIMATED LIMIT OF ARSENIC > 300 PPM OUTSIDE OF THE EXTENT OF TANNERY WASTE DELINEATION (BASED ON THE MAY 2006 LOCKHEED MARTIN REPORT)
- EXISTING MONITORING WELL
- MA–SB–31 — FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 — FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- PROPOSED ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED ARSENIC AND VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED TANNERY WASTE, ARSENIC AND VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED ARSENIC DELINEATION SOIL BORING (VERTICAL)
- PROPOSED TANNERY WASTE AND ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED GEOTECHNICAL SOIL BORING (HOLLOW–STEM AUGER BORING)
- PROPOSED TEST PIT (LOCATION TO BE DETERMINED IN THE FIELD)
- VOC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA); NO EXCEEDANCE OF ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300 mg/kg) (USEPA DATA); NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA)
- NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA) OR ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA) AND VOC EXCEEDANCE OF SOURCE CLEANUP GOAL (1mg/kg) (USEPA DATA)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS (OTHER THAN PONTE EQUITIES PROPERTY BOREHOLES) FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC. PONTE EQUITIES PROPERTY BOREHOLE LOCATIONS DIGITIZED FROM FIGURE 2 OF THE MAY 2006 EPA INVESTIGATION REPORT, TITLED "SOIL BORING LOCATIONS AND CROSS–SECTION LINES PONTE EQUITIES SITE," PREPARED BY LOCKHEED MARTIN.

3.) ARSENIC AND VOC SOURCE AREAS, DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL.

4.) TANNERY WASTE THICKNESS CONTOURS DIGITIZED FROM FIGURE 4 OF THE MAY 2006 EPA INVESTIGATION REPORT, PREPARED BY LOCKHEED MARTIN.

5.) FORMER GLASS MANUFACTURING BUILDING DIGITIZED FROM HARD COPY OF FIGURE 4, 1926 SANBORN MAP OF BLOCK 460.

25 0 25 50
SCALE FEET

FIGURE PDI-1

REVIEW	RSW 02/28/08
CHECK	KFM 02/28/08
CADD	AM 02/28/08
DESIGN	SDM 02/28/08
REV. 0	SCALE AS SHOWN
FILE No.	07386114A001
PROJECT No.	073–86114

TITLE

SITE LAYOUT APPROXIMATED SOURCE AREAS AND PROPOSED PDI SOIL BORINGS

PROJECT

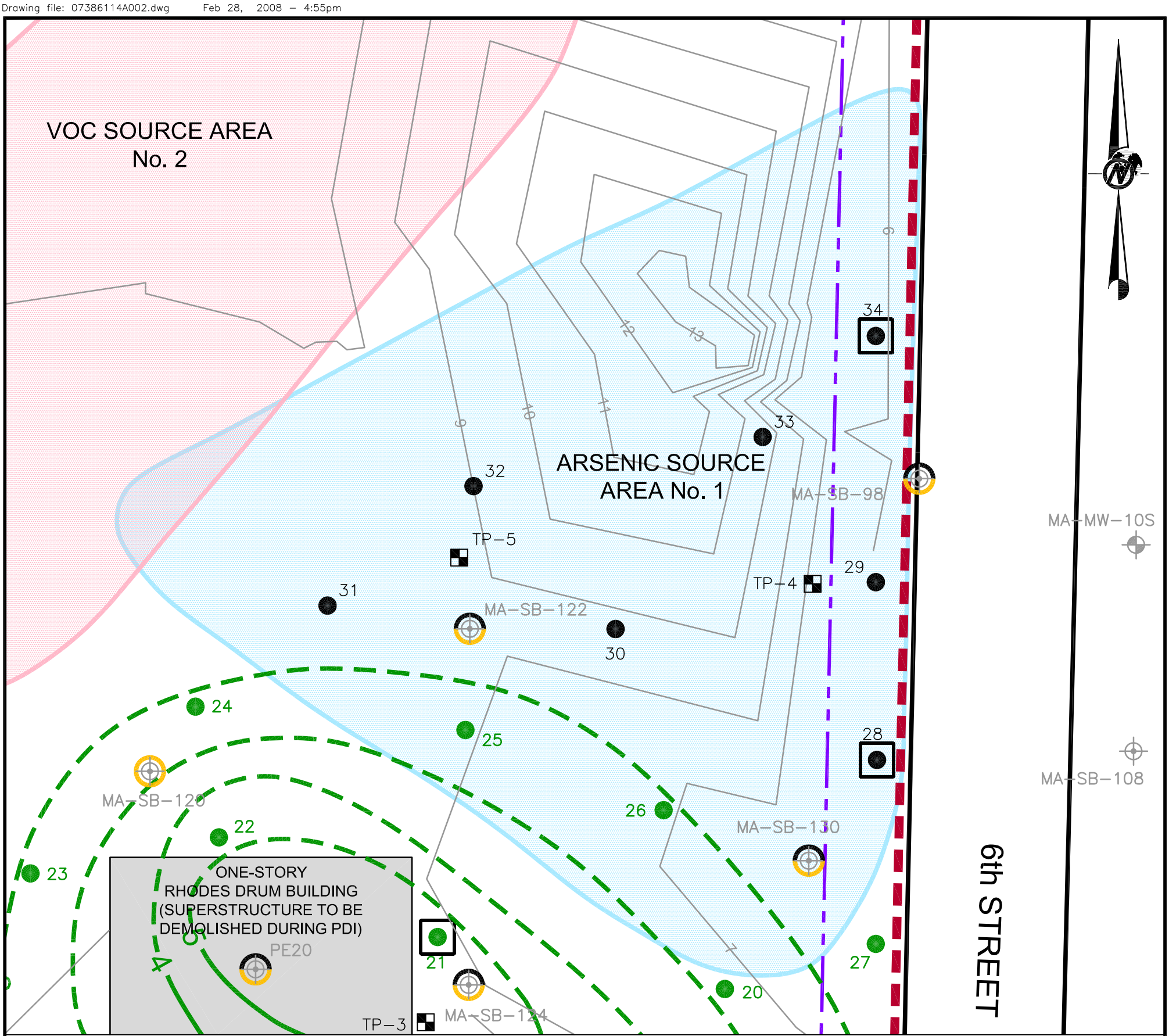
MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

NJ Authorization #24GA28029100

Golder Associates
Philadelphia USA

Drawing file: 07386114A002.dwg Feb 28, 2008 – 4:55pm



LEGEND

- LIMITS OF SOIL REMEDIATION
- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- 5 — APPROXIMATE TANNERY WASTE THICKNESS (FT)
- 10 — GROUND ELEVATION (FT–MSL)
- EXISTING BUILDING
- APPROXIMATE ARSENIC SOURCE AREA > 300 PPM (AS ESTIMATED BY USEPA)
- APPROXIMATE VOC SOURCE AREA > 1 PPM (AS ESTIMATED BY USEPA)
- EXISTING MONITORING WELL
- MA–SB–31 — FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 — FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- PROPOSED ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED TANNERY WASTE AND ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED GEOTECHNICAL SOIL BORING (HOLLOW–STEM AUGER BORING)
- PROPOSED TEST PIT (LOCATION TO BE DETERMINED IN THE FIELD)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300 mg/kg) (USEPA DATA); NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA)
- NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA) OR ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS (OTHER THAN PONTE EQUITIES PROPERTY BOREHOLES) FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC. PONTE EQUITIES PROPERTY BOREHOLE LOCATIONS DIGITIZED FROM FIGURE 2 OF THE MAY 2006 EPA INVESTIGATION REPORT, TITLED "SOIL BORING LOCATIONS AND CROSS–SECTION LINES PONTE EQUITIES SITE," PREPARED BY LOCKHEED MARTIN.

3.) ARSENIC AND VOC SOURCE AREAS, DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL.

4.) TANNERY WASTE THICKNESS CONTOURS DIGITIZED FROM FIGURE 4 OF THE MAY 2006 EPA INVESTIGATION REPORT, PREPARED BY LOCKHEED MARTIN.

20 0 20
SCALE FEET

FIGURE PDI-2

REVIEW	RSW	02/28/08
CHECK	KFM	02/28/08
CADD	AM	02/28/08
DESIGN	KM	02/28/08
REV. 0	SCALE AS SHOWN	
FILE No.	07386114A002	
PROJECT No.	073–86114	

TITLE

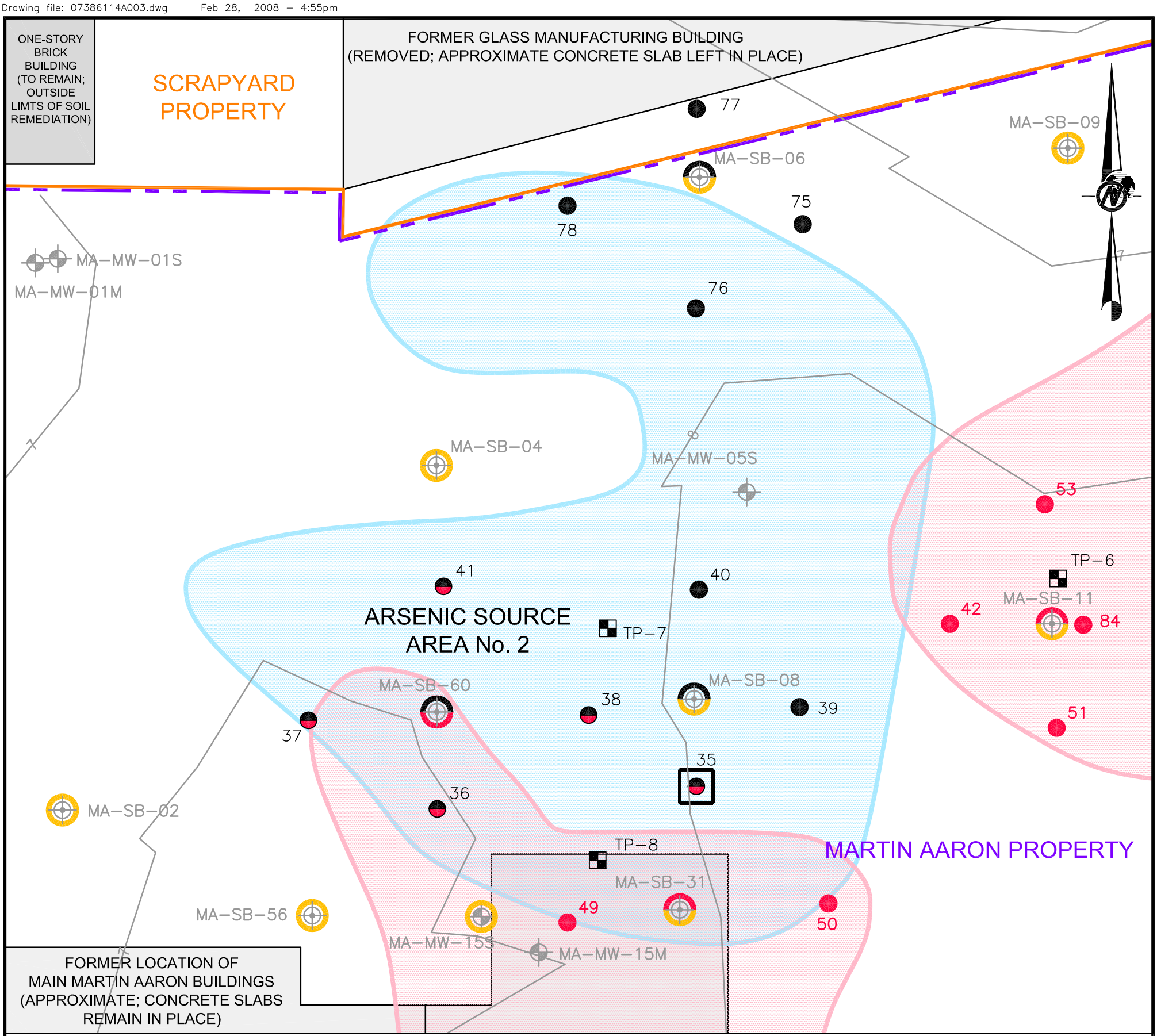
ARSENIC SOURCE AREA No. 1 - STAGE 1 PDI BORING LOCATIONS

PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Golder Associates
Philadelphia USA

Drawing file: 07386114A003.dwg Feb 28, 2008 – 4:55pm



LEGEND

- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- SCRAPYARD PROPERTY(OWNED BY MR GEORGE P. ACKERLE AND MS. CALOGERA C. ACKERLE)
- 10 GROUND ELEVATION (FT–MSL)
- FORMER BUILDING (APPROXIMATE)
- APPROXIMATE ARSENIC SOURCE AREA > 300 PPM (AS ESTIMATED BY USEPA)
- APPROXIMATE VOC SOURCE AREA > 1 PPM (AS ESTIMATED BY USEPA)
- EXISTING MONITORING WELL
- MA–SB–31 FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- PROPOSED ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED ARSENIC AND VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED GEOTECHNICAL SOIL BORING (HOLLOW–STEM AUGER BORING)
- PROPOSED TEST PIT (LOCATION TO BE DETERMINED IN THE FIELD)
- VOC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA); NO EXCEEDANCE OF ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300 mg/kg) (USEPA DATA); NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA)
- NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA) OR ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA) AND VOC EXCEEDANCE OF SOURCE CLEANUP GOAL (1mg/kg) (USEPA DATA)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC.

3.) ARSENIC AND VOC SOURCE AREAS, DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL.

4.) FORMER GLASS MANUFACTURING BUILDING DIGITIZED FROM HARD COPY OF FIGURE 4, 1926 SANBORN MAP OF BLOCK 460.

25 0 25
SCALE FEET

FIGURE PDI-3

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CHECK	KFM	02/28/08
CADD	AM	02/28/08
DESIGN	KM	02/28/08
REV. 0 SCALE AS SHOWN		
FILE No. 07386114A003		
PROJECT No. 073–86114		

TITLE

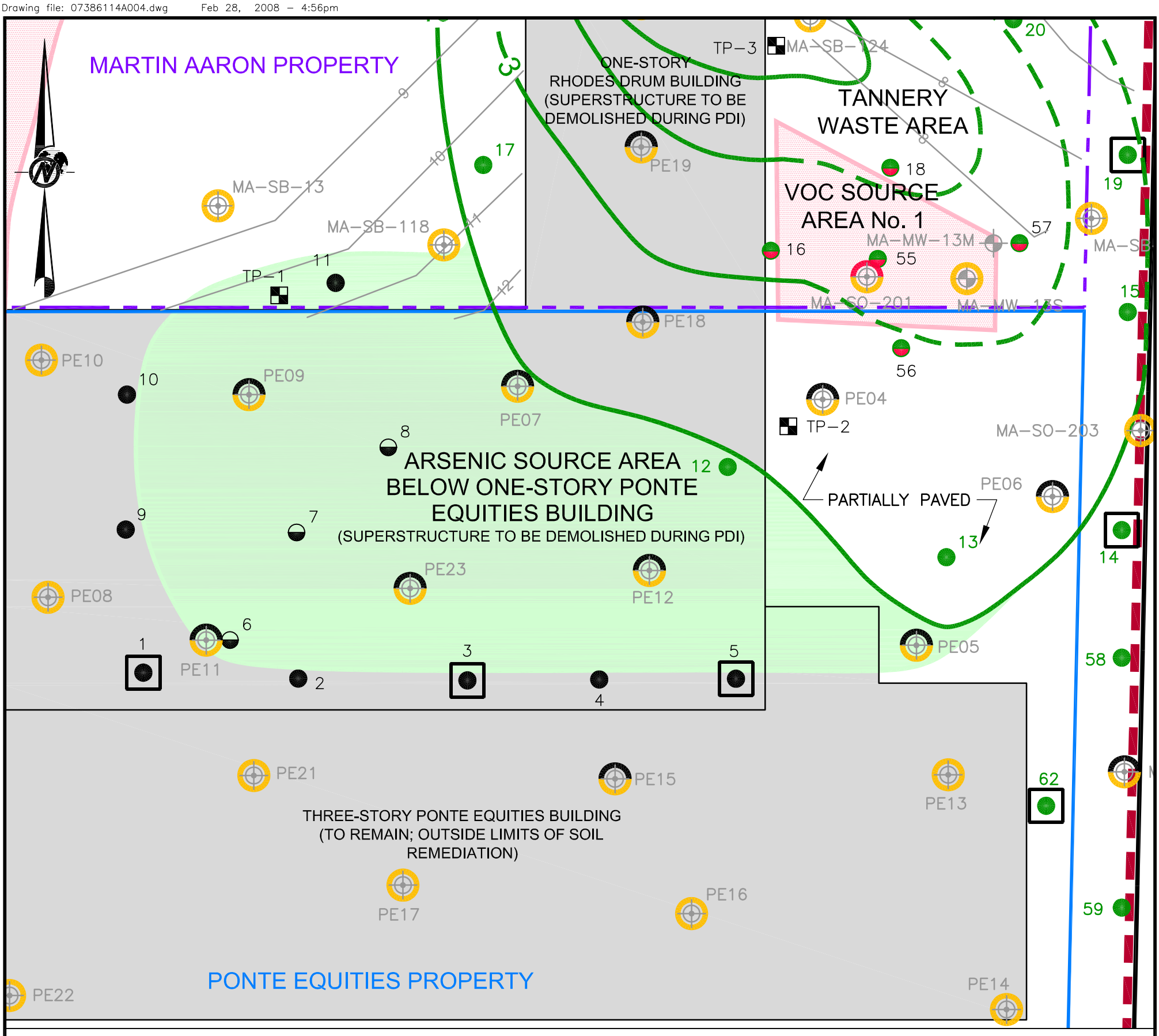
ARSENIC SOURCE AREA No. 2 - STAGE 1 PDI BORING LOCATIONS

PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Golder Associates
Philadelphia USA

Drawing file: 07386114A004.dwg Feb 28, 2008 – 4:56pm



LEGEND

- LIMITS OF SOIL REMEDIATION
- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- PONTE EQUITIES PROPERTY (OWNED BY PONTE EQUITIES, INC.)
- 10 GROUND ELEVATION (FT–MSL)
- EXISTING BUILDING
- APPROXIMATE VOC SOURCE AREA > 1 PPM (AS ESTIMATED BY USEPA)
- ESTIMATED ARSENIC SOURCE AREA > 300 PPM OUTSIDE OF THE EXTENT OF TANNERY WASTE DELINEATION (BASED ON THE MAY 2006 LOCKHEED MARTIN REPORT)
- EXISTING MONITORING WELL
- MA–SB–31 FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- PROPOSED ARSENIC DELINEATION BORING (HORIZONTAL AND VERTICAL)
- PROPOSED TANNERY WASTE, ARSENIC AND VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED ARSENIC DELINEATION SOIL BORING (VERTICAL)
- PROPOSED TANNERY WASTE AND ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED GEOTECHNICAL SOIL BORING (HOLLOW–STEM AUGER BORING)
- PROPOSED TEST PIT (LOCATION TO BE DETERMINED IN THE FIELD)
- VOC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA); NO EXCEEDANCE OF ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300 mg/kg) (USEPA DATA); NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA)
- NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA) OR ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS (OTHER THAN PONTE EQUITIES PROPERTY BOREHOLES) FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC. PONTE EQUITIES PROPERTY BOREHOLE LOCATIONS DIGITIZED FROM FIGURE 2 OF THE MAY 2006 EPA INVESTIGATION REPORT, TITLED "SOIL BORING LOCATIONS AND CROSS–SECTION LINES PONTE EQUITIES SITE," PREPARED BY LOCKHEED MARTIN.

3.) ARSENIC AND VOC SOURCE AREAS, DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL.

4.) TANNERY WASTE THICKNESS CONTOURS DIGITIZED FROM FIGURE 4 OF THE MAY 2006 EPA INVESTIGATION REPORT, PREPARED BY LOCKHEED MARTIN.

25 0 25
SCALE FEET

FIGURE PDI-4

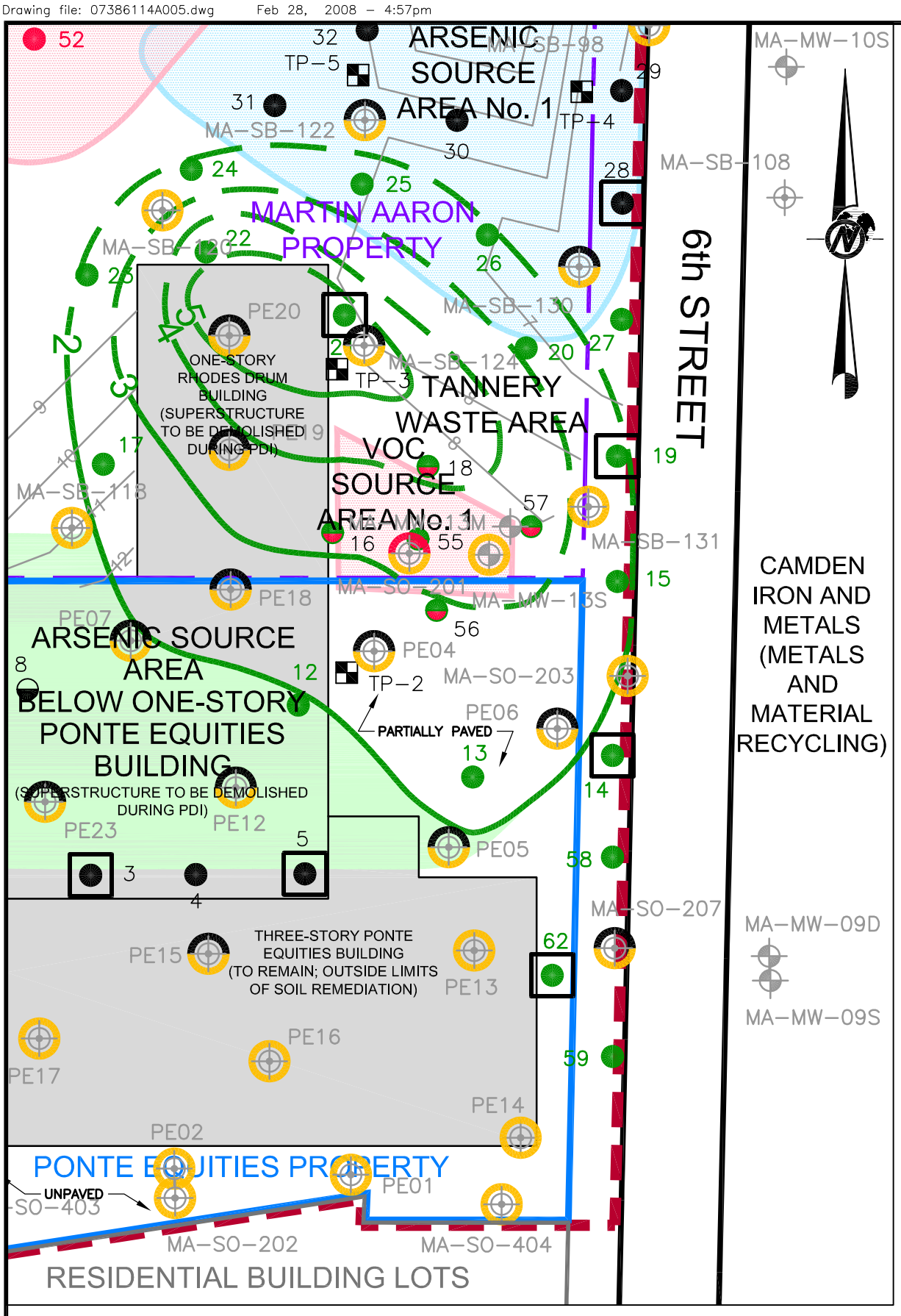
REVIEW	RSW	02/28/08
CHECK	KFM	02/28/08
CADD	AM	02/28/08
DESIGN	KM	02/28/08
REV. 0 SCALE AS SHOWN		
FILE No. 07386114A004		
PROJECT No. 073–86114		

TITLE
ARSENIC SOURCE AREA BELOW ONE-STORY PONTE EQUITIES BUILDING - STAGE 1 BORING LOCATIONS

PROJECT
MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Golder Associates
Philadelphia USA

Drawing file: 07386114A005.dwg Feb 28, 2008 – 4:57pm



LEGEND

- LIMITS OF SOIL REMEDIATION
- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- PONTE EQUITIES PROPERTY (OWNED BY PONTE EQUITIES, INC.)
- 5 — APPROXIMATE TANNERY WASTE THICKNESS (FT)
- RESIDENTIAL BUILDING LOTS
- 10 — GROUND ELEVATION (FT–MSL)
- EXISTING BUILDING
- APPROXIMATE ARSENIC SOURCE AREA > 300 PPM (AS ESTIMATED BY USEPA)
- APPROXIMATE VOC SOURCE AREA > 1 PPM (AS ESTIMATED BY USEPA)
- ESTIMATED LIMIT OF ARSENIC > 300 PPM OUTSIDE OF THE EXTENT OF TANNERY WASTE DELINEATION (BASED ON THE MAY 2006 LOCKHEED MARTIN REPORT)
- EXISTING MONITORING WELL
- MA–SB–31 — FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 — FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- PROPOSED ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED TANNERY WASTE, ARSENIC AND VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED ARSENIC DELINEATION SOIL BORING (VERTICAL)
- PROPOSED TANNERY WASTE AND ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED GEOTECHNICAL SOIL BORING (HOLLOW–STEM AUGER BORING)
- PROPOSED TEST PIT (LOCATION TO BE DETERMINED IN THE FIELD)
- VOC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA); NO EXCEEDANCE OF ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300 mg/kg) (USEPA DATA); NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA)
- NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA) OR ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS (OTHER THAN PONTE EQUITIES PROPERTY BOREHOLES) FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC. PONTE EQUITIES PROPERTY BOREHOLE LOCATIONS DIGITIZED FROM FIGURE 2 OF THE MAY 2006 EPA INVESTIGATION REPORT, TITLED "SOIL BORING LOCATIONS AND CROSS–SECTION LINES PONTE EQUITIES SITE," PREPARED BY LOCKHEED MARTIN.

3.) ARSENIC AND VOC SOURCE AREAS, DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL.

4.) TANNERY WASTE THICKNESS CONTOURS DIGITIZED FROM FIGURE 4 OF THE MAY 2006 EPA INVESTIGATION REPORT, PREPARED BY LOCKHEED MARTIN.

40 0 40
SCALE FEET

FIGURE PDI-5

REVIEW	RSW 02/28/08
CHECK	KFM 02/28/08
CADD	AM 02/28/08
DESIGN	KFM 02/28/08
REV. 0	SCALE AS SHOWN
FILE No.	07386114A005
PROJECT No.	073–86114

TITLE

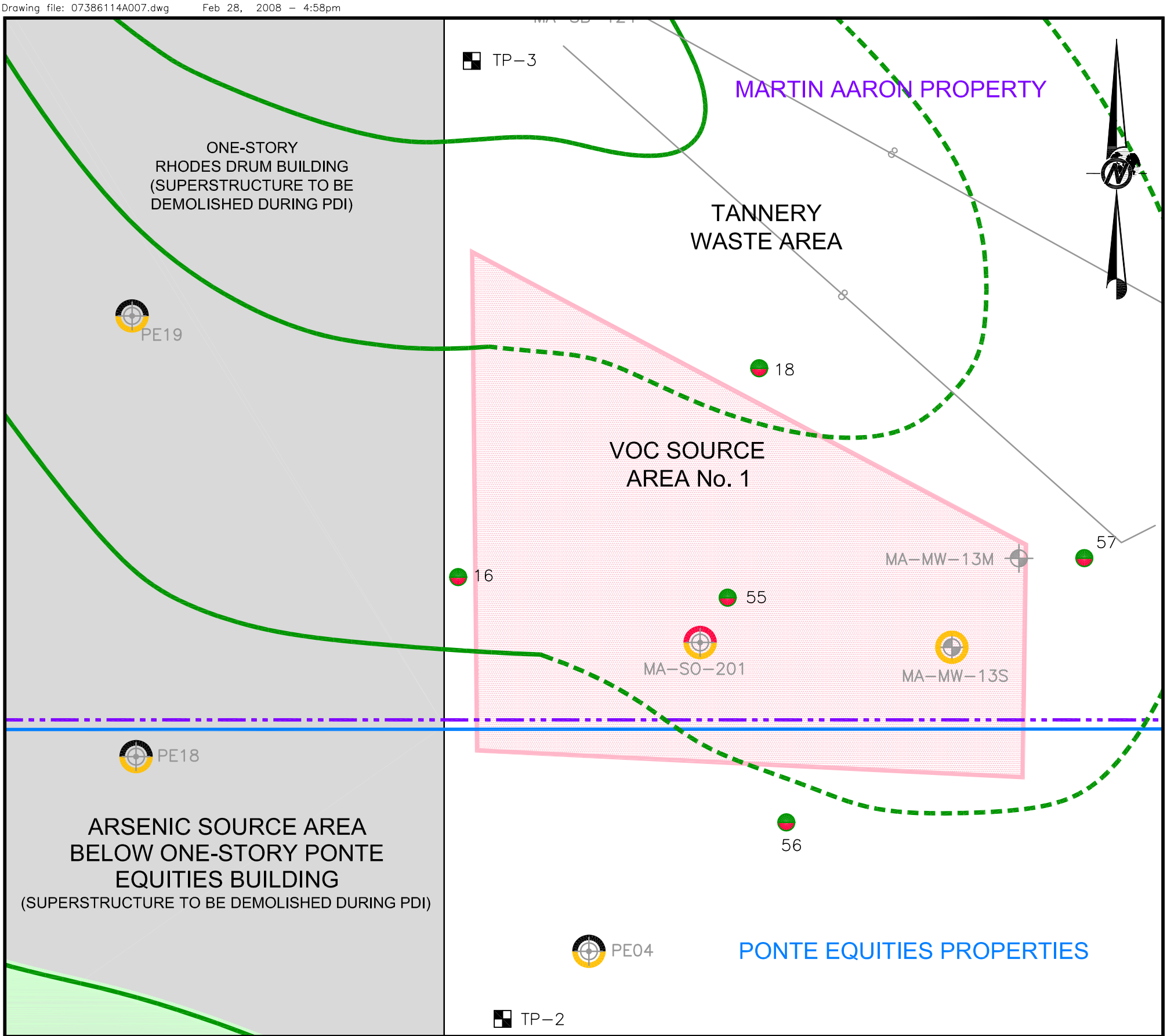
TANNERY WASTE AREA STAGE 1 PDI BORING LOCATIONS

PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Golder Associates
Philadelphia USA

Drawing file: 07386114A007.dwg Feb 28, 2008 – 4:58pm



LEGEND

- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- PONTE EQUITIES PROPERTY (OWNED BY PONTE EQUITIES, INC.)
- 5 — APPROXIMATE TANNERY SLUDGE THICKNESS (FT)
- 10 — GROUND ELEVATION (FT–MSL)
- EXISTING BUILDING
- APPROXIMATE VOC SOURCE AREA > 1 PPM (AS ESTIMATED BY USEPA)
- ESTIMATED LIMIT OF ARSENIC > 300 PPM OUTSIDE OF THE EXTENT OF TANNERY WASTE DELINEATION (BASED ON THE MAY 2006 LOCKHEED MARTIN REPORT)
- EXISTING MONITORING WELL
- MA–SB–31 — FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 — FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- PROPOSED TANNERY WASTE, ARSENIC AND VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED TEST PIT (LOCATION TO BE DETERMINED IN THE FIELD)
- VOC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA); NO EXCEEDANCE OF ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300 mg/kg) (USEPA DATA); NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA)
- NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA) OR ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS (OTHER THAN PONTE EQUITIES PROPERTY BOREHOLES) FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC. PONTE EQUITIES PROPERTY BOREHOLE LOCATIONS DIGITIZED FROM FIGURE 2 OF THE MAY 2006 EPA INVESTIGATION REPORT, TITLED "SOIL BORING LOCATIONS AND CROSS–SECTION LINES PONTE EQUITIES SITE," PREPARED BY LOCKHEED MARTIN.

3.) ARSENIC AND VOC SOURCE AREAS, DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL.

4.) TANNERY WASTE THICKNESS CONTOURS DIGITIZED FROM FIGURE 4 OF THE MAY 2006 EPA INVESTIGATION REPORT, PREPARED BY LOCKHEED MARTIN.

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SCALE FEET

FIGURE PDI-6

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PROJECT No.	073–86114	

TITLE

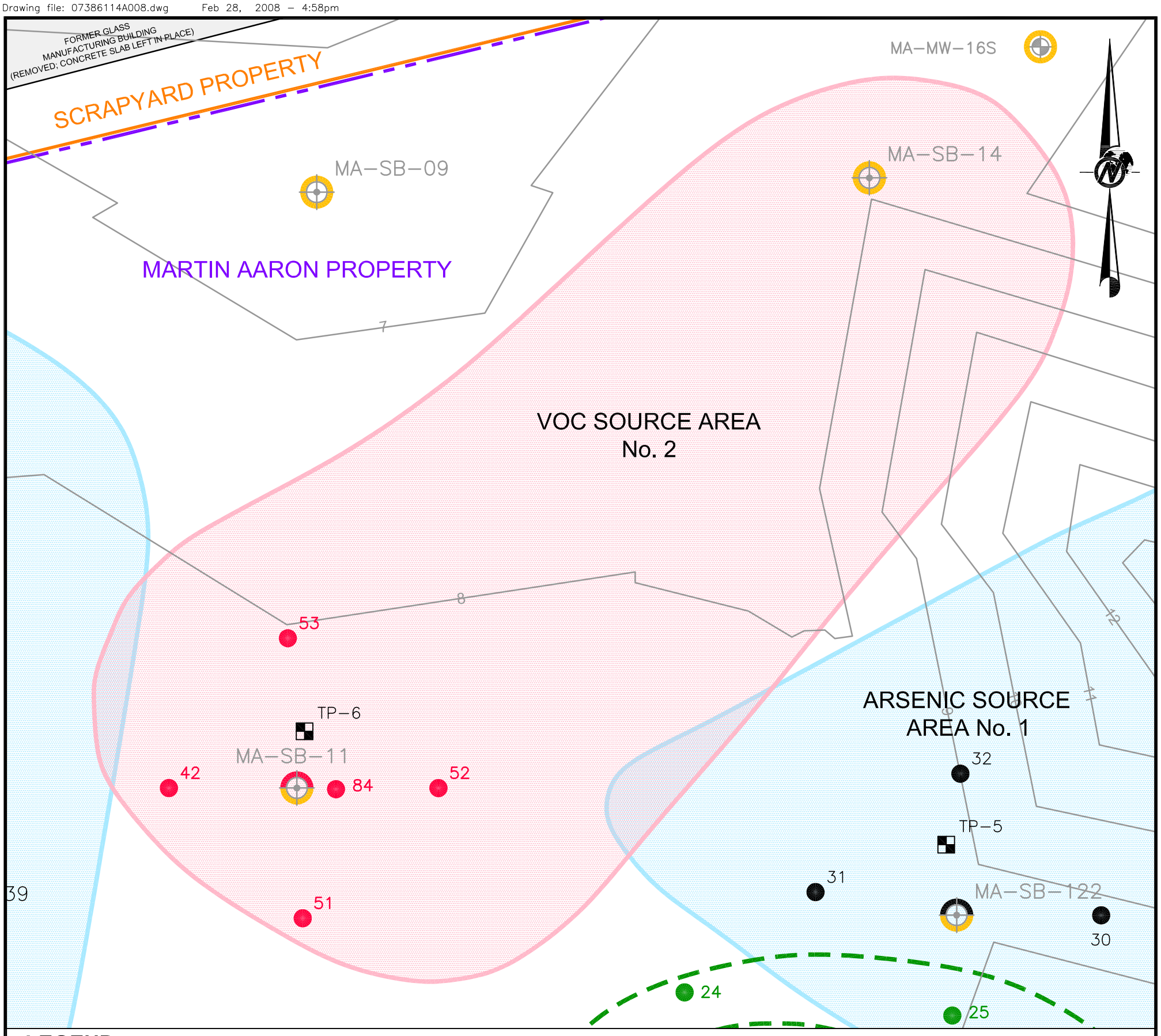
VOC SOURCE AREA No. 1 - STAGE 1 PDI BORING LOCATIONS

PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Golder Associates
Philadelphia USA

Drawing file: 07386114A008.dwg Feb 28, 2008 – 4:58pm



LEGEND

- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- SCRAPYARD PROPERTY (OWNED BY MR GEORGE P. ACKERLE AND MS. CALOGERA C. ACKERLE)
- 5 — APPROXIMATE TANNERY WASTE THICKNESS (FT)
- 10 — GROUND ELEVATION (FT–MSL)
- FORMER BUILDING (APPROXIMATE)
- APPROXIMATE ARSENIC SOURCE AREA > 300 PPM (AS ESTIMATED BY USEPA)
- APPROXIMATE VOC EXCAVATION AREA > 1 PPM (AS ESTIMATED BY USEPA)
- EXISTING MONITORING WELL
- MA–SB–31 — FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 — FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- PROPOSED ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED TANNERY WASTE AND ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED TEST PIT (LOCATION TO BE DETERMINED IN THE FIELD)
- VOC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA); NO EXCEEDANCE OF ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300 mg/kg) (USEPA DATA); NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA)
- NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA) OR ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC.

3.) ARSENIC AND VOC SOURCE AREAS, DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL.

4.) TANNERY WASTE THICKNESS CONTOURS DIGITIZED FROM FIGURE 4 OF THE MAY 2006 EPA INVESTIGATION REPORT, PREPARED BY LOCKHEED MARTIN.

5.) FORMER GLASS MANUFACTURING BUILDING DIGITIZED FROM HARD COPY OF FIGURE 4, 1926 SANBORN MAP OF BLOCK 460.

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SCALE FEET

FIGURE PDI-7

REVIEW	RSW	02/28/08
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PROJECT No.	073–86114	

TITLE

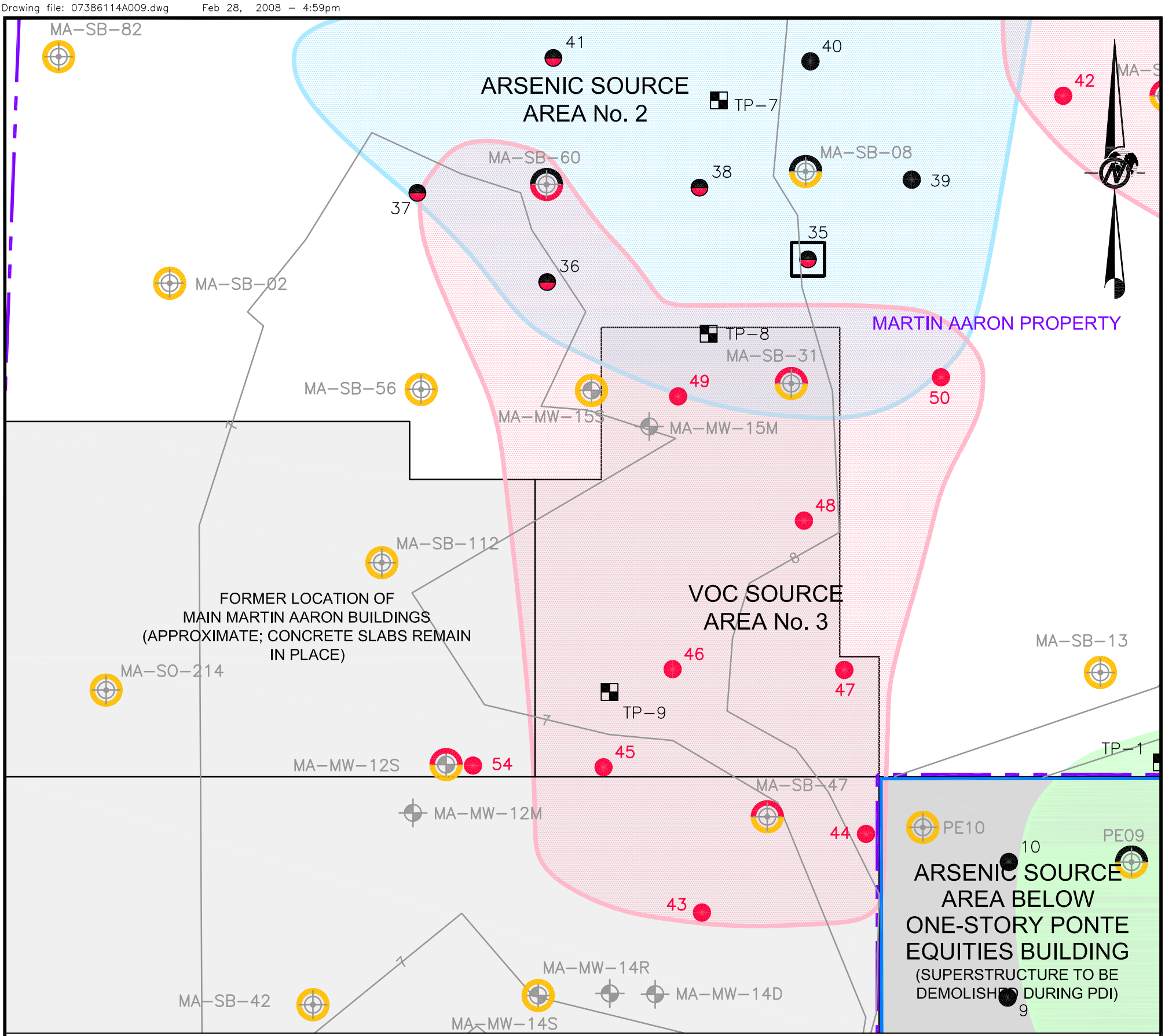
VOC SOURCE AREA No. 2 - STAGE 1 PDI BORING LOCATIONS

PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Golder Associates
Philadelphia USA

Drawing file: 07386114A009.dwg Feb 28, 2008 – 4:59pm



LEGEND

- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- PONTE EQUITIES PROPERTY (OWNED BY PONTE EQUITIES, INC.)
- 10 GROUND ELEVATION (FT–MSL)
- EXISTING BUILDING
- FORMER BUILDING (APPROXIMATE)
- APPROXIMATE ARSENIC SOURCE AREA > 300 PPM (AS ESTIMATED BY USEPA)
- APPROXIMATE VOC SOURCE AREA > 1 PPM (AS ESTIMATED BY USEPA)
- ESTIMATED LIMIT OF ARSENIC > 300 PPM OUTSIDE OF THE EXTENT OF TANNERY WASTE DELINEATION (BASED ON THE MAY 2006 LOCKHEED MARTIN REPORT)
- EXISTING MONITORING WELL
- MA–SB–31 FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- PROPOSED ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED ARSENIC AND VOC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED GEOTECHNICAL SOIL BORING (HOLLOW–STEM AUGER BORING)
- PROPOSED TEST PIT (LOCATION TO BE DETERMINED IN THE FIELD)
- VOC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA); NO EXCEEDANCE OF ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300 mg/kg) (USEPA DATA); NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA)
- NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA) OR ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA) AND VOC EXCEEDANCE OF SOURCE CLEANUP GOAL (1mg/kg) (USEPA DATA)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS (OTHER THAN PONTE EQUITIES PROPERTY BOREHOLES) FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC. PONTE EQUITIES PROPERTY BOREHOLE LOCATIONS DIGITIZED FROM FIGURE 2 OF THE MAY 2006 EPA INVESTIGATION REPORT, TITLED "SOIL BORING LOCATIONS AND CROSS–SECTION LINES PONTE EQUITIES SITE," PREPARED BY LOCKHEED MARTIN.

3.) ARSENIC AND VOC SOURCE AREAS, DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL.

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SCALE FEET

FIGURE PDI-8

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PROJECT No.	073–86114	

TITLE

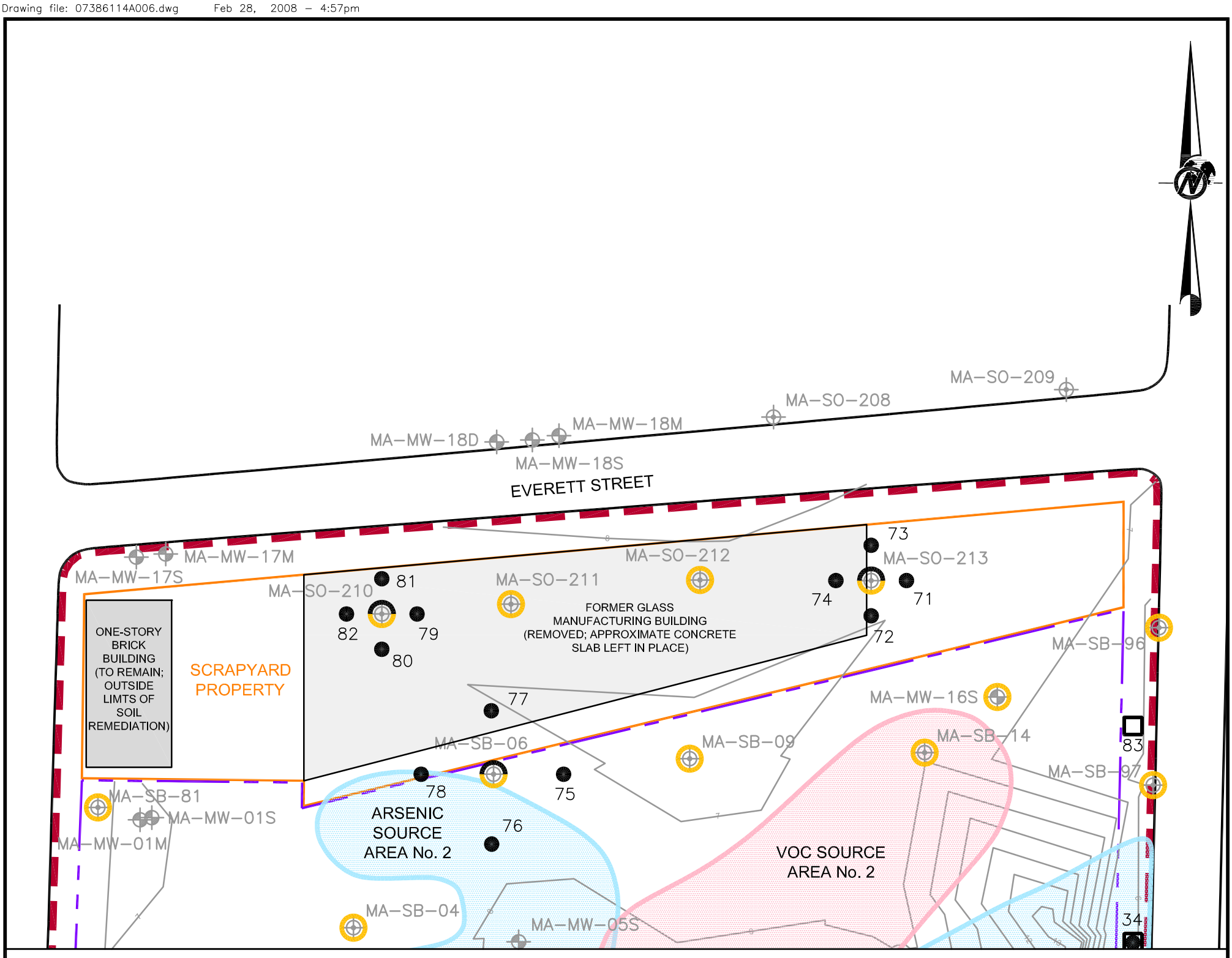
VOC SOURCE AREA No. 3 - STAGE 1 PDI BORING LOCATIONS

PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Golder Associates
Philadelphia USA

Drawing file: 07386114A006.dwg Feb 28, 2008 – 4:57pm



LEGEND

- LIMITS OF ROD SOIL REMEDIATION
- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- SCRAPYARD PROPERTY (OWNED BY MR. GEORGE P. ACKERLE AND MS CALOGERA C. ACKERLE)
- 10 GROUND ELEVATION (FT–MSL)
- EXISTING BUILDING
- FORMER BUILDING (APPROXIMATE)
- APPROXIMATE ARSENIC SOURCE AREA > 300 PPM (AS ESTIMATED BY USEPA)
- APPROXIMATE VOC SOURCE AREA > 1 PPM (AS ESTIMATED BY USEPA)
- EXISTING MONITORING WELL
- MA–SB–31 FORMER USEPA REMEDIAL INVESTIGATION SOIL BORING
- PE01 FORMER USEPA PONTE EQUITIES INVESTIGATION SOIL BORING
- PROPOSED ARSENIC DELINEATION SOIL BORING (HORIZONTAL AND VERTICAL)
- PROPOSED GEOTECHNICAL SOIL BORING (HOLLOW–STEM AUGER BORING)
- ARSENIC EXCEEDANCE OF SOURCE AREA CLEANUP GOAL (300 mg/kg) (USEPA DATA); NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA)
- NO EXCEEDANCE OF VOC SOURCE AREA CLEANUP GOAL (1mg/kg) (USEPA DATA) OR ARSENIC SOURCE AREA CLEANUP GOAL (300mg/kg) (USEPA DATA)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) MONITORING WELL AND BOREHOLE LOCATIONS FROM EXCEL FILE Sample Locations.XLS PROVIDED BY de maximis, INC.

3.) ARSENIC AND VOC SOURCE AREAS, DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL.

4.) GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL.

50 0 50
SCALE FEET

FIGURE PDI-9

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FILE No.	07386114A006	
PROJECT No.	073–86114	

TITLE

SCRAPYARD LOCATIONS - PHASE 1 PDI BORING LOCATIONS

PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Golder Associates
Philadelphia USA

APPENDIX B

QUALITY ASSURANCE / QUALITY CONTROL PROJECT PLAN

Golder Associates Inc.

200 Century Parkway, Suite C
Mt. Laurel, NJ 08054
Tel: (856) 793-2005
Fax: (856) 793-2006
www.golder.com

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Prepared for:

Martin Aaron Superfund Site Settling Performing Defendants

Prepared by:

Golder Associates Inc.
200 Century Parkway, Suite C
Mount Laurel, New Jersey 08054

DISTRIBUTION:

7 Copies	US Environmental Protection Agency
3 Copies	NJ Dept. of Environmental Protection
1 Copy	Martin Aaron Superfund Site Trust Counsel
6 Copies	Martin Aaron Settling Performing Defendants
2 Copies	*de maximis, inc.*
2 Copies	Golder Associates Inc.

August 2008 Project No.: 073-86114

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QAPP-7 Precision and Accuracy Limits - Pesticides - Soil/Solid
QAPP-8 Surrogate Recovery Limits - Polychlorinated Biphenyls - Soil/Solid
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QAPP-27 Surrogate Recovery Limits – Pesticides – Aqueous IDW
QAPP-28 Precision and Accuracy Limits – Pesticides – Aqueous IDW
QAPP-29 Surrogate Recovery Limits – Polychlorinated Biphenyls – Aqueous IDW
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Attachments

Attachment 1 Field Standard Operating Procedures
Attachment 2 Laboratory Analytical Standard Operating Procedures
Attachment 3 Laboratory Quality Assurance Manuals
Attachment 4 Data Validation Standard Operating Procedure

QAPP Worksheet #1 - Title and Approval Page

Site Name/Project Name: Martin Aaron Superfund Site
Site Location: Camden, New Jersey

Document Title: Quality Assurance Project Plan for the Martin Aaron Superfund Site

Lead Organization: Martin Aaron Superfund Site Settling Performing Defendants (Group)

Preparer's Name and Organizational Affiliation:
Julie M. Lehrman, CHMM
Golder Associates Inc.

Preparer's Address, Telephone Number, and E-mail Address:
Golder Associates Inc.
200 Century Parkway, Suite C
Mt. Laurel, NJ 08054
856-793-2005
jlehrman@golder.com

Preparation Date (Day/Month/Year): August 29, 2008

Investigative Organization's Project Manager/Date:

_____ _____
Signature Date
Printed Name/Organization: Randolph S. White/Golder Associates Inc.

Investigative Organization's Project Data QA/QC Task Leader/Date:

_____ _____
Signature Date
Printed Name/Organization: Julie Lehrman/Golder Associates

Lead Organization's Project Coordinator/Date:

_____ _____
Signature Date
Printed Name/Organization: Geoffrey Seibel / *de maximis, inc.*

QAPP Worksheet #2 - QAPP Identifying Information

Site Name/Project Name: Martin Aaron Superfund Site
Site Location: Camden, New Jersey
Site Number/Code: Not Applicable
Operable Unit: 1
Contractor Name: Golder Associates Inc.
Contractor Number: Not Applicable
Contract Title: Not Applicable
Work Assignment Number: Not Applicable

Title: Quality Assurance Project Plan
Revision Number: 0
Revision Date:

1. Identify regulatory program: CERCLA
2. Identify approval entity: USEPA Region II
3. The QAPP is (select one): ☐Generic ☒Project Specific
4. List dates of scoping sessions that were held:
   January 3, 2008, January 17, 2008, February 6, 2008
5. List dates and titles of QAPP documents written for previous site work, if applicable:

   USEPA Quality Assurance Project Plan - Remedial Investigation at the Martin Aaron, Inc. Superfund Site - Camden, New Jersey, CH2MHILL as contractor to USEPA, August 31, 2006

6. List organizational partners (stakeholders) and connection with lead organization:

   Golder Associates Inc. is under contract with the Martin Aaron Superfund Site Settling Performing Defendants (Group)

7. List data users:

   Golder Associates Inc., ***de maximis,*** inc., Martin Aaron Superfund Site Settling Performing Defendants, United States Environmental Protection Agency Region II, New Jersey Department of Environmental Protection

8. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusions below:

   All required elements are included.

QAPP Worksheet #2 - QAPP Identifying Information

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to QAPP Worksheets and Related Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	RDWP Section 1.0, QAPP Worksheet #1
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	QAPP Worksheet #2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	QAPP Worksheets #3 & #4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	RDWP Section 8.0 QAPP Worksheets #5, #6, #7 & #8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	RDWP Section 2.0, QAPP Worksheets #9, #10 & #11
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	QAPP Worksheets #12, & QAPP Tables 1 through 30
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	QAPP Worksheet #13
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	RDWP Sections 4.3 and 7.0, QAPP Worksheets #14, #15, #16
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.3 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.4 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/SOP Requirements Table - Analytical Methods/SOP Requirements Table - Field Quality Control Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	PDIWP, QAPP Worksheets #17, #18, #19, #20, #21, #22, QAPP Attachment 1

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to QAPP Worksheets and Related Documents
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	QAPP Worksheets #23, #24, #25. QAPP Attachment 2
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal	QAPP Worksheet #26, #27, QAPP Attachment 1
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples Table - Screening/Confirmatory Analysis Decision Tree	QAPP Worksheet #28
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management SOPs	QAPP Worksheet #29 & #30, QAPP Attachment 4
Assessment/Oversight		
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments Table - Audit Checklists - Assessment Findings and Corrective Action Responses Table	QAPP Worksheets #31 & #32
4.2 QA Management Reports	- QA Management Reports Table	QAPP Worksheet #33
4.3 Final Project Report		
Data Review		
5.1 Overview		
5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	QAPP Worksheets #34, #35, #36 & #37
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining		QAPP Attachment 4.

Notes:

QAPP Quality Assurance Project Plan
RDWP Remedial Design Work Plan
PDIWP Pre-Design Investigation Work Plan, RDWP Appendix A

Acronyms And Abbreviations
Used In The Quality Assurance Project Plan, Remedial Design Work Plan And Pre-Design Investigation Work Plan

Acronym	Definition
%	Percent
%D	Percent difference
AASHTO	American Association of State Highway and Transportation Officials
ACM	Asbestos containing material
AMRL	AASHTO Materials Reference Library
AOC	Administrative Order on Consent
ARAR	Applicable or relevant and appropriate requirements
AST	Aboveground storage Tank
ASTM	American Society for Testing Materials
bgs	Below ground surface
BRS	Brownfield Redevelopment Solutions
BTEX	Benzene, toluene, ethylbenzene and xylenes
°C	Degrees Centigrade (Celsius)
CAS	Chemical Abstracts Service
CCMUA	Camden County Municipal Utility Authority
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Chain of Custody
CU	Consolidated – Undrained
CVAA	Cold Vapor Atomic Absorption
DO	Dissolved Oxyen
DOT	Department of Tranportation
DQI	Data quality indicator
EM	Electromagnetic
EQPM	Environmental Quality Policy Manual
FPXRF	Field Portable X-ray Fluorescence
FS	Feasability Study
g	Gram
GC	Gas Chromatograph
GC/FID	Gas Chromatograph/Flame Ionization Detector
GC/ECD	Gas Chromatograph/Electronic Conductivity Detector
GC/MS	Gas Chromatograph/Mass Spectrometer
GQS	Groundwater quality standard
GPR	Ground Penetrating Radar
HCl	Hydrochloric Acid
HNO_3	Nitric Acid
HSA	Hollow Stem Augur
HSP	Health and Safety Contingency Plan
ICB	Initial Calibration Blank
ICP	Inductively Coupled Plasma
ICP-MS	Inductively Coupled Plasma-Mass Spectroscopy
ICV	Initial Calibration Verification
IDW	Investigation Derived Waste
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LDR	Land Disposal Restrictions
LQAP	Laboratory Quality Assurance Plan

Acronym	Definition
MDL	Method Detection Limit
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
ml	Milliliter
MPC	Measurement performance criteria
MS	Matrix Spike
MSD	Matrix Spike Duplicate
N.J.A.C.	New Jersey Administrative Code
NaOH	Sodium Hydroxide
NAPs	Natural Attenuation Parameters
NJDEP	New Jersey Department of Environmental Protection
ORP	Oxidation-Reduction Potential
P.E.	Professional Engineer
P.G.	Professional Geologist
PCBs	Polychlorinated biphenyls
PDI	Pre-Design Investigation
PDIWP	Pre-Design Investigation Work Plan
PID	Photoionization detector
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
PT	Performance Test
PVC	Polyvinyl chloride
QA	Quality Assurance
QAM	Quality Assurance Manual
QAPP	Quality Assurance Project Plan
QAO	Quality Assurance Officer
QC	Quality Control
QL	Quantitation Limit
r^2	Correlation coefficient
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RDWP	Remedial Design Work Plan
RI	Remedial Investigation
ROD	Record of Decision
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SJPC	South Jersey Port Corporation
SM20	Standard Methods, 20th Edition
SOP	Standard Operating Procedure
SOW	Statement of Work
SPCC	System Performance Check Compound
SPT	Standard Penetration Test
SVOC	Semivolatile Organic Compounds
SW-846	*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*
TBD	To Be Determined
TCLP	Toxicity Characteristic Leaching Procedure
ug/kg	Micrograms per kilogram
ug/L	Micrograms per liter
UPRM	Upper Potomac Raritan Magothy
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank

Acronym	Definition
UU	Undrained-Unconsolidated
VOC	Volatile Organic Compounds
XRF	X-Ray Fluorescence
ZHE	Zero Headspace Extractor
ZnOAc	Zinc Acetate

QAPP Worksheet #3 - Distribution List

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address
Mark B. Austin	Remedial Project Manager	U.S. Environmental Protection Agency	212-637-3954	212-637-4429	austin.mark@epa.gov
Craig Wallace	NJDEP Representative	New Jersey Dept. of Environmental Protection	609-984-3727	609-633-2360	craig.wallace@dep.state.nj.us
Louis DeStefano, Esq.	Group Council	Martin Aaron Superfund Site Trust	973-273-9800	973-273-9430	Louis.destefano@bipc.com
Geoffrey Seibel	Project Coordinator	*de maximus*, inc.	610-435-1151	610 435-8459	gcs@demaximis.com
Randolph S. White	Project Manager	Golder Associates Inc.	856-793-2005	856-793-2006	white@golder.com

QAPP Worksheet #4 - Project Personnel Sign-Off Sheet

Organization: Golder Associates

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Geoffrey Seibel	Project Coordinator	610- 435-1151		
Randolph S. White	Project Manager	856-793-2005		
Robert S. Valorio, P.E.	Design Manager	856-793-2005		
Charles Lawrence	Pre-Design Investigation Task Leader	856-793-2005		

QAPP Worksheet #5 - Project Organizational Chart

The Project Organizational Chart is provided in the Remedial DesignWork Plan (RDWP) Section 8.0. Organizational charts for future activities will be supplied in the applicable work plan.

QAPP Worksheet #6 - Communication Pathways

Communication Pathways are discussed in Section 8.0 of the RDWP. In addition, the Statement of Work (SOW), which is Appendix B of the Consent Decree, describes procedures for EPA review and the process and time frame for the response and revision of project design submissions.

A list of project contacts is provided below.

Project Name: Martin Aaron Projected Date(s) of Sampling: TBD Project Manager: Randy White			Site Name: Martin Aaron Superfund Site Site Location: Camden, New Jersey		
Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Mark Austin	Remedial Project Manager	EPA	212-637-3954	Austin.mark@epa.gov	Remedial Project Manager
Geoffrey Seibel	Project Coordinator	*de maximis, inc*	610-435-1151	gsc@demaximis.com	Project Coordinator
Kelly Fifer	Alternate Project Coordinator	*de maximis, inc*	610-435-1151	Kelly@demaximis.com	Assisting the Project Coordinator
Randolph S. White	Project Manager for Supervising Contractor	Golder Associates	856-793-2005	white@golder.com	Project Manager
Stuart D. Mitchell	Associate	Golder Associates	856-793-2005	smitchell@golder.com	PDI Strategist
Robert S. Valorio	Design Manager	Golder Associates	856-793-2005	Rvalorio@golder.com	Remedial Design Task Leader
Charles Lawrence	PDI Task Leader	Golder Associates	856-793-2005	kmccullen@golder.com	PDI Task Leader
Michael Borda	Project Geochemist	Golder Associates	856-793-2005	mborda@golder.com	Chemistry Data Evaluation
Julie Lehrman	Data QA/QC Task Leader	Golder Associates	856-793-2005	jlehrman@golder.com	QAPP Preparer, Data QA/QC Task Leader

The Group's primary contact with the USEPA is Mr. Geoff Seibel from *de maximis inc.* (the Group's Project Coordinator). Mr. Seibel's primary contact with Golder Associates (Group's Supervising Contractor) is Mr. Randy White. Both Messers. Seibel and White may contact USEPA with progress updates, recommendations, proposed field changes, or questions. However, only Mr. Seibel can represent the Group in final decision making matters. Messrs Seibel and White will contact USEPA via telephone, email, or in writing. Mr. Seibel, on behalf of the Group, will document important decisions reached via return email or in a confirmation letter.

Paragraph 44 of the Consent Decree requires the Group's Project Coordinator and USEPA's Remedial Project Manager will meet, at a minimum, on a monthly basis. It may be prudent to meet more frequently or hold regularly scheduled calls with USEPA during the critical PDI stages and the schedule for these calls (as needed) can be set-up following USEPA's approval of the RDWP. The Group's Project Coordinator and USEPA's Remedial Project Manager have agreed to develop an appropriate meeting schedule and frequency as the work progresses.

The Group will maintain an open line of communication with the USEPA RPM (Mr. Mark Austin) during the course of the project to discuss technical issues and/or obtain feedback on and approvals of alternative approaches that may arise during the PDI and detailed design. Since, the PDI source area delineation is a dynamic program, interaction between the Group and the USEPA RPM will be required to adapt the program so that it achieves its desired objectives as data are acquired and evaluated. As a result, the Group may have to contact USEPA during the course of the PDI to discuss one or more of the following issues such as:

- Approval of amendments to the QAPP;
- Initiation, notification and/or approval of real time modifications;
- Notification of delays or changes to field work;
- Recommendations to stop work and initiation of corrective action;
- Reporting of issues related to analytical data quality, including, but not limited to, ability to meet reporting limits.

In addition to the above, there are two specific instances where the Group is likely to contact USEPA during the course of the PDI:

- Following the completion of the Stage 1 PDI, the results will be tabulated, compared to the Source Area Cleanup Goals, and preliminary Source Area boundaries (both horizontal and vertical) will be identified. Stage 2 PDI boring locations will be selected to verify the preliminary Source Area boundaries and to focus the collection of samples within these boundaries for RCRA characterization and other parameters needed to evaluate various material handling options. The Group and USEPA should discuss the preliminary Source Area boundaries and the scope of the Stage 2 PDI prior to proceeding.
- As discussed in the PDI Work Plan on page A-24 (under VOC Source Area Delineation) and page A-25 (under Arsenic Area Delineation) there may be instances where anomalous data, borderline data, random results or an exceedance of the TVOC goal due to VOCs that do not have specified Source Area Cleanup Goals are obtained and may be considered differently when defining the Source Area boundary. The Group will contact USEPA to discuss these instances if they arise.

Communication pathways for future activities will be supplied in the applicable Work Plan.

QAPP Worksheet #7 - Personnel Responsibilities and Qualification Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
Randolph S. White	Project Manager	Golder Associates Inc.	See PDIWP	Note 1
James P. Valenti, P.G.	PDI Health and Safety Coordinator	Golder Associates Inc.	See PDIWP	Note 1
Robert S. Valorio, P.E.	Design Manager	Golder Associates Inc.	See PDIWP	Note 1
Charles Lawrence	Pre-Design Investigation Task Leader	Golder Associates Inc.	See PDIWP	Note 1
Julie Lehrman, CHMM	Data QA/QC Task Leader	Golder Associates Inc.	See PDIWP	Note 1
Geoffrey Seibel	Project Coordinator	*de maximus*, inc.	See RDWP	Note 2
Timothy S. Oostdyk	Executive Vice President	Lancaster Laboratories	See Lancaster Labs EQPM, Appendix D	See Lancaster Labs EQPM, Appendix D
Kathleen M. Loewen	Director, Quality Assurance	Lancaster Laboratories	See Lancaster Labs EQPM, Appendix D	See Lancaster Labs EQPM, Appendix D
Robert M. Large	Director, Environmental Client Services	Lancaster Laboratories	See Lancaster Labs EQPM, Appendix D	See Lancaster Labs EQPM, Appendix D
Matthew Ruf	Director of Direct-Push Services	S_2C_2	See S_2C_2 Quality Assurance Manual, Section 2	See S_2C_2 Quality Assurance Manual, Section 2
David E. Vandenberg	Vice President/ Laboratory Director	Kemron Environmental Services	See Kemron Laboratory Quality Assurance Plan Section 4.1	See Kemron Laboratory Quality Assurance Plan Section 4.1
David L. Bumgarner	Technical Director/ Quality Assurance Officer	Kemron Environmental Services	See Kemron Laboratory Quality Assurance Plan Section 4.1	See Kemron Laboratory Quality Assurance Plan Section 4.1
Charles E. Malson	Regional Geotechnical Practice Leader	TRC	See TRC QMP Section 5.1	See TRC QMP Section 5.1

Notes:

[1]Qualifications, including a *Quality Management Plan*, for the Group's proposed Supervising Contractor were provided to USEPA on December 6, 2007. The qualifications package described the education and qualifications of the Golder Associates personnel named above. The USEPA approved the Group's nomination of Golder Associates Inc. as the Supervising Contractor by letter dated January 14, 2008.

[2]USEPA Approved Project Coordinator

QAPP Worksheet #8 - Special Personnel Training Requirements Table

As described in RDWP Section 8.0, project team members with appropriate experience, technical skills and training have been selected to perform the project tasks. The subcontractors selected for drilling, laboratory analysis and other required project tasks were selected by Golder Associates based on qualifications and experience of the subcontractor to perform the required work. The subcontractors will meet the general requirements of USEPA Region II and NJ DEP to perform these tasks. Special personnel training requirements for future activities will be described in the appropriate work plans.

QAPP Worksheet #9 - Project Scoping Session Participants Sheets

Project Name: Martin Aaron **Projected Date(s) of Sampling:** TBD **Project Manager:** Randy White	**Site Name:** Martin Aaron Superfund Site **Site Location:** Camden, New Jersey

Date of Session: January 3, 2008
Scoping Session Purpose: RDWP report planning.

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Randolph S. White	Project Manager	Golder Associates	856-793-2005	White@ golder.com	Project Manager
Stuart D. Mitchell, P.G.	Associate	Golder Associates	856-793-2005	SMitchell@ golder.com	PDI Strategist
James P. Valenti, P.G.	PDI Health & Safety Coordinator	Golder Associates	856-793-2005	JValenti@ golder.com	Health & Safety Coordinator
Robert S. Valorio, P.E.	Design Manager	Golder Associates	856-793-2005	RValorio@ golder.com	Remedial Design Task Leader
Kevin McCullen	PDI Task Leader	Golder Associates	856-793-2005	KMcCullen@ golder.com	PDI Task Leader
Julie Lehrman, CHMM	Data QA/QC Task Leader	Golder Associates	856-793-2005	JLehrman@ golder.com	QAPP Preparer, Data QA/QC Task Leader
Peter Guy	Senior Environmental Scientist	Golder Associates	856-793-2005	PGuy@ golder.com	Information Management GroupLeader
Michael Borda	Project Geochemist	Golder Associates	856-793-2005	MBorda@ golder.com	Chemistry data evaluation
William Creamer	Staff Scientist	Golder Associates	856-793-2005	WCreamer@ golder.com	Environmental science staff member

Topic: Internal meeting to discuss the projected activities for the PDI and the additional information required to complete the RDWP, PDIWP, and QAPP.

Outcome: The meeting described above represents one of a series of internal meetings of the core project team to discuss the technical details of the project scope and sampling design. Golder Associates routinely conducts several such informal internal scoping sessions during the course of a project. These sessions typically discuss and reach outcomes of the following:

- Identification of PDI and detailed design data gaps
- Detailed design technical strategies
- Specific details for PDI and detailed design data acquisition including location, depth, parameters, and methods (field and analytical)
- Schedule for completion of project deliverables
- Project staff roles and responsibilities in preparing the Work Plans for implementation of the Work Plans

The outcome of these discussions are summarized and captured in the RDWP and PDI Work Plan.

QAPP Worksheet #9 - Project Scoping Session Participants Sheets

Project Name: Martin Aaron **Projected Date(s) of Sampling:** TBD **Project Manager:** Randy White	**Site Name:** Martin Aaron Superfund Site **Site Location:** Camden, New Jersey

Date of Session: January 17, 2008
Scoping Session Purpose: Prepare for Kickoff Meeting with EPA

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Geoffrey Seibel	Project Coordinator	*de maximus*, inc	610-435-1151	gsc@ demaximis.com	Project Coordinator
Kelly Fifer	Alternate Project Coordinator	*de maximus*, inc	610-435-1151	kelly@ demaximis.com	Assisting the Project Coordinator
Randolph S. White	Project Manager	Golder Associates	856-793-2005	White@ golder.com	Project Manager
Stuart D. Mitchell, P.G.	Associate	Golder Associates	856-793-2005	SMitchell@ golder.com	PDI Strategist
James P. Valenti, P.G.	PDI Health & Safety Coordinator	Golder Associates	856-793-2005	JValenti@ golder.com	Health & Safety Coordinator
Robert S. Valorio, P.E.	Design Manager	Golder Associates	856-793-2005	RValorio@ golder.com	Remedial Design Task Leader
Kevin McCullen	PDI Task Leader	Golder Associates	856-793-2005	KMcCullen@ golder.com	PDI Task Leader

Topic: Discussed site history, planned PDI activities and design approach. Prepared for February 6, 2008 meeting with Mark Austin, USEPA.

Outcome: In general, the outcome of this meeting was twofold:

- First, the project data gaps, technical strategy and approaches, and specific methods to acquire the design data were discussed between *de maximis inc* and Golder Associates and an agreed upon approach was identified. The details of the strategy/approach are presented in the RDWP and PDI Work Plan.

- Second, the technical issues and recommendations to discuss with Mr. Mark Austin was discussed and agreed to. These issues/recommendations established the Agenda for the February 6, 2008 scoping meeting with USEPA.

QAPP Worksheet #9 - Project Scoping Session Participants Sheets

Project Name: Martin Aaron **Projected Date(s) of Sampling:** TBD **Project Manager:** Randy White	**Site Name:** Martin Aaron Superfund Site **Site Location:** Camden, New Jersey

Date of Session: February 6, 2008
Scoping Session Purpose: Formal Project Kick-off Meeting

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Mark Austin	Remedial Project Manager	EPA	212- 637-3954	austin.mark@epa.gov	Remedial Project Manager
Geoffrey Seibel	Project Coordinator	*de maximus*, inc	610-435-1151	gsc@demaximis.com	Project Coordinator
Kelly Fifer	Alternate Project Coordinator	*de maximus*, inc	610-435-1151	kelly@demaximis.com	Assisting the Project Coordinator
Randolph S. White	Project Manager	Golder Associates	856-793-2005	White@golder.com	Project Manager
Stuart D. Mitchell, P.G.	Asssociate	Golder Associates	856-793-2005	SMitchell@golder.com	PDI Strategist
Robert S. Valorio, P.E.	Design Manager	Golder Associates	856-793-2005	RValorio@golder.com	Remedial Design Task Leader
Kevin McCullen	PDI Task Leader	Golder Associates	856-793-2005	KMcCullen@golder.com	PDI Task Leader
Michael Borda	Project Geochemist	Golder Associates	856-793-2005	MBorda@golder.com	Chemistry data evaluation
Julie Lehrman, CHMM	Data QA/QC Task Leader	Golder Associates	856-793-2005	JLehrman@golder.com	QAPP Preparer, Data QA/QC Task Leader

Topic: See attached Agenda. Purpose of the meeting was to introduce the Golder team to the EPA representative for the site and to get preliminary consensus for technical issues concerning the PDI.

Outcome: The primary outcome of this meeting was to obtain preliminary concurrence from Mark Austin of USEPA on the methods proposed to address the identified technical issues. The methods to address the technical issues were described in the RDWP and the PDI Work Plan for final approval by USEPA.

Martin Aaron Site
Project Kick-off Meeting
Wednesday, February 6, 2008

Proposed Agenda

1. **Introduction of Project Personnel and Primary Responsibilities**
   a. USEPA
   b. de maximis
   c. Golder Associates
   d. USEPA Oversight Contractor (if assigned)

2. **Lines/Methods of Communication**

3. **Communication with City of Camden**
   a. USEPA Contacts??

4. **Community Relations Plan**
   a. Who are the interested community players?
   b. Is USEPA planning a public notification session in near future?

5. **Schedule for Submittal of Remedial Design Work Plan**
   a. Date of USEPA Issuance – January 14, 2008
   b. RDWP Submittal Date (45 days from Issuance) – February 28, 2008

6. **Remedial Design Approach and Technical Issues**
   a. **Pre-Design Investigation for Soils – General Approach (Phase I and II)**
      i. **Excavation Delineation Parameters - Arsenic and VOCs**
      The Source Area Cleanup Goals listed in ROD Table 6 are for arsenic and VOCs. Therefore, it is proposed that soil samples collected during the PDI for the purpose of delineating source area excavations will be analyzed for those parameters (i.e., arsenic and VOCs).

      ii. **Delineation of Total VOCs (TVOC)**
      In addition to the VOCs listed in Table 6, the ROD also identifies a target total VOC (TVOC) source area cleanup goal of 1 mg/kg. For the purpose of excavation delineation during the PDI, TVOC values will be derived by totaling the concentration of those VOCs in Table 6 of the ROD and using ½ the detection limit value for results for those compounds that are ND. Detections of other VOCs that may cause a VOC summation to exceed 1 mg/kg (1/2 the DL

for ND results for these other VOCs would not be included in the sum) will be evaluated and discussed with USEPA on a case by case basis.

iii. **Analysis for Bis 2-Chloroethylether (BCEE)**
BCEE is included in Table 6 (Soil Cleanup Criteria) as a VOC - - it is a SVOC. However, there is no Source Area Cleanup Goal in Table 6 for BCEE, just a direct contact goal. Therefore, SVOCs will only be analyzed as part of the cap delineation (not source area delineation), to the extent necessary.

iv. **Phase Cap Delineation Sampling After Source Area Delineation**
Capping is not required in areas where source area excavation is performed due to final backfill with clean soil. Since the limits of the Source Areas have not yet been determined, it is possible that a Source Area will encroach into an area currently designated as "cap only". If that were to occur, sampling to delineate the limits of the cap might be of little value if the soil is to be excavated.

v. **Use of soil which exceeds direct contact cleanup goals but is less than source area cleanup goals as backfill in Source Area excavations.**
The PDI may delineate areas (or layers) of soil that exceeds the Direct Contact Cleanup Goals in Table 6 but not the Source Area Cleanup Goals. The design might also identify soils from grading and/or the construction of the cap and surface water management system that exceed the direct contact goals in Table 6 but not the Source Area Cleanup Goals. We would like to discuss if it is acceptable to USEPA to use this soil as backfill in the source area excavations as long as it is ultimately capped in accordance with the ROD requirements.

b. **PDI for Groundwater**

i. **General Overview of PDI Objectives and Approach**
The overall objective for the groundwater PDI is to obtain data that will allow the development of an effective groundwater Interim Monitoring Plan (IMP) (see item 7 below) and to evaluate potential for in-situ technologies to achieve ROD cleanup criteria. The groundwater PDI activities will include:

1. Locate and evaluate condition of existing wells
2. Conduct sampling of existing wells (arsenic, VOCs and geochemical parameters)
3. Recommend abandonment of existing wells and installation of new wells (as appropriate)

ii. **BCEE**

BCEE (as a SVOC) was detected in 11 of 96 groundwater samples (DEP and EPA data). These 11 detections occurred in four wells, MW-9S, MW-11M, MW-16S, and MW-20M. BCEE exceeded the ROD Cleanup Goal in Table 7 (10 ppb-NJGWQS) at MW-9S only once (15 ppb). Based on these data it is not believed that BCEE will play a significant role in the groundwater remedy. We would like to discuss not including BCEE in the groundwater PDI effort due to additional cost for sampling/testing this single SVOC.

c. **Schedule for RD**

In Section V, Paragraph C, Subsection 4, the SOW requires that the RD be completed within 9 months of EPA's approval of the RDWP. Golder will have a draft schedule for discussion. Major tasks/efforts under the RD include:

- Demolition of Rhodes Drum/Ponte One-Story Superstructures
- Pre-Design Investigation
- 30% Remedial Design Submittal
- EPA Review of 30% Submittal
- 95% RD Submittal
- EPA Review of 95% Submittal
- Final RD Submittal
- EPA Review and Approval of Final RD

4. **Timing of the Interim GW Monitoring Plan**

According to the SOW, the Interim GW Monitoring Plan is to be submitted to USEPA within 90 days of issuance of NTP. Under this schedule, the Interim Monitoring Plan is to be submitted by April 14, 2008. This is before the results of the GW PDI are evaluated. Since the PDI for groundwater includes a sampling event, this effort is consistent with the goal of the Interim Monitoring Plan (to obtain/start a baseline sampling program). Once the PDI for groundwater is complete and USEPA comments on the PDI Report, the Interim GW Monitoring Plan can be written and implemented (may include the installation of new wells). This IMP timing is believed consistent with the ROD/SOW in that the IMP can be implemented prior to the RA (providing a pre-RA baseline) and continue after the RA (providing post-RA data to assess effectiveness).

8. **Concept of In-situ Treatment of Soils to Prior to Disposal**
For the purpose of evaluating soil management options, a soil conditioning assessment will be included in the PDI to evaluate the potential to treat soil in-situ prior to excavation and off-site disposal. In-situ treatment of soil prior to excavation and off-site disposal is consistent with USEPA policies for managing remediation waste.

In-situ treatment is consistent with USEPA Area of Contamination (AOC) Policy (and possibly other USEPA soil management policies/procedures) as discussed in the USEPA documents "*Management of Remediation Waste Under RCRA*," USEPA, October 14, 1998 and "*Land Disposal Restrictions: Summary of Requirements,*" Revised August 2001 (USEPA 530-R-01-007).

9. **Use of Cap Material Other Than Asphalt**
The ROD/FS states that "Asphalt capping has been specified, for cost-estimation purposes; though a redevelopment plan including a combination of building foundations and other ground covers could be designed that would be protective." (ROD, pg. 17). There is no remedial action objective for reducing infiltration and the cost of asphalt pavement is significantly more that soil or gravel. Capping materials that would increase runoff (e.g. use of asphalt) will require that storm water management issues be addressed and incorporated into the cap. This could include on-site storm water retention basins and/or connections to the City stormwater system (a feasibility study may be required – uncertainty of existing system capacity, etc). The RD will propose flexibility for cap material specification and grading until final cap/grading plan can be developed as part of site redevelopment (which are envisioned to incorporate building(s) and/or paved surfaces into the final grades, cap and surface water management).

10. **Coordination/Communication on QAPP**
USEPA has new guidance for the content and format of the QAPP. Golder would like to contact USEPA to clarify some of the submittal requirements.

QAPP Worksheet #10 - Problem Definition

The problem to be addressed by the project:

The overall objective of this project is to acquire data needed to complete the design of the Phase 1 Remedial Action (Phase 1 RA) and to develop a groundwater Interim Monitoring Plan (IMP). The Phase 1 RA as summarized in Sections 1.3, 1.4, and 1.5 of the RDWP, and the IMP are described in the Consent Decree Scope of Work (SOW). In order to achieve this overall objective, the following specific objectives related to this QAPP need to be met:

- Delineation of arsenic and VOC impacted soil/fill to the ROD Source Area Cleanup Goals as listed in Table 6 of the ROD and as described in Section 4.4.1 and 4.4.2 of the RDWP. The areas of the Site that require delineation are discussed in Section A.3.1 of the PDI Work Plan. Section A.3.1, A.3.2, and A.3.3 of the PDI Work Plan (Appendix A of the RDWP) present specific procedures for completing the delineation;
- Characterization of soil/fill within the delineation areas described above for RCRA parameters and the full suite of TAL/TCL parameters as described in Sections A.3.1.9 and A.3.3.3 of the PDI Work Plan;
- Completion of a soil conditioning study as discussed in Section A.3.3.4 of the PDI Work Plan;
- Completion of a geotechnical investigation as discussed in Section A.3.4 of the PDI Work Plan;
- Completion of a groundwater investigation as discussed in Section A.4.0 of the PDI Work Plan; and,
- Pre-demolition evaluation of roofing materials for Asbestos Containing Material (ACM) as discussed in Section A.2.1.1 of the PDI Work Plan.

The overall Quality Assurance (QA) objective for this project is to develop and implement procedures for field sampling, sample custody, laboratory analysis, and data reporting that will provide results which are of known quality and can be evaluated using the ROD Table 6 Cleanup Goals. Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal QC, preventive maintenance of field equipment, and corrective action are described in other sections of this document.

This QAPP covers the specific activities of the PDI, but is intended to be general enough to cover all environmental and geotechnical sampling at the Martin Aaron Site through remedial construction and the initial stages of post-remedial monitoring. As a result, while job titles and specific companies are identified as the responsible party for each activity, specific individuals to fulfill each role will be identified in the appropriate Work Plans.

QAPP Worksheet #10 - Problem Definition

The environmental questions being asked include:

What volume of soil exceeds the Source Area Cleanup Goals (ROD Table 6)?

Once soil is excavated, will it be hazardous waste?

Can the soil to be excavated be pre-conditioned so that it is not a hazardous waste when excavated?

What geotechnical issues constrain the design of the excavation?

What are the physical characteristics of the historic fill and Meadow Mat geologic units at the Site (see RDWP Section 3.0)?

What is the condition of the existing groundwater montioring system?

What are the current chemical and geochemical conditions of groundwater (see RDWP Section 3.0)?

Is the roofing material from the structures slated for demolition classified as ACM (See PDI Work Plan Section A.2.1.1)?

Observations from any site reconnaissance reports:

Golder Associates personnel visited the site on January 23, 2008 during preparation of the PDI Work Plan. A preliminary well condition survey was conducted on the main Martin Aaron property and indicated the need to conduct a more thorough well condition survey during the PDI. The Golder field staff also observed several abandoned, empty drums visible aboveground, which appear to be left from previous investigations.

A synopsis of secondary data or information from site reports:

A synopsis of site conditions based on published USEPA and NJDEP reports is located in Section 2.3 of the RDWP.

The possible classes of contaminants and the affected matrices:

The primary Site contaminants of concern are VOCs and arsenic in soil and groundwater. Secondary contaminants of concern are related to characterization of waste streams and include TCL/TAL parameters, RCRA characteristics, and ACM (building roofing materials slated for demolition). Samples will be collected from the soil, groundwater, demolition materials, and IDW matrices. The IDW anticipated from the PDI includes drill cuttings, drilling fluid, decontamination water, purged groundwater and PPE materials.

The rationale for inclusion of chemical and nonchemical analyses:

The objectives of the PDI and the rationale for inclusion of specific chemical and geotechnical analyses are discussed in Sections 3.0 through 4.0 of the PDI Work Plan. The rationale for the inclusion of specific analyses for future activities will be provided in the applicable work plans.

QAPP Worksheet #10 - Problem Definition

Project decision conditions ("If..., then..." statements):

If the soil concentration of either VOCs (in accordance with Section 4.4.1 of the RDWP) or arsenic is above the ROD Source Area Cleanup Goals, the soil will be considered for excavation.

If the soil following excavation contains chemicals above the RCRA regulatory levels for Toxicity Characteristic Hazardous waste, then it will handled as a hazardous waste.

If the soil potentially contains chemicals above the RCRA regulatory levels for Toxicity Characteristic Hazardous wastes, then can the soil be effectively pre-conditioned in-situ so that when it is excavated it does not exhibit hazardous waste characteristics?

If the soil following excavation is determined to be a characteristic hazardous waste, then does it contain any underlying hazardous constituents requiring treatment to meet LDRs.

If an area requires excavation, then what geotechnical factors will affect the design of the excavation in order to protect adjacent structures, streets and/or utilities.

If the roofing materials are classified as ACM, then building demolition procedures will be modified accordingly (see PDI Work Plan Section A.2.1.1).

The project decisions described above are applicable to the PDI. The project decision conditions for future sampling will be discussed in the applicable Work Plans.

QAPP Worksheet #11- Project Quality Objectives/Systematic Planning Process Statements

Who will use the data? Golder Associates Inc., *de maximus, inc.*, the Martin Aaron Superfund Site Settling Performing Defendants, USEPA Region II and NJDEP.
What will the data be used for? The data will be used to: a) characterize soil conditions to permit detailed engineering design of the Phase 1 RA at the Martin Aaron Superfund Site; b) characterize geotechnical conditions to permit detailed engineering design of the Phase 1 RA at the Martin Aaron Superfund Site; c) characterize site groundwater conditions to permit development of the IMP; and, d) characterize investigation derived waste (IDW).
What types of data are needed? Volatile Organic Compounds (VOC), Semivolatile Organic Compounds (SVOC), Pesticides, Polychlorinated Biphenyls (PCB), Metals, RCRA waste chararacterization Toxicity Characteristic Leaching Procedure (TCLP) data, Groundwater quality monitoring including Natural Attenuation Parameters (NAPs), such as chloride and Total Organic Carbon, and Field Geochemical parameters such as temperature and dissolved oxygen, and, Geotechnical Engineering data, such as soil index, strength and consolidation properties. Samples will be collected from the soil, groundwater and IDW matrices. The analytical methods selected for each matrix during the PDI and whether the analysis will be performed in the field or at an off-site fixed laboratory are provided in Table QAPP-1. The types of data required for future sampling events will be provided in the applicable Work Plan or in an addendum to this QAPP.

QAPP Worksheet #11- Project Quality Objectives/Systematic Planning Process Statements

How "good" do the data need to be in order to support the environmental decision? Three types of data will be generated during the Pre-Design Investigation: Definitive Data, Screening Data and Geotechnical Engineering Data. The majority of the data will be definitive analytical data that are suitable for final decision-making. Definitive data are usually generated at fixed environmental analytical laboratories, but can be obtained in the field if suitable calibration and documentation procedures are followed. Examples of definitive data to be generated during the PDI are groundwater VOC data, soil SVOC and IDW TCLP data and field measurements of geocehmical parameters. Screening data are analytical data that are suitable for interim decision-making. Screening data usually require confirmation by definitive data prior to final decision making. Screening data are also usable to support definitive data. Examples of screening data anticipated during the PDI are field measurements of geochemical parameters and field portable X-ray fluorescence (FPXRF) metals analysis. Engineering data are data concerning soil classification, structure and properties suitable for decision making when performed by a qualified geotechnical laboratory and used by an appropriately qualified Geotechnical Engineer.
How much data are needed? The number of samples anticipated for Stage 1 of the PDI is detailed in Setions 3.0 and 4.0 of the PDI Work Plan and summarized in Table 1 and Table 2 of the PDI Work Plan. Since Golder Associates Inc. will be using a phased, dynamic work-plan, specific sample numbers can not be provided in the QAPP. The PDI Work Plan provides the rationale for determining where additional data will be required and how it will be acquired. The number of samples for future sampling activities will be provided in the applicable Work Plans.
Where, when, and how should the data be collected/generated? The PDI will begin after approval of the RDWP by USEPA.

QAPP Worksheet #11- Project Quality Objectives/Systematic Planning Process Statements

Who will collect and generate the data? Golder Associates Inc. and subcontracted laboratories. Data for the majority of the environmental analytical samples will be generated by Lancaster Laboratories, Inc. S_2C_2 will generate the FPXRF data. Kemron will generate data related to the soil pre-conditioning studies. TRC will generate soil geotechnical laboratory data.
How will the data be reported? The data from the PDI will be presented in the PDI Report which will be submitted to the Agencies as part of the 35% Remedial Design Report. Future sampling activities will be reported in documents as agreed upon by the Martin Aaron Superfund Site Group and USEPA Region II
How will the data be archived? Golder Associates will maintain electronic copies of all laboratory deliverables as part of the project file. A copy of these electronic deliverables will be incorporated into the Site chemical database. An archived hard copy of the laboratory data will be maintaned in a secure off-site storage facility until 10 years after the Group receives USEPA Certification of Completion, as required by Section XXV of the Record of Decision for the Site.

Measurement Performance Criteria

This section describes the approach to the Measurement Performance Criteria Tables using data quality indicators expressed as precision, accuracy, representativeness, completeness, comparability and sensitivity (PARCCS). Where possible, acceptance criteria are specified to help delineate minimum acceptability levels for use of data in the overall decision making process.

Precision

Precision refers to the degree to which repeated measurements are similar to one another. It measures the agreement (reproducibility) among individual measurements, obtained under prescribed similar conditions. Measurements that are precise are in close agreement with one another.

Field precision is assessed through the collection and measurement of field duplicates, which will be collected at an approximate rate of 1 duplicate per 20 field analytical samples collected. A field duplicate sample is defined as two or more representative portions taken from the same sampling location, homogenized, split and submitted for identical analyses. The field duplicate sample is submitted to the laboratory blind (i.e. submitted as an individual sample and not identified as a field duplicate) so as to impartially represent field precision.

Precision in the laboratory is assessed through the calculation of relative percent differences (RPD) between sample results. The RPD is calculated according to the following formula.

$$RPD = \frac{2 \times |\text{Amount in Sample 1} - \text{Amount in Sample 2}|}{(\text{Amount in Sample 1} + \text{Amount in Sample 2})} \times 100$$

General precision control limits are provided in the Measurement Performance Criteria Tables (QAPP Worksheet #12). The precision control limits provided are based on the laboratory QC control limits, which are routinely re-evaluated following the procedures in the laboratory quality assurance policies and the requirements of the analytical methods. Should the laboratory QC limits change between the submission of this QAPP and the sample analyses, the limits in place at the time of sample analysis will be used to evaluate the data, and updated QAPP tables will be submitted as an addendum.

For organic analyses, field and laboratory precision shall be assessed through the analysis of field duplicate samples. For inorganic analyses, laboratory precision shall be assessed through the analysis of laboratory duplicate pairs and field and laboratory precision through the analysis of field duplicate pairs. If the RPDs for field or

laboratory duplicates are within evaluation criteria, the original field sample result should be used, and not the duplicate sample result. If the RPDs for field or laboratory duplicates are not within evaluation criteria, the data will be qualified as estimated and the more conservative value should be used.

Accuracy

Accuracy is the degree of agreement between an observed value and an accepted reference or true value. The accuracy measurement is generally determined by the percent recovery (%R) of a known value. Accuracy as %R is determined by the following equation:

$$\% R = \frac{(\text{Amount in Spiked Sample} - \text{Amount in Sample}) \times 100}{\text{Known amount added}}$$

Accuracy in the field is assessed through the use of equipment rinsate and trip blanks to assess the potential of cross contamination. In addition, field accuracy is assessed by the adherence to all sample handling, preservation, and holding time criteria.

Laboratory accuracy is assessed through the analysis of standard reference materials (SRM), laboratory control samples (LCS), Matrix Spike/Matrix Spike Duplicate (MS/MSD), surrogate compounds, and the determination of the %R for these measurements. General accuracy control limits are provided in Measurement Performance Criteria Tables (QAPP Worksheet #12). Where accuracy criteria are not met, data will be qualified as either estimated (minor deviation from accuracy criteria) or rejected (major deviation from accuracy criteria). Data qualified as rejected should not be used for decision making purposes.

Representativeness

Representativeness expresses the degree to which data accurately and precisely represents a characteristic of a population, a parameter variation at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary.

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Work Plan is followed and that proper sampling techniques are used. The sampling program was designed to provide data representative of Site conditions. During development of this program, consideration was given to historical activities, existing analytical data, physical setting and processes. Using the proper analytical procedures, appropriate methods, meeting sample holding times and meeting QC criteria for each parameter, affirms representativeness in the laboratory. An additional assessment of representativeness will be made through field

duplicates. While field duplicates are primarily used to assess precision, they also indicate sample homogeneity and therefore the representativeness of the site.

Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount of data that was expected under normal conditions. Data is considered valid and complete if all QC elements have met the criteria established in this QAPP. Qualified data may be considered usable and will be considered complete on a case by case basis.

Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\textit{Completeness} = \frac{\textit{(number of valid measurements)}}{\textit{(number of measurements planned)}} \times 100$$

The laboratory and field completeness goal for this project is greater than 90 percent. Field measurements not collected from a specified location, or samples not collected due to environmental conditions, will be identified in the PDI report. Data qualified by the laboratory or data reviewer as estimated is usable and therefore considered complete; however, data qualified as rejected are not usable and do not count toward completeness goals.

Comparability

Comparability is an expression of the confidence with which one data set can be compared to another. Comparability of data is achieved by ensuring site-wide sample collection and analyses follow the same protocol. Comparability depends upon the proper design of the sampling program and will be satisfied by following the Work Plan, SOPs, and using proper sampling techniques. The field manager will routinely oversee field activities and verify compliance to the Work Plan and field sampling SOPs identified in QAPP Worksheet #21.

Analytical data are comparable when similar analytical methods are used as identified in Worksheet #23. Appropriate laboratory personnel will review and have a working knowledge of the laboratory SOPs to be used during the analysis of samples for the investigation. Additionally, the laboratory QA manager will review all data generated, verify compliance with method requirements, and attest that QA objectives are met.

Comparability between the metals data generated by fixed laboratory analysis and the data obtained through field measurements using a FPXRF spectrometer will be assessed by submitting an initial subset of the FPXRF samples to the fixed laboratory for analysis.

Sensitivity

Sensitivity is defined as the capability of a method or instrument to discriminate between measurement responses representing different levels of a variable of interest. Two measurement responses of interest in assessing sensitivity are the method detection limit (MDL) and the quantitation limit (QL). The MDL is defined as the minimum concentration of a substance that can be identified, measured and reported with a 99 percent confidence that the substance concentration is greater than zero, for a specific matrix containing the substance. The MDLs are determined as outlined in 40 CRF Part 136. The QL is defined as the level of measurement that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operations. The QLs are generally 2-5 times greater than the MDLs.

The sensitivity for field measurements will be determined, in part, by the limitations of field instrumentation as described in the manufacturer's manual and specific field measurement SOPs. Other factors that will influence sensitivity include matrix and environmental conditions.

The MDL and QL goals for field investigations are identified in QAPP Worksheet #15. The laboratory will verify the QLs defined by a point on the calibration curve which is below the stated QL. Additionally the laboratory will provide MDL studies for each compound upon request by the USEPA and/or Golder Associates QA officer. Should the laboratory MDL or QL change between the submission of this QAPP and the sample analyses, the limits in place at the time of sample analysis will be used to evaluate the data, and updated QAPP tables will be submitted as an addendum.

QAPP Worksheet #12 - Measurement Performance Criteria Tables
12-1 Volatile Organic Compounds – Soil/Solid

Matrix	Soil/Solid
Analytical Group	VOCs
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-01	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-01	Accuracy	Meets criteria in Table QAPP-2	Surrogate Recovery	A
GFP-5	LL-01	Accuracy	Meets criteria in Table QAPP-3	LCS	A
GFP-5	LL-01	Accuracy	No target compounds > QL except common laboratory contaminants, methylene chloride, 2-butanone and acetone, which must be < 2x QL	Method and Storage Blanks	A
GFP-5	LL-01	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-01	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-1	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-2 Semivolatile Organic Compounds – Soil/Solid

Matrix	Soil/Solid
Analytical Group	SVOCs
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-02	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-02	Accuracy	Meets criteria in Table QAPP-4	Surrogate Recovery	A
GFP-5	LL-02	Accuracy	Meets criteria in Table QAPP-5	LCS	A
GFP-5	LL-02	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	LL-02	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-02	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-2	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-3 Pesticides – Soil/Solid

Matrix	Soil/Solid
Analytical Group	Pesticides
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-03	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-03	Accuracy	Meets criteria in Table QAPP-6	Surrogate Recovery	A
GFP-5	LL-03	Accuracy	Meets criteria in Table QAPP-7	LCS	A
GFP-5	LL-03	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	LL-03	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-03	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-3	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-4 Polychlorinated Biphenyls – Soil/Solid

Matrix	Soil/Solid
Analytical Group	PCBs
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-04	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-04	Accuracy	Meets criteria in Table QAPP-8	Surrogate Recovery	A
GFP-5	LL-04	Accuracy	Meets criteria in Table QAPP-9	LCS	A
GFP-5	LL-04	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	LL-04	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-04	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-4	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-5 Metals – Soil/Solid

Matrix	Soil/Solid
Analytical Group	Metals
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S &A)
GFP-5	LL-05, LL-06, LL-07	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-05, LL-06, LL-07	Precision	Meets criteria in Table QAPP-10	LCS/LCSD, MS/MSD or Laboratory Duplicate	A
GFP-5	LL-05, LL-06, LL-07	Accuracy	Meets criteria in Table QAPP-10	LCS or MS	A
GFP-5	LL-05, LL-06, LL-07	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	LL-05, LL-06, LL-07	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-05, LL-06, LL-07	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15 -5	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-6 X-Ray Fluorescence Metals – Soil

Matrix	Soil
Analytical Group	XRF Metals
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	S_2C_2-1	Precision	Arsenic RSD <20% for the analysis of 7 replicates from the same sample.	Analytical Replicates	A
GFP-5	S_2C_2-1	Accuracy	No target compounds > QL	Method Blank	A
GFP-5	S_2C_2-1	Completeness	> 90% sample collection, >90% analysis	Data Completeness Check	S & A
GFP-5	S_2C_2-1	Comparability	The FPXRF results will be compared to the off-site laboratory analytical results using regression analysis.	XRF Correlation Sample	S & A
GFP-5	S_2C_2-1	Sensitivity	QL meets criteria in Worksheet 15-6	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-7 Volatile Organic Compounds - RCRA Waste Characterization

Matrix	Soil/Solid, IDW
Analytical Group	TCLP VOCs
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-09, LL-10	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-09, LL-10	Accuracy	Meets criteria in Table QAPP-11	Surrogate Recovery	A
GFP-5	LL-09, LL-10	Accuracy	Meets criteria in Table QAPP-12	LCS	A
GFP-5	LL-09, LL-10	Accuracy	No target compounds > QL except common laboratory contaminants, methylene chloride and 2-butanone which must be < 2x QL	Method Blank	A
GFP-5	LL-09, LL-10	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-09, LL-10	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15 - 7	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-8 Semivolatile Organic Compounds - RCRA Waste Characterization

Matrix	Soil/Solid, IDW
Analytical Group	TCLP SVOC
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-11, LL-02	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-11, LL-02	Accuracy	Meets criteria in Table QAPP-13	Surrogate Recovery	A
GFP-5	LL-11, LL-02	Accuracy	Meets criteria in Table QAPP-14	LCS	A
GFP-5	LL-11, LL-02	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	LL-11, LL-02	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-11, LL-02	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-8	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-9 Pesticides - RCRA Waste Characterization

Matrix	Soil/Solid, IDW
Analytical Group	TCLP Pesticides
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-11, LL-12	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-11, LL-12	Accuracy	Meets criteria in Table QAPP-15	Surrogate Recovery	A
GFP-5	LL-11, LL-12	Accuracy	Meets criteria in Table QAPP-16	LCS	A
GFP-5	LL-11, LL-12	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	LL-11, LL-12	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-11, LL-12	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15 -9	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-10 Herbicides - RCRA Waste Characterization

Matrix	Soil/Solid, IDW
Analytical Group	TCLP Herbicides
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-11, LL-13, LL-14	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-11, LL-13, LL-14	Accuracy	Meets criteria in Table QAPP-17	Surrogate Recovery	A
GFP-5	LL-11, LL-13, LL-14	Accuracy	Meets criteria in Table QAPP-18	LCS	A
GFP-5	LL-11, LL-13, LL-14	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	LL-11, LL-13, LL-14	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-11, LL-13, LL-14	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15 - 10	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-11 Metals - RCRA Waste Characterization

Matrix	Soil/Soild, IDW
Analytical Group	TCLP Metals
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-11, LL-15, LL-05, LL-06, LL-07	Precision	< 30% RPD	Field Duplicates	S & A
GFP-5	LL-11, LL-15, LL-05, LL-06, LL-07	Precision	Meets criteria in Table QAPP-19	LCS/LCSD, MS/MSD or Laboratory Duplicate	A
GFP-5	LL-11, LL-15, LL-05, LL-06, LL-07	Accuracy	Meets criteria in Table QAPP-19	LCS or MS	A
GFP-5	LL-11, LL-15, LL-05, LL-06, LL-07	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	LL-11, LL-15, LL-05, LL-06, LL-07	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-11, LL-15, LL-05, LL-06, LL-07	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-11	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-12 Metals – Soil Conditioning Study Samples

Matrix	Soil Conditioning Study Samples
Analytical Group	Total RCRA Metals
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S &A)
GFP-5	K-1 or K-2, K-3 or K-4, K-5, K-10	Accuracy	80 – 120% R	LCS or MS	A
GFP-5	K-1 or K-2, K-3 or K-4, K-5, K-10	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	K-1 or K-2, K-3 or K-4, K-5, K-10	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	K-1 or K-2, K-3 or K-4, K-5, K-10	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-12	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-13 TCLP Metals - Soil Conditioning Study Samples

Matrix	Soil Contioning Study Samples
Analytical Group	TCLP Metals
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	K-6, K-7 or K-8, K-3 or K-4, K-9	Accuracy	80 – 120%	LCS or MS	A
GFP-5	K-6, K-7 or K-8, K-3 or K-4, K-9	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-5	K-6, K-7 or K-8, K-3 or K-4, K-9	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	K-6, K-7 or K-8, K-3 or K-4, K-9	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-13	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-14 Volatile Organic Compounds – Groundwater and Aqueous IDW

Matrix	Groundwater, Aqueous IDW
Analytical Group	VOCs
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-4	LL-16	Precision	<20% RPD	Field Duplicates	S & A
GFP-4	LL-16	Accuracy	Meets criteria in Table QAPP-20	Surrogate Recovery	A
GFP-4	LL-16	Accuracy	Meets criteria in Table QAPP-21	LCS	A
GFP-4	LL-16	Accuracy	No target compounds > QL except common laboratory contaminants, methylene chloride, 2-butanone and acetone, which must be < 2x QL	Method, Trip and Storage Blanks	S & A
GFP-4	LL-16	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-4	LL-16	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15 -14	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-15 Metals – Groundwater and Aqueous IDW

Matrix	Groundwater, Aqueous IDW
Analytical Group	Metals
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2, 3]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-4	LL-05, LL-06, LL-07, LL-26, LL-27	Precision	< 20% RPD	Field Duplicates	S & A
GFP-4	LL-05, LL-06, LL-07, LL-26, LL-27	Precision	Meets criteria in Table QAPP-22	LCS/LCSD, MS/MSD or Laboratory Duplicate	A
GFP-4	LL-05, LL-06, LL-07, LL-26, LL-27	Accuracy	Meets criteria in Table QAPP-22	LCS or MS	A
GFP-4	LL-05, LL-06, LL-07, LL-26, LL-27	Accuracy	No target compounds > QL	Method and Equipment Rinsate Blanks	S & A
GFP-4	LL-05, LL-06, LL-07, LL-26, LL-27	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-4	LL-05, LL-06, LL-07, LL-26, LL-27	Sensitivity	Sample size and dilution adjusted QL meets criteria in Worksheet 15-15	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[2]Arsenic concentrations for groundwater shall be determined by ICP-MS following LL-26/LL-27. Mercury concentrations will be determined by LL-07. All other metals shall be determined by ICP following LL-05/LL-06.

12-16 Natural Attenuation Parameters – Groundwater

Matrix	Groundwater
Analytical Group	Natural Attenuation Parameters
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-4	Various (see below)	Precision	< 20% RPD	Field Duplicates	S & A
GFP-4	Various (see below)	Precision	Meets criteria in Table QAPP-23	LCS/LCSD, MS/MSD or Laboratory Duplicate	A
GFP-4	Various (see below)	Accuracy	Meets criteria in Table QAPP-23	LCS or MS	A
GFP-4	Various (see below)	Accuracy	No target compounds > QL	Method and Field Blanks	S & A
GFP-4	Various (see below)	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-4	Various (see below)	Sensitivity	Sample size and dilution adjusted QL meets criteria in Worksheet 15-16	Method Blanks	A

The Natural Attenuation Parameters (NAPs): Alkalinity, Chloride, Nitrate, Nitrite, pH, Sulfate, Total Organic Carbon, Total Phosphate, Total Sulfide, Total Suspended Solids, and Methane, Ethane, and Ethene.

The analytical methods to be used for the NAPs include: LL-18, LL-19, LL-20, LL-21, LL-22, LL-23, LL-24, and LL-25.

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-17 Field Parameters – Groundwater

Matrix	Groundwater
Analytical Group	Field Parameters
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-4	Various (see below)	Precision	Meets criteria in Table QAPP-24	Analytical Replicates	A
GFP-4	Various (see below)	Completeness	> 90% sample collection	Data Completeness Check	S & A

Field Parameters: Dissolved Oxygen, Ferrous Iron, Oxidation-Reduction Potential, pH, Specific Conductance, Temperature, and Turbidity

The analytical methods to be used include: G-6, G-7, G-8, G-9, and G-10.

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-18 Semivolatile Organic Compounds – Aqueous IDW

Matrix	Aqueous IDW
Analytical Group	SVOCs
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-02	Accuracy	Meets criteria in Table QAPP-25	Surrogate Recovery	A
GFP-5	LL-02	Accuracy	Meets criteria in Table QAPP-26	LCS	A
GFP-5	LL-02	Accuracy	No target compounds > QL	Method Blanks	S & A
GFP-5	LL-02	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-02	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-2	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-19 Pesticides – Aqueous IDW

Matrix	Aqueous IDW
Analytical Group	Pesticides
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-12	Accuracy	Meets criteria in Table QAPP-27	Surrogate Recovery	A
GFP-5	LL-12	Accuracy	Meets criteria in Table QAPP-28	LCS	A
GFP-5	LL-12	Accuracy	No target compounds > QL	Method Blanks	S & A
GFP-5	LL-12	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-12	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-3	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

12-20 Polychlorinated Biphenyls – Aqueous IDW

Matrix	Aqueous IDW
Analytical Group	PCBs
Concentration Level	All

Sampling Procedure[1]	Analytical Method/SOP[2]	Data Quality Indicators (DQI)	Measurement Performance Criteria (MPC)	QC Sample and/or Activity	QC Sample Assesses Error for Sampling (S), Analytical (A) or Both (S&A)
GFP-5	LL-28	Accuracy	Meets criteria in Table QAPP-29	Surrogate Recovery	A
GFP-5	LL-28	Accuracy	Meets criteria in Table QAPP-30	LCS	A
GFP-5	LL-28	Accuracy	No target compounds > QL	Method Blanks	S & A
GFP-5	LL-28	Completeness	> 90% sample collection, >90% laboratory analysis	Data Completeness Check	S & A
GFP-5	LL-28	Sensitivity	Moisture and dilution adjusted QL meets criteria in Worksheet 15-4	Method Blanks	A

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

QAPP Worksheet #13- Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Extent of Soil and Groundwater Contamination	Remedial Investigation Report, Martin Aaron Superfund Site, Camden, New Jersey, CH2MHill, under contract with USEPA, December 2004	CH2MHill/USEPA	Data will be used in conjuction with the PDI data to complete delineation of the site.	None
Extent of Soil and Groundwater Contamination	Draft-Final Feasibility Study Report, Martin Aaron Superfund Site, Camden, New Jersey, CH2MHill, under contract with USEPA, July 2005	CH2MHill/USEPA	Data will be used in conjuction with the PDI data to complete delineation of the site.	None
Extent of Soil and Groundwater Contamination	Final Sampling and Analysis Report, Surface Soil and Building Interior Sampling, Ponte Equities Site, Camden, Camden County, New Jersey, Weston Solutions, Inc., under contract with USEPA, March 2006	Weston Solutions, Inc./USEPA	Data will be used in conjuction with the PDI data to complete delineation of the site.	None
Extent of Soil and Groundwater Contamination	Soil Investigation of the Ponte Equities Site, WA#0-183, Final Trip Report, Lockheed Martin, under contract with USEPA, May 2006	Lockheed Martin Technology Services, Environmental Services REAC/USEPA	Data will be used in conjuction with the PDI data to complete delineation of the site.	None
Extent of Soil and Groundwater Contamination	Draft Remedial Investigation Report for Martin Aaron Site, Camden City, Camden County, New Jersey, L. Robert Kimball and Associates, under contract with NJDEP, June 2000.	L. Robert Kimball and Associates/NJDEP	Data will be selectively used for historical information during the Phase I Remedial Action Design. Data will not be used for delineation of the site.	Data quality issues and site regrading following NJDEP RI question whether data is representative of current site conditions.

QAPP Worksheet #14 – Summary of Project Tasks

Sampling Tasks:

Project sampling tasks for the PDI are defined in PDI Work Plan Sections 3.0 for soil and 4.0 for groundwater. Future project sampling tasks will be described in the respective work plans.

Analysis Tasks:

Project analysis tasks for the PDI are described in the PDI Work Plan Sections 3.0 for soil and 4.0 for groundwater. The project analytical scope is further detailed in Table QAPP-1. Future project analytical tasks will be described in the respective work plans.

Quality Control Tasks:

Quality Control tasks are described in QAPP Worksheet #22, QAPP Worksheet #24, and the laboratory analytical Standard Operating Procedures (SOPs) provided in Attachment 2 of the QAPP. Additional Quality Control Tasks are described in QAPP Worksheet #33 - QA Management Reports. The data verification and validation, followed by a data usability assessment can also be considered a Quality Control Tasks. These activities are described in Worksheets #34, #35, #36 and the Data Review SOP included as Attachment 4 to the QAPP. Future quality control tasks not covered by these items will be described in the respective work plan.

Secondary Data:

Secondary data sources are described in QAPP Worksheet #13. The secondary data will be integrated with the data generated during the PDI to form a revised site conceptual model. Future secondary data tasks will be described in the respective work plans.

Data Management Tasks:

Data management tasks, such as how the data will be reported and archived, are discussed in QAPP Worksheet #11. Future data management tasks will be detailed in the respective work plans.

Documentation and Records:

Field documentation procedures are provided in SOP GFP-2. The documentation of subcontract laboratory analytical data is described following QAPP Worksheet #34. Documentation of data review tasks is included in the Data Review SOP.

Assessment/Audit Tasks:

Assessment and audit tasks are discussed in QAPP Worksheet #31.

Data Review Tasks:

Data review tasks are described in QAPP Worksheets #34, #35, #36 and the Data Validation SOP.

QAPP Worksheet #15 - Reference Limits and Evaluation Tables

15-1 Volatile Organic Compounds – Soil/Solid

		USEPA Cleanup Goals for Soil ROD Appendix II, Table 6.			
Analyte	**CAS Number**	**Direct-Contact Clean-up Goals (Commercial/Industrial) (mg/kg)**	**Source Area Cleanup goals[1,2] (mg/kg)**	**Achievable Laboratory Limits (mg/kg)**	
				MDLs	**QLs**
Acetone	67-64-1			0.007	0.02
Benzene	71-43-2	1.4	1	0.0005	0.005
Bromodichloromethane	75-27-4			0.001	0.005
Bromoform	75-25-2			0.001	0.005
Bromomethane	74-83-9			0.002	0.005
2-Butanone	78-93-3			0.004	0.01
Carbon Disulfide	75-15-0			0.001	0.005
Carbon Tetrachloride	56-23-5			0.001	0.005
Chlorobenzene	108-90-7			0.001	0.005
Chloroethane	75-00-3			0.002	0.005
Chloroform	67-66-3	0.47	1	0.001	0.005
Chloromethane	74-87-3			0.002	0.005
Cyclohexane	110-82-7			0.001	0.005
1,2-Dibromo-3-chloropropane	96-12-8			0.002	0.005
Dibromochloromethane	124-48-1			0.001	0.005
1,2-Dibromoethane	106-93-4			0.001	0.005
1,2-Dichlorobenzene	95-50-1			0.001	0.005
1,3-Dichlorobenzene	541-73-1			0.001	0.005
1,4-Dichlorobenzene	106-46-7			0.001	0.005
Dichlorodifluoromethane	75-71-8			0.002	0.005
1,1-Dichloroethane	75-34-3			0.001	0.005
1,2-Dichloroethane	107-06-2			0.001	0.005
1,1-Dichloroethene	75-35-4			0.001	0.005
cis-1,2-Dichloroethene	156-59-2			0.001	0.005
trans-1,2-Dichloroethene	156-60-5			0.001	0.005
1,2-Dichloropropane	78-87-5			0.001	0.005
cis-1,3-Dichloropropene	10061-01-5			0.001	0.005
trans-1,3-Dichloropropene	10061-02-6			0.001	0.005
Ethylbenzene	100-41-4			0.001	0.005
Freon 113	76-13-1			0.002	0.01
2-Hexanone	591-78-6			0.003	0.01
Isopropylbenzene	98-82-8			0.001	0.005
Methyl Acetate	79-20-9			0.002	0.005
Methyl Cyclohexane	108-87-2			0.001	0.005
Methyl tert-Butyl Ether	1634-04-4			0.0005	0.005
4-Methyl-2-pentanone	108-10-1			0.003	0.01
Methylene Chloride	75-09-2			0.002	0.005
Styrene	100-42-5			0.001	0.005

15-1 Volatile Organic Compounds – Soil/Solid

Analyte	CAS Number	USEPA Cleanup Goals for Soil ROD Appendix II, Table 6. Direct-Contact Clean-up Goals (Commercial/Industrial) (mg/kg)	Source Area Cleanup goals[1,2] (mg/kg)	Achievable Laboratory Limits (mg/kg)	
1,1,2,2-Tetrachloroethane	79-34-5			0.001	0.005
Tetrachloroethene	127-18-4	1.3	1	0.001	0.005
Toluene	108-88-3			0.001	0.005
1,2,4-Trichlorobenzene	120-82-1			0.001	0.005
1,1,1-Trichloroethane	71-55-6			0.001	0.005
1,1,2-Trichloroethane	79-00-5			0.001	0.005
Trichloroethene	79-01-6	0.11	1	0.001	0.005
Trichlorofluoromethane	75-69-4			0.002	0.005
Vinyl Chloride	75-01-4	0.75	10	0.001	0.005
Xylenes, Total	1330-20-7			0.001	0.005
Bromochloromethane	74-97-5			0.001	0.005
1,2,3-Trichlorobenzene	87-61-6			0.001	0.005

Notes:

1)Analytes shown in **bold** have both direct contact and source area cleanup goals provided in Appendix II, Table 6 of the ROD
2) One of the source area cleanup goals is 1 ppm Total VOCs of Concern calculated as described in Section 4.4.1 of the RDWP
3) Additional analytes shown for comparison to Universal Treatment Standards should the material be characterized as a hazardous waste after excavation.
4) While Bis(2-chloroethyl) ether is shown as a VOC in Appendix II, Table 6 of the ROD, it is not amenable to VOC analysis.
5) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis following SOP LL-01. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-2 Semivolatile Organic Compounds – Soil/Solid

Analyte	CAS Number	USEPA Cleanup Goals for Soil ROD Appendix II, Table 6. Direct-Contact Clean-up Goals (Commercial/Industrial) (mg/kg)	Achievable Laboratory Limits (mg/kg)	
			MDLs	QLs
Acenaphthene	83-32-9		0.033	0.167
Acenaphthylene	208-96-8		0.033	0.167
Anthracene	120-12-7		0.033	0.167
Benzoic Acid	65-85-0		0.167	0.500
Benzo[a]anthracene	56-55-3	2.1	0.033	0.167
Benzo[b]fluoranthene	205-99-2	2.1	0.033	0.167
Benzo[k]fluoranthene	207-08-9	21	0.033	0.167
Benzo[g,h,i]perylene	191-24-2		0.033	0.167
Benzo[a]pyrene	50-32-8	0.21	0.033	0.167
Bis(2-chloroethoxy)methane	111-91-1		0.033	0.167
Bis(2-chloroethyl) Ether	111-44-4	0.58	0.033	0.167
Bis(2-chloroisopropyl) Ether	108-60-1		0.033	0.167
Bis(2-ethylhexyl) Phthalate	117-81-7		0.067	0.333
4-Bromophenyl Phenyl Ether	101-55-3		0.033	0.167
Butylbenzyl Phthalate	85-68-7		0.067	0.167
Carbazole	86-74-8		0.033	0.167
4-Chloroaniline	106-47-8		0.067	0.167
4-Chloro-3-methylphenol	59-50-7		0.067	0.167
2-Chloronaphthalene	91-58-7		0.033	0.167
2-Chlorophenol	95-57-8		0.033	0.167
4-Chlorophenyl-phenylether	7005-72-3		0.033	0.167
Chrysene	218-01-9		0.033	0.167
Dibenzo[a,h]anthracene	53-70-3	0.21	0.033	0.167
Dibenzofuran	132-64-9		0.033	0.167
Di-n-Butyl Phthalate	84-74-2		0.067	0.167
3,3'-Dichlorobenzidine	91-94-1		0.100	0.333
2,4-Dichlorophenol	120-83-2		0.033	0.167
Diethyl Phthalate	84-66-2		0.067	0.167
2,4-Dimethylphenol	105-67-9		0.067	0.167
Dimethyl Phthalate	131-11-3		0.067	0.167
4,6-Dinitro-2-methylphenol	534-52-1		0.167	0.500
2,4-Dinitrophenol	51-28-5		0.667	2.000
2,4-Dinitrotoluene	121-14-2		0.067	0.167
2,6-Dinitrotoluene	606-20-2		0.033	0.167
Di-n-octyl Phthalate	117-84-0		0.067	0.167
Fluoranthene	206-44-0		0.033	0.167
Fluorene	86-73-7		0.033	0.167
Hexachlorobenzene	118-74-1		0.033	0.167

15-2 Semivolatile Organic Compounds – Soil/Solid

Analyte	CAS Number	USEPA Cleanup Goals for Soil ROD Appendix II, Table 6. Direct-Contact Clean-up Goals (Commercial/Industrial) (mg/kg)	Achievable Laboratory Limits (mg/kg)	
Hexachlorobutadiene	87-68-3		0.067	0.167
Hexachlorocyclopentadiene	77-47-4		0.167	0.500
Hexachloroethane	67-72-1		0.033	0.167
Indeno[1,2,3-cd]pyrene	193-39-5	2.1	0.033	0.167
Isophorone	78-59-1		0.033	0.167
2-Methylnaphthalene	91-57-6		0.033	0.167
2-Methylphenol	95-48-7		0.067	0.167
4-Methylphenol	106-44-5		0.067	0.167
Naphthalene	91-20-3		0.033	0.167
2-Nitroaniline	88-74-4		0.033	0.167
3-Nitroaniline	99-09-2		0.067	0.167
4-Nitroaniline	100-01-6		0.067	0.167
Nitrobenzene	98-95-3		0.033	0.167
2-Nitrophenol	88-75-5		0.033	0.167
4-Nitrophenol	100-02-7		0.167	0.500
N-Nitrosodiphenylamine	86-30-6		0.033	0.167
N-Nitroso-di-n-propylamine	621-64-7		0.033	0.167
Pentachlorophenol	87-86-5		0.167	0.500
Phenanthrene	85-01-8		0.033	0.167
Phenol	108-95-2		0.033	0.167
Pyrene	129-00-0		0.033	0.167
1,2,4-Trichlorobenzene	120-82-1		0.033	0.167
2,4,5-Trichlorophenol	95-95-4		0.067	0.167
2,4,6-Trichlorophenol	88-06-2		0.033	0.167

Notes:

1)Analytes shown in **bold** have direct contact cleanup goals provided in Appendix II, Table 6 of the ROD

2) Additional analytes shown for comparison to Universal Treatment Standards should the material be characterized as a hazardous waste after excavation.

3) While Bis(2-chloroethyl) ether is shown as a VOC in Appendix II, Table 6 of the ROD, it is not amenable to VOC analysis.

4) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of solid samples following SOP LL-02. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-3 Pesticides – Soil/Solid

Analyte	CAS Number	USEPA Cleanup Goals for Soil ROD Appendix II, Table 6. Direct-Contact Clean-up Goals (Commercial/Industrial) (mg/kg)	Achievable Laboratory Limits (mg/kg)	
			MDLs	QLs
Aldrin	309-00-2	0.1	0.00033	0.00083
delta-BHC	319-86-8		0.00017	0.00083
alpha-BHC	319-84-6		0.00033	0.00100
beta-BHC	319-85-7		0.00061	0.00200
gamma-BHC	58-89-9		0.00017	0.00083
alpha-Chlordane	5103-71-9		0.00017	0.00083
beta-Chlordane	5103-74-2		0.00100	0.00300
4,4-DDT	50-29-3		0.00033	0.00170
4,4-DDD	72-54-8		0.00033	0.00170
4,4-DDE	72-55-9		0.00033	0.00170
Dieldrin	60-57-1	0.11	0.00033	0.00170
alpha-Endosulfan	959-98-8		0.00022	0.00083
beta-Endosulfan	33213-65-9		0.00033	0.00170
Endosulfan Sulfate	1031-07-8		0.00033	0.00170
Endrin	72-20-8		0.00033	0.00170
Endrin Aldehyde	7421-93-4		0.00033	0.00170
Endrin Ketone	53494-70-5		0.00033	0.00170
Heptachlor	76-44-8		0.00017	0.00083
Heptachlor Epoxide	1024-57-3		0.00017	0.00083
Methoxychlor	72-43-5		0.00170	0.00830
Toxaphene	8001-35-2		0.01100	0.03300

Notes:

1)Analytes shown in **bold** have direct contact cleanup goals provided in Appendix II, Table 6 of the ROD

2) Additional analytes shown for comparison to Universal Treatment Standards should the material be characterized as a hazardous waste after excavation.

3) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of solid samples following SOP LL-03. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-4 Polychlorinated Biphenyls – Soil/Solid

Analyte	CAS Number	USEPA Cleanup Goals for Soil ROD Appendix II, Table 6. Direct-Contact Clean-up Goals (Commercial/Industrial) (mg/kg)	Achievable Laboratory Limits (mg/kg)	
			MDLs	QLs
Aroclor 1016	12674-11-2		0.0033	0.0170
Aroclor 1221	11104-28-2		0.0052	0.0170
Aroclor 1232	11141-16-5		0.0033	0.0170
Aroclor 1242	53469-21-9		0.0033	0.0170
Aroclor 1248	12672-29-6		0.0033	0.0170
Aroclor 1254	11097-69-1	10	0.0033	0.0170
Aroclor 1260	11096-82-5	10	0.0033	0.0170

Notes:

1)Analytes shown in **bold** have direct contact cleanup goals provided in Appendix II, Table 6 of the ROD

2) Additional analytes shown for comparison to Universal Treatment Standards should the material be characterized as a hazardous waste after excavation.

3) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of solid samples following SOP LL-04. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-5 Metals – Soil/Solid

Analyte	CAS Number	USEPA Cleanup Goals for Soil ROD Appendix II, Table 6. Direct-Contact Clean-up Goals[1,2] (Commercial/Industrial) (mg/kg)	Source Area Cleanup Goals[1,2] (mg/kg)	Achievable Laboratory Limits (mg/kg)	
				MDLs	QLs
Aluminum	7429-90-5			3.4	20
Antimony	7440-36-0			0.9	2
Arsenic	7440-38-2	20	300	0.9	2
Barium	7440-39-3			0.0	0.5
Beryllium	7440-41-7			0.1	0.5
Cadmium	7440-43-9			0.1	0.5
Calcium	7440-70-2			6.1	20
Chromium	7440-47-3			0.6	1.5
Cobalt	7440-48-4			0.1	0.5
Copper	7440-50-8			0.2	1
Iron	7439-89-6			4.7	20
Lead	7439-92-1			0.5	2
Magnesium	7439-95-4			2.5	10
Manganese	7439-96-5			0.1	0.5
Mercury	7439-97-6			0.01	0.1
Molybdenum	7439-98-7			0.4	1
Nickel	7440-02-0			0.6	1
Potassium	7440-09-7			3.3	50
Selenium	7782-49-2			1.0	2
Silver	7440-22-4			0.2	0.5
Sodium	7440-23-5			34.8	100
Thallium	7440-28-0			0.9	2
Vanadium	7440-62-2			0.2	0.5
Zinc	7440-66-6			0.7	2

Notes:
1) Analytes shown in **bold** have both direct contact and source area cleanup goals provided in Appendix II, Table 6 of the ROD.
2) Additional analytes shown for comparison to Universal Treatment Standards should the material be characterized as a hazardous waste after excavation.
3) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of solid samples following SOPs LL-05, LL-06 and LL-07. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-6 X-Ray Fluorescence Metals – Soil

Analyte	CAS Number	USEPA Cleanup Goals for Soil ROD Appendix II, Table 6. Source Area Cleanup Goals[1] (mg/kg)	Achievable Laboratory Limits[2] (mg/kg)	
			MDLs[3]	QLs[4]
Arsenic	7440-38-2	300	8	10-100
Barium	7440-39-3		Not Analyzed	50-150
Cadmium	7440-43-9		41	50-150
Chromium	7440-47-3		60	10-100
Lead	7439-92-1		16	10-100
Mercury	7439-97-6		18	10-100
Selenium	7782-49-2		6	10-100
Silver	7440-22-4		42	50-150

Notes:

1) Additional analytes shown for comparison to Universal Treatment Standards should the material be characterized as a hazardous waste after excavation.
2) Based on information supplied by S_2C_2
3) S_2C_2 uses manufacturer MDLs based on the EPA Innovative Technology Verification Report dated February 2006.
4) QL vary depending on soil matrix and metals present in sample. The manufacture's software calculates QL for each analyte in each sample run.

15-7 Volatile Organic Compounds - RCRA Waste Characterization

Analyte	CAS Number	Regulatory Level[1] (mg/L)	Achievable Laboratory Limits[2] (mg/L)	
			MDLs	QLs
Benzene	71-43-2	0.5	0.01	0.1
2-Butanone	78-93-3	200	0.06	0.2
Carbon Tetrachloride	56-23-5	0.5	0.02	0.1
Chlorobenzene	108-90-7	100	0.016	0.1
Chloroform	67-66-3	6	0.016	0.1
1,2-Dichloroethane	107-06-2	0.5	0.02	0.1
1,1-Dichloroethene	75-35-4	0.7	0.016	0.1
Tetrachloroethene	127-18-4	0.7	0.016	0.1
Trichloroethene	79-01-6	0.5	0.02	0.1
Vinyl Chloride	75-01-4	0.2	0.02	0.1

Notes:
1) Regulatory Levels taken from 40 CFR Part 261.24 Table 1 and are specified for the analyte concentration in a TCLP extract.
2) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for extract of solid samples following SOP LL-09 and analysis following SOP LL-10. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-8 Semivolatile Organic Compounds - RCRA Waste Characterization

Analyte	CAS Number	Regulatory Level[1] (mg/L)	Achievable Laboratory Limits[2] (mg/L)	
			MDLs	QLs
m,p-Cresol (reported as 4-methylphenol)		200	0.004	0.02
o-cresol (reported as 2-methylphenol)	95-48-7	200	0.002	0.02
1,4-Dichlorobenzene	106-46-7	7.5	0.002	0.02
2,4-Dinitrotoluene	121-14-2	0.13	0.002	0.02
Hexachlorobenzene	118-74-1	0.13	0.002	0.02
Hexachlorobutadiene	87-68-3	0.5	0.002	0.02
Hexachloroethane	67-72-1	3	0.002	0.02
Nitrobenzene	98-95-3	2	0.002	0.02
Pentachlorophenol	87-86-5	100	0.006	0.05
Pyridine	110-86-1	5	0.004	0.02
2,4,5-Trichlorophenol	95-95-4	400	0.002	0.02
2,4,6-Trichlorophenol	88-06-2	2	0.002	0.02

Notes:
1) Regulatory Levels taken from 40 CFR Part 261.24 Table 1 and are specified for the analyte concentration in a TCLP extract.
2) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for extract of solid samples following SOP LL-11 and analysis following SOP LL-02. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-9 Pesticides - RCRA Waste Characterization

Analyte	CAS Number	Regulatory Level[1] (mg/L)	Achievable Laboratory Limits[2] (mg/L)	
			MDLs	QLs
gamma-BHC (Lindane)	58-89-9	0.4	0.00001	0.00005
Chlordane	57-74-9	0.03	0.00035	0.0025
Endrin	72-20-8	0.02	0.00002	0.00010
Heptachlor	76-44-8	0.008	0.000015	0.00005
Heptachlor Epoxide	1024-57-3	0.008	0.000015	0.00005
Methoxychlor	72-43-5	10	0.000015	0.00005
Toxaphene	8001-35-2	0.5	0.005	0.015

Notes:
1) Regulatory Levels taken from 40 CFR Part 261.24 Table 1 and are specified for the analyte concentration in a TCLP extract.
2) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for extract of solid samples following SOP LL-11 and analysis following SOP LL-12. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-10 Herbicides - RCRA Waste Characterization

Analyte	CAS Number	Regulatory Level[1] (mg/L)	Achievable Laboratory Limits[2] (mg/L)	
			MDLs	QLs
2,4-D	94-75-7	10	0.0020	0.0100
Silvex	93-72-1	1	0.0002	0.0010

Notes:
1) Regulatory Levels taken from 40 CFR Part 261.24 Table 1 and are specified for the analyte concentration in a TCLP extract.
2) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for extract of solid samples following SOP LL-11 and analysis following SOP LL-14. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-11 Metals - RCRA Waste Characterization

Analyte	CAS Number	Regulatory Level[1] (mg/L)	Achievable Laboratory Limits[2] (mg/L)	
			MDLs	QLs
Arsenic	7440-38-2	5	0.01	0.02
Barium	7440-39-3	100	0.0006	0.005
Cadmium	7440-43-9	1	0.0009	0.005
Chromium	7440-47-3	5	0.0023	0.015
Lead	7439-92-1	5	0.0069	0.015
Mercury	7439-97-6	0.2	0.000056	0.0002
Selenium	7782-49-2	1	0.0094	0.02
Silver	7440-22-4	5	0.0016	0.005

Notes:

1) Regulatory Levels taken from 40 CFR Part 261.24 Table 1 and are specified for the analyte concentration in a TCLP extract.
2) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for extract of solid samples following SOP LL-11 and analysis following SOP LL-05, LL-06, and LL-07. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-12 Metals – Soil Conditioning Study Samples

Analyte	CAS Number	USEPA Cleanup Goals for Soil ROD Appendix II, Table 6[4] Direct-Contact Clean-up Goals[1,2] (Commercial/Industrial) (mg/kg)	Source Area Cleanup Goals[1,2] (mg/kg)	Achievable Laboratory Limits[3] (mg/kg)	
				MDLs	QLs
Arsenic	7440-38-2	20	300	0.5	5
Barium	7440-39-3			0.1	0.5
Cadmium	7440-43-9			0.05	0.5
Chromium	7440-47-3			0.12	1
Lead	7439-92-1			0.5	5
Mercury	7439-97-6			0.01	0.25
Selenium	7782-49-2			0.5	5
Silver	7440-22-4			0.25	2

Notes:

1) Analytes shown in **bold** have both direct contact and source area cleanup goals provided in Appendix II, Table 6 of the ROD.
2) Additional analytes shown for comparison to Universal Treatment Standards should the material be characterized as a hazardous waste after excavation.
3) MDL and QL based on Kemron QC limits as of January 1, 2008 for analysis of solid samples following Kemron SOPs K-1 or K-2, K-3 or K-4, K-5, K-10. Kemron routinely re-evaluates QC criteria using the procedures in the LQAP. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
4) The data generated during the soil conditioning study will not be directly used to evaluate compliance with the direct contact or Source Area clean-up goals. Kemron will be reporting total arsenic only in the context of reagent selection and to evaluate any changes in the quantifiable concentration of arsenic after treatment.

15-13 TCLP Metals - Soil Conditioning Study Samples

Analyte	CAS Number	Regulatory Level[1] (mg/L)	Achievable Laboratory Limits[2] (mg/L)	
			MDLs	QLs
Arsenic	7440-38-2	5	0.1	1
Barium	7440-39-3	100	0.025	5
Cadmium	7440-43-9	1	0.025	0.1
Chromium	7440-47-3	5	0.025	0.2
Lead	7439-92-1	5	0.1	1
Mercury	7439-97-6	0.2	0.001	0.005
Selenium	7782-49-2	1	0.5	0.8
Silver	7440-22-4	5	0.05	0.1

Notes:
1) Regulatory Levels taken from 40 CFR Part 261.24 Table 1 and are specified for the analyte concentration in a TCLP extract.
2) MDL and QL based on Kemron QC limits as of January 1, 2008 for analysis of solid samples following Kemron SOPs K-6, K-7 or K-8, K-3 or K-4, and K-9. Kemron routinely re-evaluates QC criteria using the procedures in the LQAP. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-14 Volatile Organic Compounds – Groundwater and Aqueous IDW

		USEPA Cleanup Goals for Groundwater ROD Appendix II, Table 7[1]				
Analyte	**CAS Number**	**EPA MCL (ug/L)**	**NJ MCL (ug/L)**	**NJ GWQS (ug/L)**	**Achievable Laboratory Limits (ug/L)**	
					MDLs	**QLs**
Acetone	67-64-1				3	5
Benzene	71-43-2	5	1	1	0.1	0.5
Bromodichloromethane	75-27-4				0.1	0.5
Bromoform	75-25-2				0.1	0.5
Bromomethane	74-83-9				0.1	0.5
2-Butanone	78-93-3				1	5
Carbon Disulfide	75-15-0				0.1	0.5
Carbon Tetrachloride	56-23-5				0.1	0.5
Chlorobenzene	108-90-7				0.1	0.5
Chloroethane	75-00-3				0.1	0.5
Chloroform	67-66-3				0.1	0.5
Chloromethane	74-87-3				0.1	0.5
Cyclohexane	110-82-7				0.1	0.5
1,2-Dibromo-3-chloropropane	96-12-8				0.5	2
Dibromochloromethane	124-48-1				0.1	0.5
1,2-Dibromoethane	106-93-4				0.1	0.5
1,2-Dichlorobenzene	95-50-1				0.1	0.5
1,3-Dichlorobenzene	541-73-1				0.1	0.5
1,4-Dichlorobenzene	106-46-7				0.1	0.5
Dichlorodifluoromethane	75-71-8				0.1	0.5
1,1-Dichloroethane	75-34-3				0.1	0.5
1,2-Dichloroethane	107-06-2				0.1	0.5
1,1-Dichloroethene	75-35-4				0.1	0.5
cis-1,2-Dichloroethene	156-59-2				0.1	0.5
trans-1,2-Dichloroethene	156-60-5				0.1	0.5
1,2-Dichloropropane	78-87-5				0.1	0.5
cis-1,3-Dichloropropene	10061-01-5				0.1	0.5
trans-1,3-Dichloropropene	10061-02-6				0.1	0.5
Ethylbenzene	100-41-4				0.1	0.5
Freon 113	76-13-1				0.2	0.5
2-Hexanone	591-78-6				1	5
Isopropylbenzene	98-82-8				0.1	0.5
Methyl Acetate	79-20-9				0.3	1
Methyl Cyclohexane	108-87-2				0.1	0.5
Methyl tert-Butyl Ether	1634-04-4				0.1	0.5
4-Methyl-2-pentanone	108-10-1				1	5
Methylene Chloride	75-09-2				0.2	0.5
Styrene	100-42-5				0.1	0.5
1,1,2,2-Tetrachloroethane	79-34-5				0.1	0.5
Tetrachloroethene	127-18-4	5	1	1	0.1	0.5

15-14 Volatile Organic Compounds – Groundwater and Aqueous IDW

		USEPA Cleanup Goals for Groundwater ROD Appendix II, Table 7[1]				
Analyte	**CAS Number**	**EPA MCL (ug/L)**	**NJ MCL (ug/L)**	**NJ GWQS (ug/L)**	**Achievable Laboratory Limits (ug/L)**	
Toluene	108-88-3				0.1	0.5
1,2,4-Trichlorobenzene	120-82-1				0.1	0.5
1,1,1-Trichloroethane	71-55-6				0.1	0.5
1,1,2-Trichloroethane	79-00-5				0.1	0.5
Trichloroethene	79-01-6	5	1	1	0.1	0.5
Trichlorofluoromethane	75-69-4				0.1	0.5
Vinyl Chloride	75-01-4	2	2	5	0.1	0.5
Xylenes, Total	1330-20-7				0.1	0.5
Bromochloromethane	74-97-5				0.1	0.5
1,2,3-Trichlorobenzene	87-61-6				0.1	0.5

Notes:

1) Cleanup goals for Groundwater are listed for only those analytes having cleanup goals presented in Appendix II, Table 7 of the ROD.
2) While Bis(2-chloroethyl) ether is shown as a VOC in Appendix II, Table 7 of the ROD, it is not amenable to VOC analysis.
3) Additional analytes shown for comparison to hazardous waste criteria.
4) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of aqueous samples following SOP LL-16 utilizing a 25 ml purge volume. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-15 Metals – Groundwater and Aqueous IDW

Analyte	CAS Number	USEPA Cleanup Goals for Groundwater ROD Appendix II, Table 7[1] EPA MCL (ug/L)	NJ MCL (ug/L)	NJ GWQS (ug/L)	Achievable Laboratory Limits (ug/L)	
					MDLs	QLs
Aluminum	7429-90-5				80.2	200
Antimony	7440-36-0				9.7	20
Arsenic	7440-38-2	10	50	8	0.7	2
Barium	7440-39-3				0.6	5
Beryllium	7440-41-7				0.9	5
Cadmium	7440-43-9				0.9	5
Calcium	7440-70-2				63.2	200
Chromium	7440-47-3				2.3	15
Cobalt	7440-48-4				2.1	5
Copper	7440-50-8				2.2	10
Iron	7439-89-6				52.2	200
Lead	7439-92-1				6.9	15
Magnesium	7439-95-4				32.2	100
Manganese	7439-96-5				0.8	5
Mercury	7439-97-6				0.06	0.2
Molybdenum	7439-98-7				4.6	10
Nickel	7440-02-0				5.6	10
Potassium	7440-09-7				50.3	500
Selenium	7782-49-2				9.4	20
Silver	7440-22-4				1.6	5
Sodium	7440-23-5				433.0	1000
Thallium	7440-28-0				10.5	20
Vanadium	7440-62-2				1.5	5
Zinc	7440-66-6				8.1	20

Notes:

1) Cleanup goals for Groundwater are listed for only those analytes having cleanup goals presented in Appendix II, Table 7 of the ROD.

2) Additional analytes shown for comparison to hazardous waste criteria.

3) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of aqueous samples following SOPs LL-05, LL-06, LL-07, LL-26, and LL-27. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

4) Arsenic concentrations for groundwater shall be determined by ICP-MS following LL-26/LL-27. Mercury concentrations will be determined by LL-07. All other metals shall be determined by ICP following LL-05/LL-06.

5) Arsenic concentrations for Aqueous IDW shall be determined by ICP (MDL = 10 ug/L, QL = 20 ug/L)

15-16 Natural Attenuation Parameters – Groundwater

Analyte	CAS Number	Achievable Laboratory Limits[2] (ug/L)	
		MDLs	QLs
Alkalinity (as Calcium Carbonate)	ALK	460	2000
Chloride	16887-00-6	200	400
Ethane	74-84-0	1	5
Ethene	74-85-1	1	5
Methane	74-82-8	2	5
Nitrate	14797-55-8	50	100
Nitrite	14797-65-0	80	100
Sulfate	14808-79-8	300	1000
Total Organic Carbon	TOC	1000	2000
Total Phosphate	14265-44-2	250	310
Total Sulfide	18496-25-8	54	160
Total Suspended Solids	TSS	3000	12000

Notes:
1) Appendix II, Table 7 of the ROD does not establish cleanup goals for NAPs in groundwater, therefore no comparison criteria are included above.
2) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of aqueous samples following SOPs LL-18, LL-19, LL-20, LL-21, LL-22, LL-23, LL-24, and LL-25. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-17 Semivolatile Organic Compounds – Aqueous IDW

Analyte	CAS Number	USEPA Cleanup Goals for Groundwater ROD Appendix II, Table 7[1] NJ GWQS (ug/L)	Achievable Laboratory Limits[3] (ug/L)	
			MDLs	QLs
Acenaphthene	83-32-9		1	5
Acenaphthylene	208-96-8		1	5
Anthracene	120-12-7		1	5
Benzoic Acid	65-85-0		6	15
Benzo[a]anthracene	56-55-3		1	5
Benzo[b]fluoranthene	205-99-2		1	5
Benzo[k]fluoranthene	207-08-9		1	5
Benzo[g,h,i]perylene	191-24-2		1	5
Benzo[a]pyrene	50-32-8		1	5
Bis(2-chloroethoxy)methane	111-91-1		1	5
Bis(2-chloroethyl) Ether	111-44-4	10	1	5
Bis(2-chloroisopropyl) Ether	108-60-1		1	5
Bis(2-ethylhexyl) Phthalate	117-81-7		2	5
4-Bromophenyl Phenyl Ether	101-55-3		1	5
Butylbenzyl Phthalate	85-68-7		2	5
Carbazole	86-74-8		1	5
4-Chloroaniline	106-47-8		1	5
4-Chloro-3-methylphenol	59-50-7		1	5
2-Chloronaphthalene	91-58-7		2	5
2-Chlorophenol	95-57-8		1	5
4-Chlorophenyl-phenylether	7005-72-3		2	5
Chrysene	218-01-9		1	5
Dibenzo[a,h]anthracene	53-70-3		1	5
Dibenzofuran	132-64-9		1	5
Di-n-Butyl Phthalate	84-74-2		2	5
3,3'-Dichlorobenzidine	91-94-1		2	5
2,4-Dichlorophenol	120-83-2		1	5
Diethyl Phthalate	84-66-2		2	5
2,4-Dimethylphenol	105-67-9		3	10
Dimethyl Phthalate	131-11-3		2	5
4,6-Dinitro-2-methylphenol	534-52-1		5	15
2,4-Dinitrophenol	51-28-5		20	60
2,4-Dinitrotoluene	121-14-2		1	5
2,6-Dinitrotoluene	606-20-2		1	5
Di-n-octyl Phthalate	117-84-0		2	5
Fluoranthene	206-44-0		1	5
Fluorene	86-73-7		1	5
Hexachlorobenzene	118-74-1		1	5
Hexachlorobutadiene	87-68-3		1	5

15-17 Semivolatile Organic Compounds – Aqueous IDW

Analyte	CAS Number	USEPA Cleanup Goals for Groundwater ROD Appendix II, Table 7[1] NJ GWQS (ug/L)	Achievable Laboratory Limits[3] (ug/L)	
Hexachlorocyclopentadiene	77-47-4		5	15
Hexachloroethane	67-72-1		1	5
Indeno[1,2,3-cd]pyrene	193-39-5		1	5
Isophorone	78-59-1		1	5
2-Methylnaphthalene	91-57-6		1	5
2-Methylphenol	95-48-7		1	5
4-Methylphenol	106-44-5		2	5
Naphthalene	91-20-3		1	5
2-Nitroaniline	88-74-4		1	5
3-Nitroaniline	99-09-2		1	5
4-Nitroaniline	100-01-6		1	5
Nitrobenzene	98-95-3		1	5
2-Nitrophenol	88-75-5		1	5
4-Nitrophenol	100-02-7		10	30
N-Nitrosodiphenylamine	86-30-6		2	5
N-Nitroso-di-n-propylamine	621-64-7		1	5
Pentachlorophenol	87-86-5		3	15
Phenanthrene	85-01-8		1	5
Phenol	108-95-2		1	5
Pyrene	129-00-0		1	5
1,2,4-Trichlorobenzene	120-82-1		1	5
2,4,5-Trichlorophenol	95-95-4		1	5
2,4,6-Trichlorophenol	88-06-2		1	5

Notes:
1) Cleanup goals for Groundwater are listed for only those analytes having cleanup goals presented in Appendix II, Table 7 of the ROD.
2) While Bis(2-chloroethyl) ether is shown as a VOC in Appendix II, Table 7 of the ROD, it is not amenable to VOC analysis.
3) Additional analytes shown for comparison to hazardous waste criteria.
4) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of aqueous samples following SOP LL-02. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-18 Pesticides – Aqueous IDW

Analyte	CAS Number	USEPA Cleanup Goals for Groundwater ROD Appendix II, Table 7[1] NJ GWQS (ug/L)	Achievable Laboratory Limits (ug/L)	
			MDLs	QLs
Aldrin	309-00-2		0.004	0.02
delta-BHC	319-86-8		0.003	0.01
alpha-BHC	319-84-6		0.0027	0.01
beta-BHC	319-85-7		0.004	0.02
gamma-BHC	58-89-9		0.002	0.01
alpha-Chlordane	5103-71-9		0.003	0.01
beta-Chlordane	5103-74-2		0.003	0.01
4,4-DDT	50-29-3		0.006	0.02
4,4-DDD	72-54-8		0.004	0.02
4,4-DDE	72-55-9		0.005	0.02
Dieldrin	60-57-1	0.03	0.004	0.02
alpha-Endosulfan	959-98-8		0.003	0.01
beta-Endosulfan	33213-65-9		0.004	0.02
Endosulfan Sulfate	1031-07-8		0.004	0.02
Endrin	72-20-8		0.004	0.02
Endrin Aldehyde	7421-93-4		0.02	0.1
Endrin Ketone	53494-70-5		0.004	0.02
Heptachlor	76-44-8		0.003	0.01
Heptachlor Epoxide	1024-57-3		0.003	0.01
Methoxychlor	72-43-5		0.03	0.1
Toxaphene	8001-35-2		1	3

Notes:
1) Cleanup goals for Groundwater are listed for only those analytes having cleanup goals presented in Appendix II, Table 7 of the ROD.
2) Additional analytes shown for comparison to hazardous waste criteria.
3) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of aqueous samples following SOP LL-17. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

15-19 Polychlorinated Biphenyls – Aqueous IDW

Analyte	CAS Number	Achievable Laboratory Limits (ug/L)	
		MDLs	QLs
Aroclor 1016	12674-11-2	0.1	0.5
Aroclor 1221	11104-28-2	0.1	0.5
Aroclor 1232	11141-16-5	0.2	0.5
Aroclor 1242	53469-21-9	0.1	0.5
Aroclor 1248	12672-29-6	0.1	0.5
Aroclor 1254	11097-69-1	0.1	0.5
Aroclor 1260	11096-82-5	0.1	0.5

Notes:

1) Appendix II, Table 7 of the ROD does not establish cleanup goals for PCBs in groundwater, therefore no comparison criteria are included above.

2) MDL and QL based on Lancaster Laboratory QC limits as of January 1, 2008 for analysis of aqueous samples following SOPLL-12. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.

QAPP Worksheet #16 - Project Schedule Timeline

The projected project schedule for the PDI and subsequent remedial design is shown in Figure 5 of the RDWP and discussed in Section 7.0 of the RDWP. The schedule will be refined throughout the Remedial Design and the remedial action and monitoring aspects may be revised, subject to USEPA's approval.

The projected project schedule for future sampling events will be included in the applicable Work Plan.

QAPP Worksheet #17 - Sampling Design and Rationale

Sampling Design and Rationale is discussed in detail in Sections 3.0 and 4.0 of the PDI Work Plan. The proposed sampling locations are shown on Figures PDI-1 through PDI-9 of the PDI Work Plan. The sampling design and rationale will be discussed in the applicable work plans for future tasks.

QAPP Worksheet #18 - Sampling Locations and Methods/SOP Requirements Table

The proposed sampling locations for Stage 1 of the PDI are shown on Figures PDI-1 through PDI-9 and summarized in Table 1 of the PDI Work Plan for soil samples and Table 2 of the PDI Work Plan for groundwater samples. The rationale behind the selection of each sampling location is provided in Sections 3.0 and 4.0 of the PDI Work Plan.

All soil samples will be collected in accordance with SOP GFP-4 and all groundwater samples will be collected in accordance with SOP GFP-5. These SOPs are included in Attachment 1 of this QAPP. Field QC sample locations will be chosen by the field staff based on the environmental conditions and material availability.

Sampling locations will be provided in the work plan for future sampling events.

QAPP Worksheet #19 - Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil , Solid IDW	VOCs	All	LL-01	3 x 5g aliquots	Small-diameter core sampler (for example Purge and Trap Soil Sampler®, En Core® sampler, Easy Draw Syringe® or other equivalent small-diameter tube/plunger sampler) and/or 40 ml glass vials	< 6°C	48 hours for preservation of samples by laboratory/14 days until analysis
Soil , Solid IDW	SVOC	All	LL-02	100 g	8 oz. glass bottle, Teflon lined cap	< 6°C	14 days to extraction/40 days from extraction to analysis
Soil , Solid IDW	Pesticides	All	LL-03	100 g	8 oz. glass bottle, Teflon lined cap	< 6°C	14 days to extraction/40 days from extraction to analysis
Soil , Solid IDW	PCBs	All	LL-04	100 g	8 oz. glass bottle, Teflon lined cap	< 6°C	14 days to extraction/40 days from extraction to analysis
Soil , Solid IDW	Metals	All	LL-05, LL-07, or K-3, K-4, K-5	100 g	8 oz. glass bottle, Teflon lined cap	< 6°C	28 days for mercury; 180 days for metals
Soil , Solid IDW	pH/Corrosivity	All	LL-08	25 g	8 oz. glass bottle, Teflon lined cap	< 6°C	As soon as possible after receipt by laboratory
Soil , Solid IDW	Cyanide	All	LL-09	100 g	8 oz. glass bottle, Teflon lined cap	< 6°C	14 days
Soil , Solid IDW	Moisture Content	All	LL-27	10 g	2 oz. glass bottle, Teflon lined cap	< 6°C	14 days
Soil , Solid IDW	TCLP VOCs	All	LL-10, LL-11	25 g solid	40 ml glass vials or 2 oz. glass bottle with minimal headspace for ZHE	< 6°C	TCLP extraction within 14 days of sampling/VOC analysis within 14 days of TCLP extraction
Soil , Solid IDW	TCLP SVOC	All	LL-12, LL-11	500 g solid for all Non-volatile TCLP parameters	8 oz. glass bottle, Teflon lined cap	< 6°C	TCLP extraction within 14 days of sampling/SVOC extraction within 7 days of TCLP/40 days from SVOC extraction to analysis

QAPP Worksheet #19 - Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil , Solid IDW	TCLP Pesticides	All	LL-12, LL-13	500 g solid for all Non-volatile TCLP parameters	8 oz. glass bottle, Teflon lined cap	< 6°C	TCLP extraction within 14 days of sampling/SVOC extraction within 7 days of TCLP/40 days from SVOC extraction to analysis
Soil , Solid IDW	TCLP Herbicides	All	LL-12, LL-15	500 g solid for all Non-volatile TCLP parameters	8 oz. glass bottle, Teflon lined cap	< 6°C	TCLP extraction within 14 days of sampling/SVOC extraction within 7 days of TCLP/40 days from SVOC extraction to analysis
Soil , Solid IDW	TCLP Metals	All	LL-12, LL-16 LL-05, LL-07 or K-6, K-3, K-4, K-9	500 g solid for all Non-volatile TCLP parameters	8 oz. glass bottle, Teflon lined cap	< 6°C	TCLP extraction within 28 days/analysis within 28 days of TCLP extraction for mercury; TCLP extraction within 180 days/analysis within 180 days of TCLP extract for other metals.
Groundwater, Aqueous IDW	VOCs	All	LL-17	3 x 40 ml vial	3 x 40 ml glass vial	< 6°C; HCl; pH <2	14 days
Groundwater, Aqueous IDW	Metals	All	LL-05, LL-06, LL-07, LL-26, LL-27	2 x 100 ml	500 ml polyethylene bottle	HNO_3; pH <2	28 days for mercury; 180 days for metals
Groundwater, Aqueous IDW	pH	All	LL-18	100 ml	100 ml polyethylene bottle	< 6°C	As soon as possible after receipt by laboratory
Groundwater	NAPs - Alkalinity	All	LL-19	50 ml	500 ml polyethylene bottle	< 6°C	14 days
Groundwater	NAPs - Chloride	All	LL-20	100 ml	100 ml polyethylene bottle	< 6°C	28 days
Groundwater	NAPs - Nitrate	All	LL-21	50 ml	100 ml polyethylene bottle	< 6°C	48 hours
Groundwater	NAPs - Nitrite	All	LL-21	50 ml	100 ml polyethylene bottle	< 6°C	48 hours
Groundwater	NAPs - Sulfate	All	LL-21	50 ml	100 ml polyethylene bottle	< 6°C	28 days

QAPP Worksheet #19 - Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Groundwater and Aqueous IDW	NAPs - Sulfide	All	LL-23	100 ml	500 ml polyethylene bottle	< 6°C, ZnOAc, NaOH	7 days
Groundwater	NAPs - Total Organic Carbon	All	LL-24	250 ml	250 ml amber glass bottle	< 6°C; HNO_3; pH <2	28 days
Groundwater	NAPs – Total Phosphate	All	LL-22	250 ml	500 ml glass bottle	< 6°C; HNO_3; pH <2	28 days
Groundwater	NAPs – Total Suspended Solids	All	LL-25	200 ml	500 ml polyethylene bottle	< 6°C	7 days
Groundwater	NAPs – Methane, Ethane, Ethene	All	LL-26	3 x 40 ml vial	3 x 40 ml glass vial	< 6°C; HCl; pH <2	14 days
Groundwater	Ferrous Iron	All	GFP-4	Field Measurement – Not Applicable	Field Measurement – Not Applicable	None	15 minutes
Groundwater	Dissolved Oxygen	All	GFP-3	Field Measurement – Not Applicable	Field Measurement – Not Applicable	None	15 minutes
Groundwater	Oxidation Reduction Potential	All	GFP-3	Field Measurement – Not Applicable	Field Measurement – Not Applicable	None	15 minutes
Groundwater	Specific Conductance	All	GFP-3	Field Measurement – Not Applicable	Field Measurement – Not Applicable	None	15 minutes
Groundwater	Turbidity	All	GFP-3	Field Measurement – Not Applicable	Field Measurement – Not Applicable	None	15 minutes
Groundwater	pH	All	GFP-3	Field Measurement – Not Applicable	Field Measurement – Not Applicable	None	15 minutes
Groundwater	Temperature	All	GFP-3	Field Measurement – Not Applicable	Field Measurement – Not Applicable	None	15 minutes
Aqueous IDW	SVOC	All	LL-02	1000 ml	1000 ml amber glass bottle	< 6°C	Extraction within 7 days of sampling/analysis within 40 days of extraction
Aqueous IDW	Pesticides	All	LL-13	1000 ml	1000 ml amber glass bottle	< 6°C	Extraction within 7 days of sampling/analysis within 40 days of extraction
Aqueous IDW	PCBs	All	LL-28	1000 ml	1000 ml amber glass bottle	< 6°C	Extraction within 7 days of sampling/analysis within 40 days of extraction

[1]Reference number from QAPP Worksheet #23

QAPP Worksheet #20 - Field Quality Control Sample Summary Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference[1]	# of Sampling Locations	# of Field Duplicate Pairs	# of MS (Inorganic)	# of Field Blanks	# of Equipment Blanks	No. of PT Samples[2]	Total No. of Samples to Lab
Soil/Solid	VOCs	All	LL-01	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	None	TBD
Soil/Solid	SVOCs	All	LL-02	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	None	TBD
Soil/Solid	Pesticides	All	LL-03	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	None	TBD
Soil/Solid	PCBs	All	LL-04	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	None	TBD
Soil/Solid	Metals	All	LL-05, LL-06, LL-07	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	None	TBD
Soil/Solid	FPXRF Metals	All	S_2C_2-1	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	Not Applicable	None	TBD
Soil/Solid	TCLP VOC	All	LL-10, LL-11	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD

QAPP Worksheet #20 - Field Quality Control Sample Summary Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference[1]	# of Sampling Locations	# of Field Duplicate Pairs	# of MS (Inorganic)	# of Field Blanks	# of Equipment Blanks	No. of PT Samples[2]	Total No. of Samples to Lab
Soil/Solid	TCLP SVOC	All	LL-12, LL-11	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Soil/Solid	TCLP Pesticides	All	LL-12, LL-13	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Soil/Solid	TCLP Herbicides	All	LL-12, LL-15	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Soil/Solid	TCLP Metals	All	LL-12, LL-16 LL-05, LL-06, LL-07	TBD	1 per 20 primary samples	None	Not Applicable	None	None	TBD
Soil conditioning study samples	Metals	All	K-1 or K-2, K-3 or K-4, K-5	TBD	None	None	Not Applicable	None	None	TBD
Soil conditioning study samples	TCLP Metals	All	K-6, K-7 or K-8, K-3 or K-4, K-9	TBD	None	None	Not Applicable	None	None	TBD
Solid IDW	VOC	All	LL-01	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Solid IDW	SVOC	All	LL-02	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Solid IDW	Pesticides	All	LL-03	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Solid IDW	PCB	All	LL-04	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Solid IDW	Metals	All	LL-05, LL-06, LL-07	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD
Groundwater	VOCs	All	LL-17	TBD	1 per 20 primary samples	Not Applicable	Daily trip blanks	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	None	TBD

QAPP Worksheet #20 - Field Quality Control Sample Summary Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference[1]	# of Sampling Locations	# of Field Duplicate Pairs	# of MS (Inorganic)	# of Field Blanks	# of Equipment Blanks	No. of PT Samples[2]	Total No. of Samples to Lab
Groundwater	Metals	All	LL-05, LL-06, LL-07, LL-26, LL-27	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	None	TBD
Groundwater	NAPs - Alkalinity	All	LL-19	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD
Groundwater	NAPs - Chloride	All	LL-20	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD
Groundwater	NAPs - Nitrate	All	LL-21	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD
Groundwater	NAPs - Nitrite	All	LL-21	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD
Groundwater	NAPs - Sulfate	All	LL-21	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD
Groundwater	NAPs - Sulfide	All	LL-23	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD
Groundwater	NAPs - Total Organic Carbon	All	LL-24	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD
Groundwater	NAPs – Total Phosphate	All	LL-22	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD
Groundwater	NAPs – Total Suspended Solids	All	LL-25	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD

QAPP Worksheet #20 - Field Quality Control Sample Summary Table

Matrix	Analytical Group	Conc. Level	Analytical and Preparation SOP Reference[1]	# of Sampling Locations	# of Field Duplicate Pairs	# of MS (Inorganic)	# of Field Blanks	# of Equipment Blanks	No. of PT Samples[2]	Total No. of Samples to Lab
Groundwater	NAPs – Methane, Ethane, Ethene	All	LL-26	TBD	1 per 20 primary samples	Not Applicable	Daily Trip Blanks	None	None	TBD
Groundwater	Ferrous Iron	All	GFP-4	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	Not Applicable	None	TBD
Groundwater	Dissolved Oxygen	All	GFP-3	TBD	Not Applicable	Not Applicable	Not Applicable	None	None	TBD
Groundwater	Oxidation Reduction Potential	All	GFP-3	TBD	Not Applicable	Not Applicable	Not Applicable	None	None	TBD
Groundwater	Specific Conductance	All	GFP-3	TBD	Not Applicable	Not Applicable	Not Applicable	None	None	TBD
Groundwater	Turbidity	All	GFP-3	TBD	Not Applicable	Not Applicable	Not Applicable	None	None	TBD
Groundwater	pH	All	GFP-3	TBD	Not Applicable	Not Applicable	Not Applicable	None	None	TBD
Groundwater	Temperature	All	GFP-3	TBD	Not Applicable	Not Applicable	Not Applicable	None	None	TBD
Aqueous IDW	VOCs	All	LL-17	TBD	1 per 20 primary samples	Not Applicable	Daily trip blanks	None	None	TBD
Aqueous IDW	SVOC	All	LL-02	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Aqueous IDW	Pesticides	All	LL-13	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Aqueous IDW	PCB	All	LL-28	TBD	1 per 20 primary samples	Not Applicable	Not Applicable	None	None	TBD
Aqueous IDW	Metals	All	LL-05	TBD	1 per 20 primary samples	1 per 20 primary samples	Not Applicable	None	None	TBD

[1]Reference number from QAPP Worksheet #23

[2] The laboratory shall analyze PT samples at the frequency required by the laboratory accrediting body such as NELAC, ASTM, AASHTO or NJDEP. The PT sample results can be made available to USEPA for review upon request. Site specific PT samples will not be submitted.

QAPP Worksheet #21 - Project Sampling SOPs Requirements Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Check if yes)	Comments
GFP-1	Decontamination and Waste Handling	Golder Associates Inc.	Scrub brushes, dish pans, distilled or deionized water, non-phosphate soap, solvent (if necessary).	☒	Field procedure for sampling equipment decontamination and management of investigation derived waste.
GFP-2	Field Documentation	Golder Associates Inc.	Field notebook, field observation forms, digital camera, pens.	☒	Field procedure for documentation
GFP-3	Field Measurement and Instrument Calibration Procedures	Golder Associates Inc.	Electronic water level meter and/or oil-water interface probe; Horiba or equivalent in-line flow through cell	☒	Field procedure for water level measurements, total well depth measurements, groundwater field parameter measurements; and VOC vapor measurements
GFP-4	Groundwater Sampling Procedure	Golder Associates Inc.	Various equipment including power sources, control boxes, pumps, flow-through cells, bailers. See GFP-4 for complete equipment list.	☒	Field procedure for groundwater well purging and groundwater sample collection
GFP-5	Soil/Fill Sampling Procedure	Golder Associates Inc.	Various supplies including coring equipment, shovels, bowls, spoons. See GFP-5 for complete equipment list.	☒	Field procedures for soil/fill characterization, field screening to asses for potential chemical impacts and soil sample collection
GFP-6	Groundwater Well Development	Golder Associates Inc.	Various well development equipment including power sources, pumps, bailers and flow-through cells.	☒	Field procedures for groundwater monitoring well development.
GFP-7	Sample Handling, Custody, and Shipment	Golder Associates Inc.	Sample containers, coolers, ice, chain of custody.	☒	Field procedures for sample packaging, custody and shipment.
GFP-8	Location and Sample Naming Procedure	Golder Associates Inc.	None	☒	Procedure for naming borings, groundwater wells, environmental and geotechnical samples.

QAPP Worksheet #21 - Project Sampling SOPs Requirements Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Check if yes)	Comments
ASTM D1586	Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils	ASTM	Drilling Rig	☐	This ASTM test method describes the procedure, generally known as the Standard Penetration Test (SPT), for driving a split-barrel sampler to obtain a representative soil sample and a measure of the resistance of the soil to penetration of the sampler. This test method provides qualitative data for engineering decisions.
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)	ASTM	Field notebook, Soil Classification Reference Chart	☐	This ASTM practice describes a system for classifying mineral and organo-mineral soils for engineering purposes. This practice provides qualitative data for engineering decisions.
ASTM D2488	Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)	ASTM	Field notebook, Soil Classification Reference Chart	☐	This ASTM practice covers procedures for the description of soils for engineering purposes. This practice provides qualitative data for engineering decisions.
ASTM D1587	Standard Practice for Thin-Walled Tube Geotechnical Sampling of Soils	ASTM	Thin-Walled sampling device	☐	This practice covers a procedure for using a thin-walled metal tube, such as a Shelby tube, to recover relatively undisturbed soil samples suitable for laboratory tests of structural properties.

Golder Associates project sampling and field procedure SOPs are included in Attachment 1. ASTM Methods are available for purchase through **www.ASTM.com**. Due to licensing restrictions, ASTM methods are not included in Attachment 1.

QAPP Worksheet #22 - Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person[1]	SOP Reference[2]
Electronic water level meter and/or an oil-water interface probe;				Check Battery	Prior to each measurement	Sufficient charge for proper operation	Change batteries if required	Golder Field Sampling Personnel	GFP-3
Photo ionization detector				Confirm that lamp voltage matches the lamp specified by the Health and Safety Plan	Daily	Correct lamp installed	Install correct lamp	Golder Field Sampling Personnel	GFP-3
Photo ionization Detector	Calibrate following manufacturer specification				Daily	Meets manufacturers specification	If readings do not meet manufacturers specifications, clean following manufacturers instructions, check/replace filters and other consumable parts, recalibrate or service as necessary. Obtain replacement instrument.	Golder Field Sampling Personnel	GFP-3
Photo ionization Detector		Clean lamp			As needed	Readings stabilize within manufacturers specification	If probe reading fails to stabilize check lamp for condensation and clean.	Golder Field Sampling Personnel	GFP-3
Generator				Check fuel level and oil levels	Continuously during operation	Sufficient fuel	Fill Tank	Golder Field Sampling Personnel	GFP-4
Grunfos Control box				Check power cords and electrical lines	When control box is plugged into generator	Cords are not frayed or worn	Obtain replacement control box	Golder Field Sampling Personnel	GFP-4
Grunfos Redi-Flo 2 Submersible pump				Check pump leads	Prior to installing pump in well	Leads are not frayed or worn	Obtain replacement pump	Golder Field Sampling Personnel	GFP-4

QAPP Worksheet #22 - Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person[1]	SOP Reference[2]
Grunfos Redi-Flo 2 Submersible pump		Check coolant in pump			Daily	Coolant chamber properly filled with DI water	Replace dirty water with clean DI water. Fill chamber with DI water if level is low.	Golder Field Sampling Personnel	GFP-4
Grunfos Redi-Flo 2 Submersible pump		Decontaminate pump			At the beginning of the project and between sample locations	Pump has been cleaned	Perform decontamination procedure	Golder Field Sampling Personnel	GFP-4
Air Compressor				Check fuel level	Continuously during operation	Sufficient fuel	Fill Tank	Golder Field Sampling Personnel	GFP-4
Well Wizard Pump control box				Check batteries	Continuously during operation	Control box operating	Replace batteries	Golder Field Sampling Personnel	GFP-4
Portable Well Wizard Bladder Pump		Decontaminate pump			At the beginning of the project and between sample locations	Pump has been cleaned	Perform decontamination procedur	Golder Field Sampling Personnel	GFP-4
Peristaltic Pump		Decontaminate pump			At the beginning of the project and between sample locations	Pump has been cleaned	Perform decontamination procedur	Golder Field Sampling Personnel	GFP-4
Tubing				Check for kinks or breaks in tubing	Prior to use	No kinks or breaks in tubing	Replace tubing as necessary	Golder Field Sampling Personnel	GFP-4
Teflon-lined Bailer					Prior to use	Packaging undamaged	Do not use if damaged	Golder Field Sampling Personnel	GFP-4
Nylon well rope				Rope is clean and unfrayed	Prior to use	Rope is clean and unfrayed	Replace if damaged	Golder Field Sampling Personnel	GFP-4

QAPP Worksheet #22 - Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person[1]	SOP Reference[2]
Small-diameter core sampler such as Purge and Trap Soil Sampler®, En Core® sampler, Easy Draw Syringe® or other equivalent small-diameter tube/plunger sampler				Packaging intact and sampling equipment undamaged	Prior to use	Packaging intact and sampling equipment undamaged	Do not use if damaged	Golder Field Sampling Personnel	GFP-5
Homogenization bowls, mixing spoons				Equipment decontaminated	Prior to use	Sampling supplies are clean and dry	Decontaminate per FSP-1 and dry if needed	Golder Field Sampling Personnel	GFP-5
Multi-Gas Meter (combustible gas, oxygen, carbon monoxide, hydrogen sulfide)	Calibrate following manufacturer specifications				Daily	Meets manufacturers specification	If readings do not meet manufacturer's specification, clean following manufacturer's instructions, check/replace filters and other consumable parts, recalibrate or return for servicing as needed. Obtain replacement meter.	Golder Field Sampling Personnel	Health and Safety Contingency Plan (HSCP) RDWP Appendix C
Colorimetric detector tubes				Packaging intact. Tube has not expired.	As needed	Packaging intact. Tube has not expired.	Use alternate tubes.	Golder Field Sampling Personnel	Health and Safety Contingency Plan (HSCP) RDWP Appendix C

QAPP Worksheet #22 - Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person[1]	SOP Reference[2]
Dust monitor	Calibrate following manufacturer specifications				Daily	Meets manufacturers specification	If readings do not meet manufacturer's specification, clean following manufacturer's instructions, check/replace filters and other consumable parts, recalibrate or return for servicing as needed. Obtain replacement meter.	Golder Field Sampling Personnel	Health and Safety Contingency Plan (HSCP) RDWP Appendix C
Drill Rig				Check drilling equipment	Prior to use	Drill Rig is operating condition	Repair as required	Drill Rig Operator	NA
Geoprobe				Check Geoprobe equipment	Prior to use	Geoprobe is in operating condition	Repair as required	Geoprobe operator	NA

[1]Rental equipment will be maintained and tested by the company supplying the equipment. Golder personnel will field calibrate certain instruments used in field screening, such as PID. Subcontractors will be responsible for the calibration, maintenance, testing and inspection of their own equipment prior to use.
[2]Reference number from QAPP Worksheet #21

QAPP Worksheet #23 - Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive, Screening or Engineering Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
G-1	Standard Operating Procedures for Specific Conductance (COND) Calibration Golder SOP 101, Revision 0, May 27, 2005	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-2a	Standard Operating Procedures for Dissolved Oxygen (DO) Calibration – Daily, Golder SOP 102a, Revision 2, January 22, 2008	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-2b	Standard Operating Procedures for Dissolved Oxygen (DO) Calibration – Weekly, Golder SOP 102b, Revision 3, January 23, 2008	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-3	Standard Operating Procedures for Temperature (TEMP) Calibration, Golder SOP 103, Revision 2, January 22, 2008	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-4	Standard Operating Procedures for pH Calibration, Golder SOP 104, Revision 2, January 23, 2008	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-5	Standard Operating Procedure for Turbidity Calibration, Golder SOP 105, Revision 0, May 27, 2008	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-6	Standard Operating Procedure for Collection of Specific Conductance (COND), Golder SOP 201, Revision 0, May 27, 2005	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-7	Standard Operating Procedures for Dissolved Oxygen (DO) Analysis, Golder SOP 202, Revision 1, January 23, 2008	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-8	Standard Operating Procedures for Temperature (TEMP) Analysis, Golder SOP 203, Revision 1, January 23, 2008	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-9	Standard Operating Procedures for pH Analysis, Golder SOP 204, Revision 1, January 23, 2008	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐
G-10	Standard Operating Procedures for Turbidity (TURB) Analysis, Golder SOP 205, Revision 0, May 27, 2005	Screening	Field Parameters	Horiba U-22 or equivalent in-line flow through cell	Golder Associates	☐

QAPP Worksheet #23 - Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive, Screening or Engineering Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
LL-01	Determination of Volatile Target Compounds by Capillary Column Gas Chromatography/Mass Spectrometery (GC/MS) in Soils and Solids by Method 8260B, Revision 8, August 13, 2007	Definitive	VOC	GC/MS	Lancaster Laboratories	☐
LL-02	Determination of Semivolatile Organic Compounds by Method 8270C, Revision 8, December 26, 2007	Definitive	SVOC	GC/MS	Lancaster Laboratories	☐
LL-03	Analysis of Pesticides and Polychlorinated Biphenyls (PCBs) in Solid Samples, Revision 7, April 12, 2007	Definitive	Pesticides	GC/ECD	Lancaster Laboratories	☐
LL-04	Analysis of Polychlorinated Biphenyls (PCBs) in Solid Samples and Wipes, Revision 11, August 27, 2007	Definitive	PCB	GC/ECD	Lancaster Laboratories	☐
LL-05	Operation of the Thermo Jarrell Ash ICAP TM 61E and ICAP TM 6000 series Trace Analyzer Spectrometers, Revision 6, December 10, 2007	Definitive	Metals	ICP	Lancaster Laboratories	☐
LL-06	Quality Control Procedures for ICP, Revision 22, September 6, 2007	Definitive	Metals	ICP	Lancaster Laboratories	☐
LL-07	Mercury by Cold Vapor Generation, Revision 8, April 3, 2007	Definitive	Metals	CVAA Hg Analyzer	Lancaster Laboratories	☐
LL-08	Moisture (Gravimetric), Revision 6, July 24, 2007	Definitive	Solids	Balance	Lancaster Laboratories	☐
LL-09	Toxicity Characteristic Leaching Procedure (TCLP) Zero Headspace Leachate, Revision 7, March 24, 2006	Definitive	TCLP VOCs	Zero Headspace Extractor and Tumbler	Lancaster Laboratories	☐
LL-10	Toxicity Characteristic Leachate Procedure (TCLP); Analyisis of Zero Headspace Extractions (ZHE) of Solid Waste, Soils, and other Matrices for Volatile Target Compounds by Gas Chromatography/Mass Spectrometry (GC/MS); Capillary Column Technique	Definitive	TCLP VOCs	GC/MS	Lancaster Laboratories	☐
LL-11	Toxicity Characteristic Leaching Procedure (TCLP) Nonvolatile Leachates, Revision 7, September 10, 2007	Definitive	TCLP	Extractor and Tumbler	Lancaster Laboratories	☐
LL-12	Analysis of Pesticides and Polychlorinated Biphenyls (PCBs) in Aqueous Samples, Revision 7, April 18, 2007	Definitive	Pesticides	GC/ECD	Lancaster Laboratories	☐
LL-13	Extraction of Chlorinated Herbicides in a Water Matrix, Revision 8, June 14, 2007	Definitive	Herbicides	Extractor and concentrator	Lancaster Laboratories	☐
LL-14	Analysis of Chlorinated Herbicides in Water, Revision 8, August 24, 2007	Definitive	Herbicides	GC/ECD	Lancaster Laboratories	☐

QAPP Worksheet #23 - Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive, Screening or Engineering Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
LL-15	Sample Preparation of Wastewater and Extracts for Analysis of Total Metals by Inductively Coupled Plasma Atomic Emission Spectrometry, Revision 5, September 26, 2007	Definitive	TCLP Metals	ICP	Lancaster Laboratories	☐
LL-16	Determinations of Volatile Target Compounds by Capillary Column Gas Chromatography/Mass Spectrometry (GC/MS) in Waters and Wastewasters by Method 8260B, Revision 10, August 13, 2007	Definitive	VOCs	GC/MS	Lancaster Laboratories	☐
LL-17	Analysis of Polychlorinated Biphenyls (PCBs) in Aqueous samples	Definitive	PCBs	GC/ECD	Lancaster Laboratories	
LL-18	Analysis #0201 Alkalinity to pH 8.3 (titrimetric); Analysis #0202 Alkalinity to pH 4.5 (titrimetric), Revision 8, April 5, 2007	Definitive	Natural Attenuation Parameters	Electrode	Lancaster Laboratories	☐
LL-19	Chloride (titrimetric determination), Revision 7, April 4, 2007; Procedural Amendment 1, April 4, 2007; Procedural Amendment 2, November 21, 2007.	Definitive	Natural Attenuation Parameters	None	Lancaster Laboratories	☐
LL-20	Determination of Inorganic Anions by Ion Chromatography, Revision 11, April 5, 2007	Definitive	Natural Attenuation Parameters	IC	Lancaster Laboratories	☐
LL-21	Determination of Total and Soluble Phosphorus in Water, Wastewater and Soils (Colorimetric, Ascorbic Acid, Automated), Revision 10, January 12, 2007; Procedural Amendment 1, November 28, 2007	Definitive	Natural Attenuation Parameters	Spectro- photometer	Lancaster Laboratories	☐
LL-22	Colorimetric Sulfide, Revision 9, April 6, 2007	Definitive	Natural Attenuation Parameters	N Spectro-photometer	Lancaster Laboratories	☐
LL-23	Determination of Total Organic Carbon, Dissolved Organic Carbon, and Inorganic Carbon in Water and Wastewaetr, Revision 11, October 12, 2007	Definitive	Natural Attenuation Parameters	TOC analyzer	Lancaster Laboratories	☐
LL-24	Total Suspended Solids (Gravimetric), Revision 6, April 6, 2007	Definitive	Natural Attenuation Parameters	Balance	Lancaster Laboratories	☐
LL-25	Determination of Volatile Hydrocarbons in Water Using Headspace Sampling Techniques and Gas Chromatography with Flame Ionization Detection (GC-FID)	Definitive	Natural Attenuation Parameters	GC/FID	Lancaster Laboratories	☐
LL-26	Operation of and Analysis with the Perkin-Elmer Elan 9000 ICP-MS, Revision 6, July 6, 2007	Definitive	Metals	ICP/MS	Lancaster Laboratories	☐
LL-27	Quality Control Procedures for ICP-MS, Revision 10, June 7, 2007	Definitive	Metals	ICP/MS	Lancaster Laboratories	☐
S_2C_2-1	S_2C_2 Inc. Mobile Laboratory Program Standard Operating Procedure Innov-X Alpha 4000 Field X-Ray Fluorescence Analyzer	Screening	XRF Metals	Innov-X Alpha 4000 Analyzer	S_2C_2 Inc	☒

QAPP Worksheet #23 - Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive, Screening or Engineering Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
K-1	Standard Operating Procedure for Acid Digesting Sediments, Sludges and Soils for Inductively Coupled Plasma or Graphite Furnace Atomic Absorption Spectroscopy (3050B) Block Digestor, SOP ME403, Revision 13, October 15, 2006	Definitive	Metals	Balance, centrifuge, digestion block	Kemron	☐
K-2	Standard Operating Procedure Microwave Digestion of Sediments, Sludges and Oils (3051), SOPME406, Revision 9, December 15, 2006	Definitive	Metals	Balance, centrifuge, Microwave	Kemron	☐
K-3	Standard Operationg Procedure for Perkin Elmer Optima 3000 & Optima 4300 Inductively Coupled Plasma Atomic Emission Spectroscopy SW-846 Method 6010B/200.7, SOP ME600E, Revision 8, September 15, 2007	Definitive	Metals	ICP	Kemron	☐
K-4	Standard Operationg Procedure for Thermo Jarrell Ash Iris Advantage Inductively Coupled Plasma Atomic Emission Spectroscopy SW-846 Method 6010B/200.7, SOP ME600F, Revision 7, May 15, 2007	Definitive	Metals	ICP	Kemron	☐
K-5	Standard Operating Procedure Mercury, SW-846 Method 7471A, SOP ME405, Revision 8, September 15, 2007	Definitive	Metals	CVAA	Kemron	☐
K-6	Standard Operating Procedures for the Toxicity Characteristic Leaching Procedure SW-846 Method 1311/1312, SOP TCLP01, Revision 8, May 15, 2005	Definitive	TCLP	Extractor and Tumbler	Kemron	☐
K-7	Standard Operating Procedure Acid Digestion of Waters for Total Recoverable or Dissolved Inductively Coupled Plasma Spectroscopy (3005A), SOP ME401, Revision 13, October 15, 2006	Definitive	Metals	Digestor, centrifuge	Kemron	☐
K-8	Standard Operating Procedure Microwave Digestion – Aqueous SW0846 3915, SOP ME407, Revison 9, December 15, 2005	Definitive	Metals	Microwave Unit	Kemron	☐
K-9	Standard Operating Procedure Mercury (7470A, 245.1), SOP ME404, Revision 11, September 15, 2007	Definitive	Metals	CVAA	Kemron	☐
K-10	Standard Operating Procedure Percent Solids (Percent Moisture) SOP K0003, Revision 9, February 28, 2003	Definitive	Percent Solids	Balance, Oven	Kemron	☐
ASTM D422	Standard Test Method for Particle-Size Analysis of Soils, ASTM, D422-63(2007)	Engineering	Geotechnical Parameters	Balance, Hydrometer, Sieves	TRC Companies, Inc.	☐
ASTM D854	Standard Test Method for Specific Gravity of Soil Solids by Water Pycnometer, ASTM, D854-06	Engineering	Geotechnical Parameters	Pycnometer, Balance	TRC Companies, Inc.	☐

QAPP Worksheet #23 - Analytical SOP References Table

Reference Number	Title, Revision Date, and/or Number	Definitive, Screening or Engineering Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work?
ASTM D2216	Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass, ASTM, D2216-05	Engineering	Geotechnical Parameters	Balance, Oven	TRC Companies, Inc.	☐
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils, ASTM D4318-05	Engineering	Geotechnical Parameters	Liquid Limit Device, Balance, drying oven	TRC Companies, Inc.	☐
ASTM D2166	Standard Test Method for Unconfined Compressive Strength of Cohesive Soil, ASTM D2166-06	Engineering	Geotechnical Parameters	Compression Device, Deformation dial indicator, dial comparator, balance, timer	TRC Companies, Inc.	☐
ASTM D2435	Standard Test Methods for One-Dimensional Consolodation Properties of Soils Using Incremental Loading, ASTM, D2435-04	Engineering	Geotechnical Parameters	Consolidometer, balance, dial comparitor	TRC Companies, Inc.	☐
ASTM D2850	Standard Test Method for Unconsolidated-Undrained Triaxial Compression Test on Cohesive Soils, ASTM, D2850-03a(2007)	Engineering	Geotechnical Parameters	Axial Loading Device, Axial Load Measuring Device, Pressure Control device, Deformation Indicator	TRC Companies, Inc.	☐
ASTM D4767	Standard Test Method for Consolidated-Undrained Triaxial Compression Test for Cohesive Soils, ASTM, D4767094	Engineering	Geotechnical Parameters	Axial Loading Device, Axial Load Measuring Device, Pressure Control device, Deformation Indicator	TRC Companies, Inc.	☐
ASTM D5084	Standard Test Method for Measurement of Hydraulic Conductivity of Staturated Porous Materials Using a Flexible Wall Permeameter, ASTM D5084-03	Engineering	Geotechnical Parameters	Flexible Wall Permeameter	TRC Companies, Inc.	☐
IATL-1	QA/QC Manual and Standard Operating Procedures Bulk Materials Analysis by Polarized Light Microscopy for Asbestos, Revision 0501, July 15, 2005	Engineering	Asbestos	Polarized Light Microscope	IATL	☐

Note:
Analytical SOPs provided by Golder Associates, Lancaster Laboratories, Kemron , S_2C_2 and IATL are provided in Attachment 2. TRC Companies, Inc. follows the ASTM compendium during sample analysis and does not produce laboratory specific SOPs. ASTM Methods are available through www.ASTM.com. Due to licensing restrictions, the ASTM methods are not included in Attachment 2.

QAPP Worksheet #24 - Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
Horiba U-22 or equivalent in-line flow cell	Conductivity – immerse probe in 1.00 mS/m and distilled water standards	Daily prior to use	Meets manufacturer specifications	Clean probe, recalibrate meter	Golder Associates Field Staff	G-1
Horiba U-22 or equivalent in-line flow cell	DO - Calibrate probe against HACH DO test kit (“Winkler” Method)	Weekly	Results from probe within ±0.2 mg/L of result from HACH kit.	Clean probe, replace DO membrane	Golder Associates Field Staff	G-2b
Horiba U-22 or equivalent in-line flow cell	DO – immerse probe in zero percent DO solution and air saturated water	Daily prior to use	Results for air saturated water must match Table 1 of SOP G-2a	Clean probe, replace DO membrane, repeat weekly calibration procedure	Golder Associates Field Staff	G-2a
Horiba U-22 or equivalent in-line flow cell	Temperature – Compare the termistor sensor results to the resut from an NIST certified thermometer in a room temperature water sample	Quarterly	Adjust meter to result from the NIST thermometer	Send probe for repair	Golder Associates Field Staff	G-3
Horiba U-22 or equivalent in-line flow cell	pH – immerse sensor in pH 7.00 buffer and either pH 4.00 or pH 9.00 buffer	Daily prior to use, check every 3 hours	±0.05 pH Units	Clean electrode, recalibrate meter	Golder Associates Field Staff	G-4
Horiba U-22 or equivalent in-line flow cell	Turbidity – immerse probe in 100 NTU and distilled water standards	Daily prior to use	Daily prior to use	Clean probe, recalibrate meter	Golder Associates Field Staff	G-5
GC/MS	Perform 6 point initial calibration in accordance with SW-846 Method 8000B.	Prior to beginning sample analysis and after failing CCV. Minimum frequency not defined.	RF for chlorobenzene and 1,1,2,2-tetrachloroethane >0.300; RF for 1,1-dichloroethene, bromoform and chloromethane >0.100; %RSD <30% for CCCs	Corrective maintenance, re-calibrate instrument and re-analyze samples	Lancaster Laboratories Analyst	LL-01, LL-10, LL-16

QAPP Worksheet #24 - Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
GC/MS	Perform 6 point calibration in accordance with SW-846 Method 8000B.	Prior to beginning sample analysis and after failing CCV. Minimum frequency not defined.	RF for SPCCs > 0.050 Max %RSD for CCCs <30%	corrective maintenance, re-calibrate instrument and re-analyze samples	Lancaster Laboratories Analyst	LL-02
GC/ECD	Perform 5 point calibration in accordance with SW-846 Method 8000B.	Prior to beginning sample analysis and after failing CCV. Minimum frequency not defined.	%RSD <20% or curve with correlation coefficient >0.995; degradation of DDT, endrin <15% for pesticides	corrective maintenance, re-calibrate instrument and re-analyze samples	Lancaster Laboratories Analyst	LL-03, LL-04, LL-12, LL-14, LL-17,
GC/FID	Perform 5 point calibration in accordance with SW-846 Method 8000B.	Prior to beginning sample analysis and after failing CCV. Minimum frequency not defined.	Max %RSD 20% to use average response factor	corrective maintenance, re-calibrate instrument and re-analyze samples	Lancaster Laboratories Analyst	LL-25
ICP	Analyze ICV and interelement check standard.	Prior to beginning sample analysis. At least once per day.	ICV within ±10% of true value	corrective maintenance, re-calibrate instrument and re-analyze samples	Lancaster Laboratories Analyst	LL-05, LL-06
ICP-MS	Analyze ICV and interelement check standard.	Prior to beginning sample analysis. At least once per day.	ICV within ±10% of true value	corrective maintenance, re-calibrate instrument and re-analyze samples	Lancaster Laboratories Analyst	LL-26, LL-27
CVAA	Perform 5 point calibration	Prior to beginning sample analysis. At least once per day.	correlation coefficient >0.995; ICV ±10%	corrective maintenance, re-calibrate instrument and re-analyze samples	Lancaster Laboratories Analyst	LL-07
IC	Perform 5 point calibration	Monthly or after failing CCV.	correlation coefficient >0.995; CCV ±5%	Re-calibrate instrument with fresh standards	Lancaster Laboratories Analyst	LL-20
Spectro-photometer	Perform 6 point calibration	Phosphate - at beginning of analytical shift or after failing CCV; sulfide – every 3 months or after failing CCV.	correlation coefficient >0.995; CCV ±10%	Re-calibrate instrument with fresh standards	Lancaster Laboratories Analyst	LL-21, LL-22

QAPP Worksheet #24 - Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
TOC Analyzer	Perform 6 point calibration	Monthly	correlation coefficient >0.995; CCV ±10%	Re-calibrate instrument with fresh standards	Lancaster Laboratories Analyst	LL-23
FPXRF	Check energy calibration/gain setting using copper disk supplied by manufacturer	Once every 24 hours or when the temperature varies more than 20 F	meets manufacturers requirement	correct calibration/gain setting	S_2C_2 Field Sampling Personnel	S_2C_2-1
FPXRF	Analyze standard reference material as calibration verification check standard	At the beginning and end of each working day at a minimum	±20% of true value	re-analyze check sample; analyze new energy gain standard and re-analyze samples	S_2C_2 Field Sampling Personnel	S_2C_2-1
ICP	Analyze ICV and interelement check standard.	Each analytical run	ICV within ±10% of true value	corrective maintenance, re-calibrate instrument and re-analyze samples	Kemron Analyst	K-3, K-4
CVAA	5 point calibration	Each analytical run	correlation coefficient >0.995; ICV ±10%	corrective maintenance, re-calibrate instrument and re-analyze samples	Kemron Analyst	K-5, K-9

[1]Reference number from QAPP Worksheet #23

QAPP Worksheet #25 – Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

All analytical instrumentation will be inspected prior to use by the operator.

Golder Associates performs field equipment maintenance for equipment owned by Golder Associates at the frequency recommended by the field equipment manufacturer. Preventative maintenance and testing of rental equipment is the responsibility of the rental company.

The Lancaster Laboratories preventative maintenance schedule is Appendix G of the Lancaster Laboratories EQPM. Kemron discusses preventative maintenance in Section 10 of the Kemron LQPA. S_2C_2 addresses preventative maintenance in Section 13 of the S_2C_2 QAM. TRC maintains their analytical instruments in accordance with the requirements of the relevant ASTM standards and the manufacturer specifications. The laboratory quality manuals are provided in Attachment 3.

QAPP Worksheet #26 - Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT
Sample Collection (Personnel/Organization): Golder Associates Inc.
Sample Packaging (Personnel/Organization): Golder Associates Inc.
Coordination of Shipment (Personnel/Organization): Golder Associates Inc.
Type of Shipment/Carrier: Commercial carrier such as FedEx or UPS
SAMPLE RECEIPT AND ANALYSIS – Soil, Groundwater, and IDW Samples
Sample Receipt (Personnel/Organization): Environmental Sample Administration, Lancaster Laboratories
Sample Custody and Storage (Personnel/Organization): Environmental Sample Storage, Lancaster Laboratories
Sample Preparation (Personnel/Organization): See Lancaster Laboratories EQPM, Appendix C
Sample Determinative Analysis (Personnel/Organization): See Lancaster Laboratories EQPM, Appendix C
SAMPLE ARCHIVING – Soil, Groundwater, and IDW Samples
Field Sample Storage (No. of days from sample collection): minimum 30 days after sample reporting
Sample Extract/Digestate Storage (No. of days from extraction/digestion): minimum 30 days after sample reporting
Biological Sample Storage (No. of days from sample collection): Not Applicable
SAMPLE DISPOSAL – Soil, Groundwater, and IDW Samples
Personnel/Organization: Environmental Sample Storage, Lancaster Laboratories
Number of Days from Analysis: Samples are eligible for disposal 30 days after reporting
SAMPLE RECEIPT AND ANALYSIS – Soil Conditioning Study Samples
Sample Receipt (Personnel/Organization): Sample Custodian, Kemron Environmental Services
Sample Custody and Storage (Personnel/Organization): Sample Custodian, Kemron Environmental Services
Sample Preparation (Personnel/Organization): See Kemron LQAP
Sample Determinative Analysis (Personnel/Organization): See Kemron LQAP
SAMPLE ARCHIVING – Soil Conditioning Study Samples

QAPP Worksheet #26 - Sample Handling System

Field Sample Storage (No. of days from sample collection): minimum 30 days after sample reporting
Sample Extract/Digestate Storage (No. of days from extraction/digestion): minimum 30 days after sample reporting
Biological Sample Storage (No. of days from sample collection): Not Applicable
SAMPLE DISPOSAL – Soil Conditioning Study Samples
Personnel/Organization: Sample Custodian, Kemron Environmental Services
Number of Days from Analysis: Sample Custodian, Kemron Environmental Services
SAMPLE RECEIPT AND ANALYSIS – Geotechnical Samples
Sample Receipt (Personnel/Organization): TRC Laboratories
Sample Custody and Storage (Personnel/Organization): TRC Laboratories
Sample Preparation (Personnel/Organization): TRC Laboratories
Sample Determinative Analysis (Personnel/Organization): TRC Laboratories
SAMPLE ARCHIVING – Geotechnical Samples
Field Sample Storage (No. of days from sample collection): minimum 30 days after sample reporting
Sample Extract/Digestate Storage (No. of days from extraction/digestion): Not Applicable
Biological Sample Storage (No. of days from sample collection): Not Applicable
SAMPLE DISPOSAL– Geotechnical Samples
Personnel/Organization: TRC Laboratories
Number of Days from Analysis: Samples are eligible for disposal 30 days after reporting

QAPP Worksheet #27 – Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): Field sample custody procedures are documented in field procedure GFP-7.
Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal): Lancaster Laboratory sample custody procedures are provided in Section 5, Sample Handling, of the Lancaster Laboratory EQPM. Kemron sample custody procedures are provided in Section 7, Sample Handling, of the Kemron LQAP. S_2C_2 addresses laboratory sample custody in Section 7, Laboratory Sample Custody, of the S_2C_2 QAM.
Sample Identification Procedures: Samples will be assigned unique site-specific identifiers following the paradigm discussed in field procedure GFP-8.
Chain-of-custody Procedures: Chain of custody procedures are described in field procedure GFP-7.

QAPP Worksheet #28 – QC Samples Tables
28-1 Volatile Organic Compounds – Soil/Solid

Matrix	Soil/Solid
Analytical Group	VOCs
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-01
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per instrument per analytical shift	no results above QL	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Equipment Rinsate Blank[3]	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equip. is used.	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	< 30% RPD
LCS	1 per analytical shift	Meets laboratory QC limits in Table QAPP-3	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples.	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-3
LCS	1 per analytical shift	Meets laboratory QC limits in Table QAPP-3	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-3
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-2	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-2
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-2	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-2

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Equipment Rinsate Blanks and Field Duplicates will not be collected for IDW samples

28-2 Semivolatile Organic Compounds – Soil/Solid

Matrix	Soil/Solid
Analytical Group	SVOC
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-02
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Equipment Rinsate Blank[3]	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	< 30% RPD
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-5	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-5
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-5	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-5
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-4	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-4
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-4	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-4

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Equipment Rinsate Blanks and Field Duplicates will not be collected for IDW samples

28-3 Pesticide Compounds – Soil/Solid

Matrix	Soil/Solid
Analytical Group	Pesticides
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-03
Sampler's Name	TBD
Field Sampling ZOrganization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Equipment Rinsate Blank[3]	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	< 30% RPD
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-7	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-7
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-7	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-7
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-6	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-6
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-6	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-6

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Equipment Rinsate Blanks and Field Duplicates will not be collected for IDW samples

28-4 Polychlorinated Biphenyl Compounds – Soil/Solid

Matrix	Soil/Solid
Analytical Group	PCBs
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-04
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Equipment Rinsate Blank[3]	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	< 30% RPD
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-9	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-9
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-9	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-9
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-8	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-8
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-8	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-8

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Equipment Rinsate Blanks and Field Duplicates will not be collected for IDW samples

28-5 Metals – Soil/Solid

Matrix	Soil/Solid
Analytical Group	Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-05, LL-06, LL-07
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Equipment Rinsate Blank[3]	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Continuing Calibration Blank	1 per 10 samples	no results above QL	Reanalyze sample bracketed by compliant Continuing Calibration Blank	Lancaster Laboratories Analyst	Accuracy	no results above QL
Continuing Calibration Verification	1 per 10 samples	90-110% of true value	Reanalyze sample bracketed by compliant Continuing Calibration Verification	Lancaster Laboratories Analyst	Accuracy	90-110% of true value
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	<30% RPD
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-10	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-10
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-10	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-10

28-5 Metals – Soil/Solid

Matrix	Soil/Solid
Analytical Group	Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-05, LL-06, LL-07
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Matrix Spike [3]	1 per 20 samples	Meets laboratory QC limits in Table QAPP-10	If the LCS meets acceptance criteria, no corrective action required. Otherwise, if sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-10
Matrix Spike [3]	1 per 20 samples	Meets laboratory QC limits in Table QAPP-10	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-10

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Equipment Rinsate Blanks , Field Duplicates and Matrix Spikes will not be collected for IDW samples.

28-6 X-Ray Fluorescence Metals - Soil

Matrix	Soil/Solid
Analytical Group	XRF Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	S_2C_2-1
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	S_2C_2
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Analytical Replicates	Once per day analyze 7 replicates of a moderate concentration	Arsenic RSD <20%	Re-homogenize sample and re-analyze. If still doesn't meet acceptance limits, re-run energy calibration and re-analyze calibration check	S_2C_2 Field Technician	Precision	Arsenic RSD <20%
Energy Calibration	Every 5 hours	Meets Manufacturers specifications	Send instrument for servicing	S_2C_2 Field Technician	Accuracy	Meets Manufacturers specifications
Instrument Blank	At least once a day	no results above QL	Remove gross contamination from probe window. "Zero" the instrument following manufacturer specifications. Re-run energy calibration, and re-analyze blank.	S_2C_2 Field Technician	Accuracy	no results above QL
Method Blank	1 per 20 samples	No results above QL	Remove gross contamination from the probe window. Re-run energy calibration, re-analyze blank. Reanalyze affected samples.	S_2C_2 Field Technician	Accuracy	no results above QL
Method Blank	1 per 20 samples	no results above QL	Qualify data as required.	Golder Associates Data Validator	Accuracy	no results above QL

28-6 X-Ray Fluorescence Metals - Soil

Matrix	Soil/Solid
Analytical Group	XRF Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	S_2C_2-1
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	S_2C_2
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Calibration Verification	Minimum at the beginning and end of the work-day	80 - 120% of the true value	Re-analyze check sample. If still does not meet acceptance limits, perform a new energy calibration and CCV prior to re-analyzing the affected sample	S_2C_2 Field Technician	Accuracy	80 - 120% of the true value
XRF Correlation Samples	100% of the PDI Stage I samples will be submitted for off-site laboratory analysis. During Stage II of the PDI and subsequent sampling activities, 100% of the samples used to identify the excavation boundary and at up to 10 percent of the remaining FPXRF samples will be submitted to the off-site laboratory for confirmation analysis.	none	Qualify Data if required	Golder Associates Data Validator	Accuracy, Comparability	TBD based on Stage I correlation analysis.

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

28-7 Volatile Organic Compounds – RCRA Waste Characterization

Matrix	Soil/Solid
Analytical Group	TCLP VOCs
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-09, LL-10
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per instrument per analytical shift	no results above QL	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per instrument per analytical shift	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Field Duplicates[3]	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	none	Qualify data as required	Golder Associates Data Validator	Precision	< 30% RPD
LCS	1 per analytical shift	Meets laboratory QC limits in Table QAPP-12	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples.	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-12
LCS	1 per analytical shift	Meets laboratory QC limits in Table QAPP-12	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-12
Surrogate Spike	every sample	Meets laboratory QC limits in Table QAPP-11	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-11
Surrogate Spike	every sample	Meets laboratory QC limits in Table QAPP-11	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-11

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Equipment Rinsate Blanks and Field Duplicates will not be collected for IDW samples

28-8 Semivolatile Organic Compounds – RCRA Waste Characterization

Matrix	Soil, Solid IDW
Analytical Group	TCLP SVOC
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-12, LL-02
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	< 30% RPD
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-14	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-14
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-14	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-14
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-13	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-13
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-13	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-13

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Field Duplicates will not be collected for IDW samples

28-9 Pesticides – RCRA Waste Characterization

Matrix	Soil/Solid
Analytical Group	TCLP Pesticides
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-11, LL-12
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	< 30% RPD
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-16	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-16
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-16	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-16
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-15	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-15
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-15	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-15

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3] Field Duplicates will not be collected for IDW samples

28-10 Herbicides – RCRA Waste Characterization

Matrix	Soil, Solid IDW
Analytical Group	TCLP Herbicides
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-11, LL-14
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	< 30% RPD
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-18	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-18
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-18	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-18
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-17	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-17
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-17	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-17

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3] Field Duplicates will not be collected for IDW samples.

28-11 Metals – RCRA Waste Characterization

Matrix	Soil/Solid
Analytical Group	TCLP Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-11, LL-15, LL-05, LL-06, LL-07
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator**	**Measurement Performance Criteria**
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Continuing Calibration Blank	1 per 10 samples	no results above QL	Reanalyze sample bracketed by compliant Continuing Calibration Blank	Lancaster Laboratories Analyst	Accuracy	no results above QL
Continuing Calibration Verification	1 per 10 samples	90-110% of true value	Reanalyze sample bracketed by compliant Continuing Calibration Verification	Lancaster Laboratories Analyst	Accuracy	90-110% of true value
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	<30% RPD
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-19	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-19
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-19	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-19

28-11 Metals – RCRA Waste Characterization

Matrix	Soil/Solid
Analytical Group	TCLP Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-11, LL-15, LL-05, LL-06, LL-07
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Matrix Spike[3]	1 per 20 samples	Meets laboratory QC limits in Table QAPP-19	If the LCS meets acceptance criteria, no corrective action required. Otherwise, if sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-19
Matrix Spike[3]	1 per 20 samples	Meets laboratory QC limits in Table QAPP-19	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-19

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Field Duplicates and Matrix Spikes will not be collected for IDW samples.

28-12 Metals – Soil Conditioning Study

Matrix	Soil Contioning Study Samples
Analytical Group	Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	K-1 or K-2, K-3 or K-4, K-5, K-10
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Kemron
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Kemron Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Continuing Calibration Blank	1 per 10 samples	no results above QL	Reanalyze sample bracketed by compliant Continuing Calibration Blank	Kemron Analyst	Accuracy	no results above QL
Continuing Calibration Verification	1 per 10 samples	90 - 110% of true value	Reanalyze sample bracketed by compliant Continuing Calibration Verification	Kemron Analyst	Accuracy	90-110% of true value
LCS	1 per extraction batch	80 - 120%	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Kemron Analyst	Accuracy	80 - 120%
LCS	1 per extraction batch	80 - 120%	Qualify data as required	Golder Associates Data Validator	Accuracy	80 - 120%

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

28-13 TCLP Metals – Soil Conditioning Study

Matrix	Soil Contioning Study Samples
Analytical Group	TCLP Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	K-6, K-7 or K-8, K-3 or K-4, K-9
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Kemron
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Kemron Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Continuing Calibration Blank	1 per 10 samples	no results above QL	Reanalyze sample bracketed by compliant Continuing Calibration Blank	Kemron Analyst	Accuracy	no results above QL
Continuing Calibration Verification	1 per 10 samples	90-110% of true value	Reanalyze sample bracketed by compliant Continuing Calibration Verification	Kemron Analyst	Accuracy	90-110% of true value
LCS	1 per extraction batch	80 - 120%	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Kemron Analyst	Accuracy	80 - 120%
LCS	1 per extraction batch	80 - 120%	Qualify data as required	Golder Associates Data Validator	Accuracy	80 - 120%

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

28-14 Volatile Organic Compounds – Groundwater and Aqueous IDW

Matrix	Groundwater, Aqueous IDW
Analytical Group	VOCs
Concentration Level	All
Sampling SOP[1]	GFP-4
Analytical Method/ SOP Reference[2]	LL-16
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Trip Blank	1 per day	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Method Blank	1 per instrument per analytical shift	no results above QL	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Trip Blank	1 per day	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Method Blank	1 per instrument per analytical shift	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Equipment Rinsate Blank[3]	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	< 30% RPD

28-14 Volatile Organic Compounds – Groundwater and Aqueous IDW

Matrix	Groundwater, Aqueous IDW
Analytical Group	VOCs
Concentration Level	All
Sampling SOP[1]	GFP-4
Analytical Method/ SOP Reference[2]	LL-16
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per analytical shift	Meets laboratory QC limits in Table QAPP-21	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-21
LCS	1 per analytical shift	Meets laboratory QC limits in Table QAPP-21	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-21
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-20	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-20
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-20	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-20

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Equipment Rinsate Blanks and Field Duplicates will not be collected for IDW samples

28-15 Metals – Groundwater and Aqueous IDW

Matrix	Groundwater, Aqueous IDW
Analytical Group	Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-05, LL-06, LL-07, LL-26, LL-27
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action**	**Person(s) Responsible for Corrective Action**	**Data Quality Indicator**	**Measurement Performance Criteria**
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Equipment Rinsate Blank[3]	1 rinsate blank per day, or 1 per 20 samples, whichever is more frequent, whenever field decontaminated equipment is used.	none	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Continuing Calibration Blank	1 per 10 samples	no results above QL	Reanalyze sample bracketed by compliant Continuing Calibration Blank	Lancaster Laboratories Analyst	Accuracy	no results above QL
Continuing Calibration Verification	1 per 10 samples	90-110% of true value	Reanalyze sample bracketed by compliant Continuing Calibration Verification	Lancaster Laboratories Analyst	Accuracy	90-110% of true value
Field Duplicates[3]	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	<30% RPD

28-15 Metals – Groundwater and Aqueous IDW

Matrix	Groundwater, Aqueous IDW
Analytical Group	Metals
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-05, LL-06, LL-07, LL-26, LL-27
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-22	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-22
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-22	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-22
Matrix Spike[3]	1 per 20 samples	Meets laboratory QC limits in Table QAPP-22	If the LCS meets acceptance criteria, no corrective action required. Otherwise, if sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-22
Matrix Spike[3]	1 per 20 samples	Meets laboratory QC limits in Table QAPP-22	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-22

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3]Equipment Rinsate Blanks, Field Duplicates and Matrix Spikes will not be collected for IDW samples
[4]Arsenic concentrations for groundwater shall be determined by ICP-MS following LL-26/LL-27. Mercury concentrations will be determined by LL-07. All other metals shall be determined by ICP following LL-05/LL-06.

28-16 Natural Attenuation Parameters – Groundwater

Matrix	Groundwater
Analytical Group	Natural Attenuation Parameters
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	Various[3]
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
Continuing Calibration Blank	1 per 10 samples	no results above QL	Reanalyze sample bracketed by compliant Continuing Calibration Blank	Lancaster Laboratories Analyst	Accuracy	no results above QL
Continuing Calibration Verification	1 per 10 samples	90-110% of true value	Reanalyze sample bracketed by compliant Continuing Calibration Verification	Lancaster Laboratories Analyst	Accuracy	90-110% of true value
Field Duplicates	1 per 20 samples	none	Qualify data as required	Golder Associates Data Validator	Precision	<30% RPD
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-23	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-23
LCS	Meets laboratory QC limits in Table QAPP-23	Meets laboratory QC limits in Table QAPP-23	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-23

28-16 Natural Attenuation Parameters – Groundwater

Matrix	Groundwater
Analytical Group	Natural Attenuation Parameters
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	Various[3]
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Matrix Spike	1 per 20 samples	Meets laboratory QC limits in Table QAPP-23	If the LCS meets acceptance criteria, no corrective action required. Otherwise, if sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-23
Matrix Spike	1 per 20 samples	Meets laboratory QC limits in Table QAPP-23	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-23

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23
[3] SOPs LL-18, LL-19, LL-20, LL-21, LL-22, LL-23, LL-24, and LL-25

28-17 Semivolatile Organic Compounds – Aqueous IDW

Matrix	Aqueous IDW
Analytical Group	SVOC
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-02
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-26	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-26
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-26	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-26
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-25	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-25
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-25	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-25

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

28-18 Pesticide Compounds – Aqueous IDW

Matrix	Aqueous IDW
Analytical Group	Pesticides
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-13
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-28	If more than 5% of the analytes do not meet the LCS accuracy criteria and sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-28
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-28	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-28
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-27	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-27
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-27	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-27

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

28-19 Polychlorinated Biphenyl Compounds – Aqueous IDW

Matrix	Aqueous IDW
Analytical Group	PCBs
Concentration Level	All
Sampling SOP[1]	GFP-5
Analytical Method/ SOP Reference[2]	LL-28
Sampler's Name	TBD
Field Sampling Organization	Golder Associates Inc.
Analytical Organization	Lancaster Laboratories
No. of Sample Locations	TBD

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator	Measurement Performance Criteria
Method Blank	1 per extraction batch	no results above QL	If sufficient sample volume is available, re-extract and reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	no results above QL
Method Blank	1 per extraction batch	no results above QL	Qualify data as required	Golder Associates Data Validator	Accuracy	no results above QL
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-30	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Meets laboratory QC limits in Table QAPP-30
LCS	1 per extraction batch	Meets laboratory QC limits in Table QAPP-30	Qualify data as required	Golder Associates Data Validator	Accuracy	Meets laboratory QC limits in Table QAPP-30
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-29	If sufficient sample volume is available, reanalyze the samples	Lancaster Laboratories Analyst	Accuracy	Surrogate recovery meets QC limits in Table QAPP-29
Surrogate Spike	every sample	Surrogate recovery meets QC limits in Table QAPP-29	Qualify data as required	Golder Associates Data Validator	Accuracy	Surrogate recovery meets QC limits in Table QAPP-29

[1]Reference number from QAPP Worksheet #21
[2]Reference number from QAPP Worksheet #23

QAPP Worksheet #29 - Project Documents and Records Table

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Field Notes Sample Collection Forms Chain of Custody Forms Air bills Telephone Logs and Emails	Field Notes Sample Tracking Logs Equipment Calibration Logs Sample Preparation Logs Analytical Run Logs Equipment Maintenance, Testing and Inspection Logs Corrective Action Reports or Forms (if required) Reported Field Sample Results Reported QC Sample Results Reported Calibration Verification Sample Results Telephone Logs and Emails	Sample Receipt, Custody and Tracking Records Standard Traceability Logs Equipment Calibration Logs Sample Preparation Logs Analytical Run Logs Equipment Maintenance, Testing and Inspection Logs Corrective Action Reports or Forms (if required) Reported Field Sample Results Reported QC Sample Results Reported Calibration Standard and Calibration Verification Sample Results Instrument Printouts (raw data) for Field Samples, Standards, and QC Samples Electronic Data Deliverable reporting Field Sample and QC Sample results Telephone Logs and emails	Data Review Checklists Data Review Summary Data Usability Summaries Telephone Logs and Emails	

QAPP Worksheet #30 - Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization	Backup Laboratory/Organization
Soil/Solid	VOC	All	TBD	LL-01	Standard: 10 business days preliminary data/ 20 business days final deliverables. Select samples during Stage 2 of the PDI may be submitted for expedited (5 business day) preliminary deliverables.	Lancaster Laboratories, Inc.	TBD if required
Soil/Solid	SVOC	All	TBD	LL-02	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Soil/Solid	Pesticides	All	TBD	LL-03	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Soil/Solid	PCB	All	TBD	LL-04	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Soil/Solid	Metals	All	TBD	LL-05, LL-06, LL-07	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Soil/Solid	TCLP VOCs	All	TBD	LL-10, LL-11	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Soil/Solid	TCLP SVOC	All	TBD	LL-12, LL-02	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Soil/Solid	TCLP Pesticides	All	TBD	LL-12, LL-13	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Soil/Solid	TCLP Herbicides	All	TBD	LL-12, LL-15	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Soil/Solid	TCLP Metals	All	TBD	LL-12, LL-16, LL-05, LL-07	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required

QAPP Worksheet #30 - Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Location/ ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization	Backup Laboratory/Organization
Soil	XRF Metals	All	TBD	S_2C_2-1	Standard: 1 business day preliminary data/20 business days final deliverables	S_2C_2 Inc.	TBD if required
Soil Conditioning Study Samples	Metals	All	TBD	K-1 or K-2, K-3 or K-4, K-5, K-10	Standard: 10 business days preliminary data/ 20 business days final deliverables	Kemron	TBD if required
Soil Conditioning Study Samples	TCLP Metals	All	TBD	K-6, K-7 or K-8, K-3 or K-4, K-9	Standard: 10 business days preliminary data/ 20 business days final deliverables	Kemron	TBD if required
Soil	Geotechnical Parameters	All	TBD	Various ASTM Methods - See Worksheet #23	Standard: 20- 25 business days final deliverables	TRC Companies, Inc.	TBD if required
Groundwater and Aqueous IDW	VOC	All	TBD	LL-17	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Groundwater and Aqueous IDW	Metals	All	TBD	LL-05, LL-06, LL-07, LL-26, LL-27	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Groundwater	Natural Attenuation Parameters	All	TBD	Various (see Footnote to Worksheet #12 and Worksheet #23)	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Aqueous IDW	SVOC	All	TBD	LL-02	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Aqueous IDW	Pesticides	All	TBD	LL-13	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required
Aqueous IDW	PCB	All	TBD	LL-28	Standard: 10 business days preliminary data/ 20 business days final deliverables	Lancaster Laboratories, Inc.	TBD if required

QAPP Worksheet #31 - Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Field Sampling Techical Systems Audit	As necessary	Internal	Golder Associates Inc.	PDI Task Leader or designee/Golder Associates Inc.	Golder Associates Field Sampling Personnel	PDI Task Leader or designee/Golder Associates Inc.	PDI Task Leader or designee/Golder Associates Inc.
On-Site Analytical Services (FPXRF) Technical Systems Audit	As necessary	External	Golder Associates Inc.	PDI Task Leader or designee/Golder Associates Inc.	Field Sampling Personnel, S_2C_2	Field Sampling Personnel, S_2C_2	PDI Task Leader or designee/Golder Associates Inc.

No formal project assessments are required by the ROD and Consent Decree SOW. No formal project assesments are planned. The Golder Associates PDI Task Leader will review adherance to field sampling procedures at the beginning of each sample phase and as required throughout the sampling.

Lancaster Laboratories participates in technical systems assessments to maintain NELAC and NJDEP accreditation. Golder Associates and S_2C_2 are regularly audited to maintain the NJDEP ELAP accreditation. TRC Laboratories undergoes external technical system audits to maintain AASHTO accreditation. All of the laboratories have a provision for periodic internal assessments provided in the respective laboratory QAM. No additional assessment activities are deemed necessary for the subcontract laboratories.

QAPP Worksheet #32 - Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Field Sampling Techical Systems Audit	Verbal debriefing, internal memos, email and/or field log books	Project Manager, Golder Associates Inc.	2 business days	Internal memo to project staff and to project file.	PDI Task Leader /Golder Associates Inc.; Data QA/QC Task Leader/ Golder Associates Inc.	2 business days after notification
On-Site Laboratory Services Technical Systems Audit	Verbal debriefing, memo and/or email to project staff	Quality Assurance Officer, S_2C_2	2 business days	Memo to project staff and to project file. May be provided via email.	PDI Task Leader /Golder Associates Inc.; Data QA/QC Task Leader/ Golder Associates Inc.	2 business days after notification

QAPP Worksheet #33 - QA Management Reports

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Informal report of QA deficiencies requiring a major change to field procedures	Monthly	Monthly	Golder Associates Inc.	Geoffrey Seibel, *de maximus, inc.*
The results and data usability assessment for the PDI will be incorporated into the PDI report, which will be submitted as part of the Preliminary (35%) Remedial Design Report	Once	TBD	Golder Associates Inc.	USEPA

QAPP Worksheet #34 - Sampling and Analysis Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification
Chain of Custody (COC)	COC forms will be reviewed by the field staff prior to sample submission to the laboratory to verify that the COC matches the cooler contents. COC forms will also be reviewed by the Data QA/QC Task Leader or designee to verify that the sampling plan is being followed.	Int.	Golder Associates Inc.
Laboratory sample receipt documentation	The Data QA/QC Task Leader or designee will review the laboratory sample receipt documentation and compare to the COC. If discrepancies are found, the Data QA/QC Task Leader or designee will contact the field staff and laboratory to resolve the questions. All communications concerning changes to the sample identifications and required analyses, including telephone memoranda and emails, will be saved to the project file at Golder Associates.	Ext.	Golder Associates Inc.
Chemistry Analytical Data - Preliminary Results Packages	All preliminary analytical data packages will be verified internally by the laboratory performing the work for completeness prior to submittal.	Int.	Lancaster Laboratories, S_2C_2, Kemron
Chemistry Analytical Data - Preliminary Results Packages	All preliminary analytical data packages will be verified for completeness by the Data QA/QC Task Leader or designee upon receipt. The Data QA/QC Task Leader or designee will document XRF sample comparability during the verification process.	Ext.	Golder Associates Inc.
Chemistry Analytical Data - Final Packages	All analytical data packages will be verified internally by the laboratory performing the work for completeness prior to submittal.	Int.	Lancaster Laboratories, S_2C_2, Kemron
Chemistry Analytical Data - Final Packages	The Data QA/QC Task Leader or designee will verify that the analytical data packages contain all of the information required for data validation upon receipt. The data package elements required for each laboratory are described following Worksheet #34.	Ext.	Golder Associates Inc.
Geotechnical Field Data	Geotechnical field observations will be reviewed internally upon their completion. Geotechnical soil classification data will be compiled into boring logs, which will be verified against the original field observations and the results of laboratory index property testing.	Int.	Golder Associates Inc.
Geotechnical Laboratory Data Packages	The geotechnical laboratory will verify that the geotechnical testing results data packages contain all information necessary to satisfy the most recent and currently available ASTM specifications prior to data package submission.	Int.	TRC
Geotechnical Laboratory Data Packages	The Design Manager or designee will verify that the geotechnical testing results data packages contain all required information.	Ext.	Golder Associates Inc.
Groundwater Field parameters	The tabulated field observation data will be checked to ensure no transcription errors occurred. The field observations are considered screening data and will not be formally validated.	Int.	Golder Associates Inc.

QAPP Worksheet #34 - Sampling and Analysis Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification
FPXRF data	All FPXRF data will be verified internally by the laboratory performing the work for completeness prior to submittal.	Int.	S_2C_2
FPXRF data	The Data QA/QC Task Leader or designee will verify that the analytical data packages contain all of the information required for data review upon receipt. The data package elements required for FPXRF are described following Worksheet #34.	Ext.	Golder Associates Inc.

Data Package Elements

The SOW from the ROD requires that analytical data packages for definitive environmental analytical data performed in an off-site laboratory be equivalent to complete CLP data packages. The data packages for the VOC and Arsenic soil delineation samples will meet this requirement. The laboratory report format for the soil, groundwater and IDW analyses performed by Lancaster Laboratories shall consist of the following:

Case Narrative

- Date of issuance
- Laboratory analysis performed
- Laboratory batch number
- Numbers of samples and respective matrices
- QC procedures utilized and also references to the acceptance criteria
- Laboratory report contents
- Project name and number
- Condition of samples 'as-received'
- Discussion of whether or not sample holding times were met
- Any deviations from intended analytical strategy
- Any deviations or modifications of the laboratory SOPs
- Discussion of technical problems or other observations which may have created analytical difficulties
- Discussion of any laboratory QC checks which failed to meet project criteria and the corrective actions pursued
- Signature of the Laboratory QA Officer or designee

Chemistry Data Package

- Chain of custody documentation
- Case narrative for each analyzed batch of samples
- Summary page indicating dates of analyses for samples and laboratory QC checks
- Cross referencing of laboratory sample to project sample identification numbers
- Description of data qualifiers to be used
- Sample preparation and analyses for samples (including instrument run logs)
- Sample results (results between the MDL and QL will be reported as estimated values)
- A QC summary package including the results of LCS, MS/MSD, surrogates, interference check samples, serial dilutions, laboratory duplicates, and method blanks;
- Raw data for sample results and laboratory QC samples (including LCS, MS/MSD, surrogates, interference check samples, serial dilutions, and method blanks)
- Results of (dated) initial calibration and continuing calibration checks, GC/MS and ICP/MS tuning results, and GC/ECD instrument performance checks.
- Electronic data deliverable containing the results for all field and QC samples.

While the data provided by Kemron to support the soil conditioning study will be definitive data, the data will be used to support engineering design considerations and not to verify compliance with the ROD. Since the data

provided by Kemron does not require full validation to ensure that the project data quality objectives are met, the laboratory reports provided by Kemron will be in an abbreviated format. The Kemron deliverables will not contain the raw instrument data, but will contain the following elements:

Chemistry Data Package

- Chain of custody documentation
- Case narrative for each analyzed batch of samples
- Summary page indicating dates of analyses for samples and laboratory QC checks
- Cross referencing of laboratory sample to project sample identification numbers
- Description of data qualifiers to be used
- Sample results (results between the MDL and QL will be reported as estimated values)
- A QC summary package including the results of LCS, MS/MSD, interference check samples, serial dilutions, laboratory duplicates, and method blanks.

Complete laboratory reports will not be provided for the on-site analytical screening data. S_2C_2 will compile the results from the FPXRF analyses and Golder Associates will compile the results from the groundwater field parameters into a spreadsheets. The raw sample results will be archived by the party performing the analyses, but will not be submitted to EPA.

Similarly, ASTM requirements for reporting geotechnical data differ from the requirements for environmental analytical data. TRC will report results for the geotechnical parameters following the requirements of the analytical method. The raw data for the samples and the calibration data for the method are not expected in the data packages.

QAPP Worksheet #35 - Sampling and Analysis Validation (Steps IIa and IIb) Process Table

Step IIa/IIb[1]	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa/IIb	Final Chemistry Analytical Data Packages	The Data QA/QC Task Leader or designee will review all definitive analytical chemistry data following the Golder Associates Data Review/Data Validation Procedure provided in Attachment 4. In general, the review will follow the guidance from the USEPA Region II Data Validation SOPs detailed in Worksheet #36, where applicable to the analytical methodologies. The data will be evaluated relative the specific QC criteria presented in the QAPP.	Golder Associates Inc.
IIa	FPXRF Data	The Data QA/QC Task Leader or designee will review the FPXRF data for compliance with SOP S_2C_2-1. The FPXRF data will not be formally validated. The MPC provided in Worksheets #12-6 and #28-6 will be considered when evaluating the data usability of the FPXRF screening data.	Golder Associates Inc.
IIa	Geotechnical Field Data	The Design Manager or designee will determine that the data conforms to the referenced ASTM specification and that the data is suitable for decision making. The geotechnical field data will not be formally validated.	Golder Associates Inc.
IIa	Geotechnical Laboratory Data Packages	The Design Manager or designee will determine that the data conforms to the referenced ASTM specification and that the data is suitable for decision making. The geotechnical laboratory data will not be formally validated	Golder Associates Inc.

[1]Validation Step IIa is the review of the data for compliance with methods, procedures and contracts. Validation Step IIb is the comparison with the MPC provided in this QAPP.

QAPP Worksheet #36 - Sampling and Analysis Validation (Steps IIa and IIb) Summary Table

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa/IIb	All	VOCs	All	USEPA Region II SOP HW-24, Validating Volatile Organic Compounds by GC/MS SW-846 Method 8260B, Revision 2, October 2006	Golder Associates Inc.
IIa/IIb	All	SVOC	All	USEPA Region II SOP HW-22, Validating Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometer SW-846 Method 8270D, Revision 3, October 2006	Golder Associates Inc.
IIa/IIb	All	Pesticides	All	USEPA Region II SOP HW-44, Validating Pesticide Compounds - Organochlorine Pesticides by Gas Chromatography SW-846 Method 8081B, Revision 1, October 2006	Golder Associates Inc.
IIa/IIb	All	PCBs	All	USEPA Region II SOP HW-45, Validating PCB Compounds - PCBs by Gas Chromatography SW-846 Method 8082A, Revision 1, October 2006	Golder Associates Inc.
IIa/IIb	All	Herbicides	All	USEPA Region II SOP HW-22, Validating Chlorinated Herbicides by GC SW-846 Method 8151A, Revision 2, September 2006	Golder Associates Inc.
IIa/IIb	All	Metals	All	USEPA Region II SOP HW-2, Validation of Metals for the Contract Laboratory Program (CLP) based on SOW ILM05.3, Revision 13, September 2006; QC criteria based on SW-846 Methods 6010B, 7470A and 7471A	Golder Associates Inc.
IIa/IIb	All	Natural Attenuation Paramters	All	The laboratory QC summaries will be compared to the laboratory QC limits and the requirements of the individual analytical methods.	Golder Associates Inc.

QAPP Worksheet #37 – Data Usability Assessment

Summarize the usability assessment process:

After the data has been reviewed for compliance with the analytical methods and the MPC as specified in QAPP Worksheet #35, the Data QA/QC Task Leader or designee will provide an preliminary summary of potential data usability concerns to the Golder Project Manager, Design Manager and PDI Task Leader.

The data obtained will then be both qualitatively and quantitatively assessed for data usability on a project-wide, matrix-specific, parameter-specific, and unit-specific basis cooperatively by the Data QA/QC Task Leader, Design Manager and the PDI Task Leader or their designees. Factors to be considered in this overall assessment of field and laboratory data will include, but not be limited to, the following:

- Were samples obtained using the methodologies proposed in the PDIWP or in accordance with modified methods developed during the course of the work?
- Were proposed analyses performed according to the methods identified in this QAPP or in accordance with modified methods selected during the course of the work?
- Were samples obtained from the proposed sampling locations and depths?
- Do analytical results exhibit elevated detection limits due to matrix interference or contaminants present at high concentrations?
- Were target analytes not expected to be present at the facility, or a given unit, identified?
- Were field and laboratory data validated according to the validation protocols, including project-specific QC objectives, proposed in this QAPP?
- Which chemical data sets were found to be unusable based on the data validation results?
- Which geotechnical data were found to be unusable based on engineering judgment?
- Which chemical data were found to be usable based on the data validation results?
- Which geotechnical data were found to be usable based on the data validation results?
- What effects do qualifiers, applied as a result of data validation, have on the ability to implement project decisions?
- Can valid conclusions be drawn for all matrices at each unit and/or area under investigation?
- Were issues requiring corrective action fully resolved?
- For cases where the proposed procedures and/or requirements have not been met, has the effect of these issues on the project objectives been evaluated?

Identify the personnel responsible for performing the usability assessment:

The Golder Associates Data QA/QC Task Leader, Design Manager, and PDI Task Leader or their designees will be responsible for performing the usability assessment

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

The usability assessment will be presented as part of the PDI report and subsequent reports. A standalone document describing the usability assessment is not anticipated.

TABLE QAPP-1
ANALYTICAL METHODS
MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

Matrix	Parameter	Analytical Method Reference	Analysis Location
Soil/Solids	VOCs	SW-846 5035/8260B	off-site laboratory
Soil/Solids	SVOCs	SW-846 8270C	off-site laboratory
Soil/Solids	Pesticides	SW-846 8081A	off-site laboratory
Soil/Solids	PCB Aroclors	SW-846 8082	off-site laboratory
Soil/Solids	TAL Metals	SW-846 6010B/7471A	off-site laboratory
Soil/Solids	Total Arsenic	SW-846 6010B	off-site laboratory
Soil/Solids	Total Barium, Chromium, and Lead	SW-846 6010B	off-site laboratory
Soil/Solids	XRF metals	SW-846 6200	on-site field measurement
Soil/Solids	Total Cyanide	SW-846 9012A	off-site laboratory
Soil/Solids	Total Sulfide	SM20 4500 S2 D	off-site laboratory
Soil/Solids	pH	SW-846 9045C	off-site laboratory
Soil/Solids	Moisture	SM20 2540 G	off-site laboratory
Soil/Solids	TCLP Zero Headspace Extraction	SW-846 1311	off-site laboratory
Soil/Solids	TCLP Non-volatile Extraction	SW-846 1311	off-site laboratory
Soil/Solids	TCLP Volatiles	SW-846 8260B	off-site laboratory
Soil/Solids	TCLP Acid Base/Neutrals	SW-846 8270C	off-site laboratory
Soil/Solids	TCLP Pesticides	SW-846 8081A	off-site laboratory
Soil/Solids	TCLP Herbicides	SW-846 8151A	off-site laboratory
Soil/Solids	TCLP Metals	SW-846 6010B/7470A	off-site laboratory
Conditioning study soils	Total RCRA Metals	SW-846 8260B	off-site laboratory
Conditioning study soils	TCLP Non-volatile Extraction	SW-846 1311	off-site laboratory
Conditioning study soils	TCLP Metals	SW-846 6010B/7470A	off-site laboratory
Groundwater and Aqueous IDW	Volatiles	SW-846 8260B (25 mL Purge)	off-site laboratory
Groundwater and Aqueous IDW	TAL Metals	SW-846 6010B/6020/7470A	off-site laboratory
Groundwater	Alkalinity	SM20 2320 B	off-site laboratory
Groundwater	Chloride	SM20 4500 Cl C	off-site laboratory
Groundwater	Nitrate	SW-846 9056	off-site laboratory
Groundwater	Nitrite	SW-846 9056	off-site laboratory
Groundwater	Sulfate	SW-846 9056	off-site laboratory
Groundwater	Total Sulfide	SM20 4500 S2 D	off-site laboratory
Groundwater	Total Phosphate	EPA 365.1	off-site laboratory
Groundwater	Total Organic Carbon	SM20 5310 C	off-site laboratory
Groundwater	Total Suspended Solids	SM20 2540 D	off-site laboratory
Groundwater	Methane, Ethane & Ethene	SW-846 8015B mod	off-site laboratory
Groundwater	Dissolved Oxygen	SM20 4500-O G	on-site field measurement
Groundwater	Ferrous Iron	field measurement - HACH kit	on-site field measurement
Groundwater	Oxidation-Reduction Potential	field measurement - probe	on-site field measurement
Groundwater	pH	SM20 4500-H+ B	on-site field measurement
Groundwater	Specific Conductance	EPA 120.1	on-site field measurement
Groundwater	Temperature	SM20 2550 B	on-site field measurement
Groundwater	Turbidity	EPA 180.1	on-site field measurement
Aqueous IDW	SVOCs	SW-846 8270C	off-site laboratory
Aqueous IDW	Pesticides	SW-846 8081A	off-site laboratory
Aqueous IDW	PCB Aroclors	SW-846 8082	off-site laboratory
Geotechnical	Grain size	ASTM D422	off-site laboratory
Geotechnical	Specific gravity	ASTM D854	off-site laboratory
Geotechnical	Moisture content	ASTM D2216	off-site laboratory
Geotechnical	Atterberg limits	ASTM D4318	off-site laboratory
Geotechnical	Unconfined compression	ASTM D2166	off-site laboratory
Geotechnical	One-dimensional consolidation	ASTM D2435	off-site laboratory
Geotechnical	Unconsolidated-undrained (UU) triaxial shear strength	ASTM D2850	off-site laboratory
Geotechnical	Consolidated-undrained (CU) triaxial shear strength	ASTM D4767	off-site laboratory
Geotechnical	Hydraulic conductivity	ASTM D5084	off-site laboratory
Demolition Debris	Asbestos Containing Material	EPA 600/R-93/116	off-site laboratory

Notes:
See list of Acronymns for definitions

QAPP-2
Surrogate Recovery Limits - Volatile Organic Compounds - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid	
Analytical Method/SOP	LL-01	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Dibromofluoromethane	1868-53-7	71 - 114
1,2-Dichloroethane-d4	17060-07-0	70 - 109
Toluene-d8	2037-26-5	70 - 123
4-Bromofluorobenzene	460-00-4	70 - 111

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-3
Precision and Accuracy Limits - Volatile Organic Compounds - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid		
Analytical Method/SOP	LL-01		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Acetone	67-64-1	18 - 200	30
Benzene	71-43-2	84 - 115	30
Bromodichloromethane	75-27-4	77 - 116	30
Bromoform	75-25-2	63 - 120	30
Bromomethane	74-83-9	53 - 124	30
2-Butanone	78-93-3	39 - 170	30
Carbon Disulfide	75-15-0	74 - 117	30
Carbon Tetrachloride	56-23-5	76 - 122	30
Chlorobenzene	108-90-7	81 - 112	30
Chloroethane	75-00-3	63 - 120	30
Chloroform	67-66-3	81 - 117	30
Chloromethane	74-87-3	44 - 115	30
Cyclohexane	110-82-7	52 - 129	30
1,2-Dibromo-3-chloropropane	96-12-8	58 - 127	30
Dibromochloromethane	124-48-1	80 - 113	30
1,2-Dibromoethane	106-93-4	77 - 114	30
1,2-Dichlorobenzene	95-50-1	81 - 109	30
1,3-Dichlorobenzene	541-73-1	76 - 112	30
1,4-Dichlorobenzene	106-46-7	78 - 108	100
Dichlorodifluoromethane	75-71-8	28 - 121	30
1,1-Dichloroethane	75-34-3	82 - 116	30
1,2-Dichloroethane	107-06-2	76 - 126	30
1,1-Dichloroethene	75-35-4	83 - 121	30
cis-1,2-Dichloroethene	156-59-2	84 - 113	30
trans-1,2-Dichloroethene	156-60-5	84 - 116	30
1,2-Dichloropropane	78-87-5	78 - 119	30
cis-1,3-Dichloropropene	10061-01-5	80 - 111	30
trans-1,3-Dichloropropene	10061-02-6	79 - 112	30
Ethylbenzene	100-41-4	82 - 115	30
Freon 113	76-13-1	68 - 121	30
2-Hexanone	591-78-6	38 - 154	30
Isopropylbenzene	98-82-8	82 - 110	30
Methyl Acetate	79-20-9	59 - 150	30
Methyl Cyclohexane	108-87-2	57 - 129	30
Methyl tert-Butyl Ether	1634-04-4	72 - 117	30
4-Methyl-2-pentanone	108-10-1	51 - 141	30
Methylene Chloride	75-09-2	75 - 120	30
Styrene	100-42-5	79 - 108	30
1,1,2,2-Tetrachloroethane	79-34-5	64 - 121	30
Tetrachloroethene	127-18-4	77 - 120	30
Toluene	108-88-3	81 - 116	30
1,2,4-Trichlorobenzene	120-82-1	60 - 116	30
1,1,1-Trichloroethane	71-55-6	74 - 127	30
1,1,2-Trichloroethane	79-00-5	81 - 112	30

QAPP-3
Precision and Accuracy Limits - Volatile Organic Compounds - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid		
Analytical Method/SOP	LL-01		
Concentration Level	All		
Trichloroethene	79-01-6	81 - 114	30
Trichlorofluoromethane	75-69-4	58 - 125	30
Vinyl Chloride	75-01-4	52 - 111	30
Xylenes, Total	1330-20-7	82 - 117	30
Bromochloromethane	74-97-5	83 - 119	30
1,2,3-Trichlorobenzene	87-61-6	63 - 120	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-4
Surrogate Recovery Limits - Semivolatile Organic Compounds - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil	
Analytical Method/SOP	LL-02/Solid	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Phenol-d6	13127-88-3	36 - 126
2-Fluorophenol	367-12-4	34 - 126
2,4,6-Tribromophenol	118-79-6	32 - 145
Nitrobenzene-d5	4165-60-0	47 - 128
2-Fluorobiphenyl	321-60-8	55 - 123
Terphenyl-d14	1718-51-0	49 - 134

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-5
Precision and Accuracy Limits - Semi-Volatile Organic Compounds - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid		
Analytical Method/SOP	LL-02		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Acenaphthene	83-32-9	76 - 103	50
Acenaphthylene	208-96-8	66 - 110	50
Anthracene	120-12-7	68 - 117	50
Benzoic Acid	65-85-0	6 - 79	30
Benzo[a]anthracene	56-55-3	72 - 115	50
Benzo[b]fluoranthene	205-99-2	74 - 118	50
Benzo[k]fluoranthene	207-08-9	71 - 119	50
Benzo[g,h,i]perylene	191-24-2	73 - 116	50
Benzo[a]pyrene	50-32-8	66 - 112	50
Bis(2-chloroethoxy)methane	111-91-1	69 - 119	30
Bis(2-chloroethyl) Ether	111-44-4	75 - 109	30
Bis(2-chloroisopropyl) Ether	108-60-1	37 - 138	30
Bis(2-ethylhexyl) Phthalate	117-81-7	62 - 126	30
4-Bromophenyl Phenyl Ether	101-55-3	67 - 110	30
Butylbenzyl Phthalate	85-68-7	63 - 120	30
Carbazole	86-74-8	80 - 110	30
4-Chloroaniline	106-47-8	42 - 115	30
4-Chloro-3-methylphenol	59-50-7	72 - 114	30
2-Chloronaphthalene	91-58-7	56 - 100	30
2-Chlorophenol	95-57-8	77 - 103	30
4-Chlorophenyl-phenylether	7005-72-3	79 - 110	30
Chrysene	218-01-9	71 - 108	50
Dibenzo[a,h]anthracene	53-70-3	73 - 116	50
Dibenzofuran	132-64-9	79 - 106	30
Di-n-Butyl Phthalate	84-74-2	77 - 114	30
3,3'-Dichlorobenzidine	91-94-1	45 - 111	30
2,4-Dichlorophenol	120-83-2	66 - 110	30
Diethyl Phthalate	84-66-2	79 - 108	30
2,4-Dimethylphenol	105-67-9	60 - 107	30
Dimethyl Phthalate	131-11-3	69 - 106	30
4,6-Dinitro-2-methylphenol	534-52-1	66 - 123	30
2,4-Dinitrophenol	51-28-5	46 - 128	30
2,4-Dinitrotoluene	121-14-2	75 - 122	100
2,6-Dinitrotoluene	606-20-2	70 - 108	30
Di-n-octyl Phthalate	117-84-0	71 - 125	30
Fluoranthene	206-44-0	73 - 107	50
Fluorene	86-73-7	71 - 106	50
Hexachlorobenzene	118-74-1	68 - 113	30
Hexachlorobutadiene	87-68-3	33 - 136	30
Hexachlorocyclopentadiene	77-47-4	23 - 143	30
Hexachloroethane	67-72-1	35 - 125	30
Indeno[1,2,3-cd]pyrene	193-39-5	68 - 129	50
Isophorone	78-59-1	63 - 105	30
2-Methylnaphthalene	91-57-6	38 - 118	50

QAPP-5
Precision and Accuracy Limits - Semi-Volatile Organic Compounds - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid		
Analytical Method/SOP	LL-02		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
2-Methylphenol	95-48-7	56 - 105	30
4-Methylphenol	106-44-5	62 - 99	30
Naphthalene	91-20-3	62 - 116	50
2-Nitroaniline	88-74-4	73 - 115	30
3-Nitroaniline	99-09-2	63 - 112	30
4-Nitroaniline	100-01-6	51 - 104	30
Nitrobenzene	98-95-3	61 - 111	30
2-Nitrophenol	88-75-5	82 - 121	30
4-Nitrophenol	100-02-7	12 - 78	30
N-Nitrosodiphenylamine	86-30-6	75 - 112	30
N-Nitroso-di-n-propylamine	621-64-7	71 - 107	30
Pentachlorophenol	87-86-5	48 - 108	100
Phenanthrene	85-01-8	73 - 112	50
Phenol	108-95-2	31 - 60	30
Pyrene	129-00-0	67 - 117	50
1,2,4-Trichlorobenzene	120-82-1	60 - 116	30
2,4,5-Trichlorophenol	95-95-4	70 - 115	30
2,4,6-Trichlorophenol	88-06-2	69 - 111	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-6
Surrogate Recovery Limits - Pesticides - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid	
Analytical Method/SOP	LL-03	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Tetrachloro-m-xylene	877-09-8	38 - 132
Decachlorobiphenyl	2051-24-3	62 - 159

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-7
Precision and Accuracy Limits - Pesticides - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid		
Analytical Method/SOP	LL-03		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Aldrin	309-00-2	74 - 137	20
delta-BHC	319-86-8	66 - 118	20
alpha-BHC	319-84-6	60 - 127	20
beta-BHC	319-85-7	68 - 137	20
gamma-BHC	58-89-9	59 - 125	30
alpha-Chlordane	5103-71-9	66 - 127	30
beta-Chlordane	5103-74-2	57 - 130	30
4,4-DDT	50-29-3	57 - 124	20
4,4-DDD	72-54-8	60 - 153	20
4,4-DDE	72-55-9	52 - 159	20
Dieldrin	60-57-1	71 - 133	20
alpha-Endosulfan	959-98-8	65 - 121	20
beta-Endosulfan	33213-65-9	73 - 134	20
Endosulfan Sulfate	1031-07-8	58 - 133	20
Endrin	72-20-8	65 - 134	30
Endrin Aldehyde	7421-93-4	40 - 119	20
Endrin Ketone	53494-70-5	70 - 143	30
Heptachlor	76-44-8	61 - 129	30
Heptachlor Epoxide	1024-57-3	72 - 132	30
Methoxychlor	72-43-5	49 - 148	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-8
Surrogate Recovery Limits - Polychlorinated Biphenyls - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid	
Analytical Method/SOP	LL-04	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Tetrachloro-m-xylene	877-09-8	53 - 139
Decachlorobiphenyl	2051-24-3	53 - 142

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-9
Precision and Accuracy Limits - Polychlorinated Biphenyls - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid		
Analytical Method/SOP	LL-04		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Aroclor 1016	12674-11-2	72 - 120	30
Aroclor 1260	11096-82-5	65 - 137	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-10
Precision and Accuracy Limits - Metals - Soil/Solid
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid
Analytical Method/SOP	LL-05, LL-06, LL-07
Concentration Level	All

Compound	CAS Number	MS/MSD Recovery Window (%)	MS/MSD RPD (%)	LCS Recovery Limits (%)	LCS/LCSD RPD (%)
Aluminum	7429-90-5	75 - 125	30	85 - 115	30
Antimony	7440-36-0	75 - 125	30	27 - 173	30
Arsenic	7440-38-2	75 - 125	30	86 - 114	30
Barium	7440-39-3	75 - 125	30	90 - 110	30
Beryllium	7440-41-7	83 - 111	30	90 - 110	30
Cadmium	7440-43-9	75 - 125	30	90 - 110	30
Calcium	7440-70-2	75 - 125	30	90 - 110	30
Chromium	7440-47-3	75 - 125	30	79 - 121	30
Cobalt	7440-48-4	81 - 110	30	90 - 110	30
Copper	7440-50-8	75 - 125	30	90 - 110	30
Iron	7439-89-6	75 - 125	30	40 - 160	30
Lead	7439-92-1	75 - 125	30	90 - 110	30
Magnesium	7439-95-4	75 - 125	30	88 - 112	30
Manganese	7439-96-5	75 - 125	30	89 - 111	30
Mercury	7439-97-6	80 - 120	30	66.5 - 113.6	30
Molybdenum	7439-98-7	77 - 110	30	87 - 113	30
Nickel	7440-02-0	75 - 125	30	90 - 110	30
Potassium	7440-09-7	75 - 125	30	82 - 118	30
Selenium	7782-49-2	75 - 125	30	85 - 115	30
Silver	7440-22-4	75 - 125	30	89 - 111	30
Sodium	7440-23-5	75 - 125	30	78 - 122	30
Thallium	7440-28-0	75 - 125	30	90 - 110	30
Vanadium	7440-62-2	75 - 125	30	68 - 132	30
Zinc	7440-66-6	75 - 125	30	91 - 110	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-11
Surrogate Recovery Limits - Volatile Organic Compounds - RCRA Waste Characterization
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid, IDW	
Analytical Method/SOP	LL-9, LL-10	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Dibromofluoromethane	1868-53-7	80 - 116
1,2-Dichloroethane-d4	17060-07-0	77 - 113
Toluene-d8	2037-26-5	80 - 113
4-Bromofluorobenzene	460-00-4	78 - 113

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-12
Precision and Accuracy Limits - Volatile Organic Compounds - RCRA Waste Characterization
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid, IDW		
Analytical Method/SOP	LL-9, LL-10		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Benzene	71-43-2	78-119	30
2-Butanone	78-93-3	52-163	30
Carbon Tetrachloride	56-23-5	77-130	30
Chlorobenzene	108-90-7	85-115	30
Chloroform	67-66-3	77-125	30
1,2-Dichloroethane	107-06-2	69-135	30
1,1-Dichloroethene	75-35-4	76-122	30
Tetrachloroethene	127-18-4	76-118	30
Trichloroethene	79-01-6	87-117	30
Vinyl Chloride	75-01-4	54-123	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-13
Surrogate Recovery Limits - Semivolatile Organic Compounds - RCRA Waste Characterization
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid, IDW	
Analytical Method/SOP	LL-11, LL-02	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Nitrobenzene-d5	4165-60-0	51 - 123
2-Fluorobiphenyl	321-60-8	63 - 118
Terphenyl-d14	1718-51-0	52 - 151
Phenol-d6	13127-88-3	10 - 82
2-Fluorophenol	367-12-4	10 - 103
2,4,6-Tribromophenol	118-79-6	20 - 159

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-14
Precision and Accuracy Limits - Semivolatile Organic Compounds - RCRA Waste Characterization
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid, IDW		
Analytical Method/SOP	LL-11, LL-02		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
m,p-Cresol (reported as 4-methylphenol)	106-44-5	62 - 99	30
2-Methylphenol	95-48-7	56 - 105	30
2,4-Dinitrotoluene	121-14-2	75 - 122	100
Hexachlorobenzene	118-74-1	68 - 113	30
Hexachlorobutadiene	87-68-3	35 - 135	30
Hexachloroethane	67-72-1	35 - 125	30
Nitrobenzene	98-95-3	61 - 111	30
Pentachlorophenol	87-86-5	48 - 108	100
Pyridine	110-86-1	24 - 89	30
2,4,5-Trichlorophenol	95-95-4	70 - 115	30
2,4,6-Trichlorophenol	88-06-2	69 - 111	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-15
Surrogate Recovery Limits - Pesticides - RCRA Waste Characterization
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid, IDW	
Analytical Method/SOP	LL-11, LL-12	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Tetrachloro-m-xylene	877-09-8	55 - 130
Decachlorobiphenyl	2051-24-3	44 - 146

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-16
Precision and Accuracy Limits - Pesticides - RCRA Waste Characterization
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid, IDW		
Analytical Method/SOP	LL-11, LL-12		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
gamma-BHC	58-89-9	65 - 144	30
Endrin	72-20-8	69 - 120	30
Heptachlor	76-44-8	65 - 123	30
Heptachlor Epoxide	1024-57-3	73 - 141	30
Methoxychlor	72-43-5	49 - 155	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-17
Surrogate Recovery Limits - Herbicides - RCRA Waste Characterization
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid, IDW	
Analytical Method/SOP	LL-11, LL-13, LL-14	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
2,4-dichlorophenylacetic acid	19719-28-9	41 - 148

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-18
Precision and Accuracy Limits - Herbicides - RCRA Waste Characterization
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid, IDW
Analytical Method/SOP	LL-11, LL-13, LL-14
Concentration Level	All

Compound	CAS Number	MS/MSD Recovery Window (%)	MS/MSD RPD (%)	LCS Recovery Limits (%)	LCS/LCSD RPD (%)
2,4-D	94-75-7	38 - 176	30	52 - 140	30
Silvex	93-72-1	44 - 161	30	61 - 124	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-19
Precision and Accuracy Limits - Metals - RCRA Waste Characterization
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil/Solid, IDW
Analytical Method/SOP	LL-11, LL-15, LL-05, LL-06, LL-07
Concentration Level	All

Compound	CAS Number	MS/MSD Recovery Window (%)	MS/MSD RPD (%)	LCS Recovery Limits (%)	LCS/LCSD RPD (%)
Arsenic	7440-38-2	75 - 125	30	86 - 114	30
Barium	7440-39-3	75 - 125	30	90 - 110	30
Cadmium	7440-43-9	83 - 116	30	90 - 110	30
Chromium	7440-47-3	81 - 120	30	79 - 121	30
Lead	7439-92-1	75 - 125	30	90 - 110	30
Mercury	7439-97-6	80 - 120	30	66.5 - 113.6	30
Selenium	7782-49-2	75 - 125	30	85 - 115	30
Silver	7440-22-4	75 - 125	30	89 - 111	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-20
Surrogate Recovery Limits - Volatile Organic Compounds - Groundwater and Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Groundwater, Aqueous IDW	
Analytical Method/SOP	LL-16	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Dibromofluoromethane	1868-53-7	77 - 114
1,2-Dichloroethane-d4	17060-07-0	74 - 113
Toluene-d8	2037-26-5	77 - 110
4-Bromofluorobenzene	460-00-4	78 - 110

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-21
Precision and Accuracy Limits - Volatile Organic Compounds - Groundwater and Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrices	Groundwater, Aqueous IDW		
Analytical Method/SOP	LL-16		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Acetone	67-64-1	66 - 138	30
Benzene	71-43-2	87 - 111	30
Bromodichloromethane	75-27-4	85 - 123	30
Bromoform	75-25-2	79 - 126	30
Bromomethane	74-83-9	59 - 140	30
2-Butanone	78-93-3	70 - 145	30
Carbon Disulfide	75-15-0	77 - 123	30
Carbon Tetrachloride	56-23-5	76 - 134	30
Chlorobenzene	108-90-7	88 - 112	30
Chloroethane	75-00-3	65 - 135	30
Chloroform	67-66-3	83 - 121	30
Chloromethane	74-87-3	51 - 135	30
Cyclohexane	110-82-7	78 - 121	30
1,2-Dibromo-3-chloropropane	96-12-8	65 - 129	30
Dibromochloromethane	124-48-1	84 - 127	30
1,2-Dibromoethane	106-93-4	86 - 116	30
1,2-Dichlorobenzene	95-50-1	89 - 114	30
1,3-Dichlorobenzene	541-73-1	85 - 109	30
1,4-Dichlorobenzene	106-46-7	85 - 112	100
Dichlorodifluoromethane	75-71-8	44 - 146	30
1,1-Dichloroethane	75-34-3	84 - 116	30
1,2-Dichloroethane	107-06-2	83 - 130	30
1,1-Dichloroethene	75-35-4	84 - 117	30
cis-1,2-Dichloroethene	156-59-2	86 - 113	30
trans-1,2-Dichloroethene	156-60-5	86 - 111	30
1,2-Dichloropropane	78-87-5	85 - 115	30
cis-1,3-Dichloropropene	10061-01-5	79 - 114	30
trans-1,3-Dichloropropene	10061-02-6	77 - 122	30
Ethylbenzene	100-41-4	88 - 114	30
Freon 113	76-13-1	78 - 114	30
2-Hexanone	591-78-6	69 - 135	30
Isopropylbenzene	98-82-8	87 - 115	30
Methyl Acetate	79-20-9	42 - 165	30
Methyl Cyclohexane	108-87-2	86 - 116	30
Methyl tert-Butyl Ether	1634-04-4	77 - 115	30
4-Methyl-2-pentanone	108-10-1	71 - 130	30
Methylene Chloride	75-09-2	83 - 111	30
Styrene	100-42-5	85 - 118	30
1,1,2,2-Tetrachloroethane	79-34-5	83 - 119	30
Tetrachloroethene	127-18-4	81 - 116	30
Toluene	108-88-3	89 - 113	30
1,2,4-Trichlorobenzene	120-82-1	78 - 117	30

QAPP-21
Precision and Accuracy Limits - Volatile Organic Compounds - Groundwater and Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrices	Groundwater, Aqueous IDW		
Analytical Method/SOP	LL-16		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
1,1,1-Trichloroethane	71-55-6	83 - 123	30
1,1,2-Trichloroethane	79-00-5	87 - 115	30
Trichloroethene	79-01-6	87 - 116	30
Trichlorofluoromethane	75-69-4	71 - 140	30
Vinyl Chloride	75-01-4	63 - 133	30
Xylenes, Total	1330-20-7	88 - 115	30
Bromochloromethane	74-97-5	83 - 115	30
1,2,3-Trichlorobenzene	87-61-6	76 - 117	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-22
Precision and Accuracy Limits - Metals - Groundwater and Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Groundwater, Aqueous IDW				
Analytical Method/SOP	LL-05, LL-06, LL-07, LL-25, LL-26				
Concentration Level	All				
Compound	**CAS Number**	**MS/MSD Recovery Window (%)**	**MS/MSD RPD (%)**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Aluminum	7429-90-5	75 - 125	20	90 - 112	20
Antimony	7440-36-0	75 - 125	20	88 - 111	20
Arsenic	7440-38-2	75 - 125	20	86 - 111	20
Barium	7440-39-3	75 - 125	20	90 - 110	20
Beryllium	7440-41-7	87 - 114	20	90 - 112	20
Cadmium	7440-43-9	83 - 116	20	90 - 112	20
Calcium	7440-70-2	75 - 125	20	90 - 112	20
Chromium	7440-47-3	81 - 120	20	90 - 110	20
Cobalt	7440-48-4	87 - 112	20	90 - 110	20
Copper	7440-50-8	86 - 122	20	90 - 112	20
Iron	7439-89-6	75 - 125	20	90 - 112	20
Lead	7439-92-1	75 - 125	20	90 - 113	20
Magnesium	7439-95-4	75 - 125	20	89 - 110	20
Manganese	7439-96-5	75 - 125	20	90 - 110	20
Mercury	7439-97-6	80 - 120	20	67 - 133	20
Molybdenum	7439-98-7	89 - 112	20	90 - 110	20
Nickel	7440-02-0	86 - 115	20	90 - 111	20
Potassium	7440-09-7	75 - 125	20	88 - 119	20
Selenium	7782-49-2	75 - 125	20	80 - 120	20
Silver	7440-22-4	75 - 125	20	90 - 118	20
Sodium	7440-23-5	75 - 125	20	80 - 120	20
Thallium	7440-28-0	75 - 125	20	80 - 120	20
Vanadium	7440-62-2	90 - 111	20	90 - 110	20
Zinc	7440-66-6	80 - 121	20	90 - 111	20

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions
3) Arsenic concentrations for groundwater shall be determined by ICP-MS following LL-25/LL-26. Mercury concentrations will be determined by LL-07. All other metals shall be determined by ICP following LL-05/LL-06.

QAPP-23
Precision and Accuracy Limits - Natural Attenuation Parameters - Groundwater
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Groundwater
Analytical Method/SOP	See Note 3
Concentration Level	All

Compound	CAS Number	MS/MSD Recovery Window (%)	MS/MSD RPD (%)	LCS Recovery Limits (%)	LCS/LCSD RPD (%)
Alkalinity (as Calcium Carbonate)	None	64 - 130	20	98 - 103	20
Chloride	16887-00-6	91 - 105	20	96 - 102	20
Ethane	74-84-0	68 - 131	20	80 - 120	20
Ethene	74-85-1	46 - 164	20	80 - 120	20
Methane	74-82-8	71 - 123	20	80 - 120	20
Nitrate	14797-55-8	90 - 110	20	90 - 110	20
Nitrite	14797-65-0	90 - 110	20	90 - 110	20
Sulfate	14808-79-8	90 - 110	20	90 - 110	20
Total Organic Carbon	None	62 - 148	20	80 - 120	20
Total Phosphate	14265-44-2	90 - 110	20	89 - 110	20
Total Sulfide	18496-25-8	35 - 169	18	90 - 110	12
Total Suspended Solids	None	75 - 125	20	84 - 192	28

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions
3) The analytical methods for the NAPs include:
LL-18, LL-19, LL-20, LL-21, LL-22, LL-23, LL-24, and LL-25.

QAPP-24
Precision and Accuracy Limits - Field Parameters - Groundwater
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Groundwater	
Analytical Method/SOP	See Note 2.	
Concentration Level	All	
Compound	**CAS Number**	**Precision Criterion**
Dissolved Oxygen	None	± 0.2 mg/L
Ferrous Iron	16887-00-6	± 0.2 mg/L
ORP	74-84-0	± 15 mV
pH	74-85-1	± 0.1 pH Units
Specific Conductance	74-82-8	± 3%
Temperature	14797-55-8	± 0.2 °C
Turbidity	14797-65-0	± 5%

Note:
1) See Acronym list for definitions

QAPP-25
Surrogate Recovery Limits - Semivolatile Organic Compounds - Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Aqueous IDW	
Analytical Method/SOP	LL-02	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
2-Fluorophenol	367-12-4	10 - 103
Phenol-d6	13127-88-3	10 - 82
2,4,6-Tribromophenol	118-79-6	20 - 159
Nitrobenzene-d5	4165-60-0	51 - 123
2-Fluorobiphenyl	321-60-8	63 - 118
Terphenyl-d14	1718-51-0	52 - 151

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-26
Precision and Accuracy Limits - Semivolatile Organic Compounds - Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Aqueous IDW		
Analytical Method/SOP	LL-02		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Acenaphthene	83-32-9	74 - 110	50
Acenaphthylene	208-96-8	73 - 114	50
Anthracene	120-12-7	69 - 109	50
Benzoic Acid	65-85-0	20 - 159	30
Benzo[a]anthracene	56-55-3	72 - 112	50
Benzo[b]fluoranthene	205-99-2	66 - 123	50
Benzo[k]fluoranthene	207-08-9	67 - 122	50
Benzo[g,h,i]perylene	191-24-2	63 - 124	50
Benzo[a]pyrene	50-32-8	69 - 119	50
Bis(2-chloroethoxy)methane	111-91-1	70 - 119	30
Bis(2-chloroethyl) Ether	111-44-4	60 - 112	30
Bis(2-chloroisopropyl) Ether	108-60-1	38 - 128	30
Bis(2-ethylhexyl) Phthalate	117-81-7	63 - 131	30
4-Bromophenyl Phenyl Ether	101-55-3	70 - 111	30
Butylbenzyl Phthalate	85-68-7	69 - 117	30
Carbazole	86-74-8	69 - 109	30
4-Chloroaniline	106-47-8	2 - 116	30
4-Chloro-3-methylphenol	59-50-7	59 - 134	30
2-Chloronaphthalene	91-58-7	60 - 101	30
2-Chlorophenol	95-57-8	72 - 106	30
4-Chlorophenyl-phenylether	7005-72-3	69 - 110	30
Chrysene	218-01-9	71 - 112	50
Dibenzo[a,h]anthracene	53-70-3	70 - 130	50
Dibenzofuran	132-64-9	72 - 107	30
Di-n-Butyl Phthalate	84-74-2	68 - 112	30
3,3'-Dichlorobenzidine	91-94-1	3 - 122	30
2,4-Dichlorophenol	120-83-2	72 - 108	30
Diethyl Phthalate	84-66-2	75 - 109	30
2,4-Dimethylphenol	105-67-9	68 - 103	30
Dimethyl Phthalate	131-11-3	76 - 108	30
4,6-Dinitro-2-methylphenol	534-52-1	55 - 117	30
2,4-Dinitrophenol	51-28-5	33 - 122	30
2,4-Dinitrotoluene	121-14-2	73 - 115	100
2,6-Dinitrotoluene	606-20-2	75 - 109	30
Di-n-octyl Phthalate	117-84-0	61 - 117	30
Fluoranthene	206-44-0	66 - 109	50
Fluorene	86-73-7	66 - 115	50
Hexachlorobenzene	118-74-1	69 - 114	30
Hexachlorobutadiene	87-68-3	66 - 112	30
Hexachlorocyclopentadiene	77-47-4	33 - 152	30
Hexachloroethane	67-72-1	56 - 112	30
Indeno[1,2,3-cd]pyrene	193-39-5	59 - 122	50
Isophorone	78-59-1	64 - 96	30
2-Methylnaphthalene	91-57-6	67 - 101	50

QAPP-26
Precision and Accuracy Limits - Semivolatile Organic Compounds - Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Aqueous IDW		
Analytical Method/SOP	LL-02		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
2-Methylphenol	95-48-7	63 - 100	30
4-Methylphenol	106-44-5	64 - 116	30
Naphthalene	91-20-3	69 - 105	50
2-Nitroaniline	88-74-4	76 - 117	30
3-Nitroaniline	99-09-2	34 - 119	30
4-Nitroaniline	100-01-6	32 - 98	30
Nitrobenzene	98-95-3	68 - 105	30
2-Nitrophenol	88-75-5	74 - 113	30
4-Nitrophenol	100-02-7	42 - 142	30
N-Nitrosodiphenylamine	86-30-6	67 - 105	30
N-Nitroso-di-n-propylamine	621-64-7	61 - 109	30
Pentachlorophenol	87-86-5	44 - 107	100
Phenanthrene	85-01-8	70 - 107	50
Phenol	108-95-2	64 - 108	30
Pyrene	129-00-0	67 - 116	50
1,2,4-Trichlorobenzene	120-82-1	68 - 105	30
2,4,5-Trichlorophenol	95-95-4	73 - 104	30
2,4,6-Trichlorophenol	88-06-2	73 - 112	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-27
Surrogate Recovery Limits - Pesticides - Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Aqueous IDW	
Analytical Method/SOP	LL-12	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Tetrachloro-m-xylene	877-09-8	55 - 130
Decachlorobiphenyl	2051-24-3	44 - 146

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-28
Precision and Accuracy Limits - Pesticides - Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Aqueous IDW		
Analytical Method/SOP	LL-12		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Aldrin	309-00-2	74 - 137	20
delta-BHC	319-86-8	66 - 118	20
alpha-BHC	319-84-6	60 - 127	20
beta-BHC	319-85-7	68 - 137	20
gamma-BHC	58-89-9	59 - 125	30
alpha-Chlordane	5103-71-9	66 - 127	30
beta-Chlordane	5103-74-2	57 - 130	30
4,4-DDT	50-29-3	57 - 124	20
4,4-DDD	72-54-8	60 - 153	20
4,4-DDE	72-55-9	52 - 159	20
Dieldrin	60-57-1	71 - 133	20
alpha-Endosulfan	959-98-8	65 - 121	20
beta-Endosulfan	33213-65-9	73 - 134	20
Endosulfan Sulfate	1031-07-8	58 - 133	20
Endrin	72-20-8	65 - 134	30
Endrin Aldehyde	7421-93-4	40 - 119	20
Endrin Ketone	53494-70-5	70 - 143	30
Heptachlor	76-44-8	61 - 129	30
Heptachlor Epoxide	1024-57-3	72 - 132	30
Methoxychlor	72-43-5	49 - 148	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP-29
Surrogate Recovery Limits - Polychlorinated Biphenyls - Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Soil	
Analytical Method/SOP	LL-17	
Concentration Level	All	
Analyte	**CAS Number**	**Recovery Window (%)**
Tetrachloro-m-xylene	877-09-8	43 - 122
Decachlorobiphenyl	2051-24-3	28 - 135

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

QAPP- 30
Precision and Accuracy Limits - Polychlorinated Biphenyls - Aqueous IDW
Martin Aaron Superfund Site
Camden, New Jersey

Matrix	Aqueous IDW		
Analytical Method/SOP	LL-04		
Concentration Level	All		
Compound	**CAS Number**	**LCS Recovery Limits (%)**	**LCS/LCSD RPD (%)**
Aroclor 1016	12674-11-2	72 - 120	30
Aroclor 1260	11096-82-5	65 - 137	30

Note:
1) Recovery windows based on Lancaster Laboratory QC limits as of January 1, 2008. Lancaster Laboratories routinely re-evaluates QC criteria using the procedures in the laboratory EQPM. The current laboratory limits at the time of sample submission will be used to evaluate analytical performance.
2) See Acronym list for definitions

ATTACHMENT 1

FIELD STANDARD OPERATING PROCEDURES

GFP-1 GOLDER FIELD PROCEDURE 1
DECONTAMINATION AND WASTE HANDLING

1.0 DECONTAMINATION

Decontamination procedures in this section are intended for use by field personnel for cleaning sampling, drilling and other equipment in the field. Deviations from these procedures will be documented in the field records described in Standard Operating Procedure (SOP) GFP-2 "Field Documentation". Specifications for standard decontamination materials follow. These materials will be used, as appropriate, for non-dedicated equipment.

- Soap - shall be a phosphate-free laboratory detergent such as Liquinox® or Alconox.® Use of other detergent must be documented in the field logbooks and investigative reports.

- Solvent - shall be pesticide-grade isopropanol. Use of a solvent other than pesticide-grade isopropanol for equipment cleaning purposes must be justified and documented in field logbooks and investigation reports.

- Tap water - may be used from any municipal water treatment system. Use of an untreated potable water supply is not an acceptable substitute for tap water.

- Deionized water - tap water that has been run through a standard deionizing resin column. It is commercially available. The deionized water should contain no heavy metals or other inorganic compounds (i.e., at or above the analytical detection limits) as defined by the inductively coupled Argon Plasma Spectrophotometer (ICP) scan standard analytical method or any justified equivalent method.

- Distilled water - tap water that has been distilled. It is commercially available.

- Analyte free water - tap water that has been treated with activated carbon and a standard deionizing resin column. At a minimum, the finished water should contain no constituents above the laboratory reporting limits that are being analyzed for as part of the investigation.

Solvents, laboratory detergent, and rinse waters used to clean non-dedicated equipment shall not be reused during field decontamination and will be stored in DOT-approved 55-gallon drums. These materials will be treated as investigation derived waste (IDW). See below for proper handling and disposal of these materials. Any brushes used to clean equipment as outlined in the following sections shall not be of the wire-wrapped type.

1.1 Drilling Equipment Decontamination

The procedures in this section are to be used for all non-dedicated drilling equipment. All decontamination procedures in this section will be performed on a decontamination pad at the Site.

1.2 Decontamination Pad Specifications

The decontamination pad for field cleaning of sampling and drilling equipment at the Site will meet the following minimum specifications:

- The pad is located and/or constructed in an area known or believed to be free of surface contamination.
- The pad does not leak excessively.
- The pad is locates and/or constructed on a sloped surface and which facilitates the removal of wastewater. The pad has one corner lower than the rest or has a sump or pit for wastewater collection. Any sump or pit should also be lined.
- Water should be removed from the decontamination pad as needed. Water pumped from the decontamination pad will be containerized.
- The pad should be lined with a water impermeable material. This material should be either easily replaced (disposable) or repairable.

At the completion of site activities, any temporary decontamination pad will be deactivated. No solvent rinsates will be placed on the pad. Solvent rinsates will be collected in separate containers for proper disposal.

The drill rig will be high pressure, steam cleaned prior to arrival at the Site and departure from the Site, as well as upon completion of each boring/monitoring well installation. All drilling equipment including augers, tools, well screens, and riser pipe, etc., will also be decontaminated by pressure washing. All activities shall be performed at the Site's designated decontamination pad.

1.3 Sampling and Monitoring Equipment Decontamination

The procedures in this section are to be used for all non-dedicated sampling equipment used for collection/homogenization of soil samples.

1. Clean with tap water and soap using a brush to remove obvious particulate matter and surface films;

2. Rinse thoroughly with tap water;

3. If sampling for inorganic constituents, rinse equipment with a 10% nitric acid solution;

4. Rinse thoroughly with deionized or distilled water;

5. Rinse thoroughly with isopropanol, unless made of PVC or plastic. These items are not to be solvent rinsed;

6. Rinse thoroughly with analyte free water. If analyte free water is not available, equipment should be allowed to completely dry;

7. Equipment should be wrapped in aluminum foil until needed for sampling. If possible please allow equipment to air dry before wrapping in aluminum foil.

1.4 Groundwater Sampling Equipment (Non-Dedicated Pumps)

Non-dedicated groundwater sampling equipment used for the low flow purging and sampling technique will be decontaminated prior to sampling each well by the procedure described below.

1. For variable rate peristaltic pumps, replace silicone tubing within the pump head prior to and between low flow purging and sampling each well.

2. Inspect the dedicated Teflon-lined polyethylene tubing within each well. Replace tubing, as necessary. If visual inspection indicates the tubing has significant sediment build-up, flush the tubing with deionized water to remove any sediment that may be trapped;

3. Flush the pump with a weak, non-phosphate detergent solution;

4. Flush the pump with tap water to remove all the detergent solution. Generous amounts of tap water should be used to ensure that detergent and any sediment does not remain;

5. Flush the pump with deionized or distilled water;

6. Flush pump with a minimum of 1-liter isopropanol; and,

7. Flush the pump with analyte free water. A minimum of 1-gallon should be used to remove the isopropanol.

1.5 pH, ORP, Temperature, Specific Conductance, Dissolved Oxygen, Turbidity, Depth to Water Probes, and Total Well Depth Recorders

All pH, ORP, temperature, specific conductance, DO, turbidity, and depth to water/oil-water probes will be rinsed thoroughly with distilled or deionized water prior to each use.

2.0 WASTE HANDLING

Investigation Derived Waste (IDW) that may generated during field activities include: soil, decontamination water and solvent, purge and well development water, non-aqueous phase liquid (NAPL), and personal protective equipment (PPE). Each type of IDW will be handled as described below:

- ***Soil -*** All soil generated from sampling and drilling activities will be retained in 55-gallon drums and labeled as "Drill Cuttings" or placed in an appropriately sized, lined, roll-off container. Once a drum has been filled, it will be sealed, dated, and numbered, and recorded in the Field notebook.

- ***Water -*** All decontamination, purge, and well development water will be retained in 55-gallon drums and labeled or placed in an appropriately sized container. Once a drum has been filled, it will be sealed, dated, and numbered, and recorded in the Field notebook.

- ***NAPL –*** Any LNAPL or DNAPL collected will be retained in 55-gallon drums and labeled as "LNAPL" or "DNAPL", as appropriate. The drum will be sealed, dated, numbered, and recorded in the Field notebook. The drum will be placed within a secondary containment system.

- ***PPE -*** All PPE generated will be retained in containers and labeled "PPE". Once a drum has been filled, it will be sealed, dated and numbered, and recorded in the Field notebook.

The drums will be staged in a secure location at the site. IDW generated during the Pre-Design Investigation (PDI) will be characterized and disposed of, along with Arsenic and Volatile Organic Compound (VOC) Source Area material, during the Remedial Action (RA).

GFP-2 GOLDER FIELD PROCEDURE 2
FIELD DOCUMENTATION

1.0 FIELD DOCUMENTATION

In order to ensure that all pertinent information and data collected are documented completely and correctly, the procedures and protocols described in the following sections will be implemented.

1.1 Field Notebooks

All pertinent field investigation information will be recorded in bound and numbered field notebooks. All field notes must be legible and a waterproof pen shall be used to make entries. Any errors should be crossed out with a single line and initialed. Field records should at a minimum contain the following information:

- Date;
- Project or site name;
- Time of each data entry;
- Description of work being performed that day;
- Names and affiliations of personnel at location;
- Weather conditions on site;
- Location and type of activity;
- Visual observations;
- Pertinent field data (and any other measurements);
- Serial numbers, if any, on seals, transportation cases, and equipment;
- Name of field custodian; and,
- Photographs taken, including date, time, direction faced, description of subject or activity.

Specific sample information will be compiled into the field notebook and/or Chain of Custody (COC). All field notebooks will be standard engineering hardbound books and will be dedicated to the project. All field notebooks will be photocopied so that copies of field notes can be kept in appropriate project files.

1.2 Field Instruments

Calibration of field instruments should be documented including:

- Name of person conducting the calibration;
- Date and time of calibration;
- Date and time and results of calibration checks;
- Instrument type, model number, and serial number (if present); and,

- Manufacturer, concentration, and lot number of calibration standards which are used.

1.3 Photographic Documentation

When photographs are taken, field personnel will record time, date, site location, general direction faced, and brief description of the subject in a field notebook. Photographic documentation will be conducted using a digital camera. The digital camera will be checked to ensure the correct date and time is recorded for each photo.

1.4 Correspondence/Communications

Correspondence received or sent from the field will be dated and labeled with a project filing identification number. Telephone conversations will be documented and filed.

1.5 Changes in Procedures

Approval from the USEPA Project Manager will be obtained as needed prior to implementation for major changes in procedures. Minor procedural changes will be made by Golder Associates' personnel, and if present, with the concurrence of the on-site USEPA representative. Changes will be documented in the field notebooks.

GFP-3 GOLDER FIELD PROCEDURE 3
FIELD MEASUREMENT AND INSTRUMENTATION CALIBRATION PROCEDURES

1.0 FIELD MEASUREMENT PROCEDURES

The following sections describe procedures to be followed for collection of field measurements.

1.1 Water Level Measurements

Groundwater level measurements will be collected prior to the purging of a well, during the low flow purge sampling process to monitor well drawdown, and during synoptic measurement events for use in generating groundwater elevation maps.

Equipment

The following equipment and materials are required to perform this procedure:

- Electronic water level meter and/or an oil-water interface probe;
- Distilled or de-ionized water;
- Groundwater Sample Field Information Form; and,
- Field notebook.

Water Level Measurement Procedure

The well identification number, measuring device type and serial number, date and time will be recorded prior to each day water level measurements are obtained. The water level meter will be decontaminated in accordance with the procedures described in Standard Operating Procedure (SOP) GFP-1 of the QAPP prior to each use. The water level meter or oil-water interface probe will be turned on and the battery checked prior to each water level measurement. The wire will be lowered into the monitoring well and stopped at the depth where the meter indicates a completed circuit. Depth to water measurements will be made relative to an established surveyed reference point on the well casing and recorded to the nearest 0.01 foot.

Total Well Depth Measurement Procedures

The bell sounder, weighted tape, or electronic water level indicators can be used to determine the total well depth. This is accomplished by lowering the tape or cable until the weighted end is felt resting on the bottom of the well. Because of tape buoyancy and weight effects encountered in deep wells with long water columns, it may be difficult to determine when the tape end is touching the

bottom of the well. Care must be taken in these situations to ensure accurate measurements. Total well depth measurements will be made relative to an established reference point on the well casing and recorded to the nearest 0.1 foot. In all instances, the instrument used to measure well depth will be decontaminated prior to and after use in accordance with the procedures outlined in SOP GFP-1 of the QAPP.

1.2 Groundwater Field Parameter Measurements

The following procedures will be used to obtain representative field measurements of temperature, specific conductance, pH, oxidation-reduction potential (ORP), turbidity and dissolved oxygen (DO).

Equipment

The following equipment and materials are required to perform this procedure:

- An in-line, flow through cell;
- Calibration Standards;
- A water quality instrument capable of measuring temperature, specific conductance, pH, ORP, turbidity, and DO;
- Groundwater Sample Field Information Form; and,
- Field notebook.

Procedure

All field measurements will be made where they are shielded from the wind and direct sunlight (if possible), away from electrical systems, motors, pumps, wires, etc. which might induce stray electrical currents in the instrument or its probe, and with the probe and calibration standards temperature equilibrated with the water to be tested. Samples for field measurements should never be filtered or preserved.

Calibration of the water quality instrument is performed in accordance with the standard operating procedures (SOPs) for temperature, specific conductance, pH, ORP, turbidity, and DO found in Attachment 2 of the QAPP. These SOPs were submitted to the NJ Department of Environmental Protection (NJDEP) to meet the current requirements of the Environmental Laboratory/Measurement Certification Program under the Regulations Governing the Certification of Laboratories and Environmental Measurements, N.J.A.C. 7:18 et seq. The following information is documented in the field notebook:

- Date and time;
- Meter identification (make, model, serial number);
- Calibration results including source and lot number of standards; and,
- Sampler's initials.

After the meter has been calibrated according to the above mentioned SOPs, sample measurements can be taken. Place the flow through cell to be used as the sampling chamber in line before purging of the well begins. Insert the instrument/probe into the flow-through cell. Position the instrument/probe so that it will measure the influent sample to the chamber. Record field parameter measurements, date, time, volume of water removed, and flow rate at uniform increments of approximately 5 minutes.

- Temperature will be recorded to the nearest 0.1 degrees Celsius;
- Specific conductance units are measured in micromohs per centimeter (µmohs/cm) or microsiemens (µS/cm) corrected for 25°C. Results will be reported to the nearest ten (10) units for readings below 1,000 µmohs/cm @ 25°C and to the nearest one hundred (100) units for reading above 1,000 µmohs/cm @ 25°C;
- pH measurements will be recorded to the nearest 0.1 standard pH units (SU);
- Turbidity measurements will be recorded to the nearest whole number nephelometric turbidity units (NTUs);
- DO measurements will be recorded to the nearest 0.1 milligrams per liter (mg/l);
- ORP measurements will be recorded to the nearest 0.1 millivolts (mV); and
- Groundwater will be measured to the nearest 0.01 feet (ft).

1.3 VOC Vapor Measurements

These procedures will be used when making field measurements of VOC vapors from soil samples. The VOC vapor result will be recorded to the nearest 0.1 ppm

Equipment

The following equipment and materials are required to perform this procedure:

- PID (with moisture protection disc);
- Stainless steel knife; and,
- Field notebook.

Procedure

Photo ionization detector (PID) will be used for screening soil samples collected during the soil boring program and for health and safety monitoring. The PID normally operates with a 10.6 electron Volt (eV) lamp, however 8.4, 9.5, 10.2 and 11.7 eV lamps are available. The specific PID lamp to be used will be designated in Health and Safety Contingency Plan (HSCP). It is important to realize that some compounds will exhibit a very low response on the PID in relation to their actual concentrations, while others will not respond at all to the detector's ionization energy. Winds and high humidity will affect measurement readings. Foggy or high humidity conditions can cause condensation on the lamp, thus affecting measurements. PIDs and

The PID will be calibrated in accordance with manufacturers' instructions. After the split spoon or macro-core sample has been removed from the borehole and opened, the soil core will be scored, approximately 6 inches at a time, with a decontaminated stainless steel knife. The probe of the PID will be slowly moved over the freshly exposed surface. The PID will be held over the soil core for at least one minute to allow time for the vapor to be pumped into the instrument. If the PID indicated the presence of target compounds, the instrument will be held in the same spot until all vapor has reached the detector in the instrument (i.e., the result on the display has reached its highest point). The peak result will be recorded in the field notebook. Odor and visual characteristics will also be recorded.

2.0 FIELD INSTRUMENTATION CALIBRATION

All field instrumentation will be calibrated in accordance with the above referenced SOPs and/or manufactures specifications. Calibration of field meters should be documented including:

- Analysts' name;
- Date and time of calibration;
- Date and time and results of calibration checks;
- Instrument type, model number, and serial number (if present); and,
- Manufacturer, concentration, and lot number of calibration standards which are used.

GFP-4 GOLDER FIELD PROCEDURE 4
GROUNDWATER SAMPLING PROCEDURE

1.0 GROUNDWATER SAMPLING PREPARATION

Prior to sampling, all monitoring wells will be inspected for signs of damage, tampering, and access. Groundwater sampling equipment will be constructed of inert materials such as stainless steel or Teflon. Proper equipment decontamination procedures, attached in SOP GFP-1 of the QAPP, will be followed to minimize the potential for cross-contamination.

1.1 Equipment Requirements

Depending on the type of monitoring well sampling that will be conducted either A, B or C **AND** D category equipment listed below is necessary.

A. Low Flow Sampling with Submersible Pump
- Gundfos Redi-Flow II submersible pump (or equivalent);
- Gundfos Redi-Flow II control box
- Teflon-lined polyethylene tubing (recommended for low flow purge and sampling technique); and
- Generator.

B. Low Flow Sampling with Well Wizard Bladder Pump
- Dedicated Well Wizard Bladder Pumps or Portable Bladder Pump with Teflon Bladders and Teflon lined tubing;
- Well Wizard control box; and
- Well Wizard air compressor.

C. Low Flow Sampling with Peristaltic Pump
- Peristaltic pump;
- Teflon-lined polyethylene tubing;
- Flexible, medical grade silastic tubing; and,
- Power source (battery or generator).

D. General Equipment
- Latex and/or nitrile gloves;
- 55-gallon drums or similar container to hold purge water;
- Field Meter(s) capable of in-line measurements for pH, specific conductance, dissolved oxygen (DO), temperature, turbidity, and oxidation-reduction potential (ORP);
- Groundwater Sample Field Information Form/COC form;
- Sample bottles and preservatives;
- Cooler with ice;
- Water level meter;

- Sample location map;
- Well construction information;
- Sample collection forms from prior event (if available);
- PID; and,
- Site Specific Health and Safety Plan.

1.2 Equipment Set-up

Prior to purging the monitoring well, a decontaminated water level meter will be used to measure the depth from top of the inner well casing (or equivalent measuring point) to the top of water surface to the nearest 0.01 feet. Periodically, the depth to the bottom of the well will be measured to confirm the construction details. Depth to bottom measurements should not be collected immediately prior to well purging or sampling in order to minimize potential cross-contamination and disturbance to sediments which may have accumulated in the bottom of the well.

1.3 Grundfos Redi-Flo 2 Submersible Pump

The decontaminated submersible pump, with dedicated Teflon-lined polyethylene tubing, will be carefully lowered into the well to the midpoint of the well screen or open interval. Be sure to remove the water level indicator before lowering the pump as it may tangle and cause the pump and tubing to get stuck in the well. In instances where the screened or open interval is not completely saturated, the pump will be lowered to the midpoint of the saturated interval, which will assure representative samples are collected from the water-bearing zone. A bungee cord should be securely wrapped around the pump electrical line and tubing and secured to the top of the well. This will hold the pump at the desired elevation.

Next, attach the pump discharge tubing to the in-line flow through cell with multi-parameter water quality meter attached. Be sure the meter is calibrated to the manufacture specifications. Following installation of the pump, attach the electrical line to the control box; and the power cord to the generator. Before turning on the control box, completely lower the pump speed. After the pump is turned on slowly increase the pump speed until water is seen in the tubing. Adjust discharge water flow to a rate that limits drawdown in the well. This is done by monitoring the water level while increasing or decreasing the pump flow. This will minimizes disturbance of sediment in the bottom of the well, thereby producing a sample with low turbidity; minimizes aeration of the groundwater during sample collection; and usually reduces the amount of groundwater purged from a well. Once

the flow cell is full begin monitoring and recording field parameters as specified below and in Standard Operating Procedure (SOP) GFP-3 of the QAPP.

1.4 Portable Well Wizard Bladder Pump

The decontaminated pump, with dedicated Teflon-lined polyethylene tubing and air line attached, will be carefully lowered into the well to the midpoint of the well screen or open interval. The airline connection to the pump should be securely fastened in order to avoid introduction of air into the well. Be sure to remove the water level indicator before lowering the pump as it may tangle and cause the pump and tubing to get stuck in the well. In instances where the screened or open interval is not completely saturated, the pump will be lowered to the midpoint of the saturated interval, which will assure representative samples are collected from the water-bearing zone. A bungee cord should be securely wrapped around the pump electrical line and tubing and secured to the top of the well. This will hold the pump at the desired elevation.

Next, attach the pump discharge tubing to the in-line flow through cell with multi-parameter water quality meter attached. Be sure the meter is calibrated to the manufacture specifications. Following installation the pump, attach the air lines from the pump and compressor to the control box. Turn the control box power on and position the setting as follows: (1) The pressure setting should be set at the psi corresponding to the pump depth plus 10 feet; and (2) the discharge and refill cycles should initially be set for 4 cycles per minute. Adjust discharge time to a rate that limits drawdown in the well. This is done by monitoring the water level while increasing the pump discharge rate and/or air pressure. This will minimizes disturbance of sediment in the bottom of the well, thereby producing a sample with low turbidity; minimizes aeration of the groundwater during sample collection; and usually reduces the amount of groundwater purged from a well. Once the flow cell is full begin monitoring and recording field parameters as specified below and in SOP GFP-3 of the QAPP.

1.5 Dedicated Well Wizard Bladder Pump

Attach the compressor air line to the control box inflow connection, and the control box air discharge line to the well connection. Then, connect the water discharge tubing to the in-line flow cell with field quality meter attached. Be sure the meter is calibrated to the manufacture specifications. Turn the control box power on and position the setting as follows: (1) The pressure

setting should be set at the psi corresponding to the pump depth plus 10 feet; and (2) the discharge and refill cycles should initially be set for 4 cycles per minute. Adjust discharge water flow to a rate that limits drawdown in the well. This is done by monitoring the water level while increasing the pump discharge rate and/or air pressure. This will minimizes disturbance of sediment in the bottom of the well, thereby producing a sample with low turbidity; minimizes aeration of the groundwater during sample collection; and usually reduces the amount of groundwater purged from a well. Once the flow cell is full begin monitoring and recording field parameters as specified below and in SOP GFP-3 of the QAPP.

1.6 Peristaltic Pump

One end of the dedicated teflon-lined polyethylene tubing is inserted into the well. The other end is attached to a short length of flexible, medical grade silastic tubing, which has been threaded around the rotor, out of the pump, and connected to short length of teflon-lined polyethylene discharge tubing. The liquid moves totally within the tubing, thus no part of the pump contacts the liquid. Tubing used for well evacuation may also be used for sample collection. The discharge tubing is then connected to the in-line flow cell with field quality meter attached. Be sure the meter is calibrated in accordance with Standard Operating Procedure (SOP) GFP-3. Then connect the pump to the power source (battery or generator. Turn the pump on and adjust the discharge water flow to a rate that limits drawdown in the well. This is done by monitoring the water level while increasing or decreasing the pump flow. This will minimizes disturbance of sediment in the bottom of the well, thereby producing a sample with low turbidity; minimizes aeration of the groundwater during sample collection; and usually reduces the amount of groundwater purged from a well. Once the flow cell is full begin monitoring and recording field parameters as specified below and in SOP GFP-3 of the QAPP.

2.0 WELL PURGING PROCEDURES

The following information will be recorded in the Low Flow Groundwater Purge/Sample Field Information Form (Attachment 1) for each sample point:

- Before Purging:
  - Date, time;
  - Well ID;
  - PID readings taken from the well immediately after the cap is removed (if applicable);
  - Depth to water
  - Well depth (if measured);
  - Construction well depth;
  - Meter calibration time; and
  - Site name, location, project number.

- Purging:
  - Start and end time for purging;
  - Purge device;
  - Purge rate;
  - Depth to water, pH, ORP, temperature, specific conductance, turbidity and dissolved oxygen (approximately every 5 minutes);
  - Analytical parameters that will be collected; and,
  - Pump depth.

- Sampling:
  - Start and end time for sampling;
  - Weather conditions;
  - Sampling method;
  - Pertinent observations regarding sample characteristics (turbidity, color, etc.);
  - Results of field kit test, if required; and,
  - Post samples field parameters (if required).

2.1 Low Flow Well Purging Procedure[1] using a Grundfos Redi-Flo 2 Submersible Pump, Well Wizard Bladder Pumps, or a Peristaltic Pump

The low flow purge and sampling procedures are as follows:

Purge each well at a rate of approximately 200 to 500 milliliters per minute. During purging, monitor the water level and adjust pumping rate such that the water level draw down is minimized (ideally no more than 0.3 feet drawdown during purge). If drawdown is excessive, the pump rate should be lowered to minimize drawdown (be sure to note lowered purge rates on the field form). There must be at least 2 feet of water maintained over the pump intake to prevent pump suction being broken, or entrainment of air in the sample. If there is risk of water level dropping to within 2 feet above the pump, purge should be terminated, and procedures for bailer sampling should be followed (see below). Record the pumping rate adjustments and depth(s) to water on the sample collection form (Attachment 1).

Attach a decontaminated and calibrated (to manufacturer specifications) multi-parameter water quality instrument (HoribaU-22 or equivalent), and in-line flow through cell to the discharge tubing. Measurements will be taken with a flow-through cell so that they are recorded prior to the sample being exposed to the atmosphere. During purging, monitor the field parameters (temperature, pH, turbidity, specific conductance, oxidation-reduction potential (ORP), and dissolved oxygen (DO) approximately every 5 minutes (or at a minimum of one flow through cell volume exchange) until the parameters have stabilized over three (3) consecutive readings. Stabilization is considered achieved if pH is within +/- 0.1, conductivity is within 3%, temperature is within 3%, ORP is within 10 mV, turbidity is within 10%, and DO is within 10%. All measurements will be recorded on the sample collection form or in field notebooks.

If the well is pumped dry during purging, the samples will be collected as soon as there is a sufficient recharge volume to fill the sample bottles. VOCs will be collected within 2-hours, if possible and all other parameters will be collected within 24-hours.

[1] The procedures to be used for sampling monitoring wells are based upon the USEPA Region II document entitled "Groundwater Sampling Procedure Low Stress Purging and Sampling" dated March 16, 1998.

3.0 SAMPLE COLLECTION

Following purge using the submersible pump, remove the flow through cell from the discharge tubing and collect the samples directly from the end of the tubing. If using a bailer, collect samples directly from the bailer port. Samples for VOC and appropriate gas sensitive parameters must be collected first. The pump flow rate will be reduced to approximately 100 milliliters per minute during collection of samples for VOCs and appropriate gas-sensitive parameters and as high as approximately 500 milliliters per minute for other parameters depending on the well yield and turbidity of the sample. The bottles will be preserved according to the specifications listed in the analytical methods. All sample bottles will be filled by allowing the pump discharge to flow gently down the inside of the bottle with minimal turbulence. Cap each bottle as it is filled. For VOCs and appropriate gas-sensitive parameters, steps will be taken to eliminate headspace in the 40-milliliter (ml) vial. Such steps may include adding several drops of the sample to create a meniscus on the vial opening before capping bottle and inverting the vial to check for air bubbles. All samples will be labeled prior to sample collection, per SOP GFP-7.

Immediately after sample collection, sample bottles will be placed on ice and maintained at approximately 4° Celsius (C) and transported by overnight courier to the laboratory. Samples must be logged on a chain-of-custody form, which is kept with the samples. Strict chain-of-custody procedures will be maintained throughout the sampling and transportation process.

GFP-5 GOLDER FIELD PROCEDURE 5
SOIL/FILL SAMPLING PROCEDURES

1.0 SOIL/FILL SAMPLING PROCEDURES

Accurate and detailed field logging, field screening and, if specified, field testing will be completed for each borehole. These data will not only be used to help assess and delineate the distribution of impacts (when present) but will also be used to select sample intervals for laboratory analysis.

This document presents procedures for:

- conducting soil borings;
- field geologic/geotechnical characterization of fill/soil;
- field screening of soil to assess potential chemical impacts; and,
- collection of soil samples for laboratory analysis.

Before initiating any drilling activities, the drill rig, drilling tools, and sampling equipment will be decontaminated as described in Standard Operating Procedure (SOP) GFP-1 of the QAPP. Investigation Derived Waste (IDW) generated during site activities that cannot be returned to its point-of-origin will be separated, stored, and staged on-Site for subsequent disposal as IDW (SOP GFP-1 of the QAPP).

1.1 Boring Installation/Geotechnical Characterization

Boreholes will be drilled by a driller licensed in the state of New Jersey and the work will be supervised by a qualified geologist or engineer. The driller will obtain all required permits. Soil samples will be examined by the field geologist or engineer, who will maintain a descriptive log for each boring. All drilling activities will be in compliance with the Site-Specific Health and Safety Plan.

Geoprobe drill rig samples will be collected by driving a sampler equipped with an acetate liner ahead of the boring into undisturbed material at continuous intervals. During field geologic/geotechnical characterization of the borings, the total recovery of the samples and relative moisture content will be recorded and the soil classified, based on visual description, using the Unified Soil Classifications System (ASTM D 2488-06 “Standard Practice for Description and Identification of Soils [Visual-Manual Procedure]”; 2006 and ASTM D 2487-06 “Standard Practice for Classification of Soils for Engineering Purposes [Unified Soil Classification System]”; 2006).

Upon completion of each soil boring that will not be converted into a monitoring well, the boring will be abandoned by tremie grouting with a cement/bentonite grout mixture. For monitoring well installation details see SOP GFP-6 of the QAPP.

While utilizing the hollow stem auger (HSA) drilling techniques, samples will be collected in general conformance with ASTM D-1586-84 by driving a 2-inch outside diameter (OD) split-spoon sampler a distance of 2 feet ahead of the boring into undisturbed material. In areas where remnant subsurface slabs and/or foundations are present, solid stem auger (SSA) or coring drilling techniques may be used to penetrate the material. Once the material has been penetrated, drilling will resume using HSA. If two or more feet of concrete is encountered, or at the discretion of the field geologist/engineer, a replacement boring may be off-set 5 to 10 feet away from the original boring location to attempt to find more accessible conditions. Blow counts required to drive the split-spoon each 6-inch increment will be recorded. The total recovery of the samples and relative moisture content will be recorded and the soil classified, based on visual description, using the soil classifications system designated in the Site-Specific work plan.

In the case when a power auger and hand-operated stainless steel bucket auger or hand driven split spoon are used, the recovered soil will be inspected for relative moisture content will be recorded and the soil classified, based on visual description, using the soil classifications system designated in the Site-Specific work plan. These boreholes will be backfilled with the drill cuttings removed from the boring.

1.2 Field Screening

All soil samples will be field screened. The field screening and testing procedures are described below.

- Organic vapor readings will be monitored using a PID;
- Visual observations will be recorded noting evidence of staining, discoloration, sheens, presence of free-phase liquids, sludge, etc.; and,
- Noticeable/unusual odors will be recorded (Note, field personnel are not advised to sniff the samples for health and safety reasons, but should record any detected ambient odors).

Results of the field screening will be recorded in the field book and on each soil boring log. Specific procedures for instrument calibration and VOC air monitoring can be found in SOP__, respectively.

1.3 Subsurface Soil Sampling

The following equipment and procedures will be used to collect subsurface soil samples for laboratory chemical analysis. Specific chemical analysis for the soil samples are designated in the Pre-Design Investigation Work Plan (PDI WP).

Subsurface soil sampling equipment includes:

- PID;
- nitrile gloves;
- COC form;
- Field notebook;
- Stainless steel knife;
- Stainless steel mixing bowls and spoons;
- Appropriate sample bottles;
- Temperature blank; and,
- Cooler with wet ice.

Collection of samples for VOC analysis will be performed with the use of a dedicated or decontaminated small-diameter core sampler (Purge and Trap Soil Sampler®, En Core® sampler, Easy Draw Syringe® or other equivalent small-diameter tube/plunger sampler) as designated in the PDI WP. The small-diameter core sampler will be capable of collecting the required amount of sample from the large-diameter sampling device (e.g., split spoon or soil corer) or from freshly exposed soils. The small-diameter core sample collection will be completed in accordance with EPA Method 5035A.

For samples being analyzed for other organic and inorganic parameters, a core of soil (or a longitudinal slice of the core) from the desired depth will be removed from the split-spoon/macro-core/bucket auger using decontaminated stainless steel tools (knife, spatula, spoon, etc.) and placed in a decontaminated stainless steel mixing bowl or dedicated plastic bowls (to be used during inorganic sample collection only) and homogenized. Any large rocks, twigs, roots, leaves, or other debris not representative of the soil will be removed. The soil will be homogenized with a decontaminated stainless steel spoon according to the procedure below:

- The sample will be scraped from the sides, bottom, and any corners of the bowl and rolled into the middle of the mass using the stainless steel spoon;

- The mass of the sample will be mixed thoroughly. The sample will then be divided into four quarters, which will be moved to separate parts of the bowl. Each quarter will be individually mixed. Then the four quarters will be recombined and the entire sample mass mixed again; and,

- Sample jars will be filled and compacted to the lip of the jar or to the extent that is allowed given the amount of sample recovered.

Sample containers and required amounts of sample will be designated in the Site-Specific work plan. The appropriate amount of soil for each parameter will be placed into sampling jars. The jars will then be labeled and put into a cooler with ice. All samples will be stored and shipped at approximately 4° C. A laboratory-supplied temperature blank will be included in each cooler so that the laboratory can perform a temperature check upon receipt.

1.4 Surface Soil Sampling

Equipment used to collect surface soil samples may include a hand driven split-spoon sampler, bucket auger or stainless steel scoop. All equipment will be properly decontaminated in accordance with SOP GFP-1 of the QAPP. Samples collected using these methods will be field screened/tested and logged as appropriate.

A uniform cylinder of soil will be extracted from a depth of 0 to 0.5 feet bgs. The upper portion of the sample may contain sod or other accumulated organic debris or gravel, which will be discarded. Collection of samples for VOC analysis will be performed with the use of a dedicated or decontaminated small-diameter core sampler (Purge and Trap Soil Sampler®, En Core® sampler, Easy Draw Syringe® or other equivalent small-diameter tube/plunger sampler) as designated in the PDI WP. The small-diameter core sampler will be capable of collecting the required amount of sample from the large-diameter sampling device (e.g., split spoon or soil corer) or from freshly exposed soils. The small-diameter core sample collection will be completed in accordance with EPA Method 5035A. Sample homogenization and laboratory bottle filling/handling for other organic and inorganic parameters will be conducted after the VOC samples have been collected, as described above.

GFP-6 GOLDER FIELD PROCEDURE 6
GROUNDWATER WELL DEVELOPMENT

1.0 WELL DEVELOPMENT

Newly completed well should not be developed for at least 24 hours after the surface pad and outer protective casing are installed. This will allow sufficient time for the well materials to cure before development procedures are initiated. The main purpose of developing new wells is to remove the residual materials remaining in the wells after installation has been completed, and to attempt to re-establish the natural hydraulic flow condition of the formation which may have been disturbed by well construction around the immediate vicinity of each well. New wells will be developed until the column of water in the well is relatively turbid-free, and the pH, temperature, and specific conductivity have stabilized.

The following development procedures may be used to develop the wells:

1. Pumping;
2. Compressed air (with the appropriate organic filter system);
3. Bailing;
4. Surging;
5. Backwashing ("rawhiding"); and
6. Jetting.

Newly installed wells will not be sampled until at least 14 days after the completion of well development to allow for the formation to restabilize to pre-well construction conditions. The selected development method(s) will be approved by a field geologist/hydrogeologist before any well development activities are initiated and will be documented on well development forms and in the site-specific Field notebook.

GFP-7 GOLDER FIELD PROCEDURE 7
SAMPLE HANDLING, CUSTODY, AND SHIPMENT

1.0 SAMPLE HANDLING

The laboratory will supply appropriately prepared sample containers. Preservation procedures and analytical holding times will be in accordance with the published analytical methods and USEPA Region II guidelines as further detailed below.

1.1 Sample Preservation

Sample containers will be kept closed until the time they are to be filled. After filling, the containers will be securely closed, residue wiped from the sides of the containers, and immediately placed in a cooler. Samples shall be cooled to approximately 4°C immediately after collection. This temperature should be maintained for samples during storage and shipment to the laboratory. Samples will generally be shipped on the day of sample collection to the laboratory via overnight courier. Samples requiring chemical preservatives will be collected into pre-preserved containers obtained from the laboratory.

1.2 Sample Identification

All samples shall be adequately marked for identification from the time of collection and packaging through shipping and storage. Marking shall be on a sample label attached to the sample container. Sample identification shall include, as a minimum:

- Project name and/or code;
- Sample identification number;
- Analysis requested;
- Chemical preservatives;
- Sample date and time; and,
- Initials of the individual performing the sampling (samples for chemical analysis).

Each sample will be assigned a unique sample identification (ID) number to be recorded on the sample label. Each sample ID number will be recorded in the field notebook, a Sample Field Information Form and, as applicable, on chain-of-custody documentation. Sample Naming procedures are described in Standard Operating Procedure (SOP) GFP-8 and Stage 1 boring location numbers are presented in the Pre-Design Investigation Work Plan (PDI WP).

Equipment

- Water proof marking pen;
- Sample bottle labels;
- Transparent tape; and,
- Site base map with designated sampling locations.

Procedure

Sample labels should be marked with the sample ID, the analytes to be tested, the initials of the sampler, and the date of sample collection. The labels should be affixed to the sample containers and, if necessary, secured with tape. The corresponding sample ID should be marked in the project field notebook for correlation during report preparation.

2.0 SAMPLE CUSTODY

Chain of Custody (COC) procedures have been established to ensure sample traceability from the time of collection through completion of analysis.

The National Enforcement Investigations Center (NEIC) of USEPA considers a sample to be in custody under the following conditions:

1. It is in your possession; or
2. It is in your view after being in your possession; or
3. It was in your possession and you locked it up; or
4. It is in a designated secure area.

2.1 Field Sample Custody

All environmental samples will be handled under strict COC procedures beginning in the field. The following procedure should be used to maintain COC of environmental samples.

Equipment

The following equipment and materials are needed to perform COC procedures:

- Chain-of-custody forms;
- Chain-of-custody seals; and,
- A secure (locked) vehicle or building.

Procedures

Samples and sample containers must be kept under proper COC during field sampling. If custody of the samples (and sample bottles) is exchanged during field sampling, such transfer must be documented on the COC form. The departing field staff should sign indicating the custody has been relinquished, and the arriving field staff should sign indicating responsibility for the custody of the samples. The COC form and Field notebook (and/or field information form) should include:

- Sample identification number and matrix;
- Project or site name or number;
- Sampler's name or initials;
- Sample collection date and time (military time);
- Designation as a grab or composite sample;
- Requested analysis;
- Any special comments; and,
- Any preservatives added to the sample.

When shipping samples to the laboratory, all sample bottles and requested analyses should be noted on the COC form. Where multiple analytical methods are available for a particular analysis, the specific method number should be listed on the COC form.

One member of the sampling team should sign the COC form relinquishing custody to the laboratory. If using an overnight courier service, record the tracking number on the COC. The COC form should be sealed inside the shipping container with the samples. The paperwork should be sealed inside a plastic bag to prevent damage from water condensation. The courier does not need to sign the COC form if it is sealed within the shipping container using custody seals. If the samples are hand delivered to the laboratory by field staff, the COC form should be signed at the laboratory when the samples are delivered, and the shipping container does not need to be sealed as long as it is kept under proper COC until delivered to the laboratory. If possible, COC seals should be signed and dated, and the serial numbers listed on the COC form. At least two seals should be used on each shipping container.

2.2 Laboratory Custody

Once samples are transported to the analytical laboratory, custodial responsibility is transferred to the Laboratory Sample Manager to assure that the procedures presented in the laboratory's Quality Assurance Plan (QAP) and the appropriate analytical method are followed. The laboratory QAP will contain a detailed description of the laboratory chain-of-custody procedures, including receipt of samples, designation of a sample custodian, custody within the laboratory and laboratory storage, and disposal procedures.

3.0 SAMPLE PACKAGING AND SHIPMENT

The following procedure is to be used to enhance successful shipping of samples to the laboratory.

Equipment

The following equipment and materials are required to perform this procedure:

- Overnight courier airbills and courier phone number (if applicable);
- Packing tape;
- Cushion material such as bubble wrap or vermiculite;
- Address labels; and,
- Laboratory address and phone number.

Procedure

Samples should be packed into a cooler in a manner that will minimize potential breakage of sample bottles. This may include use of laboratory-supplied bubble wrap designed to fit the particular bottle, polystyrene chips, or vermiculite. Wet ice will be used for preservation. Make sure that wet ice is securely placed in zip locked bags and cannot leak. If the bottles sit in standing water, the sample integrity may be compromised. The sample containers must contain enough wet ice to maintain a temperature of $4^{o}C$ during transport to the laboratory. A temperature blank should be placed in each cooler being returned to the laboratory. In general, samples should be shipped to the laboratory within 24 hours of collection. Samples of different matrices (i.e., soil and water) will be shipped separately to minimize the chances of cross-contamination

GFP-8 GOLDER FIELD PROCEDURE 8
LOCATION AND SAMPLE NAMING PROCEDURE

1.0 LOCATION AND SAMPLE NAMING PROCEDURE

The naming procedures in this section are intended for use by field personnel for identifying locations (borings and monitoring wells), primary samples, Quality Assurance / Quality Control (QA/QC) samples and Investigation Derived Waste (QA/QC) in the field. Deviations from these procedures will be documented in the field records described in Standard Operating Procedure (SOP) GFP-2 "Field Documentation".

2.0 BORING/ MONITORING WELL NAMING CONVENTION

2.1 Environmental Soil Borings

For environmental soil borings, the location of the borings should be marked in accordance with the naming convention described below.

ESB-ABBB

Where:

ESB	=	Environmental Soil Boring
A	=	Indicates the stage in which the sample was collected (e.g. Stage I = 1, Stage II = 2, etc.)
BBB	=	Designates the three digit soil boring number (e.g. boring 1 = 001, boring 10 = 010, etc.).

2.2 Geotechnical Soil Borings and Test Pits

Each geotechnical boring will be identified using a naming convention consistent with the system outlined above for the environmental boring. The borings will be identified as follows:

GTB-ABBB

Where:

GTB	=	Geotechnical Boring
A	=	Indicates the stage in which the boring was performed (e.g., Stage I = 1, Stage II = 2, etc.)
BBB	=	Designates the three digit geotechnical boring number (e.g., boring 1 = 001, boring 10 = 010, etc.)

Geotechnical test pits will be identified using a similar convention as that used for the borings:

GTP-ABBB

Where:

GTB	=	Geotechnical Test Pit
A	=	Indicates the stage in which the test pit was excavated (e.g., Stage I = 1, Stage II = 2, etc.)
BBB	=	Designates the three digit geotechnical test pit number (e.g., boring 1 = 001, boring 10 = 010, etc.)

2.3 Monitoring Wells

For monitoring wells, the location of the well should be designated in accordance with the naming convention described below.

MW-AAB

Where

MW	=	Monitoring Well
AA	=	Indicates the monitoring well number
B	=	Designates interval in which the screen is located as follows:
S	=	shallow wells screened in the soil/historic fill above the Meadow Mat Unit
M	=	wells screen in central portion of the Upper PRM aquifer
R	=	wells screen in the base of the Upper PRM aquifer or the confining unit between the Upper PRM aquifer and Middle PRM aquifer
D	=	wells screen in the Middle PRM aquifer

3.0 SAMPLE NAMING CONVENTION

3.1 Environmental Soil Samples

For environmental soil samples, the location of the sample should be marked in accordance with the naming convention described below.

ESB-ABBB-CC

Where:

- ESB = Environmental Soil Boring
- A = Indicates the stage in which the sample was collected (e.g. Stage I = 1, Stage II = 2, etc.)
- BBB = Designates the three digit soil boring number (e.g. boring 1 = 001, boring 10 = 010, etc.).
- CC = Designates the top of the sample interval in feet below ground surface (e.g. a sample collected at 10 ft bgs = 10, a sample collected at 7.5 ft bgs = 07.5, etc.)

When results are generated in the field using Field Portable X-Ray Fluorescence (FPXRF):

- FLD = Indicates the sample result is generated in the field. Samples will be named following the convention described above and followed with the designation (e.g., ESB-ABBB-CC-FLD);
- DRD = Indicates the sample result is generated in the field after a sample has been dried. Samples will be named following the convention described above and followed with the designation (e.g., ESB-ABBB-CC-DRD).

3.2 Geotechnical Soil Samples

For geotechnical soil samples, the location of the sample should be marked in accordance with the naming convention described below.

GTB-ABBB/CC-DD/EE

Where

- GTB = Geotechnical Boring
- A = Indicates the stage in which the sample was collected (e.g. Stage I = 1, Stage II = 2, etc.)
- BBB = Designates the three digit soil boring number (e.g. boring 1 = 001, boring 10 = 010, etc.).
- CC-DD = Designates the top and bottom of the sample interval in feet below ground surface (e.g. a sample collected from 10-12 ft bgs = 10-12, a sample collected from 7.5-9 ft bgs = 07.5-09, etc.). It should be noted that the interval recorded should be the attempted interval for split spoon samples (i.e. always 2-foot intervals) and as the actual interval recovered for Shelby tube samples and piston tube samples.
- EE = Type of geotechnical sample collected; DO for split spoon samples, TO for Shelby tube samples, and TP for a piston tube sample

3.3 Groundwater Samples

Samples collected from monitoring wells will be identified according to the following protocol:

- For groundwater samples, the monitoring well name will be appended with a dash ("-") followed by the 6-digit date of the sample (e.g. May 25, 2008 = 052508). For example a sample collected from MW-01S on May 25, 2008 would be labeled MW-01S-052508.

- If for some reason a monitoring well is sampled twice (or more) in a single day a letter is added to the end of the sample ID to designate that it was a subsequent sample collected from a well (e.g. B for second sample collected, C for third, etc.). For example a second sample collected from MW-01S on May 25, 2008 would be labeled MW-01S-052508B.

4.0 QUALITY ASSESSMENT / QUALITY CONTROL (QA/QC) NAMING CONVENTION

QA/QC samples will be identified following the naming convention described below.

4.1 Field Duplicates – Soil

SFD-AA-BBB

Where

SFD	=	Soil Field Duplicate
AA	=	Indicates the sequential sample number
BBB	=	The 6-digit date of the sample.

For example SFD-01-011108 would be the first soil field duplicate collected on January 11, 2008.

4.2 Field Duplicates – Groundwater

GWFD-AA-BBB

Where

GWFD	=	Groundwater Field Duplicate
AA	=	Indicates the sequential sample number
BBB	=	The 6-digit date of the sample.

For example GWFD-01-011108 would be the first groundwater field duplicate collected on January 11, 2008.

4.3 Trip Blanks

TB-AA-BBB

Where

TB	=	Trip Blank
AA	=	Indicates the sequential sample number
BBB	=	The 6-digit date of the sample.

For example TB-01-011108 would be the first trip blank collected on January 11, 2008.

4.4 Rinsate Blanks – Soil

SRB-AA-BBB

Where

SRB	=	Soil Rinsate Blank
AA	=	Indicates the sequential sample number

BBB = The 6-digit date of the sample.

For example SRB-01-011108 would be the first soil rinsate blank collected on January 11, 2008.

4.5 Rinsate Blanks – Groundwater

GWRB-AA-BBB

Where

GWRB = Groundwater Rinsate Blank
AA = Indicates the sequential sample number
BBB = The 6-digit date of the sample.

For example GWRB-01-011108 would be the first groundwater rinsate blank collected on January 11, 2008.

4.6 Matrix Spike/Matrix Spike Duplicates (MS/MSD)

MS would be added to the end of the sample ID for the second set of sample bottles collected at a sample location and MSD would be added for the third set. For example MW-01S-011108 would be the ID for the primary sample, MW-01S-011108MS would be the ID for the Matrix Spike, and MW-01S-011108MSD would be the ID for the Matrix Spike Duplicate for a MS/MSD sample collected from MW-01S on January 11, 2008.

5.0 INVESTIGATION DERIVED WASTE (IDW) NAMING CONVENTION

IDW samples will be identified following the naming convention described below.

IDW-AA-BB-CC

Where

IDW	=	Investigation Derived Waste
AA	=	Sample matrix, SO for soil/drill cuttings, AQ for aqueous samples, and PPE for personal protective equipment
BB	=	The location where the IDW was generated (not necessary for PPE samples).
CC	=	The sequential sample number

For example IDW-SO-ESB-1001-001 would be the first soil/drill cuttings IDW sample collected from drums of soil/drill cuttings generated during the drilling of boring ESB-1001.

ATTACHMENT 2

LABORATORY ANALYTICAL STANDARD OPERATING PROCEDURES

ATTACHMENT 3

LABORATORY QUALITY ASSURANCE MANUALS

PROVIDED ON SEPARATE CD

ATTACHMENT 4

DATA VALIDATION STANDARD OPERATING PROCEDURES

Data Review/Data Validation Procedure
Martin Aaron Site, Camden, New Jersey

One hundred percent of the definitive environmental chemistry data will undergo a data review by the Golder Associates Data QA/QC Task Leader or designee. The data review will include the examination of the QC parameters listed below:

- Chain of custody
- Cooler receipt form
- Case narrative
- Holding times
- Method blanks
- Trip blanks (aqueous volatiles only)
- Field equipment rinsate blanks (for field decontaminated sampling equipment)
- Surrogate spikes (organics)
- MS/MSDs (inorganics only)
- Laboratory Control Standards (LCS)
- Serial dilutions (ICP only)
- Field duplicates
- Split samples

In general, the review will follow the guidance from the USEPA Region II Data Validation SOPs detailed in Worksheet 36, where applicable to the analytical methodologies. The data will be evaluated relative the specific QC criteria presented in this QAPP. The QC criteria presented in this QAPP are derived from USEPA methodology and laboratory historical performance, and are subject to change based on periodic laboratory re-evaluation as specified in the analytical methods. If the USEPA Region II Data Validation SOPs do not specifically address an analytical method, the QC criteria identified by the analytical method and this QAPP will be used. Data will be qualified as estimated (**J/UJ**) or rejected (**R**) based on the results of the data reviews.

If significant QC deficiencies that might require rejection of data are identified in the laboratory case narrative, the data reviewer will address the issues identified by the laboratory. If required, data will be qualified as rejected (**R**).

The data review will be documented on the Golder Associates Inorganic and Organic Data Review Checklists – QA Level II, which will be placed in the project file. Examples of the Checklists for Organic and Inorganic data review are attached to this procedure. The findings of the data reviews will be discussed in a data review summary, along with supporting tables presenting the specific deficiencies identified during the data review. The qualified data will be presented in tabular format. The data review summary and tabulated qualified data will be submitted to USEPA along with a CD-ROM containing the complete, laboratory data deliverables. The qualified laboratory data will be incorporated into the site chemistry database.

To streamline the data review process, the data from the RCRA Characterization Samples, Soil/Fill Pre-Conditioning Study samples, and Investigation Derived Waste (IDW) samples will only be subjected to a data review based on the laboratory QC summaries.

If sufficient QC deficiencies are noted during the data review, up to 10% of the analytical data from the VOC and Arsenic Source Area delineation soil samples and groundwater samples may undergo a full data validation by the Data QA/QC Task Leader or designee. The validation is a more comprehensive examination of the data than the data review. The validation will also follow the USEPA Region II Data Validation SOPs detailed in Worksheet 36, as applicable to the analytical methodologies. As in the data reviews, the data will be qualified as estimated (**J/UJ**) or rejected (**R**) based on the results of the data validations.

The validation will include all of the elements identified in the review in addition to the items identified below and the recalculation of select values using the raw data. The additional QC parameters to be examined during the validation include the following:

- Instrument blanks
- Continuing Calibration Blanks (inorganics)
- Initial Calibration
- Continuing Calibration Verification
- Internal standard areas (GC/MS analysis)
- Mass tuning (GC/MS analysis)
- Analyte second column confirmation (GC analysis)

Should data validation be required, the validation will be documented on the Golder Associates Inorganic and Organic Data Validation Checklists – QA Level IV, which will be placed in the project file. Examples of the Checklists for Organic and Inorganic Data Validation are attached to this procedure. The findings of any data validations will be incorporated into the data review summary, tabulations of qualified data and the site chemistry database.

INORGANIC DATA REVIEW CHECKLIST - QA LEVEL II

Reviewing Company: _____ Project Manager: _____
Project Name: _____ Project Number: _____
Reviewer: _____ Validation Date: _____

Laboratory: _____ SDG #: _____
Analytical Method (type and no.): _____
Matrix: ☐ Air ☐ Soil/Sed. ☐ Water ☐ Waste ☐ Other _____
Data Validation Guidance (include SOP # if applicable): _____

Sample Identification	Date Sampled

Field/COC Information	YES	NO	NA	COMMENTS
a) Sampling dates noted?	☐	☐	☐	_____
b) Sampling team indicated?	☐	☐	☐	_____
c) Sample location noted?	☐	☐	☐	_____
d) Sample type indicated (grab/composite)?	☐	☐	☐	_____
e) Field QC noted?	☐	☐	☐	_____
f) Field parameters collected (note types)?	☐	☐	☐	_____
g) Was the COC signed by both field and laboratory personnel?	☐	☐	☐	_____
h) Were samples received in good condition?	☐	☐	☐	_____
i) Were the correct preservatives used?	☐	☐	☐	_____
j) Was the sample cooler temperature within QC limits?	☐	☐	☐	_____

Laboratory Case Narrative

a) Does the laboratory narrative indicate deficiencies?	☐	☐	☐	_____

Note Deficiencies:

General (reference QAPP or Method)	YES	NO	NA	COMMENTS
a) Was the correct method used?	☐	☐	☐	_____
b) Were hold times met for sample preparation?	☐	☐	☐	_____
c) Were hold times met for sample analysis?	☐	☐	☐	_____
d) Were appropriate reporting limits achieved?	☐	☐	☐	_____
e) Were any sample dilutions noted?	☐	☐	☐	_____
f) Were any matrix problems noted?	☐	☐	☐	_____

INORGANIC DATA REVIEW CHECKLIST - QA LEVEL II

Blanks	**YES**	**NO**	**NA**	**COMMENTS**
a) Were analytes detected in the method blank(s)?	☐	☐	☐	_____
b) Were analytes detected in the field blank(s)?	☐	☐	☐	_____
c) Were analytes detected in the field/equip blank(s)?	☐	☐	☐	_____
d) Were analytes detected in the trip blank(s)?	☐	☐	☐	_____

Laboratory Control Sample (LCS)	**YES**	**NO**	**NA**	**COMMENTS**
a) Was a LCS analyzed once per SDG?	☐	☐	☐	_____
b) Were the proper analytes included in the LCS?	☐	☐	☐	_____
c) Was the LCS accuracy criteria met?	☐	☐	☐	_____

Matrix Spike/Matrix Spike Duplicate (MS/MSD)	**YES**	**NO**	**NA**	**COMMENTS**
a) Was MS accuracy criteria met (note %R)?	☐	☐	☐	_____
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☐	_____
b) Was MSD accuracy criteria met (note %R)?	☐	☐	☐	_____
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☐	_____
c) Were MS/MSD precision criteria met (note RPD)?	☐	☐	☐	_____

Duplicates (Lab and Field)	**YES**	**NO**	**NA**	**COMMENTS**
a) Were field duplicates collected (note original and duplicate sample names)?				_____
	☐	☐	☐	_____
b) Were field dup. precision criteria met (note RPD)?	☐	☐	☐	_____
c) Were lab duplicates analyzed (note original and duplicate samples)?				_____
	☐	☐	☐	_____
d) Were lab dup. precision criteria met (note RPD)?	☐	☐	☐	_____

ICP Serial Dilution (SD)	**YES**	**NO**	**NA**	**COMMENTS**
a) Was an ICP SD analyzed once per SDG?	☐	☐	☐	_____
b) Was the ICP SD criteria met?	☐	☐	☐	_____

Split Sample Results	**YES**	**NO**	**NA**	**COMMENTS**
a) Were split samples collected (indicate IDs)?	☐	☐	☐	_____
b) Were the split sample results within criteria?	☐	☐	☐	_____

Comments/Notes:

INORGANIC DATA REVIEW CHECKLIST - QA LEVEL II

Data Qualification:

Sample Name	Constituent(s)	New Result	New RL	Qualifier	Reason

Signature: _____ Date: _____

Definitions:

SDG: Sample Delivery Group
COC: Chain of Custody
TAL: Target Analyte List
TDS: Total Dissolved Solids
% D: Percent Difference
LCS: Laboratory Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
ICV: Initial Calibration Verification
CCV: Continuing Calibration Verification
CRDL: Contract Required Quantitation Limit
RL: Reporting Limit

QC: Quality Control
QAPP: Quality Assurance Project Plan
TOC: Total Organic Carbon
TPH: Total Petroleum Hydrocarbons
RPD: Relative Percent Difference
RSD: Relative Standard Deviation
ICP: Inductively Coupled Plasma
ICB: Initial Calibration Blank
CCB: Continuing Calibration Blank
MDL: Method Detection Limit
%R: Percent Recovery

INORGANIC DATA VALIDATION CHECKLIST - QA LEVEL IV

Company Name: _____ Project Manager: _____
Project Name: _____ Project Number: _____
Reviewer: _____ Validation Date: _____

Laboratory: _____ SDG #: _____
Analytical Method (type and no.): _____
Matrix: ☐ Air ☐ Soil/Sed. ☐ Water ☐ Waste ☐ Other _____
Data Validation Guidance (include SOP # if applicable): _____

Sample Identification	Date Sampled

Field/COC Information	YES	NO	NA	COMMENTS
a) Sampling dates noted?	☐	☐	☐	_____
b) Sampling team indicated?	☐	☐	☐	_____
c) Sample location noted?	☐	☐	☐	_____
d) Sample type indicated (grab/composite)?	☐	☐	☐	_____
e) Field QC noted?	☐	☐	☐	_____
f) Field parameters collected (note types)?	☐	☐	☐	_____
g) Was the COC signed by both field and laboratory personnel?	☐	☐	☐	_____
h) Were samples received in good condition?	☐	☐	☐	_____
i) Were the correct preservatives used?	☐	☐	☐	_____
j) Was the sample cooler temperature within QC limits?	☐	☐	☐	_____

Laboratory Case Narrative

a) Does the laboratory narrative indicate deficiencies?	☐	☐	☐	_____

Note Deficiencies: _____

_____

_____

General (reference QAPP or Method)	YES	NO	NA	COMMENTS
a) Was the correct method used?	☐	☐	☐	_____
b) Were hold times met for sample pretreatment?	☐	☐	☐	_____
c) Were hold times met for sample analysis?	☐	☐	☐	_____
d) Were appropriate reporting limits achieved?	☐	☐	☐	_____
e) Were any sample dilutions noted?	☐	☐	☐	_____
f) Were any matrix problems noted?	☐	☐	☐	_____

INORGANIC DATA VALIDATION CHECKLIST - QA LEVEL IV

Logs	YES	NO	NA	COMMENTS
a) Distillation logs present for each analysis type?	☐	☐	☐	_____
b) pH metals ≤2; pH cyanide ≥12?	☐	☐	☐	_____
c) Analysis Logs present?	☐	☐	☐	_____

Blanks	YES	NO	NA	COMMENTS
a) Were blanks performed at required frequency?	☐	☐	☐	_____
b) Were analytes detected in the prep blank(s)?	☐	☐	☐	_____
c) ICB/CCB for all target metals and CN?	☐	☐	☐	_____
d) ICB criteria achieved?	☐	☐	☐	_____
e) CCB criteria achieved?	☐	☐	☐	_____
f) CCB analyzed every 2 hours or 10 samples?	☐	☐	☐	_____
g) Were analytes detected in the field/equip blank(s)?	☐	☐	☐	_____

Laboratory Control Sample (LCS)	YES	NO	NA	COMMENTS
a) Was a LCS analyzed once per SDG?	☐	☐	☐	_____
b) Were the proper analytes included in the LCS?	☐	☐	☐	_____
c) Was the LCS accuracy criteria met?	☐	☐	☐	_____

Matrix Spike/Matrix Spike Duplicate (MS/MSD)	YES	NO	NA	COMMENTS
a) Was MS accuracy criteria met (note %R)?	☐	☐	☐	_____
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☐	_____
b) Was MSD accuracy criteria met (note %R)?	☐	☐	☐	_____
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☐	_____
c) Were MS/MSD precision criteria met (note RPD)?	☐	☐	☐	_____

Duplicates (Lab and Field)	YES	NO	NA	COMMENTS
a) Were field duplicates collected (note original and duplicate sample names)?				_____
	☐	☐	☐	_____
b) Were field dup. precision criteria met (note RPD)?	☐	☐	☐	_____
c) Were lab duplicates analyzed (note original and duplicate samples)?				_____
	☐	☐	☐	_____
d) Were lab dup. precision criteria met (note RPD)?	☐	☐	☐	_____

ICP Serial Dilution	YES	NO	NA	COMMENTS
a) Was a ICP SD analyzed once per SDG?	☐	☐	☐	_____
b) Was the ICP SD criteria met?	☐	☐	☐	_____

ICP Interference Check Sample (optional for SW846)	YES	NO	NA	COMMENTS
c) ICP Interference check performed?	☐	☐	☐	_____
d) Were recoveries within control limits?	☐	☐	☐	_____

INORGANIC DATA VALIDATION CHECKLIST - QA LEVEL IV

Calibration and Instrument Parameters	YES	NO	NA	COMMENTS
e) At least 2 point calibration for ICP?	☐	☐	☐	_____
f) 5 point calibration present for Mercury?	☐	☐	☐	_____
g) 4 point calibration present for Flame AA, GFAA, CN?	☐	☐	☐	_____
h) One calibration standard at the CRDL or QL for all metals and CN (except Mercury)?	☐	☐	☐	(not necessarily required for SW846) _____
i) Is Correlation coefficient ≥ 0.995 for Hg, CN, AA?	☐	☐	☐	_____
j) Are IDLs provided and < CRDLs?	☐	☐	☐	_____
k) Are linear ranges for the calibrations provided?	☐	☐	☐	_____
l) Are Interelement Correlation Factors provided?	☐	☐	☐	_____

Calibration Verification	YES	NO	NA	COMMENTS
m) Complete for all target metals and CN?	☐	☐	☐	_____
n) ICV criteria achieved?	☐	☐	☐	_____
o) CCV criteria achieved?	☐	☐	☐	_____
p) CCV analyzed every 2 hours or 10 samples?	☐	☐	☐	_____
q) CRDL standard analyzed for ICP and AA?	☐	☐	☐	(not necessarily required for SW846) _____
r) If analyzed, run at appropriate frequency?	☐	☐	☐	_____
s) If analyzed, within control limits?	☐	☐	☐	_____

Graphite Furnace AA (GFAA)	YES	NO	NA	COMMENTS
a) Were any metals analyzed using GFAA?	☐	☐	☐	_____
b) If so, were duplicate injections performed?	☐	☐	☐	_____
c) Do duplicate injections agree ±20%?	☐	☐	☐	_____
d) Is Post Digestion Spike within control limits?	☐	☐	☐	_____
e) Was Method of Standard Addition (MSA) used?	☐	☐	☐	_____
f) If so, is correlation coefficient ≥0.990?	☐	☐	☐	_____
g) Was proper quantitation procedures followed?	☐	☐	☐	_____

Analyte Quantitation	YES	NO	NA	COMMENTS
a) Were correct calculations of all sample results verified?	☐	☐	☐	_____
b) Were correct qualifiers used by laboratory?	☐	☐	☐	_____
c) Were reporting limits adjusted for dilutions and/or %solids?	☐	☐	☐	_____

Comments/Notes:

INORGANIC DATA VALIDATION CHECKLIST - QA LEVEL IV

Data Qualification:

Sample Name	Constituent(s)	New Result	New RL	Qualifier	Reason

Signature: _____ Date: _____

Definitions:

SDG: Sample Delivery Group
COC: Chain of Custody
TAL: Target Analyte List
TDS: Total Dissolved Solids
%D: Percent Difference
LCS: Laboratory Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
ICV: Initial Calibration Verification
CCV: Continuing Calibration Verification
CRDL: Contract Required Detection Limit
RL: Reporting Limit
%R: Percent Recovery
AA: Atomic Absorption
QC: Quality Control
QAPP: Quality Assurance Project Plan
TOC: Total Organic Carbon
TPH: Total Petroleum Hydrocarbons
RPD: Relative Percent Difference
RSD: Relative Standard Deviation
ICP: Inductively Coupled Plasma
ICB: Initial Calibration Blank
CCB: Continuing Calibration Blank
MDL: Method Detection Limit
IDL: Instrument Detection Limit
SD: Serial Dilution
QL: Quantitation Limit

ORGANIC DATA REVIEW CHECKLIST - QA LEVEL II

Reviewing Company: _____ Project Manager: _____
Project Name: _____ Project Number: _____
Reviewer: _____ Validation Date: _____

Laboratory: _____ SDG #: _____
Analytical Method (type and no.): _____
Matrix: ☐ Air ☐ Soil/Sed. ☐ Water ☐ Waste ☐ Other _____
Data Validation Guidance (include SOP # if applicable): _____

Sample Identification	Date Sampled

Field/COC Information	YES	NO	NA	COMMENTS
a) Sampling dates noted?	☐	☐	☐	_____
b) Sampling team indicated?	☐	☐	☐	_____
c) Sample location noted?	☐	☐	☐	_____
d) Sample type indicated (grab/composite)?	☐	☐	☐	_____
e) Field QC noted?	☐	☐	☐	_____
f) Field parameters collected (note types)?	☐	☐	☐	_____
g) Was the COC signed by both field and laboratory personnel?	☐	☐	☐	_____
h) Were samples received in good condition?	☐	☐	☐	_____
i) Were the correct preservatives used?	☐	☐	☐	_____
j) Was the sample cooler temperature within QC limits?	☐	☐	☐	_____

Laboratory Case Narrative

a) Does the laboratory narrative indicate deficiencies?	☐	☐	☐	_____

Note Deficiencies:

General (reference QAPP or Method)	YES	NO	NA	COMMENTS
a) Was the correct method used?	☐	☐	☐	_____
b) Were hold times met for sample pretreatment?	☐	☐	☐	_____
c) Were hold times met for sample analysis?	☐	☐	☐	_____
d) Were appropriate reporting limits achieved?	☐	☐	☐	_____
e) Were any sample dilutions noted?	☐	☐	☐	_____
f) Were any matrix problems noted?	☐	☐	☐	_____

ORGANIC DATA REVIEW CHECKLIST - QA LEVEL II

Blanks	**YES**	**NO**	**NA**	**COMMENTS**
a) Were analytes detected in the method blank(s)?	☐	☐	☐	_____
b) Were analytes detected in the field blank(s)?	☐	☐	☐	_____
c) Were analytes detected in the equipment blank(s)?	☐	☐	☐	_____
d) Were analytes detected in the trip blank(s)?	☐	☐	☐	_____
e) Were analytes detected in the storage blank(s)?	☐	☐	☐	_____

Surrogate (System Monitoring) Compounds	**YES**	**NO**	**NA**	**COMMENTS**
a) Were surrogate compounds added to all samples?	☐	☐	☐	_____
b) Were recoveries within control limits?	☐	☐	☐	_____
c) Were surrogate recoveries not calculated due to dilutions?	☐	☐	☐	_____
d) Were recoveries not calculated due to interference?	☐	☐	☐	_____

Laboratory Control Sample	**YES**	**NO**	**NA**	**COMMENTS**
a) Was a LCS analyzed at the appropriate frequency?	☐	☐	☐	_____
b) Were the proper compounds included in the LCS?	☐	☐	☐	_____
c) Was the LCS accuracy criteria met?	☐	☐	☐	_____

Duplicates	**YES**	**NO**	**NA**	**COMMENTS**
a) Were field duplicates collected (note original and duplicate sample names)?				_____
	☐	☐	☐	_____
b) Were field dup. precision criteria met (note RPD)?	☐	☐	☐	_____
c) Were lab duplicates analyzed (note original and duplicate samples)?				_____
	☐	☐	☐	_____
d) Were lab dup. precision criteria met (note RPD)?	☐	☐	☐	_____

Comments/Notes:

ORGANIC DATA REVIEW CHECKLIST - QA LEVEL II

Data Qualification:

Sample Name	Constituent(s)	New Result	New RL	Qualifier	Reason

Signature: _____ Date: _____

Definitions:

SDG: Sample Delivery Group
COC: Chain of Custody
VOC: Volatile Organic Compound
TCL: Target Compound List
%D: Percent Difference
LCS: Laboratory Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
MDL: Method Detection Limit
%R: Percent Recovery
CC: Continuing Calibration
RRF: Relative Response Factor
TCLP: Toxicity Characteristic Leaching Procedure
QC: Quality Control
QAPP: Quality Assurance Project Plan
SVOC: Semivolatile Organic Compound
PCB: Polychlorinated Biphenyl
RPD: Relative Percent Difference
RSD: Relative Standard Deviation
CRDL: Contract Required Quantitation Limit
RL: Reporting Limit
PEM: Performance Evaluation Mixture
SPCC: System Performance Check Compound
RT: Retention Time
SPLP: Synthetic Precipitation Leaching Procedure

ORGANIC DATA VALIDATION CHECKLIST – QA LEVEL IV

Reviewing Company::_____ Project Manager: _____
Project Name:_____ Project Number: _____
Reviewer: _____ Validation Date:_____

Laboratory: _____ SDG #:_____
Analytical Method (type and no.): _____
Matrix: ☐ Air ☐ Soil/Sed. ☐ Water ☐ Waste ☐ Other _____
Data Validation Guidance (include SOP # if applicable): _____

Sample Identification	Date Sampled

Field/COC Information	YES	NO	NA	COMMENTS
a) Sampling dates noted?	☐	☐	☐	_____
b) Sampling team indicated?	☐	☐	☐	_____
c) Sample location noted?	☐	☐	☐	_____
d) Sample type indicated (grab/composite)?	☐	☐	☐	_____
e) Field QC noted?	☐	☐	☐	_____
f) Field parameters collected (note types)?	☐	☐	☐	_____
g) Was the COC signed by both field and laboratory personnel?	☐	☐	☐	_____
h) Were samples received in good condition?	☐	☐	☐	_____
i) Were the correct preservatives used?	☐	☐	☐	_____
j) Was the sample cooler temperature within QC limits?	☐	☐	☐	_____

Laboratory Case Narrative

a) Does the laboratory narrative indicate deficiencies?	☐	☐	☐	_____

Note Deficiencies:

General (reference QAPP or Method)	YES	NO	NA	COMMENTS
a) Was the correct method used?	☐	☐	☐	_____
b) Were hold times met for sample pretreatment?	☐	☐	☐	_____
c) Were hold times met for sample analysis?	☐	☐	☐	_____
d) Were appropriate reporting limits achieved?	☐	☐	☐	_____
e) Were any sample dilutions noted?	☐	☐	☐	_____
f) Were any matrix problems noted?	☐	☐	☐	_____

ORGANIC DATA VALIDATION CHECKLIST – QA LEVEL IV

Blanks	**YES**	**NO**	**NA**	**COMMENTS**
a) Were analytes detected in the method blank(s)?	☐	☐	☐	_____
b) Was a method blank analysis performed according to the method used?	☐	☐	☐	_____
c) Was a method blank analysis performed for each instrument used for sample analyses?	☐	☐	☐	_____
d) Were analytes detected in the instrument blank(s)?	☐	☐	☐	_____
e) Were analytes detected in the field blank(s)?	☐	☐	☐	_____
f) Were analytes detected in the equipment blank(s)?	☐	☐	☐	_____
g) Were analytes detected in the trip blank(s)?	☐	☐	☐	_____
h) Were analytes detected in the storage blank(s)?	☐	☐	☐	_____

Surrogate (System Monitoring) Compounds	**YES**	**NO**	**NA**	**COMMENTS**
a) Were surrogate compounds added to all samples?	☐	☐	☐	_____
b) Were recoveries within control limits?	☐	☐	☐	_____
c) Were surrogate recoveries not calculated due to dilutions?	☐	☐	☐	_____
d) Were recoveries not calculated due to interference?	☐	☐	☐	_____

Laboratory Control Sample	**YES**	**NO**	**NA**	**COMMENTS**
a) Was a LCS analyzed once per SDG?	☐	☐	☐	_____
b) Were the proper compounds included in the LCS?	☐	☐	☐	_____
c) Was the LCS accuracy criteria met?	☐	☐	☐	_____

Matrix Spike/Matrix Spike Duplicate	**YES**	**NO**	**NA**	**COMMENTS**
a) Was MS accuracy criteria met (note %R)?	☐	☐	☐	_____
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☐	_____
b) Was MSD accuracy criteria met (note %R)?	☐	☐	☐	_____
Recovery could not be calculated since sample contained high concentration of analyte?	☐	☐	☐	_____
c) Were MS/MSD precision criteria met (note RPD)?	☐	☐	☐	_____

Duplicates	**YES**	**NO**	**NA**	**COMMENTS**
a) Were field duplicates collected (note original and duplicate sample names)?	☐	☐	☐	_____
b) Were field dup. precision criteria met (note RPD)?	☐	☐	☐	_____
c) Were lab duplicates analyzed (note original and duplicate samples)?	☐	☐	☐	_____
d) Were lab dup. precision criteria met (note RPD)?	☐	☐	☐	_____

ORGANIC DATA VALIDATION CHECKLIST – QA LEVEL IV

GC/MS Tuning and Performance (Instrument Performance Check (IPC)

	YES	NO	NA	COMMENTS
a) IPC for each 12-hour period during sample analyses?	☐	☐	☐	_____
b) Transcription errors?	☐	☐	☐	_____
c) Calculation errors?	☐	☐	☐	_____
d) Does (circle one) BFB or DFTPP meet the ion abundance criteria?	☐	☐	☐	_____
e) Is the mass assignment correct and is the mass listing normalized correctly?	☐	☐	☐	_____

GC/MS Initial Calibration (IC)

	YES	NO	NA	COMMENTS
a) Were correct standards used for IC?	☐	☐	☐	_____
b) Was the correct initial calibration used?	☐	☐	☐	_____
c) Were correct standards used for results calculations?	☐	☐	☐	_____
d) Were SPCC compounds RRF > 0.3/0.05?	☐	☐	☐	_____
e) Were other compounds RRF > 0.05?	☐	☐	☐	_____
f) Was the %RSD < 30%? ***(Fill in alternate criteria as appropriate)***	☐	☐	☐	_____

GC/MS Continuing Calibration (CC)

	YES	NO	NA	COMMENTS
a) Were correct standards used for CC?	☐	☐	☐	_____
b) Was the correct continuing calibration used?	☐	☐	☐	_____
c) Were correct standards used for results calculations?	☐	☐	☐	_____
d) Were SPCC compounds RRF >0.3/0.05?	☐	☐	☐	_____
e) Were other compounds RRF > 0.05?	☐	☐	☐	_____
f) Was the %D < 25% (for low conc. water %D<30%)? ***(Fill in alternate criteria as appropriate)***	☐	☐	☐	_____

Pesticide/PCB GC Calibration

	YES	NO	NA	COMMENTS
a) Do standard retention times fall within RT windows?	☐	☐	☐	_____
b) Are linearity criteria achieved (IC)?	☐	☐	☐	_____
c) Criteria for peaks in Resolution Check achieved?	☐	☐	☐	_____
d) DDT and Endrin breakdown criteria achieved?	☐	☐	☐	_____
e) % Drift criteria achieved on both columns?	☐	☐	☐	_____
f) Are PEM CC criteria achieved (±25%)?	☐	☐	☐	_____
g) Are INDA/B CC criteria achieved (±25%)?	☐	☐	☐	_____

ORGANIC DATA VALIDATION CHECKLIST – QA LEVEL IV

Pesticide/PCB Analytical Sequence/Quantitation	**YES**	**NO**	**NA**	**COMMENTS**
a) Was proper analytical sequence followed?	☐	☐	☐	_____
b) Were all samples within 12 hr of std and Inst Blk?	☐	☐	☐	_____
c) Specific multi-comp stds run w/i 72 hr of sample?	☐	☐	☐	_____
d) Cleanup performed on extracts?	☐	☐	☐	_____
e) If performed, were %R criteria for checks achieved?	☐	☐	☐	_____
f) Sample RT within Standard RT windows?	☐	☐	☐	_____
g) %D for positive results on both columns <25%?	☐	☐	☐	_____
h) Aroclor pattern present and meets criteria?	☐	☐	☐	_____
i) Were there any false negatives?	☐	☐	☐	_____

***GC/MS* Internal Standards**	**YES**	**NO**	**NA**	**COMMENTS**
a) Verify from raw data that IS retention times and areas are reported correctly.	☐	☐	☐	_____
b) Are the IS retention times and areas within control limits?	☐	☐	☐	_____

Compound Quantitation	**YES**	**NO**	**NA**	**COMMENTS**
a) Were correct calculations of all sample results verified?	☐	☐	☐	_____
b) Was the correct IS, quantitation ion, and RRF used to quantitate compounds (GC/MS) or the correct RF used (GC)?	☐	☐	☐	_____
c) Were reporting limits adjusted for dilutions and/or %solids?	☐	☐	☐	_____

Tentatively Identified Compounds *(GC/MS only)*	**YES**	**NO**	**NA**	**COMMENTS**
a) Do major ions meet criteria?	☐	☐	☐	_____
b) Are the TIC peaks present in blank sample chromatograms?	☐	☐	☐	_____
c) Were the mass spectra criteria met?	☐	☐	☐	_____
d) Was the library searches criteria met?	☐	☐	☐	_____
e) Are common laboratory contaminants present?	☐	☐	☐	_____
f) Are the target compounds identified in more than one fraction	☐	☐	☐	_____
g) Were library searches performed on the IS or Surrogates?	☐	☐	☐	_____
h) Was the proper RRF used for calculations?	☐	☐	☐	_____

Comments/Notes:

ORGANIC DATA VALIDATION CHECKLIST – QA LEVEL IV

Data Qualification:

Sample Name	Constituent(s)	New Result	New RL	Qualifier	Reason

Signature: _____ Date: _____

Definitions:

SDG: Sample Delivery Group
COC: Chain of Custody
VOC: Volatile Organic Compound
TCL: Target Compound List
% D: Percent Difference
LCS: Laboratory Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
MDL: Method Detection Limit
%R: Percent Recovery
IC: Initial Calibration
CC: Continuing Calibration
RRF: Relative Response Factor
TCLP: Toxicity Characteristic Leaching Procedure
TICS: Tentatively Identified Compounds
QC: Quality Control
QAPP: Quality Assurance Project Plan
SVOC: Semivolatile Organic Compound
PCB: Polychlorinated Biphenyl
RPD: Relative Percent Difference
RSD: Relative Standard Deviation
CRQL: Contract Required Quantitation Limit
RL: Reporting Limit
PEM: Performance Evaluation Mixture
IPC: Instrument Performance Check
SPCC: System Performance Check Compound
RT: Retention Time
SPLP: Synthetic Precipitation Leaching Procedure
IS: Internal Standard

APPENDIX C

HEALTH AND SAFETY CONTINGENCY PLAN

Golder Associates Inc.

200 Century Parkway, Suite C
Mount Laurel, NJ USA 08054
Telephone (856) 793-2005
Fax (856) 793-2006

HEALTH AND SAFETY CONTINGENCY PLAN

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

OPERABLE UNIT 1 – PHASE 1 REMEDIAL ACTION

REVISION LEVEL: 0

Prepared for:

Martin Aaron Superfund Site Settling Performing Defendants

Prepared by:

Golder Associates Inc.
200 Century Parkway, Suite C
Mount Laurel, New Jersey 08054

DISTRIBUTION:

7 Copies	US Environmental Protection Agency
3 Copies	NJ Dept. of Environmental Protection
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2 Copies	Golder Associates Inc.

August 2008 Project No.: 073-86114

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LIST OF ATTACHMENTS

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Attachment 2 Site Health and Safety Contingency Plan Acknowledgement
Attachment 3 Report Form for Unsafe Conditions and Practices
Attachment 4 Daily Safety Briefing Form
Attachment 5 Incident Report Form

LIST OF ACRONYMS AND DEFINITIONS

ACGIH - American Conference of Governmental Industrial Hygienists

Authorized Personnel - Any person, including task-specific personnel, project personnel, oversight personnel, contractors and consultants whose presence is authorized.

Breathing Zone - The worker's breathing zone is an imaginary zone of two foot radius surrounding the head.

Contamination Reduction Zone or CRZ - The area designated for removal of contaminants from personnel and equipment. This area is adjacent to the Exclusion Zone.

Contractor/Consultant - Any person or firm, retained or hired by the Group and/or their contractors, to carry out and/or supervise any portion of the work conducted at the Site.

Exclusion Zone or EZ - The area to which all personnel entering must be directly involved in the ongoing work, have designated personal protective equipment, and meet training and medical monitoring requirements. The Exclusion Zone will be defined by an approximate 25-foot radius around the work area, which will be suitably marked.

Group - Martin Aaron Superfund Site Settling Performing Defendants

HSCP - Health and Safety Contingency Plan

HSC - Office Health and Safety Coordinator

HSO - Health and Safety Officer

IDLH - Immediate Danger to Life and Health

JSA – Job Safety Analysis

MSDS - Material Safety Data Sheets, which provide information on the physical, chemical, and hazardous properties of chemical compounds.

NIOSH - National Institute of Occupational Safety and Health

On-Site - The land area comprised of the properties identified in Section 1.3 above composing the Martin Aaron Superfund Site.

Off-Site - Areas not composing the Martin Aaron Superfund Site.

OSHA - Occupational Safety and Health Administration

Oversight Personnel - Any person designated by State or Federal governments to carry out oversight work.

PID - Photo-ionization Detector

PEL - Permissible Exposure Limit

PPE - Personal Protective Equipment

PPM - Parts per million; expressed as ppm(v) for gases and vapors

REL - Recommended Exposure Limit

QAPP - Quality Assurance / Quality Control Project Plan

SAMP - Sampling Analysis and Monitoring Plan

SHSC - Site Health and Safety Coordinator

STEL - Short Term Exposure Limit

Site - The Martin Aaron Superfund Site

Support Zone or SZ - The area outside the Exclusion Zone that is considered clean for the purpose of the HSCP. It is used for transfer of equipment and materials into the work site (i.e., support) and providing communications between the various zones.

TLV - Threshold Limit Value

1.0 GENERAL INFORMATION

1.1 Purpose

This Health and Safety Contingency Plan (HSCP) has been prepared by Golder Associates Inc. (Golder Associates) on behalf of the Martin Aaron Superfund Site Settling Performing Defendants to address, *"the protection of public health and safety and the response to contingencies that could impact public health, safety, and the environment"* as required under Section V, Item B of the Consent Decree Statement of Work for the Martin Aaron Superfund Site (Site) located within the City of Camden, Camden County, New Jersey (see Figure 1). This plan was prepared in accordance with "Guidance for Conducting Remedial Investigations and Feasibility Studies (RI/FS) under CERCLA" and the NIOSH/OSHA/USCG/EPA "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities" as well as 29 CFR 1910.120, 29 CFR 1926 and applicable Federal and State regulations and guidelines. This plan supersedes any previous health and safety plans prepared for the Site. This HSCP is a living document and will be reviewed and updated, as appropriate, when additional field and/or laboratory data becomes available and as activities at the Site change to ensure that the proper level(s) of protection are provided/maintained.

1.2 Description of Work

Revision Level 0: The work associated with Revision Level 0 of this HSCP includes field activities to be performed at the Site as described in the Remedial Design Work Plan (Golder Associates, February 2008), specifically, Appendix A – Pre-Design Investigation Work Plan, for the Site. Planned field activities include site clearing, utility mark out, demolition, test pit excavations, soil borings, groundwater well sampling and the collection of samples for geotechnical and environmental testing. There will be approximately 63 environmental borings advanced to approximately 16 feet below existing ground surface (bgs), 11 geotechnical borings advanced to approximately 30 feet bgs, and 9 test pits excavated depth limited by the reach of the excavation equipment or where excavation below the groundwater table causes sloughing of the excavation sidewalls and inhibits visual observation.

1.3 Site Description and Access

The Site is located at 1542 South Broadway in the City of Camden, Camden County, New Jersey (Figure 1). The Site consists of the following properties:

- Martin Aaron Property identified as Block 460, Lot 1 on the Tax Map of the City of Camden, County of Camden, New Jersey, owned by Mr. Martin Aaron;

- Comarco Property identified as Block 460, Lots 3 and 26 on the Tax Map of the City of Camden, County of Camden, New Jersey, owned by Mr. Thomas Hoversen and Ms. Karen G. Hoversen;

- Pontes Equities Property identified as Block 460, Lot 29 on the Tax Map of the City of Camden, County of Camden, New Jersey, owned by Ponte Equities, Inc.;

- Scrapyard Property identified as Block 460, Lots 2 and 4 on the Tax Map of the City of Camden, County of Camden, New Jersey, owned by Mr. George P. Ackerle and Ms. Calogera C. Ackerle; and,

- Various adjacent right-of-way locations, including the areas between the above named properties and Broadway, 6th and Everett Streets.

Property boundaries are depicted on Figure 1, and are roughly coincident with the approximately 6.5-acre Site defined by the "Limits of Soil Remediation" specified in the Consent Decree. The Site is situated on relatively level land in an area of mixed-industrial and residential properties. Geologically, the Site is located within the New Jersey Coastal Plain, and as such, is underlain by generally permeable, unconsolidated sediments comprised primarily of sands and gravels. The Site also lies within the outcrop area of the Potomac-Raritan-Magothy (PRM) Aquifer System.

Access to the main Martin Aaron Property (and most of the Site area) is restricted by a chainlink fence with two locked gates, one on Broadway and one on 6th Street. Access to the Scrapyard Property is obtained through the locked gate on Everett Street. Access agreements will be in-place with all property owners prior to conducting work at the Site.

1.4 Site History

Historical records indicate that the properties within the Site have been used for light industrial activities as early as 1886. From 1887 to 1908, a majority of the Site was used as a tannery by Kifferty Morocco Manufacturing Company, which specialized in the tanning and glazing of hides and leathers. During that time period, the tannery tripled in size.

In 1908, the property was purchased by the Castle Kid Company and was used to produce mat and glazed kid leathers. By 1921, the Castle Kid Company facility had developed into a large scale manufacturing complex. Facility expansion included a substantial amount of building

construction, and the addition of a railroad spur. Expansion included the construction and use of the buildings on the current Ponte Equities property. By 1926, however, the tannery operation was on the decline, and the facility was noticeably downsized.

During tanning operations, animal skins are converted into leather. As described in the S*ummary of Historical Ownership and Uses of the Martin Aaron Superfund Site and Select Nearby Properties* (*de maximis*, 2005), tanning operations during that time period used tannin, derived from ground tree bark, as the principle component of the tanning of leather. However a number of other constituents were needed to complete the entire process. The hides were first washed in water for cleansing and softening, and then prepared for depilation (unhairing) by soaking the hides in a lime vat. The hides were often treated with an arsenic solution to enhance the hair-removal process. The hides were then taken from the lime and/or arsenic solution, washed with water, and the hair and flesh scraped off. The resulting leather was softened prior to the tanning process by bating, in which the hide was placed in a bath with water and various compounds, including fermented bran and muriate of ammonia. The hide was then placed into vat containing tannin for a variable time period. When taken out of the vat, the hide was washed, hung to dry, rolled until smooth, hung to dry again, and when thoroughly dry, was ready for market. During the approximate 40 year time period that the property was used for leather tanning operations, the property was impacted with tannery and hide processing wastes.

In 1940, following cessation of tannery operations, the property was seized by the City of Camden due to tax delinquency and sold to Benjamin Schmerling. It was subsequently leased to H. Preston Lowden Company (Preston) and American Chain and Cable Company - Pennsylvania Lawn Mower Division (AC&C). Preston leased building space in the southwestern corner, and operated a hair-and-wool blending business. AC&C leased building space in the southeastern corner for use as the physical plant area of its manufacturing facility.

Martin Aaron, Incorporated (Martin Aaron) purchased its property from Benjamin Schmerling in 1968, and is currently the owner of record. From 1968 to 1987, Martin Aaron operated a drum recycling business on its property. In 1985, Drum Service of Camden, a joint venture, began operating at the Site. In or about 1986, the joint venture purportedly dissolved and Drum Service of Camden continued drum recycling operations as a DBA for Westfall Ace Drum Company (WADCO). Rhodes Drum Incorporated (Rhodes) also operated at the site from around 1985 until it ceased business in 1998. WADCO occupied the main on-site building (the Martin Aaron

building), while Rhodes Drum operated from a smaller building in the southeast corner of the property (Rhodes Drum building). WADCO was liquidated in bankruptcy proceedings in 1994.

1.5 Project Safety Requirements

The level of protection and the procedures specified in this HSCP are based on the information currently available regarding the Site and represent the minimum health and safety requirements to be observed by personnel engaged in work at the Site. Unknown conditions at the Site may exist and known conditions may change. Should any situation arise which is beyond the scope of the personal protection and safety and decontamination procedures specified herein, work activities shall be immediately halted pending discussion with Golder Associates' Office Health and Safety Coordinator (HSC) and Project Manager, and revision of the specified health and safety procedures. Any revision of the health and safety procedures will be recorded in a Field Procedure Change Authorization Form, as included as Attachment 1, and will require authorization from Golder Associates' HSC and the Project Manager.

All Site personnel engaged in work at the Site must read this document carefully and must provide acknowledgement of such on the form included as Attachment 2. Personnel who have any questions or concerns regarding implementation of this plan are encouraged to request clarification from the HSC or Site Health and Safety Coordinator (SHSC). All personnel must follow the designated health and safety procedures, be alert to the hazards associated with work assignment and working close to vehicles and equipment, and above all else, use common sense and exercise reasonable caution at all times.

1.6 Designated Safety Personnel and Chain of Command

Golder Associates personnel responsible for implementing this HSCP include the following:

Charles Lawrence	Site Health and Safety Coordinator (SHSC)
James Valenti	Office Health and Safety Coordinator (HSC)
Randolph White	Remedial Design Project Manager
Charles Haury, CIH, CSP	Corporate Health and Safety Officer (HSO)

Each subcontractor will have a designated project Health and Safety Coordinator. Health and Safety Coordinators are responsible for assuring that the designated procedures are implemented in the field. Golder Associates' SHSC is responsible for coordinating Site safety activities.

The HSC has overall responsibility for establishing appropriate health and safety procedures for the project and will have the requisite authority to implement those procedures including, if necessary, the authority to temporarily stop the work for health and safety reasons. The Project Manager also has the authority to take whatever actions may be necessary, based on the advice and direction of the HSC, to provide a safe working environment for all project personnel.

The ultimate responsibility for the health and safety of the individual employee rests with the employee and his or her colleagues. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her own health and safety and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the attention of the appropriate health and safety personnel as designated above, and to follow-up the verbal notification by completing the "Unsafe Conditions and Practices" report form provided as Attachment 3.

Should an employee find himself or herself in a potentially hazardous situation, the employee shall immediately discontinue the hazardous procedure(s) and either personally effect appropriate preventative or corrective measures, or immediately notify the Site Health and Safety Coordinator or Project Manager of the nature of the hazard. In the event of an immediately dangerous or life-threatening situation, the employee always has "stop work" authority.

Unsafe work practices or procedures are never justified by "extenuating circumstances" such as budget or time constraints, equipment breakdown, changing or unexpected conditions, etc. In fact, the opposite is true. Under stressful circumstances all project personnel must be mindful of the potential to consciously or unconsciously compromise health and safety standards, and be especially safety conscious. All Site personnel are required to consider "safety first" at all times.

1.7 Medical Surveillance and Training

All personnel engaged in field activities on this project must have baseline physical examinations and be participants in their employer's medical surveillance program. This program must meet,

at a minimum, the requirements of 29 CFR 1910.120(f). Procedures beyond baseline physical and routine medical surveillance are not planned for the tasks listed in this HSCP.

All project personnel, who have potential to contact contaminated soil, water, and/or air, must be trained in hazardous waste site investigation health and safety in accordance with 29 CFR 1910.120(e) including respiratory protection, personal protective clothing, decontamination, hazard recognition and the proper calibration and use of the multi- gas monitor, photo-ionization detector (PID), and colorimetric detector tubes. Personnel must have appropriate refresher courses as detailed in 29 CFR 1910.120(e). Supervisory personnel will have completed the supervisor training requirement detailed in 29 CFR 1910.120(e).

Personnel who operate specialized equipment (e.g., drill rigs, forklifts) shall be trained by their employer(s) to operate such equipment.

These training requirements apply to all employees unless the employer can demonstrate that the operation does not involve employee exposure, or the reasonable possibility for employee exposure, to safety and health hazards. Some non-intrusive activities (e.g. supply delivery, surveying activities) may meet this exemption. In consideration that Site information and/or conditions are subject to change, the training requirements for non-intrusive activities will be reviewed on a case-by-case basis. The SHSC will make the determination on the case-by-case basis and will consult the HSC as necessary.

1.7.1 First Aid and CPR

A first aid kit shall be available in all field vehicles. This kit shall be of an appropriate size in relation to the number of personnel on-Site and shall include at a minimum two pairs of latex gloves, CPR barrier and eye wash solution, in addition to first aid supplies (e.g., bandages, first aid cream, antiseptic).

Health and Safety Coordinators shall have current training in basic first aid and CPR.

1.7.2 Communications

A mobile phone will be located in a designated field vehicle. Note that mobile phones operating outside of their original territory may not contact the proper (i.e., local) emergency response

authorities. Mobile phone users would be better served by dialing the full emergency response number. Emergency notification telephone numbers, including those for Designated Safety Personnel as listed in Section 1.6 above, are listed in Section 5.6.

The "buddy system" will be employed between Golder Associates' personnel and the personnel of Golder Associates' subcontractors requiring a minimum of two people working together to complete each task during all on-Site activities. Additionally, if field operations require that two or more field teams work at the Site but beyond visual/aural range, two-way radios or cell phones may be necessary to maintain communications.

The protective equipment requirements for some tasks may necessitate the use of respiratory protection which could adversely affect communications. In such instances, the field team will review basic hand signal communications during a safety briefing prior to donning respiratory protection equipment.

1.8 General Hygiene and Conduct Guidelines

The following general personal hygiene and work practice guidelines are intended to prevent injuries and adverse health effects. These guidelines represent the minimum standard procedures for reducing potential risks associated with various aspects of this project and are to be followed by all Site personnel at all times.

- A multi-purpose dry chemical fire extinguisher, a complete field first aid kit, and a bottle of emergency eye wash solution shall be maintained in every field vehicle.
- Do not handle waste samples or any other potentially contaminated media unless wearing the minimum specified personal protective equipment as described hereinafter. Employees should treat all soil and water encountered at the Site as if it were impacted. Always make an effort to approach any potentially impacted feature/facility from upwind.
- Thoroughly wash hands and face before eating or putting anything in your mouth (i.e., avoid hand to mouth contamination).
- Eating, drinking, chewing gum or tobacco and smoking are permitted only in areas designated by the SHSC. Under no circumstances will these activities be permitted in the immediate vicinity of any intrusive activities (e.g., drilling).
- Be alert to potentially changing exposure conditions, for example, as evidenced by perceptible odors or oily sheen on water.

- Do not, under any circumstances, enter or ride in or on any backhoe bucket, materials hoist, or any other similar device not specifically designed to carry human passengers.
- Be alert to the symptoms of fatigue and heat/cold stress, and their affects on the normal caution and judgment of personnel.
- Noise may pose a health and safety hazard, particularly during drilling and construction activities. A good rule of thumb is if it is necessary to shout to communicate at a distance of three feet in steady state (continuous) noise, hearing protection should be worn. Likewise, any impact noises from activities (e.g., driving casing on a drilling operation) which is loud enough to cause discomfort, would also indicate the need for hearing protection. Hearing protection is available and is included in the standard field kit along with hard hat and safety glasses.
- Always use an appropriate level of personal protection. Reduced levels of protection can result in preventable exposure; excessive levels of safety equipment can impair efficiency and increase the potential for accidents to occur.
- Be aware of the effect of inclement weather (rain, snow, ice, lightning) has on Site safety. Be prepared to suspend activities as conditions warrant.
- Extreme caution must be used when drilling or other activities occur near overhead utility lines. The National Drilling Federation recommends a minimum distance of 20 feet between the lines and drill rig. Contact the local power company if you have any questions regarding utility line status or voltage. In addition, underground utilities must be positively located and marked prior to intrusive activities.
- All personnel are required to wear orange colored vests when working in the proximity of public rights-of-way and/or parking areas. Additionally, traffic cones and other warning devices may be required if the public rights-of-way are obstructed.

1.9 Site Safety Meetings

The Site Health and Safety Coordinators shall conduct a Site safety briefing for all personnel upon their initial arrival to the Site. All personnel will be required to read the HSCP and provide acknowledgement of such in the form included as Attachment 2 before conducting any work on-Site.

The Site Health and Safety Coordinators or his/her designee shall conduct and document daily safety meetings (a.k.a., “tailgate” or “toolbox” meetings). The topics to be covered are determined by the task activities, and should include:

- Weather and traffic related safety issues,
- Hazards specific to the task(s) and protective equipment,
- Unusual site conditions/areas,
- Safety problems and issues, and
- Changes in the HSCP.

The date, time, content and attendees of each meeting shall be documented by recording this information on a standard form such as that included as Attachment 4.

2.0 HAZARD EVALUATION

Potential Site hazards include chemical hazards, physical hazards, and biological hazards. Each of these groups of potential hazards is addressed below. In addition, a task-specific job safety analysis (JSA) will be performed each workday as part of the safety briefing held before the start of work.

Potential Hazards:

- ☒ Chemical
- ☐ Radiological
- ☒ Heat/Cold Stress
- ☒ Fire/Explosion
- ☒ Confined Space
- ☒ Heavy Equipment/Vehicular Traffic
- ☒ Trips, Slips, Falls
- ☒ Trenching/Shoring
- ☒ Unstable/Uneven Terrain
- ☒ Overhead Hazards
- ☒ Other - Describe below

2.1 Potential Chemical Hazards

Hazard Evaluation:

Media	Hazardous Characteristics
☒ Airborne Contamination	☐ Ignitable
☒ Surface Contamination	☐ Corrosive
☒ Contaminated Soil	☐ Reactive
☒ Contaminated Groundwater	☐ Explosive
☐ Contaminated Surface Water	☒ Toxic (non-radiological)
☒ Solid Waste	☐ Radioactive
☐ Liquid Waste	
☒ Sludge	

As discussed in Section 1.4, results of past sampling activities at the Site indicate that there has been chemical contamination of the soil and groundwater. Table 1 summarizes the potentially hazardous chemicals of concern found at the Site based on the previous investigations. Table 2 summarizes airborne exposure limits for these chemical contaminants. The hazards associated with the reported chemical concentrations in Site groundwater and soil include:

- Inhalation of organic vapors due to the presence of VOCs in the soil and groundwater;
- Inadvertent ingestion of potentially toxic substances via hand to mouth contact or deliberate ingestion of materials inadvertently contaminated with potentially toxic materials. Included in this list are VOCs, SVOCs, pesticides, tannery sludge, PCBs and inorganic compounds; and,
- Dermal exposure and possible percutaneous (skin) absorption of certain lipophilic (readily absorbed through the skin) organic chemicals including benzene.

Exposure via the ingestion route can be controlled effectively by the means of good personal hygiene habits, and prohibition of smoking, eating, drinking and chewing in contaminated areas. Similarly, dermal exposure can be eliminated by good personal hygiene and appropriate clothing. Inhalation hazards are addressed in Section 4.3 below.

2.2 Potential Physical Hazards

2.2.1 Heat and Cold Stress

Work performed during warm weather can result in heat stress and working in protective clothing can greatly increase the likelihood of its development. This can result in health effects ranging from transient heat fatigue to serious illness or death. The signs and symptoms of heat stress are presented in Section 2.4. Workers shall monitor themselves and others for signs of heat stress when ambient temperatures exceed 80 degrees Fahrenheit (70 degrees when wearing Tyvek® coveralls).

Similarly, work performed during cold weather exposing personnel to cold temperatures (especially during windy conditions) can result in cold stress in the form of frost nip, frost bite or hypothermia. Signs and symptoms of cold stress are described in Section 2.4. Workers shall monitor themselves and others for signs of frost nip when cold weather occurs. Extra caution will be exercised when working in windy conditions and/or when clothing becomes wet.

2.2.2 Fire and Explosion

Although the known information regarding the Site contaminates does not indicate the potential for a fire or explosion hazard, the presence of active underground natural gas utility piping, presence of active electrical lines, and imported fuels and lubricants for the work could. Site personnel shall take appropriate precautions to safeguard against fire and explosion during performance of the work.

Underground utility locating shall be completed in accordance with the procedures outlined in the Pre-Design Investigation Work Plan for the Site. These include, at a minimum, notification to the New Jersey One-Call System at 1-800-272-1000 in accordance with the requirements of N.J.A.C. 14:2.

Any fuels, lubricants, or other flammable materials brought to the Site for use in performing the work shall be stored in approved containers, as appropriate, and maintained separate of potential ignition sources. Smoking is prohibited in all areas where flammable, combustible or similar hazardous materials are stored or used. All field vehicles and major motorized equipment used on Site will be equipped with a fire extinguisher of the type and make approved by the National Board of Fire Underwriters.

2.2.3 Confined Space

A confined space is defined as any space not currently used or intended for human occupancy, having a limited means of egress, which is subject to the accumulation of toxic contaminants, a flammable or oxygen deficient atmosphere, or other hazards, such as engulfment, or electrical or mechanical hazards should equipment be inadvertently activated while an employee is in the space. Confined spaces include but are not limited to underground utility vaults, air ducts, air pollution control devices, smoke stacks, sewers, and open top spaces more than four feet in depth such as test pits, waste disposal trenches, and sumps.

No confined space entry is anticipated at the Site in connection with the work. Personnel of Golder Associates and subcontractors are <u>not</u> to enter test pits/excavations to obtain samples during performance of the Pre-Design Investigation field work at the Site. Samples shall be obtained from outside the excavation via equipment bucket or appropriate sampling device.

Should confined space entry become necessary, a revision to this HSCP will be prepared detailing appropriate entry procedures.

2.2.4 Heavy Equipment/Vehicular Traffic

Site personnel must be alert to the hazards associated with vehicular traffic, operation of drilling and excavation equipment, and other heavy equipment to be used in performance of the work. These hazards include noise, crushing injuries, overhead hazards, and pinch points. Personnel

must be alert to weather-related hazards (e.g., lightning) or the possibility of increased hazard due to weather (e.g., slipping on mud or ice).

During drilling activities no more than two lengths of drill rod may extend above the top of the rig derrick at any time. Hard hats are required during drill rig operation.

Test pit excavation by backhoe shall not be performed until the stabilizing outriggers have been extended and bear upon firm ground.

Site personnel shall at all times during operation of heavy equipment be alert and conscious to the location and movement of the equipment. Site personnel should maintain a direct line of sight with the equipment operator and maintain a safe working distance from the operating equipment. High-visibility clothing (e.g., safety vests) must be worn at all times when working within or near public rights-of-way and during any portions of the work requiring haul traffic.

Daily safety briefings shall include a JSA for heavy equipment and trafficking and discuss how traffic and equipment management shall be addressed during these activities.

2.2.5 Slips, Trips, and Falls

Site personnel must take note of potential slip, trip, and fall hazards. These may include, but are not necessarily limited to, open excavations, uneven ground, debris, and slippery and/or congested walking surfaces. Personnel must be alert to the possibility of increased hazard due to weather conditions (e.g., slipping on mud or ice).

Prior to beginning field Pre-Design Investigation field activities at the Site, clearing will be performed for improved worker safety and to facilitate access during fieldwork. Clearing will expose uneven ground and reduce the potential for hidden debris or holes beneath the existing vegetation with the intent to reduce tripping and falling hazards and visually expose the ground surface. Ground vegetation across the Site will be close-cut, debris removed, and uneven terrain leveled within planned investigation areas.

2.2.6 Trenching/Shoring

Trenching and excavation activities involve potential hazards, which may bear serious consequences. These include slope failure (cave-ins); utilities (both underground and overhead); overhead hazards due to objects falling in the trench or bumping into bracing; and slip, trip and fall hazards. The following procedures represent the absolute minimum considerations, which must be addressed prior to any excavation:

- Check the location of gas, water, telephone, and electric utilities (all underground utilities) prior to any excavation;
- Equipment booms and arms and high voltage transmission lines do not mix. If excavation must be performed in the vicinity of such lines, an alternative method should be considered. Maintain at least 20 feet of clearance from all active power lines;
- Any excavation greater than five feet in depth must comply with OSHA (29 CFR 1926.650-653) or applicable state requirements for acceptable angle of repose and/or shoring. The acceptable angle of repose may have to be modified in extremely wet, extremely dry or other unusual circumstances. No employee shall enter any pit or trench unless it is properly shored or laid-back or other appropriate precautionary measures such as the use of a trench box are employed;
- A "competent person", one who is trained in the safety aspects of trenching and shoring and has authority to correct deficiencies, must inspect excavations on a daily basis;
- Tools, equipment, and excavated material must be kept at least two feet from the edge of the trench;
- Employees must always wear a hard hat when entering any excavation;
- Certain pits and trenches may be "confined-spaces" and must be treated as such;
- Standing or walking on braces or stringers is strongly discouraged. If there is no alternative, and with HSC approval be sure that the standing/walking surface, and shoes/boots are dry and free of mud; and,
- Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered Professional Engineer.

Personnel of Golder Associates and subcontractors are <u>not</u> to enter test pits/excavations to obtain samples during performance of the Pre-Design Investigation field work at the Site. Samples shall be obtained from outside the excavation via equipment bucket or appropriate sampling device. Excavations shall be delineated using high visibility caution tape, barriers, or fencing.

2.2.7 Unstable/Uneven Terrain

Site personnel must be conscious of the potential for unstable and uneven terrain. Prior investigations and removal activities at the Site, along with variable ground conditions (e.g., remnant pavement, building slabs, fill), have resulted in an irregular ground surface and potentially soft ground.

Prior to beginning field Pre-Design Investigation field activities at the Site, clearing will be performed for improved worker safety and to facilitate equipment access during fieldwork. Clearing will expose uneven ground and reduce the potential for hidden debris or holes beneath the existing vegetation with the intent to reduce tripping hazards and hazards to equipment and vehicles and visually expose the ground surface. Ground vegetation across the Site will be close-cut, debris removed, and uneven terrain leveled within planned investigation areas.

This does not preclude the potential for loss of ground stability beneath the load of heavy equipment due to consolidation of unengineered fill, void collapse, etc., and equipment operators are alerted to take note of such potential when trafficking equipment over the Site.

2.2.8 Overhead Hazards

Site personnel must be alert to overhead hazards at the Site and during performance of the work. Overhead hazards occur whenever there is moving equipment such as hoists, conveyors, drilling tools, etc.; protrusions from machinery or structural members present above eye level; or, whenever a worker must work where there are other work activities being conducted above him or her. Overhead utilities also present hazards to which Site personnel and equipment operators must be cognizant of.

Overhead cables, including live electric cables, are known to be present at the Site along the perimeters and immediately adjacent to Site access gates. Adequate clearance for the passage of equipment beneath overhead cables must be verified. Equipment operation below overhead cables shall comply with industry-standard clearance guidelines.

In addition to the presence of overhead utilities, the two existing dilapidated and unstable one-story buildings at the Site pose a significant overhead hazard due to imminent threat of collapse. With the objectives to reduce exposure of Site personnel to unsafe working conditions,

demolition and removal of the unstable superstructure (roof and walls) of these buildings will conducted. Access to these structures is restricted to personnel associated with the demolition activities.

Site personnel are required to wear a hard hat when working in the vicinity of potential overhead hazards, whether it is a “hard-hat area” or not.

2.2.9 Other Physical Hazards

Site personnel must take note of physical hazards which are identified by the task-specific job safety analysis performed each workday as part of the safety briefing held before the start of work. Other physical hazards may include: portable power tools, heavy lifting, pinch points, and others.

2.3 Biological Hazards

The Site area may contain ticks and spiders which can transmit Rocky Mountain Spotted Fever and Lyme Disease. During tick season (March to November), Site employees must check for ticks. Light colored clothing should be worn and any openings (shirt and pant cuffs) should be secured to inhibit tick movement from clothing to skin. The use of insect repellents should be considered if its use will not interfere with sampling activities, and its use is acceptable to the Project Manager. Field personnel will acquaint themselves with the symptoms of tick-borne diseases detailed below and will contact a physician as well as the HSC if a disease is suspected.

In addition, the Site area may also harbor potentially harmful snakes. Site personnel must be alert to these reptiles.

Poison Ivy may also be present at the Site and can be recognized by an oily sheen on the leaf and/or three leaflets together or similar vegetation. The active substances can be transmitted by direct skin contact and via contact with contaminated clothing. Site personnel should familiarize themselves with identification of Poison Ivy.

2.4 Signs and Symptoms of Exposure

2.4.1 Chemical Exposure

The health effects associated with the chemical contaminants at the Site are varied. Site personnel who experience any of the following symptoms should report the occurrence to the Health and Safety Coordinator promptly:

- Skin, eye, or respiratory system irritations,
- Skin rashes/burns,
- Headaches, dizziness,
- Nausea/GI tract problems,
- Muscle spasms/tremors,
- Chills, and/or
- Fatigue.

Note that the above symptoms are not necessarily caused by chemical exposure. Any serious medical problem should be promptly referred to professional medical care. If personnel experience any of the above symptoms, the Health and Safety Coordinator shall evacuate the area (upwind if possible), if necessary, and evaluate affected personnel for signs and symptoms of exposure. Appropriate first aid measures shall be taken. The activity will not resume until the atmospheric conditions are evaluated using monitoring instruments by personnel wearing Level C (or B, if Level C was utilized when the incident occurred) PPE. Atmospheric conditions will be evaluated by monitoring for concentrations of combustible gases and VOCs, as described in Section 3.

2.4.2 Physical Exposure

Heat Stress

The signs of heat stress are as follows:

- Heat rash may result from continuous exposure to heat or humid air.
- Heat cramps caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in hands, feet, and abdomen.

Heat exhaustion results from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- Pale, cool, moist skin;
- Heavy sweating;
- Dizziness;
- Nausea; and,
- Fainting.

Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms are:

- Red, hot, usually dry skin;
- Lack of or reduced perspiration;
- Nausea;
- Dizziness and confusion;
- Strong, rapid pulse; and,
- Coma.

Working in protective clothing can greatly increase the likelihood of heat fatigue, heat exhaustion, and heat stroke, the latter being a life threatening condition. General controls for the prevention of heat-stress-induced illness include making fluids readily available, using the buddy system, taking scheduled or unscheduled breaks in a cooler area, providing shade, scheduling work during cooler parts of the day, providing forced ventilation, encouraging physical fitness, and application of prudent judgment by the SHSC and Site personnel. Specific requirements include those below and shown in the following tables.

1. If ambient temperatures reach or exceed 70 degrees Fahrenheit, workers will be allowed to take unscheduled breaks, as needed, in a cooler area. A break is defined as minimal physical activity (sitting or standing) and should be accomplished in the shade, if possible.
2. If ambient temperatures reach or exceed, or are expected to reach or exceed, 70 degrees Fahrenheit, site-specific training will include heat-stress recognition and control and first aid for heat-stress-induced illnesses.

3. If ambient temperatures reach or exceed, or are expected to reach or exceed, 70 degrees Fahrenheit, cooled water and Gatorade® or equivalent drink will be made conveniently available to site workers, and site workers will be encouraged to drink frequently.

4. If ambient temperatures reach or exceed 70 degrees Fahrenheit, a physiological monitoring (pulse rate, ear canal temperature, or oral temperature) protocol will be implemented as specified in the monitoring intervals table below. Physiological monitoring will be performed within 1 minute of stopping work. The action levels and appropriate actions are presented in the action levels table below.

Maximum Intervals for Physiological Monitoring of Heat Strain

Dry-bulb Temperature or WBGT (°F)	Work Time (minutes) Normal Work Clothing (Level D)			Work Time (minutes) Impervious Clothing – PPE		
	Light[a]	Moderate[b]	Heavy[c]	Light[a]	Moderate[b]	Heavy[c]
Less than 70	NL	NL	NL	NL	NL	NL
70 – 74.9	NL	120	90	120	90	60
75 – 79.9				90	60	45
80 – 84.9				60	45	30
85 – 89.9	120	60	45	45	30	15
90 – 94.9				30	15	10
95 – 99.9				15	10	5
100 – 104.9	60	15	5	Not allowed	Not allowed	Not allowed
105 or more	30	5	Not allowed	Not allowed	Not allowed	Not allowed

Note: The length of breaks associated with physiological monitoring will be determined by the results of physiological monitoring coupled with the SSHO's judgment of site conditions, worker fitness, other controls such as cooling systems or fans, and other relevant factors.

[a]Light work consists of performing light hand or arm work. Examples include preparing and packaging samples, classifying subsurface soil samples, supervising a sampling crew, operating a drill rig or other heavy equipment, and assisting the driller. The work performed by the driller, driller's helper, sample manager, and geologist during subsurface soil sampling is typically light work.

[b]Moderate work consists of walking, lifting, or pushing for more than 50 percent of the work period. Tasks such as those of the driller's helper during well installation meet this definition if the physical work occupies more than 50 percent of the work period.

[c]Heavy work consists of pick-and-shovel work or similar strenuous activity that takes place over more than 50 percent of the work period. Manual brush clearing, hand augering, manual drum moving, and similar tasks fall in this category if they meet the time requirement.

NL = No limit.

Action Levels for Physiological Monitoring of Heat Strain

Action Levels	Action
Monitoring results are below action level: –pulse rate ≤110 bpm –ear canal temperature ≤100 °F –oral temperature ≤ 99.6 °F	Return to work
Monitoring results exceed action level: –pulse rate >110 bpm –ear canal temperature >100 °F –oral temperature > 99.6 °F	Rest in shaded or air-conditioned area until monitoring results fall below action levels. Re-measure (pulse rate or temperature) after 5 minutes of rest.
Monitoring results exceed action level after 5 minutes of rest: –pulse rate >110 bpm –ear canal temperature >100 °F –oral temperature > 99.6 °F	Implement additional heat stress controls, potentially including shading the work area, re-arranging the task to share workload, providing personal cooling devices, modifying PPE, or shortening the work cycle by one-third.

Cold Stress

Signs of cold stress include yellow or white patches of skin on the fingertips, nose and ears. These areas will be numb. In cold weather, the body can also lose heat faster than it can be produced, especially if clothing becomes wet. The result is the much more serious condition hypothermia, or abnormally low body temperature. Symptoms of hypothermia include uncontrollable shivering, decreased physical and mental capabilities, and drowsiness.

The affected parts will be re-warmed gently and the patient will not return to work until additional protection (e.g., gloves, hard hat liner) is obtained. It is essential to prevent frost bite as the person may become susceptible to future cold-related medical problems. Personnel are encouraged to change into dry socks after the lunch break as perspiration held by the socks prompts cooling of the feet. Should clothing become wet, it is imperative that the person change into dry clothes before resuming work.

Persons exhibiting symptoms of cold stress or hypothermia will not return to work without the approval of the Health and Safety Coordinator.

2.4.3 Biological Exposure

Symptoms of Rocky Mountain Spotted Fever include fever chills, headache, abdominal, muscle pain, and nausea. A red rash develops at the wrist and ankles two to five days after exposure. Symptoms develop two to fourteen days after exposure.

Symptoms of Lyme Disease include fatigue, stiffness (particularly in the neck). There may be a red circular rash. Fever may be present. Symptoms develop a few days to two years after exposure.

Personnel exhibiting symptoms of Rocky Mountain Spotted Fever or Lyme Disease should consult a medical professional immediately.

Personnel bitten by a snake will immediately clean the wound and proceed to the hospital for medical evaluation.

Skin-sensitizing (poisonous) vegetation produces a bumpy, swollen rash at the point of contact. This rash is easily spread if the oil gets on the fingers. Wash affected area(s) including tools, as soon as possible. Use over-the-counter medications to reduce the irritation. Avoid scratching the rash. Cover the affected area(s) with clean dressings. Severe exposure may necessitate evaluation by a medical professional.

2.5 Task Risk Analysis/Job Safety Analysis

Table 3 presents a comparative risk analysis based on anticipated field activities and hazards. Table 3 will be reviewed and updated, as appropriate, when additional field and/or laboratory data becomes available and as activities at the Site change to ensure that the proper level(s) of protection are provided/maintained. All Site personnel will be aware that specific hazards and the associated potential severity may be influenced by weather, season, and fatigue.

3.0 SITE MONITORING AND ACTION LEVELS

Air monitoring is required during intrusive tasks. The requirements for air monitoring and associated action levels for each site activity are detailed below. The monitoring methods involved and their interpretation are discussed in the following sections. Intrusive activities have the potential for exposures to VOCs and a slight possibility of explosive concentrations of various gases.

3.1 Combustible Gases

Chemical waste sites may contain explosive concentrations of non-methane gases. Underground utility lines could be damaged or weakened such that explosive gases are released. Digging or drilling (including hand augering) into such an area can pose a fire and explosion hazard.

	Instrument	**Monitoring Frequency**				
X	PID (HNU, OVM) w/ 10.2 eV lamp	Cont.	15min	30min.	hourly	other ____
____	OVA	Cont.	15min.	30min.	hourly	other ____
X	CGI or Multi Gas Monitor	Cont.	15min.	30min.	hourly	other X
X	H_2S Detector	Cont.	15min.	30min.	hourly	other ____
X	Colorimetric Detector Tubes	Cont.	15min.	30min.	hourly	other X
____	Other (describe below)					

PID monitoring will be performed at the commencement of drilling activities and will be continual when working inside the exclusion/hot zone. Colorimetric detector tubes will be utilized when sustained (five consecutive readings at one-minute intervals) PID levels are 1.0 ppm above the background baseline level for the detection of the following constituents:

- Vinyl Chloride - CAS No. 74-01-4
- Benzene - CAS No. 71-43-2

A Combustible Gas Indicator or multi gas monitor will be used to monitor combustible gas concentrations during appropriate tasks as defined below. The instrument calibration must be checked daily.

Instrument	Action Level/Criteria	Specific Action
PID Colorimetric Detection Tubes: Benzene and Vinyl Chloride	If the PID reading is 1.0 ppm above background level, use one Benzene and one Vinyl Chloride colorimetric detection tube, if **either** of the colorimetric detection tubes are ≥ 0.5 ppm (in breathing zone)	Cease work and evacuate area. Upgrade to Level C PPE for emergency stabilization/demobilization purposes only. Evaluate if mechanical ventilation is feasible.
PID	If the PID reading is 5.0 ppm above background level (in breathing zone)	Cease work and evacuate area. Upgrade to Level C PPE for emergency stabilization/demobilization purposes only. Evaluate if mechanical ventilation is feasible.
Combustible Gas Indicator	25 % LEL Any point where a source of ignition exists	Cease work, wait for air to clear.

The LEL concentration (the lowest concentration at which a gas becomes explosive in air) is typically between one percent (1%) and seven percent (7%) for most "combustible" organic vapors and gases. This corresponds to a concentration of 10,000 to 70,000 parts per million (ppm) by volume in air. The LEL concentration of methane for example is 5% or 50,000 ppm in air. Consequently, 50% LEL of methane is equivalent to 25,000 ppm. At such concentrations most flammable gases can be detected by the sense of smell. However, methane and hydrogen are notable exceptions.

During drilling operations, the gas indicator shall be used to determine gas concentrations at the borehole mouth and in the workers' breathing zone. Do not lower the probe into water. Use the in-line water trap when working around liquids.

No open flames, matches, cigarette lighters, or fires of any kind shall be allowed in the vicinity of the drilling operations. If the elevated levels are due to a localized pocket of gas, levels may drop and drilling can proceed, with caution and vigilant monitoring. If levels increase, the hole may be purged with carbon dioxide gas (which is heavier than air), or solid CO_2 (dry ice). If subsequent combustible gas levels at the surface and combustible gas/oxygen levels at depth no longer indicate the presence of an explosion hazard, work may continue with frequent monitoring and extreme caution. <u>If explosive gas levels exceed 20% LEL beyond the mouth of the hole, work should be halted pending discussion with health and safety personnel</u>.

Combustible gas levels must always be determined prior to any welding on casing or in the vicinity of the borehole. Readings should be taken at the mouth of the casing, and around the outside of the casing at ground level. Readings in excess of 20% LEL indicate the need for an inflatable bladder to isolate the borehole atmosphere from any potential ignition sources. The bladder is inserted into the well casing below the weld, inflated, and covered with water to ensure a gas-tight fit. When welding is completed, the bladder is deflated and removed. Should explosive gas in excess of 20% LEL be detected in the casing annulus, work will temporarily cease, ignition sources will be secured and the Project Manager will be contacted. If the condition does not subside, engineering controls will be established. These controls will be situation dependent and will be tested for effectiveness before welding occurs.

It may not be appropriate to designate a single "cease operations" action level for combustible gases encountered during drilling operations. The SHSC must be sufficiently knowledgeable to assess the situation taking into account all of the factors discussed above. As a general rule, however, any readings greater than 20% LEL are cause for increased monitoring activity. Readings greater than 50% LEL in the presence of oxygen concentrations greater than 12 percent require extreme caution, increased vigilance, and a careful assessment of overall conditions as discussed above. In the presence of combustible gas levels greater than 20% LEL a foot or so above the mouth of the hole or casing, the SHSC should temporarily cease operations and carefully assess the situation. Conditions may call for preventative or corrective measures, such as purging the hole using carbon dioxide or general site ventilation.

3.2 Hydrogen Sulfide

Hydrogen sulfide (H_2S) concentrations will be monitored with an appropriately calibrated detector. Combination instruments, such as the MultiRae Plus can monitor H_2S directly in ppm concurrently with LEL gas measurements. Calibration of any hydrogen sulfide detector must be checked prior to each day of use.

The eight hour time weighted average threshold limit value (TLV) for H_2S is 10 ppm and the 15 minute short term exposure limit (STEL) is 15 ppm. The immediately dangerous to life and health (IDLH) level is 100 ppm.

If H_2S concentrations greater than 10 ppm are detected at the mouth of the borehole, the monitoring frequency shall be increased and/or the gas monitor can be set up to run continuously at the driller's operating position.

At concentrations of a few ppm in the breathing zone, the odor nuisance would be such that Site personnel would probably voluntarily don air purifying respirators. Such use of air purifying respirators is appropriate if H_2S concentrations are being monitored continuously.

If concentrations in the breathing zone exceed 10 ppm for more than an hour, 15 ppm for more than 15 minutes, or at any time exceed 25 ppm, work shall be temporarily halted until H_2S levels subside, engineering controls are implemented or until Site personnel are equipped with pressure demand air supplying respirators. The HSC must be advised of such conditions and approve the revised procedures prior to implementation.

3.3 VOC Monitoring

Volatile organics that are of most concern from an inhalation standpoint are those that are moderately to highly toxic and have odor thresholds higher than their corresponding TLV. Tetrachloroethylene, benzene and trichloroethylene fall into this category.

Photo-ionization detectors shall be utilized at all times during intrusive activities. Calibration of the instrument must be checked daily prior to each day of use by introducing a known concentration of isobutylene gas in accordance with the manufacturer's instructions. Background levels must be established well upwind of any excavation, borehole, spoils pile, etc. The SHSC shall monitor the borehole and employee breathing zone <u>at least</u> every 15 minutes, or whenever there is any indication that concentrations may have changed (odors, visible gases, appearance of drill cuttings, etc.) since the last measurement.

If the exact nature of the contaminant(s) is unknown, any consistent readings >1 ppm in the breathing zone (above background level) for more than five minutes, or any readings in the breathing zone greater than 10 ppm above background level other than a momentary peak or any peak >25 ppm above background level shall be the action level for donning air purifying respirators equipped with HEPA/organic vapor acid gas cartridges. The HSC must be advised of such conditions and approve the revised procedures. Prolonged concentrations above 25 ppm

above background levels or numerous peaks will be evaluated by the HSC and Project Manager for upgrading to Level "B" respiratory protection.

Given the rapid "breakthrough" time of some substances, cartridges will be replaced after each day of use or immediately upon an indication of "breakthrough" (perceptible odors inside of the mask), whichever is less. High humidity situations (>80% relative humidity) may require cartridge replacement at a more frequent rate (every 4 hours).

Engineering controls such as additional ventilation may be used in place of respiratory protection if it is demonstrated through monitoring that the engineering controls are effective in reducing airborne concentrations.

3.4 Nuisance Dust, Pesticides, PCBs and Metals Monitoring

Dust is anticipated during planned building demolition at the Site. In addition, nuisance dust, pesticides, PCBs and metals have the potential for becoming a problem during disruptive or intrusive activities such as drilling and excavation. The specific metal concentrations are variable through the Site.

Where soils or other materials have the potential to generate dust during performance of the work, wetting and misting with water will be required before and during disruptive or intrusive activities. Should these controls be ineffective within work zones as evidenced by chronic visible airborne dust, Level C respiratory protection will be utilized, real time aerosol monitoring using an MIE PDM-3 Miniram or equivalent will be conducted, and the airborne metal concentration will be estimated using prior worst case soil concentration data for metals. The MIE PDM-3 Miniram is factory calibrated by the vendor prior to field use.

If airborne dust is visually observed migrating beyond the limits of the Site, and wetting and misting is being utilized, operations will be immediately halted. Work shall not resume until the circumstances resulting in the migration can be examined by the HSC and Project Manager and steps taken, as appropriate, to better control or alleviate dust generation and/or migration. This may involve suspending the activities until more favorable atmospheric conditions develop (e.g., winds die down or shift direction), or implementing other engineering controls to suppress dust. Such engineering controls could include erection of temporary windscreens adjacent to the work area or work zone perimeter misting walls or application of tactifiers.

4.0 ON-SITE CONTROL

4.1 Site Communication System

Personnel will operate using the "buddy system". Each individual shall maintain visual/aural contact with another individual or group at all times. If more than one group is working at the Site and the groups are not within visual/aural communication range, two-way radios or cell phones may be necessary to maintain communications.

4.2 Site Safety Zone and Access Control

No on-Site safety zones are required for non-intrusive activities. During intrusive activities (e.g., drilling and test pitting), an Exclusion Zone will be established by the SHSC. The Exclusion Zone will generally be a 25-foot radius from a single borehole or 25-foot offset from each side of a single test pit or group of boreholes and/or test pits. Monitoring will be periodically conducted at the downwind perimeters to assure that the concentrations are similar to background concentrations. If perimeter concentrations are greater than background concentrations for more than 5 minutes, the downwind perimeter shall be extended, where practical, or engineering controls will be implemented such that downwind and background concentrations are similar. Exposed materials such as cuttings will be contained or covered and perimeter monitoring will continue until ambient air concentrations upwind and downwind of the Exclusion Zone are equal. The limits of the Exclusion Zone will be marked with high visibility caution tape or four or more traffic cones or similar devices.

The Exclusion Zone will be accessed through a marked Contamination Reduction Zone (CRZ). The CRZ shall be used for gross decontamination of both personnel and equipment items. It shall be configured to allow the decontamination of the field crew while upwind of the Exclusion Zone. The SHSC or his designee will assure that all personnel entering the Exclusion Zone wear the required protective equipment and that upgraded level of protection equipment is readily available.

As work activities will be conducted throughout the Site, a centralized decontamination facility will be used for the full decontamination of drilling and sampling equipment and personnel. The facility will be lined with an impermeable material (e.g., geomembrane, polyethylene plastic sheet, etc.) and designed to capture decontamination fluids and solids within the lined confines. All decontamination fluids and solids will be properly collected, containerized, and properly stored until disposal occurs.

4.3 Personal Protective Clothing and Respiratory Protection

The following scheme will be used to designate the required level(s) of personal protective equipment and respiratory protection: the alphabetical designations "B," "C," and "D" shall refer specifically to levels of respiratory protection, namely pressure-demand air supplying respirators with escape provisions, air purifying respirators, and no respiratory protection, respectively. Since potential dermal exposure hazards may require a wide variety of personal protective clothing without regard to the required level of respiratory protection, the numerical designations "1," "2," and "3" will be used to specify the level of protective clothing that is to be employed in addition to the designated level of respiratory protection as described below (i.e., the level of protective equipment can be completely defined by a designation of "D-2," "B-1," etc.). The required levels of protective equipment and upgrade criteria for each work task are specified below. All equipment and clothing shall be inspected by the wearer prior to use. All suspect protective equipment will be rejected and disposed of as non-contaminated waste. Levels of protection are described below.

LEVEL D-1

1. Standard work clothes
   (long pants and sleeved shirt)
2. Steel toed boots
3. Safety glasses
4. High visibility safety vests
   (when working near public traffic)
5. Hard hats
   (when an overhead hazard is possible)
6. Hearing protection
   (during noise producing activities)
7. Work gloves
   (when working with equipment)

LEVEL D-2

1. Level D-1 protective clothing
2. Inner latex or nitrile gloves
3. Outer Nitrile Butyl Rubber (NBR) gloves

LEVEL D-3

1. Level D-2 protective clothing
2. Full-body protective splash suits (rain suit, coveralls and jacket, Polycoated Tyvek® suits)
3. Chemical protective boots

LEVEL C

1. Level D-3 protective clothing
2. Full-face air-purifying respirator

LEVEL B

1. Level D-3 protective clothing
2. Supplied air (open or closed circuit)

Full-body protective splash suits will be worn where it is probable that there will be contact with subsurface soils, groundwater and/or surface water containing PCBs and/or pesticides. Full-body protective splash suits will also be worn when working in muddy conditions.

Anticipated initial levels of protection for Site personnel are summarized by job function/task in the table below:

Job Function/Task	Location	Initial Level of Protection
Site visits, clearing, demolition, surveying, utility location	General Site	B C **D** **1** 2 3 other
Borings, wells, and test pits, sampling (upgrade to Level C PPE for emergency stabilization/demobilization only)	Exclusion Zone	B C **D** 1 **2** 3 other
Decontamination of personnel and/or equipment	Decontamination CRZ & Support Zones	B C **D** 1 **2** 3 other

If conditions are found which are beyond the above-referenced Level(s) of Protection, personnel are to leave the area immediately and obtain the required protective equipment. Should the personnel suspect an inhalation hazard (e.g., unusual and continuous odors, dizziness, or respiratory irritation), they are to immediately move upwind from the area and promptly notify the SHSC. Work will not proceed in these areas until the nature of the hazard has been assessed by air monitoring and additional protective measures are employed to the satisfaction of the SHSC. Re-entry will be from an upwind position (when possible). Monitoring will precede re-entry. Personnel who experienced symptoms will not re-enter the area until symptoms have subsided and additional equipment/precautions are employed as determined by the monitoring. An examination by a physician may be prudent depending on the symptoms and duration.

4.4 Decontamination

Decontamination will involve two phases. Gross decontamination of personnel and equipment, comprising removal of mud by dry brushing or scraping, will take place in the Contamination Reduction Zone established at the Site of each intrusive activity. All soil removed in this way will be backfilled into the borehole or test pit or collected, containerized and properly stored for disposal. All personnel and equipment will undergo gross decontamination prior to moving to a new investigation location on the Site. Prior to leaving the Site, personnel and equipment will undergo full decontamination at the central decontamination facility. Where appropriate to avoid

possible cross contamination, (for example between soil borings) full decontamination (e.g., steam cleaning, solution wash, etc.) of equipment and tools (e.g., augers, split-spoons, excavator bucket, etc.) will also take place between investigation locations.

Personnel Decontamination Procedures

All Site personnel involved in intrusive activities and/or contaminated personnel shall decontaminate prior to leaving the Site. The central decontamination facility will be lined with an impermeable material and designed to capture decontamination fluids and solids within the lined confines. The decontamination facility will include the following, at a minimum:

- 2 wash tubs (1 wash, 1 rinse),
- Several scrub brushes,
- Disposable towels and plastic bags,
- Seating to facilitate boot removal,
- Decontamination solution (e.g. Alconox),
- Duct tape,
- Hand soap, and
- Potable wash water.

Personnel will follow the decontamination procedure outline in the table below. At a minimum all personnel will wash their hands and face prior to eating, smoking or leaving the Site. The SHSC will inspect personnel and non-disposable protective equipment for cleanliness prior to release from the Site.

Decontamination Station/Step	Procedure
Station 1: Equipment Drop	Deposit equipment used on-Site (hand tools, sampling devices and containers, monitoring instruments, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Station 2: Outer Garment, Boots, and Gloves Wash and Rinse	Scrub boots, outer gloves and splash garments (if worn) with decon solution. Rinse thoroughly with water.
Station 3: Outer Glove Removal	Remove outer gloves. Deposit in container with plastic liner.

Station 4: Cartridge or Respirator Change (if applicable)	If worker leaves exclusion zone to change cartridges (or respirator), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves donned, joints taped, and worker returns to duty.
Station 5: Boot, Gloves and Inner Garment Removal (if applicable)	Boots, protective suit, inner gloves removed and deposited in disposal containers.
Station 6: Respirator Removal (if applicable)	Respirator is removed. Avoid touching face with fingers, respirator deposited on plastic sheet.
Station 7: Field Wash	Hands and face are thoroughly washed. Shower as soon as possible.

Equipment Decontamination Procedures

Monitoring equipment, respirators, and hand tools shall be retrieved and decontaminated using methods appropriate for the type of equipment. Containing equipment in plastic (as applicable) prior to Site entry will expedite decontamination. The HSCS shall inspect the equipment for cleanliness.

Drill rigs and excavation equipment decontamination will follow the methods described in the project Quality Assurance / Quality Control Project Plan (QAPP).

All disposable PPE will be containerized in DOT-approved 55 gallon drums and disposed of with other investigation derived waste (IDW) from the Site. IDW will be handled in accordance with Standard Operating Procedure (SOP) GFP-1 of the QAPP. Decontamination materials are also considered to be IDW and will be containerized in 55-gallon drums meeting the requirements of DOT-17H. Decontamination fluid and solids will be containerized separately.

5.0 CONTINGENCY AND EMERGENCY RESPONSE PLANS

If an unanticipated, potentially hazardous situation arises as indicated by visible contamination, unusual or excessive odors, Site personnel shall temporarily cease operations, move away to a safe area, and contact the Site Health and Safety Coordinator. The following procedures have been established to deal with emergency situations that might occur during Site and off-property activities. Prior to starting work at the Site, the local emergency response services will be contacted and informed that field activities will be in progress. Site personnel will familiarize themselves with the location of the nearest phones and medical facilities upon arrival at the Site. In the event of a serious emergency situation (e.g. medical problems beyond routine first aid, explosive gas concentrations, or fire beyond incipient stage), Site personnel shall contact the Camden Police Department, inform them of the nature of the emergency, and then notify Golder Associates' HSC. When help arrives, Site personnel shall defer all emergency response authority to appropriate responding agency personnel. Emergency notification information is summarized in Section 5.6.

Camden is served by local police, medical and fire services and is able to provide first response to all emergencies which might occur at the Site or off-property.

5.1 Medical Emergency Response Plan

The nature of chemical contamination on this project is not anticipated to present an immediate threat to human health. Other than removal of outer protective garments and gross contamination (e.g., mud), immediate emergency treatment of injuries should therefore generally take precedence over personal decontamination.

Should any person on the Site be injured or become ill, initiate the following emergency response plan and notify the Site Health and Safety Coordinator and Personnel Department as soon as possible:

1. If able, the injured person should proceed to the nearest available source of first aid. If the injured party is extremely muddy, remove outer garments and if necessary, wash the injured area with soap and water. If the "injury" involves a potential overexposure to hazardous gases or vapors, (headache, dizziness, nausea, disorientation), get the victim to fresh air and take him or her to the Cooper University Hospital, Three Cooper Plaza, Camden, New Jersey, (see Figure 2) telephone (856) 342-3430, for a complete physical examination as soon as possible.

If the injury involves foreign material in the eyes, immediately flush the eyes with emergency eye wash solution and/or rinse with copious amounts of potable water. Obtain or administer first aid as required. If further medical treatment is required, seek professional medical assistance as discussed below.

Appropriate measures should be taken to protect the privacy of workers in connection with putting on and taking off of protective clothing.

First aid providers shall wear latex gloves when providing any first aid. Severe injuries involving large quantities of blood require that first aid providers don Tyvek® coveralls and safety glasses in addition to gloves.

2. If the victim is unconscious or unable to move, or if there is any evidence of spinal injury, do not move the injured person unless absolutely necessary to save his or her life, until the nature of the injury has been determined. Administer rescue breathing using a CPR barrier if the victim is not breathing, control severe bleeding and immediately seek medical assistance as discussed below.

3. If further medical treatment is required and

   a. **the injury is not severe**, contact Cooper University Hospital (856) 342-3430 and take the injured party to the hospital by private automobile.

      Directions to the Hospital:
      From the Site turn north onto South Broadway;
      Make a right onto Martin Luther King Boulevard;
      Follow Martin Luther King Boulevard to Haddon Avenue; and,
      Turn right onto Haddon Avenue and arrive at Cooper University Hospital.

   b. **the injury is severe**, implement appropriate first-aid and immediately call for emergency medical assistance by dialing 911 from a standard phone.

   In both cases, if decontamination is not undertaken, appropriate precautions should be taken to avoid transfer of contaminants to vehicles and other facilities. This can be done by using plastic sheeting or the exposure blanket contained in the first aid kit.

4. Any injured person taken to the hospital shall be accompanied by an individual designated by the Health and Safety Coordinator to ensure prompt and proper medical attention. After proper medical treatment has been obtained, the designated companion should notify the HSC and prepare a written report. Site personnel shall maintain their medical insurance identification with them whenever they are on Site.

   In the event that any personnel are injured at the Site a copy of this HSCP shall be provided to any treating physicians, or treating health care workers or facilities.

5.2 Fire and Explosions

Dry chemical fire extinguishers are effective for fires involving ordinary combustibles such as wood, grass, flammable liquids, and electrical equipment. They are appropriate for small, localized fires such as a drum of burning refuse, a small burning gasoline spill, a vehicle engine fire, etc. No attempt should be made to use these extinguishers for well established fires or large areas or volumes of flammable liquids.

In the case of fire, prevention is the best contingency plan. There will be no smoking on Site except in pre-designated areas. Catalytic converters on the underside of vehicles are sufficiently hot to ignite dry grass. Personnel should avoid driving over dry grass that is higher than the ground clearance of the vehicle, and be aware of the potential fire hazard posed by the catalytic converter, at all times. Never allow a running vehicle to sit in a stationary position over dry grass or other combustible materials.

In the event of a fire or explosion:

- If the situation **can** be readily controlled with available resources without jeopardizing the health and safety of Site personnel, take immediate action to do so.

- If the situation **cannot** be readily controlled with available resources, without jeopardizing the health and safety of Site personnel, isolate the fire to prevent spreading, if possible. Clear the area of all personnel working in the immediate vicinity. Immediately notify Site emergency personnel and the Camden Fire Department by dialing 911 using a standard phone. Non emergency contact for the Camden Fire Department is at (856)-757-7511.

5.3 Chemical Exposure First Aid

In an event of exposure to chemicals through inhalation:

1. Move the victim to an up-wind location for fresh air.
2. Signal for help.
3. Initiate CPR to revive the victim, if necessary.
4. Contact Camden Police Department, if necessary.

For exposure through dermal route (including eyes):

1. Wash the affected area with copious fluids for at least fifteen (15) minutes (signal for help if necessary).
2. If irritation persists, seek professional medical care.

For ingestion:

1. Drink a large amount of water to dilute the contaminant(s).
2. Transport the victim to the hospital. Take a copy of this HSCP to the hospital.

If decontamination is not undertaken prior to transporting the victim to the hospital, appropriate precautions should be taken to avoid transfer of contaminants to vehicles and other facilities.

5.4 Unforeseen Circumstances

The health and safety procedures specified in this HSCP are based on the best information available at the time. Unknown conditions may exist, and known conditions may change. This HSCP cannot account for every unknown or anticipate every contingency. Should personnel suspect or encounter areas of substantially higher levels of contamination, or should any situation arise which is obviously beyond the scope of the safety procedures specified herein, work activities shall be modified (such as by moving to another location) or halted pending discussions with the HSC and implementation of appropriate protective measures.

5.5 Accident and Incident Reports

If an incident or accident occurs, the Health and Safety Officer and Project Manager shall be notified and an Incident Report completed on the form included as Attachment 5. The report shall be completed by an eye witnesses (if possible) along with assistance from the SHSC. The report will be forwarded to the HSC as soon as possible for further investigation or follow up.

5.6 Emergency Contact Information

Medical	911	Camden Emergency
Police	911	Camden Police Department
Fire	911	Camden Fire Department
Hospital	856-342-3430	Cooper University Hospital, Camden, NJ
USEPA Project Manager	212-637-3954	Mark Austin
Golder Associates Project Manager	856-793-2005	Randolph White
Golder Associates Project HSC	856-793-2005	James Valenti
USEPA National Response Center	732-548-8730	
Camden Police Water/Sewer Hotline	856-541-7867	
NJ One Call System	800-272-1000	

TABLE 1

MAXIMUM CHEMICAL CONSTITUENT VALUES
MARTIN AARON SUPERFUND SITE

Chemical	Groundwater *ppb*	Soils *mg/kg*
benzene	150	31
cis-1,2-DCE	380	24
1,2-dichloropropane	1.7	NR
1,1,1-TCA	87	NR
TCE	NR	630
PCE	NR	110
vinyl chloride	58	NR
n-nitrosodiphenylamine	38	NR
benzo(a)anthracene	NR	120
benzo(a)pyrene	NR	110
benzo(b)fluoranthene	NR	110
carbazole	NR	14
dibenzo(a,h)anthracene	NR	19
fluoranthene	NR	290
indeno(1,2,3-cd)pyrene	NR	59
pyrene	NR	230
aluminum	33000	NR
antimony	23.7	37.2
arsenic	7130	23300
barium	36500	30800
cadmium	45.7	110
chromium	NR	1080
copper	NR	1400
iron	51900	NR
lead	192	112000
manganese	1350	NR
mercury	NR	7.7
nickel	NR	576
selenium	NR	5.9
silver	NR	45.7
zinc	NR	23900
sodium	184000	NR
dieldrin	0.99	1,300*
aldrin	NR	1,300*
beta-BHC	NR	37*

Notes:
NR: Not Reported
ppb: parts per billion
mg/kg: milligram per kilogram
"*": ug/kg: microgram per kilogram

Reference: EPA RI Report (December 2004), ROD (September 2005), FS Tables

TABLE 2

AIRBORNE EXPOSURE LIMIT INFORMATION
MARTION AARON SUPERFUND SITE

Chemical	OSHA PEL	NIOSH REL	ACGIH TLV	IDLH	Ionization Potential, eVolts	PID Meter Response Factor	Odor Threshold, ppm
benzene	TWA 1 ppm ST 5 ppm	Ca TWA 0.1 ppm ST 1 ppm	10 ppm (TWA)	Ca [500 ppm]	9.24	0.6	34 - 119
cis-1,2-DCE	TWA 200 ppm	TWA 200 ppm	200 ppm (TWA)	1000 ppm	9.65	--	chloroform-like
1,2-dichloropropane	TWA 75 ppm	Ca	--	Ca [400 ppm]	10.87	--	chloroform-like
1,1,1-TCA	TWA 350 ppm	C 350 ppm [15-minute]	--	700 ppm	11	--	chloroform-like
TCE	TWA 100 ppm C 200 ppm 300 ppm (5min/2hr)	Ca	50 ppm (TWA)/10 ppm (STEL)	Ca [1000 ppm]	9.45	0.6	82
PCE	TWA 100 ppm C 200 ppm 300 ppm (5min/3hr)	Ca - minimize	25 ppm (TWA)/100 ppm (STEL)	Ca [150 ppm]	9.32	--	47
vinyl chloride	TWA 1 ppm C 5 ppm [15-minute]	Ca	5 ppm	Ca [N.D.]	9.99	--	pleasant
n-nitrosodiphenylamine	--	--	NE	--	--	--	--
benzo(a)anthracene	TWA 0.2 mg/m^3	--	suspect human carcinogen	Ca	--	--	--
benzo(a)pyrene	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3	suspect human carcinogen	Ca [80 mg/m^3]	--	--	--
benzo(b)fluoranthene	TWA 0.2 mg/m^3	--	suspect human carcinogen	--	--	--	--
carbazole	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3	--	Ca [80 mg/m^3]	--	--	--
dibenzo(a,h)anthracene	--	--	NE	--	--	--	--
fluoranthene	TWA 0.2 mg/m^3	0.1 mg/m^3	0.2 mg/m^3	Ca [700 mg/m^3]	varies	--	--
indeno(1,2,3-cd)pyrene	--	--	NE	--	--	--	--
pyrene	TWA 0.2 mg/m^3	Ca TWA 0.1 mg/m^3	0.2 mg/m^3	Ca [80 mg/m^3]	varies	--	--
aluminum	TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)	TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)	--	N.D.	NA	--	odorless
antimony	TWA 0.5 mg/m^3	TWA 0.5 mg/m^3	0.5 mg Sb/m^3 (TWA)	50 mg/m^3	NA	--	--
arsenic	TWA 0.010 mg/m^3	Ca C 0.002 mg/m^3 [15-minute]	0.1 mg As/m^3 (TWA)	Ca [5 mg/m^3 (as As)]	NA	NA	odorless
barium	TWA 0.5 mg/m^3	--	--	50 mg/m^3	--	--	--
cadmium	TWA 0.005 mg/m^3	Ca	0.01 mg/m^3 (total dust)/0.002 mg/m^3 (respirable dust)	Ca [9 mg/m^3 (as Cd)]	NA	--	odorless
chromium	TWA 1 mg/m^3	TWA 0.5 mg/m^3	0.5 mg/m3 (TWA)	250 mg/m^3 (as Cr)	NA	--	odorless
copper	TWA 1 mg/m^3	TWA 1 mg/m^3	1 mg/m^3	100 mg/m^3 (as Cu)	NA	--	odorless
iron	TWA 10 mg/m^3	--	NE	2500 mg/m^3	NA	--	--
lead	TWA 0.050 mg/m^3	TWA 0.050 mg/m^3	0.15 mg/m^3 (TWA)	100 mg/m^3 (as Pb)	NA	NA	--
manganese	C 5 mg/m^3	TWA 1 mg/m^3 ST 3 mg/m^3	5 mg/m^3	500 mg/m^3 (as Mn)	NA	--	--
mercury	TWA 0.05 mg/m^3 C 0.01 mg/m^3	--	0.01 mg/m^3	10 mg/m^3	--	--	--
nickel	TWA 1 mg/m^3	Ca TWA 0.015 mg/m^3	1 mg/m^3 (TWA), 0.1 mg/m^3	Ca [10 mg/m^3 (as Ni)]	NA	--	odorless
selenium	TWA 0.2 mg/m^3	TWA 0.2 mg/m^3	--	1 mg/m^3 (as Se)	NA	--	--
silver	TWA 0.01 mg/m^3	TWA 0.01 mg/m^3	0.1 mg/m^3 (metal)/0.1 mg/m^3 (soluble compounds)	10 mg/m^3 (as Ag)	NA	--	--
zinc	TWA 10 mg ZNO/m^3, NE	--	10 mg/m^3	--	NA	--	--
sodium	TWA 2 mg/m^3	C 2 mg/m^3	C 2 mg/m^3	10 mg/m^3	--	--	odorless
dieldrin	TWA 0.25 mg/m^3 [skin]	Ca TWA 0.25 mg/m^3 [skin]	0.25 mg/m^3	Ca [50 mg/m^3]	--	--	--
aldrin	TWA 0.25 mg/m^3 [skin]	Ca TWA 0.25 mg/m^3 [skin]	0.25 mg/m^3	Ca [25 mg/m^3]	--	--	--
beta-BHC	TWA 300 ppm	TWA 300 ppm	--	1300 ppm	9.88	--	chloroform-like

OSHA PEL: Occupational Safety and Health Adminstration Permissable Exposure Limit
NIOSH REL: National Institute of Occupational Safety and Health Recommended Exposure Limit
ACGIH TLV: American Conference of Governmental Industrial Hygienists Threshold Limit Value
IDLH: Immediately Dangerous to Life or Health
Ca: carcinogen
lowest feasible: reduce exposure to lowest feasible concentration
minimize: minimize exposure

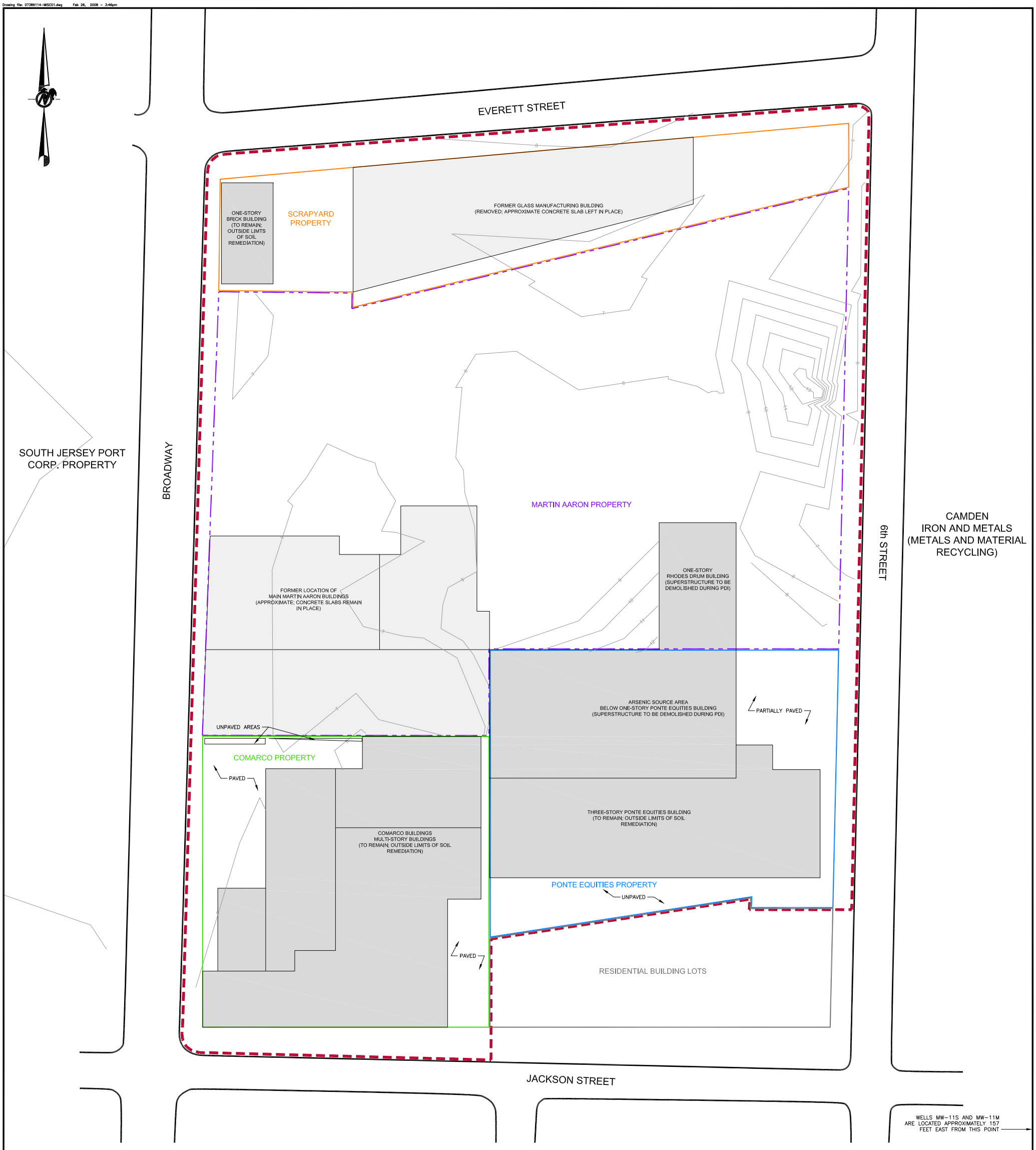
ppm: parts per million
mg/m^3: milligrams per cubic meter
mg/kg: milligrams per kilogram of body weight (Sax)
NE: Not Established
NA: Not Applicable
--: Not Reported/Available

TABLE 3

JOB SAFETY ANALYSIS
MARTIN AARON SUPERFUND SITE

Job/Task	Potential Hazard	Remedy
Site Mobilization	Traffic Accident	Undergo driver safety training, practice safe driving techniques. Ensure that vehicles are road-worthy and in current repair. Ensure that all necessary towing equipment is present and functioning properly, and that safety chains are properly secured.
Building Demolition	Overhead	Restrict access to condemned structures to personnel associated with the demolition activities. Site personnel are required to wear a hard hat when working in the vicinity of potential overhead hazards, whether it is a "hard-hat area" or not.
	Personal Injury	Restrict access to demolition zone to personnel associated with the demolition activities. Maintain awareness at all times of the working environment, including possible hazards, work being performed, and the limits of the demolition area.
Drilling/Excavation	Slip/Trip/Falls	Maintain proper PPE while working, including boots with suitable traction.
		Maintain safe working distance from the edge of open excavations.
		Keep working area clear of tripping hazards at all times. Properly store equipment so that it does not become a possible hazard. Identify and minimize any hazards caused by cables or hoses or other equipment
	Overhead	Overhead utilities are present at the Site along the perimeters and immediately adjacent to Site access gates. Adequate clearance for the passage of equipment beneath overhead cables must be verified. Equipment operation below overhead cables shall comply with industry-standard clearance guidelines.
	Pinch Points	Be aware of all pinch points associated with the drilling and excavation equipment, and where possible, cover points or clearly identify their location.
	Personnel Injury	Maintain awareness at all times of the working environment, including possible hazards, work being performed and the limits of the work area.
		Where possible cover all moving parts that personnel may come in casual contact with.
		Ensure that all personnel know the location and operation procedures for the automatic stop mechanism for the drilling equipment.
		Maintain proper PPE at all times while performing all operations associated with drilling and excavation including, but not necessarily limited to: hard hat, gloves, eye protection, hearing protection and steel toe boots.
	Weather	The weather forecast for each day will be checked each morning.
		In the event of lightning, all work will be stopped and personnel will wait-out the storm in the shelter of their automobiles.
		In the event of high winds that result in equipment instability, prohibit the safe, controlled use of the equipment, or otherwise results in unsafe working conditions, secure the equipment and Site until such time favorable conditions return.
		Work may continue during periods of inclement weather provided that <u>all</u> contractor, inspection and safety personnel feel comfortable under the present working conditions.
Sample Handling	Contaminated Samples	Previous chemical analysis performed Site indicated the presence of arsenic and other constituents of concern for dermal exposure. When handling samples of Site soils and groundwater, or if there is potential to contact these media during work activities, the required PPE will be employed.
	Slip/Trip/Fall	Samples recovered/collected during drilling and excavation activites shall be placed out of highly trafficked areas and properly secured.
Lifting	Personnel Injury	All heavy or cumbersome items, such as sample containers/cooler, will be lifted by 2 or more people in order to reduce the possibility of personnel injure and loss of balance.
		Any items hoisted shall be guided by a worker and all personnel within the area shall be made aware of the operation.
		Personnel not performing a necessary task shall remain clear of items being hoisted until secured.
General	Heat Stress	Personnel must continually replenish body fluids and maintain hydration to combat heat related illnesses. See supplementary information herein.
	Cold Stress	Personnel shall wear appropriate cold-weather clothing. Should clothing become wet, change into dry clothes before resuming work.
	Over-exposure	Personnel shall protect themselves from over-exposure to harmful UV radiation by wearing appropriate clothing and sunblock.

Drawing file: 07386114-MISC01.dwg Feb 26, 2008 – 3:46pm



LEGEND

- LIMIT OF SOIL REMEDIATION
- MARTIN AARON PROPERTY (OWNED BY MR. MARTIN AARON)
- PONTE EQUITIES PROPERTY (OWNED BY PONTE EQUITIES, INC.)
- COMARCO PROPERTY (OWNED BY MR. THOMAS HOVERSEN AND MRS. KAREN G. HOVERSEN
- SCRAPYARD PROPERTY (OWNED BY MR GEORGE P. ACKERLE AND MS. CALOGERA C. ACKERLE)
- RESIDENTIAL BUILDING LOTS
- 10 GROUND ELEVATION (FT–MSL)
- EXISTING BUILDING
- FORMER BUILDING (APPROXIMATE)

REFERENCES

1.) BASE MAP, INCLUDING STREETS, EXISTING BUILDINGS AND PROPERTY LINES, DIGITIZED FROM FIGURE TITLED "LIMITS OF SOIL REMEDIATION, MARTIN AARON SUPERFUND SITE," DATED MAY 8, 2007, PROVIDED BY de maximis, INC. FORMER BUILDING DIGITIZED FROM FIGURE TITLED "SITE LOCATION MAP, PROPOSED PLAN," PREPARED BY CH2MHILL. GROUND SURFACE TOPOGRAPHY DIGITIZED FROM FIGURE 1–2 OF THE EPA FEASIBILITY STUDY, TITLED "MARTIN AARON SITE LAYOUT AND TOPOGRAPHY," PREPARED BY CH2MHILL. THE COORDINATE SYSTEM IS NJ STATE PLANE, FIPS ZONE 2900. THE DATUM IS NAD 83. THE LOCATIONS OF ALL STRUCTURES AND PROPERTY LINES ARE APPROXIMATE ONLY.

2.) CAP AREA DIGITIZED FROM FIGURE 4–5 OF THE EPA FEASIBILITY STUDY, TITLED "SOIL MEDIA ALTERNATIVE 4 CAP, EXCAVATION, TREATMENT, AND OFF SITE DISPOSAL, MARTIN AARON SUPERFUND SITE," PREPARED BY CH2MHILL. THE CAP AREA HAS BEEN MODIFIED ON THIS DRAWING TO REFLECT CHANGES TO THE BUILDING OUTLINES.

3.) FORMER GLASS MANUFACTURING BUILDING DIGITIZED FROM HARD COPY OF FIGURE 4, 1926 SANBORN MAP OF BLOCK 460.

25 0 25 50
SCALE FEET

FIGURE 1

PROJECT No.	073-86114-	
FILE No.	07386114-MISC01	
REV. 0	SCALE	AS SHOWN
DESIGN	RSV	02/08/08
CADD	RG	02/27/08
CHECK	KFM	02/27/08
REVIEW	SDM	02/27/08

TITLE

SITE MAP

PROJECT

MARTIN AARON SUPERFUND SITE
CAMDEN, NEW JERSEY

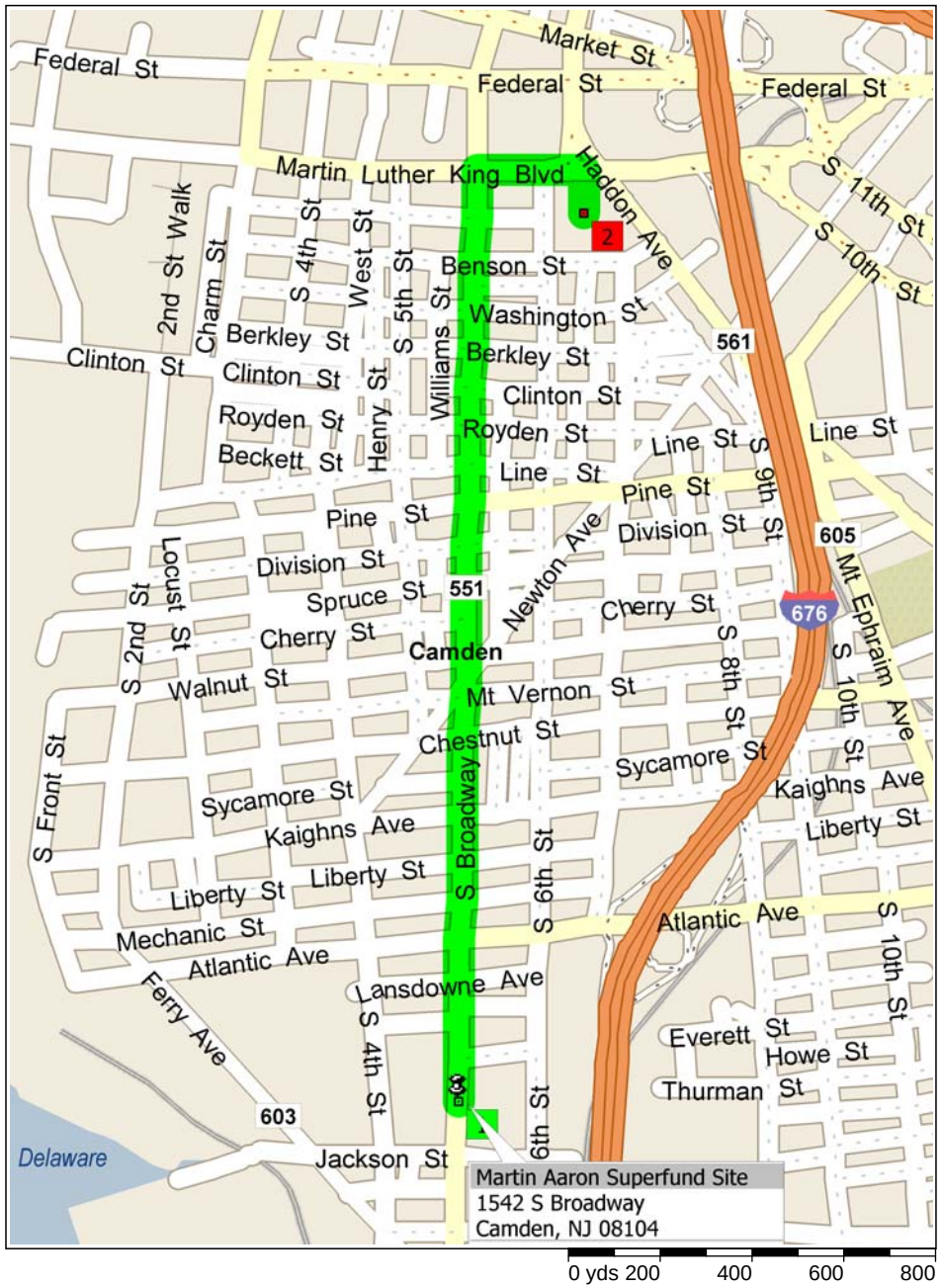
REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

NJ Authorization #24GA28029100

Golder Associates
Philadelphia USA

FIGURE 2 - Martin Aaron Superfund Site to Cooper University Hospital

1.3 miles; 2 minutes



8:00 AM	0.0 mi	1 Depart Martin Aaron Superfund Site [1542 S Broadway, Camden, NJ 08104] on CR-551 [S Broadway] (North) for 1.0 mi
8:01 AM	1.0 mi	Keep STRAIGHT onto CR-551 [Bill Cosby Pl] for 0.1 mi
8:01 AM	1.1 mi	Turn RIGHT (East) onto Martin Luther King Blvd for 0.1 mi
8:02 AM	1.3 mi	Turn RIGHT (South) onto Local road(s) for 98 yds
8:02 AM	1.3 mi	2 Arrive Cooper Hospital [401 Haddon Ave, Camden, NJ 08103, (856) 342-2000]

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ATTACHMENT 1

FIELD PROCEDURES CHANGE AUTHORIZATION

Instruction Number: _____ Date:_____

Duration of Authorization Requested ___ Today only

___ Duration of Task

Description of Procedures Modification:

Justification:

Person Requesting Change:	**Verbal Authorization Received From:**
Name	Name Time
Title	Title
Signature	Approved By (Signature of person named above to be obtained within 48 hours of verbal authorization)

ATTACHMENT 2

SITE HEALTH AND SAFETY PLAN ACKNOWLEDGEMENT

I have read understand and agree to follow the provisions detailed in the Health and Safety Contingency Plan (HSCP) for the Martin Aaron Superfund Site.

I am aware of emergency procedures, equipment locations, and emergency telephone numbers.

I understand that my failure to comply with these provisions may lead to disciplinary actions and/or my dismissal from the Site.

Printed Name	Organization	Signature	Date/Time

This form is to be kept on file on Site. Copies should be made available to personnel from all companies involved with Site work.

ATTACHMENT 3

REPORT OF UNSAFE CONDITIONS AND PRACTICES

Description of Unsafe Condition or Practice _____

_____

_____

_____

_____

Description of Circumstances Surrounding Unsafe Condition or Practice_____

_____

_____

_____

_____

Is this an Existing Condition or Potential Hazard? _____

Reported To _____

Reported By _____ Date _____

Comments_____

_____

_____

_____

_____

Report Received By _____

Date _____

ATTACHMENT 4

DAILY SAFETY BRIEFING FORM

The following personnel were present at the daily safety briefing conducted at _____ (time) on _____ (date) at _____ (location).

Name	Signature

Fully charged ABC Class fire extinguisher available on site? ☐ YES

Fully stocked First Aid Kit available on site? ☐ YES

All project personnel advised of location of nearest phone? ☐ YES

All project personnel advised of location of designated medical facility or facilities? ☐ YES

Additional task-specific JSAs:

_____

_____

_____

_____

_____

_____

_____

Field Team Leader or Site Health and Safety Coordinator:

_____

Signature Date

ATTACHMENT 5

INCIDENT REPORT FORM

In the event of any injury, accident or illness requiring medical attention beyond minor first aid, please complete this form. Retain two copies for your files and send the original to Linda Laganella in the Mount Laurel, New Jersey, office of Golder Associates Inc.

Employee's office mailing address:

_____

_____

_____

_____

Location of office (if different):

_____

_____

_____

_____

EMPLOYEE INFORMATION:

Employee name:_____

Employee number:_____

Home address:

_____

_____

_____

Occupation/Position:_____

Department or group:_____

PROJECT INFORMATION:

Project number: _____ Project Manager: _____

Project short title: _____ Field Supervisor: _____

Project Description (briefly describe the project, location, employee's role, etc.):

_____

_____

_____

_____

_____

-over-

ACCIDENT/EXPOSURE INFORMATION:

Description of accident/incident (briefly describe how the accident/incident occurred, what task the employee was working on at the time, working conditions, etc.)

_____

_____

_____

_____

_____

INJURY/ILLNESS INFORMATION:

Description of injury/illness (please describe the nature of the injury/illness, body part(s) affected, and the object/agent which caused the injury/illness):

_____

_____

_____

_____

_____

Name and address of attending physician:

_____

_____

_____

_____

Name and address of hospital (if admitted):

_____

_____

_____

_____

Report prepared by:_____

Title:_____

Date:_____