REVISED FINAL REMEDIAL INVESTIGATION REPORT

A world of capabilities delivered locally

REVISED FINAL REMEDIAL INVESTIGATION REPORT

Folcroft Landfill and Annex Site
Folcroft, Pennsylvania

Submitted To: US Environmental Protection Agency
1650 Arch Street
Philadelphia, PA 19103

Prepared For: Folcroft Landfill Steering Committee

Prepared By: Golder Associates Inc.
200 Century Parkway, Suite C
Mt. Laurel, NJ 08054 USA

Distribution:

4 Copies	USEPA
1 Copy	PADEP
1 Copy	USFWS
1 Copy	Golder Associates Inc.

May 2018 **Project No.: 023-6134.007**

Golder Associates

EXECUTIVE SUMMARY

This Revised Final Remedial Investigation Report (Final RI Report) for the Folcroft Landfill and Annex Site (Site) has been prepared by Golder Associates Inc. (Golder) on behalf of the Folcroft Landfill Steering Committee (Steering Committee). In May 2017, Golder submitted the Revised RI Report that updated the original RI Report that was submitted to the United States Environmental Protection Agency (USEPA) in May 2010. The May 2017 RI Report and this Final RI Report document the results of the site investigations and risk assessments performed from 2006 through 2017 to satisfy the requirements of the Administrative Settlement Agreement and Order on Consent (Settlement Agreement) entered into between the USEPA and the Steering Committee. All work was performed in accordance with the Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Golder 2006a) and subsequent work plans that were reviewed and approved by the USEPA.

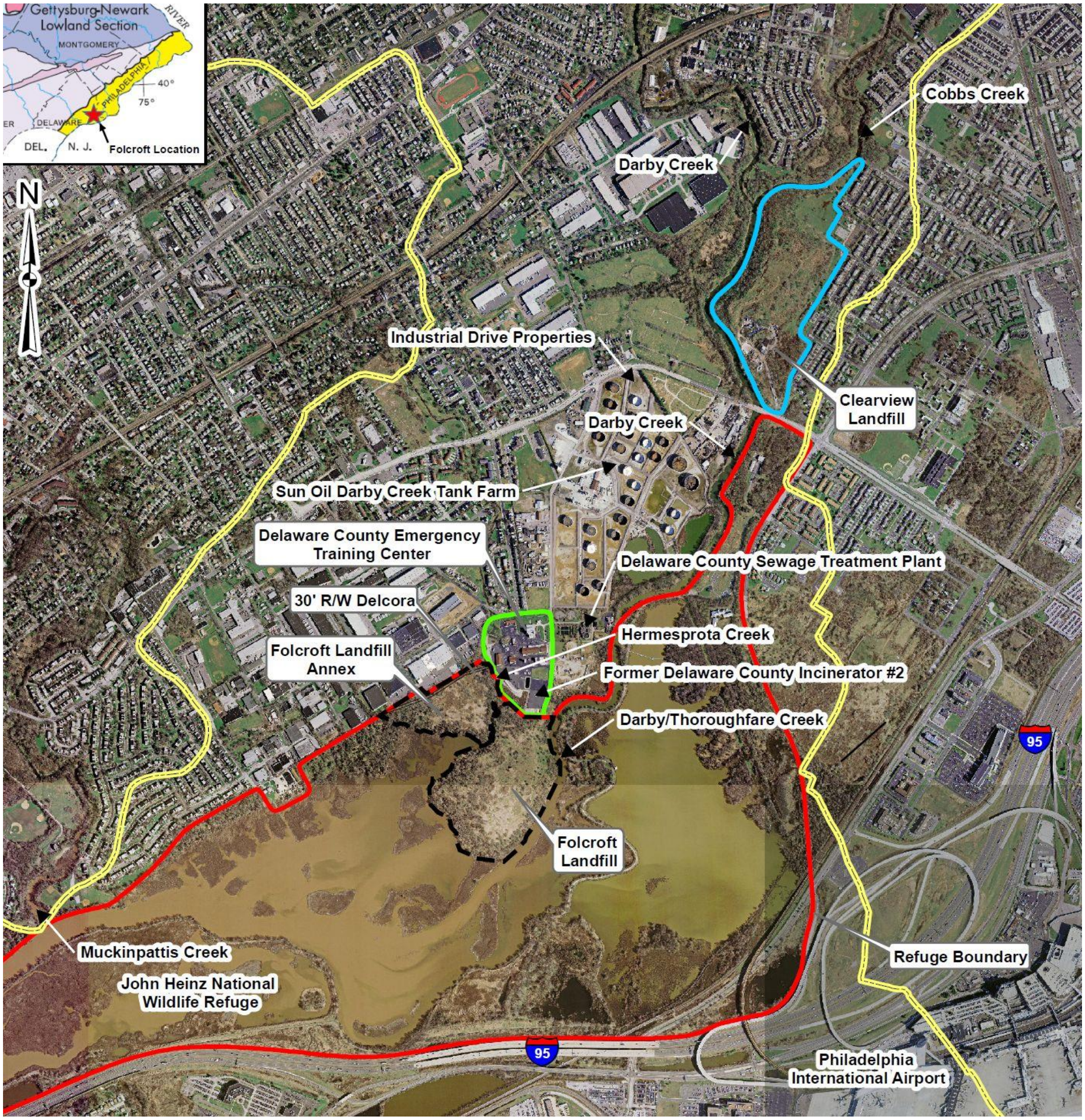
SITE HISTORY

The Site is a former landfill that operated from approximately 1961 to 1974, accepting a variety of municipal, demolition, industrial, and commercial wastes. Landfill closure activities, which included a 2-foot soil cover, grading requirements, and were performed under PADER supervision, were completed around 1977. In 1980, the United States Department of Interior (DOI) purchased the Site as part of a Congressional authorization to expand the Tinicum National Environmental Center (“TNEC”), which is now the John Heinz National Wildlife Refuge at Tinicum (the Refuge). Figure ES-1 shows the Site and the boundary of the Refuge. DOI’s Fish and Wildlife Service (FWS) has operated the Refuge since then.

Various US Government-led investigations, which included installing groundwater monitoring wells, were conducted at the Landfill between 1978 and 1998. In May 2000, USEPA proposed the Lower Darby Creek Area (LDCA) for listing on the National Priorities List (NPL). The LDCA initially included seven sources,[1] but the Final NPL listing for the LDCA on June 14, 2001 included only the Clearview Landfill and the Folcroft Landfill and Annex. The USEPA is taking the lead performing the RI/FS for the Clearview Landfill. This Final RI Report is limited to the Folcroft Landfill and Annex. The Site history is further summarized in Table ES-1, located at end of this Executive Summary.

[1] The seven sites were: 1) the Clearview Landfill; 2) the Industrial Drive properties; 3) the Oily Sludge Disposal Area and 4) Catalyst Disposal Area, both which are located at the Sun Oil Terminal; 5) the former Delaware County (DELCO) Sewage Treatment Plant; 6) the former DELCO Incinerator; and 7) the Folcroft Landfill and Annex.

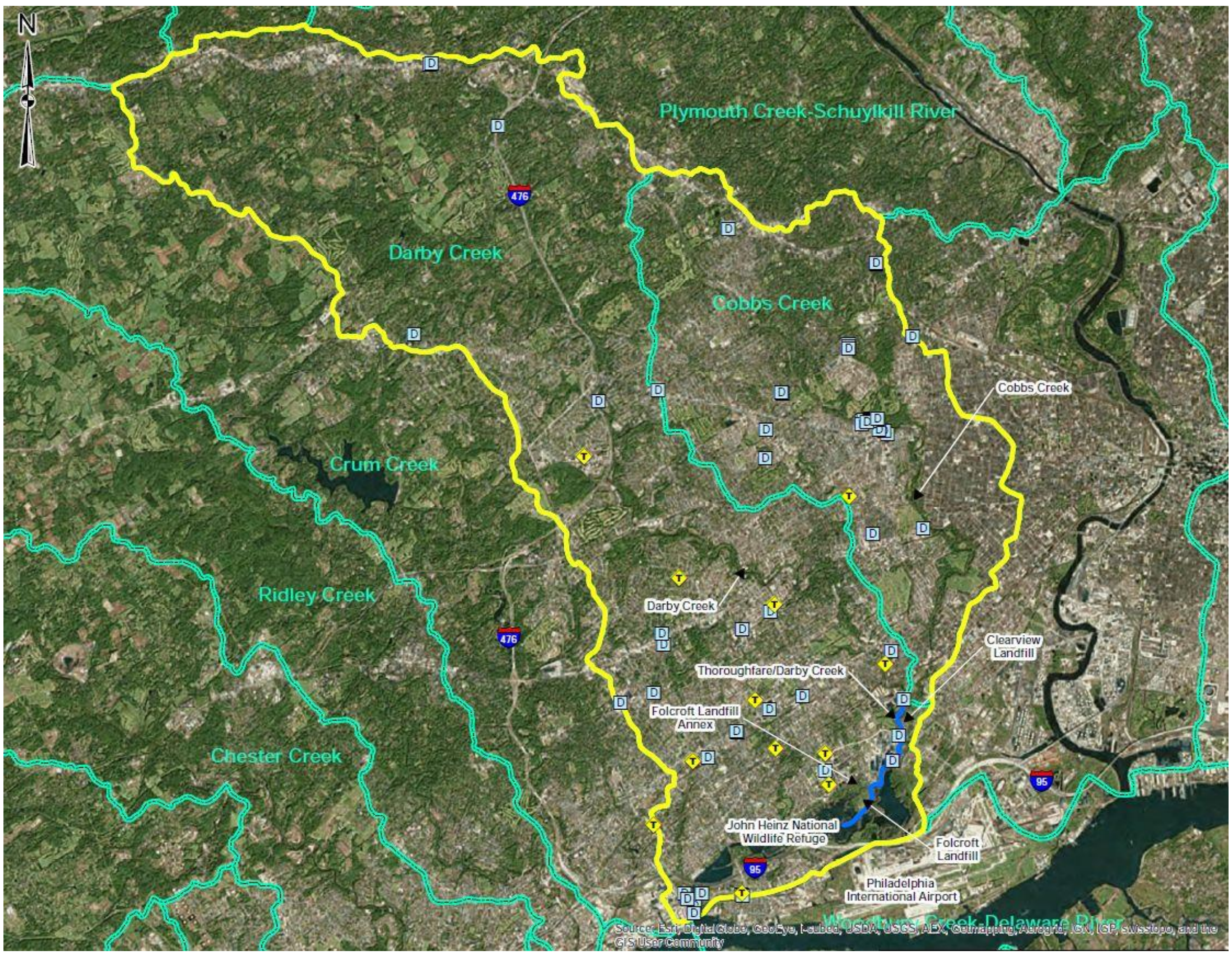
Figure ES-1: Lower Darby Creek Area and the Folcroft Landfill and Annex Site



SITE SETTING

The LDCA is a depositional and tidal environment located at the downstream end of the Darby-Cobbs Creek Watershed, draining 77 square miles in three suburban counties as well as parts of the City of Philadelphia. See Figure ES-2. The watershed has a population of approximately 500,000 residents and numerous permitted and unpermitted dischargers to surface water. Within the LDCA, the Site is located in an area where stream gradients flatten sharply, creating a natural sediment depositional area. The creeks adjacent to the Site are tidally connected to the Delaware River, with flow reversal occurring during the tidal cycle. Tides generally have a 4 to 4.5-foot range in the vicinity of the Site.

Figure ES-2: Darby-Cobbs Creek Watershed



The Site is located in an industrialized portion of southeastern Delaware County and consists of two adjacent sections, the Landfill and Annex, that are separated by Hermesprota Creek. The Landfill is approximately 47.5 acres in size and is bordered by Darby Creek/Thoroughfare Creek to the east and southeast, Hermesprota Creek to the west, a tidal marsh to the south, and industrial/commercial properties to the north. The Annex is approximately 16.5 acres in size and is bordered by Hermesprota Creek to the east and northeast, industrial/commercial properties to the north and northwest, an unnamed tributary to the west and southwest, and a tidal marsh to the south. The Landfill and Annex sit above the tidal portion of the surrounding creeks and marshes with a maximum elevation of approximately 40 feet NAVD88. The Philadelphia Airport and I-95 are outside the eastern edge of the Refuge.

REMEDIAL INVESTIGATION ACTIVITIES

RI activities were conducted from 2006 through 2016. Consistent with the RI/FS Work Plan, these investigations and associated risk assessments were limited to the terrestrial environment within the boundaries of the Landfill and Annex and did not include any aquatic investigations or assessments. USEPA is separately evaluating impacts from the entire watershed on the LDCA. For the purpose of this report, the "Site" refers to property within the boundaries of the Landfill and Annex. Any investigation outside of the boundaries of the Landfill and Annex is considered "off-Site".

Investigations took place in two parts: initial investigations, and off-Site groundwater investigations. Initial field work began in March 2006 and was completed in June 2008, and included the following tasks:

- Site reconnaissance to assess the general condition of the soil cover, and detailed inspection of the site perimeter;
- Soil investigation to assess the physical condition and thickness of the existing soil cover as well as to evaluate the presence of constituents of concern (COCs) within surface and subsurface soils and the potential for offsite transport. Included installation of 54 direct push borings and collection of 177 surface and subsurface soil samples;
- Seep investigation to evaluate the presence of COCs in "intertidal" seeps (no conventional seeps were identified). Included soil and aqueous samples at 7 seep locations within the intertidal zone;
- Initial groundwater investigations to evaluate the presence of COCs in groundwater and the potential for offsite migration. Included installation of six on-Site monitoring wells, redevelopment of existing wells, and two rounds of groundwater monitoring from 12 wells;
- Landfill gas/ambient air investigation to assess the potential for off-Site methane migration as well as the presence of COCs in ambient air and the potential for off-Site transport; and
- Land surveying to define the property boundary, confirm site topography, and locate all sampling points.

The results of these investigations were used to perform a baseline human health risk assessment (BHHRA) and a screening level ecological risk assessment (SLERA). The RI results along with the BHHRA and SLERA were initially submitted to USEPA in the May 2010 RI Report.

As mentioned above, additional off-Site groundwater investigations were conducted in response to USEPA comments on the May 2010 RI Report to evaluate the potential presence of Site-related COCs (primarily 1,4-dioxane and chlorinated volatile organic compounds [Cl-VOCs]) in groundwater beyond the limits of the

Landfill (beneath Thoroughfare Creek/Darby Creek and further downgradient within the Refuge). Field work began in January 2012, was completed in July 2016, and included the following:

- A groundwater investigation conducted at the southern toe of the Landfill and immediately across Thoroughfare Creek. This investigation included screening boring advancement, installing seven monitoring wells, and groundwater monitoring;
- An overburden groundwater investigation conducted at upgradient, on-Site, and downgradient locations. This investigation consisted of groundwater screening with Hydropunch® borings, installing 10 monitoring wells, and groundwater monitoring; and
- A bedrock groundwater investigation conducted at on-Site and downgradient locations. This investigation consisted of downhole geophysical logging of existing wells, installing three bedrock monitoring wells, on-Site groundwater screening with a Hydropunch® boring, and groundwater monitoring.

Additionally, in response to USEPA's comments on the initial RI Report regarding air monitoring, a supplemental ambient air monitoring program was implemented to address exceedances of screening levels observed previously. Interim submittals for the Supplemental Ambient Air Monitoring program and the groundwater investigations conducted after 2011 were prepared and submitted to the USEPA following the completion of all associated field work. The submittals are included with this report as Appendices.

CONCEPTUAL SITE MODEL

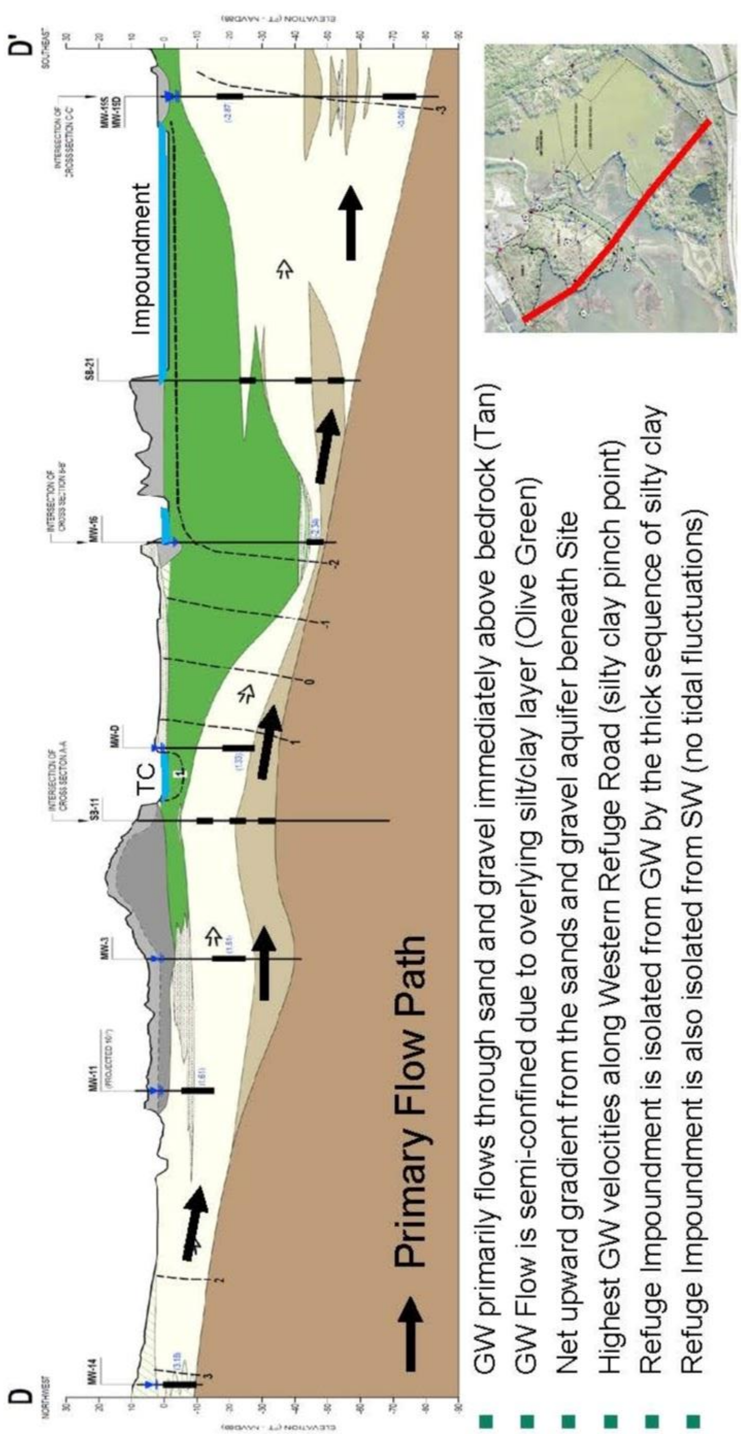
The results of the off-Site groundwater investigations refined the current understanding of Site geology, groundwater flow, and off-Site contaminant transport.

Geology

The Site is located in the Coastal Plain just east (downgradient) of the Fall Line and is underlain by unconsolidated materials. Across the Site, there is a 20- to 40-foot layer of Coastal Plain deposits (the "overburden"), overlying bedrock of the Wissahickon Formation. See Figure ES-3.

- At the Landfill, cover soil and waste overlie silts and silty clays; however, the silts/silty clays do not form a continuous layer beneath the waste. Beneath the silts/silty clays is a sequence of sands and gravels with coarser materials generally found deeper and closer to the bedrock consistent with deposition in a fluvial system. Gaps in the silt/silty clay layer at the base of the waste in the Landfill allow vertical migration of groundwater downward into the underlying sand and gravel units.
- Moving Off-Site and downgradient (in an easterly direction), there is a thick sequence of continuous, silty clays overlying the sand and gravel units. This continuous silty clay isolates underlying groundwater from adjacent surface water and the Refuge Impoundment.

Figure ES-3: Conceptual Site Cross-Section



Groundwater Flow

Groundwater flow in both the overburden and bedrock migrates in a generally southeasterly direction. The relatively high hydraulic conductivity in deep sands and gravels of the overburden indicate that the sand and gravel units are the preferential COC-pathway for migration.

Net vertical groundwater gradients between overburden and bedrock are upward at and adjacent to the Landfill. Observed net vertical gradients between overburden and bedrock are downward in areas of the Refuge downgradient of the Landfill. However, the vertical migration of groundwater into the bedrock from the overburden sand and gravel materials is limited due to: 1) the near-horizontal foliation (i.e., repetitive layering in metamorphic rocks) in the upper bedrock at the overburden/bedrock interface; 2) the lower hydraulic conductivity of the upper bedrock compared to the hydraulic conductivity of the sand and gravel overburden; and 3) generally upward vertical hydraulic gradients beneath the Landfill.[2]

SUMMARY OF RI RESULTS AND CONCLUSIONS

Existing Cover Assessment

The Landfill and Annex are vegetated with open fields and gentle slopes in the central portions that transition to shrubs and wooded areas on moderate to steep slopes along the perimeters. In localized sections along the perimeter there were areas of debris at the surface. Along the water's edge there were locations where buoyant waste from off-site (e.g., bottles, cans, plastics, wood, and rubber) appears to have washed up with the rise and fall of the tide, and other localized areas where intertidal seeps have been identified.

Cover soil ranges in thickness from less than 1 foot up to approximately 12 feet, and consists of topsoil, sand, silt, clay, and gravel. However, the Landfill and Annex each have soil covers greater than 1-foot in thickness over only approximately 30 percent of their surface areas. These areas are generally located in the central portions of the properties. Landfill cover is absent in localized areas where waste/debris is present at the surface; however, some debris may have been present in the cover material.

While there are localized areas where waste is present at the surface, and portions of the periphery of the Landfill and Annex exhibit steep slopes, there is very little visual evidence of continuing erosion on the surfaces of the Landfill and Annex. Therefore, erosion is not considered a significant pathway for off-Site contaminant transport.

[2] Furthermore, the difference in groundwater temperatures observed along the Western Refuge Road compared to the Landfill suggest a lack of direct hydraulic communication between bedrock groundwater beneath the Landfill and bedrock groundwater near Western Refuge Road and that the colder groundwater water observed along the Western Refuge Road may be controlled by a different, deeper, groundwater source.

Nature and Extent of Potential Contamination

Landfill Gas

The Landfill gas investigation showed that off-Site methane migration is not a concern. The initial ambient air monitoring survey and supplemental monitoring for COCs also showed that air impacts are not a concern at the Landfill or Annex.

Soil

Concentrations of several metals (primarily arsenic and chromium) and SVOCs (primarily benzo[a]pyrene) in cover soils at the Landfill and Annex exceed background levels. However, exceedances of the Pennsylvania Non-Residential Surface Soil Direct Contact Medium Specific Concentrations (MSCs) are very isolated, and are limited to the following:

- Landfill - Beryllium at L-4 (0-6 inches) and L-39S (0-6 inches), Cadmium at L-14 (0-6 inches), Iron at L-39S (0-6 inches), and Lead at L-4 (0-6 inches) and L-36 (0-6 inches)
- Annex - Arsenic at A-22 (6-24 inches)

Intertidal Seeps

Leachate seeps are not present at the Site. However, several intertidal bank water seeps are present at low tide at both the Landfill and Annex, attributed to surface water flushing in and out of banks. Aqueous analytical results from these locations show that intertidal seeps are impacted primarily by metals and some pesticides. However, the seeps are limited in area, are not easily accessed, and only appear at low tide. While dissolved contaminants in intertidal seepage may migrate into surface water, the extent of such seeps is very small compared to the overall perimeter of the landfills.

Groundwater Flux

The updated Conceptual Site Model (CSM), based on the extensive Off-Site Groundwater Investigation, is that overburden groundwater does not discharge into surface waters of the Refuge, but instead flows in the deep sand and gravel unit that underlies the silty clay unit. The silty clay isolates the overburden groundwater from the adjacent surface waters and the Refuge Impoundment. As a further conservative screening evaluation, the groundwater flux from the Landfill and the Annex into adjacent surface water bodies in the hypothetical absence of the observed clay layer, was re-evaluated utilizing a series of Pennsylvania Department of Environmental Protections Agency (PADEP)-approved groundwater modeling programs. The results of this model screening demonstrate that there would be no impact on surface water quality from this hypothetical groundwater discharge from the Landfill or Annex.

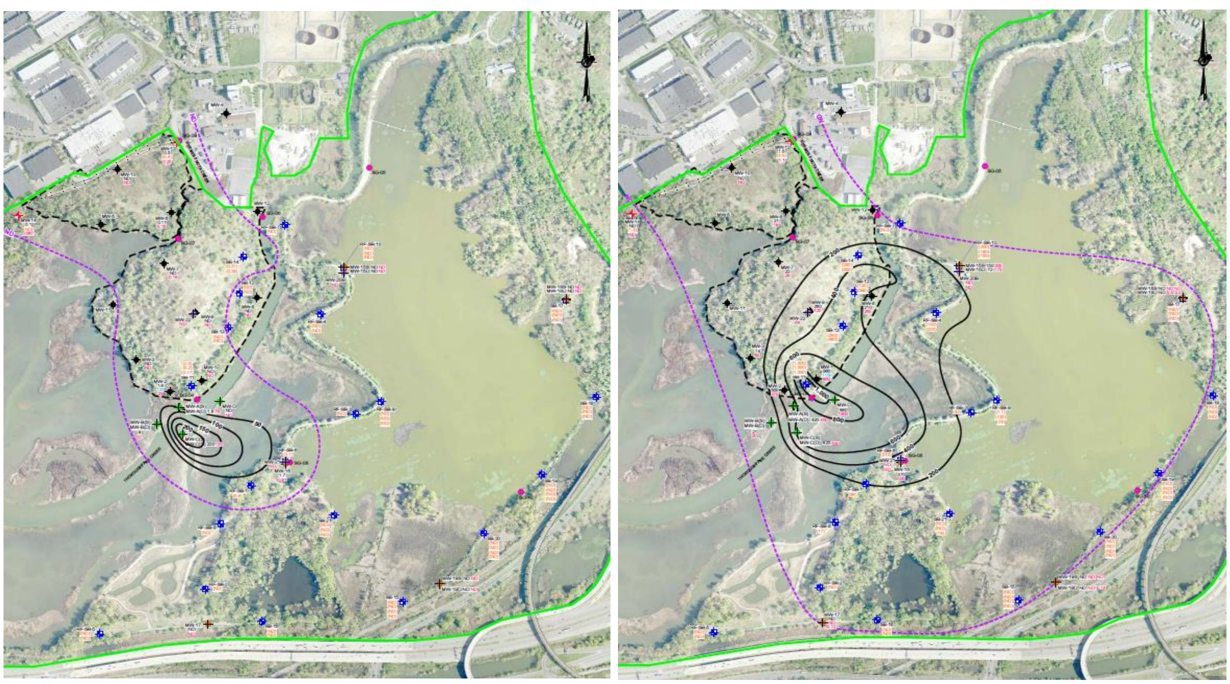
Groundwater

The initial groundwater investigations in 2007 detected VOCs, naphthalene, and metals in groundwater underlying the Landfill and Annex. Supplemental RI groundwater sampling by USEPA, targeting 1,4-dioxane, detected 1,4-dioxane in groundwater from multiple wells at the Landfill and Annex. Subsequent groundwater investigations from 2012 to 2016 determined the following:

- Monitoring wells on the northern and western (upgradient) boundaries of the Annex exhibited low-level detections of Cl-VOCs and/or 1,4-dioxane;
- Cl-VOC and 1,4-dioxane exceedances above screening levels (USEPA Regional Screening Levels (RSLs) and Pennsylvania Residential and Non-Residential Groundwater MSCs) in overburden groundwater extend beyond the Landfill limits. The leading edge of the low-level 1,4-dioxane plume in overburden groundwater remains within the downgradient boundary of the Refuge; and
- Low-level VOC and 1,4-dioxane detections in bedrock groundwater are limited to beneath the Landfill.

Site-related COCs are found in groundwater at the Landfill and Annex and migrating downgradient in the deep sand and gravel unit located tens of feet under Darby/Thoroughfare Creek. See Figure ES-4.

Figure ES-4: Site COC Extent in Overburden Groundwater



TCE **1,4-dioxane**

While migration of dissolved COCs in groundwater is potentially the most significant transport mechanism at the Site, off-Site impacts are limited because:

- Concentrations of Cl-VOCs are decreasing downgradient of the Landfill, and natural attenuation is occurring by both abiotic and biotic mechanisms;
- There are no drinking water sources in the vicinity of the Landfill, or even far downgradient beyond the Refuge boundaries.

Risk to Human Receptors

The BHHRA identified chemicals of potential concern (COPCs) at the Site, and estimated quantitative risks from the COPCs assuming conservative exposure scenarios, as required by USEPA, under both current and hypothetical future land use conditions for the following receptors associated with the Site:

- Construction/Excavation Workers
- Maintenance /Refuge Workers
- Adolescent Trespassers
- Adult and Child Refuge Visitors

The BHHRA considered direct contact exposures to soil, intertidal seeps, shallow groundwater in a trench at the Landfill or Annex, and indoor air for potential future structures constructed at the Landfill, Annex, and Refuge (vapor intrusion only). It did not assume any groundwater ingestion exposures, because there are currently no potable wells at the Annex/Landfill or at the Refuge and installing drinking water wells for residential use at the Refuge is not a reasonable scenario. Because groundwater beneath the Wildlife Refuge is considered by USEPA to be a potential future drinking water source, the OU-2 Feasibility Study (FS) will evaluate options for restoring groundwater to its beneficial use, wherever practicable in accordance with 40 CFR § 300.430(a)(1)(iii)(F).

The results of the BHHRA showed no exceedances of USEPA cancer or non-cancer risk levels for every human health pathway/receptor for current and future scenarios; the exception is the hypothetical indoor air exposures to a lifetime Refuge visitor from vapor intrusion to a future occupied space constructed proximal to groundwater impacted by VOCs. Although the cancer risks are above the USEPA acceptable risk range at 2E-04, the VISL model is a screening model that does not account for site-specific factors, such as subsurface conditions and building characteristics. The potential for a future complete vapor intrusion pathway will be addressed as part of the Feasibility Study.

Risk to Ecological Receptors

The SLERA identified chemicals of potential ecological concern (COPECs) at the Site, and estimated potential risks from these COPECs to selected terrestrial wildlife and plants/invertebrates receptors. For wildlife, several COPECs had mid-level (10-20) hazard quotients (HQs) resulting in potential adverse effects through food chain consumption for insectivores (such as the American woodcock, short-tailed shrew, and American robin). When assuming both mean and 95% upper confidence limit (UCL) concentrations in soil, the main COPECs identified as having lowest observed adverse effect level (LOAEL) based on HQs>1 were the following:

- Landfill - copper (shrew, robin, and woodcock), lead (shrew, robin, and woodcock), nickel (shrew), and PAHs (shrew).
- Annex - lead for the robin.

Metals and PAHs are also present in background samples, albeit at lower concentrations.

For plants/invertebrates, the average concentrations of multiple constituents in soil are above Regional Screening Levels (RSLs). However, the following should also be noted:

- Plant/invertebrate soil screening levels are very conservative (some Pennsylvania Clean Fill criteria also exceed RSLs);
- Many of the constituents are present in background, albeit at lower concentrations;
- The screening levels are not actionable criteria; and
- Soil cover-stabilizing plant communities are thriving.

Conclusions

The results of this remedial investigation showed the following:

- There is less than 1-foot of cover soil over approximately 70% of the Site, with the majority of the Annex/Landfill area vegetated with ruderal species;
- There are localized areas where waste and/or debris is present at the surface, and a few areas of the periphery of the Landfill and Annex exhibit steep slopes and localized erosion;
- Landfill gas impacts are not a concern;
- Intertidal seeps and groundwater flux have little to no impact on surface water quality;
- The absence of a continuous, silty clay layer below waste at the Landfill allows Site COCs to migrate to groundwater;
- The potentially most significant contaminant transport mechanism at the Site is migration of dissolved COCs, primarily Cl-VOCs and 1,4-dioxane, in groundwater;
- The continuous, silty clay layer downgradient of the Landfill (i.e., Off-Site) isolates surface water from groundwater impacts;
- COC concentrations in groundwater decrease downgradient of the Site due to natural attenuation;
- Site COCs attenuate to Residential Groundwater MSCs within the boundaries of the Refuge;
- There are no drinking water sources in the vicinity of or downgradient from the Site, and local ordinances require the use of public water for drinking water;

- There are no unacceptable risks to human health from Site COCs under current and most future use scenarios;
- There is an improbable potential future complete vapor intrusion pathway given the localized Refuge area where groundwater VOC concentrations would pose an indoor air risk to an occupied structure if built within the Refuge; this potential pathway will be addressed in the Feasibility Study; and
- Potential ecological risks are associated with the presence of select metals and pesticides in soil. Since these constituents are also present in background soils, the incremental risk posed by the Site is likely minimal.

The Remedial Investigation has sufficiently characterized the environmental conditions at the Landfill and Annex to now proceed to the Feasibility Study.

Table ES-1: Folcroft Landfill Historic Activities and Milestones

Historic Activity/Milestone	Date(s)
Landfill operations began.	1961
Periodic inspections of landfill operations at the Site were performed by PADER and PADOH.	1966 - 1973
Commonwealth Court of Pennsylvania ordered Folcroft Landfill Corporation to cease landfill operations at the Site and to close the landfill.	8/29/73
After federal legislation passed creating the Tinicum National Environmental Center, DOI began acquiring properties within the legislatively established boundaries.	1972
Landfill operations closed and closure operations commenced.	1974
Congress extended the boundaries of the Refuge to include the 45-acre Folcroft Landfill.	1976
PA Attorney General's Office issued a letter stating Landfill is closed in substantial compliance with Order.	10/27/77
Various US Government Investigations conducted at the Landfill.	1978 -1980
DOI purchased properties within the geographic boundaries of the Landfill and the Annex.	1980
USEPA Region III Regional Counsel reviewed the site investigations that had been conducted at the Folcroft Landfill and concluded that Congress' 1980 mandate to the USEPA and FWS "to determine environmental hazards from Folcroft Landfill" had not been met.	6/1/85
USEPA report concluded that "EPA and DOI should conduct a full scale site assessment to determine the extent and degree of contamination in Tinicum.	12/31/86
USEPA and FWS conducted a joint investigation that included sampling of soil, sediment, surface water, seeps, and groundwater at and adjacent to the Site.	1988
FWS begins sampling groundwater monitoring wells on an annual basis.	1988
FWS excavated two underground storage tanks (USTs) from the Folcroft Landfill property.	6/1/90
PADER notified the Tinicum National Environmental Center (NEC) that it was in violation of the Pennsylvania Clean Streams Law, as a result of the unacceptable levels of certain contaminants found in the soil at the excavation site.	8/31/90
PADER informed the Tinicum NEC that the contamination present at the UST excavation site was a violation of the Storage Tank and Spill Prevention Act and directed the FWS to submit a remedial action plan for the site.	5/31/96
Investigation of the LDCA identified several seeps on the southeastern edge of the Landfill along Thoroughfare Creek. Erosion of the toe of slope was observed and was attributed to surface water runoff and tidal influences.	3/1/1998
USEPA proposed the LDCA for inclusion on the National Priorities List (NPL).	5/11/00
USEPA decided to promulgate the LDCA as a grouping of two separate sites, the Clearview Landfill site and the Folcroft Landfill and Annex site, "for administrative purposes".	6/14/01
USEPA approved the RI/FS Work Plan.	9/28/06
USEPA executed the Settlement Agreement with private parties.	11/14/06

Historic Activity/Milestone	Date(s)
Golder performed Initial Remedial Investigation (RI) Field Activities.	2006-2008
RI Report submitted to USEPA.	5/24/10
USEPA provided initial comments on RI Report.	11/19/10
USEPA provided additional comments on RI Report.	8/18/11
USEPA approved Additional Groundwater Investigation Work Plan.	12/22/11
Golder performed Additional Groundwater Investigations.	2012
Golder submitted initial groundwater screening results letter report.	2/29/12
Golder submitted Supplemental Air Monitoring Work Plan.	5/8/12
Golder submitted Additional Groundwater Investigation Data Summary Report.	8/20/12
Golder performed Supplemental Air Monitoring - Field Activities.	2012
USEPA approved Off-Site Groundwater Investigations Work Plan.	9/6/13
Golder performed Off-Site Groundwater Investigations - Phases 1 and 2.	2013 -2014
Golder submitted initial Off-Site Groundwater Investigation Report to present the results of the Phase 1 and Phase 2 investigations.	11/11/14
USEPA approved an Appended Work Plan for a Limited Bedrock Groundwater Investigation.	5/6/15
Golder performed Off-Site Groundwater Investigations - Phase 3.	2015 -2016
Golder submitted revised Off-Site Groundwater Investigation Report.	1/18/17
Golder submitted Revised RI Report	5/19/17
USEPA Comments received on May 2017 Revised RI Report	10/11/17; 2/28/18
Golder submitted Draft / Final Response to Comment Letter on May 2017 Revised RI Report	2/7/18 / 4/16/18

Table of Contents

LIST OF TABLES

SLERA

LIST OF FIGURES

LIST OF APPENDICES

RI

BHHRA

SLERA

1.0 INTRODUCTION

1.1 Purpose of Report

This Revised Final Remedial Investigation Report (Final RI Report) has been prepared by Golder Associates Inc. (Golder) on behalf of the Folcroft Landfill Steering Committee (Steering Committee), pursuant to the Administrative Settlement Agreement and Order on Consent (Settlement Agreement) executed by the United States Environmental Protection Agency (USEPA or Agency) in November 2006 (USEPA Index No. CERC-03-2007-0033DC) and the approved Remedial Investigation/Feasibility Study (RI/FS) Work Plan (RI/FS Work Plan; Golder 2006a) for the Folcroft Landfill (Landfill) and Folcroft Landfill Annex (Annex) (collectively referred to herein as “the Site” and depicted on Figure 1-1).

The original RI Report was submitted to the USEPA in May 2010 (Golder 2010b), and presented the results of the initial Remedial Investigation (RI) conducted at the Site, along with the results of the Baseline Human Health Risk Assessment (BHRRA) and Screening Level Ecological Risk Assessment (SLERA) performed for the Site.

The objectives of the initial RI and the associated risk assessments, as defined in the Work Plan, were to develop an updated Conceptual Site Model (CSM) to aid in the following evaluations:

- Evaluate the nature and extent of contamination at the Site
- Evaluate whether contaminants have migrated off of the Site
- Evaluate potential on-Site threats to public health or welfare or the environment caused by the release, or potential release, of contaminants from the Site

In response to USEPA comments on the RI Report (USEPA 2010a, USEPA 2011a), further investigations of groundwater and ambient air were conducted at the Site from 2012 through 2016. In May 2017, Golder submitted the Revised RI Report (Golder 2017c) that incorporated the results of those additional investigations as well as responses to other USEPA comments on the May 2010 RI Report. The May 2017 Revised RI Report is being further revised to address additional comments received from USEPA, Pennsylvania Department of Environmental Protection (PADEP) and US Fish & Wildlife Service (FWS) in October 2017 and February 2018, leading to this Final RI Report. Preparation and submission of this Final RI Report, including the Baseline Human Health Risk Assessment (BHHRA) and Screening Level Ecological Risk Assessment (SLERA), represents the next required activity under the Settlement Agreement and the approved RI/FS Work Plan, as modified on December 22, 2011.

1.2 Regulatory Background

The Site is part of the Lower Darby Creek Area (LDCA) Superfund site. On May 11, 2000, the USEPA proposed the LDCA for inclusion on the National Priorities List (NPL). At the time of the proposal, the LDCA included the Site and five other potential source areas along Darby Creek: the Clearview Landfill; the Industrial Drive properties; the Sun Oil-Darby Creek Tank Farm; the former Delaware County Sewage Treatment Plant; and the former Delaware County Incinerator. In the June 14, 2001 final NPL listing, the LDCA was modified after considering public comments and "EPA decided to promulgate the LDCA as a grouping of two separate sites, the Clearview Landfill site and the Folcroft Landfill and Annex site, for administrative purposes". However, the single LDCA NPL listing was kept to facilitate the management of the investigation and cleanup of all releases to this portion of Darby Creek, which includes fisheries, wetlands, and other sensitive environments, including the John Heinz National Wildlife Refuge (USEPA 2001a). The Clearview Landfill, situated on the east side of Darby Creek approximately 1.5 to 2 miles upstream of the Site (Figure 1-2), is being addressed separately by the USEPA.

1.3 Initial RI Activities

Following the listing of the LDCA on the NPL in May 2000, the USEPA issued notice letters to a number of private parties and Federal Agencies, alleging they were responsible for response costs at the Folcroft Landfill under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). In response, a subset of the private parties voluntarily formed the Steering Committee. The Steering Committee began negotiations with the USEPA to enter into a Settlement Agreement that set forth requirements for conducting an RI/FS at the Site. As part of the negotiations, Golder conducted a preliminary site reconnaissance for the Steering Committee, and the Steering Committee subsequently submitted a Work Plan for the RI/FS (Golder 2006a) which described the proposed field investigations and the BHHRA and SLERA. The Work Plan was approved by the USEPA on September 28, 2006, and the Settlement Agreement, which incorporated the Work Plan, was executed by the USEPA on November 14, 2006.

Pursuant to the approved RI/FS Work Plan:

- Field investigations were conducted from December 2006 through August 2007;
- A meeting was held with the USEPA on April 29, 2008 to review the preliminary findings of the RI and to consult with the Agency regarding the content of the upcoming risk assessment interim submittals;
- The Interim Submittal for the BHHRA was initially submitted to the USEPA on July 31, 2008. Following two rounds of comments from the USEPA, the BHHRA Interim Submittal was approved by the USEPA on December 9, 2009; and,
- The Interim Submittal for the SLERA was initially submitted to the USEPA on November 5, 2008. Following comments from the USEPA, the SLERA Interim Submittal was approved by the USEPA on January 22, 2010.

The results of the initial RI along with the BHHRA and SLERA were submitted to the USEPA in the May 24, 2010 RI Report (Golder 2010b).

USEPA provided initial comments on the RI Report in November 2010 (USEPA 2010a) and additional comments in August 2011 (USEPA 2011a). Specific comments focused on the need for further monitoring of ambient air at the Annex and further investigations of groundwater at the Landfill. In response to USEPA comments and subsequent discussions with USEPA and the Pennsylvania Department of Environmental Protections Agency (PADEP), Golder submitted written responses to USEPA's comments on the RI Report on June 28, 2011 (Golder 2011a) and March 23, 2012 (Golder 2012a), respectively, and performed the additional RI activities summarized in the following sections.

1.4 Additional RI Activities

1.4.1 Supplemental Ambient Air Monitoring (2012)

In its comments on the initial RI Report, USEPA stated there were insufficient data to support the conclusion that the photoionization detector (PID) readings above the volatile organic compound (VOC) screening level, 5.0 parts per millions (ppm), at the Annex were due to the Delaware County Regional Water Quality Control Authority (DELCORA) sewer line and not the Annex materials, and recommended that additional ambient air samples be collected utilizing Summa canisters and analyzed by USEPA Method TO-15.

After a February 15, 2011 meeting with representatives of the Steering Committee and Golder, USEPA agreed to modify its original request for Summa canister sampling to the following phased approach:

- Additional field screening at the Annex sampling locations where exceedances of the screening levels were previously observed as well as at the background locations and sewer vents (Phase 1 and Phase 2); and
- Sampling with Summa canisters at locations only if the field screening results exceed the screening level (Phase 3).

Subsequent to the USEPA meeting, DELCORA announced that it would be replacing up to approximately 300 feet of the sewer line on either side of an on-site gas vent on the northwest side of the Annex (Figure 1-2) because of recurring sewer leaks and associated repairs in this area. In light of this announcement, the additional ambient air monitoring requested by USEPA at the Annex took place after the planned DELCORA sewer line repairs were completed. That work was initiated in October 2012. The results of this investigation are discussed in Section 3.5.2.3.

1.4.2 Groundwater Investigations

As part of its comments on the RI Report (Golder 2010), USEPA required further evaluation of the potential presence of Site related constituents of concern (COCs) in groundwater beyond the limits of the Landfill and beneath Thoroughfare Creek/Darby Creek. USEPA required further investigation based on the results of independently analyzed split groundwater samples taken by the USEPA contractor during groundwater sampling conducted by Golder in January and May 2007. Specifically, USEPA's request for additional groundwater evaluation was based upon the following:

- USEPA groundwater data detecting 1,4-dioxane at Landfill perimeter monitoring wells, with the highest concentration at 840 micrograms per liter (µg/l) in MW-1 at the toe of the Landfill adjacent to Thoroughfare Creek
- The potential for 1,4-dioxane to migrate
- The classification of 1,4-dioxane by USEPA as an emerging contaminant because "it is highly mobile and has not been shown to readily biodegrade in the environment"[3]

In response to these concerns, Golder performed fate and transport analyses using published half-life times ranging between 0.5 and 1 year. The fate and transport analyses results demonstrated that 1,4-dioxane concentrations in groundwater would attenuate to levels below Pennsylvania Residential Used Aquifer Medium Specific Concentration (MSCs) within the boundaries of the Refuge. These analyses were presented to USEPA and the PADEP during a meeting on February 15, 2011 at the USEPA Region 3 offices to discuss the comments on the RI Report.

In response, USEPA and PADEP stated the current Site-specific data were insufficient to confirm the results of the fate and transport analyses and requested that the extent of Site-related COCs in groundwater be further delineated in the marsh downgradient of the Landfill. In addition, the USEPA and PADEP acknowledged the practical difficulty of sampling groundwater beneath the marsh with the Refuge.

Subsequent to the February 2011 meeting, the Steering Committee agreed to evaluate potential off-Site impacts to groundwater. An initial investigation conducted in 2012, the Additional Groundwater Investigation, determined that Site-related COCs were migrating beneath Thoroughfare Creek and additional downgradient investigation was required. Therefore, the USEPA approved Off-Site Groundwater Investigations were conducted from 2013 to 2016 utilizing a phased investigation approach. The phased approach included groundwater screening followed by installation of monitoring wells and groundwater sampling to evaluate the nature and extent of Site-related COCs in overburden and bedrock groundwater and the potential for groundwater migration to surface water. The Off-Site Groundwater Investigations were deemed complete by USEPA with the submittal of the Revised Off-Site Groundwater Investigation Report in January 2017.

The results of the Off-Site Groundwater Investigations are discussed in detail in Section 3.6.

[3] Emerging Contaminant –1,4-Dioxane, Fact Sheet, EPA 505-F-09-006. September 2009

1.4.3 Revised RI Report (May 2017)

As noted above, in May 2017, Golder submitted the Revised RI Report (Golder 2017) that incorporated the results of these additional investigations, as well as responses to USEPA comments on the May 2010 RI Report (Golder 2018). The May 2017 Revised RI Report was further revised to address additional comments received from USEPA, PADEP and FWS in October 2017 and February 2018, leading to this Final RI Report.

2.0 GENERAL SITE DESCRIPTION

2.1 Description of the Property

The Site is located in Folcroft, Pennsylvania within the John Heinz National Wildlife Refuge at Tinicum (Refuge) as shown on Figure 1-2. As discussed below in Section 2.2, the Refuge contains a 200-acre tidal marsh[4]. The Site (consisting of the Landfill and the Annex) is comprised of approximately 64 acres, all but four acres of which are owned and operated by the Department of the Interior (DOI), FWS. Landfilling operations began in 1961 and operations ceased and closure operations began in 1974 (SMC-Martin 1979). The Site is currently vegetated in most areas, as shown on Figure 2-1, and supports a diverse community of terrestrial organisms (USEPA 1989a).

The Site consists of two adjacent sections, the Landfill and Annex, which are separated by Hermesprota Creek, and are described in greater detail below.

2.1.1 Landfill

The Landfill is approximately 47.5 acres in size and is bordered by Darby Creek/Thoroughfare Creek to the east and southeast, Hermesprota Creek to the west, a tidal marsh to the southwest where Muckinipattis Creek drains into Darby/Thoroughfare Creek approximately one mile downgradient from the Site, and the Delaware County Emergency Services Training Center (EMTC) (former Delaware County incinerator) and an Action Concrete facility to the north.

Currently, there is limited access to the Landfill. Authorized vehicle and foot traffic can access the Landfill from Calcon Hook Road through an unpaved easement between the Delaware County EMTC and Action Concrete properties. The FWS maintains a locked steel swing gate across the entrance to the easement. The easement is accessed from a paved parking area/driveway at the end of Calcon Hook Road that is owned by Action Concrete. Action Concrete limits access to this area with an 8-foot steel fence with a gate that is generally open during the day, but locked at night and on weekends. Both FWS and Delaware County have agreements with Action Concrete to access this area. Trespassers can access the Landfill property with difficulty by water from the creeks or by land across adjacent properties along the creek banks.

From the Landfill entrance, the ground elevation rises to the southwest from approximately 10 feet above mean sea level (amsl) to approximately 45 feet amsl at the high point near the geographic center of the Landfill. The Landfill crown ranges from 35 to 45 feet amsl over approximately 10 acres. From the crown to the east, the Landfill slopes downward moderately to within approximately 100 feet from Thoroughfare Creek where the grade changes significantly and there are 15 to 20 foot drop offs to the creek. From the

[4] John Heinz National Wildlife Refuge at Tinicum Comprehensive Conservation Plan, August 2012, pg 1-1

crown to the south, the Landfill slopes moderately down to the toe of the Landfill, which is generally flat and 50 to 150 feet wide. From the crown to the west, the Landfill slopes moderately down to the creek banks where grades vary from large flat areas to localized mounds ranging from 5 to 10 feet amsl. Towards the northwest, the Landfill slopes moderately to approximately 50 feet from Hermesprota Creek where there are 10 to 15 foot drop offs to the creek near a former bridge to the Annex. Towards the north, the Landfill slopes moderately to wetlands near the Delaware County EMTC property boundary and Hermesprota Creek.

2.1.2 Annex

The Annex, which is not contiguous with the Landfill, is approximately 16.5 acres in size and is bordered by Hermesprota Creek to the east and northeast, a business park to the north and northwest, an unnamed tributary to the west and southwest, and a tidal marsh to the south. There is a right-of-way for a DELCORA sewer line near the northern boundary that crosses the Annex from near the unnamed tributary northeast towards Hermesprota Creek (see Figure 2-1).

Currently, there is unrestricted access to the Annex from the parking lots along Maple Avenue behind the industrial/commercial buildings on Kaiser Drive. Authorized and unauthorized vehicle traffic can access the Annex from Maple Avenue through an unpaved road. Southwest of the unpaved road, trespassers can access the Annex on foot from any point along the Maple Avenue parking lot; however, vehicle access is limited in this area by trees and shrubs. Further northwest along this boundary, vehicle and foot traffic is prevented by fences on adjacent properties. However, trespassers can access the Annex with difficulty by water from the creeks or by land via the creek banks from adjacent properties.

From the Annex entrance, the elevation rises to the southeast from approximately 15 feet amsl to approximately 23 feet amsl at the high point, which is slightly north and east of the geographic center of the Annex. The Annex crown ranges from 20 to 23 feet amsl over approximately 7 acres. From the crown to the east, the Annex slopes moderately down to Hermesprota Creek. From the crown to the south, the Annex slopes moderately to approximately 30 to 50 feet from the marsh and Hermesprota Creek where there are 10 to 15 foot drop offs. From the crown to the southwest, the Annex slopes moderately downward to the banks of the unnamed tributary and the marsh.

2.2 Surrounding Land Use and Demography

The Site is located in Folcroft Borough, Delaware County. The United States Census estimate for 2015 shows that Folcroft Borough has a population of 6,637 people. Although the Site is within the Refuge, the greater surrounding area is highly industrialized and heavily developed. Interstate 95 and the Philadelphia International Airport are located within one mile to the southeast of the Site.

The Refuge was established by an Act of Congress in 1972 to protect the largest freshwater tidal marsh in Pennsylvania, and is administered by the DOI, specifically the FWS. As reported by the FWS, the Refuge currently includes 1,200 acres of varied habitats, including 200 acres of tidal marsh, which have become a resting and feeding area for more than 300 species of birds, 80 of which reportedly nest within the Refuge. In addition, fox, deer, muskrat, turtles, fish, frogs and a wide variety of wildflowers and plants are found within the Refuge[5].

As noted above, the Site is part of the larger LDCA Superfund site. According to the *Final Hazard Ranking System Documentation Record* (Tetra Tech, 2000), the LDCA Superfund site is located in an industrialized portion of southeastern Delaware County and southwestern Philadelphia County, Pennsylvania. It is located primarily in Darby Township and Folcroft Borough, in Delaware County, but also extends into the southwest section of the City of Philadelphia. The LDCA is located within the Darby-Cobbs Creek Watershed along an approximately two mile stretch of Darby Creek, between Cobbs Creek to the north and the tidal marsh of the Refuge to the south. Darby Creek generally flows from north to south through the LDCA site and discharges to the Delaware River a few miles downstream. The LDCA Superfund Site originally consisted of six sites, including Folcroft Landfill and Annex and Clearview Landfill. Several of the other sites have subsequently been administered under the Pennsylvania Act 2 program.

The Darby-Cobbs Creek Watershed is a complex urban watershed that drains 77 square miles in three suburban counties and parts of the City of Philadelphia (see Figure 2-2). The Darby-Cobbs Creek Watershed has a population of approximately 500,000 residents, and numerous dischargers to surface water including 38 combined sewer overflows (CSOs) and three major stormwater outfalls in Philadelphia[6] along with 76 other permitted treatment facilities or discharge points throughout the watershed. The watershed also has 12 Toxic Release Inventory (TRI) facilities and three other NPL Sites (Austin Avenue Radiation, Havertown PCP, and Lansdowne Radiation). The area of the Darby-Cobbs Creek Watershed occurs mainly in the Piedmont uplands physiographic province, although the southernmost portion of the watershed occurs in the Atlantic Coastal Plain (Coastal Plain) physiographic province. The Fall Line separates these two provinces and acts as a geomorphologic break between areas of sediment shedding and sediment deposition. At the downstream extremity of the Darby-Cobbs Creek Watershed, where the Site is located, the stream gradients flatten sharply, the watershed is tidal, and the tidal marshes south of the Site are a natural deposition area of material sourced from the Piedmont uplands.

[5] http://www.fws.gov/heinz/welcome.htm

[6] Pg.1, *Draft Technical Memorandum No. 1 Historical Water Quality for the Darby and Cobbs Creeks Watershed*, Philadelphia Water Department, February 2000.

2.3 History of Site Ownership and Operations

The properties within the boundaries of the Folcroft Landfill and/or Folcroft Landfill Annex as shown on Figure 2-3 were owned at various times in the past by the Folcroft Landfill Corporation, Philadelphia Electric Company (PECO), Wilbur C. Henderson, and/or the Henderson Columbia Corporation (USEPA 2002a). The Landfill includes portions of Tracts 13a, 14d, and 27a, as well as all of Tract 27. The Annex includes portions of Tracts 13a, 16, 16b, and 27a. The Table below summarizes property ownership information for those tracts of land, within the geographic boundaries of the Landfill and the Annex, prior to their sale to DOI.

IMMEDIATE OWNERS PRIOR TO SALE TO DOI

Tract No.	Owner	Year Acquired by Owner	Year Sold to DOI
13a	PECO	Assembled through numerous transactions between 1957 and 1973, and beyond; involved in easements, leasing, fee title actions, and other transactions during that period	(still owned by PECO)
14d	Wilbur C. Henderson	Acquired through 6 separate deed conveyances between 1958 and 1969	1980
16	Folcroft Landfill Corp.	Acquired through 2 separate deed conveyances in 1967 and 1973	1980
16b	Folcroft Landfill Corp	Acquired through 2 separate deed conveyances in 1967 and 1972	1980
27	Henderson Columbia Corp.	1967	1980
27a	Henderson Columbia Corp.	1967	1980

From 1961 to 1963, landfilling operations began when Wilbur C. Henderson leased certain property within the boundaries of the Folcroft Landfill to the now-defunct Landfill Corporation of Pennsylvania, Inc. In 1963, that lease was terminated and the property was leased to the Folcroft Landfill Corporation for the operation of a sanitary landfill. Folcroft Landfill Corporation operated the landfill pursuant to a permit issued by the Borough of Folcroft under its municipal ordinance regulating landfills. Henderson Columbia Corporation purchased a portion of the Landfill Annex property in 1967. No available records indicate that the Annex was leased or permitted for landfill operations.

Figure 2-4 includes aerial photographs showing historical site conditions prior to development, during landfill operations, and after landfill closure.

Beginning January 1, 1970, Pennsylvania sanitary landfills were required to obtain permits from the Pennsylvania Department of Health (PADOH).[7] In 1970, Folcroft Landfill Corporation applied for a landfill permit, but its application was denied. Subsequently, the Commonwealth of Pennsylvania brought legal action against Folcroft Landfill Corporation to cease disposal activities and close the landfill. On August 29, 1973, the Commonwealth Court of Pennsylvania ordered Folcroft Landfill Corporation to cease landfill operations at the Site and to close the landfill. Landfill operations were terminated and closure operations commenced in 1974, including placement of a 2 to 10 foot thick soil cover (SMC Martin, 1979a). Cover materials reportedly were obtained from borrow sources that included dredge spoils, soils excavated for construction of Interstate 95, and soils excavated from a construction project at the Sun Oil refinery in Marcus Hook, Pennsylvania (Ecology and Environment, 1980). With respect to at least the material from the Marcus Hook construction project, the material was analyzed and then approved by the Pennsylvania Department of Environmental Resources (PADER) prior to its use as a cover material in 1977 (SMC Martin, 1979a). In a letter to Commonwealth Court dated October 27, 1977, the Pennsylvania Attorney General's office reported that PADER had determined that the Folcroft Landfill had been satisfactorily closed, and requested that its case against Folcroft Landfill Corporation be discontinued (Appendix A).

As early as 1965, DOI began investigating the acquisition of additional lands for inclusion in the Refuge (DOI 1965). Following the introduction of federal legislation in 1971 authorizing DOI to acquire lands necessary to preserve the Tinicum Marsh and establishing the Tinicum Marsh as part of the National Wildlife Refuge system[8], DOI commenced negotiations with Mr. Wilbur Henderson for the purchase of certain properties owned by Mr. Henderson and the Henderson-Columbia Corporation to be included within the Refuge. During the course of negotiations with Mr. Henderson and other affected property owners, DOI continued its investigation of areas within and surrounding the Tinicum Marsh for possible acquisition. Once the federal legislation creating the Tinicum National Environmental Center (now the John Heinz National Wildlife Refuge at Tinicum) passed in 1972, DOI began acquiring properties within the legislatively established boundaries. In 1976, Congress extended the boundaries of the Refuge to include the 45-acre Folcroft Landfill.[9] Following another amendment to the 1972 legislation increasing the funding authorization for land acquisition and other projects[10], the United States purchased the following properties in 1980, portions of which are within the geographic boundaries of the Landfill and the Annex as shown on Figure

[7] Act of July 31, 1968, P.L. 788, *repealed* 35 P.S. § 6018.1001 (1980 Act repealed and replaced 1968 Act, but all permits and orders issued under the 1968 Act remained in full force and effect unless and until modified, amended, suspended, or revoked).

[8] This legislation creating the Tinicum National Environmental Center and authorizing DOI to acquire lands for inclusion in the refuge was passed in 1972. Pub. L. No. 92-326, 86 Stat. 391 (1972).

[9] Pub. L. No. 94-548, 90 Stat. 2528 (1976).

[10] Pub. L. No. 96-315, 94 Stat. 957 (1980).

1-1: tract 14d from Mr. Henderson; tracts 27 and 27a from the Henderson-Columbia Corporation; and tracts 16 and 16b from the Folcroft Landfill Corporation.

Prior to the 1980 sale and at the request of DOI, Mr. Henderson contracted with SMC-Martin to perform an environmental study of the Folcroft Landfill "to evaluate the present condition of the landfill and to determine if, in fact, any negative environmental impact exists or is anticipated to develop in the future." The environmental evaluation report (SMC Martin, 1979a) presented the following conclusions:

Environmental analyses demonstrate that the Folcroft Landfill is not causing any environmental problems. The closure procedure has provided an excellent earth cover over the refuse material. Vegetation has been established over most of the site though the establishment of complete vegetation on the eastern portion of the site has yet to be accomplished.

The site investigations and the water sampling program have found only an insignificant amount of leachate emanating from the site. The only active leachate seep was located on the eastern edge of the closed landfill. No additional leachate seeps were found at any point around the landfill perimeter. The water quality samples indicate an absence of toxic or chemical waste materials in the ground water. The quality of the water emanating from the closed landfill is indicative of general municipal refuse.

The closed landfill has no appreciable impact upon Thoroughfare Creek. The landfill is stable and, therefore, highly desirable for development. Almost no gas odor could be detected at the site. The closed landfill is not creating any environmental problems nor can any be anticipated in the future.

As a follow up to the report of sparse vegetation on the eastern portion of the Landfill, SMC-Martin was contracted to perform a revegetation investigation. While the report noted that methane gas was not responsible for the lack of growth, it acknowledged that no explanation had been found for the lack of vegetation on the eastern portion of the Landfill and recommended further evaluations (SMC-Martin, 1979b). Copies of both SMC-Martin reports are included as Appendix A.

In addition to the SMC-Martin reports, DOI conducted its own investigation of environmental and other site conditions at the Landfill and the Annex and the surrounding marshlands prior to the 1980 purchase (FWS, 1978). When Congress authorized DOI to purchase the Folcroft Landfill, Congress was aware that the Landfill had been used as a disposal site for a variety of wastes. The legislative history of the public laws that authorized acquisition of this property contains numerous statements that illustrate that Congress expected federal funds would be used to investigate conditions at the Landfill and to improve site conditions. For example, the 1980 Amendment to the 1972 legislation creating the Refuge increased funding authorization from $11.1 million to $19.5 million and provided that "[t]he Administrator of the Environmental Protection Agency, in consultation with and cooperation with the FWS, is directed to investigate potential environmental health hazards resulting from the Folcroft landfill, within the authorized boundary of the Tinicum National Environmental Center, and to develop alternative recommendations as to how such hazards, if any, might best be addressed in order to protect the refuge and the general public." Pub. L. No. 96-315, 94 Stat. 957 (1980).

Since the purchase in 1980, DOI has owned all of the Site, except for approximately four acres of the Annex which is owned by the PECO, and the FWS has managed the Site as part of the Refuge (USEPA, 2002a).

2.4 History of Site Investigations and Remedial Measures

Since 1966, numerous inspections, studies, and investigations have documented and/or evaluated environmental conditions at the Site. This section summarizes the results of some of those site investigations, and describes some discrete remedial measures undertaken at the Site.

Periodic inspections of landfill operations at the Site were performed by PADER and PADOH between 1966 and 1973 (Tetra Tech 2000), and general landfill operations are well documented by aerial photographs (USEPA 1984). The Site is defined as a "Type I landfill" in accordance with the USEPA guidance (USEPA 1991a)[11].

As discussed in Section 2.3 above, prior to 1980, investigations of conditions on the Site were conducted by SMC Martin and DOI. In 1980, in conjunction with the increased funding authorization for the Refuge and in anticipation of DOI's acquisition of the Landfill, Congress directed the USEPA, in consultation with the DOI[12], to:

(i) investigate potential environmental health hazards resulting from the Folcroft landfill; and,

(ii) develop alternative recommendations to ensure the protection of the Refuge and the general public.

On October 29, 1980, a USEPA contractor performed an on-site inspection and conducted sampling at the Landfill (Ecology and Environment, 1980). The USEPA contractor reported that one major leachate flow was observed emanating from the southeast toe of the Landfill, and that smaller seeps were observed along

[11] A "Type I Landfill" is a "co-disposal facility where records or some other form of evidence indicate that hazardous wastes were disposed of with municipal solid wastes. There are no known or suspected hot spot areas, and historical records and physical evidence, such as aerial photographs and the site visit, do not document any discrete subsurface disposal areas." (USEPA 1991a, at 3-1).

[12] Section 2, Pub. L. No. 96-315, 94 Stat. 957 (1980).

the creek banks on the east and west sides of the Landfill. Although environmental samples were collected, the data could not subsequently be located by USEPA (Tetra Tech, 2000).

In July 1983, a fire burned over 11 acres of the Annex, with material burning both on and beneath the surface. The fire was caused by the catalytic converter of a FWS-owned vehicle parked over some underbrush at the Annex. The USEPA Regional Response Team responded to the fire. Intact 55-gallon drums were present on the surface. Eight samples were taken from the drums and characterized in terms of pH, flammability, reactivity, corrosivity, and pesticide content. Two drum samples were also screened for metals. Six of the drums were classified as hazardous wastes and shipped off-site for disposal at a RCRA approved facility. Two of the drums showing no hazardous waste were crushed and buried at the Annex. Soil, sediment, water and air samples were taken and analyzed for 44 contaminants. USEPA concluded that the sample results indicated that there was no imminent or substantial endangerment to public health at the Site, but that the disturbed and exposed surface of the Annex needed to be adequately covered. That portion of the Annex property disturbed during the response action or having exposed waste was covered with 6 to 8 inches of fly ash (filter cake) which had been approved for use as cover material by PADER and the USEPA based upon laboratory test results. The ash was then covered with compacted soil, and the entire area was hydroseeded (USEPA 1983). No other information regarding the fire at the Annex and the associated investigations is readily available for review.

Another site inspection was completed by a USEPA contractor in September 1983. During the site inspection, water was observed seeping from the bank of the Landfill and discharging into Hermesprota Creek. Water and sediment samples were collected from Darby Creek, Hermesprota Creek, and the tidal marsh area below the Landfill Annex. Data quality was deemed questionable by USEPA and other various consultants: Inorganic and pesticide data were compromised by discrepancies in paperwork and organic data was compromised by blank contamination. The report concluded that "[n]o direct hazards to human health are apparent based on available data," and that additional information was necessary to determine whether the Site posed any hazards to fish and wildlife (NUS, 1985).

In 1985, USEPA Region III Regional Counsel reviewed the site investigations that had been conducted at the Folcroft Landfill and concluded that Congress' 1980 mandate to the USEPA and FWS "to determine environmental hazards from Folcroft Landfill" had not been met (USEPA 1985). In response, a joint investigation to further evaluate Site conditions was performed in February 1986 by the USEPA's Environmental Services Division and the FWS. The purpose of the investigation was to identify whether the Site posed an environmental threat to the Refuge. The USEPA recognized that Folcroft Landfill was not the only potential source of contamination to the Refuge, and investigated other sources in the watershed as part of the site investigation, including Tinicum Township Wastewater Treatment Plant, Delaware County Incinerator #2, Delaware County Joint Sewer Authority, Gulf Oil Darby Creek Tank Farm, Clearview Landfill, and Havertown PCP Site. The effort included sampling of various environmental media and a review of historical sampling data. The report concluded that the Site "may be a notable source of aluminum, cyanide, copper, lead, and zinc to the Center [Refuge]." Toxicity testing indicated leachate from the Site containing high levels of inorganic compounds were toxic to organisms. The report further concluded that "EPA and DOI should conduct a full-scale site assessment to determine the extent and degree of contamination in Tinicum" (USEPA 1986).

In 1988, the USEPA and FWS conducted a joint investigation that included sampling of soil, sediment, surface water, seeps, and groundwater at and adjacent to the Site. The investigation included collection of nine surface soil samples from the existing cover materials. Eight of the nine samples were composite samples collected on approximate 100 foot centers in a grid pattern, and the ninth soil sample was from a leachate seep. Surface soil samples were analyzed for a full range of parameters, including pesticides and polychlorinated biphenyls (PCBs). A summary of these results is shown on Table 2-1. The analyses showed that polynuclear aromatic hydrocarbons (PAHs) and metals were found in surface soils at concentrations greater than three times that detected in background samples (Tetra Tech, 2000). VOCs were detected only from the leachate seep soil sample. PCBs were not detected, and the pesticides that were detected were determined by the USEPA not to be site-related (USEPA 1989a).

As part of the joint investigation, five groundwater monitoring wells, MW-1 through MW-5 (Figure 2-1), were installed. Three of the wells (MW-1, MW-2, and MW-3) were installed at the toe of the Landfill along a bermed area outside the primary fill area. Another monitoring well (MW-5) was installed at the Annex. An upgradient well (MW-4) was installed near the former Delaware County incinerator. All five wells were screened in the shallow unconsolidated overburden unit (i.e., not in the underlying bedrock) (see Section 4.3).

From 1988 to 2002, the FWS sampled the groundwater monitoring wells on an annual basis (FWS, 2001). The analytical test results are summarized in Tables 2-2, 2-3, and 2-4. The groundwater sampling showed detections of VOCs and metals, but none for pesticides or PCBs. Low concentrations of semi-volatile organic compounds (SVOCs), including PAHs, were found. However, previous well surveys showed that the wells contained silt, and total suspended solids (TSS) analysis of the groundwater samples by FWS showed elevated concentrations of suspended solids. Since PAHs and metals readily adsorb to suspended solids, the groundwater samples may not have been representative of Site groundwater conditions for these constituents. Low concentrations of phthalate esters were also found; however, those compounds commonly have false positives, and they are not considered to be Site-related constituents.

A May 1998 investigation of the LDCA identified several springs and seeps on the southeastern edge of the Landfill along Thoroughfare Creek. Erosion of the toe of slope was observed and was attributed to surface water runoff and tidal influences. Groundwater and leachate samples were collected; however, with only one minor exception (Aroclor 1248 at 0.833 micrograms per liter (µg/L)), no organic constituents were detected in the leachate sample (Weston, 1999). No other information regarding the 1998 investigation is readily available for review.

In 1990, FWS excavated two underground storage tanks (USTs) from the Folcroft Landfill property in the vicinity of current monitoring well MW-12. The USTs were each 1,000 gallons in capacity and contained heating oil and gasoline, respectively. PADER notified the Tinicum National Environmental Center (NEC) that it was in violation of the Pennsylvania Clean Streams Law[13], as a result of the unacceptable levels of certain contaminants found in the soil at the excavation site (PADER, 1990). PADER further informed the Center that it was required to adequately remediate any pollution and remove any residual petroleum contamination from the ground and from any affected water of the Commonwealth.

The UST excavation area was left open for approximately two years during which time no remedial action occurred. A preliminary assessment of the area was conducted in 1992. No further investigation or remedial action was performed at the Site until 1996 (FWS, 1997). In 1996, PADER informed the Tinicum NEC that the contamination present at the UST excavation site was a violation of the Storage Tank and Spill Prevention Act. PADER directed the FWS to submit a remedial action plan for the site by May 31, 1996 (PADER, 1996). Currently it is not known whether this UST removal investigation was closed out by PADEP.

It should be noted that neither the accuracy nor the representativeness of the data described above, which was generated by the USEPA, DOI, and their contactors, has been verified.

[13] 35 Pa. Cons. Stat. Ann. § 691.301

3.0 REMEDIAL INVESTIGATION ACTIVITIES

This section summarizes the field investigation activities associated with the Remedial Investigation including work plan development, agency correspondence, and reporting.

3.1 Overview of Field Investigation Activities

The Initial RI field investigations began in March 2006 and were completed in June 2008 and included the following:

- Initial site reconnaissance
- Soil investigation
- Bank seepage investigation
- Landfill gas/ambient air investigation
- Groundwater investigations

In response to USEPA comments on the RI Report in 2010, supplemental ambient air monitoring and additional groundwater investigation activities were completed. Those field investigation activities began in January 2012 and were completed in July 2016.

The Remedial Investigation activities were conducted in accordance with the various Work Plans (Golder 2006a; Golder 2011d; Golder 2012b; Golder 2013b; Golder 2015) approved by USEPA. A summary of the initial RI and data quality objectives is shown in Table 3-1.

3.2 Initial Site Reconnaissance

The initial site reconnaissance consisted of visual surveys of the Site to assess the general condition of the soil cover, the site perimeter, and the monitoring wells at both the Landfill and Annex. Specific objectives of the site reconnaissance included:

- Make a preliminary determination of the condition of the cover;
- Identify potential seeps for sampling;
- Determine the integrity of the historical monitoring wells;
- Refine the soil and groundwater sampling locations; and,
- Select locations for staff gauges.

The site reconnaissance activities were performed following approval from the USEPA Remedial Project Manager (RPM) and prior to USEPA's execution of the Settlement Agreement. These activities are described below.

A variety of materials reportedly were historically disposed at the Site. For discussion purposes in the sections below and throughout this RI Report, scrap metal, appliances, furniture, tires, drums, storage tanks, and municipal types of waste, including bottles, cans, plastics, scrap wood, rubber, cardboard, garbage, roofing supplies, and related materials, were considered "waste," and construction/demolition materials, such as bricks, blocks, concrete, asphalt, glass, and related materials, were considered "debris."

3.2.1 Preliminary Cover and Perimeter Survey

The preliminary cover and perimeter survey was conducted on March 14 and 15, 2006, and consisted of a site walkover during low tide to assess the condition of the existing soil cover, and to identify potential seep locations and areas of erosion along the perimeters of both the Landfill and Annex. The survey included a visual inspection to confirm areas with established vegetative cover for further soil investigation as well to identify areas of concern (i.e., signs of erosion, exposed waste and debris, stressed vegetation, and slope instability). Survey points of interest were noted, photographed, and located using a hand-held global positioning system (GPS) unit. Survey observations are summarized in Table 3-2 and survey photographs are included as Appendix B. Areas identified on the table and in the photographs are shown on Figure 3-1. The results of the survey are summarized below.

3.2.1.1 Landfill

The Landfill survey was performed on March 14, 2006 at approximately low tide. The survey started in the northeast corner of the Landfill and proceeded south along the banks of Thoroughfare Creek and west and then north along the banks of Hermesprota Creek around the perimeter of the Landfill. The entire perimeter was not accessible due to topography and/or thick vegetation. The perimeter survey was followed by routes back and forth across the crown of the Landfill to survey the conditions of the soil cover. No conventional landfill leachate seeps (e.g., leachate "break outs" through the cover at elevations above tidal range) were observed anywhere on the Landfill surface. However, there was some evidence of localized seeps occurring at elevations within tidal range along the perimeter that are intertidal in nature as discussed below in Section 3.4.

3.2.1.2 Cover Survey Observations

Landfill cover survey observations are summarized by area below:

Entrance: The entrance path appeared to be in generally good condition, and the cover appeared adequate (i.e. well vegetated with no evidence of erosion or waste/debris at the surface). Small piles of debris were noted in the front that appeared to have been placed after the Landfill was closed.

Central Crown (Between Areas 14 and 15): The central crown of the Landfill has gentle to moderate slopes with vegetated cover and no evidence of erosion. There was no exposed waste or debris in this area with the exception of a few locations where trees had been uprooted and/or animals had burrowed through the cover (Appendix B, Photographs 22 and 23).

Eastern Portion (Areas 1, 2, and 3): The eastern portion of the Landfill slopes moderately downward from the central crown to approximately 100 feet from Thoroughfare Creek where the grade changes significantly and there are 15 to 20 foot drop offs (steep banks) to the creek. A stand of trees stretches along the eastern perimeter of the Landfill where the grade transitions. In the moderately sloping areas, the Landfill is vegetated with little evidence of erosion and waste and/or debris is generally only exposed in those areas where animals have burrowed through the cover. There is a swath of land approximately 100 to 125 feet inland from the water's edge in the transition zone where there are several locations with exposed debris (i.e., tires, scrap metal, construction/demolition debris) protruding through the cover, as well as other debris (i.e., a home heating oil type tank, bottles, cans, plastics, wood, and rubber) near the shoreline that appears to have washed up with the rise and fall of the tide (Appendix B, Photographs 1 through 10).

Southern Portion (Areas 4, 5, 6, 7, 8, 9, 10, 11, and 12): The southern portion of the Landfill slopes moderately from the central crown down to the toe of the Landfill. The toe of the Landfill is generally a flat, low lying area approximately 50 to 150 feet wide. This area appears prone to flooding, with evidence of high water well up the slope into the transition zone. There are areas with vegetated cover including common reed (*Phragmites australis*), shrubs and trees in the transition zone. However, there are other areas with debris protruding through the cover (i.e., tires, scrap metal, brick) and waste/debris in the roots of uprooted trees. In general, the amount of exposed debris increases towards the toe of the landfill. This includes buoyant debris (e.g., bottles, cans, plastics, wood, and rubber) observed at the toe of the landfill near the shoreline. The buoyant waste appears to have washed up on the Landfill with the rise and fall of the tide, and thus is not Site-related. Other materials noted at the Landfill toe included a closed drum standing on the surface near MW-3, and large concrete construction debris at the water's edge (Appendix B, Photographs 11 through 21).

Western Portion (Areas 13 and 19): The western portion of the Landfill slopes moderately downward from the central crown to the creek banks where grades vary from large flat areas to localized mounds ranging from 5 to 10 feet msl. This area appears prone to flooding, having localized pools of water in low lying areas. The area is generally vegetated with trees and shrubs in the transition zone and along the water's edge. Dense vegetation prevented access in some areas. In these areas, there are also several locations with debris protruding through the cover (i.e., tires, scrap metal, brick) as well as debris piles on the surface (i.e., tires, home heating oil type tank) that appear to have been brought to the Site after closure of the Landfill (Appendix B, Photographs 24 through 25). The amount of exposed debris generally increases towards the water's edge, where there are localized areas with buoyant debris (e.g., bottles, cans, plastics, wood, and rubber) that appears to have washed up on the Landfill with the rise and fall of the tide.

Northwestern Portion (Area 18): The northwestern portion of the Landfill slopes moderately downward from the central crown to approximately 50 feet from Hermesprota Creek where there are 10 to 15 foot vertical drop offs to the creek. The areas are vegetated with trees and shrubs in the transition zone and along the water's edge. Debris was observed protruding through the cover (i.e., concrete, scrap metal, plastic) at several locations and Debris was found on the surface (e.g., rusted drum) that appear to have been brought to the Site after closure of the Landfill (Appendix B, Photographs 24 through 25). There are several locations along the water's edge where buoyant debris (e.g., bottles, cans, plastics, wood, and rubber) appears to have washed up on the Landfill with the rise and fall of the tide. Several areas were observed where stormwater erosion or tidal cycles have formed channels in the side slope.

Northern Portion (Area 16): The northern portion of the Landfill slopes moderately downward from the central crown towards the Delaware County ESTC and wetlands near Hermesprota Creek. In the transition areas, the area is vegetated with trees and shrubs. Debris was observed protruding through the cover at several locations.

3.2.1.2.1 Perimeter Survey Observations

No conventional landfill leachate seeps (i.e. leachate breakouts through cover soil) were observed during the perimeter survey at the Landfill. However, there were localized areas noted along the creek banks and adjacent to marshes that showed signs of intertidal seeps. The approximate locations of these areas are shown on Figure 3-1. In some of these areas, soil staining was noted on the ground surface and sheens were noted on the water surface directly adjacent to the seep areas (Appendix B, photographs 1 through 5).

Based on the results of the initial site reconnaissance, intertidal seep sampling was proposed at Landfill Areas 1, 2, and 3 (see Section 3.4). The seep sample locations are shown on Figure 3-2.

3.2.1.3 Annex Survey

The Annex survey was performed on March 15, 2006 around the time of low tide. The survey started in the northeast corner of the Annex and proceeded south along the banks of Hermesprota Creek and west along the banks of the un-named tributary around the perimeter. The perimeter survey was followed by several routes back and forth across the crown of the Annex to survey the conditions of the soil cover. Several areas could not be surveyed due to steep topography and/or thick vegetation.

3.2.1.3.1 Cover Survey Observations

Annex cover survey observations are summarized by area below:

Entrance: The entrance to the Annex adjacent to the parking lot contained small piles of bricks and other construction debris on the surface that appeared to have been dumped after landfill operations ceased.

Sewer Line (Area SS): A concrete manhole/vent was observed approximately 90 feet from the entrance. The manhole/vent was approximately 4 feet by 4 feet by 4 feet and had a manhole cover on the top (Appendix B, Photographs 53 and 54). Based on discussions with the FWS and DELCORA, this structure provides service for a sanitary sewer force main that runs across the northern edge of the Annex and conveys sewage from eastern Delaware County to the Philadelphia Southwest Wastewater Treatment Plant (WWTP). The force main was installed about 30 years ago and conveys sewage between a pump station near Muckinipattis Creek and the Darby WWTP pump station. The manhole/vent was installed sometime prior to 2006 to release gases from a high point in the line.

In January 2010, the sewer line ruptured at a joint in the concrete pipe just downgradient of the manhole/vent. For the repairs, the sewer line was uncovered and a boot/patch was installed to seal the rupture. Based on Golder's observations during the repairs, there was approximately 1 foot of soil cover in the area and the concrete sewer line appeared to have been installed several feet down within waste material without any apparent bedding material. Based on observations and discussions with USEPA and FWS representatives, the waste included household trash, plastics, and several crushed drums.

Central Crown and Northeastern Portion: The central crown and northeastern portions of the Annex have gentle slopes with vegetated cover and little to no evidence of erosion or exposed waste/debris. The vegetative growth was typically dense, as seen in Photograph 40 in Appendix B. The only observed instances of waste or debris were within the root structure of uprooted trees. *Phragmites* covered much of the northern portion during the survey. During subsequent visits, *Phragmites* was found to cover the entire central and northeastern portion of the Annex, which severely limited visibility and access to certain areas.

Eastern Portion (Areas A, B, C, and D): The eastern portion slopes moderately from the crown down to Hermesprota Creek. The area along the creek was vegetated with trees and shrubs. Several locations in this area were observed to have exposed debris (i.e., plastic, tires, scrap metal, construction/demolition debris) protruding through the cover. Other waste (e.g., broken concrete, rubber hoses, metal scraps, and propane type tank) noted appears to have been have been brought to the Site after closure of the Annex (Appendix B, Photographs 33, 34, and 38). Buoyant debris (e.g., bottles, cans, plastics, wood, and rubber) appears to have washed up on the Annex with the rise and fall of the tide at several locations along the water's edge (Appendix B, Photographs 30, 32, 35, 36, and 39).

Southern/Southwestern Portion (Areas E, F, G, H, J, K, and L): The southern/southwestern portion of the Annex slopes moderately downward from the crown to approximately 30 to 50 feet from water's edge where there were 10 to 15 foot vertical drop offs to the marsh below. The drop-offs decreased in height, and the area leveled out, moving westward along the perimeter. This area is vegetated with trees and shrubs in this transition zone along the water's edge. Many locations were difficult to investigate due to the presence of dense vegetation, downed trees, large pieces of exposed concrete/construction debris, and steep slopes (Appendix B, Photographs 46). Tires, plastic, construction debris, or scrap metal parts were protruding through the side slopes at a few locations (Appendix B, Photographs 41 and 47). At other locations, debris (i.e., tires, scrap metal, rusted drum) were noted on the surface and appears to have been brought to the Annex after landfill closure (Appendix B, Photographs, 42, 43, and 45). Buoyant debris (e.g., bottles, cans, plastics, wood, and rubber) washed up at several locations along the water's edge (Appendix B, Photograph 44).

Western Portion: The western portion of the Annex slopes gently downward from the crown to the unnamed tributary and the parking lot along Maple Avenue. This area is generally vegetated with trees and shrubs; however, there were localized areas with plastic waste and scrap metal protruding through the cover (Appendix B, Photographs 51 and 53) and other areas with debris (i.e., bricks, tires, scrap metal piles) found on the surface that appeared to have been brought to the Annex after closure of the Landfill (Appendix B, Photographs 49, 50, 52). Household waste (bottles, plastics, rubber, wood, cardboard, etc.) was also observed on the surface in areas directly adjacent to the parking lot.

3.2.1.3.2 Perimeter

There were no conventional leachate seeps (i.e. leachate breakouts through cover) observed during the perimeter survey at the Annex. However, there were localized areas noted along the creek banks and adjacent to marshes that showed signs of intertidal seeps. The approximate locations of these areas are shown on Figure 3-1. In some of these areas, soil staining was noted on the ground surface and sheens were noted on the water surface directly adjacent to the seep areas.

Hermesprota Creek (Areas A, B, and D): Several seep areas were noted along the banks of Hermesprota Creek. The approximate locations of these areas are shown on Figure 3-1. These seeps appeared to be related to tidal fluctuations in the creek, which flushes water in and out of the creek bank. One of the observed seepage areas was related to an animal burrow in the creek bank located below the high tide level which was observed draining at low tide. Photographs 29, 36, and 37 in Appendix B show these potential seep areas. Reddish-brown colored staining was observed on the ground surface adjacent to these potential seep areas (see photographs 30, 35, 37, and 39 in Appendix B).

Un-named Tributary (Areas J and L): Localized areas along the marsh and un-named tributary showed signs of intertidal seeps. The approximate locations of these areas are shown on Figure 3-2. Soil staining was present on the ground surface and sheens were noted on the water surface directly adjacent to the seep areas in some of these areas (Photographs 44 and 48 in Appendix B).

Based on the results of the initial site reconnaissance, intertidal seep sampling was proposed at Annex Areas A, D, J, and L (see Section 3.4). The seep sample locations are shown on Figure 3-1.

3.2.2 Well Integrity Survey

The five monitoring wells installed in 1988 as part of the USEPA and FWS joint site investigation (MW-1, MW-2, MW-3, MW-4, and MW-5) and three shallow wells installed near the entrance to the Landfill during the UST removal by FWS (MW-A, MW-B, and MW-C) were inspected to determine whether they could be used for groundwater sampling purposes. Items inspected included: the condition of the riser pipe, surface seal, and security measures (lock, etc.); total well depth; depth to water, water turbidity; and presence, if any, of sediment that may have accumulated at the bottom of the well. All three of the UST wells are in relatively close proximity to each other and are screened at the same approximate interval. Because of these similarities and MW-B's location between the UST excavation and Thoroughfare Creek, only MW-B was selected for further monitoring. This well was subsequently re-named and will be referred to as MW-12 for the duration of this report. The aforementioned former wells (MW-A and MW-C) are located in the vicinity of MW-12, which is shown on Figure 3-2.

The well integrity survey was performed on March 16 and 23, 2006 and consisted of a visual inspection of each well, followed by sounding with a water level probe, and then collecting water with a bailer for visual inspection. The results of the surface inspection showed that the monitoring wells were in generally good structural condition. Recommendations were made to add an extension to the outer casing of MW-3 and to install a new locking outer casing cap to MW-5. Well integrity survey observations are summarized in Appendix C.

3.3 Soil Investigation

3.3.1 Detailed Landfill Cover Investigation

A more detailed and intrusive investigation of the physical condition of the existing soil cover was performed at both the Landfill and Annex as a follow-up to the preliminary cover survey (described above). The detailed landfill cover investigation was designed to evaluate the thickness, extent, and condition of the existing cover and to determine the need, if any, for repairs or upgrades.

The investigation program proposed in the Work Plan consisted of potential sampling locations on an approximate 200 feet by 200 feet grid that included accessible areas at the toe of the Landfill out to the low tide line. Consistent with USEPA guidance (USEPA 1991a) and the approved Work Plan, sample locations could be adjusted in the field so that no soil borings were conducted in areas that obviously required cover repairs. The following guidelines were used to identify those areas where soil borings were not considered necessary:

- Evidence of erosion, exposed waste or debris, or seeps; and,
- Poorly established vegetative cover.

USEPA reviewed the soil boring plan before field work began and added nine additional sampling locations at the Landfill and five additional locations at the Annex, for a total of 35 locations at the Landfill and 18 locations at the Annex. It should be noted that several of these additional locations had exposed debris at the surface. The final locations are shown on Figure 3-2.

The detailed landfill cover investigation was performed from December 12 to December 20, 2006. The intrusive investigation was conducted using a Geoprobe® drill rig operated by Uni-Tech Drilling Co., Inc. (Uni-Tech), a Pennsylvania licensed driller. Borings were generally extended to a depth of 4 feet[14]. The following information was collected at each sampling location:

- Global Positioning System (GPS) location
- Photograph
- Field density and moisture content measurements of cover soil (using a Troxler® nuclear gauge)

Additional soil physical property testing (i.e., grain size, modified Proctor, and re-compacted permeability, (see Table 3-1) had been considered, but was not performed (see below). All soil cores were logged and the soil classified according to the Unified Soil Classification System (USCS). A summary of field density and moisture content measurements is shown in Table 3-3.

At both the Landfill and Annex, waste or debris was encountered in many of the borings within the top 2 feet. A summary of these depths is shown below.

Range of Depths to Waste or Debris in Soil Borings

Depth to Waste or Debris	Landfill	Annex
0.0 ft bgs	8 of 36 (22%)	1 of 18 (6%)
0.1 – 0.9 ft bgs	15 of 36 (42%)	7 of 18 (39%)
1.0 – 1.9 ft bgs	9 of 36 (25%)	7 of 18 (39%)
≥ 2.0 ft bgs	4 of 36 (11%)	3 of 18 (17%)

Note:

ft bgs – feet below ground surface

[14] One boring at the Landfill, L-27, was conducted to only 2 feet due to refusal by waste/debris.

Due to the preponderance of locations having waste and/or debris in the top 2 feet, the other soil physical testing was not conducted.

A summary of soil cover sampling, including depth to waste or debris, is shown in Table 3-4, a photolog of soil sampling activities is shown in Appendix D, and soil boring logs are presented in Appendix E.

The depth to waste/debris (cover thickness) data was input into an Environmental Visualization System (EVS) model to interpolate the soil cover thicknesses and extent across the Site. Figure 3-3 shows the projected extent of cover soil greater than 0.3 feet based on the EVS model.

3.3.2 Soil Sampling and Analysis

Soil sampling and analysis was performed as part of the detailed landfill cover investigation to determine whether there were any chemicals of potential concern within cover soils at concentrations that could potentially cause risk to human health or ecological receptors.

"Surface" soil samples (25 from the Landfill and 15 from the Annex) were collected from a depth of 0 to 6 inches and analyzed for target compound list (TCL) SVOCs, pesticides/PCBs, target analyte list (TAL) Metals and total organic carbon (TOC). "Subsurface" soil samples (11 from the Landfill and 5 from the Annex) were collected from the 6 to 24 inch interval and analyzed for TCL VOCs, TCL SVOCs, pesticides/PCBs, and TAL Metals. Soil samples were biased towards those intervals with evidence of possible contamination based on visual observations and/or PID screening results. At those locations where there was little to no such evidence, the sample was collected as a composite of the entire sampled interval, in accordance with the RI/FS Work Plan. In those instances, the VOC samples were collected from a depth range of 6 to 12 inches, 12 to 18 inches, or 18 to 24 inches. The depth intervals were selected so consistent 6-inch intervals between the depths of 6 and 24 inches would be sampled at multiple locations across the Site. All VOC soil sampling was conducted using the EnCORE™ method.

Samples were collected for dioxin analyses at 10% of the soil sampling locations, including areas with visible evidence of historic landfill fires or ash. For example, a sample was taken at location A-2 because there appeared to be a pile of fly ash at the surface, and at location A-14 because a black ash-type material was observed at 0.5 to 1.3 feet below ground surface (bgs). All measured analytical results for the composite samples were compared directly to screening criteria.

A summary of soil cover samples/analyses is shown on Table 3-5 and results are discussed in Section 5.3.

3.4 Seep Investigation

A more detailed perimeter inspection was conducted on June 27, 2007 with USEPA personnel as a follow up to the previous reconnaissance and to identify locations for subsequent seep sampling. Consistent with the previous investigation, no conventional leachate “break outs” were observed at the Landfill or the Annex sides; however, stained soils and intertidal bank seepage were observed during low tides at several locations near the low-water marks or in mudflats adjacent to the Site.

In consultation with the USEPA, seven intertidal bank seepage areas were identified for aqueous and soil sampling and five additional perimeter soil samples were identified based on geography to provide further characterization of the intertidal areas. The bank seepage and perimeter soil sampling locations are shown on Figure 3-2.

The sampling was conducted on August 14 to August 16, 2007. Intertidal seepage areas were sampled at or near the time of low tide. At each location, the soil sample was collected first in order to create a small depression for the accumulation of seepage, which facilitated aqueous sample collection. Soil samples were collected directly beneath the seep location using a stainless steel trowel and transferred to the laboratory provided sample containers. Aqueous samples were collected using dedicated wide-mouth containers and transferred to the sample containers. Headspace was eliminated in the VOC vials by allowing the liquid to flow slowly down, and completely fill the bottle and cap. The vial was then immediately capped.

All aqueous samples were analyzed for TCL VOCs, TCL SVOCs, pesticides/PCBs, and TAL Metals[15]. Both filtered and un-filtered samples were analyzed for TAL Metals.

Soil samples were analyzed for TCL SVOCs, pesticides/PCBs, and TAL Metals to complement the systematic surface soil grid sampling described in Section 3.3.2 above.

A summary of seepage and perimeter soil samples/analyses is shown on Table 3-5. A photolog of the seepage sampling activities is provided in Appendix F. Seep sample results are discussed further in Section 5.4.

3.5 Landfill Gas/Ambient Air Investigation

3.5.1 Subsurface Landfill Gas Migration Survey

A landfill gas survey was performed in accordance with the RI/FS Work Plan on December 19, 2006 to evaluate the potential for off-site methane migration along the northwest border of the Annex, which abuts

[15] With the exception of one sample (ANA-A), which was analyzed only for TCL VOCs and TAL Metals due to a lack of volume because the seep dried up.

a light industrial area. Other areas of the Site, which are adjacent to water, do not pose a concern for off-site methane migration (Figure 3-4).

A total of 15 bar hole probe measurements were taken approximately every 100 feet along the northwestern perimeter of the Annex at the locations shown on Figure 3-4. A bar hole punch was manually driven to a depth of approximately 3 feet below ground surface (ft bgs), and a Rae Systems VRae multi-gas meter probe inserted into the bar hole to measure percent lower explosive limit (%LEL), carbon monoxide (CO), hydrogen sulfide (H_2S), and oxygen (O_2) in soil gas. In accordance with the Work Plan, the soil gas data were screened against the Pennsylvania regulatory criterion of 25% of methane LEL.

Soil gas was measured at 0% LEL at 12 locations, 1% LEL at two locations, and 2% LEL at one location. It should be noted that all locations where methane was detected (albeit well below the 25% LEL criterion) were in the vicinity of the sewer manhole/vent for the DELCORA force main that runs across the northern boundary of the Annex.

A summary of landfill gas migration survey is shown on Table 3-6. LEL readings are also shown on Figure 3-4. Hourly weather observations for the day of the survey, December 19, 2006, are shown on Table 3-7.

3.5.2 Ambient Air Monitoring Survey

The RI/FS Work Plan proposed ambient air monitoring over both the Landfill and Annex on a 200 foot by 200 foot grid, at background locations, and at additional locations based on a review of soil and groundwater data. Following a review of the data and subsequent discussions with an agreement by the USEPA, the following additional monitoring locations were proposed:

- All seepage sampling areas (Landfill Areas 1, 2, and 3 and Annex Areas A, D, J, and L); and,
- Monitoring wells MW-1, MW-2, MW-3, MW-6, and MW-8.

3.5.2.1 Initial Air Monitoring

The initial ambient air monitoring event was conducted from September 25 to September 27, 2007 and included measurements taken approximately 3 feet above ground surface locations and directly above open monitoring wells. Various VOCs were monitored utilizing the following air monitoring equipment:

- Total non-methane VOCs - MiniRAE 2000 photoionization detector (PID) with a 10.6 eV lamp;
- Total VOCs (including methane) - Photovac MicroFID flame ionization detector (FID); and
- Vinyl chloride - Draeger Tubes with low detection limit tubes.

PID and FID readings were taken over an approximate 2 minute time interval at each sample location. Draeger tube sampling was then conducted following the manufacturer's guidelines for confirmation purposes.

A summary of the initial ambient air monitoring results, including local weather conditions, is provided in Table 3-8. As shown, there were no vinyl chloride detections during the monitoring event. PID and FID readings were evaluated to determine the need for follow-up work according to the following Work Plan criteria:

- PID Background reading +5 ppm
- Methane Higher of either:
  - Background reading x 2; or
  - 25% of methane LEL (i.e., 12,500 ppm)

Three locations (L-10, A-3, and A-7) were found to have PID readings slightly greater than 5 ppm over the background. No locations exceeded the methane criteria.

Recognizing that the background locations were not necessarily upwind based on prevailing wind direction, other locations that exceeded a PID reading of background +5 ppm were also considered, and it was noted that locations A-2 and Seep Area J on the Annex marginally exceeded this criterion. These locations were included in the follow-up work discussed below.

3.5.2.2 Additional Air Monitoring

Following approval by the USEPA, an additional round of ambient air monitoring was conducted at the Site on June 26, 2008 at those specific locations where previous PID readings were greater than background +5 ppm. Ambient air monitoring was initially performed using a PID and a FID at those locations, and then subsequently at step-out locations 100 feet north, south, east, and west of the initial locations. The additional monitoring points included areas adjacent to the Site, and at locations within the Refuge upwind of the Site. Two readings were taken at each location. A summary of the additional ambient air monitoring results, including local weather conditions, is described on Table 3-9 and shown on Figure 3-4.

The FID readings were zero at all onsite and offsite locations. The PID readings were below 5 ppm at locations L-10, A-2, A-3, A-7, and Seep Area J. PID readings were above 5 ppm at two step-out locations. At location A-3 West, the initial measurement was 6 ppm, but a second reading taken two minutes later was 4.8 ppm. At location A-7 East, readings of 15.9 ppm and 11.4 ppm were recorded. However, the concentration fell below 5 ppm at an additional step-out location 25 feet further east.

The differences between the FID and the PID readings are likely related to the sensitivities of the two monitoring instruments to different chemicals and humidity. Specifically, PIDs detect sulfur compounds, but not methane, and FIDs detect methane, but not sulfur. Locations A-7, A-3, and A-2 are near the DELCORA sewer right-of-way and downwind of the DELCORA manhole/vent, and PID readings may have been affected by sulfur emissions related to the sewer, which are thought to be present based on odor. According to the instrument manufacturer, "FIDs are generally free from humidity effects, except if water condenses in the sensor, the flame can be extinguished. PIDs have slightly reduced response as humidity increases and can have false-positive humidity response at very high humidities" (RAE Systems, 2004).

At locations A-3 West and A-7 East, where the PID readings were in excess of 5 ppm, the humidity was reported to be 83% and 81%, respectively, during the survey. Based on the above information, the slightly elevated PID readings were not believed to represent Site-related impacts to ambient air, and therefore, with the USEPA's concurrence, no further air monitoring was performed.

3.5.2.3 Supplemental Air Monitoring

Following USEPA's approval of the Supplemental Air Monitoring Work Plan (Golder, 2012b) and repair of the DELCORA sewer line, the field team mobilized to the Annex on September 9, 2012 to conduct Site reconnaissance including the mark out of the primary air monitoring locations and to screen the area of the newly installed DELCORA sewer line repair with a PID. No VOCs were detected during the reconnaissance; therefore, the monitoring program was not implemented.

The supplemental ambient air monitoring program was conducted on October 12, 2012 when forecasted weather conditions were favorable (i.e., westerly winds less than 15 miles per hour and no precipitation during the monitoring event). Both the Phase 1 (Initial Screening) and Phase 2 (Additional Screening) activities were implemented to help ensure sufficient data was collected to support the RI conclusions. Results of the Phase 1 and 2 work showed that Phase 3 (Summa Canister Sampling) was not necessary in accordance with the work plan.

The results of the supplemental ambient air monitoring program were submitted to USEPA in the Supplemental Air Monitoring Letter Report on February 27, 2017 (Golder 2013a), which is included as Appendix G. The following sections summarize the Phase 1 and Phase 2 results. Additional details are provided in Appendix G.

3.5.2.3.1 Phase 1 – Initial Screening

Ambient air was monitored at each primary location (A-7, A-7 East, A-3, A-3 West, and A-2), with both PIDs over a 5-minute interval. The PID readings were visually monitored throughout the 5-minute interval to identify any sudden spikes and recorded the PID readings at 1-minute intervals. Initial screening locations are shown in Appendix G, Figure 1 and the screening results are shown in Appendix G, Table 2. No spikes were noted and no VOCs were detected (i.e., the PID readings observed at all locations were 0.0 parts ppm).

3.5.2.3.2 Phase 2 – Additional Screening

While Phase 2 screening was not specifically required by the Work Plan based on the Phase 1 Screening results, additional screening was conducted for confirmation and completeness purposes. The following additional screening locations were selected to bound the initial screening area:

- A-7 – two locations approximately 25 feet north (A-7 (N)) and west A-7 (W) from the primary location
- A-7 East – two locations approximately 25 feet south (A-7 East (S)) and west (A-7 East (W)) from the primary location
- A-3 – one location approximately 25 feet north (A-3 (N)) from the primary location
- A-3 West – one location approximately 50 feet west (A-3 West (W)) and a second location approximately 100 feet north (A-3 West ((N)) from the primary location
- A-2 – two locations approximately 25 feet east (A-2 (E)) and west (A-2 (W)) from the primary location
- A-3 East and two locations approximately 25 feet south (A-3 East (S)) and east (A-3 East (E)) from this location
- Perimeter screening included four (4) locations along the western and northern boundaries of the Annex
- Sewer screening included one location at the on-Site manhole near the Annex entrance.

All screening activities were conducted using the same methods and instruments used for the initial screening activities. Similar to the initial screening results, no spikes were noted and no VOCs were detected (i.e., the PID readings observed at all locations were 0.0 ppm).

3.6 Groundwater Investigations

An initial groundwater investigation was conducted in 2006 through 2007 in accordance with the Work Plan (Golder, 2006a) and included monitoring well installation and development, groundwater sampling and analysis, hydrogeological testing, and investigation location survey. The results of the initial groundwater investigation were submitted as part of the initial RI Report (Golder, 2010b)

A preliminary review of the first round of groundwater data showed that the reported constituents, but not necessarily the concentrations, were consistent with previous FWS groundwater sampling results shown on Tables 2-2, 2-3, and 2-4. Therefore, with concurrence from USEPA, a second round of groundwater samples was collected from the newly installed wells and existing well MW-12 on May 24, 2007 and analyzed for the same analyses as the first round except for MW-2, which was analyzed for VOCs only.

During the May 2007 monitoring event, USEPA's Oversight Contractor also collected groundwater samples from the twelve Site monitoring wells for analysis of 1,4-dioxane.

USEPA comments on the RI Report (USEPA 2010a) required further evaluation of the potential presence of VOCs and 1,4-dioxane in groundwater beyond the limits of the Landfill and beneath Thoroughfare Creek/Darby Creek. The Steering Committee agreed to perform additional groundwater investigation in accordance with Additional Groundwater Investigation Work Plan (Golder 2011d), approved by the USEPA on December 22, 2011 (USEPA, 2011d).

The Additional Groundwater Investigation was subsequently performed in phases and included monitoring well installation and development, groundwater screening boring advancement, groundwater sampling and analysis, hydrogeological testing, and investigation location survey. The initial phase included the installation of four new monitoring wells in shallow/deep well pairs at locations MW-A and MW-B at the southern toe of the Landfill and groundwater sampling for VOCs and SVOCs, including 1,4-dioxane. The well installations also included screening borings adjacent to the well locations.

The initial groundwater screening results were reported to USEPA on February 29, 2012 (Golder 2012) and showed that concentrations of Site-related COCs in groundwater increased with depth and could potentially be migrating under Thoroughfare Creek. Additional wells (MW-C and MW-D) were installed to evaluate conditions on the southeastern side of Thoroughfare Creek. The results of Additional Groundwater Investigation were summarized in the Additional Groundwater Investigation Data Summary Report dated August 20, 2012 (Golder 2012d), included herein as Appendix K, which concluded that Site-related COCs, primarily 1,4-dioxane and Cl-VOCs, were migrating beneath Thoroughfare Creek from the southern toe of the Landfill toward the southeast.

Based on these results, the Off-Site Groundwater Investigation was subsequently performed in three phases from 2013 to 2016 to evaluate Site-related COCs in groundwater downgradient of the Site. The first and second phases focused on overburden groundwater and were implemented in accordance with the Off-Site Groundwater Investigation Work Plan (Golder 2013b), approved by USEPA on September 6, 2013 (USEPA 2013). Phases 1 and 2 of the Off-Site Groundwater Investigation included the following activities:

- Monitoring well installation and development
- Groundwater screening boring advancement
- Groundwater sampling and analysis
- Staff gauge installation
- Continuous water level monitoring
- Hydrogeological testing

- Shelby tube collection
- Investigation location survey

The initial Off-Site Groundwater Investigation Report (Phases 1 and 2) was submitted to USEPA on November 11, 2014 (Golder 2014a).

Based on USEPA's comments on that report (USEPA 2014a), a third phase of the investigation was implemented to focus on shallow bedrock groundwater. Phase 3 investigation activities were conducted in accordance with the Appended Work Plan for a Limited Bedrock Groundwater Investigation (Golder 2015) approved by USEPA on May 6, 2015 (USEPA 2015) and included the following activities:

- Monitoring well installation and development
- Groundwater screening boring advancement
- Groundwater sampling and analysis
- Continuous water level monitoring
- Hydrogeological testing
- Downhole geophysical survey
- Investigation location surveys

On September 19, 2016, Golder provided a summary report to USEPA presenting the results of the groundwater sampling associated with Phase 3 of the investigation (Golder 2016a). In an email dated November 11, 2016, USEPA agreed that the groundwater investigation adequately characterized the nature and extent of COCs in groundwater at the Site; accordingly, the RI was complete and the Steering Committee could begin the FS. The off-Site groundwater investigation activities and results are described in detail in the Revised Off-Site Groundwater Investigation Report (Golder 2017a) submitted to USEPA on January 18, 2017. This report detailed the field and laboratory analytical activities conducted during the three-phase overburden and bedrock groundwater investigations and the interpretations of the data collected during these investigations. The USEPA provided comments on the report on February 28, 2017 that were incorporated into a Final Revised Off-Site Groundwater Investigation Report, included herein as Appendix L.

The groundwater investigations activities conducted during the RI are summarized in the following sections. Additional details are provided in the complete groundwater investigation reports in Appendix K and Appendix L.

3.6.1 Well Installation

The results of the initial site reconnaissance in 2007 indicated existing Landfill monitoring wells MW-1, MW-2, MW-3, and MW-12 (former MW-B); Annex monitoring well MW-5; and background well MW-4, were structurally sound and suitable for groundwater monitoring following well re-development. Six additional wells (MW-6 through MW-11) were installed by Uni-Tech Drilling Co. (Uni-Tech) of Franklinville, NJ from December 14, 2006 to January 9, 2007 using hollow stem auger (HSA) drilling techniques. The lithology from wells installations were visually logged and screened with a PID by a Golder geologist. Monitoring well installation photographs from this Site mobilization are provided in Appendix H. Lithologic and well construction logs for screening borings and monitoring wells installed during the RI are included as Appendix I.

During the initial screening phase of the Additional Groundwater Investigation, four monitoring wells (MW-A(S), MW-A(D), MW-B(S), and MW-B(D) were installed by Uni-Tech as shallow and deep well pairs using direct push technology (DPT) methodologies between January 5 and January 10, 2012. Continuous soil cores were collected from the surface to approximately 35 feet bgs using DPT methodologies at locations MW-A and MW-B. Groundwater screening analyses indicated Site-related COCs were present in the groundwater at monitoring well locations MW-A and MW-B. Therefore, three additional wells (MW-C(S), MW-C(D), and MW-D) were installed by Uni-Tech between April 3 and April 6, 2012 on the eastern side of Thoroughfare Creek to evaluate whether the groundwater impacts had migrated off-Site beneath the creek. These three wells were installed using a Jet Wash Rotary rig supported by a tripod mount that was transported to the well locations using a small barge.

During Phase 2 of the Off-Site Groundwater Investigation, a total of 10 new overburden monitoring wells were installed between April 28, and June 3, 2014 by Cascade Drilling, L.P (Cascade), of Woodlinville, Washington, using Rotosonic® (mini-sonic) drilling techniques: wells at the Annex and upgradient locations (MW-13 and MW-14), wells along the Western Refuge Road (MW-15 and MW-16), and wells along the Eastern Refuge Road (MW-17 through MW-19). Monitoring wells MW-15, MW-18 and MW-19 were installed as well pairs comprising two individual monitoring wells screened in the shallow and deep overburden water-bearing zones at these locations. Monitoring wells MW-13, MW-14, MW-16, and MW-17 were installed as single screened interval wells.

During Phase 3 of the Off-Site Groundwater Investigation, three new bedrock monitoring wells (MW-20B, MW-21, and MW-22) were installed by Sonic Drilling Services, Inc. (Sonic), of Dundee, OH, using Rotosonic® (mini-sonic) drilling techniques. These installations required multiple Site mobilizations that began on May 28, 2015 and lasted through October 20, 2015. Monitoring well MW-22 was installed in the upper bedrock interval at the Landfill. Monitoring wells MW-20B and MW-21 were installed in the upper bedrock interval along the Western Refuge Road.

Monitoring wells MW-6 through MW-11, installed during the initial groundwater investigation, utilized isolation casings to seal the waste interval from the underlying formation. A six-inch carbon-steel surface casing was installed from the surface to below the observed waste interval. Monitoring wells installed during Phase 3 of the Off-Site Groundwater Investigation also utilized isolation casings to seal the overburden interval from the bedrock interval. Monitoring well locations MW-21 and MW-22 were installed using triple cased well construction. Monitoring well location MW-20B was installed using double cased well construction. Isolation casings were grouted in place from the base of the casing to the ground surface using tremie pipe methods.

The monitoring wells installed during the RI were generally constructed using 2-inch inside diameter (ID) schedule 40 polyvinyl chloride (PVC) riser with 0.010-inch slot-sized screens that varied in length depending on the thickness of the observed water bearing interval. A filter pack consisting of coarse sand was installed to approximately 2 feet above the well screen interval. A minimum 1-foot thick bentonite chip seal was then installed above the filter pack and allowed to hydrate. After sufficient hydration, the monitoring well annulus was grouted to the surface with a cement/bentonite mix using tremie methods. A summary of monitoring well construction information is provided in Table 3-10. Monitoring well installation logs are included in Appendix I.

Following monitoring well installation, the wells were developed using continuous cycles of pumping and recovery. The cycles continued until relatively clear water was produced (i.e., turbidity equal to less than 30 NTU) and field parameters (pH, specific conductance, temperature and turbidity) measured using a calibrated water quality meter stabilized between consecutive readings, indicating adequate hydraulic communication between the well and the surrounding water-bearing zone.

3.6.2 Groundwater Screening Borings

During the implementation of the Additional Groundwater Investigation, two groundwater screening borings were advanced at monitoring well locations MW-A and MW-B at the southern toe of the Landfill to provide a vertical groundwater chemistry profile in each of the well pairs. Hydropunch® borings were advanced by Uni-Tech and groundwater samples were collected on January 25, 2012 adjacent to each new monitoring well pair location (MW-A and MW-B) at three depth intervals corresponding with the screened intervals of the deep and shallow wells and an intermediate point. The results of the screening borings were reported to USEPA on February 29, 2012 (Golder 2012). Lithologic descriptions for these borings are included in the well construction and boring logs in Appendix I.

During the implementation of Phase 1 and 2 of the Off-Site Groundwater Investigation, 21 groundwater screening borings (RF-SB-01 through SB-21) were advanced by Cascade at the Landfill and along the Western and Eastern Refuge Roads to provide vertical groundwater chemistry profiles and to aid in the selection of monitoring well locations and screened intervals. The screening required three mobilizations beginning on October 28, 2013 and lasting through May 12, 2014. Screening boring logs for Phase 1 and 2 of the Off-Site Groundwater Investigation are included in Appendix I. Locations are shown on Figure 3-5.

During the implementation of Phase 3 of the Off-Site Groundwater Investigation, one groundwater screening boring (requested by USEPA during its review of Phase 2 results) was advanced by Sonic at the Landfill in proximity to MW-9 and MW-22 to evaluate the formation below the base of the screened interval in MW-9 and above the bedrock interface. Lithologic descriptions for this boring are included with the MW-22 well log in Appendix I.

3.6.3 Groundwater Sampling and Analysis

Multiple groundwater sampling events have been conducted at the Site as part of the RI using low-flow purging and sampling methods described in the RI/FS Work Plan (Golder, 2006a) and the Quality assurance/quality control (QA/QC) outlined in the Sampling and Analysis Plan/Quality Assurance Plan (Golder, 2006b).

During the first sampling event from January 29 to January 31, 2007, groundwater samples were collected from monitoring wells MW-1 through MW-12 and were submitted to an USEPA approved laboratory and analyzed for TCL VOCs, TCL SVOCs, Pesticide/PCBs, TAL Metals (unfiltered), and select geochemical parameters (including alkalinity and ammonia) for evaluating natural attenuation.

During the Additional Groundwater Investigation in 2012, two rounds of groundwater sampling were performed following installation of the wells east of Thoroughfare Creek: one from April 23 through 24, 2012 and one from June 5 through June 8, 2012. Each round consisted of sampling wells MW-1, MW-2, MW-3, MW-8, MW-9, MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), and MW-D.

During Phase 2 of the Off-Site Groundwater Investigation, a total of 22 monitoring wells were sampled from June 26 to July 1, 2014 and submitted to CompuChem Labs, Inc. of Cary, North Carolina (CompuChem) for analysis. Sample bottles broken during shipment to the analytical laboratory required that several wells be re-sampled for specific analyses, which was completed on July 8, 2014. CompuChem analyzed the Phase 2 groundwater samples for VOCs, SVOCs including 1,4-dioxane, and TSS.

Groundwater samples collected from select wells during Phase 2 were also analyzed for geochemical natural attenuation parameters (NAPs) to assist in evaluating the natural attenuation of Site related Cl-VOCs. The selected well samples were analyzed for the following NAPs: methane, ethane, and ethene (MEE), alkalinity, sulfate, sulfide, ammonia, nitrate, nitrite, chloride, and total organic carbon (TOC). In addition, pH, specific conductance, oxidation reduction potential (Eh), temperature, dissolved oxygen (DO), and ferrous iron (Fe^{+2}) were measured in the field during sampling.

During Phase 3 of the Off-Site Groundwater Investigation, a total of 25 new and existing wells were sampled to establish updated groundwater chemistry conditions and confirm previous groundwater monitoring results.

The groundwater sampling event was conducted from March 21 through March 25, 2016. Samples were submitted to TestAmerica-Burlington for analysis and initial laboratory data reports were received on April 27, 2016. As reported to USEPA in March 2016 progress report (Golder 2016b), laboratory and reporting issues were identified that resulted in uncertainties in the initial data provided by TestAmerica-Burlington, including:

- The laboratory errantly spiked the groundwater samples with a high concentration of surrogate that would have required dilutions to run the low level detection USEPA CLP SVOC SOM1.2 SIM method. In response, the laboratory was directed to analyze the 1,4-dioxane samples using the standard USEPA CLP SVOC SOM1.2 method to minimize the potential for diluting low-level results below laboratory detection levels.
- The laboratory's VOC and SVOC reporting approach was not consistent with the approach of the previous contracted laboratory, CompuChem. In response, TestAmerica-Burlington agreed to revise and re-issue the laboratory reports to maintain consistency in laboratory reporting for the project.

USEPA was notified via email on June 29, 2016 that the potential issues with the data received from TestAmerica-Burlington warranted re-sampling of select monitoring wells for 1,4-dioxane (only) to confirm the results of the March 2016 sampling. The seven downgradient monitoring wells previously reported as non-detects or with concentrations of 1,4-dioxane less than 5.5 ug/l (i.e., MW-17, MW-18(S and D), MW-19(S and D), MW-20B, and MW-21) were subsequently re-sampled on July 19 and July 20, 2016.

Groundwater sample results are discussed further in Section 5.5.

3.6.4 Staff Gauge Installation

During Phase 2 of the Off-Site Groundwater Investigation, a total of seven staff gauges (SG-04 through SG-10) were utilized. Five of these staff gauges were installed and/or re-surveyed from previous investigations at the initial locations identified in the Off-Site Groundwater Work Plan (Golder 2013). Staff gauges were installed at two additional locations in Hermesprota Creek (SG-9, adjacent to well MW-13) and within the Impoundment along Eastern Refuge Road (SG-10). Locations of staff gauges are shown on Figure 3-5.

3.6.5 Continuous Water Level Monitoring

During Phase 2 of the Off-Site Groundwater Investigation, continuous water level monitoring was performed using seven surface water staff gauge locations in Thoroughfare Creek, Hermesprota Creek, and the Impoundment; and 21 groundwater monitoring locations. All locations were equipped with data-logging pressure transducers on July 9, 2014 and July 10, 2014 to evaluate hydrogeological conditions in the overburden. The groundwater monitoring locations include the following wells: MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, MW-12, MW-13, MW-14, MW-15(S/D), MW-16, MW-17, MW-18(S/D), MW-19(S/D), MW-B(D), MW-C(D), and MW-D.

The data loggers were time-synchronized and programmed to collect water level and temperature data every two minutes. Manual water levels were measured each week in the monitoring wells during Site mobilizations to download data-loggers. Monitoring was completed on August 11, 2014 after the approximate completion of one lunar cycle. During the monitoring event, data-logger malfunctions occurred in monitoring wells MW-B(D) and MW-C(D). The devices at these locations were replaced when the malfunctions were noted; however, about one week of data is missing from both data sets. In addition, the data-logger at staff gauge location SG-07 was periodically exposed to the air during low tide, at which time Hermesprota Creek was effectively dry. Analysis of recovered transducer data was conducted over a period of time approximately equal to a lunar sidereal month (27.32 days). The period of time in which transducers were acquiring data and complete overlap of times was available was determined to be 27.44 days (i.e., 53 complete tidal cycles).

During Phase 3 of the Off-Site Groundwater Investigation, continuous groundwater level and temperature data were also collected in bedrock wells (MW-20B, MW-21, and MW-22) and their associated overburden well pairs (MW-9, MW-15(S/D), and MW-16) using data logging pressure transducers. The monitoring period extended from November 13 through 20, 2015. The data loggers were time-synchronized and programmed to collect water level and temperature data every two minutes. Manual water levels were measured in the monitoring wells during Site mobilizations to download data-loggers.

The water level obtained during the two “long-term” monitoring events were synthesized and evaluated to assess vertical hydraulic gradients between the overburden and bedrock aquifers as discussed further in Section 4. Additional information regarding the groundwater level monitoring conducted during the Off-Site Groundwater Investigation is provided in Appendix L.

3.6.6 Hydrogeological Testing

Hydrogeological “slug” tests were performed in Site monitoring wells during the multiple phases of the RI to estimate the hydraulic conductivity of the screened intervals. Test data were first analyzed using the Hvorslev (Hvorslev 1951) and Bouwer and Rice methods (Bouwer 1976). When appropriate, test data from highly conductive wells were also analyzed using the van der Kamp (van der Kamp 1976) method, which is applicable for highly conductive conditions. Hydrogeologic test data are included in Appendix J. A summary of the slug test analysis results is provided on Table 3-11 and discussed further in Section 4.

3.6.7 Shelby Tube Collection

During implementation of Phase 2 of the Off-Site Groundwater Investigation, a Shelby Tube sample was collected on May 23, 2014 from well location MW-16 to evaluate the permeability of a clay unit encountered at a depth interval of 17-19 feet bgs. The Shelby Tube was advanced ahead of the casing and allowed to sit for 10 to 30 minutes to allow the pore pressure to equilibrate before extraction. After extraction, the Shelby Tube was stored in an upright position prior to submitting to a geotechnical laboratory, TRC Engineers, Inc. (TRC), for analysis. The laboratory permeability results are discussed in Section 4.

3.6.8 Investigation Location Survey

Monitoring wells MW-4, MW-5, and MW-6 were surveyed in 2007 by James M. Stewart, Inc. Monitoring wells MW-A, MW-B, MW-C, and MW-D were surveyed in 2012 by Gilmore and Associates. All other monitoring wells were surveyed by Vargo Associates from 2014 to 2015. Screening borings RF-SB-01 through SB-21 and staff gauges SG-04 through SG-10 were also surveyed by Vargo Associates from 2014 through 2015.

Survey of monitoring well locations included reporting of ground surface, top of inner casing, and top of outer casing with a horizontal accuracy of ±0.1 feet and a vertical accuracy ±0.01 feet. Screening borings and staff gauges were surveyed to a horizontal accuracy of ±0.1 feet and a vertical accuracy of ±0.01 feet. Survey locations are shown on Figure 2-1.

3.7 Investigation Derived Waste

During the initial remedial investigation, solid investigation derived waste (IDW) was drummed and stored on-Site. The drums were subsequently inventoried and waste characterization analyses were performed to determine appropriate disposal options and the waste was disposed at an appropriate permitted disposal facility. During subsequent groundwater investigation, solid IDW from Refuge locations was transported in temporary containers to a staging area where a large roll-off container was present. The solid IDW was stored there until characterization was completed. Based on the results of the waste characterization analyses, the IDW was deemed non-hazardous and was disposed off-Site in an appropriately permitted disposal facility.

In accordance with the approved work plan, aqueous IDW (i.e., purged groundwater) generated at the Refuge, was stored in a tank, characterized, and then transported off-Site for disposal at an appropriately licensed disposal facility. At the Landfill, the purged groundwater was discharged onto the ground surface in a manner that allowed it to percolate into the surrounding soil without running off directly into surface water bodies.

3.8 Land Surveying

The following land survey work was completed on June 1, 2006 by James M. Stewart, Inc., a Pennsylvania Licensed surveyor, during the RI:

- Boundary survey of the Site that including the following:
  - Incorporating property lines from deed information provided by the FWS on to an existing photogrammetric base map of the Site developed by the USEPA's contractors;
  - Field confirmation of the topography in obscured areas on the base map;

Horizontal control is tied to the Pennsylvania State Plane Coordinates (NAD 83 – South Zone) and vertical datum NAVD 88. Surveying results are included in Appendix M.

3.9 Background Soil Sampling

The USEPA conducted background soil sampling program as part of the investigation for the Clearview Landfill operable unit of the LDCA site. Sampling was conducted in April 2007 at the Refuge near the Visitors Center and at the Korman Suites International Chalet property across Lindbergh Boulevard from the Refuge. It is not known what criteria were used to determine that these locations represented background conditions.

At the Refuge, the USEPA's Contractor collected soil at two depth intervals (0 to 6 inches and 6 to 18 inches) at four locations between the Environmental Education Center and the Maintenance Building. The soil was analyzed for VOCs, SVOCs, pesticides, and total metals. At the Korman Suites, the USEPA's Contractor collected soil samples at the same depth intervals at seven locations on the property. These samples were also analyzed for VOCs, SVOCs, pesticides, and total metals.

The results were accepted as is, based on the USEPA's representation of their validity, and were incorporated without adjustment into the evaluation of COPCs and estimation of risk in this report. The results of these sampling events are included as Appendix N.

3.10 Sample Analysis/Data Validation/Data Management

3.10.1 Initial Remedial Investigation (2006 through 2008)

Groundwater, soil, and seepage samples were analyzed in a fixed laboratory for TCL/TAL analytes in accordance with the USEPA CLP Statements of Work (SOW) OLC03.2, OLM04.3, and ILM04.3. In addition, groundwater samples were analyzed for the following biogeochemical parameters to support evaluation of contaminant fate: Light Hydrocarbons (MEE); alkalinity; sulfate; sulfide; ammonia; nitrate; nitrite; and TOC. The following additional parameters were measured in the field: pH; specific conductance; Eh; temperature; DO; and Fe^{+2}.

CompuChem, was used for all laboratory analyses except MEE, which was subcontracted to Microseeps Inc. of Pittsburgh, Pennsylvania (Microseeps). Both CompuChem and Microseeps are Pennsylvania certified laboratories. All analytical data from CompuChem and Microseeps were validated in accordance with the USEPA Region III Standard Operating Procedures. The approved Sampling and Analysis Plan/Quality Assurance Plan (Golder 2006b) includes information regarding sampling procedures, analytical procedures, quality assurance, and data validation procedures.

An electronic database was constructed using EarthSoft's EQuIS environmental data management software to manage the analytical data, and to export files in formats consistent with USEPA Region III electronic data deliverables. The database was also used to generate data tables, with qualified results, for use in the risk assessments. The electronic data was previously submitted to the USEPA in both the EQuIS and Excel formats, and is provided in Appendices O and P.

Golder's assessment of the laboratory data quality showed that the analytical results for the monitoring event were acceptable for their intended use, with the exception of data qualified as **R** (rejected). Acceptable levels of accuracy and precision, based on LCS, MS/MSD, field duplicate and surrogate recoveries, were achieved for the vast majority of generated data. In addition, the data completeness (i.e. the ratio of the amount of valid data obtained to the amount expected) was 99.1%, which exceeded the project goal of 90%. The data quality assessment is provided as Appendix Q.

3.10.2 Groundwater Investigations (2012 through 2016)

Groundwater samples collected during the Additional Groundwater Investigation (locations MW-A through MW-D) and Phase 2 of the Off-Site Groundwater Investigation were submitted to CompuChem for laboratory analysis, with exception of analysis of methane, ethane, and ethane (MEE), which was sent to Microseeps Inc. The laboratory data was validated by Golder in accordance with RI/FS Work Plan (Golder 2006a). The following is a list of the analytical parameters and their associated analytical methods:

- TCL VOCs; USEPA Method 8260B
- TCL SVOCs; USEPA Method 8270C
- TSS; Standard Method SM 2540D

Based on the data quality assessment, the analytical data for the samples collected during the April and June sampling events were determined to be acceptable for their intended use with the exception of data qualified as rejected (R). Acceptable levels of accuracy and precision, based on laboratory and field QC samples, surrogate recoveries, instrument calibrations, and internal standards were achieved for the vast majority of generated data. In addition, the data completeness (i.e. the ratio of the amount of valid data obtained to the amount expected, including estimated data (J/UJ)) was 98.7%.

Groundwater samples collected during Phase 3 of the Off-Site Groundwater Investigation were submitted to Test America Burlington for analysis. The laboratory data was validated in accordance with RI/FS Work Plan. The following is a list of the analytical parameters and their associated analytical methods:

- TCL VOCs; USEPA Method 8260B
- TCL SVOCs including 1,4-dioxane; USEPA CLP SVOC SOM1.2

Based on the data quality assessment, the analytical data for the samples collected during the sampling event were determined to be acceptable for their intended use. Acceptable levels of accuracy and precision, based on LCS, MS/MSD, field and laboratory duplicates, and surrogate recoveries were achieved for the generated data. In addition, the data completeness (i.e. the ratio of the amount of valid data obtained to the amount expected, including estimated data (J/J+/J-/UJ)) was 100%.

4.0 SITE CHARACTERISTICS

4.1 Site Meteorology

According to historical information for Philadelphia from the Pennsylvania State Climatologist, measurable precipitation falls approximately 119 days of the year. The average rainfall is 42.05 inches, and the average snowfall is 19.3 inches. The wettest month of the year is July with an average rainfall of 4.39 inches. The average annual temperature is approximately 55.3°F, with summer temperatures averaging approximately 72°F to 78°F and winter temperatures averaging approximately 32°F to 43°F.

Based on data from the National Climatic Data Center[16], the average annual wind velocity in Philadelphia is approximately 10 miles per hour (mph) with summer wind speeds averaging approximately 8 to 9 mph and winter wind speeds averaging approximately 10 to 11 mph. Wind direction is, on average, from the southwest.

4.2 Surface Water Hydrology

The Site is located in the Darby-Cobbs Creek Watershed (Figure 2-2), which is a complex urban watershed that drains 77 square miles in 3 suburban counties as well as parts of the City of Philadelphia. The watershed has a population of approximately 500,000 residents and numerous permitted and unpermitted dischargers to surface water. The Site is located at the downstream end of this watershed where the stream grade decreases significantly and therefore serves as a regional “sink” for fluvial sediments originating in upstream urban areas, and suspended load and bed load contaminants are deposited adjacent to the Site where the stream grade decreases and the water velocity is correspondingly lower compared to upstream and downstream areas (USEPA 1986). The filtering action of vegetation also likely leads to additional deposition of regional contaminants in the marsh sediments adjacent to the Site.

In the vicinity of the Site, surface water includes impoundments, creeks, and marsh areas. The larger streams in the Site vicinity include Darby Creek, Cobbs Creek, Thoroughfare Creek, Hermesprota Creek, and Muckinipattis Creek, which drain into Tinicum Marsh (part of the Refuge). Cobbs Creek flows into Darby Creek upstream of the Site, and Darby Creek is renamed Thoroughfare Creek in the vicinity of the Site (Figure 1-2). Thoroughfare Creek bounds the Landfill to the east and southeast and Hermesprota Creek separates the western boundary of the Landfill and the eastern boundary of the Annex. An unnamed tributary to Hermesprota Creek forms the southwestern boundary of the Annex. Surface water from the area ultimately flows into the Delaware River, although flow reversals occur as a result of tidal action and extend well upstream from the Site (Tetra Tech 2002). The creeks in the area flow through industrial

[16] NOAA National Climatic Data Center

and heavily urbanized areas upstream of the Site. The periodic deposition of flood debris onto the Folcroft site is self-evident.

4.3 Geology

The following sections summarize the regional geologic setting, the geology of the unconsolidated materials (overburden) based on the results of the Phase 1 and Phase 2 Off-Site Groundwater Investigations, and the upper bedrock geology of the Site based on the Phase 3 Off-Site Groundwater Investigation.

Figures related to the identification and interpretation of geologic materials present at the Site based on the historical and newly-obtained RI data are presented as follows:

- ***Figure 4-1*** – Provides locations of interpreted geologic cross-sections used to illustrate subsurface geology.
- ***Figure 4-2*** – Presents a top-of-bedrock contour map referenced to elevation in feet North American Vertical Datum of 1988 (NAVD88) based on data collected from screening borings, newly installed monitoring wells, and historical well installations.
- ***Figure 4*-3** – Presents geological cross-sections of the strata underlying the Annex from the northwest to the southeast (Cross-Section A-A') and from the southwest to the northeast (Cross-Section B-B').
- ***Figure 4-4*** – Presents geologic cross-sections of the strata underlying the eastern portion of the Landfill (Cross-Section C-C'') and underlying the Western Refuge Road based on borings RF-SB-1 through RF-SB-10 (Cross-Section D-D').
- ***Figure 4-5*** – Presents geologic cross-sections of the strata underlying Eastern Refuge Road (Cross-Section E-E') and the strata extending from upgradient monitoring well MW-14 through the southern portion of the Landfill and the Western Refuge Road southeastward towards the downgradient sentinel monitoring well location MW-19 (Cross-Section F-F').
- ***Figure 4*-6 –** Presents geological cross-sections from the center of the Landfill at monitoring well location MW-9 to the southeast along the Western Refuge Road at monitoring well location MW-16 (Cross-Section G-G') and from MW-11 at the Landfill to the northeast along the Western Refuge Road at monitoring well location MW-15 (Cross-Section H-H').

Geologic boring and well installation logs are provided in Appendix I for the boreholes drilled and monitoring wells installed during these phases of the investigation.

4.3.1 Regional Geology

The Site is located just east (downgradient) of the "Fall Line", which defines the boundary of the Coastal Plain Physiographic Province (lowlands), characterized by unconsolidated materials, to the south and east of the Site; and the Piedmont Physiographic Province (highlands), characterized by crystalline bedrock, to the north and west of the Site.

The Coastal Plain is described as a seaward dipping wedge of unconsolidated materials that increases in thickness toward the east (Zapeca, 1989). In the vicinity of the Site, the Coastal Plain sediments are typically comprised of Quaternary, Tertiary, and Cretaceous age interbedded sands, silts and gravels. The topography of the Coastal Plain is typically low relief and low elevation. In contrast, the Piedmont is geologically more complex and typically comprises a variety of deformed and metamorphosed consolidated rocks, with a surface characterized by low, rolling hills with elevations up to several hundred feet above mean sea level. The Piedmont in the vicinity of the Site is typically underlain by Lower Paleozoic metasedimentary rocks, primarily the oligoclase-mica schist of the Wissahickon Formation, commonly known as the Wissahickon Schist.

4.3.2 Overburden Geology

The following information provides a summary of the surficial unconsolidated materials (overburden) encountered during the RI. Geological data were collected during advancement of screening borings and monitoring well installations at upgradient locations north and west of the Annex, the Annex, the Landfill, and downgradient locations at the Western Refuge Road and the Eastern Refuge Road.

The majority of surficial materials encountered at the Annex and the Landfill has been re-worked and in-filled by Site landfill operations to the extent that little, if any, of the original surface topography or geomorphology remain. Waste and debris were placed over much of the Site. Court records demonstrate that a 2-foot-thick soil cover was placed over the Landfill. Specifically, a minimum two-foot soil cover was placed over the entire landfill based on the findings of the inspectors of the PA Department of Environmental Resources (PADER, now PADEP). An August 29, 1973 Pennsylvania Commonwealth Court Order required “complete coverage of the entire landfill site” using sources of soil cover approved by PADER or, if acceptable cover could not be acquired in time, “using those sources of material which are available or have been acquired.” Based on inspection by PADER, the Assistant Attorney General reported to the Court on October 29, 1977 that “the site has been finally closed, covered with earth, regraded, and revegetated in substantial compliance with the Order of Commonwealth Court…” Cover materials reportedly were obtained from borrow sources that included dredge spoils, soils excavated for construction of Interstate 95, and soils excavated from a construction project at the Sun Oil refinery in Marcus Hook, Pennsylvania (Ecology and Environment 1980). The material from the Marcus Hook construction project was characterized and then approved by PADER for use as a cover material in 1977 (SMC Martin 1979a). Therefore, the presence of concrete fragments, brick, etc., at the Annex/Landfill surface does not necessarily represent exposed wastes and the absence of cover. Information regarding other existing cover borrow sources is limited.

As shown on cross-sections, geologic units encountered at the Annex can be generalized in vertically-descending order as follows:

- ***Cover Soil / Fill:*** Ranging in thickness from <1 to 10 feet; this material is generally silty and contains construction and demolition material
- ***Fill / Waste Material:*** Ranging in thickness from 3 to 16 feet, this material is similar to the cover soil/fill but also contains refuse
- ***Sands / Silts / Clays:*** Ranging in thickness from 3 to 16 feet, this material is grey to brown. The fine grained materials (silts and clays) generally include a sandy matrix
- ***Weathered Schist:*** The top of bedrock ranged in depth from elevation -8.4 to greater than -22.55 feet NAVD88 with the lowest elevation observed to the southeast. The bedrock was logged as weathered and broken schist.

At location MW-14, just west of the Annex, no evidence of fill was encountered during drilling. Materials encountered during drilling showed alternating sequences of sands and silty clays with rounded to sub-rounded gravels interspersed from ground surface to approximately 17.5 feet bgs where weathered bedrock was encountered. Drilling terminated on more competent bedrock at 20.5 feet bgs (Cross-Section F-F').

As shown on the cross-sections, the geologic units encountered at the Landfill can be generalized in descending order as follows:

- ***Cover Soil / Fill***: Ranging in thickness from <1 to 11.5 feet, this material is generally silty with traces of brick and concrete fragments. Colors range from medium brown to black and the materials include occasional organic matter (e.g., roots).
- ***Fill / Waste Material***: Ranging in thickness from 3 to 25.5 feet, with an average thickness of 13.25 feet in the four borings conducted during this investigation. The material is predominately silty with a darker brown color than the cover materials, and inclusion of wood, concrete, and general refuse.
- ***Silty Clay Unit***: Ranging in thickness from 0 to 4 feet, the material is thickest at SB-11 and SB-12 (4 feet) with no silty clay observed at SB-13 and SB-14. The material is brown to gray, soft and cohesive, with occasional root fibers.
- ***Silty Sands / Sands***: Ranging in thickness from 8 to 22.5 feet, the sands are generally well graded and brown with occasional gravels. A 0.5 foot thick silt interbed is present near the top of the sand in SB-11.
- ***Sandy Gravels / Clayey Gravels***: Ranging in thickness from 0 (SB-12) to 7.5 feet (SB-11), this material is generally directly overlying the weathered bedrock surface with the exception of boring SB-14, where a 2 foot thick sand sequence was observed to underlie the gravel and rest in direct contact on the underlying weathered bedrock surface.
- ***Weathered Schist***: The top of the bedrock interface ranged in depth from elevation -16 to -33.9 feet NAVD88 with the lowest elevation observed to the south. The bedrock was logged as moderately weathered and broken schist. Thickness ranged from approximately 0 to 30 feet.

Materials logged in soil borings along the eastern side of the Landfill (Cross-Section C-C') show the presence of cover soil and waste overlying silts and silty clays; however, the clays do not form a continuous layer beneath the waste. The areas where the silty clay is absent may be due to natural erosional processes that occurred locally or may be a result of excavation of the clays prior to placement of the waste/fill material (potentially for daily cover during waste placement). Underlying the waste and fine grained sediments are a sequence of sands and gravels with coarser materials generally found deeper and closer to the bedrock consistent with deposition in a fluvial system. These materials have been identified by others as the Quaternary Age Trenton Gravel Formation (Pennsylvania Geologic Survey, 2001).

The geologic units encountered at the Western Refuge Road, located hydraulically downgradient of the Landfill, can be generalized in descending order as follows:

- ***Topsoil / Fill / Roadbase***: Ranging in thickness from 3 to 7 feet, this material is generally silty with traces of brick and root fibers. The material has been compacted in places to form the Western Refuge Road embankment.
- ***Silty Clay Unit***: Ranging in thickness from 16 to 47 feet, materials recovered during drilling were soft and cohesive and exhibit occasional high organic and root content (peat) as well as interbedded fine grained layers (characteristic of seasonal variations referred to as varves). Where encountered, the peat layers are usually 1.5 to 2 feet in thickness. The thickest area of clay (approximately 40 to 45 feet) was encountered between RF-SB-9 and RF-SB-2, and generally thins to the north and south. Occasional thin sand layers are observed in the lower portions of this unit.
- ***Interbedded Sands and Gravels***: This unit is generally less than 15 feet thick, underlies the silty clay sequence, and consists of intermixed sand and gravel. In general, continuous vertical sequences of sand are greater to the south. The sand and gravel include intermittent zones of clayey or silty clay with no apparent preferred sequence. With the exception of RF-SB-4 and RF-SB-10, this unit is immediately underlain by weathered bedrock.
- ***Interbedded Clays, Silts, Sands and Gravels***: Observed in borings RF-SB-4 and RF-SB-10 are an interbedded sequence of mixed lithologies ranging in thickness from 0.5 to 3 feet that appear to be distinct from the previously described Silty Clay Unit. Clay content increases with depth including the presence of 2 to 3 foot thick clay layers that are firmer than the Silty Clay Unit.
- ***Weathered Schist***: Top of the bedrock interface along this transect of borings ranged in depth from -20 to -57 feet NAVD88 with the lowest elevation observed in RF-SB-10. This material was logged as moderately-weathered and broken schist. Thickness ranged from approximately 0 to 21 feet.

Western Refuge Road borings (Cross-Section D-D'), located immediately east of Thoroughfare Creek and the Landfill, encountered a thick sequence of silty clays overlying sands and gravels in direct contact with the weathered bedrock. The character of the sands and gravels suggest they were deposited in a high energy fluvial environment, whereas deposition of the thick sequence of fine grained materials (silty clay) that overlie the sands and gravels would require a relatively low energy environment such as a lake or estuary. The presence of peat layers within the clays indicates that these sediments were deposited at or near mean sea level at that time.

The geologic units encountered in the borings advanced along the Eastern Refuge Road, hydraulically downgradient of the Landfill and the Impoundment, can be generalized in descending order as follows:

- ***Topsoil / Fill / Roadbase***: Ranging in thickness from 3 to 7 feet, this material is generally a combination of silts, clays and clayey gravel with some foreign material including traces of brick, root fibers and metal scraps. The material has been compacted in places to form the Eastern Refuge Road embankment. The Lansdowne, PA, 1942, 7.5 minute topographic map shows that this embankment was constructed to support a rail line.
- ***Silty Clay Unit***: Immediately underlying the fill material, this unit is generally thinner than observed along the Western Refuge Road with thickness ranging from 0 (SB-17 and SB-18) to 39 feet in SB-16. There is significant variability of this unit at the boring locations investigated. The thickest continuous sequences are at SB-16 and SB-19 (20.5 feet thick). A thick sequence of clay was also encountered at MW-17 (51 feet thick) that contains two roughly 1-foot thick interbedded sand layers at depths from 16 to 18 feet bgs. Apparent thickness of shallow silty clays in other borings range from 5 to 6.5 feet. The material has characteristics similar to the silty clay described for the Western Refuge Road.
- ***Interbedded Clays, Silts, Sands and Gravels***: Similar to the materials described for borings RF-SB-4 and RF-SB-10 along the Western Refuge Road, underlying the silty clay (or in direct contact with fill where the silty clay is missing) is an interbedded sequence of mixed lithologies. In general, sands, and to a lesser extent sands mixed with gravels, dominate the observed sedimentary sequences with vertical sequence thicknesses of up to 50 feet. Interbedded with the sands and gravels are clay and silty clays that are firmer than the shallow Silty Clay.
- ***Weathered Schist***: Top of the bedrock interface along this transect of borings ranged in depth from -58 to -79 feet NAVD88 with the lowest elevations observed in SB-18, SB-19 and SB-20 (Figure 3). This material is described as moderately weathered and broken schist. Thickness ranged from approximately 0 to greater than 5 feet.

The borings along the Eastern Refuge Road (Cross-Section E-E') indicated a thicker sequence of sediment overlying bedrock that has a much greater percentage of coarse grained sands and gravels than was encountered along the Western Refuge Road. This area may include older (Cretaceous Age), reworked sediments deposited in a near shore shallow marine delta environment.

The multiple phases of investigations of overburden geology identified a fine grained (silty clay) sedimentary sequence that underlies the Landfill and thickens eastward underneath the eastern portions of the Refuge Impoundment where it begins to thin, continuing eastward. Underlying the silty clay and directly above the weathered bedrock surface is a continuous sand and gravel sequence that thickens to the east and contains coarse grained sediments with occasional, interbedded finer-grained silts and clays. These interpreted continuous sequences are presented in Section F-F' which illustrates the geologic materials oriented from the most upgradient portion of the investigation area (MW-14) through the center of the Landfill and to the most downgradient portion of the investigation area along the Eastern Refuge Road (MW-19).

4.3.3 Bedrock Geology

Bedrock at the Site is identified as the Wissahickon Formation, a metamorphic sequence of sedimentary and granitic origin that is Lower Paleozoic Age. The Wissahickon Formation includes oligoclase-mica schist, some hornblende gneiss, some augen gneiss, and some quartz-rich and feldspar-rich members due to various degrees of granitization (Pennsylvania Geologic Survey, 2001). The Wissahickon Formation is considered a single bedrock geologic unit for the purposes of the RI at the Site, as shown on Cross Sections G-G' and H-H' on Figure 4-6.

In general, the upper bedrock formation encountered at the Site consists of highly weathered mica-schist bedrock underlain by more competent Wissahickon Formation rock structure at varying depths and is as follows:

- The bedrock is generally foliated (i.e. rock texture where mineral orientation is parallel). When possible to be measured (core samples not directionally oriented), foliation angles generally ranged from zero to 50 degrees from the horizontal axis of the retrieved core. Sub-vertical foliation features were observed at 87.5 ft bgs (-81.5 feet NAVD88).in MW-21.
- Orange iron oxide staining was observed beneath the Landfill in monitoring well MW-22 at the 66.5 to 68.5 ft bgs interval (-22.6 to -24.6 feet NAVD88). Additionally, orange iron oxide staining was observed in the overburden at the 62.25 to the 66.2 ft bgs (-18.35 to -20.3 ft NAVD88) at the base of the overburden sediments.
- Variable degrees of weathering were observed within the upper bedrock zone, ranging from friable samples that could be manually deformed to intermittent zones of relatively stronger rock (e.g., could not be manually deformed and required a hammer to break). Some of the fractures observed in the stronger rock intervals may be associated with the Rotosonic® drilling technique rather than actual natural weathering processes and/or rock competence but these differences are sometimes difficult to discern.
- Vertical fractures were observed in some deeper (i.e., greater than 100 ft bgs) core samples.

Overall, the top of bedrock surface in the vicinity of the Site generally dips to the east/southeast. From monitoring well MW-22 toward monitoring well MW-20B, the top of bedrock surface gradient is approximately 0.021. From monitoring well MW-22 toward monitoring well MW-21, the top of bedrock surface gradient is approximately 0.015. Bedrock surface peaks and valleys oriented perpendicular to true dip and areas of preferential weathering form an undulating top of weathered bedrock stratum at the overburden/bedrock interface that ranges in thickness from several feet to greater than 20 feet.

4.4 Hydrogeology

The following sections summarize the regional hydrogeologic characteristics of the Coastal Plain and Piedmont Physiographic Provinces, the hydrogeology of the unconsolidated materials (overburden) based on the results of the Phase 1 and Phase 2 Off-Site Groundwater Investigations, and the hydrogeology of the upper bedrock at the Site based upon the results of the Phase 3 Off-Site Groundwater Investigation.

4.4.1 Regional Hydrogeology

Groundwater flow in the Coastal Plain sediments is typically through inter-granular or primary porosity under unconfined or semi-confined aquifer conditions. In contrast, groundwater flow in the igneous and metamorphic rocks of the Piedmont is usually under confined conditions through a network of interconnected secondary openings such as fractures, joints, and/or cleavage planes (Low *et al*., 2002).

Groundwater flow in southeastern Pennsylvania generally takes place within local flow systems that discharge within days or weeks to adjacent stream valleys or surface water bodies. Groundwater in the vicinity of the Site originally flowed from the higher elevation areas near the Fall Line and ultimately discharged to the tidally-influenced Delaware and Schuylkill, but the original flow paths have been significantly altered by urbanization (Low *et al*., 2002).

Large volume pumping wells used for potable, agricultural or industrial purposes since the early 1900s have resulted in depressions in the potentiometric surface. The pumping caused localized reversals of the natural hydraulic gradient in those areas, with local recharge coming from the rivers (Greenman *et al.,* 1961). Regional groundwater pumping is still occurring today that may influence groundwater elevations at the Site. As described in Appendix L, the potentiometric elevations in wells along the Eastern Refuge Road suggest the possible influence of off-site pumping wells. Various historical reports and observations as well as discussions with USEPA have identified historical and current industrial groundwater pumping operations ranging from 2.5 miles northeast of the Site in Southwest Philadelphia (Southwest Water Pollution Control Plant) to 4 miles east of the Site in South Philadelphia (Navy Yard). Other regional groundwater pumping may be occurring at an indeterminate distance from the Site.

4.4.2 Overburden Hydrogeology

As discussed in Section 3.6, due to the local influence of marine tides on overburden groundwater levels, a long-term transducer survey was conducted in existing and new monitoring wells with additional locations added as staff gauges at select surface water bodies. Interpreted groundwater elevation contours reflecting recorded water pressures at the times of the highest observed high tide, the lowest observed low tide, and average tide conditions were developed to demonstrate the Site's direct groundwater interaction with Thoroughfare Creek during these end-member tide conditions. Based on observed surface water levels and groundwater pressure responses in Landfill and off-Site monitoring locations the following inferences can be made:

- During high tide, potentiometric hydraulic heads are generally greater at Thoroughfare Creek than the Landfill and the Impoundment.
- During low tide, potentiometric hydraulic heads are generally greater at the Landfill and the Impoundment than Thoroughfare Creek.

- Based on a full tidal cycle (net groundwater gradient conditions), potentiometric hydraulic heads are generally greater in Thoroughfare Creek than the Landfill and the Impoundment.

Figure 4-7, Figure 4-8, and Figure 4-9 depict overburden groundwater flow and potentiometric surface interpretations based on average groundwater conditions, maximum high tide conditions, and minimum low tide conditions, respectively.

In addition, the long-term transducer survey allowed for the evaluation of vertical gradients in the overburden strata at the Site based on three locations where multiple vertical screened intervals are present in close proximity to each other (MW-15, MW-18 and MW-19) as follows:

- ***MW-15*** *(located on the Western Refuge Road roughly 850 feet northeast of Landfill well MW-8)*: The average water pressure at the midpoint of the confined screen interval of MW-15S (approximately -0.11 feet NAVD88) is lower than the average water pressure observed at the midpoint of the confined screen interval of MW-15D (approximately 0.12 feet NAVD88) calculated over the same time interval. This difference in pressure shows the potential for upward vertical gradients to the overlying sedimentary sequence at this location.
- ***MW-18*** *(northernmost well pair on Eastern Refuge Road)*: The average water pressure at the midpoint of the confined screen interval of MW-18S (approximately -4.58 feet NAVD88) is slightly lower than the average water pressure observed at the midpoint of the confined screen interval of MW-18D (approximately -4.57 feet NAVD88) calculated over the same time interval. This difference in pressure shows the potential for very slight upward vertical gradients from the bedrock into the overlying sedimentary sequence at this location. It should be noted that the difference in water pressures at these two screens (0.01 feet) is within the established range of surveying accuracy.
- ***MW-19*** *(well pair southeast of the Landfill)*: The average water pressure at the midpoint of the confined screen interval of MW-19S (approximately -2.87 feet NAVD88) is slightly higher than the average water pressure observed at the midpoint of the confined screen interval of MW-19D (approximately -3.06 feet NAVD88) calculated over the same time interval. This difference in pressure shows the potential for slight downward vertical gradients from the overlying sedimentary sequence into bedrock at this location.

Vertical groundwater flow gradients observed between bedrock and overburden groundwater at the Site based on information obtained during the bedrock groundwater investigation are discussed in Section 4.4.3.

4.4.2.1 Overburden Hydraulic Conductivity and Estimated Groundwater Velocities

Hydrogeologic slug tests to evaluate hydraulic conductivity were performed during the different phases of the RI. The slug test data analysis sheets and tables of data generated during the RI are included in Appendix J and a summary of the results of the hydraulic conductivity testing is provided in Table 3-11. The overburden hydraulic conductivity results are summarized as follows:

- The calculated overburden hydraulic conductivity values ranged from 2.33×10^{-5} centimeters per second (cm/sec) or 0.0662 feet/day, to 2.00×10^{-1} cm/sec (931 feet/day)

- The calculated geometric mean of overburden hydraulic conductivity value is 2.61 x 10^{-3} cm/sec or 7.86 feet/day
- The lowest overburden hydraulic conductivity values are observed at MW-17, the southern-most overburden monitoring location along Eastern Refuge Road
- The highest overburden hydraulic conductivity values are observed at MW-D across Thoroughfare Creek

Estimated groundwater velocities in the overburden strata at the Site were calculated as a linear flow velocity based on the geometric mean hydraulic conductivity values of water-bearing units and estimated groundwater gradients. Based on these data, the average groundwater velocities at various locations across the Site are as follows:

- Upgradient of the Landfill 0.01 feet/day
- Across the Landfill 0.003 feet/day
- Across Thoroughfare Creek 0.14 feet/day
- Downgradient of Thoroughfare Creek 0.13 feet/day

Average groundwater velocity calculations are included in Appendix L.

4.4.2.2 Site Overburden Hydrogeology Summary

Key overburden hydrogeologic observations based upon the multi-phase RI investigations are as follows:

- Overburden groundwater generally flows toward the southeast.
- The wells in the vicinity of Thoroughfare Creek respond to tidal influences.
- The overburden groundwater unit (sands/sands and gravel) beneath Thoroughfare Creek and Hermesprota Creek appears to be in semi-confined conditions.
- A net upward hydraulic gradient from the sands and gravel unit in the vicinity of Thoroughfare Creek was observed during the transducer survey.
- Horizontal groundwater gradients in the overburden aquifer beneath the northern, central and southern portions of the Landfill, where semi-confined conditions are present, are low and show a net flow direction east toward monitoring well MW-15, and south to southeast toward monitoring well MW-16.
- Groundwater velocities are expected to be highest in the vicinity of Western Refuge Road where high gradients and conductive sands and gravels coincide with a thinned sand/gravel aquifer.
- The western portion of the Refuge Impoundment is hydraulically isolated from the underlying sand and gravel unit in the vicinity of the Landfill by the thick sequence of silty clay (permeability of 5.1 x 10^{-8} cm/sec from Shelby Tube sample analysis).
- The potential exists for surface water infiltration from the Refuge Impoundment into the underlying sand and gravel unit where the Silty Clay Unit thins along Eastern Refuge Road.
- Downgradient wells along Eastern Refuge Road (MW-18S and MW-18D) have relatively lower measured groundwater elevations (approximately -4.5 feet NAVD88), which may

indicate the influence of one or more pumping wells at an indeterminate distance east of the Site.

A hydrogeological cross-section developed using the average water level elevations and groundwater table contour map to produce an interpreted groundwater flow profile for the Site is shown in Figure 4-10.

4.4.3 Bedrock Hydrogeology

Similar to the overburden groundwater investigation, continuous groundwater level and temperature information were collected from the newly installed bedrock wells and their associated overburden well pairs using data logging pressure transducers to evaluate bedrock groundwater characteristics and vertical groundwater gradients between overburden and upper bedrock zones. Average groundwater elevations were calculated for each monitoring point over the course of the seven-day study to reduce data interference from tidal fluctuations, thereby allowing for evaluation of vertical groundwater gradients between overburden and bedrock water bearing zones at the well pair locations.

Net upward vertical hydraulic gradients were observed between the overburden and bedrock water-bearing zones at the Landfill (i.e., monitoring wells MW-9 and MW-22). Net downward vertical hydraulic gradients were observed between the overburden and bedrock units along Western Refuge Road (i.e., MW-16/MW-21 and MW-15/ MW-20B). Vertical gradient information as it relates to conceptual groundwater flow and transport is illustrated on Figure 4-6.

Temperature data were also evaluated during the bedrock groundwater monitoring program to assess differences in groundwater temperature at different areas of the Site. Water temperatures obtained from transducers deployed in monitoring wells during both the July and November field programs showed groundwater in bedrock underlying the Landfill is approximately 4.5°C warmer than bedrock groundwater along the Western Refuge Road. Colder groundwater observed along the Western Refuge Road well pairs suggests that the primary source of groundwater for these wells is from deeper, colder bedrock groundwater that is different than the Landfill area groundwater.

4.4.3.1 Estimated Upper Bedrock Hydraulic Conductivity

Slug tests were conducted to evaluate the hydraulic conductivity of the screened interval in new bedrock wells. Because of the low permeability bedrock screened by these wells, slug test durations were significantly longer than the slug tests performed on wells screened in the overburden. Consequently, the bedrock slug tests exhibited data interference associated with regional tidal pressure changes. The raw transducer data were reduced by fitting a 6^{th} order polynomial trend line to the tidal signature. The equation obtained from the polynomial was then used to create an additional data set representing the inferred tidal sequence, which was then subtracted from the original data set, thereby removing the influence of the tidal fluctuations while still maintaining the results of the slug test. These data were then used to calculate the hydraulic conductivity in the screened intervals.

The geometric mean of the slug test hydraulic conductivity values was calculated for each monitoring well. An overall average (geometric mean) bedrock hydraulic conductivity value based on the individual well results was used to characterize the hydraulic conductivity of the upper bedrock. The following list summarizes the results of the observed hydraulic conductivity evaluation:

- The lowest hydraulic conductivity was observed at the Landfill at bedrock well MW-22 and calculated to be 1.60 x 10^{-5} cm/sec (4.53 x 10^{-2} feet/day)
- The highest hydraulic conductivity was observed along the Western Refuge Road at bedrock well MW-21 and calculated to be 1.54 10^{-4} cm/sec (4.35 10^{-1} feet/day).
- The geometric mean bedrock hydraulic conductivity was calculated to be 6.85 x 10^{-5} cm/sec (1.94 x 10^{-1} feet/day).

These hydraulic conductivity values are representative of the upper bedrock in the vicinity of the screened intervals at these locations and do not necessarily reflect the hydraulic conductivity of the bedrock unit throughout the Site.

4.4.3.2 Site Bedrock Hydrogeology Summary

Key bedrock hydrogeologic observations based upon the Phase 3 Bedrock Investigation are summarized as follows:

- Observed groundwater elevations at the MW-16/MW-21 monitoring location are generally about three feet lower than the groundwater elevations observed at the MW-15/MW-20B monitoring location. Therefore, groundwater flow in bedrock is toward the southeast in the proximity of the Landfill.
- The hydraulic conductivity calculated in bedrock monitoring well MW-22 beneath the Landfill is an order of magnitude lower than the hydraulic conductivity calculated in the Western Refuge Road bedrock monitoring wells.
- The hydraulic conductivity of the upper bedrock is about two orders of magnitude lower than the hydraulic conductivity of the overburden, which minimizes vertical migration of groundwater into the bedrock from the overburden sand and gravel materials. The near-horizontal foliation observed in most boring locations also reduces vertically-downward groundwater flow.
- At the Landfill (MW-22), groundwater flow in bedrock is primarily horizontal as it flows along near horizontal foliation features observed in the weathered bedrock surface. Net vertical gradients were observed to be upward at the Landfill between the overburden and bedrock intervals (indicated by vertical light blue arrows in Figure 4-6), reducing the potential for downward migration of Site-related COCs from the Landfill into weathered bedrock.
- Based on the transducer study data, short term reversals in vertical hydraulic gradients occur beneath the Landfill associated with tidal fluctuations. Iron oxide staining observed in the upper two feet of the bedrock rock interval as well as at the base of the overburden

sediments at well location MW-22 beneath the Landfill suggests the presence of groundwater and a fluctuating potentiometric surface at the bedrock/overburden contact.

- Along the Western Refuge Road (MW-20B and MW-21), vertical groundwater gradients were observed to be downward (indicated by vertical light blue arrows in Figure 4-6. Unlike vertical gradients observed at the Landfill, vertical gradients during the study in these locations were consistently downward.
- Water temperatures obtained from transducers deployed in monitoring wells during both the July and November 2016 field programs showed that groundwater in the overburden and bedrock underlying the Landfill is approximately 4.5°C warmer than overburden and bedrock groundwater along the Western Refuge Road.

Overall, the hydrogeological information obtained during the RI indicate vertical migration of groundwater into the bedrock from the overburden sand and gravel materials is limited due to: 1) the near-horizontal foliation observed in the upper bedrock at the overburden/bedrock interface, 2) the lower hydraulic conductivity of the upper bedrock compared to the hydraulic conductivity of the overburden, and 3) net upward vertical hydraulic gradients beneath the Landfill. Furthermore, the difference in groundwater temperatures observed along the Western Refuge Road compared to the Landfill suggest a lack of direct hydraulic communication between bedrock groundwater beneath the Landfill and bedrock groundwater near Western Refuge Road and that the colder groundwater water observed along the Western Refuge Road may be controlled by a different, deeper, groundwater source.

5.0 NATURE AND EXTENT OF CONTAMINATION

5.1 Screening Criteria

The nature and extent of contamination at the Site presented herein is based upon results from both background soil and groundwater investigations conducted in the vicinity of the Site, as well from the on-Site soil, intertidal seep, and on-site and off-site groundwater investigations. The results of the investigation were used to assess the nature and extent of contamination at the Site with respect to various screening criteria. These criteria were chosen based upon media type, site use, and other conditions, and included the following:

- Background Soils
  - USEPA Industrial Regional Screening Levels (RSLs)[17] for Industrial Soils (Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2016).
  - Pennsylvania Non-Residential Direct Contact MSCs for Surface Soil (0-2 ft) (PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, last updated August 2016).
- Site Soils
  - USEPA Industrial Regional Screening Levels (RSLs) for Industrial Soils (Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2016).
  - Pennsylvania Non-Residential Direct Contact MSCs for Surface Soil (0-2 ft) (PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, last updated August 2016).
  - USEPA (2005) Ecological Soil Screening Levels, USEPA (2006) Region III BTAG freshwater screening benchmarks, and other toxicological benchmarks (presented in Section 8 and summarized below)
- Intertidal Seeps
  - Pennsylvania Surface Water Criteria Continuous Concentration: Table 5 – Water Quality Criteria for Toxic Substances, PA Code Title 25, Chapter 93 - Water Quality Standards, July 2013
  - Pennsylvania Surface Water Criteria Maximum Concentration: Table 5 – Water Quality Criteria for Toxic Substances, PA Code Title 25, Chapter 93 - Water Quality Standards, July 2013
  - Pennsylvania Surface Water Human Health Criteria: Table 5 – Water Quality Criteria for Toxic Substances, PA Code Title 25, Chapter 93 - Water Quality Standards, July 2013
  - USEPA (2006) Region III BTAG freshwater screening benchmarks and other toxicological benchmarks (presented in Section 8 and summarized below)

---

[17] formerly known as Preliminary Remediation Goals (PRGs)

- Groundwater
  - USEPA RSLs for Residential Tap Water (Regional Screening Levels for Chemical Contaminants at Superfund Sites, May 2016).
  - Pennsylvania Residential Used Aquifer MSCs for groundwater (PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Groundwater, last updated August 2016).
  - Pennsylvania Non-Residential Non-Use Aquifer MSCs for groundwater (PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Groundwater, last updated August, 2016).
  - USEPA (2006) Region III BTAG freshwater screening benchmarks and other toxicological benchmarks (presented in Section 8 and summarized below)

As discussed with USEPA and reflected in the Revised RI Report response to comments (Golder 2018), groundwater beneath the Wildlife Refuge is considered by EPA to be a potential future drinking water source and, consistent with the National Contingency Plan (NCP), the OU-2 Feasibility Study (FS) will evaluate options for restoring groundwater to its beneficial use, wherever practicable in accordance with 40 CFR § 300.430(a)(1)(iii)(F). The Folcroft PRP Group acknowledges EPA's view and will evaluate groundwater remedial alternatives accordingly, as appropriate to the Site conditions, in order to move the RI/FS process forward. However, it is the position of the Group that an existing and robust Congressionally-mandated institutional control (IC) is in place that restricts the Site use in perpetuity to that of a National Wildlife Refuge, effectively preventing any possible future residential groundwater use. In the view of the Group, this existing control eliminates a possible drinking water pathway and should ultimately guide USEPA's remedy selection.

At the Annex/Landfill properties, there will not be any future use of the groundwater primarily because, in accordance with the prevailing Pennsylvania closure requirements and State law at the time of the Landfill closure, installing wells (other than monitoring wells) at the Site would be prohibited.

In the Refuge Area, future use of groundwater for potable water or other residential purposes is also unrealistic for the following reasons.

- Both Delaware County[18] and Philadelphia County[19] have local ordinances or building codes that require connection to public water supplies if they are available. In addition, these

[18] Delaware County Planning Commission ordinance Section 305-Water Supply and Distribution Services, Subsection 305.2-Public Water Supply of the Delaware County Land Development & Subdivision Ordinance. A "connection to a public water supply system shall be required where such a system can be provided to the proposed subdivision or land development tract and where the capacity of such a system can adequately fill the water supply demands of the proposed development. A distribution system shall be designed to furnish an adequate supply of water to each lot."

[19] City of Philadelphia adheres to the International Code Council (ICC) code in accordance with the Pennsylvania Uniform Construction Code (PA UCC). Applicable code is 2009 International Residential Code, Section P2602 Individual Water Supply and Sewage Disposal. Section P2602 Individual Water Supply and Sewage Disposal, P2602.1 General. "The water-distribution and drainage system of any building or premises where plumbing fixtures are installed shall be connected to a public water supply or sewer system, respectively, if available."

counties have requirements for preventing connections between public and private potable water supply systems.

- Because eastern Delaware County (location of Site) and Philadelphia County (location of the Refuge Environmental Center/Offices) are serviced by public water supply systems, expansion of current Refuge uses would require connection to these existing public systems.

Therefore, future use of groundwater at either the Site or the surrounding Refuge is not realistic.

Groundwater COC results were compared to USEPA RSLs and PADEP Act 2 Residential Used Aquifer Medium Specific Concentrations (MSCs) to provide a conservative evaluation of groundwater chemistry. It should be noted that these screening criteria used to characterize the nature and extent of contamination do not necessarily quantify the potential risks associated with any identified contamination discussed in subsequent sections. Potential risks to human health and wildlife have been addressed using the following conservative risk assessment screening criteria, as required by the USEPA, in the BHHRA and the SLERA found in Sections 7.0 and 8.0, respectively.

- BHHRA
  - USEPA RSLs for residential soil and tap water (May 2016)
- SLERA
  - USEPA (2005a) Ecological Soil Screening Levels (Eco-SSLs)
  - USEPA (2006) Region III BTAG Screening Levels
  - Efroymson et al. (1997a) Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants, Soil and Litter Invertebrates, and Heterotrophic Process.

Results are being compared to PA MSCs because the MSCs are promulgated cleanup standards that account for varying site uses and aquifer conditions. As promulgated standards, they are potential chemical-specific applicable, or relevant and appropriate requirements (ARARs) relevant to CERCLA sites. The MSCs are included in this RI Report for screening purposes along with USEPA criteria to help focus the Final RI Report on the most significant Site-related COCs. The PA MSCs are strictly related to human health and do not address ecological receptors.

5.2 Background Samples

As defined by USEPA (2002b), "background" refers to constituents or locations not influenced by the releases from a site, and is usually described as one of the following types:

- Anthropogenic - natural and human-made substances present in the environment as a result of human activities (not specifically related to the CERCLA release in question); and,

- Naturally occurring - substances present in the environment in forms that have not been influenced by human activity.

Generally under CERCLA, cleanup levels are not set at concentrations below the natural background levels or anthropogenic background concentrations (USEPA, 2002b).

As discussed in Section 3.9, the USEPA conducted a background soil sampling program as part of the investigation of the LDCA. The sampling related to the Site was conducted in April 2007 at the Refuge near the Visitors Center and at the Korman Suites property across Lindbergh Boulevard from the Refuge. A groundwater sample was collected from MW-4 as part of the RI, which is indicative of background groundwater quality upgradient of the Site.

The USEPA's soil background data are included as Appendix N and detections are shown in Tables 5-1a and 5-1b. These results are provided as is, based on the USEPA's validation of the data. Background groundwater exceedances from MW-4 are shown in Table 5-2.

5.2.1 Background Soil

As shown on Tables 5-1a and 5-1b, Golder compared the USEPA background soil sampling results for both the Refuge and Korman Suites properties to the USEPA RSLs for Industrial Soils. For the Refuge soils, the USEPA's results showed the following exceedances of the RSLs for SVOCs and metals.

Summary of USEPA Background Soil Exceedances of USEPA Industrial Soil RSLs in Refuge Soils

Compounds	RSL for Industrial Soils	No. of Exceedances	Range of Exceedances
Benzo(a)pyrene	290 µg/kg	4 of 8	330 – 630 µg/kg
Antimony	47 mg/kg	1 of 8	53.3 mg/kg
Arsenic	3 mg/kg	6 of 8	4.4 – 42.5 mg/kg
Chromium	6.3 mg/kg	7 of 8	12.5 – 79.3 mg/kg
Iron	82,000 mg/kg	1 of 8	122,000 mg/kg
Lead	800 mg/kg	1 of 8	3,010 mg/kg
Thallium	1 mg/kg	1 of 8	1.3 mg/kg

Results were also compared to the PADEP Non-Residential Direct Contact, Surface Soil (0-2 feet) MSCs and two exceedances were observed: 8.6 mg/kg cadmium (MSC of 6 mg/kg) and 3,010 mg/kg lead (MSC of 1,000 mg/kg).

For the Korman Suites soils, the USEPA's results showed the following exceedances of the USEPA RSLs for Industrial Soils for SVOCs and metals.

Summary of USEPA Background Soil Exceedances of USEPA Industrial Soil RSLs in Korman Suites Soil

Compounds	RSL for Industrial Soils	No. of Exceedances	Range of Exceedances
Benzo(a)pyrene	290 µg/kg	1 of 15	490 µg/kg
Arsenic	3 mg/kg	12 of 15	3.5 – 11.4 mg/kg
Chromium	6.3 mg/kg	15 of 15	8 – 59.5 mg/kg

5.2.2 Background Groundwater

Historical groundwater monitoring data (Tables 2-2, 2-3, and 2-4) as well as RI water level and groundwater data demonstrate that MW-4 is not influenced by releases from the Site, and therefore represents a background well in accordance with the approved RI/FS Work Plan (Golder, 2006a).

There were no detections of SVOCs, pesticides, or PCBs in samples from MW-4 during the January 2007 monitoring event. For screening purposes, the detections of VOCs and metals were initially compared to USEPA Tap Water RSLs. This comparison showed that the only exceedances of those criteria were for three metals (total and dissolved chromium, cobalt and manganese). To further characterize the metal exceedances, the data were compared to the PADEP Residential Used Aquifer MSCs and then to the Non-Residential Non-Use Aquifer MSCs. These comparisons showed both cobalt and manganese detections were below the PADEP Non-Residential Non-Use Aquifer MSCs

In May 2007, the USEPA sampled MW-4 for 1,4-dioxane. The results were non-detect.

5.3 On-Site Soils

For the cover soil investigation, a total of 40 primary surface soil (0 to 6 inches) samples and 16 primary subsurface soil (6 to 24 inches) samples were collected from 53 soil borings at the Landfill and Annex (the "L" Landfill series and "A" Annex series borings). The cover soil samples were analyzed for TCL VOCs, SVOCs, pesticides/PCBs, dioxins/furans, and TAL Metals as shown in Table 3-4. In addition, 12 primary surface soil samples were collected from seven intertidal seep locations and five perimeter soil sampling locations during the seep and perimeter soil investigation. The seep and perimeter soil samples were analyzed for TCL SVOCs, pesticides/PCBs, and TAL Metals as shown in Table 3-5. The soil data are included in Appendix O1.

The soil data were initially compared to the USEPA Industrial Soil RSLs[20] for screening purposes to evaluate the distribution of classes of compounds across the Site and the frequency of exceedances of specific compounds within those classes. To further characterize the distribution and frequency of those exceedances, the soil data were then compared to the PADEP Non-Residential Surface Soil Direct Contact MSCs. Surface and subsurface cover soil results exceeding the USEPA Industrial Soil RSLs are shown on Tables 5-3 and 5-4, respectively, for the Landfill and Tables 5-5 and 5-6, respectively, for the Annex. Intertidal seep soil and perimeter soil results exceeding the USEPA Industrial Soil RSLs are shown on Table 5-7 for the Landfill and Table 5-8 for the Annex. The soil results are described below.

5.3.1 VOCs

With the exception of two detections of acetone, a common laboratory contaminant, there were no VOCs detected in Site soils. Both detections were well below the USEPA Industrial Soil RSL and not believed to be Site related.

5.3.2 SVOCS

SVOCs were detected in soils throughout the Landfill and Annex. As shown on Figure 5-1A, the concentrations of total SVOCs tended to be higher at the Landfill and with the exception of two locations (L-20 and L-36), they tended to be higher in surface soils. When the results were compared to the USEPA Industrial Soil RSLs (Figure 5-1B), there were exceedances of one or more SVOC screening levels at the Landfill and Annex. Approximately 58 percent of the locations sampled at the Landfill exceeded USEPA Industrial Soil RSLs. Approximately 25 percent of the locations sampled at the Annex exceeded USEPA Industrial Soil RSLs. Specific compounds with number of exceedances are listed below:

SVOCs Exceeding USEPA Industrial Soil RSLs

Landfill			Annex		
Compound	Exceedances		Compound	Exceedances	
	Surface	Subsurface		Surface	Subsurface
Benzo[a]anthracene	1	0	Benzo[a]pyrene	4	1
Benzo[b]fluoranthene	1	0			
Benzo[a]pyrene	16	3			
Dibenzo[a,h]anthracene	5	0			
Naphthalene	0	1			

[20] The historic use of the Site as a landfill and the current use of the Site as a Refuge most closely reflect an industrial exposure scenario rather than residential use scenario.

When the SVOC results are compared to the PADEP Non-Residential Surface Soil Direct Contact MSCs, there are no exceedances.

5.3.3 Pesticides

Pesticides were detected at low levels in soils throughout the Landfill and Annex. As shown on Figure 5-2A, the concentrations of total pesticides generally tended to be higher at the Landfill. In particular, there was one location (L-43) with total concentrations that were an order of magnitude greater than any other location. When the results were compared to the USEPA Industrial Soil RSLs (Figure 5-2B), there were no exceedances.

When the pesticide results were compared to the PADEP Non-Residential Surface Soil Direct Contact MSCs, there were also no exceedances.

5.3.4 PCBs

PCBs were not detected at the Landfill, but they were detected at 6 locations at the Annex. As shown on Figure 5-3A, the concentrations of total PCBs tended to be higher in surface soils. In particular, there was one location (A-16) with total concentrations that were an order of magnitude greater than any other location. When the results were compared to the USEPA Industrial Soil RSLs (Figure 5-3B), there was only location (A-16) with exceedances of one or more PCB screening levels. Specific compounds with number of exceedances are listed below:

PCBs Exceeding USEPA Industrial Soil RSLs

Landfill			Annex		
Compound	Exceedances		Compound	Exceedances	
	Surface	Subsurface		Surface	Subsurface
None			Aroclor 1248	1	0
			Aroclor 1254	1	0

When the PCB results are compared to the PADEP Non-Residential Surface Soil Direct Contact MSCs, there are no exceedances.

5.3.5 Dioxins/Furans

Dioxins/furans were detected in low levels in several samples at both the Landfill and Annex. There were two exceedances of USEPA Industrial Soil RSLs at boring L-21 at a depth of 24-48 inches and one exceedance at boring L-9 at a depth of 6-24 inches. Specific compounds with number of exceedances are listed below:

Dioxins/Furans Exceeding USEPA Industrial Soil RSLs

Landfill			Annex		
Compound	Exceedances		Compound	Exceedances	
	Surface	Sub-surface		Surface	Sub-surface
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0	1	None		
Hexachlorinated Dibenzo-p-dioxins, Total	0	2			

When the 2,3,7,8-Tetrachlorodibenzo-p-dioxin and total hexachlorinated dibenzo-p-dioxin results are compared to the PADEP Non-Residential Surface Soil Direct Contact MSCs, there are no exceedances.

5.3.6 Metals

Metals were detected in soils throughout the Landfill and Annex. As shown on Figure 5-4, the concentrations of total metals tended to be higher at the Landfill with the highest total metals concentrations detected at L-4 and L-14. When the results were compared to the USEPA Industrial Soil RSLs, there were exceedances of one or more metal screening levels at all of the Landfill and Annex locations. Specific compounds with number of exceedances are listed below:

Metals Exceeding USEPA Industrial Soil RSLs

Landfill			Annex		
Compound	Exceedances		Compound	Exceedances	
	Surface	Subsurface		Surface	Subsurface
Arsenic	31	10	Arsenic	14	5
Chromium	32	10	Chromium	20	5
Cobalt	2	0			
Copper	1	0			
Iron	1	0			
Lead	4	0			
Manganese	1	0			
Mercury	1	1			

When the metal results are compared to the PADEP Non-Residential Surface Soil Direct Contact MSCs, there are only the following exceedances:

- Landfill - Beryllium at L-4 (0-6 inches) and L-39S (0-6 inches), Cadmium at L-14 (0-6 inches), Iron at L-39S (0-6 inches), and Lead at L-4 (0-6 inches) and L-36 (0-6 inches)
- Annex - Arsenic at A-22 (6-24 inches)

5.3.7 Comparison of Site Soil Results to Background

To better characterize the Site and assist in the evaluation of appropriate remedial alternatives, graphical and statistical comparisons were made between Site and background concentrations of inorganic and organic analytes that were determined to be ecological risk drivers: copper, endrin, lead, nickel, and high molecular weight PAHs. Two sets of background data were provided by USEPA (Refuge area samples and Korman Suites residential area samples). These areas are not expected to have been affected by Site activities and they represent both natural and possible anthropogenic background conditions. For statistical comparison purposes, the complete on-Site data set was used (i.e., all depths sampled). A total of 44 Site samples were compared against 23 background samples.

A variety of graphical and statistical methods can be used to compare Site and background concentrations as described in the USEPA's background guidance document (USEPA, 2002b). Graphical comparison methods include using quantile-quantile and double quantile plots. Quantile-quantile plots were used to compare Site and background concentrations, with Site concentrations displayed on the vertical axis and background concentrations displayed on the horizontal axis. If the site and background distributions are identical, the plotted values will lie along a straight line through the origin with a slope of 1. Any deviation from this line shows differences between the two data distributions.

USEPA's guidance suggests adding a "substantial difference" (denoted as "S") to background data to account for the naturally variable (random) nature of the data. Site concentrations are considered to be different from background concentrations if Site concentrations exceed Background + S. For the purposes of this background evaluation, the value of "S" was determined based on the typical required precision for sample analysis.

Precision is measured by calculating a "relative percent difference" (RPD) for multiple analyses of a "Laboratory Control Sample." RPDs of 20-30% are generally accepted as within quality control limits. Therefore, based on this natural variability in the analytical procedure, a "substantial difference" equal to 20% of the average (mean) background concentration for each analyte is appropriate. For example, for copper, a value of 15.6 mg/kg was chosen based on 20% of the average background concentration (approximately 78 mg/kg).

Quantile-quantile plots were developed for each of the analytes listed above (see Figures O2-1 through O2-5 of Appendix O2). These plots show that site concentrations for the risk-driving analytes appear to be significantly different from background, both in the range of concentrations and in the pattern of the data distribution. The one exception is lead, which appears to be only slightly elevated above background at the upper end of the concentration range, while the low end of the range appears to be more elevated. Based on the quantile-quantile plots for copper, endrin, lead, nickel, and high molecular weight PAHs, it appears that Site concentrations of these analytes exceed background levels.

Additional analyses were conducted to confirm this finding including double quantile plots and numerical statistical comparisons including the two-sample t-test for lead and the Wilcoxon Rank Sum Test for all other risk driving analytes. The results of these analyses suggest that Site concentrations of the risk-driving analytes are elevated above background conditions.

A summary of the test statistics for each of the analytes is provided in Table O2-1 of Appendix O2. The methods used to generate quantile plots and to perform statistical analyses are explained in more detail in Appendix O2. This appendix also includes sample calculations for the various tests performed.

5.3.8 Ecological Screening of Soil

For ecological impacts, the soil data were compared to relevant criteria as described above and as summarized in Section 8. The COPECs included in the SLERA include primarily metals, polycyclic aromatic hydrocarbons, pesticides and dioxins/furans in soils from 0-2 ft bgs. The locations where the maximum soil COPEC concentration exceeded the screening criteria are provided in Section 8 (Tables 8-2.1 and 8.2-2 for the Landfill and Annex, respectively); generally, these locations are distributed across the Annex and Landfill areas. As part of FS evaluations, the range of soil COPEC concentrations relative to cover thickness will be evaluated.

5.4 Intertidal Seeps

For the seep investigation, aqueous samples were collected from three Landfill and four Annex bank seepage locations in the intertidal zone. There were no observed conventional “breakout seeps,” so no samples were taken from locations above the intertidal zone. The samples were analyzed for VOCs, SVOCs, pesticides/PCBs, metals, and hardness. The aqueous seep data are included in Appendix P.

The intertidal seep data can be compared to ambient water quality criteria to describe the nature and extent of potential contamination associated with their discharge to surface water bodies.

The aqueous seep data were directly compared to Pennsylvania surface water criteria to get an initial understanding of the distribution and frequency of contaminants in seeps. The Pennsylvania surface water criteria are risk-based standards. The following criteria are being compared to the aqueous seep results: Criteria Continuous Concentration (CCC), Criteria Maximum Concentration (CMC), and Human Health Criteria (HHC). In addition, as part of the SLERA (Section 8), aqueous seep data are compared to the USEPA Region III BTAG screening benchmarks for surface water.

Certain compounds, generally inorganics, require a site specific standard that is based on water hardness. Although surface water quality was not evaluated during this investigation, surface water in the vicinity of the Site was sampled and analyzed as part of the SLERA completed by CDM Smith (2014), on behalf of the USEPA. An average surface water hardness from five samples taken in the vicinity of the Site was used to calculate the Site-specific standards for the following compounds: cadmium, chromium, copper, lead, nickel, silver, and zinc. The following summarizes the calculations used to determine the Site-specific standards for these compounds:

Average Hardness Calculation

Sample ID	Hardness (mg/l)	Average Hardness (mg/l)
FL-SW30	107	115.86
FL-SW40	203	
FL-SW41	82.5	
FL-SW44	96.5	
FL-SW45	90.3	

Note: From CDM Smith, Final Screening Level Ecological Risk Assessment of Aquatic Habitats Associated with the Lower Darby Creek Superfund Site, December 4, 2014

Site-Specific Criteria

Chemical Name	Formula: Criterial Continuous Concentration	Calculated Criteria: Continuous Concentration (mg/l)	Formula: Criteria Maximum Concentration	Calculated Criteria: Maximum Concentration (mg/l)
Cadmium	{1.101672-(ln[H]x0.041838)}xExp(0.7409xln[H]-4.719)	0.272	{1.136672-(ln[H]x0.041838)}xExp(1.0166xln[H]-3.924)	2.32
Chromium	0.860xExp(0.819xln[H]+0.6848)	83.6	0.316Exp(0.819xln[H]+3.7256)	643
Copper	0.960xExp(0.8545xln[H]-1.702)	10.2	0.960xExp(0.9422xln[H]-1.700)	15.4
Lead	{1.46203-(ln[H]x0.145712)}xExp(1.273xln[H]-4.705)	2.95	{1.46203-(ln[H]x0.145712)}xExp(1.273xln[H]-1.460)	75.8
Nickel	0.997xExp(0.846xln[H]+0.0584)	58.9	0.998xExp(0.846xln[H]+2.255)	530
Silver	N/A	N/A	0.850xExp(1.72xln[H]-6.590)	414
Zinc	0.986xExp(0.8473xln[H]+0.884)	134	0.978xExp(0.8473xln[H]+0.884)	133

Note: PA Code Title 25, Chapter 93 - Water Quality Standards

Aqueous seep results exceeding the Pennsylvania surface water criteria are shown on Tables 5-9 and 5-10, respectively, for the Landfill and Annex and are summarized in the following sections. All aqueous seep results are provided in Appendix P. Aqueous seep results are discussed further in Sections 7.0 and 8.0.

For ecological impacts, the seep data were compared to relevant criteria as described above and as summarized in Section 8. The COPECs included in the SLERA include primarily metals and pesticides. A full list of COPECs identified for the seep data are provided in Table 8-1.

5.4.1 VOCs

Vinyl chloride was detected at one seep location (ANA-LW) at the Annex above the Pennsylvania HHC surface water criteria. There were no other exceedances for VOCs.

5.4.2 SVOCs

There were no exceedances of Pennsylvania surface water criteria for SVOCs.

5.4.3 Pesticides

Pesticide concentrations exceeding PADEP CCC and HHC were observed at four seep locations: ANA-DW, ANA-JW, LF-A1W, and LF-A2W. Exceedances were observed for the following pesticides: 4,4-DDD, 4,4-DDE, 4,4-DDT, aldrin, dieldrin, and alpha chlordane. There were no other exceedances for pesticides.

5.4.4 PCBs

There were no exceedances of Pennsylvania surface water criteria for PCBs.

5.4.5 Dioxins/Furans

There were no exceedances of Pennsylvania surface water criteria for dioxins/furans.

5.4.6 Metals

Dissolved metal concentrations exceeding PADEP HHC were observed at five seep locations: ANA-DW, ANA-JW, LF-A1W, LF-A2W, and LF-A3W. Exceedances were observed for the following dissolved metals: arsenic, iron, and manganese.

Total metal concentrations exceeding PADEP CCC, CMC, and HHC were observed at seven seep locations; ANA-AW, ANA-DW, ANA-JW, ANA-LW, LF-A1W, LF-A2W, and LF-A3W. Exceedances of PADEP CCC were observed for lead and nickel. Exceedances of PADEP CMC were observed for lead and zinc. Exceedances of PADEP HHC were observed for iron, manganese, and mercury.

5.5 Groundwater

As described in Section 3.6, multiple groundwater investigations and sampling events have been performed as part of the RI. A comprehensive summary of detected analytical results from the multiple RI sampling events is included as Table 5-11.

Groundwater samples were analyzed for TCL VOCs, TCL SVOCs, pesticides, PCBs, TAL Metals (total and dissolved), and geochemical parameters during two initial sampling events conducted in January and May 2007. During the May 2007 sampling event, the USEPA Contractor also collected a sample from each of the 12 monitoring wells for analysis of 1,4-dioxane. The groundwater analytical data from the groundwater sampling events are included as Appendix P1 and analytical results of the USEPA sampling event are included in Appendix P2.

Based upon USEPA's review of the initial groundwater results, additional groundwater delineation was required for Cl-VOCs and 1,4-dioxane. Therefore, groundwater samples were collected in subsequent groundwater sampling events (i.e., the Additional Groundwater Investigation in 2012 and the Off-Site Groundwater Investigations in 2014-2016) and analyzed for VOCs, SVOCs (including 1,4-dioxane), and geochemical parameters. The groundwater analytical data for these events are included in the Additional Groundwater Data Investigation Summary Report (Appendix K) and the Revised Off-Site Groundwater Investigation Report (Appendix L).

As noted above, while Site and Refuge groundwater are currently not used, and the Congressionally-mandated land use as a National Wildlife Refuge appears to preclude residential groundwater use, the RI groundwater data were screened against USEPA Tap Water RSLs, PADEP Residential Used Aquifer MSCs, and the Non-Residential Non-Use Aquifer MSCs to evaluate the nature and extent of potential Site-related impacts Analytes detected during the RI above the RSLs and/or the PADEP MSCs are noted as exceedances in Table 5-11. VOC and SVOC exceedances from groundwater sampling conducted in 2016 are presented below and shown on Figure 5-5 and Figure 5-6. The remaining information (PCBs, metals, and pesticides) discusses results of groundwater sampling conducted at the Site in 2007 as these constituents were not evaluated during the more recent groundwater studies. All groundwater results are provided in Appendix P. Below is a summary of the groundwater COCs with RSL exceedances.

For ecological impacts, the groundwater data were compared to relevant criteria as described above and as summarized in Section 8. The COPECs included in the SLERA include primarily metals, polycyclic aromatic hydrocarbons and pesticides. A full list of COPECs identified for the groundwater data are provided in Table 8-1.

5.5.1 VOCs

VOC Exceedances of USEPA RSLs for Residential Tap Water

Location	Wells	Compounds
Upgradient	MW-13 and MW-14	vinyl chloride
Annex	MW-6	1,2 -dichloroethane

Location	Wells	Compounds
Landfill	MW-2, MW-3, MW-7, MW-8, and MW-9	1,4-dichlorobenzene, benzene, chlorobenzene, cis-1,2-dichloroethene, trichloroethene, and vinyl chloride
Downgradient	MW-16, MW-A(D), MW-B(D), MW-C(D), and MW-D	1,1-dichloroethane, 1,2,4-trichlorobenzene, 1,4-dichlorobenzene, benzene, chlorobenzene, cis-1,2-dichloroethene, trichloroethene, and vinyl chloride
Bedrock	MW-22	benzene

The following list compares the VOC groundwater results to PADEP Residential Used and Non-Residential Non-Use Aquifer MSCs:

- For upgradient overburden wells MW-13 and MW-14 (upgradient perimeter of the Site), there were no exceedances of PADEP Residential Used Aquifer MSCs and/or Non-Residential Non-Use Aquifer MSCs.
- For Annex overburden wells, VOC concentrations exceeding both PADEP Residential Used Aquifer MSCs and Non-Residential Non-Use Aquifer MSCs were reported in MW-6 for 1,2-dichloroethane only.
- For Landfill overburden wells, VOC concentrations exceeding PADEP Residential Used Aquifer MSCs were reported in three wells; MW-2, MW-3, and MW-7, including 1,1-dichlorethene, 1,2-dichloroethane, chlorobenzene, cis-1,2-dichloroethene, trichloroethene, and vinyl chloride. When compared to PADEP Non-Residential Non-Use Aquifer MSCs, exceedances were reported for vinyl chloride only.
- For off-Site overburden wells, VOC concentrations exceeding PADEP Residential Used Aquifer MSCs were reported in five wells located downgradient of the Landfill; MW-16, MW-A(D), MW-B(D), MW-C(D), and MW-D including 1,4-dichlorobenzene, benzene, chlorobenzene cis-1,2-dichlorbenzene, trichloroethene, and vinyl chloride. When compared to PADEP Non-Residential Non-Use Aquifer MSCs, exceedances were reported for trichloroethene and vinyl chloride.
- For Landfill and off-Site bedrock wells, there were no exceedances of PADEP Residential Used Aquifer or Non-Residential Non-Use Aquifer MSCs reported for VOCs in bedrock groundwater.

Monitoring locations where VOCs exceeded groundwater criteria in 2016 are illustrated on Figure 5-5. A full summary of groundwater detections is provided in Table 5-11.

5.5.2 SVOCs (including 1,4-dioxane)

SVOC Exceedances of USEPA RSLs for Residential Tap Water

Location	Wells	Compounds
Upgradient	MW-13	1,4-dioxane
Annex	MW-6	1,4-dioxane

Location	Wells	Compounds
Landfill	MW-1, MW-2, MW-3, MW-7, MW-8, and MW-9	1,4-dioxane, benzo[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, dibenzofuran, naphthalene
Downgradient	MW-15(S), MW-15(D), MW-16, MW-17, MW-18(S), MW-A(D), MW-B(D), MW-C(D), and MW-D	1,4-dioxane, naphthalene
Bedrock	MW-22	1,4-dioxane

The following list compares the SVOC groundwater results to PADEP Residential Used and Non-Residential Non-Use Aquifer MSCs:

- For upgradient overburden wells MW-13 and MW-14, (upgradient perimeter of the Site) there were no exceedances of PADEP Residential Used Aquifer MSCs and/or Non-Residential Non-Use Aquifer MSCs.
- For Annex overburden wells, SVOC concentrations exceeding PADEP Residential Used Aquifer MSCs were reported in one well for 1,4-dioxane only: MW-6. There were no exceedances of PADEP Non-Residential Non-Use Aquifer MSCs.
- For Landfill overburden wells, SVOC concentrations exceeding PADEP Residential Used Aquifer MSCs were reported in six wells at the Landfill; MW-1, MW-2, MW-3, MW-7, MW-8, and MW-9, including 1,4-dioxane, benzo[a]anthracene, benzo[a]pyrene, and benzo[b]fluoranthene. When compared to PADEP Non-Residential Non-Use Aquifer MSCs, exceedances were reported in five Landfill wells for 1,4-dioxane only: MW-1, MW-2, MW-3, MW-8, and MW-9.
- For off-Site overburden wells, SVOC concentrations exceeding PADEP Residential Used-Aquifer MSCs were reported in in seven wells downgradient of the Landfill; MW-15(S), MW-15(D), MW-16, MW-A(D), MW-B(D), MW-C(D), and MW-D, for 1,4-dioxane only. When compared to PADEP Non-Residential Non-Use Aquifer MSCs, exceedances were reported in six downgradient wells for 1,4-dioxane only; MW-15(S), MW-15(D), MW-16, MW-A(D), MW-C(D), and MW-D.
- For Landfill and off-Site bedrock wells, SVOC concentrations exceeding PADEP Residential Used Aquifer MSCs are limited to only 1,4-dioxane in bedrock monitoring well MW-22, at the Landfill. There were no exceedances of PADEP Non-Residential Non-Use Aquifer MSCs reported for SVOCs in bedrock groundwater.

Monitoring locations where SVOCs exceeded groundwater criteria in 2016 are illustrated on Figure 5-6. A full summary of groundwater detections is provided in Table 5-11

5.5.3 Pesticides

- Pesticide concentrations exceeding USEPA Tap Water RSLs were reported for heptachlor and beta-BHC at the Annex in MW-6. There were no exceedances of PADEP Residential Used Aquifer MSCs and/or PADEP Non-Residential Non-Use Aquifer MSCs.

- Pesticide concentrations exceeding USEPA Tap Water RSLs were reported in five wells at the Landfill; MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, and MW-11. There were no exceedances of PADEP Residential Used Aquifer MSCs and/or PADEP Non-Residential Non-Use Aquifer MSCs reported at the Landfill.

Monitoring locations where pesticides are detected in groundwater during the RI are illustrated on Figure 5-7.

5.5.4 PCBs

No PCBs were detected in groundwater.

5.5.5 Metals and Inorganics

Concentrations of metals and inorganics were reported above the USEPA Tap Water RSLs in all wells at the Landfill and Annex. When compared to PADEP Residential Used Aquifer MSCs, dissolved-phase metal exceedances are reported for manganese at the Annex and for arsenic, cobalt, lead, manganese, nickel, thallium, vanadium, ammonia, and nitrate at the Landfill. When compared to PADEP Non-Residential Non-Use Aquifer MSCs, there are no exceedances reported at the Annex or the Landfill for metals or nitrite. Ammonia concentrations reported at the Landfill exceed the PADEP Non-Residential Non-Use Aquifer MSCs.

Monitoring locations where metals and other inorganics are detected in groundwater during the RI are illustrated on Figure 5-8.

5.5.6 Overburden Groundwater Summary

The following conclusions were made regarding the nature and extent of Site COCs in groundwater at the Site:

- There is a co-mingled plume of 1,4-dioxane and Cl-VOCs emanating from the toe of the Landfill and migrating southeast under Thoroughfare Creek toward the Western Refuge Road at monitoring well location MW-16 (Figures 9 through 12 of Appendix L).
- There is an additional 1,4-dioxane groundwater plume moving from the Landfill in a more easterly direction under Thoroughfare Creek toward the Western Refuge Road at monitoring well location MW-15 (Figure 12 of Appendix L).
- The primary Cl-VOC constituents detected are strongly associated with the trichloroethene (TCE) degradation sequence (e.g., TCE→cis 1,2-DCE→vinyl chloride).
- The highest concentrations for TCE, cis 1,2-DCE, and vinyl chloride during this investigation were detected downgradient of the toe of the Landfill along the primary flow path.
  - The highest concentrations for TCE and cis 1,2-DCE were encountered at MW-C(D) located approximately 400 feet southeast of the toe of the Landfill.
  - The highest concentration for vinyl chloride was encountered at MW-16.

- Prior to 2014, the highest concentrations of TCE, cis 1,2-DCE and vinyl chloride within the footprint of the Landfill were observed at MW-2.
- A single low-level concentration of cis-1,2 DCE was detected along the Eastern Refuge Road at monitoring well MW-19D (0.39 µg/l). However, the detection was well below the USEPA RSL (36 µg/l) and the Pennsylvania Used Aquifer Residential MSC (70 µg/l).
- The highest concentrations of 1,4-dioxane were detected at the southern toe of the Landfill at SB-11 and across Thoroughfare Creek at MW-D.
- 1,4-dioxane concentrations are migrating along the interpreted groundwater flow paths (southeast and east).
- 1,4-dioxane concentrations decrease as the plume progresses eastward.
- Low-level concentrations of 1,4-dioxane were detected during 2016 at three of five wells along the Eastern Refuge Road. The estimated detections at MW-17 (0.12 µg/l) and MW-19D (0.13 µg/l) were below the USEPA RSL (0.46 µg/l). The detections at MW-18D (3.2 and 5.5 µg/l) exceeded the USEPA RSL, but were below the Pennsylvania Used Aquifer Residential MSC (6.4 µg/l).

Overall, concentrations of both Cl-VOCs and 1,4-dioxane were detected at overburden wells at the Landfill as well as downgradient overburden well locations along Western Refuge Road. Site COC concentrations in groundwater decrease eastward from the Landfill and are reduced to levels below detection before reaching Eastern Refuge Road. As described in Section 6, when compared to a scorecard included within the USEPA approved Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water (Protocol; USEPA, 1998), natural attenuation is occurring at the Site.

5.5.7 Bedrock Groundwater Summary

The RI identified low-level groundwater detections of benzene (1.5 µg/l), chlorobenzene (0.47 µg/l), cis-1,2-DCE (0.49 µg/l), and 1,4-dioxane (64 µg/l) in bedrock groundwater monitoring well MW-22 (approximate center of Landfill; Figure 2-1) above both the USEPA RSL and Pennsylvania MSC. However, these detections were an order of magnitude less than concentrations reported in Landfill overburden wells and there were no detections of Site COCs in bedrock wells MW-20B and MW-21 along the Western Refuge Road.

Figure 4-6 presents relative 1,4-dioxane concentrations on two Site hydrogeologic cross-sections, which include groundwater elevations and groundwater flow direction indicators. Overburden groundwater results above screening levels are indicated by large red circles representing locations with 1,4-dioxane concentrations ranging from 120 µg/l to 500 µg/l. The one bedrock groundwater result above screening levels is indicated by a small orange circle representing the location at the Landfill with a 1,4-dioxane concentration of 64 µg/l. Bedrock groundwater results with “Non-Detects” are indicated by small blue circles representing locations along the Wester Refuge Road with no detectable concentrations of 1,4-dioxane.

Overall, RI analytical results show that Site COCs are primarily migrating in groundwater in the sands and gravels located just above bedrock. Below that, Site COCs observed at the Landfill were limited to upper bedrock well MW-22 where overburden and bedrock groundwater mix, evident by the gradient reversals observed during the transducer studies and further supported by the findings along the Western Refuge Road where Site COCs in the overburden sands and gravels were not observed in the bedrock monitoring wells MW-20B and MW-21. Therefore, a key finding of the RI is that exceedances of Site COC screening levels in bedrock groundwater are limited to the upper bedrock in the proximity of the Landfill and are not present downgradient along the Western Refuge Road where bedrock groundwater is most likely associated with a deeper regional source.

6.0 CONTAMINANT FATE AND TRANSPORT

6.1 Overview

Fate and transport are affected by a contaminant's mobility and persistence in environmental media. Mobility is the extent to which a compound can migrate through the environment and is affected by Site characteristics, the media in which the contaminant is found, and the physical and chemical properties of the contaminant. The persistence of a contaminant is a measure of the time that the contaminant remains in the environment at concentrations of concern. Persistence is principally affected by the physical and chemical properties of the contaminant, and by site characteristics that affect chemical-biological interactions such as biodegradation and/or bioaccumulation.

6.2 Transport Mechanisms for Contaminated Media

As described in Section 5, the principal contaminant classes (i.e., COCs) at the Site are SVOCs and metals in soils, metals in intertidal seeps, and VOCs, 1,4-dioxane, naphthalene, and metals in groundwater. Potential transport mechanisms at the Site include:

- Transport of surface contaminants in cover soils via wind erosion or overland flow in stormwater runoff
- Transport of subsurface contaminants via bank soil erosion and during intrusive remedial activities such as re-grading or excavation
- Dissolution of contaminants in cover soil and waste and transport to the underlying Overburden groundwater
- Transport of dissolved contaminants in groundwater
- Transport of contaminants via intertidal seeps toward the surrounding creeks and tidal marshes

6.2.1 Transport of Surface Contaminants

Contaminants contained within or adsorbed onto surface soils may migrate through erosion such as wind or surface water run-off. Transport of contaminants may likewise occur either by adhering to a person, animal, or vehicle moving across the Site.

While localized portions of the Site near the creeks have been subject to erosion, both the Landfill and Annex have a vegetative cover over much of their ground surface. Therefore, continued erosion by wind or surface runoff is limited. This exposure pathway is evaluated in sections 7.0 and 8.0.

6.2.2 Transport of Subsurface Soil Contaminants

Contaminants contained within or adsorbed on sub-surface soils or waste may migrate through dislocations caused by movement of flora or fauna (e.g., worms, burrowing creatures, root growth), or through large scale anthropogenic disturbances such as excavation or re-grading. Additionally, bank soil erosion caused by surface water flow in adjacent creeks can result in exposure and subsequent transport of subsurface soil COCs and/or result in protruding of wastes/debris. Unprotected anthropogenic disturbances are unlikely based on the ownership and use of the property as a Refuge. This exposure pathway is evaluated in sections 7.0 and 8.0.

6.2.3 Dissolution

The most significant mechanism of contaminant movement through the subsurface is via the dissolution into groundwater. Precipitation percolating downward through the unsaturated zone can dissolve certain contaminants and carry them into the underlying groundwater.

6.2.4 Groundwater Transport

Dissolved contaminants in groundwater may migrate by advective flow. The rate of transport is affected by the groundwater flow velocity and by sorption and degradation processes that retard the migration rate to some degree. An evaluation of groundwater velocities is provided in Appendix L. Solute transport velocities for Cl-VOCs and 1,4-dioxane are expected to be slightly less but similar to groundwater velocities.

6.2.5 Intertidal Seeps

Dissolved contaminants in intertidal seepage may migrate into creeks and surrounding marshes. Based on field investigations, migration occurs away from and into the Landfill and Annex based on the ebb and flow of the tides. During high tides, surface water floods the creek banks and infiltrates the soil and then drains back into the creeks at low tide. The extent of such seeps is relatively small compared to the overall perimeter of the landfills and the flow is negligible when compared to the flows in Darby/Thoroughfare or Hermesprota Creeks.

6.3 Contaminant Flux

In response to the USEPA August 2011 comments on the May 2010 RI Report regarding the method and analysis of groundwater contaminant flux to surface water, Golder re-evaluated groundwater contaminant flux from the Site to the surrounding surface water bodies.

In accordance with the RI Work Plan, the May 2010 RI Report included an evaluation of groundwater contaminant flux to surface water. Specifically, advective-flux calculations, which accounted for tidally influenced groundwater gradient reversals, were used to evaluate the discharge to surface water. In the RI Work Plan, it was assumed that groundwater mounded beneath the Landfill and the Annex discharged radially to the surrounding surface water bodies.

However, additional information gathered during groundwater studies conducted after 2011 (Appendix L) indicate that groundwater from the Landfill does not discharge to surface water but flows east and southeast below the water bodies primarily within a sand and gravel layer that lies immediately above bedrock and is overlain by a clay unit. The clay unit, which serves as an aquitard, is thickest (approximately 40 feet thick) to the east/southeast along the Western Refuge Road and thins (approximately 4 feet thick) farther to the east as it approaches the Eastern Refuge Road, see Figure 4-6. The silty clay isolates the overburden groundwater from the adjacent surface waters and the Refuge Impoundment. This updated CSM is supported by groundwater chemistry in wells east of the Landfill that show Site COC concentrations greater than concentrations observed at the Landfill.

To address the aforementioned USEPA comments, Golder conservatively assumed that all groundwater migrating beneath the Annex/Landfill discharges to the closest receiving surface water body even though the Off-Site Investigation has demonstrated that groundwater is primarily flowing beneath the surface water through the basal sand and gravel unit. Additionally, USEPA suggested in its comments that Golder use the Pennsylvania Department of Environmental Protection (PADEP) approved modeling programs for calculating this hypothetical flux to surface water. As presented below, the results of this screening model demonstrate that there would be no impact on surface water quality from this hypothetical groundwater discharge from the Landfill or Annex.

6.3.1 Methodology

To evaluate the potential flux of groundwater impacts from the Annex and the Landfill into the surface water bodies adjacent to the Landfill and Annex, Golder used the following fate and transport (F&T) models:

- SWLOAD5B (SWL). A PADEP approved model (PADEP 2002a) that estimates the maximum average concentration, total plume flow, and mass loading to a stream from a decaying or non-decaying dissolved phase contaminant plume emanating from a constant source. The SWL results are then used as inputs for PENTOXSD, if necessary. PENTOXSD modeling is not required if the maximum modeled or measured concentration from SWL is below applicable criteria.
- PENTOXSD - A PADEP approved surface water mixing model (PADEP 2002a) that evaluates if groundwater discharge to a stream will exceed applicable surface water quality criteria. The model calculates a recommended effluent limit for each COC, which is then compared to the maximum average concentration estimated using SWL. If the recommended effluent limit is greater than the maximum average concentration, then no action is required.

The SWL model was run for each groundwater COC that exceeded applicable groundwater standards based on data collected during the RI. In addition, the SWL model was run for each detected groundwater chemicals of potential ecological concern (COPEC) indicated in the SLERA (discussed in Section 8.0). Furthermore, a SWL model was run for 1,4-dioxane, however, because there is no applicable surface water criterion, 1,4-dioxane was only evaluated for discharge compliance at the stream interface and was not evaluated for mixing with surface water.

For chemicals where SWL modeling (in hypothetical absence of the clay layer) indicated a COC concentration could potentially exceed groundwater discharge to surface water criteria, additional more-rigorous modeling was required utilizing the PENTOXSD model. PENTOXSD is a mixing model that evaluates whether the mass loading from a particular source at a specified rate (mass flux) will exceed PADEP surface water criteria based on risk levels. The utilized criteria in the PENTOXSD model are as follows: Acute Fish Criterion (AFC), Chronic Fish Criterion (CFC), Threshold Human Health (THH), and Cancer Risk Level (CRL), which correspond to the Criteria Continuous Concentrations, Criteria Maximum Concentrations, and Human Health Criteria contained in PA Code Title 25, Chapter 93 - Water Quality Standards. The following summarizes the evaluation sequence for each modeled compound:

- Calculate the potential groundwater discharge from the Landfill and the Annex (calculated separately) into surrounding surface water bodies using the SWL model for each groundwater COC. Discharge results are compared directly to applicable PADEP groundwater screening criteria.
- For each COC exceeding applicable PADEP groundwater screening criteria based on SWL analysis, conduct additional evaluations with the PENTOXSD model regarding the predicted mixed concentrations in surface water bodies receiving discharge from the Landfill and the Annex.
- Determine if SWL results exceed the PENTOXSD predicted effluent limits for each COC evaluated by both models.

As an initial conservative evaluation, groundwater discharge was assessed at peak conditions and the following conservative assumptions and inputs were made for the SWL and subsequent PENTOXSD (if required) model runs:

- Source Concentration: Historical maximum groundwater concentrations were used for SWL input.
- Source Width: The wetted perimeter of both the Landfill and Annex were used for SWL input.
- Source Thickness: The maximum observed wetted thickness of the waste was used SWL input.
- Head Difference/Hydraulic Gradient: The maximum observed head change between groundwater at the Landfill/Annex and surface water bodies was used to calculate the hydraulic gradient for SWL.
- Discharge Concentration: The maximum concentration calculated by the SWL analysis was used for the PENTOXSD input.

The SWL and PENTOXSD models estimate groundwater discharge under constant groundwater flow conditions. However, at the Landfill and Annex, tidal conditions are present where there are periods of hydraulic gradient reversals. Specifically, there are periods where hydraulic heads at the Landfill/Annex are greater than the hydraulic heads in the surface water and periods where hydraulic heads at the

Landfill/Annex are less that hydraulic heads in the surface water. Therefore, because discharges to surface water are not occurring at all times during a 24-hour period, the model results are extremely conservative. In addition, while the Off-Site Investigation has demonstrated that groundwater primarily migrates beneath Thoroughfare Creek in the vicinity of the Site, the SWL and PENTOXSD evaluations were modeled as if all groundwater discharged to the surrounding surface water bodies.

An entire list of the assumptions for both SWL and PENTOXSD is presented in the Results of Modeling Chemical Flux from Groundwater to Surface Water Memorandum, which is included as Appendix R.

6.3.2 Results and Conclusions

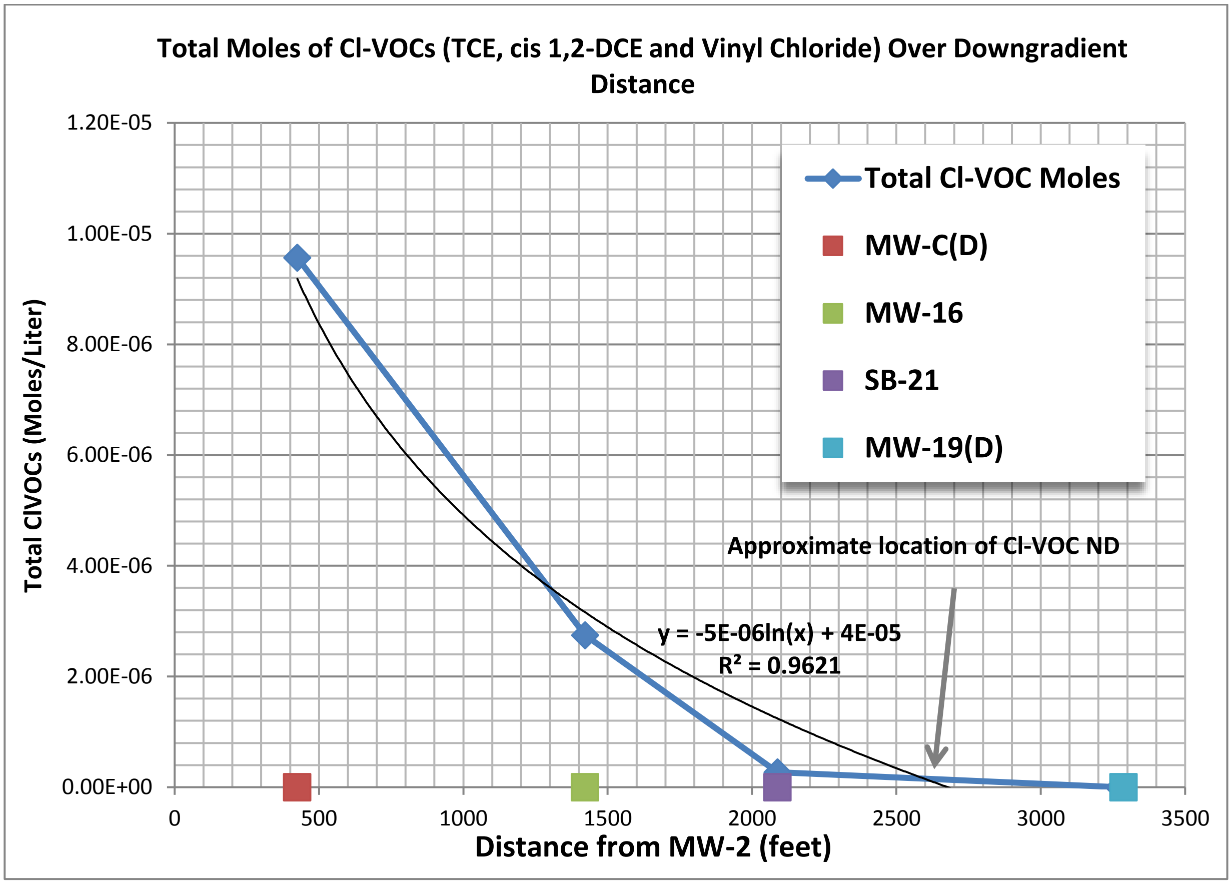
The results of this extremely conservative groundwater flux evaluation show that no compounds retained for further analysis, based on SWL modeling results, exceeded the recommended effluent limits calculated by PENTOXSD. Therefore, based on these conservative modeling results and the current understanding of groundwater flow at the Site, potential groundwater flux from the Site poses no threat to surface water quality, even in the hypothetical absence of the clay layer.

6.4 Natural Attenuation

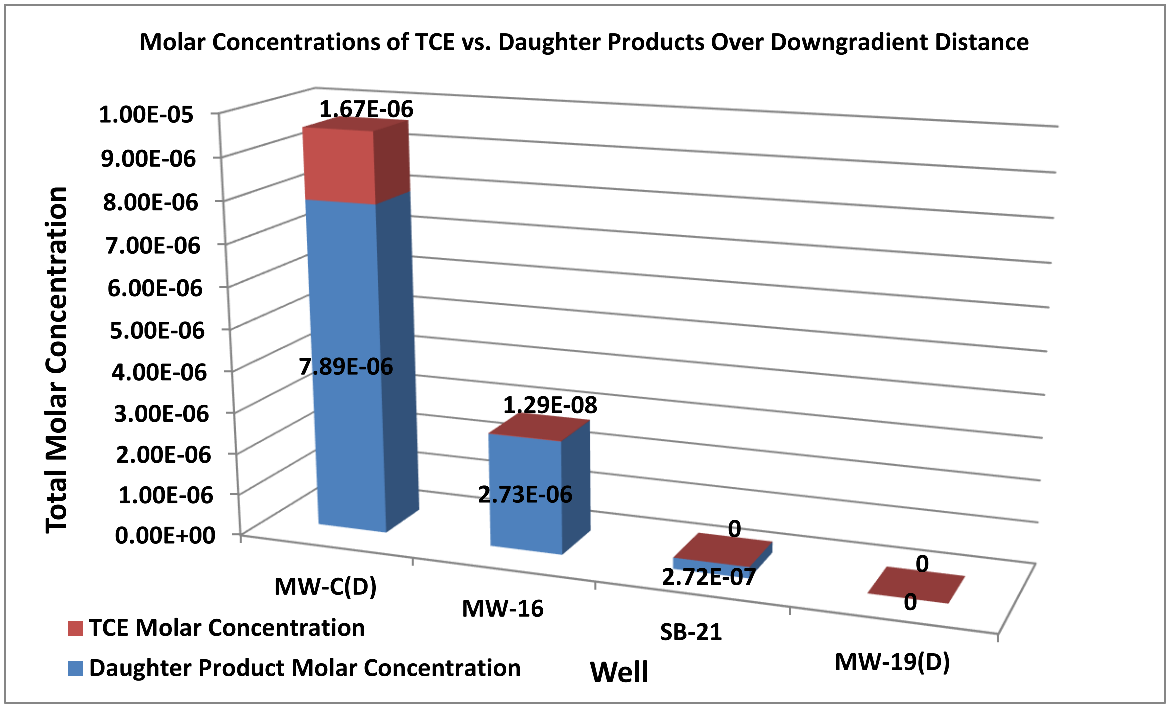
Natural attenuation of Cl-VOCs and 1,4-dioxane were evaluated as part of the RI groundwater evaluations conducted in 2014. The evaluation is summarized below. Appendix L includes additional details regarding natural attenuation occurring at the Site and downgradient locations.

6.4.1 Cl-VOCs

The total molar concentrations of observed Cl-VOCs were calculated at wells/borings along the flow path to evaluate the potential for natural attenuation of Cl-VOCs (see figure below). This evaluation indicated a general decrease in CL-VOC molar concentrations with downgradient distance from the Landfill.



The evaluation also identified an increase in TCE daughter products (i.e., cis-DCE and vinyl chloride) relative to TCE concentrations, as the total molar concentration decreases over a distance of approximately 2,800 linear feet downgradient from the Landfill.



In addition to the total molar concentration evaluation, a numeric evaluation sheet (Scorecard) developed by USEPA (USEPA, 1998), was used to evaluate additional lines of evidence to support that natural attenuation of Cl-VOCs is occurring at the Site. The Scorecard uses the following scoring system shown below.

Score	Interpretation
0 to 5	Inadequate evidence for anaerobic biodegradation* of chlorinated organics
6 to 14	Limited evidence for anaerobic biodegradation* of chlorinated organics
15 to 20	Adequate evidence for anaerobic biodegradation* of chlorinated organics
>20	Strong evidence for anaerobic biodegradation* of chlorinated organics

Monitoring wells MW-C(D) and MW-16, where reported Cl-VOC concentrations were greatest, had scores of 21 and 24, respectively, which strongly indicate that subsurface conditions support natural attenuation at those locations. Overall, there is sufficient evidence that concentrations are decreasing downgradient and natural attenuation (via both abiotic and biotic mechanisms) is occurring. Refer to Appendix L for further discussion on this scoring system and Cl-VOC degradation.

6.4.2 1,4-Dioxane

Attenuation of 1,4-dioxane was also evaluated during the Off-Site Groundwater Investigations in 2014 and 2016. The current groundwater 1,4-dioxane concentrations decrease substantially with distance from the

Landfill along the two primary identified flow paths. Low-level detections of 1,4-dioxane along Eastern Refuge Road are several orders of magnitude less than the highest concentrations observed at the Landfill. Although 1,4-dioxane has not been shown to readily degrade in the environment, recent studies show promise that 1,4-dioxane may degrade naturally under certain subsurface geochemical conditions. The potential for natural attenuation of 1,4-dioxane through advection, dispersion, and degradation will be further evaluated in the FS based on additional groundwater monitoring data.

7.0 BASELINE HUMAN HEALTH RISK ASSESSMENT

This BHHRA has been prepared in accordance with the following documents:

- RI/FS Work Plan (Golder 2006a)
- Interim Submittal for the BHHRA (Golder 2008a)
- Response to USEPA's November 6, 2008 comments of the BHHRA Interim Submittal (Golder 2009a)
- Response to USEPA's July 28, 2009 additional comments on the BHHRA Interim Submittal (Golder 2009b)
- Response to USEPA's November 19, 2010 comments on the May 2010 Remedial Investigation Report (Golder 2011a)
- Response to USEPA's August 18, 2011 comments on the May 2010 Remedial Investigation Report (Golder 2012a)
- Relevant USEPA guidance.

7.1 Risk Assessment Process and Report Organization

The risk assessment methods described in this report are based on the USEPA's Risk Assessment Guidance for Superfund (RAGS) and on specific USEPA Region III policies. Risk assessments incorporate a number of assumptions and forms of extrapolation that cannot be verified by traditional scientific means, especially with regard to carcinogenic effects. This approach is conservative (i.e., health protective) and is used by regulatory officials to place an upper bound on risk in order to ensure health protection in the absence of complete experimental information. Risk assessments are not intended to provide a solid line between "safe" and "unsafe" levels of exposure. A substantial margin of safety is built into toxicity values, thereby providing a high degree of certainty that the levels derived as "acceptable" by regulatory agencies will cause no adverse health effects in the potentially exposed population. The risk assessment methodology provides a systematic approach that allows public health policy makers to establish the relative risks posed by various environmental substances and potential exposure pathways. A discussion of the uncertainties in the risk assessment process is presented in Section 7.9.5 of this report including the multiple conservative assumptions used in order to place them into proper context with respect to site-specific conditions and the relative strength of the underlying toxicity studies.

The potential risks estimated using these risk assessment methods <u>are not absolute</u> (i.e., the risk estimates do not predict the number of individuals who will experience health consequences as a result of an assumed exposure). Furthermore, the risk estimates developed herein do not relate to absolute individual risks, but indicate risk to similarly exposed populations. Many individual risk factors such as occupational exposures, smoking habits, age, diet, gender, exposures to other environmental sources, and inherent genetic susceptibility influence the probability of an individual developing a specific health effect.

The BHHRA consists of all relevant[21] standard Risk Assessment Guidance for Superfund (RAGS) Part D Tables 7-1 through 7-9 and explanatory text. Tables 7-1 through 7-4 were included in the May 2010 RI Report submittal of the HRRA and have been previously approved by the USEPA. The RAGS Part D tables presented herein summarize the selection of pathways and chemicals of potential concern (COPCs), the intake exposure parameters, chemical toxicity data (carcinogenic and non-carcinogenic), and estimates of potential risks from all pathways and COPCs. The methods used to formulate the tables are described in the following sections:

- Section 7.2: Conceptual Site Model, provides a description of the Site history and current conditions, including the nature and extent of contamination;
- Section 7.3: Selection of Human Health Exposure Receptors and Pathways, discusses exposure scenarios and assumptions for current and potential future uses of the Site, as summarized in Table 7-1;
- Section 7.4: Occurrence, Distribution and Selection of Chemicals of Potential Concern, summarizes the results of the remedial investigation and the screening of chemicals against toxicity benchmark values to identify chemicals of potential concern, as presented in Table 7-2 (sub-Tables 7-2.1 through 7-2.5);
- Section 7.5: Exposure Point Concentration Summary, estimates exposure pathway-specific concentrations of Site-related contaminants (using statistical analyses of data and/or modeling) as presented in Table 7-3 (sub-Tables 7-3.1 through 7-3.5);
- Section 7.6: Estimated Daily Intake, estimates human intake based on chemical concentrations at the points of exposure combined with exposure variables, as presented in Table 7-4 (sub-Tables 7-4.1 through 7-4-18);
- Section 7.7: Toxicological Assessment, presents a hazard evaluation for each selected chemical to derive toxicity values for cancer and non-cancer health effects, as presented in Tables 7-5 (sub-Tables 7-5.1 and 7-5.2 and 7-6 (sub-Tables 7-6.1 and 7-6.2);
- Section 7.8: Risk Characterization, presents numerical estimates of carcinogenic and non-carcinogenic risks calculated for each chemical by each potential route of exposure, as presented in Tables 7-7 (sub-Tables 7-7.1 through 7-7.42) and 7-8 (sub-Tables 7-8.1 through 7-8.16);
- Section 7.9: Uncertainty Assessment, discusses the assumptions used in the BHHRA and their effects on the estimated risks; and,
- Section 7.10: Summary of BHHRA Results, presents a summary of the cancer risks and non-cancer hazards, as presented in Table 7-9.

7.2 Conceptual Site Model

The CSM is developed for a BHHRA to characterize the site settings, impacted environmental media, and site-specific factors that influence the receptors present and potentially complete exposure pathways.

[21] Tables relating to radionuclide risk estimations are not relevant.

The information provided in this section supports the development of a CSM that describes the pathways between impacted environmental media and potentially exposed receptors. A more detailed description of the site history and site features is provided in previous sections of the RI Report.

7.2.1 Site Setting

The Site is located in a highly industrialized and heavily developed portion of southeastern Pennsylvania, at the lower end of the Darby-Cobbs Creek Watershed and within the 1,200-acre John Heinz National Wildlife Refuge (Figure 1-2). The Site and surrounding land use in the vicinity of the Site are described in detail in Sections 2.1 and 2.2 of this report, respectively. The Landfill is approximately 47.5 acres in size and is bordered by Darby Creek/Thoroughfare Creek to the east and southeast, Hermesprota Creek to the west, a tidal marsh to the south, and the Delaware County EMTC and an Action Concrete facility to the north. The Annex, which is separated from the Landfill by Hermesprota Creek, is approximately 16.5 acres in size and is bordered by Hermesprota Creek to the east and northeast, a business park to the north and northwest, an unnamed tributary to the west and southwest, and a tidal marsh to the south.

The Darby-Cobbs Creek Watershed is a complex urban watershed that drains 77 square miles in 3 suburban counties as well as parts of the City of Philadelphia (see Figure 2-3). The watershed has a population of approximately 500,000 residents and numerous permitted and unpermitted dischargers to surface water. At the downstream extremity of the Darby-Cobbs Creek Watershed, where the Site is located, the stream gradients flatten sharply, the watershed is tidal, and the tidal marshes south of the Site are a natural sediment deposition area.

7.2.2 Historic Operations at Property

The Folcroft Landfill opened in 1961 and operated until 1974 when landfill operations were terminated and closure operations commenced. In 1977, the Pennsylvania Attorney General's office reported that PADER had determined that the Folcroft Landfill had been satisfactorily closed. Subsequent to the landfill closure, the DOI purchased the Landfill and Annex in 1980 to extend the boundaries of the Refuge. The Site history and operations are described in detail in Sections 2.3 and 2.4 of this report.

7.2.3 Geology and Hydrogeology

As previously discussed, the surface of the Site (Landfill and Annex) consists of a cover soil that is made of topsoil, sand, silt, clay, and gravel reportedly taken from a number of local borrow sources up to approximately 12 feet in thickness. The cover soil may also contain materials consistent with historical construction and demolition debris (i.e., brick concrete, rebar, glass). Beneath the cover soil, a waste layer is present varying in thickness from zero up to 45 feet, with the thickest portions observed near the center of the Landfill. Beneath the waste lays the unconsolidated Coastal Plain deposits. The Coastal Plain deposits consists of mostly fluvial sediments and form a wedge like shape that increases in thickness to the east/southeast. At the furthest downgradient locations of investigation (approximately 2,800 feet southeast of the Landfill but within the Refuge boundary), the thickest portions of Coastal Plain deposits were observed. Underlying the Coastal Plain deposits is bedrock of the Piedmont province (Wissahickon Formation). The Wissahickon Formation dips to the east-southeast with an undulating and weathered bedrock surface.

Groundwater in both the overburden and bedrock migrates in a southeasterly direction. Groundwater levels fluctuate due to tidal effects. However, due to a silty-clay layer observed at the eastern boundary of the Landfill and at downgradient investigation locations (see cross sections G-G" and H-H' on Figure 4-6), groundwater preferentially migrates in semi-confined conditions through a sand and gravel layer immediately above the bedrock surface. Therefore, limited discharge of groundwater from the Landfill is anticipated into the surrounding water bodies. Additionally, near horizontal foliation observed in the bedrock surface limits the interaction of overburden groundwater and bedrock groundwater.

7.3 Selection of Human Health Exposure Receptors and Pathways

In this section, the potentially exposed populations (receptors) and possible exposure pathways under current and hypothetical future land-use conditions are identified. Exposed receptors refer to groups of individuals who may be exposed to a chemical or physical agent released into the environment from the Site. Potential exposure pathways are those mechanisms by which an exposed receptor could come in contact with impacted environmental media at or originating from the Site. As required by USEPA guidance, the exposure assessment does not take into account any engineering or management controls that likely would be implemented; for example, limiting visitor access to wood walkways and/or prescribed paths.

7.3.1 Identification of Exposure Receptors

For purposes of this BHHRA, receptors were identified considering both current and hypothetical future land use conditions. Current land use is as part of the Refuge and the Site is intermittently visited by Refuge workers for inspection and maintenance purposes. The future land use conditions only vary from the current land use in terms of the potential use of the Site by visitors as the Site will continue to be maintained by the FWS as a Refuge. The following potential land use and associated receptors were identified in the approved Interim BHHRA submittal.

7.3.1.1 Construction/Excavation Worker

This population includes future construction/excavation workers who may access the Site to construct future improvements consistent with its use as a Refuge, such as a visitor walkway, or a repair of the sewer line that crosses through the northwest corner of the Annex. Although heavy construction requiring extended periods of subsurface excavation and trenching is unlikely in the future, the conservative exposure scenario assumes construction/excavation workers are involved in these activities for up to one year (250 days per year) for a full working day (8 hours) for reasonable maximum exposures (RME). These assumptions are very conservative (most construction/excavation projects would be completed in significantly less than one year's time) and exposures at this level are therefore extremely unlikely to occur. However, it should be noted that these exposure assumptions do not account for any potential use of personal protective equipment (PPE). As a point of comparison, during a recent repair (2012) of a major break in the sewer line on the Annex, initial response plus the permanent repair were accomplished in approximately 30 days. In addition to general construction activities, these receptors may be involved in trench work.

For exposure to seep water via dermal contact, an exposure frequency of 75 days/year was assumed, based on the assumption that 30% of exposure time would occur in the seep area. In addition, an exposure time of 0.25 hours/event and event frequency of 1 event/day were assumed. Construction/excavation workers are assumed to potentially work on both the Landfill and Annex and may spend time at the edges of the Site where intertidal seeps have been observed.

7.3.1.2 Maintenance Worker/Refuge Employee

This population includes both current and future adults working on behalf of the FWS, to patrol and/or otherwise maintain the Site as a Refuge. The receptor is assumed to potentially be present at the Site for the duration of a working lifetime (25 years) for 225 days per year and 8 hours per day. This assumption is also conservative as workers spend time throughout the combined Annex and Landfill 64-acre area. Maintenance workers/Refuge employees are assumed to access both the Landfill and Annex and may spend time at the edges of the Site where intertidal seeps have been observed. For exposure to seep water via dermal contact, an exposure frequency of 68 days/year was assumed, based on the assumption that 30% of exposure time would occur in the seep area. In addition, an exposure time of 0.25 hours/event and event frequency of 1 event/day were assumed.

There is also potential exposure to volatiles in indoor air via vapor transport from groundwater to potential future structures on the Site and Refuge. As opposed to outdoor exposure, an exposure frequency of 250 days per year was assumed for potential indoor exposure.

7.3.1.3 Adolescent Trespasser

This population includes adolescents from ages 13-18 years (5 years total exposure) who may currently access the Site and may continue to access the Site in the future. Although official access to the Site is currently restricted to maintenance workers, local adolescents may access the Site. These receptors are assumed to be on Site for a limited number of days per year (96 days) for up to four hours per day. These site-specific factors have been determined assuming three site visits per week for the warmer months of the year (mid-March to mid-November). For exposure to seep water via dermal contact, an exposure frequency of 48 days/year was assumed, based on the assumption that 50% of exposure time would occur in the seep area. In addition, an exposure time of 0.25 hours/event and event frequency of 1 event/day were assumed. As the Site does not have recreational facilities and is not easily accessed due to its remote location beyond industrial/commercial facilities, it is conservative to assume that a trespasser may spend up to four hours at the Site during a site visit. Trespassers are assumed to access both the Landfill and Annex. These receptors may spend some time at the edges of the Site where intertidal seeps have been observed.

7.3.1.4 Refuge Visitors (Adult and Child)

This population includes future Refuge visitors who may access the Site for wildlife observation and nature walks. The Site does not currently provide accessible trails for walking, but may in the future if this portion of the Refuge is opened to visitors. Future Refuge visitors are assumed to be both children and adults who visit the Site three times per week during the warmer months of the year (96 days total per year). Children are assumed to be from 1 to 6 years of age. For exposure to seep water via dermal contact, an exposure frequency of 48 days/year was assumed, based on the conservative assumption that 50% of exposure time would occur in the seep area. In addition, an exposure time of 0.25 hours/event and event frequency of 1 event/day were assumed. Refuge visitors are assumed to have unrestricted access to both the Landfill and Annex of the Site and to spend time at the edges of the Site where intertidal seeps have been observed, and they are assumed to have potential exposure to volatiles in indoor ambient air in future Refuge buildings via vapor transport from impacted groundwater.

7.3.2 Identification of Exposure Pathways

Exposure pathways refer to potential routes by which the receptors may be exposed to contaminants within impacted media at the Site. The mechanism of exposure (i.e. ingestion, dermal contact, or inhalation) depends on the environmental medium in which the substance is present (e.g., groundwater, air, etc.). In this BHHRA, both current and future pathways were evaluated. Table 7-1 presents the exposure pathways applicable to the Site in the standard RAGS Part D format, and these pathways are discussed in greater detail below.

Receptors can potentially be exposed to contamination through exposure to soil, groundwater, intertidal seepage, and ambient air at the Site.

7.3.2.1 Groundwater

Groundwater impacts have been identified at both the Landfill and Annex of the Site. Consistent with the approved Work Plan and Interim HHRA submittal, direct contact (ingestion, dermal contact) with impacted groundwater is limited to exposure during future construction/excavation activities. This scenario assumes that the trench work would be deep enough to breach the shallow groundwater at the Site (4 to 10 ft bgs). Currently, there are no drinking water wells at the Site and they are not likely to be present in the future based on the required continued use of the Site as a Refuge (i.e., no residential or commercial use of the Site) and municipal ordinances per Section 5.1. Additionally, no groundwater users have been identified in locations relevant to groundwater conditions described in the report.

As discussed with USEPA, the feasibility of restoring groundwater to its beneficial use will be evaluated as part of the Feasibility Study.

7.3.2.2 Soil

Soil impacts have been identified in both surface soils (0 to 6 inches bgs) and in shallow subsurface soils (6 to 24 inches bgs) in both Landfill and Annex of the Site. The exposure point for soil includes all soil locations and intertidal seep locations. All receptors (i.e., future construction worker, maintenance worker, trespasser, and refuge visitors) identified at the Site are assumed to be exposed to impacted soils via incidental ingestion and dermal contact. For those receptors potentially present during future excavation/construction activities (maintenance worker, trespasser, and construction/excavation worker), inhalation of particulates, as fugitive dusts, may also occur. During a construction/excavation activity, it is assumed that a significant portion of the vegetation may be removed from the area and, coupled with the activity, fugitive dust emissions may occur.

7.3.2.3 Intertidal Seeps

Intertidal water seeps have been observed along the perimeter of portions of the Site. Although the seeps are limited in area and are not easily accessed, it is assumed that for at least some portion of the time spent at the Site, a receptor may access the seep areas. As the water does not pool, ingestion of the seep water is not considered to be a complete pathway, however, dermal contact with the seep water is possible and therefore, all of the receptors include a dermal exposure pathway for seep water.

7.3.2.4 Air

Monitoring of ambient air at the Site has not identified impacts, however, it is considered possible that volatile compounds in groundwater may impact ambient air, particularly during construction/excavation work in a trench. Therefore, ambient air exposures resulting from volatile compounds in groundwater have been evaluated for all current and future receptors. Additional air exposures to volatile compounds in both soil and groundwater for construction/excavation workers in a trench were also evaluated. Furthermore, potential exposure to volatiles in indoor air via vapor transport were also evaluated based on the assumption that Refuge workers and visitors would be exposed in potential future structures at the Site and Refuge.

7.3.3 Refuge Summary of Exposure Receptors and Pathways

Conservative representations of current and potential future receptors that may be exposed to Site-related impacts in groundwater, soil, intertidal seeps, indoor air, and ambient air have been included in the BHHRA.

Other potential receptors (e.g., intermittent landscape worker) would represent a less conservative receptor than one already included in the BHHRA and therefore, these risks are addressed by the more conservative receptors.

Complete details of the exposure pathways selected are provided in Table 7-1 and illustrated in the updated CSM (Figure 7-1).

7.4 Occurrence, Distribution and Selection of Chemicals of Potential Concern

Groundwater, intertidal seep water, and soil samples were analyzed for TCL VOCs and SVOCs, PCBs, pesticides, and inorganic compounds. Soil samples were also analyzed for dioxins. Compounds that were detected at least once were included in the screening to determine chemicals of potential concern (COPCs). The list of samples that were used in the development of screening tables is included in Appendix S.

COPCs were selected according to the following screening procedures specified in the USEPA's RAGS documents. Data from the Site were screened against generic screening levels from the most recent version (May 2016)[22] of the USEPA RSLs for residential soil and tap water at a risk level of 1E-06 for carcinogens or a hazard index of 0.1 for non-carcinogens. Although the Site is not currently residential land and will not be redeveloped as residential land by the FWS, USEPA required that the residential soil RSLs be used for screening purposes. Similarly, the tap water RSLs required by the USEPA are considered overly conservative screening values because groundwater or seep water at the Site will not be used for potable purposes.

For the potential impact of soils (as fugitive dusts and volatile compounds) to ambient air, the soil data were also screened against the RSLs for residential air exposures, as is consistent with the USEPA requested approach for soil and groundwater screening. First, the soil data were converted to air concentrations using a particulate emission factor (PEF) for inorganic and semi-volatile compounds or a chemical-specific volatilization factor for VOCs (noted as 'V' in the RSL table). The calculation of the soil screening concentration (the maximum) is provided in Table 7-2.3 with the equation and PEF/VF values provided in the footnotes and Appendix T. These concentrations were subsequently screened against the RSLs.

For the groundwater to ambient air pathway, the lower of the carcinogenic and non-carcinogenic inhalation tap water RSLs were selected. Only those compounds identified as volatile ('V' in the RSL table) (e.g., VOCs, mercury, naphthalene) were screened against the residential tap water-inhalation criteria (Table 7-2.3). The tap water-inhalation screening criteria was selected as the most appropriate, if highly

[22] Although more recent RSL tables have been released, per discussion with USEPA, the May 2016 RSL tables have been retained and any revisions will be incorporated in the Feasibility Study. A copy of the full May 2016 RSL tables is provided in Appendix T.

conservative, screening criteria for this pathway due to the lack of appropriate groundwater to outdoor ambient air screening criteria.

For the groundwater to indoor air pathway, the lower of the carcinogenic and non-carcinogenic inhalation residential groundwater vapor intrusion screening levels (VISLs) were selected. Only those compounds identified as volatile (e.g., noted as 'V' in the RSL table) were screened against the tap water-inhalation criteria (Table 7-2.3).

Surrogate screening values were used for some compounds (e.g., pyrene for phenanthrene, endosulfan for endosulfan sulfate) where an appropriate surrogate value was available. Surrogate values used are noted in the footnotes of the screening tables (Tables 7-2.1 through 7-2.5). In the event that no RSL was available and no surrogate value was considered appropriate, the compound was identified as a COPC.

A compound was retained as a COPC unless its maximum detection was below the screening value. This is consistent with the overall conservative approach wherein the default assumption is to retain compounds. Consistent with the USEPA policy, non-threshold carcinogens (previously identified as Group A carcinogens) that were detected at any concentration were also retained as COPCs irrespective of concentration (e.g., benzene). These compounds were identified from the substances list of the National Toxicology Program *Report on Carcinogens, Fourteenth Edition* (NTP 2016). Based on this list, the following COPCs were identified as 'known to be human carcinogens' and therefore, identified as COPCs for further evaluation; arsenic, benzene, beryllium (inhalation only), cadmium (inhalation only), chromium, trichloroethene, and vinyl chloride.[23] Compounds considered essential nutrients (e.g., calcium) were not retained as COPCs.

For certain compounds, very conservative (health protective) assumptions were made as to chemical form in the screening process. For chromium, USEPA has required that all data be screened against the lower RSLs for hexavalent chromium (Cr^{+6}) even though trivalent chromium (Cr^{+3}) is known to be more prevalent in the environment. For dioxins, the congeners were converted to 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) equivalents following the toxicity equivalency factors (TEFs) provided by the World Health Organization (USEPA 2010) and used by the USEPA in the RSL tables (USEPA 2016b). A copy of the calculation is provided in Appendix T in the ProUCL input table.

Tables 7-2.1 through 7-2.4 present the screening tables for groundwater, soil, and seep water. Table 7-2.5 presents the screening table for the groundwater to ambient and indoor air pathways.

[23] While nickel is identified in this list, the available cancer slope factor in IRIS is for 'nickel, refinery dusts' and the HHRA evaluates nickel as nickel, soluble salts, which does not have a slope factor in IRIS.

7.4.1 Groundwater Screening Results

For overburden groundwater, there were detections of all classes of compounds in both the Landfill and Annex. The follow subsections provide the COPCs identified for the quantitative risk estimations.

7.4.1.1 Annex

The results of the screening identified 9 inorganic compounds, 2 pesticides, 6 SVOCs, and 7 VOCs as COPCs for direct contact exposures. The COPCs in Annex overburden groundwater are as follows.

ANNEX - GROUNDWATER COPCS

Inorganic Compounds	Pesticides	SVOCs	VOCs
Aluminum	Beta-BHC	1,4-Dioxane	1,2-Dichloroethane
Antimony	Heptachlor	2-Methylnaphthalene	1,4-Dichlorobenzene
Arsenic		Bis(2-ethylhexyl)phthalate	Benzene
Barium		Carbazole	Chlorobenzene
Chromium		Dibenzofuran	Ethylbenzene
Cobalt		Naphthalene	Trichloroethene
Iron			Vinyl Chloride
Manganese			
Thallium			

7.4.1.2 Landfill

The results of the screening identified 12 inorganic compounds, 6 pesticides, 12 SVOCs, and 13 VOCs COPCs for direct contact exposures. The COPCs in Landfill overburden groundwater are as follows.

LANDFILL – GROUNDWATER COPCS

Inorganic Compounds	Pesticides	SVOCs	VOCs
Arsenic	Aldrin	1,4-Dioxane	1,1,2,2-Tetrachloroethane
Barium	Beta-BHC	2-Methylnaphthalene	1,1-Dichloroethene
Cadmium	Delta-BHC	Acenaphthene	1,2-Dichloroethane
Chromium	Gamma-Chlordane	Benzo(a)anthracene	1,4-Dichlorobenzene
Cobalt	Heptachlor	Benzo(a)pyrene	2-Hexanone
Iron	Heptachlor Epoxide	Benzo(b)fluoranthene	Benzene
Lead		Biphenyl	Chlorobenzene
Manganese		Carbazole	Cis-1,2-Dichloroethene
Mercury		Dibenzofuran	Ethylbenzene
Nickel		Fluorene	Methylene Chloride
Thallium		Naphthalene	Trichloroethene
Vanadium		Phenanthrene	Vinyl Chloride
			Xylenes

7.4.2 Surface and Subsurface Soil Screening Results

For surface (0-6 inches) and subsurface (6-24 inches) soils, there were detections of all classes of compounds in both the Landfill and Annex. The following subsections provide the COPCs identified for the quantitative risk estimations.

7.4.2.1 Annex

The results of the screening identified 12 inorganic compounds, 3 PCBs, 6 SVOCs, and 2,3,7,8-TCDD equivalents as COPCs in Annex surface and subsurface soils. The COPCs are as follows.

ANNEX – SOIL COPCS

Inorganic Compounds	PCBs	SVOCs	Dioxins
Aluminum	Aroclor-1248[2]	Benzo(a)anthracene	2,3,7,8-TCDD Equivalents
Antimony	Aroclor-1254	Benzo(a)pyrene	
Arsenic	Aroclor-1260	Benzo(b)fluoranthene	
Beryllium[1]		Carbazole	
Cadmium[1]		Dibenzo(ah)anthracene	
Chromium[1]		Indeno(1,2,3-cd)pyrene	
Cobalt			
Iron			
Lead			
Manganese			
Thallium			
Vanadium			

1 – Identified for the soil to ambient air pathway (as fugitive dust) per Table 7.2-3
2 – Identified as COPC for inhalation pathway as well (construction/excavation trench scenario)

7.4.2.2 Landfill

The results of the screening identified 15 inorganic compounds, 1 pesticide, 8 SVOCs, and 2,3,7,8-TCDD equivalents as COPCs in Landfill Area surface and subsurface soils. The COPCs are as follows.

LANDFILL – SOIL COPCS

Inorganic Compounds	Pesticides	SVOCs	Dioxins
Aluminum	Dieldrin	Benzo(a)anthracene	2,3,7,8-TCDD Equivalents
Antimony		Benzo(a)pyrene	
Arsenic		Benzo(b)fluoranthene	
Beryllium		Benzo(k)fluoranthene	
Cadmium		Carbazole	
Chromium[1]		Dibenzo(ah)anthracene	
Cobalt[1]		Indeno(1,2,3-cd)pyrene	
Copper		Naphthalene[2]	
Iron			
Lead			

Inorganic Compounds	Pesticides	SVOCs	Dioxins
Manganese[1]			
Mercury			
Nickel			
Vanadium			
Zinc			

1 - Identified for the soil to ambient air pathway (as fugitive dust) per Table 7-2.3
2 – Identified as COPC for inhalation pathway as well (construction/excavation trench scenario)

7.4.3 Intertidal Seepage Results

For seep water, there were detections of most classes of compounds in the Landfill and Annex. The following sub-sections provide the COPCs identified for the quantitative risk estimations.

7.4.3.1 Annex

The results of the screening identified 8 inorganic compounds, 1 SVOC, and 2 VOC as COPCs in Annex Area seep water. The COPCs are as follows.

ANNEX – SEEP WATER COPCS

Inorganic Compounds	SVOCs	VOCs
Aluminum	Naphthalene	Vinyl Chloride
Arsenic		Benzene
Chromium		
Cobalt		
Iron		
Lead		
Manganese		
Vanadium		

7.4.3.2 Landfill

The results of the screening identified 6 inorganic compounds, and 2 pesticides as COPCs in Landfill seep water. The COPCs are as follows.

LANDFILL – SEEP WATER COPCS

Inorganic Compounds	Pesticides
Arsenic	Aldrin
Chromium	Dieldrin
Cobalt	
Iron	
Lead	
Manganese	

7.4.4 Air Pathway

Initial ambient air monitoring data collected during the RI showed elevated levels of VOCs in localized areas of the Annex. However, additional air monitoring conducted in 2012, after the DELCORA sewer line was repaired, did not show any impacts. At the request of the USEPA, the groundwater volatilization to ambient air pathway was considered as discussed above.

7.4.4.1 Annex (Groundwater to Ambient Air)

The results of the screening identified 1 pesticide, 2 SVOCs and 6 VOCs as COPCs in Annex ambient/trench air. The COPCs are as follows.

ANNEX – AMBIENT/TRENCH AIR COPCS

Pesticides	SVOCs	VOCs
Heptachlor	1,4-Dioxane	1,2-Dichloroethane
	Naphthalene	1,4-Dichlorobenzene
		Benzene
		Chlorobenzene
		Trichloroethene
		Vinyl Chloride

7.4.4.2 Landfill (Groundwater to Ambient Air)

The results of the screening identified 1 inorganic compound, 3 pesticides, 3 SVOCs and 12 VOCs as COPCs for Landfill ambient/trench air. The COPCs are as follows.

LANDFILL – AMBIENT/TRENCH AIR COPCS

Inorganic Compounds	Pesticides	SVOCs	VOCs
Mercury	Aldrin	1,4-Dioxane	1,1,2,2-Tetrachloroethane
	Heptachlor	Biphenyl	1,2-Dichloroethane
	Heptachlor Epoxide	Naphthalene	1,4-Dichlorobenzene
			2-Hexanone
			Benzene
			Chlorobenzene
			Ethylbenzene
			Trichloroethene
			Vinyl chloride
			Xylenes, total
			1,1-Dichloroethene
			Methylene Chloride

7.4.4.3 Refuge (Groundwater to Indoor Air)

The results of the screening identified four VOCs as COPCs for Refuge vapor intrusion to indoor air pathway (potential future structures constructed at the Refuge). The COPCs are as follows.

REFUGE – INDOOR AIR COPCS

VOCs
Chloroform
Trichloroethene
Vinyl chloride
Benzene

7.5 Exposure Point Concentration Summary

RAGS Part D Table 3s are provided for each of the COPCs and for each unique Scenario Timeframe/Medium/Exposure Medium combination. The Table 7-3 series summarizes the distribution of measured concentrations by reporting the arithmetic mean of the concentrations, the 95% upper confidence limit on the mean (95% UCL), and the maximum detected concentration for each COPC in each medium of concern.

The arithmetic mean and 95% UCL were calculated from the data used to compile the Table 7-2 series. For the calculation of the arithmetic mean, one-half the method detection limit was used for non-detect results. This adjustment was not undertaken for the calculation of the 95% UCL prior to the data input into the USEPA's ProUCL (version 5.0) software package as the software evaluates whether the full or half method detection limit is used. The UCL values in the Table 7.2 series are based on the statistical distributions recommended by the program. In the case of multiple recommended UCLs, the highest UCL was used.

The 95% UCL was generally chosen as the exposure point concentration (EPC) presented in the Table 7-3 series except where the 95% UCL exceeded the maximum detection. In these instances, the maximum detection was chosen as the EPC consistent with the USEPA guidance (USEPA 2002c). For all pathways associated with the same source media, but different exposure media (e.g., direct exposure to groundwater and groundwater to ambient air), the same EPCs were used.

ProUCL output sheets are included in Appendix S.

7.5.1 Fate and Transport Modeling

Certain exposures were estimated using fate and transport modeling where direct measurements were not available.

7.5.1.1 Groundwater to Ambient Air Pathway

For the inhalation of volatiles in ambient air originating from groundwater, the methodology developed by ASTM International (ASTM) in standard E1739-95 (ASTM, 2015) used to develop volatilization factors from groundwater to outdoor ambient air were utilized.

The ASTM methodology uses a receptor box model and assumptions made about the surface (e.g., wind speed) and subsurface (e.g., depth to groundwater) conditions to calculate an ambient air concentration. This concentration assumes a constant groundwater concentration; for the purposes of this BHHRA the groundwater EPC (95% UCL or maximum concentration as provided in Table 7-3.1) was used. Inputs for the box model were as follows:

- Box Model
  - Height of Box – 2 m for adult, 1 m for child
  - Length of Box – 10 m (default)
  - Wind Speed – 2 m/s (default)
- Unsaturated Zone – Sandy Gravel
  - Distance from Groundwater Surface – 1.5 m (based on minimum depth of 4 ft bgs as reported in the RFI)
  - Total Porosity – 0.25 cm^3/cm^3
  - Water Content – 0.1 cm^3/cm^3
  - Thickness of the Capillary Fringe – 5 cm
  - Air Content in Capillary Fringe – 0.03 cm^3/cm^3

The calculated outputs, along with the appropriate equations, are provided in Appendix T. In addition, similar methodology used to calculate a volatilization factor from subsurface soil to outdoor ambient air was used to calculate an EPC for Annex trench air due to Aroclor 1248. This calculation, along with the corresponding equations, inputs, as well as outputs are provided in Appendix T.

7.5.1.2 Ambient Air in Trench Scenario

For a construction/excavation worker, it was assumed that on the main areas of the Site the worker performs a portion of the work in a subsurface trench. It was further assumed that for this scenario, volatiles from groundwater and subsurface soil could accumulate in the trench air and the worker would be exposed to these compounds via inhalation. The EPCs for VOCs in trench air from groundwater were calculated using the Virginia Department of Environmental Quality's Virginia Unified Risk Assessment Model (VURAM) spreadsheets (VDEQ 2018). Consistent with USEPA's comments on the RI Report, the EPCs were calculated using the spreadsheet for groundwater greater than 15 feet deep (Table 3.7). The calculated EPCs for each COPC were input with no other modifications to the spreadsheet.

The calculated outputs are provided in Appendix T.

In addition, the ASTM methodology described in Section 7.5.1.1 was used to calculate a volatilization factor from subsurface soil to outdoor ambient air to calculate an EPC for Landfill trench air due to naphthalene. This calculation, along with the corresponding equations and inputs are provided in Appendix T.

7.5.1.3 Inhalation of Particulates

For the inhalation of particulates (as fugitive dusts), the standard USEPA equation was used to estimate an airborne exposure concentration (EC) for each soil COPC (equation provided in Table 7-4). For this equation, a site-specific particulate emission factor (PEF) was calculated using Equation 4-5 of the Soil Screening Guidance (USEPA 2002b). Values for Q/C_{wind} at both the Annex and Landfill were calculated using A, B, and C values for Philadelphia (Exhibit D-1) with site-specific land areas (16.5 acres for the Annex area and 47.5 acres for the Landfill area). A mean annual wind velocity of 4.29 m/s was used (9.6 mph as reported by NOAA). For this pathway to be considered complete, it was assumed that fugitive dusts would be of concern during periods of excavation and calculations were conservatively based on the removal of 100% of the vegetative cover. The PEF calculations are provided in Appendix T.

7.6 Estimated Daily Intake

For the oral and dermal pathways, the estimated human exposure, or intake, received through these exposure pathways is calculated as a Chronic Daily Intake (CDI), which is expressed in terms of mass of the COPC taken into the body per unit of body weight per unit of time (expressed in units of mg/kg/day). The CDI for each receptor and exposure pathway is a function of the EPC, contact rate (e.g., ingestion rate, inhalation rate, etc.), exposure frequency and duration, body weight, and time. Some of these variables are comparable for all situations and so standard values are used, while others are dependent on the characteristics of the Site and the potentially exposed populations.

For the inhalation pathway, the USEPA RAGS Part F (2009b) recommends calculating risks by using a ratio of a calculated exposure concentration (EC) to the inhalation toxicity factor (unit risk for carcinogens and reference concentrations for non-carcinogens). This approach no longer considers averaging time and body weight in the calculation as these factors are incorporated into the inhalation toxicity factors.

The parameters needed to calculate the CDI/EC for each receptor (including adults, children, and adolescents, as appropriate) and exposure route are summarized in the RAGS Part D Table 4 format for the exposure scenarios identified in Table 7-1. Consistent with USEPA guidance, the option to perform calculation under central tendency scenarios are developed when the RME risks are above the recommended levels of concern (1E-04 for cancer risks or a HQ greater than 1 for target organ specific risks). Exposure variables are taken from the USEPA guidance documents and, where appropriate, professional judgment based on known or anticipated Site conditions. The rationale/sources of the values presented are identified in Tables 7-4.1 through 7-4.18. Ancillary data and calculations (e.g., calculation of DA_{event} for dermal exposures to groundwater and seep water) are provided in Appendix T.

Consistent with the USEPA guidelines, the body weight of an adult is assumed to be 80 kg, while the weight of a child is estimated to be 15 kg. The averaging time for non-carcinogenic effects for all pathways is equal to the exposure duration in days. For carcinogenic effects, the excess lifetime cancer risk (ELCR) is calculated using an averaging time of 70 years (25,550 days).

7.6.1 Construction/Excavation Worker

Construction/excavation workers are assumed to be adults, exposed to impacted media for 8 hours/day, 250 days/year, for a construction activity period of one year without PPE. This is a conservative estimate of the amount of time it would take for conceivable construction projects at the Refuge, particularly for the parts of the construction project that would involve excavation activities.

For these workers, dermal contact to groundwater may occur during activities in which excavations have breached the groundwater (assumed to be about 50% of the exposure frequency). An incidental ingestion rate of 0.02 L/day is assumed for groundwater (VDEQ 2018). As construction/excavation would require boots and long pants, the dermal area potentially exposed is limited to hands, forearms, and face. This results in a Surface Area of 2,670 cm^2, based on the 95^{th} percentile surface area for each body part (USEPA 2011, Appendix T). Additionally, it is assumed that a construction/excavation worker may spend up to 30% of their time within the seep areas.

The skin surface area available for contact is the USEPA default skin surface area of 3,527 cm^2 and the USEPA default soil adherence factor (AF) of 0.3 mg/cm^2 (USEPA 2014). A soil ingestion rate of 330 mg/day is assumed for the RME exposure scenario (USEPA 2002d and 2014b).

For non-trench ambient air exposures, construction/excavation workers are assumed to be exposed to ambient air for a period of 8 hours/day for 250 days/year for the duration of the exposure period (1 year). For trench-related inhalation exposures, it was assumed that these workers would spend up to 30 days of the exposure period working in the trench.

Equations and inputs for the construction/excavation worker scenario are presented in Tables 7-4.1 (groundwater), 7-4.2 (soil), and 7-4.3 (seep water).

7.6.2 Maintenance/Refuge Worker

Maintenance/Refuge workers are assumed to be adults, exposed to impacted media for 8 hours/day, 225 days/year, for a career spanning 25 years (USEPA 2002d). This is a conservative estimate of the amount of time that one person is employed and spends outdoors (particularly in the northeastern United States) during their tenure. In addition, for the potential indoor air exposure in future Site buildings, an RME exposure frequency of 250 days per year was utilized (USEPA 2014).

The skin surface area available for contact is the USEPA default skin surface area of 3,527 cm^2 and soil AF of 0.12 mg/cm^2 (USEPA 2014b). A soil ingestion rate of 100 mg/day is assumed for the RME exposures (USEPA 2002d, USEPA 2014b).

For ambient air inhalation exposures, maintenance/Refuge workers are assumed to be present full-time at the site and thus are exposed to ambient air for a period of 8 hours/day for 225 days/year for the duration of the exposure period.

For indoor air inhalation exposures, maintenance/Refuge workers are assumed to be present full-time at the site and thus are exposed to indoor air for a period of 8 hours/day for 250 days/year for the duration of the exposure period.

For exposures to seep water, the dermal area potentially exposed is limited to hands, forearms, and face. This results in a Surface Area of 2,670 cm^2, based on the 95^{th} percentile surface area for each body part (USEPA 2011e, Appendix T). It is assumed that a maintenance/Refuge worker could spend about 30% of their time within the seep areas.

Equations and inputs for the maintenance/Refuge worker scenario are presented in Tables 7-4.4 (groundwater), 7-4.5 (soil), and 7-4.6 (seep water).

7.6.3 Adolescent Trespasser

Trespassers are assumed to be unaccompanied adolescents between the ages of 13 to 18 years with a total exposure duration of 5 years. These receptors are assumed to access the site at a frequency of 96 days/year for time period of 4 hours/day. This exposure frequency is based on professional judgment and assumes a trespasser would access the site three times a week during the warmer eight months of the year (mid-March to mid-November).

The skin surface area available for contact is assumed to be 2,443 cm^2 with a soil AF of 0.04 mg/cm^2 (USEPA 2011e). The AF value is the 95^{th} percentile value for outdoor sports (Table 7-4; USEPA, 2011e). This value is considered to be conservative as the heavily vegetated ground surface does not lend itself to sporting activities. A soil ingestion rate of 100 mg/day is assumed (USEPA 2014b).

For ambient air inhalation exposures, trespassers are assumed to be exposed to ambient air (both volatiles and fugitive dusts) for a period of 4 hours/day for 96 days/year for the duration of the exposure period (5 years).

For exposures to seep water, the dermal area potentially exposed is limited to ½ legs, hands, and feet. The value used is the 95th percentile for males and females from 13 to 18 years as reported in the Exposure Factors Handbook (USEPA 2011e). It is assumed that a trespasser could spend about 50% of their time within the seep areas.

Equations and inputs for the trespasser scenario are presented in Tables 7-4.7 (groundwater), 7-4.8 (soil), and 7-4.9 (seep water).

7.6.4 Refuge Visitor – Adult

Adult Refuge visitors are assumed to be adult residents of the local community for the portion of time residing near the Site as an adult (an exposure duration of 21 years). These receptors are assumed to access the site at a frequency of 96 days/year for time period of 4 hours/day. This exposure frequency is based on professional judgment and assumes a Refuge visitor would access the site three times a week during the warmer eight months of the year (mid-March to mid-November).

The skin surface area available for contact is assumed to be the USEPA default skin surface area of 6,032 cm^2 with a soil adherence factor of 0.07 mg/cm^2 (USEPA 2014b). A soil ingestion rate of 100 mg/day is assumed (USEPA 2014b).

For inhalation exposures, adult Refuge visitors are assumed to be exposed to ambient air for a period of 4 hours/day for 96 days/year for the duration of the exposure period (21 years).

For exposures to seep water, the dermal area potentially exposed is limited to lower legs, hands, and feet. The value used, 5,942 cm^2, is the 95th percentile for adult males and females as reported in the Exposure Factors Handbook (USEPA 2011e). It is assumed that a Refuge visitor could spend about 50% of their time within the seep areas.

Equations and inputs for the adult Refuge visitor scenario are presented in Tables 7-4.10 (groundwater), 7-4.11 (soil), and 7-4.12 (seep water).

7.6.5 Refuge Visitor – Child

Child Refuge visitors are assumed to be accompanied child residents of the local community from ages 1 to 6 years. These receptors are assumed to access the site at a frequency of 96 days/year for time period of 4 hours/day. This exposure frequency is based on professional judgment and assumes a child Refuge visitor would access the site for periods of time similar to the adult Refuge visitor, i.e., three times a week during the warmer eight months of the year (mid-March to mid-November).

The skin surface area available for contact for soil exposures is assumed to be 2,373 cm^2 with a soil AF of 0.2 mg/cm^2 (USEPA 2011e). A soil ingestion rate of 200 mg/day is assumed (USEPA 2014b).

For inhalation exposures, child Refuge visitors are assumed to be exposed to ambient air for a period of 4 hours/day for 96 days/year for the duration of the exposure period (6 years).

For exposures to seep water, the dermal area potentially exposed is limited to full legs, hands, and feet (3,042 cm^2). This value is the 95th percentile for males and females from 1 to 6 years as reported in the Exposure Factors Handbook (USEPA 2011e). It is assumed that a Refuge visitor could spend about 50% of their time within the seep areas.

Equations and inputs for the child Refuge visitor scenario are presented in Tables 7-4.13 (groundwater), 7-4.14 (soil), and 7-4.15 (seep water)

7.6.6 Refuge Visitor – Lifetime

Lifetime Refuge visitors are assumed to be accompanied child residents of the local community who continue to visit through adulthood, from ages 1 to 27 years. These receptors are assumed to access the site at a frequency of 96 days/year for time period of 4 hours/day. This exposure frequency is based on professional judgment and assumes a Refuge visitor would access the site three times a week during the warmer eight months of the year (mid-March to mid-November).

For soil ingestion, assuming the soil ingestion rates mentioned above, an age-adjusted soil ingestion rate of 8,920 mg/kg, as well as, a mutagenic age-adjusted soil ingestion rate of 33,080 mg/kg were utilized.

For dermal contact with soil, assuming the same dermal exposure factors mentioned above, an age-adjusted soil dermal factor of 25,828 mg/kg, as well as, a mutagenic age-adjusted soil dermal factor of 87,598 mg/kg were utilized.

For inhalation exposures, Refuge visitors are assumed to be exposed to ambient air for a period of 4 hours/day for 96 days/year for the duration of the exposure period (26 years).

For exposures to seep water, assuming the same dermal exposure factors mentioned above, an age-adjusted seep dermal factor of 123,541 cm^2-event/kg, as well as, a mutagenic age-adjusted seep dermal factor of 360,330 cm^2-event/kg were utilized.

Equations and inputs for the lifetime Refuge visitor scenario are presented in Tables 7-4.16 (groundwater), 7-4.17 (soil), and 7-4.18 (seep water)

7.6.7 Bioavailability

One of the assumptions in risk assessment, particularly for inorganics, is that 100% of the inorganic compounds in soil ingested by a receptor will be available for enteric absorption (bioavailability). The USEPA guidance (USEPA 1989b) includes discussion for the determination of relative bioavailability of a chemical, particularly in soil. Many factors, including those related to the soil content, solubility, and biological factors can affect the overall bioavailability of a compound. This can be of particular issue for arsenic, the toxicity values of which are based on human ingestion of arsenic-containing drinking water. The arsenic in the drinking water has been assumed to be 100% bioavailable in the development of the toxicity factors. However, recent studies on the ingestion of arsenic-containing soils in both *in vivo* and *in vitro* laboratory studies have demonstrated that the ingestion of arsenic in soils may have significantly less bioavailability. For example, recent studies by Roberts *et al*. (2002; 2007) using primate models demonstrated that generally less than 30% (10-25% in the 2002 study and 5-31% in the 2007 study) of arsenic in soils was absorbed upon ingestion of arsenic-containing soil. The Florida Department of Environmental Protection (FDEP) also used data from these studies and other studies to recommend a science-based policy decision to adopt a default bioavailability factor of 33% as a worst case risk assessment when the ingestion of arsenic-containing soils is possible. The USEPA Region 8 reported that for *in vivo* testing in swine of 29 different test materials containing arsenic, the relative bioavailability ranged from less than 10% to more than 60% (USEPA 2005a). For this BHHRA, a factor of 60% was applied for the ingestion of arsenic in soils pathway, which is in agreement with the methodology used to calculate USEPA RSLs for arsenic in soil (USEPA 2016b).

No other COPCs were adjusted for potential effects based on bioavailability.

7.7 Toxicological Assessment

7.7.1 Purpose

The purpose of the toxicity assessment is to weigh available evidence regarding the potential for COPCs to cause adverse health effects in an exposed population and, to the extent possible, to establish a relationship between the extent of exposure and the increased likelihood and/or severity of the adverse effects (USEPA 1989b). Relevant toxicological literature detailing the adverse effects in humans or laboratory animals resulting from chemical exposures under various dosing regimens is used to quantitatively evaluate the potential health risks associated with environmental exposures to chemicals. The USEPA has conducted such assessments on many frequently occurring environmental chemicals and has developed standardized toxicity values for use in risk assessment for these compounds. The USEPA calculates reference doses (RfDs) and reference concentrations (RfCs) for assessment of non-carcinogenic effects, and cancer slope factors (CSFs) and unit risk factors (URs) for effects from known, suspected, or possible human carcinogens. Many of these toxicity values are published in the USEPA's on-line database, the Integrated Risk Information System (IRIS), as well as other sources.

For noncarcinogens, the RfD (used for oral and dermal pathways) and RfC (used for inhalation pathway) are USEPA's estimates of the daily exposure rates that are unlikely to pose an appreciable risk of adverse health effects to humans over a lifetime exposure scenario. These toxicity values include uncertainty and modifying factors to address issues such as effects on sensitive subgroups of the population and interspecies differences (toxicity values are generally based on studies performed on laboratory animals). Derivation of a typical RfD generally includes a modifying factor of at least 100, which represents two 10-fold uncertainty factors to address interspecies variation and the sensitivity of subgroups. Because of the substantial safety factors that are incorporated into RfDs, an exposure in excess of the RfD does not necessarily indicate that adverse health effects will occur.

For the dermal pathway, the RfD for the oral route is typically used as a conservative surrogate toxicity value (few data are available for dermal specific pathways). The USEPA (2004) also recommends modifying the oral RfD for certain compounds to account for a low gastrointestinal absorption. RfDs were modified by the USEPA recommended factor (USEPA 2016b) for antimony, barium, beryllium, cadmium, chromium, mercury, manganese, nickel, and vanadium.

To evaluate the carcinogenic potential of a chemical, the USEPA uses a two-part analysis; the first step, called a Weight-of-Evidence assessment, is to determine the likelihood that the substance is a human carcinogen. The USEPA Cancer Guidelines (USEPA 2005b) emphasize the value of understanding the biological changes that the chemical can cause and how these changes might lead to the development of cancer. They also discuss methods to evaluate and use such information, including information about an agent's postulated *mode of action*, or the series of steps and processes that lead to cancer formation. Mode-of-action data, when available and of sufficient quality, may be useful in drawing conclusions about the potency of an agent, its potential effects at low doses, whether findings in animals are relevant to humans, and which populations or life stages may be particularly susceptible. In the absence of mode-of-action information, default options are available to allow the risk assessment to proceed.

The 2005 Guidelines recommend that an agent's human carcinogenic potential be described in a *weight-of-evidence narrative* rather than the previously identified letter categories (A = known; B= probable, C = possible, D = not classifiable, and E = non-human carcinogen). The narrative summarizes the full range of available evidence and describes any conditions associated with conclusions about an agent's hazard potential. For example, the narrative may explain that an agent appears to be carcinogenic by some routes of exposure but not others (e.g., by inhalation but not ingestion). Similarly, a hazard may be attributed to exposures during sensitive life stages of development but not at other times. The narrative also summarizes uncertainties and key default options that have been invoked.

The following are the five recommended standard hazard descriptors:

- Carcinogenic to humans;
- Likely to be carcinogenic to humans;
- Suggestive evidence of carcinogenic potential;
- Not classifiable as to its carcinogenic potential; and,
- Not likely to be carcinogenic to humans.

The USEPA communicates the carcinogenic weight of evidence of chemical through the IRIS chemical process. Through the IRIS process, chemicals are nominated, and all chemicals are evaluated consistent with the 2005 Guidelines and a narrative developed describing the Weight-of-Evidence. The IRIS chemical file is then reviewed through internal Agency consensus review and external peer-review. The requirements for in-depth analysis of "mode-of-action data" and the review process does not allow the equating of a chemical evaluated under the old system with the letter classification with the 2005 Classification narrative, rather a full analysis of the data is required.

Based on the above guidance, and for the purposes of this risk assessment, the following COPCs were considered and assessed as non-threshold carcinogens: arsenic, benzene, chromium, and vinyl chloride.

The second step of the USEPA two-step process for assessing potential carcinogenic risks is to quantify the relationship between the dose of a compound and the response it invokes (i.e., carcinogenic potency). This leads to the calculation of a CSF (for ingestion and dermal contact pathways) or UR (for inhalation pathways) for those compounds that are or may be human carcinogens. These factors represent the 95% upper confidence limit on the linear component of the slope of the dose-response curve in the low-dose (low-risk) portion of the curve.

7.7.2 Toxicity Values for Chemicals Evaluated in the Risk Assessment

Toxicity data were gathered from the USEPA's IRIS as the primary source. Where IRIS values were unavailable, the USEPA Regional Screening Levels (RSL) table (USEPA 2016b) was used as a secondary source. For compounds with multiple potential values, the value associated with the screening criteria used in the previous step of the BHHRA (e.g., chromium VI for chromium) was retained.

Toxicity values for both non-carcinogenic and carcinogenic effects, as well as target organs and the USEPA weight of evidence for carcinogens, are provided in Tables 7-5.1 through 7-6.2.

7.7.3 Mutagenic Compounds

Some of the carcinogenic compounds identified as COPCs for this HHRA are identified as mutagenic on the RSL table. These compounds include the carcinogenic chromium, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, trichloroethene, and vinyl chloride. For these compounds, an additional factor is applied to the toxicity factors to account for early-life exposure to these compounds. For vinyl chloride, a value of 2 was applied to the carcinogenic toxicity factors (Tables 7-6.1 and 7-6.2) for both child recreators and adolescent trespassers. This value is consistent with the early life toxicity factors provided in IRIS (USEPA 2010b) and follows the guidance provided for “Cancer Risk Calculations” for chemicals with chemical-specific data (USEPA 2009d).

For chromium and mutagenic PAHs, modifying factors based on age-specific mutagenic adjustment factors were calculated for the trespasser and child recreator exposure scenarios. For the trespasser, a mutagenic modifying factor of 2.2 was utilized based on the assumption that ages 13 through 16 (three years) would use an age-dependent adjustment factor (ADAF) of three, and ages 16 through 18 would use an ADAF of one, resulting in a weighted average of 2.2. For the child recreator, a mutagenic modifying factor of 4.4 was utilized based on the assumption that ages 1 through 2 (one year) would use an ADAF of 10, and ages 2 through 6 would use an ADAF of three, resulting in a weighted average of 4.4. For the lifetime exposure scenario, mutagenic adjusted exposure factors described above were utilized. The use of ADAFs is consistent with guidance provided for chemicals without chemical specific data (USEPA 2009d).

In addition, when characterizing risk from exposure to trichloroethene, both mutagenic adjustment factors (MAFs) and carcinogenic adjustment factors (CAFs) were utilized as described in the USEPA RSL Users Guide (USEPA 2016b). For adult only exposure (i.e., adult recreator, refuge worker, and construction worker) the daily intake of trichloroethene was multiplied by a CAF of 0.804 for oral exposure and 0.756 for inhalation exposure. For exposure scenarios with a youth or child components (i.e., trespasser, child recreator, and lifetime recreator), MAFs of 0.202 for oral exposure and 0.244 for inhalation exposure were utilized. In addition, for those exposure scenarios with a youth or child component, risk was calculated for both carcinogenic and mutagenic effects, and then summed to reflect the different target effects.

Finally, for exposure to vinyl chloride by a lifetime recreator, a unique calculation meant to capture risk from continuous lifetime exposure utilized, as documented in table 7-4.16.

7.8 Human Health Risk Characterization

In accordance with the USEPA guidance, estimated or potential cancer risks associated with different exposure routes are summed for a given receptor. The USEPA’s acceptable risk range is a cumulative excess lifetime cancer risk (ELCR) of between 1E-06 and 1E-04 (one in a million to one in ten thousand).

For the ingestion and dermal pathways, the ELCR is estimated by multiplying the CDI value by the chemical-specific CSF. For the inhalation pathway, the EC is multiplied by the chemical-specific UR.

Ingestion and Dermal Contact: $ELCR = CDI \times CSF$

Inhalation: $ELCR = EC \times UR$

Where,

CDI	=	Chemical Daily Intake (mg/kg-day)
CSF	=	Cancer Slope Factor, $(\text{mg/kg-day})^{-1}$
EC	=	Exposure Concentration ($\mu g/m^3$)
UR	=	Unit Risk Factor $(\mu g/m^3)^{-1}$

Potential non-cancer risks are estimated by calculating hazard quotients (HQ) for each chemical. An HQ is the CDI (EC value for inhalation) divided by the chemical-specific RfD (RfC for inhalation pathway). Potential non-cancer hazards from Site-related chemicals of less than 1 are considered acceptable. When receptors may be exposed to multiple COPCs, the chemical-specific HQs are added together to yield a hazard index (HI). In some cases, each chemical-specific HQ may not exceed unity (1) but the overall HI may do so. When this occurs, the chemicals are grouped together by the effects on specific target organs or organ systems to more appropriately assess potential non-cancer hazards (e.g., potential liver damage risks are considered separately from risks to the central nervous system).

Ingestion and Dermal Contact: $HQ = \frac{CDI}{RfD}$

Inhalation: $HQ = \frac{EC}{RfC}\mathrm{HQ} = \frac{\mathrm{EC}}{\mathrm{RfC}}$

Where,

CDI	=	Chemical Daily Intake (mg/kg-day)
RfD	=	Reference Dose, (mg/kg-day)
EC	=	Exposure Concentration (mg/m^3)
RfC	=	Reference Concentration (mg/m^3)

7.8.1 Quantitative Risk Estimates

The sum of ELCRs and HIs for each receptor are summarized in Table 7-9.

7.8.1.1 Construction/Excavation Worker

Tables 7-7.1 through 7-7.8 present the potential future risks to construction/excavation workers within both areas of the Site including both ELCR and HQs. The risks are summarized in Tables 7-8.1 and 7-8.2.

7.8.1.1.1 Annex

For the Annex, the total ELCR for a potential construction/excavation worker who also spends a portion of the exposure period working in a subsurface trench is 3.4E-06 for RME exposures, which is considered within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Groundwater – 1E-07
- Surface and Subsurface Soil – 3E-06
- Seep Water – 1E-07
- Trench Air – 9E-09

The highest contribution of risk (approximately 64%) is associated with the ingestion of arsenic and chromium in surface and subsurface soils.

The total estimated hazard index for a potential construction/excavation worker at the Annex is 1 under RME conditions, which is at the USEPA's acceptable threshold value of 1. The non-carcinogenic hazards for each media are as follows:

- Groundwater – 0.1
- Surface and Subsurface Soil – 1
- Seep Water – 0.01
- Trench Air – 0.0005

When non-cancer risks are summed for target organ and target system, no HI was greater than 1 (Table 7-8.1).

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.1.2 Landfill

For the Landfill, the total ELCR for a potential construction/excavation worker who also spends a portion of the exposure period working in a subsurface trench is 5E-06. The primary risk drivers/pathways are the ingestion of chromium and dioxins in surface and subsurface soils (approximately 46% of the total ELCR). The sum of all estimated RME cancer risks for the construction/excavation worker is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Groundwater – 1E-6
- Surface and Subsurface Soil – 3E-06
- Seep Water – 2E-07

- Trench Air – 4E-8

The total estimated hazard index for a potential construction/excavation worker at the Landfill is 2 under RME conditions, which is slightly above the USEPA's acceptable threshold value of 1. The non-carcinogenic hazards for each media are as follows:

- Groundwater – 0.2
- Surface and Subsurface Soil – 2
- Seep Water – 0.02
- Trench Air – 0.1

Non-cancer hazards are also driven primarily by the ingestion of dioxins, cobalt, copper, and iron in soils. When non-cancer risks are summed for target organ and target system, no HI was greater than 1 (Table 7-8.2).

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.2 Maintenance/Refuge Worker

Tables 7-7.9 through 7-7.15 present the potential risks to maintenance/Refuge workers within all areas of the Site including both ELCR and HQs. The risks are summarized in Tables 7-8.3, 7-8.4, and 7-8.5.

7.8.1.2.1 Annex

For the Annex, the total ELCR for a potential maintenance/Refuge worker is 3E-05. No COPCs had a potential individual RME ELCR greater than 1E-05. The sum of all estimated RME cancer risks for the maintenance/Refuge worker is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 2E-05
- Seep Water – 2E-06
- Ambient Air (from Groundwater) – 4E-10

The majority of the risk is associated with the ingestion of arsenic, chromium, and Aroclor 1248 in soils (approximately 69%).

The total estimated hazard index for a potential maintenance/Refuge worker at the Annex is 0.2 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.2.2 Landfill

For the Landfill, the total ELCR for a potential maintenance/Refuge worker is 3E-05. No COPCs had a potential individual RME ELCR greater than 1E-05. The sum of all estimated RME cancer risks for the maintenance/Refuge worker is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 2E-05
- Seep Water – 3E-06
- Ambient Air (from groundwater) – 1E-09

The majority of the risk is associated with the exposures to arsenic, chromium, benzo(a)pyrene and dioxins in soils (approximately 68%).

The total estimated hazard index for a potential maintenance/Refuge worker at the Landfill is 0.5 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.2.3 Potential Future Site/Refuge Offices

For the Refuge, the total ELCR for a potential maintenance/Refuge worker is 1E-05. Vinyl chloride had the highest contribution to cancer risks at 1E-05. The sum of all estimated RME cancer risks for the maintenance/Refuge worker is within the USEPA's acceptable risk range.

The total estimated hazard index for a potential maintenance/Refuge worker at the Landfill is 0.1 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks were within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.3 Adolescent Trespasser

Tables 7-7.16 through 7-7.21 present the estimated risks for potential adolescent trespassers within both areas of the Site including both ELCR and HQs. The risks are summarized in Tables 7-8.6 and 7-8.7.

7.8.1.3.1 Annex

For the Annex, the total ELCR for a potential adolescent trespasser is 3E-06. The sum of all estimated RME cancer risks for the adolescent trespasser is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 2E-06
- Seep Water – 8E-07
- Ambient Air (from Groundwater) – 4E-11

The majority of the risk is associated with ingestion of chromium in surface and subsurface soils (approximately 30%).

The total estimated hazard index for a potential adolescent trespasser at the Annex is 0.06 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.3.2 Landfill

For the Landfill, the total ELCR for a potential adolescent trespasser is 3E-06. No COPCs had a potential individual RME ELCR greater than 1E-06. The sum of all estimated RME cancer risks for the adolescent trespasser is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 3E-06
- Seep Water – 8E-07
- Ambient Air (from Groundwater) – 2E-10

The majority of the risk is associated with the ingestion of chromium in surface and subsurface soils (approximately 30%).

The total estimated hazard index for a potential adolescent trespasser at the Landfill is 0.1 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.4 Refuge Visitor – Adult

Tables 7-7.22 and 7-7.28 present the estimated potential future risks for adult Refuge visitors within all areas of the Site including both ELCRs and HQs. The risks are summarized in Tables 7-8.8, 7-8.9, and 7-8.10.

7.8.1.4.1 Annex

For the Annex, the total ELCR for a potential adult Refuge visitor is 7E-06. No COPCs had a potential individual RME ELCR greater than 1E-06. The sum of all estimated RME cancer risks for the adult Refuge visitor is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 5E-06
- Seep Water – 2E-06
- Ambient Air (from Groundwater) – 7E-11

The majority of the risk is associated with the ingestion of arsenic and chromium in surface and subsurface soils (approximately 20%) and dermal contact with chromium in seep water (approximately 20%).

The total estimated hazard index for a potential adult Refuge visitor at the Annex is 0.1 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.4.2 Landfill

For the Landfill, the total ELCR for a potential adult Refuge visitor is 9E-06. Three compounds (chromium, aldrin, and dioxins) had a potential RME greater than 1E-06. The sum of all estimated RME cancer risks for the adult Refuge visitor is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 5E-06
- Seep Water – 4E-06
- Ambient Air (from Groundwater) – 3E-10

The majority of the risk is associated with the ingestion of chromium and dioxins in surface and subsurface soils approximately 30%) and dermal contact with chromium and aldrin in seep water (approximately 37%).

The total estimated hazard index for a potential adult Refuge visitor at the Landfill is 0.3 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.4.3 Potential Future Site/Refuge Visitor's Center

For the Refuge, the total ELCR for a potential adult Refuge visitor is 2E-06, which is within the USEPA's acceptable risk range of 1.0E-06 to 1.0E-04.

The total estimated hazard index for a potential adult Refuge visitor at the Landfill is 0.02 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.5 Refuge Visitor – Child

Tables 7-7.29 and 7-7.35 present the estimated potential future risks for child Refuge visitors within all areas of the Site including both ELCRs and HQs. The risks are summarized in Tables 7-8.11, 7-8.12, and 7-8.13.

7.8.1.5.1 Annex

For the Annex, the total ELCR for a potential child Refuge visitor is 3E-05. Chromium is the sole COPC with a potential individual RME ELCR greater than 1E-05. The sum of all estimated RME cancer risks for the child Refuge visitor is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 2E-05
- Seep Water – 6E-06
- Ambient Air (from Groundwater) – 4E-11

The majority of the risk is associated with the ingestion of arsenic and chromium in surface and subsurface soils (approximately 62%) and dermal contact with chromium in seep water (approximately 20%).

The total estimated hazard index for a potential child Refuge visitor at the Annex is 0.5 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.5.2 Landfill

For the Landfill, the total ELCR for a potential child Refuge visitor is 4E-05. Chromium is the sole COPC with a potential individual RME ELCR greater than 1E-05. The sum of all estimated RME cancer risks for the child Refuge visitor is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 3E-05
- Seep Water – 6E-06
- Ambient Air – 1E-10

The majority of the risk is associated with the ingestion of chromium in surface and subsurface soils (approximately 50%) and dermal contact with chromium in seep water (approximately 12%).

The total estimated hazard index for a potential child Refuge visitor at the Landfill is 1 under RME conditions, equal to the USEPA's acceptable threshold value of 1. The non-carcinogenic hazards for each media are as follows:

- Surface and Subsurface Soil – 1
- Seep Water – 0.06
- Ambient Air – 0.00002

The majority of these hazards for this receptor (43%) are associated with ingestion of dioxin in soils (HQ = 0.5).

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks are within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.5.3 Potential Future Site/Refuge Visitor's Center

For the Refuge, the total ELCR for a potential child Refuge visitor is 6E-07, which is below the USEPA's acceptable risk range of 1.0E-06 to 1.0E-04.

The total estimated hazard index for a potential child Refuge visitor at the Annex is 0.02 under RME conditions, which is below USEPA's acceptable threshold value of 1.

As the organ-specific non-cancer risks are below USEPA's non-cancer risk threshold and cancer risks were within USEPA's target risk ranges for this receptor, no CTE risks were calculated.

7.8.1.6 Refuge Visitor – Lifetime

Tables 7-7.36 and 7-7.42 present the estimated potential future risks for lifetime Refuge visitors within all areas of the Site including both ELCRs and HQs. The risks are summarized in Tables 7-8.14, 7-8.15, and 7-8.16.

7.8.1.6.1 Annex

For the Annex, the total ELCR for a potential lifetime Refuge visitor is 7E-05. Chromium is the sole COPC with a potential individual RME ELCR greater than 1E-05. The sum of all estimated RME cancer risks for the lifetime Refuge visitor is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 6E-05
- Seep Water – 1E_05
- Ambient Air – 6E-10

The majority of the risk is associated with the ingestion of chromium in surface and subsurface soils (approximately 62%) and dermal contact with chromium in seep water (approximately 15%).

As the cancer risks for this receptor are within USEPA's target risk range, no CTE risks were calculated.

7.8.1.6.2 Landfill

For the Landfill, the total ELCR for a potential lifetime Refuge visitor is 1E-04. Chromium and benzo(a)pyrene are the only the COPCs with a potential individual RME ELCR greater than 1E-05. The sum of all estimated RME cancer risks for the lifetime Refuge visitor is within the USEPA's acceptable risk range. The carcinogenic risks for each media are as follows:

- Surface and Subsurface Soil – 1E-04
- Seep Water – 1E-05
- Ambient Air – 2E-08

The majority of the risk is associated with the ingestion of chromium and benzo(a)pyrene in surface and subsurface soils (approximately 70%).

As the cancer risks for this receptor are within USEPA's target risk range, no CTE risks were calculated.

7.8.1.6.3 Potential Future Site/Refuge Visitor's Center

For the Refuge, the total ELCR for a potential lifetime Refuge visitor is 2E-04. Vinyl chloride is the sole COPC associated with a risk greater than 1E-06. The sum of all estimated RME cancer risks for the lifetime

Refuge visitor exceeds the USEPA's acceptable risk range. All of the risk is associated with the potential inhalation of vinyl chloride in indoor air via vapor transport from groundwater (approximately 100%).

Although the potential risks for this receptor exceed USEPA's acceptable risk range, CTE risks were not calculated. This pathway is considered incomplete as no current occupied structure is present in the vicinity of groundwater with vinyl chloride. The potential for a future complete vapor intrusion pathway will be addressed as part of the Feasibility Study for Refuge groundwater.

7.8.2 Exposures to Lead

Consistent with the USEPA guidance, the evaluation of hazards associated with lead exposures is conducted separately from the deterministic risk assessment approach used for other COPCs. Models to calculate blood lead levels (PbBs) were used to assess potential hazards associated with lead exposures from soil. Exposures to lead in groundwater (construction/excavation worker only) and seep water (dermal contact only) are not considered in the current USEPA-provided models and are therefore addressed qualitatively.

Only lead in soil within the Landfill of the Site was evaluated as the lead concentrations within the Annex were below the screening value for residential exposures (400 mg/kg). The average concentration for the Landfill (364 mg/kg lead) was used as the EPC for modeling purposes as is consistent with USEPA guidance (USEPA 2003 and USEPA 2007c). The typical level of concern is a 5% probability of exceeding a blood lead level (PbB) in children and fetuses of 10 µg/dL (USEPA 2007a).

7.8.2.1 Adult Lead Model

For the adult and adolescent receptors at the Site, the adult lead model (ALM) as provided by the USEPA (2003a) was used. The ALM was developed in response to the need for a scientifically defensible approach for assessing human health hazards to lead in non-residential settings. The ALM was developed by the Technical Review Workgroup for Lead after a review of available models (USEPA 2001b). ALM spreadsheet model outputs are provided in Appendix T.

Each of the adult receptors (construction/excavation worker, maintenance/Refuge worker, adolescent trespasser, and adult Refuge visitor) was evaluated using the ALM and the arithmetic mean concentration for lead in soils as provided in Table 7.3-2. The adolescent trespasser and the adult Refuge visitor were evaluated as one group as the ALM does not allow for alteration of body weight and both receptors have similar soil ingestion rates (100 mg/day) and exposure frequencies (96 days/year). The effect of using the ALM on the adolescent trespasser is addressed in the Uncertainty Section (Section 7.9). For other inputs, the default parameters were left unchanged.

For the construction/excavation worker, the model was carried out using the same inputs as the deterministic risk calculations (soil ingestion of 330 mg/day and exposure frequency of 250 days/year). Predicted blood lead levels ranged from 1.8-2.3 µg/dL for adult workers and 4.4-7.2 µg/dL for fetuses of adult workers (95th percentile). The probability that fetal blood lead levels will exceed the 5 µg/dL threshold is between 3-12.3%.

For the maintenance/Refuge workers, the model was carried out using the same inputs as the deterministic risk calculations (soil ingestion of 100 mg/day and exposure frequency of 225 days/year). Predicted blood lead levels ranged from 1.2-1.7 µg/dL for adult workers and 2.9-5.3 µg/dL for fetuses of adult workers (95th percentile). The probability that fetal blood lead levels will exceed the 5 µg/dL threshold is between 0.5-5.8%.

For the adolescent trespasser and adult Refuge visitor, the model was carried out using the same inputs as the deterministic risk calculations (soil ingestion of 100 mg/day and exposure frequency of 96 days/year). Predicted blood lead levels ranged from 1.1-1.6 µg/dL for adolescent trespassers and adult Refuge visitors and 2.6-4.69 µg/dL for fetuses of these receptors (95th percentile), which are below USEPA's threshold level for blood lead (5 µg/dL).

7.8.2.2 IEUBK Model

For the child Refuge visitor, the Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children (version 1.1, build 11; USEPA 2010c) was used. The Advanced mode of the IEUBK model was used and site-specific information was utilized where appropriate. Default parameters were used where site-specific information is unavailable. The IEUBK model assumes a significant portion of lead exposure may occur from food, indoor dust, and tap water (4 µg/L) and these values were not adjusted.

Based on the IEUBK output (Appendix T), the modeled range of blood lead levels for a child Refuge visitor are all below USEPA's threshold level for blood lead of 5 µg/dL.

7.9 Uncertainty Assessment

A number of assumptions need to be made in any assessment of risk. The risk assessment process does not provide fully probabilistic estimates of risk, but conditional estimates that manage uncertainty by generally using conservative assumptions about exposure and toxicity. For the RME scenarios provided in the BHHRA, upper bound estimates of exposure and conservative site-specific judgments were used per USEPA guidance. These assumptions lead to uncertainties in the results of the assessment and it is important to fully specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in a proper perspective. According to USEPA (1989b), in environmental risk assessments, the uncertainty associated with numerical estimates of risk is typically large (at least an order of magnitude).

Therefore, it is important to identify those assumptions that contribute most significantly to the risk estimates. Most of the uncertainties identified in this BHHRA result in an overestimation of potential risk. There are five general categories of uncertainties that are introduced in the risk assessment process.

- Environmental sampling and laboratory measurement uncertainties
- Mathematical fate and transport modeling uncertainties
- Receptor exposure assessment uncertainties
- Toxicological assessment uncertainties
- Risk characterization uncertainties.

7.9.1 Environmental Sampling and Laboratory Measurement Uncertainties

Environmental sampling uncertainties are introduced by the field sampling program. The locations of samples collected, as well as the sampling methodology, can introduce errors or uncertainties in the estimation of exposure point concentrations. If the sampling program targets areas of high concentration, then the overall exposure of the population at the Site can be overestimated, while ignoring these areas will likely underestimate the exposure.

The number of samples can also introduce significant certainty in the risk assessment. For certain exposure points (Annex groundwater, Annex and Landfill seeps), a limited number of samples were collected. Due to the small data set, the maximum detected concentration was used as the EPC. A larger data set collected from these areas would allow for a more robust calculation of the 95% UCL for these exposure points and would likely result in less risk for receptors exposed to these areas. Additional rounds of monitoring data on-site may decrease the uncertainty associated with sampling.

7.9.2 Mathematical Fate and Transport Modeling Uncertainties

In order to assess the potential risks associated with inhalation of ambient air, trench air, and fugitive dust while engaged in activities at the Site, concentrations of COPCs in these media were estimated using fate and transport models (Section 6.1). Site-specific parameters used in these models were chosen to be conservative and likely result in an overestimate of risks. Specific assumptions are discussed further below.

7.9.2.1 Vapor Transport to Ambient Air Uncertainties

Due to the inherent uncertainty in evaluating the groundwater to ambient air pathway, a number of default assumptions were made. The receptor box model used to evaluate this pathway assumes a receptor is within a confined area of the Site located above a reasonable maximum estimation of the site-wide concentrations of VOCs in groundwater. In a real world scenario, it is unlikely that a receptor would remain in place at the Site given its acreage and use as a Refuge, particularly if walkways are constructed for recreational receptors to use while traversing the Site. The box model also assumes that conditions in the sub-surface are consistent throughout which is not accurate. The depth to groundwater at the Site ranges from 4 to 10 feet bgs, although the shallowest depth (4 feet) was used for the box model input to provide a level of conservatism. The sub-surface was also assumed to be ‘sandy gravel’ which is consistent with some observations at the Site but may not be consistent across all areas of the Site. These assumptions likely overestimate risks for this pathway.

7.9.2.2 Vapor Transport to Trench Air

There are few models available for evaluating vapor transport in ambient air in a trench with little to no field studies validating that the models are appropriate or realistic. The VDEQ trench model spreadsheet, part of the VURAM program (VDEQ 2018) was used at the request of USEPA and is considered a conservative screening tool used to assure that risks are not present, but is not used to realistically quantify human exposures from this pathway. Given the uncertainty of the model’s output, the risks from this pathway are uncertain and likely overestimated.

7.9.2.3 PEF Calculation

The inhalation of particulates was assumed to occur for those receptors present when excavation activities could occur and the removal of the vegetative cover could enhance fugitive dusts in ambient air. An overly conservative value of 100% removal of vegetative cover was used. As the foreseeable construction/excavation activities at the Site are limited to the construction of walkways or repair of an underground utility line, the realistic loss of vegetative cover would likely be far less than 50%.

7.9.3 Receptor Exposure Assessment Uncertainties

The screening of the data against generic screening values for typical residential exposures likely overestimates the number of COPCs that would likely contribute significantly to overall risks and hazards at the Site. In particular, the groundwater to ambient air pathway screening was conducted through comparison to the inhalation from tap water RSLs. The inhalation component of the RSL equation is for volatiles from tap water that accumulate in indoor air. The limiting effects of subsurface conditions and the likely significant diluting effects of vapors into ambient air across a site spanning many acres likely overestimates the number of COPCs that were evaluated in this BHHRA for this pathway.

In all risk assessments, a variety of assumptions must be made to estimate the potential human exposure to COPCs. The calculations of CDI involve parameters such as ingestion and inhalation rates, which are not necessarily constant values that apply to the entire population exposed to the contaminated area. In order to conservatively estimate potential risks, the USEPA recommends conducting the risk assessment using reasonable maximum exposure (95^{th} percentile) variables for most parameters. This approach is used to intentionally provide estimates of the maximum risk that is reasonably expected to occur at the Site. However, combining multiple parameters that are each applicable to the 95^{th} percentile level results in exposure estimates that reflect much higher percentiles (as high as the 99^{th} percentile). Exposures at this level are not reasonably expected to occur. Therefore, it is important to also consider more reasonable exposure variables when assessing risk, such as those represented by the CTE estimates. The individual uncertainties involved with each exposure pathway are discussed in further detail below.

Parameters common to multiple pathways, such as exposure duration and frequency, introduce uncertainty but are standard USEPA values and have a greater level of certainty than some of the pathway-specific parameters. For the recreational and trespassing receptors, there are no standard USEPA values. These assumptions were based on professional judgment and are considered to be much greater than would normally occur.

7.9.3.1 Soil Pathway

7.9.3.1.1 Ingestion Pathway

Soil ingestion rates are taken from the USEPA guidelines. These values are considered to be conservative estimates of daily intake rates and are intended to avoid underestimation of the soil ingestion risks. The USEPA guidance provides a soil ingestion rate for children (200 mg/day), which was used in the calculations. A number of studies have been conducted on the ingestion of soil by children that suggest lower ingestion rates may be appropriate. Clausing *et al*. (1987) estimated a mean of 56 mg/day in Dutch children ages 2 to 4. Davis and Mirick (2006) estimated values from 37 to 207 mg/day based on different tracer elements. Stanek and Calabrese (1995) reanalyzed data from several previous studies and concluded that childhood soil ingestion rates were 37 mg/day (50th percentile) to 156 mg/day (90th percentile). The USEPA's IEUBK model, which is intended to be conservative, uses ingestion rates that vary between 85 mg/day and 135 mg/day depending upon the age of the child. Using the average of the Clausing et al (1987) and the highest rate from the three other studies would have reduced the ingestion rate from 200 mg/day to 136 mg/day, a 32% reduction in soil ingestion.

7.9.3.1.2 Dermal Pathway

The dermal contact with soil pathway introduces a significant number of uncertainties as discussed in the RAGS Part E (USEPA 2004). The main uncertainties arise from the values used for skin surface area available for contact, the adherence factor of soil to skin, and the absorption fraction for chemicals.

The soil-to-skin adherence factors (AFs) include a number of assumptions that increase the uncertainty in the dermal pathway risk estimates. Variables such as the soil type, soil moisture content, specific activity, and exposure duration can have a significant impact on the adherence of soil particles to skin. For example, studies have shown that finer soil particles adhere to a greater extent than larger particles. In addition, wet soils adhere more readily than dry soils. The underlying assumptions regarding soil type, moisture content, and specific activity that were used to develop the USEPA's recommended AFs may either result in over or underestimations of the potential risk to receptors. In general, a mixture of central tendency and the

RME conditions were used (e.g. the central tendency adherence during a high-contact activity) by the USEPA to develop the default values in order to minimize the uncertainty. However, one of the assumptions is a contact time of 24 hours between the soil and the skin, which means that a receptor does not wash his or her hands and body for 24 hours after each and every exposure to the contaminated soil. This is highly unlikely and is therefore likely to significantly overestimate the risks from dermal exposure.

Dermal absorption factors (DAF) are difficult to estimate and are heavily dependent on the fate of chemicals (i.e., their chemical state in the environment) and on soil properties such as temperature, soil type, organic carbon content, and pH. The values used in this risk assessment may over or underestimate the potential dermal absorption of contaminants depending upon the Site-specific soil conditions.

7.9.3.1.3 Inhalation Pathway

The greatest source of uncertainty associated with the inhalation pathway is the estimation of the exposure concentration for both particulates and ambient air pathways. Both of these estimations assume that the concentrations of COPCs in ambient air will remain fairly constant, but varying wind speeds, activities, moisture content, and other factors may affect the actual concentration of particulates or volatiles in air.

7.9.3.2 Groundwater/Seep Water Pathway

The main source of uncertainty associated with the groundwater and seep water pathways is exposure time and intensity. Groundwater is not used at the Site and will not be used in the future; therefore, exposures to groundwater are incidental. Incidental ingestion and dermal contact to groundwater pathways do not have well studied and recommended values, such as ingestion rate and skin surface area. Professional judgment was used to describe this pathway and likely overestimate risks.

Seep water does not pool and are located along the shoreline which is difficult to access and the seep areas will be under water (and therefore not accessible) during extended periods of the tidal cycle. The assumption of 50% exposure duration to seeps therefore likely overstates risk. Only dermal contact to the lower extremities is included in the BHHRA. More or less intense exposures to seep water will over or underestimate the risks.

7.9.3.3 Ambient Air Pathway

The latest guidelines for inhalation risk assessment (USEPA 2009b) no longer recommend using inhalation rates to determine exposure and this type of uncertainty is already accounted for in the RfCs and URs. The calculation of the exposure concentration (EC) is normalized over the course of the exposure period and may over or underestimates the actual risks associated with this pathway.

7.9.3.4 Indoor Air Pathway

The use of the USEPA's VISL model may not represent actual Site conditions in terms of depth to groundwater, soil type, and building characteristics considering many of these factors are either unknown (soil type) or impossible to be known (building characteristics) as no occupied building currently exists or is currently planned to exist within the Refuge in the area proximal to the elevated VOC concentrations. In addition, the actual location of potential buildings, as well as, their usage would likely result in lower levels of exposure. This has the potential to significantly overestimate exposure to volatiles in indoor air via vapor transport from groundwater.

7.9.3.5 Receptor Specific Uncertainties

Each receptor included in the BHHRA was conservatively assumed to be at the Annex or Landfill at a high exposure frequency given the location and foreseeable use of the Site and at a duration that is typical of an upper bound estimate (e.g., total working lifetime). The assumptions that affect each receptor are described in more detail below.

7.9.3.6 Construction/Excavation Worker

A construction/excavation worker was assumed to be present at the Site for a period of one year at a frequency of 250 days/year. While a one year construction scenario is a conservative estimate for a typical construction scenario, the reasonably foreseeable construction and excavation work at the Site (a potential walkway through the Site and a utility corridor in the northern portion of the Annex) are likely to be of a far less duration than 1 year. For example, a recent excavation to access the utility line at the Annex lasted for approximately 30 days. The exposure duration and frequency for this receptor overestimate potential risks at the Site.

The calculation of the PEF for this receptor assumes that during a large construction project at the Site, up to 100% of the vegetation could be removed which would result in higher concentrations of airborne dust and exposures. In reality, the foreseeable construction and excavation work would be in limited portions of the Site with far less vegetative cover removed. The PEF based on the 100% removal of vegetation overestimates risks.

7.9.3.6.1 Refuge/Maintenance Worker

A refuge/maintenance worker was assumed to be present at the Site for the USEPA default working lifetime (25 years) in either the Annex of Landfill. It is unlikely that a refuge/maintenance worker would spend a significant portion of the working lifetime at the Site and would more likely spend some of the time in the Annex, some of the time in the Landfill, and a majority of time in other (large) parts of the Refuge. Risks to this receptor are therefore likely to be overestimated. Other factors that overestimate the risk for these receptors include; the calculation of the PEF and the portion of time spent within the intertidal seep areas.

7.9.3.6.2 Adolescent Trespasser/Refuge Visitors

Risks to the adolescent trespasser are likely overestimated with respect to the exposure frequency and the assumption that these receptors will have access to all portions of the Site. Other exposure parameters, such as soil adherence factors, are based on activities (e.g., soccer) that are not feasible at the Site. Actual risks from dermal contact with surface and subsurface soils will be much less.

7.9.4 Toxicological Assessment Uncertainties

Uncertainty and/or modifying factors are routinely applied to toxicity values to account for interspecies variation, protection of susceptible populations, and other differences between the toxicity study and the target use of the toxicity value. The uncertainty factors applied to the toxicity factors used in this BHHRA range from 1 (manganese) to 3000 (e.g., 4-chloroaniline). These uncertainties in the toxicological values can lead to over or underestimation of risk.

As part of the BHHRA, a single source of screening and toxicity data was used in the form of the USEPA RSL tables which are updated and maintained by Oak Ridge National Laboratory (ORNL). The USEPA RSL tables (2016b) are then used to derive applicable VISLs (USEPA 2016b; 2016c). The following compounds did not have toxicity values in IRIS or the RSL table.

- Carbazole
- delta-BHC
- 1,3-Dichlorobenzene
- Dimethyl phthalate
- Methyl Cyclohexane.

Of these, delta-BHC, 1,3-dichlorobenzene, dimethyl phthalate, and methyl cyclohexane were screened against the RSLs and VISLs for surrogate compounds of similar structure and chemical class (beta-BHC, 1,2-dichlorobenzene, diethyl phthalate, and cyclohexane, respectively). This has the potential to both over- and underestimate risk as a lack of adequate toxicity values for these compounds indicates uncertainty over potential toxicity effects. In addition, carbazole lacks any appropriate toxicity factors or surrogates, indicating that risk characterization could not be undertaken; as such there is a potential for the underestimation or risk from exposure to carbazole.

Some of the toxicity values only have data for one route of exposure (ingestion or inhalation) as there are no reliable data for the other exposure route. The route-to-route extrapolation of ingestion toxicity values for the inhalation pathway (and vice versa) is no longer standard risk assessment practice. The lack of data for toxicity values for both routes may underestimate risks for some of the COPCs.

It is also assumed that COPCs affect the body in the same way whether they are ingested or are absorbed through dermal contact. Many laboratory animal toxicity studies include oral administration of compounds only. The ingestion toxicity values are then used for both oral and dermal exposure scenarios, when, in fact, the effect of the COPC may vary depending upon how it is absorbed into the body. This assumption may lead to an over or underestimation of risk estimates for dermal pathways. Previous risk assessment practice included applying a modifying factor when extrapolating dermal exposures using oral toxicity factors to account for gastrointestinal absorption. However, recent USEPA guidance (2004) recommends using a factor of 1 for most chemicals when the data indicate a modifying factor between 1 and 0.5. This may overestimate risks from the dermal pathway from chemicals with a value less than 1, but greater than 0.5 (e.g., most organic compounds have a factor >50%).

7.9.5 Risk Characterization Uncertainties

In the risk characterization for the Site, it was assumed that the potential adverse effects of the various COPCs are independent of one another and that the effects are additive. However, it is possible that the combined effect of the various chemicals may be less than or greater than the sum of the individual effects (e.g., antagonistic and synergistic effects). Therefore, by assuming that the risks are additive, the actual potential risks may either be over or underestimated.

In addition, when multiple target organs were listed for a COPC in IRIS, it was assumed that the COPC affects each target organ equally. However, it is more realistic to anticipate that the COPC doses required to cause adverse effects on the various organs would vary. Because toxicity values are intentionally chosen to be conservative, the HIs shown in Table 8.1 and 8.2 for the target organs may overestimate the actual risk posed to some of those organs.

For chromium in soils, both the screening evaluation and the risk estimation assumed that the total detected chromium detected in each sample was hexavalent chromium. It is unlikely that more than a small amount of the actual chromium content in organic soils is present in the hexavalent state. This assumption overestimates the potential risks associated with exposures to chromium at the site.

7.9.5.1 Lead Models

To evaluate potential hazards associated with exposures to lead, models were used to estimate conservative blood lead levels for each receptor. Both of the models used (ALM, IEUBK) have default values that were used and are conservative models that may overestimate actual blood lead levels observed in exposed populations. Site-specific data was input into the models where available.

In summary, by following the USEPA's risk assessment process, both site-specific and general assumptions were made to quantify risks for each receptor in the BHRRA. These assumptions are a necessary part of the risk assessment process and collectively result in upper bound estimates of risks associated with exposures to contaminated media at the Site. Because these risk estimates are inherently conservative, their maximum utility is to readily identify exposures and pathways that are not significant (i.e., within the USEPA acceptable risk ranges).

7.9.6 Characterization of Background

Although a comparison to background was not conducted for the BHHRA, background data was collected by USEPA at two off-site locations. These data include detections of VOCs, SVOCs, pesticides, and inorganics. In both background locations, arsenic was detected above the risk-based standard. It is assumed that some of the risks calculated in the BHHRA, particularly for inorganics, have, in some part, a contribution from natural and anthropogenic background conditions. For example, for the maintenance/refuge worker at the Landfill, the chemicals with the highest contribution to the overall ELCR are the following compounds: arsenic, chromium, dioxins, and benzo(a)pyrene in soils (87% of the overall ELCR). The two background studies completed by USEPA identified all of these inorganics and benzo(a)pyrene in background soils (USEPA 2008a and 2008b). With the exception of arsenic, the concentrations at the Landfill are somewhat higher than the background dataset. However, it is concluded that a portion of the calculated ELCR for the maintenance/refuge worker at the Landfill is also due to natural concentrations of these constituents in area soils.

For the maintenance/refuge worker at the Annex, the chemicals with the highest contribution to the overall ELCR are arsenic, chromium, and Aroclor 1248 (84% of overall ELCR). The two background studies completed by USEPA identified both of these inorganics in background soils and found arsenic above the risk-based screening level (USEPA 2008a and 2008b). Similar to the Landfill dataset, concentrations at the Annex are somewhat higher than the background dataset, however, it is concluded that a portion of the calculated ELCR for the maintenance/refuge worker at the Landfill is also due to natural concentrations of these constituents in area soils.

7.10 Summary of BHHRA Findings

A BHHRA has been completed in accordance with the approved RI Work Plan, the approved BHHRA Interim Submittal (Golder 2008a), and relevant USEPA guidance. The BHHRA included the following tasks:

- Evaluation of potentially exposed populations (receptors) and possible exposure pathways under both current and hypothetical future land-use conditions;
- Screening of RI data against toxicity benchmark values to identify COPCs;
- Estimating exposure pathway-specific concentrations and human intake of COPCs based on conservative assumptions about exposure;
- Presenting a hazard evaluation for each selected chemical to derive toxicity values for cancer and non-cancer health effects; and,

- Estimating carcinogenic and non-carcinogenic risks for each COPC by each potential route of exposure.

A summary of cancer risks and non-cancer hazards based on RME scenarios, is shown on Table 7-9. These risk calculations indicate the following:

- The current RME cancer risks do not exceed USEPA's acceptable risk range with a maximum cancer risk of 1E-04 for the lifetime Refuge visitor at the Landfill/Annex;
- The future park visitor (lifetime) at a hypothetical occupied structure could exceed USEPA's acceptable risk range for the vapor intrusion pathway with a cancer risk of 1E-04. Currently, this receptor and pathway are incomplete as no occupied structures exist within the Site within footprint of VOC plume. However, these risks will be considered as part of the Feasibility Study.
- The RME non-cancer hazard indices for all receptors are at or below 1 except for the Construction/Excavation Worker at the Landfill with a HI of 2;
- When evaluated on a target-organ specific basis, no target organ-specific HI exceeds a value of 1, indicating that all target organ-specific hazards are below the USEPA acceptable threshold value of 1.
- When on-site data is compared to the USEPA background dataset, a contribution to the overall calculated ELCR and HI from risk-driving COPCs (e.g., chromium) for each receptor can be attributed to natural and/or anthropogenic background sources.

Based on the above results, it can be concluded that the risks to human health from exposure to COPCs at the Site under current scenarios are within the acceptable risk ranges used by USEPA in the decision making process. In addition, the uncertainty analysis showed that potential calculated risks associated with exposures to Site COPCs are likely to be overly conservative.

8.0 SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT

This screening level ecological risk assessment (SLERA) has been prepared in accordance with the RI/FS Work Plan (Golder 2006a), the approved Interim Submittal for the SLERA (Golder 2008b), and USEPA's *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (ERAGS) (USEPA 1997a).

The SLERA assesses qualitatively and quantitatively (where appropriate) the potential environmental risks associated with the Site if no action is taken. Pursuant to the USEPA's guidance, conservative assumptions were used in this SLERA to assess which contaminants and exposure pathways present at the Site may present ecological risks and therefore warrant additional evaluation.

This SLERA presents the following screening of Site-related ecological risks:

- Problem Formulation — a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants, and selection of endpoints for further study.
- Exposure Assessment — a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors, and estimation of conservative exposure point concentrations.
- Ecological Effects Assessment — a review of available data linking contaminant concentrations to effects on ecological receptors.
- Risk Characterization — an estimation of potential risks to ecological receptors.

8.1 Problem Formulation

The Site is located in a highly industrialized and heavily developed portion of southeastern Pennsylvania, at the lower end of the Darby-Cobbs Creek Watershed and within the 1,200-acre John Heinz National Refuge (Figure 1-2). The Site and surrounding land use in the vicinity of the Site are described in detail in Sections 2.1 and 2.2 of this report, respectively. The Landfill is approximately 47.5 acres and is bordered by Darby Creek/Thoroughfare Creek to the east and southeast, Hermesprota Creek to the west, a tidal marsh to the southwest, and the Delaware County EMTC and an Action Concrete facility to the north. The Annex, which is separated from the Landfill by Hermesprota Creek, is approximately 16.5 acres and is bordered by Hermesprota Creek to the east and northeast, a business park to the north and northwest, an unnamed tributary to the west and southwest, and a tidal marsh to the south.

The Darby-Cobbs Creek Watershed is a complex urban watershed that drains 77 square miles in 3 suburban counties as well as parts of the City of Philadelphia (see Figure 2-3). The watershed has a population of approximately 500,000 residents and numerous permitted and unpermitted dischargers to surface water. At the downstream extremity of the Darby-Cobbs Creek Watershed, where the Site is located, the stream gradients flatten sharply, the watershed is tidal, and the tidal marshes south of the Site are a natural sediment deposition area.

Current ecological conditions at the Site were assessed through multiple on-Site inspections during various seasons, contact with regulatory agencies to assess the potential presence of Federal or State threatened or endangered species in the vicinity of the Site, and review of documents provided by the FWS related to the habitat and wildlife at the Site.

8.1.1 Habitats and Vegetative Community

The Site consists of three distinct vegetative communities: open field, shrub/scrub, and deciduous wooded areas. The deciduous wooded areas cover approximately 47% of the total Landfill/Annex surface and consist primarily of medium sized (6 to 12 inch diameter at breast height) native box elder (*Acer negundo*), invasive white mulberry (*Morus alba*) species and invasive tree-of-heaven (*Ailanthus altissima*). Shrub/scrub communities occupy approximately 13% to 15% of the surface on both the Landfill and Annex. The dominant shrub/scrub species found at the Landfill are the invasive mugwort (*Artemisia vulgaris*), and invasive white Amur honeysuckle (*Lonicera maackii*); non-native annual wormwood *(Artemisia annua)*, and invasive mile-a-minute vine (*Polygonum perfoliatum*) dominate the Annex shrub/scrub communities.

The remaining areas of the Landfill and Annex topography consist primarily of open fields containing a diverse population of grasses and forbs including, but not limited to, invasive Japanese brome (*Bromus japonicas*), non-native tall fescue (*Festuca elatior*), native white snakeroot (*Eupatorium rugosum*) and native late flowering throughwort (*Eupatorium serotinum*).

8.1.2 Biota and Threatened/Endangered Species

Over 300 species of birds have been recorded in and around the Refuge (FWS, 2007), and the Landfill and Annex provide habitat that would be attractive to most species at least part of the time. The Landfill and Annex also provide habitat for wildlife species. In common with other areas of the Refuge (FWS, 2007), deer (*Odocoileus virginianus*), opossum (*Didelphis virginiana*), fox (*Vulpes vulpes)*, raccoon (*Procyon lotor*), muskrat (*Ondatra zibethicus*), and other small mammals are expected to utilize the Landfill and Annex.

No federally listed threatened or endangered species were noted during site visits as part of the RI, and the FWS has indicated that no federally listed threatened or endangered species are known to occur at the Landfill or Annex. A pair of bald eagles began nesting at the Refuge in 2009 within approximately 1,600 feet of the Landfill. Although no longer listed federally as endangered, bald eagles are still protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

According to the FWS's "Comments on the Revised RI/FS Work Plan for Folcroft Landfill", dated December 1, 2003 (FWS, 2003), other bird species given national and regional priority by the FWS that inhabit the Refuge include wood duck (*Aix sponsa*), American woodcock (*Scolopax minor*), snowy egret (*Egretta thula*), great egret (*Ardea alba*), and black-crowned night heron (*Nycticorax nycticorax*).

Pennsylvania state-listed species utilizing the Refuge include the following: red-bellied turtle (*Pseudemys rubriventris*) – threatened; coastal plain leopard frog *(Rana sphenocephala)* – endangered; osprey *(Pandion haliaetus)* – threatened; short-eared owl *(Asio flammeus)* – endangered; American bittern *(Botaurus lentiginosus)* – endangered; least bittern *(Ixobrychus exilis)* – endangered; great egret (*Ardea alba*) – endangered, and king rail *(Rallus elegans)* - endangered (FWS, 2003). State-listed endangered plant species existing on the Refuge, although not noted at the Landfill or Annex, are the hirsute sedge *(Carex Caroliniana)*, velvety panic grass (*Dichanthelium scoparium*), forked rush (*Juncus dichotomus*), willow oak (*Quercus phellos*),and Walter's barnyard grass (*Echinochloa walteri)*.

8.1.2.1 Pennsylvania Natural Diversity Inventory Review

A Pennsylvania Natural Diversity Inventory (PNDI) on-line database review was conducted to determine whether there could be potential impacts to species of special concern at the Landfill and Annex. The review identified 11 potential impacts under the jurisdiction of the FWS, Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, or Pennsylvania Fish and Boat Commission. As a follow-up, Golder submitted letters to these agencies requesting additional information regarding the potential impacts. The agencies' responses are listed below and provided in Appendix U:

- The FWS concluded that there was "no effect" on listed species or their critical habitat at the Site. Except for occasional transient species, no federally listed threatened or endangered species under FWS jurisdiction are known to occur within the "project area".
- The Pennsylvania Game Commission indicated that black-crowned night heron (*Nycticorax nycticorax)*, least bittern (*Ixobrychus exilis*), and (*Tyto alba*) were species of special concern potentially present in the area. In addition, other special concern species of birds known to inhabit the areas in and around the Refuge include, but are not limited to, the great egret, yellow-crowned night heron (*Nyctanassa violacea*), osprey *(Pandion haliaetus)*, bald eagle *(Haliaeetus leucocephalus)*, marsh wren *(Cistothorus palustris)*, king rail *(Rallus elegans)*, American bittern *(Botaurus lentiginosus)*, and northern harrier *(Circus cyaneus)*.
- The Pennsylvania Department of Conservation and Natural Resources indicated potential impacts to species and/or resources of special concern, including waterhemp ragweed *(Amaranthus cannabinus)*, Walter's barnyard grass (*Echinochloa walteri)*, southern red oak *(Quercus falca)*, willow oak *(Quercus phellos)*, river bulrush *(Scirpus fluviatilis)*, and Indian wild rice (*Zizania aquatic)*. In addition, the freshwater intertidal marsh was identified as a community of special concern.
- The Pennsylvania Fish and Boat Commission indicated the following rare or protected species are known to be in the vicinity: red-bellied turtle (*Pseudemys rubriventris*), coastal plain leopard frog *(Rana sphenocephala)*, three-spine stickleback *(Gasterosteus aculeatus)*, and eastern mud minnow *(Umbra pygmaea)*.

It should be noted that except for the FWS, the agencies' responses referred to areas in the vicinity of the project site (e.g., Refuge) and were not specific to the Landfill or Annex, as agencies do not provide specific locations of listed species as a measure of protection against harm or collection.

8.1.2.2 Wildlife Observations

During multiple site visits by Golder conducted during different seasons, white-tailed deer *(Odocoileus virginianus)* were observed on the Landfill and Annex, and red fox *(Vulpes vulpes)* burrows were observed on the Landfill. Deer and carnivore (probably raccoon or skunk) tracks in mud flats and mummichog *(Fundulus heteroclitus)* in water were observed in Hermesprota Creek. Numerous songbirds were observed overhead and perching in the vegetation at the Landfill and Annex.

The FWS (1988) noted ring-necked pheasant (*Phasianus colchicus*), red-tailed hawk (*Buteo jamaicensis*), marsh hawk (*Circus cyaneus*), kestrel (*Falco sparverius*), catbird (*Dumetella carolinensis*), robin (*Turdus migratorius*), mockingbird (*Mimus polyglottos*), song sparrow (*Melospiza melodia*), tree swallow (*Spizella arborea*), cardinal (*Cardinalis cardinalis*), northern oriole (*Icterus galbula*), downy woodpecker (*Picoides pubescens*), and house wren (*Troglodytes aedon*) at the Site.

It should be noted that none of these species are unique to the Site.

8.1.3 Conceptual Site Model

In accordance with the USEPA approved RI/FS Work Plan (Golder 2006a) and subsequent comments on the SLERA Interim Submittal (Golder 2010a), the updated CSM (Figure 7-1) addresses terrestrial receptors potentially exposed to surface soils, as well as intertidal seep water. The primary pathways of exposure to site-related contaminants for terrestrial receptors include the following:

- Direct contact with contaminated environmental media in the form of surface soil and seep water;
- Dietary ingestion of contaminated prey items; and,
- Direct or incidental ingestion of contaminated abiotic media, (i.e. soil, seep water) during feeding.

The first exposure route considers a direct absorption route where the primary producers and lower trophic level consumers come into contact with contaminants in environmental media. The second mechanism, ingestion of prey items, applies to higher trophic levels, and accounts for an indirect mechanism of exposure to contaminants, especially those that bioconcentrate or biomagnify within food webs. This pathway considers the direct accumulation and concentration of contaminants within plant or animal tissues, and the subsequent ingestion of these organisms by higher trophic levels.

The last mechanism involves the incidental ingestion of soils containing contaminants during other behavioral activities such as grooming (i.e., ingestion of dust or soil particles during cleaning behavior) and feeding (i.e., ingestion of dust or soil particles during ingestion of food). This pathway is typically considered in higher trophic level receptors, and represents a small fraction of the dietary ingestion rate for these receptors.

Other mechanisms of exposure include inhalation of volatile chemicals or dust particles with absorbed contaminants and dermal absorption of contaminants across skin membranes. Since most species inhabit open environments and given the rapid dilution of volatile compounds in ambient air, this pathway is typically not considered significant for ecological receptors. The dermal absorption route is also not typically considered a significant pathway since higher trophic level receptors (i.e., birds, mammals, and reptiles) are covered in hair, feathers, or scales. The only exceptions are the amphibians (i.e., frogs, toads, and salamanders), which have permeable skin that lacks a barrier such as scales, hair, or feathers to offset this exposure route.

The following Assessment and Measurement Endpoints are utilized in this screening level ecological risk assessment:

Ecological Receptor	Assessment Endpoints	Measurement Endpoints
Invertebrates	Protection of **terrestrial (soil) invertebrates** from the toxic effects (on survival and growth) of site-related chemicals present in soil	Comparison of maximum soil concentrations with terrestrial invertebrate-based screening (benchmark) values
Vegetation	Protection of terrestrial **vegetation** from the toxic effects (on survival and growth) of site-related chemicals present in soil	Comparison of maximum soil concentrations with terrestrial plant-based screening (benchmark) values
Mammals	Protection of **herbivorous, insectivorous, omnivorous, and carnivorous terrestrial mammals** to ensure that ingestion of contaminants in soil and seep water and through diet does not have negative impacts on growth, survival, and reproduction	Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by ecotoxicity values that are associated with a no observed adverse effect level (NOAEL) and a lowest observed adverse effect level (LOAEL)
Birds	Protection of **herbivorous, insectivorous, omnivorous, and carnivorous terrestrial birds** to ensure that ingestion of contaminants in soil and seep water and through diet does not have negative impacts on growth, survival, and reproduction	Dietary HQs are calculated for individual chemicals by dividing an estimated level of exposure by ecotoxicity values that are associated with a no observed adverse effect level (NOAEL) and a lowest observed adverse effect level (LOAEL)

Following the screening level calculations, a determination will be made whether sufficient information is available to make a risk management decision. At this Scientific/Management Decision Endpoint (SMDP), there are three possible decisions:

- "There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk;
- The information is not adequate to make a decision at this point, and the ecological risk assessment process will continue to Step 3; or
- The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted (USEPA 1997a)."

If the screening level calculations support the first decision, then the ecological risk assessment process is complete. For assessments that continue, the screening-level analysis can be used to eliminate certain contaminants and exposure pathways from further consideration because they do not pose a substantive risk.

8.1.4 Selection of Contaminants of Potential Ecological Concern

Selection of chemicals of potential ecological concern (COPECs) is performed to narrow the focus of the SLERA. The selection process serves to include all compounds unless they can be shown to have no potential for contributing to risk under conservative scenarios. The selection process used was based on the methodology presented in ERAGS and the guidance provided in USEPA's *Ecological Assessment of Superfund Sites: An Overview*, ECO Update Intermittent Bulletin, Volume 1, Number 2, December 1991 (USEPA 1991d). The selection process involved the following steps:

- Maximum detected chemical concentrations in soil and seep water were compared to screening values that have been established to protect biota. Chemicals for which the maximum detected field concentration exceeds screening values were retained as COPECs. Detected chemicals for which screening values have not been established were, by default, retained as COPECs and evaluated qualitatively in the Uncertainty Assessment (Section 8.6) if toxicity data were not available. Chemicals that were not detected, but have established screening values, were compared to the screening values at one-half the detection limit. A summary of the COPECs retained for additional evaluation because the maximum detected concentrations were above screening values is shown in Table 8-1 below.
- Detections in groundwater were also evaluated at the specific request of the USEPA Region III and compared to USEPA Region III freshwater screening criteria (USEPA 2006). However, no further food chain evaluation has been conducted due to the lack of complete exposure pathways relevant to the receptors to be addressed in this SLERA.
- Any compound with a detection frequency of less than 5% was eliminated from further consideration as a COPEC, although the data was reviewed so as not to exclude possible localized "hot-spots". However, based on the final SLERA evaluation, no COPECs were eliminated based on low frequency of detection.

- Detected compounds eliminated from consideration as COPECs based on the criteria above were assessed as to their bioaccumulation potential (see discussion below). Detected chemicals that possess the ability to bioaccumulate were retained as COPECs, irrespective of concentration or frequency of detection.
- Calcium, magnesium, potassium, and sodium were removed from further consideration as COPECs because they are ubiquitous, occur naturally in high concentrations, and are essential nutrients.
- Consistent with USEPA guidance, constituents that may be naturally elevated in background were retained if they exceeded screening values.

Table 8-1 Summary of COPECs Retained Via Comparison of Maximum Concentrations to Ecological Screening Values

Analyte	Soil		Seeps		Groundwater		
	Landfill	Annex	Landfill	Annex	Landfill	Annex	Refuge
Inorganics							
Aluminum	Y	Y	Y	Y	Y	N	NA
Antimony	Y	Y	N	N	N	N	NA
Arsenic	Y	Y	Y	Y	Y	Y	NA
Barium	Y	Y	Y	Y	Y	Y	NA
Beryllium	Y	N	Y	Y	N	N	NA
Cadmium	Y	Y	Y	Y	Y	Y	NA
Chromium	Y	Y	N	N	N	Y	NA
Cobalt	Y	Y	N	Y	Y	N	NA
Copper	Y	Y	Y	Y	Y	N	NA
Iron	Y	Y	Y	Y	Y	Y	NA
Lead	Y	Y	Y	Y	Y	N	NA
Manganese	Y	Y	Y	Y	Y	Y	NA
Mercury	Y	Y	Y	Y	Y	Y	NA
Nickel	Y	Y	Y	N	Y	N	NA
Selenium	Y	Y	Y	Y	Y	Y	NA
Silver	Y	Y	Y	N	N	Y	NA
Thallium	Y	Y	Y	Y	Y	Y	NA
Vanadium	Y	Y	Y	Y	Y	N	NA
Zinc	Y	Y	Y	Y	N	N	NA
Ammonia	NA	NA	NA	NA	Y	Y	Y
VOCs							
1,1-Dichloroethene	N	N	N	N	Y	N	N
1,2-Dichlorobenzene	N	N	N	N	Y	Y	N
1,3-Dichlorobenzene	N	N	N	N	Y	Y	Y
1,4-Dichlorobenzene	N	N	N	N	Y	Y	Y
Acetone	Y	Y	N	N	N	N	N

Analyte	Soil		Seeps		Groundwater		
	Landfill	Annex	Landfill	Annex	Landfill	Annex	Refuge
Carbon Disulfide	N	N	N	N	Y	N	Y
Chlorobenzene	N	N	N	N	Y	Y	N
Isopropyl benzene	N	N	N	N	Y	N	N
Toluene	N	N	N	N	Y	Y	N
Trichloroethene	N	N	N	N	Y	N	N
Xylenes, Total	N	N	N	N	Y	N	NA
SVOCs							
2-Methylnaphthalene	Y	N	N	N	Y	Y	N
4-Bromophenyl-Phenylether	N	N	Y	N	N	N	N
4-Chlorophenyl-Phenylether	N	N	N	N	Y	N	Y
Acenaphthene	Y	N	Y	N	Y	Y	N
Acenaphthylene	Y	N	N	N	Y	N	Y
Acetophenone	Y	N	N	N	N	N	N
Anthracene	Y	Y	Y	N	Y	Y	Y
Atrazine	N	N	Y	Y	N	N	N
Benzo(a)Anthracene	Y	Y	Y	N	Y	Y	Y
Benzo(a)Pyrene	Y	Y	Y	N	Y	Y	Y
Benzo(b)Fluoranthene	Y	Y	N	N	N	N	N
Benzo(g,h,i)Perylene	Y	Y	N	N	N	N	N
Benzo(k)Fluoranthene	Y	Y	N	N	N	N	N
Biphenyl	Y	N	N	N	Y	N	N
Bis(2-Ethylhexyl) Phthalate	Y	Y	N	N	N	N	N
Butylbenzyl Phthalate	Y	Y	N	N	N	N	N
Carbazole	Y	Y	N	N	N	N	N
Chrysene	Y	Y	N	N	N	N	N
Dibenzo(a,h)Anthracene	Y	Y	N	N	N	N	N
DibenzoFuran	Y	N	N	N	Y	Y	N
Dimethyl Phthalate	Y	N	N	N	N	N	N
Di-N-Octyl Phthalate	Y	Y	N	N	N	N	N
Fluoranthene	Y	Y	Y	N	Y	Y	Y
Fluorene	Y	N	N	N	Y	Y	N
Hexachlorobenzene	N	N	Y	N	Y	Y	Y
Hexachlorobutadiene	N	N	Y	N	N	N	N
Hexachlorocyclopentadiene	Y	Y	N	N	N	N	N
Indeno(1,2,3-cd)Pyrene	Y	Y	N	N	N	N	N
Naphthalene	Y	N	Y	Y	Y	Y	N
N-Nitrosodiphenylamine	Y	Y	N	N	N	N	N

Analyte	Soil		Seeps		Groundwater		
	Landfill	Annex	Landfill	Annex	Landfill	Annex	Refuge
Pentachlorophenol	N	N	Y	N	N	N	N
Phenanthrene	Y	Y	Y	N	Y	Y	N
Phenol	Y	Y	N	N	Y	Y	N
Pyrene	Y	Y	Y	N	Y	Y	Y
PCBs							
Aroclor 1016	N	N	N	N	Y	Y	NA
Aroclor 1221	N	N	N	N	Y	Y	NA
Aroclor 1232	N	N	N	N	Y	Y	NA
Aroclor 1242	N	N	N	N	Y	Y	NA
Aroclor 1248	N	Y	N	N	Y	Y	NA
Aroclor 1254	N	Y	N	N	Y	Y	NA
Aroclor 1260	N	Y	N	N	Y	Y	NA
Pesticides							
4,4'-DDD	Y	Y	Y	Y	N	N	NA
4,4'-DDE	Y	Y	Y	Y	N	N	NA
4,4'-DDT	Y	Y	Y	Y	Y	Y	NA
Alpha-Chlordane	N	N	Y	N	Y	Y	NA
gamma-Chlordane	N	N	Y	Y	Y	Y	NA
Toxaphene	N	N	Y	N	Y	Y	NA
Aldrin	Y	Y	Y	N	N	Y	NA
Alpha-BHC	Y	Y	N	N	N	N	NA
Alpha-Endosulfan	Y	Y	N	N	N	N	NA
Beta-BHC	Y	Y	N	N	N	N	NA
Beta-Endosulfan	Y	Y	N	N	N	N	NA
Delta-BHC	Y	N	N	N	N	N	NA
Dieldrin	Y	Y	Y	N	N	N	NA
Endosulfan Sulfate	Y	Y	N	N	N	N	NA
Endrin	Y	Y	N	N	N	Y	NA
Endrin Aldehyde	Y	Y	N	N	N	N	NA
Endrin Ketone	Y	Y	N	N	N	N	NA
Gamma-BHC	Y	Y	N	N	Y	Y	NA
Heptachlor	Y	Y	Y	N	Y	Y	NA
Heptachlor Epoxide	Y	Y	Y	N	Y	Y	NA
Methoxychlor	Y	Y	Y	N	Y	Y	NA
Dioxins/Furans							
2,3,7,8-TCDD equivalents	Y	Y	Y	Y	N	Y	NA

Notes:
Y – Yes N – No NA – Not Analyzed

8.1.4.1 Selection of Screening Values

Three sources were used to compile a list of ecological toxicity screening values for contaminants in soil:

- The USEPA (2005) Ecological Soil Screening Levels (Eco-SSLs) based on the lowest Eco-SSL of those listed for plants, soil invertebrates, birds or mammals;
- The USEPA (1995) Region III BTAG Screening Levels; and
- Efroymson *et al*. (1997a) Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants, Soil and Litter Invertebrates, and Heterotrophic Process.

Ecological toxicity screening values for contaminants in seep water were based on the USEPA Region III BTAG Freshwater Screening Benchmarks (USEPA 2007b)[24].

The benchmark values, along with a summary of analytical results and COPEC selection are presented in Table 8-2.1 and 8-3.1 for the Landfill, and Tables 8-2.2 and 8-3.2 for the Annex. Consistent with USEPA guidance, maximum detected concentrations were screened against these values to develop a list of appropriate COPECs as described above. Groundwater screening comparisons are shown in Tables 8-4.1, 8-4.2, and 8-.43.

8.1.4.2 Bioaccumulation Potential

The potential for a detected chemical to bioaccumulate within organisms and biomagnify through the food chain was examined in order to further refine the selection of COPECs. As defined by the USEPA, bioaccumulation is "the accumulation of pollutants in living organisms by direct adsorption or through food chains," and "accumulation by an organism of materials that are not an essential component or nutrient of that organism" (USEPA 2006c). For the purpose of this SLERA, compounds were identified as bioaccumulative in either media based on the compounds listed in Table 4-2 of USEPA (2000a). For the SLERA, all detected compounds identified as bioaccumulative were carried forward as COPECs. The COPECs determined to be bioaccumulative are identified in Tables 8-2.1 and 8-2.2 for soils and Tables 8-3.1 and 8-3.2 for seep water.

8.1.5 Receptor Species

Since it is not feasible to evaluate every species that may be impacted, indicator species were selected to focus the SLERA and allow for characterization of Site risk. Receptor selection is guided by the results of

[24] The only constituent in seep water lacking an applicable Region III screening criteria was 4,4'-DDT. However, as 4,4'-DDT is potentially bioaccumulative, it was carried through the SLERA.

the Site habitat characterization, resident species information, and to address various trophic levels (to assess food chain impact and potential concern for bioaccumulation).

Species chosen as receptors are representative of those that have been observed or are expected to occur with some frequency on the Site. Receptor species were selected for this SLERA in consultation with the USEPA and are tabulated below.

Target Receptor	Exposures
Terrestrial vegetation	Direct soil exposure.
Terrestrial invertebrates	Direct soil exposure.
Herbivorous mammal (Meadow Vole)	Ingestion of food items and incidental ingestion of soil and seep water.
Omnivorous mammal (Deer Mouse)	Ingestion of food items and incidental ingestion of soil and seep water.
Insectivorous mammal (Short-tailed Shrew)	Ingestion of food items and incidental ingestion of soil and seep water.
Carnivorous mammal (Red Fox)	Ingestion of food items and incidental ingestion of soil and seep water.
Herbivorous bird (Northern Bobwhite)	Ingestion of food items and incidental ingestion of soil and seep water.
Omnivorous bird (American Robin)	Ingestion of food items and incidental ingestion of soil and seep water.
Insectivorous bird (American Woodcock)	Ingestion of food items and incidental ingestion of soil and seep water.
Carnivorous bird (Red-tailed Hawk)	Ingestion of food items and incidental ingestion of soil and seep water.

The species selected to represent mammals and birds were chosen because they are present in southeastern Pennsylvania and could potentially utilize the Site.

8.2 Exposure Assessment

The exposure assessment step of the SLERA characterizes the total exposure each receptor is expected to have to the COPECs.

8.2.1 Receptor Exposure

All of the receptors selected for this SLERA have the potential to be exposed directly to contaminants in Site surface soil. For purposes of this SLERA, and consistent with the ERAGS, conservative exposure point concentrations for these receptors are the maximum contaminant concentrations detected in the soil.

The exposure of mammals (red fox, meadow vole, short-tailed shrew, and deer mouse) and birds (American robin, American woodcock, northern bobwhite, and red-tailed hawk) to contaminants in soil and seep water could occur through direct contact with soil and seeps and through their diet. For the purposes of this

SLERA, and consistent with the ERAGS, the exposure point concentrations are estimated through food chain exposure dose estimation and, for this screening level assessment, are based on the maximum detected concentration in soil and seep water. However, it should be noted that the use of maximum detected concentrations to estimate potential ecological risk over an entire site is overly conservative and not realistic. Following discussions with the USEPA Region III BTAG and review of similar studies, exposure point concentrations and food chain exposure dose estimates were also calculated based on the 95% Upper Confidence Level (UCL) and the arithmetic mean concentrations for comparison purposes. In all evaluations, dietary concentrations were estimated using models provided in USEPA guidance documents.

The dermal exposure pathway was considered to have a lesser impact than the ingestion exposure route on the total exposure of receptors. Considering this, and since there is a lack of appropriate wildlife uptake rate information for the dermal exposure route, dermal exposure is addressed qualitatively.

8.2.2 Food Chain Exposure Dose Estimation

Food chain models were used to estimate exposure doses, in milligrams (mg) of chemical intake per kilogram (kg) of body weight per day (mg/kg/day). Required parameters include food ingestion rate, body weight, soil ingestion rate, the proportion of diet coming from each food item, and the concentration of each COPEC in the food items. Species-specific parameters are presented in Table 8-5 and the basic equation used to estimate daily doses is as follows:

$$Dose = \frac{(IR_{dw} \times P_s \times C_s) + \sum_i (IR_{ww} \times P_f^i \times C_f^i)}{BW} \times AUF$$

where,

Dose	=	Potential dietary exposure through ingestion of soil and typical food items (mg COPC/kg body weight/day),
IR_{dw}	=	Food ingestion rate (kg diet/day) (dry weight),
IR_{ww}	=	Food ingestion rate (kg diet/day) (wet weight),
P_s	=	Proportion of diet that is soil (unit less),
C_s	=	Concentration of COPEC in soil (mg/kg),
P_f^i	=	Proportion of diet that is food item *i* – (unit less),
C_f^i	=	Concentration of the COPEC in food item *i* based on chemical-specific equations (mg/kg),
BW	=	Body weight (kg), and
AUF	=	Area Use Factor (unit less).

For the purposes of the SLERA, an area use factor (AUF) (the ratio of the size of the Site to the size of the receptor's home range or feeding territory size) of 1.0 was used to calculate potential risks for all representative species at the Site as a conservative assumption for receptors with a large home range. While smaller range species (shrew, robin) may exist solely within the Annex or Landfill area, species with home ranges larger than the area of these Sites (red fox, red-tailed hawk) would be more likely be present at the Site intermittently and thus, obtain food and water from areas not associated with either the Annex or Landfill.

Concentrations of Site COPECs in each food item considered in the food chain exposure model for terrestrial receptors were calculated using equations found in USEPA's Eco-SSL guidance (USEPA 2007d), A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture (Baes 1984), or USEPA's SLERA Protocol for Hazardous Waste Combustion Facilities (USEPA 1999). In addition, uptake of PCBs from soils to invertebrates was modelled using the methodology described in the Development and Validation of Bioaccumulation Models for Earthworms (Sample 1998). This methodology outlined by Sample et al. for PCBs has been used at numerous Superfund Sites, and is recognized as an appropriate source of uptake models in the USEPA Eco-SSL guidance. The input parameters used for these equations and the resulting dietary concentrations are presented in Tables 8-6 and 8-7. The tables also specify the source references for each part of the calculations.

For receptors with diets comprised of multiple food items (such as the American robin), each food item was evaluated and included in the total exposure. The estimated exposure doses are presented in Tables 8-8.1 through 8-8.8 for the Landfill and Tables 8-9.1 through 8-9.8 for the Annex.

8.3 Ecological Effects Assessment

The goal of the ecological effects assessment is to determine the potential toxic effects of COPECs at the Site on the selected ecological receptors by comparing estimated exposure doses to toxicity reference values. The primary data source used to establish toxicity reference values was *Toxicological Benchmarks for Wildlife: 1996 Revision* (Sample *et al*. 1996). This document provides a consolidated listing of toxicity data for a wide range of contaminants and includes body weight conversions and other receptor-specific considerations. Secondary sources of toxicity data that were used are referenced in Tables 8-10 and 8-11.

Chronic no observed adverse effect levels (NOAELs) for COPECs were preferentially selected as protective toxicity reference values (TRVs) for purposes of this SLERA (USEPA 1997a). Risk estimates based on chronic lowest observed adverse effect levels (LOAELs) were also calculated. In some cases, acute or chronic LOAELs or median lethal doses (LD_{50}) were the only available ecotoxicity values. In such cases, adjustments were made to these values using safety factors to reflect levels of uncertainty. The following protocol was used to obtain an equivalent chronic NOAEL when only a LOAEL or LD_{50} was available (based on guidance provided by Calabrese and Baldwin, 1993):

- Chronic LOAELs (or chronic LD_{50}) are multiplied by a correction factor of 0.1;
- Acute LOAELs are multiplied by a correction factor of 0.04; and,
- Acute LD_{50} are multiplied by a correction factor of 0.02.

The toxicity reference values selected for this SLERA are summarized in Tables 8-10 and 8-11.

8.4 Risk Characterization

The potential risks to ecological receptors at the Site were assessed by comparing Site soil concentrations and/or modeled dietary intake of contaminants with the appropriate toxicity reference values (TRVs). For receptors with food chain exposure, a hazard quotient (HQ) was calculated for each individual COPEC, defined as the daily dose divided by the species-specific TRV:

$$HQ = \frac{\text{Daily Dose of a given COC}}{\text{Dose-Based Toxicity Reference Value for a given species}}$$

In this SLERA, the potential risks to the various receptors were assessed in the following ways:

- Potential risks to terrestrial plants and invertebrates were evaluated by comparing the maximum detected soil and water (seep water and groundwater) concentrations to phytotoxicity and invertebrate toxicity screening values as shown in Tables 8-2.1, 8-3.1, and 8-4.1 for the Landfill and Tables 8-2.2, 8-3.2, and 8-4.2 for the Annex;
- Potential food chain risks from soil ingestion to the red fox, meadow vole, short-tailed shrew, deer mouse, America robin, American woodcock, northern bobwhite, and red-tailed hawk were evaluated by calculating the HQs as described above; and,
- Potential seep water ingestion risks to the red fox, meadow vole, short-tailed shrew, deer mouse, America robin, American woodcock, northern bobwhite, and red-tailed hawk were also evaluated by calculating the HQs as described above.

In a SLERA, a hazard quotient equal to or less than unity (1.0) indicates that there is no potential for adverse effects on the given species.

It is important to note that this methodology is not a measure of, and cannot be used to determine, absolute quantitative risk. Use of this technique, however, can indicate the potential for ecological receptors to be at risk of an adverse effect from exposure to Site-related COPECs.

8.4.1 Estimation of Direct Contact Risk

Potential ecological risks from contaminants in the surface soil (upper 2 feet) at the Site were assessed for terrestrial plants and invertebrates using direct comparisons of contaminant concentrations with benchmark values. Comparisons were made between the maximum detected contaminant levels and available phytotoxicity and invertebrate toxicity data during the screening phase for COPECs (Section 8.1.4). For the Landfill and Annex, maximum detected on-Site concentrations of inorganics, SVOCs, pesticides and dioxins exceeded soil direct contact toxicity benchmark values as summarized in Table 8-1 and shown in Tables 8-2.1 and 8-2.2. The Annex also had maximum detected on-Site concentrations of PCBs that exceeded soil direct contact toxicity benchmark values.

For the flora and invertebrate communities, the potential for adverse ecological risks may exist due to both soil and surface water exposures associated with inorganics, pesticides and SVOCs in the Landfill and with inorganics, pesticides, dioxins and SVOCs in the Annex.

8.4.2 Estimation of Food Chain Risk

Potential food chain risks for contaminant uptake through the food chain were estimated for the red fox, meadow vole, short-tailed shrew, deer mouse, America robin, American woodcock, northern bobwhite and red-tailed hawk as detailed in Section 8.2.2. Tables 8-8.1 through 8-8.8 show in detail the food chain evaluation for each receptor species for the Landfill. Tables 8-9.1 through 8-9.8 show in detail the food chain evaluation for each receptor species for the Annex. The NOAEL- and LOAEL-based hazard quotients that exceed unity (1.0) for food chain exposure modeling are summarized in Table 8-12 for the Landfill and Table 8-13 for the Annex and are discussed below.

8.4.2.1 Deer Mouse

Potential risks to the deer mouse were assessed by comparing the estimated exposure dose levels with dose-based toxicological benchmark values (NOAEL and LOAEL). The resultant HQs based on the maximum, 95% UCL, and arithmetic mean detected concentrations of COPECs, are calculated in 8-8.1 and 8-9.1 for the Landfill and Annex and summarized in Tables 8-12 and 8-13, respectively. Based on the maximum detected concentration, the following compounds were found to have a NOAEL HQ or a LOAEL HQ greater than 1:

LANDFILL COPECS - HQ > 1.0 FOR DEER MOUSE FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 200 Antimony = 4 Copper = 10 Lead = 3	Aluminum = 20 Antimony = 4 Copper = 8 Lead = 3

Class of Compounds	NOAEL	LOAEL
	Nickel = 10	Nickel = 7
SVOCs	Biphenyl = 3 Bis(2-ethylhexyl) phthalate = 8 Di-n-octyl-phthalate = 500 Total HMW PAHs[25] = 2	None
Pesticides	Aldrin = 7 Endrin = 10 Heptachlor Epoxide = 3 Endrin Aldehyde = 10	None
Dioxins/Furans	Total 2,3,7,8-TCDD Eq[26] = 20	Total 2,3,7,8-TCDD Eq = 2

LOAEL HQs based on the 95% UCL exceed 1 only for aluminum.

ANNEX COPECS - HQ > 1.0 FOR DEER MOUSE FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 300 Thallium = 2	Aluminum = 30
SVOCs	Di-n-octyl-phthalate = 3	None
PCBs	Aroclor 1248 = 10 Aroclor 1254 = 2	None
Pesticides	Aldrin = 4 Heptachlor epoxide = 2 Endrin Aldehyde = 4 Endrin = 5	None
Dioxins/Furans	Total 2,3,7,8-TCDD Eq[27] = 4	None

The calculated risk for the deer mouse at the Annex is driven by Aroclors 1248 and Aroclor 1254 are based on a single potentially anomalous detection (one out of 68 sample locations across both the Landfill and the Annex). LOAEL HQs for this receptor at the Annex exceed 1 only for aluminum.

8.4.2.2 Short-tailed Shrew

Potential risks to the short-tailed shrew were assessed by comparing the estimated exposure dose levels with dose-based toxicological benchmark values (NOAEL and LOAEL). The resultant HQs for the short-tailed shrew, based on the maximum, 95% UCL, and arithmetic mean detected concentrations of COPECs, are calculated in 8-8.2 and 8-9.2 and summarized in 8-12 and 8-13 for the Landfill and Annex, respectively.

[25] Total High Weight Molecular (Total HMW) PAHs
[26] Total 2,3,7,8-TCDD Equivalents
[27] Total 2,3,7,8-TCDD Equivalents

Based on the maximum detected concentration, the following compounds were found to have a NOAEL HQ or a LOAEL HQ greater than 1:

LANDFILL COPECS - HQ > 1.0 FOR SHORT-TAILED SHREW FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 1000 Antimony = 30 Cadmium = 4 Chromium = 2 Copper = 90 Lead = 20 Nickel =70 Thallium = 5 Zinc = 3	Aluminum = 100 Antimony = 30 Copper = 50 Lead = 10 Nickel = 50
SVOCs	Biphenyl = 20 Bis(2-ethylhexyl) phthalate = 60 Di-n-octyl-phthalate = 3000 Total HMW PAHs = 10	Biphenyl = 2 Bis(2-ethylhexyl) phthalate = 6 Total HMW PAHs = 3
Pesticides	4,4'-DDE = 5 4,4'-DDT = 9 Aldrin = 50 Methoxychlor = 3 Dieldrin = 10 Alpha-endosulfan = 2 Beta-endocsulfan = 4 Endosulfan sulfate = 6 Heptachlor = 3 Heptachlor Epoxide = 30 Endrin Aldehyde = 80 Endrin = 100	4,4'-DDE = 3 4,4'-DDT = 5 Aldrin = 10 Methoxychlor = 2 Dieldrin = 5 Heptachlor Epoxide = 3 Endrin Aldehyde = 8 Endrin = 10
Dioxins/Furans	Total 2,3,7,8-TCDD Eq = 100	Total 2,3,7,8-TCDD Eq =10

LOAEL HQs based on the 95% UCL are substantially lower and many of the HQs drop below 1 (Table 8-8.2).

ANNEX COPECS - HQ > 1.0 FOR SHORT-TAILED SHREW FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 2000 Antimony = 6 Cadmium = 2 Chromium = 3 Copper = 90	Aluminum = 200 Antimony = 6 Lead = 2 Nickel = 3 Selenium = 4

Class of Compounds	NOAEL	LOAEL
	Lead = 2 Nickel =5 Selenium = 4 Thallium = 20	Thallium = 2
SVOCs	Bis(2-ethylhexyl) phthalate = 7 Di-n-octyl-phthalate = 20	None
PCBs	Aroclor 1248 = 70 Aroclor 1254 = 10	Aroclor 1248 = 7
Pesticides	Aldrin = 30 Beta-BHC = 2 Dieldrin = 2 Heptachlor Epoxide = 10 Endrin Aldehyde = 30 Endrin = 40	Aldrin = 6 Endrin Aldehyde = 3 Endrin = 4
Dioxins/Furans	Total 2,3,7,8-TCDD Eq = 9	None

LOAEL HQs based on the 95% UCL exceed 1 for aluminum, antimony, and aldrin (Table 8-9.2).

8.4.2.3 Meadow Vole

Potential risks to the meadow vole were assessed by comparing the estimated exposure dose levels with dose-based toxicological benchmark values (NOAEL and LOAEL). The resultant HQs for the meadow vole, based on the maximum, 95% UCL, and arithmetic mean detected concentrations of COPECs, are calculated in 8-8.3 and 8-9.3 and summarized in 8-12 and 8-13 for the Landfill and Annex, respectively. Based on the maximum detected concentration, the following compounds were found to have a NOAEL HQ or a LOAEL HQ greater than 1:

LANDFILL COPECS - HQ > 1.0 FOR MEADOW VOLE FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 20 Copper = 3 Nickel = 2	Aluminum = 2 Copper = 2

For the annex, only the HQ for aluminum for the meadow vole was greater than 1 for both NOAEL and LOAEL calculations at 20 and 2, respectively.

8.4.2.4 Red Fox

Potential risks to the red fox were assessed by comparing the estimated exposure dose levels with dose-based toxicological benchmark values (NOAEL and LOAEL). The resultant HQs for the red fox, based on the maximum, 95% UCL, and arithmetic mean detected concentrations of COPECs, are calculated in 8-8.4 and 8-9.4 and summarized in 8-12 and 8-13 for the Landfill and Annex, respectively. Based on the maximum detected concentration, the following compounds were found to have a NOAEL HQ or a LOAEL HQ greater than 1:

LANDFILL COPECS - HQ > 1.0 FOR RED FOX FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 8	None

Similarly, only one COPEC, aluminum, had a HQ greater than 1 for the maximum concentration using the NOAEL TRV (HQ = 10). For both the Landfill and Annex, HQs for the red fox using the LOAEL did not exceed 1.

8.4.2.5 American Robin

Potential risks to the America robin were assessed by comparing the estimated exposure dose levels with dose-based toxicological benchmark values (NOAEL and LOAEL). The resultant HQs for the robin, based on the maximum, 95% UCL, and arithmetic mean detected concentrations of COPECs, are calculated in 8-8.5 and 8-9.5 and summarized in 8-12 and 8-13 for the Landfill and Annex, respectively. Based on the maximum detected concentration, the following compounds were found to have a NOAEL HQ or a LOAEL HQ greater than 1:

LANDFILL COPECS - HQ > 1.0 FOR AMERICAN ROBIN FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 20 Cadmium = 2 Chromium = 2 Copper = 100 Lead = 80 Manganese = 2 Nickel = 20 Zinc = 9	Chromium = 2 Copper = 100 Lead = 70 Nickel = 9 Zinc = 4
SVOCs	Bis(2-ethylhexyl) phthalate = 600	None
Pesticides	4,4'-DDE = 2 4,4'-DDT = 4 Endrin Aldehyde = 500 Endrin = 600	4,4'-DDE = 2 4,4'-DDT = 3 Endrin Aldehyde = 50 Endrin = 60
Dioxins/Furans	Total 2,3,7,8-TCDD Eq = 4	None

The risk for the American robin at the Landfill is driven by risks associated with metals and pesticides. LOAEL HQs based on the 95% UCL are substantially lower and only copper, lead, nickel endrin and endrin aldehyde exceed 1.

ANNEX COPECS - HQ > 1.0 FOR AMERICAN ROBIN FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 30 Chromium = 3 Copper = 4 Lead = 7 Selenium = 2 Vanadium = 7 Zinc = 2	Chromium = 3 Copper = 3 Lead = 6 Selenium = 2 Vanadium = 6
SVOCs	Bis(2-ethylhexyl) phthalate = 90	None
PCBs	Aroclor 1248 = 20 Aroclor 1254 = 4	Aroclor 1248 = 2
Pesticides	Endrin Aldehyde = 200 Endrin = 300	Endrin Aldehyde =20 Endrin = 30
Dioxins/Furans	Total 2,3,7,8-TCDD Eq = 2	None

The risk for the American robin at the Annex is driven by risks associated with metals, PCBs and pesticides. LOAEL HQs based on the 95% UCL are substantially lower and only lead, vanadium, endrin aldehyde and endrin have a HQ greater than 1.

8.4.2.6 Northern Bobwhite

Potential risks to the northern bobwhite were assessed by comparing the estimated exposure dose levels with dose-based toxicological benchmark values (NOAEL and LOAEL). The resultant HQs for the northern bobwhite, based on the maximum, 95% UCL, and arithmetic mean detected concentrations of COPECs, are calculated in 8-8.6 and 8-9.6 and summarized in 8-12 and 8-13 for the Landfill and Annex, respectively. Based on the maximum detected concentration, the following compounds were found to have a NOAEL HQ or a LOAEL HQ greater than 1:

LANDFILL COPECS - HQ > 1.0 FOR NORTHERN BOBWHITE FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Copper = 4 Lead = 4	Copper = 4 Lead = 4

The risk for the northern bobwhite at the Landfill is driven by metals (copper and lead). LOAEL HQs based on the 95% UCL are less than 1 for all COPECs. In addition, there were no COPEQs with HQs exceeding 1 at the Annex for the northern bobwhite.

8.4.2.7 American Woodcock

Potential risks to the American woodcock were assessed by comparing the estimated exposure dose levels with dose-based toxicological benchmark values (NOAEL and LOAEL). The resultant HQs for the American woodcock, based on the maximum, 95% UCL, and arithmetic mean detected concentrations of COPECs, are calculated in 8-8.7 and 8-9.7 and summarized in 8-12 and 8-13 for the Landfill and Annex, respectively. Based on the maximum detected concentration, the following compounds were found to have a NOAEL HQ or a LOAEL HQ greater than 1:

LANDFILL COPECS - HQ > 1.0 AMERICAN WOODCOCK FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 40 Cadmium = 4 Chromium = 3 Copper = 200 Lead = 80 Nickel = 30 Vanadium = 4 Zinc = 7	Chromium = 3 Copper = 200 Lead = 70 Nickel = 20 Vanadium = 4 Zinc = 3
SVOCs	Bis(2-ethylhexyl) phthalate = 1000	None
Pesticides	4,4'-DDE = 5 4,4'-DDT = 8 Endrin Aldehyde = 1000 Endrin = 1000	4,4'-DDE = 4 4,4'-DDT = 7 Endrin Aldehyde = 100 Endrin = 100
Dioxins/Furans	Total 2,3,7,8-TCDD Eq = 9	None

The risk for the American woodcock at the Landfill is driven by metals, pesticides, and dioxins (total 2,3,7,8-TCDD equivalents). LOAEL HQs based on the 95% UCL are substantially lower and some drop below 1.

ANNEX COPECS - HQ > 1.0 FOR AMERICAN WOODCOCK FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Aluminum = 50 Cadmium = 2 Chromium = 4 Copper = 4 Lead = 8 Nickel = 2 Selenium = 3 Vanadium = 5 Zinc = 2	Chromium = 4 Copper = 4 Lead = 7 Selenium = 2 Vanadium = 4
SVOCs	Bis(2-ethylhexyl) phthalate = 200	None
PCBs	Aroclor 1248 = 40 Aroclor 1254 = 6	Aroclor 1248 = 4
Pesticides	Beta-BHC = 2 Endrin Aldehyde = 400 Endrin = 500	Endrin Aldehyde = 40 Endrin = 50
Dioxins/Furans	Total 2,3,7,8-TCDD Eq = 3	None

The risk for the American woodcock at the Annex is driven by metals, SVOCs, PCBs, and pesticides. LOAEL HQs based on the 95% UCL are substantially lower and only lead, vanadium, endrin and endrin aldehyde have a HQ greater than 1 (Table 8-9.7).

8.4.2.8 Red-Tailed Hawk

Potential risks to the red-tailed hawk were assessed by comparing the estimated exposure dose levels with dose-based toxicological benchmark values (NOAEL and LOAEL). The resultant HQs for the red-tailed hawk, based on the maximum, 95% UCL, and arithmetic mean detected concentrations of COPECs, are calculated in 8-8.8 and 8-9.8 and summarized in 8-12 and 8-13 for the Landfill and Annex, respectively. Based on the maximum detected concentration, he following compounds were found to have a NOAEL HQ or a LOAEL HQ greater than 1.

LANDFILL COPECS - HQ > 1.0 RED-TAILED HAWK FOR MAXIMUM CONCENTRATION

Class of Compounds	NOAEL	LOAEL
Inorganics	Copper = 5 Lead = 5	Copper = 4 Lead = 4

Risks for the red-tailed hawk were driven by copper and lead. Using the 95% UCL and the LOAEL, no HQs were greater than 1 for this receptor.

There were no COPECs with HQs exceeding 1 at the Annex for the red-tailed hawk.

8.5 SLERA Refinements

Since the HQs calculated in this SLERA indicate the potential for adverse effects on ecological receptors, further refinement of the risk calculations is appropriate and consistent with USEPA guidance. For example, this SLERA primarily utilized maximum detected concentrations of contaminants to estimate potential risks and at the request of USEPA utilized an area use factor of 1 for all receptors. For receptors with a large home range (e.g., red fox, red-tailed hawk), risks would be substantially lower if a species-specific AUF was utilized. However, USEPA guidance indicates that the goal of ecological risk assessment is generally to be protective of receptor populations on a site, and not of individuals. Therefore, consideration can be given to the effect of using the 95% UCL soil concentrations to provide a more realistic assessment of population risks at a site, as shown in the following Tables 8-14 and 8-15 below.

Table 8-14 Refined Summary of Potential Ecological Risks – Landfill

Receptor	COPEC	LOAEL	
		95% UCL EPC	Mean EPC
Deer Mouse	Aluminum HQ =	**10**	**10**
Short-tailed Shrew	Aluminum HQ =	**100**	**100**
	Antimony HQ =	**4**	**3**
	Copper HQ =	**8**	**2**
	Lead HQ =	**2**	**2**
	Nickel HQ=	**8**	**3**
	Bis (2-ethylhexyl) phthalate HQ=	**1000**	**800**
	Aldrin HQ=	**2**	1
	Endrin Aldehyde HQ =	**2**	1
	Endrin HQ =	**2**	1
	Total 2,3,7,8-TCDD Equivalents. HQ =	**10**[a]	**2**
American Robin	Copper HQ =	**20**	**5**
	Lead HQ =	**8**	**7**
	Nickel HQ =	**2**	1
	Endrin Aldehyde HQ =	**10**	7
	Endrin HQ =	**10**	6
American Woodcock	Copper HQ =	**20**	**7**
	Lead HQ =	**10**	**8**
	Nickel HQ =	**3**	1
	Vanadium HQ =	**2**	**2**
	Endrin Aldehyde HQ =	**30**	**20**
	Endrin HQ =	**30**	**10**

a – As the 95%UCL for TCDD Equivalents was higher than the maximum concentration, the risks are shown using the maximum concentration and the LOAEL TRV.

Table 8-15 Refined Summary of Potential Ecological Risks - Annex

Receptor	COPEC	LOAEL	
		95% UCL EPC	Mean EPC
Deer Mouse	Aluminum HQ =	**20**	**10**
Short-tailed Shrew	Aluminum HQ =	**100**	**100**
	Antimony HQ =	**2**	**2**
	Aldrin =	**2**	0.8
Meadow Vole	Aluminum HQ =	**2**	1
American Robin	Lead HQ =	**3**	1
	Vanadium HQ =	**4**	**3**
	Endrin Aldehyde HQ =	**4**	**2**
	Endrin HQ=	**5**	**2**
American Woodcock	Lead HQ =	**3**	0.9
	Vanadium HQ =	**3**	**2**
	Endrin Aldehyde HQ =	**7**	**3**
	Endrin HQ =	**9**	**4**

Considering these refinements to the ecological risk assessment, the receptors that appear to have the most potential for adverse effects through food chain consumption are insectivores, such as the short-tailed shrew, and the American robin, which are assumed to receive half of their overall diet from invertebrates. Potential adverse effects on individuals are primarily associated with the presence of select metals and pesticides. These constituents are also present in background and so the incremental risk posed by the Site is likely minimal. In addition, the refinement of the AUF for receptors with larger home ranges (AUF was set at 1 for all receptors for the SLERA) would further reduce the calculated HQs. The terrestrial pathways of exposure will be addressed in the FS.

8.6 Uncertainty Assessment

In any risk assessment, it is necessary to make assumptions. Assumptions carry with them associated uncertainties that must be identified to put risk estimates in perspective. The following describes the major assumptions used in this SLERA and the associated uncertainties.

The maximum detected contaminant concentration was used to conservatively estimate potential ecological risks from Site soil. In reality, ecological receptors will likely be exposed to a range of contaminant concentrations lower than the maximum concentration, and the calculations based on 95% UCL and mean concentrations may provide more realistic estimates for upper trophic level organisms. However, this may not be true for plants and invertebrates, where the use of a maximum detected concentration may be more appropriate. However, it should be noted that the overall goal of this evaluation is the protection of populations and communities of receptors at the site (USEPA 1999).

There are no screening values available that are inclusive of all potential Site receptors, thus the screening values used are not necessarily protective of ecological receptors that may be more sensitive to the effects of a chemical. However, in general, sensitive species and conservative assumptions are used to develop screening values. This likely contributes to an overestimation of the risk to actual Site receptors.

All potential risks to mammalian and avian species at the Site were determined solely based on the measured soil concentrations of COPECs. No biota (such as plant, invertebrate, and small mammal) samples were collected for analysis of COPEC concentrations in this investigation. Therefore, bioaccumulation/bioconcentration factors and regression equations were used to estimate these concentrations from measured soil levels. Actual bioaccumulation into food items is variable, depending upon such factors as chemical state, and soil properties such as organic carbon content. These calculations are often used in SLERAs as it is generally accepted that they are conservative in estimating animal and plant tissue concentrations of COPECs, so the risk is not likely to be significantly under-estimated, and is more likely over-estimated.

The estimation of exposures to ecological receptors through the food chain also includes a number of parameters for which assumptions must be made. Specifically, the parameters used are the dietary composition, the food ingestion rate, the food dry weight fraction, the soil ingestion rate, and the body weight. In this assessment, the USEPA 1993 Wildlife Exposure Factors Handbook was used as the primary source for these parameters, however in certain cases other references were used as detailed in the appropriate tables. Each parameter introduces some level of uncertainty, although the results are generally regarded as conservative (i.e., protective). For example, the soil ingestion rate (which is determined by multiplying the soil ingestion fraction from USEPA (2007d) by the dry weight food ingestion rate) is based on 90th percentile estimates (USEPA 2007d), which may result in an overestimate of the risks.

In addition, seep water concentrations were used for the surface water ingestion component of the food chain calculations at the direction of the USEPA and BTAG. Assuming that the entire surface water ingestion component for on-Site receptors will come from the limited intertidal seeps found on-Site rather than from the surface water features that surround the Site is very conservative and likely results in an overestimate of risk.

In selecting benchmark toxicity values from available literature, generally the most conservative toxicity value was used for each receptor. The application of these values most likely over-estimates ecological risk. In some cases, toxicity values vary depending on the chemical state of a contaminant (for example, Cr^{+6} and Cr^{+3}). Because the chemical form of each contaminant was not always known, the most conservative toxicity value was generally chosen for each COPEC. Using the most conservative toxicity values in these cases is likely to cause an overestimation of risk. In general, literature toxicity values are derived from experiments conducted under laboratory conditions with genetically-uniform individuals and may not reflect actual field conditions.

For some COPECs, mammalian or avian TRVs were unavailable (e.g., iron, acetophenone) and therefore, HQs could not be calculated. The absence of appropriate TRVs for a receptor under-estimates potential risks. Similarly, the equations to calculate uptake of certain metals (e.g., iron, aluminum) into prey items are not available and these pathways may be under-represented in the final HQ calculations leading to an underestimation of risks.

Potential toxicological risks to individual receptors have been evaluated in this SLERA. However, adverse effects on individuals may not be reflected at the population and community level. In addition, the inverse of this may be true in that adverse effects on a population and community level may not be reflected in an individual. However, it is for more likely that individual effects would not be manifested at a population or community level. In general, the goal of ecological risk management is to be protective of populations rather than individual ecological receptors.

Receptor risks were characterized by estimating potential risks associated with each individual analyte. Compounds may interact synergistically or antagonistically to either mitigate or aggravate adverse effects from the combined contaminants. However, insufficient research exists to quantify such interactions, and so individual analyte risks are used to evaluate potential impacts.

9.0 SUMMARY AND CONCLUSIONS

An RI was conducted at the Folcroft Landfill and Folcroft Landfill Annex between March 2006 and July 2016 in accordance with several USEPA approved work plans. As noted in Section 1.1, the objectives of the RI and the associated risk assessments were to develop an updated CSM to aid in the following evaluations:

- Evaluate the nature and extent of contamination at the Site
- Evaluate whether contaminants have migrated off of the Site
- Evaluate potential on-Site risks to public health or welfare or the environment caused by the release, or potential release, of contaminants from the Site

To meet these objectives, the RI included activities to 1) assess the condition of the existing soil cover, 2) investigate the nature and extent of contamination in soil, landfill gas, intertidal seeps, and groundwater, 3) evaluate the fate and transport of Site COCs, and 4) evaluate potential risks to human and terrestrial ecological receptors. Those activities and the resulting conclusions are summarized below.

9.1 Updated Conceptual Site Model

The results of the off-Site groundwater investigations refined the current understanding of Site geology, groundwater flow, and off-Site contaminant transport.

9.1.1 Geology

The Site is located in the Coastal Plain just east (downgradient) of the Fall Line and is underlain by unconsolidated materials. Across the Site, there is a 20 to 40 foot layer of Coastal Plain deposits, overlying bedrock of the Wissahickon Formation.

- Upgradient of the Landfill, borings encountered material consistent with infilling of low-lying areas to produce man-made uplands. It appears that the fill material was placed directly on existing recent sediments, without excavation or mixing of native soils.
- Along the eastern side of the Landfill, borings showed the presence of cover soil and waste overlying silts and silty clays; however, the clays do not form a continuous layer beneath the waste. Underlying the waste and the silty clay unit are a sequence of sands and gravels with coarser materials generally found deeper and closer to the bedrock consistent with deposition in a fluvial system. Gaps in the clay layer at the base of the waste in the Landfill allow vertical migration of groundwater downward into the underlying sands and gravels.
- Along the Western Refuge Road, borings encountered a thick sequence of silty clays overlying sands and gravels in direct contact with the weathered bedrock.
- Along the Eastern Refuge Road, borings encountered a thicker sequence of sediment overlying bedrock that has a much greater percentage of coarse grained sands and gravels than was encountered along the Western Refuge Road.

Moving downgradient from the Landfill, the silty clay thickens eastward to a maximum that generally underlies the eastern portions of the Refuge Impoundment and subsequently thins continuing eastward. This silty clay isolates underlying groundwater from the creeks and Refuge Impoundment.

Underlying the silty clay and directly above the weathered bedrock surface is a continuous sand and gravel sequence. The sand and gravel sequence thickens to the east and contains coarse grained sediments with occasional, interbedded finer-grained silts and clays.

9.1.2 Groundwater Flow

Groundwater in both the overburden and bedrock migrates in a generally southeasterly direction. The relatively high hydraulic conductivity in deep sands and gravels of the overburden indicate that the sand and gravel units are the preferential pathway for migration of Site-related COCs in groundwater downgradient of the Landfill.

Groundwater velocities are calculated to be highest in the overburden in the vicinity of Western Refuge Road where high groundwater gradients and relatively high-conductivity sands and gravels coincide with a thinned sand/gravel aquifer.

Observed net vertical groundwater gradients between overburden and bedrock are upward at and adjacent to the Landfill. Observed net vertical gradients between overburden and bedrock are downward in areas of the Refuge downgradient of the Landfill. However, the vertical migration of groundwater into the bedrock from the overburden sand and gravel materials is limited due to: 1) the near-horizontal foliation (mineral layering) observed in the upper bedrock at the overburden/bedrock interface, 2) the lower hydraulic conductivity of the upper bedrock compared to the hydraulic conductivity of the sand and gravel overburden, and 3) generally upward vertical hydraulic gradients beneath the Landfill.

Furthermore, the difference in groundwater temperatures observed along the Western Refuge Road compared to the Landfill suggest a lack of direct hydraulic communication between bedrock groundwater beneath the Landfill and bedrock groundwater near the Western Refuge Road and that the colder groundwater water observed along the Western Refuge Road may be controlled by a different, deeper, groundwater source.

9.2 RI Results and Conclusions

9.2.1 Existing Cover Assessment

The site reconnaissance discovered both the Landfill and Annex were vegetated with open fields and gentle slopes in the central portions that transition to shrubs and wooded areas on moderate to steep slopes along the perimeters. In localized sections along the perimeter of both the Landfill and the Annex, there were areas of debris at the surface. Landfill cover is absent in localized areas where waste/debris is present at the surface; however, some debris may have been present in the cover material. Along the water's edge there were also locations where buoyant waste (e.g., bottles, cans, plastics, wood, and rubber) appears to have washed up with the rise and fall of the tide, and other localized areas where intertidal seeps have been identified.

The site reconnaissance and subsequent soil boring program showed that cover soil ranges in thickness from less than 1 foot up to approximately 12 feet, and consists of topsoil, sand, silt, clay, and gravel. The Landfill and Annex each have soil covers greater than 1-foot in thickness over only approximately 30 percent of their surface area. These areas are generally located in the central portions of the properties. These covers were constructed in the 1970s, as approved by PADER, and reportedly had the required cover thickness when they were approved.

While there are areas where waste is present at the surface, and portions of the periphery of the Landfill and Annex exhibit steep slopes, there is very little visual evidence of continuing erosion on the surfaces of the Landfill and Annex. Therefore, surface erosion is not considered a significant pathway for off-Site contaminant transport.

9.2.2 Nature and Extent of Potential Contamination

9.2.2.1 Landfill Gas

The bar hole probe investigation showed that off-Site methane migration is not a concern. The initial ambient air monitoring survey and supplemental monitoring showed that air impacts from Site VOCs also are not a concern.

9.2.2.2 Soil

Soil analytical results show that concentrations of several metals (primarily arsenic and chromium) and SVOCs (primarily benzo[a]pyrene) in cover soils at the Landfill and Annex exceed background levels. However, exceedances of the PADEP Non-Residential Surface Soil Direct Contact Medium Specific Concentrations (MSCs) are very isolated, and are limited to the following:

- Landfill - Beryllium at L-4 (0-6 inches) and L-39S (0-6 inches), Cadmium at L-14 (0-6 inches), Iron at L-39S (0-6 inches), and Lead at L-4 (0-6 inches) and L-36 (0-6 inches)
- Annex - Arsenic at A-22 (6-24 inches)

9.2.2.3 Intertidal Seeps

The seep investigation determined that conventional leachate seeps are not present at the Site. However, several intertidal bank seeps are present at low tide at both the Landfill and Annex, attributed to surface water flushing in and out of banks. Aqueous analytical results from these locations show that intertidal seeps are impacted primarily by metals and some pesticides. However, the seeps are limited in area, are not easily accessed, and only appear at low tide. While dissolved contaminants in intertidal seepage may migrate into creeks and surrounding marshes, the extent of such seeps is very small compared to the overall perimeter of the landfills and the flow is negligible when compared to the flows in Darby/Thoroughfare or Hermesprota Creeks.

9.2.2.4 Groundwater Flux

The updated CSM, based on the extensive Off-Site Groundwater Investigation, concludes that overburden groundwater does not discharge into surface waters of the Refuge, but instead flows in the deep sand and gravel unit that underlies the silty clay unit. The silty clay isolates the overburden groundwater from the adjacent surface waters and the Refuge Impoundment. Furthermore, the results of this updated contaminant flux modeling demonstrates that there would be no impact on surface water quality in the hypothetical absence of this clay layer

9.2.2.5 Groundwater

The initial groundwater investigations in 2007 detected VOCs, naphthalene, and metals in groundwater underlying the Landfill and Annex. Supplemental RI groundwater sampling by USEPA targeting 1,4-dioxane detected it in multiple wells at the Landfill and Annex. Subsequent groundwater investigations from 2012 to 2016 determined the following:

- Monitoring wells on the northern and western (upgradient) boundaries of the Annex exhibited low-level detections of Cl-VOCs and/or 1,4-dioxane.
- Cl-VOC and 1,4-dioxane exceedances above screening levels (USEPA Regional Screening Levels (RSLs) and Pennsylvania Residential and Non-Residential Groundwater MSCs) in overburden groundwater extend beyond the Landfill limits. The leading edge of the low-level 1,4-dioxane plume in overburden groundwater remains within the downgradient boundary of the Refuge.
- Based on the data collected, low-levels of VOCs and 1,4-dioxane were detected in bedrock groundwater beneath the Landfill.

Site-related COCs are found in groundwater at the Landfill and Annex and migrating downgradient in the deep sand and gravel unit located tens of feet under Darby/Thoroughfare Creek. While migration of dissolved contaminants in groundwater is potentially the most significant transport mechanism at the Site, the off-Site impacts are limited for the following reasons:

- Concentrations of Cl-VOCs are decreasing downgradient of the Landfill due to natural attenuation (via both abiotic and biotic mechanisms), and
- The investigations continued to show that there are no drinking water sources in the vicinity of, or even far downgradient from, the Landfill.

9.2.3 Risk to Human Receptors

The BHHRA identified chemicals of potential concern (COPCs) at the Site, and estimated quantitative risks from the COPCs assuming conservative exposure scenarios, as required by USEPA, under both current and hypothetical future land use conditions for the following receptors associated with the Site:

- Construction/Excavation Workers
- Maintenance /Refuge Workers
- Adolescent Trespassers
- Adult and Child Refuge Visitors

The BHHRA considered direct contact exposures to soil, intertidal seeps, shallow groundwater in a trench at the Landfill or Annex, and indoor air in potential future structures constructed at the Landfill, Annex, and Refuge (vapor intrusion only). It did not assume any groundwater ingestion exposures, because there are currently no potable wells, and installing drinking water wells at the Refuge is prohibited. The results of the BHHRA showed the following:

- One exceedance of USEPA acceptable carcinogenic risk levels for a future lifetime refuge visitor exposure to indoor air at a hypothetical occupied building within the footprint of the VOC plume.
- No other exceedances of USEPA acceptable carcinogenic risk levels for any current human health pathway/receptor.
- Although the construction worker at the Landfill had a cumulative HI greater than 1 (at 2), there were no exceedances of a cumulative non-cancer hazard index threshold of 1.0, on a target-organ specific basis, for this receptor and the remaining human health pathway/receptors.

Based on these results, Site COPCs pose no unacceptable risks to human health under current use scenarios. Under the hypothetical future of the Site, a potential unacceptable risk is present for vapor transport into indoor air. The remaining future use scenarios are within the acceptable risk ranges used by USEPA in the remedial decision-making process.

9.2.4 Risk to Ecological Receptors

The SLERA identified chemicals of potential ecological concern (COPECs) at the Site, and estimated potential risks from these COPECs to selected terrestrial wildlife and plants/invertebrates receptors. Based on the results of the SLERA, the following was concluded regarding risks to terrestrial wildlife and plants/invertebrates at the Site.

Tables 8-12 and 8-13 summarize the HQs for each representative species at the maximum 95% UCL, and mean concentrations for both NOAEL and LOAEL benchmarks where available. In general, risks are highest for the insectivores (such as the American woodcock, American robin and short-tailed shrew) due to high bioconcentration estimates for the soil invertebrate prey item. Some of the COPECs with HQs greater than 1, in particular metals and PAHs, are also present in background samples, albeit at lower concentrations.

Consistent with conversations with EPA, no further refinements of the SLERA are necessary as the potential ecological risks from the terrestrial portions of the Site will be addressed during the FS.

9.2.5 Conclusions

The results of this remedial investigation showed the following:

- There are localized areas where waste and/or debris is present at the surface, and a few areas of the periphery of the Landfill and Annex exhibit steep slopes and localized erosion;
- There is less than 1 foot of cover soil over approximately 70% of the Site, with the majority of the Annex/Landfill area vegetated with ruderal species;
- Landfill gas impacts are not a concern;
- Intertidal seeps and groundwater flux have little to no impact on surface water quality;
- The absence of a continuous, silty clay layer below waste at the Landfill allows Site COCs to migrate to groundwater;
- The potentially most significant contaminant transport mechanism at the Site is migration of dissolved COCs, primarily Cl-VOCs and 1,4-dioxane, in groundwater;
- The continuous, silty clay layer downgradient of the Landfill effectively mitigates the potential for groundwater flux from the Landfill area to surface water;
- Current COC concentrations in groundwater downgradient of the Landfill Perimeter and Darby Creek decrease significantly with distance to non-detect or trace levels in monitoring wells along the Eastern Refuge Road;
- Site COCs attenuate to Residential Groundwater MSCs within the boundaries of the Refuge;
- There are no drinking water sources in the vicinity of or downgradient from the Site, and local ordinances require the use of public water for drinking waters;
- There are currently no unacceptable risks to human health from Site COCs;
- Any future risks to human health are limited to vapor transport into a hypothetical indoor air scenario and,
- Potential ecological risks are associated with the presence of COCs in soil, and to a lesser extent seep water.

The Remedial Investigation has sufficiently characterized the environmental conditions at the Landfill and Annex to now proceed to the Feasibility Study.

10.0 REFERENCES

American Ornithologists' Union 2010. The A.O.U. check-list of North American birds, 7th ed., [Online]. American Ornithologists' Union (Producer). Available: http://www.aou.org/checklist/north/index.php. Last accessed April 30, 2010.

ASTM 2015. Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites. Designation: E1839-95. Reapproved 2015.

Baes 1984. Baes, C.F., et. al. A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Lab, Health and Safety Research Division. September, 1984.

Betchel-Jacobs 1998. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Oak Ridge National Laboratory BJC/OR-133. Bechtel Jacobs Company L.L.C.

Beyer 1993. Beyer, W. Nelson et. al. Estimates of Soil Ingestion by Wildlife. Journal of Wildlife Management, 58(2):375-382.

Bouwer, H. 1989. The Bouwer and Rice slug test--an update, Ground Water, vol. 27, no. 3, pp. 304-309.

Bouwer, H. and R.C. Rice 1976. A slug test method for determining hydraulic conductivity of unconfined aquifers with completely or partially penetrating wells, Water Resources Research, vol. 12, no. 3, pp. 423-428.

Calabrese, E. J. and L. A. Baldwin 1993. Performing Ecological Risk Assessments. Chelsea, MI: Lewis Publishers.

Clausing, P. et al. 1987. A method for estimating soil ingestion in children. Int Arch Occup Environ Med 59: 73-82.

Damron 1975. Damron, B.L., and H.R. Wilson. Lead Toxicity of Bobwhite Quail. Bull. Environ. Contam. Toxicol. V14 (4):489-496.

Davis, S. and D.K. Mirick 2006. Soil ingestion in children and adults in the same family. J Exp Sci Environ Epidemol 16: 63-75.

DOI 1965. Feasibility Study, Tinicum Marsh Area, Delaware County, Pennsylvania, U.S. Department of the Interior Fall 1965.

Ecology and Environment 1980. An On-Site Inspection of Folcroft Dump Site, Field Investigations of Uncontrolled Hazardous Waste Sites, FIT Project, TDD #F3-8008-01, USEPA # PA-34, undated (inspection completed October 1980).

Efroymson 1997a. Efroymson, Will and Suter. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision prepared for the U.S. Department of Energy. ES/ER/TM-126/R2.

Efroymson 1997b. Efroymson, Will, Suter and Wooten. Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision prepared for the U.S. Department of Energy. ES/ER/TM-85/R3.

FWS 1978. Final Environmental Assessment on Proposed Acquisition of Lands and Implementation of a Master Plan for the Tinicum National Environmental Center, U.S. Fish and Wildlife Service, 1978.

FWS 1988. Information provided from flora and fauna investigation conducted by the U.S. Fish and Wildlife Service in the summer of 1988.

FWS 1997. Draft Remedial Action Plan, United States Fish and Wildlife Service John Heinz National Refuge at Tinicum, Delaware County, Pennsylvania, May 1997.

FWS 2001. Chemical Analysis of Groundwater Samples from the Folcroft Landfill and Annex, John Heinz National Refuge at Tinicum, 1988-2001, U.S. Fish and Wildlife Service, December 2001.

FWS 2003. Comments on the Revised RI/FS Work Plan for Folcroft Landfill, prepared by Robert Allen, U.S. Fish and Wildlife Service, December 2003.

FWS 2007. Flora and Fauna Species of John Heinz Refuge Landfill Prepared by Linda Kelly" for the U.S. Fish and Wildlife Service, 2007.

Golder 2005. Response to USEPA Comments on Revised RI/FS Work Plan, Golder Associates Inc., September 2005.

Golder 2006a. Remedial Investigation/Feasibility Study Work Plan, Folcroft Landfill and Annex, Golder Associates Inc., November 2006.

Golder 2006b. Sampling and Analysis Plan/Quality Assurance Plan For The Remedial Investigation/ Feasibility Study Work Plan, Folcroft Landfill/Annex, Lower Darby Creek, Golder Associates Inc., November 2006.

Golder 2008a. Interim Submittal for the Folcroft Landfill and Annex Baseline Human Health Risk Assessment (BHRRA), Golder Associates Inc., July 2008.

Golder 2008b. Interim Deliverable for the Folcroft Landfill and Annex Screening Level Ecological Risk Assessment (SLERA), Golder Associates Inc., November 2008.

Golder 2009a. Response to USEPA's November 6, 2008 comments of the BHHRA Interim Submittal, Golder Associates Inc., March 2009.

Golder 2009b. Response to USEPA's July 28, 2009 additional comments on the BHHRA Interim Submittal, Golder Associates Inc., November 2009.

Golder 2010a. Response to USEPA's August 12, 2009 comments of the SLERA Interim Submittal, Golder Associates Inc., January 2010.

Golder 2010b. Remedial Investigation Report, Folcroft Landfill and Annex Remedial Investigation/Feasibility Study, Golder Associates Inc., May 2010.

Golder 2011a. Responses to USEPA's November 2010 Comments on the Remedial Investigation Report Folcroft Landfill and Annex Site, Folcroft, Pennsylvania, Golder Associates Inc., June 28, 2011.

Golder 2011b. Letter proposing scope of work for additional groundwater investigations to address USEPA and PADEP concerns related to 1,4-dioxane concentrations at the perimeter of the Folcroft Landfill, Golder Associates Inc., July 18, 2011.

Golder 2011c. Letter proposing revised scope of work for additional groundwater investigations to address USEPA and PADEP concerns related to 1,4-dioxane concentrations at the perimeter of the Folcroft Landfill, Golder Associates Inc., October 12, 2011.

Golder 2011d. Letter proposing final revised scope of work for additional groundwater investigations to address USEPA and PADEP concerns related to 1,4-dioxane concentrations at the perimeter of the Folcroft Landfill, Golder Associates Inc., December 21, 2011.

Golder 2011e. Letter transmitting final revised groundwater investigation scope of work and documenting that the additional groundwater investigations are a non-minor modification to the RI/FS Work Plan and have been made in mutual agreement between the Settling Parties and the USEPA, Golder Associates Inc., December 21, 2011.

Golder 2012a. Responses to USEPA's August 2011 Comments on the Remedial Investigation Report, Golder Associates Inc., March 23, 2012.

Golder 2012b. Supplemental Air Monitoring Work Plan, Folcroft Landfill and Annex Remedial Investigation/ Feasibility Study, Golder Associates Inc., May 2012.

Golder 2012c. Initial Screening Results and Recommendations, Additional Groundwater Investigations, Golder Associates Inc., February 29, 2012.

Golder 2012d. Additional Groundwater Investigation Data Summary Report, Folcroft Landfill and Annex Remedial Investigation/Feasibility Study, Golder Associates Inc., August 2012.

Golder 2013a. Supplemental Ambient Air Monitoring Summary Report, Golder Associates Inc., February 27, 2013.

Golder 2013b. Final Work Plan, Offsite Groundwater Investigations, Folcroft Landfill and Annex Remedial Investigation/Feasibility Study, Golder Associates Inc., August 2013.

Golder 2014a. Off-Site Groundwater Investigation Report, Folcroft Landfill and Annex Site Remedial Investigation/Feasibility Study, Golder Associates Inc., November 11, 2014.

Golder 2014b. Phase 1 Results and Recommended Additional Borings, Groundwater Screening, and Phase 2 Well Locations Folcroft Landfill and Annex Site Remedial Investigation/Feasibility Study, Golder Associates Inc., April 2014.

Golder 2015. Appended Work Plan for a Limited Bedrock Groundwater Investigation, Folcroft Landfill and Annex Site Remedial Investigation/Feasibility Study, Golder Associates Inc., May 2015.

Golder 2016a. Expanded Groundwater Study Summary Results, Folcroft Landfill and Annex Site Remedial Investigation/Feasibility Study, Golder Associates Inc., September 19, 2016.

Golder 2016b. Progress Report – March 2016 Reporting Period, Folcroft Landfill & Annex Site, Folcroft, Pennsylvania, Golder Associates Inc., April 18, 2016.

Golder 2017a. Revised Off-Site Groundwater Investigation Report, Folcroft Landfill and Annex Site Remedial Investigation/Feasibility Study, Golder Associates Inc., January 18, 2017.

Golder 2017b. Updated Revised Off-Site Groundwater Investigation Report, Folcroft Landfill and Annex Site Remedial Investigation/Feasibility Study, Golder Associates Inc., May 19, 2017.

Golder 2017c. Revised Remedial Investigation Report, Folcroft Landfill and Annex Site Remedial Investigation/Feasibility Study, Golder Associates Inc., May 19, 2017.

Golder 2018. Response to Comments on May 2017 Revised Remedial Investigation Report, Folcroft Landfill and Annex Site, Operable Unit 2, Lower Darby Creek Area Superfund Site, Golder Associates Inc., April 16, 2018.

Hvorslev, M. 1951, Time lag and soil permeability in groundwater observations. Bull. Waterways Experiment Station, US Army Corps of Engineers, Vicksburg, w. 38, 50 pp.

Greenman, D.W., D.R. Rima, W.N. Lockwood, and H. Meisler 1961. Ground Water Resources of the Coastal Plain Area of Southeastern Pennsylvania, Pennsylvania Geological Survey Bulletin W 13.

Low, Dennis J.; Hippe, Daniel J.; Yannacci, Dawna 2002. Geohydrology of southeastern Pennsylvania, USGS Water-Resources Investigations Report 00-4166.

NTP (National Toxicology Program). 2016. Report on Carcinogens, Fourteenth Edition. Research Triangle Park, NC. U.S. Department of Health and Human Services, Public Health Service.

NUS Corporation 1985. Site Inspection of Tinicum Environmental Center, TDD No. F3-8308-07, USEPA No. PA-817, Contract No. 68-01-6699, March.

Opresko, D.M., Sample, B.E., and G.W. Suter 1993. Toxicological Benchmarks for Wildlife. Oak Ridge, TN: Oak Ridge National Laboratory. ES/ER/TM-86.

PADER 1990. Letter from Pennsylvania Department of Environmental Resources to Dick Nugent, TNEC, dated September 18, 1990.

PADER 1996. John Heinz National Wildlife Refuge At Tinicum Complex, Philadelphia, Pennsylvania, Annual Narrative Report, Pennsylvania Department of Environmental Resources, Calendar Year 1996.

Pennsylvania Geologic Survey 2001. Bedrock Geology of Pennsylvania, Edition: 1.0, Digital Map, 2001, Pennsylvania Department of Conservation and Natural Resources, Bureau of Topographic and Geologic Survey, Retrieved from internet 9-30-2004.

PWD 2000. Draft Technical Memorandum No. 1 Historical Water Quality for the Darby and Cobbs Creek Watersheds, Philadelphia Water Department, February 2000.

RAE Systems 2004. Comparison of Photoionization Detectors (PIDs) and Flame Ionization Detectors (FIDs), Application Note AP-226, rev 2, January 2004.

Roberts SM, Weimar WR, Vinson JRT, Munson JW and RJ Bergeron 2002. Measurement of Arsenic Bioavailability in Soil Using a Primate Model. Tox Sci 67: 303-310.

Roberts SM, Munson JW, Lowney YW, and MV Ruby 2007. Relative Oral Bioavailability of Arsenic from Contaminated Soils Measured in Cynomolgus Monkeys. Tox Sci 95(1): 281-288.

Sample 1996. Sample, B.E., D.M. Opresko, and G.W. Suter II. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory. ES/ER/TM-86/R3.

Sample 1998. Sample, B.E., Beauchamp, J.J., Efroymson, R.A., Suter II, G.W., and Ashwood, T.L.. Development and Validation of Bioaccumulation Models for Earthworms. Oak Ridge National Laboratory. ES/ER/TM-220.

SMC-Martin 1979a. Environmental Evaluation of Folcroft Landfill, Delaware County, PA, Final Report, November 1979.

SMC-Martin 1979b. Revegetation Investigation of Folcroft Landfill, Delaware County, PA, November 1979.

Stanek, E.J. and E.J. Calabrese, 1995. Soil ingestion estimates for use in site evaluation based on the best tracer method. HERA 1(2): 133-156.

Tetra Tech EM Inc. 2000. Final Hazard Ranking System Documentation Record, Lower Darby Creek Area, Delaware and Philadelphia Counties, Pennsylvania, Technical Directive Document 03-9908-0002, USEPA Contract No. 68-S5-3002, April 2000.

Tetra Tech/Black & Veatch 2002. Final Work Plan, Remedial Investigation and Feasibility Study, Lower Darby Creek Area Including Parts of Folcroft and Eastwick, Delaware and Philadelphia Counties, Pennsylvania, Work Assignment No. 029-RICO-D366, Contact 68-S7-3002, February 2002.

USEPA 1983, CERCLA-EPA Region III Immediate Removal Action, Tinicum National Environmental Center, Folcroft, PA, On-Scene Coordinator's Report, U.S. Environmental Protection Agency, 1983

USEPA 1984. "Site Analysis, Tinicum Marsh Environmental Center, Folcroft, Pennsylvania", Environmental Photograph Interpretation Center, U.S. Environmental Protection Agency, May 1984.

USEPA 1985. Review and Approvals, Tinicum National Environmental Center, Philadelphia, Pennsylvania, Annual Narrative Report, U.S. Environmental Protection Agency, Calendar Year 1986.

USEPA 1986. "An Investigation of Potential Environmental Hazards at Tinicum Environmental Center," U.S. Environmental Protection Agency prepared jointly with U.S. Fish and Wildlife Service, September 1986.

USEPA 1989a. "Site Investigation Report for the Folcroft Landfill and Tinicum Marsh," U.S. Environmental Protection Agency completed in conjunction with U.S. Fish and Wildlife Service, September 1989.

USEPA 1989b. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A). USEPA/540/1-89/002. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C., December 1989.

USEPA 1991a. "Conducting Remedial Investigation/Feasibility Studies for CERCLA Municipal Landfill Sites," USEPA/540/P-91/001, U.S. Environmental Protection Agency, February 1991.

USEPA 1991b. Human health evaluation manual, supplemental guidance: Standard default exposure factors. OSWER Directive 9285.6-03. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C., March 1991.

USEPA 1991c. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. OSWER Directive 9355.0-30. U.S. Environmental Protection Agency, April 1991.

USEPA 1991d. Ecological Assessment of Superfund Sites: An Overview, ECO Update Intermittent Bulletin, Volume 1, Number 2, U.S. Environmental Protection Agency, December 1991.

USEPA 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. OSWER 9285.7-08I. U.S. Environmental Protection Agency, May 1992.

USEPA 1993. Wildlife Exposure Factors Handbook, U.S. Environmental Protection Agency, 1993.

USEPA 1994. Guidance Manual for the IEUBK Model In Children. Office of Solid Waste and Emergency Response. Washington, D.C. PB93-963510, U.S. Environmental Protection Agency, February 1994.

USEPA 1995. USEPA Region III BTAG Screening Levels, U.S. Environmental Protection Agency, 1995.

USEPA 1997a. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. Interim Final. USEPA/540-R-97-006, U.S. Environmental Protection Agency, June 1997.

USEPA 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater, U.S. Environmental Protection Agency, September 1998.

USEPA 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities, EPA530-D-99-001A, U.S. Environmental Protection Agency, 1999.

USEPA 2000a. Bioaccumulation Testing and Interpretation for the Purposes of Sediment Quality Assessment. USEPA/823/R 00/001, U.S. Environmental Protection Agency, Office of Water, Office of Solid Waste, February 2000.

USEPA 2000b. Great Lakes Ecosystem Report 2000. EPA-905-R-01-001, U.S. Environmental Protection Agency, December 2000.

USEPA 2001a, "NPL Listing Package for the Lower Darby Creek Area Delaware and Philadelphia Counties, Pennsylvania," U.S. Environmental Protection Agency, June 2000.

USEPA 2001b. Review of Adult Lead Models Evaluation of Models for Assessing Human Health Risks Associated with Lead Exposures at Non-Residential Areas of Superfund and Other Hazardous Waste Sites. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. OSWER 9285.7-46, August 2001.

USEPA 2002a. Draft Administrative Order on Consent for Remedial Investigation/Feasibility Study for the Folcroft Landfill and Folcroft Landfill Annex Components of the Lower Darby Creek Area Superfund Site," U.S. Environmental Protection Agency, August 2002.

USEPA 2002b. Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, OSWER 9285.7-41, U.S. Environmental Protection Agency, September 2002.

USEPA 2002c. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10, U.S. Environmental Protection Agency, December 2002.

USEPA 2002d. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24, U.S. Environmental Protection Agency, December 2002.

USEPA 2003a. Recommendations of the Technical Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil. Technical Review Workgroup for Lead. USEPA/540/R/03/001, U.S. Environmental Protection Agency, January 2003.

USEPA 2003b. Updated Dermal Exposure Guidance. Region 3 Technical Guidance Manual, Risk Assessment, U.S. Environmental Protection Agency, June 2003.

USEPA 2003c. Ecological Soil Screening Level for Aluminum. Interim Final, U.S. Environmental Protection Agency, November 2003.

USEPA 2003d. Ecological Soil Screening Level for Antimony. Interim Final, U.S. Environmental Protection Agency, November 2003.

USEPA 2004. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final USEPA/540/R/99/005, U.S. Environmental Protection Agency, July 2004.

USEPA 2005a. USEPA Region 8 Review Draft: Estimation of Relative Bioavailability of Arsenic in Soil and Soil-like Materials by In Vivo and In Vitro Methods. Denver, CO, U.S. Environmental Protection Agency, March 2005.

USEPA 2005b. Guidelines for Carcinogen Risk Assessment. Risk Assessment Forum. USEPA/630/P-03/001F, U.S. Environmental Protection Agency, March 2005.

USEPA 2006a. Data Quality Assessment: Statistical Methods for Practitioners, EPA QA/G-9S. EPA/240/B-06/003, U.S. Environmental Protection Agency, February 2006.

USEPA 2006b. National Recommended Water Quality Criteria. Washington, D.C.: USEPA, Office of Water, Office of Science and Technology, U.S. Environmental Protection Agency, 2006.

USEPA 2006c. Terminology Reference System result for “bioaccumulation”. Washington, D.C.: EPA, Office of Science and Technology, U.S. Environmental Protection Agency, 2006.

USEPA 2007a. User’s Guide for the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) Windows®. U.S. Environmental Protection Agency, Office of Superfund Remediation and Technology Innovation. EPA 9285.7-42, May 2007.

USEPA 2007b. USEPA Region III BTAG Freshwater Screening Benchmarks, U.S. Environmental Protection Agency, 2007.

USEPA 2007c. Estimating the Soil Lead Concentration Term for the Integrated Exposure Uptake Biokinetic (IEUBK) model. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. OSWER 9200.1-78. September 2007.

USEPA 2007d. Guidance for Developing Ecological Soil Screening Levels: Attachment 4-1: Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. OSWER Directive 9285.7-55, U.S. Environmental Protection Agency, April 2007 revision.

USEPA 2008a. Letter to Dawn Ewing of Korman Suites from Kristine Matzko of USEPA. RE: Results of Soil Sampling in April 2007 by EPA, U.S. Environmental Protection Agency, May 2008.

USEPA 2008b. Letter to Robert J. Allen of John Heinz National Refuge at Tinicum from Kristine Matzko of USEPA. RE: Results of Background Soil Sampling from Refuge for Clearview Landfill RI/FS Lower Darby Creek Superfund Site, Delaware and Philadelphia Counties, PA, U.S. Environmental Protection Agency, May 2008.

USEPA 2009a. National Primary Drinking Water Regulations. USEPA/816/F/09/004, U.S. Environmental Protection Agency, May 2009.

USEPA 2009b. Risk Assessment Guidance for Superfund (RAGS), Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) Final USEPA/540/R/070/002, U.S. Environmental Protection Agency, January 2009.

USEPA 2009c. Update of the Adult Lead Methodology's Default Baseline Blood Lead Concentrations and Geometric Standard Deviation Parameters. Lead Committee of the Technical Review Workgroup for Metals and Asbestos. OSWER 9200.2-82. U.S. Environmental Protection Agency, June 2009.

USEPA 2009d. Handbook for Implementing the Supplemental Cancer Guidance at Waste and Cleanup Sites. "Cancer Risk Calculations". Available at http://www.epa.gov/oswer/riskassessment/sghandbook/riskcalcs.htm#pahs. U.S. Environmental Protection Agency, last updated October 1, 2009.

USEPA 2010a. Review of Draft Remedial Investigation Report, Folcroft Landfill and Annex, Operable Unit 2 – Lower Darby Creek Area Superfund Site, May 2010, U.S. Environmental Protection Agency, November 19, 2010.

USEPA 2010b. Recommended Toxicity Equivalence Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Dioxin Like Compounds. Risk Assessment Forum. EPA/100/R-10/005. U.S. Environmental Protection Agency, December 2010.

USEPA 2010c. Integrated Exposure Uptake Biokinetic (IEUBK) Model for Lead in Children (version 1.1, build 11), U.S. Environmental Protection Agency, February 2010.

USEPA 2011a. Review of the Response to USEPA Comments on the May 2010 Draft Remedial Investigation Report for the Folcroft Landfill and Annex Site, Folcroft Landfill and Annex, Operable Unit 2 – Lower Darby Creek Area Superfund Site, June 2011, U.S. Environmental Protection Agency, August 18, 2011.

USEPA 2011b. Email providing technical comments on the additional groundwater investigation proposal, U.S. Environmental Protection Agency, August 11, 2011.

USEPA 2011c. Review of Revised Draft Additional Groundwater Investigations Scope of Work, Folcroft Landfill and Annex, Operable Unit 2 – Lower Darby Creek Area Superfund Site, October 12, 2011, U.S. Environmental Protection Agency, December 3, 2011.

USEPA 2011d. USEPA approval of additional groundwater investigations and concurrence with the non-minor modification to the RI/FS Work Plan, U.S. Environmental Protection Agency, December 22, 2011.

USEPA 2011e. Exposure Factors Handbook. EPA/600/R-09/052F. U.S. Environmental Protection Agency, October 2011.

USEPA 2012a. Review of the Response to US EPA Comments on the Remedial Investigation Report, Folcroft Landfill and Annex, Operable Unit 2 – Lower Darby Creek Area Superfund Site, March 23, 2012, U.S. Environmental Protection Agency, May 21, 2012.

USEPA 2013. EPA Approval of Final Work Plan, Offsite Groundwater Investigations, Folcroft Landfill and Annex Remedial Investigation/Feasibility Study, Operable Unit 2 – Lower Darby Creek Area Superfund Site, August 30, 2013, U.S. Environmental Protection Agency, September 6, 2013.

USEPA 2014a. Review of the Off-Site Groundwater Investigation Report, for the Folcroft Landfill and Annex Site, Operable Unit 2 – Lower Darby Creek Area Superfund Site, November 25, 2014, U.S. Environmental Protection Agency, December 31, 2014.

USEPA 2014b. Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors. OSWER Directive 9200.1-120. Last updated November 2015. Available at https://www.epa.gov/sites/production/files/2015-11/documents/oswer_directive_9200.1-120_exposurefactors_corrected2.pdf, U.S. Environmental Protection Agency, 2014.

USEPA 2015. Review of the Response to USEPA Comments, Proposed Work Plan for a Limited Bedrock Groundwater Investigation, for the Folcroft Landfill and Annex Site Remedial Investigation/Feasibility Study, Operable Unit 2 – Lower Darby Creek Area Superfund Site, May 4, 2015, U.S. Environmental Protection Agency, May 6, 2015.

USEPA 2016a. EPA Comments - EXPANDED GROUNDWATER STUDY SUMMARY RESULTS Letter, 9/19/16, Folcroft Landfill and Annex, Lower Darby Creek Area Superfund Site, email from U.S. Environmental Protection Agency, November 1, 2016.

USEPA 2016b. Regional Screening Levels tables and Users Guide. Last updated May, 2016. Available at: https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables-may-2016, U.S. Environmental Protection Agency, last updated May, 2016.

USEPA 2016c. Vapor Intrusion Screening Level Tables. Available at: https://www.epa.gov/vaporintrusion, U.S. Environmental Protection Agency, last updated June 2016.

van der Kamp, Garth 1976. Determining Aquifer Transmissivity by Means of Well Response Tests: The Underdamped Case: Water Resources Research, v. 12(1), 71–77 p.

VDEQ (Virginia Department of Environmental Quality). 2018. Virginia Unified Risk Assessment Model (VURAM). Available at: http://www.deq.virginia.gov/Programs/LandProtectionRevitalization/RemediationProgram/RiskAssessment.aspx

Weston 1999. Sampling Trip Report, Lower Darby Creek Area, Delaware and Philadelphia Counties, PA, August 1999.

World Health Organization 2006. The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds. TOXICOLOGICAL SCIENCES 93(2), 223–241 (2006). July 7, 2006. Available at https://semspub.epa.gov/work/03/2218791.pdf.

TABLE 2-1
SUMMARY OF HISTORIC SURFACE SOIL ANALYTICAL RESULTS - ORGANIC AND INORGANIC COMPOUNDS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Sample ID	Detection Limits	SSC	FOL-1	FOL-2	FOL-3	FOL-4	FOL-5	ANN-1	ANN-2	ALS
Sampling Date		Week of 7/25/88	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 7/25/88
Organic Compounds (µg/kg)										
Chlorobenzene	6	ND	ND	ND	ND	ND	ND	ND	ND	33
Naphthalene	390	ND	DB	DB	DB	ND	7,900	ND	1300	ND
2-Methyl naphthalene	390	ND	DB	DB	DB	ND	16,000	ND	1400	ND
Acenaphthene	390	ND	DB	DB	ND	ND	DB	DB	1200	ND
Fluorene	390	ND	ND	DB	ND	ND	2,300	DB	1600	ND
Phenanthrene	390	ND	DB	2,400	DB	DB	12,000	520	10,000	DB
Anthracene	390	ND	ND	DB	DB	ND	DB	DB	2,200	ND
Fluoranthene	390	ND	DB	5,300	DB	DB	3,100	650	11,000	DB
Pyrene	390	ND	DB	4,000	DB	DB	8,300	590	5,400	DB
Benzo(a)anthracene	390	ND	DB	2,100	ND	DB	2,800	DB	3,600	DB
Chrysene	390	ND	DB	2,500	ND	DB	3,100	DB	4,000	DB
Benzo(b)fluoranthene	390	ND	DB	2,400	ND	DB	DB	DB	4,700	DB
Benzo(k)fluoranthene	390	ND	DB	2,300	ND	DB	DB	DB	2,900	DB
Benzo(a)pyrene	390	ND	DB	2,300	ND	DB	DB	DB	3,500	DB
Indeno (1,2,3-cd) pyrene	390	ND	ND	DB	ND	DB	DB	DB	740	ND
Benzo(g,h,I)perylene	390	ND	DB	DB	DB	DB	DB	DB	880	ND
dibenzofuran	390	ND	DND	DB	ND	DB	ND	ND	1,500	ND
4,4'-DDE	117	ND	ND	ND	ND	4,200	ND	ND	ND	ND
4,4'-DDT	118	ND	240	ND	150	ND	ND	ND	ND	ND
Lindane	59	ND	DB	ND	ND	1,030	61.3	ND	DB	ND

SUMMARY OF HISTORIC SURFACE SOIL ANALYTICAL RESULTS - ORGANIC AND INORGANIC COMPOUNDS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Sample ID / **Sampling Date**	**Detection Limits**	**SSC**	**FOL-1**	**FOL-2**	**FOL-3**	**FOL-4**	**FOL-5**	**ANN-1**	**ANN-2**	**ALS**
		Week of 7/25/88	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 11/3/1987	Week of 7/25/88
Inorganic Compounds (mg/kg)										
Antimony	0.006	ND	3.4	1.0	3.3	3.7	3.4	4.1	2.4	NA
Copper	0.01	30	149	209	167	178	84.3	135	36.3	NA
Lead	0.002	62.5	376	650	472	210	219	132	33	NA
Magnesium	0.01	1660	4630	3350	4380	3560	2700	5,540	4570	NA
Mercury	0.0002	0.21	ND	0.6	1.6	3.1	1.1	ND	0.04	NA
Selenium	0.003	ND	2.9	2.8	4	3.7	1.7	2.5	1.7	NA
Silver	0.01	ND	ND	2.5	12.5	ND	2.4	ND	ND	NA
Vanadium	0.01	14.3	41	38.8	40.2	32.3	43.0	44.9	57.1	NA
Zinc	0.01	105	295	882	261	244	216	249	111	NA

Notes:

All data from 1989 USEPA Site Inspection Report.

Only compounds with detected concentrations are included in this table

ALS- Surface soil sample collected near leachate seep

ANN- Folcorft Annex

DB- Detected below the quantifiable limit

FOL- Folcroft Landfill

NA- Not analyzed

ND- None detected

SSC- Control site, background

*- these pesticides may be present as a result of routine application, therefore their presence is not attributed to waste disposed of in the landfill.

Golder Associates

SUMMARY OF HISTORIC GROUNDWATER ANALYTICAL RESULTS - VOCs AND SVOCs
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Monitoring Well	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
1,1-Dichloroethane, ug/l	MW-1	ND	ND	2	25	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-2	8	10	17	ND	ND	11	ND	ND	2.07 J	ND	3.08J	3.36J	ND
	MW-3	ND	ND	20	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-5	ND	ND	ND	ND	ND	ND	1.6	1.12 J	ND	ND	ND	ND	ND
1,1-Dichloroethene, ug/l	MW-1	ND			17	2.5	ND			ND				
	MW-2	ND			ND	25	10			9.61				
	MW-3	ND			ND	ND	ND			ND				
	MW-4	ND			ND	ND	ND			ND				
	MW-5	ND			ND	ND	ND			ND				
1,2-Dichloroethene, total, ug/l	MW-1	17	ND		348	ND	ND	37.3	34.88		ND	ND	ND	
	MW-2	195	67		ND	ND	ND	510	211		92.4	ND	ND	
	MW-3	71	ND		ND	ND	ND	ND	ND		ND	ND	ND	
	MW-4	ND	ND		ND	ND	ND	ND	ND		ND	ND	ND	
	MW-5	ND	ND		ND	ND	ND	6.2	6.23		1.65 J	ND	ND	
2,2-Dichloroethene, ug/l	MW-1			ND										
	MW-2			16										
	MW-3			ND										
	MW-4			ND										
	MW-5			ND										
Acenaphthene, ug/l	MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-5	19	1.9 J	8.0 J	2.0 J	ND	ND	ND	1.38 J	ND	ND	1.08J	ND	ND
Acetone, ug/l	MW-1	1.0 B,J			42.0 J		5.3 B							
	MW-2	26.0 B			ND		10.0 B							
	MW-3	14.0 B			58.0 J		15.0 B							
	MW-4	5.0 B			ND		ND							
	MW-5	24.0 B,J			ND		11.0 B							
Anthracene, ug/l	MW-1	ND			ND		ND			ND				
	MW-2	DL			ND		ND			ND				
	MW-3	ND			ND		ND			ND				
	MW-4	ND			ND		ND			ND				
	MW-5	ND			ND		ND			ND				
Benzene, ug/l	MW-1	ND	2.5	ND	5.6 J	ND	2.5	2.4	2.38	1	ND	1.73J	52.2	ND
	MW-2	25	17	21	2.5	10.5	6.3	8.2	4.68	4.8	1.4	5.7	4.48J	4.2
	MW-3	245	430	20	699	370	170	140	89.8	61.2	ND	63.6	1.19J	43
	MW-4	ND	8.2	ND	2.5	ND	2.5	0.5	0.5	4.91	80.4	ND	ND	ND
	MW-5	ND	2.5	ND	2.5	2.1	2.5	0.5	0.5	0.5	ND	ND	ND	ND

	Monitoring Well	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
Benzoic acid, ug/l	MW-1	ND					ND							
	MW-2	ND					ND							
	MW-3	ND					ND							
	MW-4	ND					ND							
	MW-5	ND					ND							
bis(2-ethylhexyl)phthalate, ug/l	MW-1	ND			ND		ND			1.59 J,B				
	MW-2	ND			17.0 B		ND			1.54 J,B				
	MW-3	ND			11.0 B		ND			1.81 J,B				
	MW-4	ND			9.0 B,J		ND			2.81 J,B				
	MW-5	ND			9.0 B,J		11			1.49 J,B				
Carbon disulfide, ug/l	MW-1	ND			7.4 J		ND							
	MW-2	ND			ND		ND							
	MW-3	ND			ND		ND							
	MW-4	ND			ND		ND							
	MW-5	ND			ND		ND							
Chlorobenzene, ug/l	MW-1	ND	2.2 J	ND	ND	8.1	8	14	11.1	2	5.18	18.4	425	12
	MW-2	ND	4.4 J	21	3.8 J	6	12	18	19	16.8	4.91	15.6	13	10
	MW-3	660	1180	10	1220	1200	770	880	588	413	ND	413	16.8	350
	MW-4	ND	ND	ND	ND	ND	2.5	0.5	1	39.4	526	ND	ND	ND
	MW-5	15	6.2	17	ND	10	8.3	8.6	7.25	1	5.17	5.46	6.02	3
Chloroform, ug/l	MW-1	ND			ND		ND			ND				
	MW-2	ND			ND		ND			ND				
	MW-3	ND			ND		ND			ND				
	MW-4	ND			ND		ND			ND				
	MW-5	ND			7.7		ND			ND				
Di-n-butylphthalate, ug/l	MW-1	ND			2.0 B,J		ND			ND				
	MW-2	ND			1.0 B,J		ND			ND				
	MW-3	ND			1.0 B,J		ND			ND				
	MW-4	ND			1.0 B,J		ND			ND				
	MW-5	ND			2.0 B,J		ND			ND				
Dibenzofuran, ug/l	MW-1	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
	MW-2	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
	MW-3	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
	MW-4	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
	MW-5	17	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
Diethylphthalate, ug/l	MW-1	ND			ND		ND			ND				
	MW-2	ND			ND		ND			ND				
	MW-3	ND			ND		ND			ND				
	MW-4	ND			ND		ND			ND				
	MW-5	ND			ND		ND			ND				

SUMMARY OF HISTORIC GROUNDWATER ANALYTICAL RESULTS - VOCs AND SVOCs
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Monitoring Well	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
Ethylbenzene, ug/l	MW-1	ND			ND	ND	ND			ND				
	MW-2	ND			ND	ND	ND			ND				
	MW-3	ND			ND	ND	ND			ND				
	MW-4	ND			ND	ND	ND			ND				
	MW-5	ND			ND	ND	ND			ND				
Fluoranthene, ug/l	MW-1	ND			ND		ND			ND				
	MW-2	ND			ND		ND			ND				
	MW-3	ND			ND		ND			ND				
	MW-4	ND			ND		ND			ND				
	MW-5	ND			4.0 J		ND			1.83 J				
Fluorene, ug/l	MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-5	16	ND	4.8 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride, ug/l	MW-1	4.7 J			ND	ND	ND			ND				
	MW-2	7			ND	ND	ND			ND				
	MW-3	5.0J			14.0 B,J	ND	ND			ND				
	MW-4	2.0J			ND	ND	ND			ND				
	MW-5	9			ND	ND	ND			ND				
Napthalene, ug/l	MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-2	32	ND	7.8 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-3	ND	2.8 J	2.6 J	2.0 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-5	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene, ug/l	MW-1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-5	29	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pyrene, ug/l	MW-1	ND			ND		ND			ND				
	MW-2	ND			ND		ND			ND				
	MW-3	ND			ND		ND			ND				
	MW-4	ND			ND		ND			ND				
	MW-5	ND			2.0 J		ND			1.07 J				
Trichloroethene, ug/l	MW-1	ND	2.5	9	ND	19	19	12	12.4	2.96	ND	ND	ND	ND
	MW-2	5	6.2	29	ND	120	59	87	17.6	11.4	7.25	25.5	10.8	38
	MW-3	ND	ND	50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 2-2
SUMMARY OF HISTORIC GROUNDWATER ANALYTICAL RESULTS - VOCs AND SVOCs
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Monitoring Well	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
Vinyl Chloride, ug/l	MW-1	ND	5	11	ND	27	ND	15	13.6	6.98 J	ND	4.35J	ND	ND
	MW-2	28	38	68	ND	300	620	230	186	160	62.3	189	94.5	110
	MW-3	18.0 J	ND	250	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	MW-5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene, ug/l	MW-1	ND	2.5	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
	MW-2	61	29	6	ND	ND	ND	ND	ND		ND	ND	ND	ND
	MW-3	ND	120	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
	MW-4	ND	12	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND
	MW-5	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND	ND

Notes:

- Data summary provided by FWS; not checked against original lab reports.

- 1999 Results reported for MW-3 and MW-4 may have been switched based on inconsistencies noted in the FWS Report "Chemical Analysis of Groundwater Samples from the Folcroft Landfill and Annex, John Heinz National Wildlife Refuge at Tinicum, 1988-1999" (June 8, 2000)

ND = Non-detect
B = Probable blank contamination
J = Estimated value

TABLE 2-3
SUMMARY OF HISTORIC GROUNDWATER ANALYTICAL RESULTS - METALS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Monitoring Well	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
Aluminum, mg/l	MW-1	1.85												
	MW-2	2.13												
	MW-3	1.87												
	MW-4	2.15												
	MW-5	1.92												
Antimony, mg/l	MW-1	ND												
	MW-2	ND												
	MW-3	ND												
	MW-4	ND												
	MW-5	ND												
Arsenic, mg/l	MW-1	0.009	0.025	0.012	0.025	0.02	0.014	0.016	0.023	0.0172	0.0031	0.0087	0.0886	0.0188
	MW-2	0.0025	0.025	0.066	0.025	0.0067	0.011	0.01	0.015	0.0205	0.001	0.0024	0.0165	0.0184
	MW-3	0.03	0.025	0.005	0.025	0.1	0.094	0.075	0.094	0.0876	0.001	0.001	0.0232	0.08
	MW-4	ND	0.025	0.005	0.025	0.0066	0.033	0.0025	0.0048	0.005	0.0131	0.0332	0.02	ND
	MW-5	0.009	0.025	0.005	0.025	0.012	0.005	0.008	0.0087	0.005	0.001	0.0042	0.0068	0.00602
Barium, mg/l	MW-1	0.6												
	MW-2	0.7												
	MW-3	0.4												
	MW-4	ND												
	MW-5	0.3												
Beryllium, mg/l	MW-1	ND												
	MW-2	ND												
	MW-3	ND												
	MW-4	ND												
	MW-5	ND												
Cadmium, mg/l	MW-1	ND	0.012	ND	ND	ND	ND	ND	ND	ND	0.00196			ND
	MW-2	ND	0.005	ND	ND	ND	ND	ND	ND	ND	0.00269			ND
	MW-3	ND	0.005	ND	ND	ND	ND	ND	ND	ND	0.00107			ND
	MW-4	ND	0.005	ND	ND	ND	ND	ND	ND	ND	0.00069			ND
	MW-5	ND	0.005	ND	ND	ND	ND	ND	ND	ND	0.00098			ND

TABLE 2-3
SUMMARY OF HISTORIC GROUNDWATER ANALYTICAL RESULTS - METALS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Monitoring Well	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
Calcium, mg/l	MW-1	83.5												
	MW-2	78.6												
	MW-3	81.3												
	MW-4	58.1												
	MW-5	36.9												
Chromium, mg/l	MW-1	0.02	0.025		0.025	ND	0.098	0.005	0.005	0.005	0.001			ND
	MW-2	0.01	0.025		0.025	ND	0.01	0.005	0.005	0.005	0.0025			ND
	MW-3	0.03	0.025		0.025	0.011	0.01	0.011	0.015	0.0125	0.001			ND
	MW-4	0.01	0.025		0.025	ND	0.283	0.005	0.005	0.005	0.0087			ND
	MW-5	0.06	0.025		0.025	ND	0.01	0.005	0.005	0.005	0.001			ND
Cobalt, mg/l	MW-1	0.03												
	MW-2	0.02												
	MW-3	0.03												
	MW-4	0.06												
	MW-5	ND												
Copper, mg/l	MW-1	0.02	0.025	ND	0.025	ND	0.039	ND	ND	ND	ND			ND
	MW-2	0.02	0.025	ND	0.025	ND	ND	ND	ND	ND	0.0033			ND
	MW-3	0.02	0.025	ND	0.025	ND	ND	ND	0.018	ND	0.0034			ND
	MW-4	0.03	0.025	ND	0.025	ND	0.159	ND	ND	ND	0.004			ND
	MW-5	0.02	0.025	ND	0.025	ND	ND	ND	ND	ND	ND			ND
Cyanide, total, ug/l	MW-1	ND	ND		ND	ND	ND	ND	ND	ND	ND			ND
	MW-2	ND	ND		ND	ND	ND	ND	ND	ND	ND			ND
	MW-3	20	ND		ND	ND	17	ND	ND	ND	ND			ND
	MW-4	ND	ND		ND	ND	ND	ND	ND	ND	ND			ND
	MW-5	ND	ND		ND	ND	ND	ND	ND	ND	ND			ND
Iron	MW-1	31.4	12	35.1	7.2	37	93.1	36	37	23.2	0.525			15
	MW-2	18.3	1.8	27	5.5	14	19.7	16	17	18.1	0.137			23
	MW-3	40.4	3.6	15	0.99	14	20.5	16	7.9	12.7	3.84			17
	MW-4	19.6	19	14.5	2.4	11	125	13	7.6	1.34	0.753			6.8
	MW-5	33.6	18	27	11	22	33.1	24	24	19.1	18.2			27

TABLE 2-3
SUMMARY OF HISTORIC GROUNDWATER ANALYTICAL RESULTS - METALS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Monitoring Well	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
Lead, mg/l	MW-1	ND	0.0025	ND	ND	ND	ND	ND	0.0027	0.0164	ND			ND
	MW-2	ND	ND	0.06	ND	ND	ND	ND	0.0026	0.0153	ND			ND
	MW-3	ND	ND	ND	ND	ND	ND	ND	ND	0.0057	ND			ND
	MW-4	ND	ND	ND	ND	ND	0.103	ND	ND	ND	ND			ND
	MW-5	ND	ND	ND	ND	ND	ND	ND	ND	0.0153	ND			ND
Magnesium, mg/l	MW-1	78.8												
	MW-2	110.6												
	MW-3	101.3												
	MW-4	27.9												
	MW-5	39.5												
Manganese, mg/l	MW-1	17.2	4.7	3.87	2.6	2.8	6.37	2	1.6	1.37	0.642			0.4
	MW-2	20.2	1.8	0.17	1.2	2.1	1.9	2.1	0.9	1.75	0.35			0.92
	MW-3	5.35	0.16	2.14	0.13	0.13	0.139	0.14	0.21	0.153	1.03			0.17
	MW-4	2.02	1.1	0.75	0.65	0.67	1.28	0.55	1.4	1.25	0.0713			0.76
	MW-5	3.2	2.5	3.2	2.5	2.6	1.98	3.2	3.6	2.25	3.37			3.4
Mercury, mg/l	MW-1	ND	0.0005	ND	ND	ND	ND	ND	0.00024	ND	ND			ND
	MW-2	ND	ND	ND	ND	ND	ND	ND	0.0002	ND	ND			ND
	MW-3	ND	ND	ND	ND	ND	ND	ND	0.0002	ND	ND			ND
	MW-4	ND	ND	ND	ND	ND	ND	ND	0.0001	ND	ND			ND
	MW-5	ND	ND	ND	ND	ND	ND	ND	0.0002	ND	ND			ND
Nickel, mg/l	MW-1	ND	0.025	ND	ND	ND	0.095	ND	0.044	0.0348	0.0499			0.082
	MW-2	0.06	0.067	ND	0.065	ND	0.074	0.051	0.093	0.069	0.0544			0.082
	MW-3	0.05	0.025	ND	ND	ND	ND	ND	0.021	ND	0.0112			ND
	MW-4	ND	0.025	ND	ND	ND	0.169	ND	ND	ND	0.0161			ND
	MW-5	ND	0.025	ND	ND	ND	ND	ND	ND	ND	ND			ND
Potassium, mg/l	MW-1	20.4												
	MW-2	46												
	MW-3	87.8												
	MW-4	9.38												
	MW-5	18.3												

TABLE 2-3
SUMMARY OF HISTORIC GROUNDWATER ANALYTICAL RESULTS - METALS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Monitoring Well	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
Selenium, mg/l	MW-1	ND	0.005	ND	0.005	ND	ND	ND	ND	0.0108	ND			ND
	MW-2	ND	0.005	ND	0.005	ND	ND	ND	ND	0.0196	ND			ND
	MW-3	ND	0.005	ND	0.005	ND	ND	ND	ND	0.007	ND			ND
	MW-4	ND	0.005	ND	0.005	ND	ND	ND	ND	0.0102	ND			ND
	MW-5	ND	0.005	ND	0.005	ND	ND	ND	ND	ND	ND			ND
Silver, mg/l	MW-1	ND												
	MW-2	ND												
	MW-3	ND												
	MW-4	ND												
	MW-5	ND												
Sodium, mg/l	MW-1	325												
	MW-2	450												
	MW-3	1000												
	MW-4	74												
	MW-5	132												
Thallium, mg/l	MW-1	ND												
	MW-2	ND												
	MW-3	ND												
	MW-4	ND												
	MW-5	ND												
Vanadium, mg/l	MW-1	ND												
	MW-2	ND												
	MW-3	0.015												
	MW-4	ND												
	MW-5	ND												
Zinc, mg/l	MW-1	0.020	0.025	0.01	0.025	0.01	0.148	0.01	0.14	0.005	0.0025			ND
	MW-2	0.010	0.025	0.04	0.025	0.01	0.026	0.01	0.13	0.005	0.0351			0.065
	MW-3	0.030	0.087	0.01	0.025	0.01	0.01	0.01	0.2	0.005	0.0454			ND
	MW-4	0.010	0.063	0.025	0.051	0.025	0.466	0.01	0.12	0.005	0.0151			ND
	MW-5	0.010	0.025	0.01	0.025	0.02	0.031	0.01	0.15	0.005	0.0025			ND

Notes:

- Data summary provided by FWS; not checked against original lab reports.

- 1999 Results reported for MW-3 and MW-4 may have been switched based on inconsistencies noted in the FWS Report "Chemical Analysis of Groundwater Samples
ND = Non-detect
B = Probable blank contamination
J = Estimated value

SUMMARY OF HISTORIC GROUNDWATER ANALYTICAL RESULTS - GENERAL WATER QUALITY PARAMETERS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Monitoring Well I.D.	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
Alkalinity, mg/l	MW 1	416.0	540	470	540	420	480	470	494	600	651	713	1720	840
	MW 2	608.0	600	1770	649	470	760	670	531	838	612	630	591	620
	MW 3	2230.0	280	674	1060	2100	2000	2000	2010	1920	1290	1760	751	1600
	MW 4	172.0	150	160	140	120	180	130	180	209	185	231	159	170
	MW 5	400.0	280	328	380	340	320	320	327	224	172	191	199	150
Ammonia - Nitrogen, mg/l	MW 1	0.8												
	MW 2	17.0												
	MW 3	108.0												
	MW 4	2.6												
	MW 5	10.0												
Total Hardness, mg/l	MW 1	570.0	710	698	666	930	539	720	826	740	640	610	490	500
	MW 2	660.0	640	627	576	500		560	775	140	600	633	606	640
	MW 3	720.0	2500	635	519	580	255	520	663	116	560	580	510	530
	MW 4	312.0	500	343	274	270	353	250	302	288	313	340	220	250
	MW 5	344.0	2500	956	333	340	824	390	441	300	373	388	344	370
Kjedahl Nitrogen, total, mg/l	MW 1	6.4												
	MW 2	22.0												
	MW 3	120.0												
	MW 4	3.8												
	MW 5	12.0												
Oil and Grease, mg/l	MW 1	0.4												
	MW 2	1.4												
	MW 3	6.6												
	MW 4	ND												
	MW 5	ND												
Organic Carbon, total, mg/l	MW 1	41.0												
	MW 2	105.0												
	MW 3	274.0												
	MW 4	4.1												
	MW 5	14.0												
Organic Halogen, total, ug/l	MW 1	850.0												
	MW 2	900.0												
	MW 3	1280.0												
	MW 4	12.0												
	MW 5	240.0												

SUMMARY OF HISTORIC GROUNDWATER ANALYTICAL RESULTS - GENERAL WATER QUALITY PARAMETERS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Monitoring Well I.D.	1988	1989	1990	1992	1993	1994	1995	1996	1997	1999	2000	2001	2002
pH	MW 1	6.5	6.81	6.1, 6.2	7.17	6.6	6.67	6.5	6.5	6.36	7.81	6.94	7.72	6.28
	MW 2	6.9	7.15	6.8, 6.6	7.18	7.1	6.16	6.5	6.5	6.41	7.43	7.13	6.76	6.02
	MW 3	7.1	7.15	7.0, 7.1	6.85	5.9	6.77	7	7.2	6.97	8.02	7.87	6.86	6.55
	MW 4	6.5	6.26	6.1, 6.1	6.82	6.3	6.92	6	6.8	6.34	7.42	8.06	6.66	5.78
	MW 5	6.8	6.52	6.4, 6.5	7.09	6.5	6.39	6.5	6.6	6.35	7.63	6.7	6.57	5.86
Phenolics, total, mg/l	MW 1	0.006												
	MW 2	0.014												
	MW 3	0.024												
	MW 4	ND												
	MW 5	ND												
Phosphorous, total, mg/l	MW 1	ND												
	MW 2	0.06												
	MW 3	0.07												
	MW 4	ND												
	MW 5	0.07												
Solids, Total Dissolved, mg/l	MW 1	1730.0	2300	2470	3050	2400	2670	2600	2920	2570	2800	2660	1910	2750
	MW 2	2200.0	2000	3150	2410	1600	2070	2100	2490	2210	2140	2170	2220	2090
	MW 3	3920.0	3500	2200	3620	2700	2680	2600	2840	2620	2730	2550	2860	2110
	MW 4	637.0	740	343	682	580	492	570	538	560	562	608	526	536
	MW 5	830.0	3500	710	1010	730	604	870	884	754	814	1000	972	924
Solids, Total Suspended, mg/l	MW 1	267.0												
	MW 2	63.0												
	MW 3	290.0												
	MW 4	1383.0												
	MW 5	293.0												

Notes:

- Data summary provided by FWS; not checked against original lab reports.

- 1999 Results reported for MW-3 and MW-4 may have been switched based on inconsistencies noted in the FWS Report "Chemical Analysis of Groundwater Samples from the Folcroft Landfill and Annex, John Heinz National Wildlife Refuge at Tinicum, 1988-1999" (June 8, 2000).

ND = Non-detect
B = Probable blank contamination
J = Estimated value

TABLE 3-1
REMEDIAL INVESTIGATION AND DATA QUALITY OBJECTIVES
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Remedial Investigation Activity	Matrix	Number of Locations	Parameters of Interest	Frequency of Monitoring	Purpose/Objective of Activity
Soil/ Leachate Seep Sampling (6)	Surface Soil	Up to 79	TCL SVOCs, Pesticides/PCBs, TAL metals, TOC and Dioxin at 10% of locations	Once	Collect definitive data to define nature and extent of contamination and for use in preparing the Baseline Human Health and Screening Level Ecological Risk Assessments.
	Subsurface Soil	Up to 79	TCL VOCs, SVOCs, Pesticides/PCBs, TAL metals, TOC and Dioxin at 10% of locations	Once	Collect definitive data to define nature and extent of contamination and for use in preparing the Baseline Human Health and Screening Level Ecological Risk Assessments.
	Leachate Seeps and Soils	Determined based on field observations.	TCL SVOCs, Pesticides/PCBs, TAL metals, TOC (sediment only), Dioxin at 10% of locations and VOCs (seep soil only)	Once	Collect definitive data to define nature and extent of contamination and for use in preparing the Baseline Human Health and Screening Level Ecological Risk Assessments.
Landfill Cover Investigation	Soil	Up to 79	Field Density, Moisture Content, Grain Size, Modified Proctor and Recompacted Permeability	Once	Collect definitive data to support an evaluation of the physical effectiveness of the existing closure cover and the need for repair/upgrades.
Hydrogeology and Groundwater Characterization	Groundwater	6 existing wells and 6 new wells	TCL VOCs, SVOCs, Pesticides/PCBs, TAL metals, biogeochemical parameters, and field parameters	Once (all wells) Twice (new wells only)	Collect definitive data to define nature and extent of contamination and to evaluate geochemical environments that affect contaminant fate.
	Groundwater	6 existing wells and 6 new wells	Hydraulic Conductivity, Tidal Influence	Once	Collect definitive data to characterize aquifer hydraulic parameters
Landfill Gas Survey	Ambient Air	Minimum of 79	Methane and Non-Methane VOCs	Once	Screening survey to evaluate whether there are detecteble levels of landfill gas or non-methane VOCs in ambient air. If not, the landfill gas/ambient air pathway can be addressed qualitatively during the baseline risk assessment.
	Landfill Gas	15	Methane in Soil Gas	Once	Collect screening data to assess potential off-site migration of landfill gas above PA standards to the northwest of the Annex.
Surveying	NA	All soil and leachate seep locations and well locations	Elevation (wells only), northings and eastings	Once	Collect definitive data to verify well elevations and provide location data for soil and leachate samples

Notes:

1. The Target Compound List (TCL) VOC, SVOCs, Pesticides/PCBs lists are defined in CLP Statements of Work OLC03.2 and OLM04.3.
   The Target Analyte List (TAL) parameters are listed in CLP Statement of Work ILM04.1.
2. The methodologies that were used for analysis are listed in SAP (Golder, 2006b) Tables A-3 and A-5.
3. Biogeochemical parameters include: Total Alkalinity, Sulfate, Sulfide, Ammonia, Nitrate, Nitrite, Light Hydrocarbons (methane, ethane, ethene), Total Organic Carbon (TOC).
4. Quality control samples were collected per matrix at the following frequency : 1 field duplicate per twenty primary samples; 1 MS/MSD pair per twenty primary + field duplicate samples;
   1 rinsate blank per day per type of decontamination event where non-dedicated equipment is used. 1 trip blank per day when aqueous VOC samples were collected.
5. Field Parameters for groundwater monitoring include: pH, Temperature, Specific Conductivity, Turbidity, Dissolved Oxygen, Oxidation-Reduction Potential, and Ferrous Iron.
6. Background soil sampling was performed by USEPA.
7. The exact number of samples was determined based on field conditions.

TABLE 3-2
PRELIMINARY COVER AND PERIMETER SURVEY OBSERVATIONS
REMEDIAL INVESTIGATION/FEASIBILITY
FOLCROFT LANDFILL & ANNEX SITE - FOLCROFT, PA

Location	Coordinates		Field Observations
	Latitude	Longitude	
Landfill			
Area 1	39°53'10"N	075°15'54"W	Observed seepage towards the Thoroughfare Creek. Some exposed debris adjacent to the creek.
Area 2	39°53'04"N	075°15'58"W	Observed seepage towards the Thoroughfare Creek. Some exposed debris adjacent to the creek. Some areas with exposed waste/debris protruding through cover along sideslopes.
Area 3	39°53'01"N	075°16'01"W	Observed seepage towards the Thoroughfare Creek. Some exposed waste and debris to the west of the creek. Some waste appears to have washed up from tidal rise and fall.
Area 4	39°53'00"N	075°16'03"W	Observed seepage towards the Thoroughfare Creek with soil staining on the creek bank.
Area 5	39°53'00"N	075°16'03"W	Observed seepage towards the Thoroughfare Creek with soil staining on the creek bank.
Area 6	39°52'59"N	075°16'04"W	Observed potential seepage in the southern portion of the site. Could not get close to the bank to confirm.
Area 7	39°52'59"N	075°16'06"W	Exposed waste and debris protruding through cover thoughout area including rusted and crushed drums, large pieces of concrete, and tires.
Area 8	39°51'33"N	075°14'55"W	Exposed waste and debris protruding through cover throughout area. Some waste appears to have washed up from tidal rise and fall.
Area 9	39°53'01"N	075°16'07"W	Existing topography is uneven and there are areas of exposed waste and debris throughout area.
Area 10	39°53'02"N	075°16'07"W	Dense vegetative growth with some areas having exposed waste. Waste observed in the root structure of uprooted tree.
Area 11	39°53'02"N	075°16'10"W	Exposed waste and debris protruding through cover thoughout area. Some waste that appears to have washed up from tidal rise and fall. Fifty-five gallon drum located on surface in vicinity of MW-3.
Area 12	39°53'03"N	075°16'08"W	Approximate transition from areas with dense vegetative growth to areas with minimum vegetative growth. The amount of exposed waste and debris increases while the soil cover thickness decreases from the crown heading towards the west.
Area 13	39°53'04"N	075°16'08"W	Approximate transition from areas with dense vegetative growth to areas with minimum vegetative growth. The amount of exposed waste and debris increases while the soil cover thickness decreases from the crown heading towards the west.
Area 14	39°53'09"N	075°16'06"W	Some areas with waste and debris exposed.
Area 15	39°53'08"N	075°15'58"W	Dense vegetative growth with little to no exposed waste. Animal burrows through cover in several locations have exposed waste.
Area 16	39°53'16"N	075°15'59"W	Exposed waste in the northern portion of the site.
Area 18	39°53'13"N	075°16'05"W	Exposed waste and debris protruding through the cover as well as waste/debris on the surface including a 55-gallon drum, bricks, large pieces of concrete. Approximate 20 to 25-feet drop off in some locations to Hermesprota Creek.
Area 19	39°53'08"N	075°16'11"W	Exposed waste and debris protruding through the cover as well as several waste piles on surface including tires and heating oil type tank.

TABLE 3-2
PRELIMINARY COVER AND PERIMETER SURVEY OBSERVATIONS
REMEDIAL INVESTIGATION/FEASIBILITY
FOLCROFT LANDFILL & ANNEX SITE - FOLCROFT, PA

Location	Coordinates		Field Observations
	Latitude	Longitude	
Annex			
Area A	39°53'22"N	075°16'04"W	Observed orange-brown stained soils and seepage along Hermesprota Creek. Some waste along banks appears to have washed up from tidal rise and fall. Exposed waste and debris protruding through cover upgradient from the creek towards the west.
Area B	39°53'21"N	075°16'04"W	Observed orange-brown stained soils on the ground surface and seepage along the Hermesprota Creek, sheen noticed on the water. Some waste along banks appears to have washed up from tidal rise and fall. Exposed waste and debris protruding through cover and lying on surface upgradient from the creek towards the west.
Area C	39°53'20"N	075°16'05"W	Exposed waste and debris protruding through cover and lying on surface. Surface waste/debris included tires, rusted drum, and construction debris.
Area D	39°53'20"N	075°16'04"W	Observed orange-brown stained soils and seepage along banks of Hermesprota Creek. Some waste along banks that appears to have washed up from tidal rise and fall. Exposed waste and debris towards the west including half-buried tires as well as broken concrete, rubber hoses, metal scraps, and propane type tank on surface.
Area E	39°53'15"N	075°15'62"W	Exposed waste and debris; mainly construction/demolition debris located along the side slopes. Drop off to the adjacent marsh area below.
Area F	39°53'17"N	075°16'08"W	Dense, thick vegetative growth with minimum amounts of exposed waste and debris.
Area G	39°53'15"N	075°16'10"W	Observed seepage south towards the marsh area. Sheen on the water near edge of Annex. Exposed waste and debris, especially construction demolition debris and tires.
Area H	39°53'16"N	075°16'10"W	Exposed waste and debris including municipal types of waste and construction demolition debris.
Area J	39°53'15"N	075°16'11"W	Exposed waste and debris on surface including rusted drum, tires, large pieces of concrete, bricks, and metals scraps. Some waste along banks appears to have washed up from tidal rise and fall. Several tires noted in the mudflats of the marsh area away from the Annex. Observed seepage towards the adjacent marsh area.
Area K	39°53'16"N	75°16'15"W	Exposed waste protruding through cover including tires and plastic.
Area L	39°53'16"N	075°16'17"W	Some waste along banks appears to have washed up from tidal rise and fall. Observed seepage towards unnamed tributary.
SS	39°53'20"N	075°16'16"W	Sanitary sewer manhole/vent located at the entrance to the Annex. Using manhole/vent as a guide, the sewer line appeared to run from southwest to northeast across the western edge of the Annex. West and southwest of the manhole/vent there are areas with exposed waste and debris protruding through cover (e.g. plastics) and lying on surface (i.e, bricks, tires, scrap metal piles).

Notes:
- Coordinates determined using a handheld global positioning system (GPS) unit.
- Approximate Site Reconnaissance Areas Shown on Figure 3-2

- For the purposes of this Remedial Investigation, scrap metal, appliances, furniture, drums, storage tanks, and municipal types of waste, including bottles, cans, plastics, scrap wood, rubber, cardboard, garbage, roofing supplies, and related materials, were considered “waste,” and construction/demolition materials, such as bricks, blocks, concrete, asphalt, glass, and related materials were considered “debris".

TABLE 3-3
SUMMARY OF FIELD DENSITY AND MOISTURE CONTENT MEASUREMENTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Test Location	L-35	L-28	L-21	L-23	L-30	L-22	L-29	L-36	L-44	L-43
Date Tested	12/18/2006	12/18/2006	12/18/2006	12/18/2006	12/18/2006	12/18/2006	12/18/2006	12/18/2006	12/18/2006	12/18/2006
Depth, in.	12	12	12	12	12	12	12	12	12	12
Density Count	734	1348	1221	1586	1631	710	3219	1206	2712	886
Moisture Count	275	201	321	172	216	245	251	290	211	321
Wet Density, pcf	114.7	97.5	96.8	93.0	92.0	115.9	72.8	100.3	77.8	109.0
Moisture %	28.0	22.5	21.3	19.4	26.6	23.7	45.5	36.0	31.6	37.2
Dry Density, pcf	89.6	79.6	88.1	78.0	72.7	93.7	50.7	73.7	59.1	79.5
Max. Dry Density, pcf	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0
% Compaction	61.8	54.9	51.7	53.8	50.1	64.6	39.5	50.8	40.9	54.8
Daily Standard Counts:										
Moisture	2567									
Density	622									

Note:
1. All data acquired using Nuclear Gauge Method - ASTM D 3017/2922
2. Maximum Dry Density, pcf (145.0) was input already in Troxler.

TABLE 3-3
SUMMARY OF FIELD DENSITY AND MOISTURE CONTENT MEASUREMENTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Test Location	L-1	L-4	L-5	L-10	L-11	A-1	A-9	A-7	A-13
Date Tested	12/15/2006	12/15/2006	12/15/2006	12/15/2006	12/15/2006	12/14/2006	12/14/2006	12/14/2006	12/14/2006
Depth, in.	12	12	12	12	12	12	12	12	12
Density Count	711	503	741	1103	937	1082	1451	832	951
Moisture Count	189	208	245	218	264	274	285	262	318
Wet Density, pcf	115.8	126.1	114.3	102.9	107.5	120.5	149.1	129.7	124.8
Moisture %	16.7	17.0	23.7	23.1	26.9	26.0	21.1	22.4	30.5
Dry Density, pcf	99.3	107.7	92.4	83.6	84.7	95.6	123.1	106.0	96.7
Max. Dry Density, pcf	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0	145.0
% Compaction	68.5	74.3	63.8	57.7	58.4	65.9	84.9	73.1	66.0
Daily Standard Counts:									
Moisture	2544					2564			
Density	629					624			

Note:
1. All data acquired using Nuclear Gauge Method - ASTM D 3017/2922
2. Maximum Dry Density, pcf (145.0) was input already in Troxler.

TABLE 3-3
SUMMARY OF FIELD DENSITY AND MOISTURE CONTENT MEASUREMENTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Test Location	A-14	A-8	A-3	A-4	A-5	A-10
Date Tested	12/14/2006	12/14/2006	12/14/2006	12/14/2006	12/14/2006	12/14/2006
Depth, in.	12	12	12	12	12	12
Density Count	1767	1132	1052	1220	1269	808
Moisture Count	228	327	213	280	265	302
Wet Density, pcf	140.6	159.9	121.8	100.0	98.9	111.8
Moisture %	17.0	23.1	18.5	34.2	32.1	32.8
Dry Density, pcf	120.1	129.8	102.8	74.5	74.9	84.1
Max. Dry Density, pcf	145.0	145.0	145.0	145.0	145.0	145.0
% Compaction	82.8	89.5	70.9	51.4	51.6	58.8
Daily Standard Counts:						
Moisture		2564				
Density		624				

Note:
1. All data acquired using Nuclear Gauge Method - ASTM D 3017/2922
2. Maximum Dry Density, pcf (145.0) was input already in Troxler.

TABLE 3-4
SUMMARY OF SOIL COVER SAMPLING
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Location	Borehole ID	Hole Depth	Troxler Test	Sample 0-6 in Analyses						Primary Samples	Total Analyses	Sample 6-24 in Analyses					Primary Samples	Total Analyses	Depth to Debris[1] (ft)	Depth to Waste[2] (ft)	Cover Thickness (ft)	Date	Additional Notes
				VOCs	Dioxin	SVOCs	Pest/PCB	Metals	TOC			VOCs	Dioxin	SVOCs	Pest/PCB	Metals							
	L-1	4	X																0.5	NA	0.5	12/15/2006	Not sampled.
	L-3	4																	0.2	0.0	0.0	12/19/2006	Not sampled.
	L-4	4	X			X	X	X	X										0.5	2.3	0.5	12/15/2006	Odor @ 28 in bgs
	L-5	4	X			X	X	X	X			X		X	X	X			0.0	2.3	0.0	12/15/2006	Odor @ 28 in bgs. Green powder @ 16-30 in bgs.
	L-6	4				X	X	X	X			X		X	X	X			0.8	NA	0.8	12/15/2006	
	L-8	4																	0.5	NA	0.5	12/19/2006	Not sampled.
	L-9	4				X	X	X	X			X		X	X	X			1.8	NA	1.8	12/19/2006	
	L-10	4	X			X	X	X	X			X		X	X	X			2.3	NA	2.3	12/15/2006	Subsurface sample taken at 6-26 in bgs.
	L-11	4	X																0.6	1.0	0.6	12/15/2006	Not sampled.
	L-12	4				X	X	X	X										NA	1.0	1.0	12/19/2006	Surface sample taken at 0-8 in bgs.
	L-14	4				X	X	X	X										0.5	1.2	0.5	12/19/2006	
	L-15	4		X	X	X	X	X	X										0.6	2.3	0.6	12/19/2006	
	L-16	4				X	X	X	X			X		X	X	X			2.0	1.6	1.6	12/15/2006	
	L-17	4				X	X	X	X										0.7	NA	0.7	12/15/2006	Debris at surface; holes in ground
	L-18	4																	0.3	NA	0.3	12/19/2006	Not sampled.
	L-19	4																	NA	0.0	0.0	12/19/2006	Waste at surface. Not sampled.
	L-20	4												X	X				0.0	1.3	0.0	12/19/2006	Odor @ 19 in bgs. Sample taken at 19-24 in bgs.
Landfill	L-21	4	X	X		X	X	X	X				X	X	X	X			NA	2.8	2.8	12/18/2006	Dioxin sample taken from 21-48 in bgs.
	L-22	4	X			X	X	X	X										NA	1.2	1.2	12/18/2006	Odor @ 14 in bgs.
	L-23	4	X			X	X	X	X										NA	0.6	0.6	12/18/2006	
	L-24	4			X	X	X	X	X			X		X	X	X			NA	NA	>4.0	12/19/2006	
	L-27	2				X	X	X	X										0.3	0.0	0.0	12/19/2006	Waste, full drum at surface.
	L-28	4	X			X	X	X	X										NA	1.3	1.3	12/18/2006	
	L-29	4	X																NA	0.3	0.3	12/18/2006	Odor @ 12 in bgs. Not sampled.
	L-30	4	X			X	X	X	X										0.5	0.5	0.5	12/18/2006	
	L-31	4				X	X	X	X										0.2	NA	0.2	12/19/2006	
	L-34	4																	NA	0.0	0.0	12/19/2006	Waste at surface. Not sampled.
	L-35	4	X			X	X	X	X										1.1	1.8	1.1	12/18/2006	Odor @ 21 in bgs.
	L-36	4	X			X	X	X	X			X	X	X	X	X			NA	1.3	1.3	12/18/2006	Odor @ 18 in bgs.
	L-37	4				X	X	X	X										NA	0.5	0.5	12/18/2006	
	L-38	4				X	X	X	X			X		X	X	X			NA	NA	>4.0	12/19/2006	
	L-42	4																	NA	0.0	0.0	12/18/2006	Waste at surface. Not sampled.
	L-43	4	X		X	X	X	X	X			X		X	X	X			NA	1.3	1.3	12/18/2006	
	L-44	4	X			X	X	X	X										NA	1.1	1.1	12/18/2006	
	L-45	4				X	X	X	X										0.4	0.4	0.4	12/19/2006	
	L-51	4																	NA	0.0	0.0	12/18/2006	Waste at surface. Not sampled.
Subtotals	**36**		**15**	**2**	**3**	**25**	**25**	**25**	**25**	**25**	**130**	**9**	**2**	**11**	**11**	**10**	**11**	**43**					

TABLE 3-4
SUMMARY OF SOIL COVER SAMPLING
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Location	Borehole ID	Hole Depth	Troxler Test	Sample 0-6 in Analyses						Primary Samples	Total Analyses	Sample 6-24 in Analyses					Primary Samples	Total Analyses	Depth to Debris[1] (ft)	Depth to Waste[2] (ft)	Cover Thickness (ft)	Date	Additional Notes
				VOCs	Dioxin	SVOCs	Pest/PCB	Metals	TOC			VOCs	Dioxin	SVOCs	Pest/PCB	Metals							
Annex	A-1	4	X			X	X	X	X			X		X	X	X			NA	NA	>4.0	12/14/2006	Subsurface sample taken from 18-36 in bgs interval not 6-24 in bgs interval.
	A-2	4			X														NA	1.1	1.1	12/14/2006	Surface sample for dioxin only.
	A-3	4	X	X	X	X	X	X	X										NA	0.5	0.5	12/14/2006	
	A-4	4	X	X		X	X	X	X										0.6	0.6	0.6	12/14/2006	
	A-5	4	X			X	X	X	X										NA	1.0	1.0	12/14/2006	
	A-7	4	X	X	X	X	X	X	X										NA	1.2	1.2	12/15/2006	
	A-8	4	X	X	X	X	X	X	X										0.5	1.5	0.5	12/14/2006	
	A-9	4	X			X	X	X	X			X		X	X	X			NA	2.0	2.0	12/13/2006	
	A-10	4	X	X	X	X	X	X	X										1.0	1.0	1.0	12/14/2006	
	A-12	4																	NA	0.0	0.0	12/14/2006	Waste at surface. Not sampled.
	A-13	4	X			X	X	X	X			X		X	X	X			NA	0.5	0.5	12/14/2006	Subsurface sample taken from 16-36 in bgs interval not 6-24 in bgs interval.
	A-14	4	X	X	X	X	X	X	X										1.3	1.3	1.3	12/14/2006	Dioxins only on 12/13/2006. Black ash at 6 in bgs.
	A-15	4																	NA	0.2	0.2	12/13/2006	Not sampled.
	A-16	4		X		X	X	X											1.5	1.3	1.3	12/13/2006	Surface soil taken from 0-16 in bgs.
	A-20	4				X	X	X	X										NA	0.4	0.4	12/14/2006	
	A-21	4				X	X	X	X			X		X	X	X			NA	NA	>4.0	12/20/2006	
	A-22	4				X	X	X	X			X				X			1.3	NA	1.3	12/20/2006	Pest/PCB/SVOC sample collected, but not analyzed due to broken sample bottle. Ash coated sand from 1.0 to 3.0 ft bgs.
	A-23	4				X	X	X	X										1.3	0.5	0.5	12/13/2006	Green sand in sample.
Subtotals	**18**		**10**	**7**	**6**	**15**	**15**	**15**	**14**	**15**	**72**	**5**	**0**	**4**	**4**	**5**	**5**	**18**					
Totals	**54**		**25**	**9**	**9**	**40**	**40**	**40**	**39**	**40**	**177**	**14**	**2**	**15**	**15**	**15**	**16**	**61**					

Notes:
[1] Bricks, blocks, concrete, asphalt, glass, and related materials
[2] Scrap metal, appliances, furniture, drums, storage tanks, and municipal types of waste, including bottles, cans, plastics, scrap wood, rubber, cardboard, garbage, roofing supplies, and related materials
(yellow highlight) Borings where no debris or waste was seen in the top 2 feet of soil.
in - inches
ft - feet
bgs - below ground surface

TABLE 3-5
SUMMARY OF BANK SEEPAGE AND PERIMETER SOIL SAMPLING
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Aqueous Analyses								Soil (0-6 inches) Analyses							
Area	**Location**	**Location /Sample ID**	**VOCs**	**SVOCs**	**Pest/PCB**	**Total Metals**	**Dissolved Metals**	**Hardness**	**Primary Samples**	**Total Analyses**	**SVOCs**	**Pest/PCB**	**Metals**	**Primary Samples**	**Total Analyses**	**Date**	**Sample Type**	**Additional Notes**
Landfill	Seep Area 1	LF-A1	X	X	X	X	X	X			X	X	X			8/14/2007	Bank Seepage	
	Seep Area 2	LF-A2	X	X	X	X	X	X			X	X	X			8/14/2007	Bank Seepage	
	Seep Area 3	LF-A3	X	X	X	X	X	X			X	X	X			8/15/2007	Bank Seepage	
	Perimeter	L-13									X	X	X			8/15/2007	Perimeter Soil	
	Perimeter	L-39									X	X	X			8/14/2007	Perimeter Soil	
	Perimeter	L-48									X	X	X			8/14/2007	Perimeter Soil	
	Perimeter	L-54									X	X	X			8/15/2007	Perimeter Soil	
Subtotals		**7**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**18**	**7**	**7**	**7**	**7**	**21**			
Annex	Seep Area A	ANA-A	X			X		X			X	X	X			8/16/2007	Bank Seepage	Insufficient volume for Pest/PCB/SVOC sample.
	Seep Area D	ANA-D	X	X	X	X	X	X			X	X	X			8/15/2007	Bank Seepage	Aqueous sample was collected in two phases because location was flooded by incoming tide. VOCs and metals collected on 8/15/07. All other parameters collected on 8/16/07.
	Seep Area J	ANA-J	X	X	X	X	X	X			X	X	X			8/16/2007	Bank Seepage	
	Seep Area L	ANA-L	X	X	X	X	X	X			X	X	X			8/15/2007	Bank Seepage	
	Perimeter	A-17									X	X	X			8/14/2007	Perimeter Soil	
Subtotals		**5**	**4**	**3**	**3**	**4**	**3**	**4**	**4**	**21**	**5**	**5**	**5**	**5**	**15**			
Totals		**12**	**7**	**6**	**6**	**7**	**6**	**7**	**7**	**39**	**12**	**12**	**12**	**12**	**36**			

TABLE 3-6
SUMMARY OF LANDFILL GAS MONITORING RESULTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Date	Time	Monitoring Location			Parameters**			
		ID	Coordinates*		CO	LEL***	H_2S	O_2
			N (Degrees)	W (Degrees)	ppm	%	ppm	%
12/19/2006	8:41 AM	BH-1	39.89012	75.26850	1.0	0.0	0.0	20.8
12/19/2006	8:50 AM	BH-2	39.88999	75.26887	0.0	0.0	0.0	20.8
12/19/2006	8:59 AM	BH-3	39.88985	75.26911	0.0	0.0	0.0	20.7
12/19/2006	9:04 AM	BH-4	39.88970	75.26945	0.0	0.0	0.0	20.6
12/19/2006	9:12 AM	BH-5	39.88945	75.26974	0.0	0.0	0.0	20.5
12/19/2006	9:21 AM	BH-6	39.88936	75.27011	1.0	0.0	0.0	20.3
12/19/2006	9:33 AM	BH-7	39.88926	75.27044	0.0	2.0	0.0	20.6
12/19/2006	9:47 AM	BH-8	39.88916	75.27074	5.0	1.0	0.0	16.3
12/19/2006	9:58 AM	BH-9	39.88900	75.27109	0.0	1.0	0.0	17.4
12/19/2006	10:09 AM	BH-10	39.88900	75.27148	0.0	0.0	0.0	20.6
12/19/2006	10:14 AM	BH-11	39.88881	75.27174	0.0	0.0	0.0	19.6
12/19/2006	10:20 AM	BH-12	39.88870	75.27205	0.0	0.0	0.0	20.4
12/19/2006	10:26 AM	BH-13	39.88850	75.27232	0.0	0.0	0.0	20.5
12/19/2006	10:35 AM	BH-14	39.88842	75.27269	0.0	0.0	0.0	20.6
12/19/2006	10:42 AM	BH-15	39.88816	75.27306	1.0	0.0	0.0	20.5

Notes:

* Coordinates were identified using a Garmin Vista handheld GPS device.

** Monitoring was conducted using a bar hole probe and a Rae Systems VRae multigas meter.

*** Landfill gas data screened against Pennsylvania regulatory criterion of 25% LEL of methane as an acceptable level.

TABLE 3-7
HOURLY WEATHER OBSERVATIONS FOR PHILADELPHIA, PA ON 12/19/2006
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Date	Hour	Temperature F°	Dewpoint Temperature F°	Relative Humidity %	Pressure mb	Wind Direction degrees	Wind Speed mph
12/19/2006	0:00	53.9	37.9	54	1021.8	330	14.9
12/19/2006	1:00	50	33.9	53	1022.4	340	8
12/19/2006	2:00	51.9	35.9	54	1022.8	-----	6.9
12/19/2006	3:00	50	35.9	58	1023.3	310	9.2
12/19/2006	4:00	48	33	56	1023.4	340	9.2
12/19/2006	5:00	46	33	60	1023.9	360	12.6
12/19/2006	6:00	42.9	30.9	62	1024.1	10	9.2
12/19/2006	7:00	42.9	30	59	1024.4	10	9.2
12/19/2006	8:00	42	28.9	59	1025	10	9.2
12/19/2006	9:00	39.9	28	62	1024.9	350	4.6
12/19/2006	10:00	39	28	64	1025	340	3.4
12/19/2006	11:00	39.9	28.9	64	1025.9	310	4.6
12/19/2006	13:00	41	26.9	57	1026.3	320	6.9
12/19/2006	14:00	42	26	52	1026.5	340	11.5
12/19/2006	15:00	42.9	24.9	48	1026.8	330	10.3
12/19/2006	16:00	42.9	24	46	1025.8	10	6.9
12/19/2006	17:00	44	24	45	1024.8	350	8
12/19/2006	18:00	44.9	23	41	1023.8	310	5.7
12/19/2006	19:00	48	23	37	1023.6	280	11.5
12/19/2006	20:00	48	23	37	1024	310	13.8
12/19/2006	21:00	46	21.9	38	1024.7	330	11.5
12/19/2006	22:00	44	23	43	1025.6	330	14.9
12/19/2006	23:00	42	23	46	1026.8	330	13.8
Daily Averages		**44.9**	**28.1**	**52.0**	**1024.6**	**270.5**	**9.4**

Notes:
Source: Pennsylvania State Climatologist record for Philadelphia (http://www.climate.psu.edu/cgi-bin/hourly.pl?id=PHL)
F°: Degrees Farenheit
%: Percent
mb: Millibars
mph: Miles per Hour

Golder Associates

TABLE 3-8
SUMMARY OF INITIAL AMBIENT AIR MONITORING RESULTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Date	Time	Weather					Monitoring Location	GPS Coordinates		Instrument Readings		
(mm/dd/yy)	(24:00 hr)	Conditions	Temp. (^{o} F)	Relative Humidity (%)	Wind Direction	Wind Speed (mph)		X_GEO_LONG	Y_GEO_LAT	PID (ppm)	FID (ppm)	Vinyl Chloride (ppm)
Landfill												
9/25/2007	8:00	Fog	64.0	96	SSW	8.0						
	8:34						Offsite Area L	-75.27197	39.89009	16.5	76.00	0.0
	9:00	Fog	64.9	93	WSW	8.0						
	9:22						L-10	-75.26606	39.88654	26.6	86.00	0.0
	9:46						L-11	-75.26549	39.88621	1.3	22.00	0.0
	9:56						Seep Area 1	-75.26494	39.88612	0.0	122.00	0.0
	10:00	Haze	68.0	83	S	6.9	L-12	-75.26491	39.88589	0.0	5.10	0.0
	10:17						MW-8	-75.26533	39.88556	0.0	10.00	0.0
	10:26						L-18	-75.26534	39.88544	0.0	12.05	0.0
	10:33						L-24	-75.26576	39.88500	0.0	2.55	0.0
	10:38						L-31	-75.26619	39.88456	0.0	1.35	0.0
	10:44						L-38	-75.26661	39.88412	0.0	3.50	0.0
	10:50						L-45	-75.26703	39.88368	0.0	1.55	0.0
	10:57						MW-1	-75.26715	39.88366	0.0	1.05	0.0
	11:00	Sunny	71.9	73	SSW	5.7						
	11:04						L-52	-75.26746	39.88324	0.0	1.55	0.0
	11:09						Seep Area 3	-75.26736	39.88331	0.0	62.00	0.0
	11:20						MW-2	-75.26824	39.88341	0.0	1.00	0.0
	12:00	Sunny	77.0	59	W	9.2						
9/26/2007	8:00	Sunny	68.0	89	S	5.7						
	8:12						L-17	-75.26591	39.88577	2.4	4.25	0.0
	8:23						L-23	-75.26633	39.88533	0.4	1.40	0.0
	8:29						L-30	-75.26676	39.88489	4.4	12.10	0.0
	8:33						L-37	-75.26718	39.88445	2.1	4.00	0.0
	8:39						L-44	-75.26761	39.88401	0.4	1.20	0.0
	8:52						L-51	-75.26803	39.88357	0.2	1.10	0.0
	9:00	Sunny	71.0	78	SW	9.2						
	9:08						L-55	-75.26845	39.88312	0.6	0.75	0.0
	9:18						L-54	-75.26903	39.88345	1.4	2.15	0.0
	9:25						L-50	-75.26860	39.88389	1.3	2.45	0.0
	9:29						L-43	-75.26818	39.88433	1.1	1.75	0.0
	9:32						L-36	-75.26776	39.88477	0.4	0.20	0.0
	9:39						MW-9	-75.26762	39.88522	0.0	458.00	0.0
	9:42						L-29	-75.26733	39.88522	0.0	2.10	0.0
	9:48						L-22	-75.26691	39.88566	0.0	1.05	0.0
	9:50						L-16	-75.26648	39.88610	0.0	0.0	0.0
	9:58						L-5	-75.26563	39.88698	0.0	1.30	0.0

TABLE 3-8
SUMMARY OF INITIAL AMBIENT AIR MONITORING RESULTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Date	Time	Weather					Monitoring Location	GPS Coordinates		Instrument Readings		
(mm/dd/yy)	(24:00 hr)	Conditions	Temp. (^{o} F)	Relative Humidity (%)	Wind Direction	Wind Speed (mph)		X_GEO_LONG	Y_GEO_LAT	PID (ppm)	FID (ppm)	Vinyl Chloride (ppm)
9/26/2007	10:00	Sunny	73.9	73	WSW	8.0						
	10:04						L-6	-75.26518	39.88653	0.0	0.55	0.0
	10:11						Seep Area 2	-75.26598	39.88445	0.0	27.00	0.0
	10:27						L-1	-75.26578	39.88775	0.0	1.10	0.0
	10:49						L-4	-75.26621	39.88731	0.0	0.40	0.0
	10:54						L-9	-75.26663	39.88687	0.0	0.10	0.0
	10:58						L-15	-75.26706	39.88642	0.0	0.55	0.0
	11:00	Sunny	78.0	64	S	8.0	L-21	-75.26748	39.88598	0.0	1.10	0.0
	11:05						L-28	-75.26790	39.88554	0.0	0.75	0.0
	11:10						L-35	-75.26833	39.88510	0.0	3.25	0.0
	11:15						L-42	-75.26875	39.88466	0.0	0.0	0.0
	11:29						L-48	-75.26975	39.88455	0.0	0.35	0.0
	11:38						L-49	-75.26918	39.88422	0.0	0.15	0.0
	11:40						MW-3	-75.26949	39.88435	0.0	25.85	0.0
	11:44						L-53	-75.26960	39.88378	0.0	0.0	0.0
	11:51						L-41	-75.26932	39.88499	0.0	0.75	0.0
	11:56						L-34	-75.26890	39.88543	0.0	0.0	0.0
	12:00	Sunny	82.0	54	SW	11.5						
	12:01						L-27	-75.26848	39.88587	0.0	0.10	0.0
	12:05						L-20	-75.26805	39.88631	0.0	1.25	0.0
	12:10						L-14	-75.26763	39.88675	0.0	52.00	0.0
	12:11						L-8	-75.26720	39.88719	0.0	0.25	0.0
	12:14						L-3	-75.26678	39.88763	0.0	0.15	0.0
	13:00	Sunny	84.9	51	W	9.2						
	13:35						L-2	-75.26735	39.88796	0.0	6.50	0.0
	13:43						L-7	-75.26778	39.88752	0.0	6.70	0.0
	13:48						L-13	-75.26816	39.88705	0.0	5.50	0.0
	13:52						L-19	-75.26863	39.88664	0.0	4.45	0.0
	13:55						MW-7	-75.26872	39.88691	0.0	95.00	0.0
	14:00	Sunny	87.9	45	SW	13.8						
	14:02						L-26	-75.26905	39.88620	0.0	10.55	0.0
	14:05						L-33	-75.26947	39.88575	0.0	9.85	0.0
	14:12						L-40	-75.26990	39.88531	0.0	6.70	0.0
	14:17						L-47	-75.27032	39.88487	0.0	8.20	0.0
	14:25						L-46	-75.27081	39.88523	0.0	9.70	0.0
	14:30						L-39	-75.27047	39.88564	0.0	4.65	0.0
	14:36						L-32	-75.27005	39.88608	0.0	8.45	0.0
	14:41						L-25	-75.26962	39.88652	0.0	10.15	0.0

Golder Associates

TABLE 3-8
SUMMARY OF INITIAL AMBIENT AIR MONITORING RESULTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Date	Time	Weather					Monitoring Location	GPS Coordinates		Instrument Readings		
(mm/dd/yy)	(24:00 hr)	Conditions	Temp. (^{o} F)	Relative Humidity (%)	Wind Direction	Wind Speed (mph)		X_GEO_LONG	Y_GEO_LAT	PID (ppm)	FID (ppm)	Vinyl Chloride (ppm)
Annex												
	7:00	Fog	69.9	90	SSW	4.6						
	7:50						Seep Area D	-75.26782	39.88903	1.5	32.50	0.0
	8:00	Fog	69.9	93	S	3.4						
	8:02						A-5	-75.26782	39.88903	2.3	8.95	0.0
	8:10						Seep Area A	-75.26781	39.88958	3.1	23.55	0.0
	8:13						A-2	-75.26834	39.88970	7.0	6.05	0.0
	8:22						A-1	-75.26902	39.88984	1.9	3.25	0.0
	8:27						A-3	-75.26920	39.88931	8.6	6.45	0.0
	8:32						A-7	-75.27007	39.88892	9.6	11.35	0.0
	8:36						A-6	-75.27076	39.88905	2.5	5.75	0.0
	8:48						A-11	-75.27163	39.88866	0.0	3.10	0.0
	8:51						A-17	-75.27250	39.88827	0.5	3.60	0.0
	8:57						A-18	-75.27181	39.88813	0.0	2.65	0.0
	9:00	Fog	71.9	90	S	4.6						
	9:02						A-12	-75.27094	39.88852	0.0	2.95	0.0
	9:07						A-19	-75.27112	39.88799	0.0	1.50	0.0
	9:15						Seep Area L	-75.27157	39.88794	2.4	25.00	0.0
09/27/07	9:26						Seep Area J	-75.26970	39.88769	5.2	220.00	0.0
	9:40						A-20	-75.27043	39.88785	0.0	0.55	0.0
	9:44						A-13	-75.27025	39.88838	0.0	0.0	0.0
	9:50						A-21	-75.26974	39.88771	0.0	0.95	0.0
	9:52						A-14	-75.26956	39.88825	0.0	0.0	0.0
	9:55						A-8	-75.26938	39.88878	0.0	1.25	0.0
	10:00	Mostly Cloudy	75.0	81	S	8.0	A-4	-75.26851	39.88917	0.0	1.65	0.0
	10:13						A-10	-75.26800	39.88850	0.0	3.35	0.0
	10:19						MW-6	-75.26795	39.88808	1.5	26.45	0.0
	10:22						A-16	-75.26818	39.88797	0.0	2.25	0.0
	10:28						A-23	-75.26836	39.88744	0.0	4.75	0.0
	10:35						A-22	-75.26894	39.88766	0.0	3.60	0.0
	10:43						A-15	-75.26887	39.88811	0.0	2.65	0.0
	10:46						A-9	-75.26869	39.88864	0.0	1.75	0.0
	11:00	Cloudy	78.0	71	S	9.2						
	11:02						MW-5	-75.27067	39.88775	0.5	27.55	0.0
	11:18						Offsite Area A	-75.26514	39.89174	2.4	33.00	0.0
	12:00	Mostly Cloudy	78.9	69	S	8.0						

Notes:

1) GPS Coordinates; Garmin Etrex Legend
2) Weather Data at Philadelphia International Airport from Pennsylvania State Climatologist; http://www.climate.psu.edu
3) No Precipitation during monitoring event
4) FID - Flame Ionization Detector; Photovac MicroFID
5) PID - Photoionization Detector; MiniRAE 2000 (10.6 ev lamp)
6) Vinyl Chloride; Drager Tubes, low detection limit (vinyl chloride 0.5/b)

Golder Associates

TABLE 3-9
SUMMARY OF ADDITIONAL AMBIENT AIR MONITORING RESULTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Date	Time	Weather					Monitoring Location	GPS Coordinates		Instrument Readings	
(mm/dd/yy)	(24:00 hr)	Conditions	Temp. (^{o} F)	Relative Humidity (%)	Wind Direction	Wind Speed (mph)		X_GEO_LONG	Y_GEO_LAT	PID (ppm)	FID (ppm)
							Annex				
	7:54	Partly Cloudy	77.0	70.0	SSW	10.4					
	9:30						A-7	-75.27007	39.88892	0.0	0.0
	9:32						A-7	-75.27007	39.88892	0.0	0.0
	9:33						A-7 North	-75.27010	39.88916	4.5	0.0
	9:35						A-7 North	-75.27010	39.88916	0.3	0.0
	9:39						A-7 East 1	-75.26972	39.88898	15.9	0.0
	9:41						A-7 East 1	-75.26972	39.88898	11.4	0.0
	9:43						A-7 East 2	-75.26967	39.88903	2.6	0.0
	9:46						A-7 East 2	-75.26967	39.88903	4.7	0.0
	9:49						A-7 South	-75.27000	39.88863	3.1	0.0
	9:51						A-7 South	-75.27000	39.88863	4.8	0.0
	9:54						A-7 West	-75.27039	39.88888	0.0	0.0
	9:56						A-7 West	-75.27039	39.88888	0.0	0.0
	10:01	Partly Cloudy	80.1	64.0	SW	11.5	A-3	-75.26920	39.88931	0.0	0.0
	10:03						A-3	-75.26920	39.88931	0.0	0.0
	10:04						A-3 South	-75.26905	39.88905	0.0	0.0
	10:06						A-3 South	-75.26905	39.88905	0.0	0.0
	10:09						A-3 West	-75.26945	39.88908	6.0	0.0
	10:11						A-3 West	-75.26945	39.88908	4.8	0.0
	10:13						A-3 East	-75.26893	39.88935	0.0	0.0
	10:15						A-3 East	-75.26893	39.88935	0.0	0.0
	10:17						A-3 North	-75.26926	39.88956	0.0	0.0
6/26/2008	10:19						A-3 North	-75.26926	39.88956	0.0	0.0
	10:33						A-2	-75.26834	39.88970	0.0	0.0
	10:35						A-2	-75.26834	39.88970	0.0	0.0
	10:36						A-2 West	-75.26876	39.88972	0.0	0.0
	10:38						A-2 West	-75.26876	39.88972	0.0	0.0
	10:40						A-2 North	-75.26820	39.88990	0.0	0.0
	10:42						A-2 North	-75.26820	39.88990	0.0	0.0
	10:43						A-2 East	-75.26797	39.88947	0.0	0.0
	10:45						A-2 East	-75.26797	39.88947	1.1	0.0
	10:47						A-2 South	-75.26853	39.88940	3.7	0.0
	10:49						A-2 South	-75.26853	39.88940	4.9	0.0
	11:44	Partly Cloudy	80.1	64.0	SSW	10.4					
	12:39	Partly Cloudy	81.0	62.0	SSW	10.4					
	12:47						Seep Area J	-75.26992	39.88765	0.0	0.0
	12:49						Seep Area J	-75.26992	39.88765	0.5	0.0
	12:51						Seep Area J North	-75.26971	39.88791	0.2	0.0
	12:53						Seep Area J North	-75.26971	39.88791	0.0	0.0
	12:54										
	12:55						Seep Area J East	-75.26978	39.88763	0.0	0.0
	12:57						Seep Area J East	-75.26978	39.88763	0.0	0.0
	12:58						Seep Area J West	-75.27012	39.88778	0.4	0.0
	13:00	Partly Cloudy	86.0	44.0	W	18.4	Seep Area J West	-75.27012	39.88778	0.3	0.0
	NA						Seep Area J South	NA	NA	NA	NA
	NA						Seep Area J South	NA	NA	NA	NA

TABLE 3-9
SUMMARY OF ADDITIONAL AMBIENT AIR MONITORING RESULTS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Date	Time	Weather					Monitoring Location	GPS Coordinates		Instrument Readings	
(mm/dd/yy)	(24:00 hr)	Conditions	Temp. (^{o}F)	Relative Humidity (%)	Wind Direction	Wind Speed (mph)		X_GEO_LONG	Y_GEO_LAT	PID (ppm)	FID (ppm)
6/26/2008	*Landfill*										
	11:44										
	11:54										
	12:05	Partly Cloudy	86.0	44.0	W	18.40.	L-10	-75.26606	39.88654	0.0	0.0
	12:08						L-10	-75.26606	39.88654	0.0	0.0
	12:09						L-10 West	-75.26644	39.88651	0.0	0.0
	12:11						L-10 West	-75.26644	39.88651	0.0	0.0
	12:25						L-10 North	-75.26611	39.88679	0.3	0.0
	12:27						L-10 North	-75.26611	39.88679	0.2	0.0
	12:28						L-10 East	-75.26570	39.88657	0.4	0.0
	12:30						L-10 East	-75.26570	39.88657	0.4	0.0
	12:31						L-10 South	-75.26607	39.88625	0.4	0.0
	12:33						L-10 South	-75.26607	39.88625	0.0	0.0
	12:39	Partly Cloudy	86.0	44.0	W	18.4					
	Offsite										
	7:54	Partly Cloudy	77.0	70.0	SSW	10.4					
	8:44						Offisite A	-75.27197	39.89008	0.1	0.0
	8:49						Offisite A	-75.27197	39.89008	0.1	0.0
	8:57						Offsite L	-75.26517	39.89173	0.1	0.0
	9:02						Offsite L	-75.26517	39.89173	0.1	0.0
	9:45						WOA 1	-75.26220	39.88612	0.3	0.0
	9:50						WOA 1	-75.26220	39.88612	0.2	0.0
	9:54										
	10:02	Partly Cloudy	80.1	64.0	SW	11.5	WOA 2	-75.26553	39.88118	0.2	0.0
	10:07						WOA 2	-75.26553	39.88118	0.2	0.0
	10:25						WOA 3	-75.27707	39.88002	0.2	0.0
	10:30						WOA 3	-75.27707	39.88002	0.2	0.0
	11:05						Offisite A	-75.27197	39.89008	0.3	0.0
	11:18						Offsite L	-75.26517	39.89173	0.4	0.0
	11:20						Offisite A	-75.27197	39.89008	0.3	0.0
	11:23						Offsite L	-75.26517	39.89173	0.3	0.0

Notes:

1) GPS Coordinates; Garmin Etrex Legend
2) Weather Data at Philadelphia International Airport from Pennsylvania State Climatologist; http://www.climate.psu.edu
3) Weather Conditions noted from on-site observation
4) No Precipitation during monitoring event
5) FID - Flame Ionization Detector; Photovac MicroFID
6) PID - Photoionization Detector; MiniRAE 2000 (10.6 ev lamp)
7) Seep Area J South could not be sampled due to location in Creek
8) WOA (Wildlife Observation Area)

Table 3-10
Monitoring Well Construction
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex
Folcroft, Pennsylvania

Monitoring Well	Ground Surface (ft NAVD88)	Measuring Point (ft NAVD88)	Well Depth (ft bgs)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Top of Screen (ft NAVD88)	Bottom of Screen (ft NAVD88)	Bottom of Isolation Casing (ft bgs)
MW-1	8.40	11.49	35.00	24.00	34.00	-15.60	-25.60	None
MW-2	5.60	9.02	36.00	25.00	35.00	-19.40	-29.40	None
MW-3	5.40	8.10	31.00	20.00	30.00	-14.60	-24.60	None
MW-4	15.71	15.93	20.00	14.00	19.00	1.71	-3.29	None
MW-5	10.45	13.60	29.00	18.00	28.00	-7.55	-17.55	None
MW-6	11.98	14.63	33.00	23.00	33.00	-11.02	-21.02	20.00
MW-7	21.50	23.64	38.00	28.00	38.00	-6.50	-16.50	27.00
MW-8	16.60	19.13	41.00	31.00	41.00	-14.40	-24.40	29.00
MW-9	43.90	46.52	57.00	47.00	57.00	-3.10	-13.10	45.00
MW-10	16.94	18.92	24.00	19.00	24.00	-2.06	-7.06	19.00
MW-11	8.70	11.48	24.00	14.00	24.00	-5.30	-15.30	12.00
MW-12	7.30	9.96	NA	NA	NA	NA	NA	NA
MW-13	7.60	10.07	15.00	10.00	15.00	-2.40	-7.40	None
MW-14	8.30	11.32	18.00	8.00	18.00	0.30	-9.70	None
MW-15S	6.40	6.10	35.50	30.50	35.50	-24.10	-29.10	None
MW-15D	6.44	6.20	62.50	57.50	62.50	-51.06	-56.06	None
MW-16	5.27	5.02	54.00	49.00	54.00	-43.73	-48.73	None
MW-17	18.12	17.74	66.00	61.00	66.00	-42.88	-47.88	None
MW-18S	0.60	0.32	18.00	8.00	18.00	-7.40	-17.40	None
MW-18D	0.70	0.17	58.00	50.00	58.00	-49.30	-57.30	None
MW-19S	1.00	0.60	25.00	15.00	25.00	-14.00	-24.00	None
MW-19D	1.00	0.62	78.00	68.00	78.00	-67.00	-77.00	None
MW-20B	5.90	5.39	129.00	114.00	129.00	-108.10	-123.10	95.00
MW-21	6.01	5.56	104.00	89.00	104.00	-82.99	-97.99	84.00
MW-22	43.89	46.52	88.00	78.00	88.00	-34.11	-44.11	77.00
MW-A(S)	3.32	5.60	14.00	9.00	14.00	-5.68	-10.68	None
MW-A(D)	3.28	5.20	32.00	27.00	32.00	-23.72	-28.72	None
MW-B(S)	3.66	5.97	15.00	10.00	15.00	-6.34	-11.34	None
MW-B(D)	NM	5.35	35.00	30.00	35.00	NA	NA	None
MW-C(S)	3.30	5.42	21.00	16.00	21.00	-12.70	-17.70	None
MW-C(D)	3.26	5.42	39.00	29.00	39.00	-25.74	-35.74	None
MW-D	3.60	5.54	31.00	21.00	31.00	-17.40	-27.40	None

Notes:
1. NA - MW-12 well construction information is not available

Table 3-11
Slug Test Results
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site
Folcroft, Pennsylvania

Well	Investigation	Monitoring Zone	Head Test		Hvorslev Result (K)	Bouwer and Rice Result (K)	van der Kamp Result (K)
MW-1	Previous Investigations	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	3.59E-05	3.66E-05	NA
				ft/day	1.02E-01	1.04E-01	
MW-2	Previous Investigations	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	8.99E-04	9.45E-04	NA
				ft/day	2.55E+00	2.68E+00	
MW-3	Previous Investigations	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	8.63E-05	8.28E-05	NA
				ft/day	2.45E-01	2.35E-01	
MW-4	Previous Investigations	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	6.30E-04	5.53E-04	NA
				ft/day	1.79E+00	1.57E+00	
MW-5	Previous Investigations	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	1.68E-04	1.67E-04	NA
				ft/day	4.77E-01	4.74E-01	
MW-6	Initial RI Investigation	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	1.21E-04	1.23E-04	NA
				ft/day	3.44E-01	3.49E-01	
MW-7	Initial RI Investigation	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	NA	NA	NA
				ft/day			
MW-8	Initial RI Investigation	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	9.95E-03	9.80E-03	NA
				ft/day	2.82E+01	2.78E+01	
MW-9	Initial RI Investigation	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	2.87E-02	2.62E-02	NA
				ft/day	8.14E+01	7.42E+01	
MW-10	Initial RI Investigation	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	1.89E-01	2.00E-01	NA
				ft/day	5.35E+02	5.67E+02	
MW-11	Initial RI Investigation	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	5.55E-03	6.14E-03	NA
				ft/day	1.57E+01	1.74E+01	
MW-12	Previous Investigations	Overburden	Falling	cm/sec	NA	NA	NA
				ft/day			
			Rising	cm/sec	1.89E-02	1.90E-02	NA
				ft/day	5.35E+01	5.38E+01	
MW-13	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	4.15E-04	4.14E-04	NA
				ft/day	1.18E+00	1.17+00	
			Rising	cm/sec	1.96E-04	2.11E-04	NA
				ft/day	5.57E-01	5.97E-01	
MW-14	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	5.71E-04	5.61E-04	NA
				ft/day	1.62E+00	1.59E+00	
			Rising	cm/sec	4.12E-04	4.11E-04	NA
				ft/day	1.17E+00	1.17E+00	
MW-15(S)	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	5.94E-03	5.53E-03	NA
				ft/day	1.68E+01	1.57E+01	
			Rising	cm/sec	8.76E-03	7.90E-03	NA
				ft/day	2.48E+01	2.24E+01	
MW-15(D)	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	5.11E-03	6.34E-03	NA
				ft/day	1.45E+01	1.80E+01	
			Rising	cm/sec	3.99E-03	3.98E-03	NA
				ft/day	1.13E+01	1.13E+01	
MW-16	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	NA	NA	1.72E-01
				ft/day			4.87E+02
			Rising	cm/sec	NA	NA	1.66E-01
				ft/day			4.71E+02
MW-17	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	2.98E-05	3.15E-05	NA
				ft/day	8.45E-02	8.92E-02	
			Rising	cm/sec	2.33E-05	2.38E-05	NA
				ft/day	6.62E-02	6.75E-02	
MW-18(S)	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	5.99E-02	5.83E-02	NA
				ft/day	1.70e+02	1.65E+02	
			Rising	cm/sec	1.11E-01	1.27E-01	NA
				ft/day	3.14E+02	3.61E+02	
MW-18(D)	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	6.26E-03	6.26E-03	NA
				ft/day	1.77E+01	1.77E+01	
			Rising	cm/sec	5.61E-03	5.55E-03	NA
				ft/day	1.59E+01	1.57E+01	
MW-19(S)	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	2.03E-02	2.18E-02	NA
				ft/day	5.76E+01	6.19E+01	
			Rising	cm/sec	6.63E-02	7.03E-02	9.49E-02
				ft/day	1.88E+02	1.99E+02	2.69E+02
MW-19(D)	Off-Site Groundwater Investigation	Overburden	Falling	cm/sec	3.45E-03	3.45E-03	NA
				ft/day	9.78E+00	9.77E+00	
			Rising	cm/sec	3.08E-03	3.10E-03	NA
				ft/day	8.72E+00	8.80E+00	
MW-A(S)	Additional Groundwater Investigaiton	Overburden	Falling	cm/sec	2.67E-04	3.17E-04	NA
				ft/day	7.58E-01	8.99E-01	
			Rising	cm/sec	2.38E-04	3.23E-04	NA
				ft/day	6.74E-01	9.17E-01	
MW-B(S)	Additional Groundwater Investigaiton	Overburden	Falling	cm/sec	2.94E-04	3.59E-04	NA
				ft/day	8.32E-01	1.02E+00	
			Rising	cm/sec	3.23E-04	2.85E-04	NA
				ft/day	9.16E-01	8.09E-01	

Table 3-11
Slug Test Results
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site
Folcroft, Pennsylvania

Well	Investigation	Monitoring Zone	Head Test		Hvorslev Result (K)	Bouwer and Rice Result (K)	van der Kamp Result (K)
MW-C(S)	Additional Groundwater Investigaiton	Overburden	Falling	cm/sec	2.38E-02	2.18E-02	NA
				ft/day	6.74E+01	6.18E+01	
			Rising	cm/sec	1.72E-02	1.33E-02	NA
				ft/day	4.87E+01	3.77E+01	
MW-C(D)	Additional Groundwater Investigaiton	Overburden	Falling	cm/sec	8.31E-03	7.55E-03	NA
				ft/day	2.36E+01	2.14E+01	
			Rising	cm/sec	NA	NA	6.21E-02 cm/sec
				ft/day			1.76E+02
MW-D	Additional Groundwater Investigaiton	Overburden	Falling	cm/sec	2.42E-02	1.31E-02	3.28E-01 cm/sec
				ft/day	6.86E+01	3.71E+01	9.31E+02
			Rising	cm/sec	4.16E-03	4.23E-03	NA
				ft/day	1.18E+01	1.20E+01	
MW-20B[1]	Off-Site Groundwater Investigation	Bedrock	Falling	cm/sec	1.16E-04	1.18E-04	NA
				ft/day	3.28E-01	3.35E-01	
			Rising	cm/sec	1.25E-04	1.28E-04	NA
				ft/day	3.55E-01	3.62E-01	
MW-20B[2]			Falling	cm/sec	1.18E-04	1.19E-04	NA
				ft/day	3.33E-01	3.38E-01	
			Rising	cm/sec	1.22E-04	1.19E-04	NA
				ft/day	3.45E-01	3.38E-01	
MW-21[1]	Off-Site Groundwater Investigation	Bedrock	Falling	cm/sec	1.44E-04	1.47E-04	NA
				ft/day	4.07E-01	4.16E-01	
			Rising	cm/sec	1.31E-04	1.31E-04	NA
				ft/day	3.72E-01	3.71E-01	
MW-21[2]			Falling	cm/sec	1.53E-04	1.54E-04	NA
				ft/day	4.34E-01	4.35E-01	
			Rising	cm/sec	1.40E-04	1.42E-04	NA
				ft/day	3.97E-01	4.03E-01	
MW-22[1]	Off-Site Groundwater Investigation	Bedrock	Falling	cm/sec	1.72E-05	1.76E-05	NA
				ft/day	4.89E-02	4.98E-02	
			Rising	cm/sec	1.80E-05	1.88E-05	NA
				ft/day	5.10E-02	5.32E-02	
MW-22[2]			Falling	cm/sec	2.33E-05	2.37E-05	NA
				ft/day	6.61E-02	6.71E-02	
			Rising	cm/sec	1.60E-05	1.67E-05	NA
				ft/day	4.53E-02	4.74E-02	

Statistics	cm/sec	ft/day
Bedrock Geometric Average	6.85E-05	1.94E-01
Overburden Geometric Average	2.61E-03	7.86E+00
Bedrock Minimum	1.60E-05	4.53E-02
Overburden Minimum	2.33E-05	6.62E-02
Bedrock Maximum	1.54E-04	4.35E-01
Overburden Maximum	2.00E-01	9.31E+02

Notes:
1.) Logged tidal data prior to slug test was used to evaluate the hydraulic conductivity of this analysis.
2.) Logged tidal data following the slug test was used to evaluate the hydraulic conductivity of this analysis.
3.) NA - Non Applicable or Not Analyzed

Prepared by:BAR
Checked by:

TABLE 5-1a
USEPA BACKGROUND SOIL SAMPLING RESULTS - REFUGE - APRIL 2007
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Analyte		CAS Number	EPA Industrial RSL (2016_05)	PADEP MSC, 2016 (0-2 FT)	Basis	Units	Type	PSS-10D	PSS-10S	PSS-07D	PSS-07S	PSS-08D	PSS-08S	PSS-09D	PSS-09S
Sampling Date								4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007
Depth								24"	0"-6"	12"	0"-6"	-	0"-6"	17"	0"-6"
Description								native sand	-	brick, gravel	-	glass, fill, debris	glass, fill, debris	brick, gravel	-
SEMIVOLATILES	2-Methylnaphthalene	91-57-6	300,000	13,000,000	N	ug/Kg	BNA	20	8.5	21	19	15	9.8	34	
	Acenaphthene	83-32-9	4,500,000	190,000,000	N	ug/Kg	BNA	16	10	72	59	35	40	70	
	Acenaphthylene	208-96-8	NS	190,000,000		ug/Kg	BNA	11				19	22	11	
	Acetophenone	98-86-2	12,000,000	10,000,000	N	ug/Kg	BNA	26	30	23	24	110	36	42	22
	Anthracene	120-12-7	23,000,000	190,000,000	N	ug/Kg	BNA	37	33	130	110	97	120	160	
	Benzaldehyde	100-52-7	820,000	NS	N	ug/Kg	BNA	25	29	23	28	110	29	43	38
	Benzo(a)anthracene	56-55-3	2,900	130,000	C	ug/Kg	BNA	170	130	280	380	670	530	430	
	Benzo(a)pyrene	50-32-8	290	12,000	C	ug/Kg	BNA	160	110	210	*330*	*630*	*380*	*350*	
	Benzo(b)fluoranthene	205-99-2	2,900	76,000	C	ug/Kg	BNA	210	140	310	470	1100	640	560	
	Benzo(g,h,i)perylene	191-24-2	NS	190,000,000		ug/Kg	BNA	95	55	93	200	260	150	110	
	Benzo(k)fluoranthene	207-08-9	29,000	76,000	C	ug/Kg	BNA	96	59	100	180	370	210	220	
	Bis(2-ethylhexyl)phthalate	117-81-7	160,000	6,500,000	C	ug/Kg	BNA	27	22			2500	55	22	22
	Butylbenzylphthalate	85-68-7	1,200,000	10,000,000	N	ug/Kg	BNA					47	12		
	Carbazole	86-74-8	NS	4,600,000	C	ug/Kg	BNA	18	14	46	49	60	33	75	
	Chrysene	218-01-9	290,000	760,000	C	ug/Kg	BNA	170	110	250	380	710	450	440	
	Dibenzo(a,h)anthracene	53-70-3	290	22,000	C	ug/Kg	BNA			29	65	97	74		
	Dibenzofuran	132-64-9	100,000	3,200,000	N	ug/Kg	BNA	9.2		34	25			79	
	Diethylphthalate	84-66-2	66,000,000	10,000,000	N	ug/Kg	BNA								
	Di-n-butylphthalate	84-74-2	8,200,000	10,000,000		ug/Kg	BNA					58	14		
	Fluoranthene	206-44-0	3,000,000	130,000,000	N	ug/Kg	BNA	280	220	560	690	1300	960	1200	
	Fluorene	86-73-7	3,000,000	130,000,000	N	ug/Kg	BNA	17	13	72	53	35	51	120	
	Indeno(1,2,3-cd)pyrene	193-39-5	2,900	76,000	C	ug/Kg	BNA	100	63	110	230	370	250	160	
	Naphthalene	91-20-3	17,000	760,000	N	ug/Kg	BNA	26	11	20	23	27	21	48	
	Phenanthrene	85-01-8	NS	190,000,000		ug/Kg	BNA	180	140	450	410	520	570	1200	
	Pyrene	129-00-0	2,300,000	96,000,000	N	ug/Kg	BNA	270	190	430	650	920	740	960	
PESTICIDES	4,4'-DDD	72-54-8	9,600	380,000	C	ug/Kg	PEST	1.3	0.52	0.12	1.5	960	3.4	0.32	
	4,4'-DDE	72-55-9	9,300	270,000	C	ug/Kg	PEST	0.15	0.68	0.26	1.1	200	4.3		
	4,4'-DDT	50-29-3	8,500	270,000	C	ug/Kg	PEST	0.35	3.6	1.3	13		8	1.3	
	Aldrin	309-00-2	180	5,400	C	ug/Kg	PEST								
	alpha-BHC	319-84-6	360	14,000		ug/Kg	PEST		0.1		0.43	5.9	0.081		
	alpha-Chlordane	5103-71-9	7,700	260,000		ug/Kg	PEST	0.21	0.25			68	2.5		
	beta-BHC	319-85-7	1,300	51,000		ug/Kg	PEST					0.71			
	delta-BHC	319-86-8	NS	NS		ug/Kg	PEST					1.7			
	Dieldrin	60-57-1	140	6,000	C	ug/Kg	PEST	1.2	2.2	0.14	0.78	40	4.7	0.17	
	Endosulfan I	959-98-8	700	19,000,000		ug/Kg	PEST								
	Endosulfan II	33213-65-9	700	19,000,000		ug/Kg	PEST	0.18	0.26	0.24	0.87	5	0.47	0.25	
	Endosulfan sulfate	1031-07-8	NS	19,000,000		ug/Kg	PEST				0.55		0.27		
	Endrin	72-20-8	25,000	960,000	N	ug/Kg	PEST	0.44	0.26	0.088	2.5	11	0.6	0.072	
	Endrin aldehyde	7421-93-4	25,000	960,000		ug/Kg	PEST				4.4	3.4			
	Endrin ketone	53494-70-5	25,000	960,000		ug/Kg	PEST	2.3	3.6		4.9				
	gamma-Chlordane	5566-34-7	7,700	260,000		ug/Kg	PEST	0.26	0.2		1.4	75	2.1		
	Heptachlor	76-44-8	630	20,000	C	ug/Kg	PEST		0.037	0.091					
	Heptachlor epoxide	1024-57-3	330	10,000	C	ug/Kg	PEST	0.15	0.096			15	0.11		
	Methoxychlor	72-43-5	410,000	16,000,000	N	ug/Kg	PEST		3.4	0.2	6.4	18	2.3	0.52	

TABLE 5-1a
USEPA BACKGROUND SOIL SAMPLING RESULTS - REFUGE - APRIL 2007
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Analyte	CAS Number	EPA Industrial RSL (2016_05)	PADEP MSC, 2016 (0-2 FT)	Basis	Units	Type	PSS-10D	PSS-10S	PSS-07D	PSS-07S	PSS-08D	PSS-08S	PSS-09D	PSS-09S
	Sampling Date							4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007
	Depth							24"	0"-6"	12"	0"-6"	-	0"-6"	17"	0"-6"
	Description							native sand	-	brick, gravel	-	glass, fill, debris	glass, fill, debris	brick, gravel	-
TOTAL METALS	Aluminum	7429-90-5	110,000	190,000	N	mg/Kg	TM	2150	4110	9600	8330	11600	8540	9430	10500
	Antimony	7440-36-0	47	1,300	N	mg/Kg	TM					*53.3*	4.9		
	Arsenic	7440-38-2	3	61	C	mg/Kg	TM	1.2	3	*5.5*	*5.3*	*40.9*	*42.5*	*4.6*	*4.4*
	Barium	7440-39-3	22,000	190,000	N	mg/Kg	TM	14.4	42.2	85.3	76.2	1320	535	101	77.4
	Beryllium	7440-41-7	230	11	N	mg/Kg	TM	0.15	0.24	0.55	0.51	0.24	0.78	0.6	0.6
	Cadmium	7440-43-9	98	6	N	mg/Kg	TM		0.22		0.27	**8.6**	3.1	0.27	
	Calcium	7440-70-2	NS	NS		mg/Kg	TM	860	3370	4120	3710	13000	3840	3280	2030
	Chromium*	7440-47-3	6.3	220	N	mg/Kg	TM	5.9	*12.5*	*30.3*	*29.9*	*79.3*	*29.8*	*24.7*	*28.5*
	Cobalt	7440-48-4	35	960		mg/Kg	TM	2.7	4.8	8.1	7.7	18.8	15	8.8	9
	Copper	7440-50-8	4,700	120,000	N	mg/Kg	TM	6.9	19	46.1	25.5	1140	110	24.9	12.1
	Cyanide	57-12-5	15	1,900	N	mg/Kg	TM					3.6	0.68		
	Iron	7439-89-6	82,000	190,000	N	mg/Kg	TM	5500	9380	15800	14600	*122000*	33600	18000	16500
	Lead	7439-92-1	800	1,000		mg/Kg	TM	9.2	44.1	128	59.6	***3010***	698	80	13
	Magnesium	7439-95-4	NS	NS		mg/Kg	TM	836	2660	3180	3290	1240	1120	4080	4280
	Manganese	7439-96-5	2,600	150,000	N	mg/Kg	TM	75.6	289	261	289	798	332	478	224
	Mercury	7439-97-6	5	510		mg/Kg	TM	0.034	0.6	1.2	0.54	1.1	0.6	0.15	0.045
	Nickel	7440-02-0	2,200	64,000	N	mg/Kg	TM	4.6	8.5	18.1	15.1	154	29	16.4	17.8
	Potassium	2023695	NS	NS		mg/Kg	TM	296	583	927	964	706	830	1180	1180
	Selenium	7782-49-2	580	16,000	N	mg/Kg	TM					11.5	27.5	1.2	
	Silver	7440-22-4	580	16,000	N	mg/Kg	TM					10.5	1.4		
	Sodium	7440-23-5	NS	NS		mg/Kg	TM	186	265	382	387	4980	1680	400	380
	Thallium	7440-28-0	1	32	N	mg/Kg	TM						*1.3*		
	Vanadium	7440-62-2	580	220	N	mg/Kg	TM	4.8	13.9	47	34.8	32	28.8	24.1	27.2
	Zinc	7440-66-6	35,000	190,000	N	mg/Kg	TM	28.2	61.6	84.8	82.5	2290	773	93.2	55.3
VOCs	Methylene chloride	75-09-2	320,000	10,000,000	C	ug/Kg	VOC	1.4	3.3	30	7.8	57	18	5.7	5.9
	Tetrachloroethene	127-18-4	39,000	3,200,000	C	ug/Kg	VOC					17			
	Toluene	108-88-3	4,700,000	10,000,000	N	ug/Kg	VOC	0.29		0.69	0.52			0.45	
	Trichlorofluoromethane	75-69-4	35,000,000	10,000,000	N	ug/Kg	VOC			0.92		2.4	1.1		

Results above the PADEP MSCs criteria are shown in **bold.**

Results above the EPA Industrial RSLs are shown *italicized*.

EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.

PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

* Only total chromium is reported; EPA RSLs and PADEP MSCs shown are for hexavalent chromium

USEPA BACKGROUND SOIL SAMPLING RESULTS - KORMAN SUITES - APRIL 2007
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Analyte	CAS Number	EPA Industrial RSL (2016_05)	PADEP MSC, 2016 (0-2 FT)	Basis	Units	Type	PSS-13D	PSS-13S	PSS-15D	PSS-15S	PSS-18D	PSS-18S	PSS-19D	PSS-19S	PSS-27D	PSS-27S	PSS-29D	PSS-29S	PSS-30D	PSS-30S	PSS-98*
	Sampling Date							4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007
	Depth							18"	0"-6"	14"	0"-6"	-	0"-6"	18"	0"-6"	12"	0"-6"	18"	0"-6"	18"	0"-6"	18"
	Description							common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill
SEMIVOLATILES	2-Methylnaphthalene	91-57-6	300,000	13,000,000	N	ug/Kg	BNA	9.4	8.3							9.4		8.7	11			9.2
	Acenaphthene	83-32-9	4,500,000	190,000,000	N	ug/Kg	BNA	18								25	19		26			18
	Acenaphthylene	208-96-8	NS	190,000,000		ug/Kg	BNA	18	10									11	12			
	Acetophenone	98-86-2	12,000,000	10,000,000	N	ug/Kg	BNA	22	18	24	20	18	22	22	20	20	23	61	45	35	47	45
	Anthracene	120-12-7	23,000,000	190,000,000	N	ug/Kg	BNA	48	20				11		19	45	36	20	54		12	50
	Benzaldehyde	100-52-7	820,000	NS	N	ug/Kg	BNA	25	24	37	26	24	29	25	21	24	21	40	33	33	39	35
	Benzo(a)anthracene	56-55-3	2,900	130,000	C	ug/Kg	BNA	250	110		63		54	40	87	180	150	120	380	27	71	230
	Benzo(a)pyrene	50-32-8	290	12,000	C	ug/Kg	BNA	240	130		58		47	40	79	150	120	120	*490*	22	76	220
	Benzo(b)fluoranthene	205-99-2	2,900	76,000	C	ug/Kg	BNA	330	190		80		70	54	130	260	190	190	650	34	120	340
	Benzo(g,h,i)perylene	191-24-2	NS	190,000,000		ug/Kg	BNA	140	72						37	71	45	56	310			68
	Benzo(k)fluoranthene	207-08-9	29,000	76,000	C	ug/Kg	BNA	130	48		25		28	24	35	81	86	58	240	9.2	33	100
	Bis(2-ethylhexyl)phthalate	117-81-7	160,000	6,500,000	C	ug/Kg	BNA									24					50	64
	Butylbenzylphthalate	85-68-7	1,200,000	10,000,000	N	ug/Kg	BNA		40													17
	Carbazole	86-74-8	NS	4,600,000	C	ug/Kg	BNA	17	9.5						10	38	25		29			23
	Chrysene	218-01-9	290,000	760,000	C	ug/Kg	BNA	250	100		51		52	39	90	190	150	120	380	18	69	220
	Dibenzo(a,h)anthracene	53-70-3	290	22,000	C	ug/Kg	BNA	32								31			110			
	Dibenzofuran	132-64-9	100,000	3,200,000	N	ug/Kg	BNA										14		11			
	Diethylphthalate	84-66-2	66,000,000	10,000,000	N	ug/Kg	BNA													9.4		
	Di-n-butylphthalate	84-74-2	8,200,000	10,000,000		ug/Kg	BNA															
	Fluoranthene	206-44-0	3,000,000	130,000,000	N	ug/Kg	BNA	440	190	17	87		100	78	160	420	360	210	490	34	120	410
	Fluorene	86-73-7	3,000,000	130,000,000	N	ug/Kg	BNA	20	9.4						8.9	24	20		27			19
	Indeno(1,2,3-cd)pyrene	193-39-5	2,900	76,000	C	ug/Kg	BNA	150	87				21		48	110	74	79	420		45	110
	Naphthalene	91-20-3	17,000	760,000	N	ug/Kg	BNA	12	11	12	12	8.6	8.8	7.9	10	19	12	14	16	8.1	9.2	15
	Phenanthrene	85-01-8	NS	190,000,000		ug/Kg	BNA	250	98		21		55	39	92	340	280	87	260	15	52	240
	Pyrene	129-00-0	2,300,000	96,000,000	N	ug/Kg	BNA	440	200	18	72		95	71	150	340	280	210	550	34	120	400
PESTICIDES	4,4'-DDD	72-54-8	9,600	380,000	C	ug/Kg	PEST	0.57		1.6	0.6		0.14	1.3	0.42		0.42	3.2	1.7	0.61	3.3	0.74
	4,4'-DDE	72-55-9	9,300	270,000	C	ug/Kg	PEST	1.6	0.77	0.24	0.42		1.1	0.7	0.62	0.55	0.49	1.3	1	0.97	4.5	1.1
	4,4'-DDT	50-29-3	8,500	270,000	C	ug/Kg	PEST	4.2	2.1	2.2	0.85		1.9	1.2	1.5	8.1	2.2	3.9	3	3.4	12	4.5
	Aldrin	309-00-2	180	5,400	C	ug/Kg	PEST		0.15	0.097	0.18		0.089	0.12	0.28	0.045	0.29	0.16	0.11		0.036	0.23
	alpha-BHC	319-84-6	360	14,000		ug/Kg	PEST												0.032	0.12	0.037	0.55
	alpha-Chlordane	5103-71-9	7,700	260,000		ug/Kg	PEST	0.29	0.25	0.065	0.11		0.09		0.45	1.3	0.22	0.11	1.6	0.18	1.8	0.29
	beta-BHC	319-85-7	1,300	51,000		ug/Kg	PEST													0.4	0.12	1.9
	delta-BHC	319-86-8	NS	NS		ug/Kg	PEST															
	Dieldrin	60-57-1	140	6,000	C	ug/Kg	PEST	1.1	0.3	0.51	0.67		0.095	0.25	0.42	0.76	0.42	0.64	0.53	0.64	1.3	2.4
	Endosulfan I	959-98-8	700	19,000,000		ug/Kg	PEST		0.052													
	Endosulfan II	33213-65-9	700	19,000,000		ug/Kg	PEST	0.41	0.25	0.22	0.11			0.3	0.23	0.14	0.28	0.16	0.25	0.33	0.46	0.49
	Endosulfan sulfate	1031-07-8	NS	19,000,000		ug/Kg	PEST							0.025	0.049		0.04	0.13	0.16			
	Endrin	72-20-8	25,000	960,000	N	ug/Kg	PEST	0.4		0.23	0.2		0.14	0.58		0.47		0.21	0.1	0.26	0.45	0.66
	Endrin aldehyde	7421-93-4	25,000	960,000		ug/Kg	PEST			0.13					0.46	1.3			1.1	1.9	0.35	0.55
	Endrin ketone	53494-70-5	25,000	960,000		ug/Kg	PEST	1.9						1.6				0.64	0.96	2	4.7	4
	gamma-Chlordane	5566-34-7	7,700	260,000		ug/Kg	PEST	0.44	0.078	0.11	0.2			0.22	0.53	1.2	0.23	0.11	2.1	0.32	2.3	0.46
	Heptachlor	76-44-8	630	20,000	C	ug/Kg	PEST	0.064					0.063	0.25	0.051	0.19	0.056	0.055	0.25			
	Heptachlor epoxide	1024-57-3	330	10,000	C	ug/Kg	PEST	2.7	0.51	0.17			0.52	0.077	0.98	4.5	1.2	0.06	1.9	0.35	2.3	0.59
	Methoxychlor	72-43-5	410,000	16,000,000	N	ug/Kg	PEST	0.33	1.3		0.58	0.22	0.49	2.7	0.48	1.1	1.4	0.86	1.3	0.83	0.89	2.3

USEPA BACKGROUND SOIL SAMPLING RESULTS - KORMAN SUITES - APRIL 2007
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

	Analyte	CAS Number	EPA Industrial RSL (2016_05)	PADEP MSC, 2016 (0-2 FT)	Basis	Units	Type	PSS-13D	PSS-13S	PSS-15D	PSS-15S	PSS-18D	PSS-18S	PSS-19D	PSS-19S	PSS-27D	PSS-27S	PSS-29D	PSS-29S	PSS-30D	PSS-30S	PSS-98*
	Sampling Date							4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007	4/5/2007
	Depth							18"	0"-6"	14"	0"-6"	-	0"-6"	18"	0"-6"	12"	0"-6"	18"	0"-6"	18"	0"-6"	18"
	Description							common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill	common fill
TOTAL METALS	Aluminum	7429-90-5	110,000	190,000	N	mg/Kg	TM	7920	9730	13200	8980	8240	8290	5720	4750	4010	6130	8880	6530	8870	5500	9060
	Antimony	7440-36-0	47	1,300	N	mg/Kg	TM														2.9	
	Arsenic	7440-38-2	3	61	C	mg/Kg	TM	*3.7*	*4.9*	*11.4*	*6.7*	*3.5*	*4.5*	2.4	2.8	2.4	*3.8*	*4.1*	*3.9*	*4.5*	*6.2*	*4.5*
	Barium	7440-39-3	22,000	190,000	N	mg/Kg	TM	69.7	144	128	80.6	34.9	53.7	28.7	39.6	31.6	51.2	75.8	59.3	145	219	221
	Beryllium	7440-41-7	230	11	N	mg/Kg	TM	0.5	0.62	0.88	0.62	0.52	0.52	0.35	0.37	0.24	0.43	0.6	0.5	0.55	0.35	0.6
	Cadmium	7440-43-9	98	6	N	mg/Kg	TM		0.35	2.1	0.9		0.19		0.22			0.23	0.27	0.43	1.1	0.65
	Calcium	7440-70-2	NS	NS		mg/Kg	TM	2230	2680	2620	1980	550	747	593	1270	9380	1520	2310	1800	13200	2880	3520
	Chromium*	7440-47-3	6.3	220	N	mg/Kg	TM	*18.8*	*23.8*	*59.5*	*32.3*	*13.3*	*15.9*	*12.5*	*15*	*8*	*14.2*	*22*	*16.7*	*23.5*	*17.6*	*26.8*
	Cobalt	7440-48-4	35	960		mg/Kg	TM	7	8.3	10.4	10.2	8.6	8.6	6.2	6.5	4.2	6.2	7.6	5.6	7.7	5.6	8.4
	Copper	7440-50-8	4,700	120,000	N	mg/Kg	TM	20.6	27.7	49.1	27.4	15.4	15.6	11.3	13.1	13.1	14.4	20.6	18.2	38.2	82.8	43.4
	Cyanide	57-12-5	15	1,900	N	mg/Kg	TM			0.23	0.24			0.28							0.26	
	Iron	7439-89-6	82,000	190,000	N	mg/Kg	TM	13400	16400	21600	16700	16100	15600	12100	9050	8430	13800	14600	11400	15200	50500	16700
	Lead	7439-92-1	800	1,000		mg/Kg	TM	35.5	50	68.3	42.5	5.6	34.1	6.2	19.8	42.5	47.1	54.1	39.9	92.5	190	138
	Magnesium	7439-95-4	NS	NS		mg/Kg	TM	2390	2900	4210	3110	2160	1830	1610	1620	6010	1720	2750	1990	6550	1990	3110
	Manganese	7439-96-5	2,600	150,000	N	mg/Kg	TM	304	364	338	498	304	337	241	188	186	245	257	272	340	282	301
	Mercury	7439-97-6	5	510		mg/Kg	TM	0.067	0.13	0.37	0.21	0.018	0.071	0.023	0.11	0.27	0.13	0.098	0.072	0.15	0.085	0.14
	Nickel	7440-02-0	2,200	64,000	N	mg/Kg	TM	12.2	15.7	23.2	17.9	12.8	10.8	9	11.3	5.9	8.2	14.5	11.3	16.1	12	20.3
	Potassium	2023695	NS	NS		mg/Kg	TM	760	947	1500	1140	934	829	686	561	473	534	781	600	1130	1990	999
	Selenium	7782-49-2	580	16,000	N	mg/Kg	TM			1.3											2.7	1
	Silver	7440-22-4	580	16,000	N	mg/Kg	TM			0.81	0.35									0.32	1.7	0.46
	Sodium	7440-23-5	NS	NS		mg/Kg	TM	336	448	884	488	235	265	153	202	197	261	356	296	480	640	563
	Thallium	7440-28-0	1	32	N	mg/Kg	TM														1.2	
	Vanadium	7440-62-2	580	220	N	mg/Kg	TM	21.6	25.2	35.9	24.5	20.6	22.7	17.7	14.7	11	18.9	24	17.8	25.5	24.3	28.3
	Zinc	7440-66-6	35,000	190,000	N	mg/Kg	TM	67.6	103	307	125	34.3	60.5	25.5	51.7	44.3	50.9	62.3	80.1	129	153	190
VOCs	Methylene chloride	75-09-2	320,000	10,000,000	C	ug/Kg	VOC	4.1		33		9.2	0.59	2.2			17	3.3	3.7	44		2.2
	Tetrachloroethene	127-18-4	39,000	3,200,000	C	ug/Kg	VOC															
	Toluene	108-88-3	4,700,000	10,000,000	N	ug/Kg	VOC	0.22		0.39							0.43	0.4		0.29		
	Trichlorofluoromethane	75-69-4	35,000,000	10,000,000	N	ug/Kg	VOC			1.2							0.91			1.5		

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .

EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.

PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

* Only total chromium is reported; EPA RSLs and PADEP MSCs shown are for hexavalent chromium

TABLE 5-2
BACKGROUND GROUNDWATER EXCEEDANCES - MW-4
INORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

				Sample Location	MW-4	MW-4
				Sample Date	1/31/2007	1/31/2007
				N=Normal, FD=Field Duplicate	N	N
				T=Total, D=Dissolved	D	T
Parameter	**EPA Tapwater RSLs (2016_05)**	**PADEP Residential Used Aquifer MSCs (2016)**	**PADEP Non-Residential Non-Used Aquifer MSCs (2016)**	**Unit**	**Result**	**Result**
Chromium*	0.035	100	100000	ug/L	*1.5 J*	*1.4 J*
Cobalt	0.6	13	35,000	ug/L	<u>*24.4 J*</u>	<u>*17.1 J*</u>
Manganese	43.4	300	300,000	ug/L	<u>*818*</u>	<u>*806*</u>

J - Estimated result

* Only total and dissolved chromium is reported; EPA RSL and PADEP MSCs shown are for hexavalent chromium

Results above the PADEP Residential Used Aquifer (TDS <= 2500) MSCs criteria are shown <u>underlined.</u>
Results above the PADEP Non-Residential Non-Use Aquifer MSCs criteria are shown in **bold.**
Results above the EPA Tapwater RSLs are shown *italicized*.
EPA Tapwater RSLs - EPA Regional Screening Levels for Tapwater, THQ = 0.1.
Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Groundwater, Last updated August 2016.

Checked by: WE 3/3/2017

TABLE 5-3
LANDFILL COVER SOILS - EXCEEDANCES IN SURFACE SOIL
ORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	**L-14**	**L-16**	**L-27**	**L-28**	**L-31**	**L-36**	**L-38**	**L-4**	**L-43**	**L-44**
			Sample Date	**12/19/2006**	**12/15/2006**	**12/19/2006**	**12/18/2006**	**12/19/2006**	**12/18/2006**	**12/19/2006**	**12/15/2006**	**12/18/2006**	**12/18/2006**
			N=Normal, FD=Field Duplicate	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
			Start Depth (inches):	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
			End Depth (inches):	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Benzo[a]pyrene	0.29	12	mg/kg	*0.87*	*0.3 J*	*1.9*	*0.36 J*	*0.41*	*0.88*	*0.69*	*0.58*	*0.35 J*	*0.91 J*
Dibenz[a,h]anthracene	0.29	22	mg/kg			*0.37 J*							

J - Estimated result

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by:

TABLE 5-3
LANDFILL COVER SOILS - EXCEEDANCES IN SURFACE SOIL
INORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	L-10	L-12	L-14	L-15	L-16	L-17	L-21	L-22	L-23	L-24	L-27	L-28
			Sample Date	12/15/2006	12/19/2006	12/19/2006	12/19/2006	12/15/2006	12/15/2006	12/18/2006	12/18/2006	12/18/2006	12/19/2006	12/19/2006	12/18/2006
			N=Normal, FD=Field Duplicate	N	N	N	N	N	N	N	N	N	N	N	N
			Start Depth (inches):	0	8	0	0	0	0	0	0	0	0	0	0
			End Depth (inches):	6	12	6	6	6	6	6	6	6	6	6	6
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	3.0	61	mg/kg	*10.5*	*4.9 L*	*19.8 L*	*6.3 L*	*12*	*5.7*	*14.2*	*8.2*	*11.9*	*7 L*	*7.9 L*	*8.9*
Beryllium	229	11	mg/kg												
Cadmium	98	6.1	mg/kg			**8.1**									
Chromium*	6.3	220	mg/kg	*40.9*	*26.1 L*	*102 L*	*35 L*	*45*	*24.5*	*41.1*	*54.8*	*24.5*	*26.1 L*	*43.5 L*	*57*
Cobalt	35	960	mg/kg			*158*									
Copper	4,672	120,000	mg/kg			*10500 L*									
Lead	800	1,000	mg/kg												
Manganese	2,562	150,000	mg/kg			*9770*									
Mercury	4.6	510	mg/kg												

K - Biased high
L - Biased low
* Only total chromium is reported; EPA RSL and PADEP MSC shown are for hexavalent chromium

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last

Checked by: EG 3/3/2017

TABLE 5-3
LANDFILL COVER SOILS - EXCEEDANCES IN SURFACE SOIL
INORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	L-30	L-31	L-35	L-36	L-37	L-38	L-4	L-43	L-44	L-45	L-5	L-6	L-9
			Sample Date	12/18/2006	12/19/2006	12/18/2006	12/18/2006	12/18/2006	12/19/2006	12/15/2006	12/18/2006	12/18/2006	12/19/2006	12/15/2006	12/15/2006	12/19/2006
			N=Normal, FD=Field Duplicate	N	N	N	N	N	N	N	N	N	N	N	N	N
			Start Depth (inches):	0	0	0	0	0	0	0	0	0	0	0	0	0
			End Depth (inches):	6	6	6	6	6	6	6	6	6	6	6	6	6
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	3.0	61	mg/kg	*11.3*	*6.4 L*	*6.3*	*15.5*	*9.6*	*6.3 L*	*4.7*	*14.4*	*13.3*	*8.4 L*	*7.8 K*	*6.9*	*9.5 L*
Beryllium	229	11	mg/kg							**66**						
Cadmium	98	6.1	mg/kg													
Chromium*	6.3	220	mg/kg	*46*	*27.7 L*	*140*	*54*	*61.1*	*34.7 L*	*103*	*49.7*	*46.7*	*68.7 L*	*45.5*	*69.3*	*40.1 L*
Cobalt	35	960	mg/kg							*59.8*						
Copper	4,672	120,000	mg/kg													
Lead	800	1,000	mg/kg				***2070***			***4260***						
Manganese	2,562	150,000	mg/kg													
Mercury	4.6	510	mg/kg						*4.8 K*							

K - Biased high
L - Biased low
* Only total chromium is reported; EPA RSL and PADEP MSC shown are for hexavalent chromium

Results above the PADEP MSCs criteria are shown in **bold**
Results above the EPA Industrial RSLs are shown *italicized*
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last

Checked by: EG 3/3/2017

Golder Associates

TABLE 5-4
LANDFILL COVER SOILS - EXCEEDANCES IN SUBSURFACE SOIL
ORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	**L-10**	**L-20**	**L-21**	**L-36**	**L-9**
			Sample Date	**12/15/2006**	**12/19/2006**	**12/18/2006**	**12/18/2006**	**12/19/2006**
			N=Normal, FD=Field Duplicate	**N**	**N**	**N**	**N**	**N**
			Start Depth (inches):	**6**	**19**	**24**	**6**	**6**
			End Depth (inches):	**26**	**24**	**48**	**24**	**24**
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**
Benzo[a]pyrene	0.3	12	mg/kg	*0.44*			*2.1*	*0.53 J*
Naphthalene	16.7	760	mg/kg		*70*			
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.000022	0.0007	mg/kg			*0.0000242*		
Hexachlorinated Dibenzo-p-dioxins, Total	0.00047	NS	mg/kg			*0.00696*		*0.000664*

J - Estimated result

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by:

TABLE 5-4
LANDFILL COVER SOILS - EXCEEDANCES IN SUBSURFACE SOIL
INORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	**L-10**	**L-16**	**L-21**	**L-24**	**L-36**	**L-38**	**L-43**	**L-5**	**L-6**	**L-9**
			Sample Date	**12/15/2006**	**12/15/2006**	**12/18/2006**	**12/19/2006**	**12/18/2006**	**12/19/2006**	**12/18/2006**	**12/15/2006**	**12/15/2006**	**12/19/2006**
			N=Normal, FD=Field Duplicate	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
			Start Depth (inches):	**6**	**6**	**16**	**6**	**6**	**6**	**6**	**16**	**6**	**6**
			End Depth (inches):	**26**	**24**	**24**	**24**	**24**	**24**	**24**	**30**	**24**	**24**
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	3.0	61	mg/kg	*11 K*	*11.6*	*12.7*	*10.2 L*	*9.3*	*5.6 L*	*11.8*	*6.7 K*	*10.2 K*	*13.4 L*
Chromium*	6.3	220	mg/kg	*47.4*	*49.3*	*29.1*	*22.7 L*	*43.7*	*38.7 L*	*35.6*	*68.6*	*74.9*	*85.9 L*
Mercury	4.6	510	mg/kg						*6.7 K*				

K - Biased high
L - Biased low

* Only total chromium is reported; EPA RSL and PADEP MSC shown are for hexavalent chromium

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

TABLE 5-5
ANNEX COVER SOILS - EXCEEDANCES IN SURFACE SOIL
ORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	**A-14**	**A-16**	**A-21**
			Sample Date	**12/14/2006**	**12/13/2006**	**12/20/2006**
			N=Normal, FD=Field Duplicate	**N**	**N**	**N**
			Start Depth (inches):	**0**	**0**	**0**
			End Depth (inches):	**6**	**16**	**6**
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**
Benzo[a]pyrene	0.3	12	mg/kg	*0.32 J*	*0.31 J*	*0.54*
Aroclor 1248	1.0	46	mg/kg		*3.9*	
Aroclor 1254	1.0	46	mg/kg		*1.4*	

J - Estimated result

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by: EG 3/3/17

Golder Associates

TABLE 5-5
ANNEX COVER SOILS - EXCEEDANCES IN SURFACE SOIL
INORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	**A-1**	**A-10**	**A-13**	**A-14**	**A-16**	**A-20**	**A-21**	**A-22**	**A-23**	**A-3**	**A-4**	**A-5**	**A-7**	**A-8**	**A-9**
			Sample Date	**12/14/2006**	**12/14/2006**	**12/14/2006**	**12/14/2006**	**12/13/2006**	**12/14/2006**	**12/20/2006**	**12/20/2006**	**12/15/2006**	**12/14/2006**	**12/14/2006**	**12/14/2006**	**12/15/2006**	**12/14/2006**	**12/13/2006**
			N=Normal, FD=Field Duplicate	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
			Start Depth (inches):	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
			End Depth (inches):	**6**	**6**	**6**	**6**	**16**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	3.0	61	mg/kg	*5.2 K*	*8.3 K*		*6.4 K*	*10.7 K*	*18.3 K*	*7.7 L*		*4.5*		*10.1 K*	*55.1 K*	*4.6 K*		
Chromium*	6.3	220	mg/kg	*21.8*	*47.4*	*203*	*28.9*	*39.2*	*37.4*	*45.9 L*	*64.1 L*	*44.6*	*7.7*	*11.8*	*51.6*	*44.2*	*51.3*	*49.8*

K - Biased high
L - Biased low

* Only total chromium is reported; EPA RSL and PADEP MSC shown are for hexavalent chromium

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by: EG 3/3/2017

TABLE 5-6
ANNEX COVER SOILS - EXCEEDANCES IN SUBSURFACE SOIL
ORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	A-21
			Sample Date	12/20/2006
			N=Normal, FD=Field Duplicate	N
			Start Depth (inches):	6
			End Depth (inches):	24
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**
Benzo[a]pyrene	0.3	12	mg/kg	*0.36 J*

J - Estimated result

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by: EG 3/3/17

Golder Associates

TABLE 5-6
ANNEX COVER SOILS - EXCEEDANCES IN SUBSURFACE SOIL
INORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	**A-1**	**A-13**	**A-21**	**A-22**	**A-9**
			Sample Date	**12/14/2006**	**12/14/2006**	**12/20/2006**	**12/20/2006**	**12/13/2006**
			N=Normal, FD=Field Duplicate	**N**	**N**	**N**	**N**	**N**
			Start Depth (inches):	**16**	**16**	**6**	**6**	**6**
			End Depth (inches):	**36**	**36**	**24**	**24**	**24**
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	3.0	61	mg/kg	*5.1 K*	*4.1 K*	*6.6 L*	***94.9 L***	*5.6 K*
Chromium*	6.3	220	mg/kg	*31*	*25.4*	*43.4 L*	*31.8 L*	*71.3*

K - Biased high
L - Biased low

* Only total chromium is reported; EPA RSL and PADEP MSC shown are for hexavalent chromium

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized*.
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by: EG 3/3/2017

Golder Associates

TABLE 5-7
LANDFILL BANK SEEPAGE AND PERIMETER LOCATIONS - SOIL EXCEEDANCES
ORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	L-39S	L-48S	L-54S	LF-A1S	LF-A2S	LF-A2S	LF-A3S
			Sample Date	8/14/2007	8/14/2007	8/15/2007	8/14/2007	8/14/2007	8/14/2007	8/15/2007
			N=Normal, FD=Field Duplicate	N	N	N	N	N	FD	N
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Benzo[a]anthracene	2.9	130	mg/kg		*4.8*					
Benzo[a]pyrene	0.29	12	mg/kg	*1.8*	*4.1*	*0.4*	*1.5*	*1.4*	*1.2*	*0.4 J*
Benzo[b]fluoranthene	2.9	76	mg/kg		*4.2 J*					
Dibenz[a,h]anthracene	0.29	22	mg/kg	*0.43*	*0.63 J*		*0.34 J*	*0.42 J*	*0.38 J*	

J - Estimated result

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by: 3/3/17

TABLE 5-7
LANDFILL BANK SEEPAGE AND PERIMETER LOCATIONS - SOIL EXCEEDANCES
INORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	L-13S	L-39S	L-48S	L-54S	LF-A1S	LF-A2S	LF-A2S	LF-A3S
			Sample Date	8/15/2007	8/14/2007	8/14/2007	8/15/2007	8/14/2007	8/14/2007	8/14/2007	8/15/2007
			N=Normal, FD=Field Duplicate	N	N	N	N	N	N	FD	N
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	3.0	61	mg/kg	*8*	*16*	*7*	*3.1*	*4.2*			*6*
Beryllium	229	11	mg/kg	**16.3**							
Chromium*	6	220	mg/kg	*95.5 J*	*50.3 J*	*58.7 J*	*19.4 J*	*45.3 J*	*29.4 J*	*33.8 J*	*109 J*
Iron	81,760	190,000	mg/kg		***199000***						
Lead	800	1,000	mg/kg		*901*	*831*					

* Only total chromium is reported; EPA RSL and PADEP MSC shown are for hexavalent chromium

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized*.
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by: EG 3/3/2017

Golder Associates

TABLE 5-8
ANNEX BANK SEEPAGE AND PERIMETER LOCATIONS - SOIL EXCEEDANCES
ORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	ANA-DS	ANA-JS
			Sample Date	8/15/2007	8/16/2007
			N=Normal, FD=Field Duplicate	N	N
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**
Benzo[a]pyrene	0.3	12	mg/kg	*0.31 J*	*0.62*

J - Estimated result

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by: EG 3/3/17

ANNEX BANK SEEPAGE AND PERIMETER LOCATIONS - SOIL EXCEEDANCES
INORGANICS
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

			Sample Location	A-17S	ANA-AS	ANA-DS	ANA-JS	ANA-LS
			Sample Date	8/14/2007	8/16/2007	8/15/2007	8/16/2007	8/15/2007
			N=Normal, FD=Field Duplicate	N	N	N	N	N
Parameter	**Industrial RSL (2016_05)**	**PADEP MSC (2016)**	**Unit**	**Result**	**Result**	**Result**	**Result**	**Result**
Arsenic	3.0	61	mg/kg		*8.8*	*13*	*4*	*6.7*
Chromium*	6.3	220	mg/kg	*11.5 J*	*39.1 J*	*63.3 J*	*26 J*	*26.9 J*

J - Estimated result

* Only total chromium is reported; EPA RSL and PADEP MSC shown are for hexavalent chromium

Results above the PADEP MSCs criteria are shown in **bold.**
Results above the EPA Industrial RSLs are shown *italicized* .
EPA Industrial RSL - EPA Regional Screening Levels for industrial soil, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Soil, Non-Residential Direct Contact, Surface Soil (0-2 ft). Last updated August 2016.

Checked by: EG 3/3/2017

Golder Associates

Table 5-9
Landfill Bank Seepage – Aqueous Exceedances
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

				Sample Location		LF-A1W	LF-A2W	LF-A2W	LF-A3W
				Sample Date		8/14/2007	8/14/2007	8/14/2007	8/15/2007
				N=Normal, FD=Field Duplicate		N	N	FD	N
Parameter	PA 93.8C CCC	PA 93.8C CMC	PA 93.8C HUMAN HEALTH	T=Total, D=Dissolved, N=None	Unit	Result	Result	Result	Result
Pesticides									
Aldrin	0.1	3	**0.000049**	N	ug/L	**0.024 J**			
alpha-Chlordane	*0.0043*	2.4	**0.0008**	N	ug/L	***0.07***			
4,4-DDD	*0.001*	1.1	**0.00031**	N	ug/L	***0.025 J***			
4,4-DDE	*0.001*	1.1	**0.00022**	N	ug/L	***0.03 J***			
4,4-DDT	*0.001*	1.1	**0.00022**	N	ug/L	***0.039 J***			
Dieldrin	*0.056*	0.24	**0.000052**	N	ug/L	***0.09 J***	**0.048 J**	**0.024 J**	
Metals									
Aluminum	NS	<u>750</u>	NS	T	ug/L	<u>16300</u>	<u>3750</u>	<u>4500</u>	<u>12700</u>
Arsenic	150	340	**10**	D	ug/L				**10.5**
Arsenic	150	340	**10**	T	ug/L				**17.4**
Cadmium*	*0.27*	<u>2.3</u>	NS	T	ug/L	*1.6 J*	*0.82 J*	*0.81 J*	*<u>5.2</u>*
Chromium	*10*	<u>16</u>	NS	T	ug/L	*<u>43.2</u>*	*13*	*15*	*<u>54.1</u>*
Copper*	*10*	<u>15</u>	NS	T	ug/L	*<u>107</u>*	*<u>29.6</u>*	*<u>33</u>*	*<u>110</u>*
Iron	NS	NS	**1500**	D	ug/L	**16500**	**9640**	**9550**	**5490**
Iron	NS	NS	**1500**	T	ug/L	**47000**	**20800**	**23000**	**33000**
Lead*	*3.0*	<u>76</u>	NS	T	ug/L	*<u>159</u>*	*47.1*	*53.1*	*<u>245</u>*
Manganese	NS	NS	**1000**	D	ug/L	**1430**	**1370**	**1370**	
Manganese	NS	NS	**1000**	T	ug/L	**1630**	**1410**	**1490**	
Mercury	*0.77*	1.44	**0.05**	T	ug/L	**0.43**	**0.17 J**	**0.2**	***0.78***
Zinc*	*134*	<u>133</u>	NS	T	ug/L	*<u>321 K</u>*			*<u>569 K</u>*

J - Estimated result
K - Biased high

* Site-specific criteria caluclated using average hardness (115.86 mg/l), as calculated from samples reported by CDM Smith, Final Screening Level Ecological Risk Assessment of Aquatic Habitats Associated with the Lower Darby Creek Superfund Site, December 4, 2014.

PA 93.8C - Pennsylvania DEP Chapter 93.8C Human Health and Aquatic Life Criteria for Toxic Substances

CCC - PA 93.8C Fish and Aquatic Life Criteria, Continuous Concentrations
CMC - PA 93.8C Fish and Aquatic Life Criteria, Maximum Concentrations
Human Health - PA 93.8C Human Health Criteria

Results above the CCC are shown *italicized*.
Results above the CMC are shown <u>underlined.</u>
Results above the Human Health criteria are shown in **bold.**

Golder Associates

Table 5-10
Annex Bank Seepage – Aqueous Exceedances
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

					Sample Location	ANA-AW	ANA-DW	ANA-DW	ANA-DW	ANA-JW	ANA-LW
					Sample Date	8/16/2007	8/15/2007	8/16/2007	8/16/2007	8/16/2007	8/15/2007
					N=Normal, FD=Field Duplicate	N	N	N	N	N	N
Parameter	PA 93.8C CCC	PA 93.8C CMC	PA 93.8C HUMAN HEALTH	T=Total, D=Dissolved, N=None	Unit	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds											
Vinyl Chloride	NS	NS	**0.025**	N	ug/L						**0.82**
Pesticides											
4,4-DDD	*0.001*	1.1	**0.00031**	N	ug/L			***0.033 J***			
4,4-DDE	*0.001*	1.1	**0.00022**	N	ug/L					***0.021 J***	
Metals											
Aluminum	NS	750	NS	T	ug/L	31100	17800			10600	22500
Arsenic	150	340	**10**	T	ug/L	**37.7**	**18.5**				**12.9**
Cadmium*	*0.27*	2.3	NS	T	ug/L	*2.4 J*	*3.4 J*			*1.8 J*	*2.6 J*
Chromium	*10*	16	NS	T	ug/L	*78.1*	*51.4*			*40.8*	*50.3*
Cobalt	*19*	95	NS	T	ug/L	*25.7 J*					
Copper*	*10*	15	NS	T	ug/L	*108*	*64.2*			*98.8*	*57.9*
Iron	NS	NS	**1500**	D	ug/L				**1770**	**26400**	
Iron	NS	NS	**1500**	T	ug/L	**43000**	**30600**			**52100**	**39300**
Lead*	*3.0*	76	NS	T	ug/L	*365*	*240*			*128*	*110*
Manganese	NS	NS	**1000**	T	ug/L					**1010**	**1290**
Mercury	*0.77*	1.44	**0.05**	T	ug/L	***1.2***	**0.48**			**0.4**	**0.25**
Nickel*	*59*	530	610	T	ug/L	*74.8 J*					
Zinc*	*134*	133	NS	T	ug/L	*576 K*	*362 K*			*259 K*	*270 K*

J - Estimated result
K - Biased high

* Site-specific criteria caluclated using average hardness (115.86 mg/l), as calculated from samples reported by CDM Smith, Final Screening Level Ecological Risk Assessment of Aquatic Habitats Associated with the Lower Darby Creek Superfund Site, December 4, 2014.

PA 93.8C - Pennsylvania DEP Chapter 93.8C Human Health and Aquatic Life Criteria for Toxic Substances

CCC - PA 93.8C Fish and Aquatic Life Criteria, Continuous Concentrations
CMC - PA 93.8C Fish and Aquatic Life Criteria, Maximum Concentrations
Human Health - PA 93.8C Human Health Criteria

Results above the CCC are shown *italicized*.
Results above the CMC are shown underlined.
Results above the Human Health criteria are shown in **bold.**

Sample Location					MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-12	MW-12	MW-12	MW-12	MW-12
Sample Date					1/31/2007	1/31/2007	1/31/2007	4/23/2012	4/23/2012	6/5/2012	6/5/2012	6/27/2014	3/22/2016	3/22/2016	1/29/2007	1/29/2007	1/29/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	6/25/2014	3/21/2016	3/21/2016	3/21/2016	3/21/2016	1/30/2007	1/30/2007	1/30/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	1/31/2007	1/31/2007	1/31/2007	5/24/2007	5/24/2007
N=Normal, FD=Field Duplicate					N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	FD	N	N	N	N	N	N	N	N	N	N	N	N
T=Total, D=Dissolved, N=None					D	N	T	N	N	N	N	N	N	T	D	N	T	N	D	N	T	N	N	T	N	T	D	N	T	N	D	N	T	D	N	T	N	D
Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																																						
1,1,1-Trichloroethane	801	200	2000	ug/L																																		
1,1,2,2-Tetrachloroethane	0.076	0.84	430	ug/L																																		
1,1-Dichloroethane	2.8	31	1600	ug/L									0.066 J																									
1,1-Dichloroethene	28	7	70	ug/L																																		
1,2,3-Trichlorobenzene	0.70	NS	NS	ug/L																																		
1,2,4-Trichlorobenzene	0.40	70	44000	ug/L																																		
1,2-Dichlorobenzene	30	600	60000	ug/L		0.85 K				0.98 J		0.63	0.51																									
1,2-Dichloroethane	0.17	5	50	ug/L		*0.27 K*																																
1,3-Dichlorobenzene	NS	600	60000	ug/L									0.079 J																									
1,4-Dichlorobenzene	0.48	75	7500	ug/L		0.13 K							0.11 J			0.31 J				0.27 J			0.17 J		0.18 J			0.12 L				0.12 J						
2-Butanone	557	4000	400000	ug/L												26																						
2-Hexanone	3.8	63	260	ug/L																																		
4-Methyl-2-pentanone	626	3300	930000	ug/L																																		
Acetone	1405	38000	1100000	ug/L								4.8 J	17									3.1 J						7.7 L										
Benzene	0.46	5	500	ug/L		*1.1 K*						0.13 J	0.13 J			0.27 J				0.29 J		0.039 J																
Carbon Disulfide	81	1500	6200	ug/L		0.11 K							0.077 J			0.11 J				0.27 J					0.17 J			0.11 L										
Chlorobenzene	7.8	100	10000	ug/L		*28*		*18 J*	*19 J*	*23*	*22*	*23*	*20*			1.7						1.4	1.3		1.3			0.72 L							0.41 K			
Chloroethane	2086	250	120000	ug/L																																		
Chloroform	0.22	80	800	ug/L																																		
cis-1,2-Dichloroethene	3.6	70	700	ug/L		2.9 K						0.4 J	0.24 J			0.14 J				0.18 J			0.1 J		0.067 J			0.13 L				0.12 J						
Cyclohexane	1251	13000	53000	ug/L		0.44 K						0.11 J				1.3				1.6 J		0.15 J	0.12 J		0.11 J			0.15 L				0.14 J			0.27 K			
Dichlorodifluoromethane	20	1000	100000	ug/L																																		
Ethylbenzene	1.5	700	70000	ug/L		0.11 K						0.047 J				0.27 J				0.39 J																		
Freon 113	5504	63000	170000	ug/L																																		
Isopropylbenzene	45	840	50000	ug/L		0.28 K										0.31 J				0.41 J			0.065 J		0.069 J			0.1 L										
m,p-Xylenes	19	10000	180000	ug/L								0.23 J	0.56									0.031 J																
Methyl Cyclohexane	NS	NS	NS	ug/L												0.18 J																						
Methyl tert-Butyl Ether	14	20	200	ug/L		0.51 K						0.31 J	0.36 J			0.16 J																			0.62 K			
Methylene Chloride	11	5	500	ug/L						*11 B*	*11 B*																											
o-Xylene	19	10000	180000	ug/L								0.073 J	0.079 J									0.25 J	0.19 J		0.19 J													
Styrene	121	100	10000	ug/L												0.23 J																						
Tetrachloroethene	4.1	5	50	ug/L												0.21 J				0.26 J		0.061 J																
Toluene	110	1000	100000	ug/L						1	0.87 B		0.22 J			1.3 J												0.1 L										
trans-1,2-Dichloroethene	36	100	1000	ug/L		0.28 K						0.26 J	0.22 J																									
Trichloroethene	0.28	5	50	ug/L		*0.47 K*														0.17 J																		
Vinyl Chloride	0.019	2	20	ug/L		*2.7 K*																																
Xylenes, Total	19	10000	180000	ug/L		0.14 K										0.95				1.2 J																		
Semivolatile Organic Compounds																																						
1,4-Dioxane	0.46	6.4	320	ug/L				***1100***	***950***	***410 J***	***580 J***	***560***	***850***																									
2,4-Dimethylphenol	36	830	2300000	ug/L									1.8 J+																									
2-Methylnaphthalene	3.6	170	470	ug/L												*8 J*				*6 J*																		
2-Methylphenol	93	2100	580000	ug/L																																		
4-Chloroaniline	0.37	3.7	17	ug/L																																		
4-Methylphenol	185	210	580000	ug/L												3 J																						
Acenaphthene	53	2500	3800	ug/L								3.7 J				12				11		3.9 J	5.9		4.3 J													
Acenaphthylene	NS	2500	16000	ug/L																																		
Acetophenone	192	4200	12000	ug/L																																		
Anthracene	177	66	66	ug/L																																		
Benzaldehyde	19	NS	NS	ug/L																																		
Benzo[a]anthracene	0.012	0.32	11	ug/L																																		
Benzo[a]pyrene	0.0034	0.2	3.8	ug/L																																		
Benzo[b]fluoranthene	0.034	0.19	1.2	ug/L																																		
Benzo[k]fluoranthene	0.34	0.19	0.55	ug/L																																		
Biphenyl	0.083	91	7200	ug/L																																		
Bis(2-chloroisopropyl) Ether	NS	NS	NS	ug/L																																		
Bis(2-ethylhexyl) Phthalate	5.6	6	290	ug/L																																		
Caprolactam	992	NS	NS	ug/L																																		
Carbazole	NS	37	170	ug/L												4 J				5 J																		
Chrysene	3.4	1.9	1.9	ug/L																																		
Dibenzofuran	0.79	42	4500	ug/L												*7 J*				*6 J*			0.45 J		0.33 J													

				Sample Location	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-1	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-10	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-11	MW-12	MW-12	MW-12	MW-12	MW-12
				Sample Date	1/31/2007	1/31/2007	1/31/2007	4/23/2012	4/23/2012	6/5/2012	6/5/2012	6/27/2014	3/22/2016	3/22/2016	1/29/2007	1/29/2007	1/29/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	6/25/2014	3/21/2016	3/21/2016	3/21/2016	3/21/2016	1/30/2007	1/30/2007	1/30/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	1/31/2007	1/31/2007	1/31/2007	5/24/2007	5/24/2007
				N=Normal, FD=Field Duplicate	N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	FD	N	N	N	N	N	N	N	N	N	N	N	N
				T=Total, D=Dissolved, N=None	D	N	T	N	N	N	N	N	N	T	D	N	T	N	D	N	T	N	N	T	N	T	D	N	T	N	D	N	T	D	N	T	N	D
Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Diethyl Phthalate	1484	33000	1100000	ug/L																																		
Dimethyl Phthalate	NS	NS		ug/L						9.7	8.5																											
Di-n-Butyl Phthalate	90	4200	400000	ug/L																																		
Fluoranthene	80	260	260	ug/L												2 J						1.6 J	1.9 J		1.7 J													
Fluorene	29	1700	1900	ug/L												8 J				8 J		3.7 J	3.7 J		2.8 J													
Naphthalene	0.17	100	30000	ug/L												*24*				*17*																		
N-Nitrosodiphenylamine	12	150	35000	ug/L																																		
Phenanthrene	NS	1100	1100	ug/L												11				11								2 J										
Phenol	577	2000	200000	ug/L												14				59																		
Pyrene	12	130	130	ug/L																			1.1 J		0.99 J													
Pesticides																																						
Aldrin	0.00092	0.43	20	ug/L																																		
alpha-Chlordane	0.02	2	56	ug/L																																		
alpha-Endosulfan	10	250	500	ug/L																												0.022 J						
beta-BHC	0.03	0.41	100	ug/L		*0.033 J*										0.022 J				0.012 J								*0.054*				*0.042 J*						
delta-BHC	NS	NS	NS	ug/L																												0.013 J						
Endrin	0.23	2	2	ug/L																																		
Endrin Aldehyde	NS	NS	NS	ug/L																																		
Ethane	NS	NS	NS	ug/L		14 L										0.48 L		0.51										1.1 L		0.7					1.3 L		1.1	
Ethene	NS	NS	NS	ug/L		0.68 L										1.7 L		0.86										0.98 L		0.089					0.087 L		0.055	
gamma-BHC	0.042	0.2	200	ug/L																																		
gamma-Chlordane	0.02	2	56	ug/L																																		
Heptachlor	0.0014	0.4	180	ug/L																												*0.017 J*						
Heptachlor Epoxide	0.0014	0.2	200	ug/L																																		
Metals																																						
Aluminum	1997	NS	NS	ug/L			181 J										183 J		72.8 J		250								989		16.1 J		413			51.2 J		15.9 J
Antimony	0.78	6	6000	ug/L																																		
Arsenic	0.052	10	10000	ug/L	*14.2*		*11*								*3.8 J*				*4 J*		*3.5 J*						*10.6*		*13.1*		*19.4*		*16.6*	*5 J*		*5.9 J*		*9.8 J*
Barium	377	2000	2000000	ug/L	*783*		*787*								245		241		206		203						179 J		192 J		173 J		170 J	215		220		191 J
Beryllium	2.5	4	4000	ug/L																	0.27 J																	
Cadmium	0.92	5	5000	ug/L															0.53 J												0.61 J							*0.98 J*
Calcium	NS	NS	NS	ug/L	73100		68300								85700		85500		79800		77000						38600		40200		31800		30000	55400		55300		58100
Chromium	0.035	100	100000	ug/L	*3.1 J*		*8.1 J*										*1.6 J*				*3.4 J*						*2.3 J*		*9.8 J*		*2.9 J*		*6.4 J*	*0.7 J*		*1 J*		
Cobalt	0.60	13	35000	ug/L	*5.4 J*		*8.4 J*								*7.6 J*		*17.7 J*		*9.5 J*		*7.9 J*						*7.4 J*		*6.8 J*		*10.1 J*		*7.5 J*					*4.3 J*
Copper	80	1000	1000000	ug/L	1.9 J										0.9 J						0.81 J						1.2 J		5.3 J				2.9 J	1.4 J				
Iron	1398	NS	NS	ug/L	*14600*		*20100*								*13600*		*14000*		*11100*		*11100*						*13400*		*16500*		*20200*		*20100*	*36700*		*37100*		*42100*
Lead	15	5	5000	ug/L																									4.7									
Magnesium	NS	NS	NS	ug/L	69800		65400								48900		48300		47500		46000						22300		23300		21200		20300	74000		71800		75000
Manganese	43	300	300000	ug/L	*970*		*740*								*6230*		*6270*		*5560*		*5380*						*3640*		*3380*		*2600*		*2450*	*2980*		*3060*		*3150*
Mercury	0.063	2	2000	ug/L																																		
Nickel	39	100	100000	ug/L	*107*		*98.2*								8.6 J		10.3 J		9.5 J		12.5 J						24.5 J		27.3 J		22.7 J		24.3 J			2.1 J		1.5 J
Potassium	NS	NS	NS	ug/L	9330		9030								41700		47700		62900 J		66400 J						12400		13100		12000 J		11500 J	14200		14100		13600 J
Selenium	10.0	50	50000	ug/L																																		
Silver	9.4	100	100000	ug/L			0.85 J										0.81 J												1.3 J							0.62 J		
Sodium	NS	NS	NS	ug/L	838000		774000								207000		203000		192000		192000						268000		265000		295000		277000	106000		106000		96800
Thallium	0.02	2	2000	ug/L																											*4.6 J*							*8.3 J*
Vanadium	8.6	2.9	8200	ug/L	0.96 J		1.4 J								0.47 J		1.3 J										1.2 J		3.9 J					0.64 J		0.74 J		
Zinc	600	2000	2000000	ug/L			14 J										14.9 J												17.8 J									
General Chemistry																																						
Alkalinity, Total	NS	NS	NS	mg/L		661 L										230 L				251								654 L				1010			552 L			
Ammonia	NS	30	30	mg/L		1.04 L										10.5 L												20.1 L							15.1 L			
Chloride	NS	NS	NS	mg/L																																		
Methane	NS	NS	NS	ug/L		1200 L										400 L		2300										1400 J		2000					1100 L		2000	
Nitrite	0.20	1	1000	mg/L																																		
Nitrite as N	0.20	1	1000	mg/L		*740 L*																																
Sulfate	NS	NS	NS	mg/L		5.51										48.5				48.3								31.8				18			28.5			
Sulfide	NS	NS	NS	mg/L		2.4																										0.8 J			0.6 J			
Total Organic Carbon	NS	NS	NS	mg/L		67.3										10.9				18.5												46.7			26.4			
Total Suspended Solids	NS	NS	NS	mg/L				18	12	19	20	25.6 J		26.4 J						19.2		17.7 J		5.7 J		6.1 J						4.4 J						

J - Estimated result
K - Biased high
L - Biased low

Results above the PADEP Residential Used Aquifer (TDS <= 2500) MSCs criteria are shown underlined.
Results above the PADEP Non-Residential Non-Use Aquifer MSCs criteria are shown in **bold.**
Results above the EPA Tapwater RSLs are shown *italicized*.
EPA Tapwater RSLs - EPA Regional Screening Levels for Tapwater, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Groundwater, Last updated August 2016.

				Sample Location	MW-12	MW-12	MW-13	MW-13	MW-13	MW-14	MW-14	MW-14	MW-14	MW-15D	MW-15D	MW-15D	MW-15D	MW-15D	MW-15S	MW-15S	MW-15S	MW-15S	MW-16	MW-16	MW-16	MW-17	MW-17	MW-17	MW-17	MW-18D	MW-18D	MW-18D	MW-18D	MW-18S	MW-18S	MW-19D	MW-19D	MW-19D
				Sample Date	5/24/2007	5/24/2007	6/25/2014	3/21/2016	3/21/2016	6/25/2014	6/25/2014	3/21/2016	3/21/2016	6/26/2014	3/24/2016	3/24/2016	3/24/2016	3/24/2016	6/26/2014	6/26/2014	3/24/2016	3/24/2016	6/26/2014	3/24/2016	3/24/2016	6/26/2014	3/25/2016	3/25/2016	7/19/2016	6/27/2014	3/25/2016	3/25/2016	7/19/2016	6/27/2014	3/25/2016	6/26/2014	3/25/2016	3/25/2016
				N=Normal, FD=Field Duplicate	N	N	N	N	N	N	FD	N	N	N	N	N	FD	FD	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
				T=Total, D=Dissolved, N=None	N	T	N	N	T	N	N	N	T	N	N	T	N	T	N	N	N	T	N	N	T	N	N	T	N	N	N	T	N	N	T	N	N	T
Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																																						
1,1,1-Trichloroethane	801	200	2000	ug/L																																		
1,1,2,2-Tetrachloroethane	0.076	0.84	430	ug/L																																		
1,1-Dichloroethane	2.8	31	1600	ug/L						0.11 J	0.11 J	0.1 J							0.11 J	0.093 J			*3.4*	*2.8*														
1,1-Dichloroethene	28	7	70	ug/L																			5.5	5.4 J+														
1,2,3-Trichlorobenzene	0.70	NS	NS	ug/L																																		
1,2,4-Trichlorobenzene	0.40	70	44000	ug/L																																		
1,2-Dichlorobenzene	30	600	60000	ug/L								0.14 J																										
1,2-Dichloroethane	0.17	5	50	ug/L																			0.17 J															
1,3-Dichlorobenzene	NS	600	60000	ug/L																																		
1,4-Dichlorobenzene	0.48	75	7500	ug/L				0.16 J				0.23 J																										
2-Butanone	557	4000	400000	ug/L																						1.5 J												
2-Hexanone	3.8	63	260	ug/L																																		
4-Methyl-2-pentanone	626	3300	930000	ug/L																																		
Acetone	1405	38000	1100000	ug/L			5.9			3 J																				3.7 J								
Benzene	0.46	5	500	ug/L	0.33 J		0.095 J	0.088 J		0.059 J	0.061 J			0.047 J						0.2 J			*1.6*	*1.6 J*		0.11 J				0.29 J				0.039 J				
Carbon Disulfide	81	1500	6200	ug/L			0.1 J	0.066 J		0.095 J	0.091 J															0.29 J												
Chlorobenzene	7.8	100	10000	ug/L			4.3	4.7		3.9	3.9	6.6							0.22 J	0.2 J														0.037 J				
Chloroethane	2086	250	120000	ug/L																																		
Chloroform	0.22	80	800	ug/L										0.08 J						0.041 J										*0.73*								
cis-1,2-Dichloroethene	3.6	70	700	ug/L	0.2 J		*13*	*11*		0.67	0.67	0.7							0.11 J	0.11 J	0.34 J		*79*	*55 J+*													0.39 J	
Cyclohexane	1251	13000	53000	ug/L	0.18 J		0.079 J	0.078 J															0.16 J															
Dichlorodifluoromethane	20	1000	100000	ug/L																																		
Ethylbenzene	1.5	700	70000	ug/L																						0.035 J				0.031 J								
Freon 113	5504	63000	170000	ug/L																																		
Isopropylbenzene	45	840	50000	ug/L																			0.14 J															
m,p-Xylenes	19	10000	180000	ug/L			0.045 J							0.051 J												0.1 J				0.09 J								
Methyl Cyclohexane	NS	NS	NS	ug/L				0.094 J																														
Methyl tert-Butyl Ether	14	20	200	ug/L			0.35 J	0.32 J		0.24 J	0.23 J	0.12 J							0.17 J	0.17 J	0.21 J		0.19 J	0.21 J+												0.076 J		
Methylene Chloride	11	5	500	ug/L										0.25 J						0.22 J										0.26 J								
o-Xylene	19	10000	180000	ug/L			0.041 J																			0.078 J												
Styrene	121	100	10000	ug/L																																		
Tetrachloroethene	4.1	5	50	ug/L			0.53	0.18 J																														
Toluene	110	1000	100000	ug/L																																		
trans-1,2-Dichloroethene	36	100	1000	ug/L			0.062 J	0.046 J															0.11 J															
Trichloroethene	0.28	5	50	ug/L			*0.5*	0.25 J		0.097 J	0.1 J	0.067 J											*1.7*	*0.81 J*														
Vinyl Chloride	0.019	2	20	ug/L			*1.7*	*0.91*				*0.33 J*											***120***	***93***														
Xylenes, Total	19	10000	180000	ug/L																																		
Semivolatile Organic Compounds																																						
1,4-Dioxane	0.46	6.4	320	ug/L			*1.5 J*	*1.1 J*						*72*	*170*		*150*		*85 J*	*150 J*	*200*		***370***	***500***					0.12 J		*5.5*		*3.2*					
2,4-Dimethylphenol	36	830	2300000	ug/L																				0.77 J														
2-Methylnaphthalene	3.6	170	470	ug/L																																		
2-Methylphenol	93	2100	580000	ug/L																																		
4-Chloroaniline	0.37	3.7	17	ug/L																																		
4-Methylphenol	185	210	580000	ug/L																				0.28 J			0.65 J											
Acenaphthene	53	2500	3800	ug/L										2.4 J																								
Acenaphthylene	NS	2500	16000	ug/L																																		
Acetophenone	192	4200	12000	ug/L																																		
Anthracene	177	66	66	ug/L																																		
Benzaldehyde	19	NS	NS	ug/L																																		
Benzo[a]anthracene	0.012	0.32	11	ug/L																																		
Benzo[a]pyrene	0.0034	0.2	3.8	ug/L																																		
Benzo[b]fluoranthene	0.034	0.19	1.2	ug/L																																		
Benzo[k]fluoranthene	0.34	0.19	0.55	ug/L																																		
Biphenyl	0.083	91	7200	ug/L																																		
Bis(2-chloroisopropyl) Ether	NS	NS	NS	ug/L																																		
Bis(2-ethylhexyl) Phthalate	5.6	6	290	ug/L						2.7 J				*7.5*									*8.4*															
Caprolactam	992	NS	NS	ug/L			58																				1.9 J											
Carbazole	NS	37	170	ug/L																																		
Chrysene	3.4	1.9	1.9	ug/L																																		
Dibenzofuran	0.79	42	4500	ug/L																																		

Golder Associates

				Sample Location	MW-12	MW-12	MW-13	MW-13	MW-13	MW-14	MW-14	MW-14	MW-14	MW-15D	MW-15D	MW-15D	MW-15D	MW-15D	MW-15S	MW-15S	MW-15S	MW-15S	MW-16	MW-16	MW-16	MW-17	MW-17	MW-17	MW-17	MW-18D	MW-18D	MW-18D	MW-18D	MW-18S	MW-18S	MW-19D	MW-19D	MW-19D
				Sample Date	5/24/2007	5/24/2007	6/25/2014	3/21/2016	3/21/2016	6/25/2014	6/25/2014	3/21/2016	3/21/2016	6/26/2014	3/24/2016	3/24/2016	3/24/2016	3/24/2016	6/26/2014	6/26/2014	3/24/2016	3/24/2016	6/26/2014	3/24/2016	3/24/2016	6/26/2014	3/25/2016	3/25/2016	7/19/2016	6/27/2014	3/25/2016	3/25/2016	7/19/2016	6/27/2014	3/25/2016	6/26/2014	3/25/2016	3/25/2016
				N=Normal, FD=Field Duplicate	N	N	N	N	N	N	FD	N	N	N	N	N	FD	FD	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
				T=Total, D=Dissolved, N=None	N	T	N	N	T	N	N	N	T	N	N	T	N	T	N	N	N	T	N	N	T	N	N	T	N	N	N	T	N	N	T	N	N	T
Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Diethyl Phthalate	1484	33000	1100000	ug/L																																		
Dimethyl Phthalate	NS	NS		ug/L																																		
Di-n-Butyl Phthalate	90	4200	400000	ug/L																																		
Fluoranthene	80	260	260	ug/L																							0.27 J-											
Fluorene	29	1700	1900	ug/L																																		
Naphthalene	0.17	100	30000	ug/L											*0.3 J*						*0.22 J*						*0.35 J*											
N-Nitrosodiphenylamine	12	150	35000	ug/L								0.26 J																										
Phenanthrene	NS	1100	1100	ug/L																							0.3 J											
Phenol	577	2000	200000	ug/L																																		
Pyrene	12	130	130	ug/L																							0.31 J-											
Pesticides																																						
Aldrin	0.00092	0.43	20	ug/L																																		
alpha-Chlordane	0.02	2	56	ug/L																																		
alpha-Endosulfan	10	250	500	ug/L																																		
beta-BHC	0.03	0.41	100	ug/L																																		
delta-BHC	NS	NS	NS	ug/L																																		
Endrin	0.23	2	2	ug/L																																		
Endrin Aldehyde	NS	NS	NS	ug/L																																		
Ethane	NS	NS	NS	ug/L						0.2 J	0.17												37			1										3.1		
Ethene	NS	NS	NS	ug/L						0.088 J	0.1												38			1.4										1.3		
gamma-BHC	0.042	0.2	200	ug/L																																		
gamma-Chlordane	0.02	2	56	ug/L																																		
Heptachlor	0.0014	0.4	180	ug/L																																		
Heptachlor Epoxide	0.0014	0.2	200	ug/L																																		
Metals																																						
Aluminum	1997	NS	NS	ug/L																																		
Antimony	0.78	6	6000	ug/L																																		
Arsenic	0.052	10	10000	ug/L		*6.8 J*																																
Barium	377	2000	2000000	ug/L		191 J																																
Beryllium	2.5	4	4000	ug/L		0.38 J																																
Cadmium	0.92	5	5000	ug/L		0.63 J																																
Calcium	NS	NS	NS	ug/L		55500																																
Chromium	0.035	100	100000	ug/L		*1.9 J*																																
Cobalt	0.60	13	35000	ug/L		*1.6 J*																																
Copper	80	1000	1000000	ug/L																																		
Iron	1398	NS	NS	ug/L		*41600*																																
Lead	15	5	5000	ug/L																																		
Magnesium	NS	NS	NS	ug/L		71000																																
Manganese	43	300	300000	ug/L		*3160*																																
Mercury	0.063	2	2000	ug/L																																		
Nickel	39	100	100000	ug/L		0.9 J																																
Potassium	NS	NS	NS	ug/L		13300 J																																
Selenium	10.0	50	50000	ug/L																																		
Silver	9.4	100	100000	ug/L																																		
Sodium	NS	NS	NS	ug/L		95000																																
Thallium	0.02	2	2000	ug/L		*6.3 J*																																
Vanadium	8.6	2.9	8200	ug/L																																		
Zinc	600	2000	2000000	ug/L																																		
General Chemistry																																						
Alkalinity, Total	NS	NS	NS	mg/L	604					160	162												118			465										132		
Ammonia	NS	30	30	mg/L						2.27 J	2.2 J												10.2 J			**38.2 J**										0.206 J		
Chloride	NS	NS	NS	mg/L						436 J	427 J												492 J			18.4 J										66.9 J		
Methane	NS	NS	NS	ug/L						120 J	120												5500			18000										19		
Nitrite	0.20	1	1000	mg/L						0.0186 J	0.0186 J												0.0186 J			0.0733 J										*0.271 J*		
Nitrite as N	0.20	1	1000	mg/L																																		
Sulfate	NS	NS	NS	mg/L	32.4					66.4	61.5												13.8			3.5										34.4		
Sulfide	NS	NS	NS	mg/L	0.6 J																																	
Total Organic Carbon	NS	NS	NS	mg/L	23.1					3.01	2.97												28.4			24.1										5.07		
Total Suspended Solids	NS	NS	NS	mg/L	54		188 J		212 J	15.3 J	20.9 J		33.2 J	203 J		17.9		22.5	89 J	83.6 J		59.6	108 J		52.8	197 J		1180		3.4 J		8		16.3 J	22	29.6 J		63.2

J - Estimated result
K - Biased high
L - Biased low

Results above the PADEP Residential Used Aquifer (TDS <= 2500) MSCs criteria are shown underlined.
Results above the PADEP Non-Residential Non-Use Aquifer MSCs criteria are shown in **bold.**
Results above the EPA Tapwater RSLs are shown *italicized*.
EPA Tapwater RSLs - EPA Regional Screening Levels for Tapwater, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Groundwater, Last updated August 2016.

Table 5-11
Groundwater Detections
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	MW-19D	MW-19S	MW-19S	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-20B	MW-20B	MW-21	MW-21	MW-22	MW-22	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-4	MW-4	MW-4	MW-5	MW-5	MW-5
Sample Date					7/20/2016	6/26/2014	3/25/2016	1/31/2007	1/31/2007	1/31/2007	1/31/2007	5/25/2007	4/23/2012	6/5/2012	6/27/2014	3/22/2016	3/22/2016	3/24/2016	3/24/2016	3/24/2016	3/24/2016	3/23/2016	3/23/2016	1/30/2007	1/30/2007	1/30/2007	4/24/2012	6/6/2012	6/8/2012	7/8/2014	3/22/2016	3/22/2016	1/31/2007	1/31/2007	1/31/2007	1/29/2007	1/29/2007	1/29/2007
N=Normal, FD=Field Duplicate					N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	FD	FD
T=Total, D=Dissolved, N=None					N	N	T	N	D	N	T	N	N	N	N	N	T	N	T	N	T	N	T	D	N	T	N	N	N	N	N	T	D	N	T	D	N	T
Parameter				Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																																						
1,1,1-Trichloroethane	801	200	2000	ug/L																																		
1,1,2,2-Tetrachloroethane	0.076	0.84	430	ug/L																																		
1,1-Dichloroethane	2.8	31	1600	ug/L						2 K		1.3 J			0.12 J	1.1 J																					0.34 J	
1,1-Dichloroethene	28	7	70	ug/L						*31*		*16 J*	*36 J*	*26*	2	*24 J+*																						
1,2,3-Trichlorobenzene	0.70	NS	NS	ug/L																																		
1,2,4-Trichlorobenzene	0.40	70	44000	ug/L																																		
1,2-Dichlorobenzene	30	600	60000	ug/L						0.49 K		0.29 J				0.31 J															0.12 J						0.24 J	
1,2-Dichloroethane	0.17	5	50	ug/L																																		
1,3-Dichlorobenzene	NS	600	60000	ug/L																																	0.16 J	
1,4-Dichlorobenzene	0.48	75	7500	ug/L						0.29 K		0.23 J																			0.31 J						0.3 J	
2-Butanone	557	4000	400000	ug/L																																		
2-Hexanone	3.8	63	260	ug/L																																		
4-Methyl-2-pentanone	626	3300	930000	ug/L																																		
Acetone	1405	38000	1100000	ug/L																										110 B		17						2.4 J	
Benzene	0.46	5	500	ug/L						*3.5 K*		*2.3 J*				*2*						*1.5 J*			*9.9 J*					*0.65 J*	0.45 J							
Carbon Disulfide	81	1500	6200	ug/L		0.14 J				0.99 K								1.1 J		0.45 J											0.1 J							
Chlorobenzene	7.8	100	10000	ug/L						*20 K*		*12 J*	*18 J*	*15 J*	*13*	*14*						0.47 J			*290 J*		*190*		*160*	*160*	*110*						4.7	
Chloroethane	2086	250	120000	ug/L						0.65 K																												
Chloroform	0.22	80	800	ug/L		*0.99*																																
cis-1,2-Dichloroethene	3.6	70	700	ug/L						*370*		*180*	*240 J*	*240*	*20*	*230*						0.49 J									0.2 J						1.1	
Cyclohexane	1251	13000	53000	ug/L						0.65 K		0.41 J				0.21 J															0.13 J							
Dichlorodifluoromethane	20	1000	100000	ug/L						0.4 K																												
Ethylbenzene	1.5	700	70000	ug/L						0.13 K																												
Freon 113	5504	63000	170000	ug/L																																		
Isopropylbenzene	45	840	50000	ug/L						2.1 K		1 J				0.59 J									2.5 J					1.1 J	1.6							
m,p-Xylenes	19	10000	180000	ug/L																										0.42 J	0.34 J							
Methyl Cyclohexane	NS	NS	NS	ug/L						0.64 K		0.49 J				0.45 J																						
Methyl tert-Butyl Ether	14	20	200	ug/L						0.69 K						0.46 J															0.12 J			0.19 K			0.51	
Methylene Chloride	11	5	500	ug/L						0.15 K				*94*													*14 B*		*13*									
o-Xylene	19	10000	180000	ug/L																											0.19 J							
Styrene	121	100	10000	ug/L																																		
Tetrachloroethene	4.1	5	50	ug/L																																		
Toluene	110	1000	100000	ug/L												0.22 J											3.7 B		1.7		0.21 J						0.13 J	
trans-1,2-Dichloroethene	36	100	1000	ug/L						1 K		0.57 J			0.081 J	1.3 J																						
Trichloroethene	0.28	5	50	ug/L						*12 K*		*8.1 J*	*17 J*	*15 J*	*1.8*	*39*																					0.12 J	
Vinyl Chloride	0.019	2	20	ug/L						***170***		***54***	***140 J***	***100***	*6*	***55***																						
Xylenes, Total	19	10000	180000	ug/L						0.14 K		0.42 J																										
Semivolatile Organic Compounds																																						
1,4-Dioxane	0.46	6.4	320	ug/L	0.13 J								***510 L***	*250 L*	***500***	***370***						*64*					*110*	*120 J*		*74 J*	*85*							
2,4-Dimethylphenol	36	830	2300000	ug/L																																		
2-Methylnaphthalene	3.6	170	470	ug/L																		0.45 J																
2-Methylphenol	93	2100	580000	ug/L																																		
4-Chloroaniline	0.37	3.7	17	ug/L																																		
4-Methylphenol	185	210	580000	ug/L														0.21 J																				
Acenaphthene	53	2500	3800	ug/L											5.2																0.47 J							
Acenaphthylene	NS	2500	16000	ug/L																																		
Acetophenone	192	4200	12000	ug/L														0.29 J																				
Anthracene	177	66	66	ug/L																																		
Benzaldehyde	19	NS	NS	ug/L																											0.5 J							
Benzo[a]anthracene	0.012	0.32	11	ug/L																																		
Benzo[a]pyrene	0.0034	0.2	3.8	ug/L																																		
Benzo[b]fluoranthene	0.034	0.19	1.2	ug/L																																		
Benzo[k]fluoranthene	0.34	0.19	0.55	ug/L																																		
Biphenyl	0.083	91	7200	ug/L																																		
Bis(2-chloroisopropyl) Ether	NS	NS	NS	ug/L																																		
Bis(2-ethylhexyl) Phthalate	5.6	6	290	ug/L																																		
Caprolactam	992	NS	NS	ug/L																																		
Carbazole	NS	37	170	ug/L																																		
Chrysene	3.4	1.9	1.9	ug/L																																		
Dibenzofuran	0.79	42	4500	ug/L																																		

Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Sample Location					MW-19D	MW-19S	MW-19S	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-20B	MW-20B	MW-21	MW-21	MW-22	MW-22	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-4	MW-4	MW-4	MW-5	MW-5	MW-5
Sample Date					7/20/2016	6/26/2014	3/25/2016	1/31/2007	1/31/2007	1/31/2007	1/31/2007	5/25/2007	4/23/2012	6/5/2012	6/27/2014	3/22/2016	3/22/2016	3/24/2016	3/24/2016	3/24/2016	3/24/2016	3/23/2016	3/23/2016	1/30/2007	1/30/2007	1/30/2007	4/24/2012	6/6/2012	6/8/2012	7/8/2014	3/22/2016	3/22/2016	1/31/2007	1/31/2007	1/31/2007	1/29/2007	1/29/2007	1/29/2007
N=Normal, FD=Field Duplicate					N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	FD	FD
T=Total, D=Dissolved, N=None					N	N	T	N	D	N	T	N	N	N	N	N	T	N	T	N	T	N	T	D	N	T	N	N	N	N	N	T	D	N	T	D	N	T
Diethyl Phthalate	1484	33000	1100000	ug/L																																		
Dimethyl Phthalate	NS	NS		ug/L																																		
Di-n-Butyl Phthalate	90	4200	400000	ug/L																																		
Fluoranthene	80	260	260	ug/L																																	2 J	
Fluorene	29	1700	1900	ug/L																		0.27 J																
Naphthalene	0.17	100	30000	ug/L																					*4 J*													
N-Nitrosodiphenylamine	12	150	35000	ug/L																																		
Phenanthrene	NS	1100	1100	ug/L																																		
Phenol	577	2000	200000	ug/L														2.1 J																				
Pyrene	12	130	130	ug/L																																	2 J	
Pesticides																																						
Aldrin	0.00092	0.43	20	ug/L																																		
alpha-Chlordane	0.02	2	56	ug/L																																		
alpha-Endosulfan	10	250	500	ug/L																																		
beta-BHC	0.03	0.41	100	ug/L						*0.045 J*															*0.055*													
delta-BHC	NS	NS	NS	ug/L																																		
Endrin	0.23	2	2	ug/L																																		
Endrin Aldehyde	NS	NS	NS	ug/L																																		
Ethane	NS	NS	NS	ug/L		0.41		32 L																	1.2 L									0.017 L			1.3 L	
Ethene	NS	NS	NS	ug/L		0.26		9.4 L																	0.18 L									0.055 L			0.71 L	
gamma-BHC	0.042	0.2	200	ug/L																																		
gamma-Chlordane	0.02	2	56	ug/L						0.012 J															0.0098 J													
Heptachlor	0.0014	0.4	180	ug/L																					*0.023 J*													
Heptachlor Epoxide	0.0014	0.2	200	ug/L																																		
Metals																																						
Aluminum	1997	NS	NS	ug/L							110 J															20.7 J									25.9 J			52.3 J
Antimony	0.78	6	6000	ug/L																																		
Arsenic	0.052	10	10000	ug/L					*18.6*		*14.3*													*97.7*		*102*										*5.1 J*		*7.4 J*
Barium	377	2000	2000000	ug/L					*1080*		*945*													*439*		*456*							60.3 J		59.2 J	*807*		*793*
Beryllium	2.5	4	4000	ug/L																																		
Cadmium	0.92	5	5000	ug/L																																		
Calcium	NS	NS	NS	ug/L					70000		62000													79000		78000							94300		91000	94700		93400
Chromium	0.035	100	100000	ug/L					*2.6 J*		*3.4 J*													*9.7 J*		*14.3*							*1.5 J*		*1.4 J*	*1.2 J*		*4.2 J*
Cobalt	0.60	13	35000	ug/L					*26.8 J*		*19.2 J*													*2.6 J*		*4.4 J*							*24.4 J*		*17.1 J*			
Copper	80	1000	1000000	ug/L					2.8 J															1.4 J									2.6 J			0.81 J		
Iron	1398	NS	NS	ug/L					*18200*		*17200*													*19900*		*20300*							548		675	*39800*		*38900*
Lead	15	5	5000	ug/L																																		
Magnesium	NS	NS	NS	ug/L					79100		69300													80600		79600							23000		22400	54400		54300
Manganese	43	300	300000	ug/L					*1150*		*1110*													*239*		*236*							*818*		*806*	*4770*		*4660*
Mercury	0.063	2	2000	ug/L																																		
Nickel	39	100	100000	ug/L					*90.3*		*78.8*													12.8 J		14.3 J							36.7 J		28.3 J	8 J		8.6 J
Potassium	NS	NS	NS	ug/L					33900		29700													92500		92000							17700		17200	13300		13200
Selenium	10.0	50	50000	ug/L																																		
Silver	9.4	100	100000	ug/L							0.63 J																											0.86 J
Sodium	NS	NS	NS	ug/L					514000		466000													451000		455000							110000		108000	221000		219000
Thallium	0.02	2	2000	ug/L																																		
Vanadium	8.6	2.9	8200	ug/L					1.1 J		1.3 J													*9.6 J*		*9.8 J*									0.46 J			
Zinc	600	2000	2000000	ug/L							8.6 J															11.3 J									17.6 J			6.1 J
General Chemistry																																						
Alkalinity, Total	NS	NS	NS	mg/L		115				614 L															313 L									166 L			116 L	
Ammonia	NS	30	30	mg/L		1.86 J				9.72 L															**136 L**									0.22 L			7.38 L	
Chloride	NS	NS	NS	mg/L		63.7 J																																
Methane	NS	NS	NS	ug/L		410		4000 L																	15000 J									18 L			91 L	
Nitrite	0.20	1	1000	mg/L		*0.266 J*																																
Nitrite as N	0.20	1	1000	mg/L																																		
Sulfate	NS	NS	NS	mg/L		2.65				23.5																								93.5			40.7	
Sulfide	NS	NS	NS	mg/L						1.2															2.2													
Total Organic Carbon	NS	NS	NS	mg/L		15.5				61.4															93									4.01 J			4.33 J	
Total Suspended Solids	NS	NS	NS	mg/L		89.2 J	108						22	35	28.1 J		21.4 J		20.4		3.3		50.6 J				36	41		54.2		63.8 J						

J - Estimated result
K - Biased high
L - Biased low

Results above the PADEP Residential Used Aquifer (TDS <= 2500) MSCs criteria are shown underlined.
Results above the PADEP Non-Residential Non-Use Aquifer MSCs criteria are shown in **bold.**
Results above the EPA Tapwater RSLs are shown *italicized*.
EPA Tapwater RSLs - EPA Regional Screening Levels for Tapwater, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Groundwater, Last updated August 2016.

			Sample Location		MW-5	MW-5	MW-5	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8
			Sample Date		1/29/2007	1/29/2007	1/29/2007	1/29/2007	1/29/2007	1/29/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	6/25/2014	3/21/2016	3/21/2016	1/30/2007	1/30/2007	1/30/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	7/8/2014	3/22/2016	3/22/2016	1/29/2007	1/29/2007	1/29/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	4/23/2012	6/5/2012	6/27/2014	3/22/2016
			N=Normal, FD=Field Duplicate		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
			T=Total, D=Dissolved, N=None		D	N	T	D	N	T	N	D	N	T	N	N	T	D	N	T	N	D	N	T	N	N	T	D	N	T	N	D	N	T	N	N	N	N
Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																																						
1,1,1-Trichloroethane	801	200	2000	ug/L					0.26 J				0.13 J		0.1 J	0.13 J																						
1,1,2,2-Tetrachloroethane	0.076	0.84	430	ug/L																																		
1,1-Dichloroethane	2.8	31	1600	ug/L		0.26 J			1.9				0.62 J		1	1.1			0.45 J				1.6 J			0.72			0.68				1.5					
1,1-Dichloroethene	28	7	70	ug/L					2.7 J				1.1 J		1.9	2.7			0.88 J				1.9 J			0.72												
1,2,3-Trichlorobenzene	0.70	NS	NS	ug/L															0.14 J																			
1,2,4-Trichlorobenzene	0.40	70	44000	ug/L																																		
1,2-Dichlorobenzene	30	600	60000	ug/L		0.22 J			0.27 J				0.13 J			0.17 J			0.52 J							0.3 J			0.49 J				0.48 J				0.51	0.52
1,2-Dichloroethane	0.17	5	50	ug/L					***61 K***				*15 J*		*11*	*7*			*2.6 J*				*5.2*		*0.27 J*	*8.4*												
1,3-Dichlorobenzene	NS	600	60000	ug/L		0.12 J													0.3 J							0.13 J			0.14 J				0.13 J				0.28 J	0.35 J
1,4-Dichlorobenzene	0.48	75	7500	ug/L		0.23 J			0.38 J				0.19 J		*0.66*	0.33 J			*1.2 J*				*0.78 J*			*0.56*			*0.93*				*0.99*			*1.5 L*	*1.1*	*1.2*
2-Butanone	557	4000	400000	ug/L															8.2 J																			
2-Hexanone	3.8	63	260	ug/L																																		
4-Methyl-2-pentanone	626	3300	930000	ug/L															5.4 J																			
Acetone	1405	38000	1100000	ug/L		2.2 J			4.7 J						3.3 J				17 J										11								4.5 J	
Benzene	0.46	5	500	ug/L					*0.72 J*				0.37 J		*0.61*	0.38 J			*3.9 J*				*2.5*			0.094 J			*5.7 J*				*5*			*1.4 L*	*4*	*1.3*
Carbon Disulfide	81	1500	6200	ug/L					0.11 J										0.25 J							0.11 J												0.071 J
Chlorobenzene	7.8	100	10000	ug/L		4			*13*				4.8 J		*19*	*10*			4.7 J				3.4			4.9			*15*				*14*			*14 L*	*19*	*20*
Chloroethane	2086	250	120000	ug/L					0.29 J																													
Chloroform	0.22	80	800	ug/L																																		
cis-1,2-Dichloroethene	3.6	70	700	ug/L		0.95			2.5				0.79 J		1.2	1.4			0.27 J				1.4 J			1			0.16 J				0.2 J				0.37 J	0.71
Cyclohexane	1251	13000	53000	ug/L					0.2 J						0.067 J				0.65 J				0.48 J			0.24 J			0.29 J				0.3 J				1.4	2
Dichlorodifluoromethane	20	1000	100000	ug/L															3.2																			
Ethylbenzene	1.5	700	70000	ug/L					*1.9*				0.17 J						*22 J*				*9.9*						1				0.73				0.049 J	
Freon 113	5504	63000	170000	ug/L					3.8				2 J		3.5	5			0.17 J																			
Isopropylbenzene	45	840	50000	ug/L					0.11 J										3 J				1.9 J			1.3							0.66				0.32 J	0.22 J
m,p-Xylenes	19	10000	180000	ug/L											0.055 J											0.31 J											0.62	0.46 J
Methyl Cyclohexane	NS	NS	NS	ug/L					0.19 J																	0.14 J											0.98	0.85
Methyl tert-Butyl Ether	14	20	200	ug/L		0.47 J			0.73						0.96	0.66										0.11 J			0.64								0.52	0.49 J
Methylene Chloride	11	5	500	ug/L																																9.4 B		
o-Xylene	19	10000	180000	ug/L																						0.26 J										1.1 L	5.8	6.6
Styrene	121	100	10000	ug/L																																		
Tetrachloroethene	4.1	5	50	ug/L					0.3 J				0.14 J		0.33 J	0.39 J			0.83 J				0.51 J			0.19 J												
Toluene	110	1000	100000	ug/L		0.11 J			1 J										13 J							0.15 J			0.5 J							0.7 B		0.36 J
trans-1,2-Dichloroethene	36	100	1000	ug/L																																		
Trichloroethene	0.28	5	50	ug/L					0.2 J						0.11 J	0.16 J			*0.5 J*				*0.48 J*			0.18 J												
Vinyl Chloride	0.019	2	20	ug/L					*0.57*										*1.1 J*							*0.46 J*			*0.13 J*									
Xylenes, Total	19	10000	180000	ug/L					13				0.6 J						*160*				*71*						3.1				2.4					
Semivolatile Organic Compounds																																						
1,4-Dioxane	0.46	6.4	320	ug/L											*21*	*19*									*22 J*	*28*									*260*	*240 J*	*210*	*260*
2,4-Dimethylphenol	36	830	2300000	ug/L															2 J							0.32 J			10 J									
2-Methylnaphthalene	3.6	170	470	ug/L															*5 J*				3 J						*160*				*42*		1 J	2.4 J		
2-Methylphenol	93	2100	580000	ug/L																						0.23 J			2 J									
4-Chloroaniline	0.37	3.7	17	ug/L																																		
4-Methylphenol	185	210	580000	ug/L															15							0.3 J			7 J									
Acenaphthene	53	2500	3800	ug/L															3 J						1.5 J	1.3 J			*130*				47		3.4 J	4.9	6.2	8.2
Acenaphthylene	NS	2500	16000	ug/L																									6 J									
Acetophenone	192	4200	12000	ug/L															2 J																			0.37 J+
Anthracene	177	66	66	ug/L																						0.32 J			14				11 J					1.5 J
Benzaldehyde	19	NS	NS	ug/L															3 J							1.5 J										1.9 K	1.7 J	0.87 J
Benzo[a]anthracene	0.012	0.32	11	ug/L																						*0.23 J*												*0.33 J*
Benzo[a]pyrene	0.0034	0.2	3.8	ug/L																						*0.21 J*												
Benzo[b]fluoranthene	0.034	0.19	1.2	ug/L																						*0.29 J*												
Benzo[k]fluoranthene	0.34	0.19	0.55	ug/L																						0.2 J												
Biphenyl	0.083	91	7200	ug/L																									*24*				*9 J*					
Bis(2-chloroisopropyl) Ether	NS	NS	NS	ug/L																																		
Bis(2-ethylhexyl) Phthalate	5.6	6	290	ug/L					*6 J*																													
Caprolactam	992	NS	NS	ug/L					12																													
Carbazole	NS	37	170	ug/L															3 J				3 J						51				14 J					
Chrysene	3.4	1.9	1.9	ug/L																																		0.34 J
Dibenzofuran	0.79	42	4500	ug/L																						0.57 J			*64*				*29*					0.69 J

				Sample Location	MW-5	MW-5	MW-5	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-6	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-7	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8	MW-8
				Sample Date	1/29/2007	1/29/2007	1/29/2007	1/29/2007	1/29/2007	1/29/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	6/25/2014	3/21/2016	3/21/2016	1/30/2007	1/30/2007	1/30/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	7/8/2014	3/22/2016	3/22/2016	1/29/2007	1/29/2007	1/29/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	4/23/2012	6/5/2012	6/27/2014	3/22/2016
				N=Normal, FD=Field Duplicate	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
				T=Total, D=Dissolved, N=None	D	N	T	D	N	T	N	D	N	T	N	N	T	D	N	T	N	D	N	T	N	N	T	D	N	T	N	D	N	T	N	N	N	N
Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Diethyl Phthalate	1484	33000	1100000	ug/L															5 J				2 J															
Dimethyl Phthalate	NS	NS		ug/L																																		
Di-n-Butyl Phthalate	90	4200	400000	ug/L																																9.6		
Fluoranthene	80	260	260	ug/L																						0.73 J			11				13 J		5.4	8.7 J	6.9	4.6 J
Fluorene	29	1700	1900	ug/L															2 J						1.1 J	0.96 J			*100 J*				*44*		3.7 J	5.5	5.8	2.6 J
Naphthalene	0.17	100	30000	ug/L															*8 J*				*5 J*						*460*				*130*			*2.3 J*		
N-Nitrosodiphenylamine	12	150	35000	ug/L																						0.36 J												2 J+
Phenanthrene	NS	1100	1100	ug/L															4 J				2 J			0.2 J			120				88		2.9 J	4.1 J	1.9 J	0.58 J
Phenol	577	2000	200000	ug/L																						0.35 J												
Pyrene	12	130	130	ug/L																						0.44 J			6 J				5 J		3 J	3.8 J	3.2 J	3 J
Pesticides																																						
Aldrin	0.00092	0.43	20	ug/L																													*0.012 J*					
alpha-Chlordane	0.02	2	56	ug/L									0.013 J																									
alpha-Endosulfan	10	250	500	ug/L																			0.026 J										0.014 J					
beta-BHC	0.03	0.41	100	ug/L					0.018 J				*0.027 J*						0.025 J				*0.066 J*						*0.042 J*				*0.06*					
delta-BHC	NS	NS	NS	ug/L															0.012 J				0.043 J										0.015 J					
Endrin	0.23	2	2	ug/L									0.02 J																									
Endrin Aldehyde	NS	NS	NS	ug/L																													0.02 J					
Ethane	NS	NS	NS	ug/L		1.3 L			11 L		8.6								1.4 L		0.66								1.3 L		2							
Ethene	NS	NS	NS	ug/L		0.69 L			3.2 L		4.1								2.5 L		1.3								0.72 L		0.32							
gamma-BHC	0.042	0.2	200	ug/L																													0.02 J					
gamma-Chlordane	0.02	2	56	ug/L																			*0.051 J*						0.017 J				*0.024 J*					
Heptachlor	0.0014	0.4	180	ug/L									*0.02 J*						*0.01 J*				*0.071 J*										*0.038 J*					
Heptachlor Epoxide	0.0014	0.2	200	ug/L																			*0.022 J*						*0.013 J*				*0.021 J*					
Metals																																						
Aluminum	1997	NS	NS	ug/L			27.5 J			938		13.3 J		*2630*						253		28.5 J		1600						848		33.6 J		405				
Antimony	0.78	6	6000	ug/L										*3 J*																								
Arsenic	0.052	10	10000	ug/L	*4.6 J*		*6.5 J*					*3.6 J*		*4 J*				*10.3*		*8.8 J*		*12.3*		*12.5*				*47.5*		*40.5*		*53.9*		*51.7*				
Barium	377	2000	2000000	ug/L	*801*		*804*	201		216		212		249				322		353		370		368				*710*		*715*		*644*		*659*				
Beryllium	2.5	4	4000	ug/L										0.27 J										0.38 J										0.42 J				
Cadmium	0.92	5	5000	ug/L								0.57 J		0.8 J								0.7 J		*1 J*								0.75 J		0.57 J				
Calcium	NS	NS	NS	ug/L	93900		95700	130000		132000		119000		119000				131000		144000		84800		75800				18600		20900		15700		15900				
Chromium	0.035	100	100000	ug/L	*0.98 J*		*3.8 J*	*0.78 J*		*5.4 J*				*10.1*				*2.7 J*		*6.3 J*		*7.3 J*		*52.6*				*6.5 J*		*22.3*		*9.1 J*		*17.5*				
Cobalt	0.60	13	35000	ug/L								*4 J*		*4.6 J*								*4.7 J*		*3.3 J*				*12.4 J*		*15.6 J*		*16 J*		*15 J*				
Copper	80	1000	1000000	ug/L	1 J			1.2 J		7.7 J		0.8 J		6.5 J				0.76 J		5.7 J		0.81 J		11.1 J				1.6 J				0.62 J		2.8 J				
Iron	1398	NS	NS	ug/L	*39300*		*39600*	*18700*		*20100*		*19900*		*25400*				*41100*		*42700*		*28500*		*30700*				*11800*		*15300*		*10800*		*11200*				
Lead	15	5	5000	ug/L						8.6				5.3						6.1				*27.7*						3.7								
Magnesium	NS	NS	NS	ug/L	53800		55600	70300		72000		72600		74700				82900		88300		76800		68400				109000		110000		113000		114000				
Manganese	43	300	300000	ug/L	*4670*		*4790*	*4800*		*4900*		*5220*		*5450*				*4870*		*4100*		*2090*		*2070*				*177*		*235*		*93.7*		*104*				
Mercury	0.063	2	2000	ug/L																				*0.15 L*														
Nickel	39	100	100000	ug/L	7 J		8.4 J	2.9 J		5.8 J		3.9 J		8.7 J				9.8 J		12.2 J		14.9 J		*42*				*52.4*		*54.9*		*49.5*		*56.5*				
Potassium	NS	NS	NS	ug/L	13200		13500	28400		28900		18300 J		20200 J				50000		53200		84300 J		76600 J				155000		151000		165000 J		167000 J				
Selenium	10.0	50	50000	ug/L																														3.1 J				
Silver	9.4	100	100000	ug/L			0.73 J			0.84 J										0.89 J										2.1 J								
Sodium	NS	NS	NS	ug/L	220000		224000	131000		132000		143000		144000				139000		140000		192000		173000				805000		755000		799000		791000				
Thallium	0.02	2	2000	ug/L										*4.1 J*				*6.4 J*		*6 J*		*3.2 J*		*3.9 J*								*3.1 J*						
Vanadium	8.6	2.9	8200	ug/L						2.4 J				6.5 J				1.7 J		2.9 J		2.7 J		*9 J*				5.5 J		7.8 J		6.7 J		7.6 J				
Zinc	600	2000	2000000	ug/L			6.5 J			14.5 J										11.7 J				48.8						11 J								
General Chemistry																																						
Alkalinity, Total	NS	NS	NS	mg/L		114 L			495 L				472						499 L				1220						218 L				2710					
Ammonia	NS	30	30	mg/L		7.46 L			3.91 L										**70.4 L**										**180 L**									
Chloride	NS	NS	NS	mg/L																																		
Methane	NS	NS	NS	ug/L		89 L			1000 L		1700								9300 J		11000								410 J		1200							
Nitrite	0.20	1	1000	mg/L																																		
Nitrite as N	0.20	1	1000	mg/L															*1.85 L*																			
Sulfate	NS	NS	NS	mg/L		41.4			27.5				29						15.2				10.7						3.52				2.74					
Sulfide	NS	NS	NS	mg/L		0.6 J													2.4				1.4						2.4				2.2					
Total Organic Carbon	NS	NS	NS	mg/L		4.56 J			12.2				11.6						130				44.7						112				111					
Total Suspended Solids	NS	NS	NS	mg/L									83.2		64.6 J		68.4 J						24.8		45.6		59.6 J						12.4		8	22	1.5 J	

J - Estimated result
K - Biased high
L - Biased low

Results above the PADEP Residential Used Aquifer (TDS <= 2500) MSCs criteria are shown underlined.
Results above the PADEP Non-Residential Non-Use Aquifer MSCs criteria are shown in **bold.**
Results above the EPA Tapwater RSLs are shown *italicized*.
EPA Tapwater RSLs - EPA Regional Screening Levels for Tapwater, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Groundwater, Last updated August 2016.

			Sample Location		MW-8	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9	MW-9
			Sample Date		3/22/2016	1/30/2007	1/30/2007	1/30/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007	4/23/2012	6/5/2012	6/27/2014	7/8/2014	3/22/2016	3/22/2016
			N=Normal, FD=Field Duplicate		N	N	N	N	N	FD	N	N	N	FD	FD	FD	N	N	N	N	N	N
			T=Total, D=Dissolved, N=None		T	D	N	T	N	N	D	N	T	D	N	T	N	N	N	N	N	T
Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																						
1,1,1-Trichloroethane	801	200	2000	ug/L																		
1,1,2,2-Tetrachloroethane	0.076	0.84	430	ug/L								0.2 J										
1,1-Dichloroethane	2.8	31	1600	ug/L																		
1,1-Dichloroethene	28	7	70	ug/L																		
1,2,3-Trichlorobenzene	0.70	NS	NS	ug/L																		
1,2,4-Trichlorobenzene	0.40	70	44000	ug/L																		
1,2-Dichlorobenzene	30	600	60000	ug/L			0.18 K					0.81 J			0.36 K							
1,2-Dichloroethane	0.17	5	50	ug/L																		
1,3-Dichlorobenzene	NS	600	60000	ug/L			0.14 K					0.26 J			0.27 K				0.23 J			
1,4-Dichlorobenzene	0.48	75	7500	ug/L			0.4 K					0.7			0.7 K				0.53		0.45 J	
2-Butanone	557	4000	400000	ug/L			2.2 K												2 J			
2-Hexanone	3.8	63	260	ug/L								8.2			5.1 K							
4-Methyl-2-pentanone	626	3300	930000	ug/L								2.3 J			2.2 K							
Acetone	1405	38000	1100000	ug/L														110 L	13		48	
Benzene	0.46	5	500	ug/L			5.9 K					11			9.9 K			3.5 L	1.4		2.4 J	
Carbon Disulfide	81	1500	6200	ug/L			0.1 K					0.26 J			0.18 K							
Chlorobenzene	7.8	100	10000	ug/L			3.4 K					7.9			7.3 K			4.7 L	4.4		4.5	
Chloroethane	2086	250	120000	ug/L											0.17 K							
Chloroform	0.22	80	800	ug/L																		
cis-1,2-Dichloroethene	3.6	70	700	ug/L			0.1 K					0.21 J			0.18 K				0.13 J			
Cyclohexane	1251	13000	53000	ug/L			0.79 K					1.8			1.8 K				2.1		1.9 J	
Dichlorodifluoromethane	20	1000	100000	ug/L																		
Ethylbenzene	1.5	700	70000	ug/L			3 K					7.1			6.3 K				0.079 J			
Freon 113	5504	63000	170000	ug/L																		
Isopropylbenzene	45	840	50000	ug/L			2.8 K					5.5			6 K			4.8 L	4.9		4.7	
m,p-Xylenes	19	10000	180000	ug/L														1.9 L	1.1		1.5 J	
Methyl Cyclohexane	NS	NS	NS	ug/L			0.39 K					0.89			0.9 K				1.4		1.4 J	
Methyl tert-Butyl Ether	14	20	200	ug/L			0.38 K												0.55		0.5 J	
Methylene Chloride	11	5	500	ug/L														11 B				
o-Xylene	19	10000	180000	ug/L														1.5 L	1.7		1.8 J	
Styrene	121	100	10000	ug/L								0.61										
Tetrachloroethene	4.1	5	50	ug/L																		
Toluene	110	1000	100000	ug/L			12 K					14			12 K			1 L			0.28 J	
trans-1,2-Dichloroethene	36	100	1000	ug/L																		
Trichloroethene	0.28	5	50	ug/L								3.7 K										
Vinyl Chloride	0.019	2	20	ug/L																		
Xylenes, Total	19	10000	180000	ug/L			20 K					51			42 K							
Semivolatile Organic Compounds																						
1,4-Dioxane	0.46	6.4	320	ug/L													390	220 J		260	120	
2,4-Dimethylphenol	36	830	2300000	ug/L								4 J			3 J							
2-Methylnaphthalene	3.6	170	470	ug/L			16					25			24		7.1	6.6	2.1 J		27	
2-Methylphenol	93	2100	580000	ug/L																		
4-Chloroaniline	0.37	3.7	17	ug/L			44															
4-Methylphenol	185	210	580000	ug/L			5 J					8 J			10 J							
Acenaphthene	53	2500	3800	ug/L			15					20			18		6.7	11	13		18	
Acenaphthylene	NS	2500	16000	ug/L																		
Acetophenone	192	4200	12000	ug/L																		
Anthracene	177	66	66	ug/L											2 J						0.56 J	
Benzaldehyde	19	NS	NS	ug/L															1.5 J		1.1 J	
Benzo[a]anthracene	0.012	0.32	11	ug/L																		
Benzo[a]pyrene	0.0034	0.2	3.8	ug/L																		
Benzo[b]fluoranthene	0.034	0.19	1.2	ug/L																		
Benzo[k]fluoranthene	0.34	0.19	0.55	ug/L																		
Biphenyl	0.083	91	7200	ug/L																		
Bis(2-chloroisopropyl) Ether	NS	NS	NS	ug/L																		
Bis(2-ethylhexyl) Phthalate	5.6	6	290	ug/L											19							
Caprolactam	992	NS	NS	ug/L																		
Carbazole	NS	37	170	ug/L																	1.1 J	
Chrysene	3.4	1.9	1.9	ug/L																		
Dibenzofuran	0.79	42	4500	ug/L			7 J					9 J			8 J			4.8	6.1		11	

Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	MW-8 3/22/2016 N T Result	MW-9 1/30/2007 N D Result	MW-9 1/30/2007 N N Result	MW-9 1/30/2007 N T Result	MW-9 5/24/2007 N N Result	MW-9 5/24/2007 FD N Result	MW-9 5/24/2007 N D Result	MW-9 5/24/2007 N N Result	MW-9 5/24/2007 N T Result	MW-9 5/24/2007 FD D Result	MW-9 5/24/2007 FD N Result	MW-9 5/24/2007 FD T Result	MW-9 4/23/2012 N N Result	MW-9 6/5/2012 N N Result	MW-9 6/27/2014 N N Result	MW-9 7/8/2014 N N Result	MW-9 3/22/2016 N N Result	MW-9 3/22/2016 N T Result
Diethyl Phthalate	1484	33000	1100000	ug/L																		
Dimethyl Phthalate	NS	NS		ug/L																		
Di-n-Butyl Phthalate	90	4200	400000	ug/L								11										
Fluoranthene	80	260	260	ug/L																		
Fluorene	29	1700	1900	ug/L			8 J					10			9 J		3.3 J	6.2	6		9.4	
Naphthalene	0.17	100	30000	ug/L			*4 J*					*4 J*			*4 J*						*6.9*	
N-Nitrosodiphenylamine	12	150	35000	ug/L																		
Phenanthrene	NS	1100	1100	ug/L			7 J					9 J			9 J		1.7 J	2.7 J	3.3 J		6.1	
Phenol	577	2000	200000	ug/L			13 J					11			14 J							
Pyrene	12	130	130	ug/L																		
Pesticides																						
Aldrin	0.00092	0.43	20	ug/L																		
alpha-Chlordane	0.02	2	56	ug/L																		
alpha-Endosulfan	10	250	500	ug/L								0.022 J			0.014 J							
beta-BHC	0.03	0.41	100	ug/L			*0.063*					*0.036 J*			*0.075 J*							
delta-BHC	NS	NS	NS	ug/L																		
Endrin	0.23	2	2	ug/L																		
Endrin Aldehyde	NS	NS	NS	ug/L																		
Ethane	NS	NS	NS	ug/L			1.9 L		1.4	1.4												
Ethene	NS	NS	NS	ug/L			0.45 L		0.39	0.32												
gamma-BHC	0.042	0.2	200	ug/L																		
gamma-Chlordane	0.02	2	56	ug/L								0.014 J			0.017 J							
Heptachlor	0.0014	0.4	180	ug/L			*0.027 J*					*0.066*			*0.083*							
Heptachlor Epoxide	0.0014	0.2	200	ug/L																		
Metals																						
Aluminum	1997	NS	NS	ug/L		171 J		970			60 J		966	50.4 J		1140						
Antimony	0.78	6	6000	ug/L																		
Arsenic	0.052	10	10000	ug/L		*59.9*		*62.2*			*66.2*		*60.9*	*64.4*		*63.3*						
Barium	377	2000	2000000	ug/L		*498*		*517*			*467*		*459*	*462*		*470*						
Beryllium	2.5	4	4000	ug/L									0.48 J			0.53 J						
Cadmium	0.92	5	5000	ug/L							*1.4 J*		0.64 J	*1.2 J*		0.64 J						
Calcium	NS	NS	NS	ug/L		42900		44700			48200		46700	46000		46000						
Chromium	0.035	100	100000	ug/L		*15.8*		*30.5*			*40.5*		*42.5*	*40.6*		*46.6*						
Cobalt	0.60	13	35000	ug/L		*19.7 J*		*34.9 J*			*18 J*		*12 J*	*15.6 J*		*11.9 J*						
Copper	80	1000	1000000	ug/L		1.8 J							4 J	0.7 J		4.5 J						
Iron	1398	NS	NS	ug/L		*8510*		*10000*			*10000*		*10100*	*9670*		*11100*						
Lead	15	5	5000	ug/L																		
Magnesium	NS	NS	NS	ug/L		124000		127000			147000		142000	142000		140000						
Manganese	43	300	300000	ug/L		*133*		*155*			*89.7*		*105*	*85*		*105 L*						
Mercury	0.063	2	2000	ug/L																		
Nickel	39	100	100000	ug/L		32.1 J		*40*			33.9 J		*44.6*	33.3 J		*46.1*						
Potassium	NS	NS	NS	ug/L		224000		227000			276000 J		269000 J	267000 J		263000 J						
Selenium	10.0	50	50000	ug/L												4.9 J						
Silver	9.4	100	100000	ug/L				0.71 J														
Sodium	NS	NS	NS	ug/L		765000		773000			846000		840000	840000		824000						
Thallium	0.02	2	2000	ug/L																		
Vanadium	8.6	2.9	8200	ug/L		*22.6 J*		*25.5 J*			*26 J*		*25.9 J*	*25 J*		*27.1 J*						
Zinc	600	2000	2000000	ug/L																		
General Chemistry																						
Alkalinity, Total	NS	NS	NS	mg/L			129 L					4500			4020							
Ammonia	NS	30	30	mg/L			**283 L**															
Chloride	NS	NS	NS	mg/L																		
Methane	NS	NS	NS	ug/L			15000 J		15000	13000												
Nitrite	0.20	1	1000	mg/L																		
Nitrite as N	0.20	1	1000	mg/L			*809 L*															
Sulfate	NS	NS	NS	mg/L			6.99					4.83			4.62							
Sulfide	NS	NS	NS	mg/L			5.4					3			3.4							
Total Organic Carbon	NS	NS	NS	mg/L			49.3					118			122							
Total Suspended Solids	NS	NS	NS	mg/L	20.9 J							10.8			22.8		120	61	63.9 J			71.2 J

J - Estimated result
K - Biased high
L - Biased low

Results above the PADEP Residential Used Aquifer (TDS <= 2500) MSCs criteria are shown underlined.
Results above the PADEP Non-Residential Non-Use Aquifer MSCs criteria are shown in **bold.**
Results above the EPA Tapwater RSLs are shown *italicized*.
EPA Tapwater RSLs - EPA Regional Screening Levels for Tapwater, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Groundwater, Last updated August 2016.

Sample Location					MW-A	MW-A	MW-A	MW-A(D)	MW-A(D)	MW-A(D)	MW-A(D)	MW-A(D)	MW-A(S)	MW-A(S)	MW-B	MW-B	MW-B	MW-B	MW-B(D)	MW-B(D)	MW-B(D)	MW-B(D)	MW-B(D)	MW-B(S)	MW-B(S)	MW-C(D)	MW-C(D)	MW-C(D)	MW-C(D)	MW-C(D)	MW-C(S)	MW-C(S)	MW-C(S)	MW-D	MW-D	MW-D	MW-D	MW-D
Sample Date					1/25/2012	1/25/2012	1/25/2012	4/23/2012	6/7/2012	6/30/2014	3/23/2016	3/23/2016	4/24/2012	6/7/2012	1/25/2012	1/25/2012	1/25/2012	1/25/2012	4/24/2012	6/7/2012	6/30/2014	3/23/2016	3/23/2016	4/24/2012	6/7/2012	4/24/2012	6/6/2012	7/1/2014	3/23/2016	3/23/2016	4/24/2012	6/6/2012	6/8/2012	4/24/2012	6/6/2012	7/1/2014	3/23/2016	3/23/2016
N=Normal, FD=Field Duplicate					N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
T=Total, D=Dissolved, N=None					N	N	N	N	N	N	N	T	N	N	N	N	N	N	N	N	N	N	T	N	N	N	N	N	N	T	N	N	N	N	N	N	N	T
Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Volatile Organic Compounds																																						
1,1,1-Trichloroethane	801	200	2000	ug/L																																		
1,1,2,2-Tetrachloroethane	0.076	0.84	430	ug/L																																		
1,1-Dichloroethane	2.8	31	1600	ug/L	0.43 J						0.28 J																		0.47 J							0.76 J	0.87 J	
1,1-Dichloroethene	28	7	70	ug/L	43			56	43	0.97	27 J+				1.1 J							2.1 J				64	48	39	21 J+								0.6 J	
1,2,3-Trichlorobenzene	0.70	NS	NS	ug/L																																		
1,2,4-Trichlorobenzene	0.40	70	44000	ug/L																															13	24	9.8	
1,2-Dichlorobenzene	30	600	60000	ug/L							0.21 J																								1 J		1.2	
1,2-Dichloroethane	0.17	5	50	ug/L																																		
1,3-Dichlorobenzene	NS	600	60000	ug/L																																0.9 J	1.6	
1,4-Dichlorobenzene	0.48	75	7500	ug/L																									0.55 J					21 J	19	35	120	
2-Butanone	557	4000	400000	ug/L																																		
2-Hexanone	3.8	63	260	ug/L																																		
4-Methyl-2-pentanone	626	3300	930000	ug/L																																		
Acetone	1405	38000	1100000	ug/L	6.9	4.6 JB									7.6 J	39 J	6.6	2.9 J						19 B	15 B						11 B		28 B		35 B	14 J		
Benzene	0.46	5	500	ug/L	2.3						2 J				0.24 J											4.5 J		4 J	2.1					9.2 J	5.7	5	5.1	
Carbon Disulfide	81	1500	6200	ug/L		0.11 J					0.3 J				0.12 J		0.1 J																0.13 J				0.12 J	
Chlorobenzene	7.8	100	10000	ug/L	18	0.22 J		20 J	19 J	0.42 J	21																		0.43 J					99	86	95	140	
Chloroethane	2086	250	120000	ug/L																																		
Chloroform	0.22	80	800	ug/L																																		
cis-1,2-Dichloroethene	3.6	70	700	ug/L	540	2.8	0.33 J	660	630	11	310				39	48	1.7		61	66	8	56				860	800	610	400		2.2		2.6	14 J	15	9.4	7.5	
Cyclohexane	1251	13000	53000	ug/L	0.32 J						0.27 J																		0.24 J								0.21 J	
Dichlorodifluoromethane	20	1000	100000	ug/L																																		
Ethylbenzene	1.5	700	70000	ug/L																																		
Freon 113	5504	63000	170000	ug/L																																		
Isopropylbenzene	45	840	50000	ug/L																																	0.15 J	
m,p-Xylenes	19	10000	180000	ug/L	0.22 J	0.18 J									0.13 J		0.12 J																				0.12 J	
Methyl Cyclohexane	NS	NS	NS	ug/L																																		
Methyl tert-Butyl Ether	14	20	200	ug/L	0.48 J	0.29 J					0.56 J				0.26 J		0.19 J					0.47 J+							0.62 J		0.29 J		0.33 J			0.26 J	0.4 J	
Methylene Chloride	11	5	500	ug/L	0.42 JB	0.56 B	0.39 JB		100				14 B	20 J	0.43 JB	2 JB	0.37 JB	0.39 JB	3.9 B	19 B				0.54 B	1.2 B		89 B				0.84 B		0.77 B	14 B	18 B			
o-Xylene	19	10000	180000	ug/L	0.15 J																																0.18 J	
Styrene	121	100	10000	ug/L																																		
Tetrachloroethene	4.1	5	50	ug/L																																		
Toluene	110	1000	100000	ug/L	0.3 JB	0.15 JB	0.14 JB		2.6				2.6 B	1.7 J	0.26 JB	0.67 JB	0.21 JB	0.13 JB	0.57 B	0.65 B				0.28 B	0.14 B						0.097 B		0.28 B	2.8 B	0.79 B		0.23 J	
trans-1,2-Dichloroethene	36	100	1000	ug/L	2.5					0.078 J	3 J+				0.39 J						0.058 J	0.38 J						5 J	3.5 J+									
Trichloroethene	0.28	5	50	ug/L	63	3.1	0.13 J	98	88	1.8	78				36	46	1.7	0.17 J	79	70	8	57				330	270	220	130				0.14 J					
Vinyl Chloride	0.019	2	20	ug/L	110			140	110	2.2	53				2.3	2.6				3.5 J						160	130	100	59				0.19 J	93	71	45	35	
Xylenes, Total	19	10000	180000	ug/L																																		
Semivolatile Organic Compounds																																						
1,4-Dioxane	0.46	6.4	320	ug/L	330	16	1.5 JB	410	540	420 J	400			2.6 B	20	24	3.3 B	1.4 JB	30	25	21 J	20				450	340 L	620	530		1.6 B			1000	1100 J	880	1300	
2,4-Dimethylphenol	36	830	2300000	ug/L																																		
2-Methylnaphthalene	3.6	170	470	ug/L																																		
2-Methylphenol	93	2100	580000	ug/L																																		
4-Chloroaniline	0.37	3.7	17	ug/L																																		
4-Methylphenol	185	210	580000	ug/L																																		
Acenaphthene	53	2500	3800	ug/L																																		
Acenaphthylene	NS	2500	16000	ug/L																																		
Acetophenone	192	4200	12000	ug/L																																		
Anthracene	177	66	66	ug/L																																		
Benzaldehyde	19	NS	NS	ug/L																																		
Benzo[a]anthracene	0.012	0.32	11	ug/L																																		
Benzo[a]pyrene	0.0034	0.2	3.8	ug/L																																		
Benzo[b]fluoranthene	0.034	0.19	1.2	ug/L																																		
Benzo[k]fluoranthene	0.34	0.19	0.55	ug/L																																		
Biphenyl	0.083	91	7200	ug/L																																		
Bis(2-chloroisopropyl) Ether	NS	NS	NS	ug/L																														2 J				
Bis(2-ethylhexyl) Phthalate	5.6	6	290	ug/L										2.3 J	18	18																						
Caprolactam	992	NS	NS	ug/L																																		
Carbazole	NS	37	170	ug/L																																		
Chrysene	3.4	1.9	1.9	ug/L																																		
Dibenzofuran	0.79	42	4500	ug/L																																		

			Sample Location		MW-A	MW-A	MW-A	MW-A(D)	MW-A(D)	MW-A(D)	MW-A(D)	MW-A(D)	MW-A(S)	MW-A(S)	MW-B	MW-B	MW-B	MW-B	MW-B(D)	MW-B(D)	MW-B(D)	MW-B(D)	MW-B(D)	MW-B(S)	MW-B(S)	MW-C(D)	MW-C(D)	MW-C(D)	MW-C(D)	MW-C(D)	MW-C(S)	MW-C(S)	MW-C(S)	MW-D	MW-D	MW-D	MW-D	MW-D
			Sample Date		1/25/2012	1/25/2012	1/25/2012	4/23/2012	6/7/2012	6/30/2014	3/23/2016	3/23/2016	4/24/2012	6/7/2012	1/25/2012	1/25/2012	1/25/2012	1/25/2012	4/24/2012	6/7/2012	6/30/2014	3/23/2016	3/23/2016	4/24/2012	6/7/2012	4/24/2012	6/6/2012	7/1/2014	3/23/2016	3/23/2016	4/24/2012	6/6/2012	6/8/2012	4/24/2012	6/6/2012	7/1/2014	3/23/2016	3/23/2016
			N=Normal, FD=Field Duplicate		N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
			T=Total, D=Dissolved, N=None		N	N	N	N	N	N	N	T	N	N	N	N	N	N	N	N	N	N	T	N	N	N	N	N	N	T	N	N	N	N	N	N	N	T
Parameter	EPA Tapwater RSLs (2016_05)	PADEP Residential Used Aquifer MSCs (2016)	PADEP Non-Residential Non-Used Aquifer MSCs (2016)	Unit	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result	Result
Diethyl Phthalate	1484	33000	1100000	ug/L																																		
Dimethyl Phthalate	NS	NS		ug/L																																		
Di-n-Butyl Phthalate	90	4200	400000	ug/L																																		
Fluoranthene	80	260	260	ug/L																																		
Fluorene	29	1700	1900	ug/L																																		
Naphthalene	0.17	100	30000	ug/L																																		
N-Nitrosodiphenylamine	12	150	35000	ug/L																																		
Phenanthrene	NS	1100	1100	ug/L																																		
Phenol	577	2000	200000	ug/L																																		
Pyrene	12	130	130	ug/L																																		
Pesticides																																						
Aldrin	0.00092	0.43	20	ug/L																																		
alpha-Chlordane	0.02	2	56	ug/L																																		
alpha-Endosulfan	10	250	500	ug/L																																		
beta-BHC	0.03	0.41	100	ug/L																																		
delta-BHC	NS	NS	NS	ug/L																																		
Endrin	0.23	2	2	ug/L																																		
Endrin Aldehyde	NS	NS	NS	ug/L																																		
Ethane	NS	NS	NS	ug/L						13																		16										
Ethene	NS	NS	NS	ug/L						1.4																		1.9										
gamma-BHC	0.042	0.2	200	ug/L																																		
gamma-Chlordane	0.02	2	56	ug/L																																		
Heptachlor	0.0014	0.4	180	ug/L																																		
Heptachlor Epoxide	0.0014	0.2	200	ug/L																																		
Metals																																						
Aluminum	1997	NS	NS	ug/L																																		
Antimony	0.78	6	6000	ug/L																																		
Arsenic	0.052	10	10000	ug/L																																		
Barium	377	2000	2000000	ug/L																																		
Beryllium	2.5	4	4000	ug/L																																		
Cadmium	0.92	5	5000	ug/L																																		
Calcium	NS	NS	NS	ug/L																																		
Chromium	0.035	100	100000	ug/L																																		
Cobalt	0.60	13	35000	ug/L																																		
Copper	80	1000	1000000	ug/L																																		
Iron	1398	NS	NS	ug/L																																		
Lead	15	5	5000	ug/L																																		
Magnesium	NS	NS	NS	ug/L																																		
Manganese	43	300	300000	ug/L																																		
Mercury	0.063	2	2000	ug/L																																		
Nickel	39	100	100000	ug/L																																		
Potassium	NS	NS	NS	ug/L																																		
Selenium	10.0	50	50000	ug/L																																		
Silver	9.4	100	100000	ug/L																																		
Sodium	NS	NS	NS	ug/L																																		
Thallium	0.02	2	2000	ug/L																																		
Vanadium	8.6	2.9	8200	ug/L																																		
Zinc	600	2000	2000000	ug/L																																		
General Chemistry																																						
Alkalinity, Total	NS	NS	NS	mg/L						599 J																		340										
Ammonia	NS	30	30	mg/L						1.22 J																		0.347 J										
Chloride	NS	NS	NS	mg/L						454 J																		531										
Methane	NS	NS	NS	ug/L						700																		790										
Nitrite	0.20	1	1000	mg/L																																		
Nitrite as N	0.20	1	1000	mg/L																																		
Sulfate	NS	NS	NS	mg/L						24.7 J																		29.9										
Sulfide	NS	NS	NS	mg/L																																		
Total Organic Carbon	NS	NS	NS	mg/L						39.1 J																		37.3										
Total Suspended Solids	NS	NS	NS	mg/L	17.5	68	127		2 J	18.7 J		1.1 J	83	46	71.5 J	42 J	108	104	2 J	3	1 J		1 J	119	129	19	49	14.7		23.5 J	71	73		101	125	140		165 J

J - Estimated result
K - Biased high
L - Biased low

Results above the PADEP Residential Used Aquifer (TDS <= 2500) MSCs criteria are shown underlined.
Results above the PADEP Non-Residential Non-Use Aquifer MSCs criteria are shown in **bold.**
Results above the EPA Tapwater RSLs are shown *italicized*.
EPA Tapwater RSLs - EPA Regional Screening Levels for Tapwater, THQ = 0.1. Last updated May 2016.
PADEP MSC - Medium Specific Concentrations for Organic and Inorganic Regulated Substances in Groundwater, Last updated August 2016.

Table 7-1
Selection of Exposure Pathways
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe	Medium	Exposure Medium	Exposure Points	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/ Future	Groundwater	Groundwater	On-Site Wells in Landfill and Annex	Maintenance Worker/Refuge Employee	Adult	Ingestion	On-site	Qualitative	Incomplete pathway for refuge workers.
						Dermal Absorption	On-site	Qualitative	Incomplete pathway for refuge workers.
				Trespasser	Adolescent	Ingestion	On-site	Qualitative	Incomplete pathway for adolescent trespassers.
						Dermal Absorption	On-site	Qualitative	Incomplete pathway for adolescent trespassers.
	Surface Soil	Soil	Landfill and Annex Surface Soils and Seep Surface Soils	Trespasser	Adolescent	Ingestion	On-site	Quantitative	Adolescent trespassers may be exposed to contaminants in soils at both the Landfill and Annex.
						Dermal Absorption	On-site	Quantitative	Adolescent trespassers may be exposed to contaminants in soils at both the Landfill and Annex.
				Maintenance Worker/Refuge Employee	Adult	Ingestion	On-site	Quantitative	Adult refuge workers may be exposed to contaminants in soils at both the Landfill and Annex.
						Dermal Absorption	On-site	Quantitative	Adult refuge workers may be exposed to contaminants in soils at both the Landfill and Annex.
	Seeps	Seeps	Landfill and Annex Seep Areas	Trespasser	Adolescent	Ingestion	On-site	Qualitative	Adolescent trespassers are unlikely to ingest contaminants in seep liquid, because seepage does not pool.
						Dermal Absorption	On-site	Quantitative	Adolescent trespassers may have dermal contact to contaminants in seep liquid at both the Landfill and Annex.
				Maintenance Worker/Refuge Employee	Adult	Ingestion	On-site	Qualitative	Adult refuge workers are unlikely to ingest contaminants in seep liquid, because seepage does not pool.
						Dermal Absorption	On-site	Quantitative	Adult refuge workers may have dermal contact to contaminants in seep liquid at both the Landfill and Annex.
	Groundwater	Air	Landfill and Annex Air	Trespasser	Adolescent	Inhalation	On-site	Quantitative	Pathway may be complete for trespassers breathing in volatile compounds from groundwater.
				Maintenance Worker/Refuge Employee	Adult	Inhalation	On-site	Quantitative	Pathway may be complete for refuge workes breathing in volatile compounds from groundwater.
			Refuge Indoor Air	Park Visitor	Child	Inhalation	On-site	Quantitative	Pathway may be complete for park visitor breathing in volatile compounds from groundwater.
					Adult	Inhalation	On-site	Quantitative	Pathway may be complete for park visitor breathing in volatile compounds from groundwater.
				Maintenance Worker/Refuge Employee	Adult	Inhalation	On-site	Quantitative	Pathway may be complete for maintenance worker breathing in volatile compounds from groundwater.
	Surface Soil	Airborne Particulates	Landfill and Annex Air	Trespasser	Adolescent	Inhalation	On-site	Quantitative	Pathway may be complete for trespassers breathing in particulates during excavation work (reduced vegetative cover).
				Maintenance Worker/Refuge Employee	Adult	Inhalation	On-site	Quantitative	Pathway may be complete for refuge workers breathing in particulates during excavation work (reduced vegetative cover).
Future	Groundwater	Groundwater	On-Site Wells in Landfill and Annex	Park Visitor	Child	Ingestion	On-site	Qualitative	Incomplete pathway for park visitors.
						Dermal Absorption	On-site	Qualitative	Incomplete pathway for park visitors.
					Adult	Ingestion	On-site	Qualitative	Incomplete pathway for park visitors.
						Dermal Absorption	On-site	Qualitative	Incomplete pathway for park visitors.
				Construction/Excavation Worker	Adult	Ingestion	On-site	Quantitative	Adult excavation workers may be exposed to contaminants in groundwater at both the Landfill and Annex if excavation occurs below groundwater level.
						Dermal Absorption	On-site	Quantitative	Adult excavation workers may be exposed to contaminants in groundwater at both the Landfill and Annex if excavation occurs below groundwater level.
	Surface Soil	Soil	Landfill and Annex Surface Soils and Seep Surface Soils	Park Visitor	Child	Ingestion	On-site	Quantitative	Child park visitors may be exposed to contaminants in soils at both the Landfill and Annex.
						Dermal Absorption	On-site	Quantitative	Child park visitors may be exposed to contaminants in soils at both the Landfill and Annex.
					Adult	Ingestion	On-site	Quantitative	Adult park visitors may be exposed to contaminants in soils at both the Landfill and Annex.
						Dermal Absorption	On-site	Quantitative	Adult park visitors may be exposed to contaminants in soils at both the Landfill and Annex.
				Construction/Excavation Worker	Adult	Ingestion	On-site	Quantitative	Adult excavation workers may be exposed to contaminants in soils at both the Landfill and Annex.
						Dermal Absorption	On-site	Quantitative	Adult excavation workers may be exposed to contaminants in soils at both the Landfill and Annex.
	Seeps	Seeps	Landfill and Annex Seep Areas	Park Visitor	Child	Ingestion	On-site	Qualitative	Child park visitors are unlikely to ingest contaminants in seep liquid, because seepage does not pool.
						Dermal Absorption	On-site	Quantitative	Child park visitors may have dermal contact to contaminants in seep liquid at both the Landfill and Annex.
					Adult	Ingestion	On-site	Qualitative	Adult park visitors are unlikely to ingest contaminants in seep liquid, because seepage does not pool.
						Dermal Absorption	On-site	Quantitative	Adult park visitors may have dermal contact to contaminants in seep liquid at both the Landfill and Annex.
				Construction/Excavation Worker	Adult	Ingestion	On-site	Qualitative	Adult excavation workers are unlikely to ingest contaminants in seep liquid, because seepage does not pool.
						Dermal	On-site	Quantitative	Adult excavation workers may have dermal contact to contaminants in seep liquid at both the Landfill and Annex.
	Groundwater	Air	Landfill and Annex Air	Park Visitor	Child	Inhalation	On-site	Qualitative	Pathway may be complete for park visitor breathing in volatile compounds from groundwater.
					Adult	Inhalation	On-site	Qualitative	Pathway may be complete for park visitor breathing in volatile compounds from groundwater.
				Construction/Excavation Worker	Adult	Inhalation	On-site	Quantitative	Adult excavation workers may be exposed to volatile compounds from groundwater and soil that accumulate in a trench.
			Refuge Indoor Air	Park Visitor	Child	Inhalation	On-site	Qualitative	Pathway may be complete for park visitor breathing in volatile compounds from groundwater.
					Adult	Inhalation	On-site	Qualitative	Pathway may be complete for park visitor breathing in volatile compounds from groundwater.
				Maintenance Worker/Refuge Employee	Adult	Inhalation	On-site	Quantitative	Pathway may be complete for maintenance worker breathing in volatile compounds from groundwater.
	Surface Soil	Airborne Particulates	Landfill and Annex Air	Park Visitor	Child	Inhalation	On-site	Qualitative	Incomplete pathway due to vegetative cover.
					Adult	Inhalation	On-site	Qualitative	Incomplete pathway due to vegetative cover.
				Construction/Excavation Worker	Adult	Inhalation	On-site	Quantitative	Adult excavation workers may be exposed to particulates in air if dust suppression is not employed.

Notes:
These pathways represent exposures for both the Landfill and Annex Exposure Points

Table 7-2.1

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (4) (N/C) Tap Water		Potential ARAR/TBC Value (5)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
								Metals								
Groundwater - Annex	**7429-90-5**	**Aluminum**	**52.3 J**	**2,630 J**	**ug/l**	**MW-6**	**5 / 5**	**11.1 - 15.3**	**2,630**	**NE**	**2,000**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-36-0	**Antimony**	**3 J**	**3 J**	**ug/l**	**MW-6**	**1 / 5**	**2.1 - 2.2**	**3**	**NE**	**0.78**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-38-2	**Arsenic**	**3.5 J**	**7.4 J**	**ug/l**	**MW-5**	**3 / 5**	**2.8 - 2.9**	**7.4**	**NE**	**0.052**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-39-3	**Barium**	**203**	**804**	**ug/l**	**MW-5**	**5 / 5**	**0.1 - 0.2**	**804**	**NE**	**380**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-41-7	Beryllium	0.27 J	0.27 J	ug/l	MW-10	2 / 5	0.2 - 0.3	0.27	NE	2.5	(N)	NA	NA	N	BSL
	7440-43-9	Cadmium	0.8 J	0.8 J	ug/l	MW-6	1 / 5	0.4 - 0.5	0.8	NE	0.92	(N)	NA	NA	N	BSL
	7440-70-2	Calcium	77,000	132,000	ug/l	MW-6	5 / 5	1.8 - 2.4	132,000	NE	-	-	NA	NA	N	NUTR
	7440-47-3	**Chromium**	**1.6 J**	**10.1 J**	**ug/l**	**MW-6**	**5 / 5**	**0.3 - 0.5**	**10.1**	**NE**	**0.035**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-48-4	**Cobalt**	**4.6 J**	**17.7 J**	**ug/l**	**MW-10**	**3 / 5**	**0.9 - 1**	**17.7**	**NE**	**0.6**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-50-8	Copper	0.81 J	7.7 J	ug/l	MW-6	3 / 5	0.5 - 3.1	7.7	NE	80	(N)	NA	NA	N	BSL
	7439-89-6	**Iron**	**11,100**	**39,600**	**ug/l**	**MW-5**	**5 / 5**	**10 - 15.3**	**39,600**	**NE**	**1,400**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-92-1	Lead	5.3	8.6	ug/l	MW-6	2 / 5	1 - 1.9	8.6	NE	15	(MCL)	NA	NA	N	BSL
	7439-95-4	Magnesium	46,000	74,700	ug/l	MW-6	5 / 5	3.6 - 4.3	74,700	NE	-	-	NA	NA	N	NUTR
	7439-96-5	**Manganese**	**4790**	**6,270**	**ug/l**	**MW-10**	**5 / 5**	**0.1 - 0.2**	**6,270**	**NE**	**43**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-02-0	Nickel	5.8 J	12.5 J	ug/l	MW-10	5 / 5	0.8 - 1.4	12.5	NE	39	(N)	NA	NA	N	BSL
	7440-09-7	Potassium	13,500	66,400	ug/l	MW-10	5 / 5	3.7 - 4.4	66,400	NE	-	-	NA	NA	N	NUTR
	7440-22-4	Silver	0.81 J	0.86 J	ug/l	MW-5	3 / 5	0.5 - 1.2	0.86	NE	9.4	(N)	NA	NA	N	BSL
	7440-23-5	Sodium	132,000	224,000	ug/l	MW-5	5 / 5	78.5 - 90.1	224,000	NE	-	-	NA	NA	N	NUTR
	7440-28-0	**Thallium**	**4.1 J**	**4.1 J**	**ug/l**	**MW-6**	**1 / 5**	**2.9 - 4.3**	**4.1**	**NE**	**0.02**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-62-2	Vanadium	1.3 J	6.5 J	ug/l	MW-6	3 / 5	0.4 - 2.1	6.5	NE	8.6	(N)	NA	NA	N	BSL
	7440-66-6	Zinc	6.5 J	14.9 J	ug/l	MW-10	3 / 5	0.7 - 3.2	14.9	NE	600	(N)	NA	NA	N	BSL
								Pesticides/PCBs								
	5103-71-9	Alpha-Chlordane	0.013 J	0.013 J	ug/l	MW-6	1 / 5	0.0091 - 0.0093	0.013	NE	0.02	(C) SURR[a]	NA	NA	N	BSL
	319-85-7	**Beta-BHC**	**0.012 J**	**0.027 J**	**ug/l**	**MW-6**	**4 / 5**	**0.0091 - 0.0093**	**0.027**	**NE**	**0.025**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	72-20-8	Endrin	0.02 J	0.02 J	ug/l	MW-6	1 / 5	0.018 - 0.019	0.02	NE	0.23	(N)	NA	NA	N	BSL
	76-44-8	**Heptachlor**	**0.02 J**	**0.02 J**	**ug/l**	**MW-6**	**1 / 5**	**0.0091 - 0.0093**	**0.02**	**NE**	**0.0014**	**(C)**	**NA**	**NA**	**Y**	**ASL**
								SVOCs								
	123-91-1	**1,4-Dioxane**	**19**	**21**	**ug/l**	**MW-6**	**2 / 4**	**0.26 - 0.49**	**21**	**NE**	**0.46**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	91-57-6	**2-Methylnaphthalene**	**6 J**	**8 J**	**ug/l**	**MW-10**	**2 / 9**	**0.33 - 2.1**	**8**	**NE**	**3.6**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	106-44-5	4-Methylphenol	3 J	3 J	ug/l	MW-10	1 / 9	0.34 - 2.5	3	NE	190	(N)	NA	NA	N	BSL
	83-32-9	Acenaphthene	3.9 J	12 J	ug/l	MW-10	4 / 9	0.3 - 2.1	12	NE	53	(N)	NA	NA	N	BSL
	117-81-7	**Bis(2-Ethylhexyl) Phthalate**	**6 J**	**6 J**	**ug/l**	**MW-6**	**1 / 9**	**2 - 3.2**	**6**	**NE**	**5.6**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	105-60-2	Caprolactum	12	12	ug/l	MW-6	1 / 5	1.8 - 2.1	12	NE	990	(N)	NA	NA	N	BSL
	86-74-8	**Carbazole**	**4 J**	**5 J**	**ug/l**	**MW-10**	**2 / 9**	**0.3 - 2.1**	**5**	**NE**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	132-64-9	**Dibenzofuran**	**0.45 J**	**7 J**	**ug/l**	**MW-10**	**3 / 9**	**0.21 - 2.1**	**7**	**NE**	**0.79**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	206-44-0	Fluoranthene	1.6 J	2 J	ug/l	MW-10	4 / 9	0.32 - 2.1	2	NE	80	(N)	NA	NA	N	BSL
	86-73-7	Fluorene	3.7 J	8 J	ug/l	MW-10	4 / 9	0.23 - 2.1	8	NE	29	(N)	NA	NA	N	BSL
	91-20-3	**Naphthalene**	**17**	**24**	**ug/l**	**MW-10**	**2 / 9**	**0.26 - 2.1**	**24**	**NE**	**0.17**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	85-01-8	Phenanthrene	11	11	ug/l	MW-10	2 / 9	0.13 - 2.1	11	NE	12	(N) SURR[a]	NA	NA	N	BSL
	108-95-2	Phenol	14	59	ug/l	MW-10	2 / 9	0.22 - 2.1	59	NE	580	(N)	NA	NA	N	BSL
	129-00-0	Pyrene	1.1 J	2 J	ug/l	MW-5	2 / 9	0.26 - 2.1	2	NE	12	(N)	NA	NA	N	BSL

Table 7-2.1

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (4) (N/C) Tap Water		Potential ARAR/TBC Value (5)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
		VOCs														
Groundwater - Annex	71-55-6	1,1,1-Trichloroethane	0.1 J	0.26 J	ug/l	MW-6	4 / 9	0.03 - 0.1	0.26	NE	800	(N)	NA	NA	N	BSL
	75-34-3	1,1-Dichloroethane	0.34 J	1.9 J	ug/l	MW-6	5 / 9	0.04 - 0.1	1.9	NE	2.8	(C)	NA	NA	N	BSL
	75-35-4	1,1-Dichloroethene	1.1 J	2.7 J	ug/l	MW-6	4 / 9	0.07 - 0.1	2.7	NE	28	(N)	NA	NA	N	BSL
	95-50-1	1,2-Dichlorobenzene	0.13 J	0.27 J	ug/l	MW-6	4 / 9	0.03 - 0.1	0.27	NE	30	(N)	NA	NA	N	BSL
	107-06-2	**1,2-Dichloroethane**	**7**	**61**	**ug/l**	**MW-6**	**4 / 9**	**0.068 - 0.1**	**61**	**NE**	**0.17**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	541-73-1	1,3-Dichlorobenzene	0.16 J	0.16 J	ug/l	MW-5	1 / 9	0.045 - 0.1	0.16	NE	30	(N) SURR[a]	NA	NA	N	BSL
	106-46-7	**1,4-Dichlorobenzene**	**0.18 J**	**0.66 J**	**ug/l**	**MW-6**	**8 / 9**	**0.059 - 0.14**	**0.66**	**NE**	**0.48**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	78-93-3	2-Butanone	26	26	ug/l	MW-10	1 / 9	0.36 - 13	26	NE	560	(N)	NA	NA	N	BSL
	67-64-1	Acetone	2.4 J	4.7 J	ug/l	MW-6	4 / 9	1.3 - 14	4.7	NE	1,400	(N)	NA	NA	N	BSL
	71-43-2	**Benzene**	**0.039 J**	**0.72 J**	**ug/l**	**MW-6**	**7 / 9**	**0.037 - 0.1**	**0.72**	**NE**	**0.46**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	75-15-0	Carbon Disulfide	0.11 J	0.27 J	ug/l	MW-10	3 / 9	0.056 - 0.1	0.27	NE	81	(N)	NA	NA	N	BSL
	108-90-7	**Chlorobenzene**	**1.3**	**19**	**ug/l**	**MW-6**	**8 / 9**	**0.03 - 1**	**19**	**NE**	**7.8**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	75-00-3	Chloroethane	0.29 J	0.29 J	ug/l	MW-6	1 / 9	0.1 - 0.21	0.29	NE	2,100	(N)	NA	NA	N	BSL
	156-59-2	Cis-1,2-Dichloroethene	0.1 J	2.5 J	ug/l	MW-6	8 / 9	0.054 - 0.1	2.5	NE	3.6	(N)	NA	NA	N	BSL
	110-82-7	Cyclohexane	0.067 J	1.6 J	ug/l	MW-10	6 / 9	0.053 - 0.1	1.6	NE	1,300	(N)	NA	NA	N	BSL
	100-41-4	**Ethylbenzene**	**0.17 J**	**1.9 J**	**ug/l**	**MW-6**	**4 / 9**	**0.03 - 0.1**	**1.9**	**NE**	**1.5**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	76-13-1	Freon 113	2 J	5 J	ug/l	MW-6	4 / 9	0.054 - 0.21	5	NE	5,500	(N)	NA	NA	N	BSL
	98-82-8	Isopropylbenzene	0.069 J	0.41 J	ug/l	MW-10	4 / 9	0.057 - 0.1	0.41	NE	45	(N)	NA	NA	N	BSL
	108-87-2	Methyl Cyclohexane	0.18 J	0.19 J	ug/l	MW-6	2 / 9	0.035 - 0.1	0.19	NE	1300	(N) SURR[a]	NA	NA	N	BSL
	1634-04-4	Methyl Tert-Butyl Ether	0.16 J	0.96 J	ug/l	MW-6	5 / 9	0.037 - 0.1	0.96	NE	14	(C)	NA	NA	N	BSL
	100-42-5	Styrene	0.23 J	0.23 J	ug/l	MW-10	1 / 9	0.03 - 0.1	0.23	NE	120	(N)	NA	NA	N	BSL
	127-18-4	Tetrachloroethene	0.061 J	0.39 J	ug/l	MW-6	7 / 9	0.028 - 0.1	0.39	NE	4.1	(N)	NA	NA	N	BSL
	108-88-3	Toluene	0.13 J	1.3 J	ug/l	MW-10	3 / 9	0.05 - 2.3	1.3	NE	110	(N)	NA	NA	N	BSL
	79-01-6	**Trichloroethene**	**0.11 J**	**0.2 J**	**ug/l**	**MW-6**	**5 / 9**	**0.049 - 0.1**	**0.2**	**NE**	**0.28**	**(N)**	**NA**	**NA**	**Y**	**CARC**
	75-01-4	**Vinyl Chloride**	**0.57**	**0.57**	**ug/l**	**MW-6**	**1 / 9**	**0.023 - 0.1**	**0.57**	**NE**	**0.019**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	179601-23-1	m,p-Xylenes	0.031 J	0.055 J	ug/l	MW-6	2 / 4	0.03 - 0.046	0.055	NE	19	(N)	NA	NA	N	BSL
	95-47-6	o-Xylene	0.19 J	0.25 J	ug/l	MW-10	2 / 4	0.03 - 0.053	0.25	NE	19	(N)	NA	NA	N	BSL
	1330-20-7	Xylenes, Total	0.6 J	13 J	ug/l	MW-6	4 / 5	0.1 - 0.1	13	NE	19	(N)	NA	NA	N	BSL
		Metals														
Groundwater - Landfill	7429-90-5	Aluminum	20.7 J	1,600 J	ug/l	MW-7	12 / 13	11.1 - 34.8	1,600	NE	2,000	(N)	NA	NA	N	BSL
	7440-38-2	**Arsenic**	**5.9 J**	**102 J**	**ug/l**	**MW-3**	**13 / 13**	**2.8 - 2.9**	**102**	**NE**	**0.052**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-39-3	**Barium**	**170 J**	**945 J**	**ug/l**	**MW-2**	**13 / 13**	**0.1 - 0.2**	**945**	**NE**	**380**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-41-7	Beryllium	0.38 J	0.48 J	ug/l	MW-9	4 / 13	0.2 - 0.3	0.48	NE	2.5	(N)	NA	NA	N	BSL
	7440-43-9	**Cadmium**	**0.57 J**	**1 J**	**ug/l**	**MW-7**	**4 / 13**	**0.4 - 0.5**	**1**	**NE**	**0.92**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-70-2	Calcium	15,900	144,000	ug/l	MW-7	13 / 13	1.8 - 2.4	144,000	NE	-	-	NA	NA	N	NUTR
	7440-47-3	**Chromium**	**1 J**	**52.6 J**	**ug/l**	**MW-7**	**13 / 13**	**0.3 - 0.5**	**52.6**	**NE**	**0.035**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-48-4	**Cobalt**	**1.6 J**	**34.9 J**	**ug/l**	**MW-9**	**11 / 13**	**0.9 - 1**	**34.9**	**NE**	**0.6**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-50-8	Copper	2.8 J	11.1 J	ug/l	MW-7	6 / 13	0.5 - 5.7	11.1	NE	80	(N)	NA	NA	N	BSL
	7439-89-6	**Iron**	**10,000**	**42,700**	**ug/l**	**MW-7**	**13 / 13**	**10 - 15.3**	**42,700**	**NE**	**1,400**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-92-1	**Lead**	**3.7**	**27.7**	**ug/l**	**MW-7**	**4 / 13**	**1 - 1.9**	**27.7**	**NE**	**15**	**(MCL)**	**NA**	**NA**	**Y**	**ASL**
	7439-95-4	Magnesium	20,300	142,000	ug/l	MW-9	13 / 13	3.6 - 4.3	142,000	NE	-	-	NA	NA	N	NUTR
	7439-96-5	**Manganese**	**104**	**4,100**	**ug/l**	**MW-7**	**13 / 13**	**0.1 - 0.2**	**4,100**	**NE**	**43**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-97-6	**Mercury**	**0.15 L**	**0.15 L**	**ug/l**	**MW-7**	**1 / 13**	**0.1 - 0.1**	**0.15**	**NE**	**0.063**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-02-0	**Nickel**	**0.9 J**	**98.2 J**	**ug/l**	**MW-1**	**13 / 13**	**0.8 - 1.4**	**98.2**	**NE**	**39**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-09-7	Potassium	9,030	269,000	ug/l	MW-9	13 / 13	3.7 - 4.4	269,000	NE	-	-	NA	NA	N	NUTR
	7782-49-2	Selenium	3.1 J	3.1 J	ug/l	MW-8	1 / 13	2.2 - 2.7	3.1	NE	10	(N)	NA	NA	N	BSL
	7440-22-4	Silver	0.62 J	2.1 J	ug/l	MW-8	7 / 13	0.5 - 1.2	2.1	NE	9.4	(N)	NA	NA	N	BSL
	7440-23-5	Sodium	95,000	840,000	ug/l	MW-9	13 / 13	78.5 - 180	840,000	NE	-	-	NA	NA	N	NUTR
	7440-28-0	**Thallium**	**3.9 J**	**6.3 J**	**ug/l**	**MW-12**	**3 / 13**	**2.9 - 4.3**	**6.3**	**NE**	**0.02**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-62-2	**Vanadium**	**0.74 J**	**25.9 J**	**ug/l**	**MW-9**	**11 / 13**	**0.4 - 2.4**	**25.9**	**NE**	**8.6**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-66-6	Zinc	8.6 J	48.8 J	ug/l	MW-7	7 / 13	0.6 - 8.3	48.8	NE	600	(N)	NA	NA	N	BSL

Table 7-2.1

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (4) (N/C) Tap Water		Potential ARAR/TBC Value (5)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
		Pesticides/PCBs														
Groundwater - Landfill	309-00-2	Aldrin	0.012 J	0.012 J	ug/l	MW-8	1 / 13	0.0091 - 0.0095	0.012	NE	0.00092	(C)	NA	NA	Y	ASL
	959-98-8	Alpha-Endosulfan	0.014 J	0.026 J	ug/l	MW-7	4 / 13	0.0091 - 0.0095	0.026	NE	10	(N) SURR[a]	NA	NA	N	BSL
	319-85-7	Beta-BHC	0.025 J	0.066 J	ug/l	MW-7	11 / 13	0.0091 - 0.0095	0.066	NE	0.025	(C)	NA	NA	Y	ASL
	319-86-8	Delta-BHC	0.012 J	0.043 J	ug/l	MW-7	4 / 13	0.0091 - 0.0095	0.043	NE	0.025	(N) SURR[a]	NA	NA	Y	ASL
	7421-93-4	Endrin Aldehyde	0.02 J	0.02 J	ug/l	MW-8	1 / 13	0.018 - 0.019	0.02	NE	0.23	(N) SURR[a]	NA	NA	N	BSL
	58-89-9	Gamma-BHC	0.02 J	0.02 J	ug/l	MW-8	1 / 13	0.0091 - 0.0095	0.02	NE	0.042	(C)	NA	NA	N	BSL
	5566-34-7	Gamma-Chlordane	0.0098 J	0.051 J	ug/l	MW-7	6 / 13	0.0091 - 0.0095	0.051	NE	0.02	(C)	NA	NA	Y	ASL
	76-44-8	Heptachlor	0.01 J	0.071 J	ug/l	MW-7	7 / 13	0.0091 - 0.0095	0.071	NE	0.0014	(C)	NA	NA	Y	ASL
	1024-57-3	Heptachlor Epoxide	0.013 J	0.022 J	ug/l	MW-7	3 / 13	0.0091 - 0.0095	0.022	NE	0.0014	(C)	NA	NA	Y	ASL
		SVOCs														
	123-91-1	!,4-Dioxane	22 J	1100 J	ug/l	MW-1	29 / 29	0.13 - 9.8	1100	NE	0.46	(C)	NA	NA	Y	ASL
	105-67-9	2,4-Dimethylphenol	0.32 J	10 J	ug/l	MW-8	5 / 36	0.096 - 2.1	10	NE	36	(N)	NA	NA	N	BSL
	91-57-6	2-Methylnaphthalene	0.45 J	160 J	ug/l	MW-8	13 / 36	0.22 - 2.1	160	NE	3.6	(N)	NA	NA	Y	ASL
	95-48-7	2-Methylphenol	0.23 J	2 J	ug/l	MW-8	2 / 36	0.21 - 2.2	2	NE	93	(N)	NA	NA	N	BSL
	106-44-5	4-Methylphenol	0.3 J	15 J	ug/l	MW-7	5 / 36	0.096 - 2.9	15	NE	190	(N)	NA	NA	N	BSL
	83-32-9	Acenaphthene	0.47 J	130 J	ug/l	MW-8	18 / 36	0.19 - 2.1	130	NE	53	(N)	NA	NA	Y	ASL
	208-96-8	Acenaphthylene	6 J	6 J	ug/l	MW-8	1 / 36	0.16 - 2.1	6	NE	53	(N) SURR[a]	NA	NA	N	BSL
	98-86-2	Acetophenone	0.37 J+	2 J+	ug/l	MW-7	2 / 36	0.14 - 2.1	2	NE	190	(N)	NA	NA	N	BSL
	120-12-7	Anthracene	0.32 J	14 J	ug/l	MW-8	5 / 36	0.18 - 4.9	14	NE	180	(N)	NA	NA	N	BSL
	100-52-7	Benzaldehyde	0.5 J	3 J	ug/l	MW-7	8 / 36	0.21 - 3.3	3	NE	19	(C)	NA	NA	N	BSL
	56-55-3	Benzo[a]anthracene	0.23 J	0.33 J	ug/l	MW-8	2 / 36	0.12 - 2.1	0.33	NE	0.012	(C)	NA	NA	Y	ASL
	50-32-8	Benzo[a]pyrene	0.21 J	0.21 J	ug/l	MW-7	1 / 36	0.21 - 2.1	0.21	NE	0.0034	(C)	NA	NA	Y	ASL
	205-99-2	Benzo[b]fluoranthene	0.29 J	0.29 J	ug/l	MW-7	1 / 36	0.22 - 2.1	0.29	NE	0.034	(C)	NA	NA	Y	ASL
	207-08-9	Benzo[k]fluoranthene	0.2 J	0.2 J	ug/l	MW-7	1 / 36	0.16 - 2.3	0.2	NE	0.34	(C)	NA	NA	N	BSL
	92-52-4	Biphenyl	9 J	24 J	ug/l	MW-8	2 / 36	0.14 - 2.1	24	NE	0.083	(N)	NA	NA	Y	ASL
	86-74-8	Carbazole	1.1 J	51 J	ug/l	MW-8	5 / 36	0.2 - 4.9	51	NE	-	-	NA	NA	Y	NSL
	218-01-9	Chrysene	0.34 J	0.34 J	ug/l	MW-8	1 / 36	0.2 - 2.1	0.34	NE	3.4	(C)	NA	NA	N	BSL
	132-64-9	Dibenzofuran	0.57 J	64 J	ug/l	MW-8	9 / 36	0.18 - 4.9	64	NE	0.79	(N)	NA	NA	Y	ASL
	84-66-2	Diethyl Phthalate	2 J	5 J	ug/l	MW-7	2 / 36	0.4 - 2.1	5	NE	1,500	(N)	NA	NA	N	BSL
	131-11-3	Dimethyl Phthalate	8.5	9.7	ug/l	MW-1	2 / 36	0.2 - 2.1	9.7	NE	1500	(N) SURR[a]	NA	NA	N	BSL
	84-74-2	Di-n-Butyl Phthalate	9.6	11	ug/l	MW-9	2 / 36	0.13 - 2.1	11	NE	90	(N)	NA	NA	N	BSL
	206-44-0	Fluoranthene	0.73 J	13 J	ug/l	MW-8	7 / 36	0.18 - 2.1	13	NE	80	(N)	NA	NA	N	BSL
	86-73-7	Fluorene	0.27 J	100 J	ug/l	MW-8	16 / 36	0.23 - 2.1	100	NE	29	(N)	NA	NA	Y	ASL
	91-20-3	Naphthalene	2.3 J	460 J	ug/l	MW-8	9 / 36	0.19 - 2.1	460	NE	0.17	(C)	NA	NA	Y	ASL
	86-30-6	N-Nitrosodiphenylamine	0.36 J	2 J	ug/l	MW-8	2 / 36	0.16 - 5.1	2	NE	12	(C)	NA	NA	N	BSL
	85-01-8	Phenanthrene	0.2 J	120 J	ug/l	MW-8	16 / 36	0.13 - 2.1	120	NE	12	(N) SURR[a]	NA	NA	Y	ASL
	108-95-2	Phenol	0.35 J	13 J	ug/l	MW-9	3 / 36	0.15 - 2.1	13	NE	580	(N)	NA	NA	N	BSL
	129-00-0	Pyrene	0.44 J	6 J	ug/l	MW-8	7 / 36	0.26 - 2.1	6	NE	12	(N)	NA	NA	N	BSL
		VOCs														
	79-34-5	1,1,2,2-Tetrachloroethane	0.2 J	0.2 J	ug/l	MW-9	1 / 37	0.06 - 3	0.2	NE	0.076	(C)	NA	NA	Y	ASL
	75-34-3	1,1-Dichloroethane	0.066 J	2 J	ug/l	MW-2	10 / 37	0.04 - 2	2	NE	2.8	(C)	NA	NA	N	BSL
	75-35-4	1,1-Dichloroethene	0.72	36	ug/l	MW-2	13 / 43	0.07 - 3.5	36	NE	28	(N)	NA	NA	Y	ASL
	87-61-6	1,2,3-Trichlorobenzene	0.14 J	0.14 J	ug/l	MW-7	1 / 37	0.049 - 3.5	0.14	NE	0.7	(N)	NA	NA	N	BSL
	95-50-1	1,2-Dichlorobenzene	0.12 J	0.98 J	ug/l	MW-1	16 / 37	0.03 - 1.5	0.98	NE	30	(N)	NA	NA	N	BSL
	107-06-2	1,2-Dichloroethane	0.27 K	8.4 K	ug/l	MW-7	5 / 37	0.068 - 4.5	8.4	NE	0.17	(C)	NA	NA	Y	ASL
	541-73-1	1,3-Dichlorobenzene	0.079 J	0.35 J	ug/l	MW-8	10 / 37	0.045 - 1.5	0.35	NE	30	(N) SURR[a]	NA	NA	N	BSL
	106-46-7	1,4-Dichlorobenzene	0.11 J	1.5 J	ug/l	MW-8	19 / 37	0.059 - 1.4	1.5	NE	0.48	(C)	NA	NA	Y	ASL
	78-93-3	2-Butanone	2 J	8.2 J	ug/l	MW-7	3 / 37	0.36 - 52	8.2	NE	560	(N)	NA	NA	N	BSL
	591-78-6	2-Hexanone	8.2 J	8.2 J	ug/l	MW-9	1 / 37	0.52 - 51	8.2	NE	3.8	(N)	NA	NA	Y	ASL
	108-10-1	4-Methyl-2-Pentanone	2.3 J	5.4 J	ug/l	MW-7	2 / 37	0.33 - 17	5.4	NE	630	(N)	NA	NA	N	BSL
	67-64-1	Acetone	4.5 J	250 J	ug/l	MW-2	15 / 37	1.3 - 140	250	NE	1,400	(N)	NA	NA	N	BSL
	71-43-2	Benzene	0.094 J	11 J	ug/l	MW-9	24 / 37	0.037 - 2	11	NE	0.46	(C)	NA	NA	Y	ASL
	75-15-0	Carbon Disulfide	0.071 J	0.99 J	ug/l	MW-2	10 / 37	0.056 - 2	0.99	NE	81	(N)	NA	NA	N	BSL

Table 7-2.1

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)		Maximum Concentration (Qualifier) (1)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (4) (N/C) Tap Water		Potential ARAR/TBC Value (5)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Groundwater - Landfill	108-90-7	**Chlorobenzene**	0.41	K	290	K	ug/l	MW-3	38 / 43	0.03 - 1.5	290	NE	7.8	(N)	NA	NA	Y	ASL
	75-00-3	Chloroethane	0.65	K	0.65	K	ug/l	MW-2	1 / 37	0.1 - 7	0.65	NE	2,100	(N)	NA	NA	N	BSL
	156-59-2	**Cis-1,2-Dichloroethene**	0.1	K	370	K	ug/l	MW-2	28 / 43	0.054 - 4.5	370	NE	3.6	(N)	NA	NA	Y	ASL
	110-82-7	Cyclohexane	0.11	J	2.1	J	ug/l	MW-9	21 / 37	0.053 - 3	2.1	NE	1,300	(N)	NA	NA	N	BSL
	75-71-8	Dichlorodifluoromethane	0.4	K	3.2	K	ug/l	MW-7	2 / 37	0.059 - 1.5	3.2	NE	20	(N)	NA	NA	N	BSL
	100-41-4	**Ethylbenzene**	0.047	J	22	J	ug/l	MW-7	11 / 37	0.03 - 1.5	22	NE	1.5	(C)	NA	NA	Y	ASL
	76-13-1	Freon 113	0.17	L	0.17	L	ug/l	MW-7	1 / 37	0.054 - 2.1	0.17	NE	5,500	(N)	NA	NA	N	BSL
	98-82-8	Isopropylbenzene	0.1	L	5.5	L	ug/l	MW-9	19 / 37	0.057 - 1	5.5	NE	45	(N)	NA	NA	N	BSL
	79-20-9	Methyl Acetate	5	U	25	U	ug/l	MW-2	5 / 37	0.096 - 5.5	25	NE	2,000	(N)	NA	NA	N	BSL
	108-87-2	Methyl Cyclohexane	0.14	J	1.4	J	ug/l	MW-9	10 / 37	0.035 - 2	1.4	NE	1300	(N) SURR[a]	NA	NA	N	BSL
	1634-04-4	Methyl Tert-Butyl Ether	0.11	J	0.69	J	ug/l	MW-2	14 / 37	0.037 - 2	0.69	NE	14	(C)	NA	NA	N	BSL
	75-09-2	**Methylene Chloride**	0.1	U	94	U	ug/l	MW-2	8 / 37	0.1 - 11	94	NE	11	(N)	NA	NA	Y	ASL
	100-42-5	Styrene	0.61		0.61		ug/l	MW-9	1 / 37	0.03 - 1.5	0.61	NE	120	(N)	NA	NA	N	BSL
	127-18-4	Tetrachloroethene	0.19	J	0.83	J	ug/l	MW-7	3 / 37	0.028 - 1.5	0.83	NE	4.1	(N)	NA	NA	N	BSL
	108-88-3	Toluene	0.1	L	14	L	ug/l	MW-9	16 / 37	0.05 - 5.3	14	NE	110	(N)	NA	NA	N	BSL
	156-60-5	Trans-1,2-Dichloroethene	0.081	J	1.3	J	ug/l	MW-2	7 / 37	0.045 - 2.5	1.3	NE	36	(N)	NA	NA	N	BSL
	79-01-6	**Trichloroethene**	0.18	J	39	J	ug/l	MW-2	15 / 43	0.049 - 2.5	39	NE	0.28	(N)	NA	NA	Y	ASL
	75-01-4	**Vinyl Chloride**	0.13	J	170	J	ug/l	MW-2	16 / 42	0.023 - 3	170	NE	0.019	(C)	NA	NA	Y	ASL
	179601-23-1	m,p-Xylenes	0.23	J	1.9	J	ug/l	MW-9	10 / 23	0.03 - 1.5	1.9	NE	19	(N)	NA	NA	N	BSL
	95-47-6	o-Xylene	0.073	J	6.6	J	ug/l	MW-8	10 / 23	0.03 - 1.5	6.6	NE	19	(N)	NA	NA	N	BSL
	1330-20-7	**Xylenes, Total**	0.14	K	160	K	ug/l	MW-7	9 / 14	0.1 - 0.1	160	NE	19	(N)	NA	NA	Y	ASL

Footnotes:

(1) The Qualifier codes are defined as the following:

J - The analyte was detected and is considered an estimated value.

K - Analyte present, results may be biased high. Actual result is expected lower.

(2) Maximum detected value for compounds detected in at least one sample

(3) NE - Not established

(4) Units are the same as those for Screening Concentrations. Where available, Screening Toxicity Values are May 2016 USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites for Tap Water. Values were adjusted for a HI= 0.1 for non-cancer effects, where (C)=Cancer ; (N)= Noncancer.

a - SURR - Surrogate screening value used (chlordane for alpha-chlordane and gamma-chlordane, endrin for endrin aldehyde, pyrene for phenathrene, endosulfan for alpha-endosulfan, acenaphthene for acenaphthylene, 1,2-dichlorobenzene for 1,3-dichlorobenzene, cyclohexane for methylcyclohexane, Technical BHC for delta-BHC, and diethyl phthalate for dimethylphthalate)

b - Per USEPA comment, tap water RSL for methyl mercury was used to screen groundwater.

MCL - Action Levels for lead and thallium in tap water from the May 2009 USEPA Edition of the Drinking Water Standards and Health Advisories

(-) = no RSL or suitable surrogate value available

(5) Potential ARARs/TBC values are the USEPA Water Quality Criteria (WQS) for ingestion of fish only

NA = Not Available

(6) ASL = Above Screening Limit; BSL = Below Screening Limit; NUTR = Essential Nutrient; NSL = No Screening Limit; CARC = Known human carcinogen

Table 7-2.2
Occurrence, Distribution, and Selection of Chemicals of Potential Concern
Remedial Investigation/Feasbility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Surface and Subsurface Soil (1)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency						Concentration Used for Screening (3)	Background Value (4)	Screening Toxicity Value (5) (N/C) Residential		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
	Metals																					
On-Site Surface and Subsurface Soil - Annex	**7429-90-5**	**Aluminum**	**2,150**		**28,100**		**mg/kg**	**A-13**	**25**	**/**	**25**	**4.3**	**-**	**7.5**	**28,100**	**NE**	**7,700**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-36-0	**Antimony**	**0.58**	**L**	**3.7**	**L**	**mg/kg**	**A-21**	**17**	**/**	**25**	**0.28**	**-**	**3.8**	**3.7**	**NE**	**3.1**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-38-2	**Arsenic**	**0.98**	**K**	**94.9**	**K**	**mg/kg**	**A-22**	**24**	**/**	**25**	**0.6**	**-**	**1.6**	**94.9**	**NE**	**0.68**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-39-3	Barium	4.6	J	470	J	mg/kg	A-5	25	/	25	0.023	-	0.14	470	NE	1,500	(N)	NA	NA	N	BSL
	7440-41-7	Beryllium	0.31	J	5.9	J	mg/kg	A-22	23	/	25	0.023	-	0.36	5.9	NE	16	(N)	NA	NA	N	BSL
	7440-43-9	Cadmium	0.077	J	3.7	J	mg/kg	A-20	21	/	25	0.046	-	1.3	3.7	NE	7.1	(N)	NA	NA	N	BSL
	7440-70-2	Calcium	137	J	13,300	J	mg/kg	A-1	25	/	25	0.71	-	5.3	13,300	NE	-	-	NA	NA	N	NUTR
	7440-47-3	**Chromium**	**7.7**		**203**		**mg/kg**	**A-13**	**25**	**/**	**25**	**0.092**	**-**	**0.32**	**203**	**NE**	**0.3**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-48-4	**Cobalt**	**0.099**	**J**	**19.6**	**J**	**mg/kg**	**A-13**	**25**	**/**	**25**	**0.092**	**-**	**0.33**	**19.6**	**NE**	**2.3**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-50-8	Copper	3.1	J	232	J	mg/kg	A-20	25	/	25	0.21	-	0.68	232	NE	310	(N)	NA	NA	N	BSL
	7439-89-6	**Iron**	**5,100**		**40,900**		**mg/kg**	**A-9**	**25**	**/**	**25**	**1.7**	**-**	**5.5**	**40,900**	**NE**	**5,500**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-92-1	**Lead**	**4.8**		**293**		**mg/kg**	**ANA-DS**	**25**	**/**	**25**	**0.31**	**-**	**0.54**	**293**	**NE**	**200**	**(L)**	**NA**	**NA**	**Y**	**ASL**
	7439-95-4	Magnesium	89.7	J	12,400	J	mg/kg	A-13	25	/	25	0.6	-	2.5	12,400	NE	-	-	NA	NA	N	NUTR
	7439-96-5	**Manganese**	**11.8**		**1,180**		**mg/kg**	**ANA-DS**	**25**	**/**	**25**	**0.023**	**-**	**0.11**	**1,180**	**NE**	**180**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-97-6	Mercury	0.091	K	0.88	K	mg/kg	A-21	14	/	25	0.043	-	0.091	0.88	NE	1.1	(N)	NA	NA	N	BSL
	7440-02-0	Nickel	0.83	J	92.3	J	mg/kg	A-13	25	/	25	0.12	-	0.5	92.3	NE	150	(N)	NA	NA	N	BSL
	7440-09-7	Potassium	164	J	10,400	J	mg/kg	A-9	25	/	25	0.73	-	4	10,400	NE	-	-	NA	NA	N	NUTR
	7782-49-2	Selenium	0.6	J	4.2	J	mg/kg	A-22	7	/	25	0.57	-	1.6	4.2	NE	39	(N)	NA	NA	N	BSL
	7440-22-4	Silver	0.52	J	2.4	J	mg/kg	A-21	8	/	25	0.12	-	0.32	2.4	NE	39	(N)	NA	NA	N	BSL
	7440-23-5	Sodium	363	J	379	J	mg/kg	A-22	2	/	25	22.2	-	245	379	NE	-	-	NA	NA	N	NUTR
	7440-28-0	**Thallium**	**1**	**J**	**1**	**J**	**mg/kg**	**A-22**	**1**	**/**	**25**	**0.64**	**-**	**2.6**	**1**	**NE**	**0.078**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-62-2	**Vanadium**	**10.6**	**J**	**102**	**J**	**mg/kg**	**A-5**	**25**	**/**	**25**	**0.092**	**-**	**0.21**	**102**	**NE**	**39**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-66-6	Zinc	7.6		1,540		mg/kg	A-20	25	/	25	0.14	-	0.64	1,540	NE	2,300	(N)	NA	NA	N	BSL
	Dioxins																					
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.00162	J	0.0611	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.0611	NE	-	-	NA	NA	Y	ASL(8)
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-P-Dioxin	0.0103		0.239		ug/kg	A-10	6	/	6	0.000441	-	0.00054	0.239	NE	-	-	NA	NA	Y	ASL(8)
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.000263	J	0.00361	J	ug/kg	A-10	4	/	6	0.000441	-	0.00051	0.00361	NE	-	-	NA	NA	Y	ASL(8)
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	0.00026	J	0.00914	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.00914	NE	-	-	NA	NA	Y	ASL(8)
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	0.000192	J	0.00281	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.00281	NE	-	-	NA	NA	Y	ASL(8)
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	0.000137	J	0.00541	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.00541	NE	-	-	NA	NA	Y	ASL(8)
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	0.000394	J	0.00869	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.00869	NE	-	-	NA	NA	Y	ASL(8)
	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	0.000284		0.00157		ug/kg	A-10	3	/	6	0.000441	-	0.00051	0.00157	NE	-	-	NA	NA	Y	ASL(8)
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	0.000327	J	0.00693	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.00693	NE	-	-	NA	NA	Y	ASL(8)
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	0.000127	J	0.00391	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.00391	NE	-	-	NA	NA	Y	ASL(8)
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	0.000165	J	0.00246	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.00246	NE	-	-	NA	NA	Y	ASL(8)
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	0.000181	J	0.00723	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.00723	NE	-	-	NA	NA	Y	ASL(8)
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	0.000212	J	0.0133	J	ug/kg	A-10	6	/	6	0.000441	-	0.00051	0.0133	NE	-	-	NA	NA	Y	ASL(8)
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	0.000337	J	0.00681	J	ug/kg	A-10	6	/	6	5.66E-05	-	0.00033	0.00681	NE	-	-	NA	NA	Y	ASL(8)
	1746-01-6	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	0.00264		0.00264		ug/kg	A-10	1	/	6	0.00038	-	0.00051	0.00264	NE	0.0048	(C)	NA	NA	Y	ASL(8)
	39001-02-0	Octachlorodibenzofuran	0.00276	J	0.161	J	ug/kg	A-10	6	/	6	0.000882	-	0.00102	0.161	NE	-	-	NA	NA	Y	ASL(8)
	3268-87-9	Octachlorodibenzo-P-Dioxin	0.132		7.51		ug/kg	A-10	6	/	6	0.000882	-	0.00102	7.51	NE	-	-	NA	NA	Y	ASL(8)
		2,3,7,8-TCDD Equivalents	**0.00078**		**0.019**		**ug/kg**	**A-10**							**0.019**	**NE**	**0.0048**	**(C)**	**NA**	**NA**	**Y**	**ASL**

Table 7-2.2
Occurrence, Distribution, and Selection of Chemicals of Potential Concern
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Surface and Subsurface Soil (1)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency		Concentration Used for Screening (3)	Background Value (4)	Screening Toxicity Value (5) (N/C) Residential		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
	Pesticides/PCBs																	
On-Site Surface and Subsurface Soil - Annex	72-54-8	4,4-DDD	1.9	J	65	J	ug/kg	ANA-DS	8 / 24	0.33 - 0.33	65	NE	2,300	(C)	NA	NA	N	BSL
	72-55-9	4,4-DDE	1.1	J	19	J	ug/kg	A-21	12 / 24	0.33 - 0.33	19	NE	2,000	(C)	NA	NA	N	BSL
	50-29-3	4,4-DDT	2	J	55	J	ug/kg	A-20	11 / 24	0.5 - 0.5	55	NE	1,900	(C)	NA	NA	N	BSL
	309-00-2	Aldrin	1.2	J	1.3	J	ug/kg	A-14	2 / 24	0.17 - 0.17	1.3	NE	39	(C)	NA	NA	N	BSL
	319-84-6	Alpha-BHC	0.83	K	1.3	K	ug/kg	ANA-DS	2 / 24	0.18 - 0.18	1.3	NE	86	(C)	NA	NA	N	BSL
	5103-71-9	Alpha-Chlordane	0.58	J	8	J	ug/kg	A-21	9 / 23	0.17 - 0.17	8	NE	1,700	(C) SURR[a]	NA	NA	N	BSL
	959-98-8	Alpha-Endosulfan	0.84	J	1.1	J	ug/kg	A-23	2 / 24	0.17 - 0.17	1.1	NE	47,000	(N) SURR[a]	NA	NA	N	BSL
	12672-29-6	**Aroclor 1248**	**3,900**		**3,900**		**ug/kg**	**A-16**	**1 / 24**	**3.6 - 3.6**	**3,900**	**NE**	**230**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	11097-69-1	**Aroclor 1254**	**76**		**1,400**		**ug/kg**	**A-16**	**4 / 24**	**5.5 - 5.5**	**1,400**	**NE**	**120**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	11096-82-5	**Aroclor 1260**	**68**		**400**		**ug/kg**	**A-23**	**7 / 24**	**5.5 - 5.5**	**400**	**NE**	**240**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	319-85-7	Beta-BHC	0.67	J	15	J	ug/kg	A-16	10 / 23	0.25 - 0.25	15	NE	300	(C)	NA	NA	N	BSL
	5566-34-7	gamma-Chlordane	0.66	J	6.1	J	ug/kg	A-14	8 / 24	0.17 - 0.17	6.1	NE	1,700	(C) SURR[a]	NA	NA	N	BSL
	33213-65-9	Beta-Endosulfan	1.2	J	1.4	J	ug/kg	A-14	2 / 24	0.33 - 0.33	1.4	NE	47,000	(N) SURR[a]	NA	NA	N	BSL
	60-57-1	Dieldrin	0.96	J	22	J	ug/kg	A-10	10 / 23	0.33 - 0.33	22	NE	34	(C)	NA	NA	N	BSL
	1031-07-8	Endosulfan Sulfate	1.5	J	2	J	ug/kg	A-14	2 / 24	0.37 - 0.37	2	NE	47,000	(N) SURR[a]	NA	NA	N	BSL
	72-20-8	Endrin	1.3	J	8.9	J	ug/kg	A-23	4 / 24	0.33 - 0.33	8.9	NE	1,900	(N)	NA	NA	N	BSL
	7421-93-4	Endrin Aldehyde	0.91	J	7.8	J	ug/kg	A-14	4 / 24	0.33 - 0.33	7.8	NE	1,900	(N) SURR[a]	NA	NA	N	BSL
	53494-70-5	Endrin Ketone	1.4	J	16	J	ug/kg	A-14	3 / 24	0.35 - 0.35	16	NE	1,900	(N) SURR[a]	NA	NA	N	BSL
	58-89-9	Gamma-BHC	0.48	J	1.3	J	ug/kg	A-16	2 / 24	0.17 - 0.17	1.3	NE	570	(C)	NA	NA	N	BSL
	76-44-8	Heptachlor	1.1	J	1.1	J	ug/kg	A-17S	1 / 24	0.28 - 0.28	1.1	NE	130	(C)	NA	NA	N	BSL
	1024-57-3	Heptachlor Epoxide	0.57	J	4	J	ug/kg	ANA-DS	8 / 24	0.22 - 0.22	4	NE	70	(C)	NA	NA	N	BSL
	72-43-5	Methoxychlor	29		29		ug/kg	A-14	1 / 24	1.7 - 1.7	29	NE	32,000	(N)	NA	NA	N	BSL
	SVOCs																	
	98-86-2	Acetophenone	-		-		ug/kg	-	0 / 24	67 - 380	190	NE	780,000	(N)	NA	NA	N	BSL
	120-12-7	Anthracene	100	J	240	J	ug/kg	ANA-JS	7 / 24	35 - 67	240	NE	1,800,000	(N)	NA	NA	N	BSL
	56-55-3	**Benzo(A)Anthracene**	**90**	**J**	**840**	**J**	**ug/kg**	**A-16**	**13 / 24**	**35 - 67**	**840**	**NE**	**160**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	50-32-8	**Benzo(A)Pyrene**	**120**	**J**	**620**	**J**	**ug/kg**	**ANA-JS**	**8 / 24**	**35 - 67**	**620**	**NE**	**16**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	205-99-2	**Benzo(B)Fluoranthene**	**170**	**J**	**1,300**	**J**	**ug/kg**	**A-16**	**11 / 24**	**35 - 67**	**1,300**	**NE**	**160**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	191-24-2	Benzo(G,H,I)Perylene	140	J	230	J	ug/kg	ANA-JS	4 / 24	35 - 67	230	NE	180000	(N) SURR[a]	NA	NA	N	BSL
	207-08-9	Benzo(K)Fluoranthene	160	J	1,300	J	ug/kg	A-16	11 / 24	35 - 67	1,300	NE	1,600	(C)	NA	NA	N	BSL
	117-81-7	Bis(2-Ethylhexyl) Phthalate	84	J	180	J	ug/kg	A-20	3 / 24	35 - 340	180	NE	39,000	(C)	NA	NA	N	BSL
	85-68-7	Butylbenzyl Phthalate	190	J	190	J	ug/kg	A-16	1 / 24	35 - 67	190	NE	290,000	(C)	NA	NA	N	BSL
	86-74-8	**Carbazole**	**100**	**J**	**150**	**J**	**ug/kg**	**A-10**	**3 / 24**	**35 - 67**	**150**	**NE**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	218-01-9	Chrysene	100	J	870	J	ug/kg	ANA-JS	13 / 24	35 - 67	870	NE	16,000	(C)	NA	NA	N	BSL
	53-70-3	**Dibenzo(A,H)Anthracene**	**97**	**J**	**160**	**J**	**ug/kg**	**A-16**	**3 / 24**	**35 - 67**	**160**	**NE**	**16**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	117-84-0	Di-N-Octyl Phthalate	120	J	120	J	ug/kg	A-16	1 / 24	35 - 67	120	NE	63000	(N)	NA	NA	N	BSL
	206-44-0	Fluoranthene	100	J	1,700	J	ug/kg	ANA-JS	14 / 24	35 - 67	1,700	NE	240,000	(N)	NA	NA	N	BSL
	193-39-5	**Indeno(1,2,3-Cd)Pyrene**	**140**	**J**	**320**	**J**	**ug/kg**	**ANA-JS**	**7 / 24**	**35 - 67**	**320**	**NE**	**160**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	85-01-8	Phenanthrene	110	J	970	J	ug/kg	ANA-JS	13 / 24	35 - 67	970	NE	180000	(N) SURR[a]	NA	NA	N	BSL
	108-95-2	Phenol	150	J	150	J	ug/kg	A-17S	1 / 24	35 - 67	150	NE	1,900,000	(N)	NA	NA	N	BSL
	129-00-0	Pyrene	100	J	1,600	J	ug/kg	ANA-JS	13 / 24	35 - 67	1,600	NE	180,000	(N)	NA	NA	N	BSL
	VOCs																	
	67-64-1	Acetone	6	J	13	J	ug/kg	A-10	2 / 12	3.3 - 21	13	NE	6,100,000	(N)	NA	NA	N	BSL

Golder Associates

Table 7-2.2
Occurrence, Distribution, and Selection of Chemicals of Potential Concern
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Surface and Subsurface Soil (1)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency		Concentration Used for Screening (3)	Background Value (4)	Screening Toxicity Value (5) (N/C) Residential		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
	Metals																	
On-Site Surface and Subsurface Soil - Landfill	**7429-90-5**	**Aluminum**	**6,290**		**22,700**		**mg/kg**	**LF-A3S**	**43 / 43**	**4.4 - 8.6**	**22,700**	**NE**	**7,700**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-36-0	**Antimony**	**0.45**	**L**	**17.9**	**L**	**mg/kg**	**L-14**	**28 / 43**	**0.27 - 22.3**	**17.9**	**NE**	**3.1**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-38-2	**Arsenic**	**2.4**	**J**	**19.8**	**J**	**mg/kg**	**L-14**	**43 / 43**	**0.58 - 1.8**	**19.8**	**NE**	**0.68**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-39-3	Barium	39.7	J	864	J	mg/kg	L-36	43 / 43	0.022 - 0.16	864	NE	1,500	(N)	NA	NA	N	BSL
	7440-41-7	**Beryllium**	**0.37**	**J**	**66**	**J**	**mg/kg**	**L-4**	**42 / 43**	**0.022 - 0.4**	**66**	**NE**	**16**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-43-9	**Cadmium**	**0.2**	**J**	**8.1**	**J**	**mg/kg**	**L-14**	**43 / 43**	**0.044 - 0.13**	**8.1**	**NE**	**7.1**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-70-2	Calcium	917	J	83,400	J	mg/kg	L-36	43 / 43	0.69 - 5.4	83,400	NE	-	-	NA	NA	N	NUTR
	7440-47-3	**Chromium**	**19.4**	**J**	**140**	**J**	**mg/kg**	**L-35**	**43 / 43**	**0.089 - 0.36**	**140**	**NE**	**0.3**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-48-4	**Cobalt**	**4.9**	**J**	**158**	**J**	**mg/kg**	**L-14**	**43 / 43**	**0.089 - 0.31**	**158**	**NE**	**2.3**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-50-8	**Copper**	**24.5**	**L**	**10,500**	**L**	**mg/kg**	**L-14**	**43 / 43**	**0.2 - 0.77**	**10,500**	**NE**	**310**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-89-6	**Iron**	**14,500**		**199,000**		**mg/kg**	**L-39S**	**43 / 43**	**1.7 - 7.7**	**199,000**	**NE**	**5,500**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-92-1	**Lead**	**30.5**		**4,260**		**mg/kg**	**L-4**	**43 / 43**	**0.31 - 0.61**	**4,260**	**NE**	**200**	**(L)**	**NA**	**NA**	**Y**	**ASL**
	7439-95-4	Magnesium	1,230	J	38,200	J	mg/kg	L-36	43 / 43	0.58 - 2.8	38,200	NE	-	-	NA	NA	N	NUTR
	7439-96-5	**Manganese**	**163**		**9,770**		**mg/kg**	**L-14**	**43 / 43**	**0.022 - 0.12**	**9,770**	**NE**	**180**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-97-6	**Mercury**	**0.21**		**6.7**		**mg/kg**	**L-38**	**43 / 43**	**0.041 - 0.11**	**6.7**	**NE**	**1.1**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-02-0	**Nickel**	**13.1**		**1,300**		**mg/kg**	**L-39S**	**43 / 43**	**0.13 - 0.47**	**1,300**	**NE**	**150**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-09-7	Potassium	452	J	3,180	J	mg/kg	LF-A2S	43 / 43	0.71 - 4.5	3,180	NE	-	-	NA	NA	N	NUTR
	7782-49-2	Selenium	0.67	J	1.1	J	mg/kg	L-37	6 / 43	0.56 - 1.8	1.1	NE	39	(N)	NA	NA	N	BSL
	7440-22-4	Silver	0.13	J	5.4	J	mg/kg	L-24	29 / 43	0.11 - 0.36	5.4	NE	39	(N)	NA	NA	N	BSL
	7440-23-5	Sodium	278	J	2,290	J	mg/kg	L-4	10 / 43	21.5 - 385	2,290	NE	-	-	NA	NA	N	NUTR
	7440-62-2	**Vanadium**	**26.9**	**J**	**84.2**	**J**	**mg/kg**	**L-4**	**43 / 43**	**0.089 - 0.24**	**84.2**	**NE**	**39**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-66-6	**Zinc**	**71.3**	**L**	**17,500**	**L**	**mg/kg**	**L-4**	**43 / 43**	**0.13 - 1.3**	**17,500**	**NE**	**2,300**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	Dioxins																	
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.0158		0.453		ug/kg	L-21	5 / 5	0.000487 - 0.0234	0.453	NE	-	-	NA	NA	Y	ASL(8)
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-P-Dioxin	0.111		8.91		ug/kg	L-21	5 / 5	0.000487 - 0.0476	8.91	NE	-	-	NA	NA	Y	ASL(8)
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.000992	J	0.00419	J	ug/kg	L-43	3 / 5	0.000487 - 0.0291	0.00419	NE	-	-	NA	NA	Y	ASL(8)
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	0.00193	J	0.0188	J	ug/kg	L-36	4 / 5	0.000487 - 0.025	0.0188	NE	-	-	NA	NA	Y	ASL(8)
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	0.00108	J	0.00205	J	ug/kg	L-43	3 / 5	0.000487 - 0.0296	0.00205	NE	-	-	NA	NA	Y	ASL(8)
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	0.00141	J	0.0117	J	ug/kg	L-36	4 / 5	0.000487 - 0.0239	0.0117	NE	-	-	NA	NA	Y	ASL(8)
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	0.00404	J	0.876	J	ug/kg	L-21	5 / 5	0.000487 - 0.0307	0.876	NE	-	-	NA	NA	Y	ASL(8)
	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	0.000555	J	0.00178	J	ug/kg	L-43	3 / 5	0.000497 - 0.0282	0.00178	NE	-	-	NA	NA	Y	ASL(8)
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	0.00393	J	0.219	J	ug/kg	L-21	4 / 5	0.000487 - 0.0299	0.219	NE	-	-	NA	NA	Y	ASL(8)
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	0.000803	J	0.00173	J	ug/kg	L-43	3 / 5	0.000487 - 0.0153	0.00173	NE	-	-	NA	NA	Y	ASL(8)
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	0.000887	J	0.00181	J	ug/kg	L-43	3 / 5	0.000487 - 0.0233	0.00181	NE	-	-	NA	NA	Y	ASL(8)
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	0.00194	J	0.0163	J	ug/kg	L-36	4 / 5	0.000487 - 0.0248	0.0163	NE	-	-	NA	NA	Y	ASL(8)
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	0.00248	J	0.00985	J	ug/kg	L-21	4 / 5	0.000487 - 0.0147	0.00985	NE	-	-	NA	NA	Y	ASL(8)
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	0.00106		0.0268		ug/kg	L-21	4 / 5	0.000128 - 0.0189	0.0268	NE	-	-	NA	NA	Y	ASL(8)
	1746-01-6	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	0.00035	J	0.0242	J	ug/kg	L-21	4 / 5	0.000198 - 0.0368	0.0242	NE	0.0048	(C)	NA	NA	Y	ASL(8)
	39001-02-0	Octachlorodibenzofuran	0.0428		0.943		ug/kg	L-21	5 / 5	0.000975 - 0.0731	0.943	NE	-	-	NA	NA	Y	ASL(8)
	3268-87-9	Octachlorodibenzo-P-Dioxin	4.64		79.7		ug/kg	L-21	5 / 5	0.000975 - 0.0814	79.7	NE	-	-	NA	NA	Y	ASL(8)
		2,3,7,6-TCDD Equivalents	**0.0049**		**0.27**		**ug/kg**	**L-21**			**0.27**	**NE**	**0.0048**	**(C)**	**NA**	**NA**	**Y**	**ASL**

Golder Associates

Table 7-2.2
Occurrence, Distribution, and Selection of Chemicals of Potential Concern
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Surface and Subsurface Soil (1)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency						Concentration Used for Screening (3)	Background Value (4)	Screening Toxicity Value (5) (N/C) Residential		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
	Pesticides/PCBs																					
On-Site Surface and Subsurface Soil - Landfill	72-54-8	4,4-DDD	1.1	J	240	J	ug/kg	L-43	37	/	39	0.33	-	0.33	240	NE	2,300	(C)	NA	NA	N	BSL
	72-55-9	4,4-DDE	0.94	J	720	J	ug/kg	L-43	33	/	42	0.33	-	0.33	720	NE	2,000	(C)	NA	NA	N	BSL
	50-29-3	4,4-DDT	2.2	J	1,900	J	ug/kg	L-43	34	/	44	0.5	-	5.9	1,900	NE	1,900	(C)	NA	NA	N	BSL
	309-00-2	Aldrin	0.61	J	2.2	J	ug/kg	L-4	5	/	43	0.17	-	0.17	2.2	NE	39	(C)	NA	NA	N	BSL
	319-84-6	Alpha-BHC	0.48	J	1.9	J	ug/kg	L-43	5	/	42	0.18	-	0.18	1.9	NE	86	(C)	NA	NA	N	BSL
	5103-71-9	Alpha-Chlordane	0.49	J	20	J	ug/kg	L-48S	19	/	44	0.17	-	1.8	20	NE	1,700	(C) SURR[a]	NA	NA	N	BSL
	959-98-8	Alpha-Endosulfan	0.45	J	7.3	J	ug/kg	L-24	12	/	44	0.17	-	3	7.3	NE	47,000	(N) SURR[a]	NA	NA	N	BSL
	319-85-7	Beta-BHC	0.69	J	5.4	J	ug/kg	L-27	20	/	40	0.25	-	0.25	5.4	NE	300	(C)	NA	NA	N	BSL
	5566-34-7	gamma-Chlordane	0.42	J	25	J	ug/kg	LF-A3S	32	/	43	0.17	-	0.17	25	NE	1,700	(C) SURR[a]	NA	NA	N	BSL
	33213-65-9	Beta-Endosulfan	0.82	J	15	J	ug/kg	L-36	19	/	44	0.33	-	0.33	15	NE	47,000	(N) SURR[a]	NA	NA	N	BSL
	319-86-8	Delta-BHC	0.5	J	0.95	J	ug/kg	L-43	3	/	44	0.17	-	0.17	0.95	NE	300	(C) SURR[a]	NA	NA	N	BSL
	60-57-1	**Dieldrin**	**0.98**	**J**	**120**	**J**	**ug/kg**	**L-39S**	**37**	**/**	**39**	**0.33**	**-**	**0.33**	**120**	**NE**	**34**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	1031-07-8	Endosulfan Sulfate	1	J	22	J	ug/kg	L-44	21	/	44	0.37	-	0.37	22	NE	47,000	(N) SURR[a]	NA	NA	N	BSL
	72-20-8	Endrin	0.92	J	24	J	ug/kg	L-24	14	/	44	0.33	-	0.33	24	NE	1,900	(N)	NA	NA	N	BSL
	7421-93-4	Endrin Aldehyde	0.85	J	23	J	ug/kg	L-44	23	/	44	0.33	-	0.33	23	NE	1,900	(N) SURR[a]	NA	NA	N	BSL
	53494-70-5	Endrin Ketone	0.91	J	41	J	ug/kg	L-48S	21	/	44	0.35	-	0.35	41	NE	1,900	(N) SURR[a]	NA	NA	N	BSL
	58-89-9	Gamma-BHC	0.47	J	0.98	J	ug/kg	L-12	3	/	44	0.17	-	0.17	0.98	NE	570	(C)	NA	NA	N	BSL
	76-44-8	Heptachlor	0.74	J	8.9	J	ug/kg	L-4	3	/	44	0.28	-	0.28	8.9	NE	130	(C)	NA	NA	N	BSL
	1024-57-3	Heptachlor Epoxide	0.57	J	8.3	J	ug/kg	L-37	29	/	42	0.22	-	0.22	8.3	NE	70	(C)	NA	NA	N	BSL
	72-43-5	Methoxychlor	4.2	J	63	J	ug/kg	L-24	14	/	43	1.7	-	1.7	63	NE	32,000	(N)	NA	NA	N	BSL
	SVOCs																					
	91-57-6	2-Methylnaphthalene	110	J	13,000	J	ug/kg	L-36	20	/	44	35	-	800	13,000	NE	24,000	(N)	NA	NA	N	BSL
	83-32-9	Acenaphthene	91	J	4,800	J	ug/kg	L-36	10	/	44	35	-	800	4,800	NE	360,000	(N)	NA	NA	N	BSL
	208-96-8	Acenaphthylene	100	J	3,200	J	ug/kg	L-36	10	/	44	35	-	800	3,200	NE	360,000	(N) SURR[a]	NA	NA	N	BSL
	98-86-2	Acetophenone	88	J	88	J	ug/kg	L-43	1	/	44	67	-	910	88	NE	780,000	(N)	NA	NA	N	BSL
	120-12-7	Anthracene	87	J	2,500	J	ug/kg	L-36	23	/	44	35	-	800	2,500	NE	1,800,000	(N)	NA	NA	N	BSL
	56-55-3	**Benzo(A)Anthracene**	**79**	**J**	**4,800**	**J**	**ug/kg**	**L-48S**	**34**	**/**	**44**	**35**	**-**	**800**	**4,800**	**NE**	**160**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	50-32-8	**Benzo(A)Pyrene**	**84**	**J**	**4,100**	**J**	**ug/kg**	**L-48S**	**31**	**/**	**44**	**35**	**-**	**800**	**4,100**	**NE**	**16**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	205-99-2	**Benzo(B)Fluoranthene**	**86**	**J**	**4,200**	**J**	**ug/kg**	**L-48S**	**32**	**/**	**44**	**35**	**-**	**800**	**4,200**	**NE**	**160**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	191-24-2	Benzo(G,H,I)Perylene	83	J	1,800	J	ug/kg	L-48S	30	/	44	35	-	800	1,800	NE	180000	(N) SURR[a]	NA	NA	N	BSL
	207-08-9	**Benzo(K)Fluoranthene**	**82**	**J**	**4,100**	**J**	**ug/kg**	**L-48S**	**28**	**/**	**44**	**35**	**-**	**800**	**4,100**	**NE**	**1,600**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	92-52-4	Biphenyl	170	J	2,500	J	ug/kg	L-36	4	/	44	35	-	800	2,500	NE	4,700	(N)	NA	NA	N	BSL
	117-81-7	Bis(2-Ethylhexyl) Phthalate	92	J	1,400	J	ug/kg	L-37	14	/	44	35	-	800	1,400	NE	39,000	(C)	NA	NA	N	BSL
	85-68-7	Butylbenzyl Phthalate	150	J	940	J	ug/kg	L-36	2	/	44	35	-	800	940	NE	290,000	(C)	NA	NA	N	BSL
	86-74-8	**Carbazole**	**96**	**J**	**400**	**J**	**ug/kg**	**LF-A1S**	**9**	**/**	**44**	**35**	**-**	**800**	**400**	**NE**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	218-01-9	Chrysene	86	J	7,000	J	ug/kg	L-48S	39	/	44	35	-	800	7,000	NE	16,000	(C)	NA	NA	N	BSL
	53-70-3	**Dibenzo(A,H)Anthracene**	**91**	**J**	**630**	**J**	**ug/kg**	**L-48S**	**12**	**/**	**44**	**35**	**-**	**800**	**630**	**NE**	**16**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	132-64-9	Dibenzofuran	85	J	1,500	J	ug/kg	L-36	4	/	44	35	-	800	1,500	NE	7300	(N)	NA	NA	N	BSL
	131-11-3	Dimethyl Phthalate	410		410		ug/kg	L-4	1	/	44	35	-	800	410	NE	5100000	(N) SURR[a]	NA	NA	N	BSL
	117-84-0	Di-N-Octyl Phthalate	100	J	19,000	J	ug/kg	L-20	3	/	44	35	-	800	19,000	NE	63000	(N)	NA	NA	N	BSL
	206-44-0	Fluoranthene	120	J	3,700	J	ug/kg	L-48S	35	/	44	35	-	800	3,700	NE	240,000	(N)	NA	NA	N	BSL
	86-73-7	Fluorene	100	J	9,700	J	ug/kg	L-36	12	/	44	35	-	800	9,700	NE	240,000	(N)	NA	NA	N	BSL
	193-39-5	**Indeno(1,2,3-Cd)Pyrene**	**84**	**J**	**1,500**	**J**	**ug/kg**	**L-27**	**21**	**/**	**44**	**35**	**-**	**800**	**1,500**	**NE**	**160**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	91-20-3	**Naphthalene**	**100**	**J**	**70,000**	**J**	**ug/kg**	**L-20**	**13**	**/**	**44**	**35**	**-**	**800**	**70,000**	**NE**	**3,800**	**(C)**	**NA**	**NA**	**Y**	**ASL**

Golder Associates

Table 7-2.2

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Surface and Subsurface Soil (1)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency		Concentration Used for Screening (3)	Background Value (4)	Screening Toxicity Value (5) (N/C) Residential		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
On-Site Surface and Subsurface Soil - Landfill	85-01-8	Phenanthrene	93	J	20,000	J	ug/kg	L-36	37 / 44	35 - 800	20,000	NE	180000	(N) SURR[a]	NA	NA	N	BSL
	108-95-2	Phenol	85	J	210	J	ug/kg	LF-A1S	4 / 44	35 - 800	210	NE	1900000	(N)	NA	NA	N	BSL
	129-00-0	Pyrene	110	J	12,000	J	ug/kg	L-36	40 / 44	35 - 800	12,000	NE	180000	(N)	NA	NA	N	BSL
	VOCs																	
	67-64-1	Acetone	7	J	29	J	ug/kg	L-6	2 / 11	3.3 - 8	29	NE	6100000	(N)	NA	NA	N	BSL

Footnotes:

(1) Surface and subsurface soils were collected primarily from 0-36 inches depth.

(2) The Qualifier codes are defined as the following:

J - The analyte was detected and is considered an estimated value.

K - Analyte present, results may be biased high. Actual result is expected lower.

L - Analyte present, results may be biased low. Actual result is expected to be higher.

(3) Maximum detected value was used for screening.

(4) NE - Not established

(5) Units are the same as those for Screening Concentrations. USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites dated May, 2016 for residential soil were used , Noncancer values adjusted for a HI= 0.1, where (C)=Cancer; (N)= Noncancer.

a - SURR - Surrogate screening value used (endosulfan for alpha-endosulfan, beta-endosulfan and endosulfan sulfate; chlordane for alpha-chlordane and gamma-chlordane; endrin for endrin ketone and endrin aldehyde; pyrene for phenathrene and benzo(ghi)perylene; technical-BHC for delta-BHC; diethyl phthalate for dimethyl phthalate; and acenaphthene for acenaphthylene)

(-) = no RSL or suitable surrogate values available

(6) NA - No potential ARARs identified at this time.

(7) ASL = Above Screening Limit; BSL = Below Screening Limit; NSL = No Screening Limit; NUTR = analyte is an essential nutrient

(8) - No screening values are available for individual dioxin congeners and/or dioxins are addressed as 2,3,7,8-TCDD equivalents.

Table 7-2.3

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasbility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Ambient Air/Fugitive Dusts

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (3)	Inhalation Concentration Used for Screening (4) (ug/m³)	Screening Toxicity Value (5) (N/C) Residential (ug/m³)		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
		Metals																
On-Site Surface and Subsurface Soil - Annex	7429-90-5	Aluminum	2,150		28,100		mg/kg	A-13	25 / 25	4.3 - 7.5	28,100	5.9E-02	5.2E-01	(N)	NA	NA	N	BSL
	7440-36-0	Antimony	0.58	L	3.7	L	mg/kg	A-21	17 / 25	0.28 - 3.8	3.7	7.7E-06	-	-	NA	NA	Y	NSL
	7440-38-2	Arsenic	0.98	K	94.9	K	mg/kg	A-22	24 / 25	0.6 - 1.6	95	2.0E-04	6.5E-04	(C)	NA	NA	Y	CARC
	7440-39-3	Barium	4.6	J	470	J	mg/kg	A-5	25 / 25	0.023 - 0.14	470	9.8E-04	5.2E-02	(N)	NA	NA	N	BSL
	7440-41-7	Beryllium	0.31	J	5.9	J	mg/kg	A-22	23 / 25	0.023 - 0.36	5.9	1.2E-05	1.2E-03	(C)	NA	NA	Y	CARC
	7440-43-9	Cadmium	0.077	J	3.7	J	mg/kg	A-20	21 / 25	0.046 - 1.3	3.7	7.7E-06	-	-	NA	NA	Y	CARC
	7440-70-2	Calcium	137	J	13,300	J	mg/kg	A-1	25 / 25	0.71 - 5.3	13,300	2.8E-02	-	-	NA	NA	N	NUTR
	7440-47-3	Chromium	7.7		203		mg/kg	A-13	25 / 25	0.092 - 0.32	203	4.2E-04	1.2E-05	(C)	NA	NA	Y	ASL
	7440-48-4	Cobalt	0.099	J	19.6	J	mg/kg	A-13	25 / 25	0.092 - 0.33	20	4.1E-05	3.1E-04	(C)	NA	NA	N	BSL
	7440-50-8	Copper	3.1	J	232	J	mg/kg	A-20	25 / 25	0.21 - 0.68	232	4.8E-04	-	-	NA	NA	Y	NSL
	7439-89-6	Iron	5,100		40,900		mg/kg	A-9	25 / 25	1.7 - 5.5	40,900	8.5E-02	-	-	NA	NA	Y	NSL
	7439-92-1	Lead	4.8		293		mg/kg	ANA-DS	25 / 25	0.31 - 0.54	293	6.1E-04	1.5E-01	L	NA	NA	N	BSL
	7439-95-4	Magnesium	89.7	J	12,400	J	mg/kg	A-13	25 / 25	0.6 - 2.5	12,400	2.6E-02	-	-	NA	NA	N	NUTR
	7439-96-5	Manganese	11.8		1,180		mg/kg	ANA-DS	25 / 25	0.023 - 0.11	1,180	2.5E-03	5.2E-03	(N)	NA	NA	N	BSL
	7439-97-6	Mercury	0.091	K	0.88	K	mg/kg	A-21	14 / 25	0.043 - 0.091	0.88	1.8E-06	3.1E-02	(N)	NA	NA	N	BSL
	7440-02-0	Nickel	0.83	J	92.3	J	mg/kg	A-13	25 / 25	0.12 - 0.5	92	1.9E-04	9.4E-03	(N)	NA	NA	N	BSL
	7440-09-7	Potassium	164	J	10,400	J	mg/kg	A-9	25 / 25	0.73 - 4	10,400	2.2E-02	-	-	NA	NA	N	NUTR
	7782-49-2	Selenium	0.6	J	4.2	J	mg/kg	A-22	7 / 25	0.57 - 1.6	4.2	8.8E-06	2.1E+00	(N)	NA	NA	N	BSL
	7440-22-4	Silver	0.52	J	2.4	J	mg/kg	A-21	8 / 25	0.12 - 0.32	2.4	5.0E-06	-	-	NA	NA	Y	NSL
	7440-23-5	Sodium	363	J	379	J	mg/kg	A-22	2 / 25	22.2 - 245	379	7.9E-04	-	-	NA	NA	N	NUTR
	7440-28-0	Thallium	1	J	1	J	mg/kg	A-22	1 / 25	0.64 - 2.6	1.0	2.1E-06	-	-	NA	NA	Y	NSL
	7440-62-2	Vanadium	10.6	J	102	J	mg/kg	A-5	25 / 25	0.092 - 0.21	102	2.1E-04	1.0E-02	(N)	NA	NA	N	BSL
	7440-66-6	Zinc	7.6		1,540		mg/kg	A-20	25 / 25	0.14 - 0.64	1,540	3.2E-03	-	-	NA	NA	Y	NSL
		Dioxins																
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.00162	J	0.0611	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.0611	1.3E-10	-	-	NA	NA	N	BSL(8)
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-P-Dioxin	0.0103		0.239		ug/kg	A-10	6 / 6	0.000441 - 0.00054	0.239	5.0E-10	-	-	NA	NA	N	BSL(8)
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.000263	J	0.00361	J	ug/kg	A-10	4 / 6	0.000441 - 0.00051	0.00361	7.5E-12	-	-	NA	NA	N	BSL(8)
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	0.00026	J	0.00914	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.00914	1.9E-11	-	-	NA	NA	N	BSL(8)
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	0.000192	J	0.00281	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.00281	5.9E-12	-	-	NA	NA	N	BSL(8)
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	0.000137	J	0.00541	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.00541	1.1E-11	-	-	NA	NA	N	BSL(8)
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	0.000394	J	0.00869	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.00869	1.8E-11	-	-	NA	NA	N	BSL(8)
	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	0.000284		0.00157		ug/kg	A-10	3 / 6	0.000441 - 0.00051	0.00157	3.3E-12	-	-	NA	NA	N	BSL(8)
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	0.000327	J	0.00693	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.00693	1.4E-11	-	-	NA	NA	N	BSL(8)
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	0.000127	J	0.00391	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.00391	8.1E-12	-	-	NA	NA	N	BSL(8)
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	0.000165	J	0.00246	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.00246	5.1E-12	-	-	NA	NA	N	BSL(8)
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	0.000181	J	0.00723	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.00723	1.5E-11	-	-	NA	NA	N	BSL(8)
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	0.000212	J	0.0133	J	ug/kg	A-10	6 / 6	0.000441 - 0.00051	0.0133	2.8E-11	-	-	NA	NA	N	BSL(8)
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	0.000337	J	0.00681	J	ug/kg	A-10	6 / 6	5.66E-05 - 0.00033	0.00681	1.4E-11	-	-	NA	NA	N	BSL(8)
	1746-01-6	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	0.00264		0.00264		ug/kg	A-10	1 / 6	0.00038 - 0.00051	0.00264	5.5E-12	7.4E-08	(C)	NA	NA	N	BSL(8)
	39001-02-0	Octachlorodibenzofuran	0.00276	J	0.161	J	ug/kg	A-10	6 / 6	0.000882 - 0.00102	0.161	3.4E-10	-	-	NA	NA	N	BSL(8)
	3268-87-9	Octachlorodibenzo-P-Dioxin	0.132		7.51		ug/kg	A-10	6 / 6	0.000882 - 0.00102	7.51	1.6E-08	-	-	NA	NA	N	BSL(8)
		2,3,7,8-TCDD Equivalents	0.00078		0.019		ug/kg	A-10			0.019	3.9E-11	7.4E-08	(C)	NA	NA	N	BSL

Table 7-2.3
Occurrence, Distribution, and Selection of Chemicals of Potential Concern
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Ambient Air/Fugitive Dusts

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (3)	Inhalation Concentration Used for Screening (4) (ug/m^3)	Screening Toxicity Value (5) (N/C) Residential (ug/m^3)		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
	Pesticides/PCBs																	
On-Site Surface and Subsurface Soil - Annex	72-54-8	4,4-DDD	1.9	J	65	J	ug/kg	ANA-DS	8 / 24	0.33 - 0.33	65	1.4E-07	4.1E-02	(C)	NA	NA	N	BSL
	72-55-9	4,4-DDE	1.1	J	19	J	ug/kg	A-21	12 / 24	0.33 - 0.33	19	4.0E-08	2.9E-02	(C)	NA	NA	N	BSL
	50-29-3	4,4-DDT	2	J	55	J	ug/kg	A-20	11 / 24	0.5 - 0.5	55	1.1E-07	2.9E-02	(C)	NA	NA	N	BSL
	309-00-2	Aldrin	1.2	J	1.3	J	ug/kg	A-14	2 / 24	0.17 - 0.17	1.3	2.7E-09	5.7E-04	(C)	NA	NA	N	BSL
	319-84-6	Alpha-BHC	0.83	K	1.3	K	ug/kg	ANA-DS	2 / 24	0.18 - 0.18	1.3	2.7E-09	1.6E-03	(C)	NA	NA	N	BSL
	5103-71-9	Alpha-Chlordane	0.58	J	8	J	ug/kg	A-21	9 / 23	0.17 - 0.17	8	1.7E-08	2.8E-02	C (SURR)	NA	NA	N	BSL
	959-98-8	**Alpha-Endosulfan**	**0.84**	**J**	**1.1**	**J**	**ug/kg**	**A-23**	**2 / 24**	**0.17 - 0.17**	**1.1**	**2.3E-09**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	12672-29-6	Aroclor 1248	3,900		3,900		ug/kg	A-16	1 / 24	3.6 - 3.6	3,900	8.1E-06	4.9E-03	(C)	NA	NA	N	ASL
	11097-69-1	Aroclor 1254	76		1,400		ug/kg	A-16	4 / 24	5.5 - 5.5	1,400	2.9E-06	4.9E-03	(C)	NA	NA	N	BSL
	11096-82-5	Aroclor 1260	68		400		ug/kg	A-23	7 / 24	5.5 - 5.5	400	8.3E-07	4.9E-03	(C)	NA	NA	N	BSL
	319-85-7	Beta-BHC	0.67	J	15	J	ug/kg	A-16	10 / 23	0.25 - 0.25	15	3.1E-08	5.3E-03	(C)	NA	NA	N	BSL
	5566-34-7	gamma-Chlordane	0.66	J	6.1	J	ug/kg	A-14	8 / 24	0.17 - 0.17	6.1	1.3E-08	2.8E-02	C (SURR)	NA	NA	N	BSL
	33213-65-9	**Beta-Endosulfan**	**1.2**	**J**	**1.4**	**J**	**ug/kg**	**A-14**	**2 / 24**	**0.33 - 0.33**	**1.4**	**2.9E-09**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	60-57-1	Dieldrin	0.96	J	22	J	ug/kg	A-10	10 / 23	0.33 - 0.33	22	4.6E-08	6.1E-04	(C)	NA	NA	N	BSL
	1031-07-8	Endosulfan Sulfate	1.5	J	2	J	ug/kg	A-14	2 / 24	0.37 - 0.37	2	4.2E-09	-	-	NA	NA	Y	NSL
	72-20-8	**Endrin**	**1.3**	**J**	**8.9**	**J**	**ug/kg**	**A-23**	**4 / 24**	**0.33 - 0.33**	**8.9**	**1.9E-08**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	7421-93-4	**Endrin Aldehyde**	**0.91**	**J**	**7.8**	**J**	**ug/kg**	**A-14**	**4 / 24**	**0.33 - 0.33**	**7.8**	**1.6E-08**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	53494-70-5	**Endrin Ketone**	**1.4**	**J**	**16**	**J**	**ug/kg**	**A-14**	**3 / 24**	**0.35 - 0.35**	**16**	**3.3E-08**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	58-89-9	Gamma-BHC	0.48	J	1.3	J	ug/kg	A-16	2 / 24	0.17 - 0.17	1.3	2.7E-09	9.1E-03	(C)	NA	NA	N	BSL
	76-44-8	Heptachlor	1.1	J	1.1	J	ug/kg	A-17S	1 / 24	0.28 - 0.28	1.1	2.3E-09	2.2E-03	(C)	NA	NA	N	BSL
	1024-57-3	Heptachlor Epoxide	0.57	J	4	J	ug/kg	ANA-DS	8 / 24	0.22 - 0.22	4	8.3E-09	1.1E-03	(C)	NA	NA	N	BSL
	72-43-5	**Methoxychlor**	**29**		**29**		**ug/kg**	**A-14**	**1 / 24**	**1.7 - 1.7**	**29**	**6.0E-08**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	SVOCs																	
	120-12-7	**Anthracene**	**100**	**J**	**240**	**J**	**ug/kg**	**ANA-JS**	**7 / 24**	**35 - 67**	**240**	**5.0E-07**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	56-55-3	Benzo(A)Anthracene	90	J	840	J	ug/kg	A-16	13 / 24	35 - 67	840	1.8E-06	9.2E-03	(C)	NA	NA	N	BSL
	50-32-8	Benzo(A)Pyrene	120	J	620	J	ug/kg	ANA-JS	8 / 24	35 - 67	620	1.3E-06	9.2E-04	(C)	NA	NA	N	BSL
	205-99-2	Benzo(B)Fluoranthene	170	J	1,300	J	ug/kg	A-16	11 / 24	35 - 67	1,300	2.7E-06	9.2E-03	(C)	NA	NA	N	BSL
	191-24-2	**Benzo(G,H,I)Perylene**	**140**	**J**	**230**	**J**	**ug/kg**	**ANA-JS**	**4 / 24**	**35 - 67**	**230**	**4.8E-07**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	207-08-9	Benzo(K)Fluoranthene	160	J	1,300	J	ug/kg	A-16	11 / 24	35 - 67	1,300	2.7E-06	9.2E-03	(C)	NA	NA	N	BSL
	117-81-7	Bis(2-Ethylhexyl) Phthalate	84	J	180	J	ug/kg	A-20	3 / 24	35 - 340	180	3.8E-07	1.2E+00	(C)	NA	NA	N	BSL
	85-68-7	**Butylbenzyl Phthalate**	**190**	**J**	**190**	**J**	**ug/kg**	**A-16**	**1 / 24**	**35 - 67**	**190**	**4.0E-07**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	86-74-8	**Carbazole**	**100**	**J**	**150**	**J**	**ug/kg**	**A-10**	**3 / 24**	**35 - 67**	**150**	**3.1E-07**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	218-01-9	Chrysene	100	J	870	J	ug/kg	ANA-JS	13 / 24	35 - 67	870	1.8E-06	9.2E-02	(C)	NA	NA	N	BSL
	53-70-3	Dibenzo(A,H)Anthracene	97	J	160	J	ug/kg	A-16	3 / 24	35 - 67	160	3.3E-07	8.4E-04	(C)	NA	NA	N	BSL
	117-84-0	**Di-N-Octyl Phthalate**	**120**	**J**	**120**	**J**	**ug/kg**	**A-16**	**1 / 24**	**35 - 67**	**120**	**2.5E-07**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	206-44-0	**Fluoranthene**	**100**	**J**	**1,700**	**J**	**ug/kg**	**ANA-JS**	**14 / 24**	**35 - 67**	**1,700**	**3.5E-06**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	193-39-5	Indeno(1,2,3-Cd)Pyrene	140	J	320	J	ug/kg	ANA-JS	7 / 24	35 - 67	320	6.7E-07	9.2E-03	(C)	NA	NA	N	BSL
	85-01-8	**Phenanthrene**	**110**	**J**	**970**	**J**	**ug/kg**	**ANA-JS**	**13 / 24**	**35 - 67**	**970**	**2.0E-06**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	108-95-2	Phenol	150	J	150	J	ug/kg	A-17S	1 / 24	35 - 67	150	3.1E-07	2.1E+01	(N)	NA	NA	N	BSL
	129-00-0	**Pyrene**	**100**	**J**	**1,600**	**J**	**ug/kg**	**ANA-JS**	**13 / 24**	**35 - 67**	**1,600**	**3.3E-06**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	VOCs																	
	67-64-1	Acetone	6	J	13	J	ug/kg	A-10	2 / 12	3.3 - 21	13	1.2E-03	3.2E+03	(N)	NA	NA	N	BSL

Golder Associates

Table 7-2.3
Occurrence, Distribution, and Selection of Chemicals of Potential Concern
Remedial Investigation/Feasbility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Ambient Air/Fugitive Dusts

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (3)	Inhalation Concentration Used for Screening (4) (ug/m^3)	Screening Toxicity Value (5) (N/C) Residential (ug/m^3)		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
		Metals																
On-Site Surface and Subsurface Soil - Landfill	7429-90-5	Aluminum	6,290		22,700		mg/kg	LF-A3S	43 / 43	4.4 - 8.6	22,700	5.7E-02	5.2E-01	(N)	NA	NA	N	BSL
	7440-36-0	**Antimony**	**0.45**	**L**	**17.9**	**L**	**mg/kg**	**L-14**	**28 / 43**	**0.27 - 22.3**	**17.9**	**4.5E-05**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	7440-38-2	**Arsenic**	**2.4**	**J**	**19.8**	**J**	**mg/kg**	**L-14**	**43 / 43**	**0.58 - 1.8**	**19.8**	**5.0E-05**	**6.5E-04**	**(C)**	**NA**	**NA**	**Y**	**CARC**
	7440-39-3	Barium	39.7	J	864	J	mg/kg	L-36	43 / 43	0.022 - 0.16	864	2.2E-03	5.2E-02	(N)	NA	NA	N	BSL
	7440-41-7	**Beryllium**	**0.37**	**J**	**66**	**J**	**mg/kg**	**L-4**	**42 / 43**	**0.022 - 0.4**	**66**	**1.7E-04**	**1.2E-03**	**(C)**	**NA**	**NA**	**Y**	**CARC**
	7440-43-9	**Cadmium**	**0.2**	**J**	**8.1**	**J**	**mg/kg**	**L-14**	**43 / 43**	**0.044 - 0.13**	**8.1**	**2.0E-05**	**-**	**-**	**NA**	**NA**	**Y**	**CARC**
	7440-70-2	Calcium	917	J	83,400	J	mg/kg	L-36	43 / 43	0.69 - 5.4	83,400	2.1E-01	-	-	NA	NA	N	NUTR
	7440-47-3	**Chromium**	**19.4**	**J**	**140**	**J**	**mg/kg**	**L-35**	**43 / 43**	**0.089 - 0.36**	**140**	**3.5E-04**	**1.2E-05**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-48-4	**Cobalt**	**4.9**	**J**	**158**	**J**	**mg/kg**	**L-14**	**43 / 43**	**0.089 - 0.31**	**158**	**4.0E-04**	**3.1E-04**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-50-8	**Copper**	**24.5**	**L**	**10,500**	**L**	**mg/kg**	**L-14**	**43 / 43**	**0.2 - 0.77**	**10,500**	**2.6E-02**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	7439-89-6	**Iron**	**14,500**		**199,000**		**mg/kg**	**L-39S**	**43 / 43**	**1.7 - 7.7**	**199,000**	**5.0E-01**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	7439-92-1	Lead	30.5		4,260		mg/kg	L-4	43 / 43	0.31 - 0.61	4,260	1.1E-02	1.5E-01	L	NA	NA	N	BSL
	7439-95-4	Magnesium	1,230	J	38,200	J	mg/kg	L-36	43 / 43	0.58 - 2.8	38,200	9.6E-02	-	-	NA	NA	N	NUTR
	7439-96-5	**Manganese**	**163**		**9,770**		**mg/kg**	**L-14**	**43 / 43**	**0.022 - 0.12**	**9,770**	**2.4E-02**	**5.2E-03**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-97-6	Mercury	0.21		6.7		mg/kg	L-38	43 / 43	0.041 - 0.11	6.7	1.7E-05	3.1E-02	(N)	NA	NA	N	BSL
	7440-02-0	Nickel	13.1		1,300		mg/kg	L-39S	43 / 43	0.13 - 0.47	1,300	3.3E-03	9.4E-03	(N)	NA	NA	N	BSL
	7440-09-7	Potassium	452	J	3,180	J	mg/kg	LF-A2S	43 / 43	0.71 - 4.5	3,180	8.0E-03	-	-	NA	NA	N	NUTR
	7782-49-2	Selenium	0.67	J	1.1	J	mg/kg	L-37	6 / 43	0.56 - 1.8	1.1	2.8E-06	2.1E+00	(N)	NA	NA	N	BSL
	7440-22-4	**Silver**	**0.13**	**J**	**5.4**	**J**	**mg/kg**	**L-24**	**29 / 43**	**0.11 - 0.36**	**5.4**	**1.4E-05**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
	7440-23-5	Sodium	278	J	2,290	J	mg/kg	L-4	10 / 43	21.5 - 385	2,290	5.7E-03	-	-	NA	NA	N	NUTR
	7440-62-2	Vanadium	26.9	J	84.2	J	mg/kg	L-4	43 / 43	0.089 - 0.24	84.2	2.1E-04	1.0E-02	(N)	NA	NA	N	BSL
	7440-66-6	**Zinc**	**71.3**	**L**	**17,500**	**L**	**mg/kg**	**L-4**	**43 / 43**	**0.13 - 1.3**	**17,500**	**4.4E-02**	**-**	**-**	**NA**	**NA**	**Y**	**NSL**
		Dioxins																
	67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	0.0158		0.453		ug/kg	L-21	5 / 5	0.000487 - 0.0234	0.453	1.1E-09	-	-	NA	NA	N	BSL[8]
	35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-P-Dioxin	0.111		8.91		ug/kg	L-21	5 / 5	0.000487 - 0.0476	8.91	2.2E-08	-	-	NA	NA	N	BSL[8]
	55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	0.000992	J	0.00419	J	ug/kg	L-43	3 / 5	0.000487 - 0.0291	0.00419	1.0E-11	-	-	NA	NA	N	BSL[8]
	70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	0.00193	J	0.0188	J	ug/kg	L-36	4 / 5	0.000487 - 0.025	0.0188	4.7E-11	-	-	NA	NA	N	BSL[8]
	39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-P-Dioxin	0.00108	J	0.00205	J	ug/kg	L-43	3 / 5	0.000487 - 0.0296	0.00205	5.1E-12	-	-	NA	NA	N	BSL[8]
	57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	0.00141	J	0.0117	J	ug/kg	L-36	4 / 5	0.000487 - 0.0239	0.0117	2.9E-11	-	-	NA	NA	N	BSL[8]
	57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-P-Dioxin	0.00404	J	0.876	J	ug/kg	L-21	5 / 5	0.000487 - 0.0307	0.876	2.2E-09	-	-	NA	NA	N	BSL[8]
	72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	0.000555	J	0.00178	J	ug/kg	L-43	3 / 5	0.000497 - 0.0282	0.00178	4.5E-12	-	-	NA	NA	N	BSL[8]
	19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-P-Dioxin	0.00393	J	0.219	J	ug/kg	L-21	4 / 5	0.000487 - 0.0299	0.219	5.5E-10	-	-	NA	NA	N	BSL[8]
	57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	0.000803	J	0.00173	J	ug/kg	L-43	3 / 5	0.000487 - 0.0153	0.00173	4.3E-12	-	-	NA	NA	N	BSL[8]
	40321-76-4	1,2,3,7,8-Pentachlorodibenzo-P-Dioxin	0.000887	J	0.00181	J	ug/kg	L-43	3 / 5	0.000487 - 0.0233	0.00181	4.5E-12	-	-	NA	NA	N	BSL[8]
	60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	0.00194	J	0.0163	J	ug/kg	L-36	4 / 5	0.000487 - 0.0248	0.0163	4.1E-11	-	-	NA	NA	N	BSL[8]
	57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	0.00248	J	0.00985	J	ug/kg	L-21	4 / 5	0.000487 - 0.0147	0.00985	2.5E-11	-	-	NA	NA	N	BSL[8]
	51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	0.00106		0.0268		ug/kg	L-21	4 / 5	0.000128 - 0.0189	0.0268	6.7E-11	-	-	NA	NA	N	BSL[8]
	1746-01-6	2,3,7,8-Tetrachlorodibenzo-P-Dioxin	0.00035	J	0.0242	J	ug/kg	L-21	4 / 5	0.000198 - 0.0368	0.0242	6.1E-11	7.4E-08	(C)	NA	NA	N	BSL
	39001-02-0	Octachlorodibenzofuran	0.0428		0.943		ug/kg	L-21	5 / 5	0.000975 - 0.0731	0.943	2.4E-09	-	-	NA	NA	N	BSL[8]
	3268-87-9	Octachlorodibenzo-P-Dioxin	4.64		79.7		ug/kg	L-21	5 / 5	0.000975 - 0.0814	79.7	2.0E-07	-	-	NA	NA	N	BSL[8]
		2,3,7,8-TCDD Equivalents	0.0049		0.24		ug/kg	L-21			0.24	6.0E-10	7.4E-08	(C)	NA	NA	N	BSL

Table 7-2.3
Occurrence, Distribution, and Selection of Chemicals of Potential Concern
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Ambient Air/Fugitive Dusts

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)	Maximum Concentration (Qualifier) (2)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (3)	Inhalation Concentration Used for Screening (4) (ug/m^3)	Screening Toxicity Value (5) (N/C) Residential (ug/m^3)	Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
		Pesticides/PCBs													
On-Site Surface and Subsurface Soil - Landfill	72-54-8	4,4-DDD	1.1 J	240 J	ug/kg	L-43	37 / 39	0.33 - 0.33	240	6.0E-07	4.1E-02 (C)	NA	NA	N	BSL
	72-55-9	4,4-DDE	0.94 J	720 J	ug/kg	L-43	33 / 42	0.33 - 0.33	720	1.8E-06	2.9E-02 (C)	NA	NA	N	BSL
	50-29-3	4,4-DDT	2.2 J	1,900 J	ug/kg	L-43	34 / 44	0.5 - 5.9	1,900	4.8E-06	2.9E-02 (C)	NA	NA	N	BSL
	309-00-2	Aldrin	0.61 J	2.2 J	ug/kg	L-4	5 / 43	0.17 - 0.17	2.2	5.5E-09	5.7E-04 (C)	NA	NA	N	BSL
	319-84-6	Alpha-BHC	0.48 J	1.9 J	ug/kg	L-43	5 / 42	0.18 - 0.18	1.9	4.8E-09	1.6E-03 (C)	NA	NA	N	BSL
	5103-71-9	Alpha-Chlordane	0.49 J	20 J	ug/kg	L-48S	19 / 44	0.17 - 1.8	20	5.0E-08	2.8E-02 C (SURR)	NA	NA	N	BSL
	959-98-8	Alpha-Endosulfan	0.45 J	7.3 J	ug/kg	L-24	12 / 44	0.17 - 3	7.3	1.8E-08	- -	NA	NA	N	NSL
	319-85-7	Beta-BHC	0.69 J	5.4 J	ug/kg	L-27	20 / 40	0.25 - 0.25	5.4	1.4E-08	5.3E-03 (C)	NA	NA	N	BSL
	5566-34-7	gamma-Chlordane	0.42 J	25 J	ug/kg	LF-A3S	32 / 43	0.17 - 0.17	25	6.3E-08	2.8E-02 C (SURR)	NA	NA	N	BSL
	33213-65-9	Beta-Endosulfan	0.82 J	15 J	ug/kg	L-36	19 / 44	0.33 - 0.33	15	3.8E-08	- -	NA	NA	N	NSL
	319-86-8	Delta-BHC	0.5 J	0.95 J	ug/kg	L-43	3 / 44	0.17 - 0.17	0.95	2.4E-09	5.3E-03 (C)	NA	NA	N	BSL
	60-57-1	Dieldrin	0.98 J	120 J	ug/kg	L-39S	37 / 39	0.33 - 0.33	120	3.0E-07	6.1E-04 (C)	NA	NA	N	BSL
	1031-07-8	Endosulfan Sulfate	1 J	22 J	ug/kg	L-44	21 / 44	0.37 - 0.37	22	5.5E-08	- -	NA	NA	N	NSL
	72-20-8	Endrin	0.92 J	24 J	ug/kg	L-24	14 / 44	0.33 - 0.33	24	6.0E-08	- -	NA	NA	N	NSL
	7421-93-4	Endrin Aldehyde	0.85 J	23 J	ug/kg	L-44	23 / 44	0.33 - 0.33	23	5.8E-08	- -	NA	NA	N	NSL
	53494-70-5	Endrin Ketone	0.91 J	41 J	ug/kg	L-48S	21 / 44	0.35 - 0.35	41	1.0E-07	- -	NA	NA	N	NSL
	58-89-9	Gamma-BHC	0.47 J	0.98 J	ug/kg	L-12	3 / 44	0.17 - 0.17	0.98	2.5E-09	9.1E-03 (C)	NA	NA	N	BSL
	76-44-8	Heptachlor	0.74 J	8.9 J	ug/kg	L-4	3 / 44	0.28 - 0.28	8.9	2.2E-08	2.2E-03 (C)	NA	NA	N	BSL
	1024-57-3	Heptachlor Epoxide	0.57 J	8.3 J	ug/kg	L-37	29 / 42	0.22 - 0.22	8.3	2.1E-08	1.1E-03 (C)	NA	NA	N	BSL
	72-43-5	Methoxychlor	4.2 J	63 J	ug/kg	L-24	14 / 43	1.7 - 1.7	63	1.6E-07	- -	NA	NA	N	NSL
		SVOCs													
	91-57-6	2-Methylnaphthalene	110 J	13,000 J	ug/kg	L-36	20 / 44	35 - 800	13,000	3.3E-05	- -	NA	NA	N	NSL
	83-32-9	Acenaphthene	91 J	4,800 J	ug/kg	L-36	10 / 44	35 - 800	4,800	1.2E-05	- -	NA	NA	N	NSL
	208-96-8	Acenaphthylene	100 J	3,200 J	ug/kg	L-36	10 / 44	35 - 800	3,200	8.0E-06	- -	NA	NA	N	NSL
	98-86-2	Acetophenone	88 J	88 J	ug/kg	L-43	1 / 44	67 - 910	88	2.2E-07	- -	NA	NA	N	NSL
	120-12-7	Anthracene	87 J	2,500 J	ug/kg	L-36	23 / 44	35 - 800	2,500	6.3E-06	- -	NA	NA	N	NSL
	56-55-3	Benzo(A)Anthracene	79 J	4,800 J	ug/kg	L-48S	34 / 44	35 - 800	4,800	1.2E-05	9.2E-03 (C)	NA	NA	N	BSL
	50-32-8	Benzo(A)Pyrene	84 J	4,100 J	ug/kg	L-48S	31 / 44	35 - 800	4,100	1.0E-05	9.2E-04 (C)	NA	NA	N	BSL
	205-99-2	Benzo(B)Fluoranthene	86 J	4,200 J	ug/kg	L-48S	32 / 44	35 - 800	4,200	1.1E-05	9.2E-03 (C)	NA	NA	N	BSL
	191-24-2	Benzo(G,H,I)Perylene	83 J	1,800 J	ug/kg	L-48S	30 / 44	35 - 800	1,800	4.5E-06	- -	NA	NA	N	NSL
	207-08-9	Benzo(K)Fluoranthene	82 J	4,100 J	ug/kg	L-48S	28 / 44	35 - 800	4,100	1.0E-05	9.2E-03 (C)	NA	NA	N	BSL
	92-52-4	Biphenyl	170 J	2,500 J	ug/kg	L-36	4 / 44	35 - 800	2,500	6.3E-06	4.2E-02 (N)	NA	NA	N	BSL
	117-81-7	Bis(2-Ethylhexyl) Phthalate	92 J	1,400 J	ug/kg	L-37	14 / 44	35 - 800	1,400	3.5E-06	1.2E+00 (C)	NA	NA	N	BSL
	85-68-7	Butylbenzyl Phthalate	150 J	940 J	ug/kg	L-36	2 / 44	35 - 800	940	2.4E-06	- -	NA	NA	N	NSL
	86-74-8	Carbazole	96 J	400 J	ug/kg	LF-A1S	9 / 44	35 - 800	400	1.0E-06	- -	NA	NA	N	NSL
	218-01-9	Chrysene	86 J	7,000 J	ug/kg	L-48S	39 / 44	35 - 800	7,000	1.8E-05	9.2E-02 (C)	NA	NA	N	BSL
	53-70-3	Dibenzo(A,H)Anthracene	91 J	630 J	ug/kg	L-48S	12 / 44	35 - 800	630	1.6E-06	8.4E-04 (C)	NA	NA	N	BSL
	132-64-9	Dibenzofuran	85 J	1,500 J	ug/kg	L-36	4 / 44	35 - 800	1,500	3.8E-06	- -	NA	NA	N	NSL
	131-11-3	Dimethyl Phthalate	410	410	ug/kg	L-4	1 / 44	35 - 800	410	1.0E-06	- -	NA	NA	N	NSL
	117-84-0	Di-N-Octyl Phthalate	100 J	19,000 J	ug/kg	L-20	3 / 44	35 - 800	19,000	4.8E-05	- -	NA	NA	N	NSL
	206-44-0	Fluoranthene	120 J	3,700 J	ug/kg	L-48S	35 / 44	35 - 800	3,700	9.3E-06	- -	NA	NA	N	NSL
	86-73-7	Fluorene	100 J	9,700 J	ug/kg	L-36	12 / 44	35 - 800	9,700	2.4E-05	- -	NA	NA	N	NSL
	193-39-5	Indeno(1,2,3-Cd)Pyrene	84 J	1,500 J	ug/kg	L-27	21 / 44	35 - 800	1,500	3.8E-06	9.2E-03 (C)	NA	NA	N	BSL
	78-59-1	Isophorone	-	-	ug/kg	-	0 / 44	35 - 800	400	1.0E-06	2.1E+02 (N)	NA	NA	N	BSL
	91-20-3	Naphthalene	100 J	70,000 J	ug/kg	L-20	13 / 44	35 - 800	70,000	1.8E-04	8.3E-02 (C)	NA	NA	N	BSL

Golder Associates

Table 7-2.3

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasbility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil (1)
Exposure Medium:	Ambient Air/Fugitive Dusts

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency			Range of Detection Limits			Concentration Used for Screening (3)	Inhalation Concentration Used for Screening (4) (ug/m^3)	Screening Toxicity Value (5) (N/C) Residential (ug/m^3)		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
On-Site Surface and Subsurface Soil - Landfill	85-01-8	Phenanthrene	93	J	20,000	J	ug/kg	L-36	37	/	44	35	-	800	20,000	5.0E-05	-	-	NA	NA	N	NSL
	108-95-2	Phenol	85	J	210	J	ug/kg	LF-A1S	4	/	44	35	-	800	210	5.3E-07	2.1E+01	(N)	NA	NA	N	BSL
	129-00-0	Pyrene	110	J	12,000	J	ug/kg	L-36	40	/	44	35	-	800	12,000	3.0E-05	-	-	NA	NA	N	NSL
		VOCs																				
	67-64-1	Acetone	7	J	29	J	ug/kg	L-6	2	/	11	3.3	-	8	29	2.1E-05	3.2E+03	(N)	NA	NA	N	BSL

Footnotes:

(1) Surface and subsurface soils were collected primarily from 0-36 inches depth.

(2) The Qualifier codes are defined as the following:

J - The analyte was detected and is considered an estimated value.

K - Analyte present, results may be biased high. Actual result is expected lower.

L - Analyte present, results may be biased low. Actual result is expected to be higher.

(3) Maximum detected value was used for screening.

(4) The following equations were used to estimate maximum air concentration of chemical in air:

For non-VOC compounds: $$C_{air} = C_{soil} \times \frac{1}{PEF}$$

For VOCs (acetone) $$C_{air} = C_{soil} \times \frac{1}{VF}$$

Where:

C_{air} = Concentration in air in ug/m^3

C_{soil} = Concentration in soil in ug/kg

For inorganic compounds, an additional factor of 1000 is applied to C_{soil} to convert mg/kg concentration in soil to ug/kg

PEF - Particulate Emission Factor (see Appendix T) in m^3/kg (PEF for annex is 4.8E+08 m^3/kg; PEF for landfill is 4.0E+08 m^3/kg)

VF - Chemical-specific Volatilization Factor (see Appendix T) in m^3/kg

(5) Units are in ug/m^3. USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites dated May, 2016 for residential air were used , Noncancer values adjusted for a HI= 0.1, where (C)=Cancer; (N)= Noncancer.

a - SURR - Surrogate screening value used (chlordane for alpha-chlordane and gamma-chlordane; technical BHC for delta-BHC)

(-) = no RSL or suitable surrogate values available

(6) NA - No potential ARARs identified at this time.

(7) ASL = Above Screening Limit; BSL = Below Screening Limit; NSL = No Screening Limit; NUTR = analyte is an essential nutrient; CARC = Known human carcinogen

(8) - Dioxins are addressed as 2,3,7,8-TCDD equivalents.

Golder Associates

Table 7-2.4

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timefram Current/Future
Medium: Seeps (1)
Exposure Medium: Seeps (1)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (3)	Background Value (4)	Screening Toxicity Value (5) (N/C) Tap Water		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
	Metals																	
On-Site Seeps - Annex	7429-90-5	Aluminum	10,600		31,100		ug/l	ANA-AW	4 / 4	21.1 - 21.1	31,100	NE	20000	(N)	NA	NA	Y	ASL
	7440-36-0	Antimony	2.9	J	3.2	J	ug/l	ANA-JW	2 / 4	2 - 2	3.2	NE	7.8	(N)	NA	NA	N	BSL
	7440-38-2	Arsenic	7.9	J	37.7		ug/l	ANA-AW	4 / 4	4.4 - 4.4	37.7	NE	0.52	(C)	NA	NA	Y	ASL
	7440-39-3	Barium	528		938		ug/l	ANA-JW	4 / 4	0.4 - 0.4	938	NE	3800	(N)	NA	NA	N	BSL
	7440-41-7	Beryllium	0.65	J	2.4	J	ug/l	ANA-AW	4 / 4	0.5 - 0.5	2.4	NE	25	(N)	NA	NA	N	BSL
	7440-43-9	Cadmium	1.8	J	3.4	J	ug/l	ANA-DW	4 / 4	0.3 - 0.3	3.4	NE	9.2	(N)	NA	NA	N	BSL
	7440-70-2	Calcium	78,500		188,000		ug/l	ANA-JW	4 / 4	13 - 13	188,000	NE	-	-	NA	NA	N	NUTR
	7440-47-3	Chromium	40.8		78.1		ug/l	ANA-AW	4 / 4	0.9 - 0.9	78.1	NE	0.35	(C)	NA	NA	Y	ASL
	7440-48-4	Cobalt	7.9	J	25.7	J	ug/l	ANA-AW	4 / 4	0.7 - 0.7	25.7	NE	6	(N)	NA	NA	Y	ASL
	7440-50-8	Copper	57.9		108		ug/l	ANA-AW	4 / 4	1.9 - 1.9	108	NE	800	(N)	NA	NA	N	BSL
	7439-89-6	Iron	30,600		52,100		ug/l	ANA-JW	4 / 4	15.3 - 15.3	52,100	NE	14000	(N)	NA	NA	Y	ASL
	7439-92-1	Lead	110		365		ug/l	ANA-AW	4 / 4	1.5 - 1.5	365	NE	15	(MCL)	NA	NA	Y	ASL
	7439-95-4	Magnesium	24,200		75,400		ug/l	ANA-JW	4 / 4	7 - 7	75,400	NE	-	-	NA	NA	N	NUTR
	7439-96-5	Manganese	632		1,290		ug/l	ANA-LW	4 / 4	0.3 - 0.3	1,290	NE	430	(N)	NA	NA	Y	ASL
	7439-97-6	Mercury	0.25		1.2		ug/l	ANA-AW	4 / 4	0.1 - 0.1	1.2	NE	2	(N)	NA	NA	N	BSL
	7440-02-0	Nickel	36.5	J	74.8	J	ug/l	ANA-AW	4 / 4	0.6 - 0.6	74.8	NE	390	(N)	NA	NA	N	BSL
	7440-09-7	Potassium	8,840	J	33,700	J	ug/l	ANA-JW	4 / 4	11.2 - 11.2	33,700	NE	-	-	NA	NA	N	NUTR
	7440-22-4	Silver	1.2	J	1.7	J	ug/l	ANA-AW	3 / 4	0.9 - 0.9	1.7	NE	94	(N)	NA	NA	N	BSL
	7440-23-5	Sodium	40,800		94,300		ug/l	ANA-JW	4 / 4	136 - 136	94,300	NE	-	-	NA	NA	N	NUTR
	7440-62-2	Vanadium	54.2		95.3		ug/l	ANA-AW	4 / 4	0.6 - 0.6	95.3	NE	86	(N)	NA	NA	Y	ASL
	7440-66-6	Zinc	259	K	576	K	ug/l	ANA-AW	4 / 4	1.8 - 1.8	576	NE	600	(N)	NA	NA	N	BSL
	Pesticides/PCBs																	
	72-55-9	4,4-DDE	0.021	J	0.021	J	ug/l	ANA-JW	1 / 3	0.018 - 0.02	0.021	NE	0.46	(C)	NA	NA	N	BSL
	72-54-8	4,4-DDD	0.033	J	0.033	J	ug/l	ANA-DW	1 / 3	0.018 - 0.02	0.033	NE	0.32	(C)	NA	NA	N	BSL
	5566-34-7	gamma-Chlordane	0.011	J	0.011	J	ug/l	ANA-JW	1 / 3	0.0091 - 0.01	0.011	NE	0.2	(C)	NA	NA	N	BSL
	SVOCs																	
	91-20-3	Naphthalene	5	J	5	J	ug/l	ANA-JW	1 / 3	4 - 4.4	5	NE	1.7	(C)	NA	NA	Y	ASL

Table 7-2.4

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timefram Current/Future
Medium: Seeps (1)
Exposure Medium: Seeps (1)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (3)	Background Value (4)	Screening Toxicity Value (5) (N/C) Tap Water		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
									VOCs									
On-Site Seeps - Annex	95-50-1	1,2-Dichlorobenzene	0.14	J	0.69		ug/l	ANA-JW	2 / 4	0.1 - 0.1	0.69	NE	300	(N)	NA	NA	N	BSL
	541-73-1	1,3-Dichlorobenzene	0.35	J	0.35	J	ug/l	ANA-JW	1 / 4	0.1 - 0.1	0.35	NE	300	(N) SURR[a]	NA	NA	N	BSL
	106-46-7	1,4-Dichlorobenzene	0.15	J	1.2		ug/l	ANA-JW	4 / 4	0.1 - 0.1	1.2	NE	4.8	(C)	NA	NA	N	BSL
	71-43-2	**Benzene**	**0.14**	**J**	**0.16**	**J**	**ug/l**	**ANA-LW**	**2 / 4**	**0.1 - 0.1**	**0.16**	**NE**	**4.6**	**(C)**	**NA**	**NA**	**Y**	**CARC**
	75-15-0	Carbon Disulfide	0.14	J	0.15	J	ug/l	ANA-JW	2 / 4	0.1 - 0.1	0.15	NE	810	(N)	NA	NA	N	BSL
	108-90-7	Chlorobenzene	0.67		7.6	J	ug/l	ANA-JW	4 / 4	0.1 - 0.1	7.6	NE	78	(N)	NA	NA	N	BSL
	156-59-2	cis-1,2-Dichloroethene	0.12	J	0.54		ug/l	ANA-LW	2 / 4	0.1 - 0.1	0.54	NE	36	(N)	NA	NA	N	BSL
	98-82-8	Isopropylbenzene	0.23	J	0.23	J	ug/l	ANA-JW	1 / 4	0.1 - 0.1	0.23	NE	450	(N)	NA	NA	N	BSL
	1634-04-4	Methyl tert-Butyl Ether	0.23	J	0.23	J	ug/l	ANA-JW	1 / 4	0.1 - 0.1	0.23	NE	140	(C)	NA	NA	N	BSL
	108-88-3	Toluene	0.12	J	0.12	J	ug/l	ANA-DW	1 / 4	0.1 - 0.23	0.12	NE	1100	(N)	NA	NA	N	BSL
	75-01-4	**Vinyl Chloride**	**0.82**		**0.82**		**ug/l**	**ANA-LW**	**1 / 4**	**0.1 - 0.1**	**0.82**	**NE**	**0.19**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	1330-20-7	Xylenes, Total	0.28	J	0.28	J	ug/l	ANA-JW	1 / 4	0.1 - 0.1	0.28	NE	190	(N)	NA	NA	N	BSL
									Metals									
On-Site Seeps - Landfill	7429-90-5	Aluminum	4,500		16,300		ug/l	LF-A1W	3 / 3	21.1 - 21.1	16,300	NE	20000	(N)	NA	NA	N	BSL
	7440-36-0	Antimony	3	J	3.9	J	ug/l	LF-A3W	2 / 3	2 - 2	3.9	NE	7.8	(N)	NA	NA	N	BSL
	7440-38-2	**Arsenic**	**7.9**	**J**	**17.4**	**J**	**ug/l**	**LF-A3W**	**3 / 3**	**4.4 - 4.4**	**17.4**	**NE**	**0.52**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-39-3	Barium	315		585		ug/l	LF-A3W	3 / 3	0.4 - 0.4	585	NE	3800	(N)	NA	NA	N	BSL
	7440-41-7	Beryllium	0.96	J	1.1	J	ug/l	LF-A1W	2 / 3	0.5 - 0.5	1.1	NE	25	(N)	NA	NA	N	BSL
	7440-43-9	Cadmium	0.82	J	5.2	J	ug/l	LF-A3W	3 / 3	0.3 - 0.3	5.2	NE	9.2	(N)	NA	NA	N	BSL
	7440-70-2	Calcium	61,500		113,000		ug/l	LF-A3W	3 / 3	13 - 13	113,000	NE	-	-	NA	NA	N	NUTR
	7440-47-3	**Chromium**	**15**		**54.1**		**ug/l**	**LF-A3W**	**3 / 3**	**0.9 - 0.9**	**54.1**	**NE**	**0.35**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	7440-48-4	**Cobalt**	**4.7**	**J**	**12.3**	**J**	**ug/l**	**LF-A3W**	**3 / 3**	**0.7 - 0.7**	**12.3**	**NE**	**6**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7440-50-8	Copper	33		110		ug/l	LF-A3W	3 / 3	1.9 - 1.9	110	NE	800	(N)	NA	NA	N	BSL
	7439-89-6	**Iron**	**23,000**		**47,000**		**ug/l**	**LF-A1W**	**3 / 3**	**15.3 - 15.3**	**47,000**	**NE**	**14000**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-92-1	**Lead**	**53.1**		**245**		**ug/l**	**LF-A3W**	**3 / 3**	**1.5 - 1.5**	**245**	**NE**	**15**	**(MCL)**	**NA**	**NA**	**Y**	**ASL**
	7439-95-4	Magnesium	22,700		39,800		ug/l	LF-A3W	3 / 3	7 - 7	39,800	NE	-	-	NA	NA	N	NUTR
	7439-96-5	**Manganese**	**534**		**1,630**		**ug/l**	**LF-A1W**	**3 / 3**	**0.3 - 0.3**	**1,630**	**NE**	**430**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7439-97-6	Mercury	0.2		0.78		ug/l	LF-A3W	3 / 3	0.1 - 0.1	0.78	NE	2	(N)	NA	NA	N	BSL
	7440-02-0	Nickel	15.8	J	57.5	J	ug/l	LF-A3W	3 / 3	0.6 - 0.6	57.5	NE	390	(N)	NA	NA	N	BSL
	7440-09-7	Potassium	6,240	J	20,200	J	ug/l	LF-A3W	3 / 3	11.2 - 11.2	20,200	NE	-	-	NA	NA	N	NUTR
	7440-22-4	Silver	0.94	J	0.94	J	ug/l	LF-A3W	1 / 3	0.9 - 0.9	0.94	NE	94	(N)	NA	NA	N	BSL
	7440-23-5	Sodium	34,700		63,200		ug/l	LF-A2W	3 / 3	136 - 136	63,200	NE	-	-	NA	NA	N	NUTR
	7440-62-2	Vanadium	16.9	J	50	J	ug/l	LF-A3W	3 / 3	0.6 - 0.6	50	NE	86	(N)	NA	NA	N	BSL
	7440-66-6	Zinc	96	K	569	K	ug/l	LF-A3W	3 / 3	1.8 - 1.8	569	NE	6000	(N)	NA	NA	N	BSL

Golder Associates

Table 7-2.4

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timefram Current/Future
Medium: Seeps (1)
Exposure Medium: Seeps (1)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (2)		Maximum Concentration (Qualifier) (2)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (3)	Background Value (4)	Screening Toxicity Value (5) (N/C) Tap Water		Potential ARAR/TBC Value (6)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (7)
		Pesticides/PCBs																
On-Site Seeps - Landfill	**309-00-2**	**Aldrin**	**0.024**	**J**	**0.024**	**J**	**ug/l**	**LF-A1W**	**1 / 3**	**0.0091 - 0.01**	**0.024**	**NE**	**0.0092**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	60-57-1	**Dieldrin**	**0.048**	**J**	**0.09**	**J**	**ug/l**	**LF-A1W**	**2 / 3**	**0.018 - 0.02**	**0.09**	**NE**	**0.018**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	72-55-9	4,4-DDE	0.03	J	0.03	J	ug/l	LF-A1W	1 / 3	0.018 - 0.02	0.03	NE	0.46	(C)	NA	NA	N	BSL
	72-54-8	4,4-DDD	0.025	J	0.025	J	ug/l	LF-A1W	1 / 3	0.018 - 0.02	0.025	NE	0.32	(C)	NA	NA	N	BSL
	50-29-3	4,4-DDT	0.039	J	0.039	J	ug/l	LF-A1W	1 / 3	0.018 - 0.02	0.039	NE	2.3	(C)	NA	NA	N	BSL
	5103-71-9	alpha-Chlordane	0.07		0.07		ug/l	LF-A1W	1 / 3	0.0091 - 0.01	0.07	NE	0.2	(C) SURR[a]	NA	NA	N	BSL
	5566-34-7	gamma-Chlordane	0.031	J	0.077	J	ug/l	LF-A1W	2 / 3	0.0091 - 0.01	0.077	NE	0.2	(C) SURR[a]	NA	NA	N	BSL
		VOCs																
	75-34-3	1,1-Dichloroethane	0.14	J	0.14	J	ug/l	LF-A3W	1 / 3	0.1 - 0.1	0.14	NE	28	(C)	NA	NA	N	BSL
	108-90-7	Chlorobenzene	0.47	J	0.47	J	ug/l	LF-A3W	1 / 3	0.1 - 0.1	0.47	NE	78	(N)	NA	NA	N	BSL
	1634-04-4	Methyl tert-Butyl Ether	0.11	J	0.16	J	ug/l	LF-A2W	2 / 3	0.1 - 0.1	0.16	NE	140	(C)	NA	NA	N	BSL
	108-88-3	Toluene	0.29	J	0.29	J	ug/l	LF-A1W	1 / 3	0.1 - 0.1	0.29	NE	1100	(N)	NA	NA	N	BSL
	1330-20-7	Xylenes, Total	0.1	J	0.1	J	ug/l	LF-A2W	1 / 3	0.1 - 0.1	0.1	NE	190	(N)	NA	NA	N	BSL

(1) - Seeps consist of aqueous samples collected at seepage areas.

(2) The Qualifier codes are defined as the following:

J - The analyte was detected and is considered an estimated value.

K - Analyte present, results may be biased high. Actual result is expected lower.

(3) Maximum detected value for compounds detected in at least one sample

(4) NE - Not established

(5) Units are the same as those for Screening Concentrations. Where available, Screening Toxicity Values are USEPA Regional Screening Levels for Chemical Contaminants at Superfund Sites dated May, 2016 for Tap Water. For surface seep liquid screening, tap water values were multiplied by a factor of 10 before adjustment for HI = 0.1. Values were adjusted for a HI = 0.1 for non-cancer effects, where (C)=Cancer; (N)= Noncancer.

a - SURR - Surrogate screening value used (chlordane for alpha-chlordane and gamma-chlordane;1,2-dichlorobenzene for 1,3-dichlorobenzene)

b - Per USEPA comment, tap water RSL for methyl mercury used to screen seep water

MCL - Action Levels for lead in tap water from the May 2009 USEPA Edition of the Drinking Water Standards and Health Advisories

(-) = no PRG/RBC or suitable surrogate values found

(6) NA - No potential ARARs identified at this time.

(7) ASL = Above Screening Limit; BSL = Below Screening Limit; NSL; No Screening Limit; NUTR = Essential Nutrient; CARC - Known human carcinogen

(8) - No screening values are available for individual dioxin congeners and/or dioxins are addressed as 2,3,7,8-TCDD equivalents.

Table 7-2.5

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site, Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Ambient Air

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxity Value (4) Inhalation Tap Water		Potential ARAR/TBC Value (5)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Groundwater - Annex		*Metals*														
	7664-41-7	Ammonia	3.91 J	10.5 J	mg/l	MW-10	3 / 4	0.0558 - 0.112	10.5	NE	-	-	NA	NA	N	NSL
		Pesticides/PCBs														
	76-44-8	**Heptachlor**	**0.02 J**	**0.02 J**	**ug/l**	**MW-6**	**1 / 5**	**0.0091 - 0.0093**	**0.02**	**NE**	**4.3E-03**	**(C)**	**0.000079**	**WQS**	**Y**	**ASL**
		SVOCs														
	123-91-1	**1,4-Dioxane**	**19**	**21**	**ug/l**	**MW-6**	**2 / 4**	**0.26 - 0.49**	**21**	**NE**	**1.1E+00**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	91-57-6	2-Methylnaphthalene	6 J	8 J	ug/l	MW-10	2 / 9	0.33 - 2.1	8	NE	-	-	NA	NA	N	NSL
	83-32-9	Acenaphthene	3.9 J	12 J	ug/l	MW-10	4 / 9	0.3 - 2.1	12	NE	-	-	NA	NA	N	NSL
	132-64-9	Dibenzofuran	0.45 J	7 J	ug/l	MW-10	3 / 9	0.21 - 2.1	7	NE	-	-	NA	NA	N	NSL
	86-73-7	Fluorene	3.7 J	8 J	ug/l	MW-10	4 / 9	0.23 - 2.1	8	NE	-	-	NA	NA	N	NSL
	91-20-3	**Naphthalene**	**17**	**24**	**ug/l**	**MW-10**	**2 / 9**	**0.26 - 2.1**	**24**	**NE**	**1.7E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	85-01-8	Phenanthrene	11	11	ug/l	MW-10	2 / 9	0.13 - 2.1	11	NE	-	-	NA	NA	N	NSL
	129-00-0	Pyrene	1.1 J	2 J	ug/l	MW-5	2 / 9	0.26 - 2.1	2	NE	-	-	4,000	WQS	N	NSL
		VOCs														
	71-55-6	1,1,1-Trichloroethane	0.1 J	0.26 J	ug/l	MW-6	4 / 9	0.03 - 0.1	0.26	NE	1.0E+03	(N)	NA	NA	N	BSL
	75-34-3	1,1-Dichloroethane	0.34 J	1.9 J	ug/l	MW-6	5 / 9	0.04 - 0.1	1.9	NE	3.5E+00	(C)	NA	NA	N	BSL
	75-35-4	1,1-Dichloroethene	1.1 J	2.7 J	ug/l	MW-6	4 / 9	0.07 - 0.1	2.7	NE	4.2E+01	(N)	NA	NA	N	BSL
	95-50-1	1,2-Dichlorobenzene	0.13 J	0.27 J	ug/l	MW-6	4 / 9	0.03 - 0.1	0.27	NE	4.2E+01	(N)	NA	NA	N	BSL
	107-06-2	**1,2-Dichloroethane**	**7**	**61**	**ug/l**	**MW-6**	**4 / 9**	**0.068 - 0.1**	**61**	**NE**	**2.2E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	541-73-1	1,3-Dichlorobenzene	0.16 J	0.16 J	ug/l	MW-5	1 / 9	0.045 - 0.1	0.16	NE	4.2E+01	(N) SURR	NA	NA	N	BSL
Groundwater - Annex	**106-46-7**	**1,4-Dichlorobenzene**	**0.18 J**	**0.66 J**	**ug/l**	**MW-6**	**8 / 9**	**0.059 - 0.14**	**0.66**	**NE**	**5.1E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	78-93-3	2-Butanone	26	26	ug/l	MW-10	1 / 9	0.36 - 13	26	NE	1.0E+03	(N)	NA	NA	N	BSL
	67-64-1	Acetone	2.4 J	4.7 J	ug/l	MW-6	4 / 9	1.3 - 14	4.7	NE	6.4E+03	(N)	NA	NA	N	BSL
	71-43-2	**Benzene**	**0.039 J**	**0.72 J**	**ug/l**	**MW-6**	**7 / 9**	**0.037 - 0.1**	**0.72**	**NE**	**7.2E-01**	**(C)**	**NA**	**NA**	**Y**	**CARC**
	75-15-0	Carbon Disulfide	0.11 J	0.27 J	ug/l	MW-10	3 / 9	0.056 - 0.1	0.27	NE	1.5E+02	(N)	NA	NA	N	BSL
	108-90-7	**Chlorobenzene**	**1.3**	**19**	**ug/l**	**MW-6**	**8 / 9**	**0.03 - 1**	**19**	**NE**	**1.0E+01**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	75-00-3	Chloroethane	0.29 J	0.29 J	ug/l	MW-6	1 / 9	0.1 - 0.21	0.29	NE	2.1E+03	(N)	NA	NA	N	BSL
	156-59-2	Cis-1,2-Dichloroethene	0.1 J	2.5 J	ug/l	MW-6	8 / 9	0.054 - 0.1	2.5	NE	-	-	NA	NA	N	NSL
	110-82-7	Cyclohexane	0.067 J	1.6 J	ug/l	MW-10	6 / 9	0.053 - 0.1	1.6	NE	1.3E+03	(N)	NA	NA	N	BSL
	100-41-4	Ethylbenzene	0.17 J	1.9 J	ug/l	MW-6	4 / 9	0.03 - 0.1	1.9	NE	2.2E+00	(C)	NA	NA	N	BSL
	76-13-1	Freon 113	2 J	5 J	ug/l	MW-6	4 / 9	0.054 - 0.21	5	NE	6.3E+03	(N)	NA	NA	N	BSL
	98-82-8	Isopropylbenzene	0.069 J	0.41 J	ug/l	MW-10	4 / 9	0.057 - 0.1	0.41	NE	8.3E+01	(N)	NA	NA	N	BSL
	108-87-2	Methyl Cyclohexane	0.18 J	0.19 J	ug/l	MW-6	2 / 9	0.035 - 0.1	0.19	NE	1.3E+03	(N) SURR	NA	NA	N	BSL
	1634-04-4	Methyl Tert-Butyl Ether	0.16 J	0.96 J	ug/l	MW-6	5 / 9	0.037 - 0.1	0.96	NE	2.2E+01	(C)	NA	NA	N	BSL
	100-42-5	Styrene	0.23 J	0.23 J	ug/l	MW-10	1 / 9	0.03 - 0.1	0.23	NE	2.1E+02	(N)	NA	NA	N	BSL
	127-18-4	Tetrachloroethene	0.061 J	0.39 J	ug/l	MW-6	7 / 9	0.028 - 0.1	0.39	NE	8.3E+00	(N)	NA	NA	N	BSL
	108-88-3	Toluene	0.13 J	1.3 J	ug/l	MW-10	3 / 9	0.05 - 2.3	1.3	NE	1.0E+03	(N)	NA	NA	N	BSL
	79-01-6	**Trichloroethene**	**0.11 J**	**0.2 J**	**ug/l**	**MW-6**	**5 / 9**	**0.049 - 0.1**	**0.2**	**NE**	**4.2E-01**	**(N)**	**NA**	**NA**	**Y**	**CARC**
	75-01-4	**Vinyl Chloride**	**0.57**	**0.57**	**ug/l**	**MW-6**	**1 / 9**	**0.023 - 0.1**	**0.57**	**NE**	**3.4E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	1330-20-7	Xylenes, Total	0.6 J	13 J	ug/l	MW-6	4 / 5	0.1 - 0.1	13	NE	2.1E+01	(N)	NA	NA	N	BSL
		Metals														
	7439-97-6	**Mercury**	**0.15 L**	**0.15 L**	**ug/l**	**MW-7**	**1 / 13**	**0.1 - 0.1**	**0.15**	**NE**	**6.3E-02**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	7664-41-7	Ammonia	1.04 J	283 J	mg/l	MW-9	8 / 8	0.0558 - 2.79	809	NE	-	-	NA	NA	N	NSL
		Pesticides/PCBs														
	309-00-2	**Aldrin**	**0.012 J**	**0.012 J**	**ug/l**	**MW-8**	**1 / 13**	**0.0091 - 0.0095**	**0.012**	**NE**	**1.1E-03**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	5566-34-7	Gamma-Chlordane	0.0098 J	0.051 J	ug/l	MW-7	6 / 13	0.0091 - 0.0095	0.051	NE	5.6E-02	(C) SURR	NA	NA	N	BSL
	76-44-8	**Heptachlor**	**0.01 J**	**0.071 J**	**ug/l**	**MW-7**	**7 / 13**	**0.0091 - 0.0095**	**0.071**	**NE**	**4.3E-03**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	1024-57-3	**Heptachlor Epoxide**	**0.013 J**	**0.022 J**	**ug/l**	**MW-7**	**3 / 13**	**0.0091 - 0.0095**	**0.022**	**NE**	**2.2E-03**	**(C)**	**NA**	**NA**	**Y**	**ASL**

Table 7-2.5

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site, Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Ambient Air

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxity Value (4) Inhalation Tap Water		Potential ARAR/TBC Value (5)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
		SVOCs														
Groundwater - Landfill	**123-91-1**	**1,4-Dioxane**	**22 J**	**1100 J**	**ug/l**	**MW-1**	**29 / 29**	**0.13 - 9.8**	**1100**	**NE**	**1.1E+00**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	91-57-6	2-Methylnaphthalene	0.45 J	160 J	ug/l	MW-8	13 / 36	0.22 - 2.1	160	NE	-	-	NA	NA	N	NSL
	83-32-9	Acenaphthene	0.47 J	130 J	ug/l	MW-8	18 / 36	0.19 - 2.1	130	NE	-	-	NA	NA	N	NSL
	208-96-8	Acenaphthylene	6 J	6 J	ug/l	MW-8	1 / 36	0.16 - 2.1	6	NE	-	-	NA	NA	N	NSL
	98-86-2	Acetophenone	0.37 J+	2 J+	ug/l	MW-7	2 / 36	0.14 - 2.1	2	NE	-	-	NA	NA	N	NSL
	120-12-7	Anthracene	0.32 J	14 J	ug/l	MW-8	5 / 36	0.18 - 4.9	14	NE	-	-	NA	NA	N	NSL
	100-52-7	Benzaldehyde	0.5 J	3 J	ug/l	MW-7	8 / 36	0.21 - 3.3	3	NE	-	-	NA	NA	N	NSL
	92-52-4	**Biphenyl**	**9 J**	**24 J**	**ug/l**	**MW-8**	**2 / 36**	**0.14 - 2.1**	**24**	**NE**	**8.3E-02**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	132-64-9	Dibenzofuran	0.57 J	64 J	ug/l	MW-8	9 / 36	0.18 - 4.9	64	NE	-	-	NA	NA	N	NSL
	86-73-7	Fluorene	0.27 J	100 J	ug/l	MW-8	16 / 36	0.23 - 2.1	100	NE	-	-	NA	NA	N	NSL
	91-20-3	**Naphthalene**	**2.3 J**	**460 J**	**ug/l**	**MW-8**	**9 / 36**	**0.19 - 2.1**	**460**	**NE**	**1.7E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	85-01-8	Phenanthrene	0.2 J	120 J	ug/l	MW-8	16 / 36	0.13 - 2.1	120	NE	-	-	NA	NA	N	NSL
	129-00-0	Pyrene	0.44 J	6 J	ug/l	MW-8	7 / 36	0.26 - 2.1	6	NE	-	-	NA	NA	N	NSL
		VOCs														
	79-34-5	**1,1,2,2-Tetrachloroethane**	**0.2 J**	**0.2 J**	**ug/l**	**MW-9**	**1 / 37**	**0.06 - 3**	**0.2**	**NE**	**9.7E-02**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	75-34-3	1,1-Dichloroethane	0.066 J	2 J	ug/l	MW-2	10 / 37	0.04 - 2	2	NE	3.5E+00	(C)	NA	NA	N	BSL
	75-35-4	1,1-Dichloroethene	0.72	36	ug/l	MW-2	13 / 43	0.07 - 3.5	36	NE	4.2E+01	(N)	NA	NA	N	BSL
	87-61-6	1,2,3-Trichlorobenzene	0.14 J	0.14 J	ug/l	MW-7	1 / 37	0.049 - 3.5	0.14	NE	-	-	NA	NA	N	NSL
	95-50-1	1,2-Dichlorobenzene	0.12 J	0.98 J	ug/l	MW-1	16 / 37	0.03 - 1.5	0.98	NE	4.2E+01	(N)	NA	NA	N	BSL
	107-06-2	**1,2-Dichloroethane**	**0.27 K**	**8.4 K**	**ug/l**	**MW-7**	**5 / 37**	**0.068 - 4.5**	**8.4**	**NE**	**2.2E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	541-73-1	1,3-Dichlorobenzene	0.079 J	0.35 J	ug/l	MW-8	10 / 37	0.045 - 1.5	0.35	NE	4.2E+01	(N) SURR	NA	NA	N	BSL
	106-46-7	**1,4-Dichlorobenzene**	**0.11 J**	**1.5 J**	**ug/l**	**MW-8**	**19 / 37**	**0.059 - 1.4**	**1.5**	**NE**	**5.1E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	78-93-3	2-Butanone	2 J	8.2 J	ug/l	MW-7	3 / 37	0.36 - 52	8.2	NE	1.0E+03	(N)	NA	NA	N	BSL
	591-78-6	**2-Hexanone**	**8.2 J**	**8.2 J**	**ug/l**	**MW-9**	**1 / 37**	**0.52 - 51**	**8.2**	**NE**	**6.3E+00**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	108-10-1	4-Methyl-2-Pentanone	2.3 J	5.4 J	ug/l	MW-7	2 / 37	0.33 - 17	5.4	NE	6.3E+02	(N)	NA	NA	N	BSL
	67-64-1	Acetone	4.5 J	250 J	ug/l	MW-2	15 / 37	1.3 - 140	250	NE	6.4E+03	(N)	NA	NA	N	BSL
	71-43-2	**Benzene**	**0.094 J**	**11 J**	**ug/l**	**MW-9**	**24 / 37**	**0.037 - 2**	**11**	**NE**	**7.2E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	75-15-0	Carbon Disulfide	0.071 J	0.99 J	ug/l	MW-2	10 / 37	0.056 - 2	0.99	NE	1.5E+02	(N)	NA	NA	N	BSL
	108-90-7	**Chlorobenzene**	**0.41 K**	**290 K**	**ug/l**	**MW-3**	**38 / 43**	**0.03 - 1.5**	**290**	**NE**	**1.0E+01**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	75-00-3	Chloroethane	0.65 K	0.65 K	ug/l	MW-2	1 / 37	0.1 - 7	0.65	NE	2.1E+03	(N)	NA	NA	N	BSL

Table 7-2.5

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site, Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Ambient Air

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)		Maximum Concentration (Qualifier) (1)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxity Value (4) Inhalation Tap Water		Potential ARAR/TBC Value (5)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Groundwater - Landfill	156-59-2	Cis-1,2-Dichloroethene	0.1	K	370	K	ug/l	MW-2	28 / 43	0.054 - 4.5	370	NE	-	-	NA	NA	N	NSL
	110-82-7	Cyclohexane	0.11	J	2.1	J	ug/l	MW-9	21 / 37	0.053 - 3	2.1	NE	1.3E+03	(N)	NA	NA	N	BSL
	75-71-8	Dichlorodifluoromethane	0.4	K	3.2	K	ug/l	MW-7	2 / 37	0.059 - 1.5	3.2	NE	2.1E+01	(N)	NA	NA	N	BSL
	100-41-4	**Ethylbenzene**	**0.047**	**J**	**22**	**J**	**ug/l**	**MW-7**	**11 / 37**	**0.03 - 1.5**	**22**	**NE**	**2.2E+00**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	76-13-1	Freon 113	0.17	L	0.17	L	ug/l	MW-7	1 / 37	0.054 - 2.1	0.17	NE	6.3E+03	(N)	NA	NA	N	BSL
	98-82-8	Isopropylbenzene	0.1	L	5.5	L	ug/l	MW-9	19 / 37	0.057 - 1	5.5	NE	8.3E+01	(N)	NA	NA	N	BSL
	79-20-9	Methyl Acetate	5	U	25	U	ug/l	MW-2	5 / 37	0.096 - 5.5	25	NE	-	-	NA	NA	N	NSL
	108-87-2	Methyl Cyclohexane	0.14	J	1.4	J	ug/l	MW-9	10 / 37	0.035 - 2	1.4	NE	1.3E+03	(N) SURR	NA	NA	N	BSL
	1634-04-4	Methyl Tert-Butyl Ether	0.11	J	0.69	J	ug/l	MW-2	14 / 37	0.037 - 2	0.69	NE	2.2E+01	(C)	NA	NA	N	BSL
	75-09-2	Methylene Chloride	0.1	U	94	U	ug/l	MW-2	8 / 37	0.1 - 11	94	NE	1.3E+02	(N)	NA	NA	N	BSL
	100-42-5	Styrene	0.61		0.61		ug/l	MW-9	1 / 37	0.03 - 1.5	0.61	NE	2.1E+02	(N)	NA	NA	N	BSL
	127-18-4	Tetrachloroethene	0.19	J	0.83	J	ug/l	MW-7	3 / 37	0.028 - 1.5	0.83	NE	8.3E+00	(N)	NA	NA	N	BSL
	108-88-3	Toluene	0.1	L	14	L	ug/l	MW-9	16 / 37	0.05 - 5.3	14	NE	1.0E+03	(N)	NA	NA	N	BSL
	156-60-5	Trans-1,2-Dichloroethene	0.081	J	1.3	J	ug/l	MW-2	7 / 37	0.045 - 2.5	1.3	NE	-	-	NA	NA	N	NSL
	79-01-6	**Trichloroethene**	**0.18**	**J**	**39**	**J**	**ug/l**	**MW-2**	**15 / 43**	**0.049 - 2.5**	**39**	**NE**	**4.2E-01**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	75-01-4	**Vinyl Chloride**	**0.13**	**J**	**170**	**J**	**ug/l**	**MW-2**	**16 / 42**	**0.023 - 3**	**170**	**NE**	**3.4E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	179601-23-1	m,p-Xylenes	0.23	J	1.9	J	ug/l	MW-9	10 / 23	0.03 - 1.5	1.9	NE	2.1E+01	(N)	NA	NA	N	BSL
	95-47-6	o-Xylene	0.073	J	6.6	J	ug/l	MW-8	10 / 23	0.03 - 1.5	6.6	NE	2.1E+01	(N)	NA	NA	N	BSL
	1330-20-7	**Xylenes, Total**	**0.14**	**K**	**160**	**K**	**ug/l**	**MW-7**	**9 / 14**	**0.1 - 0.1**	**160**	**NE**	**2.1E+01**	**(N)**	**NA**	**NA**	**Y**	**ASL**
Groundwater - Refuge		***Metals***																
	7664-41-7	Ammonia	0.206	J	38.2	J	mg/l	MW-17	4 / 4	0.082 - 0.41	38.2	NE	-	-	NA	NA	N	NSL
		SVOCs																
	123-91-1	1,4-Dioxane	0.12	J	740	J	ug/l	MW-16	17 / 27	0.13 - 8.7	740	NE	2.9E+03	(N)	NA	NA	N	BSL
	105-67-9	2,4-Dimethylphenol	0.77	J	0.77	J	ug/l	MW-16	1 / 20	0.094 - 0.41	0.77	NE	-	-	NA	NA	N	NSL
	106-44-5	4-Methylphenol	0.21	J	0.65	J	ug/l	MW-17	3 / 20	0.094 - 0.63	0.65	NE	-	-	NA	NA	N	NSL
	83-32-9	Acenaphthene	2.4	J	2.4	J	ug/l	MW-15D	1 / 20	0.19 - 0.48	2.4	NE	-	-	NA	NA	N	NSL
	98-86-2	Acetophenone	0.29	J	0.29	J	ug/l	MW-20B	1 / 20	0.14 - 0.53	0.29	NE	-	-	NA	NA	N	NSL
	117-81-7	Bis(2-ethylhexyl) Phthalate	7.5		8.4		ug/l	MW-16	2 / 20	1.9 - 2.9	8.4	NE	-	-	NA	NA	N	NSL
	91-20-3	Naphthalene	0.22	J	0.35	J	ug/l	MW-17	3 / 0	0 - 0	0.35	NE	4.6E+00	(C)	NA	NA	N	BSL
	85-01-8	Phenanthrene	0.3	J	0.3	J	ug/l	MW-17	1 / 20	0.13 - 0.17	0.3	NE	-	-	NA	NA	N	NSL
	129-00-0	Pyrene	0.31	J-	0.31	J-	ug/l	MW-17	1 / 20	0.25 - 0.3	0.31	NE	-	-	NA	NA	N	NSL
		VOCs																
	75-34-3	1,1-Dichloroethane	0.093	J	3.4	J	ug/l	MW-16	4 / 20	0.04 - 0.29	3.4	NE	7.6E+00	(C)	NA	NA	N	BSL
	75-35-4	1,1-Dichloroethene	1		5.5		ug/l	MW-16	7 / 27	0.07 - 0.5	5.5	NE	2.0E+01	(N)	NA	NA	N	BSL
	107-06-2	1,2-Dichloroethane	0.17	J	0.17	J	ug/l	MW-16	1 / 20	0.09 - 0.34	0.17	NE	2.2E+00	(C)	NA	NA	N	BSL
	78-93-3	2-Butanone	1.5	J	1.5	J	ug/l	MW-17	1 / 20	1 - 1.8	1.5	NE	2.2E+05	(N)	NA	NA	N	BSL
	67-64-1	Acetone	3.7	J	3.7	J	ug/l	MW-18D	1 / 20	2.7 - 6.5	3.7	NE	2.3E+06	(N)	NA	NA	N	BSL
	71-43-2	**Benzene**	**0.039**	**J**	**1.6**	**J**	**ug/l**	**MW-16**	**7 / 20**	**0.037 - 0.29**	**1.6**	**NE**	**1.6E+00**	**(C)**	**NA**	**NA**	**Y**	**CARC**
	75-15-0	Carbon Disulfide	0.14	J	1.1	J	ug/l	MW-20B	5 / 20	0.09 - 0.28	1.1	NE	1.2E+02	(N)	NA	NA	N	BSL
	108-90-7	Chlorobenzene	0.037	J	1	J	ug/l	MW-15D	7 / 27	0.03 - 0.3	1	NE	4.1E+01	(N)	NA	NA	N	BSL
	67-66-3	**Chloroform**	**0.041**	**J**	**0.99**	**J**	**ug/l**	**MW-19S**	**4 / 20**	**0.04 - 0.24**	**0.99**	**NE**	**8.1E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**
	156-59-2	Cis-1,2-Dichloroethene	0.11	J	79	J	ug/l	MW-16	11 / 27	0.09 - 0.9	79	NE	-	-	NA	NA	N	NSL
	110-82-7	Cyclohexane	0.16	J	0.16	J	ug/l	MW-16	1 / 20	0.06 - 0.27	0.16	NE	1.0E+02	(N)	NA	NA	N	BSL
	100-41-4	Ethylbenzene	0.031	J	0.035	J	ug/l	MW-17	2 / 20	0.03 - 0.25	0.035	NE	3.5E+00	(C)	NA	NA	N	BSL
	98-82-8	Isopropylbenzene	0.14	J	0.14	J	ug/l	MW-16	1 / 20	0.08 - 0.29	0.14	NE	8.9E+01	(N)	NA	NA	N	BSL
	179601-23-1	m,p-Xylenes	0.051	J	0.1	J	ug/l	MW-17	3 / 20	0.03 - 0.23	0.1	NE	3.8E+01	(N)	NA	NA	N	BSL
	1634-04-4	Methyl Tert-Butyl Ether	0.076	J	0.21	J	ug/l	MW-15S	6 / 20	0.04 - 0.19	0.21	NE	4.5E+02	(C)	NA	NA	N	BSL
	75-09-2	Methylene Chloride	0.22	J	0.26	J	ug/l	MW-18D	3 / 20	0.21 - 0.6	0.26	NE	4.7E+02	(N)	NA	NA	N	BSL
	95-47-6	o-Xylene	0.078	J	0.078	J	ug/l	MW-17	1 / 20	0.03 - 0.27	0.078	NE	3.8E+01	(N)	NA	NA	N	BSL

Table 7-2.5

Occurrence, Distribution, and Selection of Chemicals of Potential Concern

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site, Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Ambient Air

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)		Maximum Concentration (Qualifier) (1)		Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxity Value (4) Inhalation Tap Water		Potential ARAR/TBC Value (5)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
	156-60-5	Trans-1,2-Dichloroethene	0.11	J	0.11	J	ug/l	MW-16	1 / 20	0.05 - 0.23	0.11	NE	-	-	NA	NA	N	NSL
	79-01-6	**Trichloroethene**	**0.81**	**J**	**1.7**	**J**	**ug/l**	**MW-16**	**7 / 27**	**0.049 - 0.31**	**1.7**	**NE**	**5.2E-01**	**(N)**	**NA**	**NA**	**Y**	**ASL**
	75-01-4	**Vinyl Chloride**	**1**		**120**		**ug/l**	**MW-16**	**7 / 27**	**0.023 - 0.45**	**120**	**NE**	**1.5E-01**	**(C)**	**NA**	**NA**	**Y**	**ASL**

Footnotes:

(1) The Qualifier codes are defined as the following:

J - The analyte was detected and is considered an estimated value.

K - Analyte present, results may be biased high. Actual result is expected lower.

L - Analyte present, results may be biased low. Actual result is expected to be higher.

ND - Not detected

(2) Maximum detected value for compounds detected in at least one sample

(3) NE - Not established

(4) Units are the same as those for Screening Concentrations. Where available, Screening Toxicity Values were obtained USEPA RSL values for tap water (May 2016), inhalation pathway. Values were adjusted for a HI= 0.1 for non-cancer effects, where (C)=Cancer ; (N)= Noncancer. For refuge groundwater, concentrations were comapred to the USEPA residential VISLs (June 2016) for vapor intrusion

a - SURR - Surrogate screening value used (chlordane for gamma-chlordane, 1,2-dichlorobenzene for 1,3-dichlorobenzene, and cyclohexane for methylcyclohexane)

(5) NA - No potential ARARs identified at this time.

(6) ASL = Above Screening Limit; BSL = Below Screening Limit; NSL = No Screening Limit; CARC = Known human carcinogen

Table 7-3.1

Exposure Point Concentration Summary

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)		Maximum Concentration (Qualifier) (3)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
Groundwater - Annex	Aluminum	ug/l	811	1834	(N)	2,630	J	1,834	ug/l	95% Student's-t UCL	(5)
	Antimony	ug/l	25	-	(NC)	3.0	J	3.0	ug/l	Max	(4)
	Arsenic	ug/l	5.0	7.6	(NP)	7.4	J	7.4	ug/l	Max	(4)
	Barium	ug/l	343	847	(NP)	804		804	ug/l	Max	(4)
	Chromium	ug/l	4.9	8.0	(N)	10	J	8.0	ug/l	95% Student's-t UCL	(5)
	Cobalt	ug/l	16	18	(N)	18	J	18	ug/l	Max	(4)
	Iron	ug/l	22,040	32,871	(N)	39,600		32,871	ug/l	95% Student's-t UCL	(5)
	Manganese	ug/l	5,358	5,917	(N)	6,270		5,917	ug/l	95% Student's-t UCL	(5)
	Thallium	ug/l	4.8	-	(NC)	4.1	J	4.1	ug/l	Max	(4)
	PESTPCBs										
	Beta-BHC	ug/l	0.021	0.027	(NC)	0.027	J	0.027	ug/l	95% KM(t) UCL	(5)
	Heptachlor	ug/l	0.024	-	(NP)	0.020	J	0.020	ug/l	Max	(4)
	SVOCs										
	1,4-Dioxane	ug/l	10	26	(NP)	21		21	ug/l	Max	(4)
	2-Methylnaphthalene	ug/l	4.3	6.8	(NP)	8	J	6.8	ug/l	95% KM(t) UCL	(5)
	Bis(2-Ethylhexyl) Phthalate	ug/l	4.0	-	(NC)	6.0	J	6.0	ug/l	Max	(4)
	Carbazole	ug/l	3.7	4.6	(NP)	5.0	J	4.6	ug/l	95% KM(t) UCL	(5)
	Dibenzofuran	ug/l	4.0	5.1	(NP)	7.0	J	5.1	ug/l	95% KM(t) UCL	(5)
	Naphthalene	ug/l	7.3	14	(NP)	24		14	ug/l	95% KM(t) UCL	(5)
	VOCs										
	1,2-Dichloroethane	ug/l	11	24	(N)	61		24	ug/l	95% KM(t) UCL	(5)
	1,4-Dichlorobenzene	ug/l	0.32	0.41	(N)	0.66	J	0.41	ug/l	95% KM(t) UCL	(5)
	Benzene	ug/l	0.35	0.50	(N)	0.72	J	0.50	ug/l	95% KM(t) UCL	(5)
	Chlorobenzene	ug/l	6.3	10	(N)	19		10	ug/l	95% KM(t) UCL	(5)
	Ethylbenzene	ug/l	0.44	0.84	(N)	1.9	J	0.84	ug/l	95% KM(t) UCL	(5)
	Trichloroethene	ug/l	0.11	0.18	(N)	0.20	J	0.18	ug/l	95% KM(t) UCL	(4)
	Vinyl Chloride	ug/l	0.29	-	(NC)	0.57		0.57	ug/l	Max	(4)

Golder Associates

Table 7-3.1

Exposure Point Concentration Summary

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)		Maximum Concentration (Qualifier) (3)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
	Metals										
Groundwater - Landfill	Arsenic	ug/l	31	56	(G)	102	J	56	ug/l	95% Adjusted Gamma UCL	(5)
	Barium	ug/l	465	589	(N)	945	J	589	ug/l	95% Student's-t UCL	(5)
	Cadmium	ug/l	1.9	0.88	(N)	1	J	0.88	ug/l	95% KM(t) UCL	(5)
	Chromium	ug/l	17	25	(N)	53	J	25	ug/l	95% Student's-t UCL	(5)
	Cobalt	ug/l	14	17	(N)	35	J	17	ug/l	95% KM(t) UCL	(5)
	Iron	ug/l	22,608	30,533	(G)	42,700		30,533	ug/l	95% Adjusted Gamma UCL	(5)
	Lead	ug/l	4.3	9.0	(N)	28		9.0	ug/l	95% KM(t) UCL	(5)
	Manganese	ug/l	1,608	2,338	(NP)	4,100		2,338	ug/l	95% Student's-t UCL	(5)
	Mercury	ug/l	0.10	-	(NC)	0.15	L	0.15	ug/l	Max	(5)
	Nickel	ug/l	38	53	(N)	98	J	53	ug/l	95% Student's-t UCL	(5)
	Thallium	ug/l	5.1	6.7	(N)	6.3	J	6.7	ug/l	95% Student's-t UCL	(5)
	Vanadium	ug/l	11	21	(G)	26	J	21	ug/l	95% KM (Chebychev) UCL	(5)
	Pesticides/PCBs										
	Aldrin	ug/l	0.026	-	(NC)	0.012	J	0.012	ug/l	Max	(4)
	beta-BHC	ug/l	0.047	0.057	(N)	0.066	J	0.057	ug/l	95% KM(t) UCL	(5)
	delta-BHC	ug/l	0.024	0.034	(N)	0.043	J	0.034	ug/l	95% KM(t) UCL	(5)
	Gamma-Chlordane	ug/l	0.024	0.025	(N)	0.051	J	0.025	ug/l	95% KM(t) UCL	(5)
	Heptachlor	ug/l	0.032	0.044	(N)	0.071	J	0.044	ug/l	95% KM(t) UCL	(5)
	Heptachlor Epoxide	ug/l	0.024	0.024	(N)	0.022	J	0.024	ug/l	95% KM(t) UCL	(5)
	SVOCs										
	1,4-Dioxane	ug/l	352	373	(G)	1100	J	373	ug/L	95% Adjusted Gamma UCL	(5)
	2-Methylnaphthalene	ug/l	10	27	(G)	160	J	27	ug/l	95% Adjusted Gamma KM-UCL	(5)
	Acenaphthene	ug/l	10	21	(G)	130	J	21	ug/l	95% Adjusted Gamma KM-UCL	(5)
	Benzo(A)Anthracene	ug/l	3.3	0.36	(NP)	0.330	J	0.33	ug/l	95% KM(t) UCL	(5)
	Benzo(A)Pyrene	ug/l	3.4	-	(NC)	0.21	J	0.21	ug/l	Max	(4)
	Benzo(B)Fluoranthene	ug/l	3.4	-	(NC)	0.29	J	0.29	ug/l	Max	(4)
	Biphenyl	ug/l	4.0	6.6	(NP)	24	J	6.6	ug/l	95% KM(t) UCL	(5)
	Carbazole	ug/l	4.7	6.8	(N)	51	J	6.8	ug/l	95% KM(t) UCL	(5)
	Dibenzofuran	ug/l	6.1	11	(G)	64	J	11	ug/l	95% Adjusted Gamma KM-UCL	(5)
	Fluorene	ug/l	8	13	(LN)	100	J	13	ug/l	95% KM (BCA) UCL	(5)
	Naphthalene	ug/l	20	105	(NP)	460	J	105	ug/l	97.5% KM (Chebychev) UCL	(5)
	Phenanthrene	ug/l	24	34	(LN)	120	J	34	ug/l	97.5% KM (Chebychev) UCL	(5)

Table 7-3.1

Exposure Point Concentration Summary

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)		Maximum Concentration (Qualifier) (3)		Exposure Point Concentration			
								Value	Units	Statistic	Rationale
	VOCs										
Groundwater - Landfill	1,1,2,2-Tetrachloroethane	ug/l	2.9	-	(NC)	0.20	J	0.20	ug/l	Max	(4)
	1,1-Dichloroethene	ug/l	5.0	6.0	(N)	36		6.0	ug/l	95% KM(t) UCL	(5)
	1,2-Dichloroethane	ug/l	3.3	1.4	(N)	8.4	K	1.4	ug/l	95% KM(t) UCL	(5)
	1,4-Dichlorobenzene	ug/l	2.9	0.68	(N)	1.5	J	0.68	ug/l	95% KM(t) UCL	(5)
	2-Hexanone	ug/l	29	-	(NC)	8.2	J	8.2	ug/l	Max	(4)
	Benzene	ug/l	4.2	3.5	(G)	11	J	3.5	ug/l	95% GROS Adjusted Gamma UCL	(5)
	Chlorobenzene	ug/l	29	85	(LN)	290	K	85	ug/l	95% KM (Chebychev) UCL	(5)
	Cis-1,2-Dichloroethene	ug/l	31	156	(NP)	370	K	156	ug/l	95% KM (Chebychev) UCL	(5)
	Ethylbenzene	ug/l	4.0	4.2	(G)	22	J	4.2	ug/l	95% Adjusted Gamma KM-UCL	(5)
	Methylene Chloride	ug/l	5.9	17	(G)	94	U	17	ug/l	95% Adjusted Gamma KM-UCL	(5)
	Trichloroethene	ug/l	4.1	4.7	(N)	39	J	4.7	ug/l	95% KM (Percentile Bootstrap) UCL	(5)
	Vinyl Chloride	ug/l	14	22	(N)	170	J	22	ug/l	95% KM(t) UCL	(5)
	Xylenes, Total	ug/l	22	44	(N)	160	K	44	ug/l	95% KM(t) UCL	(5)

Footnotes:

(1) Arithmetic mean calculated using 1/2 the method detection limit for non-detect values.

(2) ProUCL version 5.0 was used to calculated 95% UCL values.

(N) - Normal distribution

(LN) - Lognormal distribution

(NP) - Nonparametric distribution

(G) - Gamma distribution

(NC) - 95% UCL not calculated due as ProUCL is unable to calculate value when only one detected value is in dataset.

(3) J - The analyte was detected and is considered an estimated value.

K - Analyte present, results may be biased high. Actual result is expected lower.

L - Analyte present, results may be biased low. Actual result is expected to be higher.

(4) Due to low number of samples or insufficient detected concentration, the maximum value was selected as EPC.

(5) The lower of the 95% UCL or the maximum detected value was selected as the EPC

Table 7-3.2

Exposure Point Concentration Summary

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface and Subsurface Soil

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)		Maximum Concentration (Qualifier) (3)		Exposure Point Concentration			
									Value	Units	Statistic	Rationale
		Metals										
On-Site Surface Soil - Annex	7429-90-5	Aluminum	mg/kg	15,403	17,908	(N)	28,100		17,908	mg/kg	95% Student's-t UCL	(5)
	7440-36-0	Antimony	mg/kg	1.2	1.5	(N)	3.7	L	1.5	mg/kg	95% KM(t) UCL	(5)
	7440-38-2	Arsenic	mg/kg	12	29	(LN)	95	K	29	mg/kg	95% KM (Chebychev) UCL	(5)
	7440-47-3	Chromium	mg/kg	45	57	(G)	203		57	mg/kg	95% Adjusted Gamma UCL	(5)
	7440-48-4	Cobalt	mg/kg	10	11	(N)	20	J	11	mg/kg	95% Student's-t UCL	(5)
	7439-89-6	Iron	mg/kg	26,041	29,429	(N)	40,900		29,429	mg/kg	95% Student's-t UCL	(5)
	7439-92-1	Lead	mg/kg	78	112		293		112	mg/kg	95% Approximate Gamma UCL	(5)
	7439-96-5	Manganese	mg/kg	359	446	(N)	1,180		446	mg/kg	95% Student's-t UCL	(5)
	7440-28-0	Thallium	mg/kg	0.55	-	(NC)	1.0	J	1.0	mg/kg	Max	(4)
	7440-62-2	Vanadium	mg/kg	57	66	(N)	102	J	66	mg/kg	95% Student's-t UCL	(5)
		Dioxins										
		2,3,7,8-TCDD Equivalents	ug/kg	0.0051	0.018		0.019		0.018	ug/kg	95% Chebychev (Mean, Sd) UCL	(5)
		Pest/PCBs										
	12672-29-6	Aroclor 1248	ug/kg	164	-	(NC)	3,900		3,900	ug/kg	Max	(4)
	11097-69-1	Aroclor 1254	ug/kg	78	193	(N)	1,400		193	ug/kg	95% KM(t) UCL	(5)
	11096-82-5	Aroclor 1260	ug/kg	54	93	(N)	400		93	ug/kg	95% KM(t) UCL	(5)
		SVOCs										
	56-55-3	Benzo(A)Anthracene	ug/kg	236	329	(N)	840	J	329	ug/kg	95% KM(t) UCL	(5)
	50-32-8	Benzo(A)Pyrene	ug/kg	138	206	(N)	620	J	206	ug/kg	95% KM (Percentile Bootstrap) UCL	(5)
	205-99-2	Benzo(B)Fluoranthene	ug/kg	251	711	(G)	1,300	J	711	ug/kg	95% GROS Adjusted Gamma UCL	(5)
	86-74-8	Carbazole	ug/kg	43	58	(G)	150	J	58	ug/kg	95% KM(t) UCL	(4)
	53-70-3	Dibenzo(A,H)Anthracene	ug/kg	43	60	(N)	160	J	60	ug/kg	95% KM(t) UCL	(5)
	193-39-5	Indeno(1,2,3-Cd)Pyrene	ug/kg	88	132	(N)	320	J	132	ug/kg	95% KM (Percentile Bootstrap) UCL	(5)

Table 7-3.2

Exposure Point Concentration Summary

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface and Subsurface Soil

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)		Maximum Concentration (Qualifier) (3)		Exposure Point Concentration			
									Value	Units	Statistic	Rationale
	Metals											
On-Site Surface Soil - Landfill	7429-90-5	Aluminum	mg/kg	14,738	15,712	(N)	22,700		15,712	mg/kg	95% Student's-t UCL	(5)
	7440-36-0	Antimony	mg/kg	2.1	2.9	(LN)	18	L	2.9	mg/kg	95% KM (BCA) UCL	(5)
	7440-38-2	Arsenic	mg/kg	9.1	10	(N)	20	J	10	mg/kg	95% Student's-t UCL	(5)
	7440-41-7	Beryllium	mg/kg	2.6	9.4	(NP)	66	J	9.4	mg/kg	95% KM (Chebychev) UCL	(5)
	7440-43-9	Cadmium	mg/kg	1.2	2.2	(LN)	8.1	J	2.2	mg/kg	95% Chebychev (Mean, Sd) UCL	(5)
	7440-47-3	Chromium	mg/kg	52	58	(G)	140	J	58	mg/kg	95% Adjusted Gamma UCL	(5)
	7440-48-4	Cobalt	mg/kg	14	30	(NP)	158	J	30	mg/kg	95% Chebychev (Mean, Sd) UCL	(5)
	7440-50-8	Copper	mg/kg	437	1,503	(NP)	10,500	L	1,503	mg/kg	95% Chebychev (Mean, Sd) UCL	(5)
	7439-89-6	Iron	mg/kg	32,616	51,756	(NP)	199,000		51,756	mg/kg	95% Student's-t UCL	(5)
	7439-92-1	Lead	mg/kg	364	828	(LN)	4,260		828	mg/kg	95% H-UCL	(5)
	7439-96-5	Manganese	mg/kg	702	1,660	(NP)	9,770		1,660	mg/kg	95% Chebychev (Mean, Sd) UCL	(5)
	7439-97-6	Mercury	mg/kg	1.5	2.4	(G)	6.7		2.4	mg/kg	95% Adjusted Gamma UCL	(5)
	7440-02-0	Nickel	mg/kg	76	223	(NP)	1,300		223	mg/kg	95% Chebychev (Mean, Sd) UCL	(5)
	7440-62-2	Vanadium	mg/kg	45	48	(N)	84	J	48	mg/kg	95% Modified-t UCL	(5)
	7440-66-6	Zinc	mg/kg	1,081	3,172	(NP)	17,500	L	3,172	mg/kg	95% Chebychev (Mean, Sd) UCL	(5)
	Dioxins											
		2,3,7,8-TCDD Equivalents	ug/kg	0.072	0.18		0.27		0.18	ug/kg	95% Student's-t UCL	(5)
	Pesticides/PCBs											
	60-57-1	Dieldrin	ug/kg	7.7	27	(LN)	120	J	27	ug/kg	97.5% KM (Chebychev) UCL	(5)
	SVOCs											
	56-55-3	Benzo(A)Anthracene	ug/kg	592	1,165	(LN)	4,800	J	1,165	ug/kg	95% KM (Chebychev) UCL	(5)
	50-32-8	Benzo(A)Pyrene	ug/kg	544	1,004	(G)	4,100	J	1,004	ug/kg	95% GROS Adjusted Gamma UCL	(5)
	205-99-2	Benzo(B)Fluoranthene	ug/kg	598	1,068	(G)	4,200	J	1,068	ug/kg	95% GROS Adjusted Gamma UCL	(5)
	207-08-9	Benzo(K)Fluoranthene	ug/kg	525	997	(G)	4,100	J	997	ug/kg	95% GROS Adjusted Gamma UCL	(5)
	86-74-8	Carbazole	ug/kg	88	118	(N)	400	J	118	ug/kg	95% KM (Percentile Bootstrap) UCL	(5)
	53-70-3	Dibenzo(A,H)Anthracene	ug/kg	110	159	(N)	630	J	159	ug/kg	95% KM (Percentile Bootstrap) UCL	(5)

Table 7-3.2

Exposure Point Concentration Summary

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Soil
Exposure Medium:	Surface and Subsurface Soil

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)		Maximum Concentration (Qualifier) (3)		Exposure Point Concentration			
									Value	Units	Statistic	Rationale
On-Site Surface Soil - Landfill	193-39-5	Indeno(1,2,3-Cd)Pyrene	ug/kg	272	377	(LN)	1,500	J	377	ug/kg	95% KM(t) UCL	(5)
	91-20-3	Naphthalene	ug/kg	1,896	9,058	(NP)	70,000	J	9,058	ug/kg	95% KM (Chebychev) UCL	(5)

Footnotes:

(1) Arithmetic mean calculated using 1/2 the method detection limit for non-detect values.

(2) ProUCL version 5.0 was used to calculated 95% UCL values.

(N) - Normal distribution

(NP) - Nonparametric distribution

(G) - Gamma distribution

(NC) - 95% UCL not calculated due as ProUCL is unable to calculate value when only one detected value is in dataset.

(3) J - The analyte was detected and is considered an estimated value.

K - Analyte present, results may be biased high. Actual result is expected lower.

L - Analyte present, results may be biased low. Actual result is expected to be higher.

(4) Due to low number of samples or insufficient detected concentration, the maximum value was selected as EPC.

(5) The lower of the 95% UCL or the maximum detected value was selected as the EPC

Table 7-3.3
Exposure Point Concentration Summary
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Surface and Subsurface Soil
Exposure Medium:	Ambient Air

Exposure Point	CAS Number	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)		Maximum Concentration (Qualifier) (3)		Exposure Point Concentration					
									Value (Soil)	Units	Value (Ambient Air) (4)	Units	Statistic (Soil)	Rationale
Soil to Ambient Air - Annex		***Metals***												
	7440-38-2	Arsenic	mg/kg	12	29	(LN)	95	K	29	mg/kg	6.3E-05	μg/m³	95% KM (Chebychev) UCL	(5)
	7440-41-7	Beryllium	mg/kg	0.94	1.9	(NP)	5.9	J	1.9	mg/kg	4.1E-06	μg/m³	95% KM (Chebychev) UCL	(5)
	7440-43-9	Cadmium	mg/kg	0.80	1.3	(G)	3.7	J	1.3	mg/kg	2.8E-06	μg/m³	95% Adjusted Gamma UCL	(5)
	7440-47-3	Chromium	mg/kg	45	57	(G)	203		57	mg/kg	1.2E-04	μg/m³	95% Adjusted Gamma UCL	(6)
		Pest/PCBs												
	12672-29-6	Aroclor 1248	ug/kg	164	-	(NC)	3,900		3,900	ug/kg	8.1E-03	μg/m³	Max	(5)
	11097-69-1	Aroclor 1254	ug/kg	78	193	(N)	1,400		193	ug/kg	2.9E-04	μg/m³	95% KM(t) UCL	(6)
	11096-82-5	Aroclor 1260	ug/kg	54	93	(N)	400		93	ug/kg	9.1E-05	μg/m³	95% KM(t) UCL	(6)
Soil to Ambient Air .- Landfill		***Metals***												
	7440-38-2	Arsenic	mg/kg	9.1	10	(N)	20	J	10	mg/kg	2.5E-05	μg/m³	95% Student's-t UCL	(6)
	7440-41-7	Beryllium	mg/kg	2.6	9.4	(NP)	66	J	9.4	mg/kg	2.4E-05	μg/m³	95% KM (Chebychev) UCL	(6)
	7440-43-9	Cadmium	mg/kg	1.2	2.2	(LN)	8.1	J	2.2	mg/kg	5.6E-06	μg/m³	95% Chebychev (Mean, Sd) UCL	(6)
	7440-47-3	Chromium	mg/kg	52	58	(G)	140	J	58	mg/kg	1.5E-04	μg/m³	95% Adjusted Gamma UCL	(6)
	7440-48-4	Cobalt	mg/kg	14	30	(NP)	158	J	30	mg/kg	7.6E-05	μg/m³	95% Chebychev (Mean, Sd) UCL	(6)
	7439-96-5	Manganese	mg/kg	702	1,660	(NP)	9,770		1,660	mg/kg	4.2E-03	μg/m³	95% Chebychev (Mean, Sd) UCL	(6)
		SVOCs												
	91-20-3	Naphthalene	ug/kg	1,896	9,058	(NP)	70,000	J	9,058	ug/kg	1.6E-02	μg/m³	95% KM (Chebychev) UCL	(6)

Footnotes:

(1) Arithmetic mean calculated using 1/2 the method detection limit for non-detect values.

(2) ProUCL version 5.0 was used to calculated 95% UCL values.
(N) - Normal distribution
(NP) - Nonparametric distribution
(G) - Gamma distribution
(NC) - 95% UCL not calculated due as ProUCL is unable to calculate value when only one detected value is in dataset.

(3) J - The analyte was detected and is considered an estimated value.
K - Analyte present, results may be biased high. Actual result is expected lower.
L - Analyte present, results may be biased low. Actual result is expected to be higher.

(4) EPC for ambient air/particulates calculation provided in Table 4e of Appendix T.

(5) Due to low number of samples or insufficient detected concentration, the maximum value was selected as EPC.

(6) The lower of the 95% UCL or the maximum detected value was selected as the EPC

Table 7-3.4

Exposure Point Concentration Summary

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Medium:	Seeps
Exposure Medium:	Seeps

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)	Maximum Concentration (Qualifier) (3)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Seeps - Annex	***Metals***								
	Aluminum	ug/l	20,500	30,614 (N)	31,100	30,614	ug/l	95% Student's-t UCL	(5)
	Arsenic	ug/l	19	35 (N)	38	35	ug/l	95% Student's-t UCL	(5)
	Chromium	ug/l	55	74 (N)	78	74	ug/l	95% Student's-t UCL	(5)
	Cobalt	ug/l	16	25 (N)	26 J	25	ug/l	95% Student's-t UCL	(5)
	Iron	ug/l	41,250	51,731 (N)	52,100	51,731	ug/l	95% Student's-t UCL	(5)
	Lead	ug/l	211	349 (N)	365	349	ug/l	95% Student's-t UCL	(5)
	Manganese	ug/l	910	1,265 (N)	1,290	1,265	ug/l	95% Student's-t UCL	(5)
	Vanadium	ug/l	67	90 (N)	95	90	ug/l	95% Student's-t UCL	(5)
	SVOCs								
	Naphthalene	ug/l	3.1	- (NC)	5.0 J	5.0	ug/l	Max	(4)
	VOCs								
	Benzene	ug/l	0.10	0.17 (NP)	0.16 J	0.16	ug/l	Max	(5)
	Vinyl Chloride	ug/l	0.24	- (NC)	0.82	0.82	ug/l	Max	(4)
Seeps - Landfill	***Metals***								
	Arsenic	ug/l	10	20 (N)	17 J	17	ug/l	Max	(4)
	Chromium	ug/l	31	71 (N)	54	54	ug/l	Max	(4)
	Cobalt	ug/l	8.2	17 (N)	12 J	12	ug/l	Max	(4)
	Iron	ug/l	30,950	54,657 (N)	47,000	47,000	ug/l	Max	(4)
	Lead	ug/l	126	314 (N)	245	245	ug/l	Max	(4)
	Manganese	ug/l	1,266	2,224 (N)	1,630	1,630	ug/l	Max	(4)
	Pesticides/PCBs								
	Aldrin	ug/l	0.01	- (NC)	0.024 J	0.024	ug/l	Max	(4)
	Dieldrin	ug/l	0.04	0.13 (N)	0.09 J	0.090	ug/l	Max	(4)

Footnotes:

(1) Arithmetic mean calculated using 1/2 the method detection limit for non-detect values.

(2) ProUCL version 5.0 was used to calculated 95% UCL values.

(NC) - 95% UCL not calculated due as ProUCL is unable to calculate value when only one detected value is in dataset.

(3) J - The analyte was detected and is considered an estimated value.

K - Analyte present, results may be biased high. Actual result is expected lower.

L - Analyte present, results may be biased low. Actual result is expected to be higher.

(4) Due to low number of samples or insufficient detected concentration, the maximum value was selected as EPC.

(5) The lower of the 95% UCL or the maximum detected value was selected as the EPC

Table 7-3.5
Exposure Point Concentration Summary
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater/Soil
Exposure Medium:	Ambient Air/Trench Air

Exposure Point	Chemical of Potential Concern	Soil/Groundwater EPC	Units	Ambient Air EPC Adult (1)	Ambient Air EPC Child (1)	Units	Trench Air EPC (2)	Units
Surface and Subsurface Soil - Annex	**Pesticides/PCBs**							
	Aroclor 1248	3.9E+03	ug/kg	---	---	ug/m^3	1.8E-03	ug/m^3
Groundwater - Annex	**Pesticides/PCBs**							
	Heptachlor	2.0E-02	ug/l	3.9E-08	7.8E-08	ug/m^3	1.3E-04	ug/m^3
	SVOCs							
	1,4-Dioxane	2.1E+01	ug/l	1.7E-06	3.5E-06	ug/m^3	2.4E-03	ug/m^3
	Naphthalene	1.4E+01	ug/l	4.3E-05	8.6E-05	ug/m^3	1.1E-01	ug/m^3
	VOCs							
	1,2-Dichloroethane	2.4E+01	ug/l	1.4E-04	2.9E-04	ug/m^3	6.6E-01	ug/m^3
	1,4-Dichlorobenzene	4.1E-01	ug/l	2.8E-06	5.7E-06	ug/m^3	1.9E-02	ug/m^3
	Benzene	5.0E-01	ug/l	8.0E-06	1.6E-05	ug/m^3	6.5E-02	ug/m^3
	Chlorobenzene	1.0E+01	ug/l	9.5E-05	1.9E-04	ug/m^3	7.5E-01	ug/m^3
	Trichloroethene	1.8E-01	ug/l	4.2E-06	8.4E-06	ug/m^3	4.4E-02	ug/m^3
	Vinyl Chloride	5.7E-01	ug/l	4.3E-05	8.6E-05	ug/m^3	4.4E-01	ug/m^3
Surface and Subsurface Soil - Landfill	***SVOCs***							
	Naphthalene	9.1E+03	ug/kg	---	---	ug/m^3	7.8E-01	ug/m^3
Groundwater - Landfill	***Metals***							
	Mercury	1.5E-01	ug/l	1.5E-06	3.0E-06	ug/m^3	8.8E-01	ug/m^3
	Pesticides/PCBs							
	Aldrin	1.2E-02	ug/l	7.4E-09	1.5E-08	ug/m^3	1.3E-05	ug/m^3
	Heptachlor	4.4E-02	ug/l	8.5E-08	1.7E-07	ug/m^3	2.9E-04	ug/m^3
	Heptachlor Epoxide	2.4E-02	ug/l	7.8E-09	1.6E-08	ug/m^3	1.4E-06	ug/m^3
	SVOCs							
	1,4-Dioxane	3.7E+02	ug/l	3.1E-05	6.2E-05	ug/m^3	4.2E-02	ug/m^3
	Biphenyl	6.6E+00	ug/l	1.6E-05	3.2E-05	ug/m^3	2.2E-02	ug/m^3
	Naphthalene	1.1E+02	ug/l	3.2E-04	6.4E-04	ug/m^3	8.1E-01	ug/m^3
	VOCs							
	1,1,2,2-Tetrachloroethane	2.0E-01	ug/l	5.8E-07	1.2E-06	ug/m^3	1.3E-03	ug/m^3
	1,1-Dichloroethene	6.0E+00	ug/l	3.6E-04	7.2E-04	ug/m^3	3.8E+00	ug/m^3
	1,2-Dichloroethane	1.4E+00	ug/l	8.5E-06	1.7E-05	ug/m^3	3.8E-02	ug/m^3
	1,4-Dichlorobenzene	6.8E-01	ug/l	4.7E-06	9.3E-06	ug/m^3	3.1E-02	ug/m^3
	2-Hexanone	8.2E+00	ug/l	9.8E-06	2.0E-05	ug/m^3	1.4E-02	ug/m^3
	Benzene	3.5E+00	ug/l	5.6E-05	1.1E-04	ug/m^3	4.6E-01	ug/m^3
	Chlorobenzene	8.5E+01	ug/l	7.9E-04	1.6E-03	ug/m^3	6.2E+00	ug/m^3
	Ethylbenzene	4.2E+00	ug/l	7.2E-05	1.4E-04	ug/m^3	6.7E-01	ug/m^3
	Methylene Chloride	1.7E+01	ug/l	2.1E-04	4.1E-04	ug/m^3	1.0E+00	ug/m^3
	Trichloroethene	4.7E+00	ug/l	9.8E-05	2.0E-04	ug/m^3	1.0E+00	ug/m^3
	Vinyl Chloride	2.2E+01	ug/l	1.7E-03	3.3E-03	ug/m^3	1.7E+01	ug/m^3
	Xylenes, Total	4.4E+01	ug/l	6.5E-04	1.3E-03	ug/m^3	4.2E+00	ug/m^3

Footnotes:

(1) Ambient air modeled from groundwater using ASTM standard #1739-95 (2015). Calculation provided in Table 4a in Appendix T.

(2) For groundwater, trench air EPC modeled using VDEQ 2018 VURAM model for construction worker in a trench. Trench model output provided in Appendix T.

Table 7-3.6

Exposure Point Concentration Summary

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Medium:	Groundwater
Exposure Medium:	Indoor Air

Exposure Point	Chemical of Potential Concern	Groundwater EPC	Units	Indoor Air EPC (1)	Units
	VOCs				
Groundwater-Indoor Air Refuge	Benzene	0.88	ug/l	2.0E-01	ug/m^3
	Chloroform	0.57	ug/l	8.6E-02	ug/m^3
	Trichloroethene	0.84	ug/l	3.4E-01	ug/m^3
	Vinyl Chloride	33	ug/l	3.8E+01	ug/m^3

Footnotes:

(1) Indoor air EPCs calculated using EPA's on-line Vapor Intrusion Screening Level calculator at a temperature of 25^{o}C. Output provided in Appendix T.

Golder Associates

Table 7-4.1
Values Used for Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater/Ambient Air
Exposure Point: Landfill and Landfill Annex
Receptor Population: Construction/Excavation Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion (Incidental)	BW	Body Weight	kg	80	EPA 2014	(CW x ED x EF x IR-W) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	365	EPA 2014	
	CW	Chemical Concentration in Water	mg/L	See Table 3-1	See Table 3-1	
	ED	Exposure Duration	yr	1	SS	
	EF	Exposure Frequency	day/yr	125	SS	Assumes 50% of the time will be spent breaching the water table
	IR-W	Ingestion Rate-Water (incidental)	L/day	0.02	VDEQ 2018	
Dermal	BW	Body Weight	kg	80	EPA 2014	(DA_{event} x EV x ED x EF x SA) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	365	EPA 2014	
	DA_{event}	Absorbed Dose per Event	mg/cm^2-event	chemical specific	EPA 2004	Calculation provided in Appendix T
	ED	Exposure Duration	yr	1	SS	
	EF	Exposure Frequency	day/yr	125	SS	Assumes 50% of the time will be spent breaching the water table
	ET	Exposure Time, Water	hours/event	0.25	SS	
	EV	Event Frequency	event/day	1	SS	
	SA	Skin Surface Area	cm^2	3,527	EPA 2014	
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	EC = (CA x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT-N	Averaging Time NonCarcinogen	hours	8,760	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	EF	Exposure Frequency	day/yr	250	SS	
	EF	Exposure Frequency (trench)	day/yr	30	SS	
	ED	Exposure Duration	yr	1	EPA 2002	
	ET	Exposure Time	hours/day	8	SS	
	CA	Chemical Concentration in Ambient Air	$\mu g/m^3$	calculated	See Table 3-4	

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement
EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, December, OSWER 9355.4-24.
EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.
EPA 2009, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) FINAL. January.

Table 7-4.2
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface and Subsurface Soils
Exposure Point: Landfill and Landfill Annex
Receptor Population: Construction/Excavation Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	80	EPA 2014	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT_c	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT_{nc}	Averaging Time NonCarcinogen	days	365	EPA 2014	
	CF	Conversion Factor	kg/mg	1.0E-06	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	ED	Exposure Duration	yr	1	SS	
	EF	Exposure Frequency	day/yr	250	EPA 2002	
	IR-S	Ingestion Rate-Soil	mg/day	330	EPA 2002	
Dermal	BW	Body Weight	kg	80	EPA 2014	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT_c	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT_{nc}	Averaging Time NonCarcinogen	days	365	EPA 2014	
	CF	Conversion Factor	kg/mg	1.0E-06	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	DABS	Dermal Absorption Factor	unitless	chemical specific	EPA 2004	Chemical specific value provided in Appendix T
	ED	Exposure Duration	yr	1	SS	
	EF	Exposure Frequency	day/yr	250	EPA 2002	
	SA	Skin Surface Area	cm^2	3,527	EPA 2014	
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.3	Exhibit 3-3; EPA 2004	
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	EC = (CS x (1/PEF + 1/VF) x ET x EF x ED)/AT
	AT_c	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT_{nc}	Averaging Time NonCarcinogen	hours	8,760	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	ED	Exposure Duration	yr	1	SS	
	EF	Exposure Frequency	day/yr	250	EPA 2002	
	ET	Exposure Time	hours/day	8	SS	
	VF	Volatilization Factor (Annex)	m^3/kg	chemical specific	SS	See Table 4d of Appendix T for calculation of site-specific VF
	VF	Volatilization Factor (Landfill)	m^3/kg	chemical specific	SS	See Table 4d of Appendix T for calculation of site-specific VF
	PEF	Particulate Emission Factor (Annex)	m^3/kg	4.7E+08	EPA 2002	See Table 4c of Appendix T for calculation of site-specific PEF
	PEF	Particulate Emission Factor (Landfill)	m^3/kg	4.0E+08	EPA 2002	See Table 4c of Appendix T for calculation of site-specific PEF

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement.
EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, December, OSWER 9355.4-24.
EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.

Table 7-4.3
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site, Folcroft, PA

Scenario Timeframe: Future
Medium: Liquid
Exposure Medium: Seep Water
Exposure Point: Landfill and Landfill Annex
Receptor Population: Construction/Excavation Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	BW	Body Weight	kg	80	EPA 2014	(DA_{event} x EV x ED x EF x SA) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	365	EPA 2104	
	DA_{event}	Absorbed Dose per Event	mg/cm^2-event	chemical specific	EPA 2004	Calculation provided in Appendix T
	ED	Exposure Duration	yr	1	SS	
	EF	Exposure Frequency	day/yr	75	SS	30% of the exposure time (250 days) in seep area
	ET	Exposure Time, Water	hours/event	0.25	SS	
	EV	Event Frequency	events/day	1	SS	
	SA	Skin Surface Area	cm^2	3,527	EPA 2014	

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement

Table 7-4.4
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Ambient Air
Exposure Point: Landfill and Landfill Annex and Refuge Offic
Receptor Population: Refuge Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	EC = (CA x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT-N	Averaging Time NonCarcinogen	hours	219,000	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	EF	Exposure Frequency (Outdoor Worker)	day/yr	225	EPA 2014	
	EF	Exposure Frequency (Indoor Worker)	day/yr	250	EPA 2014	
	ED	Exposure Duration	yr	25	EPA 2002	
	ET	Exposure Time	hours/day	8	SS	
	CA	Chemical Concentration in Ambient Air	$\mu g/m^3$	calculated	See Table 3-4	

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement
EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Site, December, OSWER 9355.4-24.
EPA 2009, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) FINAL. January.

Table 7-4.5
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Surface and Subsurface Soils
Exposure Point: Landfill and Landfill Annex
Receptor Population: Maintenance Worker/Refuge Worker
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	80	EPA 2014	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 2014	
	CF	Conversion Factor	kg/mg	1.0E-06	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	ED	Exposure Duration	yr	25	EPA 2014	
	EF	Exposure Frequency	day/yr	225	EPA 2014	
	IR-S	Ingestion Rate-Soil	mg/day	100	EPA 2014	
Dermal	BW	Body Weight	kg	80	EPA 2014	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 2014	
	CF	Conversion Factor	kg/mg	1.0E-06	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	DABS	Dermal Absorption Factor	unitless	chemical specific	EPA 2004	Chemical specific value provided in Appendix T
	ED	Exposure Duration	yr	25	EPA 2014	
	EF	Exposure Frequency	day/yr	225	EPA 2014	
	SA	Skin Surface Area	cm^2	3,527	EPA 2014	
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.12	EPA 2014	
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	EC = (CS x (1/PEF + 1/VF) x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT-N	Averaging Time NonCarcinogen	hours	219,000	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	ED	Exposure Duration	yr	25	SS	
	EF	Exposure Frequency	day/yr	225	EPA 2014	
	ET	Exposure Time	hours/day	8	SS	
	VF	Volatilization Factor (Annex)	m^3/kg	chemical specific	SS	See Table 4d of Appendix T for calculation of site-specific VF
	VF	Volatilization Factor (Landfill)	m^3/kg	chemical specific	SS	See Table 4d of Appendix T for calculation of site-specific VF
	PEF	Particulate Emission Factor (Annex)	m^3/kg	4.7E+08	EPA 2002	See Table 4c of Appendix T for calculation of site-specific PEF
	PEF	Particulate Emission Factor (Landfill)	m^3/kg	4.0E+08	EPA 2002	See Table 4c of Appendix T for calculation of site-specific PEF

RME: Reasonable Maximum Exposure

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Site, December, OSWER 9355.4-24.
EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.
EPA 2009, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) FINAL. January.

Table 7-4.6
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Current and Future
Medium: Liquid
Exposure Medium: Seep Water
Exposure Point: Landfill and Landfill Annex
Receptor Population: Maintenance Worker/Refuge Employee
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	BW	Body Weight	kg	80	EPA 2014	$(DA_{event}$ x EV x ED x EF x SA) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	9,125	EPA 2014	
	DA_{event}	Absorbed Dose per Event	mg/cm^2-event	chemical specific	EPA 2004	Calculation provided in Appendix T
	ED	Exposure Duration	yr	25	EPA 2002	
	EF	Exposure Frequency	day/yr	68	EPA 2002	30% of the exposure time (225 days) within seep areas
	ET	Exposure Time, Water	hours/event	0.25	SS	
	EV	Event Frequency	events/day	1	SS	
	SA	Skin Surface Area	cm^2	2,670	EPA 2011	face, hands and forearms, per EPA 2011

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement.
EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites, December, OSWER 9355.4-24.
EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.

Table 7-4.7
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Ambient Air
Exposure Point: Landfill and Landfill Annex
Receptor Population: Trespasser
Receptor Age: Adolescent (13 to 18 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	EC	Exposure Concentration	µg/m^3	calculated	EPA 2009	EC = (CA x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT-N	Averaging Time NonCarcinogen	hours	43,800	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	ED	Exposure Duration	yr	5	EPA 2002	
	ET	Exposure Time	hours/day	4	SS	
	CA	Chemical Concentration in Ambient Air	µg/m3	calculated	See Table 3-4	

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement
EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Site, December, OSWER 9355.4-24.
EPA 2009, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) FINAL. January.

Table 7-4.8
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Current and Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Landfill and Landfill Annex
Receptor Population: Trespasser
Receptor Age: Adolescent (13 to 18 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	63	EPA 2011	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 2014	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	3x/week for warmer months of the year (mid-March through mid-November)
	ED	Exposure Duration	yr	5	EPA 1989	Based on 4 hours/day exposure
	EF	Exposure Frequency	day/yr	96	SS	
	FI	Fraction Ingested	unitless	0.5	SS	
	IR-S	Ingestion Rate-Soil	mg/day	100	EPA 2014	
Dermal	BW	Body Weight	kg	63	EPA 2011	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 2014	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	DABS	Dermal Absorption Factor	unitless	chemical specific	EPA 2004	Chemical specific value provided in Appendix T
	ED	Exposure Duration	yr	5	EPA 1989	
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	SA	Skin Surface Area	cm^2	2,447	EPA 2011	Forearms, face, hands, and lower legs (Table 2f in Appendix T)
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.04	EPA 2011	See Appendix S for receptor specific dermal calculations
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	EC = (CS x (1/PEF + 1/VF) x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT-N	Averaging Time NonCarcinogen	hours	43,800	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	ED	Exposure Duration	yr	5	SS	
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	ET	Exposure Time	hours/day	4	SS	
	VF	Volatilization Factor (Annex)	m^3/kg	chemical specific	SS	See Table 4d of Appendix T for calculation of site-specific VF
	VF	Volatilization Factor (Landfill)	m^3/kg	chemical specific	SS	See Table 4a of Appendix T for calculation of site-specific VF
	PEF	Particulate Emission Factor (Annex)	m^3/kg	4.7E+08	EPA 2002	See Table 4c of Appendix T for calculation of site-specific PEF
	PEF	Particulate Emission Factor (Landfill)	m^3/kg	4.0E+08	EPA 2002	See Table 4c of Appendix T for calculation of site-specific PEF

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement
EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Site, December, OSWER 9355.4-24.3.
EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.
EPA 2009, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) FINAL. January.
EPA, 2011. Exposure Factors Handbook: 2011 Edition.
EPA 2014, U.S. EPA. 2014. OSWER Directive 9200.1-120. Office of Solid Waste and Emergency Response, Washington, DC

Table 7-4.9
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Current and Future
Medium: Liquid
Exposure Medium: Seep Water
Exposure Point: Landfill and Landfill Annex
Receptor Population: Trespasser
Receptor Age: Adolescent (13 to 18 years)

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	BW	Body Weight	kg	63	EPA 2011	(DA_{event} x EV x ED x EF x SA) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 2014	
	DA_{event}	Absorbed Dose per Event	mg/cm^2-event	chemical specific	EPA 2004	Calculation provided in Appendix T
	ED	Exposure Duration	yr	5	EPA 1989	
	EF	Exposure Frequency	day/yr	48	SS	50% of the park exposure (96 days) within seep areas
	ET	Exposure TIme	hours/event	0.25	SS	
	EV	Event Frequency	events/day	1	SS	
	SA	Skin Surface Area	cm^2	2,292	EPA 2011	Calculated for hands, feet, and lower legs (Table 2f of Appendix T)

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement.
EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.

Table 7-4.10
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Ambient Air
Exposure Point: Landfill, Landfill Annex, and Visitors Center
Receptor Population: Refuge Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	EC	Exposure Concentration	µg/m^3	calculated	EPA 2009	EC = (CA x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT-N	Averaging Time NonCarcinogen	hours	183,960	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	ED	Exposure Duration	yr	21	EPA 2014	Ages 6 through 27
	ET	Exposure Time	hours/day	4	SS	
	CA	Chemical Concentration in Ambient Air	µg/m3	calculated	See Table 3-4	

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement
EPA 2009, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) FINAL. January.
EPA 2014, U.S. EPA. 2014. OSWER Directive 9200.1-120. Office of Solid Waste and Emergency Response, Washington, DC

Table 7-4.11
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Landfill and Landfill Annex
Receptor Population: Refuge Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	80	EPA 2014	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	7,665	EPA 2014	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	3x/week for warmer months of the year (mid-March through mid-November)
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	Based on 4 hours/day exposure
	ED	Exposure Duration	yr	21	SS	Ages 6 through 27
	EF	Exposure Frequency	day/yr	96	SS	
	FI	Fraction Ingested	unitless	0.5	SS	
	IR-S	Ingestion Rate-Soil	mg/day	100	EPA 2002	
Dermal	BW	Body Weight	kg	80	EPA 2014	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	7,665	EPA 2014	
	CF	Conversion Factor	kg/mg	1×10^{-6}	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	DABS	Dermal Absorption Factor	unitless	chemical specific	EPA 2004	Chemical specific value provided in Appendix T
	ED	Exposure Duration	yr	21	SS	Ages 6 through 27
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	SA	Skin Surface Area	cm^2	6,032	EPA 2014	
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.07	EPA 2014	
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	EC = (CS x (1/PEF + 1/VF) x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT-N	Averaging Time NonCarcinogen	hours	7,665	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	ED	Exposure Duration	yr	21	SS	
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	ET	Exposure Time	hours/day	4	SS	
	VF	Volatilization Factor (Annex)	m^3/kg	chemical specific	SS	See Appendix T for calculation of site-specific VF
	VF	Volatilization Factor (Landfill)	m^3/kg	chemical specific	SS	See Appendix T for calculation of site-specific VF
	PEF	Particulate Emission Factor (Annex)	m^3/kg	4.7E+08	EPA 2002	See Table 4c of Appendix T for calculation of site-specific PEF
	PEF	Particulate Emission Factor (Landfill)	m^3/kg	4.0E+08	EPA 2002	See Table 4c of Appendix T for calculation of site-specific PEF

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement
EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Site, December, OSWER 9355.4-24.3.
EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.

Table 7-4.12
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Liquid
Exposure Medium: Seep Water
Exposure Point: Landfill and Landfill Annex
Receptor Population: Refuge Visitor
Receptor Age: Adult

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	BW	Body Weight	kg	80	EPA 2014	(DA_{event} x EV x ED x EF x SA) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	7,665	EPA 2014	
	DA_{event}	Absorbed Dose per Event	mg/cm^2-event	chemical specific	EPA 2004	Calculation provided in Appendix T
	ED	Exposure Duration	yr	21	EPA 2014	Ages 6 through 27
	EF	Exposure Frequency	day/yr	48	SS	50% of the park exposure (96 days) within seep areas
	ET	Exposure Time, Water	hours/event	0.25	SS	
	EV	Event Frequency	events/day	1	SS	
	SA	Skin Surface Area	cm^2	5,942	EPA 2011	Lower Legs, Hands, and Feet per EPA 2011

RME: Reasonable Maximum Exposure

Table 7-4.13
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Ambient Air
Exposure Point: Landfill, Landfill Annex, and Visitors Center
Receptor Population: Refuge Visitor
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	EC = (CA x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT-N	Averaging Time NonCarcinogen	hours	43,800	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	ED	Exposure Duration	yr	5	EPA 2014	Ages 1 through 6
	ET	Exposure Time	hours/day	4	SS	
	CA	Chemical Concentration in Ambient Air	$\mu g/m^3$	calculated	See Table 3-4	

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement
EPA 2009, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) FINAL. January.
EPA 2014, U.S. EPA. 2014. OSWER Directive 9200.1-120. Office of Solid Waste and Emergency Response, Washington, DC

Table 7-4.14
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill And Annex Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Landfill and Landfill Annex
Receptor Population: Refuge Visitor
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW	Body Weight	kg	15	EPA 2014	(CS x CF x ED x EF x IR-S) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 2014	
	CF	Conversion Factor	kg/mg	1.0E-06	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	3x/week for warmer months of the year (mid-March through mid-November)
	ED	Exposure Duration	yr	5	EPA 2014	Ages 1 through 6
	EF	Exposure Frequency	day/yr	96	SS	
	FI	Fraction Ingested	unitless	0.5	SS	
	IR-S	Ingestion Rate-Soil	mg/day	200	EPA 2014	
Dermal	BW	Body Weight	kg	15	EPA 2014	(CS x CF x EF x ED x SA x DABS x SSAF) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 2014	
	CF	Conversion Factor	kg/mg	1.0E-06	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	DABS	Dermal Absorption Factor	unitless	chemical specific	EPA 2004	Chemical specific value provided in Appendix T
	ED	Exposure Duration	yr	5	EPA 2014	Ages 1 through 6
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	SA	Skin Surface Area	cm^2	2,373	EPA 2014	
	SSAF	Soil to Skin Adherence Factor	mg/cm^2	0.2	EPA 2014	
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	EC = (CS x (1/PEF + 1/VF) x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	AT-C = lifetime years x 365 days/yr x 24 hrs/day
	AT-N	Averaging Time NonCarcinogen	hours	43,800	EPA 2009	AT-N = exposure years x 365 days/yr x 24 hrs/day
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	ED	Exposure Duration	yr	5	SS	Ages 1 - 6
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	ET	Exposure Time	hours/day	4	SS	
	VF	Volatilization Factor (Annex)	m^3/kg	chemical specific	SS	See Appendix T for calculation of site-specific VF
	VF	Volatilization Factor (Landfill)	m^3/kg	chemical specific	SS	See Appendix T for calculation of site-specific VF
	PEF	Particulate Emission Factor (Annex)	m^3/kg	4.7E+08	EPA 2002	See Appendix T for calculation of site-specific PEF
	PEF	Particulate Emission Factor (Landfill)	m^3/kg	4.0E+08	EPA 2002	See Appendix T for calculation of site-specific PEF

RME: Reasonable Maximum Exposure

SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002

EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Site, December, OSWER 9355.4-24.3.

EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.

EPA 2009, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) FINAL. January.

EPA, 2011. Exposure Factors Handbook: 2011 Edition.

EPA 2014, U.S. EPA. 2014. OSWER Directive 9200.1-120. Office of Solid Waste and Emergency Response, Washington, DC

Table 7-4.15
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Liquid
Exposure Medium: Seep Water
Exposure Point: Landfill and Landfill Annex
Receptor Population: Refuge Visitor
Receptor Age: Child

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	BW	Body Weight	kg	15	EPA 2014	(DA_{event} x EV x ED x EF x SA) ÷ (BW x AT)
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	AT-N	Averaging Time NonCarcinogen	days	1,825	EPA 2014	
	DA_{event}	Absorbed Dose per Event	mg/cm^2-event	chemical specific	EPA 2004	Calculation provided in Appendix T
	ED	Exposure Duration	yr	5	EPA 2014	Ages 1 through 6
	EF	Exposure Frequency	day/yr	48	SS	50% of the park exposure (96 days) within seep areas
	ET	Exposure Time, Water	hours/event	0.25	SS	
	EV	Event Frequency	events/day	1	SS	
	SA	Skin Surface Area	cm^2	3,042	EPA 2011	Legs, Hands, Feet per EPA 2011

RME: Reasonable Maximum Exposure

Table 7-4.16
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Ambient Air
Exposure Point: Landfill, Landfill Annex, and Visitors Center
Receptor Population: Refuge Visitor
Receptor Age: Lifetime

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	Carcinogens - EC = (CA x ET x EF x ED)/AT
	ED_{1-2}	Exposure Duration, ages 1-2	yr	1	SS	Mutagens - EC = CA x ((ET x EF x ED_{1-2} x 10)+(ET x EF x ED_{2-6} x 3)+(ET x EF x ED_{6-16} x 3)+(ET x EF x ED_{16-27} x 1))/AT
	ED_{2-6}	Exposure Duration, ages 2-6	yr	4	SS	Vinyl Chloride - EC = CA x (1+((EFxEDxET)/AT))
	ED_{6-16}	Exposure Duration, ages 6-16	yr	10	SS	TCE- EC = CA x ((ET x EF x ED x 0.756)+(ET x EF x ED_{1-2} x 0.244 x 10)+(ET x EF x ED_{2-6} x 0.244 x 3)+(ET x EF x ED_{6-16} x 0.244 x 3)+(ET x EF x ED_{16-27} x 0.244 x 1))/AT
	ED_{16-27}	Exposure Duration, ages 16-27	yr	11	SS	
	ED	Exposure Duration, Total	yr	26	EPA 2014	Ages 1 through 27
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	Vinyl Chloride= lifetime years x 365 days/yr x 24 hrs/day
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	ET	Exposure Time	hours/day	4	SS	
	CA	Chemical Concentration in Ambient Air	$\mu g/m^3$	calculated	See Table 3-4	

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement
EPA 2009, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment) FINAL. January.
EPA 2014, U.S. EPA. 2014. OSWER Directive 9200.1-120. Office of Solid Waste and Emergency Response, Washington, DC

Table 7-4.17
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill And Annex Site

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Surface Soil
Exposure Point: Landfill and Landfill Annex
Receptor Population: Refuge Visitor
Receptor Age: Lifetime

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Ingestion	BW_c	Body Weight - Child	kg	15	EPA 2014	(CS x FI x CF x (IR-Sadj or IR-Smadj)) ÷ (AT)
	BW_a	Body Weight - Adult	kg	80	EPA 2014	
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	ED_{1-2}	Exposure Duration, ages 1-2	yr	1	SS	
	ED_{2-6}	Exposure Duration, ages 2-6	yr	4	SS	
	ED_{6-16}	Exposure Duration, ages 6-16	yr	10	SS	
	ED_{16-27}	Exposure Duration, ages 16-27	yr	11	SS	
	ED_c	Exposure Duration, Child	yr	5	EPA 2014	
	ED_a	Exposure Duration, adult	yr	21	EPA 2014	
	ED	Exposure Duration, Total	yr	26	EPA 2014	
	CF	Conversion Factor	kg/mg	1.0E-06	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	3x/week for warmer months of the year (mid-March through mid-November)
	EF	Exposure Frequency	day/yr	96	SS	
	FI	Fraction Ingestion	unitless	0.5	SS	
	$IR\text{-}S_c$	Ingestion Rate-Soil (child)	mg/day	200	EPA 2014	
	$IR\text{-}S_a$	Ingestion Rate-Soil (adult)	mg/day	100	EPA 2014	
	IR-Sadj	Ingestion Rate-Soil (age adjusted, carcinogenic)	mg/kg	8920	Calculated	IR-Sadj = ((EDc x EF x IR-Sc)/BWc)+((EDa x EF x IR-Sa)/BWa)
	IR-Smadj	Ingestion Rate-Soil (age adjusted, mutagenic)	mg/kg	33080	Calculated	IR-Smadj =((ED_{1-2} x EF x $IR\text{-}S_c$ x 10)/BW_c)+((ED_{2-6} x EF x $IR\text{-}S_c$ x 3)/BW_c)+((ED_{6-16} x EF x $IR\text{-}S_a$ x 3)/BW_a)+((ED_{16-27} x EF x $IR\text{-}S_a$ x 1)/BW_a)
Dermal	BW_c	Body Weight - Child	kg	15	EPA 2014	(CS x CF x DABS x (DFSadj or DFSmadj)) ÷ (AT)
	BW_a	Body Weight - Adult	kg	80	EPA 2014	
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	ED_{1-2}	Exposure Duration, ages 1-2	yr	1	SS	
	ED_{2-6}	Exposure Duration, ages 2-6	yr	4	SS	
	ED_{6-16}	Exposure Duration, ages 6-16	yr	10	SS	
	ED_{16-27}	Exposure Duration, ages 16-27	yr	11	SS	
	ED_c	Exposure Duration, Child	yr	5	EPA 2014	
	ED_a	Exposure Duration, adult	yr	21	EPA 2014	
	ED	Exposure Duration, Total	yr	26	EPA 2014	
	CF	Conversion Factor	kg/mg	1.0E-06	EPA 1989	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	DABS	Dermal Absorption Factor	unitless	chemical specific	EPA 2004	Chemical specific value provided in Appendix T
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	DFSadj	Ages Adjusted Soil Dermal Factor	mg/kg	2.6.E+04	Calculated	DFSadj = ((EDc x EF x Sac x SSAFc)/BWc)+((EDa x EF x SAa x SSAFa)/BWa)
	DFSmadj	Mutagenic Age Adjusted Soil Dermal Factor	mg/kg	8.8.E+04	Calculated	DFSmadj =((ED_{1-2} x EF x SAc x SSAFc x 10)/BW_c)+((ED_{2-6} x SAc x SSAFc x 3)/BW_c)+((ED_{6-16} x EF x SAa x SSAFa x 3)/BW_a)+((ED_{16-27} x EF x SAa x SSAFa x 1)/BW_a)
	SAc	Skin Surface Area - Child	cm^2	2,373	EPA 2014	
	SAa	Skin Surface Area - Adult	cm^2	6,032	EPA 2014	
	SSAFc	Soil to Skin Adherence Factor - Child	mg/cm^2	0.2	EPA 2014	
	SSAFa	Soil to Skin Adherence Factor - Adult	mg/cm^2	0.07	EPA 2014	
Inhalation	EC	Exposure Concentration	$\mu g/m^3$	calculated	EPA 2009	Carcinogens - EC = (CA x ET x EF x ED)/AT
	AT-C	Averaging Time Carcinogen	hours	613,200	EPA 2009	Mutagens - EC = CA x ((ET x EF x ED_{1-2} x 10)+(ET x EF x ED_{2-6} x 3)+(ET x EF x ED_{6-16} x 3)+(ET x EF x ED_{16-27} x 1))/AT
	ED_{1-2}	Exposure Duration, ages 1-2	yr	1	SS	
	ED_{2-6}	Exposure Duration, ages 2-6	yr	4	SS	
	ED_{6-16}	Exposure Duration, ages 6-16	yr	10	SS	
	ED_{16-27}	Exposure Duration, ages 16-27	yr	11	SS	
	ED	Exposure Duration, Total	yr	26	EPA 2014	
	CS	Chemical Concentration in Soil	mg/kg	See Table 3-2	See Table 3-2	
	ED	Exposure Duration	yr	26	SS	
	EF	Exposure Frequency	day/yr	96	SS	3x/week for warmer months of the year (mid-March through mid-November)
	ET	Exposure Time	hours/day	4	SS	
	VF	Volatilization Factor (Annex)	m^3/kg	chemical specific	SS	See Appendix T for calculation of site-specific VF
	VF	Volatilization Factor (Landfill)	m^3/kg	chemical specific	SS	See Appendix T for calculation of site-specific VF
	PEF	Particulate Emission Factor (Annex)	m^3/kg	4.7E+08	EPA 2002	See Appendix T for calculation of site-specific PEF
	PEF	Particulate Emission Factor (Landfill)	m^3/kg	4.0E+08	EPA 2002	See Appendix T for calculation of site-specific PEF

RME: Reasonable Maximum Exposure
SS : Site-specific parameter based upon professional judgement

EPA 1989, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual, Part A. OERR EPA/540/1-89/002
EPA 2002, Supplemental Guidance for Developing Soil Screening Levels for Superfund Site, December, OSWER 9355.4-24.3.
EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.

Table 7-4.18
Values Used For Daily Intake Calculations
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Medium: Liquid
Exposure Medium: Seep Water
Exposure Point: Landfill and Landfill Annex
Receptor Population: Refuge Visitor
Receptor Age: Lifetime

Exposure Route	Parameter Code	Parameter Definition	Units	RME Value	RME Rationale/ Reference	Intake Equation/ Model Name
Dermal	BW_c	Body Weight - Child	kg	15	EPA 2014	(DA_{event} x ET x (DFWadj or DFWM) ÷ (AT)
	BW_a	Body Weight - Adult	kg	80	EPA 2014	For Vinyl Chloride - DA_{event} *(((DFW_{adj}/(ATC))+(EV*SA_c)/(BW_c)))
	Cw	Concentration in Seep Water	ug/L	chemical specific	SS	
	AT-C	Averaging Time Carcinogen	days	25,550	EPA 2014	
	ED_{1-2}	Exposure Duration, ages 1-2	yr	1	SS	
	ED_{2-6}	Exposure Duration, ages 2-6	yr	4	SS	
	ED_{6-16}	Exposure Duration, ages 6-16	yr	10	SS	
	ED_{16-27}	Exposure Duration, ages 16-27	yr	11	SS	
	ED_c	Exposure Duration, Child	yr	5	EPA 2014	
	ED_a	Exposure Duration, adult	yr	21	EPA 2014	
	ED	Exposure Duration, Total	yr	26	EPA 2014	
	Kp	Permeability Coefficient	cm/hr	chemical specific	EPA 2016	
	DA_{event}	Absorbed Dose per Event	mg/cm^2-event	chemical specific	EPA 2004	Calculation provided in Appendix T
	EF	Exposure Frequency	day/yr	48	SS	50% of the park exposure (96 days) within seep areas
	ET	Exposure Time, Water	hours/event	0.25	SS	
	EV	Event Frequency	events/day	1	SS	
	DFWadj	Age adjusted dermal factor	cm^2-event/kg	123541	calculated	DFWadj = ((EV x EDc x EF x Sac)/BWc)+((EV x EDa x EF x SAa)/BWa)
	DFWM	Mutagenic Age adjusted dermal factor	cm^2-event/kg	360330	calculated	DFWM =((EV x ED_{1-2} x EF x SAc x 10)/BW_c)+((EV x ED_{2-6} x SAc x 3)/BW_c)+((EV x ED_{6-16} x EF x SAa x 3)/BW_a)+((EV x ED_{16-27} x EF x SAa x 1)/BW_a)
	SA_c	Skin Surface Area - Child	cm^2	3,042	EPA 2011	
	SA_a	Skin Surface Area - Adult	cm^2	5,942	EPA 2011	

RME: Reasonable Maximum Exposure
EPA 2004, Risk Assessment Guidance for Superfund. Vol 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) FINAL. July.

Table 7-5.1
Non-Cancer Toxicity Data -- Oral/Dermal
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (3)		Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value (1),(2)	Units	value	Reference	Value (4)	Units			Source(s) (5)	Date (MM/DD/YYYY)
Volatile Organics											
1,1,2,2-Tetrachloroethane	Chronic	2.0E-02	mg/kg/day	1	EPA	2.0E-02	mg/kg/day	Liver	1000/1	IRIS	09/30/2010
1,1-Dichloroethene	Chronic	5.0E-02	mg/kg/day	1	EPA	5.0E-02	mg/kg/day	Liver	100/1	IRIS	8/13/2002
1,2-Dichloroethane	Chronic	6.0E-03	mg/kg/day	1	EPA	6.0E-03	mg/kg/day	Kidney	1000/1	PPRTV	10/1/2010
1,4-Dichlorobenzene	Chronic	7.0E-02	mg/kg/day	1	EPA	7.0E-02	mg/kg/day	Liver	100/1	ATSDR	8/1/2006
2-Hexanone	Chronic	5.0E-03	mg/kg/day	1	EPA	5.0E-03	mg/kg/day	Peripheral Nervous System	1000/1	IRIS	9/25/2009
Benzene	Chronic	4.0E-03	mg/kg/day	1	EPA	4.0E-03	mg/kg/day	Blood	300/1	IRIS	4/17/2003
Chlorobenzene	Chronic	2.0E-02	mg/kg/day	1	EPA	2.0E-02	mg/kg/day	Liver	1000/1	IRIS	7/1/1993
Chloroform	Chronic	1.0E-02	mg/kg/day	1	EPA	1.0E-02	mg/kg/day	Liver	1000/1	IRIS	10/19/2001
Ethylbenzene	Chronic	1.0E-01	mg/kg/day	1	EPA	1.0E-01	mg/kg/day	Liver and Kidney	1000/1	IRIS	6/1/1991
cis-1,2-Dichloroethene	Chronic	2.0E-03	mg/kg/day	1	EPA	2.0E-03	mg/kg/day	Blood	3000/1	IRIS	9/30/2010
Trichloroethene	Chronic	5.0E-04	mg/kg/day	1	EPA	5.0E-04	mg/kg/day	Cardiovascular/Immunological/Developmental	Multiple	IRIS	09/28/2011
Vinyl Chloride	Chronic	3.0E-03	mg/kg/day	1	EPA	3.0E-03	mg/kg/day	Liver	30/1	IRIS	8/7/2000
Xylenes, Total	Chronic	2.0E-01	mg/kg/day	1	EPA	2.0E-01	mg/kg/day	Body Weight	1000	IRIS	2/21/2003
Semivolatile Organics											
1,4-Dioxane	Chronic	3.0E-02	mg/kg/day	1	EPA	3.0E-02	mg/kg/day	Liver and Kidney	300/1	IRIS	8/11/2010
2-Methylnaphthalene	Chronic	4.0E-03	mg/kg/day	1	EPA	4.0E-03	mg/kg/day	Respiratory	1000/1	IRIS	12/22/2003
Acenaphthene	Chronic	6.0E-02	mg/kg/day	1	EPA	6.0E-02	mg/kg/day	Liver	3000/1	IRIS	4/1/1994
Benzo(a)anthracene		---				---		---	---		
Benzo(a)pyrene		---				---		---	---		
Benzo(b)fluoranthene		---				---		---	---		
Benzo(k)fluoranthene		---				---		---	---		
Biphenyl	Chronic	5.0E-01	mg/kg/day	1	EPA	5.0E-01	mg/kg/day	Kidney	30/1	IRIS	08/27/2013
Carbazole		---				---		---	---		
Bis(2-Ethylhexyl) Phthalate	Chronic	2.0E-02	mg/kg/day	1	EPA	2.0E-02	mg/kg/day	Liver	1000/1	IRIS	5/1/1991
Dibenzo(A,H)Anthracene		---				---		---	---		
Dibenzofuran	Chronic	1.0E-03	mg/kg/day	1	EPA	1.0E-03	mg/kg/day	Kindey	10000/1	PPRTV Appendix	12/10/2009

Table 7-5.1
Non-Cancer Toxicity Data -- Oral/Dermal
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (3)		Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value (1),(2)	Units	value	Reference	Value (4)	Units			Source(s) (5)	Date (MM/DD/YYYY)
Fluorene	Chronic	4.0E-02	mg/kg/day	1	EPA	4.0E-02	mg/kg/day	Blood	3000/1	IRIS	11/1/1990
Indeno(1,2,3-cd)pyrene		---		1	EPA	---		---	---		
Naphthalene	Chronic	2.0E-02	mg/kg/day	1	EPA	2.0E-02	mg/kg/day	Body Weight	3000/1	IRIS	9/17/1998
Phenanthrene	Chronic	3.0E-02	mg/kg/day	1	EPA	3.0E-02	mg/kg/day	Kidney	3000/1	IRIS	7/1/1993
Pesticides/PCBs											
Aldrin	Chronic	3.0E-05	mg/kg/day	1	EPA	3.0E-05	mg/kg/day	Liver	1000/1	IRIS	3/1/1988
Aroclor 1248		---		1	EPA	---		---	---		
Aroclor 1254	Chronic	2.0E-05	mg/kg/day	1	EPA	2.0E-05	mg/kg/day	Nail growth, Ocular effects, Immunological effects	300/1	IRIS	11/1/1996
Aroclor 1260		---				---		---	---		
beta-BHC		---				---		---	---		
delta-BHC		---				---		---	---		
Dieldrin	Chronic	5.0E-05	mg/kg/day	1	EPA	5.0E-05	mg/kg/day	Liver	100/1	IRIS	9/1/1990
Gamma-Chlordane	Chronic	5.0E-04	mg/kg/day	1	EPA	5.0E-04	mg/kg/day	Liver	300/1	IRIS	2/7/1998
Heptachlor	Chronic	5.0E-04	mg/kg/day	1	EPA	5.0E-04	mg/kg/day	Liver	300/1	IRIS	3/1/1991
Heptachlor Epoxide	Chronic	1.3E-05	mg/kg/day	1	EPA	1.3E-05	mg/kg/day	Liver	1000/1	IRIS	3/1/1991
Dioxins											
2,3,7,8-TCDD Equivalents	Chronic	7.0E-10	mg/kg/day	1	EPA	7.0E-10	mg/kg/day	Reproductive	30/1	IRIS	2/17/2012
Inorganics											
Aluminum	Chronic	1.0E+00	mg/kg/day	1	EPA	1.0E+00	mg/kg/day	Neurologic effects	100/1	PPRTV	8/23/2006
Antimony	Chronic	4.0E-04	mg/kg/day	0.15	EPA	6.0E-05	mg/kg/day	Blood, pancreas	1000/1	IRIS	2/1/1991
Arsenic	Chronic	3.0E-04	mg/kg/day	1	EPA	3.0E-04	mg/kg/day	Blood, Skin	3/1	IRIS	2/1/1993
Barium	Chronic	2.0E-01	mg/kg/day	0.07	EPA	1.4E-02	mg/kg/day	Kidney	300/1	IRIS	7/11/2005
Beryllium	Chronic	2.0E-03	mg/kg/day	0.007	EPA	1.4E-05	mg/kg/day	Gastrointestinal	300/1	IRIS	4/3/1998
Cadmium (water)	Chronic	5.0E-04	mg/kg/day	0.05	EPA	2.5E-05	mg/kg/day	Kidney	10/1	IRIS	2/1/1994
Cadmium	Chronic	1.0E-03	mg/kg/day	0.025	EPA	2.5E-05	mg/kg/day	Kidney	10/1	IRIS	2/1/1994

Table 7-5.1
Non-Cancer Toxicity Data -- Oral/Dermal
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral Absorption Efficiency for Dermal (3)		Absorbed RfD for Dermal		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value (1),(2)	Units	value	Reference	Value (4)	Units			Source(s) (5)	Date (MM/DD/YYYY)
Chromium	Chronic	3.0E-03	mg/kg/day	0.025	EPA	7.5E-05	mg/kg/day	Gastrointestinal	300/3	IRIS	9/3/1998
Cobalt	Chronic	3.0E-04	mg/kg/day	1	EPA	3.0E-04	mg/kg/day	Thyroid	3000/1	PPRTV	08/25/2012
Copper	Chronic	4.0E-02	mg/kg/day	1	EPA	4.0E-02	mg/kg/day	Gastrointestinal		HEAST	7/31/1997
Iron	Chronic	7.0E-01	mg/kg/day	1	EPA	7.0E-01	mg/kg/day	Gastrointestinal	1.50E+00	PPRTV	9/11/2006
Lead		---				---		---	---		
Manganese (water)	Chronic	2.4E-02	mg/kg/day	0.04	EPA	9.6E-04	mg/kg/day	CNS	1/1	IRIS	5/1/1996
Manganese	Chronic	1.4E-01	mg/kg/day	1		1.4E-01	mg/kg/day	CNS	1/1	IRIS	5/1/1996
Mercury	Chronic	3.0E-04	mg/kg/day	0.07	EPA	2.1E-05	mg/kg/day	Immunoloigcal/Urinary	10/1	IRIS	7/27/2001
Nickel	Chronic	2.0E-02	mg/kg/day	0.04	EPA	8.0E-04	mg/kg/day	Body weight	300/1	IRIS	12/1/1996
Thallium	Chronic	1.0E-05	mg/kg/day	1	EPA	1.0E-05	mg/kg/day	Skin	---	PPRTV Appendix	9/17/2012
Vanadium	Chronic	5.0E-03	mg/kg/day	0.026	EPA	1.3E-04	mg/kg/day	Hair	100/1	IRIS	6/30/1998
Zinc	Chronic	3.0E-01	mg/kg/day	1	EPA	3.0E-01	mg/kg/day	Blood	3/1	IRIS	8/3/2005

Notes:

--- Not Available or no value

(1) Chromium toxicity evaluated as chromium VI.

(2) Surrogate toxicity values used as follows; chlordane for gamma-chlordane and pyrene for phenanthrene.

(3) References for oral absorption efficiency are presented below.

EPA - Regional Screening Level Table, May 2016

(4) Dermal RfD values were calculated by multiplying the oral RfD by the Oral Absorption Efficiency for Dermal.

(5) References for RfD:

IRIS: U.S. Environmental Protection Agency (USEPA). Office of Health and Environmental Assessment. Environmental Criteria and Assessment Office. Integrated Risk Information System (IRIS). Cincinnati, OH.

HEAST: U.S. Environmental Protection Agency (USEPA). Office of Emergency and Remedial Response. Office of Research and Development. Health Effects Assessment Summary Tables (HEAST). Annual and Supplemental Updates. Washington, D.C.

PPRTV: U.S. Environmental Protection Agency (USEPA). Provisional Peer Reviewed Toxicity Values.

PPRTV Appendix: U.S. Environmental Protection Agency (USEPA). Provisional Peer Reviewed Toxicity Values. Appendix.

NCEA: U.S. Environmental Protection Agency (USEPA). National Center for Environmental Assessment (NCEA). Superfund Technical Support Center. Cincinnati, OH.

ATSDR - Agency for Toxic Substances and Disease Registrity. Centers for Disease Control. Atlanta, GA.

Table 7-5.2
Non-Cancer Toxicity Data -- Inhalation
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value (1),(2)	Units			Source(s) (3)	Date (MM/DD/YYYY)
Volatile Organics							
1,1,2,2-Tetrachloroethane		---		---			
1,1-Dichloroethene	Chronic	2.0E-01	mg/m^3	Liver	100/1	IRIS	08/13/2002
1,2-Dichloroethane	Chronic	7.0E-03	mg/m^3	Neurological	3000/1	PPRTV	10/1/2010
1,4-Dichlorobenzene	Chronic	8.0E-01	mg/m^3	Liver	100/1	IRIS	11/1/1996
1,4-Dioxane	Chronic	3.0E-02	mg/m^3	Nervous, Respiratory	1000/1	IRIS	09/20/2013
2-Hexanone	Chronic	3.0E-02	mg/m^3	Nervous System	3000/1	IRIS	9/25/2009
Benzene	Chronic	3.0E-02	mg/m^3	Blood	300/1	IRIS	4/17/2003
Chlorobenzene	Chronic	5.0E-02	mg/m^3	Liver/Kidney	1000/1	PPRTV	10/12/2006
Chloroform	Chronic	9.8E-02	mg/m^3	Liver	100/1	ATSDR	9/1/1997
cis-1,2-Dichloroethene		---		---	---		
Ethylbenzene	Chronic	1.0E+00	mg/m^3	Development	300/1	IRIS	3/1/1991
Methylene Chloride	Chronic	6.0E-01	mg/m^3	Liver	30/1	IRIS	11/18/2011
Trichloroethene	Chronic	2.0E-03	mg/m^3	Cardiac/Immunological/Developmental	Mulitple	IRIS	09/28/2011
Vinyl Chloride	Chronic	1.0E-01	mg/m^3	Liver	30/1	IRIS	8/7/2000
Xylenes, Total	Chronic	1.0E-01	mg/m^3	Body Weight	300/1	IRIS	2/21/2003
Semivolatile Organics							
1,4-Dioxane	Chronic	3.0E-02	mg/m^3	CNS, Respiratory	1000/1	IRIS	09/20/2013
2-Methylnaphthalene		---		---	---		
Acenaphthene		---		---	---		
Benzo(a)anthracene		---		---	---		
Benzo(a)pyrene		---		---	---		
Benzo(b)fluoranthene		---		---	---		
Benzo(k)fluoranthene		---		---	---		
Biphenyl	Chronic	4.0E-04	mg/m^3	Liver and Kidney	300/1	PPRTV Appendix	04/04/2011
bis(2-Ethylhexyl)Phthalate		---		---	---		
Carbazole		---		---	---		
Dibenzo(a,h)anthracene		---		---	---		

Table 7-5.2
Non-Cancer Toxicity Data -- Inhalation
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value (1),(2)	Units			Source(s) (3)	Date (MM/DD/YYYY)
Dibenzofuran		---		---			
Fluorene		---		---			
Indeno(1,2,3-cd)pyrene		---		---	---		
Naphthalene	Chronic	3.0E-03	mg/m^3	Nasal	3000/1	IRIS	9/7/1998
Phenanthrene		---		---	---		
Pesticides/PCBs							
Aldrin		---		---	---		
Aroclor 1248		---		---	---		
Aroclor 1254		---		---	---		
Aroclor 1260		---		---	---		
beta-BHC		---		---	---		
delta-BHC		---		---	---		
Dieldrin		---		---	---		
Gamma-Chlordane	Chronic	7.00E-04	mg/m^3	Liver	1000/1	IRIS	02/07/1998
Heptachlor		---		---	---		
Heptachlor epoxide		---		---	---		
Dioxin							
2,3,7,8-TCDD Equivalents	Chronic	4.0E-08	mg/m^3	Liver/Reproductive/Endocrine/Respiratory/Blood	---	Cal EPA	12/1/2008
Inorganics							
Aluminum	Chronic	5.0E-03	mg/m^3	Neurological	300/1	PPRTV	10/23/2006
Antimony		---		---	---		
Arsenic	Chronic	1.5E-05	mg/m^3	Reproductive/Developmental/Cardiovascular/CNS/Lung/Skin	---	Cal EPA	7/1/2014
Barium	Chronic	5.0E-04	mg/m^3	---	---		
Beryllium	Chronic	2.0E-05	mg/m^3	Lungs	10/1	IRIS	4/3/1998
Cadmium	Chronic	1.0E-05	mg/m^3	Kidney	---	ATSDR	09/01/2012
Chromium	Chronic	1.0E-04	mg/m^3	Lungs/Respiratory	300/1	IRIS	9/3/1998
Cobalt	Chronic	6.0E-06	mg/m^3	Lungs/Respiratory	300/1	PPRTV	08/25/2008
Copper		---		---	---		

Table 7-5.2
Non-Cancer Toxicity Data -- Inhalation
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfC : Target Organ(s)	
		Value (1),(2)	Units			Source(s) (3)	Date (MM/DD/YYYY)
Iron		---		---	---		
Lead		---		---	---		
Manganese	Chronic	5.0E-05	mg/m^3	CNS	1000/1	IRIS	12/1/1993
Mercury	Chronic	3.0E-04	mg/m^3	CNS	30/1	IRIS	6/1/1995
Mercury (methyl)		---		---	---		
Nickel	Chronic	9.0E-05	mg/m^3	Respiratory	30/1	ATSDR	8/1/2005
Thallium		---		---	---		
Vanadium	Chronic	1.00E-04	mg/m^3	Respiratory	30/1	ATSDR	9/1/2012
Zinc		---		---	---		

Notes:

--- Not available or no value

(1) Toxicity of chromium evaluated as chromium VI.

(2) Surrogate toxicity values used as follows; chlordane for gamma-chlordane.

(3) References for RfC:

IRIS: U.S. Environmental Protection Agency (USEPA). Office of Health and Environmental Assessment. Environmental Criteria and Assessment Office. Integrated Risk Information System (IRIS). Cincinnatti, OH.

Cal EPA: California Environmental Protection Agency.

PPRTV: U.S. Environmental Protection Agency (USEPA). Provisional Peer Reviewed Toxicity Values.

ATSDR: Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels for Hazardous Substances (MRLs)

Table 7-6.1
Cancer Toxicity Data -- Oral/Dermal
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (3)		Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description (4)	Oral CSF	
	Value (1),(2)	Units	Value	Reference	Value	Units		Source(s) (5)	Date (MM/DD/YYYY)
Volatile Organics									
1,1,2,2-Tetrachloroethane	2.0E-01	$(mg/kg\text{-}day)^{-1}$	1	EPA	2.0E-01	(mg/kg-day)-1	C	IRIS	2/1/1994
1,1-Dichloroethene	---		1	EPA	---		C	IRIS	08/13/02
1,2-Dichloroethane	9.1E-02	$(mg/kg\text{-}day)^{-1}$	1	EPA	9.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	1/1/1991
1,4-Dichlorobenzene	5.4E-03	$(mg/kg\text{-}day)^{-1}$	1	EPA	5.4E-03	$(mg/kg\text{-}day)^{-1}$	---	Cal EPA	06/01/09
2-Hexanone	---				---		---		
Benzene	5.5E-02	$(mg/kg\text{-}day)^{-1}$	1	EPA	5.5E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS	1/19/2000
Chlorobenzene	---		1	EPA	---	$(mg/kg\text{-}day)^{-1}$	D	IRIS	3/1/1991
Chloroform	3.1E-02	$(mg/kg\text{-}day)^{-1}$	1	EPA	3.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	Cal EPA	06/01/09
cis-1,2-Dichloroethene	---				---		D	IRIS	2/1/1995
Ethylbenzene	1.1E-02	$(mg/kg\text{-}day)^{-1}$	1	EPA	1.1E-02	(mg/kg-day)-1	D	Cal EPA	06/01/09
Methylene Chloride	2.0E-03	$(mg/kg\text{-}day)^{-1}$	1	EPA	2.0E-03	(mg/kg-day)-1	Likely Carcinogenic	IRIS	11/18/11
Trichloroethene	4.6E-02	$(mg/kg\text{-}day)^{-1}$	1	EPA	4.6E-02	$(mg/kg\text{-}day)^{-1}$	Carcinogenic	IRIS	9/28/2011
Vinyl Chloride	7.2E-01	$(mg/kg\text{-}day)^{-1}$	1	EPA	7.2E-01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	8/7/2000
Vinyl Chloride (child)	1.4E+00	$(mg/kg\text{-}day)^{-1}$	1	EPA	1.4E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	8/7/2000
Xylenes, Total	---				---				
Semivolatile Organics									
2,2'-oxybis(1-Chloropropane)	7.0E-02	$(mg/kg\text{-}day)^{-1}$	0.5	B	1.4E-01	(mg/kg-day)-1	C	HEAST	07/31/97
3,3'-Dichlorobenzidine	4.5E-01	$(mg/kg\text{-}day)^{-1}$	0.5	B	9.0E-01	(mg/kg-day)-1	B2	IRIS	07/01/93
3-Nitroaniline (6)	6.8E-01	$(mg/kg\text{-}day)^{-1}$	0.8	B	2.6E-02	(mg/kg-day)-1	B2	IRIS	09/01/90
1,4-Dioxane	1.0E-01	$(mg/kg\text{-}day)^{-1}$	1	EPA	1.0E-01	$(mg/kg\text{-}day)^{-1}$	Likely Carcinogenic	IRIS	09/20/13
4-Chloroaniline	2.0E-01	$(mg/kg\text{-}day)^{-1}$	1	EPA	2.0E-01	$(mg/kg\text{-}day)^{-1}$	---	PPRTV	09/30/08
4-Chlorophenyl-phenylether	---				---		---		
2,4-Dimethylphenol	---				---		---		
2-Methylnaphthalene	---				---		---		
4-Methylphenol	---				---		C	IRIS	8/1/1991
Acenaphthene	---				---		---		
Benzo(a)anthracene	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1	EPA	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2		
Benzo(a)pyrene	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1	EPA	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	11/1/1994
Benzo(b)fluoranthene	7.3E-01	$(mg/kg\text{-}day)^{-1}$	1	EPA	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2		
Benzo(G,H,I)Perylene	---				---		---		
Benzo(K)fluoranthene	7.3E-02	$(mg/kg\text{-}day)^{-1}$	1	EPA	7.3E-02	$(mg/kg\text{-}day)^{-1}$	B2		
Bis(2-chloroethyl) ether	1.1E+00	$(mg/kg\text{-}day)^{-1}$	0.5	B	7.3E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/01/94
Biphenyl	8.0E-03	$(mg/kg\text{-}day)^{-1}$	1	EPA	8.0E-03	$(mg/kg\text{-}day)^{-1}$	evidence of carcinogen	IRIS	08/27/13
Bis(2-Ethylhexyl) Phthalate	1.4E-02	$(mg/kg\text{-}day)^{-1}$	1	EPA	1.4E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	2/1/1993
Carbazole	---				---				
Dibenzo(A,H)Anthracene	7.3E+00	$(mg/kg\text{-}day)^{-1}$	1	EPA	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2		
Dibenzofuran	---				---		D	IRIS	10/1/1990
Fluorene	---				---		D	IRIS	12/1/1990

Table 7-6.1

Cancer Toxicity Data -- Oral/Dermal

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (3)		Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description (4)	Oral CSF	
	Value (1),(2)	Units	Value	Reference	Value	Units		Source(s) (5)	Date (MM/DD/YYYY)
Indeno(1,2,3-cd)pyrene	7.3E-01	(mg/kg-day)$^{-1}$	1	EPA	7.3E-01	(mg/kg-day)$^{-1}$	B2	IRIS	3/1/1994
Naphthalene	---				---		C	IRIS	9/7/1998
Phenanthrene	---				---		D	IRIS	12/1/1990
Pesticides/PCBs									
Aldrin	1.7E+01	(mg/kg-day)$^{-1}$	1	EPA	1.7E+01	(mg/kg-day)$^{-1}$	B2	IRIS	7/1/1993
Aroclor 1248	2.0E+00	(mg/kg-day)$^{-1}$	1	EPA	2.0E+00	(mg/kg-day)$^{-1}$	B2	IRIS	6/1/1997
Aroclor 1254	2.0E+00	(mg/kg-day)$^{-1}$	1	EPA	2.0E+00	(mg/kg-day)$^{-1}$	B2	IRIS	6/1/1997
Aroclor 1260	2.0E+00	(mg/kg-day)$^{-1}$	1	EPA	2.0E+00	(mg/kg-day)$^{-1}$	B2	IRIS	6/1/1997
beta-BHC	1.8E+00	(mg/kg-day)$^{-1}$	1	EPA	1.8E+00	(mg/kg-day)$^{-1}$	C	IRIS	7/1/1993
delta-BHC	1.8E+00	(mg/kg-day)$^{-1}$	1	EPA	1.8E+00	(mg/kg-day)$^{-1}$	D	IRIS	3/31/1987
Dieldrin	1.6E+01	(mg/kg-day)$^{-1}$	1	EPA	1.6E+01	(mg/kg-day)$^{-1}$	B2	IRIS	7/1/1993
Gamma-Chlordane	3.5E-01	(mg/kg-day)$^{-1}$	1	EPA	3.5E-01	(mg/kg-day)$^{-1}$	B2	IRIS	2/7/1998
Heptachlor	4.5E+00	(mg/kg-day)$^{-1}$	1	EPA	4.5E+00	(mg/kg-day)$^{-1}$	B2	IRIS	7/1/1993
Heptachlor epoxide	9.1E+00	(mg/kg-day)$^{-1}$	1	EPA	9.1E+00	(mg/kg-day)$^{-1}$	B2	IRIS	7/1/1993
Dioxin									
2,3,7,8-TCDD Equivalents	1.3E+05	(mg/kg-day)$^{-1}$	1	EPA	1.3E+05	(mg/kg-day)$^{-1}$	B2	Cal EPA	06/01/09
Inorganics									
Aluminum	---				---		---		
Antimony	---				---		---		
Arsenic	1.5E+00	(mg/kg-day)$^{-1}$	1	EPA	1.5E+00	(mg/kg-day)$^{-1}$	A	IRIS	4/10/1998
Barium	---				---		D	IRIS	3/30/1998
Beryllium	---				---		B1	IRIS	4/3/1998
Cadmium	---				---		B1	IRIS	6/1/1992
Cadmium	---				---		B1	IRIS	6/1/1992
Chromium	5.0E-01	(mg/kg-day)$^{-1}$	0.025	EPA	2.0E+01	(mg/kg-day)$^{-1}$	A	NJDEP	9/3/1998
Cobalt	---				---		---		
Copper	---				---		D	IRIS	8/1/1991
Iron	---				---		---		
Lead	---				---		---		
Manganese	---				---		D	IRIS	12/1/1996

Table 7-6.1
Cancer Toxicity Data -- Oral/Dermal
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Oral Cancer Slope Factor		Oral Absorption Efficiency for Dermal (3)		Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/ Cancer Guideline Description (4)	Oral CSF	
	Value (1),(2)	Units	Value	Reference	Value	Units		Source(s) (5)	Date (MM/DD/YYYY)
Mercury	---				---		D	IRIS	5/1/1995
Nickel	---				---		---		
Thallium	---				---		---		
Vanadium	---				---		---		
Zinc	---				---		D	IRIS	8/3/2005

Notes:

--- Not Available or no value

(1) Chromium toxicity evaluated as chromium VI.

(2) Surrogate toxicity values used as follows; HCH (technical) for delta-BHC and chlordane for gamma-chlordane.

(3) Reference for oral absorption efficiency:

EPA - Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), FINAL. EPA/540/R/99/005. OSWER 9285.7-02EP.

(4) EPA Cancer Classifications are:

Group A -- Carcinogenic to Humans;

Group B -- Probably Carcinogenic to Humans; B1 for agents for which there is limited evidence of carcinogenicity from epidemiologic studies; B2 for agents for which there is "sufficient" evidence from animal studies and for which there is "inadequate evidence" or "no data" from epidemiologic studies.

Group C --Possibly Carcinogenic to Humans;

Group D -- Not Classifiable as to Human Carcinogenicity;

Group E -- Evidence of Noncarcinogenicity for Humans.

(5) References for Oral CSF are:

IRIS: U.S. Environmental Protection Agency (USEPA). Office of Health and Environmental Assessment. Environmental Criteria and Assessment Office. Integrated Risk Information System (IRIS). Cincinnatti, OH.

HEAST: U.S. Environmental Protection Agency (USEPA). Office of Emergency and Remedial Response. Office of Research and Development. Health Effects Assessment Summary Tables (HEAST). Annual and Supplemental Updates. Washington, D.C.

NJDEP: New Jersey Department of Environmental Protection

Cal EPA: California Environmental Protection Agency (USEPA). Toxicity Values.

PPRTV: U.S. Environmental Protection Agency (USEPA). Provisional Peer Reviewed Toxicity Values.

Table 7-6.2

Cancer Toxicity Data -- Inhalation

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Inhalation Unit Risk		Weight of Evidence/ Cancer Guideline Description (3)	Inhalation Unit Risk	
	Value (1),(2)	Units		Source(s) (4)	Date (MM/DD/YYYY)
Volatile Organics					
1,1,2,2-Tetrachloroethane	5.8E-05	$(ug/m^3)^{-1}$	C	IRIS	2/1/1994
1,1-Dichloroethene	---		C	IRIS	08/13/02
1,2-Dichloroethane	2.6E-05	$(ug/m^3)^{-1}$	B2	IRIS	1/1/1991
1,4-Dichlorobenzene	1.1E-05	$(ug/m^3)^{-1}$	---	Cal EPA	06/01/09
2-Hexanone	---		---		
Benzene	7.8E-06	$(ug/m^3)^{-1}$	A	IRIS	1/19/2000
Chlorobenzene	---		D	IRIS	3/1/1991
Chloroform	2.3E-05	$(ug/m^3)^{-1}$	B2	IRIS	10/19/2001
cis-1,2-Dichloroethene	---		D	IRIS	2/1/1995
Ethylbenzene	2.5E-06	$(ug/m^3)^{-1}$	D	Cal EPA	06/01/09
Methylene Chloride	1.0E-08	$(ug/m^3)^{-1}$	Likely carcinogenic to humans	IRIS	11/18/2011
Trichloroethene	4.1E-06	$(ug/m^3)^{-1}$	Carcinogenic to Humans	IRIS	9/28/2011
Vinyl Chloride	4.4E-06	$(ug/m^3)^{-1}$	A	IRIS	8/7/2000
Vinyl Chloride (child)	8.8E-06	$(ug/m^3)^{-1}$	A	IRIS	8/7/2000
Xylenes, Total	---		---		
Semivolatile Organics					
1,4-Dioxane	5.0E-06	$(ug/m^3)^{-1}$	Likely Carcinogenic	IRIS	09/20/13
2-Methylnaphthalene	---		---		
Acenaphthene	---		---		
Benzo(a)anthracene	1.1E-04	$(ug/m^3)^{-1}$	B2	Cal EPA	06/01/09
Benzo(a)pyrene	1.1E-03	$(ug/m^3)^{-1}$	B2	Cal EPA	06/01/09
Benzo(b)fluoranthene	1.1E-04	$(ug/m^3)^{-1}$	B2	Cal EPA	06/01/09
Benzo(k)fluoranthene	1.1E-04	$(ug/m^3)^{-1}$	B2	Cal EPA	06/01/09
Biphenyl	---		---		
bis(2-Ethylhexyl)Phthalate	2.4E-06	$(ug/m^3)^{-1}$	---	Cal EPA	06/01/09
Carbazole	---		---		
Dibenzo(a,h)Anthracene	1.2E-03	$(ug/m^3)^{-1}$	B2	Cal EPA	06/01/09

Table 7-6.2
Cancer Toxicity Data -- Inhalation
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Inhalation Unit Risk		Weight of Evidence/ Cancer Guideline Description	Inhalation Unit Risk	
	Value (1),(2)	Units	(3)	Source(s) (4)	Date (MM/DD/YYYY)
Dibenzofuran	---		D	IRIS	10/1/1990
Fluorene	---		D	IRIS	12/1/1990
Indeno(1,2,3-cd)pyrene	1.1E-04	$(ug/m^3)^{-1}$	B2	Cal EPA	06/01/09
Naphthalene	3.4E-05	$(ug/m^3)^{-1}$	C	Cal EPA	12/10/09
Phenanthrene	---		D	IRIS	12/1/1990
Pesticides/PCBs					
Aldrin	4.9E-03	$(ug/m^3)^{-1}$	B2	IRIS	7/1/1993
Aroclor 1248	5.7E-04	$(ug/m^3)^{-1}$	B2	IRIS	6/1/1997
Aroclor 1254	5.7E-04	$(ug/m^3)^{-1}$	B2	IRIS	6/1/1997
Aroclor 1260	5.7E-04	$(ug/m^3)^{-1}$	B2	IRIS	6/1/1997
beta-BHC	5.3E-04	$(ug/m^3)^{-1}$	C	IRIS	7/1/1993
delta-BHC	5.1E-04	$(ug/m^3)^{-1}$	D	IRIS	7/1/1993
Dieldrin	4.6E-03	$(ug/m^3)^{-1}$	B2	IRIS	7/1/1993
Gamma-Chlordane	1.0E-04	$(ug/m^3)^{-1}$	B2	IRIS	2/7/1998
Heptachlor	1.3E-03	$(ug/m^3)^{-1}$	B2	IRIS	7/1/1993
Heptachlor Epoxide	2.6E-03	$(ug/m^3)^{-1}$	B2	IRIS	7/1/1993
Dioxin					
2,3,7,8-TCDD Equivalents	3.8E+01	$(ug/m^3)^{-1}$	B2	Cal EPA	06/01/09
Inorganics					
Aluminum	---		---		
Antimony	---		---		
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	A	IRIS	4/10/1998
Barium	---		D	IRIS	3/30/1998
Beryllium	2.4E-03	$(ug/m^3)^{-1}$	B1	IRIS	4/3/1998
Cadmium	1.8E-03	$(ug/m^3)^{-1}$	B1	IRIS	6/1/1992
Chromium	8.4E-02	$(ug/m^3)^{-1}$	A	IRIS	9/3/1998
Cobalt	9.0E-03	$(ug/m^3)^{-1}$	---	PPRTV	8/25/2008
Copper	---		D	IRIS	8/1/1991

Table 7-6.2

Cancer Toxicity Data -- Inhalation

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Chemical of Potential Concern	Inhalation Unit Risk		Weight of Evidence/ Cancer Guideline Description	Inhalation Unit Risk	
	Value (1),(2)	Units	(3)	Source(s) (4)	Date (MM/DD/YYYY)
Iron	---		---		
Lead	---		---		
Manganese	---		D	IRIS	12/1/1996
Mercury	---		D	IRIS	5/1/1995
Nickel	2.6E-04	$(ug/m^3)^{-1}$	---	Cal EPA	06/01/09
Thallium	---		---		
Vanadium	---		---		
Zinc	---		D	IRIS	8/3/2005

Notes:

--- = Not Applicable or no value

(1) Chromium toxicity evaluated as chromium VI.

(2) Surrogate toxicity values used as follows; HCH (technical) for delta-BHC and chlordane for gamma-chlordane.

(3) EPA Cancer Classifications are:

Group A -- Carcinogenic to Humans

Group B -- Probably Carcinogenic to Humans; B1 for agents for which there is limited evidence of carcinogenicity from epidemiologic studies; B2 for agents for which there is "sufficient" evidence from animal studies and for which there is "inadequate evidence" or "no data" from epidemiologic studies.

Group C --Possibly Carcinogenic to Humans

Group D -- Not Classifiable as to Human Carcinogenicity

(4) References for inhalation unit risk are:

IRIS: U.S. Environmental Protection Agency (USEPA). Office of Health and Environmental Assessment. Environmental Criteria and Assessment Office. Integrated Risk Information System (IRIS). Cincinnatti, OH.

Cal EPA: California Environmental Protection Agency (USEPA). Toxicity Values.

PPRTV: U.S. Environmental Protection Agency (USEPA). Provisional Peer Reviewed Toxicity Values.

Golder Associates

Table 7-7.1

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater - Annex	Groundwater - Annex	Groundwater - Annex	Ingestion	Aluminum	1.8E+03	ug/l	2.2E-06	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.6E-04	mg/kg/day	1.0E+00	mg/kg/day	1.6E-04
				Antimony	3.0E+00	ug/l	3.7E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	2.6E-07	mg/kg/day	4.0E-04	mg/kg/day	6.4E-04
				Arsenic	7.4E+00	ug/l	9.1E-09	mg/kg/day	1.5E+00	(mg/kg/day)$^{-1}$	1.4E-08	6.3E-07	mg/kg/day	3.0E-04	mg/kg/day	2.1E-03
				Barium	8.0E+02	ug/l	9.8E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	6.9E-05	mg/kg/day	2.0E-01	mg/kg/day	3.4E-04
				Chromium	8.0E+00	ug/l	9.8E-09	mg/kg/day	5.0E-01	(mg/kg/day)$^{-1}$	4.9E-09	6.8E-07	mg/kg/day	3.0E-03	mg/kg/day	2.3E-04
				Cobalt	1.8E+01	ug/l	2.2E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.5E-06	mg/kg/day	3.0E-04	mg/kg/day	5.1E-03
				Iron	3.3E+04	ug/l	4.0E-05	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	2.8E-03	mg/kg/day	7.0E-01	mg/kg/day	4.0E-03
				Manganese	5.9E+03	ug/l	7.2E-06	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	5.1E-04	mg/kg/day	2.4E-02	mg/kg/day	2.1E-02
				Thallium	4.1E+00	ug/l	5.0E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	3.5E-07	mg/kg/day	1.0E-05	mg/kg/day	3.5E-02
				Beta-BHC	2.7E-02	ug/l	3.2E-11	mg/kg/day	1.8E+00	(mg/kg/day)$^{-1}$	5.8E-11	2.3E-09	mg/kg/day	---	mg/kg/day	---
				Heptachlor	2.0E-02	ug/l	2.4E-11	mg/kg/day	4.5E+00	(mg/kg/day)$^{-1}$	1.1E-10	1.7E-09	mg/kg/day	5.0E-04	mg/kg/day	3.4E-06
				1,4-Dioxane	2.1E+01	ug/l	2.6E-08	mg/kg/day	1.0E-01	(mg/kg/day)$^{-1}$	2.6E-09	1.8E-06	mg/kg/day	3.0E-02	mg/kg/day	6.0E-05
				2-Methylnaphthalene	6.8E+00	ug/l	8.3E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	5.8E-07	mg/kg/day	4.0E-03	mg/kg/day	1.5E-04
				Bis(2-Ethylhexyl) Phthalate	6.0E+00	ug/l	7.3E-09	mg/kg/day	1.4E-02	(mg/kg/day)$^{-1}$	1.0E-10	5.1E-07	mg/kg/day	2.0E-02	mg/kg/day	2.6E-05
				Carbazole	4.6E+00	ug/l	5.6E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	3.9E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzofuran	5.1E+00	ug/l	6.3E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	4.4E-07	mg/kg/day	1.0E-03	mg/kg/day	4.4E-04
				Naphthalene	1.4E+01	ug/l	1.7E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.2E-06	mg/kg/day	2.0E-02	mg/kg/day	6.1E-05
				1,2-Dichloroethane	2.4E+01	ug/l	2.9E-08	mg/kg/day	9.1E-02	(mg/kg/day)$^{-1}$	2.7E-09	2.1E-06	mg/kg/day	6.0E-03	mg/kg/day	3.4E-04
				1,4-Dichlorobenzene	4.1E-01	ug/l	5.1E-10	mg/kg/day	5.4E-03	(mg/kg/day)$^{-1}$	2.7E-12	3.5E-08	mg/kg/day	7.0E-02	mg/kg/day	5.1E-07
				Benzene	5.0E-01	ug/l	6.1E-10	mg/kg/day	5.5E-02	(mg/kg/day)$^{-1}$	3.4E-11	4.3E-08	mg/kg/day	4.0E-03	mg/kg/day	1.1E-05
				Chlorobenzene	1.0E+01	ug/l	1.3E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	8.8E-07	mg/kg/day	2.0E-02	mg/kg/day	4.4E-05
				Ethylbenzene	8.4E-01	ug/l	1.0E-09	mg/kg/day	1.1E-02	(mg/kg/day)$^{-1}$	1.1E-11	7.1E-08	mg/kg/day	1.0E-01	mg/kg/day	7.1E-07
				Trichloroethene	1.8E-01	ug/l	2.2E-10	mg/kg/day	4.6E-02	(mg/kg/day)$^{-1}$	1.0E-11	1.6E-08	mg/kg/day	5.0E-04	mg/kg/day	3.1E-05
				Vinyl Chloride	5.7E-01	ug/l	7.0E-10	mg/kg/day	7.2E-01	(mg/kg/day)$^{-1}$	5.0E-10	4.9E-08	mg/kg/day	3.0E-03	mg/kg/day	1.6E-05
			Exp. Route Total								2.5E-08					7.0E-02
				Aluminum	1.8E+03	ug/l	9.9E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	6.9E-06	mg/kg/day	1.0E+00	mg/kg/day	6.9E-06
				Antimony	3.0E+00	ug/l	1.6E-10	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.1E-08	mg/kg/day	6.0E-05	mg/kg/day	1.9E-04
				Arsenic	7.4E+00	ug/l	4.0E-10	mg/kg/day	1.5E+00	(mg/kg/day)$^{-1}$	6.0E-10	2.8E-08	mg/kg/day	3.0E-04	mg/kg/day	9.3E-05
				Barium	8.0E+02	ug/l	4.3E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	3.0E-06	mg/kg/day	1.4E-02	mg/kg/day	2.2E-04
				Chromium	8.0E+00	ug/l	8.6E-10	mg/kg/day	2.0E+01	(mg/kg/day)$^{-1}$	1.7E-08	6.0E-08	mg/kg/day	7.5E-05	mg/kg/day	8.0E-04

Table 7-7.1

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
			Dermal Contact	Cobalt	1.8E+01	ug/l	3.8E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.7E-08	mg/kg/day	3.0E-04	mg/kg/day	8.9E-05
				Iron	3.3E+04	ug/l	1.8E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.2E-04	mg/kg/day	7.0E-01	mg/kg/day	1.8E-04
				Manganese	5.9E+03	ug/l	3.2E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.2E-05	mg/kg/day	9.6E-04	mg/kg/day	2.3E-02
				Thallium	4.1E+00	ug/l	2.2E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.5E-08	mg/kg/day	1.0E-05	mg/kg/day	1.5E-03
				Beta-BHC	2.7E-02	ug/l	3.1E-10	mg/kg/day	1.8E+00	$(mg/kg/day)^{-1}$	5.6E-10	2.2E-08	mg/kg/day	---	mg/kg/day	---
				Heptachlor	2.0E-02	ug/l	2.5E-09	mg/kg/day	4.5E+00	$(mg/kg/day)^{-1}$	1.1E-08	1.7E-07	mg/kg/day	5.0E-04	mg/kg/day	3.4E-04
				1,4-Dioxane	2.1E+01	ug/l	1.2E-09	mg/kg/day	1.0E-01	$(mg/kg/day)^{-1}$	1.2E-10	8.3E-08	mg/kg/day	3.0E-02	mg/kg/day	2.8E-06
				2-Methylnaphthalene	6.8E+00	ug/l	1.5E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.1E-05	mg/kg/day	4.0E-03	mg/kg/day	2.6E-03
				Bis(2-Ethylhexyl) Phthalate	6.0E+00	ug/l	6.5E-06	mg/kg/day	1.4E-02	$(mg/kg/day)^{-1}$	9.1E-08	4.6E-04	mg/kg/day	2.0E-02	mg/kg/day	2.3E-02
				Carbazole	4.6E+00	ug/l	5.4E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.8E-06	mg/kg/day	---	mg/kg/day	---
				Dibenzofuran	5.1E+00	ug/l	1.4E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.0E-05	mg/kg/day	1.0E-03	mg/kg/day	1.0E-02
				Naphthalene	1.4E+01	ug/l	1.5E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.0E-05	mg/kg/day	2.0E-02	mg/kg/day	5.1E-04
				1,2-Dichloroethane	2.4E+01	ug/l	1.8E-08	mg/kg/day	9.1E-02	$(mg/kg/day)^{-1}$	1.7E-09	1.3E-06	mg/kg/day	6.0E-03	mg/kg/day	2.1E-04
				1,4-Dichlorobenzene	4.1E-01	ug/l	4.7E-09	mg/kg/day	5.4E-03	$(mg/kg/day)^{-1}$	2.5E-11	3.3E-07	mg/kg/day	7.0E-02	mg/kg/day	4.7E-06
				Benzene	5.0E-01	ug/l	1.2E-09	mg/kg/day	5.5E-02	$(mg/kg/day)^{-1}$	6.5E-11	8.3E-08	mg/kg/day	4.0E-03	mg/kg/day	2.1E-05
				Chlorobenzene	1.0E+01	ug/l	5.8E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.1E-06	mg/kg/day	2.0E-02	mg/kg/day	2.0E-04
				Ethylbenzene	8.4E-01	ug/l	7.9E-09	mg/kg/day	1.1E-02	$(mg/kg/day)^{-1}$	8.7E-11	5.5E-07	mg/kg/day	1.0E-01	mg/kg/day	5.5E-06
				Trichloroethene	1.8E-01	ug/l	4.8E-10	mg/kg/day	4.6E-02	$(mg/kg/day)^{-1}$	2.2E-11	3.4E-08	mg/kg/day	5.0E-04	mg/kg/day	6.7E-05
				Vinyl Chloride	5.7E-01	ug/l	6.9E-10	mg/kg/day	7.2E-01	$(mg/kg/day)^{-1}$	5.0E-10	4.8E-08	mg/kg/day	3.0E-03	mg/kg/day	1.6E-05
			Exp. Route Total								1.2E-07					6.3E-02
Groundwater - Annex	Ambient Air	Ambient Air	Inhalation	1,2-Dichloroethane	1.4E-04	ug/m^3	4.7E-07	ug/m^3	2.6E-05	$(ug/m^3)^{-1}$	1.2E-11	3.3E-08	mg/m^3	7.0E-03	mg/m^3	4.7E-06
				1,4-Dichlorobenzene	2.8E-06	ug/m^3	9.2E-09	ug/m^3	1.1E-05	$(ug/m^3)^{-1}$	1.0E-13	6.5E-10	mg/m^3	8.0E-01	mg/m^3	8.1E-10
				Benzene	8.0E-06	ug/m^3	2.6E-08	ug/m^3	7.8E-06	$(ug/m^3)^{-1}$	2.0E-13	1.8E-09	mg/m^3	3.0E-02	mg/m^3	6.1E-08
				Chlorobenzene	9.5E-05	ug/m^3	3.1E-07	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.2E-08	mg/m^3	5.0E-02	mg/m^3	4.3E-07
				Trichloroethene	4.2E-06	ug/m^3	1.4E-08	ug/m^3	4.1E-06	$(ug/m^3)^{-1}$	5.6E-14	9.6E-10	mg/m^3	2.0E-03	mg/m^3	4.8E-07
				Vinyl Chloride	4.3E-05	ug/m^3	1.4E-07	ug/m^3	4.4E-06	$(ug/m^3)^{-1}$	6.1E-13	9.8E-09	mg/m^3	1.0E-01	mg/m^3	9.8E-08
				1,4-Dioxane	1.7E-06	ug/m^3	5.7E-09	ug/m^3	5.0E-06	$(ug/m^3)^{-1}$	2.8E-14	4.0E-10	mg/m^3	3.0E-02	mg/m^3	1.3E-08
				Naphthalene	4.3E-05	ug/m^3	1.4E-07	ug/m^3	3.4E-05	$(ug/m^3)^{-1}$	4.8E-12	9.9E-09	mg/m^3	3.0E-03	mg/m^3	3.3E-06
				Heptachlor	3.9E-08	ug/m^3	1.3E-10	ug/m^3	1.3E-03	$(ug/m^3)^{-1}$	1.6E-13	8.9E-12	mg/m^3	---	mg/m^3	---
			Exp. Route Total								1.8E-11					9.1E-06
		Exposure Point Total									1.5E-07					1.3E-01
	Exposure Medium Total										1.5E-07					1.3E-01
Medium and Receptor Total											1.5E-07					1.3E-01

Table 7-7.2

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
				Arsenic	5.6E+01	ug/l	6.8E-08	mg/kg/day	1.5E+00	(mg/kg/day)$^{-1}$	1.0E-07	4.8E-06	mg/kg/day	3.0E-04	mg/kg/day	1.6E-02
				Barium	5.9E+02	ug/l	7.2E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	5.0E-05	mg/kg/day	2.0E-01	mg/kg/day	2.5E-04
				Cadmium	8.8E-01	ug/l	1.1E-09	mg/kg/day	---	(mg/kg/day)$^{-2}$	---	7.6E-08	mg/kg/day	5.0E-04	mg/kg/day	1.5E-04
				Chromium	2.5E+01	ug/l	3.1E-08	mg/kg/day	5.0E-01	(mg/kg/day)$^{-1}$	1.5E-08	2.2E-06	mg/kg/day	3.0E-03	mg/kg/day	7.2E-04
				Cobalt	1.7E+01	ug/l	2.1E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.4E-06	mg/kg/day	3.0E-04	mg/kg/day	4.8E-03
				Iron	3.1E+04	ug/l	3.7E-05	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	2.6E-03	mg/kg/day	7.0E-01	mg/kg/day	3.7E-03
				Lead	9.0E+00	ug/l	1.1E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	7.7E-07	mg/kg/day	---	mg/kg/day	---
				Manganese	2.3E+03	ug/l	2.9E-06	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	2.0E-04	mg/kg/day	2.4E-02	mg/kg/day	8.3E-03
				Mercury	1.5E-01	ug/l	1.8E-10	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.3E-08	mg/kg/day	3.0E-04	mg/kg/day	4.3E-05
				Nickel	5.3E+01	ug/l	6.4E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	4.5E-06	mg/kg/day	2.0E-02	mg/kg/day	2.3E-04
				Thallium	6.7E+00	ug/l	8.3E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	5.8E-07	mg/kg/day	1.0E-05	mg/kg/day	5.8E-02
				Vanadium	2.1E+01	ug/l	2.6E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.8E-06	mg/kg/day	5.0E-03	mg/kg/day	3.6E-04
				Aldrin	1.2E-02	ug/l	1.5E-11	mg/kg/day	1.7E+01	(mg/kg/day)$^{-1}$	2.5E-10	1.0E-09	mg/kg/day	3.0E-05	mg/kg/day	3.4E-05
				Beta-BHC	5.7E-02	ug/l	6.9E-11	mg/kg/day	1.8E+00	(mg/kg/day)$^{-1}$	1.2E-10	4.8E-09	mg/kg/day	---	mg/kg/day	---
				Delta-BHC	3.4E-02	ug/l	4.2E-11	mg/kg/day	1.8E+00	(mg/kg/day)$^{-1}$	7.5E-11	2.9E-09	mg/kg/day	---	mg/kg/day	---
				Gamma-Chlordane	2.5E-02	ug/l	3.1E-11	mg/kg/day	3.5E-01	(mg/kg/day)$^{-1}$	1.1E-11	2.1E-09	mg/kg/day	5.0E-04	mg/kg/day	4.3E-06
				Heptachlor	4.4E-02	ug/l	5.4E-11	mg/kg/day	4.5E+00	(mg/kg/day)$^{-1}$	2.4E-10	3.8E-09	mg/kg/day	5.0E-04	mg/kg/day	7.5E-06
				Heptachlor Epoxide	2.4E-02	ug/l	2.9E-11	mg/kg/day	9.1E+00	(mg/kg/day)$^{-1}$	2.6E-10	2.0E-09	mg/kg/day	1.3E-05	mg/kg/day	1.6E-04
				1,4-Dioxane	3.7E+02	ug/l	4.6E-07	mg/kg/day	1.0E-01	(mg/kg/day)$^{-1}$	4.6E-08	3.2E-05	mg/kg/day	3.0E-02	mg/kg/day	1.1E-03
				2-Methylnaphthalene	2.7E+01	ug/l	3.3E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	2.3E-06	mg/kg/day	4.0E-03	mg/kg/day	5.8E-04
				Acenaphthene	2.1E+01	ug/l	2.6E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.8E-06	mg/kg/day	6.0E-02	mg/kg/day	3.1E-05
		Groundwater - Landfill	Ingestion	Benzo(A)Anthracene	3.3E-01	ug/l	4.0E-10	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	2.9E-10	2.8E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E-01	ug/l	2.6E-10	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	1.9E-09	1.8E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	2.9E-01	ug/l	3.5E-10	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	2.6E-10	2.5E-08	mg/kg/day	---	mg/kg/day	---
				Biphenyl	6.6E+00	ug/l	8.1E-09	mg/kg/day	8.0E-03	(mg/kg/day)$^{-1}$	6.5E-11	5.7E-07	mg/kg/day	5.0E-01	mg/kg/day	1.1E-06
				Carbazole	6.8E+00	ug/l	8.3E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	5.8E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzofuran	1.1E+01	ug/l	1.4E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	9.5E-07	mg/kg/day	1.0E-03	mg/kg/day	9.5E-04
				Fluorene	1.3E+01	ug/l	1.5E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.1E-06	mg/kg/day	4.0E-02	mg/kg/day	2.7E-05
				Naphthalene	1.1E+02	ug/l	1.3E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	9.0E-06	mg/kg/day	2.0E-02	mg/kg/day	4.5E-04
				Phenanthrene	3.4E+01	ug/l	4.1E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	2.9E-06	mg/kg/day	3.0E-02	mg/kg/day	9.7E-05
				1,1,2,2-Tetrachloroethane	2.0E-01	ug/l	2.4E-10	mg/kg/day	2.0E-01	(mg/kg/day)$^{-1}$	4.9E-11	1.7E-08	mg/kg/day	2.0E-02	mg/kg/day	8.6E-07
				1,1-Dichloroethene	6.0E+00	ug/l	7.4E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	5.2E-07	mg/kg/day	5.0E-02	mg/kg/day	1.0E-05
				1,2-Dichloroethane	1.4E+00	ug/l	1.7E-09	mg/kg/day	9.1E-02	(mg/kg/day)$^{-1}$	1.6E-10	1.2E-07	mg/kg/day	6.0E-03	mg/kg/day	2.0E-05
				1,4-Dichlorobenzene	6.8E-01	ug/l	8.3E-10	mg/kg/day	5.4E-03	(mg/kg/day)$^{-1}$	4.5E-12	5.8E-08	mg/kg/day	7.0E-02	mg/kg/day	8.3E-07
				2-Hexanone	8.2E+00	ug/l	1.0E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	7.0E-07	mg/kg/day	5.0E-03	mg/kg/day	1.4E-04
				Benzene	3.5E+00	ug/l	4.3E-09	mg/kg/day	5.5E-02	(mg/kg/day)$^{-1}$	2.4E-10	3.0E-07	mg/kg/day	4.0E-03	mg/kg/day	7.5E-05
				Chlorobenzene	8.5E+01	ug/l	1.0E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	7.3E-06	mg/kg/day	2.0E-02	mg/kg/day	3.6E-04
				Cis-1,2-Dichloroethene	1.6E+02	ug/l	1.9E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.3E-05	mg/kg/day	2.0E-03	mg/kg/day	6.7E-03
				Ethylbenzene	4.2E+00	ug/l	5.2E-09	mg/kg/day	1.1E-02	(mg/kg/day)$^{-1}$	5.7E-11	3.6E-07	mg/kg/day	1.0E-01	mg/kg/day	3.6E-06

Table 7-7.2

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Groundwater - Landfill	Groundwater - Landfill			Methylene Chloride	1.7E+01	ug/l	2.1E-08	mg/kg/day	2.0E-03	$(mg/kg/day)^{-1}$	4.2E-11	1.5E-06	mg/kg/day	6.0E-03	mg/kg/day	2.4E-04
				Trichloroethene	4.7E+00	ug/l	4.6E-09	mg/kg/day	4.6E-02	$(mg/kg/day)^{-1}$	2.1E-10	4.0E-07	mg/kg/day	5.0E-04	mg/kg/day	8.0E-04
				Vinyl Chloride	2.2E+01	ug/l	2.7E-08	mg/kg/day	7.2E-01	$(mg/kg/day)^{-1}$	1.9E-08	1.9E-06	mg/kg/day	3.0E-03	mg/kg/day	6.3E-04
				Xylenes, Total	4.4E+01	ug/l	5.4E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.8E-06	mg/kg/day	2.0E-01	mg/kg/day	1.9E-05
			Exp. Route Total								1.9E-07					1.0E-01
		Groundwater - Landfill	Dermal Contact	Arsenic	5.6E+01	ug/l	3.0E-09	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	4.5E-09	2.1E-07	mg/kg/day	3.0E-04	mg/kg/day	7.0E-04
				Barium	5.9E+02	ug/l	3.2E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.2E-06	mg/kg/day	1.4E-02	mg/kg/day	1.6E-04
				Cadmium	8.8E-01	ug/l	4.8E-11	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.3E-09	mg/kg/day	2.5E-05	mg/kg/day	1.3E-04
				Chromium	2.5E+01	ug/l	2.7E-09	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	5.5E-08	1.9E-07	mg/kg/day	7.5E-05	mg/kg/day	2.5E-03
				Cobalt	1.7E+01	ug/l	3.6E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.5E-08	mg/kg/day	3.0E-04	mg/kg/day	8.5E-05
				Iron	3.1E+04	ug/l	1.6E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.2E-04	mg/kg/day	7.0E-01	mg/kg/day	1.6E-04
				Lead	9.0E+00	ug/l	4.9E-11	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.4E-09	mg/kg/day	---	mg/kg/day	---
				Manganese	2.3E+03	ug/l	1.3E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.8E-06	mg/kg/day	9.6E-04	mg/kg/day	9.2E-03
				Mercury	1.5E-01	ug/l	8.1E-12	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.7E-10	mg/kg/day	2.1E-05	mg/kg/day	2.7E-05
				Nickel	5.3E+01	ug/l	5.7E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.0E-08	mg/kg/day	8.0E-04	mg/kg/day	5.0E-05
				Thallium	6.7E+00	ug/l	3.6E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.5E-08	mg/kg/day	1.0E-05	mg/kg/day	2.5E-03
				Vanadium	2.1E+01	ug/l	1.1E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.9E-08	mg/kg/day	1.3E-04	mg/kg/day	6.1E-04
				Aldrin	1.2E-02	ug/l	3.6E-09	mg/kg/day	1.7E+01	$(mg/kg/day)^{-1}$	6.1E-08	2.5E-07	mg/kg/day	3.0E-05	mg/kg/day	8.3E-03
				Beta-BHC	5.7E-02	ug/l	6.6E-10	mg/kg/day	1.8E+00	$(mg/kg/day)^{-1}$	1.2E-09	4.6E-08	mg/kg/day	---	mg/kg/day	---
				Delta-BHC	3.4E-02	ug/l	6.4E-10	mg/kg/day	1.8E+00	$(mg/kg/day)^{-1}$	1.2E-09	4.5E-08	mg/kg/day	---	mg/kg/day	---
				Gamma-Chlordane	2.5E-02	ug/l	3.6E-09	mg/kg/day	3.5E-01	$(mg/kg/day)^{-1}$	1.3E-09	2.6E-07	mg/kg/day	5.0E-04	mg/kg/day	5.1E-04
				Heptachlor	4.4E-02	ug/l	5.4E-09	mg/kg/day	4.5E+00	$(mg/kg/day)^{-1}$	2.4E-08	3.8E-07	mg/kg/day	5.0E-04	mg/kg/day	7.5E-04
				Heptachlor Epoxide	2.4E-02	ug/l	4.7E-10	mg/kg/day	9.1E+00	$(mg/kg/day)^{-1}$	4.3E-09	3.3E-08	mg/kg/day	1.3E-05	mg/kg/day	2.5E-03
				1,4-Dioxane	3.7E+02	ug/l	2.1E-08	mg/kg/day	1.0E-01	$(mg/kg/day)^{-1}$	2.1E-09	1.5E-06	mg/kg/day	3.0E-02	mg/kg/day	4.9E-05
				2-Methylnaphthalene	2.7E+01	ug/l	6.0E-07	mg/kg/day	---	$(mg/kg/day)^{-0}$	---	4.2E-05	mg/kg/day	4.0E-03	mg/kg/day	1.0E-02
				Acenaphthene	2.1E+01	ug/l	4.8E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.4E-05	mg/kg/day	6.0E-02	mg/kg/day	5.6E-04
				Benzo(A)Anthracene	3.3E-01	ug/l	7.7E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	5.6E-08	5.4E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E-01	ug/l	7.4E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	5.4E-07	5.2E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	2.9E-01	ug/l	5.9E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-08	4.2E-06	mg/kg/day	---	mg/kg/day	---
				Biphenyl	6.6E+00	ug/l	1.6E-07	mg/kg/day	8.0E-03	$(mg/kg/day)^{-1}$	1.3E-09	1.1E-05	mg/kg/day	5.0E-01	mg/kg/day	2.3E-05
				Carbazole	6.8E+00	ug/l	8.1E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.7E-06	mg/kg/day	---	mg/kg/day	---
				Dibenzofuran	1.1E+01	ug/l	3.1E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.2E-05	mg/kg/day	1.0E-03	mg/kg/day	2.2E-02
				Fluorene	1.3E+01	ug/l	3.9E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.7E-05	mg/kg/day	4.0E-02	mg/kg/day	6.8E-04
				Naphthalene	1.1E+02	ug/l	1.1E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.6E-05	mg/kg/day	2.0E-02	mg/kg/day	3.8E-03
				Phenanthrene	3.4E+01	ug/l	2.4E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.7E-04	mg/kg/day	3.0E-02	mg/kg/day	5.7E-03
				1,1,2,2-Tetrachloroethane	2.0E-01	ug/l	4.0E-10	mg/kg/day	2.0E-01	$(mg/kg/day)^{-1}$	7.9E-11	2.8E-08	mg/kg/day	2.0E-02	mg/kg/day	1.4E-06
				1,1-Dichloroethene	6.0E+00	ug/l	1.3E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.9E-07	mg/kg/day	5.0E-02	mg/kg/day	1.8E-05
				1,2-Dichloroethane	1.4E+00	ug/l	1.1E-09	mg/kg/day	9.1E-02	$(mg/kg/day)^{-1}$	9.8E-11	7.6E-08	mg/kg/day	6.0E-03	mg/kg/day	1.3E-05
				1,4-Dichlorobenzene	6.8E-01	ug/l	7.7E-09	mg/kg/day	5.4E-03	$(mg/kg/day)^{-1}$	4.2E-11	5.4E-07	mg/kg/day	7.0E-02	mg/kg/day	7.7E-06

Table 7-7.2

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				Hazard Quotient
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
				2-Hexanone	8.2E+00	ug/l	5.4E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.8E-07	mg/kg/day	5.0E-03	mg/kg/day	7.5E-05
				Benzene	3.5E+00	ug/l	8.3E-09	mg/kg/day	5.5E-02	$(mg/kg/day)^{-2}$	4.6E-10	5.8E-07	mg/kg/day	4.0E-03	mg/kg/day	1.5E-04
				Chlorobenzene	8.5E+01	ug/l	4.8E-07	mg/kg/day	---	$(mg/kg/day)^{-3}$	---	3.4E-05	mg/kg/day	2.0E-02	mg/kg/day	1.7E-03
				Cis-1,2-Dichloroethene	1.6E+02	ug/l	3.1E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.2E-05	mg/kg/day	2.0E-03	mg/kg/day	1.1E-02
				Ethylbenzene	4.2E+00	ug/l	4.0E-08	mg/kg/day	1.1E-02	$(mg/kg/day)^{-1}$	4.4E-10	2.8E-06	mg/kg/day	1.0E-01	mg/kg/day	2.8E-05
				Methylene Chloride	1.7E+01	ug/l	1.0E-08	mg/kg/day	2.0E-03	$(mg/kg/day)^{-1}$	2.0E-11	7.1E-07	mg/kg/day	6.0E-03	mg/kg/day	1.2E-04
				Trichloroethene	4.7E+00	ug/l	9.8E-09	mg/kg/day	4.6E-02	$(mg/kg/day)^{-1}$	4.5E-10	8.5E-07	mg/kg/day	5.0E-04	mg/kg/day	1.7E-03
				Vinyl Chloride	2.2E+01	ug/l	2.7E-08	mg/kg/day	7.2E-01	$(mg/kg/day)^{-1}$	1.9E-08	1.9E-06	mg/kg/day	3.0E-03	mg/kg/day	6.2E-04
				Xylenes, Total	4.4E+01	ug/l	4.2E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.0E-05	mg/kg/day	2.0E-01	mg/kg/day	1.5E-04
			Exp. Route Total								7.9E-07					7.1E-02
Groundwater - Landfill	Ambient Air	Ambient Air	Inhalation	1,1-Dichloroethene	3.6E-04	ug/m^3	1.2E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	8.2E-08	mg/m^3	2.0E-01	mg/m^3	4.1E-07
				1,1,2,2-Tetrachloroethane	5.8E-07	ug/m^3	1.9E-09	ug/m^3	5.8E-05	$(ug/m^3)^{-1}$	1.1E-13	1.3E-10	mg/m^3	---	mg/m^3	---
				1,2-Dichloroethane	8.5E-06	ug/m^3	2.8E-08	ug/m^3	2.6E-05	$(ug/m^3)^{-1}$	7.2E-13	1.9E-09	mg/m^3	7.0E-03	mg/m^3	2.8E-07
				1,4-Dichlorobenzene	4.7E-06	ug/m^3	1.5E-08	ug/m^3	1.1E-05	$(ug/m^3)^{-1}$	1.7E-13	1.1E-09	mg/m^3	8.0E-01	mg/m^3	1.3E-09
				Benzene	5.6E-05	ug/m^3	1.8E-07	ug/m^3	7.8E-06	$(ug/m^3)^{-1}$	1.4E-12	1.3E-08	mg/m^3	3.0E-02	mg/m^3	4.2E-07
				2-Hexanone	9.8E-06	ug/m^3	3.2E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.2E-09	mg/m^3	3.0E-02	mg/m^3	7.5E-08
				Chlorobenzene	7.9E-04	ug/m^3	2.6E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.8E-07	mg/m^3	5.0E-02	mg/m^3	3.6E-06
				Ethylbenzene	7.2E-05	ug/m^3	2.3E-07	ug/m^3	2.5E-06	$(ug/m^3)^{-1}$	5.8E-13	1.6E-08	mg/m^3	1.0E+00	mg/m^3	1.6E-08
				Methylene Chloride	2.1E-04	ug/m^3	6.7E-07	ug/m^3	1.0E-08	$(ug/m^3)^{-1}$	6.7E-15	4.7E-08	mg/m^3	6.0E-01	mg/m^3	7.9E-08
				Trichloroethene	9.8E-05	ug/m^3	3.2E-07	ug/m^3	4.1E-06	$(ug/m^3)^{-1}$	1.3E-12	2.2E-08	mg/m^3	2.0E-03	mg/m^3	1.1E-05
				Vinyl Chloride	1.7E-03	ug/m^3	5.4E-06	ug/m^3	4.4E-06	$(ug/m^3)^{-1}$	2.4E-11	3.8E-07	mg/m^3	1.0E-01	mg/m^3	3.8E-06
				Xylenes, Total	6.5E-04	ug/m^3	2.1E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.5E-07	mg/m^3	1.0E-01	mg/m^3	1.5E-06
				1,4-Dioxane	3.1E-05	ug/m^3	1.0E-07	ug/m^3	5.0E-06	$(ug/m^3)^{-1}$	5.0E-13	7.0E-09	mg/m^3	3.0E-02	mg/m^3	2.3E-07
				Biphenyl	1.6E-05	ug/m^3	5.2E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	3.6E-09	mg/m^3	4.0E-04	mg/m^3	9.1E-06
				Naphthalene	3.2E-04	ug/m^3	1.0E-06	ug/m^3	3.4E-05	$(ug/m^3)^{-1}$	3.6E-11	7.3E-08	mg/m^3	3.0E-03	mg/m^3	2.4E-05
				Aldrin	7.4E-09	ug/m^3	2.4E-11	ug/m^3	4.9E-03	$(ug/m^3)^{-1}$	1.2E-13	1.7E-12	mg/m^3	---	mg/m^3	---
				Heptachlor	8.5E-08	ug/m^3	2.8E-10	ug/m^3	1.3E-03	$(ug/m^3)^{-1}$	3.6E-13	1.9E-11	mg/m^3	---	mg/m^3	---
				Heptachlor Epoxide	7.8E-09	ug/m^3	2.5E-11	ug/m^3	2.6E-03	$(ug/m^3)^{-1}$	6.6E-14	1.8E-12	mg/m^3	---	mg/m^3	---
				Mercury	1.5E-06	ug/m^3	4.8E-09	ug/m^3	---	$(ug/m^3)^{-1}$	---	3.4E-10	mg/m^3	3.0E-04	mg/m^3	1.1E-06
			Exp. Route Total								6.5E-11					5.6E-05
		Exposure Point Total									9.8E-07					1.8E-01
	Exposure Medium Total										9.8E-07					1.8E-01
Medium and Receptor Total											9.8E-07					1.8E-01

Golder Associates

Table 7-7.3

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Ingestion	Aluminum	1.8E+04	mg/kg	7.2E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.1E-02	mg/kg/day	1.0E+00	mg/kg/day	5.1E-02
				Antimony	1.5E+00	mg/kg	6.1E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.3E-06	mg/kg/day	4.0E-04	mg/kg/day	1.1E-02
				Arsenic	2.9E+01	mg/kg	7.1E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-06	5.0E-05	mg/kg/day	3.0E-04	mg/kg/day	1.7E-01
				Chromium	5.7E+01	mg/kg	2.3E-06	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	1.2E-06	1.6E-04	mg/kg/day	3.0E-03	mg/kg/day	5.4E-02
				Cobalt	1.1E+01	mg/kg	4.6E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.2E-05	mg/kg/day	3.0E-04	mg/kg/day	1.1E-01
				Iron	2.9E+04	mg/kg	1.2E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.3E-02	mg/kg/day	7.0E-01	mg/kg/day	1.2E-01
				Manganese	4.5E+02	mg/kg	1.8E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.3E-03	mg/kg/day	1.4E-01	mg/kg/day	9.0E-03
				Thallium	1.0E+00	mg/kg	4.0E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.8E-06	mg/kg/day	1.0E-05	mg/kg/day	2.8E-01
				Vanadium	6.6E+01	mg/kg	2.7E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.9E-04	mg/kg/day	5.0E-03	mg/kg/day	3.7E-02
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	7.1E-13	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	9.2E-08	5.0E-11	mg/kg/day	7.0E-10	mg/kg/day	7.1E-02
				Aroclor 1248	3.9E+03	ug/kg	1.6E-07	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	3.1E-07	1.1E-05	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	7.8E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	1.6E-08	5.4E-07	mg/kg/day	2.0E-05	mg/kg/day	2.7E-02
				Aroclor 1260	9.3E+01	ug/kg	3.7E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	7.5E-09	2.6E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	1.3E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	9.7E-09	9.3E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	8.3E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	6.1E-08	5.8E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	2.9E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-08	2.0E-06	mg/kg/day	---	mg/kg/day	---
				Carbazole	5.8E+01	ug/kg	2.3E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.6E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	2.4E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-08	1.7E-07	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	5.3E-09	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	3.9E-09	3.7E-07	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								2.8E-06					9.3E-01
			Dermal	Aluminum	1.8E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	1.5E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	2.9E+01	mg/kg	1.1E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.7E-07	8.0E-06	mg/kg/day	3.0E-04	mg/kg/day	2.7E-02
				Chromium	5.7E+01	mg/kg	---	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	1.1E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Iron	2.9E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Manganese	4.5E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Thallium	1.0E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E-05	mg/kg/day	---
				Vanadium	6.6E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	6.8E-14	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	8.9E-09	4.8E-12	mg/kg/day	7.0E-10	mg/kg/day	6.8E-03
				Aroclor 1248	3.9E+03	ug/kg	7.1E-08	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	1.4E-07	4.9E-06	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	3.5E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	7.0E-09	2.4E-07	mg/kg/day	2.0E-05	mg/kg/day	1.2E-02
				Aroclor 1260	9.3E+01	ug/kg	1.7E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	3.4E-09	1.2E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	5.5E-09	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.0E-09	3.9E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	3.5E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-08	2.4E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	1.2E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	8.7E-09	8.4E-07	mg/kg/day	---	mg/kg/day	---
				Carbazole	5.8E+01	ug/kg	7.5E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.3E-08	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	1.0E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	7.3E-09	7.0E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	2.2E-09	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.6E-09	1.6E-07	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								3.8E-07					4.6E-02

Golder Associates

Table 7-7.3

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Fugitive Dust and Volatiles- Annex	Inhalation	Aluminum	3.9E-02	ug/m^3	1.3E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	8.8E-06	mg/m^3	5.0E-03	mg/m^3	1.8E-03
				Antimony	3.3E-06	ug/m^3	1.1E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---	7.5E-10	mg/m^3	---	mg/m^3	---
				Arsenic	6.3E-05	ug/m^3	2.1E-07	ug/m^3	4.3E-03	(ug/m^3)$^{-1}$	8.8E-10	1.4E-08	mg/m^3	1.5E-05	mg/m^3	9.6E-04
				Beryllium	4.1E-06	ug/m^3	1.3E-08	ug/m^3	2.4E-03	(ug/m^3)$^{-1}$	3.2E-11	9.3E-10	mg/m^3	2.0E-05	mg/m^3	4.7E-05
				Cadmium	2.4E-06	ug/m^3	7.8E-09	ug/m^3	1.8E-03	(ug/m^3)$^{-1}$	1.4E-11	5.5E-10	mg/m^3	1.0E-05	mg/m^3	5.5E-05
				Chromium	1.2E-04	ug/m^3	4.0E-07	ug/m^3	8.4E-02	(ug/m^3)$^{-1}$	3.4E-08	2.8E-08	mg/m^3	1.0E-04	mg/m^3	2.8E-04
				Cobalt	2.4E-05	ug/m^3	8.0E-08	ug/m^3	9.0E-03	(ug/m^3)$^{-1}$	7.2E-10	5.6E-09	mg/m^3	6.0E-06	mg/m^3	9.3E-04
				Iron	6.3E-02	ug/m^3	2.1E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.4E-05	mg/m^3	---	mg/m^3	---
				Manganese	9.6E-04	ug/m^3	3.1E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.2E-07	mg/m^3	5.0E-05	mg/m^3	4.4E-03
				Thallium	2.1E-06	ug/m^3	7.0E-09	ug/m^3	---	(ug/m^3)$^{-1}$	---	4.9E-10	mg/m^3	---	mg/m^3	---
				Vanadium	1.4E-04	ug/m^3	4.6E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	3.2E-08	mg/m^3	1.0E-04	mg/m^3	3.2E-04
				2,3,7,8-TCDD Equivalents	1.2E-08	ug/m^3	3.8E-11	ug/m^3	3.8E+01	(ug/m^3)$^{-1}$	1.4E-09	2.7E-12	mg/m^3	4.0E-08	mg/m^3	6.6E-05
				Aroclor 1248	8.1E-03	ug/m^3	2.6E-05	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	1.5E-08	1.8E-06	mg/m^3	---	mg/m^3	---
				Aroclor 1254	2.9E-04	ug/m^3	9.6E-07	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	5.5E-10	6.7E-08	mg/m^3	---	mg/m^3	---
				Aroclor 1260	9.1E-05	ug/m^3	3.0E-07	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	1.7E-10	2.1E-08	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	9.7E-05	ug/m^3	3.2E-07	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	3.5E-11	2.2E-08	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	4.4E-07	ug/m^3	1.4E-09	ug/m^3	1.1E-03	(ug/m^3)$^{-1}$	1.6E-12	1.0E-10	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	1.5E-06	ug/m^3	5.0E-09	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	5.5E-13	3.5E-10	mg/m^3	---	mg/m^3	---
				Carbazole	1.2E-07	ug/m^3	4.1E-10	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.9E-11	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	1.3E-07	ug/m^3	4.2E-10	ug/m^3	1.2E-03	(ug/m^3)$^{-1}$	5.0E-13	2.9E-11	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	2.8E-07	ug/m^3	9.3E-10	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	1.0E-13	6.5E-11	mg/m^3	---	mg/m^3	---
			Exp. Route Total								5.3E-08					8.8E-03
		Exposure Point Total									3.2E-06					9.9E-01
	Exposure Medium Total										3.2E-06					9.9E-01
Medium and Receptor Total											3.2E-06					9.9E-01

Notes:

a - For the inhalation pathway, the air concentration is calculated from the soil concentration in Table 4e of Appendix T.

Golder Associates

Table 7-7.4

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Ingestion	Aluminum	2E+04	mg/kg	6.3E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.4E-02	mg/kg/day	1.0E+00	mg/kg/day	4.4E-02
				Antimony	3E+00	mg/kg	1.2E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.1E-06	mg/kg/day	4.0E-04	mg/kg/day	2.0E-02
				Arsenic	1E+01	mg/kg	2.4E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	3.6E-07	1.7E-05	mg/kg/day	3.0E-04	mg/kg/day	5.7E-02
				Beryllium	9E+00	mg/kg	3.8E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.7E-05	mg/kg/day	2.0E-03	mg/kg/day	1.3E-02
				Cadmium	2E+00	mg/kg	9.0E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.3E-06	mg/kg/day	1.0E-03	mg/kg/day	6.3E-03
				Chromium	6E+01	mg/kg	2.4E-06	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	1.2E-06	1.7E-04	mg/kg/day	3.0E-03	mg/kg/day	5.5E-02
				Cobalt	3E+01	mg/kg	1.2E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.6E-05	mg/kg/day	3.0E-04	mg/kg/day	2.9E-01
				Copper	2E+03	mg/kg	6.1E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.2E-03	mg/kg/day	4.0E-02	mg/kg/day	1.1E-01
				Iron	5E+04	mg/kg	2.1E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.5E-01	mg/kg/day	7.0E-01	mg/kg/day	2.1E-01
				Lead	8E+02	mg/kg	3.3E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.3E-03	mg/kg/day	---	mg/kg/day	---
				Manganese	2E+03	mg/kg	6.7E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.7E-03	mg/kg/day	1.4E-01	mg/kg/day	3.4E-02
				Mercury	2E+00	mg/kg	9.8E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.8E-06	mg/kg/day	3.0E-04	mg/kg/day	2.3E-02
				Nickel	2E+02	mg/kg	9.0E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.3E-04	mg/kg/day	2.0E-02	mg/kg/day	3.2E-02
				Vanadium	5E+01	mg/kg	2.0E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.4E-04	mg/kg/day	5.0E-03	mg/kg/day	2.7E-02
				Zinc	3E+03	mg/kg	1.3E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	9.0E-03	mg/kg/day	3.0E-01	mg/kg/day	3.0E-02
				2,3,7,8-TCDD Equivalents	2E-01	ug/kg	7.1E-12	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	9.3E-07	5.0E-10	mg/kg/day	7.0E-10	mg/kg/day	7.1E-01
				Dieldrin	3E+01	ug/kg	1.1E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	1.7E-08	7.6E-08	mg/kg/day	5.0E-05	mg/kg/day	1.5E-03
				Benzo(A)Anthracene	1E+03	ug/kg	4.7E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	3.4E-08	3.3E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1E+03	ug/kg	4.1E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	3.0E-07	2.8E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1E+03	ug/kg	4.3E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	3.1E-08	3.0E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1E+03	ug/kg	4.0E-08	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	2.9E-09	2.8E-06	mg/kg/day	---	mg/kg/day	---
				Carbazole	1E+02	ug/kg	4.8E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.3E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	2E+02	ug/kg	6.4E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	4.7E-08	4.5E-07	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	4E+02	ug/kg	1.5E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-08	1.1E-06	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9E+03	ug/kg	3.7E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.6E-05	mg/kg/day	2.0E-02	mg/kg/day	1.3E-03
			Exp. Route Total								2.9E-06					1.7E+00
			Dermal	Aluminum	1.6E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	2.9E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	1.0E+01	mg/kg	3.9E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	5.8E-08	2.7E-06	mg/kg/day	3.0E-04	mg/kg/day	9.1E-03
				Beryllium	9.4E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-05	mg/kg/day	---
				Cadmium	2.2E+00	mg/kg	2.9E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.0E-08	mg/kg/day	2.5E-05	mg/kg/day	8.1E-04
				Chromium	5.8E+01	mg/kg	---	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	3.0E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Copper	1.5E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	4.0E-02	mg/kg/day	---
				Iron	5.2E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Lead	8.3E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	---	mg/kg/day	---
				Manganese	1.7E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Mercury	2.4E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	2.1E-05	mg/kg/day	---

Table 7-7.4

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Dermal	Nickel	2.2E+02	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	8.0E-04	mg/kg/day	---
				Vanadium	4.8E+01	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				Zinc	3.2E+03	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	3.0E-01	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	6.9E-13	mg/kg/day	1.3E+05	(mg/kg/day)$^{-1}$	8.9E-08	4.8E-11	mg/kg/day	7.0E-10	mg/kg/day	6.9E-02
				Dieldrin	2.7E+01	ug/kg	3.5E-10	mg/kg/day	1.6E+01	(mg/kg/day)$^{-1}$	5.6E-09	2.4E-08	mg/kg/day	5.0E-05	mg/kg/day	4.9E-04
				Benzo(A)Anthracene	1.2E+03	ug/kg	2.0E-08	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	1.4E-08	1.4E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1.0E+03	ug/kg	1.7E-08	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	1.2E-07	1.2E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	1.8E-08	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	1.3E-08	1.3E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	1.7E-08	mg/kg/day	7.3E-02	(mg/kg/day)$^{-1}$	1.2E-09	1.2E-06	mg/kg/day	---	mg/kg/day	---
				Carbazole	1.2E+02	ug/kg	1.5E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.1E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	2.7E-09	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	1.9E-08	1.9E-07	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	6.3E-09	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	4.6E-09	4.4E-07	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9.1E+03	ug/kg	1.5E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.1E-05	mg/kg/day	2.0E-02	mg/kg/day	5.3E-04
			Exp. Route Total								3.3E-07					8.0E-02
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Fugitive Dusts and Volatiles - Landfill	Inhalation	Aluminum	3.9E-02	ug/m^3	1.3E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	9.0E-06	mg/m^3	5E-03	mg/m^3	1.8E-03
				Antimony	7.1E-06	ug/m^3	2.3E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.6E-09	mg/m^3	---	mg/m^3	---
				Arsenic	2.5E-05	ug/m^3	8.2E-08	ug/m^3	4E-03	(ug/m^3)$^{-1}$	3.5E-10	5.7E-09	mg/m^3	2E-05	mg/m^3	3.8E-04
				Beryllium	2.4E-05	ug/m^3	7.7E-08	ug/m^3	2E-03	(ug/m^3)$^{-1}$	1.8E-10	5.4E-09	mg/m^3	2E-05	mg/m^3	2.7E-04
				Cadmium	5.6E-06	ug/m^3	1.8E-08	ug/m^3	2E-03	(ug/m^3)$^{-1}$	3.3E-11	1.3E-09	mg/m^3	1E-05	mg/m^3	1.3E-04
				Chromium	1.5E-04	ug/m^3	4.8E-07	ug/m^3	8E-02	(ug/m^3)$^{-1}$	4.0E-08	3.3E-08	mg/m^3	1E-04	mg/m^3	3.3E-04
				Cobalt	7.6E-05	ug/m^3	2.5E-07	ug/m^3	9E-03	(ug/m^3)$^{-1}$	2.2E-09	1.7E-08	mg/m^3	6E-06	mg/m^3	2.9E-03
				Copper	3.8E-03	ug/m^3	1.2E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---	8.6E-07	mg/m^3	---	mg/m^3	---
				Iron	1.3E-01	ug/m^3	4.2E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	3.0E-05	mg/m^3	---	mg/m^3	---
				Lead	2.1E-03	ug/m^3	6.8E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	4.7E-07	mg/m^3	---	mg/m^3	---
				Manganese	4.2E-03	ug/m^3	1.4E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---	9.5E-07	mg/m^3	5E-05	mg/m^3	1.9E-02
				Mercury	6.1E-06	ug/m^3	2.0E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.4E-09	mg/m^3	3E-04	mg/m^3	4.6E-06
				Nickel	5.6E-04	ug/m^3	1.8E-06	ug/m^3	3E-04	(ug/m^3)$^{-1}$	4.7E-10	1.3E-07	mg/m^3	9E-05	mg/m^3	1.4E-03
				Vanadium	1.2E-04	ug/m^3	3.9E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.8E-08	mg/m^3	1E-04	mg/m^3	2.8E-04
				Zinc	7.9E-03	ug/m^3	2.6E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.8E-06	mg/m^3	---	mg/m^3	---
				2,3,7,8-TCDD Equivalents	3.2E-07	ug/m^3	1.0E-09	ug/m^3	4E+01	(ug/m^3)$^{-1}$	3.9E-08	7.2E-11	mg/m^3	4E-08	mg/m^3	1.8E-03
				Dieldrin	6.7E-08	ug/m^3	2.2E-10	ug/m^3	5E-03	(ug/m^3)$^{-1}$	1.0E-12	1.5E-11	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	1.1E-03	ug/m^3	3.7E-06	ug/m^3	1E-04	(ug/m^3)$^{-1}$	4.1E-10	2.6E-07	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	2.5E-06	ug/m^3	8.2E-09	ug/m^3	1E-03	(ug/m^3)$^{-1}$	9.0E-12	5.7E-10	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	2.7E-06	ug/m^3	8.7E-09	ug/m^3	1E-04	(ug/m^3)$^{-1}$	9.6E-13	6.1E-10	mg/m^3	---	mg/m^3	---
				Benzo(K)Fluoranthene	2.5E-06	ug/m^3	8.1E-09	ug/m^3	1E-04	(ug/m^3)$^{-1}$	9.0E-13	5.7E-10	mg/m^3	---	mg/m^3	---

Golder Associates

Table 7-7.4

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Fugitive Dusts - Landfill	Inhalation	Carbazole	3.0E-07	ug/m^3	9.7E-10	ug/m^3	---	$(ug/m^3)^{-1}$	---	6.8E-11	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	4.0E-07	ug/m^3	1.3E-09	ug/m^3	1E-03	$(ug/m^3)^{-1}$	1.6E-12	9.1E-11	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	9.5E-07	ug/m^3	3.1E-09	ug/m^3	1E-04	$(ug/m^3)^{-1}$	3.4E-13	2.2E-10	mg/m^3	---	mg/m^3	---
				Naphthalene	1.6E-02	ug/m^3	5.3E-05	ug/m^3	3E-05	$(ug/m^3)^{-1}$	1.8E-09	3.7E-06	mg/m^3	3E-03	mg/m^3	1.2E-03
			Exp. Route Total								8.5E-08					3.0E-02
		Exposure Point Total									3.3E-06					1.8E+00
	Exposure Medium Total										3.3E-06					1.8E+00
Medium and Receptor Total											3.3E-06					1.8E+00

Notes:

a - For the inhalation pathway, the air concentration is calculated from the soil concentration in Table 4e of Appendix T.

Table 7-7.5

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Seep Liquid - Annex	Seep Liquid - Annex	Seep Liquid - Annex	Dermal	Aluminum	3.1E+04	ug/l	1.0E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.0E-05	mg/kg/day	1.0E+00	mg/kg/day	7.0E-05
				Arsenic	3.5E+01	ug/l	1.1E-09	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.7E-09	7.8E-08	mg/kg/day	3.0E-04	mg/kg/day	2.6E-04
				Chromium	7.4E+01	ug/l	4.8E-09	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	9.6E-08	3.4E-07	mg/kg/day	7.5E-05	mg/kg/day	4.5E-03
				Cobalt	2.5E+01	ug/l	3.2E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.3E-08	mg/kg/day	3.0E-04	mg/kg/day	7.6E-05
				Iron	5.2E+04	ug/l	1.7E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.2E-04	mg/kg/day	7.0E-01	mg/kg/day	1.7E-04
				Lead	3.5E+02	ug/l	1.1E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.9E-08	mg/kg/day	---	mg/kg/day	---
				Manganese	1.3E+03	ug/l	4.1E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.9E-06	mg/kg/day	9.6E-04	mg/kg/day	3.0E-03
				Naphthalene	5.0E+00	ug/l	3.1E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.2E-06	mg/kg/day	2.0E-02	mg/kg/day	1.1E-04
				Vanadium	9.5E+01	ug/l	3.1E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.2E-07	mg/kg/day	1.3E-04	mg/kg/day	1.7E-03
				Benzene	1.6E-01	ug/l	2.3E-10	mg/kg/day	5.5E-02	$(mg/kg/day)^{-1}$	1.3E-11	1.6E-08	mg/kg/day	4.0E-03	mg/kg/day	4.0E-06
				Vinyl Chloride	8.2E-01	ug/l	6.0E-10	mg/kg/day	7.2E-01	$(mg/kg/day)^{-1}$	4.3E-10	4.2E-08	mg/kg/day	3.0E-03	mg/kg/day	1.4E-05
			Exp. Route Total								9.8E-08					9.8E-03
		Exposure Point Total									9.8E-08					9.8E-03
	Exposure Medium Total										9.8E-08					9.8E-03
Medium and Receptor Total											9.8E-08					9.8E-03

Table 7-7.6

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Leachate Liquid - Landfill	Leachate Liquid - Landfill	Surface Leachate - Landfill	Dermal	Arsenic	1.7E+01	ug/l	5.2E-10	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	7.9E-10	3.7E-08	mg/kg/day	3.0E-04	mg/kg/day	1.2E-04
				Chromium	5.4E+01	ug/l	3.5E-09	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	7.0E-08	2.5E-07	mg/kg/day	7.5E-05	mg/kg/day	3.3E-03
				Cobalt	1.2E+01	ug/l	1.6E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.1E-08	mg/kg/day	3.0E-04	mg/kg/day	3.7E-05
				Iron	4.7E+04	ug/l	1.5E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.0E-04	mg/kg/day	7.0E-01	mg/kg/day	1.5E-04
				Lead	2.5E+02	ug/l	7.7E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.4E-08	mg/kg/day	---	mg/kg/day	---
				Manganese	1.6E+03	ug/l	5.3E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.7E-06	mg/kg/day	9.6E-04	mg/kg/day	3.8E-03
				Aldrin	2.4E-02	ug/l	4.3E-09	mg/kg/day	1.7E+01	$(mg/kg/day)^{-1}$	7.3E-08	3.0E-07	mg/kg/day	3.0E-05	mg/kg/day	1.0E-02
				Dieldrin	9.0E-02	ug/l	1.5E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	2.4E-08	1.1E-07	mg/kg/day	5.0E-05	mg/kg/day	2.1E-03
			Exp. Route Total								1.7E-07					2.0E-02
		Exposure Point Total									1.7E-07					2.0E-02
	Exposure Medium Total										1.7E-07					2.0E-02
Medium and Receptor Total											1.7E-07					2.0E-02

Table 7-7.7

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Ambient Air in Trench	Ambient Air in Trench	Inhalation - Trench	1,2-Dichloroethane	6.6E-01	ug/m^3	2.6E-04	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	6.7E-09	1.8E-05	mg/m^3	7.0E-03	mg/m^3	2.6E-03
				1,4-Dichlorobenzene	1.9E-02	ug/m^3	7.3E-06	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	8.0E-11	5.1E-07	mg/m^3	8.0E-01	mg/m^3	6.4E-07
				Benzene	6.5E-02	ug/m^3	2.6E-05	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	2.0E-10	1.8E-06	mg/m^3	3.0E-02	mg/m^3	6.0E-05
				Chlorobenzene	7.5E-01	ug/m^3	2.9E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.0E-05	mg/m^3	5.0E-02	mg/m^3	4.1E-04
				Trichloroethene	4.4E-02	ug/m^3	1.7E-05	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	7.0E-11	1.2E-06	mg/m^3	2.0E-03	mg/m^3	6.0E-04
				Vinyl Chloride	4.4E-01	ug/m^3	1.7E-04	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	7.6E-10	1.2E-05	mg/m^3	1.0E-01	mg/m^3	1.2E-04
				1,4-Dioxane	2.4E-03	ug/m^3	9.3E-07	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	4.6E-12	6.5E-08	mg/m^3	3.0E-02	mg/m^3	2.2E-06
				Naphthalene	1.1E-01	ug/m^3	4.2E-05	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	1.4E-09	3.0E-06	mg/m^3	3.0E-03	mg/m^3	9.9E-04
				Heptachlor	1.3E-04	ug/m^3	5.1E-08	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	6.7E-11	3.6E-09	mg/m^3	---	mg/m^3	---
			Exp. Route Total								9.0E-09					4.7E-03
Surface Soil - Annex			Inhalation - Trench	Aroclor 1248	1.8E-03	ug/m^3	7.2E-07	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	4.1E-10	5.0E-08	mg/m^3	---	mg/m^3	---
			Exp. Route Total								4.1E-10					---
		Exposure Point Total									9.4E-09					4.7E-03
	Exposure Medium Total										9.4E-09					4.7E-03
Medium and Receptor Total											9.4E-09					4.7E-03

Golder Associates

Table 7-7.8

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater - Landfill	Ambient Air in Trench	Ambient Air in Trench	Inhalation - Trench	1,1-Dichloroethene	3.8E+00	ug/m^3	1.5E-03	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.0E-04	mg/m^3	2.0E-01	mg/m^3	5E-04
				1,1,2,2-Tetrachloroethane	1.3E-03	ug/m^3	5.2E-07	ug/m^3	5.8E-05	(ug/m^3)$^{-1}$	3E-11	3.6E-08	mg/m^3	---	mg/m^3	---
				1,2-Dichloroethane	3.8E-02	ug/m^3	1.5E-05	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	4E-10	1.1E-06	mg/m^3	7.0E-03	mg/m^3	2E-04
				1,4-Dichlorobenzene	3.1E-02	ug/m^3	1.2E-05	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	1E-10	8.4E-07	mg/m^3	8.0E-01	mg/m^3	1E-06
				Benzene	4.6E-01	ug/m^3	1.8E-04	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	1E-09	1.3E-05	mg/m^3	3.0E-02	mg/m^3	4E-04
				2-Hexanone	1.4E-02	ug/m^3	5.7E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	4.0E-07	mg/m^3	3.0E-02	mg/m^3	1E-05
				Chlorobenzene	6.2E+00	ug/m^3	2.4E-03	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.7E-04	mg/m^3	5.0E-02	mg/m^3	3E-03
				Ethylbenzene	6.7E-01	ug/m^3	2.6E-04	ug/m^3	2.5E-06	(ug/m^3)$^{-1}$	7E-10	1.8E-05	mg/m^3	1.0E+00	mg/m^3	2E-05
				Trichloroethene	1.0E+00	ug/m^3	3.0E-04	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	1E-09	2.8E-05	mg/m^3	2.0E-03	mg/m^3	1E-02
				Vinyl Chloride	1.7E+01	ug/m^3	6.6E-03	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	3E-08	4.6E-04	mg/m^3	1.0E-01	mg/m^3	5E-03
				Xylenes, Total	4.2E+00	ug/m^3	1.6E-03	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.2E-04	mg/m^3	1.0E-01	mg/m^3	1E-03
				1,4-Dioxane	4.2E-02	ug/m^3	1.6E-05	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	8E-11	1.2E-06	mg/m^3	3.0E-02	mg/m^3	4E-05
				Biphenyl	2.2E-02	ug/m^3	8.5E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	5.9E-07	mg/m^3	4.0E-04	mg/m^3	1E-03
				Naphthalene	8.1E-01	ug/m^3	3.2E-04	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	1E-08	2.2E-05	mg/m^3	3.0E-03	mg/m^3	7E-03
				Aldrin	1.3E-05	ug/m^3	4.9E-09	ug/m^3	4.9E-03	(ug/m^3)$^{-1}$	2E-11	3.4E-10	mg/m^3	---	mg/m^3	---
				Heptachlor	2.9E-04	ug/m^3	1.1E-07	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	1E-10	7.9E-09	mg/m^3	---	mg/m^3	---
				Heptachlor Epoxide	1.4E-06	ug/m^3	5.6E-10	ug/m^3	2.6E-03	(ug/m^3)$^{-1}$	1E-12	4.0E-11	mg/m^3	---	mg/m^3	---
				Mercury	8.8E-01	ug/m^3	3.4E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.4E-05	mg/m^3	3.0E-04	mg/m^3	8E-02
			Exp. Route Total								4E-08					1E-01
Surface Soil - Landfill			Inhalation - Trench	Naphthalene	9.4E-01	ug/m^3	3.7E-04	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	1E-08	2.6E-05	mg/m^3	3.0E-03	mg/m^3	9E-03
			Exp. Route Total								1E-08					9E-03
		Exposure Point Total									6E-08					1E-01
	Exposure Medium Total										6E-08					1E-01
Medium and Receptor Total											6E-08					1E-01

Table 7-7.9
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Outdoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Exposure Concentration		Unit Risk		Cancer Risk	Exposure Concentration		RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater - Annex	Ambient Air - Annex	Ambient Air - Annex	Inhalation	1,2-Dichloroethane	1.4E-04	ug/m^3	1.1E-05	ug/m^3	2.6E-05	$(ug/m^3)^{-1}$	3E-10	3.0E-08	mg/m^3	7.0E-03	mg/m^3	4.2E-06
				1,4-Dichlorobenzene	2.8E-06	ug/m^3	2.1E-07	ug/m^3	1.1E-05	$(ug/m^3)^{-1}$	2E-12	5.8E-10	mg/m^3	8.0E-01	mg/m^3	7.3E-10
				Benzene	8.0E-06	ug/m^3	5.8E-07	ug/m^3	7.8E-06	$(ug/m^3)^{-1}$	5E-12	1.6E-09	mg/m^3	3.0E-02	mg/m^3	5.4E-08
				Chlorobenzene	9.5E-05	ug/m^3	7.0E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.0E-08	mg/m^3	5.0E-02	mg/m^3	3.9E-07
				Trichloroethene	4.2E-06	ug/m^3	3.1E-07	ug/m^3	4.1E-06	$(ug/m^3)^{-1}$	1E-12	8.7E-10	mg/m^3	2.0E-03	mg/m^3	4.3E-07
				Vinyl Chloride	4.3E-05	ug/m^3	3.1E-06	ug/m^3	4.4E-06	$(ug/m^3)^{-1}$	1E-11	8.8E-09	mg/m^3	1.0E-01	mg/m^3	8.8E-08
				1,4-Dioxane	1.7E-06	ug/m^3	1.3E-07	ug/m^3	5.0E-06	$(ug/m^3)^{-1}$	6E-13	3.6E-10	mg/m^3	3.0E-02	mg/m^3	1.2E-08
				Naphthalene	4.3E-05	ug/m^3	3.2E-06	ug/m^3	3.4E-05	$(ug/m^3)^{-1}$	1E-10	8.9E-09	mg/m^3	3.0E-03	mg/m^3	3.0E-06
				Heptachlor	3.9E-08	ug/m^3	2.9E-09	ug/m^3	1.3E-03	$(ug/m^3)^{-1}$	4E-12	8.0E-12	mg/m^3	---	mg/m^3	---
			Exp. Route Total								4.1E-10					8.2E-06
		Exposure Point Total									4.1E-10					8.2E-06
	Exposure Medium Total										4.1E-10					8.2E-06
Medium and Receptor Total											4.1E-10					8.2E-06

Golder Associates

Table 7-7.10

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Outdoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Exposure Concentration		Unit Risk		Cancer Risk	Exposure Concentration		RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater - Landfill	Ambient Air - Landfill	Ambient Air - Landfill	Inhalation	1,1-Dichloroethene	3.6E-04	ug/m^3	2.6E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---	7.4E-08	mg/m^3	2.0E-01	mg/m^3	3.7E-07
				1,1,2,2-Tetrachloroethane	5.8E-07	ug/m^3	4.3E-08	ug/m^3	5.8E-05	(ug/m^3)$^{-1}$	2.5E-12	1.2E-10	mg/m^3	---	mg/m^3	---
				1,2-Dichloroethane	8.5E-06	ug/m^3	6.2E-07	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	1.6E-11	1.7E-09	mg/m^3	7.0E-03	mg/m^3	2.5E-07
				1,4-Dichlorobenzene	4.7E-06	ug/m^3	3.4E-07	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	3.8E-12	9.6E-10	mg/m^3	8.0E-01	mg/m^3	1.2E-09
				Benzene	5.6E-05	ug/m^3	4.1E-06	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	3.2E-11	1.1E-08	mg/m^3	3.0E-02	mg/m^3	3.8E-07
				2-Hexanone	9.8E-06	ug/m^3	7.2E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.0E-09	mg/m^3	3.0E-02	mg/m^3	6.7E-08
				Chlorobenzene	7.9E-04	ug/m^3	5.8E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.6E-07	mg/m^3	5.0E-02	mg/m^3	3.2E-06
				Ethylbenzene	7.2E-05	ug/m^3	5.3E-06	ug/m^3	2.5E-06	(ug/m^3)$^{-1}$	1.3E-11	1.5E-08	mg/m^3	1.0E+00	mg/m^3	1.5E-08
				Trichloroethene	9.8E-05	ug/m^3	5.5E-06	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	2.2E-11	2.0E-08	mg/m^3	2.0E-03	mg/m^3	1.0E-05
				Vinyl Chloride	1.7E-03	ug/m^3	1.2E-04	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	5.3E-10	3.4E-07	mg/m^3	1.0E-01	mg/m^3	3.4E-06
				Xylenes, Total	6.5E-04	ug/m^3	4.8E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.3E-07	mg/m^3	1.0E-01	mg/m^3	1.3E-06
				1,4-Dioxane	3.1E-05	ug/m^3	2.3E-06	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	1.1E-11	6.3E-09	mg/m^3	3.0E-02	mg/m^3	2.1E-07
				Biphenyl	1.6E-05	ug/m^3	1.2E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	3.3E-09	mg/m^3	4.0E-04	mg/m^3	8.2E-06
				Naphthalene	3.2E-04	ug/m^3	2.4E-05	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	8.0E-10	6.6E-08	mg/m^3	3.0E-03	mg/m^3	2.2E-05
				Aldrin	7.4E-09	ug/m^3	5.4E-10	ug/m^3	4.9E-03	(ug/m^3)$^{-1}$	2.6E-12	1.5E-12	mg/m^3	---	mg/m^3	---
				Heptachlor	8.5E-08	ug/m^3	6.2E-09	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	8.1E-12	1.7E-11	mg/m^3	---	mg/m^3	---
				Heptachlor Epoxide	7.8E-09	ug/m^3	5.7E-10	ug/m^3	2.6E-03	(ug/m^3)$^{-1}$	1.5E-12	1.6E-12	mg/m^3	---	mg/m^3	---
				Mercury	1.5E-06	ug/m^3	1.1E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	3.1E-10	mg/m^3	3.0E-04	mg/m^3	1.0E-06
			Exp. Route Total								1.4E-09					5.1E-05
		Exposure Point Total									1.4E-09					5.1E-05
	Exposure Medium Total										1.4E-09					5.1E-05
Medium and Receptor Total											1.4E-09					5.1E-05

Table 7-7.11

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Refuge Office and Visitors Center - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Indoor Refuge Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Exposure Concentration		Unit Risk		Cancer Risk	Exposure Concentration		RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater - Refuge	Indoor Air - Refuge	Indoor Air - Refuge	Inhalation	Benzene	2.0E-01	ug/m^3	1.6E-02	ug/m^3	7.8E-06	$(ug/m^3)^{-1}$	1.3E-07	4.6E-05	mg/m^3	3.0E-02	mg/m^3	1.5E-03
				Chloroform	8.6E-02	ug/m^3	7.0E-03	ug/m^3	2.3E-05	$(ug/m^3)^{-1}$	1.6E-07	2.0E-05	mg/m^3	9.8E-02	mg/m^3	2.0E-04
				Trichloroethene	3.4E-01	ug/m^3	2.8E-02	ug/m^3	4.1E-06	$(ug/m^3)^{-1}$	1.1E-07	7.7E-05	mg/m^3	2.0E-03	mg/m^3	3.9E-02
				Vinyl Chloride	3.8E+01	ug/m^3	3.1E+00	ug/m^3	4.4E-06	$(ug/m^3)^{-1}$	1.3E-05	8.6E-03	mg/m^3	1.0E-01	mg/m^3	8.6E-02
			Exp. Route Total								1.4E-05					1.3E-01
		Exposure Point Total									1.4E-05					1.3E-01
	Exposure Medium Total										1.4E-05					1.3E-01
Medium and Receptor Total											1.4E-05					1.3E-01

Golder Associates

Table 7-7.12

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill And Annex Site - Folcroft, Pa

Scenario Timeframe:	Current/Future
Receptor Population:	Outdoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Ingestion	Aluminum	1.8E+04	mg/kg	4.9E-03	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.4E-02	mg/kg/day	1.0E+00	mg/kg/day	1.4E-02
				Antimony	1.5E+00	mg/kg	4.2E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.2E-06	mg/kg/day	4.0E-04	mg/kg/day	2.9E-03
				Arsenic	2.9E+01	mg/kg	4.8E-06	mg/kg/day	1.5E+00	(mg/kg/day)$^{-1}$	7.3E-06	1.4E-05	mg/kg/day	3.0E-04	mg/kg/day	4.5E-02
				Chromium	5.7E+01	mg/kg	1.6E-05	mg/kg/day	5.0E-01	(mg/kg/day)$^{-1}$	7.9E-06	4.4E-05	mg/kg/day	3.0E-03	mg/kg/day	1.5E-02
				Cobalt	1.1E+01	mg/kg	3.1E-06	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	8.8E-06	mg/kg/day	3.0E-04	mg/kg/day	2.9E-02
				Iron	2.9E+04	mg/kg	8.1E-03	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	2.3E-02	mg/kg/day	7.0E-01	mg/kg/day	3.2E-02
				Manganese	4.5E+02	mg/kg	1.2E-04	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	3.4E-04	mg/kg/day	1.4E-01	mg/kg/day	2.5E-03
				Thallium	1.0E+00	mg/kg	2.8E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	7.7E-07	mg/kg/day	1.0E-05	mg/kg/day	7.7E-02
				Vanadium	6.6E+01	mg/kg	1.8E-05	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	5.1E-05	mg/kg/day	5.0E-03	mg/kg/day	1.0E-02
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	4.8E-12	mg/kg/day	1.3E+05	(mg/kg/day)$^{-1}$	6.3E-07	1.4E-11	mg/kg/day	7.0E-10	mg/kg/day	1.9E-02
				Aroclor 1248	3.9E+03	ug/kg	1.1E-06	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	2.1E-06	3.0E-06	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	5.3E-08	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	1.1E-07	1.5E-07	mg/kg/day	2.0E-05	mg/kg/day	7.4E-03
				Aroclor 1260	9.3E+01	ug/kg	2.6E-08	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	5.1E-08	7.1E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	9.0E-08	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	6.6E-08	2.5E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	5.7E-08	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	4.1E-07	1.6E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	2.0E-07	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	1.4E-07	5.5E-07	mg/kg/day	---	mg/kg/day	---
				Carbazole	5.8E+01	ug/kg	1.6E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	4.5E-08	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	1.6E-08	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	1.2E-07	4.6E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	3.6E-08	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	2.7E-08	1.0E-07	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								1.9E-05					2.5E-01
			Dermal	Aluminum	1.8E+04	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	1.5E+00	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	2.9E+01	mg/kg	1.0E-06	mg/kg/day	1.5E+00	(mg/kg/day)$^{-1}$	1.5E-06	2.9E-06	mg/kg/day	3.0E-04	mg/kg/day	9.6E-03
				Chromium	5.7E+01	mg/kg	---	mg/kg/day	2.0E+01	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	1.1E+01	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Iron	2.9E+04	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Manganese	4.5E+02	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Thallium	1.0E+00	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	1.0E-05	mg/kg/day	---
				Vanadium	6.6E+01	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	6.1E-13	mg/kg/day	1.3E+05	(mg/kg/day)$^{-1}$	8.0E-08	1.7E-12	mg/kg/day	7.0E-10	mg/kg/day	2.5E-03
				Aroclor 1248	3.9E+03	ug/kg	6.4E-07	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	1.3E-06	1.8E-06	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	3.1E-08	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	6.3E-08	8.8E-08	mg/kg/day	2.0E-05	mg/kg/day	4.4E-03
				Aroclor 1260	9.3E+01	ug/kg	1.5E-08	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	3.0E-08	4.2E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	5.0E-08	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	3.6E-08	1.4E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	3.1E-08	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	2.3E-07	8.7E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	1.1E-07	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	7.9E-08	3.0E-07	mg/kg/day	---	mg/kg/day	---
				Carbazole	5.8E+01	ug/kg	6.8E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.9E-08	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	9.1E-09	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	6.6E-08	2.5E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	2.0E-08	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	1.5E-08	5.6E-08	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								3.4E-06					1.6E-02

Table 7-7.12

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill And Annex Site - Folcroft, Pa

Scenario Timeframe:	Current/Future
Receptor Population:	Outdoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Fugutive Dusts and Volatiles- Annex	Inhalation	Aluminum	3.9E-02	ug/m^3	2.8E-03	ug/m^3	---	(ug/m^3)$^{-1}$	---	7.9E-06	mg/m^3	5.0E-03	mg/m^3	1.6E-03
				Antimony	3.3E-06	ug/m^3	2.4E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	6.7E-10	mg/m^3	---	mg/m^3	---
				Arsenic	6.3E-05	ug/m^3	4.6E-06	ug/m^3	4.3E-03	(ug/m^3)$^{-1}$	2.0E-08	1.3E-08	mg/m^3	1.5E-05	mg/m^3	8.6E-04
				Beryllium	4.1E-06	ug/m^3	3.0E-07	ug/m^3	2.4E-03	(ug/m^3)$^{-1}$	7.2E-10	8.4E-10	mg/m^3	2.0E-05	mg/m^3	4.2E-05
				Cadmium	2.4E-06	ug/m^3	1.8E-07	ug/m^3	1.8E-03	(ug/m^3)$^{-1}$	3.2E-10	4.9E-10	mg/m^3	1.0E-05	mg/m^3	4.9E-05
				Chromium	1.2E-04	ug/m^3	9.1E-06	ug/m^3	8.4E-02	(ug/m^3)$^{-1}$	7.6E-07	2.5E-08	mg/m^3	1.0E-04	mg/m^3	2.5E-04
				Cobalt	2.4E-05	ug/m^3	1.8E-06	ug/m^3	9.0E-03	(ug/m^3)$^{-1}$	1.6E-08	5.0E-09	mg/m^3	6.0E-06	mg/m^3	8.4E-04
				Iron	6.3E-02	ug/m^3	4.6E-03	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.3E-05	mg/m^3	---	mg/m^3	---
				Manganese	9.6E-04	ug/m^3	7.0E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.0E-07	mg/m^3	5.0E-05	mg/m^3	3.9E-03
				Thallium	2.1E-06	ug/m^3	1.6E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	4.4E-10	mg/m^3	---	mg/m^3	---
				Vanadium	1.4E-04	ug/m^3	1.0E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.9E-08	mg/m^3	1.0E-04	mg/m^3	2.9E-04
				2,3,7,8-TCDD Equivalents	1.2E-08	ug/m^3	8.5E-10	ug/m^3	3.8E+01	(ug/m^3)$^{-1}$	3.2E-08	2.4E-12	mg/m^3	4.0E-08	mg/m^3	6.0E-05
				Aroclor 1248	8.1E-03	ug/m^3	5.9E-04	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	3.4E-07	1.7E-06	mg/m^3	---	mg/m^3	---
				Aroclor 1254	2.9E-04	ug/m^3	2.2E-05	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	1.2E-08	6.1E-08	mg/m^3	---	mg/m^3	---
				Aroclor 1260	9.1E-05	ug/m^3	6.7E-06	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	3.8E-09	1.9E-08	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	9.7E-05	ug/m^3	7.1E-06	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	7.8E-10	2.0E-08	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	4.4E-07	ug/m^3	3.2E-08	ug/m^3	1.1E-03	(ug/m^3)$^{-1}$	3.6E-11	9.1E-11	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	1.5E-06	ug/m^3	1.1E-07	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	1.2E-11	3.1E-10	mg/m^3	---	mg/m^3	---
				Carbazole	1.2E-07	ug/m^3	9.2E-09	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.6E-11	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	1.3E-07	ug/m^3	9.4E-09	ug/m^3	1.2E-03	(ug/m^3)$^{-1}$	1.1E-11	2.6E-11	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	2.8E-07	ug/m^3	2.1E-08	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	2.3E-12	5.8E-11	mg/m^3	---	mg/m^3	---
			Exp. Route Total								1.2E-06					7.9E-03
		Exposure Point Total									2.3E-05					2.8E-01
	Exposure Medium Total										2.3E-05					2.8E-01
Medium and Receptor Total											2.3E-05					2.8E-01

Notes:

a - For the inhalation pathway, the air concentration is calculated from the soil EPC in Table 4e of Appendix T.

Golder Associates

Table 7-7.13
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Receptor Population:	Outdoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface Soil - Landfill	Surface and Subsurface Soil - Landfill	Ingestion	Aluminum	1.6E+04	mg/kg	4.3E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.2E-02	mg/kg/day	1.0E+00	mg/kg/day	1.2E-02
				Antimony	2.9E+00	mg/kg	7.9E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.2E-06	mg/kg/day	4.0E-04	mg/kg/day	5.5E-03
				Arsenic	1.0E+01	mg/kg	1.7E-06	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	2.5E-06	4.6E-06	mg/kg/day	3.0E-04	mg/kg/day	1.5E-02
				Beryllium	9.4E+00	mg/kg	2.6E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.3E-06	mg/kg/day	2.0E-03	mg/kg/day	3.6E-03
				Cadmium	2.2E+00	mg/kg	6.1E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.7E-06	mg/kg/day	1.0E-03	mg/kg/day	1.7E-03
				Chromium	5.8E+01	mg/kg	1.6E-05	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	8.0E-06	4.5E-05	mg/kg/day	3.0E-03	mg/kg/day	1.5E-02
				Cobalt	3.0E+01	mg/kg	8.4E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.3E-05	mg/kg/day	3.0E-04	mg/kg/day	7.8E-02
				Copper	1.5E+03	mg/kg	4.1E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.2E-03	mg/kg/day	4.0E-02	mg/kg/day	2.9E-02
				Iron	5.2E+04	mg/kg	1.4E-02	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.0E-02	mg/kg/day	7.0E-01	mg/kg/day	5.7E-02
				Lead	8.3E+02	mg/kg	2.3E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.4E-04	mg/kg/day	---	mg/kg/day	---
				Manganese	1.7E+03	mg/kg	4.6E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.3E-03	mg/kg/day	1.4E-01	mg/kg/day	9.1E-03
				Mercury	2.4E+00	mg/kg	6.6E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.9E-06	mg/kg/day	3.0E-04	mg/kg/day	6.2E-03
				Nickel	2.2E+02	mg/kg	6.1E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.7E-04	mg/kg/day	2.0E-02	mg/kg/day	8.6E-03
				Vanadium	4.8E+01	mg/kg	1.3E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.7E-05	mg/kg/day	5.0E-03	mg/kg/day	7.4E-03
				Zinc	3.2E+03	mg/kg	8.7E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.4E-03	mg/kg/day	3.0E-01	mg/kg/day	8.1E-03
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	4.9E-11	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	6.3E-06	1.4E-10	mg/kg/day	7.0E-10	mg/kg/day	1.9E-01
				Dieldrin	2.7E+01	ug/kg	7.4E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	1.2E-07	2.1E-08	mg/kg/day	5.0E-05	mg/kg/day	4.1E-04
				Benzo(A)Anthracene	1.2E+03	ug/kg	3.2E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-07	9.0E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1.0E+03	ug/kg	2.8E-07	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-06	7.7E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	2.9E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.1E-07	8.2E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	2.7E-07	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	2.0E-08	7.7E-07	mg/kg/day	---	mg/kg/day	---
				Carbazole	1.2E+02	ug/kg	3.3E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	9.1E-08	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	4.4E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-07	1.2E-07	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	1.0E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	7.6E-08	2.9E-07	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9.1E+03	ug/kg	2.5E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.0E-06	mg/kg/day	2.0E-02	mg/kg/day	3.5E-04
			Exp. Route Total								2.0E-05					4.5E-01
			Dermal	Aluminum	2E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	3E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	1E+01	mg/kg	3.5E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	5.3E-07	9.8E-07	mg/kg/day	3.0E-04	mg/kg/day	3.3E-03
				Beryllium	9E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-05	mg/kg/day	---
				Cadmium	2E+00	mg/kg	2.6E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.3E-09	mg/kg/day	2.5E-05	mg/kg/day	2.9E-04
				Chromium	6E+01	mg/kg	---	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	3E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Copper	2E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	4.0E-02	mg/kg/day	---
				Iron	5E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Lead	8E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	---	mg/kg/day	---
				Manganese	2E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Mercury	2E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	2.1E-05	mg/kg/day	---
				Nickel	2E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	8.0E-04	mg/kg/day	---
				Vanadium	5E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				Zinc	3E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-01	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	2E-01	ug/kg	6.2E-12	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	8.0E-07	1.7E-11	mg/kg/day	7.0E-10	mg/kg/day	2.5E-02
				Dieldrin	3E+01	ug/kg	3.1E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	5.0E-08	8.8E-09	mg/kg/day	5.0E-05	mg/kg/day	1.8E-04
				Benzo(A)Anthracene	1E+03	ug/kg	1.8E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-07	4.9E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1E+03	ug/kg	1.5E-07	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-06	4.3E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1E+03	ug/kg	1.6E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-07	4.5E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1E+03	ug/kg	1.5E-07	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-08	4.2E-07	mg/kg/day	---	mg/kg/day	---
				Carbazole	1E+02	ug/kg	1.4E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.9E-08	mg/kg/day	---	mg/kg/day	---

Golder Associates

Table 7-7.13

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current/Future
Receptor Population:	Outdoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Dermal	Dibenzo(A,H)Anthracene	2E+02	ug/kg	2.4E-08	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	1.8E-07	6.7E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	4E+02	ug/kg	5.7E-08	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	4.2E-08	1.6E-07	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9E+03	ug/kg	1.4E-06	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	3.8E-06	mg/kg/day	2.0E-02	mg/kg/day	1.9E-04
			Exp. Route Total								3.0E-06					2.9E-02
		Fugitive Dusts - Landfill	Inhalation	Aluminum	3.9E-02	mg/kg	2.9E-03	ug/m^3	---	(ug/m^3)$^{-1}$	---	8.1E-06	mg/m^3	5.0E-03	mg/m^3	1.6E-03
				Antimony	7.1E-06	mg/kg	5.2E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.5E-09	mg/m^3	---	mg/m^3	---
				Arsenic	2.5E-05	mg/kg	1.8E-06	ug/m^3	4.3E-03	(ug/m^3)$^{-1}$	7.9E-09	5.2E-09	mg/m^3	1.5E-05	mg/m^3	3.4E-04
				Beryllium	2.4E-05	mg/kg	1.7E-06	ug/m^3	2.4E-03	(ug/m^3)$^{-1}$	4.2E-09	4.8E-09	mg/m^3	2.0E-05	mg/m^3	2.4E-04
				Cadmium	5.6E-06	mg/kg	4.1E-07	ug/m^3	1.8E-03	(ug/m^3)$^{-1}$	7.4E-10	1.1E-09	mg/m^3	1.0E-05	mg/m^3	1.1E-04
				Chromium	1.5E-04	mg/kg	1.1E-05	ug/m^3	8.4E-02	(ug/m^3)$^{-1}$	9.0E-07	3.0E-08	mg/m^3	1.0E-04	mg/m^3	3.0E-04
				Cobalt	7.6E-05	mg/kg	5.6E-06	ug/m^3	9.0E-03	(ug/m^3)$^{-1}$	5.0E-08	1.6E-08	mg/m^3	6.0E-06	mg/m^3	2.6E-03
				Copper	3.8E-03	mg/kg	2.8E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	7.7E-07	mg/m^3	---	mg/m^3	---
				Iron	1.3E-01	mg/kg	9.5E-03	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.7E-05	mg/m^3	---	mg/m^3	---
				Lead	2.1E-03	mg/kg	1.5E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	4.3E-07	mg/m^3	---	mg/m^3	---
				Manganese	4.2E-03	mg/kg	3.1E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	8.5E-07	mg/m^3	5.0E-05	mg/m^3	1.7E-02
				Mercury	6.1E-06	mg/kg	4.4E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.2E-09	mg/m^3	3.0E-04	mg/m^3	4.1E-06
				Nickel	5.6E-04	mg/kg	4.1E-05	ug/m^3	2.6E-04	(ug/m^3)$^{-1}$	1.1E-08	1.1E-07	mg/m^3	9.0E-05	mg/m^3	1.3E-03
				Vanadium	1.2E-04	mg/kg	8.9E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.5E-08	mg/m^3	1.0E-04	mg/m^3	2.5E-04
				Zinc	7.9E-03	mg/kg	5.8E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.6E-06	mg/m^3	---	mg/m^3	---
				2,3,7,8-TCDD Equivalents	3.2E-07	ug/kg	2.3E-08	ug/m^3	3.8E+01	(ug/m^3)$^{-1}$	8.8E-07	6.5E-11	mg/m^3	4.0E-08	mg/m^3	1.6E-03
				Dieldrin	6.7E-08	ug/kg	4.9E-09	ug/m^3	4.6E-03	(ug/m^3)$^{-1}$	2.3E-11	1.4E-11	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	1.1E-03	ug/kg	8.4E-05	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	9.3E-09	2.4E-07	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	2.5E-06	ug/kg	1.8E-07	ug/m^3	1.1E-03	(ug/m^3)$^{-1}$	2.0E-10	5.2E-10	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	2.7E-06	ug/kg	2.0E-07	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	2.2E-11	5.5E-10	mg/m^3	---	mg/m^3	---
				Benzo(K)Fluoranthene	2.5E-06	ug/kg	1.8E-07	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	2.0E-11	5.1E-10	mg/m^3	---	mg/m^3	---
				Carbazole	3.0E-07	ug/kg	2.2E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---	6.1E-11	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	4.0E-07	ug/kg	2.9E-08	ug/m^3	1.2E-03	(ug/m^3)$^{-1}$	3.5E-11	8.2E-11	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	9.5E-07	ug/kg	6.9E-08	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	7.6E-12	1.9E-10	mg/m^3	---	mg/m^3	---
				Naphthalene	1.6E-02	ug/kg	1.2E-03	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	4.0E-08	3.3E-06	mg/m^3	3.0E-03	mg/m^3	1.1E-03
			Exp. Route Total								1.9E-06					2.7E-02
		Exposure Point Total									2.5E-05					5.1E-01
	Exposure Medium Total										2.5E-05					5.1E-01
Medium and Receptor Total											2.5E-05					5.1E-01

Notes:

a - For the inhalation pathway, the air concentration is calculated from the soil EPC in Table 4e of Appendix T.

Table 7-7.14

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Receptor Population:	Outdoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Seep Liquid - Annex	Seep Liquid - Annex	Seep Liquid - Annex	Dermal	Aluminum	3.1E+04	ug/l	1.7E-05	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	4.8E-05	mg/kg/day	1.0E+00	mg/kg/day	4.8E-05
				Arsenic	3.5E+01	ug/l	1.9E-08	mg/kg/day	1.5E+00	(mg/kg/day)$^{-1}$	2.9E-08	5.4E-08	mg/kg/day	3.0E-04	mg/kg/day	1.8E-04
				Chromium	7.4E+01	ug/l	8.2E-08	mg/kg/day	2.0E+01	(mg/kg/day)$^{-1}$	1.6E-06	2.3E-07	mg/kg/day	7.5E-05	mg/kg/day	3.1E-03
				Cobalt	2.5E+01	ug/l	5.6E-09	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.6E-08	mg/kg/day	3.0E-04	mg/kg/day	5.2E-05
				Iron	5.2E+04	ug/l	2.9E-05	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	8.0E-05	mg/kg/day	7.0E-01	mg/kg/day	1.1E-04
				Lead	3.5E+02	ug/l	1.9E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	5.4E-08	mg/kg/day	---	mg/kg/day	---
				Manganese	1.3E+03	ug/l	7.0E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	2.0E-06	mg/kg/day	9.6E-04	mg/kg/day	2.0E-03
				Naphthalene	5.0E+00	ug/l	5.3E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.5E-06	mg/kg/day	2.0E-02	mg/kg/day	7.4E-05
				Vanadium	9.5E+01	ug/l	5.3E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	1.5E-07	mg/kg/day	1.3E-04	mg/kg/day	1.1E-03
				Benzene	1.6E-01	ug/l	3.9E-09	mg/kg/day	5.5E-02	(mg/kg/day)$^{-1}$	2.2E-10	1.1E-08	mg/kg/day	4.0E-03	mg/kg/day	2.7E-06
				Vinyl Chloride	8.2E-01	ug/l	1.0E-08	mg/kg/day	7.2E-01	(mg/kg/day)$^{-1}$	7.4E-09	2.9E-08	mg/kg/day	3.0E-03	mg/kg/day	9.5E-06
			Exp. Route Total								1.7E-06					6.7E-03
		Exposure Point Total									1.7E-06					6.7E-03
	Exposure Medium Total										1.7E-06					6.7E-03
Medium and Receptor Total											1.7E-06					6.7E-03

NA - According to USEPA RAGS Part E (2004), some inorganic compounds are not required to be included in dermal risk assessment calculations.

Table 7-7.15

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Current
Receptor Population:	Outdoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Leachate Liquid - Landfill	Leachate Liquid - Landfill	Surface Leachate - Landfill	Dermal	Arsenic	1.7E+01	ug/l	9.7E-09	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.4E-08	2.7E-08	mg/kg/day	3.0E-04	mg/kg/day	9.0E-05
				Chromium	5.4E+01	ug/l	6.0E-08	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	1.2E-06	1.7E-07	mg/kg/day	7.5E-05	mg/kg/day	2.2E-03
				Cobalt	1.2E+01	ug/l	2.7E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.6E-09	mg/kg/day	3.0E-04	mg/kg/day	2.5E-05
				Iron	4.7E+04	ug/l	2.6E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.3E-05	mg/kg/day	7.0E-01	mg/kg/day	1.0E-04
				Lead	2.5E+02	ug/l	1.4E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.8E-08	mg/kg/day	---	mg/kg/day	---
				Manganese	1.6E+03	ug/l	9.0E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.5E-06	mg/kg/day	9.6E-04	mg/kg/day	2.6E-03
				Aldrin	2.4E-02	ug/l	7.4E-08	mg/kg/day	1.7E+01	$(mg/kg/day)^{-1}$	1.3E-06	2.1E-07	mg/kg/day	3.0E-05	mg/kg/day	6.9E-03
				Dieldrin	9.0E-02	ug/l	2.7E-08	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	4.4E-07	7.6E-08	mg/kg/day	5.0E-05	mg/kg/day	1.5E-03
			Exp. Route Total								2.9E-06					1.3E-02
		Exposure Point Total									2.9E-06					1.3E-02
	Exposure Medium Total										2.9E-06					1.3E-02
Medium and Receptor Total											2.9E-06					1.3E-02

Table 7-7.16

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site, Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Adolescent Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value[a]	Units	Exposure Concentration		Unit Risk		Cancer Risk	Exposure Concentration		RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater - Annex	Ambient Air - Annex	Ambient Air - Annex	Inhalation	1,2-Dichloroethane	2.9E-04	ug/m^3	9.0E-07	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	2.3E-11	1.3E-08	mg/m^3	7.0E-03	mg/m^3	1.8E-06
				1,4-Dichlorobenzene	5.7E-06	ug/m^3	1.8E-08	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	1.9E-13	2.5E-10	mg/m^3	8.0E-01	mg/m^3	3.1E-10
				Benzene	1.6E-05	ug/m^3	5.0E-08	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	3.9E-13	7.0E-10	mg/m^3	3.0E-02	mg/m^3	2.3E-08
				Chlorobenzene	1.9E-04	ug/m^3	5.9E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	8.3E-09	mg/m^3	5.0E-02	mg/m^3	1.7E-07
				Trichloroethene	8.4E-06	ug/m^3	3.4E-08	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	1.4E-13	3.7E-10	mg/m^3	2.0E-03	mg/m^3	1.8E-07
				Vinyl Chloride	8.6E-05	ug/m^3	2.7E-07	ug/m^3	8.8E-06	(ug/m^3)$^{-1}$	2.4E-12	3.8E-09	mg/m^3	1.0E-01	mg/m^3	3.8E-08
				1,4-Dioxane	3.5E-06	ug/m^3	1.1E-08	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	5.4E-14	1.5E-10	mg/m^3	3.0E-02	mg/m^3	5.1E-09
				Naphthalene	8.6E-05	ug/m^3	2.7E-07	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	9.2E-12	3.8E-09	mg/m^3	3.0E-03	mg/m^3	1.3E-06
				Heptachlor	7.8E-08	ug/m^3	2.4E-10	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	3.2E-13	3.4E-12	mg/m^3	---	mg/m^3	---
			Exp. Route Total								3.6E-11					3.5E-06
		Exposure Point Total									3.6E-11					3.5E-06
	Exposure Medium Total										3.6E-11					3.5E-06
Medium and Receptor Total											3.6E-11					3.5E-06

a - EPCs for the adolescent trespasser are the child EPCs calculated in Appendix T for assuming the box plot model from ASTM. Although an adoescent is would be taller, the child EPC is considered a conservative estimate of exposure.

Table 7-7.17

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site, Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Adolescent Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value[a]	Units	Exposure Concentration		Unit Risk		Cancer Risk	Exposure Concentration		RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater - Landfill	Ambient Air - Landfill	Ambient Air - Landfill	Inhalation	1,1-Dichloroethene	7.2E-04	ug/m^3	2.2E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	3.1E-08	mg/m^3	2.0E-01	mg/m^3	1.6E-07
				1,1,2,2-Tetrachloroethane	1.2E-06	ug/m^3	3.6E-09	ug/m^3	5.8E-05	$(ug/m^3)^{-1}$	2E-13	5.1E-11	mg/m^3	---	mg/m^3	---
				1,2-Dichloroethane	1.7E-05	ug/m^3	5.3E-08	ug/m^3	2.6E-05	$(ug/m^3)^{-1}$	1E-12	7.4E-10	mg/m^3	7.0E-03	mg/m^3	1.1E-07
				1,4-Dichlorobenzene	9.3E-06	ug/m^3	2.9E-08	ug/m^3	1.1E-05	$(ug/m^3)^{-1}$	3E-13	4.1E-10	mg/m^3	8.0E-01	mg/m^3	5.1E-10
				Benzene	1.1E-04	ug/m^3	3.5E-07	ug/m^3	7.8E-06	$(ug/m^3)^{-1}$	3E-12	4.9E-09	mg/m^3	3.0E-02	mg/m^3	1.6E-07
				2-Hexanone	2.0E-05	ug/m^3	6.2E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	8.6E-10	mg/m^3	3.0E-02	mg/m^3	2.9E-08
				Chlorobenzene	1.6E-03	ug/m^3	4.9E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	6.9E-08	mg/m^3	5.0E-02	mg/m^3	1.4E-06
				Ethylbenzene	1.4E-04	ug/m^3	4.5E-07	ug/m^3	2.5E-06	$(ug/m^3)^{-1}$	1E-12	6.3E-09	mg/m^3	1.0E+00	mg/m^3	6.3E-09
				Trichloroethene	2.0E-04	ug/m^3	8.0E-07	ug/m^3	4.1E-06	$(ug/m^3)^{-1}$	3E-12	8.6E-09	mg/m^3	2.0E-03	mg/m^3	4.3E-06
				Vinyl Chloride	3.3E-03	ug/m^3	1.0E-05	ug/m^3	8.8E-06	$(ug/m^3)^{-1}$	9E-11	1.4E-07	mg/m^3	1.0E-01	mg/m^3	1.4E-06
				Xylenes, Total	1.3E-03	ug/m^3	4.1E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	5.7E-08	mg/m^3	1.0E-01	mg/m^3	5.7E-07
				1,4-Dioxane	6.2E-05	ug/m^3	1.9E-07	ug/m^3	5.0E-06	$(ug/m^3)^{-1}$	1E-12	2.7E-09	mg/m^3	3.0E-02	mg/m^3	9.0E-08
				Biphenyl	3.2E-05	ug/m^3	1.0E-07	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.4E-09	mg/m^3	4.0E-04	mg/m^3	3.5E-06
				Naphthalene	6.4E-04	ug/m^3	2.0E-06	ug/m^3	3.4E-05	$(ug/m^3)^{-1}$	7E-11	2.8E-08	mg/m^3	3.0E-03	mg/m^3	9.4E-06
				Aldrin	1.5E-08	ug/m^3	4.6E-11	ug/m^3	4.9E-03	$(ug/m^3)^{-1}$	2E-13	6.5E-13	mg/m^3	---	mg/m^3	---
				Heptachlor	1.7E-07	ug/m^3	5.3E-10	ug/m^3	1.3E-03	$(ug/m^3)^{-1}$	7E-13	7.5E-12	mg/m^3	---	mg/m^3	---
				Heptachlor Epoxide	1.6E-08	ug/m^3	4.9E-11	ug/m^3	2.6E-03	$(ug/m^3)^{-1}$	1E-13	6.8E-13	mg/m^3	---	mg/m^3	---
				Mercury	3.0E-06	ug/m^3	9.3E-09	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.3E-10	mg/m^3	3.0E-04	mg/m^3	4.3E-07
			Exp. Route Total								1.7E-10					2.2E-05
		Exposure Point Total									1.7E-10					2.2E-05
	Exposure Medium Total										1.7E-10					2.2E-05
Medium and Receptor Total											1.7E-10					2.2E-05

a - EPCs for the adolescent trespasser are the child EPCs calculated in Appendix T for assuming the box plot model from ASTM. Although an adoescent is would be taller, the child EPC is considered a conservative estimate of exposure.

Table 7-7.18
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedia Investigation/Feasibility Study
Folcroft Landfill and Annex Site, Folcroft PA

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk[b]	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Ingestion	Aluminum	1.8E+04	mg/kg	2.7E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.7E-03	mg/kg/day	1.0E+00	mg/kg/day	3.7E-03
				Antimony	1.5E+00	mg/kg	2.3E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.2E-07	mg/kg/day	4.0E-04	mg/kg/day	7.9E-04
				Arsenic	2.9E+01	mg/kg	2.6E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	3.9E-07	3.7E-06	mg/kg/day	3.0E-04	mg/kg/day	1.2E-02
				Chromium	5.7E+01	mg/kg	2.6E-06	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	1.3E-06	1.2E-05	mg/kg/day	3.0E-03	mg/kg/day	4.0E-03
				Cobalt	1.1E+01	mg/kg	1.7E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.4E-06	mg/kg/day	3.0E-04	mg/kg/day	7.9E-03
				Iron	2.9E+04	mg/kg	4.4E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.1E-03	mg/kg/day	7.0E-01	mg/kg/day	8.8E-03
				Manganese	4.5E+02	mg/kg	6.6E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	9.3E-05	mg/kg/day	1.4E-01	mg/kg/day	6.6E-04
				Thallium	1.0E+00	mg/kg	1.5E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.1E-07	mg/kg/day	1.0E-05	mg/kg/day	2.1E-02
				Vanadium	6.6E+01	mg/kg	9.8E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.4E-05	mg/kg/day	5.0E-03	mg/kg/day	2.7E-03
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	2.6E-13	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	3.4E-08	3.7E-12	mg/kg/day	7.0E-10	mg/kg/day	5.2E-03
				Aroclor 1248	3.9E+03	ug/kg	5.8E-08	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	1.2E-07	8.1E-07	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	2.9E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	5.7E-09	4.0E-08	mg/kg/day	2.0E-05	mg/kg/day	2.0E-03
				Aroclor 1260	9.3E+01	ug/kg	1.4E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	2.8E-09	1.9E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	1.5E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-08	6.9E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	9.2E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	6.7E-08	4.3E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	3.2E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.3E-08	1.5E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	2.7E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	2.0E-08	1.2E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	5.9E-09	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-09	2.8E-08	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								2.0E-06					6.9E-02
			Dermal	Aluminum	1.8E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	1.5E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	2.9E+01	mg/kg	2.6E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	3.9E-08	3.6E-07	mg/kg/day	3.0E-04	mg/kg/day	1.2E-03
				Chromium	5.7E+01	mg/kg	---	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	1.1E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Iron	2.9E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Manganese	4.5E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Thallium	1.0E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E-05	mg/kg/day	---
				Vanadium	6.6E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	1.5E-14	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	2.0E-09	2.2E-13	mg/kg/day	7.0E-10	mg/kg/day	3.1E-04
				Aroclor 1248	3.9E+03	ug/kg	1.6E-08	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	3.2E-08	2.2E-07	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	7.9E-10	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	1.6E-09	1.1E-08	mg/kg/day	2.0E-05	mg/kg/day	5.5E-04
				Aroclor 1260	9.3E+01	ug/kg	3.8E-10	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	7.6E-10	5.3E-09	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	3.7E-09	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.7E-09	1.7E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	2.3E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	1.7E-08	1.1E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	8.1E-09	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	5.9E-09	3.8E-08	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	6.8E-10	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-09	3.2E-09	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	1.5E-09	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.1E-09	7.0E-09	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								1.1E-07					2.1E-03

Table 7-7.18

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedia Investigation/Feasibility Study

Folcroft Landfill and Annex Site, Folcroft PA

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk[b]	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Fugitive Dusts and Volatiles - Annex	Inhalation	Aluminum	3.9E-02	ug/m^3	1.2E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.7E-06	mg/m^3	5.0E-03	mg/m^3	3.4E-04
				Antimony	3.3E-06	ug/m^3	1.0E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.4E-10	mg/m^3	---	mg/m^3	---
				Arsenic	6.3E-05	ug/m^3	2.0E-07	ug/m^3	4.3E-03	(ug/m^3)$^{-1}$	8.5E-10	2.8E-09	mg/m^3	1.5E-05	mg/m^3	1.8E-04
				Beryllium	4.1E-06	ug/m^3	1.3E-08	ug/m^3	2.4E-03	(ug/m^3)$^{-1}$	3.1E-11	1.8E-10	mg/m^3	2.0E-05	mg/m^3	9.0E-06
				Cadmium	2.4E-06	ug/m^3	7.5E-09	ug/m^3	1.8E-03	(ug/m^3)$^{-1}$	1.3E-11	1.0E-10	mg/m^3	1.0E-05	mg/m^3	1.0E-05
				Chromium	1.2E-04	ug/m^3	1.2E-06	ug/m^3	8.4E-02	(ug/m^3)$^{-1}$	9.7E-08	5.4E-09	mg/m^3	1.0E-04	mg/m^3	5.4E-05
				Cobalt	2.4E-05	ug/m^3	7.7E-08	ug/m^3	9.0E-03	(ug/m^3)$^{-1}$	6.9E-10	1.1E-09	mg/m^3	6.0E-06	mg/m^3	1.8E-04
				Iron	6.3E-02	ug/m^3	2.0E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.8E-06	mg/m^3	---	mg/m^3	---
				Manganese	9.6E-04	ug/m^3	3.0E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	4.2E-08	mg/m^3	5.0E-05	mg/m^3	8.4E-04
				Thallium	2.1E-06	ug/m^3	6.7E-09	ug/m^3	---	(ug/m^3)$^{-1}$	---	9.4E-11	mg/m^3	---	mg/m^3	---
				Vanadium	1.4E-04	ug/m^3	4.4E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	6.2E-09	mg/m^3	1.0E-04	mg/m^3	6.2E-05
				2,3,7,8-TCDD Equivalents	1.2E-08	ug/m^3	3.6E-11	ug/m^3	3.8E+01	(ug/m^3)$^{-1}$	1.4E-09	5.1E-13	mg/m^3	4.0E-08	mg/m^3	1.3E-05
				Aroclor 1248	8.1E-03	ug/m^3	2.5E-05	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	1.4E-08	3.5E-07	mg/m^3	---	mg/m^4	---
				Aroclor 1254	2.9E-04	ug/m^3	9.2E-07	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	5.3E-10	1.3E-08	mg/m^3	---	mg/m^3	---
				Aroclor 1260	9.1E-05	ug/m^3	2.9E-07	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	1.6E-10	4.0E-09	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	9.7E-05	ug/m^3	9.1E-07	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	1.0E-10	4.2E-09	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	4.4E-07	ug/m^3	4.2E-09	ug/m^3	1.1E-03	(ug/m^3)$^{-1}$	4.6E-12	1.9E-11	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	1.5E-06	ug/m^3	1.4E-08	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	1.6E-12	6.7E-11	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	1.3E-07	ug/m^3	1.2E-09	ug/m^3	1.2E-03	(ug/m^3)$^{-1}$	1.4E-12	5.6E-12	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	2.8E-07	ug/m^3	2.7E-09	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	2.9E-13	1.2E-11	mg/m^3	---	mg/m^3	---
			Exp. Route Total								1.2E-07					1.7E-03
		Exposure Point Total									2.2E-06					7.3E-02
	Exposure Medium Total										2.2E-06					7.3E-02
Medium and Receptor Total											2.2E-06					7.3E-02

Notes:

a - For the inhalation pathway, the air concentrations is calculated from the soil EPA as provided in Table 4e of Appendix T.

b - For the mutagenic COPCs, an ADAF of 3 was applied to the risk calculation to account for mutagenicity in childhood exposures

Table 7-7.19
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk[b]	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Ingestion	Aluminum	1.6E+04	mg/kg	2.3E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.3E-03	mg/kg/day	1.0E+00	mg/kg/day	3.3E-03
				Antimony	2.9E+00	mg/kg	4.3E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.0E-07	mg/kg/day	4.0E-04	mg/kg/day	1.5E-03
				Arsenic	1.0E+01	mg/kg	9.0E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.3E-07	1.3E-06	mg/kg/day	3.0E-04	mg/kg/day	4.2E-03
				Beryllium	9.4E+00	mg/kg	1.4E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.0E-06	mg/kg/day	2.0E-03	mg/kg/day	9.8E-04
				Cadmium	2.2E+00	mg/kg	3.3E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.7E-07	mg/kg/day	1.0E-03	mg/kg/day	4.7E-04
				Chromium	5.8E+01	mg/kg	2.6E-06	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	1.3E-06	1.2E-05	mg/kg/day	3.0E-03	mg/kg/day	4.1E-03
				Cobalt	3.0E+01	mg/kg	4.5E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.3E-06	mg/kg/day	3.0E-04	mg/kg/day	2.1E-02
				Copper	1.5E+03	mg/kg	2.2E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.1E-04	mg/kg/day	4.0E-02	mg/kg/day	7.8E-03
				Iron	5.2E+04	mg/kg	7.7E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.1E-02	mg/kg/day	7.0E-01	mg/kg/day	1.5E-02
				Lead	8.3E+02	mg/kg	1.2E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.7E-04	mg/kg/day	---	mg/kg/day	---
				Manganese	1.7E+03	mg/kg	2.5E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.5E-04	mg/kg/day	1.4E-01	mg/kg/day	2.5E-03
				Mercury	2.4E+00	mg/kg	3.6E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.0E-07	mg/kg/day	3.0E-04	mg/kg/day	1.7E-03
				Nickel	2.2E+02	mg/kg	3.3E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.7E-05	mg/kg/day	2.0E-02	mg/kg/day	2.3E-03
				Vanadium	4.8E+01	mg/kg	7.2E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.0E-05	mg/kg/day	5.0E-03	mg/kg/day	2.0E-03
				Zinc	3.2E+03	mg/kg	4.7E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.6E-04	mg/kg/day	3.0E-01	mg/kg/day	2.2E-03
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	2.6E-12	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	3.4E-07	3.7E-11	mg/kg/day	7.0E-10	mg/kg/day	5.3E-02
				Dieldrin	2.7E+01	ug/kg	4.0E-10	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	6.4E-09	5.6E-09	mg/kg/day	5.0E-05	mg/kg/day	1.1E-04
				Benzo(A)Anthracene	1.2E+03	ug/kg	5.2E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-08	2.4E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1.0E+03	ug/kg	4.5E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	3.3E-07	2.1E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	4.8E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	3.5E-08	2.2E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	4.5E-08	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	3.3E-09	2.1E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	7.1E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	5.2E-08	3.3E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	1.7E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	7.9E-08	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9.1E+03	ug/kg	1.4E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.9E-06	mg/kg/day	2.0E-02	mg/kg/day	9.5E-05
			Exp. Route Total								2.3E-06					1.2E-01

Table 7-7.19

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk[b]	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Dermal	Aluminum	1.6E+04	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	2.9E+00	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	1.0E+01	mg/kg	8.8E-09	mg/kg/day	1.5E+00	(mg/kg/day)$^{-1}$	1.3E-08	1.2E-07	mg/kg/day	3.0E-04	mg/kg/day	4.1E-04
				Beryllium	9.4E+00	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	1.4E-05	mg/kg/day	---
				Cadmium	2.2E+00	mg/kg	6.5E-11	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	9.1E-10	mg/kg/day	2.5E-05	mg/kg/day	3.6E-05
				Chromium	5.8E+01	mg/kg	---	mg/kg/day	2.0E+01	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	3.0E+01	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Copper	1.5E+03	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	4.0E-02	mg/kg/day	---
				Iron	5.2E+04	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Lead	8.3E+02	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	---	mg/kg/day	---
				Manganese	1.7E+03	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Mercury	2.4E+00	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	2.1E-05	mg/kg/day	---
				Nickel	2.2E+02	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	8.0E-04	mg/kg/day	---
				Vanadium	4.8E+01	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				Zinc	3.2E+03	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	---	mg/kg/day	3.0E-01	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	1.5E-13	mg/kg/day	1.3E+05	(mg/kg/day)$^{-1}$	2.0E-08	2.2E-12	mg/kg/day	7.0E-10	mg/kg/day	3.1E-03
				Dieldrin	2.7E+01	ug/kg	7.8E-11	mg/kg/day	1.6E+01	(mg/kg/day)$^{-1}$	1.3E-09	1.1E-09	mg/kg/day	5.0E-05	mg/kg/day	2.2E-05
				Benzo(A)Anthracene	1.2E+03	ug/kg	1.3E-08	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	9.7E-09	6.2E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1.0E+03	ug/kg	1.1E-08	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	8.3E-08	5.3E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	1.2E-08	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	8.9E-09	5.7E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	1.1E-08	mg/kg/day	7.3E-02	(mg/kg/day)$^{-1}$	8.3E-10	5.3E-08	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	1.8E-09	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	1.3E-08	8.4E-09	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	4.3E-09	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	3.1E-09	2.0E-08	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9.1E+03	ug/kg	3.4E-08	mg/kg/day	---	(mg/kg/day)$^{-1}$	---	4.8E-07	mg/kg/day	2.0E-02	mg/kg/day	2.4E-05
			Exp. Route Total								1.5E-07					3.6E-03

Golder Associates

Table 7-7.19

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk[b]	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value[a]	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Fugitive Dusts and Volatiles- Landfill	Inhalation	Aluminum	3.9E-02	ug/m^3	1.2E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.7E-06	mg/m^3	5.0E-03	mg/m^3	3.5E-04
				Antimony	7.1E-06	ug/m^3	2.2E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	3.1E-10	mg/m^3	---	mg/m^3	---
				Arsenic	2.5E-05	ug/m^3	7.9E-08	ug/m^3	4.3E-03	$(ug/m^3)^{-1}$	3.4E-10	1.1E-09	mg/m^3	1.5E-05	mg/m^3	7.3E-05
				Beryllium	2.4E-05	ug/m^3	7.4E-08	ug/m^3	2.4E-03	$(ug/m^3)^{-1}$	1.8E-10	1.0E-09	mg/m^3	2.0E-05	mg/m^3	5.2E-05
				Cadmium	5.6E-06	ug/m^3	1.8E-08	ug/m^3	1.8E-03	$(ug/m^3)^{-1}$	3.2E-11	2.5E-10	mg/m^3	1.0E-05	mg/m^3	2.5E-05
				Chromium	1.5E-04	ug/m^3	1.4E-06	ug/m^3	8.4E-02	$(ug/m^3)^{-1}$	1.2E-07	6.4E-09	mg/m^3	1.0E-04	mg/m^3	6.4E-05
				Cobalt	7.6E-05	ug/m^3	2.4E-07	ug/m^3	9.0E-03	$(ug/m^3)^{-1}$	2.1E-09	3.3E-09	mg/m^3	6.0E-06	mg/m^3	5.6E-04
				Copper	3.8E-03	ug/m^3	1.2E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.7E-07	mg/m^3	---	mg/m^3	---
				Iron	1.3E-01	ug/m^3	4.1E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	5.7E-06	mg/m^3	---	mg/m^3	---
				Lead	2.1E-03	ug/m^3	6.5E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	9.1E-08	mg/m^3	---	mg/m^3	---
				Manganese	4.2E-03	ug/m^3	1.3E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.8E-07	mg/m^3	5.0E-05	mg/m^3	3.6E-03
				Mercury	6.1E-06	ug/m^3	1.9E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.7E-10	mg/m^3	3.0E-04	mg/m^3	8.8E-07
				Nickel	5.6E-04	ug/m^3	1.8E-06	ug/m^3	2.6E-04	$(ug/m^3)^{-1}$	4.6E-10	2.5E-08	mg/m^3	9.0E-05	mg/m^3	2.7E-04
				Vanadium	1.2E-04	ug/m^3	3.8E-07	ug/m^3	---	$(ug/m^3)^{-1}$	---	5.3E-09	mg/m^3	1.0E-04	mg/m^3	5.3E-05
				Zinc	7.9E-03	ug/m^3	2.5E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	3.5E-07	mg/m^3	---	mg/m^3	---
				2,3,7,8-TCDD Equivalents	3.2E-07	ug/m^3	9.9E-10	ug/m^3	3.8E+01	$(ug/m^3)^{-1}$	3.8E-08	1.4E-11	mg/m^3	4.0E-08	mg/m^3	3.5E-04
				Dieldrin	6.7E-08	ug/m^3	2.1E-10	ug/m^3	4.6E-03	$(ug/m^3)^{-1}$	9.7E-13	2.9E-12	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	1.1E-03	ug/m^3	1.1E-05	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	1.2E-09	5.0E-08	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	2.5E-06	ug/m^3	2.4E-08	ug/m^3	1.1E-03	$(ug/m^3)^{-1}$	2.6E-11	1.1E-10	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	2.7E-06	ug/m^3	2.5E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	2.8E-12	1.2E-10	mg/m^3	---	mg/m^3	---
				Benzo(K)Fluoranthene	2.5E-06	ug/m^3	2.3E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	2.6E-12	1.1E-10	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	4.0E-07	ug/m^3	3.7E-09	ug/m^3	1.2E-03	$(ug/m^3)^{-1}$	4.5E-12	1.7E-11	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	9.5E-07	ug/m^3	8.9E-09	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	9.8E-13	4.1E-11	mg/m^3	---	mg/m^3	---
				Naphthalene	1.6E-02	ug/m^3	5.1E-05	ug/m^3	3.4E-05	$(ug/m^3)^{-1}$	1.7E-09	7.1E-07	mg/m^3	3.0E-03	mg/m^3	2.4E-04
			Exp. Route Total								1.6E-07					5.7E-03
		Exposure Point Total									2.6E-06					1.3E-01
	Exposure Medium Total										2.6E-06					1.3E-01
Medium and Receptor Total											2.6E-06					1.3E-01

Notes:

a - For the inhalation pathway, the air concentrations is calculated from the soil EPA as provided in Table 4e of Appendix T.

b - For the mutagenic COPCs, an ADAF of 3 was applied to the risk calculation to account for mutagenicity in childhood exposures

Table 7-7.20

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Seep Water - Annex	Leachate Liquid - Annex	Seep Area - Annex	Dermal	Aluminum	3.1E+04	ug/l	2.7E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.7E-05	mg/kg/day	1.0E+00	mg/kg/day	3.7E-05
				Arsenic	3.5E+01	ug/l	3.0E-09	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	4.4E-09	4.1E-08	mg/kg/day	3.0E-04	mg/kg/day	1.4E-04
				Chromium	7.4E+01	ug/l	3.8E-08	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	7.6E-07	1.8E-07	mg/kg/day	7.5E-05	mg/kg/day	2.4E-03
				Cobalt	2.5E+01	ug/l	8.6E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.2E-08	mg/kg/day	3.0E-04	mg/kg/day	4.0E-05
				Iron	5.2E+04	ug/l	4.4E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.2E-05	mg/kg/day	7.0E-01	mg/kg/day	8.8E-05
				Lead	3.5E+02	ug/l	3.0E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.2E-08	mg/kg/day	---	mg/kg/day	---
				Manganese	1.3E+03	ug/l	1.1E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.5E-06	mg/kg/day	9.6E-04	mg/kg/day	1.6E-03
				Naphthalene	5.0E+00	ug/l	8.2E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.1E-06	mg/kg/day	2.0E-02	mg/kg/day	5.7E-05
				Vanadium	9.5E+01	ug/l	8.1E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.1E-07	mg/kg/day	1.3E-04	mg/kg/day	8.8E-04
				Benzene	1.6E-01	ug/l	6.0E-10	mg/kg/day	5.5E-02	$(mg/kg/day)^{-1}$	3.3E-11	8.5E-09	mg/kg/day	4.0E-03	mg/kg/day	2.1E-06
				Vinyl Chloride	8.2E-01	ug/l	1.6E-09	mg/kg/day	1.4E+00	$(mg/kg/day)^{-1}$	2.2E-09	2.2E-08	mg/kg/day	3.0E-03	mg/kg/day	7.3E-06
			Exp. Route Total								7.7E-07					5.2E-03
		Exposure Point Total									7.7E-07					5.2E-03
	Exposure Medium Total										7.7E-07					5.2E-03
Medium and Receptor Total											7.7E-07					5.2E-03

Golder Associates

Table 7-7.21
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Seep Water - Landfill	Leachate Liquid - Landfill	Seep Area - Landfill	Dermal	Arsenic	1.7E+01	ug/l	1.5E-09	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	2.2E-09	2.1E-08	mg/kg/day	3.0E-04	mg/kg/day	6.9E-05
				Chromium	5.4E+01	ug/l	2.8E-08	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	5.5E-07	1.3E-07	mg/kg/day	7.5E-05	mg/kg/day	1.7E-03
				Cobalt	1.2E+01	ug/l	4.2E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.9E-09	mg/kg/day	3.0E-04	mg/kg/day	2.0E-05
				Iron	4.7E+04	ug/l	4.0E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.6E-05	mg/kg/day	7.0E-01	mg/kg/day	8.0E-05
				Lead	2.5E+02	ug/l	2.1E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.9E-08	mg/kg/day	---	mg/kg/day	---
				Manganese	1.6E+03	ug/l	1.4E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.9E-06	mg/kg/day	9.6E-04	mg/kg/day	2.0E-03
				Aldrin	2.4E-02	ug/l	1.1E-08	mg/kg/day	1.7E+01	$(mg/kg/day)^{-1}$	1.9E-07	1.6E-07	mg/kg/day	3.0E-05	mg/kg/day	5.3E-03
				Dieldrin	9.0E-02	ug/l	4.2E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	6.7E-08	5.9E-08	mg/kg/day	5.0E-05	mg/kg/day	1.2E-03
			Exp. Route Total								8.2E-07					1.0E-02
		Exposure Point Total									8.2E-07					1.0E-02
	Exposure Medium Total										8.2E-07					1.0E-02
Medium and Receptor Total											8.2E-07					1.0E-02

Golder Associates

Table 7-7.22

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
							Exposure Concentration		Unit Risk			Exposure Concentration		RfC		
					Value	Units	Value	Units	Value	Units	Cancer Risk	Value	Units	Value	Units	Hazard Quotient
Groundwater - Annex	Ambient Air - Annex	Ambient Air - Annex	Inhalation	1,2-Dichloroethane	1.4E-04	ug/m^3	1.9E-06	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	4.9E-11	6.3E-09	mg/m^3	7.0E-03	mg/m^3	9.0E-07
				1,4-Dichlorobenzene	2.8E-06	ug/m^3	3.7E-08	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	4.1E-13	1.2E-10	mg/m^3	8.0E-01	mg/m^3	1.5E-10
				Benzene	8.0E-06	ug/m^3	1.0E-07	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	8.2E-13	1.2E-10	mg/m^3	3.0E-02	mg/m^3	4.1E-09
				Chlorobenzene	9.5E-05	ug/m^3	1.2E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.2E-10	mg/m^3	5.0E-02	mg/m^3	2.5E-09
				Trichloroethene	4.2E-06	ug/m^3	5.5E-08	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	2.3E-13	1.2E-10	mg/m^3	2.0E-03	mg/m^3	6.2E-08
				Vinyl Chloride	4.3E-05	ug/m^3	5.6E-07	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	2.5E-12	1.2E-10	mg/m^3	1.0E-01	mg/m^3	1.2E-09
				1,4-Dioxane	1.7E-06	ug/m^3	2.3E-08	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	1.1E-13	7.6E-11	mg/m^3	3.0E-02	mg/m^3	2.5E-09
				Naphthalene	4.3E-05	ug/m^3	5.7E-07	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	1.9E-11	1.9E-09	mg/m^3	3.0E-03	mg/m^3	6.3E-07
				Heptachlor	3.9E-08	ug/m^3	5.1E-10	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	6.6E-13	1.7E-12	mg/m^3	---	mg/m^3	---
			Exp. Route Total								7.3E-11					1.6E-06
		Exposure Point Total									7.3E-11					1.6E-06
	Exposure Medium Total										7.3E-11					1.6E-06
Medium and Receptor Total											7.3E-11					1.6E-06

Table 7-7.23 RME

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Exposure Concentration		Unit Risk		Cancer Risk	Exposure Concentration		RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater - Landfill	Ambient Air - Landfill	Ambient Air - Landfill	Inhalation	1,1-Dichloroethene	3.6E-04	ug/m^3	4.7E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.6E-08	mg/m^3	2.0E-01	mg/m^3	7.9E-08
				1,1,2,2-Tetrachloroethane	5.8E-07	ug/m^3	7.6E-09	ug/m^3	5.8E-05	(ug/m^3)$^{-1}$	4E-13	2.5E-11	mg/m^3	---	mg/m^3	---
				1,2-Dichloroethane	8.5E-06	ug/m^3	1.1E-07	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	3E-12	3.7E-10	mg/m^3	7.0E-03	mg/m^3	5.3E-08
				1,4-Dichlorobenzene	4.7E-06	ug/m^3	6.1E-08	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	7E-13	2.0E-10	mg/m^3	8.0E-01	mg/m^3	2.6E-10
				Benzene	5.6E-05	ug/m^3	7.3E-07	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	6E-12	2.4E-09	mg/m^3	3.0E-02	mg/m^3	8.2E-08
				2-Hexanone	9.8E-06	ug/m^3	1.3E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	4.3E-10	mg/m^3	3.0E-02	mg/m^3	1.4E-08
				Chlorobenzene	7.9E-04	ug/m^3	1.0E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---	3.4E-08	mg/m^3	5.0E-02	mg/m^3	6.9E-07
				Ethylbenzene	7.2E-05	ug/m^3	9.4E-07	ug/m^3	2.5E-06	(ug/m^3)$^{-1}$	2E-12	3.1E-09	mg/m^3	1.0E+00	mg/m^3	3.1E-09
				Trichloroethene	9.8E-05	ug/m^3	9.8E-07	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	4E-12	4.3E-09	mg/m^3	2.0E-03	mg/m^3	2.2E-06
				Vinyl Chloride	1.7E-03	ug/m^3	2.2E-05	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	1E-10	7.2E-08	mg/m^3	1.0E-01	mg/m^3	7.2E-07
				Xylenes, Total	6.5E-04	ug/m^3	8.6E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	2.9E-08	mg/m^3	1.0E-01	mg/m^3	2.9E-07
				1,4-Dioxane	3.1E-05	ug/m^3	4.0E-07	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	2E-12	1.3E-09	mg/m^3	3.0E-02	mg/m^3	4.5E-08
				Biphenyl	1.6E-05	ug/m^3	2.1E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	7.0E-10	mg/m^3	4.0E-04	mg/m^3	1.7E-06
				Naphthalene	3.2E-04	ug/m^3	4.2E-06	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	1E-10	1.4E-08	mg/m^3	3.0E-03	mg/m^3	4.7E-06
				Aldrin	7.4E-09	ug/m^3	9.7E-11	ug/m^3	4.9E-03	(ug/m^3)$^{-1}$	5E-13	3.2E-13	mg/m^3	---	mg/m^3	---
				Heptachlor	8.5E-08	ug/m^3	1.1E-09	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	1E-12	3.7E-12	mg/m^3	---	mg/m^3	---
				Heptachlor Epoxide	7.8E-09	ug/m^3	1.0E-10	ug/m^3	2.6E-03	(ug/m^3)$^{-1}$	3E-13	3.4E-13	mg/m^3	---	mg/m^3	---
				Mercury	1.5E-06	ug/m^3	2.0E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---	6.5E-11	mg/m^3	3.0E-04	mg/m^3	2.2E-07
			Exp. Route Total								2.6E-10					1.1E-05
		Exposure Point Total									2.6E-10					1.1E-05
	Exposure Medium Total										2.6E-10					1.1E-05
Medium and Receptor Total											2.6E-10					1.1E-05

Golder Associates

Table 7-7.24 RME
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill, Annex Site, and Visitors Center - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Refuge Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Exposure Concentration		Unit Risk		Cancer Risk	Exposure Concentration		RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater Indoor Air - Refuge	Groundwater Indoor Air - Refuge	Groundwater Indoor Air - Refuge	Inhalation	Benzene	2.0E-01	ug/m^3	2.6E-03	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	2.1E-08	8.8E-06	mg/m^3	3.0E-02	mg/m^3	2.9E-04
				Chloroform	8.6E-02	ug/m^3	1.1E-03	ug/m^3	2.3E-05	(ug/m^3)$^{-1}$	2.6E-08	3.7E-06	mg/m^3	9.8E-02	mg/m^3	3.8E-05
				Trichloroethene	3.4E-01	ug/m^3	4.4E-03	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	1.8E-08	1.5E-05	mg/m^3	2.0E-03	mg/m^3	7.4E-03
				Vinyl Chloride	3.8E+01	ug/m^3	4.9E-01	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	2.2E-06	1.6E-03	mg/m^3	1.0E-01	mg/m^3	1.6E-02
			Exp. Route Total								2.2E-06					2.4E-02
		Exposure Point Total									2.2E-06					2.4E-02
	Exposure Medium Total										2.2E-06					2.4E-02
Medium and Receptor Total											2.2E-06					2.4E-02

Golder Associates

Table 7-7.25
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC[a] Value	EPC[a] Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD Value	RfD Units	Hazard Quotient
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Ingestion	Aluminum	1.8E+04	mg/kg	8.8E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.9E-03	mg/kg/day	1.0E+00	mg/kg/day	2.9E-03
				Antimony	1.5E+00	mg/kg	7.5E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.5E-07	mg/kg/day	4.0E-04	mg/kg/day	6.2E-04
				Arsenic	2.9E+01	mg/kg	8.7E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.3E-06	2.9E-06	mg/kg/day	3.0E-04	mg/kg/day	9.6E-03
				Chromium	5.7E+01	mg/kg	2.8E-06	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	1.4E-06	9.4E-06	mg/kg/day	3.0E-03	mg/kg/day	3.1E-03
				Cobalt	1.1E+01	mg/kg	5.6E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.9E-06	mg/kg/day	3.0E-04	mg/kg/day	6.2E-03
				Iron	2.9E+04	mg/kg	1.5E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.8E-03	mg/kg/day	7.0E-01	mg/kg/day	6.9E-03
				Manganese	4.5E+02	mg/kg	2.2E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.3E-05	mg/kg/day	1.4E-01	mg/kg/day	5.2E-04
				Thallium	1.0E+00	mg/kg	4.9E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.6E-07	mg/kg/day	1.0E-05	mg/kg/day	1.6E-02
				Vanadium	6.6E+01	mg/kg	3.2E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.1E-05	mg/kg/day	5.0E-03	mg/kg/day	2.2E-03
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	8.7E-13	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	1.1E-07	2.9E-12	mg/kg/day	7.0E-10	mg/kg/day	4.1E-03
				Aroclor 1248	3.9E+03	ug/kg	1.9E-07	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	3.8E-07	6.4E-07	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	9.5E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	1.9E-08	3.2E-08	mg/kg/day	2.0E-05	mg/kg/day	1.6E-03
				Aroclor 1260	9.3E+01	ug/kg	4.6E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	9.1E-09	1.5E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	1.6E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-08	5.4E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	1.0E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	7.4E-08	3.4E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	3.5E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.6E-08	1.2E-07	mg/kg/day	---	mg/kg/day	---
				Carbazole	5.8E+01	ug/kg	2.9E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	9.6E-09	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	2.9E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	2.2E-08	9.8E-09	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	6.5E-09	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.8E-09	2.2E-08	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								3.4E-06					5.4E-02
			Dermal	Aluminum	1.8E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	1.5E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	2.9E+01	mg/kg	3.7E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	5.5E-07	1.2E-06	mg/kg/day	3.0E-04	mg/kg/day	4.1E-03
				Chromium	5.7E+01	mg/kg	---	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	1.1E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Iron	2.9E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Manganese	4.5E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Thallium	1.0E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E-05	mg/kg/day	---
				Vanadium	6.6E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	2.2E-13	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	2.9E-08	7.3E-13	mg/kg/day	7.0E-10	mg/kg/day	1.0E-03
				Aroclor 1248	3.9E+03	ug/kg	2.3E-07	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	4.5E-07	7.6E-07	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	1.1E-08	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	2.2E-08	3.7E-08	mg/kg/day	2.0E-05	mg/kg/day	1.9E-03
				Aroclor 1260	9.3E+01	ug/kg	5.4E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	1.1E-08	1.8E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	1.8E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-08	5.9E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	1.1E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	8.1E-08	3.7E-08	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	3.8E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.8E-08	1.3E-07	mg/kg/day	---	mg/kg/day	---
				Carbazole	5.8E+01	ug/kg	2.4E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.1E-09	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	3.2E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-08	1.1E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	7.2E-09	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	5.2E-09	2.4E-08	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								1.2E-06					7.0E-03
		Fugitive Dusts and Volatiles-Annex	Inhalation	Aluminum	3.9E-02	ug/m^3	5.1E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	4.1E-05	mg/m^3	5.0E-03	mg/m^3	8.1E-03
				Antimony	3.3E-06	ug/m^3	4.3E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	3.4E-09	mg/m^3	---	mg/m^3	---
				Arsenic	6.3E-05	ug/m^3	8.3E-07	ug/m^3	4.3E-03	$(ug/m^3)^{-1}$	3.6E-09	6.6E-08	mg/m^3	1.5E-05	mg/m^3	4.4E-03
				Beryllium	4.1E-06	ug/m^3	5.4E-08	ug/m^3	2.4E-03	$(ug/m^3)^{-1}$	1.3E-10	4.3E-09	mg/m^3	2.0E-05	mg/m^3	2.2E-04
				Cadmium	2.4E-06	ug/m^3	3.1E-08	ug/m^3	1.8E-03	$(ug/m^3)^{-1}$	5.7E-11	2.5E-09	mg/m^3	1.0E-05	mg/m^3	2.5E-04
				Chromium	1.2E-04	ug/m^3	1.6E-06	ug/m^3	8.4E-02	$(ug/m^3)^{-1}$	1.4E-07	1.3E-07	mg/m^3	1.0E-04	mg/m^3	1.3E-03
				Cobalt	2.4E-05	ug/m^3	3.2E-07	ug/m^3	9.0E-03	$(ug/m^3)^{-1}$	2.9E-09	2.6E-08	mg/m^3	6.0E-06	mg/m^3	4.3E-03
				Iron	6.3E-02	ug/m^3	8.3E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	6.7E-05	mg/m^3	---	mg/m^3	---
				Manganese	9.6E-04	ug/m^3	1.3E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.0E-06	mg/m^3	5.0E-05	mg/m^3	2.0E-02
				Thallium	2.1E-06	ug/m^3	2.8E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.3E-09	mg/m^3	---	mg/m^3	---
				Vanadium	1.4E-04	ug/m^3	1.9E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.5E-07	mg/m^3	1.0E-04	mg/m^3	1.5E-03
				2,3,7,8-TCDD Equivalents	1.2E-08	ug/m^3	1.5E-10	ug/m^3	3.8E+01	$(ug/m^3)^{-1}$	5.8E-09	1.2E-11	mg/m^3	4.0E-08	mg/m^3	3.1E-04
				Aroclor 1248	8.1E-03	ug/m^3	1.1E-04	ug/m^3	5.7E-04	$(ug/m^3)^{-1}$	6.0E-08	8.5E-06	mg/m^3	---	mg/m^4	---
				Aroclor 1254	2.9E-04	ug/m^3	3.9E-06	ug/m^3	5.7E-04	$(ug/m^3)^{-1}$	2.2E-09	3.1E-07	mg/m^3	---	mg/m^3	---
				Aroclor 1260	9.1E-05	ug/m^3	1.2E-06	ug/m^3	5.7E-04	$(ug/m^3)^{-1}$	6.8E-10	9.6E-08	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	9.7E-05	ug/m^3	1.3E-06	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	1.4E-10	1.0E-07	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	4.4E-07	ug/m^3	5.8E-09	ug/m^3	1.1E-03	$(ug/m^3)^{-1}$	6.4E-12	4.7E-10	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	1.5E-06	ug/m^3	2.0E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	2.2E-12	1.6E-09	mg/m^3	---	mg/m^3	---
				Carbazole	1.2E-07	ug/m^3	1.6E-09	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.3E-10	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	1.3E-07	ug/m^3	1.7E-09	ug/m^3	1.2E-03	$(ug/m^3)^{-1}$	2.0E-12	1.4E-10	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	2.8E-07	ug/m^3	3.7E-09	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	4.1E-13	3.0E-10	mg/m^3	---	mg/m^3	---
			Exp. Route Total								2.1E-07					4.1E-02
		Exposure Point Total									4.8E-06					1.0E-01
	Exposure Medium Total										4.8E-06					1.0E-01
Medium and Receptor Total											4.8E-06					1.0E-01

a - For the inhalation pathway, the air concentration is calculated from the soil EPC as provided in Table 4e of Appendix T.

Golder Associates

Table 7-7.26
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC[a]		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Ingestion	Aluminum	1.6E+04	mg/kg	7.7E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.6E-03	mg/kg/day	1.0E+00	mg/kg/day	2.6E-03
				Antimony	2.9E+00	mg/kg	1.4E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.7E-07	mg/kg/day	4.0E-04	mg/kg/day	1.2E-03
				Arsenic	1.0E+01	mg/kg	3.0E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	4.4E-07	9.9E-07	mg/kg/day	3.0E-04	mg/kg/day	3.3E-03
				Beryllium	9.4E+00	mg/kg	4.6E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.5E-06	mg/kg/day	2.0E-03	mg/kg/day	7.7E-04
				Cadmium	2.2E+00	mg/kg	1.1E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.7E-07	mg/kg/day	1.0E-03	mg/kg/day	3.7E-04
				Chromium	5.8E+01	mg/kg	2.9E-06	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	1.4E-06	9.6E-06	mg/kg/day	3.0E-03	mg/kg/day	3.2E-03
				Cobalt	3.0E+01	mg/kg	1.5E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.0E-06	mg/kg/day	3.0E-04	mg/kg/day	1.7E-02
				Copper	1.5E+03	mg/kg	7.4E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.5E-04	mg/kg/day	4.0E-02	mg/kg/day	6.2E-03
				Iron	5.2E+04	mg/kg	2.6E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.5E-03	mg/kg/day	7.0E-01	mg/kg/day	1.2E-02
				Lead	8.3E+02	mg/kg	4.1E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.4E-04	mg/kg/day	---	mg/kg/day	---
				Manganese	1.7E+03	mg/kg	8.2E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.7E-04	mg/kg/day	1.4E-01	mg/kg/day	1.9E-03
				Mercury	2.4E+00	mg/kg	1.2E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.0E-07	mg/kg/day	3.0E-04	mg/kg/day	1.3E-03
				Nickel	2.2E+02	mg/kg	1.1E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.7E-05	mg/kg/day	2.0E-02	mg/kg/day	1.8E-03
				Vanadium	4.8E+01	mg/kg	2.4E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.9E-06	mg/kg/day	5.0E-03	mg/kg/day	1.6E-03
				Zinc	3.2E+03	mg/kg	1.6E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.2E-04	mg/kg/day	3.0E-01	mg/kg/day	1.7E-03
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	8.7E-12	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	1.1E-06	2.9E-11	mg/kg/day	7.0E-10	mg/kg/day	4.2E-02
				Dieldrin	2.7E+01	ug/kg	1.3E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	2.1E-08	4.4E-09	mg/kg/day	5.0E-05	mg/kg/day	8.8E-05
				Benzo(A)Anthracene	1.2E+03	ug/kg	5.7E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-08	1.9E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1.0E+03	ug/kg	5.0E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	3.6E-07	1.7E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	5.3E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	3.8E-08	1.8E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	4.9E-08	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	3.6E-09	1.6E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	7.8E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	5.7E-08	2.6E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	1.9E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.4E-08	6.2E-08	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9.1E+03	ug/kg	4.5E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.5E-06	mg/kg/day	2.0E-02	mg/kg/day	7.4E-05
			Exp. Route Total								3.6E-06					9.7E-02
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Dermal	Aluminum	1.6E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	2.9E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	1.0E+01	mg/kg	1.3E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.9E-07	4.2E-07	mg/kg/day	3.0E-04	mg/kg/day	1.4E-03
				Beryllium	9.4E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-05	mg/kg/day	---
				Cadmium	2.2E+00	mg/kg	9.3E-10	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.1E-09	mg/kg/day	2.5E-05	mg/kg/day	1.2E-04
				Chromium	5.8E+01	mg/kg	---	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	3.0E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Copper	1.5E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	4.0E-02	mg/kg/day	---
				Iron	5.2E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Lead	8.3E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	---	mg/kg/day	---
				Manganese	1.7E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Mercury	2.4E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	2.1E-05	mg/kg/day	---
				Nickel	2.2E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	8.0E-04	mg/kg/day	---
				Vanadium	4.8E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				Zinc	3.2E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-01	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	2.2E-12	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	2.9E-07	7.4E-12	mg/kg/day	7.0E-10	mg/kg/day	1.1E-02
				Dieldrin	2.7E+01	ug/kg	1.1E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	1.8E-08	3.7E-06	mg/kg/day	5.0E-05	mg/kg/day	7.5E-02
				Benzo(A)Anthracene	1.2E+03	ug/kg	6.3E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.6E-08	2.1E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1.0E+03	ug/kg	5.4E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	4.0E-07	1.8E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	5.8E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-08	1.9E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	5.4E-08	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	3.9E-09	1.8E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	8.6E-09	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	6.3E-08	2.9E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	2.0E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-08	6.8E-08	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9.1E+03	ug/kg	4.9E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.6E-06	mg/kg/day	2.0E-02	mg/kg/day	8.2E-05
			Exp. Route Total								1.1E-06					8.7E-02
			Inhalation	Aluminum	3.9E-02	ug/m^3	5.2E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	4.1E-05	mg/m^3	5.0E-03	mg/m^3	8.3E-03
				Antimony	7.1E-06	ug/m^3	9.4E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	7.5E-09	mg/m^3	---	mg/m^3	---
				Arsenic	2.5E-05	ug/m^3	3.3E-07	ug/m^3	4.3E-03	$(ug/m^3)^{-1}$	1.4E-09	2.6E-08	mg/m^3	1.5E-05	mg/m^3	1.8E-03
				Beryllium	2.4E-05	ug/m^3	3.1E-07	ug/m^3	2.4E-03	$(ug/m^3)^{-1}$	7.4E-10	2.5E-08	mg/m^3	2.0E-05	mg/m^3	1.2E-03
				Cadmium	5.6E-06	ug/m^3	7.4E-08	ug/m^3	1.8E-03	$(ug/m^3)^{-1}$	1.3E-10	5.9E-09	mg/m^3	1.0E-05	mg/m^3	5.9E-04
				Chromium	1.5E-04	ug/m^3	1.9E-06	ug/m^3	8.4E-02	$(ug/m^3)^{-1}$	1.6E-07	1.5E-07	mg/m^3	1.0E-04	mg/m^3	1.5E-03
				Cobalt	7.6E-05	ug/m^3	1.0E-06	ug/m^3	9.0E-03	$(ug/m^3)^{-1}$	9.0E-09	8.0E-08	mg/m^3	6.0E-06	mg/m^3	1.3E-02
				Copper	3.8E-03	ug/m^3	5.0E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	4.0E-06	mg/m^3	---	mg/m^3	---
				Iron	1.3E-01	ug/m^3	1.7E-03	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.4E-04	mg/m^3	---	mg/m^3	---
				Lead	2.1E-03	ug/m^3	2.7E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.2E-06	mg/m^3	---	mg/m^3	---
				Manganese	4.2E-03	ug/m^3	5.5E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	4.4E-06	mg/m^3	5.0E-05	mg/m^3	8.7E-02
				Mercury	6.1E-06	ug/m^3	8.0E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	6.4E-09	mg/m^3	3.0E-04	mg/m^3	2.1E-05
				Nickel	5.6E-04	ug/m^3	7.4E-06	ug/m^3	2.6E-04	$(ug/m^3)^{-1}$	1.9E-09	5.9E-07	mg/m^3	9.0E-05	mg/m^3	6.5E-03
				Vanadium	1.2E-04	ug/m^3	1.6E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.3E-07	mg/m^3	1.0E-04	mg/m^3	1.3E-03
				Zinc	7.9E-03	ug/m^3	1.0E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	8.4E-06	mg/m^3	---	mg/m^3	---
				2,3,7,8-TCDD Equivalents	3.2E-07	ug/m^3	4.2E-09	ug/m^3	3.8E+01	$(ug/m^3)^{-1}$	1.6E-07	3.3E-10	mg/m^3	4.0E-08	mg/m^3	8.3E-03
				Dieldrin	6.7E-08	ug/m^3	8.8E-10	ug/m^3	4.6E-03	$(ug/m^3)^{-1}$	4.1E-12	7.1E-11	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	1.1E-03	ug/m^3	1.5E-05	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	5.0E-09	1.2E-06	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	2.5E-06	ug/m^3	3.3E-08	ug/m^3	1.1E-03	$(ug/m^3)^{-1}$	1.1E-10	2.6E-09	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	2.7E-06	ug/m^3	3.5E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	1.2E-11	2.8E-09	mg/m^3	---	mg/m^3	---
				Benzo(K)Fluoranthene	2.5E-06	ug/m^3	3.3E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	1.1E-11	2.6E-09	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	4.0E-07	ug/m^3	5.2E-09	ug/m^3	1.2E-03	$(ug/m^3)^{-1}$	1.9E-11	4.2E-10	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	9.5E-07	ug/m^3	1.2E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	4.1E-12	9.9E-10	mg/m^3	---	mg/m^3	---
				Naphthalene	1.6E-02	ug/m^3	2.1E-04	ug/m^3	3.4E-05	$(ug/m^3)^{-1}$	7.2E-09	1.7E-05	mg/m^3	3.0E-03	mg/m^3	5.7E-03
			Exp. Route Total								3.5E-07					1.4E-01
		Exposure Point Total									5.0E-06					3.2E-01
	Exposure Medium Total										5.0E-06					3.2E-01
Medium and Receptor Total											5.0E-06					3.2E-01

a - For the inhalation pathway, the air concentration is calculated from the soil EPC as provided in Table 4e of Appendix T.

Table 7-7.27

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Refuge Visitor
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD Value	RfD Units	Hazard Quotient
Surface Seep Water - Annex	Leachate Liquid - Annex	Seep Area - Annex	Dermal	Aluminum	3.1E+04	ug/l	2.3E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.6E-05	mg/kg/day	1.0E+00	mg/kg/day	7.6E-05
				Arsenic	3.5E+01	ug/l	2.5E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	3.8E-08	8.4E-08	mg/kg/day	3.0E-04	mg/kg/day	2.8E-04
				Chromium	7.4E+01	ug/l	1.1E-07	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	2.2E-06	3.6E-07	mg/kg/day	7.5E-05	mg/kg/day	4.8E-03
				Cobalt	2.5E+01	ug/l	7.3E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.4E-08	mg/kg/day	3.0E-04	mg/kg/day	8.2E-05
				Iron	5.2E+04	ug/l	3.8E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.3E-04	mg/kg/day	7.0E-01	mg/kg/day	1.8E-04
				Lead	3.5E+02	ug/l	2.6E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.5E-08	mg/kg/day	---	mg/kg/day	---
				Manganese	1.3E+03	ug/l	9.3E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.1E-06	mg/kg/day	9.6E-04	mg/kg/day	3.2E-03
				Vanadium	9.5E+01	ug/l	7.0E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.3E-07	mg/kg/day	1.3E-04	mg/kg/day	1.8E-03
				Naphthalene	5.0E+00	ug/l	7.0E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.3E-06	mg/kg/day	2.0E-02	mg/kg/day	1.2E-04
				Benzene	1.6E-01	ug/l	5.2E-09	mg/kg/day	5.5E-02	$(mg/kg/day)^{-1}$	2.8E-10	1.7E-08	mg/kg/day	4.0E-03	mg/kg/day	4.3E-06
				Vinyl Chloride	8.2E-01	ug/l	1.4E-08	mg/kg/day	7.2E-01	$(mg/kg/day)^{-1}$	9.7E-09	4.5E-08	mg/kg/day	3.0E-03	mg/kg/day	1.5E-05
			Exp. Route Total								2.2E-06					1.1E-02
		Exposure Point Total									2.2E-06					1.1E-02
	Exposure Medium Total										2.2E-06					1.1E-02
Medium and Receptor Total											2.2E-06					1.1E-02

Golder Associates

Table 7-7.28

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Seep Water - Landfill	Leachate Liquid - Landfill	Seep Area - Landfill	Dermal	Arsenic	1.7E+01	ug/l	1.3E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.9E-08	4.2E-08	mg/kg/day	3.0E-04	mg/kg/day	1.4E-04
				Chromium	5.4E+01	ug/l	7.9E-08	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	1.6E-06	2.6E-07	mg/kg/day	7.5E-05	mg/kg/day	3.5E-03
				Cobalt	1.2E+01	ug/l	3.6E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.2E-08	mg/kg/day	3.0E-04	mg/kg/day	4.0E-05
				Iron	4.7E+04	ug/l	3.4E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.1E-04	mg/kg/day	7.0E-01	mg/kg/day	1.6E-04
				Lead	2.5E+02	ug/l	1.8E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.0E-08	mg/kg/day	---	mg/kg/day	---
				Manganese	1.6E+03	ug/l	1.2E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.0E-06	mg/kg/day	9.6E-04	mg/kg/day	4.1E-03
				Aldrin	2.4E-02	ug/l	9.7E-08	mg/kg/day	1.7E+01	$(mg/kg/day)^{-1}$	1.7E-06	3.2E-07	mg/kg/day	3.0E-05	mg/kg/day	1.1E-02
				Dieldrin	9.0E-02	ug/l	3.6E-08	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	5.7E-07	1.2E-07	mg/kg/day	5.0E-05	mg/kg/day	2.4E-03
			Exp. Route Total								3.8E-06					2.1E-02
		Exposure Point Total									3.8E-06					2.1E-02
	Exposure Medium Total										3.8E-06					2.1E-02
Medium and Receptor Total											3.8E-06					2.1E-02

Golder Associates

Table 7-7.29

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Exposure Concentration		Unit Risk			Exposure Concentration		RfC		Hazard Quotient
							Value[a]	Units	Value[a]	Units	Cancer Risk[b]	Value	Units	Value	Units	
Groundwater - Annex	Ambient Air - Annex	Ambient Air - Annex	Inhalation	1,2-Dichloroethane	2.9E-04	ug/m^3	9.0E-07	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	2.3E-11	1.3E-08	mg/m^3	7.0E-03	mg/m^3	1.8E-06
				1,4-Dichlorobenzene	5.7E-06	ug/m^3	1.8E-08	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	1.9E-13	2.5E-10	mg/m^3	8.0E-01	mg/m^3	3.1E-10
				Benzene	1.6E-05	ug/m^3	5.0E-08	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	3.9E-13	7.0E-10	mg/m^3	3.0E-02	mg/m^3	2.3E-08
				Chlorobenzene	1.9E-04	ug/m^3	5.9E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	8.3E-09	mg/m^3	5.0E-02	mg/m^3	1.7E-07
				Trichloroethene	8.4E-06	ug/m^3	4.8E-08	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	2.0E-13	3.7E-10	mg/m^3	2.0E-03	mg/m^3	1.8E-07
				Vinyl Chloride	8.6E-05	ug/m^3	2.7E-07	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	1.3E-12	3.8E-09	mg/m^3	1.0E-01	mg/m^3	3.8E-08
				1,4-Dioxane	3.5E-06	ug/m^3	1.1E-08	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	5.4E-14	1.5E-10	mg/m^3	3.0E-02	mg/m^3	5.1E-09
				Naphthalene	8.6E-05	ug/m^3	2.7E-07	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	9.2E-12	3.8E-09	mg/m^3	3.0E-03	mg/m^3	1.3E-06
				Heptachlor	7.8E-08	ug/m^3	2.4E-10	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	3.2E-13	3.4E-12	mg/m^3	---	mg/m^3	---
			Exp. Route Total								3.5E-11					3.5E-06
		Exposure Point Total									3.5E-11					3.5E-06
	Exposure Medium Total										3.5E-11					3.5E-06
Medium and Receptor Total											3.5E-11					3.5E-06

a - Intake for trichloroethene calculated using EPA's equation from RSL equations available at: https://www.epa.gov/risk/regional-screening-levels-rsls-equations-november-2017

b - Per EPA's *Toxicological Review of Vinyl Chloride* (2000), risks for vinyl chloride are calculated as follows = ELCR = [(EC*4.4E-06 (μg/m^3)$^{-1}$) + (EC*4.4E-06 (μg/m^3)$^{-1}$ * 5/70)]

Table 7-7.30

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Exposure Concentration		Unit Risk		Cancer Risk[b]	Exposure Concentration		RfC		Hazard Quotient
							Value[a]	Units	Value[a]	Units		Value	Units	Value	Units	
Groundwater - Landfill	Ambient Air - Landfill	Ambient Air - Landfill	Inhalation	1,1-Dichloroethene	7.2E-04	ug/m^3	2.2E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	3.1E-08	mg/m^3	2.0E-01	mg/m^3	1.6E-07
				1,1,2,2-Tetrachloroethane	1.2E-06	ug/m^3	3.6E-09	ug/m^3	5.8E-05	(ug/m^3)$^{-1}$	2.1E-13	5.1E-11	mg/m^3	---	mg/m^3	---
				1,2-Dichloroethane	1.7E-05	ug/m^3	5.3E-08	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	1.4E-12	7.4E-10	mg/m^3	7.0E-03	mg/m^3	1.1E-07
				1,4-Dichlorobenzene	9.3E-06	ug/m^3	2.9E-08	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	3.2E-13	4.1E-10	mg/m^3	8.0E-01	mg/m^3	5.1E-10
				Benzene	1.1E-04	ug/m^3	3.5E-07	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	2.7E-12	4.9E-09	mg/m^3	3.0E-02	mg/m^3	1.6E-07
				2-Hexanone	2.0E-05	ug/m^3	6.2E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---	8.6E-10	mg/m^3	3.0E-02	mg/m^3	2.9E-08
				Chlorobenzene	1.6E-03	ug/m^3	4.9E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	6.9E-08	mg/m^3	5.0E-02	mg/m^3	1.4E-06
				Ethylbenzene	1.4E-04	ug/m^3	4.5E-07	ug/m^3	2.5E-06	(ug/m^3)$^{-1}$	1.1E-12	6.3E-09	mg/m^3	1.0E+00	mg/m^3	6.3E-09
				Trichloroethene	2.0E-04	ug/m^3	1.1E-06	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	4.6E-12	8.6E-09	mg/m^3	2.0E-03	mg/m^3	4.3E-06
				Vinyl Chloride	3.3E-03	ug/m^3	1.0E-05	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	4.9E-11	1.4E-07	mg/m^3	1.0E-01	mg/m^3	1.4E-06
				Xylenes, Total	1.3E-03	ug/m^3	4.1E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---	5.7E-08	mg/m^3	1.0E-01	mg/m^3	5.7E-07
				1,4-Dioxane	6.2E-05	ug/m^3	1.9E-07	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	9.6E-13	2.7E-09	mg/m^3	3.0E-02	mg/m^3	9.0E-08
				Biphenyl	3.2E-05	ug/m^3	1.0E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.4E-09	mg/m^3	4.0E-04	mg/m^3	3.5E-06
				Naphthalene	6.4E-04	ug/m^3	2.0E-06	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	6.8E-11	2.8E-08	mg/m^3	3.0E-03	mg/m^3	9.4E-06
				Aldrin	1.5E-08	ug/m^3	4.6E-11	ug/m^3	4.9E-03	(ug/m^3)$^{-1}$	2.3E-13	6.5E-13	mg/m^3	---	mg/m^3	---
				Heptachlor	1.7E-07	ug/m^3	5.3E-10	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	6.9E-13	7.5E-12	mg/m^3	---	mg/m^3	---
				Heptachlor Epoxide	1.6E-08	ug/m^3	4.9E-11	ug/m^3	2.6E-03	(ug/m^3)$^{-1}$	1.3E-13	6.8E-13	mg/m^3	---	mg/m^3	---
				Mercury	3.0E-06	ug/m^3	9.3E-09	ug/m^3	---	(ug/m^3)$^{-1}$	---	1.3E-10	mg/m^3	3.0E-04	mg/m^3	4.3E-07
			Exp. Route Total								1.3E-10					2.2E-05
		Exposure Point Total									1.3E-10					2.2E-05
	Exposure Medium Total										1.3E-10					2.2E-05
Medium and Receptor Total											1.3E-10					2.2E-05

a - Intake for trichloroethene calculated using EPA's equation from RSL equations available at: https://www.epa.gov/risk/regional-screening-levels-rsls-equations-november-2017

b - Per EPA's *Toxicological Review of Vinyl Chloride* (2000), risks for vinyl chloride are calculated as follows = ELCR = [(EC*4.4E-06 (μg/m^3)$^{-1}$) + (EC*4.4E-06 (μg/m^3)$^{-1}$ * 5/70)]

Table 7-7.31

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill, Annex Site, and Visitors Center - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Exposure Concentration		Unit Risk		Cancer Risk[b]	Exposure Concentration		RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater to Indoor Air - Refuge	Indoor Air - Refuge	Indoor Air - Refuge	Inhalation	Benzene	2.0E-01	ug/m^3	6.3E-04	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	4.9E-09	8.8E-06	mg/m^3	3.0E-02	mg/m^3	2.9E-04
				Chloroform	8.6E-02	ug/m^3	2.7E-04	ug/m^3	2.3E-05	(ug/m^3)$^{-1}$	6.2E-09	3.7E-06	mg/m^3	9.8E-02	mg/m^3	3.8E-05
				Trichloroethene	3.4E-01	ug/m^3	1.9E-03	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	7.9E-09	1.5E-05	mg/m^3	2.0E-03	mg/m^3	7.4E-03
				Vinyl Chloride	3.8E+01	ug/m^3	1.2E-01	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	5.5E-07	1.6E-03	mg/m^3	1.0E-01	mg/m^3	1.6E-02
			Exp. Route Total								5.7E-07					2.4E-02
		Exposure Point Total									5.7E-07					2.4E-02
	Exposure Medium Total										5.7E-07					2.4E-02
Medium and Receptor Total											5.7E-07					2.4E-02

a - Intake for trichloroethene calculated using EPA's equation from RSL equations available at: https://www.epa.gov/risk/regional-screening-levels-rsls-equations-november-2017

b - Per EPA's *Toxicological Review of Vinyl Chloride* (2000), risks for vinyl chloride are calculated as follows = ELCR = [(EC*4.4E-06 (μg/m^3)$^{-1}$) + (EC*4.4E-06 (μg/m^3)$^{-1}$ * 5/70)]

Table 7-7.32
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Refuge Visitor
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk[a]	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD Value	RfD Units	Hazard Quotient
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Ingestion	Aluminum	1.8E+04	mg/kg	2.2E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.1E-02	mg/kg/day	1.0E+00	mg/kg/day	3.1E-02
				Antimony	1.5E+00	mg/kg	1.9E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.7E-06	mg/kg/day	4.0E-04	mg/kg/day	6.7E-03
				Arsenic	2.9E+01	mg/kg	2.0E-06	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	3.0E-06	2.8E-05	mg/kg/day	3.0E-04	mg/kg/day	9.4E-02
				Chromium	5.7E+01	mg/kg	3.2E-05	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	1.6E-05	1.0E-04	mg/kg/day	3.0E-03	mg/kg/day	3.4E-02
				Cobalt	1.1E+01	mg/kg	1.4E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.0E-05	mg/kg/day	3.0E-04	mg/kg/day	6.7E-02
				Iron	2.9E+04	mg/kg	3.7E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.2E-02	mg/kg/day	7.0E-01	mg/kg/day	7.4E-02
				Manganese	4.5E+02	mg/kg	5.6E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	7.8E-04	mg/kg/day	1.4E-01	mg/kg/day	5.6E-03
				Thallium	1.0E+00	mg/kg	1.3E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.8E-06	mg/kg/day	1.0E-05	mg/kg/day	1.8E-01
				Vanadium	6.6E+01	mg/kg	8.2E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.2E-04	mg/kg/day	5.0E-03	mg/kg/day	2.3E-02
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	2.2E-12	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	2.9E-07	3.1E-11	mg/kg/day	7.0E-10	mg/kg/day	4.4E-02
				Aroclor 1248	3.9E+03	ug/kg	4.9E-07	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	9.8E-07	6.8E-06	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	2.4E-08	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	4.8E-08	3.4E-07	mg/kg/day	2.0E-05	mg/kg/day	1.7E-02
				Aroclor 1260	9.3E+01	ug/kg	1.2E-08	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	2.3E-08	1.6E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	1.8E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-07	5.8E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	1.1E-07	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	8.3E-07	3.6E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	3.9E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-07	1.2E-06	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	3.3E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	2.4E-07	1.0E-07	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	7.3E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	5.3E-08	2.3E-07	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								2.2E-05					5.7E-01
			Dermal	Aluminum	1.8E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	1.5E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	2.9E+01	mg/kg	5.2E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	7.8E-07	7.3E-06	mg/kg/day	3.0E-04	mg/kg/day	2.4E-02
				Chromium	5.7E+01	mg/kg	---	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	1.1E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Iron	2.9E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Manganese	4.5E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Thallium	1.0E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E-05	mg/kg/day	---
				Vanadium	6.6E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	3.1E-13	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	4.1E-08	4.4E-12	mg/kg/day	7.0E-10	mg/kg/day	6.3E-03
				Aroclor 1248	3.9E+03	ug/kg	3.2E-07	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	6.5E-07	4.5E-06	mg/kg/day	---	mg/kg/day	---
				Aroclor 1254	1.9E+02	ug/kg	1.6E-08	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	3.2E-08	2.2E-07	mg/kg/day	2.0E-05	mg/kg/day	1.1E-02
				Aroclor 1260	9.3E+01	ug/kg	7.7E-09	mg/kg/day	2.0E+00	$(mg/kg/day)^{-1}$	1.5E-08	1.1E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Anthracene	3.3E+02	ug/kg	1.1E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	8.2E-08	3.6E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	2.1E+02	ug/kg	7.0E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	5.1E-07	2.2E-07	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	2.4E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.8E-07	7.7E-07	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	2.0E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	1.5E-07	6.5E-08	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	4.5E-08	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	3.3E-08	1.4E-07	mg/kg/day	---	mg/kg/day	---
			Exp. Route Total								2.5E-06					4.2E-02
			Inhalation	Aluminum	3.9E-02	ug/m^3	1.2E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.4E-06	mg/m^3	5.0E-03	mg/m^3	2.8E-04
				Antimony	3.3E-06	ug/m^3	1.0E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.2E-10	mg/m^3	---	mg/m^3	---
				Arsenic	6.3E-05	ug/m^3	2.0E-07	ug/m^3	4.3E-03	$(ug/m^3)^{-1}$	8.5E-10	2.3E-09	mg/m^3	1.5E-05	mg/m^3	1.5E-04
				Beryllium	4.1E-06	ug/m^3	1.3E-08	ug/m^3	2.4E-03	$(ug/m^3)^{-1}$	3.1E-11	1.5E-10	mg/m^3	2.0E-05	mg/m^3	7.5E-06
				Cadmium	2.4E-06	ug/m^3	7.5E-09	ug/m^3	1.8E-03	$(ug/m^3)^{-1}$	1.3E-11	8.7E-11	mg/m^3	1.0E-05	mg/m^3	8.7E-06
				Chromium	1.2E-04	ug/m^3	1.7E-06	ug/m^3	8.4E-02	$(ug/m^3)^{-1}$	1.4E-07	4.5E-09	mg/m^3	1.0E-04	mg/m^3	4.5E-05
				Cobalt	2.4E-05	ug/m^3	7.7E-08	ug/m^3	9.0E-03	$(ug/m^3)^{-1}$	6.9E-10	8.9E-10	mg/m^3	6.0E-06	mg/m^3	1.5E-04
				Iron	6.3E-02	ug/m^3	2.0E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.3E-06	mg/m^3	---	mg/m^3	---
				Manganese	9.6E-04	ug/m^3	3.0E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	3.5E-08	mg/m^3	5.0E-05	mg/m^3	7.0E-04
				Thallium	2.1E-06	ug/m^3	6.7E-09	ug/m^3	---	$(ug/m^3)^{-1}$	---	7.9E-11	mg/m^3	---	mg/m^3	---
				Vanadium	1.4E-04	ug/m^3	4.4E-07	ug/m^3	---	$(ug/m^3)^{-1}$	---	5.2E-09	mg/m^3	1.0E-04	mg/m^3	5.2E-05
				2,3,7,8-TCDD Equivalents	1.2E-08	ug/m^3	3.6E-11	ug/m^3	3.8E+01	$(ug/m^3)^{-1}$	1.4E-09	4.2E-13	mg/m^3	4.0E-08	mg/m^3	1.1E-05
				Aroclor 1248	8.1E-03	ug/m^3	2.5E-05	ug/m^3	5.7E-04	$(ug/m^3)^{-1}$	1.4E-08	2.9E-07	mg/m^3	---	mg/m^4	---
				Aroclor 1254	2.9E-04	ug/m^3	9.2E-07	ug/m^3	5.7E-04	$(ug/m^3)^{-1}$	5.3E-10	1.1E-08	mg/m^3	---	mg/m^3	---
				Aroclor 1260	9.1E-05	ug/m^3	2.9E-07	ug/m^3	5.7E-04	$(ug/m^3)^{-1}$	1.6E-10	3.3E-09	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	9.7E-05	ug/m^3	1.3E-06	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	1.5E-10	3.5E-09	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	4.4E-07	ug/m^3	6.1E-09	ug/m^3	1.1E-03	$(ug/m^3)^{-1}$	6.7E-12	1.6E-11	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	1.5E-06	ug/m^3	2.1E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	2.3E-12	5.6E-11	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	1.3E-07	ug/m^3	1.8E-09	ug/m^3	1.2E-03	$(ug/m^3)^{-1}$	2.1E-12	4.7E-12	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	2.8E-07	ug/m^3	3.9E-09	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	4.3E-13	1.0E-11	mg/m^3	---	mg/m^3	---
			Exp. Route Total								1.6E-07					1.4E-03
		Exposure Point Total									2.4E-05					6.1E-01
	Exposure Medium Total										2.4E-05					6.1E-01
Medium and Receptor Total											2.4E-05					6.1E-01

Notes:

a - For the mutagenic COPCs, an ADAF was applied to the risk calculation to account for potential mutagenicity in childhood exposures (10 for years 1-2 and 3 for years 2-6).

Table 7-7.33
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk			Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units	Cancer Risk[a]	Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Ingestion	Aluminum	1.6E+04	mg/kg	2.0E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.8E-02	mg/kg/day	1.0E+00	mg/kg/day	2.8E-02
				Antimony	2.9E+00	mg/kg	3.6E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.0E-06	mg/kg/day	4.0E-04	mg/kg/day	1.3E-02
				Arsenic	1.0E+01	mg/kg	7.5E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.1E-06	1.1E-05	mg/kg/day	3.0E-04	mg/kg/day	3.5E-02
				Beryllium	9.4E+00	mg/kg	1.2E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.7E-05	mg/kg/day	2.0E-03	mg/kg/day	8.3E-03
				Cadmium	2.2E+00	mg/kg	2.8E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.9E-06	mg/kg/day	1.0E-03	mg/kg/day	3.9E-03
				Chromium	5.8E+01	mg/kg	3.2E-05	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	1.6E-05	1.0E-04	mg/kg/day	3.0E-03	mg/kg/day	3.4E-02
				Cobalt	3.0E+01	mg/kg	3.8E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.3E-05	mg/kg/day	3.0E-04	mg/kg/day	1.8E-01
				Copper	1.5E+03	mg/kg	1.9E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.6E-03	mg/kg/day	4.0E-02	mg/kg/day	6.6E-02
				Iron	5.2E+04	mg/kg	6.5E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	9.1E-02	mg/kg/day	7.0E-01	mg/kg/day	1.3E-01
				Lead	8.3E+02	mg/kg	1.0E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.5E-03	mg/kg/day	---	mg/kg/day	---
				Manganese	1.7E+03	mg/kg	2.1E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.9E-03	mg/kg/day	1.4E-01	mg/kg/day	2.1E-02
				Mercury	2.4E+00	mg/kg	3.0E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	4.2E-06	mg/kg/day	3.0E-04	mg/kg/day	1.4E-02
				Nickel	2.2E+02	mg/kg	2.8E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.9E-04	mg/kg/day	2.0E-02	mg/kg/day	2.0E-02
				Vanadium	4.8E+01	mg/kg	6.1E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.5E-05	mg/kg/day	5.0E-03	mg/kg/day	1.7E-02
				Zinc	3.2E+03	mg/kg	4.0E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	5.6E-03	mg/kg/day	3.0E-01	mg/kg/day	1.9E-02
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	2.2E-11	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	2.9E-06	3.1E-10	mg/kg/day	7.0E-10	mg/kg/day	4.4E-01
				Dieldrin	2.7E+01	ug/kg	3.4E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	5.4E-08	4.7E-08	mg/kg/day	5.0E-05	mg/kg/day	9.4E-04
				Benzo(A)Anthracene	1.2E+03	ug/kg	6.4E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.7E-07	2.0E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1.0E+03	ug/kg	5.5E-07	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	4.0E-06	1.8E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	5.9E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.3E-07	1.9E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	5.5E-07	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	4.0E-08	1.7E-06	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	8.7E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	6.4E-07	2.8E-07	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	2.1E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.5E-07	6.6E-07	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9.1E+03	ug/kg	1.1E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.6E-05	mg/kg/day	2.0E-02	mg/kg/day	7.9E-04
			Exp. Route Total								2.6E-05					1.0E+00

Table 7-7.33
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Refuge Visitor
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk[a]	Non-Cancer Hazard Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	RfD Value	RfD Units	Hazard Quotient
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Dermal	Aluminum	1.6E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.0E+00	mg/kg/day	---
				Antimony	2.9E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	6.0E-05	mg/kg/day	---
				Arsenic	1.0E+01	mg/kg	1.8E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	2.7E-07	2.5E-06	mg/kg/day	3.0E-04	mg/kg/day	8.3E-03
				Beryllium	9.4E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-05	mg/kg/day	---
				Cadmium	2.2E+00	mg/kg	1.3E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.9E-08	mg/kg/day	2.5E-05	mg/kg/day	7.4E-04
				Chromium	5.8E+01	mg/kg	---	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.5E-05	mg/kg/day	---
				Cobalt	3.0E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-04	mg/kg/day	---
				Copper	1.5E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	4.0E-02	mg/kg/day	---
				Iron	5.2E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	7.0E-01	mg/kg/day	---
				Lead	8.3E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	---	mg/kg/day	---
				Manganese	1.7E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.4E-01	mg/kg/day	---
				Mercury	2.4E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	2.1E-05	mg/kg/day	---
				Nickel	2.2E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	8.0E-04	mg/kg/day	---
				Vanadium	4.8E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	1.3E-04	mg/kg/day	---
				Zinc	3.2E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	---	mg/kg/day	3.0E-01	mg/kg/day	---
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	3.2E-12	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	4.1E-07	4.4E-11	mg/kg/day	7.0E-10	mg/kg/day	6.3E-02
				Dieldrin	2.7E+01	ug/kg	1.6E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	2.6E-08	2.2E-08	mg/kg/day	5.0E-05	mg/kg/day	4.5E-04
				Benzo(A)Anthracene	1.2E+03	ug/kg	4.0E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.9E-07	1.3E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(A)Pyrene	1.0E+03	ug/kg	3.4E-07	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	2.5E-06	1.1E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	3.6E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	2.7E-07	1.2E-06	mg/kg/day	---	mg/kg/day	---
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	3.4E-07	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	2.5E-08	1.1E-06	mg/kg/day	---	mg/kg/day	---
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	5.4E-08	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	3.9E-07	1.7E-07	mg/kg/day	---	mg/kg/day	---
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	1.3E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	9.4E-08	4.1E-07	mg/kg/day	---	mg/kg/day	---
				Naphthalene	9.1E+03	ug/kg	7.0E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	9.8E-06	mg/kg/day	2.0E-02	mg/kg/day	4.9E-04
			Exp. Route Total								4.3E-06					7.3E-02
			Inhalation	Aluminum	3.9E-02	ug/m^3	1.2E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.4E-06	mg/m^3	5.0E-03	mg/m^3	2.9E-04
				Antimony	7.1E-06	ug/m^3	2.2E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.6E-10	mg/m^3	---	mg/m^3	---
				Arsenic	2.5E-05	ug/m^3	7.9E-08	ug/m^3	4.3E-03	$(ug/m^3)^{-1}$	3.4E-10	9.2E-10	mg/m^3	1.5E-05	mg/m^3	6.1E-05
				Beryllium	2.4E-05	ug/m^3	7.4E-08	ug/m^3	2.4E-03	$(ug/m^3)^{-1}$	1.8E-10	8.6E-10	mg/m^3	2.0E-05	mg/m^3	4.3E-05
				Cadmium	5.6E-06	ug/m^3	1.8E-08	ug/m^3	1.8E-03	$(ug/m^3)^{-1}$	3.2E-11	2.0E-10	mg/m^3	1.0E-05	mg/m^3	2.0E-05
				Chromium	1.5E-04	ug/m^3	2.0E-06	ug/m^3	8.4E-02	$(ug/m^3)^{-1}$	1.7E-07	5.3E-09	mg/m^3	1.0E-04	mg/m^3	5.3E-05
				Cobalt	7.6E-05	ug/m^3	2.4E-07	ug/m^3	9.0E-03	$(ug/m^3)^{-1}$	2.1E-09	2.8E-09	mg/m^3	6.0E-06	mg/m^3	4.6E-04
				Copper	3.8E-03	ug/m^3	1.2E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.4E-07	mg/m^3	---	mg/m^3	---
				Iron	1.3E-01	ug/m^3	4.1E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---	4.7E-06	mg/m^3	---	mg/m^3	---
				Lead	2.1E-03	ug/m^3	6.5E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---	7.6E-08	mg/m^3	---	mg/m^3	---
				Manganese	4.2E-03	ug/m^3	1.3E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	1.5E-07	mg/m^3	5.0E-05	mg/m^3	3.0E-03
				Mercury	6.1E-06	ug/m^3	1.9E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.2E-10	mg/m^3	3.0E-04	mg/m^3	7.4E-07
				Nickel	5.6E-04	ug/m^3	1.8E-06	ug/m^3	2.6E-04	$(ug/m^3)^{-1}$	4.6E-10	2.0E-08	mg/m^3	9.0E-05	mg/m^3	2.3E-04
				Vanadium	1.2E-04	ug/m^3	3.8E-07	ug/m^3	---	$(ug/m^3)^{-1}$	---	4.4E-09	mg/m^3	1.0E-04	mg/m^3	4.4E-05
				Zinc	7.9E-03	ug/m^3	2.5E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---	2.9E-07	mg/m^3	---	mg/m^3	---
				2,3,7,8-TCDD Equivalents	3.2E-07	ug/m^3	9.9E-10	ug/m^3	3.8E+01	$(ug/m^3)^{-1}$	3.8E-08	1.2E-11	mg/m^3	4.0E-08	mg/m^3	2.9E-04
				Dieldrin	6.7E-08	ug/m^3	2.1E-10	ug/m^3	4.6E-03	$(ug/m^3)^{-1}$	9.7E-13	2.5E-12	mg/m^3	---	mg/m^3	---
				Benzo(A)Anthracene	1.1E-03	ug/m^3	1.6E-05	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	1.7E-09	4.2E-08	mg/m^3	---	mg/m^3	---
				Benzo(A)Pyrene	2.5E-06	ug/m^3	3.5E-08	ug/m^3	1.1E-03	$(ug/m^3)^{-1}$	3.8E-11	9.2E-11	mg/m^3	---	mg/m^3	---
				Benzo(B)Fluoranthene	2.7E-06	ug/m^3	3.7E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	4.1E-12	9.8E-11	mg/m^3	---	mg/m^3	---
				Benzo(K)Fluoranthene	2.5E-06	ug/m^3	3.4E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	3.8E-12	9.1E-11	mg/m^3	---	mg/m^3	---
				Dibenzo(A,H)Anthracene	4.0E-07	ug/m^3	5.5E-09	ug/m^3	1.2E-03	$(ug/m^3)^{-1}$	6.6E-12	1.5E-11	mg/m^3	---	mg/m^3	---
				Indeno(1,2,3-Cd)Pyrene	9.5E-07	ug/m^3	1.3E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	1.4E-12	3.5E-11	mg/m^3	---	mg/m^3	---
				Naphthalene	1.6E-02	ug/m^3	5.1E-05	ug/m^3	3.4E-05	$(ug/m^3)^{-1}$	1.7E-09	5.9E-07	mg/m^3	3.0E-03	mg/m^3	2.0E-04
			Exp. Route Total								2.1E-07					4.7E-03
		Exposure Point Total									3.0E-05					1.1E+00
	Exposure Medium Total										3.0E-05					1.1E+00
Medium and Receptor Total											3.0E-05					1.1E+00

Notes:

a - For the mutagenic COPCs, an ADAF was applied to the risk calculation to account for potential mutagenicity in childhood exposures (10 for years 0-2 and 3 for years 2-6).

Table 7-7.34

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Seep Water - Annex	Leachate Liquid - Annex	Seep Area - Annex	Dermal	Aluminum	3.1E+04	ug/l	1.5E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.1E-04	mg/kg/day	1.0E+00	mg/kg/day	2.1E-04
				Arsenic	3.5E+01	ug/l	1.6E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	2.5E-08	2.3E-07	mg/kg/day	3.0E-04	mg/kg/day	7.7E-04
				Chromium	7.4E+01	ug/l	3.1E-07	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	6.2E-06	9.9E-07	mg/kg/day	7.5E-05	mg/kg/day	1.3E-02
				Cobalt	2.5E+01	ug/l	4.8E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.7E-08	mg/kg/day	3.0E-04	mg/kg/day	2.2E-04
				Iron	5.2E+04	ug/l	2.5E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.4E-04	mg/kg/day	7.0E-01	mg/kg/day	4.9E-04
				Lead	3.5E+02	ug/l	1.7E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	2.3E-07	mg/kg/day	---	mg/kg/day	---
				Manganese	1.3E+03	ug/l	6.0E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	8.4E-06	mg/kg/day	9.6E-04	mg/kg/day	8.8E-03
				Naphthalene	5.0E+00	ug/l	4.5E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.4E-06	mg/kg/day	2.0E-02	mg/kg/day	3.2E-04
				Vanadium	9.5E+01	ug/l	4.5E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	6.4E-07	mg/kg/day	1.3E-04	mg/kg/day	4.9E-03
				Benzene	1.6E-01	ug/l	3.4E-09	mg/kg/day	5.5E-02	$(mg/kg/day)^{-1}$	1.9E-10	4.7E-08	mg/kg/day	4.0E-03	mg/kg/day	1.2E-05
				Vinyl Chloride	8.2E-01	ug/l	1.8E-08	mg/kg/day	1.4E+00	$(mg/kg/day)^{-1}$	2.5E-08	1.2E-07	mg/kg/day	3.0E-03	mg/kg/day	4.1E-05
			Exp. Route Total								6.3E-06					2.9E-02
		Exposure Point Total									6.3E-06					2.9E-02
	Exposure Medium Total										6.3E-06					2.9E-02
Medium and Receptor Total											6.3E-06					2.9E-02

a - For chromium, an ADAF was applied to the risk calculation to account for potential mutagenicity in childhood exposures (10 for years 1-2 and 3 for years 2-6).

b - For vinyl chloride, the ADAF applied was a factor of 2.

Table 7-7.35

Calculation Of Chemical Cancer Risks And Non-Cancer Hazards

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Refuge Visitor
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Seep Water - Landfill	Leachate Liquid - Landfill	Seep Area - Landfill	Dermal	Arsenic	1.7E+01	ug/l	8.3E-09	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.2E-08	1.2E-07	mg/kg/day	3.0E-04	mg/kg/day	3.9E-04
				Chromium	5.4E+01	ug/l	2.3E-07	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	4.5E-06	7.2E-07	mg/kg/day	7.5E-05	mg/kg/day	9.6E-03
				Cobalt	1.2E+01	ug/l	2.3E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.3E-08	mg/kg/day	3.0E-04	mg/kg/day	1.1E-04
				Iron	4.7E+04	ug/l	2.2E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	3.1E-04	mg/kg/day	7.0E-01	mg/kg/day	4.5E-04
				Lead	2.5E+02	ug/l	1.2E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.6E-07	mg/kg/day	---	mg/kg/day	---
				Manganese	1.6E+03	ug/l	7.8E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---	1.1E-05	mg/kg/day	9.6E-04	mg/kg/day	1.1E-02
				Aldrin	2.4E-02	ug/l	6.3E-08	mg/kg/day	1.7E+01	$(mg/kg/day)^{-1}$	1.1E-06	8.8E-07	mg/kg/day	3.0E-05	mg/kg/day	2.9E-02
				Dieldrin	9.0E-02	ug/l	2.3E-08	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	3.7E-07	3.3E-07	mg/kg/day	5.0E-05	mg/kg/day	6.5E-03
			Exp. Route Total								6.0E-06					5.8E-02
		Exposure Point Total									6.0E-06					5.8E-02
	Exposure Medium Total										6.0E-06					5.8E-02
Medium and Receptor Total											6.0E-06					5.8E-02

a - For the mutagenic COPCs, an ADAF was applied to the risk calculation to account for potential mutagenicity in childhood exposures (10 for years 1-2 and 3 for years 2-6).

Table 7-7.36
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value[a]	Units	Exposure Concentration		Unit Risk		Cancer Risk
							Value[b]	Units	Value	Units	
Groundwater - Annex	Ambient Air - Annex	Ambient Air - Annex	Inhalation	1,2-Dichloroethane	2.9E-04	ug/m^3	4.7E-06	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	1.2E-10
				1,4-Dichlorobenzene	5.7E-06	ug/m^3	9.2E-08	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	1.0E-12
				Benzene	1.6E-05	ug/m^3	2.6E-07	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	2.0E-12
				Chlorobenzene	1.9E-04	ug/m^3	3.1E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---
				Trichloroethene	8.4E-06	ug/m^3	1.0E-07	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	4.3E-13
				Vinyl Chloride	8.6E-05	ug/m^3	8.7E-05	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	3.8E-10
				1,4-Dioxane	3.5E-06	ug/m^3	5.6E-08	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	2.8E-13
				Naphthalene	8.6E-05	ug/m^3	1.4E-06	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	4.8E-11
				Heptachlor	7.8E-08	ug/m^3	1.3E-09	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	1.6E-12
			Exp. Route Total								5.6E-10
		Exposure Point Total									5.6E-10
	Exposure Medium Total										5.6E-10
Medium and Receptor Total											5.6E-10

a - Child EPCs from box plot model (Appendix T) used for lifetime exposure.

b - For trichloroethene and vinyl chloride, intake rates were calculated using EPA's equations from the RSL website available at: https://www.epa.gov/risk/regional-screening-levels-rsls-equations-november-2017

Table 7-7.37
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value[a]	Units	Exposure Concentration		Unit Risk		Cancer Risk
							Value[b]	Units	Value	Units	
Groundwater - Landfill	Ambient Air - Landfill	Ambient Air - Landfill	Inhalation	1,1-Dichloroethene	7.2E-04	ug/m^3	1.2E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---
				1,1,2,2-Tetrachloroethane	1.2E-06	ug/m^3	1.9E-08	ug/m^3	5.8E-05	(ug/m^3)$^{-1}$	1.1E-12
				1,2-Dichloroethane	1.7E-05	ug/m^3	2.8E-07	ug/m^3	2.6E-05	(ug/m^3)$^{-1}$	7.2E-12
				1,4-Dichlorobenzene	9.3E-06	ug/m^3	1.5E-07	ug/m^3	1.1E-05	(ug/m^3)$^{-1}$	1.7E-12
				Benzene	1.1E-04	ug/m^3	1.8E-06	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	1.4E-11
				2-Hexanone	2.0E-05	ug/m^3	3.2E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---
				Chlorobenzene	1.6E-03	ug/m^3	2.6E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---
				Ethylbenzene	1.43E-04	ug/m^3	2.3E-06	ug/m^3	2.5E-06	(ug/m^3)$^{-1}$	5.8E-12
				Trichloroethene	2.0E-04	ug/m^3	2.4E-06	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	9.9E-12
				Vinyl Chloride	3.3E-03	ug/m^3	3.4E-03	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	1.5E-08
				Xylenes, Total	1.3E-03	ug/m^3	2.1E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---
				1,4-Dioxane	6.2E-05	ug/m^3	1.0E-06	ug/m^3	5.0E-06	(ug/m^3)$^{-1}$	5.0E-12
				Biphenyl	3.2E-05	ug/m^3	5.2E-07	ug/m^3	---	(ug/m^3)$^{-1}$	---
				Naphthalene	6.4E-04	ug/m^3	1.0E-05	ug/m^3	3.4E-05	(ug/m^3)$^{-1}$	3.6E-10
				Aldrin	1.5E-08	ug/m^3	2.4E-10	ug/m^3	4.9E-03	(ug/m^3)$^{-1}$	1.2E-12
				Heptachlor	1.7E-07	ug/m^3	2.8E-09	ug/m^3	1.3E-03	(ug/m^3)$^{-1}$	3.6E-12
				Heptachlor Epoxide	1.6E-08	ug/m^3	2.5E-10	ug/m^3	2.6E-03	(ug/m^3)$^{-1}$	6.6E-13
				Mercury	3.0E-06	ug/m^3	4.8E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---
			Exp. Route Total								1.5E-08
		Exposure Point Total									1.5E-08
	Exposure Medium Total										1.5E-08
Medium and Receptor Total											1.5E-08

a - Child EPCs from box plot model (Appendix T) used for lifetime exposure.

b - For trichloroethene and vinyl chloride, intake rates were calculated using EPA's equations from the RSL website available at: https://www.epa.gov/risk/regional-screening-levels-rsls-equations-november-2017

Table 7-7.38
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill, Annex Site, and Visitors Center - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Exposure Concentration		Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Groundwater-Refuge	Ambient Air - Refuge	Indoor Air - Refuge	Inhalation	Benzene	2.0E-01	ug/m^3	3.3E-03	ug/m^3	7.8E-06	(ug/m^3)$^{-1}$	2.5E-08
				Chloroform	8.6E-02	ug/m^3	1.4E-03	ug/m^3	2.3E-05	(ug/m^3)$^{-1}$	3.2E-08
				Trichloroethene	3.4E-01	ug/m^3	4.2E-03	ug/m^3	4.1E-06	(ug/m^3)$^{-1}$	1.7E-08
				Vinyl Chloride	3.8E+01	ug/m^3	3.8E+01	ug/m^3	4.4E-06	(ug/m^3)$^{-1}$	1.7E-04
			Exp. Route Total								1.7E-04
		Exposure Point Total									1.7E-04
	Exposure Medium Total										1.7E-04
Medium and Receptor Total											1.7E-04

a - Risks to trichloroethene and vinyl chloride calculated with equation from residential inhalation from tap water provided in the EPA regional screening level website (https://www.epa.gov/risk/regional-screening-levels-rsls-equations-november-2017)

Table 7-7.39
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value[a]	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk[b]
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Ingestion	Aluminum	1.8E+04	mg/kg	3.1E-03	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Antimony	1.5E+00	mg/kg	2.7E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Arsenic	2.9E+01	mg/kg	3.1E-06	mg/kg/day	1.5E+00	(mg/kg/day)$^{-1}$	4.6E-06
				Chromium	5.7E+01	mg/kg	8.7E-05	mg/kg/day	5.0E-01	(mg/kg/day)$^{-1}$	4.4E-05
				Cobalt	1.1E+01	mg/kg	2.0E-06	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Iron	2.9E+04	mg/kg	5.1E-03	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Manganese	4.5E+02	mg/kg	7.8E-05	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Thallium	1.0E+00	mg/kg	1.7E-07	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Vanadium	6.6E+01	mg/kg	1.1E-05	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	3.1E-12	mg/kg/day	1.3E+05	(mg/kg/day)$^{-1}$	4.0E-07
				Aroclor 1248	3.9E+03	ug/kg	6.8E-07	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	1.4E-06
				Aroclor 1254	1.9E+02	ug/kg	3.4E-08	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	6.7E-08
				Aroclor 1260	9.3E+01	ug/kg	1.6E-08	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	3.2E-08
				Benzo(A)Anthracene	3.3E+02	ug/kg	5.0E-07	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	3.6E-07
				Benzo(A)Pyrene	2.1E+02	ug/kg	3.1E-07	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	2.3E-06
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	1.1E-06	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	7.9E-07
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	9.1E-08	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	6.6E-07
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	2.0E-07	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	1.5E-07
			Exp. Route Total								5.4E-05
			Dermal	Aluminum	1.8E+04	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Antimony	1.5E+00	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Arsenic	2.9E+01	mg/kg	8.9E-07	mg/kg/day	1.5E+00	(mg/kg/day)$^{-1}$	1.3E-06
				Chromium	5.7E+01	mg/kg	---	mg/kg/day	2.0E+01	(mg/kg/day)$^{-1}$	---
				Cobalt	1.1E+01	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Iron	2.9E+04	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Manganese	4.5E+02	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Thallium	1.0E+00	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				Vanadium	6.6E+01	mg/kg	---	mg/kg/day	---	(mg/kg/day)$^{-1}$	---
				2,3,7,8-TCDD Equivalents	1.8E-02	ug/kg	5.3E-13	mg/kg/day	1.3E+05	(mg/kg/day)$^{-1}$	6.9E-08
				Aroclor 1248	3.9E+03	ug/kg	5.5E-07	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	1.1E-06
				Aroclor 1254	1.9E+02	ug/kg	2.7E-08	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	5.4E-08
				Aroclor 1260	9.3E+01	ug/kg	1.3E-08	mg/kg/day	2.0E+00	(mg/kg/day)$^{-1}$	2.6E-08
				Benzo(A)Anthracene	3.3E+02	ug/kg	3.4E-07	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	2.5E-07
				Benzo(A)Pyrene	2.1E+02	ug/kg	2.1E-07	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	1.6E-06
				Benzo(B)Fluoranthene	7.1E+02	ug/kg	7.4E-07	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	5.4E-07
				Dibenzo(A,H)Anthracene	6.0E+01	ug/kg	6.3E-08	mg/kg/day	7.3E+00	(mg/kg/day)$^{-1}$	4.6E-07
				Indeno(1,2,3-Cd)Pyrene	1.3E+02	ug/kg	1.4E-07	mg/kg/day	7.3E-01	(mg/kg/day)$^{-1}$	1.0E-07
			Exp. Route Total								5.5E-06
			Inhalation	Aluminum	3.9E-02	ug/m^3	6.3E-04	ug/m^3	---	(ug/m^3)$^{-1}$	---
				Antimony	3.3E-06	ug/m^3	5.3E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---
				Arsenic	6.3E-05	ug/m^3	1.0E-06	ug/m^3	4.3E-03	(ug/m^3)$^{-1}$	4.4E-09
				Beryllium	4.1E-06	ug/m^3	6.7E-08	ug/m^3	2.4E-03	(ug/m^3)$^{-1}$	1.6E-10
				Cadmium	2.4E-06	ug/m^3	3.9E-08	ug/m^3	1.8E-03	(ug/m^3)$^{-1}$	7.0E-11
				Chromium	1.2E-04	ug/m^3	4.7E-06	ug/m^3	8.4E-02	(ug/m^3)$^{-1}$	4.0E-07
				Cobalt	2.4E-05	ug/m^3	4.0E-07	ug/m^3	9.0E-03	(ug/m^3)$^{-1}$	3.6E-09
				Iron	6.3E-02	ug/m^3	1.0E-03	ug/m^3	---	(ug/m^3)$^{-1}$	---
				Manganese	9.6E-04	ug/m^3	1.6E-05	ug/m^3	---	(ug/m^3)$^{-1}$	---
				Thallium	2.1E-06	ug/m^3	3.5E-08	ug/m^3	---	(ug/m^3)$^{-1}$	---
				Vanadium	1.4E-04	ug/m^3	2.3E-06	ug/m^3	---	(ug/m^3)$^{-1}$	---
				2,3,7,8-TCDD Equivalents	1.2E-08	ug/m^3	1.9E-10	ug/m^3	3.8E+01	(ug/m^3)$^{-1}$	7.2E-09
				Aroclor 1248	8.1E-03	ug/m^3	1.3E-04	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	7.5E-08
				Aroclor 1254	2.9E-04	ug/m^3	4.8E-06	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	2.7E-09
				Aroclor 1260	9.1E-05	ug/m^3	1.5E-06	ug/m^3	5.7E-04	(ug/m^3)$^{-1}$	8.5E-10
				Benzo(A)Anthracene	9.7E-05	ug/m^3	3.7E-06	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	4.1E-10
				Benzo(A)Pyrene	4.4E-07	ug/m^3	1.7E-08	ug/m^3	1.1E-03	(ug/m^3)$^{-1}$	1.9E-11
				Benzo(B)Fluoranthene	1.5E-06	ug/m^3	5.8E-08	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	6.4E-12
				Dibenzo(A,H)Anthracene	1.3E-07	ug/m^3	4.9E-09	ug/m^3	1.2E-03	(ug/m^3)$^{-1}$	5.9E-12
				Indeno(1,2,3-Cd)Pyrene	2.8E-07	ug/m^3	1.1E-08	ug/m^3	1.1E-04	(ug/m^3)$^{-1}$	1.2E-12
			Exp. Route Total								4.9E-07
		Exposure Point Total									6.0E-05
	Exposure Medium Total										6.0E-05
Medium and Receptor Total											6.0E-05

a - For the inhalation pathway, the air EPC is calculated from the soil EPC as provided in Table 4e of Appendix T.

b - For mutagenic COPCs, an ADAF was applied (10 at 1-2 years, 3 at 2-16 years and 1 at 16-27 years).

Golder Associates

Table 7-7.40
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value[a]	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk[b]
							Value	Units	Value	Units	
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Ingestion	Aluminum	1.6E+04	mg/kg	2.7E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Antimony	2.9E+00	mg/kg	5.0E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Arsenic	1.0E+01	mg/kg	1.0E-06	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	1.6E-06
				Beryllium	9.4E+00	mg/kg	1.6E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Cadmium	2.2E+00	mg/kg	3.9E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Chromium	5.8E+01	mg/kg	8.9E-05	mg/kg/day	5.0E-01	$(mg/kg/day)^{-1}$	4.4E-05
				Cobalt	3.0E+01	mg/kg	5.3E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Copper	1.5E+03	mg/kg	2.6E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Iron	5.2E+04	mg/kg	9.0E-03	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Lead	8.3E+02	mg/kg	1.4E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Manganese	1.7E+03	mg/kg	2.9E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Mercury	2.4E+00	mg/kg	4.2E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Nickel	2.2E+02	mg/kg	3.9E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Vanadium	4.8E+01	mg/kg	8.4E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Zinc	3.2E+03	mg/kg	5.5E-04	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	3.1E-11	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	4.0E-06
				Dieldrin	2.7E+01	ug/kg	4.7E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	7.5E-08
				Benzo(A)Anthracene	1.2E+03	ug/kg	1.8E-06	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.3E-06
				Benzo(A)Pyrene	1.0E+03	ug/kg	1.5E-06	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	1.1E-05
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	1.6E-06	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	1.5E-06	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	1.1E-07
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	2.4E-07	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	1.8E-06
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	5.7E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	4.2E-07
				Naphthalene	9.1E+03	ug/kg	1.6E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
			Exp. Route Total								6.6E-05

Table 7-7.40
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Refuge Visitor
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC Value[a]	EPC Units	Cancer Risk Calculations: Intake/Exposure Concentration Value	Intake/Exposure Concentration Units	CSF/Unit Risk Value	CSF/Unit Risk Units	Cancer Risk[b]
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Dermal	Aluminum	1.6E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Antimony	2.9E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Arsenic	1.0E+01	mg/kg	3.0E-07	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	4.6E-07
				Beryllium	9.4E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Cadmium	2.2E+00	mg/kg	2.3E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Chromium	5.8E+01	mg/kg	---	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	---
				Cobalt	3.0E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Copper	1.5E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Iron	5.2E+04	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Lead	8.3E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Manganese	1.7E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Mercury	2.4E+00	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Nickel	2.2E+02	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Vanadium	4.8E+01	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Zinc	3.2E+03	mg/kg	---	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				2,3,7,8-TCDD Equivalents	1.8E-01	ug/kg	5.4E-12	mg/kg/day	1.3E+05	$(mg/kg/day)^{-1}$	7.0E-07
				Dieldrin	2.7E+01	ug/kg	2.7E-09	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	4.3E-08
				Benzo(A)Anthracene	1.2E+03	ug/kg	1.2E-06	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	3.7E-06
				Benzo(A)Pyrene	1.0E+03	ug/kg	1.0E-06	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	3.2E-05
				Benzo(B)Fluoranthene	1.1E+03	ug/kg	1.1E-06	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	3.4E-06
				Benzo(K)Fluoranthene	1.0E+03	ug/kg	1.0E-06	mg/kg/day	7.3E-02	$(mg/kg/day)^{-1}$	3.2E-07
				Dibenzo(A,H)Anthracene	1.6E+02	ug/kg	1.7E-07	mg/kg/day	7.3E+00	$(mg/kg/day)^{-1}$	5.0E-06
				Indeno(1,2,3-Cd)Pyrene	3.8E+02	ug/kg	3.9E-07	mg/kg/day	7.3E-01	$(mg/kg/day)^{-1}$	1.2E-06
				Naphthalene	9.1E+03	ug/kg	1.2E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
			Exp. Route Total								4.7E-05
			Inhalation	Aluminum	3.9E-02	ug/m^3	6.4E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---
				Antimony	7.1E-06	ug/m^3	1.2E-07	ug/m^3	---	$(ug/m^3)^{-1}$	---
				Arsenic	2.5E-05	ug/m^3	4.1E-07	ug/m^3	4.3E-03	$(ug/m^3)^{-1}$	1.8E-09
				Beryllium	2.4E-05	ug/m^3	3.8E-07	ug/m^3	2.4E-03	$(ug/m^3)^{-1}$	9.2E-10
				Cadmium	5.6E-06	ug/m^3	9.1E-08	ug/m^3	1.8E-03	$(ug/m^3)^{-1}$	1.6E-10
				Chromium	1.5E-04	ug/m^3	5.6E-06	ug/m^3	8.4E-02	$(ug/m^3)^{-1}$	2.0E-06
				Cobalt	7.6E-05	ug/m^3	1.2E-06	ug/m^3	9.0E-03	$(ug/m^3)^{-1}$	1.1E-08
				Copper	3.8E-03	ug/m^3	6.1E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---
				Iron	1.3E-01	ug/m^3	2.1E-03	ug/m^3	---	$(ug/m^3)^{-1}$	---
				Lead	2.1E-03	ug/m^3	3.4E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---
				Manganese	4.2E-03	ug/m^3	6.8E-05	ug/m^3	---	$(ug/m^3)^{-1}$	---
				Mercury	6.1E-06	ug/m^3	9.9E-08	ug/m^3	---	$(ug/m^3)^{-1}$	---
				Nickel	5.6E-04	ug/m^3	9.1E-06	ug/m^3	2.6E-04	$(ug/m^3)^{-1}$	2.4E-09
				Vanadium	1.2E-04	ug/m^3	2.0E-06	ug/m^3	---	$(ug/m^3)^{-1}$	---
				Zinc	7.9E-03	ug/m^3	1.3E-04	ug/m^3	---	$(ug/m^3)^{-1}$	---
				2,3,7,8-TCDD Equivalents	3.2E-07	ug/m^3	5.1E-09	ug/m^3	3.8E+01	$(ug/m^3)^{-1}$	2.0E-07
				Dieldrin	6.7E-08	ug/m^3	1.1E-09	ug/m^3	4.6E-03	$(ug/m^3)^{-1}$	5.0E-12
				Benzo(A)Anthracene	1.1E-03	ug/m^3	4.4E-05	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	4.8E-09
				Benzo(A)Pyrene	2.5E-06	ug/m^3	9.6E-08	ug/m^3	1.1E-03	$(ug/m^3)^{-1}$	4.4E-10
				Benzo(B)Fluoranthene	2.7E-06	ug/m^3	1.0E-07	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	4.7E-11
				Benzo(K)Fluoranthene	2.5E-06	ug/m^3	9.5E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	4.4E-11
				Dibenzo(A,H)Anthracene	4.0E-07	ug/m^3	1.5E-08	ug/m^3	1.2E-03	$(ug/m^3)^{-1}$	7.6E-11
				Indeno(1,2,3-Cd)Pyrene	9.5E-07	ug/m^3	3.6E-08	ug/m^3	1.1E-04	$(ug/m^3)^{-1}$	1.7E-11
				Naphthalene	1.6E-02	ug/m^3	2.6E-04	ug/m^3	3.4E-05	$(ug/m^3)^{-1}$	9.0E-09
			Exp. Route Total								2.2E-06
		Exposure Point Total									1.1E-04
	Exposure Medium Total										1.1E-04
Medium and Receptor Total											1.1E-04

a - For the inhalation pathway, the air EPC is calculated from the soil EPC as provided in Table 4e of Appendix T.

b - For mutagenic COPCs, an ADAF was applied (10 at 1-2 years, 3 at 2-16 years and 1 at 16-27 years).

Table 7-7.41
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value[a]	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Surface Seep Water - Annex	Leachate Liquid - Annex	Seep Area - Annex	Dermal	Aluminum	3.1E+04	ug/l	3.8E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Arsenic	3.5E+01	ug/l	4.2E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	6.3E-08
				Chromium	7.4E+01	ug/l	5.2E-07	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	1.0E-05
				Cobalt	2.5E+01	ug/l	1.2E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Iron	5.2E+04	ug/l	6.3E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Lead	3.5E+02	ug/l	4.2E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Manganese	1.3E+03	ug/l	1.5E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Naphthalene	5.0E+00	ug/l	1.2E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Vanadium	9.5E+01	ug/l	1.2E-07	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Benzene	1.6E-01	ug/l	8.5E-09	mg/kg/day	5.5E-02	$(mg/kg/day)^{-1}$	4.7E-10
				Vinyl Chloride	8.2E-01	ug/l	9.6E-07	mg/kg/day	7.2E-01	$(mg/kg/day)^{-1}$	6.9E-07
			Exp. Route Total								1.1E-05
		Exposure Point Total									1.1E-05
	Exposure Medium Total										1.1E-05
Medium and Receptor Total											1.1E-05

Golder Associates

Table 7-7.42
Calculation Of Chemical Cancer Risks And Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Refuge Visitor
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk
							Value	Units	Value	Units	
Surface Seep Water - Landfill	Leachate Liquid - Landfill	Seep Area - Landfill	Dermal	Arsenic	1.7E+01	ug/l	2.1E-08	mg/kg/day	1.5E+00	$(mg/kg/day)^{-1}$	3.2E-08
				Chromium	5.4E+01	ug/l	3.8E-07	mg/kg/day	2.0E+01	$(mg/kg/day)^{-1}$	7.6E-06
				Cobalt	1.2E+01	ug/l	5.9E-09	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Iron	4.7E+04	ug/l	5.7E-05	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Lead	2.5E+02	ug/l	3.0E-08	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Manganese	1.6E+03	ug/l	2.0E-06	mg/kg/day	---	$(mg/kg/day)^{-1}$	---
				Aldrin	2.4E-02	ug/l	1.6E-07	mg/kg/day	1.7E+01	$(mg/kg/day)^{-1}$	2.7E-06
				Dieldrin	9.0E-02	ug/l	5.9E-08	mg/kg/day	1.6E+01	$(mg/kg/day)^{-1}$	9.5E-07
			Exp. Route Total								1.1E-05
		Exposure Point Total									1.1E-05
	Exposure Medium Total										1.1E-05
Medium and Receptor Total											1.1E-05

Table 7-8.1
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks: Ingestion	Carcinogenic Risks: Inhalation	Carcinogenic Risks: Dermal	Carcinogenic Risks: External	Carcinogenic Risks: Exposure Routes Total	Non-Cancer Hazard Calculations: Ingestion	Non-Cancer Hazard Calculations: Inhalation	Non-Cancer Hazard Calculations: Dermal	Non-Cancer Hazard Calculations: Exposure Routes Total
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Aluminum	---	---	---	---	---	5E-02	2E-03	---	5E-02
			Antimony	---	---	---	---	---	1E-02	---	---	1E-02
			Arsenic	1E-06	9E-10	2E-07	---	1E-06	2E-01	1E-03	3E-02	2E-01
			Beryllium	---	3E-11	---	---	3E-11	---	5E-05	---	5E-05
			Cadmium	---	1E-11	---	---	1E-11	---	5E-05	---	5E-05
			Chromium	1E-06	3E-08	---	---	1E-06	5E-02	3E-04	---	5E-02
			Cobalt	---	7E-10	---	---	7E-10	1E-01	9E-04	---	1E-01
			Iron	---	---	---	---	---	1E-01	---	---	1E-01
			Manganese	---	---	---	---	---	9E-03	4E-03	---	1E-02
			Thallium	---	---	---	---	---	3E-01	---	---	3E-01
			Vanadium	---	---	---	---	---	4E-02	3E-04	---	4E-02
			2,3,7,8-TCDD Equivalents	9E-08	1E-09	9E-09	---	1E-07	7E-02	7E-05	7E-03	8E-02
			Aroclor 1248	3E-07	1E-08	1E-07	---	5E-07	---	---	---	---
			Aroclor 1254	2E-08	5E-10	7E-09	---	2E-08	3E-02	---	1E-02	4E-02
			Aroclor 1260	7E-09	2E-10	3E-09	---	1E-08	---	---	---	---
			Benzo(A)Anthracene	1E-08	3E-11	4E-09	---	1E-08	---	---	---	---
			Benzo(A)Pyrene	6E-08	2E-12	3E-08	---	9E-08	---	---	---	---
			Benzo(B)Fluoranthene	2E-08	5E-13	9E-09	---	3E-08	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	2E-08	5E-13	7E-09	---	2E-08	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	4E-09	1E-13	2E-09	---	6E-09	---	---	---	---
			Chemical Total					3E-06				1E+00
			Radionuclide Total					---				---
		Exposure Point Total						3E-06				1E+00
	Exposure Medium Total							3E-06				1E+00
	Air	Ambient Air in a Trench	Aroclor 1248	---	4E-10	---	---	4E-10	---	---	---	---
			Chemical Total									
			Radionuclide Total					---				---
		Exposure Point Total						4E-10				---
	Exposure Medium Total							4E-10				---
Soil Total								3E-06				1E+00
Groundwater - Annex	Groundwater - Annex	Groundwater - Annex	Aluminum	---	---	---	---	---	2E-04	---	7E-06	2E-04
			Antimony	---	---	---	---	---	6E-04	---	2E-04	8E-04
			Arsenic	1E-08	---	6E-10	---	1E-08	2E-03	---	9E-05	2E-03
			Barium	---	---	---	---	---	3E-04	---	2E-04	6E-04
			Chromium	5E-09	---	2E-08	---	2E-08	2E-04	---	8E-04	1E-03
			Cobalt	---	---	---	---	---	5E-03	---	9E-05	5E-03
			Iron	---	---	---	---	---	4E-03	---	2E-04	4E-03
			Manganese	---	---	---	---	---	2E-02	---	2E-02	4E-02
			Thallium	---	---	---	---	---	4E-02	---	2E-03	4E-02
			Beta-BHC	6E-11	---	6E-10	---	6E-10	---	---	---	---
			Heptachlor	1E-10	2E-13	1E-08	---	1E-08	3E-06	---	3E-04	3E-04
			1,4-Dioxane	3E-09	3E-14	1E-10	---	3E-09	6E-05	1E-08	3E-06	6E-05
			2-Methylnaphthalene	---	---	---	---	---	1E-04	---	3E-03	3E-03
			Bis(2-Ethylhexyl) Phthalate	1E-10	---	9E-08	---	9E-08	3E-05	---	2E-02	2E-02
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzofuran	---	---	---	---	---	4E-04	---	1E-02	1E-02
			Naphthalene	---	5E-12	---	---	5E-12	6E-05	3E-06	5E-04	6E-04
			1,2-Dichloroethane	3E-09	1E-11	2E-09	---	4E-09	3E-04	5E-06	2E-04	6E-04
			1,4-Dichlorobenzene	3E-12	1E-13	3E-11	---	3E-11	5E-07	8E-10	5E-06	5E-06
			Benzene	3E-11	2E-13	7E-11	---	1E-10	1E-05	6E-08	2E-05	3E-05
			Chlorobenzene	---	---	---	---	---	4E-05	4E-07	2E-04	2E-04
			Ethylbenzene	1E-11	---	9E-11	---	1E-10	7E-07	---	6E-06	6E-06
			Trichloroethene	1E-11	6E-14	2E-11	---	3E-11	3E-05	5E-07	7E-05	1E-04
			Vinyl Chloride	5E-10	6E-13	5E-10	---	1E-09	2E-05	1E-07	2E-05	3E-05
			Chemical Total					1E-07				1E-01
			Radionuclide Total					---				---
		Exposure Point Total						1E-07				1E-01
	Exposure Medium Total							1E-07				1E-01

Table 7-8.1
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks: Ingestion	Carcinogenic Risks: Inhalation	Carcinogenic Risks: Dermal	Carcinogenic Risks: External	Carcinogenic Risks: Exposure Routes Total	Non-Cancer Hazard Calculations: Ingestion	Non-Cancer Hazard Calculations: Inhalation	Non-Cancer Hazard Calculations: Dermal	Non-Cancer Hazard Calculations: Exposure Routes Total
Groundwater - Annex	Air	Ambient Air in Trench	1,2-Dichloroethane	---	7E-09	---	---	7E-09	---	3E-03	---	3E-03
			1,4-Dichlorobenzene	---	8E-11	---	---	8E-11	---	6E-07	---	6E-07
			Benzene	---	2E-10	---	---	2E-10	---	6E-05	---	6E-05
			Chlorobenzene	---	---	---	---	---	---	4E-04	---	4E-04
			Trichloroethene		7E-11	---	---	7E-11	---	6E-04	---	6E-04
			Vinyl Chloride	---	8E-10	---	---	8E-10	---	1E-04	---	1E-04
			1,4-Dioxane	---	5E-12	---	---	5E-12	---	2E-06	---	2E-06
			Naphthalene	---	1E-09	---	---	1E-09	---	1E-03	---	1E-03
			Heptachlor	---	7E-11	---	---	7E-11	---	---	---	---
			Chemical Total					9E-09				5E-03
			Radionuclide Total					---				---
		Exposure Point Total						9E-09				5E-03
	Exposure Medium Total							9E-09				5E-03
Groundwater Total								2E-07				1E-01
Seep Liquid - Annex	Seep Liquid - Annex	Seep Liquid - Annex	Aluminum	---	---	---	---	---	---	---	7E-05	7E-05
			Arsenic	---	---	2E-09	---	2E-09	---	---	3E-04	3E-04
			Chromium	---	---	1E-07	---	1E-07	---	---	4E-03	4E-03
			Cobalt	---	---	---	---	---	---	---	8E-05	8E-05
			Iron	---	---	---	---	---	---	---	2E-04	2E-04
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	3E-03	3E-03
			Naphthalene	---	---	---	---	---	---	---	1E-04	1E-04
			Vanadium	---	---	---	---	---	---	---	2E-03	2E-03
			Benzene	---	---	1E-11	---	1E-11	---	---	4E-06	4E-06
			Vinyl Chloride	---	---	4E-10	---	4E-10	---	---	1E-05	1E-05
			Chemical Total					1E-07				1E-02
			Radionuclide Total					---				---
		Exposure Point Total						1E-07				1E-02
	Exposure Medium Total							1E-07				1E-02
Seep Liquid Total								1E-07				1E-02
Receptor Total								3E-06				1E+00

Total Risks Across All Media= 3E-06

Total Hazard Across All Media= 1E+00

Total Liver HI Across All Media=	2E-02
Total Blood HI Across All Media=	2E-01
Total Kidney HI Across All Media=	1E-02
Total CNS HI Across All Media=	1E-01
Total Nasal HI Across All Media=	1E-03
Total Lung/Respiratory HI Across All Media=	5E-03
Total Pancreas HI Across All Media=	1E-02
Total Thyroid Effects HI Across All Media=	1E-01
Total Hair Effects HI Across All Media=	7E-02
Total Body Weight HI Across All Media=	7E-04
Total Immunological HI Across All Media=	4E-02
Total Endocrine HI Across All Media=	7E-05
Total Reproductive HI Across All Media=	8E-02
Total Gastrointestinal HI Across All Media=	2E-01
Total Skin Effects HI Across All Media=	5E-01
Total Cardiovascular Effects HI Across All Media=	1E-03
Total Developmental Effects HI Across All Media=	1E-03
Total Ocular Effects HI Across All Media=	4E-02

Table 7-8.2
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Aluminum	---	---	---	---	---	4E-02	2E-03	---	5E-02
			Antimony	---	---	---	---	---	2E-02	---	---	2E-02
			Arsenic	4E-07	4E-10	6E-08	---	4E-07	6E-02	4E-04	9E-03	7E-02
			Beryllium	---	2E-10	---	---	2E-10	1E-02	3E-04	---	1E-02
			Cadmium	---	3E-11	---	---	3E-11	6E-03	1E-04	8E-04	7E-03
			Chromium	1E-06	4E-08	---	---	1E-06	6E-02	3E-04	---	6E-02
			Cobalt	---	2E-09	---	---	2E-09	3E-01	3E-03	---	3E-01
			Copper	---	---	---	---	---	1E-01	---	---	1E-01
			Iron	---	---	---	---	---	2E-01	---	---	2E-01
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	3E-02	2E-02	---	5E-02
			Mercury	---	---	---	---	---	2E-02	5E-06	---	2E-02
			Nickel	---	5E-10	---	---	5E-10	3E-02	1E-03	---	3E-02
			Vanadium	---	---	---	---	---	3E-02	3E-04	---	3E-02
			Zinc	---	---	---	---	---	3E-02	---	---	3E-02
			2,3,7,8-TCDD Equivalents	9E-07	4E-08	9E-08	---	1E-06	7E-01	2E-03	7E-02	8E-01
			Dieldrin	2E-08	1E-12	6E-09	---	2E-08	2E-03	---	5E-04	2E-03
			Benzo(A)Anthracene	3E-08	4E-10	1E-08	---	5E-08	---	---	---	---
			Benzo(A)Pyrene	3E-07	9E-12	1E-07	---	4E-07	---	---	---	---
			Benzo(B)Fluoranthene	3E-08	1E-12	1E-08	---	4E-08	---	---	---	---
			Benzo(K)Fluoranthene	3E-09	9E-13	1E-09	---	4E-09	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	5E-08	2E-12	2E-08	---	7E-08	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	1E-08	3E-13	5E-09	---	2E-08	---	---	---	---
			Naphthalene	---	2E-09	---	---	2E-09	1E-03	1E-03	5E-04	3E-03
			Chemical Total					3E-06				2.E+00
			Radionuclide Total					---				---
		Exposure Point Total						3E-06				2.E+00
	Exposure Medium Total							3E-06				2.E+00
	Air	Ambient Air in a Trench	Naphthalene	---	1E-08	---	---	1E-08	---	9E-03	---	9E-03
			Chemical Total					1E-08				9E-03
			Radionuclide Total					---				---
		Exposure Point Total						1E-08				9E-03
	Exposure Medium Total							1E-08				9E-03
Soil Total								3E-06				2E+00
Groundwater - Landfill	Groundwater - Landfill	Groundwater - Landfill	Arsenic	1E-07	---	5E-09	---	1E-07	2E-02	---	7E-04	2E-02
			Barium	---	---	---	---	---	3E-04	---	2E-04	4E-04
			Cadmium	---	---	---	---	---	2E-04	---	1E-04	3E-04
			Chromium	2E-08	---	5E-08	---	7E-08	7E-04	---	3E-03	3E-03
			Cobalt	---	---	---	---	---	5E-03	---	8E-05	5E-03
			Iron	---	---	---	---	---	4E-03	---	2E-04	4E-03
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	8E-03	---	9E-03	2E-02
			Mercury	---	---	---	---	---	4E-05	1E-06	3E-05	7E-05
			Nickel	---	---	---	---	---	2E-04	---	5E-05	3E-04
			Thallium	---	---	---	---	---	6E-02	---	3E-03	6E-02
			Vanadium	---	---	---	---	---	4E-04	---	6E-04	1E-03
			Aldrin	2E-10	1E-13	6E-08	---	6E-08	3E-05	---	8E-03	8E-03
			Beta-BHC	1E-10	---	1E-09	---	1E-09	---	---	---	---
			Delta-BHC	7E-11	---	1E-09	---	1E-09	---	---	---	---
			Gamma-Chlordane	1E-11	---	1E-09	---	1E-09	4E-06	---	5E-04	5E-04
			Heptachlor	2E-10	4E-13	2E-08	---	2E-08	8E-06	---	8E-04	8E-04
			Heptachlor Epoxide	3E-10	7E-14	4E-09	---	5E-09	2E-04	---	3E-03	3E-03
			1,4-Dioxane	5E-08	5E-13	2E-09	---	5E-08	1E-03	2E-07	5E-05	1E-03
			2-Methylnaphthalene	---	---	---	---	---	6E-04	---	1E-02	1E-02
			Acenaphthene	---	---	---	---	---	3E-05	---	6E-04	6E-04

Table 7-8.2

Summary Of Receptor Risks And Hazards For COPCs

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater - Landfill	Groundwater - Landfill	Groundwater - Landfill	Benzo(A)Anthracene	3E-10	---	6E-08	---	6E-08	---	---	---	---
			Benzo(A)Pyrene	2E-09	---	5E-07	---	5E-07	---	---	---	---
			Benzo(B)Fluoranthene	3E-10	---	4E-08	---	4E-08	---	---	---	---
			Biphenyl	6E-11	---	1E-09	---	1E-09	1E-06	9E-06	2E-05	3E-05
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzofuran	---	---	---	---	---	9E-04	---	2E-02	2E-02
			Naphthalene	---	4E-11	---	---	4E-11	5E-04	2E-05	4E-03	4E-03
			Phenanthrene	---	---	---	---	---	1E-04	---	6E-03	6E-03
			1,1,2,2-Tetrachloroethane	5E-11	1E-13	8E-11	---	1E-10	9E-07	---	1E-06	2E-06
			1,1-Dichloroethene	---	---	---	---	---	1E-05	4E-07	2E-05	3E-05
			1,2-Dichloroethane	2E-10	7E-13	1E-10	---	3E-10	2E-05	3E-07	1E-05	3E-05
			1,4-Dichlorobenzene	5E-12	2E-13	4E-11	---	5E-11	8E-07	1E-09	8E-06	9E-06
			2-Hexanone	---	---	---	---	---	1E-04	7E-08	8E-05	2E-04
			Benzene	2E-10	1E-12	5E-10	---	7E-10	7E-05	4E-07	1E-04	2E-04
			Chlorobenzene	---	---	---	---	---	4E-04	4E-06	2E-03	2E-03
			Cis-1,2-Dichloroethene	---	---	---	---	---	7E-03	---	1E-02	2E-02
			Ethylbenzene	6E-11	6E-13	4E-10	---	5E-10	4E-06	2E-08	3E-05	3E-05
			Trichloroethene	2E-10	1E-12	5E-10	---	7E-10	8E-04	1E-05	2E-03	3E-03
			Vinyl Chloride	2E-08	2E-11	2E-08	---	4E-08	6E-04	4E-06	6E-04	1E-03
			Xylenes, Total	---	---	---	---	---	2E-05	1E-06	1E-04	2E-04
			Chemical Total					1E-06				2E-01
			Radionuclide Total					---				---
		Exposure Point Total						1E-06				2E-01
	Exposure Medium Total							1E-06				2E-01
	Air	Ambient Air in Trench	1,1-Dichloroethene	---	---	---	---	---	---	5E-04	---	5E-04
			1,1,2,2-Tetrachloroethane	---	3E-11	---	---	3E-11	---	---	---	---
			1,2-Dichloroethane	---	4E-10	---	---	4E-10	---	2E-04	---	2E-04
			1,4-Dichlorobenzene	---	1E-10	---	---	1E-10	---	1E-06	---	1E-06
			Benzene	---	1E-09	---	---	1E-09	---	4E-04	---	4E-04
			2-Hexanone	---	---	---	---	---	---	1E-05	---	1E-05
			Chlorobenzene	---	---	---	---	---	---	3E-03	---	3E-03
			Ethylbenzene	---	7E-10	---	---	7E-10	---	2E-05	---	2E-05
			Trichloroethene	---	1E-09	---	---	1E-09	---	1E-02	---	1E-02
			Vinyl Chloride	---	3E-08	---	---	3E-08	---	5E-03	---	5E-03
			Xylenes, Total	---	---	---	---	---	---	1E-03	---	1E-03
			1,4-Dioxane	---	8E-11	---	---	8E-11	---	4E-05	---	4E-05
			Biphenyl	---	---	---	---	---	---	1E-03	---	1E-03
			Naphthalene	---	1E-08	---	---	1E-08	---	7E-03	---	7E-03
			Aldrin	---	2E-11	---	---	2E-11	---	---	---	---
			Heptachlor	---	1E-10	---	---	1E-10	---	---	---	---
			Heptachlor Epoxide	---	1E-12	---	---	1E-12	---	---	---	---
			Mercury	---	---	---	---	---	---	8E-02	---	8E-02
			Chemical Total					4E-08				1E-01
			Radionuclide Total					---				---
		Exposure Point Total						4E-08				1E-01
	Exposure Medium Total							4E-08				1E-01
Groundwater Total								1E-06				3E-01
Seep Liquid - Landfill	Seep Liquid - Landfill	Seep Liquid - Landfill	Arsenic	---	---	8E-10	---	8E-10	---	---	1E-04	1E-04
			Chromium	---	---	7E-08	---	7E-08	---	---	3E-03	3E-03
			Cobalt	---	---	---	---	---	---	---	4E-05	4E-05
			Iron	---	---	---	---	---	---	---	1E-04	1E-04
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	4E-03	4E-03
			Aldrin	---	---	7E-08	---	7E-08	---	---	1E-02	1E-02
			Dieldrin	---	---	2E-08	---	2E-08	---	---	2E-03	2E-03

Table 7-8.2
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Construction Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks Ingestion	Carcinogenic Risks Inhalation	Carcinogenic Risks Dermal	Carcinogenic Risks External	Carcinogenic Risks Exposure Routes Total	Non-Cancer Hazard Calculations Ingestion	Non-Cancer Hazard Calculations Inhalation	Non-Cancer Hazard Calculations Dermal	Non-Cancer Hazard Calculations Exposure Routes Total
Seep Liquid - Landfill	Seep Liquid - Landfill	Seep Liquid - Landfill	Chemical Total					2E-07				2E-02
			Radionuclide Total					---				---
		Exposure Point Total						2E-07				2E-02
	Exposure Medium Total							2E-07				2E-02
Seep Liquid Total								2E-07				2E-02
Receptor Total								5E-06				2.E+00

Total Risks Across All Media=	5E-06
Total Hazard Across All Media=	2.E+00

Total Liver HI Across All Media=	4E-02
Total Blood HI Across All Media=	2E-01
Total Kidney HI Across All Media=	4E-02
Total Peripheral Nervous System HI Across All Media=	2E-04
Total CNS HI Across All Media=	2E-01
Total Nasal HI Across All Media=	2E-02
Total Lung/Respiratory HI Across All Media=	2E-02
Total Pancreas HI Across All Media=	2E-02
Total Thyroid Effects HI Across All Media=	3E-01
Total Hair Effects HI Across All Media=	3E-02
Total Body Weight HI Across All Media=	5E-02
Total Immunological HI Across All Media=	4E-02
Total Endocrine HI Across All Media=	2E-03
Total Urinary HI Across All Media=	2E-02
Total Reproductive HI Across All Media=	8E-01
Total Gastrointestinal HI Across All Media=	4E-01
Total Skin Effects HI Across All Media=	1E-01
Total Cardiovascular Effects HI Across All Media=	2E-02
Total Developmental Effects HI Across All Media=	2E-02

Table 7-8.3
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Outdoor Refuge Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Aluminum	---	---	---	---	---	1E-02	2E-03	---	2E-02
			Antimony	---	---	---	---	---	3E-03	---	---	3E-03
			Arsenic	7E-06	2E-08	2E-06	---	9E-06	5E-02	9E-04	1E-02	6E-02
			Beryllium	---	7E-10	---	---	7E-10	5E-02	9E-04	1E-02	6E-02
			Cadmium	---	3E-10	---	---	3E-10	---	4E-05	---	4E-05
			Chromium	8E-06	8E-07	---	---	9E-06	---	5E-05	---	5E-05
			Cobalt	---	2E-08	---	---	2E-08	3E-02	8E-04	---	3E-02
			Iron	---	---	---	---	---	3E-02	---	---	3E-02
			Manganese	---	---	---	---	---	2E-03	4E-03	---	6E-03
			Thallium	---	---	---	---	---	8E-02	---	---	---
			Vanadium	---	---	---	---	---	1E-02	3E-04	---	1E-02
			2,3,7,8-TCDD Equivalents	6E-07	3E-08	8E-08	---	7E-07	2E-02	6E-05	2E-03	2E-02
			Aroclor 1248	2E-06	3E-07	1E-06	---	4E-06	---	---	---	---
			Aroclor 1254	1E-07	1E-08	6E-08	---	2E-07	7E-03	---	4E-03	1E-02
			Aroclor 1260	5E-08	4E-09	3E-08	---	9E-08	---	---	---	---
			Benzo(A)Anthracene	7E-08	8E-10	4E-08	---	1E-07	---	---	---	---
			Benzo(A)Pyrene	4E-07	4E-11	2E-07	---	6E-07	---	---	---	---
			Benzo(B)Fluoranthene	1E-07	1E-11	8E-08	---	2E-07	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	1E-07	1E-11	7E-08	---	2E-07	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	3E-08	2E-12	1E-08	---	4E-08	---	---	---	---
			Chemical Total					2E-05				2E-01
			Radionuclide Total					---				---
		Exposure Point Total						2E-05				2E-01
	Exposure Medium Total							2E-05				2E-01
Soil Total								2E-05				2E-01
Groundwater - Annex	Groundwater - Annex	Groundwater - Annex	1,2-Dichloroethane	---	3E-10	---	---	3E-10	---	4E-06	---	4E-06
			1,4-Dichlorobenzene	---	2E-12	---	---	2E-12	---	7E-10	---	7E-10
			Benzene	---	5E-12	---	---	5E-12	---	5E-08	---	5E-08
			Chlorobenzene	---	---	---	---	---	---	4E-07	---	4E-07
			Trichloroethene	---	1E-12	---	---	1E-12	---	4E-07	---	4E-07
			Vinyl Chloride	---	1E-11	---	---	1E-11	---	9E-08	---	9E-08
			1,4-Dioxane	---	6E-13	---	---	6E-13	---	1E-08	---	1E-08
			Naphthalene	---	1E-10	---	---	1E-10	---	3E-06	---	3E-06
			Heptachlor	---	4E-12	---	---	4E-12	---	---	---	---
			Chemical Total					4E-10				8E-06
			Radionuclide Total					---				---
		Exposure Point Total						4E-10				8E-06
	Exposure Medium Total							4E-10				8E-06
Groundwater Total								4E-10				8E-06
Seep Liquid - Annex	Seep Liquid - Annex	Seep Liquid - Annex	Aluminum	---	---	---	---	---	---	---	5E-05	5E-05
			Arsenic	---	---	3E-08	---	3E-08	---	---	2E-04	2E-04
			Chromium	---	---	2E-06	---	2E-06	---	---	3E-03	3E-03
			Cobalt	---	---	---	---	---	---	---	5E-05	5E-05
			Iron	---	---	---	---	---	---	---	1E-04	1E-04
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	2E-03	2E-03
			Naphthalene	---	---	---	---	---	---	---	7E-05	7E-05
			Vanadium	---	---	---	---	---	---	---	1E-03	1E-03
			Benzene	---	---	2E-10	---	2E-10	---	---	3E-06	3E-06
			Vinyl Chloride	---	---	7E-09	---	7E-09	---	---	1E-05	1E-05
			Chemical Total					2E-06				7E-03
			Radionuclide Total					---				---
		Exposure Point Total						2E-06				7E-03
	Exposure Medium Total							2E-06				7E-03
Seep Liquid Total								2E-06				7E-03
Receptor Total								3E-05				2E-01

Total Risks Across All Media= 3E-05 Total Hazard Across All Media= 2E-01

Golder Associates

Table 7-8.4
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Outdoor Refuge Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Aluminum	---	---	---	---	---	1E-02	2E-03	---	1E-02
			Antimony	---	---	---	---	---	5E-03	---	---	5E-03
			Arsenic	2E-06	8E-09	5E-07	---	3E-06	2E-02	3E-04	3E-03	2E-02
			Beryllium	---	4E-09	---	---	4E-09	4E-03	2E-04	---	4E-03
			Cadmium	---	7E-10	---	---	7E-10	2E-03	1E-04	3E-04	2E-03
			Chromium	8E-06	9E-07	---	---	9E-06	2E-02	3E-04	---	2E-02
			Cobalt	---	5E-08	---	---	5E-08	8E-02	3E-03	---	8E-02
			Copper	---	---	---	---	---	3E-02	---	---	3E-02
			Iron	---	---	---	---	---	6E-02	---	---	6E-02
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	9E-03	2E-02	---	3E-02
			Mercury	---	---	---	---	---	6E-03	4E-06	---	6E-03
			Nickel	---	1E-08	---	---	1E-08	9E-03	1E-03	---	1E-02
			Vanadium	---	---	---	---	---	7E-03	2E-04	---	8E-03
			Zinc	---	---	---	---	---	8E-03	---	---	8E-03
			2,3,7,8-TCDD Equivalents	6E-06	9E-07	8E-07	---	8E-06	2E-01	2E-03	2E-02	2E-01
			Dieldrin	1E-07	2E-11	5E-08	---	2E-07	4E-04	---	2E-04	6E-04
			Benzo(A)Anthracene	2E-07	9E-09	1E-07	---	4E-07	---	---	---	---
			Benzo(A)Pyrene	2E-06	2E-10	1E-06	---	3E-06	---	---	---	---
			Benzo(B)Fluoranthene	2E-07	2E-11	1E-07	---	3E-07	---	---	---	---
			Benzo(K)Fluoranthene	2E-08	2E-11	1E-08	---	3E-08	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	3E-07	3E-11	2E-07	---	5E-07	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	8E-08	8E-12	4E-08	---	1E-07	---	---	---	---
			Naphthalene	---	4E-08	---	---	4E-08	3E-04	1E-03	2E-04	2E-03
			Chemical Total					2E-05				5E-01
			Radionuclide Total					---				---
		Exposure Point Total						2E-05				5E-01
	Exposure Medium Total							2E-05				5E-01
Soil Total								2E-05				5E-01

Table 7-8.4
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Outdoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater - Landfill	Groundwater - Landfill	Groundwater - Landfill	1,1-Dichloroethene	---	---	---	---	---	---	4E-07	---	4E-07
			1,1,2,2-Tetrachloroethane	---	2E-12	---	---	2E-12	---	---	---	---
			1,2-Dichloroethane	---	2E-11	---	---	2E-11	---	2E-07	---	2E-07
			1,4-Dichlorobenzene	---	4E-12	---	---	4E-12	---	1E-09	---	1E-09
			Benzene	---	3E-11	---	---	3E-11	---	4E-07	---	4E-07
			2-Hexanone	---	---	---	---	---	---	7E-08	---	7E-08
			Chlorobenzene	---	---	---	---	---	---	3E-06	---	3E-06
Groundwater - Landfill	Groundwater - Landfill	Groundwater - Landfill	Ethylbenzene	---	1E-11	---	---	1E-11	---	1E-08	---	1E-08
			Trichloroethene	---	2E-11	---	---	2E-11	---	1E-05	---	1E-05
			Vinyl Chloride	---	5E-10	---	---	5E-10	---	3E-06	---	3E-06
			Xylenes, Total	---	---	---	---	---	---	1E-06	---	1E-06
			1,4-Dioxane	---	1E-11	---	---	1E-11	---	2E-07	---	2E-07
			Biphenyl	---	---	---	---	---	---	8E-06	---	8E-06
			Naphthalene	---	8E-10	---	---	8E-10	---	2E-05	---	2E-05
			Aldrin	---	3E-12	---	---	3E-12	---	---	---	---
			Heptachlor	---	8E-12	---	---	8E-12	---	---	---	---
			Heptachlor Epoxide	---	1E-12	---	---	1E-12	---	---	---	---
			Mercury	---	---	---	---	---	---	1E-06	---	1E-06
			Chemical Total					1E-09				5E-05
			Radionuclide Total					---				---
		Exposure Point Total						1E-09				5E-05
	Exposure Medium Total							1E-09				5E-05
Groundwater Total								1E-09				5E-05
Seep Liquid - Landfill	Seep Liquid - Landfill	Seep Liquid - Landfill	Arsenic	---	---	1E-08	---	1E-08	---	---	9E-05	9E-05
			Chromium	---	---	1E-06	---	1E-06	---	---	2E-03	2E-03
			Cobalt	---	---	---	---	---	---	---	3E-05	3E-05
			Iron	---	---	---	---	---	---	---	1E-04	1E-04
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	3E-03	3E-03
			Aldrin	---	---	1E-06	---	1E-06	---	---	7E-03	7E-03
			Dieldrin	---	---	4E-07	---	4E-07	---	---	2E-03	2E-03
			Chemical Total					3E-06				1E-02
			Radionuclide Total					---				---
		Exposure Point Total						3E-06				1E-02
	Exposure Medium Total							3E-06				1E-02
Seep Liquid Total								3E-06				1E-02
Receptor Total								3E-05				5E-01

Total Risks Across All Media= 3E-05 Total Hazard Across All Media= 5E-01

Table 7-8.5

Summary Of Receptor Risks And Hazards For COPCs

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Refuge Office and Visitors Center - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Indoor Refuge Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater - Refuge	Groundwater - Refuge	Groundwater - Refuge	Benzene	---	1E-07	---	---	1E-07	---	2E-03	---	2E-03
			Chloroform	---	2E-07	---	---	2E-07	---	2E-04	---	2E-04
			Trichloroethene	---	1E-07	---	---	1E-07	---	4E-02	---	4E-02
			Vinyl Chloride	---	1E-05	---	---	1E-05	---	9E-02	---	9E-02
			Chemical Total					1E-05				1E-01
			Radionuclide Total					---				---
		Exposure Point Total						1E-05				1E-01
	Exposure Medium Total							1E-05				1E-01
Groundwater Total								1E-05				1E-01
Receptor Total								1E-05				1E-01

Total Risks Across All Media= 1E-05

Total Hazard Across All Media= 1E-01

Table 7-8.6
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Adolescent Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks: Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Non-Cancer Hazard Calculations: Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Aluminum	---	---	---	---	---	4E-03	3E-04	---	4E-03
			Antimony	---	---	---	---	---	8E-04	---	---	8E-04
			Arsenic	4E-07	8E-10	4E-08	---	4E-07	1E-02	2E-04	1E-03	1E-02
			Beryllium	---	3E-11	---	---	3E-11	---	9E-06	---	9E-06
			Cadmium	---	1E-11	---	---	1E-11	---	1E-05	---	1E-05
			Chromium	1E-06	1E-07	---	---	1E-06	4E-03	5E-05	---	4E-03
			Cobalt	---	7E-10	---	---	7E-10	8E-03	2E-04	---	8E-03
			Iron	---	---	---	---	---	9E-03	---	---	9E-03
			Manganese	---	---	---	---	---	7E-04	8E-04	---	2E-03
			Thallium	---	---	---	---	---	2E-02	---	---	---
			Vanadium	---	---	---	---	---	3E-03	6E-05	---	3E-03
			2,3,7,8-TCDD Equivalents	3E-08	1E-09	2E-09	---	4E-08	5E-03	1E-05	3E-04	6E-03
			Aroclor 1248	1E-07	1E-08	3E-08	---	2E-07	---	---	---	---
			Aroclor 1254	6E-09	5E-10	2E-09	---	8E-09	2E-03	---	6E-04	3E-03
			Aroclor 1260	3E-09	2E-10	8E-10	---	4E-09	---	---	---	---
			Benzo(A)Anthracene	1E-08	1E-10	3E-09	---	1E-08	---	---	---	---
			Benzo(A)Pyrene	7E-08	5E-12	2E-08	---	8E-08	---	---	---	---
			Benzo(B)Fluoranthene	2E-08	2E-12	6E-09	---	3E-08	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	2E-08	1E-12	5E-09	---	2E-08	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	4E-09	3E-13	1E-09	---	5E-09	---	---	---	---
			Chemical Total					2E-06				5E-02
			Radionuclide Total					---				---
		Exposure Point Total						2E-06				5E-02
	Exposure Medium Total							2E-06				5E-02
Soil Total								2E-06				5E-02
Groundwater - Annex	Groundwater - Annex	Groundwater - Annex	1,2-Dichloroethane	---	2E-11	---	---	2E-11	---	2E-06	---	2E-06
			1,4-Dichlorobenzene	---	2E-13	---	---	2E-13	---	3E-10	---	3E-10
			Benzene	---	4E-13	---	---	4E-13				
			Chlorobenzene	---	---	---	---	---	---	2E-07	---	2E-07
			Vinyl Chloride	---	2E-12	---	---	2E-12	---	4E-08	---	4E-08
			1,4-Dioxane	---	5E-14	---	---	5E-14	---	5E-09	---	5E-09
			Naphthalene	---	9E-12	---	---	9E-12	---	1E-06	---	1E-06
			Heptachlor	---	3E-13	---	---	3E-13	---	---	---	---
			Chemical Total					4E-11				3E-06
			Radionuclide Total					---				---
		Exposure Point Total						4E-11				3E-06
	Exposure Medium Total							4E-11				3E-06
Groundwater Total								4E-11				3E-06
Seep Liquid - Annex	Seep Liquid - Annex	Seep Liquid - Annex	Arsenic	---	---	4E-09	---	4E-09	---	---	1E-04	1E-04
			Chromium	---	---	8E-07	---	8E-07	---	---	2E-03	2E-03
			Cobalt	---	---	---	---	---	---	---	4E-05	4E-05
			Iron	---	---	---	---	---	---	---	9E-05	9E-05
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	2E-03	2E-03
			Naphthalene	---	---	---	---	---	---	---	6E-05	6E-05
			Vanadium	---	---	---	---	---	---	---	9E-04	9E-04
			Benzene	---	---	3E-11	---	3E-11	---	---	2E-06	2E-06
			Vinyl Chloride	---	---	2E-09	---	2E-09	---	---	7E-06	7E-06
			Chemical Total					8E-07				5E-03
			Radionuclide Total					---				---
		Exposure Point Total						8E-07				5E-03
	Exposure Medium Total							8E-07				5E-03
Seep Liquid Total								8E-07				5E-03
Receptor Total								3E-06				6E-02

Total Risks Across All Media= 3E-06 Total Hazard Across All Media= 6E-02

Table 7-8.7
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Adolescent Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Aluminum	---	---	---	---	---	3E-03	3E-04	---	4E-03
			Antimony	---	---	---	---	---	1E-03	---	---	1E-03
			Arsenic	1E-07	3E-10	1E-08	---	1E-07	4E-03	7E-05	4E-04	5E-03
			Beryllium	---	2E-10	---	---	2E-10	1E-03	5E-05	---	1E-03
			Cadmium	---	3E-11	---	---	3E-11	5E-04	2E-05	4E-05	5E-04
			Chromium	1E-06	1E-07	---	---	1E-06	4E-03	6E-05	---	4E-03
			Cobalt	---	2E-09	---	---	2E-09	2E-02	6E-04	---	2E-02
			Copper	---	---	---	---	---	8E-03	---	---	8E-03
			Iron	---	---	---	---	---	2E-02	---	---	2E-02
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	2E-03	4E-03	---	6E-03
			Mercury	---	---	---	---	---	2E-03	9E-07	---	2E-03
			Nickel	---	5E-10	---	---	5E-10	2E-03	3E-04	---	3E-03
			Vanadium	---	---	---	---	---	2E-03	5E-05	---	2E-03
			Zinc	---	---	---	---	---	2E-03	---	---	2E-03
			2,3,7,8-TCDD Equivalents	3E-07	4E-08	2E-08	---	4E-07	5E-02	3E-04	3E-03	6E-02
			Dieldrin	6E-09	1E-12	1E-09	---	8E-09	1E-04	---	2E-05	1E-04
			Benzo(A)Anthracene	4E-08	1E-09	1E-08	---	5E-08	---	---	---	---
			Benzo(A)Pyrene	3E-07	3E-11	8E-08	---	4E-07	---	---	---	---
			Benzo(B)Fluoranthene	3E-08	3E-12	9E-09	---	4E-08	---	---	---	---
			Benzo(K)Fluoranthene	3E-09	3E-12	8E-10	---	4E-09	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	5E-08	4E-12	1E-08	---	6E-08	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	1E-08	1E-12	3E-09	---	2E-08	---	---	---	---
			Naphthalene	---	2E-09	---	---	2E-09	9E-05	2E-04	2E-05	4E-04
			Chemical Total					3E-06				1E-01
			Radionuclide Total					---				---
		Exposure Point Total						3E-06				1E-01
	Exposure Medium Total							3E-06				1E-01
Soil Total								3E-06				1E-01

Table 7-8.7
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Adolescent Trespasser
Receptor Age:	Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater - Landfill	Groundwater - Landfill	Groundwater - Landfill	1,1-Dichloroethene	---	---	---	---	---	---	2E-07	---	2E-07
			1,1,2,2-Tetrachloroethane	---	2E-13	---	---	2E-13	---	---	---	---
			1,2-Dichloroethane	---	1E-12	---	---	1E-12	---	1E-07	---	1E-07
			1,4-Dichlorobenzene	---	3E-13	---	---	3E-13	---	5E-10	---	5E-10
			Benzene	---	3E-12	---	---	3E-12	---	2E-07	---	2E-07
			2-Hexanone	---	---	---	---	---	---	3E-08	---	3E-08
			Chlorobenzene	---	---	---	---	---	---	1E-06	---	1E-06
			Ethylbenzene	---	1E-12	---	---	1E-12	---	6E-09	---	6E-09
			Trichloroethene	---	3E-12	---	---	3E-12	---	4E-06	---	4E-06
			Vinyl Chloride	---	9E-11	---	---	9E-11	---	1E-06	---	1E-06
			Xylenes, Total	---	---	---	---	---	---	6E-07	---	6E-07
			1,4-Dioxane	---	1E-12	---	---	1E-12	---	9E-08	---	9E-08
			Biphenyl	---	---	---	---	---	---	3E-06	---	3E-06
			Naphthalene	---	7E-11	---	---	7E-11	---	9E-06	---	9E-06
			Aldrin	---	2E-13	---	---	2E-13	---	---	---	---
			Heptachlor	---	7E-13	---	---	7E-13	---	---	---	---
			Heptachlor Epoxide	---	1E-13	---	---	1E-13	---	---	---	---
			Mercury	---	---	---	---	---	---	4E-07	---	4E-07
			Chemical Total					2E-10				2E-05
			Radionuclide Total					---				---
		Exposure Point Total						2E-10				2E-05
	Exposure Medium Total							2E-10				2E-05
Groundwater Total								2E-10				2E-05
Seep Liquid - Landfill	Seep Liquid - Landfill	Seep Liquid - Landfill	Arsenic	---	---	2E-09	---	2E-09	---	---	7E-05	7E-05
			Chromium	---	---	6E-07	---	6E-07	---	---	2E-03	2E-03
			Cobalt	---	---	---	---	---	---	---	2E-05	2E-05
			Iron	---	---	---	---	---	---	---	8E-05	8E-05
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	2E-03	2E-03
			Aldrin	---	---	2E-07	---	2E-07	---	---	5E-03	5E-03
			Dieldrin	---	---	7E-08	---	7E-08	---	---	1E-03	1E-03
			Chemical Total					8E-07				1E-02
			Radionuclide Total					---				---
		Exposure Point Total						8E-07				1E-02
	Exposure Medium Total							8E-07				1E-02
Seep Liquid Total								8E-07				1E-02
Receptor Total								3E-06				1E-01

Total Risks Across All Media= 3E-06 Total Hazard Across All Media= 1E-01

Golder Associates

Table 7-8.8
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study Area
Folcroft Landfill and Annex Site - Folcroft, PA Area

Scenario Timeframe:	Future
Receptor Population:	Park Visitor
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Aluminum	---	---	---	---	---	3E-03	8E-03	---	1E-02
			Antimony	---	---	---	---	---	6E-04	---	---	6E-04
			Arsenic	1E-06	4E-09	5E-07	---	2E-06	1E-02	4E-03	4E-03	2E-02
			Beryllium	---	1E-10	---	---	1E-10	---	2E-04	---	2E-04
			Cadmium	---	6E-11	---	---	6E-11	---	3E-04	---	3E-04
			Chromium	1E-06	1E-07	---	---	2E-06	3E-03	1E-03	---	4E-03
			Cobalt	---	3E-09	---	---	---	6E-03	4E-03	---	1E-02
			Iron	---	---	---	---	---	7E-03	---	---	7E-03
			Manganese	---	---	---	---	---	5E-04	2E-02	---	2E-02
			Thallium	---	---	---	---	---	2E-02	---	---	---
			Vanadium	---	---	---	---	---	2E-03	1E-03	---	4E-03
			2,3,7,8-TCDD Equivalents	1E-07	6E-09	3E-08	---	1E-07	4E-03	3E-04	1E-03	5E-03
			Aroclor 1248	4E-07	6E-08	5E-07	---	9E-07	---	---	---	---
			Aroclor 1254	2E-08	2E-09	2E-08	---	4E-08	2E-03	---	2E-03	3E-03
			Aroclor 1260	9E-09	7E-10	1E-08	---	2E-08	---	---	---	---
			Benzo(A)Anthracene	1E-08	1E-10	1E-08	---	2E-08	---	---	---	---
			Benzo(A)Pyrene	7E-08	6E-12	8E-08	---	2E-07	---	---	---	---
			Benzo(B)Fluoranthene	3E-08	2E-12	3E-08	---	5E-08	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	2E-08	2E-12	2E-08	---	5E-08	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	5E-09	4E-13	5E-09	---	1E-08	---	---	---	---
			Chemical Total					5E-06				9E-02
			Radionuclide Total					---				---
		Exposure Point Total						5E-06				9E-02
	Exposure Medium Total							5E-06				9E-02
Soil Total								5E-06				9E-02
Groundwater - Annex	Air	Ambient Air	1,2-Dichloroethane	---	5E-11	---	---	5E-11	---	9E-07	---	9E-07
			1,4-Dichlorobenzene	---	4E-13	---	---	4E-13	---	2E-10	---	2E-10
			Benzene	---	8E-13	---	---	8E-13	---	4E-09	---	4E-09
			Chlorobenzene	---	---	---	---	---	---	2E-09	---	2E-09
			Trichloroethene	---	2E-13	---	---	2E-13	---	6E-08	---	6E-08
			Vinyl Chloride	---	2E-12	---	---	2E-12	---	1E-09	---	1E-09
			1,4-Dioxane	---	1E-13	---	---	1E-13	---	3E-09	---	3E-09
			Naphthalene	---	2E-11	---	---	2E-11	---	6E-07	---	6E-07
			Heptachlor	---	7E-13	---	---	7E-13	---	---	---	---
			Chemical Total					7E-11				2E-06
			Radionuclide Total					---				---
		Exposure Point Total						7E-11				2E-06
	Exposure Medium Total							7E-11				2E-06
Groundwater Total								7E-11				2E-06
Seep Liquid - Annex	Seep Liquid - Annex	Seep Liquid - Annex	Aluminum	---	---	---	---	---	---	---	8E-05	8E-05
			Arsenic	---	---	4E-08	---	4E-08	---	---	3E-04	3E-04
			Chromium	---	---	2E-06	---	2E-06	---	---	5E-03	5E-03
			Cobalt	---	---	---	---	---	---	---	8E-05	8E-05
			Iron	---	---	---	---	---	---	---	2E-04	2E-04
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	3E-03	3E-03
			Vanadium	---	---	---	---	---	---	---	2E-03	2E-03
			Naphthalene	---	---	---	---	---	---	---	1E-04	1E-04
			Benzene	---	---	3E-10	---	3E-10	---	---	4E-06	4E-06
			Vinyl Chloride	---	---	1E-08	---	1E-08	---	---	2E-05	2E-05
			Chemical Total					2E-06				1E-02
			Radionuclide Total					---				---
		Exposure Point Total						2E-06				1E-02
	Exposure Medium Total							2E-06				1E-02
Seep Liquid Total								2E-06				1E-02
Receptor Total								7E-06				1E-01

Total Risks Across All Media= 7E-06 Total Hazard Across All Media= 1E-01

Table 7-8.9
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Park Visitor
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Aluminum	---	---	---	---	---	3E-03	8E-03	---	1E-02
			Antimony	---	---	---	---	---	1E-03	---	---	1E-03
			Arsenic	4E-07	1E-09	2E-07	---	6E-07	3E-03	2E-03	1E-03	6E-03
			Beryllium	---	7E-10	---	---	7E-10	8E-04	1E-03	---	2E-03
			Cadmium	---	1E-10	---	---	1E-10	4E-04	6E-04	1E-04	1E-03
			Chromium	1E-06	2E-07	---	---	2E-06	3E-03	2E-03	---	5E-03
			Cobalt	---	9E-09	---	---	9E-09	2E-02	1E-02	---	3E-02
			Copper	---	---	---	---	---	6E-03	---	---	6E-03
			Iron	---	---	---	---	---	1E-02	---	---	1E-02
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	2E-03	9E-02	---	9E-02
			Mercury	---	---	---	---	---	1E-03	2E-05	---	1E-03
			Nickel	---	2E-09	---	---	2E-09	2E-03	7E-03	---	8E-03
			Vanadium	---	---	---	---	---	2E-03	1E-03	---	3E-03
			Zinc	---	---	---	---	---	2E-03	---	---	2E-03
			2,3,7,8-TCDD Equivalents	1E-06	2E-07	3E-07	---	2E-06	4E-02	8E-03	1E-02	6E-02
			Dieldrin	2E-08	4E-12	2E-08	---	4E-08	9E-05	---	7E-02	7E-02
			Benzo(A)Anthracene	4E-08	5E-09	5E-08	---	9E-08	---	---	---	---
			Benzo(A)Pyrene	4E-07	1E-10	4E-07	---	8E-07	---	---	---	---
			Benzo(B)Fluoranthene	4E-08	1E-11	4E-08	---	8E-08	---	---	---	---
			Benzo(K)Fluoranthene	4E-09	1E-11	4E-09	---	8E-09	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	6E-08	2E-11	6E-08	---	1E-07	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	1E-08	4E-12	1E-08	---	3E-08	---	---	---	---
			Naphthalene	---	7E-09	---	---	7E-09	7E-05	6E-03	8E-05	6E-03
			Chemical Total					5E-06				3E-01
			Radionuclide Total					---				---
		Exposure Point Total						5E-06				3E-01
	Exposure Medium Total							5E-06				3E-01
Soil Total								5E-06				3E-01
Groundwater - Landfill	Groundwater - Landfill	Groundwater - Landfill	1,1-Dichloroethene	---	---	---	---	---	---	8E-08	---	8E-08
			1,1,2,2-Tetrachloroethane	---	4E-13	---	---	4E-13	---	---	---	---
			1,2-Dichloroethane	---	3E-12	---	---	3E-12	---	5E-08	---	5E-08
			1,4-Dichlorobenzene	---	7E-13	---	---	7E-13	---	3E-10	---	3E-10
			Benzene	---	6E-12	---	---	6E-12	---	8E-08	---	8E-08
			2-Hexanone	---	---	---	---	---	---	1E-08	---	1E-08
			Chlorobenzene	---	---	---	---	---	---	7E-07	---	7E-07
Groundwater - Landfill	Groundwater - Landfill	Groundwater - Landfill	Ethylbenzene	---	2E-12	---	---	2E-12	---	3E-09	---	3E-09
			Trichloroethene	---	4E-12	---	---	4E-12	---	2E-06	---	2E-06
			Vinyl Chloride	---	1E-10	---	---	1E-10	---	7E-07	---	7E-07
			Xylenes, Total	---	---	---	---	---	---	3E-07	---	3E-07
			1,4-Dioxane	---	2E-12	---	---	2E-12	---	4E-08	---	4E-08
			Biphenyl	---	---	---	---	---	---	2E-06	---	2E-06
			Naphthalene	---	1E-10	---	---	1E-10	---	5E-06	---	5E-06
			Aldrin	---	5E-13	---	---	5E-13	---	---	---	---
			Heptachlor	---	1E-12	---	---	1E-12	---	---	---	---
			Heptachlor Epoxide	---	3E-13	---	---	3E-13	---	---	---	---
			Mercury	---	---	---	---	---	---	2E-07	---	2E-07
			Chemical Total					3E-10				1E-05
			Radionuclide Total					---				---
		Exposure Point Total						3E-10				1E-05
	Exposure Medium Total							3E-10				1E-05
Groundwater Total								3E-10				1E-05
Seep Liquid - Landfill	Seep Liquid - Landfill	Seep Liquid - Landfill	Arsenic	---	---	2E-08	---	2E-08	---	---	1E-04	1E-04
			Chromium	---	---	2E-06	---	2E-06	---	---	4E-03	4E-03
			Cobalt	---	---	---	---	---	---	---	4E-05	4E-05
			Iron	---	---	---	---	---	---	---	2E-04	2E-04
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	4E-03	4E-03
			Aldrin	---	---	2E-06	---	2E-06	---	---	1E-02	1E-02
			Dieldrin	---	---	6E-07	---	6E-07	---	---	2E-03	2E-03
			Chemical Total					4E-06				2E-02
			Radionuclide Total					---				---
		Exposure Point Total						4E-06				2E-02
	Exposure Medium Total							4E-06				2E-02
Seep Liquid Total								4E-06				2E-02
Receptor Total								9E-06				3E-01

Total Risks Across All Media= 9E-06 Total Hazard Across All Media= 3E-01

Golder Associates

Table 7-8.10

Summary Of Receptor Risks And Hazards For COPCs

Reasonable Maximum Exposure

Remedial Investigation/Feasibility Study

Folcroft Landfill, Annex Site, and Visitors Center - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Park Visitor
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater - Refuge	Indoor Air - Refuge	Indoor Air - Refuge	Benzene	---	2E-08	---	---	2E-08	---	3E-04	---	3E-04
			Chloroform	---	3E-08	---	---	3E-08	---	4E-05	---	4E-05
			Trichloroethene	---	2E-08	---	---	2E-08	---	7E-03	---	7E-03
			Vinyl Chloride	---	2E-06	---	---	2E-06	---	2E-02	---	2E-02
			Chemical Total					2E-06				2E-02
			Radionuclide Total					---				---
		Exposure Point Total						2E-06				2E-02
	Exposure Medium Total							2E-06				2E-02
Groundwater Total								2E-06				2E-02
Receptor Total								2E-06				2E-02

Total Risks Across All Media= 2E-06 Total Hazard Across All Media= 2E-02

Golder Associates

Table 7-8.11
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Park Visitor
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Aluminum	---	---	---	---	---	3E-02	3E-04	---	3E-02
			Antimony	---	---	---	---	---	7E-03	---	---	7E-03
			Arsenic	3E-06	8E-10	8E-07	---	4E-06	9E-02	2E-04	2E-02	1E-01
			Beryllium	---	3E-11	---	---	3E-11	---	7E-06	---	7E-06
			Cadmium	---	1E-11	---	---	1E-11	---	9E-06	---	9E-06
			Chromium	2E-05	1E-07	---	---	2E-05	3E-02	5E-05	---	3E-02
			Cobalt	---	7E-10	---	---	---	7E-02	1E-04	---	7E-02
			Iron	---	---	---	---	---	7E-02	---	---	7E-02
			Manganese	---	---	---	---	---	6E-03	7E-04	---	6E-03
			Thallium	---	---	---	---	---	2E-01	---	---	---
			Vanadium	---	---	---	---	---	2E-02	5E-05	---	2E-02
			2,3,7,8-TCDD Equivalents	3E-07	1E-09	4E-08	---	3E-07	4E-02	1E-05	6E-03	5E-02
			Aroclor 1248	1E-06	1E-08	6E-07	---	2E-06	---	---	---	---
			Aroclor 1254	5E-08	5E-10	3E-08	---	8E-08	2E-02	---	1E-02	3E-02
			Aroclor 1260	2E-08	2E-10	2E-08	---	4E-08	---	---	---	---
			Benzo(A)Anthracene	1E-07	1E-10	8E-08	---	2E-07	---	---	---	---
			Benzo(A)Pyrene	8E-07	7E-12	5E-07	---	1E-06	---	---	---	---
			Benzo(B)Fluoranthene	3E-07	2E-12	2E-07	---	5E-07	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	2E-07	2E-12	1E-07	---	4E-07	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	5E-08	4E-13	3E-08	---	9E-08	---	---	---	---
			Chemical Total					2E-05				4E-01
			Radionuclide Total					---				---
		Exposure Point Total						2E-05				4E-01
	Exposure Medium Total							2E-05				4E-01
Soil Total								2E-05				4E-01
Groundwater - Annex	Air	Ambient Air	1,2-Dichloroethane	---	2E-11	---	---	2E-11	---	2E-06	---	2E-06
			1,4-Dichlorobenzene	---	2E-13	---	---	2E-13	---	3E-10	---	3E-10
			Benzene	---	4E-13	---	---	4E-13	---	2E-08	---	2E-08
			Chlorobenzene	---	---	---	---	---	---	2E-07	---	2E-07
			Trichloroethene	---	2E-13	---	---	2E-13	---	2E-07	---	2E-07
			Vinyl Chloride	---	1E-12	---	---	1E-12	---	4E-08	---	4E-08
			1,4-Dioxane	---	5E-14	---	---	5E-14	---	5E-09	---	5E-09
			Naphthalene	---	9E-12	---	---	9E-12	---	1E-06	---	1E-06
			Heptachlor	---	3E-13	---	---	3E-13	---	---	---	---
			Chemical Total					4E-11				3E-06
			Radionuclide Total					---				---
		Exposure Point Total						4E-11				3E-06
	Exposure Medium Total							4E-11				3E-06
Groundwater Total								4E-11				3E-06
Seep Liquid - Annex	Seep Liquid - Annex	Seep Liquid - Annex	Aluminum	---	---	---	---	---	---	---	2E-04	2E-04
			Arsenic	---	---	2E-08	---	2E-08	---	---	8E-04	8E-04
			Chromium	---	---	6E-06	---	6E-06	---	---	1E-02	1E-02
			Cobalt	---	---	---	---	---	---	---	2E-04	2E-04
			Iron	---	---	---	---	---	---	---	5E-04	5E-04
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	9E-03	9E-03
			Naphthalene	---	---	---	---	---	---	---	3E-04	3E-04
			Vanadium	---	---	---	---	---	---	---	5E-03	5E-03
			Benzene	---	---	2E-10	---	2E-10	---	---	1E-05	1E-05
			Vinyl Chloride	---	---	2E-08	---	2E-08	---	---	4E-05	4E-05
			Chemical Total					6E-06				3E-02
			Radionuclide Total					---				---
		Exposure Point Total						6E-06				3E-02
	Exposure Medium Total							6E-06				3E-02
Seep Liquid Total								6E-06				3E-02
Receptor Total								3E-05				5E-01

Total Risks Across All Media= 3E-05 Total Hazard Across All Media= 5E-01

Table 7-8.12
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Park Visitor
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Aluminum	---	---	---	---	---	3E-02	3E-04	---	3E-02
			Antimony	---	---	---	---	---	1E-02	---	---	1E-02
			Arsenic	1E-06	3E-10	3E-07	---	1E-06	4E-02	6E-05	8E-03	4E-02
			Beryllium	---	2E-10	---	---	2E-10	8E-03	4E-05	---	8E-03
			Cadmium	---	3E-11	---	---	3E-11	4E-03	2E-05	7E-04	5E-03
			Chromium	2E-05	2E-07	---	---	2E-05	3E-02	5E-05	---	3E-02
			Cobalt	---	2E-09	---	---	2E-09	2E-01	5E-04	---	2E-01
			Copper	---	---	---	---	---	7E-02	---	---	7E-02
			Iron	---	---	---	---	---	1E-01	---	---	1E-01
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	2E-02	3E-03	---	2E-02
			Mercury	---	---	---	---	---	1E-02	7E-07	---	1E-02
			Nickel	---	5E-10	---	---	5E-10	2E-02	2E-04	---	2E-02
			Vanadium	---	---	---	---	---	2E-02	4E-05	---	2E-02
			Zinc	---	---	---	---	---	2E-02	---	---	2E-02
			2,3,7,8-TCDD Equivalents	3E-06	4E-08	4E-07	---	3E-06	4E-01	3E-04	6E-02	5E-01
			Dieldrin	5E-08	1E-12	3E-08	---	8E-08	9E-04	---	4E-04	1E-03
			Benzo(A)Anthracene	5E-07	2E-09	3E-07	---	8E-07	---	---	---	---
			Benzo(A)Pyrene	4E-06	4E-11	2E-06	---	7E-06	---	---	---	---
			Benzo(B)Fluoranthene	4E-07	4E-12	3E-07	---	7E-07	---	---	---	---
			Benzo(K)Fluoranthene	4E-08	4E-12	2E-08	---	6E-08	---	---	---	---
			Carbazole	---	---	---	---	---	---	---	---	---
			Dibenzo(A,H)Anthracene	6E-07	7E-12	4E-07	---	1E-06	---	---	---	---
			Indeno(1,2,3-Cd)Pyrene	2E-07	1E-12	9E-08	---	2E-07	---	---	---	---
			Naphthalene	---	2E-09	---	---	2E-09	8E-04	2E-04	5E-04	1E-03
			Chemical Total					3E-05				1E+00
			Radionuclide Total					---				---
		Exposure Point Total						3E-05				1E+00
	Exposure Medium Total							3E-05				1E+00
Soil Total								3E-05				1E+00
Groundwater - Landfill	Groundwater - Landfill	Groundwater - Landfill	1,1-Dichloroethene	---	---	---	---	---	---	2E-07	---	2E-07
			1,1,2,2-Tetrachloroethane	---	2E-13	---	---	2E-13	---	---	---	---
			1,2-Dichloroethane	---	1E-12	---	---	1E-12	---	1E-07	---	1E-07
			1,4-Dichlorobenzene	---	3E-13	---	---	3E-13	---	5E-10	---	5E-10
			Benzene	---	3E-12	---	---	3E-12	---	2E-07	---	2E-07
			2-Hexanone	---	---	---	---	---	---	3E-08	---	3E-08
			Chlorobenzene	---	---	---	---	---	---	1E-06	---	1E-06
			Ethylbenzene	---	1E-12	---	---	1E-12	---	6E-09	---	6E-09
			Trichloroethene	---	5E-12	---	---	5E-12	---	4E-06	---	4E-06
			Vinyl Chloride	---	5E-11	---	---	5E-11	---	1E-06	---	1E-06
			Xylenes, Total	---	---	---	---	---	---	6E-07	---	6E-07
			1,4-Dioxane	---	1E-12	---	---	1E-12	---	9E-08	---	9E-08
			Biphenyl	---	---	---	---	---	---	3E-06	---	3E-06
			Naphthalene	---	7E-11	---	---	7E-11	---	9E-06	---	9E-06
			Aldrin	---	2E-13	---	---	2E-13	---	---	---	---
			Heptachlor	---	7E-13	---	---	7E-13	---	---	---	---
			Heptachlor Epoxide	---	1E-13	---	---	1E-13	---	---	---	---
			Mercury	---	---	---	---	---	---	4E-07	---	4E-07
			Chemical Total					1E-10				2E-05
			Radionuclide Total					---				---
		Exposure Point Total						1E-10				2E-05
	Exposure Medium Total							1E-10				2E-05
Groundwater Total								1E-10				2E-05

Table 7-8.12
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Park Visitor
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Seep Liquid - Landfill	Seep Liquid - Landfill	Seep Liquid - Landfill	Arsenic	---	---	1E-08	---	1E-08	---	---	4E-04	4E-04
			Chromium	---	---	5E-06	---	5E-06	---	---	1E-02	1E-02
			Cobalt	---	---	---	---	---	---	---	1E-04	1E-04
			Iron	---	---	---	---	---	---	---	4E-04	4E-04
			Lead	---	---	---	---	---	---	---	---	---
			Manganese	---	---	---	---	---	---	---	1E-02	1E-02
			Aldrin	---	---	1E-06	---	1E-06	---	---	3E-02	3E-02
			Dieldrin	---	---	4E-07	---	4E-07	---	---	7E-03	7E-03
			Chemical Total					6E-06				6E-02
			Radionuclide Total					---				---
		Exposure Point Total						6E-06				6E-02
	Exposure Medium Total							6E-06				6E-02
Seep Liquid Total								6E-06				6E-02
Receptor Total								4E-05				1E+00

Total Risks Across All Media= 4E-05

Total Hazard Across All Media= 1E+00

Golder Associates

Table 7-8.13
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill, Annex Site, and Visitors Center - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Park Visitor
Receptor Age:	Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks					Non-Cancer Hazard Calculations			
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater - Refuge	Groundwater - Refuge	Groundwater - Refuge	Benzene	---	5E-09	---	---	5E-09	---	3E-04	---	3E-04
			Chloroform	---	6E-09	---	---	6E-09	---	4E-05	---	4E-05
			Trichloroethene	---	8E-09	---	---	8E-09	---	7E-03	---	7E-03
			Vinyl Chloride	---	6E-07	---	---	6E-07	---	2E-02	---	2E-02
			Chemical Total					6E-07				2E-02
			Radionuclide Total					---				---
		Exposure Point Total						6E-07				2E-02
	Exposure Medium Total							6E-07				2E-02
Groundwater Total								6E-07				2E-02
Receptor Total								6E-07				2E-02

Total Risks Across All Media= 6E-07 Total Hazard Across All Media= 2E-02

Table 7-8.14
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Park Visitor
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks: Ingestion	Inhalation	Dermal	External	Exposure Routes Total
Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Surface and Subsurface Soil - Annex	Aluminum	---	---	---	---	---
			Antimony	---	---	---	---	---
			Arsenic	5E-06	4E-09	1E-06	---	6E-06
			Beryllium	---	2E-10	---	---	2E-10
			Cadmium	---	7E-11	---	---	7E-11
			Chromium	4E-05	4E-07	---	---	4E-05
			Cobalt	---	4E-09	---	---	---
			Iron	---	---	---	---	---
			Manganese	---	---	---	---	---
			Thallium	---	---	---	---	---
			Vanadium	---	---	---	---	---
			2,3,7,8-TCDD Equivalents	4E-07	7E-09	7E-08	---	5E-07
			Aroclor 1248	1E-06	7E-08	1E-06	---	3E-06
			Aroclor 1254	7E-08	3E-09	5E-08	---	1E-07
			Aroclor 1260	3E-08	8E-10	3E-08	---	6E-08
			Benzo(A)Anthracene	4E-07	4E-10	3E-07	---	6E-07
			Benzo(A)Pyrene	2E-06	2E-11	2E-06	---	4E-06
			Benzo(B)Fluoranthene	8E-07	6E-12	5E-07	---	1E-06
			Carbazole	---	---	---	---	---
			Dibenzo(A,H)Anthracene	7E-07	6E-12	5E-07	---	1E-06
			Indeno(1,2,3-Cd)Pyrene	1E-07	1E-12	1E-07	---	2E-07
			Chemical Total					6E-05
			Radionuclide Total					---
		Exposure Point Total						6E-05
	Exposure Medium Total							6E-05
Soil Total								6E-05
Groundwater - Annex	Air	Ambient Air	1,2-Dichloroethane	---	1E-10	---	---	1E-10
			1,4-Dichlorobenzene	---	1E-12	---	---	1E-12
			Benzene	---	2E-12	---	---	2E-12
			Chlorobenzene	---	---	---	---	---
			Trichloroethene	---	4E-13	---	---	4E-13
			Vinyl Chloride	---	4E-10	---	---	4E-10
			1,4-Dioxane	---	3E-13	---	---	3E-13
			Naphthalene	---	5E-11	---	---	5E-11
			Heptachlor	---	2E-12	---	---	2E-12
			Chemical Total					6E-10
			Radionuclide Total					---
		Exposure Point Total						6E-10
	Exposure Medium Total							6E-10
Groundwater Total								6E-10
Seep Liquid - Annex	Seep Liquid - Annex	Seep Liquid - Annex	Aluminum	---	---	---	---	---
			Arsenic	---	---	6E-08	---	6E-08
			Chromium	---	---	1E-05	---	1E-05
			Cobalt	---	---	---	---	---
			Iron	---	---	---	---	---
			Lead	---	---	---	---	---
			Manganese	---	---	---	---	---
			Naphthalene	---	---	---	---	---
			Vanadium	---	---	---	---	---
			Benzene	---	---	5E-10	---	5E-10
			Vinyl Chloride	---	---	7E-07	---	7E-07
			Chemical Total					1E-05
			Radionuclide Total					---
		Exposure Point Total						1E-05
	Exposure Medium Total							1E-05
Seep Liquid Total								1E-05
Receptor Total								7E-05
							Total Risks Across All Media=	7E-05

Table 7-8.15
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe:	Future
Receptor Population:	Park Visitor
Receptor Age:	Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks Ingestion	Inhalation	Dermal	External	Exposure Routes Total
Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Surface and Subsurface Soil - Landfill	Aluminum	---	---	---	---	---
			Antimony	---	---	---	---	---
			Arsenic	2E-06	2E-09	5E-07	---	2E-06
			Beryllium	---	9E-10	---	---	9E-10
			Cadmium	---	2E-10	---	---	2E-10
			Chromium	4E-05	2E-06	---	---	5E-05
			Cobalt	---	1E-08	---	---	1E-08
			Copper	---	---	---	---	---
			Iron	---	---	---	---	---
			Lead	---	---	---	---	---
			Manganese	---	---	---	---	---
			Mercury	---	---	---	---	---
			Nickel	---	2E-09	---	---	2E-09
			Vanadium	---	---	---	---	---
			Zinc	---	---	---	---	---
			2,3,7,8-TCDD Equivalents	4E-06	2E-07	7E-07	---	5E-06
			Dieldrin	7E-08	5E-12	4E-08	---	1E-07
			Benzo(A)Anthracene	1E-06	5E-09	4E-06	---	5E-06
			Benzo(A)Pyrene	1E-05	4E-10	3E-05	---	4E-05
			Benzo(B)Fluoranthene	1E-06	5E-11	3E-06	---	5E-06
			Benzo(K)Fluoranthene	1E-07	4E-11	3E-07	---	4E-07
			Carbazole	---	---	---	---	---
			Dibenzo(A,H)Anthracene	2E-06	8E-11	5E-06	---	7E-06
			Indeno(1,2,3-Cd)Pyrene	4E-07	2E-11	1E-06	---	2E-06
			Naphthalene	---	9E-09	---	---	9E-09
			Chemical Total					1E-04
			Radionuclide Total					---
		Exposure Point Total						1E-04
	Exposure Medium Total							1E-04
Soil Total								1E-04
Groundwater - Landfill	Groundwater - Landfill	Groundwater - Landfill	1,1-Dichloroethene	---	---	---	---	---
			1,1,2,2-Tetrachloroethane	---	1E-12	---	---	1E-12
			1,2-Dichloroethane	---	7E-12	---	---	7E-12
			1,4-Dichlorobenzene	---	2E-12	---	---	2E-12
			Benzene	---	1E-11	---	---	1E-11
			2-Hexanone	---	---	---	---	---
			Chlorobenzene	---	---	---	---	---
			Ethylbenzene	---	6E-12	---	---	6E-12
			Trichloroethene	---	1E-11	---	---	1E-11
			Vinyl Chloride	---	1E-08	---	---	1E-08
			Xylenes, Total	---	---	---	---	---
			1,4-Dioxane	---	5E-12	---	---	5E-12
			Biphenyl	---	---	---	---	---
			Naphthalene	---	4E-10	---	---	4E-10
			Aldrin	---	1E-12	---	---	1E-12
			Heptachlor	---	4E-12	---	---	4E-12
			Heptachlor Epoxide	---	7E-13	---	---	7E-13
			Mercury	---	---	---	---	---
			Chemical Total					2E-08
			Radionuclide Total					---
		Exposure Point Total						2E-08
	Exposure Medium Total							2E-08
Groundwater Total								2E-08

Table 7-8.15
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Park Visitor
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks				
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total
Seep Liquid - Landfill	Seep Liquid - Landfill	Seep Liquid - Landfill	Arsenic	---	---	3E-08	---	3E-08
			Chromium	---	---	8E-06	---	8E-06
			Cobalt	---	---	---	---	---
			Iron	---	---	---	---	---
			Lead	---	---	---	---	---
			Manganese	---	---	---	---	---
			Aldrin	---	---	3E-06	---	3E-06
			Dieldrin	---	---	9E-07	---	9E-07
			Chemical Total					1E-05
			Radionuclide Total					---
		Exposure Point Total						1E-05
	Exposure Medium Total							1E-05
Seep Liquid Total								1E-05
Receptor Total								1E-04

Total Risks Across All Media= 1E-04

Table 7-8.16
Summary Of Receptor Risks And Hazards For COPCs
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill, Annex Site, and Visitors Center - Folcroft, PA

Scenario Timeframe: Future
Receptor Population: Park Visitor
Receptor Age: Lifetime

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risks				
				Ingestion	Inhalation	Dermal	External	Exposure Routes Total
Groundwater - Refuge	Groundwater - Refuge	Groundwater - Refuge	Benzene	---	3E-08	---	---	3E-08
			Chloroform	---	3E-08	---	---	3E-08
			Trichloroethene	---	2E-08	---	---	2E-08
			Vinyl Chloride	---	2E-04	---	---	2E-04
			Chemical Total					2E-04
			Radionuclide Total					---
		Exposure Point Total						2E-04
	Exposure Medium Total							2E-04
Groundwater Total								2E-04
Receptor Total								2E-04

Total Risks Across All Media= 2E-04

Table 7-9
Summary of Cancer Risks and Non-Cancer Hazards
Reasonable Maximum Exposure
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site, Folcroft, PA

Scenario Timeframe	Receptor Population	Receptor Age	Location	Groundwater		Surface and Subsurface Soil		Seep Liquid		Ambient Air		Indoor Air		Trench Air		Sum Over All Media	
				Cancer Risk	HI	Cancer Risk	HI	Cancer Risk	HI	Cancer Risk	HI	Cancer Risk	HI	Cancer Risk	HI	Cancer Risk	HI
				RME Scenario													
Future	Construction/Excavation Worker	Adult	Annex	1E-07	1E-01	3E-06	1E+00	1E-07	1E-02	2E-11	9E-06	---	---	9E-09	5E-03	3E-06	1E+00
			Landfill	1E-06	2E-01	3E-06	2E+00	2E-07	2E-02	6E-11	6E-05	---	---	6E-08	1E-01	5E-06	**2E+00**
Current and Future	Trespasser	Adolescent (13 to 18 years)	Annex	---	---	2E-06	5E-02	8E-07	5E-03	4E-11	3E-06	---	---	---	---	3E-06	6E-02
			Landfill	---	---	3E-06	1E-01	8E-07	1E-02	2E-10	2E-05	---	---	---	---	3E-06	1E-01
Future	Park Visitor	Adult	Annex	---	---	5E-06	9E-02	2E-06	1E-02	7E-11	2E-06	---	---	---	---	7E-06	1E-01
			Refuge Visitor Center	---	---	---	---	---	---	---	---	2E-06	2E-02	---	---	2E-06	2E-02
			Landfill	---	---	5E-06	3E-01	4E-06	2E-02	3E-10	1E-05	---	---	---	---	9E-06	3E-01
Future	Park Visitor	Child (1 to 6 years)	Annex	---	---	2E-05	4E-01	6E-06	3E-02	4E-11	3E-06	---	---	---	---	3E-05	5E-01
			Refuge Visitor Center	---	---	---	---	---	---	---	---	6E-07	2E-02	---	---	6E-07	2E-02
			Landfill	---	---	3E-05	1E+00	6E-06	6E-02	1E-10	2E-05	---	---	---	---	4E-05	1E+00
Future	Park Visitor	Lifetime	Annex	---	---	6E-05	---	1E-05	---	6E-10	---	---	---	---	---	7E-05	---
			Refuge Visitor Center	---	---	---	---	---	---	---	---	2E-04	--	---	---	**2E-04**	---
			Landfill	---	---	1E-04	---	1E-05	---	2E-08	---	---	---	---	---	1E-04	---
Current and Future	Refuge Worker	Adult	Annex	---	---	2E-05	2E-01	2E-06	7E-03	4E-10	8E-06	---	---	---	---	3E-05	2E-01
			Refuge Offices	---	---	---	---	---	---	---	---	1E-05	1E-01	---	---	1E-05	1E-01
			Landfill	---	---	2E-05	5E-01	3E-06	1E-02	1E-09	5E-05	---	---	---	---	3E-05	5E-01

HI = Cumulative Hazard Index
-- Incomplete pathway

TABLE 8-2.1
RANGE OF CONTAMINANTS FOUND IN SOIL AND POTENTIAL COPECs - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration		Detection Frequency	Range of Detection Limits (DL)	95% UCL	Arithmetic Mean	Dioxin Toxicity Equivalence Factor (TEF) Mammals[1]	Dioxin Toxicity Equivalence Factor (TEF) Avian[1]	Concentration Used For Screening[2]	Selected Screening Level (Source)	Bioaccumulative[7]	COPEC[8]	Contaminant Category[9]
				Location	Depth (in)											
Inorganics																
Aluminum	mg/kg	6,290	22,700	LF-A3S	0 - 0	43 / 43	4.4 - 8.6	15,759	14,738	-	-	22,700	1 (4)	NO	**YES**	**A**
Antimony	mg/kg	0.45 L	17.9 L	L-14	0 - 6	28 / 43	0.27 - 22.3	2.85	2.13	-	-	17.9	0.27 (3)	NO	**YES**	**A**
Arsenic	mg/kg	2.4 J	19.8 J	L-14	0 - 6	43 / 43	0.58 - 1.8	10.1	9.06	-	-	19.8	18 (3)	YES	**YES**	**A**
Barium	mg/kg	39.7 J	864 J	L-36	0 - 6	43 / 43	0.022 - 0.16	291	178	-	-	864	330 (3)	NO	**YES**	**A**
Beryllium	mg/kg	0.37 J	66 J	L-4	0 - 6	42 / 43	0.022 - 0.4	9.41	2.64	-	-	66	21 (3)	NO	**YES**	**A**
Cadmium	mg/kg	0.2 J	8.1 J	L-14	0 - 6	43 / 43	0.044 - 0.13	2.23	1.24	-	-	8.1	0.36 (3)	YES	**YES**	**A**
Calcium	mg/kg	917 J	83,400 J	L-36	6 - 24	43 / 43	0.69 - 5.4	12,382	9,796	-	-	83,400	-	NO	NO	NUTR
Chromium	mg/kg	19.4 J	140 J	L-35	0 - 6	43 / 43	0.089 - 0.36	59.3	52.2	-	-	140	26 (3)	YES	**YES**	**A**
Cobalt	mg/kg	4.9 J	158 J	L-14	0 - 6	43 / 43	0.089 - 0.31	30.4	14.4	-	-	158	13 (3)	NO	**YES**	**A**
Copper	mg/kg	24.5 L	10,500 L	L-14	0 - 6	43 / 43	0.2 - 0.77	1,503	437	-	-	10,500	28 (3)	YES	**YES**	**A**
Iron	mg/kg	14,500	199,000	L-39S	0 - 0	43 / 43	1.7 - 7.7	40,553	32,616	-	-	199,000	12 (4)	NO	**YES**	**A**
Lead	mg/kg	30.5	4,260	L-4	0 - 6	43 / 43	0.31 - 0.61	444	364	-	-	4,260	11 (3)	YES	**YES**	**A**
Magnesium	mg/kg	1,230 J	38,200 J	L-36	6 - 24	43 / 43	0.58 - 2.8	9,118	5,481	-	-	38,200	4,400 (4)	NO	No	NUTR
Manganese	mg/kg	163	9,770	L-14	0 - 6	43 / 43	0.022 - 0.12	1,660	702	-	-	9,770	220 (3)	NO	**YES**	**A**
Mercury	mg/kg	0.21	6.7	L-38	6 - 24	43 / 43	0.041 - 0.11	1.87	1.49	-	-	6.7	0.058 (4)	YES	**YES**	**A**
Nickel	mg/kg	13.1	1,300	L-39S	0 - 0	43 / 43	0.13 - 0.47	223	75.7	-	-	1,300	38 (4)	YES	**YES**	**A**
Potassium	mg/kg	452 J	3,180 J	LF-A2S	0 - 0	43 / 43	0.71 - 4.5	1,528	1,366	-	-	3,180	-	NO	NO	NUTR
Selenium	mg/kg	0.67 J	1.1 J	L-37	0 - 6	6 / 43	0.56 - 1.8	0.647	0.46	-	-	1.1	0.52 (3)	YES	**YES**	**A**
Silver	mg/kg	0.13 J	5.4 J	L-24	6 - 12	29 / 43	0.11 - 0.36	1.85	0.89	-	-	5.4	4.2 (3)	YES	**YES**	**A**
Sodium	mg/kg	278 J	2,290 J	L-4	0 - 6	10 / 43	21.5 - 385	336	235	-	-	2,290	-	NO	No	NUTR
Thallium	mg/kg	-	-	-	-	0 / 43	0.63 - 3		-	-	-	0.315	0.001 (4)	NO	**YES**	**B**
Vanadium	mg/kg	26.9 J	84.2 J	L-4	0 - 6	43 / 43	0.089 - 0.24	48.3	45.4	-	-	84.2	7.8 (3)	NO	**YES**	**A**
Zinc	mg/kg	71.3 L	17,500 L	L-4	0 - 6	43 / 43	0.13 - 1.3	3,172	1,081	-	-	17,500	46 (3)	YES	**YES**	**A**
Volatile Organic Compounds (VOCs)																
1,1,1-Trichloroethane	ug/kg	-	-	-	-	0 / 11	2 - 2	-	-	-	-	1	300 (4)	NO	NO	-
1,1,2,2-Tetrachloroethane	ug/kg	-	-	-	-	0 / 11	1.6 - 1.6	-	-	-	-	0.8	300 (4)	NO	NO	-
1,1,2-Trichloroethane	ug/kg	-	-	-	-	0 / 11	1.9 - 1.9	-	-	-	-	0.95	300 (4)	NO	NO	-
1,1-Dichloroethane	ug/kg	-	-	-	-	0 / 11	1.9 - 1.9	-	-	-	-	0.95	300 (4)	NO	NO	-
1,1-Dichloroethene	ug/kg	-	-	-	-	0 / 11	2.3 - 2.3	-	-	-	-	1.15	-	NO	NO	-
1,2,4-Trichlorobenzene	ug/kg	-	-	-	-	0 / 11	1.7 - 1.7	-	-	-	-	0.85	100 (4)	YES	NO	-
1,2-Dibromo-3-Chloropropane	ug/kg	-	-	-	-	0 / 11	3 - 3	-	-	-	-	1.5	-	NO	NO	-
1,2-Dibromoethane	ug/kg	-	-	-	-	0 / 11	1.7 - 1.7	-	-	-	-	0.85	5,000 (4)	NO	NO	-
1,2-Dichlorobenzene	ug/kg	-	-	-	-	0 / 11	1.2 - 1.2	-	-	-	-	0.6	100 (4)	YES	NO	-
1,2-Dichloroethane	ug/kg	-	-	-	-	0 / 11	1.9 - 1.9	-	-	-	-	0.95	870,000 (4)	NO	NO	-
1,2-Dichloropropane	ug/kg	-	-	-	-	0 / 11	1.6 - 1.6	-	-	-	-	0.8	300 (4)	NO	NO	-
1,3-Dichlorobenzene	ug/kg	-	-	-	-	0 / 11	1.4 - 1.4	-	-	-	-	0.7	-	YES	NO	-
1,4-Dichlorobenzene	ug/kg	-	-	-	-	0 / 11	1.1 - 1.1	-	-	-	-	0.55	100 (4)	YES	NO	-
2-Butanone	ug/kg	-	-	-	-	0 / 11	1.9 - 1.9	-	-	-	-	0.95	-	NO	NO	-
2-Hexanone	ug/kg	-	-	-	-	0 / 11	2.1 - 2.1	-	-	-	-	1.05	-	NO	NO	-
4-Methyl-2-Pentanone	ug/kg	-	-	-	-	0 / 11	1.6 - 1.6	-	-	-	-	0.8	-	NO	NO	-
Acetone	ug/kg	7 J	29 J	L-6	6 - 24	2 / 11	3.3 - 8	-	5.3	-	-	29	-	NO	**YES**	**C**

Checked by CWB

TABLE 8-2.1
RANGE OF CONTAMINANTS FOUND IN SOIL AND POTENTIAL COPECs - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Maximum Concentration Depth (in)	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Arithmetic Mean	Dioxin Toxicity Equivalence Factor (TEF) Mammals[1]	Dioxin Toxicity Equivalence Factor (TEF) Avian[1]	Concentration Used For Screening[2]	Selected Screening Level (Source)	Bioaccumulative[7]	COPEC[8]	Contaminant Category[9]
Semivolatile Organic Compounds																
2,4,5-Trichlorophenol	ug/kg	-	-	-	-	0 / 44	88 - 2000	-	-	-	-	44	100 (4)	NO	NO	-
2,4,6-Trichlorophenol	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	100 (4)	NO	NO	-
2,4-Dichlorophenol	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	100 (4)	NO	NO	-
2,4-Dimethylphenol	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	100 (4)	NO	NO	-
2,4-Dinitrophenol	ug/kg	-	-	-	-	0 / 44	88 - 2000	-	-	-	-	44	100 (4)	NO	NO	-
2,4-Dinitrotoluene	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	-	NO	NO	-
2,6-Dinitrotoluene	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	-	NO	NO	-
2-Chloronaphthalene	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	-	NO	NO	-
2-Chlorophenol	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	100 (4)	NO	NO	-
2-Methylphenol	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	100 (4)	NO	NO	-
2-Nitroaniline	ug/kg	-	-	-	-	0 / 44	88 - 2000	-	-	-	-	44	-	NO	NO	-
2-Nitrophenol	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	-	NO	NO	-
3,3'-Dichlorobenzidine	ug/kg	-	-	-	-	0 / 44	51 - 1200	-	-	-	-	25.5	-	NO	NO	-
3-Nitroaniline	ug/kg	-	-	-	-	0 / 44	88 - 2000	-	-	-	-	44	-	NO	NO	-
4,6-Dinitro-2-Methylphenol	ug/kg	-	-	-	-	0 / 44	88 - 2000	-	-	-	-	44	-	NO	NO	-
4-Bromophenyl-Phenylether	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	-	YES	NO	-
4-Chloro-3-Methylphenol	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	-	NO	NO	-
4-Chloroaniline	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	-	NO	NO	-
4-Chlorophenyl-Phenylether	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	-	YES	NO	-
4-Methylphenol	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	100 (4)	NO	NO	-
4-Nitroaniline	ug/kg	-	-	-	-	0 / 44	88 - 2000	-	-	-	-	44	-	NO	NO	-
4-Nitrophenol	ug/kg	-	-	-	-	0 / 44	88 - 2000	-	-	-	-	44	100 (4)	NO	NO	-
Acetophenone	ug/kg	88 J	88 J	L-43	6 - 24	1 / 44	67 - 910	-	80.5	-	-	88	-	NO	**YES**	**C**
Atrazine	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	-	NO	NO	-
Benzaldehyde	ug/kg	-	-	-	-	0 / 44	69 - 1600		-	-	-	34.5	-	NO	NO	-
Biphenyl	ug/kg	170 J	2,500 J	L-36	6 - 24	4 / 44	35 - 800	214	111	-	-	2,500	-	NO	**YES**	**C**
Bis(2-Chloroethoxy)Methane	ug/kg	-	-	-	-	0 / 44	35 - 800	-	-	-	-	17.5	-	NO	NO	-
Bis(2-Chloroethyl) Ether	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	-	NO	NO	-
Bis(2-Chloroisopropyl) Ether	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	-	NO	NO	-
Bis(2-Ethylhexyl) Phthalate	ug/kg	92 J	1,400 J	L-37	0 - 6	14 / 44	35 - 800	313	213	-	-	1,400	-	NO	**YES**	**C**
Butylbenzyl Phthalate	ug/kg	150 J	940 J	L-36	6 - 24	2 / 44	35 - 800	-	-	-	-	940	-	NO	**YES**	**C**
Caprolactum	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	-	NO	NO	-
Dibenzofuran	ug/kg	85 J	1,500 J	L-36	6 - 24	4 / 44	35 - 800	127	79.4	-	-	1,500	-	NO	**YES**	**C**
Diethyl Phthalate	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	100 (5)	NO	NO	-
Dimethyl Phthalate	ug/kg	410	410	L-4	0 - 6	1 / 44	35 - 800	-	52.0	-	-	410	200 (6)	NO	**YES**	**A**
Di-N-Butyl Phthalate	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	200 (5)	NO	NO	-
Hexachlorobenzene	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	2,000 (5)	YES	NO	-
Hexachlorobutadiene	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	-	YES	NO	-
Hexachlorocyclopentadiene	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	10 (5)	YES	**YES**	**B**
Hexachloroethane	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	-	YES	NO	-
Isophorone	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	-	NO	NO	-
Nitrobenzene	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	-	NO	NO	-
N-Nitroso-Di-N-Propylamine	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	-	NO	NO	-

TABLE 8-2.1
RANGE OF CONTAMINANTS FOUND IN SOIL AND POTENTIAL COPECs - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Maximum Concentration Depth (in)	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Arithmetic Mean	Dioxin Toxicity Equivalence Factor (TEF) Mammals[1]	Dioxin Toxicity Equivalence Factor (TEF) Avian[1]	Concentration Used For Screening[2]	Selected Screening Level (Source)	Bioaccumulative[7]	COPEC[8]	Contaminant Category[9]
N-Nitrosodiphenylamine	ug/kg	-	-	-	-	0 / 44	88 - 2000		-	-	-	44	20 (6)	NO	**YES**	**B**
Pentachlorophenol	ug/kg	-	-	-	-	0 / 44	35 - 800		-	-	-	17.5	2,100 (3)	YES	NO	-
Phenol	ug/kg	85 J	210 J	LF-A1S	0 - 0	4 / 44	35 - 800	56	54	-	-	210	100 (4)	NO	**YES**	**A**
Di-N-Octyl Phthalate	ug/kg	100 J	19,000 J	L-20	19 - 24	3 / 44	35 - 800	1,353	476	-	-	19,000	-	NO	**YES**	**C**
Acenaphthene	ug/kg	91 J	4,800 J	L-36	6 - 24	10 / 44	35 - 800	500	176	-	-	4,800	LMW-PAH (10)	YES		
Acenaphthylene	ug/kg	100 J	3,200 J	L-36	6 - 24	10 / 44	35 - 800	298	159	-	-	3,200	LMW-PAH (10)	YES		
Anthracene	ug/kg	87 J	2,500 J	L-36	6 - 24	23 / 44	35 - 800	323	216	-	-	2,500	LMW-PAH (10)	YES		
Fluorene	ug/kg	100 J	9,700 J	L-36	6 - 24	12 / 44	35 - 800	944	300	-	-	9,700	LMW-PAH (10)	YES		
Naphthalene	ug/kg	100 J	70,000 J	L-20	19 - 24	13 / 44	35 - 800	9,058	1,896	-	-	70,000	LMW-PAH (10)	YES		
Phenanthrene	ug/kg	93 J	20,000 J	L-36	6 - 24	37 / 44	35 - 800	3,154	1,176	-	-	20,000	LMW-PAH (10)	YES		
Benzo(A)Anthracene	ug/kg	79 J	4,800 J	L-48S	0 - 0	34 / 44	35 - 800	1,165	592	-	-	4,800	HMW-PAH (11)	YES		
Benzo(A)Pyrene	ug/kg	84 J	4,100 J	L-48S	0 - 0	31 / 44	35 - 800	1,004	544	-	-	4,100	HMW-PAH (11)	YES		
Carbazole	ug/kg	96 J	400 J	LF-A1S	0 - 0	9 / 44	35 - 800	118	88	-	-	400	-	NO	**YES**	**C**
Chrysene	ug/kg	86 J	7,000 J	L-48S	0 - 0	39 / 44	35 - 800	1,776	851	-	-	7,000	HMW-PAH (11)	YES		
Dibenzo(A,H)Anthracene	ug/kg	91 J	630 J	L-48S	0 - 0	12 / 44	35 - 800	159	110	-	-	630	HMW-PAH (11)	YES		
Fluoranthene	ug/kg	120 J	3,700 J	L-48S	0 - 0	35 / 44	35 - 800	1,634	900	-	-	3,700	HMW-PAH (11)	YES		
Pyrene	ug/kg	110 J	12,000 J	L-36	6 - 24	40 / 44	35 - 800	2,801	1,352	-	-	12,000	HMW-PAH (11)	YES		
Benzo(B)Fluoranthene	ug/kg	86 J	4,200 J	L-48S	0 - 0	32 / 44	35 - 800	1,068	598	-	-	4,200	HMW-PAH (11)	YES		
Benzo(K)Fluoranthene	ug/kg	82 J	4,100 J	L-48S	0 - 0	28 / 44	35 - 800	997	525	-	-	4,100	HMW-PAH (11)	YES		
Benzo(G,H,I)Perylene	ug/kg	83 J	1,800 J	L-48S	0 - 0	30 / 44	35 - 800	534	303	-	-	1,800	HMW-PAH (11)	YES		
Indeno(1,2,3-Cd)Pyrene	ug/kg	84 J	1,500 J	L-27	6 - 12	21 / 44	35 - 800	377	272	-	-	1,500	HMW-PAH (11)	YES		
2-Methylnaphthalene	ug/kg	110 J	13,000 J	L-36	6 - 24	20 / 44	35 - 800	1,788	670	-	-	13,000	-	NO	**YES**	**C**
LMW-PAHs[10]	ug/kg	93	40,200	L-36	6 - 24	39 / 44		3,005	1,890	-	-	40,200	29,000 (3)	YES	**YES**	**A**
HMW-PAHs[11]	ug/kg	110	36,330	L-48S	0 - 0	42 / 44		8,295	5,862	-	-	36,330	1,100 (3)	YES	**YES**	**A**
Pesticides																
4,4'-DDD	ug/kg	1.1 J	240 J	L-43	0 - 6	37 / 39	0.33 - 0.33	61	21	-	-	240	21 (3)	YES	**YES**	**A**
4,4'-DDE	ug/kg	0.94 J	720 J	L-43	0 - 6	33 / 42	0.33 - 0.33	102	27	-	-	720	21 (3)	YES	**YES**	**A**
4,4'-DDT	ug/kg	2.2 J	1,900 J	L-43	0 - 6	34 / 44	0.5 - 5.9	244	57	-	-	1,900	21 (3)	YES	**YES**	**A**
Aldrin	ug/kg	0.61 J	2.2 J	L-4	0 - 6	5 / 43	0.17 - 0.17	0.42	0.22	-	-	2.2	100 (4)	YES	**YES**	**D**
Alpha-BHC	ug/kg	0.48 J	1.9 J	L-43	6 - 24	5 / 42	0.18 - 0.18	0.36	0.19	-	-	1.9	-	YES	**YES**	**C**
Alpha-Chlordane	ug/kg	0.49 J	20 J	L-48S	0 - 0	19 / 44	0.17 - 1.8	5.1	2.9	-	-	20	100 (4)	NO	NO	**-**
gamma-Chlordane	ug/kg	0.42 J	25 J	LF-A3S	0 - 0	32 / 43	0.17 - 0.17	7.7	4.0	-	-	25	100 (4)	NO	NO	**-**
Alpha-Endosulfan	ug/kg	0.45 J	7.3 J	L-24	6 - 12	12 / 44	0.17 - 3	1.1	0.62	-	-	7.3	-	YES	**YES**	**C**
Beta-BHC	ug/kg	0.69 J	5.4 J	L-27	6 - 12	20 / 40	0.25 - 0.25	1.9	1.2	-	-	5.4	-	YES	**YES**	**C**
Beta-Endosulfan	ug/kg	0.82 J	15 J	L-36	6 - 24	19 / 44	0.33 - 0.33	3.1	1.8	-	-	15	-	YES	**YES**	**C**
Delta-BHC	ug/kg	0.5 J	0.95 J	L-43	6 - 24	3 / 44	0.17 - 0.17	0.25	0.12	-	-	0.95	-	YES	**YES**	**C**
Dieldrin	ug/kg	0.98 J	120 J	L-39S	0 - 0	37 / 39	0.33 - 0.33	27	7.7	-	-	120	4.9 (3)	YES	**YES**	**A**
Endosulfan Sulfate	ug/kg	1 J	22 J	L-44	0 - 6	21 / 44	0.37 - 0.37	3.6	2.4	-	-	22	-	NO	**YES**	**C**
Endrin	ug/kg	0.92 J	24 J	L-24	6 - 12	14 / 44	0.33 - 0.33	4.5	2.4	-	-	24	100 (4)	YES	**YES**	**D**
Endrin Aldehyde	ug/kg	0.85 J	23 J	L-44	0 - 6	23 / 44	0.33 - 0.33	6.4	3.7	-	-	23	-	NO	**YES**	**C**
Endrin Ketone	ug/kg	0.91 J	41 J	L-48S	0 - 0	21 / 44	0.35 - 0.35	9.4	5.1	-	-	41	-	NO	**YES**	**C**
Gamma-BHC	ug/kg	0.47 J	0.98 J	L-12	8 - 12	3 / 44	0.17 - 0.17	0.26	0.13	-	-	0.98	-	YES	**YES**	**C**
Heptachlor	ug/kg	0.74 J	8.9 J	L-4	0 - 6	3 / 44	0.28 - 0.28	0.90	0.37	-	-	8.9	-	YES	**YES**	**C**
Heptachlor Epoxide	ug/kg	0.57 J	8.3 J	L-37	0 - 6	29 / 42	0.22 - 0.22	3.6	2.3	-	-	8.3	100 (4)	YES	**YES**	**D**
Methoxychlor	ug/kg	4.2 J	63 J	L-24	6 - 12	14 / 43	1.7 - 1.7	7.9	4.7	-	-	63	100 (4)	YES	**YES**	**D**

TABLE 8-2.1
RANGE OF CONTAMINANTS FOUND IN SOIL AND POTENTIAL COPECs - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration		Detection Frequency	Range of Detection Limits (DL)	95% UCL	Arithmetic Mean	Dioxin Toxicity Equivalence Factor (TEF) Mammals[1]	Dioxin Toxicity Equivalence Factor (TEF) Avian[1]	Concentration Used For Screening[2]	Selected Screening Level (Source)	Bioaccumulative[7]	COPEC[8]	Contaminant Category[9]
				Location	Depth (in)											
Polychlorinated Biphenyls (PCBs)																
Aroclor 1016	ug/kg	-	-	-	-	0 / 44	3.5 - 3.5	-	-	-	-	1.75	100 (4)	YES	NO	-
Aroclor 1221	ug/kg	-	-	-	-	0 / 44	16 - 16	-	-	-	-	8	100 (4)	YES	NO	-
Aroclor 1232	ug/kg	-	-	-	-	0 / 44	6.1 - 6.1	-	-	-	-	3.05	100 (4)	YES	NO	-
Aroclor 1242	ug/kg	-	-	-	-	0 / 44	3.5 - 3.5	-	-	-	-	1.75	100 (4)	YES	NO	-
Aroclor 1248	ug/kg	-	-	-	-	0 / 44	3.6 - 3.6	-	-	-	-	1.8	100 (4)	YES	NO	-
Aroclor 1254	ug/kg	-	-	-	-	0 / 44	5.5 - 5.5	-	-	-	-	2.75	100 (4)	YES	NO	-
Aroclor 1260	ug/kg	-	-	-	-	0 / 44	5.5 - 5.5	-	-	-	-	2.75	100 (4)	YES	NO	-
Dioxins & Furans																
1,2,3,4,6,7,8-Heptachlorodibenzofuran	ug/kg	0.0158	0.453	L-21	24 - 48	5 / 5	0.000487 - 0.0234	0.34	0.17	0.01	0.01	-	-	NO		
1,2,3,4,7,8,9-Heptachlorodibenzofuran	ug/kg	0.000992 J	0.00419 J	L-43	0 - 6	3 / 5	0.000487 - 0.0291	0.0047	0.0057	0.01	0.01	-	-	NO		
1,2,3,4,7,8-Hexachlorodibenzofuran	ug/kg	0.00193 J	0.0188 J	L-36	6 - 24	4 / 5	0.000487 - 0.025	0.014	0.0079	0.1	0.1	-	-	YES		
1,2,3,6,7,8-Hexachlorodibenzofuran	ug/kg	0.00141 J	0.0117 J	L-36	6 - 24	4 / 5	0.000487 - 0.0239	0.0087	0.0052	0.1	0.1	-	-	NO		
1,2,3,7,8,9-Hexachlorodibenzofuran	ug/kg	0.000555 J	0.00178 J	L-43	0 - 6	3 / 5	0.000497 - 0.0282	0.0021	0.0047	0.1	0.1	-	-	NO		
1,2,3,7,8-Pentachlorodibenzofuran	ug/kg	0.000803 J	0.00173 J	L-43	0 - 6	3 / 5	0.000487 - 0.0153	0.0019	0.0035	0.03	0.1	-	-	YES		
2,3,4,6,7,8-Hexachlorodibenzofuran	ug/kg	0.00194 J	0.0163 J	L-36	6 - 24	4 / 5	0.000487 - 0.0248	0.012	0.0069	0.1	0.1	-	-	NO		
2,3,4,7,8-Pentachlorodibenzofuran	ug/kg	0.00248 J	0.00985 J	L-21	24 - 48	4 / 5	0.000487 - 0.0147	0.014	0.0071	0.3	1	-	-	YES		
2,3,7,8-Tetrachlorodibenzofuran	ug/kg	0.00106	0.0268	L-21	24 - 48	4 / 5	0.000128 - 0.0189	0.018	0.0084	0.1	1	-	-	YES		
Octachlorodibenzofuran	ug/kg	0.0428	0.943	L-21	24 - 48	5 / 5	0.000975 - 0.0731	0.67	0.31	0.0003	0.0001	-	-	NO		
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	ug/kg	0.111	8.91	L-21	24 - 48	5 / 5	0.000487 - 0.0476	19	2.0	0.01	0.0001	-	-	YES		
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ug/kg	0.00108 J	0.00205 J	L-43	0 - 6	3 / 5	0.000487 - 0.0296	0.0021	0.0050	0.1	0.05	-	-	YES		
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ug/kg	0.00404 J	0.876 J	L-21	24 - 48	5 / 5	0.000487 - 0.0307	4.4	0.19	0.1	0.01	-	-	YES		
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ug/kg	0.00393 J	0.219 J	L-21	24 - 48	4 / 5	0.000487 - 0.0299	0.14	0.050	0.1	0.1	-	-	NO		
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ug/kg	0.000887 J	0.00181 J	L-43	0 - 6	3 / 5	0.000487 - 0.0233	0.0019	0.0043	1	1	-	-	YES		
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ug/kg	0.00035 J	0.0242 J	L-21	24 - 48	4 / 5	0.000198 - 0.0368	0.019	0.0089	1	1	-	10 (4)	YES		
Octachlorodibenzo-p-dioxin	ug/kg	4.64	79.7	L-21	24 - 48	5 / 5	0.000975 - 0.0814	217	22	0.0003	0.0001	-	-	NO		
2,3,7,8-TCDD equivalents (Avian)	ug/kg	0.0067	0.10	L-21	24 - 48	5 / 5		0.25	0.031			0.10	10 (4)	YES	**YES**	**E, F**
2,3,7,8-TCDD equivalents (Mammals)	ug/kg	0.0055	0.26	L-21	24 - 48	5 / 5		0.28	0.062			0.26	10 (4)	YES	**YES**	**E, F**

Notes:
1 = Toxicity Equivalency Factors (TEFs) for dioxins/furans congeners were used to calculate 2,3,7,8-TCDD equivalents on a sample-by-sample basis using detected concentrations.
Source: Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment, June 2008; TEQ factors are located in Table 2 of the source.
2 = Maximum concentration used for screening unless analyte is undetected; in which case 1/2 lowest method detection limit used; for dioxins/furans, screening concentration is the sum of the (TEQ * maximum concentration) for all congeners.
3 = USEPA Ecological Soil Screening Levels (Eco-SSLs)
4 = USEPA Region III BTAG Screening Levels (1995); for Mn criteria 0.44% = 4,400,000 ppb = 4,400 ppm or mg/kg
5 = Efroymson et al. (1997) Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants
6 = Efroymson et al. (1997) Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process
7 = Bioaccumulative compounds will be considered in the Food Chain Evaluation
8 = Contaminant of Potential Ecological Concern
9 = Contaminant Categories
A = Constituent was detected at a concentration exceeding its screening value
B = Constituent was not detected at concentrations exceeding the DL; however, 1/2 the DL exceeds its screening value
C = Constituent was detected at concentrations exceeding its DL; however, there is no current screening value for the contaminant
D = Constituent was not detected at concentrations exceeding the DL and there is a current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
E = Constituent was detected at concentrations exceeding the DL but below the current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
F = Represents a toxicity equivalent of all dioxin/furan congeners. Concentration is the sum of all congeners after taking into consideration their relative toxicity to the benchmark compounds; 2,3,7,8-TCDD.
NUTR = Compound is considered an essential nutrient and is not identified as a COPEC.
10 = LWM-PAH - low molecular weight PAHs are grouped according to EPA Eco-SSLs and include; acenaphthene, acenaphthylene, anthracene, fluorene, phenanthrene, and naphthalene.
11 = HMW-PAH - high molecular weight PAHs are grouped according to EPA Eco-SSL and include; benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(ah)anthracene, fluoranthene, and indeno(123-cd)pyrene.
mg/kg= milligrams per kilogram
ug/kg= micrograms per kilogram

CAS #	Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration		Detection Frequency	Range of Detection Limits (DL)	95% UCL	Arithmetic Mean	Dioxin Toxicity Equivalence Factor (TEF) Mammals[1]	Dioxin Toxicity Equivalence Factor (TEF) Avian[1]	Concentration Used For Screening[2]	Selected Screening Level (Source)	Bioaccumulative[7]	COPEC[8]	Contaminant Category[9]
					Location	Depth (in)											
	Inorganics																
7429-90-5	Aluminum	mg/kg	2,150	28,100	A-13	0 - 6	25 / 25	4.3 - 7.5	17908	15,403	-	-	28,100	1 (4)	NO	**YES**	A
7440-36-0	Antimony	mg/kg	0.58 L	3.7 L	A-21	6 - 24	17 / 25	0.28 - 3.8	1.52	1.2	-	-	3.7	0.27 (3)	NO	**YES**	A
7440-38-2	Arsenic	mg/kg	0.98 K	94.9 K	A-22	6 - 24	24 / 25	0.6 - 1.6	29	12	-	-	94.9	18 (3)	YES	**YES**	A
7440-39-3	Barium	mg/kg	4.6 J	470 J	A-5	0 - 6	25 / 25	0.023 - 0.14	249	182	-	-	470	330 (3)	NO	**YES**	A
7440-41-7	Beryllium	mg/kg	0.31 J	5.9 J	A-22	6 - 24	23 / 25	0.023 - 0.36	1.899	0.94	-	-	5.9	21 (3)	NO	NO	-
7440-43-9	Cadmium	mg/kg	0.077 J	3.7 J	A-20	0 - 6	21 / 25	0.046 - 1.3	1.2	0.80	-	-	3.7	0.36 (3)	YES	**YES**	A
7440-70-2	Calcium	mg/kg	137 J	13,300 J	A-1	0 - 6	25 / 25	0.71 - 5.3	4704	3,670	-	-	13,300	-	NO	NO	NUTR
7440-47-3	Chromium	mg/kg	7.7	203	A-13	0 - 6	25 / 25	0.092 - 0.32	57	45	-	-	203	26 (3)	YES	**YES**	A
7440-48-4	Cobalt	mg/kg	0.099 J	19.6 J	A-13	0 - 6	25 / 25	0.092 - 0.33	11	9.82	-	-	19.6	13 (3)	NO	**YES**	A
7440-50-8	Copper	mg/kg	3.1 J	232 J	A-20	0 - 6	25 / 25	0.21 - 0.68	69	51	-	-	232	28 (3)	YES	**YES**	A
7439-89-6	Iron	mg/kg	5,100	40,900	A-9	6 - 24	25 / 25	1.7 - 5.5	29429	26,041	-	-	40,900	12 (4)	NO	**YES**	A
7439-92-1	Lead	mg/kg	4.8	293	ANA-DS	0 - 0	25 / 25	0.31 - 0.54	115	78	-	-	293	11 (3)	YES	**YES**	A
7439-95-4	Magnesium	mg/kg	89.7 J	12,400 J	A-13	0 - 6	25 / 25	0.6 - 2.5	5783	4,711	-	-	12,400	4,400 (4)	NO	NO	NUTR
7439-96-5	Manganese	mg/kg	11.8	1,180	ANA-DS	0 - 0	25 / 25	0.023 - 0.11	446	359	-	-	1,180	220 (3)	NO	**YES**	A
7439-97-6	Mercury	mg/kg	0.091 K	0.88 K	A-21	6 - 24	14 / 25	0.043 - 0.091	0.31	0.22	-	-	0.88	0.058 (4)	YES	**YES**	A
7440-02-0	Nickel	mg/kg	0.83 J	92.3 J	A-13	0 - 6	25 / 25	0.12 - 0.5	37	31	-	-	92.3	38 (4)	YES	**YES**	A
7440-09-7	Potassium	mg/kg	164 J	10,400 J	A-9	0 - 6	25 / 25	0.73 - 4	4878	3,327	-	-	10,400	-	NO	NO	NUTR
7782-49-2	Selenium	mg/kg	0.6 J	4.2 J	A-22	6 - 24	7 / 25	0.57 - 1.6	1.1	0.71	-	-	4.2	0.52 (3)	YES	**YES**	A
7440-22-4	Silver	mg/kg	0.52 J	2.4 J	A-21	0 - 6	8 / 25	0.12 - 0.32	0.62	0.38	-	-	2.4	4.2 (3)	YES	**YES**	E
7440-23-5	Sodium	mg/kg	363 J	379 J	A-22	0 - 6	2 / 25	22.2 - 245	98	63	-	-	379	-	NO	NO	NUTR
7440-28-0	Thallium	mg/kg	1 J	1 J	A-22	6 - 24	1 / 25	0.64 - 2.6	-	-	-	-	1	0.001 (4)	NO	**YES**	A
7440-62-2	Vanadium	mg/kg	10.6 J	102 J	A-5	0 - 6	25 / 25	0.092 - 0.21	66	57	-	-	102	7.8 (3)	NO	**YES**	A
7440-66-6	Zinc	mg/kg	7.6	1,540	A-20	0 - 6	25 / 25	0.14 - 0.64	308	182	-	-	1,540	46 (3)	YES	**YES**	A
	Volatile Organic Compounds (VOCs)																
71-55-6	1,1,1-Trichloroethane	ug/kg	-	-	-	-	0 / 12	2 - 2	-	-	-	-	1	300 (4)	NO	NO	**-**
79-34-5	1,1,2,2-Tetrachloroethane	ug/kg	-	-	-	-	0 / 12	1.6 - 1.6	-	-	-	-	0.8	300 (4)	NO	NO	**-**
79-00-5	1,1,2-Trichloroethane	ug/kg	-	-	-	-	0 / 12	1.9 - 1.9	-	-	-	-	0.95	300 (4)	NO	NO	**-**
75-34-3	1,1-Dichloroethane	ug/kg	-	-	-	-	0 / 12	1.9 - 1.9	-	-	-	-	0.95	300 (4)	NO	NO	**-**
75-35-4	1,1-Dichloroethene	ug/kg	-	-	-	-	0 / 12	2.3 - 2.3	-	-	-	-	1.15	-	NO	NO	**-**
120-82-1	1,2,4-Trichlorobenzene	ug/kg	-	-	-	-	0 / 12	1.7 - 1.7	-	-	-	-	0.85	100 (4)	YES	NO	**-**
96-12-8	1,2-Dibromo-3-Chloropropane	ug/kg	-	-	-	-	0 / 12	3 - 3	-	-	-	-	1.5	-	NO	NO	**-**
106-93-4	1,2-Dibromoethane	ug/kg	-	-	-	-	0 / 12	1.7 - 1.7	-	-	-	-	0.85	5,000 (4)	NO	NO	**-**
95-50-1	1,2-Dichlorobenzene	ug/kg	-	-	-	-	0 / 12	1.2 - 1.2	-	-	-	-	0.6	100 (4)	YES	NO	**-**
107-06-2	1,2-Dichloroethane	ug/kg	-	-	-	-	0 / 12	1.9 - 1.9	-	-	-	-	0.95	870,000 (4)	NO	NO	**-**
78-87-5	1,2-Dichloropropane	ug/kg	-	-	-	-	0 / 12	1.6 - 1.6	-	-	-	-	0.8	300 (4)	NO	NO	**-**
541-73-1	1,3-Dichlorobenzene	ug/kg	-	-	-	-	0 / 12	1.4 - 1.4	-	-	-	-	0.7	-	YES	NO	**-**
106-46-7	1,4-Dichlorobenzene	ug/kg	-	-	-	-	0 / 12	1.1 - 1.1	-	-	-	-	0.55	100 (4)	YES	NO	**-**
78-93-3	2-Butanone	ug/kg	-	-	-	-	0 / 12	1.9 - 1.9	-	-	-	-	0.95	-	NO	NO	**-**
591-78-6	2-Hexanone	ug/kg	-	-	-	-	0 / 12	2.1 - 2.1	-	-	-	-	1.05	-	NO	NO	**-**
108-10-1	4-Methyl-2-Pentanone	ug/kg	-	-	-	-	0 / 12	1.6 - 1.6	-	-	-	-	0.8	-	NO	NO	**-**
67-64-1	Acetone	ug/kg	6 J	13 J	A-10	0 - 6	2 / 12	3.3 - 21	6.624	-	-	-	13	-	NO	**YES**	**C**
	Semivolatile Organic Compounds																
95-95-4	2,4,5-Trichlorophenol	ug/kg	-	-	-	-	0 / 24	89 - 170	-	-	-	-	44.5	100 (4)	NO	NO	**-**
88-06-2	2,4,6-Trichlorophenol	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	100 (4)	NO	NO	**-**
120-83-2	2,4-Dichlorophenol	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	100 (4)	NO	NO	**-**
105-67-9	2,4-Dimethylphenol	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	100 (4)	NO	NO	**-**
51-28-5	2,4-Dinitrophenol	ug/kg	-	-	-	-	0 / 24	89 - 170	-	-	-	-	44.5	100 (4)	NO	NO	**-**
121-14-2	2,4-Dinitrotoluene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	**-**

TABLE 8-2.2
RANGE OF CONTAMINANTS FOUND IN SOIL AND POTENTIAL COPECs - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

CAS #	Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration		Detection Frequency	Range of Detection Limits (DL)	95% UCL	Arithmetic Mean	Dioxin Toxicity Equivalence Factor (TEF) Mammals[1]	Dioxin Toxicity Equivalence Factor (TEF) Avian[1]	Concentration Used For Screening[2]	Selected Screening Level (Source)	Bioaccumulative[7]	COPEC[8]	Contaminant Category[9]
					Location	Depth (in)											
606-20-2	2,6-Dinitrotoluene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
91-58-7	2-Chloronaphthalene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
95-57-8	2-Chlorophenol	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	100 (4)	NO	NO	-
95-48-7	2-Methylphenol	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	100 (4)	NO	NO	-
88-74-4	2-Nitroaniline	ug/kg	-	-	-	-	0 / 24	89 - 170	-	-	-	-	44.5	-	NO	NO	-
88-75-5	2-Nitrophenol	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
91-94-1	3,3'-Dichlorobenzidine	ug/kg	-	-	-	-	0 / 24	52 - 97	-	-	-	-	26	-	NO	NO	-
99-09-2	3-Nitroaniline	ug/kg	-	-	-	-	0 / 24	89 - 170	-	-	-	-	44.5	-	NO	NO	-
534-52-1	4,6-Dinitro-2-Methylphenol	ug/kg	-	-	-	-	0 / 24	89 - 170	-	-	-	-	44.5	-	NO	NO	-
101-55-3	4-Bromophenyl-Phenylether	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	YES	NO	-
59-50-7	4-Chloro-3-Methylphenol	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
106-47-8	4-Chloroaniline	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
7005-72-3	4-Chlorophenyl-Phenylether	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	YES	NO	-
106-44-5	4-Methylphenol	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	100 (4)	NO	NO	-
100-01-6	4-Nitroaniline	ug/kg	-	-	-	-	0 / 24	89 - 170	-	-	-	-	44.5	-	NO	NO	-
100-02-7	4-Nitrophenol	ug/kg	-	-	-	-	0 / 24	89 - 170	-	-	-	-	44.5	100 (4)	NO	NO	-
98-86-2	Acetophenone	ug/kg	-	-	-	-	0 / 24	67 - 380	-	-	-	-	33.5	-	NO	NO	-
1912-24-9	Atrazine	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
100-52-7	Benzaldehyde	ug/kg	-	-	-	-	0 / 24	69 - 130	-	-	-	-	34.5	-	NO	NO	-
92-52-4	Biphenyl	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
111-91-1	Bis(2-Chloroethoxy)Methane	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
111-44-4	Bis(2-Chloroethyl) Ether	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
108-60-1	Bis(2-Chloroisopropyl) Ether	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
117-81-7	Bis(2-Ethylhexyl) Phthalate	ug/kg	84 J	180 J	A-20	0 - 6	3 / 24	35 - 340	62.36	50.7	-	-	180	-	NO	**YES**	**C**
85-68-7	Butylbenzyl Phthalate	ug/kg	190 J	190 J	A-16	0 - 16	1 / 24	35 - 67	-	-	-	-	190	-	NO	**YES**	**C**
105-60-2	Caprolactum	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
132-64-9	Dibenzofuran	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
84-66-2	Diethyl Phthalate	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	100 (5)	NO	NO	-
131-11-3	Dimethyl Phthalate	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	200 (6)	NO	NO	-
84-74-2	Di-N-Butyl Phthalate	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	200 (5)	NO	NO	-
118-74-1	Hexachlorobenzene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	2,000 (5)	YES	NO	-
87-68-3	Hexachlorobutadiene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	YES	NO	-
77-47-4	Hexachlorocyclopentadiene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	10 (5)	YES	**YES**	**B**
67-72-1	Hexachloroethane	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	YES	NO	-
78-59-1	Isophorone	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
98-95-3	Nitrobenzene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
621-64-7	N-Nitroso-Di-N-Propylamine	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
86-30-6	N-Nitrosodiphenylamine	ug/kg	-	-	-	-	0 / 24	89 - 170	-	-	-	-	44.5	20 (6)	NO	**YES**	**B**
87-86-5	Pentachlorophenol	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	2,100 (3)	YES	NO	-
108-95-2	Phenol	ug/kg	150 J	150 J	A-17S	0 - 0	1 / 24	35 - 67	-	-	-	-	150	100 (4)	NO	**YES**	**A**
117-84-0	Di-N-Octyl Phthalate	ug/kg	120 J	120 J	A-16	0 - 16	1 / 24	35 - 67	-	-	-	-	120	-	NO	**YES**	**C**
83-32-9	Acenaphthene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	LMW-PAH (10)	YES		
208-96-8	Acenaphthylene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	LMW-PAH (10)	YES		
120-12-7	Anthracene	ug/kg	100 J	240 J	ANA-JS	0 - 0	7 / 24	35 - 67	94.58	65.5	-	-	240	LMW-PAH (10)	YES		
86-73-7	Fluorene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	LMW-PAH (10)	YES		
91-20-3	Naphthalene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	LMW-PAH (10)	NO		
85-01-8	Phenanthrene	ug/kg	110 J	970 J	ANA-JS	0 - 0	13 / 24	35 - 67	346.3	246	-	-	970	LMW-PAH (10)	YES		
56-55-3	Benzo(A)Anthracene	ug/kg	90 J	840 J	A-16	0 - 16	13 / 24	35 - 67	328.5	236	-	-	840	HMW-PAH (11)	YES		
50-32-8	Benzo(A)Pyrene	ug/kg	120 J	620 J	ANA-JS	0 - 0	8 / 24	35 - 67	207.6	138	-	-	620	HMW-PAH (11)	YES		

Checked by CWB

RANGE OF CONTAMINANTS FOUND IN SOIL AND POTENTIAL COPECs - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

CAS #	Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Maximum Concentration Depth (in)	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Arithmetic Mean	Dioxin Toxicity Equivalence Factor (TEF) Mammals[1]	Dioxin Toxicity Equivalence Factor (TEF) Avian[1]	Concentration Used For Screening[2]	Selected Screening Level (Source)	Bioaccumulative[7]	COPEC[8]	Contaminant Category[9]
86-74-8	Carbazole	ug/kg	100 J	150 J	A-10	0 - 6	3 / 24	35 - 67	58.11	42.6	-	-	150	-	NO	**YES**	**C**
218-01-9	Chrysene	ug/kg	100 J	870 J	ANA-JS	0 - 0	13 / 24	35 - 67	346.6	249	-	-	870	HMW-PAH (11)	YES		
53-70-3	Dibenzo(A,H)Anthracene	ug/kg	97 J	160 J	A-16	0 - 16	3 / 24	35 - 67	59.77	43.4	-	-	160	HMW-PAH (11)	YES		
206-44-0	Fluoranthene	ug/kg	100 J	1,700 J	ANA-JS	0 - 0	14 / 24	35 - 67	630.5	446	-	-	1,700	HMW-PAH (11)	YES		
129-00-0	Pyrene	ug/kg	100 J	1,600 J	ANA-JS	0 - 0	13 / 24	35 - 67	874.5	300	-	-	1,600	HMW-PAH (11)	YES		
205-99-2	Benzo(B)Fluoranthene	ug/kg	170 J	1,300 J	A-16	0 - 16	11 / 24	35 - 67	710.8	251	-	-	1,300	HMW-PAH (11)	YES		
207-08-9	Benzo(K)Fluoranthene	ug/kg	160 J	1,300 J	A-16	0 - 16	11 / 24	35 - 67	366.5	251	-	-	1,300	HMW-PAH (11)	YES		
191-24-2	Benzo(G,H,I)Perylene	ug/kg	140 J	230 J	ANA-JS	0 - 0	4 / 24	35 - 67	79.4	55.4	-	-	230	HMW-PAH (11)	YES		
193-39-5	Indeno(1,2,3-Cd)Pyrene	ug/kg	140 J	320 J	ANA-JS	0 - 0	7 / 24	35 - 67	132.2	87.7	-	-	320	HMW-PAH (11)	YES		
91-57-6	2-Methylnaphthalene	ug/kg	-	-	-	-	0 / 24	35 - 67	-	-	-	-	17.5	-	NO	NO	-
	LMW-PAHs[10]	ug/kg	110	1,210	ANA-JS	0 - 0	13 / 24		599	275	-	-	1,210	29,000 (3)	YES	**YES**	**E**
	HMW-PAHs[11]	ug/kg	210	7,370	A-16	0 - 16	14 / 24		3,971	1,868	-	-	7,370	1,100 (3)	YES	**YES**	**A**
	Pesticides																
72-54-8	4,4'-DDD	ug/kg	1.9 J	65 J	ANA-DS	0 - 0	8 / 24	0.33 - 0.33	10	4.39	-	-	65	21 (3)	YES	**YES**	**A**
72-55-9	4,4'-DDE	ug/kg	1.1 J	19 J	A-21	0 - 6	12 / 24	0.33 - 0.33	5.811	3.81	-	-	19	21 (3)	YES	**YES**	**D**
50-29-3	4,4'-DDT	ug/kg	2 J	55 J	A-20	0 - 6	11 / 24	0.5 - 0.5	8.855	4.67	-	-	55	21 (3)	YES	**YES**	**A**
309-00-2	Aldrin	ug/kg	1.2 J	1.3 J	A-14	0 - 6	2 / 24	0.17 - 0.17	0.408	0.18	-	-	1.3	100 (4)	YES	**YES**	**D**
319-84-6	Alpha-BHC	ug/kg	0.83 K	1.3 K	ANA-DS	0 - 0	2 / 24	0.18 - 0.18	0.379	0.17	-	-	1.3	-	YES	**YES**	**C**
5103-71-9	Alpha-Chlordane	ug/kg	0.58 J	8 J	A-21	0 - 6	9 / 23	0.17 - 0.17	2.443	1.52	-	-	8	100 (4)	NO	NO	-
5566-34-7	gamma-Chlordane	ug/kg	0.66 J	6.1 J	A-14	0 - 6	8 / 24	0.17 - 0.17	2.029	1.23	-	-	6.1	100 (4)	NO	NO	-
959-98-8	Alpha-Endosulfan	ug/kg	0.84 J	1.1 J	A-23	0 - 6	2 / 24	0.17 - 0.17	0.348	0.16	-	-	1.1	-	YES	**YES**	**C**
319-85-7	Beta-BHC	ug/kg	0.67 J	15 J	A-16	0 - 16	10 / 23	0.25 - 0.25	2.548	1.27	-	-	15	-	YES	**YES**	**C**
33213-65-9	Beta-Endosulfan	ug/kg	1.2 J	1.4 J	A-14	0 - 6	2 / 24	0.33 - 0.33	0.544	0.26	-	-	1.4	-	YES	**YES**	**C**
319-86-8	Delta-BHC	ug/kg	-	-	-	-	0 / 24	0.17 - 1.3		-	-	-	0.085	-	YES	NO	-
60-57-1	Dieldrin	ug/kg	0.96 J	22 J	A-10	0 - 6	10 / 23	0.33 - 0.33	5.127	2.87	-	-	22	4.9 (3)	YES	**YES**	**A**
1031-07-8	Endosulfan Sulfate	ug/kg	1.5 J	2 J	A-14	0 - 6	2 / 24	0.37 - 0.37	0.677	0.32	-	-	2	-	NO	**YES**	**C**
72-20-8	Endrin	ug/kg	1.3 J	8.9 J	A-23	0 - 6	4 / 24	0.33 - 0.33	1.566	0.725	-	-	8.9	100 (4)	YES	**YES**	**D**
7421-93-4	Endrin Aldehyde	ug/kg	0.91 J	7.8 J	A-14	0 - 6	4 / 24	0.33 - 0.33	1.482	0.700	-	-	7.8	-	NO	**YES**	**C**
53494-70-5	Endrin Ketone	ug/kg	1.4 J	16 J	A-14	0 - 6	3 / 24	0.35 - 0.35	2.57	1.05	-	-	16	-	NO	**YES**	**C**
58-89-9	Gamma-BHC	ug/kg	0.48 J	1.3 J	A-16	0 - 16	2 / 24	0.17 - 0.17	0.345	0.15	-	-	2.9	-	YES	**YES**	**C**
76-44-8	Heptachlor	ug/kg	1.1 J	1.1 J	A-17S	0 - 0	1 / 24	0.28 - 0.28	-	0.18	-	-	1.1	-	YES	**YES**	**C**
1024-57-3	Heptachlor Epoxide	ug/kg	0.57 J	4 J	ANA-DS	0 - 0	8 / 24	0.22 - 0.22	1.154	0.576	-	-	4	100 (4)	YES	**YES**	**D**
72-43-5	Methoxychlor	ug/kg	29	29	A-14	0 - 6	1 / 24	1.7 - 1.7	2.57	2.02	-	-	29	100 (4)	YES	**YES**	**D**
	Polychlorinated Biphenyls (PCBs)																
12674-11-2	Aroclor 1016	ug/kg	-	-	-	-	0 / 24	3.5 - 3.5	-	-	-	-	1.75	100 (4)	YES	NO	-
11104-28-2	Aroclor 1221	ug/kg	-	-	-	-	0 / 24	16 - 16	-	-	-	-	8	100 (4)	YES	NO	-
11141-16-5	Aroclor 1232	ug/kg	-	-	-	-	0 / 24	6.1 - 6.1	-	-	-	-	3.05	100 (4)	YES	NO	-
53469-21-9	Aroclor 1242	ug/kg	-	-	-	-	0 / 24	3.5 - 3.5	-	-	-	-	1.75	100 (4)	YES	NO	-
12672-29-6	Aroclor 1248	ug/kg	3,900	3,900	A-16	0 - 16	1 / 24	3.6 - 3.6	-	2	-	-	3,900	100 (4)	YES	**YES**	**A**
11097-69-1	Aroclor 1254	ug/kg	76	1,400	A-16	0 - 16	4 / 24	5.5 - 5.5	192.5	77.5	-	-	1,400	100 (4)	YES	**YES**	**A**
11096-82-5	Aroclor 1260	ug/kg	68	400	A-23	0 - 6	7 / 24	5.5 - 5.5	92.67	53.7	-	-	400	100 (4)	YES	**YES**	**A**
	Dioxin																
67562-39-4	1,2,3,4,6,7,8-Heptachlorodibenzofuran	ug/kg	0.00162 J	0.0611 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.098	0.014	0.01	0.01	-	-	YES		
55673-89-7	1,2,3,4,7,8,9-Heptachlorodibenzofuran	ug/kg	0.000263 J	0.00361 J	A-10	0 - 6	4 / 5	0.000441 - 0.000512	0.0021	0.00095	0.01	0.01	-	-	YES		
70648-26-9	1,2,3,4,7,8-Hexachlorodibenzofuran	ug/kg	0.00026 J	0.00914 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.0051	0.0023	0.1	0.1	-	-	YES		
57117-44-9	1,2,3,6,7,8-Hexachlorodibenzofuran	ug/kg	0.000137 J	0.00541 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.0031	0.0014	0.1	0.1	-	-	YES		
72918-21-9	1,2,3,7,8,9-Hexachlorodibenzofuran	ug/kg	0.000284	0.00157	A-10	0 - 6	3 / 5	0.000441 - 0.000512	0.0010	0.00053	0.1	0.1	-	-	YES		
57117-41-6	1,2,3,7,8-Pentachlorodibenzofuran	ug/kg	0.000127 J	0.00391 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.0029	0.0011	0.03	0.1	-	-	YES		
60851-34-5	2,3,4,6,7,8-Hexachlorodibenzofuran	ug/kg	0.000181 J	0.00723 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.012	0.0017	0.1	0.1	-	-	NO		

Checked by CWB

TABLE 8-2.2
RANGE OF CONTAMINANTS FOUND IN SOIL AND POTENTIAL COPECs - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

CAS #	Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Maximum Concentration Depth (in)	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Arithmetic Mean	Dioxin Toxicity Equivalence Factor (TEF) Mammals[1]	Dioxin Toxicity Equivalence Factor (TEF) Avian[1]	Concentration Used For Screening[2]	Selected Screening Level (Source)	Bioaccumulative[7]	COPEC[8]	Contaminant Category[9]
57117-31-4	2,3,4,7,8-Pentachlorodibenzofuran	ug/kg	0.000212 J	0.0133 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.012	0.0028	0.3	1	-	-	YES		
51207-31-9	2,3,7,8-Tetrachlorodibenzofuran	ug/kg	0.000337 J	0.00681 J	A-10	0 - 6	6 / 5	5.66E-05 - 0.00033	0.0088	0.0019	0.1	1	-	-	YES		
39001-02-0	Octachlorodibenzofuran	ug/kg	0.00276 J	0.161 J	A-10	0 - 6	6 / 5	0.000882 - 0.00102	0.15	0.033	0.0003	0.0001	-	-	NO		
35822-46-9	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	ug/kg	0.0103	0.239	A-10	0 - 6	6 / 5	0.000441 - 0.000544	0.31	0.065	0.01	0.0001	-	-	YES		
39227-28-6	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ug/kg	0.000192 J	0.00281 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.0026	0.00073	0.1	0.05	-	-	YES		
57653-85-7	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ug/kg	0.000394 J	0.00869 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.012	0.0022	0.1	0.01	-	-	YES		
19408-74-3	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ug/kg	0.000327 J	0.00693 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.0063	0.0017	0.1	0.1	-	-	NO		
40321-76-4	1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ug/kg	0.000165 J	0.00246 J	A-10	0 - 6	6 / 5	0.000441 - 0.000512	0.0031	0.00067	1	1	-	-	YES		
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin	ug/kg	0.00264	0.00264	A-10	0 - 6	1 / 6	0.00038 - 0.000506	-	-	1	1	-	10 (4)	YES		
3268-87-9	Octachlorodibenzo-p-dioxin	ug/kg	0.132	7.51	A-10	0 - 6	6 / 5	0.000882 - 0.00102	4.6	2.8	0.0003	0.0001	-	-	NO		
TCDD-A	2,3,7,8-TCDD equivalents (Avian)	ug/kg	0.00091	0.030		A-10 - 0	6 / 6		0.044	0.0072			0.030	10 (4)	YES	**YES**	**E, F**
TCDD-M	2,3,7,8-TCDD equivalents (Mammals)	ug/kg	0.00064	0.019		A-10 - 0	6 / 6		0.018	0.0049			0.019	10 (4)	YES	**YES**	**E, F**

Notes:
1 = Toxicity Equivalency Factors (TEFs) for dioxins/furans congeners were used to calculate 2,3,7,8-TCDD equivalents on a sample-by-sample basis using detected concentrations.
Source: Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment, June 2008; TEQ factors are located in Table 2 of the source.
2 = Maximum concentration used for screening unless analyte is undectected; in which case 1/2 lowest method detection limit used; for dioxins/furans, screening concentration is the sum of the (TEQ * maximum concentration) for all congeners.
3 = USEPA Ecological Soil Screening Levels (Eco-SSLs)
4 = USEPA Region III BTAG Screening Levels (1995); for Mn criteria 0.44% = 4,400,000 ppb = 4,400 ppm or mg/kg
5 = Efroymson et al. (1997) Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants
6 = Efroymson et al. (1997) Toxicological Benchmarks for Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process
7 = Bioaccumulative compounds will be considered in the Food Chain Evaluation
8 = Contaminant of Potential Ecological Concern
9 = Contaminant Categories
A = Constituent was detected at a concentration exceeding its screening value
B = Constituent was not detected at concentrations exceeding the DL; however, 1/2 the DL exceeds its screening value
C = Constituent was detected at concentrations exceeding its DL; however, there is no current screening value for the contaminant
D = Constituent was not detected at concentrations exceeding the DL and there is a current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
E = Constituent was detected at concentrations exceeding the DL but below the current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
F = Represents a toxicity equivalent of all dioxin/furan congeners. Concentration is the sum of all congeners after taking into consideration their relative toxicity to the benchmark compounds; 2,3,7,8-TCDD.
NUTR = Compound is considered an essential nutrient and is not identified as a COPEC.
10 = LWM-PAH - low molecular weight PAHs are grouped according to EPA Eco-SSLs and include; acenaphthene, acenaphthylene, anthracene, fluorene, phenanthrene, and naphthalene.
11 = HMW-PAH - high molecular weight PAHs are grouped according to EPA Eco-SSL and include; benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(ah)anthracene, fluoranthene, and indeno(123-cd)pyrene.
mg/kg= milligrams per kilogram
ug/kg= micrograms per kilogram

RANGE OF CONTAMINANTS FOUND IN SEEP WATER AND POTENTIAL COPECs - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	TEQ[1]	Measured Concentration Used For Screening[2]	USEPA Region 3 Freshwater Screening Benchmarks[3]	Bioaccumulative[4]	COPEC[5]	Contaminant Category[6]
Inorganics													
Aluminum	ug/l	3,750	16,300	LF-A1W	4 / 4	21.1 - 21.1	16579	-	16,300	87	NO	**YES**	**A**
Antimony	ug/l	3 J	3.9 J	LF-A3W	2 / 4	2 - 2	4.043	-	3.9	30	NO	NO	-
Arsenic	ug/l	5.5 J	17.4 J	LF-A3W	4 / 4	4.4 - 4.4	16.2	-	17.4	5	YES	**YES**	**A**
Barium	ug/l	292	585	LF-A3W	4 / 4	0.4 - 0.4	549.9	-	585	4	NO	**YES**	**A**
Beryllium	ug/l	0.96 J	1.1 J	LF-A1W	2 / 4	0.5 - 0.5	1.214	-	1.1	0.66	NO	**YES**	**A**
Cadmium	ug/l	0.81 J	5.2 J	LF-A3W	4 / 4	0.3 - 0.3	4.572	-	5.2	0.25	YES	**YES**	**A**
Calcium	ug/l	61,500	113,000	LF-A3W	4 / 4	13 - 13	106975	-	113,000	116,000	NO	NO	-
Chromium	ug/l	13	54.1	LF-A3W	4 / 4	0.9 - 0.9	55.46	-	54.1	85	YES	**YES**	**E**
Cobalt	ug/l	4 J	12.3 J	LF-A3W	4 / 4	0.7 - 0.7	13.5	-	12.3	23	NO	NO	-
Copper	ug/l	29.6	110	LF-A3W	4 / 4	1.9 - 1.9	122.4	-	110	9	YES	**YES**	**A**
Iron	ug/l	20,800	47,000	LF-A1W	4 / 4	15.3 - 15.3	45005	-	47,000	300	NO	**YES**	**A**
Lead	ug/l	47.1	245	LF-A3W	4 / 4	1.5 - 1.5	237.2	-	245	2.5	YES	**YES**	**A**
Magnesium	ug/l	22,700	39,800	LF-A3W	4 / 4	7 - 7	43835	-	39,800	82,000	NO	NO	-
Manganese	ug/l	534	1,630	LF-A1W	4 / 4	0.3 - 0.3	1850	-	1,630	120	NO	**YES**	**A**
Mercury	ug/l	0.17 J	0.78 J	LF-A3W	4 / 4	0.1 - 0.1	0.726	-	0.78	0.026	NO	**YES**	**A**
Nickel	ug/l	14 J	57.5 J	LF-A3W	4 / 4	0.6 - 0.6	52.8	-	57.5	52	YES	**YES**	**A**
Potassium	ug/l	6,240 J	20,200 J	LF-A3W	4 / 4	11.2 - 11.2	24065	-	20,200	53,000	NO	NO	-
Selenium	ug/l	-	-	-	0 / 4	4.5 - 4.5		-	2.25	1	YES	**YES**	**B**
Silver	ug/l	0.94 J	0.94 J	LF-A3W	1 / 4	0.9 - 0.9	-	-	0.94	3.2	YES	**YES**	**E**
Sodium	ug/l	34,700	63,200	LF-A2W	4 / 4	136 - 136	67625	-	63,200	680,000	NO	NO	-
Thallium	ug/l	-	-	-	0 / 4	7.3 - 7.3		-	3.65	0.8	NO	**YES**	**B**
Vanadium	ug/l	14.4 J	50 J	LF-A3W	4 / 4	0.6 - 0.6	54.75	-	50	20	NO	**YES**	**A**
Zinc	ug/l	82.9 K	569 K	LF-A3W	4 / 4	1.8 - 1.8	536.6	-	569	120	YES	**YES**	**A**
Total Suspended Solids	mg/l	173 J	584 J	LF-A1W	4 / 4	0.479 - 0.479		-	584	-	NO	**NO**	**A**
Volatile Organic Compounds (VOCs)													
1,1,1-Trichloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	11	NO	NO	-
1,1,2,2-Tetrachloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	610	NO	NO	-
1,1,2-Trichloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	1,200	NO	NO	-
1,1-Dichloroethane	ug/l	0.14 J	0.14 J	LF-A3W	1 / 4	0.1 - 0.1	-	-	0.14	47	NO	NO	-
1,1-Dichloroethene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	25	NO	NO	-
1,2,4-Trichlorobenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	24	YES	NO	-
1,2,3-Trichlorobenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	8	NO	NO	-
1,2-Dibromo-3-Chloropropane	ug/l	-	-	-	0 / 4	0.17 - 0.17		-	0.085	-	NO	NO	-
1,2-Dibromoethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
1,2-Dichlorobenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	0.7	YES	NO	-
1,2-Dichloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	100	NO	NO	-
1,2-Dichloropropane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
1,3-Dichlorobenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	150	YES	NO	-
1,4-Dichlorobenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	26	YES	NO	-
2-Butanone	ug/l	-	-	-	0 / 4	1 - 1		-	0.5	14,000	NO	NO	-
2-Hexanone	ug/l	-	-	-	0 / 4	1 - 1		-	0.5	99	NO	NO	-
4-Methyl-2-Pentanone	ug/l	-	-	-	0 / 4	1 - 1		-	0.5	170	NO	NO	-
Acetone	ug/l	-	-	-	0 / 4	6.3 - 16		-	3.15	1,500	NO	NO	-
Benzene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	370	NO	NO	-
Bromodichloromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
Bromoform	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	320	NO	NO	-
Bromomethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
Carbon Disulfide	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	0.92	NO	NO	-
Carbon Tetrachloride	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	13.3	NO	NO	-
Chlorobenzene	ug/l	0.47 J	0.47 J	LF-A3W	1 / 4	0.1 - 0.1	-	-	0.47	1.3	NO	NO	-
Chloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
Chloroform	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	1.8	NO	NO	-
Chloromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
Cis-1,2-Dichloroethene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	590	NO	NO	-
Cis-1,3-Dichloropropene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	0.055	NO	NO	-
Cyclohexane	ug/l	-	-	-	0 / 4	0.18 - 0.21		-	0.09	-	NO	NO	-
Dibromochloromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
Dichlorodifluoromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-

RANGE OF CONTAMINANTS FOUND IN SEEP WATER AND POTENTIAL COPECs - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	TEQ[1]	Measured Concentration Used For Screening[2]	USEPA Region 3 Freshwater Screening Benchmarks[3]	Bioaccumulative[4]	COPEC[5]	Contaminant Category[6]
Ethylbenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	90	NO	NO	-
Freon 113	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
Isopropylbenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	2.6	NO	NO	-
Methyl Acetate	ug/l	-	-	-	0 / 4	0.18 - 0.18		-	0.09	-	NO	NO	-
Methyl Cyclohexane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
Methyl Tert-Butyl Ether	ug/l	0.11 J	0.16 J	LF-A2W	3 / 4	0.1 - 0.1	0.158	-	0.16	11,070	NO	NO	-
Methylene Chloride	ug/l	-	-	-	0 / 4	0.1 - 0.12		-	0.05	98.1	NO	NO	-
Styrene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	72	NO	NO	-
Tetrachloroethene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	111	NO	NO	-
Toluene	ug/l	0.29 J	0.29 J	LF-A1W	1 / 4	0.1 - 0.1	-	-	0.29	2	NO	NO	-
Trans-1,2-Dichloroethene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	970	NO	NO	-
Trans-1,3-Dichloropropene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	0.055	NO	NO	-
Trichloroethene	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	21	NO	NO	-
Trichlorofluoromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	-	NO	NO	-
Vinyl Chloride	ug/l	-	-	-	0 / 4	0.1 - 0.1		-	0.05	930	NO	NO	-
Xylenes, Total	ug/l	0.1 J	0.1 J	LF-A2W	2 / 4	0.1 - 0.1	-	-	0.1	13	NO	NO	-
Semivolatile Organic Compounds													
2,4,5-Trichlorophenol	ug/l	-	-	-	0 / 4	9.5 - 11		-	4.75	-	NO	NO	-
2,4,6-Trichlorophenol	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	4.9	NO	NO	-
2,4-Dichlorophenol	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	11	NO	NO	-
2,4-Dimethylphenol	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
2,4-Dinitrophenol	ug/l	-	-	-	0 / 4	21 - 23		-	10.5	-	NO	NO	-
2,4-Dinitrotoluene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	44	NO	NO	-
2,6-Dinitrotoluene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	81	NO	NO	-
2-Chloronaphthalene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
2-Chlorophenol	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	24	NO	NO	-
2-Methylphenol	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	13	NO	NO	-
2-Nitroaniline	ug/l	-	-	-	0 / 4	9.5 - 11		-	4.75	-	NO	NO	-
2-Nitrophenol	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	1,920	NO	NO	-
3,3'-Dichlorobenzidine	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	4.5	NO	NO	-
3-Nitroaniline	ug/l	-	-	-	0 / 4	9.5 - 11		-	4.75	-	NO	NO	-
4,6-Dinitro-2-Methylphenol	ug/l	-	-	-	0 / 4	9.5 - 11		-	4.75	-	NO	NO	-
4-Bromophenyl-Phenylether	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	1.5	YES	**YES**	**B**
4-Chloro-3-Methylphenol	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
4-Chloroaniline	ug/l	-	-	-	0 / 4	4.4 - 4.9		-	2.2	232	NO	NO	-
4-Chlorophenyl-Phenylether	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	YES	NO	-
4-Methylphenol	ug/l	-	-	-	0 / 4	4.7 - 5.2		-	2.35	543	NO	NO	-
4-Nitroaniline	ug/l	-	-	-	0 / 4	9.5 - 11		-	4.75	-	NO	NO	-
4-Nitrophenol	ug/l	-	-	-	0 / 4	11 - 12		-	5.5	60	NO	NO	-
Acetophenone	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
Atrazine	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	1.8	NO	**YES**	**B**
Benzaldehyde	ug/l	-	-	-	0 / 4	6.2 - 6.8		-	3.1	-	NO	NO	-
Biphenyl	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	14	NO	NO	-
Bis(2-Chloroethoxy)Methane	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
Bis(2-Chloroethyl) Ether	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
Bis(2-Chloroisopropyl) Ether	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
Bis(2-Ethylhexyl) Phthalate	ug/l	-	-	-	0 / 4	5.9 - 6.5		-	2.95	16	NO	NO	-
Butylbenzyl Phthalate	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	19	NO	NO	-
Caprolactum	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
Dibenzofuran	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	3.7	NO	NO	-
Diethyl Phthalate	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	210	NO	NO	-
Dimethyl Phthalate	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
Di-N-Butyl Phthalate	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	19	NO	NO	-
Hexachlorobenzene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	0.0003	YES	**YES**	**B**
Hexachlorobutadiene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	1.3	YES	**YES**	**B**
Hexachlorocyclopentadiene	ug/l	-	-	-	0 / 4	8.5 - 9.4		-	4.25	-	YES	No	-
Hexachloroethane	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	12	YES	No	-
Isophorone	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
Nitrobenzene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-

TABLE 8-3.1
RANGE OF CONTAMINANTS FOUND IN SEEP WATER AND POTENTIAL COPECs - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	TEQ[1]	Measured Concentration Used For Screening[2]	USEPA Region 3 Freshwater Screening Benchmarks[3]	Bioaccumulative[4]	COPEC[5]	Contaminant Category[6]
N-Nitroso-Di-N-Propylamine	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
N-Nitrosodiphenylamine	ug/l	-	-	-	0 / 4	9.5 - 11		-	4.75	210	NO	NO	-
Pentachlorophenol	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	0.5	YES	**YES**	**B**
Phenol	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	4	NO	NO	-
Di-N-Octyl Phthalate	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	22	NO	NO	-
Acenaphthene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	5.8	YES	**YES**	**B**
Acenaphthylene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	YES	NO	-
Anthracene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	0.012	YES	**YES**	**B**
Fluorene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	3	YES	NO	-
Naphthalene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	1.1	NO	**YES**	**B**
Phenanthrene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	0.4	YES	**YES**	**B**
Benzo(A)Anthracene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	0.018	YES	**YES**	**B**
Benzo(A)Pyrene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	0.015	YES	**YES**	**B**
Carbazole	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	NO	NO	-
Chrysene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	YES	NO	-
Dibenzo(A,H)Anthracene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	YES	NO	-
Fluoranthene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	0.04	YES	**YES**	**B**
Pyrene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	0.025	YES	**YES**	**B**
Benzo(B)Fluoranthene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	YES	NO	-
Benzo(K)Fluoranthene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	YES	NO	-
Benzo(G,H,I)Perylene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	YES	NO	-
Indeno(1,2,3-Cd)Pyrene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	-	YES	NO	-
2-Methylnaphthalene	ug/l	-	-	-	0 / 4	3.8 - 4.2		-	1.9	4.7	NO	NO	-
Pesticides													
4,4-DDD	ug/l	0.025 J	0.025 J	LF-A1W	1 / 4	0.018 - 0.02	-	-	0.025	0.011	YES	**YES**	**A**
4,4-DDE	ug/l	0.03 J	0.03 J	LF-A1W	1 / 4	0.018 - 0.02	-	-	0.03	-	YES	**YES**	**E**
4,4-DDT	ug/l	0.039 J	0.039 J	LF-A1W	1 / 4	0.018 - 0.02	-	-	0.039	0.0005	YES	**YES**	**A**
Aldrin	ug/l	0.024 J	0.024 J	LF-A1W	1 / 4	0.0091 - 0.01	-	-	0.024	3	YES	**YES**	**E**
Alpha-BHC	ug/l	-	-	-	0 / 4	0.0091 - 0.01		-	0.00455	-	YES	NO	-
Alpha-Chlordane	ug/l	0.07	0.07	LF-A1W	1 / 4	0.0091 - 0.01	-	-	0.07	0.0022	YES	**YES**	**A**
gamma-Chlordane	ug/l	0.02 J	0.077 J	LF-A1W	3 / 4	0.0091 - 0.01	0.0715	-	0.077	0.0022	YES	**YES**	**A**
Alpha-Endosulfan	ug/l	-	-	-	0 / 4	0.0091 - 0.01		-	0.00455	0.051	YES	NO	-
Beta-BHC	ug/l	-	-	-	0 / 4	0.0091 - 0.01		-	0.00455	-	YES	NO	-
Beta-Endosulfan	ug/l	-	-	-	0 / 4	0.018 - 0.02		-	0.009	0.051	YES	NO	-
Delta-BHC	ug/l	-	-	-	0 / 4	0.0091 - 0.01		-	0.00455	141	YES	NO	-
Dieldrin	ug/l	0.024 J	0.09 J	LF-A1W	3 / 4	0.018 - 0.02	0.0858	-	0.09	0.056	YES	**YES**	**A**
Endosulfan Sulfate	ug/l	-	-	-	0 / 4	0.018 - 0.02		-	0.009	-	NO	NO	-
Endrin	ug/l	-	-	-	0 / 4	0.018 - 0.02		-	0.009	0.036	YES	NO	-
Endrin Aldehyde	ug/l	-	-	-	0 / 4	0.018 - 0.02		-	0.009	-	NO	NO	-
Endrin Ketone	ug/l	-	-	-	0 / 4	0.018 - 0.02		-	0.009	-	NO	NO	-
Gamma-BHC	ug/l	-	-	-	0 / 4	0.0091 - 0.01		-	0.00455	0.01	YES	NO	-
Heptachlor	ug/l	-	-	-	0 / 4	0.0091 - 0.01		-	0.00455	0.0019	YES	**YES**	**B**
Heptachlor Epoxide	ug/l	-	-	-	0 / 4	0.0091 - 0.01		-	0.00455	0.0019	YES	**YES**	**B**
Methoxychlor	ug/l	-	-	-	0 / 4	0.091 - 0.1		-	0.0455	0.019	YES	**YES**	**B**
Toxaphene	ug/l	-	-	-	0 / 4	0.97 - 1.1		-	0.485	0.0002	YES	**YES**	**B**

TABLE 8-3.1
RANGE OF CONTAMINANTS FOUND IN SEEP WATER AND POTENTIAL COPECs - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	TEQ[1]	Measured Concentration Used For Screening[2]	USEPA Region 3 Freshwater Screening Benchmarks[3]	Bioaccumulative[4]	COPEC[5]	Contaminant Category[6]
Polychlorinated Biphenyls (PCBs)													
Aroclor 1016	ug/l	-	-	-	0 / 4	0.3 - 0.33		-	0.15	0.000074	YES	NO	**-**
Aroclor 1221	ug/l	-	-	-	0 / 4	0.36 - 0.4		-	0.18	0.000074	YES	NO	**-**
Aroclor 1232	ug/l	-	-	-	0 / 4	0.34 - 0.37		-	0.17	0.000074	YES	NO	**-**
Aroclor 1242	ug/l	-	-	-	0 / 4	0.23 - 0.25		-	0.115	0.000074	YES	NO	**-**
Aroclor 1248	ug/l	-	-	-	0 / 4	0.25 - 0.27		-	0.125	0.000074	YES	NO	**-**
Aroclor 1254	ug/l	-	-	-	0 / 4	0.33 - 0.36		-	0.165	0.000074	YES	NO	**-**
Aroclor 1260	ug/l	-	-	-	0 / 4	0.27 - 0.3		-	0.135	0.000074	Yes	NO	**-**
Dioxin													
1,2,3,4,6,7,8-Heptachlorodibenzofuran	ug/l	0.0000162 J	0.0000212 J	LF-A2W	2 / 2	5.1E-06 - 5.1E-06	-	0.01	TEQ	-	NO	**YES**	**A**
1,2,3,4,7,8,9-Heptachlorodibenzofuran	ug/l	-	-	-	0 / 2	5.1E-06 - 5.5E-06		0.01	TEQ	-	NO	**YES**	**B**
1,2,3,4,7,8-Hexachlorodibenzofuran	ug/l	0.00000525 J	0.00000635 J	LF-A2W	2 / 2	5.1E-06 - 5.1E-06	-	0.1	TEQ	-	YES	**YES**	**A**
1,2,3,6,7,8-Hexachlorodibenzofuran	ug/l	-	-	-	0 / 2	5.1E-06 - 5.1E-06		0.1	TEQ	-	NO	**YES**	**B**
1,2,3,7,8,9-Hexachlorodibenzofuran	ug/l	-	-	-	0 / 2	5.1E-06 - 5.7E-06		0.1	TEQ	-	NO	**YES**	**B**
1,2,3,7,8-Pentachlorodibenzofuran	ug/l	-	-	-	0 / 2	5.1E-06 - 5.1E-06		0.03	TEQ	-	YES	**YES**	**B**
2,3,4,6,7,8-Hexachlorodibenzofuran	ug/l	-	-	-	0 / 2	5.1E-06 - 5.1E-06		0.1	TEQ	-	NO	**YES**	**B**
2,3,4,7,8-Pentachlorodibenzofuran	ug/l	-	-	-	0 / 2	5.1E-06 - 5.1E-06		0.3	TEQ	-	YES	**YES**	**B**
2,3,7,8-Tetrachlorodibenzofuran	ug/l	-	-	-	0 / 2	2.8E-06 - 3.7E-06		0.1	TEQ	-	YES	**YES**	**B**
Octachlorodibenzofuran	ug/l	0.0000483 J	0.0000652 J	LF-A2W	2 / 2	1.0E-05 - 1.0E-05	-	0.0003	TEQ	-	NO	**YES**	**A**
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	ug/l	0.0000758	0.000101	LF-A2W	2 / 2	7.1E-06 - 7.8E-06	-	0.01	TEQ	-	YES	**YES**	**A**
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ug/l	-	-	-	0 / 2	5.1E-06 - 5.1E-06		0.1	TEQ	-	YES	**YES**	**B**
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ug/l	-	-	-	0 / 2	5.1E-06 - 5.1E-06		0.1	TEQ	-	YES	**YES**	**B**
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ug/l	-	-	-	0 / 2	5.1E-06 - 5.1E-06		0.1	TEQ	-	NO	**YES**	**B**
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ug/l	-	-	-	0 / 2	5.1E-06 - 5.1E-06		1	TEQ	-	YES	**YES**	**B**
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ug/l	-	-	-	0 / 2	2.3E-06 - 2.6E-06		1	TEQ	3.1E-09	YES	**YES**	**B**
Octachlorodibenzo-p-dioxin	ug/l	0.0011	0.00161	LF-A2W	2 / 2	1.0E-05 - 1.0E-05	-	0.0003	TEQ	-	NO	**YES**	**B**
2,3,7,8-TCDD equivalents	ug/l								2.4E-06	3.1E-09	-	**YES**	**F**

Notes:
1 = Toxicity Equivalency (TEQ) Method factors for dioxins/furans and congeners. TEQ factors used are for mammals.
Source: Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment, June 2008; TEQ factors are located in Table 2 of the source.
2 = Maximum concentration used for screening unless analyte is undetected; in which case 1/2 lowest method detection limit used; for dioxins/furans, screening concentration is the sum of the (TEQ * maximum concentration) for all congeners.
3 = USEPA Region 3 Freshwater Screening Benchmarks
4 = Bioaccumulative compounds will be considered in the Food Chain Evaluation
5 = Contaminant of Potential Ecological Concern
6 = Contaminant Categories
A = Constituent was detected at a concentration exceeding its screening value
B = Constituent was not detected at concentrations exceeding the DL; however, 1/2 the DL exceeds its screening value
C = Constituent was detected at concentrations exceeding its DL; however, there is no current screening value for the contaminant
D = Constituent was not detected at concentrations exceeding the DL and there is a current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
E= Constituent was detected at concentrations exceeding the DL but below the current screening value for the contaminant (or there is no screening value); however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
F = Represents a toxicity equivalent of all dioxin/furan congeners. Concentration is the sum of all congeners after taking into consideration their relative toxicity to the benchmark compounds; 2,3,7,8-TCDD and 2,3,7,8-TCDF.
ug/l= micrograms per liter

TABLE 8-3.2
RANGE OF CONTAMINANTS FOUND IN SEEP WATER AND POTENTIAL COPECs - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	TEQ[1]	Measured Concentration Used For Screening[2]	USEPA Region 3 Freshwater Screening Benchmarks[3]	Bioaccumulative[4]	COPEC[5]	Contaminant Category[6]
Inorganics													
Aluminum	ug/l	10,600	31,100	ANA-AW	4 / 4	21.1 - 21.1	37366	-	31,100	87	NO	**YES**	**A**
Antimony	ug/l	2.9 J	3.2 J	ANA-JW	2 / 4	2 - 2		-	3.2	30	NO	NO	**-**
Arsenic	ug/l	7.9 J	37.7	ANA-AW	4 / 4	4.4 - 4.4	34.59	-	37.7	5	YES	**YES**	**A**
Barium	ug/l	528	938	ANA-JW	4 / 4	0.4 - 0.4	1058	-	938	4	NO	**YES**	**A**
Beryllium	ug/l	0.65 J	2.4 J	ANA-AW	4 / 4	0.5 - 0.5	2.941	-	2.4	0.66	NO	**YES**	**A**
Cadmium	ug/l	1.8 J	3.4 J	ANA-DW	4 / 4	0.3 - 0.3	3.896	-	3.4	0.25	YES	**YES**	**A**
Calcium	ug/l	78,500	188,000	ANA-JW	4 / 4	13 - 13	220142	-	188,000	116,000	NO	NO	**NUTR**
Chromium	ug/l	40.8	78.1	ANA-AW	4 / 4	0.9 - 0.9	74	-	78.1	85	YES	**YES**	**E**
Cobalt	ug/l	7.9 J	25.7 J	ANA-AW	4 / 4	0.7 - 0.7	25.07	-	25.7	23	NO	**YES**	**A**
Copper	ug/l	57.9	108	ANA-AW	4 / 4	1.9 - 1.9	129.3	-	108	9	YES	**YES**	**A**
Iron	ug/l	30,600	52,100	ANA-JW	4 / 4	15.3 - 15.3	51731	-	52,100	300	NO	**YES**	**A**
Lead	ug/l	110	365	ANA-AW	4 / 4	1.5 - 1.5	394.4	-	365	2.5	YES	**YES**	**A**
Magnesium	ug/l	24,200	75,400	ANA-JW	4 / 4	7 - 7	90527	-	75,400	82,000	NO	NO	**NUTR**
Manganese	ug/l	632	1,290	ANA-LW	4 / 4	0.3 - 0.3	1265	-	1,290	120	NO	**YES**	**A**
Mercury	ug/l	0.25	1.2	ANA-AW	4 / 4	0.1 - 0.1	1.436	-	1.2	0.026	NO	**YES**	**A**
Nickel	ug/l	36.5 J	74.8 J	ANA-AW	4 / 4	0.6 - 0.6	86.39	-	74.8	52	YES	**YES**	**E**
Potassium	ug/l	8,840 J	33,700 J	ANA-JW	4 / 4	11.2 - 11.2	41019	-	33,700	53,000	NO	NO	**NUTR**
Selenium	ug/l	-	-	-	0 / 4	4.5 - 4.5		-	2.25	1	YES	**YES**	**A**
Silver	ug/l	1.2 J	1.7 J	ANA-AW	3 / 4	0.9 - 0.9	1.946	-	1.7	3.2	YES	**YES**	**E**
Sodium	ug/l	40,800	94,300	ANA-JW	4 / 4	136 - 136	110059	-	94,300	680,000	NO	NO	**NUTR**
Thallium	ug/l	-	-	-	0 / 4	7.3 - 7.3		-	3.65	0.8	NO	**YES**	**A**
Vanadium	ug/l	54.2	95.3	ANA-AW	4 / 4	0.6 - 0.6	89.55	-	95.3	20	NO	**YES**	**A**
Zinc	ug/l	259 K	576 K	ANA-AW	4 / 4	1.8 - 1.8	671.6	-	576	120	YES	**YES**	**A**
Total Suspended Solids	mg/l	378 J	976 J	ANA-LW	3 / 3	0.479 - 0.479		-	976	-	NO	**NO**	**A**
Volatile Organic Compounds (VOCs)													
1,1,1-Trichloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	11	NO	NO	**-**
1,1,2,2-Tetrachloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	610	NO	NO	**-**
1,1,2-Trichloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	1,200	NO	NO	**-**
1,1-Dichloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	47	NO	NO	**-**
1,1-Dichloroethene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	25	NO	NO	**-**
1,2,4-Trichlorobenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	24	YES	NO	**-**
1,2,3-Trichlorobenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	8	NO	NO	**-**
1,2-Dibromo-3-Chloropropane	ug/l	-	-	-	0 / 4	0.17 - 0.17	-	-	0.085	-	NO	NO	**-**
1,2-Dibromoethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	**-**
1,2-Dichlorobenzene	ug/l	0.14 J	0.69	ANA-JW	2 / 4	0.1 - 0.1	-	-	0.69	0.7	YES	**YES**	**E**
1,2-Dichloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	100	NO	NO	**-**
1,2-Dichloropropane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	**-**
1,3-Dichlorobenzene	ug/l	0.35 J	0.35 J	ANA-JW	1 / 4	0.1 - 0.1	-	-	0.35	150	YES	**YES**	**E**
1,4-Dichlorobenzene	ug/l	0.15 J	1.2	ANA-JW	4 / 4	0.1 - 0.1	1.172	-	1.2	26	YES	**YES**	**E**
2-Butanone	ug/l	-	-	-	0 / 4	1 - 1	-	-	0.5	14,000	NO	NO	**-**
2-Hexanone	ug/l	-	-	-	0 / 4	1 - 1	-	-	0.5	99	NO	NO	**-**
4-Methyl-2-Pentanone	ug/l	-	-	-	0 / 4	1 - 1	-	-	0.5	170	NO	NO	**-**
Acetone	ug/l	-	-	-	0 / 4	6.4 - 24	-	-	3.2	1,500	NO	NO	**-**
Benzene	ug/l	0.14 J	0.16 J	ANA-LW	2 / 4	0.1 - 0.1	0.168	-	0.16	370	NO	NO	**-**
Bromodichloromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	**-**
Bromoform	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	320	NO	NO	**-**
Bromomethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	**-**
Carbon Disulfide	ug/l	0.14 J	0.15 J	ANA-JW	2 / 4	0.1 - 0.1	-	-	0.15	0.92	NO	NO	**-**
Carbon Tetrachloride	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	13.3	NO	NO	**-**
Chlorobenzene	ug/l	0.67	7.6 J	ANA-JW	4 / 4	0.1 - 0.1	6.719	-	7.6	1.3	NO	**YES**	**A**
Chloroethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	**-**
Chloroform	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	1.8	NO	NO	**-**
Chloromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	**-**

RANGE OF CONTAMINANTS FOUND IN SEEP WATER AND POTENTIAL COPECs - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	TEQ[1]	Measured Concentration Used For Screening[2]	USEPA Region 3 Freshwater Screening Benchmarks[3]	Bioaccumulative[4]	COPEC[5]	Contaminant Category[6]
Cis-1,2-Dichloroethene	ug/l	0.12 J	0.54	ANA-LW	2 / 4	0.1 - 0.1	-	-	0.54	590	NO	NO	-
Cis-1,3-Dichloropropene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	0.055	NO	NO	-
Cyclohexane	ug/l	-	-	-	0 / 4	0.19 - 0.52	-	-	0.095	-	NO	NO	-
Dibromochloromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	-
Dichlorodifluoromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	-
Ethylbenzene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	90	NO	NO	-
Freon 113	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	-
Isopropylbenzene	ug/l	0.23 J	0.23 J	ANA-JW	1 / 4	0.1 - 0.1	-	-	0.23	2.6	NO	NO	-
Methyl Acetate	ug/l	-	-	-	0 / 4	0.18 - 0.18	-	-	0.09	-	NO	NO	-
Methyl Cyclohexane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	-
Methyl Tert-Butyl Ether	ug/l	0.23 J	0.23 J	ANA-JW	1 / 4	0.1 - 0.1	-	-	0.23	11,070	NO	NO	-
Methylene Chloride	ug/l	-	-	-	0 / 4	0.11 - 0.22	-	-	0.055	98.1	NO	NO	-
Styrene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	72	NO	NO	-
Tetrachloroethene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	111	NO	NO	-
Toluene	ug/l	0.12 J	0.12 J	ANA-DW	1 / 4	0.1 - 0.23	-	-	0.12	2	NO	NO	-
Trans-1,2-Dichloroethene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	970	NO	NO	-
Trans-1,3-Dichloropropene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	0.055	NO	NO	-
Trichloroethene	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	21	NO	NO	-
Trichlorofluoromethane	ug/l	-	-	-	0 / 4	0.1 - 0.1	-	-	0.05	-	NO	NO	-
Vinyl Chloride	ug/l	0.82	0.82	ANA-LW	1 / 4	0.1 - 0.1	-	-	0.82	930	NO	NO	-
Xylenes, Total	ug/l	0.28 J	0.28 J	ANA-JW	1 / 4	0.1 - 0.1	-	-	0.28	13	NO	NO	-
Semivolatile Organic Compounds													
2,4,5-Trichlorophenol	ug/l	-	-	-	0 / 3	10 - 11	-	-	5	-	NO	NO	-
2,4,6-Trichlorophenol	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	4.9	NO	NO	-
2,4-Dichlorophenol	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	11	NO	NO	-
2,4-Dimethylphenol	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
2,4-Dinitrophenol	ug/l	-	-	-	0 / 3	22 - 24	-	-	11	-	NO	NO	-
2,4-Dinitrotoluene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	44	NO	NO	-
2,6-Dinitrotoluene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	81	NO	NO	-
2-Chloronaphthalene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
2-Chlorophenol	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	24	NO	NO	-
2-Methylphenol	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	13	NO	NO	-
2-Nitroaniline	ug/l	-	-	-	0 / 3	10 - 11	-	-	5	-	NO	NO	-
2-Nitrophenol	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	1,920	NO	NO	-
3,3'-Dichlorobenzidine	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	4.5	NO	NO	-
3-Nitroaniline	ug/l	-	-	-	0 / 3	10 - 11	-	-	5	-	NO	NO	-
4,6-Dinitro-2-Methylphenol	ug/l	-	-	-	0 / 3	10 - 11	-	-	5	-	NO	NO	-
4-Bromophenyl-Phenylether	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	1.5	YES	**YES**	**B**
4-Chloro-3-Methylphenol	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
4-Chloroaniline	ug/l	-	-	-	0 / 3	4.6 - 5.1	-	-	2.3	232	NO	NO	-
4-Chlorophenyl-Phenylether	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	YES	NO	-
4-Methylphenol	ug/l	-	-	-	0 / 3	4.9 - 5.4	-	-	2.45	543	NO	NO	-
4-Nitroaniline	ug/l	-	-	-	0 / 3	10 - 11	-	-	5	-	NO	NO	-
4-Nitrophenol	ug/l	-	-	-	0 / 3	11 - 13	-	-	5.5	60	NO	NO	-
Acetophenone	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
Atrazine	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	1.8	NO	**YES**	**B**
Benzaldehyde	ug/l	-	-	-	0 / 3	6.5 - 7.2	-	-	3.25	-	NO	NO	-
Biphenyl	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	14	NO	NO	-
Bis(2-Chloroethoxy)Methane	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
Bis(2-Chloroethyl) Ether	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
Bis(2-Chloroisopropyl) Ether	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
Bis(2-Ethylhexyl) Phthalate	ug/l	-	-	-	0 / 3	6.2 - 6.9	-	-	3.1	16	NO	NO	-
Butylbenzyl Phthalate	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	19	NO	NO	-
Caprolactum	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
Dibenzofuran	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	3.7	NO	NO	-
Diethyl Phthalate	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	210	NO	NO	-
Dimethyl Phthalate	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
Di-N-Butyl Phthalate	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	19	NO	NO	-
Hexachlorobenzene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	0.0003	YES	NO	-
Hexachlorobutadiene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	1.3	YES	NO	-
Hexachlorocyclopentadiene	ug/l	-	-	-	0 / 3	8.9 - 9.9	-	-	4.45	-	YES	NO	-
Hexachloroethane	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	12	YES	NO	-
Isophorone	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
Nitrobenzene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
N-Nitroso-Di-N-Propylamine	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	TEQ[1]	Measured Concentration Used For Screening[2]	USEPA Region 3 Freshwater Screening Benchmarks[3]	Bioaccumulative[4]	COPEC[5]	Contaminant Category[6]
N-Nitrosodiphenylamine	ug/l	-	-	-	0 / 3	10 - 11	-	-	5	210	NO	NO	-
Pentachlorophenol	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	0.5	YES	**YES**	**B**
Phenol	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	4	NO	NO	-
Di-N-Octyl Phthalate	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	22	NO	NO	-
Acenaphthene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	5.8	YES	NO	-
Acenaphthylene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	YES	NO	-
Anthracene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	0.012	YES	NO	-
Fluorene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	3	YES	NO	-
Naphthalene	ug/l	5 J	5 J	ANA-JW	1 / 3	4 - 4.4	-	-	5	1.1	NO	**YES**	**A**
Phenanthrene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	0.4	YES	NO	-
Benzo(A)Anthracene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	0.018	YES	NO	-
Benzo(A)Pyrene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	0.015	YES	NO	-
Carbazole	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	NO	NO	-
Chrysene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	YES	NO	-
Dibenzo(A,H)Anthracene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	YES	NO	-
Fluoranthene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	0.04	YES	NO	-
Pyrene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	0.025	YES	NO	-
Benzo(B)Fluoranthene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	YES	NO	-
Benzo(K)Fluoranthene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	YES	NO	-
Benzo(G,H,I)Perylene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	YES	NO	-
Indeno(1,2,3-Cd)Pyrene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	-	YES	NO	-
2-Methylnaphthalene	ug/l	-	-	-	0 / 3	4 - 4.4	-	-	2	4.7	NO	NO	-
Pesticides													
4,4-DDD	ug/l	0.033 J	0.033 J	ANA-DW	1 / 3	0.018 - 0.02	-	-	0.033	0.011	YES	**YES**	**A**
4,4-DDE	ug/l	0.021 J	0.021 J	ANA-JW	1 / 3	0.018 - 0.02	-	-	0.021	-	YES	**YES**	**E**
4,4-DDT	ug/l	-	-	-	0 / 3	0.018 - 0.02	-	-	0.009	0.0005	YES	**YES**	**D**
Aldrin	ug/l	-	-	-	0 / 3	0.0091 - 0.01	-	-	0.00455	3	YES	NO	-
Alpha-BHC	ug/l	-	-	-	0 / 3	0.0091 - 0.01	-	-	0.00455	-	YES	NO	-
Alpha-Chlordane	ug/l	-	-	-	0 / 3	0.0091 - 0.01	-	-	0.00455	0.0022	YES	**YES**	**B**
gamma-Chlordane	ug/l	0.011 J	0.011 J	ANA-JW	1 / 3	0.0091 - 0.01	-	-	0.011	0.0022	YES	**YES**	**A**
Alpha-Endosulfan	ug/l	-	-	-	0 / 3	0.0091 - 0.01	-	-	0.00455	0.051	YES	NO	-
Beta-BHC	ug/l	-	-	-	0 / 3	0.0091 - 0.01	-	-	0.00455	-	YES	NO	-
Beta-Endosulfan	ug/l	-	-	-	0 / 3	0.018 - 0.02	-	-	0.009	0.051	YES	NO	-
Delta-BHC	ug/l	-	-	-	0 / 3	0.0091 - 0.01	-	-	0.00455	141	YES	NO	-
Dieldrin	ug/l	-	-	-	0 / 3	0.018 - 0.02	-	-	0.009	0.056	YES	NO	-
Endosulfan Sulfate	ug/l	-	-	-	0 / 3	0.018 - 0.02	-	-	0.009	-	NO	NO	-
Endrin	ug/l	-	-	-	0 / 3	0.018 - 0.02	-	-	0.009	0.036	YES	NO	-
Endrin Aldehyde	ug/l	-	-	-	0 / 3	0.018 - 0.02	-	-	0.009	-	NO	NO	-
Endrin Ketone	ug/l	-	-	-	0 / 3	0.018 - 0.02	-	-	0.009	-	NO	NO	-
Gamma-BHC	ug/l	-	-	-	0 / 3	0.0091 - 0.01	-	-	0.00455	0.01	YES	NO	-
Heptachlor	ug/l	-	-	-	0 / 3	0.0091 - 0.01	-	-	0.00455	0.0019	YES	NO	-
Heptachlor Epoxide	ug/l	-	-	-	0 / 3	0.0091 - 0.01	-	-	0.00455	0.0019	YES	NO	-
Methoxychlor	ug/l	-	-	-	0 / 3	0.091 - 0.1	-	-	0.0455	0.019	YES	NO	-
Toxaphene	ug/l	-	-	-	0 / 3	0.97 - 1.1	-	-	0.485	0.0002	YES	NO	-
Polychlorinated Biphenyls (PCBs)													
Aroclor 1016	ug/l	-	-	-	0 / 3	0.3 - 0.33	-	-	0.15	0.000074	YES	NO	-
Aroclor 1221	ug/l	-	-	-	0 / 3	0.36 - 0.4	-	-	0.18	0.000074	YES	NO	-
Aroclor 1232	ug/l	-	-	-	0 / 3	0.34 - 0.37	-	-	0.17	0.000074	YES	NO	-
Aroclor 1242	ug/l	-	-	-	0 / 3	0.23 - 0.25	-	-	0.115	0.000074	YES	NO	-
Aroclor 1248	ug/l	-	-	-	0 / 3	0.25 - 0.27	-	-	0.125	0.000074	YES	NO	-
Aroclor 1254	ug/l	-	-	-	0 / 3	0.33 - 0.36	-	-	0.165	0.000074	YES	NO	-
Aroclor 1260	ug/l	-	-	-	0 / 3	0.27 - 0.3	-	-	0.135	0.000074	YES	NO	-
Dioxin													
1,2,3,4,6,7,8-Heptachlorodibenzofuran	ug/l	0.00000805 J	0.0000236 J	ANA-DW	2 / 2	5.2E-06 - 5.49E-06		0.01	TEQ	-	NO	NO	-
1,2,3,4,7,8,9-Heptachlorodibenzofuran	ug/l	0.00000556 J	0.00000556 J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.01	TEQ	-	NO	NO	-
1,2,3,4,7,8-Hexachlorodibenzofuran	ug/l	0.0000133 J	0.0000133 J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.1	TEQ	-	YES	NO	-
1,2,3,6,7,8-Hexachlorodibenzofuran	ug/l	0.00000912 J	0.00000912 J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.1	TEQ	-	NO	NO	-
1,2,3,7,8,9-Hexachlorodibenzofuran	ug/l	0.00000699 J	0.00000699 J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.1	TEQ	-	NO	NO	-
1,2,3,7,8-Pentachlorodibenzofuran	ug/l	0.0000119 J	0.0000119 J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.03	TEQ	-	YES	NO	-
2,3,4,6,7,8-Hexachlorodibenzofuran	ug/l	0.00000673 J	0.00000673 J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.1	TEQ	-	NO	NO	-
2,3,4,7,8-Pentachlorodibenzofuran	ug/l	0.00000985 J	0.00000985 J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.3	TEQ	-	YES	NO	-

TABLE 8-3.2
RANGE OF CONTAMINANTS FOUND IN SEEP WATER AND POTENTIAL COPECs - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration		Maximum Concentration		Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	TEQ[1]	Measured Concentration Used For Screening[2]	USEPA Region 3 Freshwater Screening Benchmarks[3]	Bioaccumulative[4]	COPEC[5]	Contaminant Category[6]
2,3,7,8-Tetrachlorodibenzofuran	ug/l	0.00000336	J	0.00000336	J	ANA-DW	1 / 2	2.89E-06 - 3.08E-06		0.1	TEQ	-	YES	NO	-
Octachlorodibenzofuran	ug/l	0.0000167	J	0.0000432	J	ANA-DW	2 / 2	1.04E-05 - 0.000011		0.0003	TEQ	-	NO	NO	-
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	ug/l	0.0000743		0.0000869		ANA-DW	2 / 2	6.73E-06 - 8.22E-06		0.01	TEQ	-	YES	NO	-
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	ug/l	0.00000657	J	0.00000657	J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.1	TEQ	-	YES	NO	-
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	ug/l	0.00000864	J	0.00000864	J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.1	TEQ	-	YES	NO	-
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	ug/l	0.00000833	J	0.00000833	J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		0.1	TEQ	-	NO	NO	-
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	ug/l	0.0000107	J	0.0000107	J	ANA-DW	1 / 2	5.2E-06 - 5.49E-06		1	TEQ	-	YES	NO	-
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ug/l	0.00000459	J	0.00000459	J	ANA-DW	1 / 2	2.8E-06 - 2.89E-06		1	TEQ	3.1E-09	YES	NO	-
Octachlorodibenzo-p-dioxin	ug/l	0.00238		0.00285		ANA-LW	2 / 2	1.04E-05 - 1.25E-05		0.0003	TEQ	-	NO	NO	-
2,3,7,8-TCDD equivalents	ug/l										2.7E-05	3.1E-09	YES	**YES**	**F**

Notes:
1 = Toxicity Equivalency (TEQ) Method factors for dioxins/furans and congeners. TEQ factors used are for mammals.
Source: Framework for Application of the Toxicity Equivalence Methodology for Polychlorinated Dioxins, Furans, and Biphenyls in Ecological Risk Assessment, June 2008; TEQ factors are located in Table 2 of the source.
2 = Maximum concentration used for screening unless analyte is undectected; in which case 1/2 lowest method detection limit used; for dioxins/furans, screening concentration is the sum of the (TEQ * maximum concentration) for all congeners.
3 = USEPA Region 3 Freshwater Screening Benchmarks
4 = Bioaccumulative compounds will be considered in the Food Chain Evaluation
5 = Contaminant of Potential Ecological Concern
6 = Contaminant Categories
A = Constituent was detected at a concentration exceeding its screening value
B = Constituent was not detected at concentrations exceeding the DL; however, 1/2 the DL exceeds its screening value
C = Constituent was detected at concentrations exceeding its DL; however, there is no current screening value for the contaminant
D = Constituent was not detected at concentrations exceeding the DL and there is a current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
E = Constituent was detected at concentrations exceeding the DL but below the current screening value for the contaminant (or there is no screening value); however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
F = Represents a toxicity equivalent of all dioxin/furan congeners. Concentration is the sum of all congeners after taking into consideration their relative toxicity to the benchmark compounds; 2,3,7,8-TCDD and 2,3,7,8-TCDF.
NUTR = Essential nutrient and not identified as COPEC.
ug/l= micrograms per liter

TABLE 8-4.1
RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Inorganics												
Aluminum	ug/l	20.7 J	1,600 J	MW-7	12 / 14	11.1 - 15.3	796.7	1,600	87	NO	**YES**	**A**
Antimony	ug/l	-	-	-	0 / 14	2.1 - 2.7	-	1.05	30	NO	NO	-
Arsenic	ug/l	5.9 J	102 J	MW-3	13 / 14	2.8 - 2.9	55.99	102	5	YES	**YES**	**A**
Barium	ug/l	170 J	945 J	MW-2	13 / 14	0.1 - 0.2	588.9	945	4	NO	**YES**	**A**
Beryllium	ug/l	0.38 J	0.48 J	MW-9	4 / 14	0.28 - 0.53	0.491	0.48	0.66	NO	NO	-
Cadmium	ug/l	0.57 J	1 J	MW-7	4 / 14	0.4 - 0.5	0.884	1	0.25	YES	**YES**	**A**
Calcium	ug/l	15,900	144,000	MW-7	13 / 14	1.8 - 2.4	72848	144,000	116,000	NO	**YES**	**A**
Chromium	ug/l	1 J	52.6 J	MW-7	13 / 14	0.3 - 2	25.28	52.6	85	YES	NO	-
Cobalt	ug/l	1.6 J	34.9 J	MW-9	11 / 14	0.9 - 1	16.8	34.9	23	NO	**YES**	**A**
Copper	ug/l	2.8 J	11.1 J	MW-7	6 / 14	0.5 - 1.4	7.6	11.1	9	YES	**YES**	**A**
Iron	ug/l	10,000	42,700	MW-7	13 / 14	10 - 15.3	30533	42,700	300	NO	**YES**	**A**
Lead	ug/l	3.7	27.7	MW-7	4 / 14	1 - 1.9	9.046	27.7	2.5	YES	**YES**	**A**
Magnesium	ug/l	20,300	142,000	MW-9	13 / 14	3.6 - 4.3	98600	142,000	82,000	NO	**YES**	**A**
Manganese	ug/l	104	4,100	MW-7	13 / 14	0.1 - 0.2	2338	4,100	120	NO	**YES**	**A**
Mercury	ug/l	0.15 L	0.15 L	MW-7	1 / 14	0.1 - 0.1	0.15	0.15	0.026	NO	**YES**	**A**
Nickel	ug/l	0.9 J	98.2 J	MW-1	13 / 14	0.8 - 1.4	52.69	98.2	52	YES	**YES**	**A**
Potassium	ug/l	9,030	269,000	MW-9	13 / 14	3.7 - 4.4	130815	269,000	53,000	NO	**YES**	**A**
Selenium	ug/l	3.1 J	3.1 J	MW-8	1 / 14	2.2 - 3.5	3.6	3.1	1	YES	**YES**	**A**
Silver	ug/l	0.62 J	2.1 J	MW-8	7 / 14	0.5 - 1.2	1.346	2.1	3.2	YES	NO	-
Sodium	ug/l	95,000	840,000	MW-9	13 / 14	78.5 - 180	600980	840,000	680,000	NO	**YES**	**A**
Thallium	ug/l	3.9 J	6.3 J	MW-12	3 / 14	2.9 - 4.3	6.746	6.3	0.8	NO	**YES**	**A**
Vanadium	ug/l	0.74 J	25.9 J	MW-9	11 / 14	0.4 - 1.5	20.95	25.9	20	NO	**YES**	**A**
Zinc	ug/l	8.6 J	48.8 J	MW-7	7 / 14	0.6 - 11.5	22.97	48.8	120	YES	**YES**	**F**
Alkalinity, Total	mg/l	129 J	4,500 J	MW-9	13 / 14	2.4 - 24	1911	4,500	-	NO	**YES**	**C**
Ammonia	mg/l	1.04 J	283 J	MW-9	8 / 8	0.0558 - 2.79	157.7	283	0.019	NO	**YES**	**A**
Nitrate as N	mg/l	-	-	-	0 / 8	0.03 - 0.03	-	0.015	-	NO	NO	-
Nitrite as N	mg/l	1.85 J	809 J	MW-9	3 / 8	0.02 - 0.02	469.3	809	-	NO	**YES**	**C**
Sulfate	mg/l	2.74	32.4	MW-12	12 / 14	0.028 - 0.14	19.93	32.4	-	NO	**YES**	**C**
Sulfide	mg/l	0.6 J	5.4 J	MW-9	12 / 14	0.6 - 0.6	2.65	5.4	-	NO	**YES**	**C**
Total Organic Carbon	mg/l	23.1	130	MW-7	12 / 14	1.6 - 3.2	89	130	-	NO	**YES**	**C**
Total Suspended Solids	mg/l	1.5 J	120 J	MW-9	29 / 24	0.31 - 2.5	48.46	120	-	NO	**YES**	**C**
Volatile Organic Compounds (VOCs)												
1,2,4,5-Tetrachlorobenzene	ug/l	-	-	-	0 / 25	0.2 - 1.5	-	0.1	-	YES	NO	-
1,1,1-Trichloroethane	ug/l	-	-	-	0 / 40	0.03 - 1.5	-	0.015	11	NO	NO	-
1,1,2,2-Tetrachloroethane	ug/l	0.2 J	0.2 J	MW-9	1 / 40	0.06 - 3	0.2	0.2	610	NO	NO	D
1,1,2-Trichloroethane	ug/l	-	-	-	0 / 40	0.08 - 4	-	0.04	1,200	NO	NO	-
1,1-Dichloroethane	ug/l	0.066 J	2 J	MW-2	10 / 40	0.04 - 2	0.792	2	47	NO	NO	D
1,1-Dichloroethene	ug/l	0.72	36	MW-2	13 / 47	0.07 - 3.5	6.037	36	25	NO	**YES**	**A**
1,2,4-Trichlorobenzene	ug/l	-	-	-	0 / 40	0.027 - 4	-	0.0135	24	YES	NO	-
1,2,3-Trichlorobenzene	ug/l	0.14 J	0.14 J	MW-7	1 / 40	0.049 - 3.5	-	0.14	8	NO	NO	D
1,2-Dibromo-3-Chloropropane	ug/l	-	-	-	0 / 40	0.013 - 6.5	-	0.0065	-	NO	NO	-
1,2-Dibromoethane	ug/l	-	-	-	0 / 40	0.046 - 3	-	0.023	-	NO	NO	-
1,2-Dichlorobenzene	ug/l	0.12 J	0.98 J	MW-1	16 / 40	0.03 - 1.5	0.882	0.98	0.7	YES	**YES**	**A**
1,2-Dichloroethane	ug/l	0.27 K	8.4 K	MW-7	5 / 40	0.068 - 4.5	1.407	8.4	100	NO	NO	D
1,2-Dichloropropane	ug/l	-	-	-	0 / 40	0.046 - 4	-	0.023	-	NO	NO	-

TABLE 8-4.1
RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration		Maximum Concentration		Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
1,3-Dichlorobenzene	ug/l	0.079	J	0.35	J	MW-8	10 / 40	0.045 - 1.5	0.254	0.35	150	YES	**YES**	**F**
1,4-Dichlorobenzene	ug/l	0.11	J	1.5	J	MW-8	19 / 40	0.059 - 1.4	0.682	1.5	26	YES	**YES**	**F**
1,4-Dioxane	ug/l	22	J	1100	J	MW-1	32 / 32	0.13 - 9.8	373.2	1100	-	NO	NO	**-**
2-Butanone	ug/l	2	J	8.2	J	MW-7	3 / 40	0.36 - 52	3.082	8.2	14,000	NO	NO	D
2-Hexanone	ug/l	8.2	J	8.2	J	MW-9	1 / 40	0.52 - 51	-	8.2	99	NO	NO	D
4-Methyl-2-Pentanone	ug/l	2.3	J	5.4	J	MW-7	2 / 40	0.33 - 17	2.842	5.4	170	NO	NO	D
Acetone	ug/l	4.5	J	250	J	MW-2	16 / 40	1.3 - 140	24.76	250	1,500	NO	NO	D
Benzene	ug/l	0.094	J	11	J	MW-9	24 / 40	0.037 - 2	3.497	11	370	NO	NO	D
Bromochloromethane	ug/l	-		-		-	0 / 40	0.039 - 3	-	0.0195	-	NO	NO	**-**
Bromodichloromethane	ug/l	-		-		-	0 / 40	0.037 - 3	-	0.0185	-	NO	NO	**-**
Bromoform	ug/l	-		-		-	0 / 40	0.024 - 7	-	0.012	320	NO	NO	-
Bromomethane	ug/l	-		-		-	0 / 40	0.1 - 7	-	0.05	-	NO	NO	**-**
Carbon Disulfide	ug/l	0.071	J	0.99	J	MW-2	10 / 40	0.056 - 2	0.26	0.99	0.92	NO	**YES**	**A**
Carbon Tetrachloride	ug/l	-		-		-	0 / 40	0.033 - 1.5	-	0.0165	13.3	NO	NO	-
Chlorobenzene	ug/l	0.41	K	290	K	MW-3	41 / 47	0.03 - 7	85.22	290	1.3	NO	**YES**	**A**
Chloroethane	ug/l	0.65	K	0.65	K	MW-2	1 / 40	0.1 - 7	0.526	0.65	-	NO	**YES**	**C**
Chloroform	ug/l	-		-		-	0 / 40	0.04 - 5.5	-	0.02	1.8	NO	NO	**-**
Chloromethane	ug/l	-		-		-	0 / 40	0.081 - 5.5	-	0.0405	-	NO	NO	**-**
Cis-1,2-Dichloroethene	ug/l	0.1	K	370	K	MW-2	28 / 47	0.054 - 5.5	155.9	370	590	NO	NO	D
Cis-1,3-Dichloropropene	ug/l	-		-		-	0 / 40	0.036 - 5.5	-	0.018	0.055	NO	NO	-
Cyclohexane	ug/l	0.11	J	2.1	J	MW-9	21 / 40	0.053 - 3	0.875	2.1	-	NO	**YES**	**C**
Dibromochloromethane	ug/l	-		-		-	0 / 40	0.032 - 2.5	-	0.016	-	NO	NO	**-**
Dichlorodifluoromethane	ug/l	0.4	K	3.2	K	MW-7	2 / 40	0.059 - 1.5	-	3.2	-	NO	**YES**	**C**
Ethylbenzene	ug/l	0.047	J	22	J	MW-7	11 / 40	0.03 - 1.5	4.222	22	90	NO	NO	D
Freon 113	ug/l	0.17	L	0.17	L	MW-7	1 / 40	0.054 - 2.1	-	0.17	-	NO	NO	**D**
Isopropylbenzene	ug/l	0.1	L	5.5	L	MW-9	19 / 40	0.057 - 1.5	2.053	5.5	2.6	NO	**YES**	**A**
Methyl Acetate	ug/l	-		-		-	0 / 40	0.096 - 5.5	-	0.048	-	NO	NO	**-**
Methyl Cyclohexane	ug/l	0.14	J	1.4	J	MW-9	10 / 40	0.035 - 2	0.69	1.4	-	NO	**YES**	**C**
Methyl Tert-Butyl Ether	ug/l	0.11	J	0.69	J	MW-2	14 / 40	0.037 - 11	0.488	0.69	11,070	NO	NO	D
Methylene Chloride	ug/l	-		-		-	0 / 40	0.1 - 11	-	0.05	98.1	NO	NO	-
Styrene	ug/l	0.61		0.61		MW-9	1 / 40	0.03 - 1.5	-	0.61	72	NO	NO	-
Tetrachloroethene	ug/l	0.19	J	0.83	J	MW-7	3 / 40	0.028 - 1.5	0.309	0.83	111	NO	NO	-
Toluene	ug/l	0.1	L	14	L	MW-9	17 / 40	0.05 - 5.3	5.927	14	2	NO	**YES**	**A**
Trans-1,2-Dichloroethene	ug/l	0.081	J	1.3	J	MW-2	7 / 40	0.045 - 6	0.451	1.3	970	NO	NO	-
Trans-1,3-Dichloropropene	ug/l	-		-		-	0 / 40	0.033 - 6	-	0.0165	0.055	NO	NO	-
Trichloroethene	ug/l	0.18	J	39	J	MW-2	15 / 47	0.049 - 3	4.661	39	21	NO	**YES**	**A**
Trichlorofluoromethane	ug/l	-		-		-	0 / 40	0.06 - 3	-	0.03	-	NO	NO	**-**
Vinyl Chloride	ug/l	0.13	J	170	J	MW-2	16 / 46	0.023 - 3	22	170	930	NO	NO	**D**
m,p-Xylenes	ug/l	0.23	J	1.9	J	MW-9	10 / 25	0.03 - 5.5	0.93	1.9	13	NO	NO	**D**
o-Xylene	ug/l	0.073	J	6.6	J	MW-8	10 / 25	0.03 - 9.3	2.274	6.6	13	NO	NO	**D**
Xylenes, Total	ug/l	0.14	K	160	K	MW-7	9 / 15	0.1 - 0.1	44.1	160	13	NO	**YES**	**A**

RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Semivolatile Organic Compounds												
2,3,4,6-Tetrachlorophenol	ug/l	-	-	-	0 / 25	0.22 - 1.7	-	0.11	-	NO	NO	**-**
2,4,5-Trichlorophenol	ug/l	-	-	-	0 / 39	0.22 - 5.1	-	0.11	-	NO	NO	**-**
2,4,6-Trichlorophenol	ug/l	-	-	-	0 / 39	0.2 - 2.1	-	0.1	4.9	NO	NO	-
2,4-Dichlorophenol	ug/l	-	-	-	0 / 39	0.16 - 2.1	-	0.08	11	NO	NO	-
2,4-Dimethylphenol	ug/l	0.32 J	10 J	MW-8	5 / 39	0.096 - 2.1	0.353	10	-	NO	**YES**	**C**
2,4-Dinitrophenol	ug/l	-	-	-	0 / 39	0.96 - 11	-	0.48	-	NO	NO	**-**
2,4-Dinitrotoluene	ug/l	-	-	-	0 / 39	0.31 - 2.1	-	0.155	44	NO	NO	-
2,6-Dinitrotoluene	ug/l	-	-	-	0 / 39	0.19 - 2.1	-	0.095	81	NO	NO	-
2-Chloronaphthalene	ug/l	-	-	-	0 / 39	0.13 - 2.1	-	0.065	-	NO	NO	**-**
2-Chlorophenol	ug/l	-	-	-	0 / 39	0.18 - 2.1	-	0.09	24	NO	NO	-
2-Methylphenol	ug/l	0.23 J	2 J	MW-8	2 / 39	0.21 - 2.2	-	2	13	NO	NO	**D**
2-Nitroaniline	ug/l	-	-	-	0 / 39	0.25 - 5.1	-	0.125	-	NO	NO	**-**
2-Nitrophenol	ug/l	-	-	-	0 / 39	0.14 - 2.1	-	0.07	1,920	NO	NO	-
3,3'-Dichlorobenzidine	ug/l	-	-	-	0 / 39	0.42 - 2.1	-	0.21	4.5	NO	NO	-
3-Nitroaniline	ug/l	-	-	-	0 / 39	0.31 - 5.1	-	0.155	-	NO	NO	**-**
4,6-Dinitro-2-Methylphenol	ug/l	-	-	-	0 / 39	0.31 - 5.1	-	0.155	-	NO	NO	**-**
4-Bromophenyl-Phenylether	ug/l	-	-	-	0 / 39	0.13 - 2.1	-	0.065	1.5	YES	NO	-
4-Chloro-3-Methylphenol	ug/l	-	-	-	0 / 39	0.2 - 2.1	-	0.1	-	NO	NO	**-**
4-Chloroaniline	ug/l	-	-	-	0 / 39	0.13 - 2.4	-	0.065	232	NO	NO	-
4-Chlorophenyl-Phenylether	ug/l	-	-	-	0 / 39	0.22 - 2.1	-	0.11	-	YES	NO	**-**
4-Methylphenol	ug/l	0.3 J	15 J	MW-7	5 / 39	0.096 - 2.9	5.606	15	543	NO	NO	D
4-Nitroaniline	ug/l	-	-	-	0 / 39	0.37 - 5.1	-	0.185	-	NO	NO	D
4-Nitrophenol	ug/l	-	-	-	0 / 39	0.29 - 5.9	-	0.145	60	NO	NO	-
Acetophenone	ug/l	0.37 J+	2 J+	MW-7	2 / 39	0.14 - 2.1	-	2	-	NO	**YES**	**C**
Atrazine	ug/l	-	-	-	0 / 39	0.21 - 2.1	-	0.105	1.8	NO	NO	-
Benzaldehyde	ug/l	0.5 J	3 J	MW-7	8 / 39	0.21 - 3.3	1.961	3	-	NO	**YES**	**C**
Biphenyl	ug/l	9 J	24 J	MW-8	2 / 39	0.14 - 2.1	6.642	24	14	NO	**YES**	**A**
Bis(2-Chloroethoxy)Methane	ug/l	-	-	-	0 / 39	0.18 - 2.1	-	0.09	-	NO	NO	**-**
Bis(2-Chloroethyl) Ether	ug/l	-	-	-	0 / 39	0.23 - 2.1	-	0.115	-	NO	NO	**-**
Bis(2-Chloroisopropyl) Ether	ug/l	-	-	-	0 / 39	0.17 - 2.1	-	0.085	-	NO	NO	**-**
Bis(2-Ethylhexyl) Phthalate	ug/l	-	-	-	0 / 39	2 - 3.2	-	1	16	NO	NO	**-**
Butylbenzyl Phthalate	ug/l	-	-	-	0 / 39	0.26 - 3.8	-	0.13	19	NO	NO	-
Caprolactum	ug/l	-	-	-	0 / 39	0.61 - 4.6	-	0.305	-	NO	NO	**-**
Dibenzofuran	ug/l	0.57 J	64 J	MW-8	9 / 39	0.18 - 4.9	11.07	64	3.7	NO	**YES**	**A**
Diethyl Phthalate	ug/l	2 J	5 J	MW-7	2 / 39	0.4 - 2.1	2.401	5	210	NO	NO	-
Dimethyl Phthalate	ug/l	8.5	9.7	MW-1	2 / 39	0.2 - 2.1	-	9.7	-	NO	**YES**	**C**
Di-N-Butyl Phthalate	ug/l	9.6	11	MW-9	2 / 39	0.13 - 2.1	5.639	11	19	NO	NO	D
Hexachlorobenzene	ug/l	-	-	-	0 / 39	0.17 - 2.2	-	0.085	0.0003	YES	**YES**	**B**
Hexachlorobutadiene	ug/l	-	-	-	0 / 39	0.15 - 4.6	-	0.075	1.3	YES	NO	-
Hexachlorocyclopentadiene	ug/l	-	-	-	0 / 39	0.38 - 4.9	-	0.19	-	YES	NO	**-**
Hexachloroethane	ug/l	-	-	-	0 / 39	0.15 - 2.1	-	0.075	12	YES	NO	-
Isophorone	ug/l	-	-	-	0 / 39	0.18 - 2.1	-	0.09	-	NO	NO	**-**
Nitrobenzene	ug/l	-	-	-	0 / 39	0.25 - 2.2	-	0.125	-	NO	NO	**-**
N-Nitroso-Di-N-Propylamine	ug/l	-	-	-	0 / 39	0.17 - 3.5	-	0.085	-	NO	NO	**-**
N-Nitrosodiphenylamine	ug/l	0.36 J	2 J	MW-8	2 / 39	0.16 - 5.1	-	2	210	NO	NO	D

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Pentachlorophenol	ug/l	-	-	-	0 / 39	0.23 - 9.8	-	0.115	0.5	YES	NO	**-**
Phenol	ug/l	0.35 J	13 J	MW-9	3 / 39	0.15 - 2.1	2.17	13	4	NO	**YES**	**A**
Di-N-Octyl Phthalate	ug/l	-	-	-	0 / 39	0.28 - 2.1	-	0.14	22	NO	NO	-
Acenaphthene	ug/l	0.47 J	130 J	MW-8	18 / 39	0.19 - 2.1	21.42	130	5.8	YES	**YES**	**A**
Acenaphthylene	ug/l	6 J	6 J	MW-8	1 / 39	0.16 - 2.1	-	6	-	YES	**YES**	**C**
Anthracene	ug/l	0.32 J	14 J	MW-8	5 / 39	0.18 - 4.9	4.778	14	0.012	YES	**YES**	**A**
Fluorene	ug/l	0.27 J	100 J	MW-8	16 / 39	0.23 - 2.1	12.51	100	3	YES	**YES**	**A**
Naphthalene	ug/l	2.3 J	460 J	MW-8	9 / 39	0.19 - 2.1	105.3	460	1.1	NO	**YES**	**A**
Phenanthrene	ug/l	0.2 J	120 J	MW-8	16 / 39	0.13 - 2.1	33.85	120	0.4	YES	**YES**	**A**
Benzo(A)Anthracene	ug/l	0.23 J	0.33 J	MW-8	2 / 39	0.12 - 2.1	0.364	0.33	0.018	YES	**YES**	**A**
Benzo(A)Pyrene	ug/l	0.21 J	0.21 J	MW-7	1 / 39	0.21 - 2.1	-	0.21	0.015	YES	**YES**	**A**
Carbazole	ug/l	1.1 J	51 J	MW-8	5 / 39	0.2 - 4.9	6.772	51	-	NO	**YES**	**C**
Chrysene	ug/l	0.34 J	0.34 J	MW-8	1 / 39	0.2 - 4.5	-	0.34	-	YES	**YES**	**F**
Dibenzo(A,H)Anthracene	ug/l	-	-	-	0 / 39	0.17 - 4.6	-	0.085	-	YES	NO	**D**
Fluoranthene	ug/l	0.73 J	13 J	MW-8	7 / 39	0.18 - 2.1	5.71	13	0.04	YES	**YES**	**A**
Pyrene	ug/l	0.44 J	6 J	MW-8	7 / 39	0.26 - 2.1	3.83	6	0.025	YES	**YES**	**A**
Benzo(B)Fluoranthene	ug/l	0.29 J	0.29 J	MW-7	1 / 39	0.22 - 2.1	-	0.29	-	YES	**YES**	**C**
Benzo(K)Fluoranthene	ug/l	0.2 J	0.2 J	MW-7	1 / 39	0.16 - 2.3	-	0.2	-	YES	**YES**	**C**
Benzo(G,H,I)Perylene	ug/l	-	-	-	0 / 39	0.15 - 2.1	-	0.075	-	YES	NO	**-**
Indeno(1,2,3-Cd)Pyrene	ug/l	-	-	-	0 / 39	0.2 - 2.1	-	0.1	-	YES	NO	**-**
2-Methylnaphthalene	ug/l	0.45 J	160 J	MW-8	13 / 39	0.22 - 2.1	26.93	160	4.7	NO	**YES**	**A**
Pesticides												
4,4-DDD	ug/l	-	-	-	0 / 14	0.018 - 0.019	-	0.009	0.011	YES	NO	**-**
4,4-DDE	ug/l	-	-	-	0 / 14	0.018 - 0.019	-	0.009	-	YES	NO	**-**
4,4-DDT	ug/l	-	-	-	0 / 14	0.018 - 0.019	-	0.009	0.0005	YES	**YES**	**B**
Aldrin	ug/l	0.012 J	0.012 J	MW-8	1 / 14	0.0091 - 0.0095	-	0.012	3	YES	NO	**-**
Alpha-BHC	ug/l	-	-	-	0 / 14	0.0091 - 0.0095	-	0.00455	-	YES	NO	**-**
Alpha-Chlordane	ug/l	-	-	-	0 / 14	0.0091 - 0.0095	-	0.00455	0.0022	NO	**YES**	**B**
gamma-Chlordane	ug/l	0.0098 J	0.051 J	MW-7	6 / 14	0.0091 - 0.0095	0.0251	0.051	0.0022	NO	**YES**	**A**
Alpha-Endosulfan	ug/l	0.014 J	0.026 J	MW-7	4 / 14	0.0091 - 0.0095	0.0255	0.026	0.051	YES	**YES**	**F**
Beta-BHC	ug/l	0.025 J	0.066 J	MW-7	11 / 14	0.0091 - 0.0095	0.0565	0.066	-	YES	**YES**	**F**
Beta-Endosulfan	ug/l	-	-	-	0 / 14	0.018 - 0.019	-	0.009	0.051	YES	NO	**-**
Delta-BHC	ug/l	0.012 J	0.043 J	MW-7	4 / 14	0.0091 - 0.0095	0.034	0.043	141	YES	**YES**	**F**
Dieldrin	ug/l	-	-	-	0 / 14	0.018 - 0.019	-	0.009	0.056	YES	NO	**-**
Endosulfan Sulfate	ug/l	-	-	-	0 / 14	0.018 - 0.019	-	0.009	-	NO	NO	**-**
Endrin	ug/l	-	-	-	0 / 14	0.018 - 0.019	-	0.009	0.036	YES	NO	**-**
Endrin Aldehyde	ug/l	0.02 J	0.02 J	MW-8	1 / 14	0.018 - 0.019	-	0.02	-	NO	**YES**	**C**
Endrin Ketone	ug/l	-	-	-	0 / 14	0.018 - 0.019	-	0.009	-	NO	NO	**-**
Gamma-BHC	ug/l	0.02 J	0.02 J	MW-8	1 / 14	0.0091 - 0.0095	-	0.02	0.01	YES	**YES**	**A**
Heptachlor	ug/l	0.01 J	0.071 J	MW-7	7 / 14	0.0091 - 0.0095	0.0438	0.071	0.0019	YES	**YES**	**A**
Heptachlor Epoxide	ug/l	0.013 J	0.022 J	MW-7	3 / 14	0.0091 - 0.0095	0.0237	0.022	0.0019	YES	**YES**	**A**
Methoxychlor	ug/l	-	-	-	0 / 14	0.091 - 0.095	-	0.0455	0.019	YES	**YES**	**B**
Toxaphene	ug/l	-	-	-	0 / 14	0.97 - 1	-	0.485	0.0002	YES	**YES**	**B**

RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Polychlorinated Biphenyls (PCBs)												
Aroclor 1016	ug/l	-	-	-	0 / 14	0.3 - 0.31	-	0.15	0.000074	YES	**YES**	**B**
Aroclor 1221	ug/l	-	-	-	0 / 14	0.36 - 0.38	-	0.18	0.000074	YES	**YES**	**B**
Aroclor 1232	ug/l	-	-	-	0 / 14	0.34 - 0.36	-	0.17	0.000074	YES	**YES**	**B**
Aroclor 1242	ug/l	-	-	-	0 / 14	0.23 - 0.24	-	0.115	0.000074	YES	**YES**	**B**
Aroclor 1248	ug/l	-	-	-	0 / 14	0.25 - 0.26	-	0.125	0.000074	YES	**YES**	**B**
Aroclor 1254	ug/l	-	-	-	0 / 14	0.33 - 0.34	-	0.165	0.000074	YES	**YES**	**B**
Aroclor 1260	ug/l	-	-	-	0 / 14	0.27 - 0.28	-	0.135	0.000074	YES	**YES**	**B**

Notes:
1 = Maximum concentration used for screening unless analyte is undectected; in which case 1/2 lowest method detection limit used; for dioxins/furans, screening concentration is the sum of the (TEQ * maximum concentration) for all congeners.
2 = USEPA Region 3 Freshwater Screening Benchmarks
3 = Bioaccumulative compounds will be considered in the Food Chain Evaluation
4 = Contaminant of Potential Ecological Concern
5 = Contaminant Categories
A = Constituent was detected at a concentration exceeding its screening value
B = Constituent was not detected at concentrations exceeding the DL; however, 1/2 the DL exceeds its screening value
C = Constituent was detected at concentrations exceeding its DL; however, there is no current screening value for the contaminant
D = Constituent was not detected at concentrations exceeding the current screening value for the contaminant
E = Constituent was not detected at concentrations exceeding the DL and there is a current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
F = Constituent was detected at concentrations exceeding the DL but below the current screening value for the contaminant (or there is no screening value); however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.

ug/l= micrograms per liter
mg/l= milligrams per liter

TABLE 8-4.2
RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Inorganics												
Aluminum	ug/l	27.5 J	2,630 J	MW-6	6 / 6	11.1 - 15.3	1834	2,630	87	NO	**YES**	**A**
Antimony	ug/l	3 J	3 J	MW-6	1 / 6	2.1 - 2.2	-	3	30	NO	NO	**-**
Arsenic	ug/l	3.5 J	7 J	MW-5	4 / 6	2.8 - 2.9	7.4	7.4	5	YES	**YES**	**A**
Barium	ug/l	203	804	MW-5	6 / 6	0.1 - 0.2	804	804	4	NO	**YES**	**A**
Beryllium	ug/l	0.27 J	0.27 J	MW-10	2 / 6	0.2 - 0.3	-	0.27	0.66	NO	NO	**-**
Cadmium	ug/l	0.8 J	0.80 J	MW-6	1 / 6	0.4 - 0.5	-	0.8	0.25	YES	**YES**	**A**
Calcium	ug/l	77000	132,000	MW-6	6 / 6	1.8 - 2.4	123819	132,000	116,000	NO	**YES**	**A**
Chromium	ug/l	1.6 J	10 J	MW-6	6 / 6	0.3 - 0.5	8.0	10.1	85	YES	**YES**	**F**
Cobalt	ug/l	4.6 J	18 J	MW-10	3 / 6	0.9 - 1	18	17.7	23	NO	NO	**-**
Copper	ug/l	0.81 J	8 J	MW-6	3 / 6	0.5 - 3.7	9.5	7.7	9	YES	**YES**	**F**
Iron	ug/l	11100	39,600	MW-5	6 / 6	10 - 15.3	32871	39,600	300	NO	**YES**	**A**
Lead	ug/l	5.3	9	MW-6	2 / 6	1 - 1.9	-	8.6	2.5	YES	**YES**	**A**
Magnesium	ug/l	46000	74,700	MW-6	6 / 6	3.6 - 4.3	72002	74,700	82,000	NO	NO	**-**
Manganese	ug/l	4660	6,270	MW-10	6 / 6	0.1 - 0.2	5917	6,270	120	NO	**YES**	**A**
Mercury	ug/l	-	-	-	0 / 6	0.1 - 0.1	-	0.05	0.026	NO	**YES**	**B**
Nickel	ug/l	5.8 J	13 J	MW-10	6 / 6	0.8 - 1.4	12	12.5	52	YES	**YES**	**F**
Potassium	ug/l	13200	66,400	MW-10	6 / 6	3.7 - 4.4	55927	66,400	53,000	NO	**YES**	**A**
Selenium	ug/l	-	-	-	0 / 6	2.2 - 2.7	-	1.1	1	YES	**YES**	**A**
Silver	ug/l	0.73 J	1 J	MW-5	4 / 6	0.5 - 1.2	-	0.86	3.2	YES	**YES**	**F**
Sodium	ug/l	132000	224,000	MW-5	6 / 6	78.5 - 90.1	216547	224,000	680,000	NO	NO	-
Thallium	ug/l	4.1 J	4 J	MW-6	1 / 6	2.9 - 4.3	-	4.1	0.8	NO	**YES**	**A**
Vanadium	ug/l	1.3 J	7 J	MW-6	3 / 6	0.4 - 2.1	6.8	6.5	20	NO	NO	**-**
Zinc	ug/l	6.1 J	15 J	MW-10	4 / 6	0.7 - 3.2	-	14.9	120	YES	**YES**	**F**
Alkalinity, Total	mg/l	114 J	495 J	MW-6	6 / 6	2.4 - 2.4	469	495	-	NO	NO	**C**
Ammonia	mg/l	3.91 J	11 J	MW-10	4 / 5	0.0558 - 0.112	13	10.5	0.019	NO	**YES**	**A**
Nitrate as N	mg/l	-	-	-	0 / 5	0.03 - 0.03	-	0.015	-	NO	NO	**-**
Nitrite as N	mg/l	-	-	-	0 / 5	0.02 - 0.02	-	0.01	-	NO	NO	**-**
Sulfate	mg/l	27.5	49	MW-10	6 / 6	0.028 - 0.14	49	48.5	-	NO	**YES**	**C**
Sulfide	mg/l	0.6 J	1 J	MW-5	1 / 6	0.6 - 0.6	-	0.6	-	NO	**YES**	**C**
Total Organic Carbon	mg/l	4.33 J	19 J	MW-10	6 / 6	1.6 - 1.6	16	18.5	-	NO	**YES**	**C**
Total Suspended Solids	mg/l	5.7 J	83 J	MW-6	7 / 3	0.31 - 0.62	70	83.2	-	NO	**YES**	**C**
Volatile Organic Compounds (VOCs)												
1,1,1-Trichloroethane	ug/l	0.1 J	0.26 J	MW-6	4 / 11	0.03 - 0.1	0.22	0.26	11	NO	NO	D
1,1,2,2-Tetrachloroethane	ug/l	-	-	-	0 / 11	0.06 - 0.1	-	0.03	610	NO	NO	-
1,1,2-Trichloroethane	ug/l	-	-	-	0 / 11	0.08 - 0.1	-	0.04	1,200	NO	NO	-
1,1-Dichloroethane	ug/l	0.26 J	1.9 J	MW-6	6 / 11	0.04 - 0.1	1.1	1.9	47	NO	NO	D
1,1-Dichloroethene	ug/l	1.1 J	2.7 J	MW-6	4 / 11	0.07 - 0.1	1.9	2.7	25	NO	NO	D
1,2,4-Trichlorobenzene	ug/l	-	-	-	0 / 11	0.027 - 0.11	-	0.0135	24	YES	NO	-
1,2,3-Trichlorobenzene	ug/l	-	-	-	0 / 11	0.049 - 0.1	-	0.0245	8	NO	NO	**-**
1,2-Dibromo-3-Chloropropane	ug/l	-	-	-	0 / 11	0.013 - 0.17	-	0.0065	-	NO	NO	**-**
1,2-Dibromoethane	ug/l	-	-	-	0 / 11	0.046 - 0.3	-	0.023	-	NO	NO	**-**
1,2-Dichlorobenzene	ug/l	0.13 J	0.27 J	MW-6	5 / 11	0.03 - 0.1	0.26	0.27	0.7	YES	**YES**	**F**
1,2-Dichloroethane	ug/l	7	61	MW-6	4 / 11	0.068 - 0.1	24	61	100	NO	NO	D
1,2-Dichloropropane	ug/l	-	-	-	0 / 11	0.046 - 0.1	-	0.023	-	NO	NO	**-**
1,3-Dichlorobenzene	ug/l	0.12 J	0.16 J	MW-5	2 / 11	0.045 - 0.1	-	0.16	150	YES	**YES**	**F**
1,4-Dichlorobenzene	ug/l	0.17 J	0.66 J	MW-6	10 / 11	0.059 - 0.14	0.41	0.66	26	YES	**YES**	**F**

TABLE 8-4.2
RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
1,4-Dioxane	ug/l	19	21	MW-6	2 / 5	0.26 - 0.49	26	21	-	NO	**YES**	**C**
2-Butanone	ug/l	26	26	MW-10	1 / 11	0.36 - 13	-	26	14,000	NO	NO	**D**
2-Hexanone	ug/l	-	-	-	0 / 11	0.52 - 1	-	0.26	99	NO	NO	-
4-Methyl-2-Pentanone	ug/l	-	-	-	0 / 11	0.33 - 1	-	0.165	170	NO	NO	-
Acetone	ug/l	2.2 J	4.7 J	MW-6	5 / 11	1.3 - 14	4.3	4.7	1,500	NO	NO	**D**
Benzene	ug/l	0.039 J	0.72 J	MW-6	7 / 11	0.037 - 0.1	0.50	0.72	370	NO	NO	D
Bromochloromethane	ug/l	-	-	-	0 / 11	0.039 - 0.1	-	0.0195	-	NO	NO	-
Bromodichloromethane	ug/l	-	-	-	0 / 11	0.037 - 0.1	-	0.0185	-	NO	NO	-
Bromoform	ug/l	-	-	-	0 / 11	0.024 - 0.1	-	0.012	320	NO	NO	-
Bromomethane	ug/l	-	-	-	0 / 11	0.1 - 0.18	-	0.05	-	NO	NO	-
Carbon Disulfide	ug/l	0.11 J	0.27 J	MW-10	4 / 11	0.056 - 0.1	0.31	0.27	0.92	NO	NO	-
Carbon Tetrachloride	ug/l	-	-	-	0 / 11	0.049 - 0.1	-	0.0245	13.3	NO	NO	-
Chlorobenzene	ug/l	1.3	19	MW-6	10 / 11	0.03 - 1	10	19	1.3	NO	**YES**	**A**
Chloroethane	ug/l	0.29 J	0.29 J	MW-6	1 / 11	0.1 - 0.21	-	0.29	-	NO	**YES**	**C**
Chloroform	ug/l	-	-	-	0 / 11	0.04 - 0.1	-	0.02	1.8	NO	NO	-
Chloromethane	ug/l	-	-	-	0 / 11	0.081 - 0.11	-	0.0405	-	NO	NO	-
Cis-1,2-Dichloroethene	ug/l	0.067 J	2.5 J	MW-6	10 / 11	0.054 - 0.1	1.3	2.5	590	NO	NO	D
Cis-1,3-Dichloropropene	ug/l	-	-	-	0 / 11	0.036 - 0.11	-	0.018	0.055	NO	NO	-
Cyclohexane	ug/l	0.067 J	1.6 J	MW-10	7 / 11	0.053 - 0.1	1.4	1.6	-	NO	**YES**	**C**
Dibromochloromethane	ug/l	-	-	-	0 / 11	0.032 - 0.1	-	0.016	-	NO	NO	-
Dichlorodifluoromethane	ug/l	-	-	-	0 / 11	0.059 - 0.13	-	0.0295	-	NO	NO	-
Ethylbenzene	ug/l	0.17 J	1.9 J	MW-6	4 / 11	0.03 - 0.1	0.84	1.9	90	NO	NO	D
Freon 113	ug/l	2 J	5 J	MW-6	4 / 11	0.054 - 0.21	3.1	5	-	NO	**YES**	**C**
Isopropylbenzene	ug/l	0.065 J	0.41 J	MW-10	5 / 11	0.057 - 0.1	0.38	0.41	2.6	NO	NO	**D**
Methyl Acetate	ug/l	-	-	-	0 / 11	0.096 - 0.18	-	0.048	-	NO	NO	-
Methyl Cyclohexane	ug/l	0.18 J	0.19 J	MW-6	2 / 11	0.035 - 0.1	0.19	0.19	-	NO	**YES**	**C**
Methyl Tert-Butyl Ether	ug/l	0.16 J	0.96 J	MW-6	6 / 11	0.037 - 0.1	0.67	0.96	11,070	NO	NO	**D**
Methylene Chloride	ug/l	-	-	-	0 / 11	0.1 - 0.25	-	0.05	98.1	NO	NO	-
Styrene	ug/l	0.23 J	0.23 J	MW-10	1 / 11	0.03 - 0.1	-	0.23	72	NO	NO	D
Tetrachloroethene	ug/l	0.061 J	0.39 J	MW-6	7 / 11	0.028 - 0.1	0.32	0.39	111	NO	NO	D
Toluene	ug/l	0.11 J	1.3 J	MW-10	4 / 11	0.05 - 2.3	0.75	1.3	2	NO	NO	D
Trans-1,2-Dichloroethene	ug/l	-	-	-	0 / 11	0.045 - 0.1	-	0.0225	970	NO	NO	-
Trans-1,3-Dichloropropene	ug/l	-	-	-	0 / 11	0.033 - 0.11	-	0.0165	0.055	NO	NO	-
Trichloroethene	ug/l	0.11 J	0.2 J	MW-6	5 / 11	0.049 - 0.1	0.28	0.2	21	NO	NO	D
Trichlorofluoromethane	ug/l	-	-	-	0 / 11	0.06 - 0.1	-	0.03	-	NO	NO	-
Vinyl Chloride	ug/l	0.57	0.57	MW-6	1 / 11	0.023 - 0.1	-	0.57	930	NO	NO	D
m,p-Xylenes	ug/l	0.031 J	0.055 J	MW-6	2 / 5	0.03 - 0.046	0.071	0.055	13	NO	NO	D
o-Xylene	ug/l	0.19 J	0.25 J	MW-10	3 / 5	0.03 - 0.053	0.29	0.25	13	NO	NO	D
Xylenes, Total	ug/l	0.6 J	13 J	MW-6	4 / 6	0.1 - 0.1	8.6	13	13	NO	NO	D

RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration		Maximum Concentration		Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Semivolatile Organic Compounds														
2,4,5-Trichlorophenol	ug/l	-		-		-	0 / 11	0.3 - 5.1	-	0.15	-	NO	NO	-
2,4,6-Trichlorophenol	ug/l	-		-		-	0 / 11	0.34 - 2.1	-	0.17	4.9	NO	NO	-
2,4-Dichlorophenol	ug/l	-		-		-	0 / 11	0.32 - 2.1	-	0.16	11	NO	NO	-
2,4-Dimethylphenol	ug/l	-		-		-	0 / 11	0.3 - 2.1	-	0.15	-	NO	NO	-
2,4-Dinitrophenol	ug/l	-		-		-	0 / 11	1.4 - 11	-	0.7	-	NO	NO	-
2,4-Dinitrotoluene	ug/l	-		-		-	0 / 11	0.33 - 2.1	-	0.165	44	NO	NO	-
2,6-Dinitrotoluene	ug/l	-		-		-	0 / 11	0.19 - 2.1	-	0.095	81	NO	NO	-
2-Chloronaphthalene	ug/l	-		-		-	0 / 11	0.25 - 2.1	-	0.125	-	NO	NO	-
2-Chlorophenol	ug/l	-		-		-	0 / 11	0.24 - 2.1	-	0.12	24	NO	NO	-
2-Methylphenol	ug/l	-		-		-	0 / 11	0.3 - 2.1	-	0.15	13	NO	NO	-
2-Nitroaniline	ug/l	-		-		-	0 / 11	0.25 - 5.1	-	0.125	-	NO	NO	-
2-Nitrophenol	ug/l	-		-		-	0 / 11	0.2 - 2.1	-	0.1	1,920	NO	NO	-
3,3'-Dichlorobenzidine	ug/l	-		-		-	0 / 11	0.51 - 2.1	-	0.255	4.5	NO	NO	-
3-Nitroaniline	ug/l	-		-		-	0 / 11	0.46 - 5.1	-	0.23	-	NO	NO	-
4,6-Dinitro-2-Methylphenol	ug/l	-		-		-	0 / 11	0.3 - 5.1	-	0.15	-	NO	NO	-
4-Bromophenyl-Phenylether	ug/l	-		-		-	0 / 11	0.13 - 2.1	-	0.065	1.5	YES	NO	-
4-Chloro-3-Methylphenol	ug/l	-		-		-	0 / 11	0.38 - 2.1	-	0.19	-	NO	NO	-
4-Chloroaniline	ug/l	-		-		-	0 / 11	0.29 - 2.4	-	0.145	232	NO	NO	-
4-Chlorophenyl-Phenylether	ug/l	-		-		-	0 / 11	0.42 - 2.1	-	0.21	-	YES	NO	-
4-Methylphenol	ug/l	3	J	3	J	MW-10	1 / 11	0.34 - 2.5	-	3	543	NO	NO	D
4-Nitroaniline	ug/l	-		-		-	0 / 11	0.5 - 5.1	-	0.25	-	NO	NO	-
4-Nitrophenol	ug/l	-		-		-	0 / 11	0.47 - 5.9	-	0.235	60	NO	NO	-
Acetophenone	ug/l	-		-		-	0 / 11	0.2 - 2.1	-	0.1	-	NO	NO	-
Atrazine	ug/l	-		-		-	0 / 11	0.29 - 2.1	-	0.145	1.8	NO	NO	-
Benzaldehyde	ug/l	-		-		-	0 / 11	0.31 - 3.3	-	0.155	-	NO	NO	-
Biphenyl	ug/l	-		-		-	0 / 11	0.45 - 2.1	-	0.225	14	NO	NO	-
Bis(2-Chloroethoxy)Methane	ug/l	-		-		-	0 / 11	0.3 - 2.1	-	0.15	-	NO	NO	-
Bis(2-Chloroethyl) Ether	ug/l	-		-		-	0 / 11	0.33 - 2.1	-	0.165	-	NO	NO	-
Bis(2-Chloroisopropyl) Ether	ug/l	-		-		-	0 / 8	0.61 - 2.1	-	0.305	-	NO	NO	-
Bis(2-Ethylhexyl) Phthalate	ug/l	6	J	6	J	MW-6	1 / 11	2 - 3.2	-	6	16	NO	NO	D
Butylbenzyl Phthalate	ug/l	-		-		-	0 / 11	0.26 - 3.8	-	0.13	19	NO	NO	-
Caprolactum	ug/l	12		12		MW-6	1 / 6	1.8 - 2.1	-	12	-	NO	**YES**	**C**
Dibenzofuran	ug/l	0.33	J	7	J	MW-10	4 / 11	0.21 - 2.1	5.1	7	3.7	NO	**YES**	**A**
Diethyl Phthalate	ug/l	-		-		-	0 / 11	0.4 - 2.1	-	0.2	210	NO	NO	-
Dimethyl Phthalate	ug/l	-		-		-	0 / 11	0.28 - 2.1	-	0.14	-	NO	NO	-
Di-N-Butyl Phthalate	ug/l	-		-		-	0 / 11	0.12 - 2.1	-	0.06	19	NO	NO	-
Hexachlorobenzene	ug/l	-		-		-	0 / 11	0.23 - 2.1	-	0.115	0.0003	YES	**YES**	**B**
Hexachlorobutadiene	ug/l	-		-		-	0 / 11	0.54 - 2.1	-	0.27	1.3	YES	NO	-
Hexachlorocyclopentadiene	ug/l	-		-		-	0 / 11	0.38 - 4.6	-	0.19	-	YES	NO	-
Hexachloroethane	ug/l	-		-		-	0 / 11	0.29 - 2.1	-	0.145	12	YES	NO	-
Isophorone	ug/l	-		-		-	0 / 11	0.24 - 2.1	-	0.12	-	NO	NO	-
Nitrobenzene	ug/l	-		-		-	0 / 11	0.35 - 2.1	-	0.175	-	NO	NO	-
N-Nitroso-Di-N-Propylamine	ug/l	-		-		-	0 / 11	0.35 - 2.1	-	0.175	-	NO	NO	-
N-Nitrosodiphenylamine	ug/l	-		-		-	0 / 11	0.19 - 5.1	-	0.095	210	NO	NO	-
Pentachlorophenol	ug/l	-		-		-	0 / 11	0.22 - 2.1	-	0.11	0.5	YES	NO	-
Phenol	ug/l	14		59		MW-10	2 / 11	0.22 - 2.1	-	59	4	NO	**YES**	**A**

RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Di-N-Octyl Phthalate	ug/l	-	-	-	0 / 11	0.28 - 2.1	-	0.14	22	NO	NO	-
Acenaphthene	ug/l	3.9 J	12 J	MW-10	5 / 11	0.3 - 2.1	8.2	12	5.8	YES	**YES**	**A**
Acenaphthylene	ug/l	-	-	-	0 / 11	0.25 - 2.1	-	0.125	-	YES	NO	-
Anthracene	ug/l	-	-	-	0 / 11	0.29 - 2.1	-	0.145	0.012	YES	**YES**	**A**
Fluorene	ug/l	2.8 J	8 J	MW-10	5 / 11	0.23 - 2.1	6.9	8	3	YES	**YES**	**A**
Naphthalene	ug/l	17	24	MW-10	2 / 11	0.26 - 2.1	14	24	1.1	NO	**YES**	**A**
Phenanthrene	ug/l	11	11	MW-10	2 / 11	0.13 - 2.1	-	11	0.4	YES	**YES**	**A**
Benzo(A)Anthracene	ug/l	-	-	-	0 / 11	0.12 - 2.1	-	0.06	0.018	YES	**YES**	**B**
Benzo(A)Pyrene	ug/l	-	-	-	0 / 11	0.21 - 2.1	-	0.105	0.015	YES	**YES**	**B**
Carbazole	ug/l	4 J	5 J	MW-10	2 / 11	0.3 - 2.1	4.6	5	-	NO	**YES**	**C**
Chrysene	ug/l	-	-	-	0 / 11	0.27 - 2.1	-	0.135	-	YES	NO	-
Dibenzo(A,H)Anthracene	ug/l	-	-	-	0 / 6	1.8 - 2.1	-	0.9	-	YES	NO	-
Fluoranthene	ug/l	1.6 J	2 J	MW-10	5 / 11	0.32 - 2.1	4.6	2	0.04	YES	**YES**	**A**
Pyrene	ug/l	0.99 J	2 J	MW-5	3 / 11	0.26 - 2.1	10	2	0.025	YES	**YES**	**A**
Benzo(B)Fluoranthene	ug/l	-	-	-	0 / 11	0.24 - 2.1	-	0.12	-	YES	NO	-
Benzo(K)Fluoranthene	ug/l	-	-	-	0 / 11	0.34 - 2.1	-	0.17	-	YES	NO	-
Benzo(G,H,I)Perylene	ug/l	-	-	-	0 / 11	0.21 - 2.1	-	0.105	-	YES	NO	-
Indeno(1,2,3-Cd)Pyrene	ug/l	-	-	-	0 / 11	0.26 - 2.1	-	0.13	-	YES	NO	-
2-Methylnaphthalene	ug/l	6 J	8 J	MW-10	2 / 11	0.33 - 2.1	6.8	8	4.7	NO	**YES**	**A**
Pesticides												
4,4-DDD	ug/l	-	-	-	0 / 6	0.018 - 0.019	-	0.009	0.011	YES	NO	-
4,4-DDE	ug/l	-	-	-	0 / 6	0.018 - 0.019	-	0.009	-	YES	NO	-
4,4-DDT	ug/l	-	-	-	0 / 6	0.018 - 0.019	-	0.009	0.0005	YES	**YES**	**B**
Aldrin	ug/l	-	-	-	0 / 6	0.0091 - 0.0093	-	0.00455	3	YES	NO	-
Alpha-BHC	ug/l	-	-	-	0 / 6	0.0091 - 0.0093	-	0.00455	-	YES	NO	-
Alpha-Chlordane	ug/l	0.013 J	0.013 J	MW-6	1 / 6	0.0091 - 0.0093	-	0.013	0.0022	NO	**YES**	**A**
gamma-Chlordane	ug/l	-	-	-	0 / 6	0.0091 - 0.0093	-	0.00455	0.0022	NO	**YES**	**B**
Alpha-Endosulfan	ug/l	-	-	-	0 / 6	0.0091 - 0.0093	-	0.00455	0.051	YES	NO	-
Beta-BHC	ug/l	0.012 J	0.027 J	MW-6	4 / 6	0.0091 - 0.0093	0.027	0.027	-	YES	**YES**	**F**
Beta-Endosulfan	ug/l	-	-	-	0 / 6	0.018 - 0.019	-	0.009	0.051	YES	NO	-
Delta-BHC	ug/l	-	-	-	0 / 6	0.0091 - 0.0093	-	0.00455	141	YES	NO	-
Dieldrin	ug/l	-	-	-	0 / 6	0.018 - 0.019	-	0.009	0.056	YES	NO	-
Endosulfan Sulfate	ug/l	-	-	-	0 / 6	0.018 - 0.019	-	0.009	-	NO	NO	-
Endrin	ug/l	0.02 J	0.02 J	MW-6	1 / 6	0.018 - 0.019	-	0.02	0.036	YES	**YES**	**F**
Endrin Aldehyde	ug/l	-	-	-	0 / 6	0.018 - 0.019	-	0.009	-	NO	NO	-
Endrin Ketone	ug/l	-	-	-	0 / 6	0.018 - 0.019	-	0.009	-	NO	NO	-
Gamma-BHC	ug/l	-	-	-	0 / 6	0.0091 - 0.0093	-	0.00455	0.01	YES	**YES**	**E**
Heptachlor	ug/l	0.02 J	0.02 J	MW-6	1 / 6	0.0091 - 0.0093	0.02	0.02	0.0019	YES	**YES**	**A**
Heptachlor Epoxide	ug/l	-	-	-	0 / 6	0.0091 - 0.0093	-	0.00455	0.0019	YES	**YES**	**B**
Methoxychlor	ug/l	-	-	-	0 / 6	0.091 - 0.093	-	0.0455	0.019	YES	**YES**	**B**
Toxaphene	ug/l	-	-	-	0 / 6	0.97 - 1	-	0.485	0.0002	YES	**YES**	**B**

RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - ANNEX
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Polychlorinated Biphenyls (PCBs)												
Aroclor 1016	ug/l	-	-	-	0 / 6	0.3 - 0.31	-	0.15	0.000074	YES	**YES**	**E**
Aroclor 1221	ug/l	-	-	-	0 / 6	0.36 - 0.37	-	0.18	0.000074	YES	**YES**	**E**
Aroclor 1232	ug/l	-	-	-	0 / 6	0.34 - 0.35	-	0.17	0.000074	YES	**YES**	**E**
Aroclor 1242	ug/l	-	-	-	0 / 6	0.23 - 0.23	-	0.115	0.000074	YES	**YES**	**E**
Aroclor 1248	ug/l	-	-	-	0 / 6	0.25 - 0.25	-	0.125	0.000074	YES	**YES**	**E**
Aroclor 1254	ug/l	-	-	-	0 / 6	0.33 - 0.34	-	0.165	0.000074	YES	**YES**	**E**
Aroclor 1260	ug/l	-	-	-	0 / 6	0.27 - 0.28	-	0.135	0.000074	YES	**YES**	**E**

Notes:
1 = Maximum concentration used for screening unless analyte is undectected; in which case 1/2 lowest method detection limit used; for dioxins/furans, screening concentration is the sum of the (TEQ * maximum concentration) for all congeners.
2 = USEPA Region 3 Freshwater Screening Benchmarks
3 = Bioaccumulative compounds will be considered in the Food Chain Evaluation
4 = Contaminant of Potential Ecological Concern
5 = Contaminant Categories
A = Constituent was detected at a concentration exceeding its screening value
B = Constituent was not detected at concentrations exceeding the DL; however, 1/2 the DL exceeds its screening value
C = Constituent was detected at concentrations exceeding its DL; however, there is no current screening value for the contaminant
D = Constituent was not detected at concentrations exceeding the current screening value for the contaminant
E = Constituent was not detected at concentrations exceeding the DL and there is a current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
F = Constituent was detected at concentrations exceeding the DL but below the current screening value for the contaminant (or there is no screening value); however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.

ug/l= micrograms per liter
mg/l= milligrams per liter

TABLE 8-4.3
RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - REFUGE AREA
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Inorganics												
Alkalinity, Total	mg/l	115	465	MW-17	4 / 4	2.72 - 5.43	409.7	465	-	NO	NO	C
Ammonia	mg/l	0.206 J	38.2 J	MW-17	4 / 4	0.082 - 0.41	33.33	38.2	0.019	NO	**YES**	**A**
Chloride	mg/l	18.4 J	492 J	MW-16	4 / 4	0.132 - 3.3	421.8	492	-	NO	NO	C
Nitrate	mg/l	-	-	-	0 / 4	0.0175 - 0.0175	-	0.00875	-	NO	NO	D
Nitrite	mg/l	0.0186 J	0.271 J	MW-19D	4 / 4	0.0137 - 0.0137	0.311	0.271	-	NO	NO	C
Sulfate	mg/l	2.65	34.4	MW-19D	4 / 4	0.238 - 0.238	30.97	34.4	-	NO	NO	C
Sulfide	mg/l	-	-	-	0 / 4	0.45 - 0.45	-	0.225	-	NO	NO	D
Total Organic Carbon	mg/l	5.07	28.4	MW-16	4 / 4	0.224 - 0.224	30.39	28.4	-	NO	NO	C
Total Suspended Solids	mg/l	3.3	1180	MW-17	21 / 20	0 - 0.775	253.1	1180	-	NO	NO	C
Volatile Organic Compounds (VOCs)												
1,2,4,5-Tetrachlorobenzene	ug/l	-	-	-	0 / 20	0.2 - 0.6	-	0.1	-	YES	**YES**	**C**
1,1,1-Trichloroethane	ug/l	-	-	-	0 / 20	0.03 - 0.24	-	0.015	11	NO	NO	-
1,1,2,2-Tetrachloroethane	ug/l	-	-	-	0 / 20	0.06 - 0.33	-	0.03	610	NO	NO	-
1,1,2-Trichloroethane	ug/l	-	-	-	0 / 20	0.08 - 0.4	-	0.04	1,200	NO	NO	-
1,1-Dichloroethane	ug/l	0.093 J	3.4 J	MW-16	4 / 20	0.04 - 0.29	0.917	3.4	47	NO	NO	D
1,1-Dichloroethene	ug/l	1	5.5	MW-16	7 / 27	0.07 - 0.5	1.855	5.5	25	NO	NO	D
1,2,4-Trichlorobenzene	ug/l	-	-	-	0 / 20	0.08 - 0.14	-	0.04	24	YES	NO	-
1,2,3-Trichlorobenzene	ug/l	-	-	-	0 / 20	0.07 - 0.25	-	0.035	8	NO	NO	-
1,2-Dibromo-3-Chloropropane	ug/l	-	-	-	0 / 20	0.013 - 0.23	-	0.0065	-	NO	NO	-
1,2-Dibromoethane	ug/l	-	-	-	0 / 20	0.23 - 0.3	-	0.115	-	NO	NO	-
1,2-Dichlorobenzene	ug/l	-	-	-	0 / 20	0.03 - 0.22	-	0.015	0.7	YES	NO	-
1,2-Dichloroethane	ug/l	0.17 J	0.17 J	MW-16	1 / 20	0.09 - 0.34	-	0.17	100	NO	NO	D
1,2-Dichloropropane	ug/l	-	-	-	0 / 20	0.08 - 0.23	-	0.04	-	NO	NO	-
1,3-Dichlorobenzene	ug/l	-	-	-	0 / 20	0.1 - 0.23	-	0.05	150	YES	NO	-
1,4-Dichlorobenzene	ug/l	-	-	-	0 / 20	0.14 - 0.3	-	0.07	26	YES	NO	-
1,4-Dioxane	ug/l	0.12 J	740 J	MW-16	17 / 27	0.13 - 8.7	170.1	740	-	NO	**YES**	**C**
2-Butanone	ug/l	1.5 J	1.5 J	MW-17	1 / 20	1 - 1.8	-	1.5	14,000	NO	NO	-
2-Hexanone	ug/l	-	-	-	0 / 20	1 - 2.6	-	0.5	99	NO	NO	-
4-Methyl-2-Pentanone	ug/l	-	-	-	0 / 20	0.33 - 2.3	-	0.165	170	NO	NO	-
Acetone	ug/l	3.7 J	3.7 J	MW-18D	1 / 20	2.7 - 6.5	-	3.7	1,500	NO	NO	D
Benzene	ug/l	0.039 J	1.6 J	MW-16	7 / 20	0.037 - 0.29	0.875	1.6	370	NO	NO	D
Bromochloromethane	ug/l	-	-	-	0 / 20	0.06 - 0.2	-	0.03	-	NO	NO	-
Bromodichloromethane	ug/l	-	-	-	0 / 20	0.037 - 0.19	-	0.0185	-	NO	NO	-
Bromoform	ug/l	-	-	-	0 / 20	0.06 - 0.12	-	0.03	320	NO	NO	-
Bromomethane	ug/l	-	-	-	0 / 20	0.14 - 0.9	-	0.07	-	NO	NO	D
Carbon Disulfide	ug/l	0.14 J	1.1 J	MW-20B	5 / 20	0.09 - 0.28	0.577	1.1	0.92	NO	**YES**	**A**
Carbon Tetrachloride	ug/l	-	-	-	0 / 20	0.033 - 0.25	-	0.0165	13.3	NO	NO	-
Chlorobenzene	ug/l	0.037 J	1 J	MW-15D	7 / 27	0.03 - 0.3	0.374	1	1.3	NO	NO	D
Chloroethane	ug/l	-	-	-	0 / 20	0.14 - 1.1	-	0.07	-	NO	NO	-
Chloroform	ug/l	0.041 J	0.99 J	MW-19S	4 / 20	0.04 - 0.24	0.571	0.99	1.8	NO	NO	D
Chloromethane	ug/l	-	-	-	0 / 20	0.11 - 0.41	-	0.055	-	NO	NO	-
Cis-1,2-Dichloroethene	ug/l	0.11 J	79 J	MW-16	11 / 27	0.09 - 0.9	18/94	79	590	NO	NO	-
Cis-1,3-Dichloropropene	ug/l	-	-	-	0 / 20	0.11 - 0.18	-	0.055	0.055	NO	NO	-
Cyclohexane	ug/l	0.16 J	0.16 J	MW-16	1 / 20	0.06 - 0.27	-	0.16	-	NO	**YES**	C
Dibromochloromethane	ug/l	-	-	-	0 / 20	0.05 - 0.16	-	0.025	-	NO	NO	-
Dichlorodifluoromethane	ug/l	-	-	-	0 / 20	0.13 - 0.3	-	0.065	-	NO	NO	-
Ethylbenzene	ug/l	0.031 J	0.035 J	MW-17	2 / 20	0.03 - 0.25	0.0365	0.035	90	NO	NO	D
Freon 113	ug/l	-	-	-	0 / 20	0.21 - 0.27	-	0.105	-	NO	NO	-

TABLE 8-4.3
RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration	Maximum Concentration	Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Isopropylbenzene	ug/l	0.14 J	0.14 J	MW-16	1 / 20	0.08 - 0.29	-	0.14	2.6	NO	NO	D
Methyl Acetate	ug/l	-	-	-	0 / 20	0.11 - 0.48	-	0.055	-	NO	NO	-
Methyl Cyclohexane	ug/l	-	-	-	0 / 20	0.035 - 0.35	-	0.0175	-	NO	NO	-
Methyl Tert-Butyl Ether	ug/l	0.076 J	0.21 J	MW-15S	6 / 20	0.04 - 0.19	0.215	0.21	11,070	NO	NO	D
Methylene Chloride	ug/l	0.22 J	0.26 J	MW-18D	3 / 20	0.21 - 0.6	0.347	0.26	98.1	NO	NO	D
Styrene	ug/l	-	-	-	0 / 20	0.03 - 0.25	-	0.015	72	NO	NO	-
Tetrachloroethene	ug/l	-	-	-	0 / 20	0.028 - 0.3	-	0.014	111	NO	NO	-
Toluene	ug/l	-	-	-	0 / 20	0.05 - 0.25	-	0.025	2	NO	NO	-
Trans-1,2-Dichloroethene	ug/l	0.11 J	0.11 J	MW-16	1 / 20	0.05 - 0.23	-	0.11	970	NO	NO	D
Trans-1,3-Dichloropropene	ug/l	-	-	-	0 / 20	0.11 - 0.17	-	0.055	0.055	NO	NO	-
Trichloroethene	ug/l	0.81 J	1.7 J	MW-16	7 / 27	0.049 - 0.31	0.838	1.7	21	NO	NO	D
Trichlorofluoromethane	ug/l	-	-	-	0 / 20	0.06 - 0.31	-	0.03	-	NO	NO	-
Vinyl Chloride	ug/l	1	120	MW-16	7 / 27	0.023 - 0.45	33.42	120	930	NO	NO	D
m,p-Xylenes	ug/l	0.051 J	0.1 J	MW-17	3 / 20	0.03 - 0.23	0.106	0.1	13	NO	NO	D
o-Xylene	ug/l	0.078 J	0.078 J	MW-17	1 / 20	0.03 - 0.27	-	0.078	13	NO	NO	D
Semivolatile Organic Compounds												
2,3,4,6-Tetrachlorophenol	ug/l	-	-	-	0 / 20	0.22 - 0.3	-	0.11	-	NO	NO	-
2,4,5-Trichlorophenol	ug/l	-	-	-	0 / 20	0.22 - 0.32	-	0.11	-	NO	NO	-
2,4,6-Trichlorophenol	ug/l	-	-	-	0 / 20	0.2 - 0.37	-	0.1	4.9	NO	NO	-
2,4-Dichlorophenol	ug/l	-	-	-	0 / 20	0.16 - 0.44	-	0.08	11	NO	NO	-
2,4-Dimethylphenol	ug/l	0.77 J	0.77 J	MW-16	1 / 20	0.094 - 0.41	-	0.77	-	NO	**YES**	**C**
2,4-Dinitrophenol	ug/l	-	-	-	0 / 20	0.94 - 4.7	-	0.47	-	NO	NO	-
2,4-Dinitrotoluene	ug/l	-	-	-	0 / 20	0.3 - 0.35	-	0.15	44	NO	NO	-
2,6-Dinitrotoluene	ug/l	-	-	-	0 / 20	0.19 - 0.27	-	0.095	81	NO	NO	-
2-Chloronaphthalene	ug/l	-	-	-	0 / 20	0.13 - 0.53	-	0.065	-	NO	NO	-
2-Chlorophenol	ug/l	-	-	-	0 / 20	0.18 - 0.6	-	0.09	24	NO	NO	-
2-Methylphenol	ug/l	-	-	-	0 / 20	0.21 - 0.55	-	0.105	13	NO	NO	-
2-Nitroaniline	ug/l	-	-	-	0 / 20	0.25 - 0.53	-	0.125	-	NO	NO	-
2-Nitrophenol	ug/l	-	-	-	0 / 20	0.14 - 0.42	-	0.07	1,920	NO	NO	-
3,3'-Dichlorobenzidine	ug/l	-	-	-	0 / 20	0.42 - 0.55	-	0.21	4.5	NO	NO	-
3-Nitroaniline	ug/l	-	-	-	0 / 20	0.3 - 0.49	-	0.15	-	NO	NO	-
4,6-Dinitro-2-Methylphenol	ug/l	-	-	-	0 / 20	0.3 - 0.45	-	0.15	-	NO	NO	-
4-Bromophenyl-Phenylether	ug/l	-	-	-	0 / 20	0.13 - 0.24	-	0.065	1.5	YES	NO	-
4-Chloro-3-Methylphenol	ug/l	-	-	-	0 / 20	0.2 - 0.41	-	0.1	-	NO	NO	-
4-Chloroaniline	ug/l	-	-	-	0 / 20	0.13 - 0.42	-	0.065	232	NO	NO	-
4-Chlorophenyl-Phenylether	ug/l	-	-	-	0 / 20	0.22 - 0.5	-	0.11	-	YES	NO	-
4-Methylphenol	ug/l	0.21 J	0.65 J	MW-17	3 / 20	0.094 - 0.63	0.617	0.65	543	NO	NO	D
4-Nitroaniline	ug/l	-	-	-	0 / 20	0.36 - 0.53	-	0.18	-	NO	NO	-
4-Nitrophenol	ug/l	-	-	-	0 / 20	0.28 - 0.51	-	0.14	60	NO	NO	-
Acetophenone	ug/l	0.29 J	0.29 J	MW-20B	1 / 20	0.14 - 0.53	-	0.29	-	NO	**YES**	C
Atrazine	ug/l	-	-	-	0 / 20	0.21 - 0.32	-	0.105	1.8	NO	NO	-
Benzaldehyde	ug/l	-	-	-	0 / 20	0.21 - 0.75	-	0.105	-	NO	NO	-
Biphenyl	ug/l	-	-	-	0 / 20	0.14 - 0.5	-	0.07	14	NO	NO	-
Bis(2-Chloroethoxy)Methane	ug/l	-	-	-	0 / 20	0.18 - 0.42	-	0.09	-	NO	NO	-
Bis(2-Chloroethyl) Ether	ug/l	-	-	-	0 / 20	0.23 - 0.57	-	0.115	-	NO	NO	-
Bis(2-Chloroisopropyl) Ether	ug/l	-	-	-	0 / 9	0.61 - 0.66	-	0.305	-	NO	NO	-
Bis(2-chloro-1-methylethyl) Ether	ug/l	-	-	-	0 / 11	0.17 - 0.19	-	0.085	-	NO	NO	-
Bis(2-Ethylhexyl) Phthalate	ug/l	7.5	8.4	MW-16	2 / 20	1.9 - 2.9	5.74	8.4	16	NO	NO	D
Butylbenzyl Phthalate	ug/l	-	-	-	0 / 20	0.26 - 2	-	0.13	19	NO	NO	-

RANGE OF CONTAMINANTS FOUND IN GROUNDWATER - LANDFILL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

Parameter	Units	Minimum Concentration		Maximum Concentration		Maximum Concentration Location	Detection Frequency	Range of Detection Limits (DL)	95% UCL	Measured Concentration Used For Screening[1]	USEPA Region 3 Freshwater Screening Benchmarks[2]	Bioaccumulative[3]	COPEC[4]	Contaminant Category[5]
Caprolactum	ug/l	1.9	J	1.9	J	MW-17	1 / 20	0.59 - 1.4	-	1.9	-	NO	**YES**	C
Dibenzofuran	ug/l	-		-		-	0 / 20	0.18 - 0.23	-	0.09	3.7	NO	NO	-
Diethyl Phthalate	ug/l	-		-		-	0 / 20	0.39 - 0.53	-	0.195	210	NO	NO	-
Dimethyl Phthalate	ug/l	-		-		-	0 / 20	0.2 - 0.32	-	0.1	-	NO	NO	-
Di-N-Butyl Phthalate	ug/l	-		-		-	0 / 20	0.12 - 0.62	-	0.06	19	NO	NO	-
Hexachlorobenzene	ug/l	-		-		-	0 / 20	0.17 - 0.25	-	0.085	0.0003	YES	**YES**	**B**
Hexachlorobutadiene	ug/l	-		-		-	0 / 20	0.15 - 0.58	-	0.075	1.3	YES	NO	-
Hexachlorocyclopentadiene	ug/l	-		-		-	0 / 20	0.37 - 0.65	-	0.185	-	YES	NO	-
Hexachloroethane	ug/l	-		-		-	0 / 20	0.15 - 0.31	-	0.075	12	YES	NO	-
Isophorone	ug/l	-		-		-	0 / 20	0.18 - 0.32	-	0.09	-	NO	NO	-
Nitrobenzene	ug/l	-		-		-	0 / 20	0.25 - 0.53	-	0.125	-	NO	NO	-
N-Nitroso-Di-N-Propylamine	ug/l	-		-		-	0 / 20	0.17 - 0.48	-	0.085	-	NO	NO	-
N-Nitrosodiphenylamine	ug/l	-		-		-	0 / 20	0.16 - 0.2	-	0.08	210	NO	NO	-
Pentachlorophenol	ug/l	-		-		-	0 / 20	0.22 - 0.38	-	0.11	0.5	YES	NO	-
Phenol	ug/l	2.1	J	2.1	J	MW-20B	1 / 20	0.15 - 0.66	-	2.1	4	NO	NO	D
Di-N-Octyl Phthalate	ug/l	-		-		-	0 / 20	0.28 - 0.96	-	0.14	22	NO	NO	-
Acenaphthene	ug/l	2.4	J	2.4	J	MW-15D	1 / 20	0.19 - 0.48	-	2.4	5.8	YES	**YES**	**F**
Acenaphthylene	ug/l	-		-		-	0 / 20	0.16 - 0.39	-	0.08	-	YES	NO	-
Anthracene	ug/l	-		-		-	0 / 20	0.18 - 0.31	-	0.09	0.012	YES	**YES**	**A**
Fluorene	ug/l	-		-		-	0 / 20	0.23 - 0.44	-	0.115	3	YES	NO	-
Naphthalene	ug/l	0.22	J	0.35	J	MW-17	3 / 20	0.19 - 0.45	1.298	0.35	1.1	NO	NO	D
Phenanthrene	ug/l	0.3	J	0.3	J	MW-17	1 / 20	0.13 - 0.17	-	0.3	0.4	YES	**YES**	**F**
Benzo(A)Anthracene	ug/l	-		-		-	0 / 20	0.12 - 0.19	-	0.06	0.018	YES	**YES**	**A**
Benzo(A)Pyrene	ug/l	-		-		-	0 / 20	0.21 - 0.23	-	0.105	0.015	YES	**YES**	**B**
Carbazole	ug/l	-		-		-	0 / 20	0.2 - 0.32	-	0.1	-	NO	NO	-
Chrysene	ug/l	-		-		-	0 / 20	0.2 - 0.29	-	0.1	-	YES	NO	-
Dibenzo(A,H)Anthracene	ug/l	-		-		-	0 / 20	0.17 - 0.36	-	0.085	-	YES	NO	-
Fluoranthene	ug/l	0.27	J-	0.27	J-	MW-17	1 / 20	0.18 - 0.37	-	0.27	0.04	YES	**YES**	**A**
Pyrene	ug/l	0.31	J-	0.31	J-	MW-17	1 / 20	0.25 - 0.3	-	0.31	0.025	YES	**YES**	**A**
Benzo(B)Fluoranthene	ug/l	-		-		-	0 / 20	0.22 - 0.36	-	0.11	-	YES	NO	-
Benzo(K)Fluoranthene	ug/l	-		-		-	0 / 20	0.16 - 0.36	-	0.08	-	YES	NO	-
Benzo(G,H,I)Perylene	ug/l	-		-		-	0 / 20	0.15 - 0.31	-	0.075	-	YES	NO	-
Indeno(1,2,3-Cd)Pyrene	ug/l	-		-		-	0 / 20	0.2 - 0.28	-	0.1	-	YES	NO	-
2-Methylnaphthalene	ug/l	-		-		-	0 / 20	0.22 - 0.57	-	0.11	4.7	NO	NO	-

Notes:
1 = Maximum concentration used for screening unless analyte is undectected; in which case 1/2 lowest method detection limit used; for dioxins/furans, screening concentration is the sum of the (TEQ * maximum concentration) for all congeners.
2 = USEPA Region 3 Freshwater Screening Benchmarks
3 = Bioaccumulative compounds will be considered in the Food Chain Evaluation
4 = Contaminant of Potential Ecological Concern
5 = Contaminant Categories
A = Constituent was detected at a concentration exceeding its screening value
B = Constituent was not detected at concentrations exceeding the DL; however, 1/2 the DL exceeds its screening value
C = Constituent was detected at concentrations exceeding its DL; however, there is no current screening value for the contaminant
D = Constituent was not detected at concentrations exceeding the current screening value for the contaminant
E = Constituent was not detected at concentrations exceeding the DL and there is a current screening value for the contaminant; however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
F = Constituent was detected at concentrations exceeding the DL but below the current screening value for the contaminant (or there is no screening value); however, the contaminant will be retained for further evaluation due to its potential to bioaccumulate.
ug/l= micrograms per liter
mg/l= milligrams per liter

Ecological Exposure Parameters
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Species	Exposure Parameter	Reported value	Assessment Value	Assumptions/Reference
Red Fox (*Vulpes vulpes*)	Home range	96 hectare (237 acres)	Area Use Factor = 1	Conservatively based on Wisconsin/diverse data from EPA, 1993. Assumes AUF based on a area of 16.5 acres for the annex and 37.5 acres for the landfill.
	Diet	Mammals/Birds/Insects/ Plants	100% small mammals	Conservative estimate to evaluate the species as a carnivore
	Food ingestion rate (wet weight)	0.069 gram/gram day	0.313 kg/day	Based on nonbreeding Adult from EPA 1993
	Food Dry Weight Fraction	0.32	0.32	Based on mammal moisture content in EPA, 2007
	Food ingestion rate (dry weight)	0.02208 gram/gram-day	0.1 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Water Ingestion Rate	0.085 gram/gram day	0.386 kg/day	Based on estimated value provided in EPA, 1993
	Soil ingestion rate	2.8% of food ingestion rate (dry weight)	0.0028 kg/day	"Estimates of Soil Ingestion by Wildlife" by Beyer et al, 1994.
	Body weight	3.94 - 5.25 kg	4.54 kg	Mean of adult males and females in spring and fall in Illinois, Iowa, Wisconsin, and North Dakota from EPA, 1993.
Deer Mouse (*Peromyscus maniculatus*)	Home range	0.595 hectare (1.47 acres)	Area Use Factor = 1	Based on mean Virginia/mixed deciduous forest data from EPA, 1993.
	Diet	Plants/Insects	37% insects 63% plants	Based on seasonal mean Indiana data from EPA, 1993.
	Food ingestion rate (wet weight)	0.205 gram/gram day	0.0043 kg/day	Based on male/female mean for Virginia lab from EPA 1993
	Food Dry Weight Fraction	0.28	0.28	Based on dietary composition above and moisture content from EPA, 2007
	Food ingestion rate (dry weight)	0.0574 gram/gram-day	0.0012 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Water Ingestion Rate	0.19 grams/gram-day	0.004 kg/day	Based on breeding adult for Illinois from EPA 1993
	Soil ingestion rate	2.0% of food ingestion rate (dry weight)	0.0000242 kg/day	"Estimates of Soil Ingestion by Wildlife" by Beyer et al, 1994.
	Body weight	20.0 - 22.0 grams	0.021 kg	Based on the mean of adult males and females in North America (Miller 1989) from EPA, 1993.
Meadow Vole (*Microtus pennsylvanicus*)	Home range	0.013 hectare (0.032 acres)	Area Use Factor = 1	Based on mean adult male and female in Virginia/old field data from EPA, 1993.
	Diet	Plants	100% Plants	Based on seasonal mean Illinois Bluegrass data from EPA, 1993. Conservative estimate to evaluate the species as an herbivore
	Food ingestion rate (wet weight)	0.325 gram/gram day	0.012 kg/day	Based on Meadow Vole Russian study from EPA 1993
	Food Dry Weight Fraction	0.15	0.15	Based on dietary composition above and moisture content from EPA, 2007
	Food ingestion rate (dry weight)	0.04875 gram/gram-day	0.0018 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Water Ingestion Rate	0.21 grams/gram-day	0.0078 kg/day	Based on Ernst, 1968 provided in EPA, 1993
	Soil ingestion rate	2.4% of food ingestion rate (dry weight)	0.0000432 kg/day	"Estimates of Soil Ingestion by Wildlife" by Beyer et al, 1994.
	Body weight	35.5 - 39.0 grams	0.037 kg	Based on the mean of adult males and females in south Indiana from EPA, 1993.

Checked by SLJ

Ecological Exposure Parameters
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Species	Exposure Parameter	Reported value	Assessment Value	Assumptions/Reference
Short-tailed Shrew (*Blarina brevicauda*)	Home range	0.108 hectares (0.267 acres)	Area Use Factor = 1	Based on mean adult male and female in Michigan bluegrass data from EPA, 1993.
	Diet	94.6% Insects 5.4% Plants	100% Insects	Based on New York data from EPA, 1993. Conservative estimate to evaluate the species as an insectivore
	Food ingestion rate (wet weight)	0.555 gram/gram day	0.0096 kg/day	Based on mean Ohio Lab data from EPA 1993
	Food Dry Weight Fraction	0.16	0.16	Based on dietary composition above and moisture content from EPA, 2007
	Food ingestion rate (dry weight)	0.0888 gram/gram-day	0.0015 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Water Ingestion Rate	0.223 grams/gram-day	0.0039 kg/day	Based on breeding adult for Illinois from EPA 1993
	Soil ingestion rate	3.0% of food ingestion rate (dry weight)	0.000046 kg/day	Used 90th percentile value for Shrew from EPA, 2005 based on diet above
	Body weight	15.58 - 19.21 grams	0.0173 kg	Based on the mean of adult males and females in Pennsylvania from EPA, 1993.
American Robin (*Turdus migratorius*)	Home range	0.81 hectare (2 acres)	Area Use Factor = 1	Based on American Robin data from EPA, 1993.
	Diet	invertebrates and plants	37.5% invertebrates 62.5% plants	Based on American Robin data (arithmetic mean of adults in eastern U.S.) in EPA, 1993.
	Food ingestion rate (wet weight)	0.89 gram/gram-day	0.0685 kg/day	Based on American Robin data for California in EPA, 1993.
	Food Dry Weight Fraction	0.1548	0.1548	Based on dietary composition above and moisture content from EPA, 2007
	Food ingestion rate (dry weight)	0.138 gram/gram-day	0.0106 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Water Ingestion Rate	0.14 grams/gram-day	0.011 kg/day	Estimated value provided in EPA, 1993
	Soil ingestion rate	15.1% of food ingestion rate (dry weight)	0.0016 kg/day	Based on 90th percentile Dove/Woodcock data from EPA, 2005 based on diet above
	Body weight	77.3 grams	0.077 kg	Based on American Robin data for Pennsylvania in EPA, 1993.
Northern Bobwhite (*Colinus virginianus*)	Home range	3.6 hectare (8.9 acres)	Area Use Factor = 1	Conservatively based on Iowa/State game area data from EPA, 1993.
	Diet	Seeds, fruits, other plants, insects	100% plants	Data from seasonal mean of south Texas/prairie data, EPA, 1993. 100% plant diet evaluated since species is evaluated as an herbivore
	Food ingestion rate (wet weight)	.07775 gram/gram-day	0.0122 kg/day	EPA, 1993. southern Texas study used.
	Food Dry Weight Fraction	0.15	0.15	Based on dietary composition above and moisture content from EPA, 2007
	Food ingestion rate (dry weight)	0.0117 gram/gram-day	0.0018 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Water Ingestion Rate	0.115 grams/gram-day	0.018 kg/day	Based on mean of adult males and females in southern Texas from EPA, 1993
	Soil ingestion rate	13.9% of food ingestion rate (dry weight)	.00026 kg/day	Based on 90th percentile Dove data from EPA, 2005.
	Body weight	157 grams	0.157 kg	Conservatively based on the mean of adult males and females in summer and winter in west Rio Grande, Texas from EPA, 1993.

Ecological Exposure Parameters
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Species	Exposure Parameter	Reported value	Assessment Value	Assumptions/Reference
American Woodcock (Scolopax minor)	Home range	73.6 hectare (181 acres)	Area Use Factor = 1	Based on mean active male home range for Pennsylvania mixed forest. EPA, 1993.Assumes AUF based on a area of 16.5 acres for the annex and 37.5 acres for the landfill.
	Diet	89.5% Invertebrates 10.5% plants	100% invertebrates	Based on North America data in EPA, 1993.Conservative estimate to evaluate the species as an insectivore
	Food ingestion rate (wet weight)	0.77 gram/gram-day	0.152 kg/day	Based on Louisiana captive data from EPA, 1993.
	Food Dry Weight Fraction	0.16	0.16	Based on dietary composition above and moisture content from EPA, 2007
	Food ingestion rate (dry weight)	0.123 gram/gram-day	0.024 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Water Ingestion Rate	0.10grams/gram-day	0.0197 kg/day	Estimated value provided in EPA, 1993
	Soil ingestion rate	10.4% of food ingestion rate (dry weight)	0.0025kg/day	Based on 90th percentile Woodcock data from EPA, 2005.
	Body weight	176 - 218 g	0.197 kg	Based on the arithmetic mean of adult males and females throughout range. EPA, 1993.
Red-tailed Hawk (*Buteo jamaicensis*)	Home range	60 - 160 hectares (148 - 395 acres)	Area Use Factor = 1	Based on adult males and females in spring in California from EPA, 1993. Assumes AUF based on a area of 16.5 acres for the annex and 37.5 acres for the landfill.
	Diet	small mammals, birds, reptiles	100% small mammals	Simplifying assumption. Small mammals are assumed to be deer mouse or similar. Dietary description from EPA, 1993.
	Food ingestion rate (wet weight)	0.093 gram/gram-day	0.105 kg/day	Based on arithmetic mean of adult males in summer and winter in Michigan from EPA, 1993.
	Food Dry Weight Fraction	0.32	0.32	Dry weight fraction for small mammals from EPA, 2007.
	Food ingestion rate (dry weight)	.02976 gram/gram-day	.0337 kg/day	Wet weight ingestion rate multiplied by dry fraction.
	Water Ingestion Rate	0.057 grams/gram-day	0.065 kg/day	Estimated value provided in EPA, 1993
	Soil ingestion rate	5.7% of food ingestion rate (dry weight)	0.00192 kg/day	Based on 90th percentile from EPA, 2005.
	Body weight	1.134 kg	1.134 kg	Based on the arithmetic mean of adult males and females in Michigan, Pennsylvania, sw Idaho, and Ohio. EPA, 1993.

References

U.S. Environmental Protection Agency (EPA). 1993. *Wildlife Exposure Factors Handbook* . EPA, Office of Health and Environmental Assessment, Office of Research and development; Washington, D.C. EPA/600/R-93/187a. December.

U.S. Environmental Protection Agency (EPA). 2007. *Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs).* Attachment 4-1. April 2007 revision.

Table 8-6
COPEC Soil Concentration Estimation in Food Items - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Food Item	Dry Fraction
Plant	0.15
Earthworms	0.16
Mammals	0.32

For uptake equations that calculate dry weight tissue concentrations of COPECs, the estimated concentration was multiplied by the appropriate dry fraction to yield the fresh weight COPC concentration. Dry fraction from EPA, 2007.

COPC	C_s^{max}	$C_s^{95\%}$	Cs^{mean}	BCF_{s-p}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{Pmean}	BCF_{s-i}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	K_{ow}	Ba_m	BCF_{p-m}	BCF_{s-m}	C_f^{smmax}	$C_f^{sm95\%}$	C_f^{smmean}
Units------->	mg/kg DW	mg/kg DW		Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	mg/kg WW	mg/kg WW	mg/kg WW					mg/kg WW	mg/kg WW	mg/kg WW
Inorganics																		
Aluminum	2.3E+04	1.6E+04	1.5E+04	4.0E-03	1.4E+01	9.5E+00	8.8E+00	2.2E-01	5.0E+03	3.5E+03	3.2E+03	-	-	-	-	-	-	-
Antimony	1.8E+01	2.9E+00	2.1E+00	-	8.9E-02	1.6E-02	1.2E-02	1.0E+00	2.9E+00	4.6E-01	3.4E-01	-	-	-	5.0E-02	1.4E-03	2.5E-04	1.9E-04
Arsenic	2.0E+01	1.0E+01	9.1E+00	3.8E-02	1.1E-01	5.7E-02	5.1E-02	-	3.2E-01	2.0E-01	1.8E-01	-	-	-	-	2.9E-02	1.7E-02	1.5E-02
Barium	8.6E+02	2.9E+02	1.8E+02	1.6E-01	2.0E+01	6.8E+00	4.2E+00	9.1E-02	1.3E+01	4.2E+00	2.6E+00	-	-	-	7.5E-03	4.9E-02	1.6E-02	1.0E-02
Beryllium	6.6E+01	9.4E+00	2.6E+00	-	1.9E+00	4.6E-01	1.8E-01	4.5E-02	4.8E-01	6.8E-02	1.9E-02	-	-	-	5.0E-02	3.0E-02	7.3E-03	2.9E-03
Cadmium	8.1E+00	2.2E+00	1.2E+00	-	2.9E-01	1.4E-01	1.0E-01	-	7.0E+00	2.5E+00	1.6E+00	-	-	-	-	2.4E-01	1.3E-01	1.0E-01
Chromium	1.4E+02	5.9E+01	5.2E+01	-	8.6E-01	3.6E-01	3.2E-01	-	6.9E+00	2.9E+00	2.6E+00	-	-	-	-	2.8E+00	1.5E+00	1.4E+00
Cobalt	1.6E+02	3.0E+01	1.4E+01	7.5E-03	1.8E-01	3.4E-02	1.6E-02	1.2E-01	3.1E+00	5.9E-01	2.8E-01	-	-	-	-	2.7E+00	3.2E-01	1.2E-01
Copper	1.1E+04	1.5E+03	4.4E+02	-	1.1E+01	5.2E+00	3.2E+00	-	8.7E+02	1.2E+02	3.6E+01	-	-	-	-	9.4E+00	7.1E+00	5.9E+00
Iron	2.0E+05	4.1E+04	3.3E+04	2.5E-03	7.5E+01	1.5E+01	1.2E+01	2.2E-01	4.4E+04	8.9E+03	7.2E+03	-	-	-	-	-	-	-
Lead	4.3E+03	4.4E+02	3.6E+02	-	4.3E+00	1.2E+00	1.1E+00	-	1.1E+02	1.8E+01	1.5E+01	-	-	-	-	1.4E+01	5.1E+00	4.7E+00
Manganese	9.8E+03	1.7E+03	7.0E+02	7.9E-02	1.2E+02	2.0E+01	8.3E+00	-	3.7E+01	1.1E+01	6.2E+00	-	-	-	2.1E-02	6.4E+01	1.1E+01	4.6E+00
Mercury	6.7E+00	1.9E+00	1.5E+00	-	2.3E-01	6.3E-02	5.0E-02	-	3.6E-01	1.0E-01	8.1E-02	-	2.5E-01 d	1.08E-03 d	6.0E-06	2.6E-04	7.1E-05	5.7E-05
Nickel	1.3E+03	2.2E+02	7.6E+01	-	3.5E+00	9.3E-01	4.1E-01	-	2.2E+02	3.8E+01	1.3E+01	-	-	-	-	7.1E+00	3.1E+00	1.9E+00
Selenium	1.1E+00	6.5E-01	4.6E-01	-	8.5E-02	4.7E-02	3.2E-02	2.2E-01	2.4E-01	1.4E-01	1.0E-01	-	-	-	-	2.2E-01	1.8E-01	1.6E-01
Silver	5.4E+00	1.9E+00	8.9E-01	1.4E-02	1.1E-02	3.9E-03	1.9E-03	-	1.8E+00	6.1E-01	2.9E-01	-	-	-	-	6.9E-03	2.4E-03	1.1E-03
Thallium	3.2E-01	-	-	4.0E-03	1.9E-04	-	-	2.2E-01	6.9E-02	-	-	-	-	-	-	-	-	-
Vanadium	8.4E+01	4.8E+01	4.5E+01	4.9E-03	6.1E-02	3.5E-02	3.3E-02	4.2E-02	5.7E-01	3.2E-01	3.1E-01	-	-	-	1.2E-02	3.3E-01	1.9E-01	1.8E-01
Zinc	1.8E+04	3.2E+03	1.1E+03	-	1.6E+02	6.3E+01	3.5E+01	-	3.4E+02	1.9E+02	1.4E+02	-	-	-	-	5.0E+01	4.4E+01	4.1E+01
VOCs																		
Acetone	2.90E-02	-	5.30E-03	5.2E+01	2.3E-01	-	4.1E-02	5.00E-02	1.5E-03	-	2.6E-04	6.0E-01	1.5E-08	6.5E-11	3.6E-13	1.5E-11	-	2.7E-12
SVOCs																		
Acetophenone	8.8E-02	-	8.1E-02	4.7E+00	6.2E-02	-	5.7E-02	1.4E+00	1.2E-01	-	1.1E-01	3.8E+01	9.5E-07	4.1E-09	2.3E-11	2.6E-10	-	2.4E-10
Biphenyl	2.5E+00	2.1E-01	1.1E-01	1.9E-01	7.0E-02	6.0E-03	3.1E-03	1.4E+02	3.4E+02	2.9E+01	1.5E+01	1.0E+04	2.6E-04	1.1E-06	6.2E-09	3.0E-08	7.0E-09	3.7E-09
Bis(2-Ethylhexyl) Phthalate	1.4E+00	3.1E-01	2.1E-01	3.8E-02	8.0E-03	1.8E-03	1.2E-03	1.3E+03	1.8E+03	4.1E+02	2.8E+02	1.6E+05	4.0E-03	1.7E-05	9.7E-08	1.8E-07	4.1E-08	2.8E-08
Butylbenzyl Phthalate	9.4E-01	-	-	7.1E-02	1.0E-02	-	-	5.3E+02	5.0E+02	-	-	5.4E+04	1.3E-03	5.8E-06	3.2E-08	6.8E-08	-	-
Carbazole	4.0E-01	1.2E-01	8.8E-02	2.7E-01	1.6E-02	4.9E-03	3.6E-03	8.0E+01	3.2E+01	9.4E+00	7.0E+00	5.2E+03	1.3E-04	5.7E-07	3.2E-09	9.7E-09	2.9E-09	2.1E-09
Dibenzofuran	1.5E+00	1.3E-01	7.9E-02	1.6E-01	3.6E-02	3.1E-03	1.9E-03	1.7E+02	2.5E+02	2.1E+01	1.3E+01	1.3E+04	3.3E-04	1.4E-06	7.9E-09	5.5E-08	4.7E-09	2.9E-09
Dimethyl Phthalate	4.1E-01	-	5.2E-02	4.6E+00	2.8E-01	-	3.6E-02	1.5E+00	6.0E-01	-	7.6E-02	4.0E+01	1.0E-06	4.3E-09	2.4E-11	1.2E-09	-	1.5E-10
Di-N-Octyl Phthalate	1.9E+01	1.4E+00	4.8E-01	1.6E-04	4.5E-04	3.2E-05	1.1E-05	3.1E+06	5.9E+07	4.2E+06	1.5E+06	2.1E+09	5.4E+01	2.3E-01	1.3E-03	7.9E-03	5.7E-04	2.0E-04
Hexachlorocyclopentadiene	1.8E-02	-	-	5.7E-02	1.5E-04	-	-	7.5E+02	1.3E+01	-	-	8.1E+04	2.0E-03	8.7E-06	4.9E-08	1.6E-09	-	-
N-Nitrosodiphenylamine	4.4E-02	-	-	6.0E-01	4.0E-03	-	-	2.6E+01	1.2E+00	-	-	1.3E+03	3.4E-05	1.5E-07	8.1E-10	5.9E-10	-	-
Phenol	2.1E-01	5.6E-02	5.4E-02	5.5E+00	1.7E-01	4.7E-02	4.5E-02	1.1E+00	2.4E-01	6.3E-02	6.1E-02	2.9E+01	7.2E-07	3.1E-09	1.7E-11	5.5E-10	1.5E-10	1.4E-10
Total Low Molecular Weight PAHS	4.0E+01	5.8E+00	1.9E+00	-	2.1E-01	8.9E-02	5.3E-02	3.0E+00	2.0E+01	2.8E+00	9.2E-01	-	-	-	0.E+00	0.E+00	0.E+00	0.E+00
Total High Molecular Weight PAHS	3.6E+01	1.1E+01	5.9E+00	-	8.2E-01	2.6E-01	1.5E-01	2.6E+00	1.5E+01	4.6E+00	2.4E+00	-	-	-	0.E+00	0.E+00	0.E+00	0.E+00
Pesticides																		
4,4'-DDD	2.4E-01	6.1E-02	2.1E-02	-	4.2E-03	1.5E-03	6.7E-04	-	1.9E-01	7.3E-02	3.5E-02	1.3E+06	3.3E-02	1.4E-04	8.0E-07	6.5E-07	2.3E-07	1.0E-07
4,4'-DDE	7.2E-01	1.0E-01	2.7E-02	-	9.5E-03	2.2E-03	8.0E-04	-	1.4E+00	2.5E-01	7.9E-02	1.8E+06	4.5E-02	1.9E-04	1.1E-06	2.1E-06	4.6E-07	1.6E-07
4,4'-DDT	1.9E+00	2.4E-01	5.7E-02	-	2.0E-02	4.2E-03	1.4E-03	-	2.3E+00	3.9E-01	1.1E-01	1.2E+06	2.9E-02	1.3E-04	7.1E-07	2.9E-06	5.9E-07	1.9E-07
Aldrin	2.2E-03	4.2E-04	2.2E-04	1.0E-02	3.4E-06	6.6E-07	3.5E-07	8.2E+03	1.8E+01	3.5E+00	1.8E+00	1.5E+06	3.8E-02	1.6E-04	9.1E-07	1.2E-09	2.3E-10	1.2E-10
alpha-BHC	1.9E-03	3.6E-04	1.9E-04	2.5E-01	7.0E-05	1.3E-05	7.1E-06	9.2E+01	1.8E-01	3.3E-02	1.8E-02	6.3E+03	1.6E-04	6.8E-07	3.8E-09	5.0E-11	9.5E-12	5.0E-12
beta-BHC	5.4E-03	1.9E-03	1.2E-03	2.4E-01	1.9E-04	6.7E-05	4.1E-05	9.8E+01	5.3E-01	1.9E-01	1.1E-01	6.8E+03	1.7E-04	7.4E-07	4.1E-09	1.5E-10	5.1E-11	3.2E-11
delta-BHC	9.5E-04	2.5E-04	1.2E-04	1.6E-01	2.2E-05	5.8E-06	2.9E-06	1.8E+02	1.7E-01	4.3E-02	2.2E-02	1.4E+04	3.5E-04	1.5E-06	8.3E-09	3.6E-11	9.3E-12	4.7E-12
gamma-BHC	9.8E-04	2.6E-04	1.3E-04	2.7E-01	4.0E-05	1.1E-05	5.3E-06	8.1E+01	7.9E-02	2.1E-02	1.1E-02	5.4E+03	1.3E-04	5.8E-07	3.2E-09	2.4E-11	6.4E-12	3.2E-12
Methoxychlor	6.3E-02	7.9E-03	4.7E-03	9.4E-02	8.9E-04	1.1E-04	6.6E-05	3.6E+02	2.3E+01	2.9E+00	1.7E+00	3.4E+04	8.4E-04	3.6E-06	2.0E-08	3.6E-09	4.6E-10	2.7E-10
Dieldrin	1.2E-01	2.7E-02	7.7E-03	4.1E-01	7.4E-03	1.6E-03	4.8E-04	1.5E+01	2.8E-01	6.3E-02	1.8E-02	1.9E+05	4.7E-03	2.0E-05	1.1E-07	1.5E-07	3.4E-08	9.8E-09
Alpha-Endosulfan	7.3E-03	1.1E-03	6.2E-04	3.4E-01	3.8E-04	5.9E-05	3.2E-05	5.8E+01	4.2E-01	6.6E-02	3.6E-02	3.5E+03	8.9E-05	3.8E-07	2.1E-09	1.5E-10	2.3E-11	1.3E-11
Beta-Endosulfan	1.5E-02	3.1E-03	1.8E-03	3.1E-01	7.0E-04	1.5E-04	8.5E-05	6.6E+01	9.9E-01	2.0E-01	1.2E-01	4.2E+03	1.0E-04	4.5E-07	2.5E-09	3.3E-10	6.8E-11	4.0E-11
Endosulfan Sulfate	2.2E-02	3.6E-03	2.4E-03	3.0E-01	9.8E-04	1.6E-04	1.1E-04	7.1E+01	1.6E+00	2.5E-01	1.7E-01	4.6E+03	1.1E-04	4.9E-07	2.8E-09	5.0E-10	8.2E-11	5.6E-11
Heptachlor	8.9E-03	9.0E-04	3.7E-04	4.9E-02	6.5E-05	6.6E-06	2.7E-06	5.8E+01	5.1E-01	5.2E-02	2.1E-02	3.5E+03	8.9E-05	3.8E-07	2.1E-09	3.1E-11	3.1E-12	1.3E-12
Heptachlor Epoxide	8.3E-03	3.6E-03	2.3E-03	7.0E-02	8.7E-05	3.7E-05	2.4E-05	5.5E+02	4.6E+00	2.0E+00	1.3E+00	5.6E+04	1.4E-03	6.1E-06	3.4E-08	6.2E-10	2.7E-10	1.7E-10
Endrin Aldehyde	2.3E-02	6.4E-03	3.7E-03	6.5E-02	2.2E-04	6.3E-05	3.6E-05	6.1E+02	1.4E+01	3.9E+00	2.2E+00	6.3E+04	1.6E-03	6.8E-06	3.8E-08	1.8E-09	5.1E-10	2.9E-10
Endrin Ketone	4.1E-02	9.4E-03	5.1E-03	NA	-	-	-	NA	-	-	-	NA		-	-	-	-	-
Endrin	2.4E-02	4.5E-03	2.4E-03	5.8E-02	2.1E-04	3.9E-05	2.1E-05	7.2E+02	1.7E+01	3.2E+00	1.7E+00	7.8E+04	2.0E-03	8.4E-06	4.7E-08	2.1E-09	3.9E-10	2.1E-10
Dioxins/Furans																		
2,3,7,8-TCDD Equivalents (Avian)	1.0E-04	-	3.1E-05	5.6E-03	8.8E-08	-	2.6E-08	1.6E+00	1.7E-04	-	4.9E-05	4.4E+06	1.1E-01	4.7E-04	2.6E-06	1.3E-10	-	3.8E-11
2,3,7,8-TCDD Equivalents (Mammals)	2.6E-04	-	6.2E-05	5.6E-03	2.2E-07	-	5.2E-08	1.6E+00	4.1E-04	-	9.9E-05	4.4E+06	1.1E-01	4.7E-04	2.6E-06	3.2E-10	-	7.7E-11

Notes:
DW = dry weight
WW = wet weight
Blank cells indicate value not available or not applicable

Parameter definitions:

C_{smax}	Maximum COPC concentration in soil
$C_{s95\%}$	95% UCL of COPC concentration in soil
Cs^{mean}	Arithmetic Mean COPC concentration in soil
BCF_{s-p}	Soil to plant bioconcentration factor
C_f^{pmax}	Maximum COPC concentration in plant tissue
$C_f^{p95\%}$	95% UCL of COPC concentration in plant tissue
C_f^{Pmean}	Arithmetic Mean COPC concentration in plant tissue
BCF_{s-i}	Soil to invertebrate bioconcentration factor
C_f^{imax}	Maximum COPC concentration in invertebrate (earthworm) tissue
$C_f^{i95\%}$	95% UCL of COPC concentration in invertebrate (earthworm) tissue
C_f^{imean}	Arithmetic Mean COPC concentration in invertebrate (earthworm) tissue
K_{ow}	Octanol-Water Coefficient
Ba_m	Biotransfer factor for mammals
BCF_{p-m}	Plant to mammal bioconcentration factor
BCF_{s-m}	Soil to mammal bioconcentration factor
C_f^{mmax}	Maximum COPC concentration in small mammals (deer mouse)
$C_f^{m95\%}$	95% UCL of COPC concentration in small mammals (deer mouse)
C_f^{smmean}	Arithmetic Mean COPC concentration in small mammals (deer mouse)

Sources:

a. U.S. Environmental Protection Agency (EPA). 2007. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). Attachment 4-1. April 2007 revision.

b. Spero, et. Al. 2000. Regulatory Chemicals Handbook.
Jennifer M. Spero (Editor), Bella DeVito (Editor), Louis Theodore (Editor). (2000) Regulatory Chemicals Handbook. Publisher: CRC (March 1, 2000)

c. EPA 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA530-D-99-001A.

d. Baes, C.F., et. al. (1984). A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Lab, Health and Safety Research Division. September, 1984.
For plants, average of reproductive (Br) and vegetative (Bv) uptake factors used. For seeds, reproductive uptake factor used. For mammals, diet to beef numbers were used for Ba_m values. These were multiplied by the fresh weight plant ingestion rate (see Table 3-1) to yield the BCF_{p-m}.

Checked by: SLJ

Food Item	Dry Fraction
Plant	0.15
Earthworms	0.16
Mammals	0.32

For uptake equations that calculate dry weight tissue concentrations of COPECs, the estimated concentration was multiplied by the appropriate dry fraction to yield the fresh weight COPC concentration. Dry fraction from EPA, 2007.

COPC	C_s^{max}	$C_s^{95\%}$	Cs^{mean}	BCF_{s-p}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{pmean}	BCF_{s-i}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	K_{ow}	Ba_m	BCF_{p-m}	BCF_{s-m}	C_f^{smmax}	$C_f^{sm95\%}$	C_f^{smmean}
Units------->	mg/kg DW	mg/kg DW	mg/kg DW	Value	mg/kg WW	mg/kg WW	mg/kg WW	Value	mg/kg WW	mg/kg WW	mg/kg WW					mg/kg WW	mg/kg WW	mg/kg WW
Inorganics																		
Aluminum	2.8E+04	1.8E+04	1.5E+04	4.0E-03	1.7E+01	1.1E+01	9.2E+00	2.2E-01	6.2E+03	3.9E+03	3.4E+03	-	-	-	-	-	-	-
Antimony	3.7E+00	1.5E+00	1.2E+00	-	2.0E-02	8.8E-03	7.2E-03	1.0E+00	5.9E-01	2.4E-01	2.0E-01	-			5.0E-02	3.2E-04	1.4E-04	1.1E-04
Arsenic	9.5E+01	2.9E+01	1.2E+01	3.8E-02	5.3E-01	1.7E-01	6.5E-02	-	9.6E-01	4.2E-01	2.2E-01	-	-	-	-	1.0E-01	4.0E-02	1.9E-02
Barium	4.7E+02	2.5E+02	1.8E+02	1.6E-01	1.1E+01	5.8E+00	4.3E+00	9.1E-02	6.8E+00	3.6E+00	2.7E+00	-			7.5E-03	2.6E-02	1.4E-02	1.0E-02
Cadmium	3.7E+00	1.2E+00	8.0E-01	-	1.9E-01	1.1E-01	8.2E-02	-	3.7E+00	1.6E+00	3.3E-02	-	-	-	5.3E-01	1.7E-01	1.0E-01	8.2E-02
Chromium	2.0E+02	5.7E+01	4.5E+01	4.1E-02	1.2E+00	3.5E-01	2.8E-01	-	9.9E+00	2.8E+00	2.2E+00	-	-	-	1.1E+01	3.7E+00	1.5E+00	1.2E+00
Cobalt	2.0E+01	1.1E+01	9.8E+00	7.5E-03	7.4E-03	4.3E-03	3.7E-03	1.2E-01	2.4E+00	1.4E+00	1.2E+00	-	-	-	-	1.8E-01	8.8E-02	7.3E-02
Copper	2.3E+02	6.9E+01	5.1E+01	-	2.5E+00	1.6E+00	1.4E+00	-	1.9E+01	5.7E+00	6.2E-01	-	-	-	1.7E+01	5.4E+00	4.5E+00	4.4E+00
Iron	4.1E+04	2.9E+04	2.6E+04	2.5E-03	1.5E+01	1.1E+01	9.8E+00	2.2E-01	9.0E+03	6.5E+03	5.7E+03	-	-	-	-	-	-	-
Lead	2.9E+02	1.2E+02	7.8E+01	-	9.6E-01	5.7E-01	4.6E-01	-	1.3E+01	5.9E+00	8.4E-01	-	-	-	1.3E+01	4.3E+00	2.8E+00	2.4E+00
Manganese	1.2E+03	4.5E+02	3.6E+02	7.9E-02	1.4E+01	5.3E+00	4.3E+00	-	3.4E+00	1.8E+00	1.4E+00	-			2.1E-02	7.7E+00	2.9E+00	2.4E+00
Mercury	8.8E-01	3.1E-01	2.2E-01	-	3.0E-02	1.0E-02	7.3E-03	-	4.8E-02	1.7E-02	1.3E-02	-	2.5E-01	1.1E-03	6.0E-06	3.4E-05	1.2E-05	8.2E-06
Nickel	9.2E+01	3.7E+01	3.1E+01	-	4.8E-01	2.4E-01	2.1E-01	-	1.6E+01	6.2E+00	4.3E-01	-	-	-	6.4E+00	2.1E+00	1.3E+00	1.2E+00
Selenium	4.2E+00	1.1E+00	7.1E-01	-	3.7E-01	8.7E-02	5.2E-02	2.2E-01	9.2E-01	2.5E-01	1.6E-01	-	-	-	1.1E+00	3.6E-01	2.2E-01	1.9E-01
Silver	2.4E+00	6.2E-01	3.8E-01	1.4E-02	5.0E-03	1.3E-03	8.0E-04	-	7.9E-01	2.0E-01	1.2E-01	-	-	4.0E-03	9.6E-03	3.1E-03	8.0E-04	4.9E-04
Thallium	1.0E+00	-	-	4.0E-03	6.0E-04	-	-	2.2E-01	2.2E-01	-	-	-	-	-	-	-	-	-
Vanadium	1.0E+02	6.6E+01	5.7E+01	4.9E-03	7.4E-02	4.8E-02	4.1E-02	4.2E-02	6.9E-01	4.4E-01	3.8E-01	-			1.2E-02	4.0E-01	2.6E-01	2.2E-01
Zinc	1.5E+03	3.1E+02	1.8E+02	-	4.2E+01	1.7E+01	1.3E+01	-	1.5E+02	9.0E+01	7.5E+01	-	-	-	4.9E+00	4.2E+01	3.8E+01	3.6E+01
VOCs																		
Acetone	1.3E-02	6.6E-03	-	5.2E+01	1.0E-01	5.2E-02	-	5.00E-02	6.5E-04	3.3E-04	-	6.0E-01						
SVOCs																		
Bis(2-Ethylhexyl) Phthalate	1.8E-01	6.2E-02	5.1E-02	3.8E-02	1.0E-03	3.6E-04	2.9E-04	1.3E+03	2.4E+02	8.2E+01	6.6E+01	1.6E+05	4.0E-03	1.7E-05	9.7E-08	2.3E-08	8.1E-09	6.6E-09
Butylbenzyl Phthalate	1.9E-01	-	-	7.1E-02	2.0E-03	-	-	5.3E+02	1.0E+02	-	-	5.4E+04	1.3E-03	5.8E-06	3.2E-08	1.4E-08	-	-
Carbazole	1.5E-01	5.8E-02	4.3E-02	2.7E-01	6.2E-03	2.4E-03	1.8E-03	8.0E+01	1.2E+01	4.6E+00	3.4E+00	5.2E+03	1.3E-04	5.7E-07	3.2E-09	3.6E-09	1.4E-09	1.0E-09
Di-N-Octyl Phthalate	1.2E-01	-	-	1.6E-04	2.8E-06	-	-	3.1E+06	3.8E+05	-	-	2.1E+09	5.4E+01	2.3E-01	1.3E-03	5.0E-05	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	5.7E-02	1.5E-04	-	-	7.5E+02	1.3E+01	-	-	8.1E+04	2.0E-03	8.7E-06	4.9E-08	1.6E-09	-	-
N-Nitrosodiphenylamine	4.5E-02	-	-	6.0E-01	4.0E-03	-	-	2.6E+01	1.2E+00	-	-	1.3E+03	3.4E-05	1.5E-07	8.1E-10	6.0E-10	-	-
Phenol	1.5E-01	-	-	5.5E+00	1.2E-01	-	-	1.1E+00	1.7E-01	-	-	2.9E+01	7.2E-07	3.1E-09	1.7E-11	3.9E-10	-	-
Total Low Molecular Weight PAHS	1.2E+00	4.1E-01	2.8E-01	-	4.4E-02	2.7E-02	2.2E-02	3.0E+00	5.9E-01	2.0E-01	1.3E-01	-	-	-	-	0.0E+00	0.0E+00	0.0E+00
Total High Molecular Weight PAHS	7.4E+00	2.7E+00	1.9E+00	-	1.8E-01	7.0E-02	4.9E-02	2.6E+00	3.1E+00	1.1E+00	7.8E-01	-	-	-	-	0.0E+00	0.0E+00	0.0E+00
PCBs																		
Aroclor 1248	3.9E+00	-	1.9E-03	1.8E-02	1.1E-02	-	5.2E-06	-	5.6E+00	-	2.9E-04	5.6E+05	1.4E-02	6.1E-05	3.4E-07	1.1E-06	-	5.2E-10
Aroclor 1254	1.4E+00	1.9E-01	7.8E-02	1.0E-02	2.1E-03	2.9E-04	1.2E-04	-	1.5E+00	1.1E-01	3.5E-02	1.6E+06	4.0E-02	1.7E-04	9.7E-07	8.0E-07	1.1E-07	4.4E-08
Aroclor 1260	4.0E-01	9.3E-02	5.4E-02	2.9E-03	1.7E-04	4.0E-05	2.3E-05	-	2.9E-01	4.4E-02	2.2E-02	1.4E+07	3.5E-01	1.5E-03	8.3E-06	1.3E-06	3.1E-07	1.8E-07
Pesticides																		
4,4'-DDD	6.5E-02	1.0E-02	4.4E-03	-	1.6E-03	3.8E-04	2.0E-04	-	7.6E-02	2.1E-02	1.2E-02	1.3E+06	3.3E-02	1.4E-04	8.0E-07	2.4E-07	5.7E-08	3.0E-08
4,4'-DDE	1.9E-02	5.8E-03	3.8E-03	-	6.2E-04	2.5E-04	1.8E-04	-	5.8E-02	2.0E-02	1.4E-02	1.8E+06	4.5E-02	1.9E-04	1.1E-06	1.3E-07	5.1E-08	3.7E-08
4,4'-DDT	5.5E-02	8.9E-03	4.7E-03	-	1.4E-03	3.5E-04	2.1E-04	-	1.1E-01	2.2E-02	1.7E-02	1.2E+06	2.9E-02	1.3E-04	7.1E-07	1.9E-07	4.6E-08	2.8E-08
Aldrin	1.3E-03	4.1E-04	1.8E-04	1.0E-02	2.0E-06	6.4E-07	2.8E-07	8.2E+03	1.1E+01	3.4E+00	1.5E+00	1.5E+06	3.8E-02	1.6E-04	9.1E-07	7.1E-10	2.2E-10	9.9E-11
alpha-BHC	1.3E-03	3.8E-04	1.7E-04	2.5E-01	4.8E-05	1.4E-05	6.3E-06	9.2E+01	1.2E-01	3.5E-02	1.6E-02	6.3E+03	1.6E-04	6.8E-07	3.8E-09	3.4E-11	1.0E-11	4.5E-12
beta-BHC	1.5E-02	2.5E-03	1.3E-03	2.4E-01	5.3E-04	9.0E-05	4.5E-05	9.8E+01	1.5E+00	2.5E-01	1.2E-01	6.8E+03	1.7E-04	7.4E-07	4.1E-09	4.1E-10	7.0E-11	3.5E-11
gamma-BHC	1.3E-03	3.5E-04	1.5E-04	2.7E-01	5.3E-05	1.4E-05	6.2E-06	8.1E+01	1.1E-01	2.8E-02	1.2E-02	5.4E+03	1.3E-04	5.8E-07	3.2E-09	3.2E-11	8.5E-12	3.7E-12
Methoxychlor	2.9E-02	-	2.0E-03	9.4E-02	4.1E-04	-	2.8E-05	3.6E+02	1.1E+01	-	7.4E-01	3.4E+04	8.4E-04	3.6E-06	2.0E-08	1.7E-09	-	1.2E-10
Dieldrin	2.2E-02	5.1E-03	2.9E-03	4.1E-01	1.4E-03	3.2E-04	1.8E-04	1.5E+01	5.2E-02	1.2E-02	6.8E-03	1.9E+05	4.7E-03	2.0E-05	1.1E-07	2.8E-08	6.5E-09	3.7E-09
Alpha-Endosulfan	1.1E-03	3.5E-04	1.6E-04	3.4E-01	5.7E-05	1.8E-05	8.2E-06	5.8E+01	6.4E-02	2.0E-02	9.2E-03	3.5E+03	8.9E-05	3.8E-07	2.1E-09	2.2E-11	7.1E-12	3.2E-12
Beta-Endosulfan	1.4E-03	5.4E-04	2.6E-04	3.1E-01	6.6E-05	2.6E-05	1.2E-05	6.6E+01	9.2E-02	3.6E-02	1.7E-02	4.2E+03	1.0E-04	4.5E-07	2.5E-09	3.1E-11	1.2E-11	5.7E-12
Endosulfan Sulfate	2.0E-03	6.8E-04	3.2E-04	3.0E-01	8.9E-05	3.0E-05	1.4E-05	7.1E+01	1.4E-01	4.8E-02	2.2E-02	4.6E+03	1.1E-04	4.9E-07	2.8E-09	4.6E-11	1.5E-11	7.2E-12
Heptachlor	1.1E-03	-	1.8E-04	4.9E-02	8.1E-06	-	1.3E-06	5.8E+01	6.4E-02	-	1.0E-02	3.5E+03	8.9E-05	3.8E-07	2.1E-09	3.8E-12	-	6.3E-13
Heptachlor Epoxide	4.0E-03	1.2E-03	5.8E-04	7.0E-02	4.2E-05	1.2E-05	6.0E-06	5.5E+02	2.2E+00	6.4E-01	3.2E-01	5.6E+04	1.4E-03	6.1E-06	3.4E-08	3.0E-10	8.6E-11	4.3E-11
Endrin Aldehyde	7.8E-03	1.5E-03	7.0E-04	6.5E-02	7.6E-05	1.4E-05	6.8E-06	6.1E+02	4.8E+00	9.0E-01	4.3E-01	6.3E+04	1.6E-03	6.8E-06	3.8E-08	6.1E-10	1.2E-10	5.5E-11
Endrin Ketone	1.6E-02	2.6E-03	1.1E-03	NA	-	-	-	-	-	-	-	NA	NA	-	-	-	-	-
Endrin	8.9E-03	1.6E-03	7.3E-04	5.8E-02	7.7E-05	1.4E-05	6.3E-06	7.2E+02	6.4E+00	1.1E+00	5.3E-01	7.8E+04	2.0E-03	8.4E-06	4.7E-08	7.8E-10	1.4E-10	6.4E-11
Dioxins/Furans																		
2,3,7,8-TCDD Equivalents (Avian)	3.0E-05	-	7.2E-06	5.6E-03	2.5E-08	-	6.0E-09	1.6E+00	4.8E-05	-	1.1E-05	4.4E+06	1.1E-01	4.7E-04	2.6E-06	3.8E-11	-	8.9E-12
2,3,7,8-TCDD Equivalents (Mammals)	1.9E-05	-	4.9E-06	5.6E-03	1.6E-08	-	4.1E-09	1.6E+00	3.1E-05	-	7.7E-06	4.4E+06	1.1E-01	4.7E-04	2.6E-06	2.4E-11	-	6.0E-12

Notes:
DW = dry weight
WW = wet weight
Blank cells indicate value not available or not applicable

Parameter definitions:

C_{smax}	Maximum COPC concentration in soil
$C_{s95\%}$	95% UCL of COPC concentration in soil
BCF_{s-p}	Soil to plant bioconcentration factor
C_f^{pmax}	Maximum COPC concentration in plant tissue
$C_f^{p95\%}$	95% UCL of COPC concentration in plant tissue
BCF_{s-i}	Soil to invertebrate bioconcentration factor
C_f^{imax}	Maximum COPC concentration in invertebrate (earthworm) tissue
$C_f^{i95\%}$	95% UCL of COPC concentration in invertebrate (earthworm) tissue
K_{ow}	Octanol-Water Coefficient
Ba_m	Biotransfer factor for mammals
BCF_{p-m}	Plant to mammal bioconcentration factor
BCF_{s-m}	Soil to mammal bioconcentration factor
C_f^{mmax}	Maximum COPC concentration in small mammals (deer mouse)
$C_f^{m95\%}$	95% UCL of COPC concentration in small mammals (deer mouse)

Sources:
a. U.S. Environmental Protection Agency (EPA). 2007. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). Attachment 4-1. April 2007 revision.
b. Spero, et. Al. 2000. Regulatory Chemicals Handbook.
Jennifer M. Spero (Editor), Bella DeVito (Editor), Louis Theodore (Editor). (2000) Regulatory Chemicals Handbook. Publisher: CRC (March 1, 2000)
c. EPA 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities. EPA530-D-99-001A.

d. Baes, C.F., et. al. (1984). A Review and Analysis of Parameters for Assessing Transport of Environmentally Released Radionuclides through Agriculture. Oak Ridge National Lab, Health and Safety Research Division. September, 1984.
For plants, average of reproductive (Br) and vegetative (Bv) uptake factors used. For seeds, reproductive uptake factor used. For mammals, diet to beef numbers were used for Ba_m values. These were multiplied by the fresh weight plant ingestion rate (see Table 3-1) to yield the BCF_{p-m}.

Checked by: SLJ

Table 8-8.1
Hazard Quotient Estimation for Deer Mouse - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.021	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0012	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.0043	kg/day	Table 8-5
Fraction of Diet Comprised of Plants	P_f^P	0.63	unitless	Table 8-5
Fraction of Diet Comprised of Invertebrates	P_f^I	0.37	unitless	Table 8-5
Fraction soil ingestion	P_s	0.02	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.004	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.1
Plant Concentration	C_f^p	Chemical-specific	mg/kg	Table 8-6
Invertebrate Concentration	C_f^I	Chemical-specific	mg/kg	Table 8-6
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-6
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-5

Parameter	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{pmean}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day
Inorganics													
Aluminum	2.3E+04	1.6E+04	1.5E+04	1.4E+01	9.5E+00	8.8E+00	5.0E+03	3.5E+03	3.2E+03	1.6E+01	2.6E+01	1.8E+01	1.7E+01
Antimony	1.8E+01	2.9E+00	2.1E+00	8.9E-02	1.6E-02	1.2E-02	2.9E+00	4.6E-01	3.4E-01	-	2.0E-02	3.3E-03	2.4E-03
Arsenic	2.0E+01	1.0E+01	9.1E+00	1.1E-01	5.7E-02	5.1E-02	3.2E-01	2.0E-01	1.8E-01	1.7E-02	2.3E-02	1.1E-02	1.0E-02
Barium	8.6E+02	2.9E+02	1.8E+02	2.0E+01	6.8E+00	4.2E+00	1.3E+01	4.2E+00	2.6E+00	5.9E-01	9.9E-01	3.3E-01	2.0E-01
Beryllium	6.6E+01	9.4E+00	2.6E+00	1.9E+00	4.6E-01	1.8E-01	4.8E-01	6.8E-02	1.9E-02	1.1E-03	7.5E-02	1.1E-02	3.0E-03
Cadmium	8.1E+00	2.2E+00	1.2E+00	2.9E-01	1.4E-01	1.0E-01	7.0E+00	2.5E+00	1.6E+00	5.2E-03	9.3E-03	2.6E-03	1.4E-03
Chromium	1.4E+02	5.9E+01	5.2E+01	8.6E-01	3.6E-01	3.2E-01	6.9E+00	2.9E+00	2.6E+00	5.4E-02	1.6E-01	6.8E-02	6.0E-02
Cobalt	1.6E+02	3.0E+01	1.4E+01	1.8E-01	3.4E-02	1.6E-02	3.1E+00	5.9E-01	2.8E-01	-	1.8E-01	3.5E-02	1.6E-02
Copper	1.1E+04	1.5E+03	4.4E+02	1.1E+01	5.2E+00	3.2E+00	8.7E+02	1.2E+02	3.6E+01	1.1E-01	1.2E+01	1.7E+00	5.0E-01
Iron	2.0E+05	4.1E+04	3.3E+04	7.5E+01	1.5E+01	1.2E+01	4.4E+04	8.9E+03	7.2E+03	4.7E+01	2.3E+02	4.6E+01	3.7E+01
Lead	4.3E+03	4.4E+02	3.6E+02	4.3E+00	1.2E+00	1.1E+00	1.1E+02	1.8E+01	1.5E+01	2.5E-01	4.9E+00	5.1E-01	4.2E-01
Manganese	9.8E+03	1.7E+03	7.0E+02	1.2E+02	2.0E+01	8.3E+00	3.7E+01	1.1E+01	6.2E+00	1.6E+00	1.1E+01	1.9E+00	8.0E-01
Mercury	6.7E+00	1.9E+00	1.5E+00	2.3E-01	6.3E-02	5.0E-02	3.6E-01	1.0E-01	8.1E-02	7.8E-04	7.7E-03	2.1E-03	1.7E-03
Nickel	1.3E+03	2.2E+02	7.6E+01	3.5E+00	9.3E-01	4.1E-01	2.2E+02	3.8E+01	1.3E+01	5.8E-02	1.5E+00	2.6E-01	8.7E-02
Selenium	1.1E+00	6.5E-01	4.6E-01	8.5E-02	4.7E-02	3.2E-02	2.4E-01	1.4E-01	1.0E-01	-	1.3E-03	7.4E-04	5.2E-04
Silver	5.4E+00	1.9E+00	8.9E-01	1.1E-02	3.9E-03	1.9E-03	1.8E+00	6.1E-01	2.9E-01	9.4E-04	6.2E-03	2.1E-03	1.0E-03
Thallium	3.2E-01	-	-	1.9E-04	-	-	6.9E-02	-	-	-	3.6E-04	-	-
Vanadium	8.4E+01	4.8E+01	4.5E+01	6.1E-02	3.5E-02	3.3E-02	5.7E-01	3.2E-01	3.1E-01	5.0E-02	9.6E-02	5.5E-02	5.2E-02
Zinc	1.8E+04	3.2E+03	1.1E+03	1.6E+02	6.3E+01	3.5E+01	3.4E+02	1.9E+02	1.4E+02	5.7E-01	2.0E+01	3.6E+00	1.2E+00
VOCs													
Acetone	2.9E-02	-	5.3E-03	2.3E-01	-	4.1E-02	1.5E-03	-	2.6E-04	-	3.3E-05	-	6.1E-06
SVOC													
Acetophenone	8.8E-02	-	8.1E-02	6.2E-02	-	5.7E-02	1.2E-01	-	1.1E-01	-	1.0E-04	-	9.2E-05
Atrazine	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-
Biphenyl	2.5E+00	2.1E-01	1.1E-01	7.0E-02	6.0E-03	3.1E-03	3.4E+02	2.9E+01	1.5E+01	-	2.9E-03	2.4E-04	1.3E-04
Bis(2-Ethylhexyl) Phthalate	1.4E+00	3.1E-01	2.1E-01	8.0E-03	1.8E-03	1.2E-03	1.8E+03	4.1E+02	2.8E+02	-	1.6E-03	3.6E-04	2.4E-04
4-Bromophenyl-phenylether	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-
Butylbenzyl Phthalate	9.4E-01	-	-	1.0E-02	-	-	5.0E+02	-	-	-	1.1E-03	-	-
Carbazole	4.0E-01	1.2E-01	8.8E-02	1.6E-02	4.9E-03	3.6E-03	3.2E+01	9.4E+00	7.0E+00	-	4.6E-04	1.4E-04	1.0E-04
Dibenzofuran	1.5E+00	1.3E-01	7.9E-02	3.6E-02	3.1E-03	1.9E-03	2.5E+02	2.1E+01	1.3E+01	-	1.7E-03	1.5E-04	9.1E-05
Dimethyl Phthalate	4.1E-01	-	5.2E-02	2.8E-01	-	3.6E-02	6.0E-01	-	7.6E-02	-	4.7E-04	-	5.9E-05
Di-N-Octyl Phthalate	1.9E+01	1.4E+00	4.8E-01	4.5E-04	3.2E-05	1.1E-05	5.9E+07	4.2E+06	1.5E+06	-	2.2E-02	1.5E-03	5.4E-04
Hexachlorobenzene	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.5E-04	-	-	1.3E+01	-	-	-	2.0E-05	-	-
N-Nitrosodiphenylamine	4.4E-02	-	-	4.0E-03	-	-	1.2E+00	-	-	-	5.0E-05	-	-
Pentachlorophenol	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-
Phenol	2.1E-01	5.6E-02	5.4E-02	1.7E-01	4.7E-02	4.5E-02	2.4E-01	6.3E-02	6.1E-02	-	2.4E-04	6.4E-05	6.2E-05
Total Low Molecular Weight PAHS	4.0E+01	5.8E+00	1.9E+00	2.1E-01	8.9E-02	5.3E-02	2.0E+01	2.8E+00	9.2E-01		4.6E-02	6.7E-03	2.2E-03
Total High Molecular Weight PAHs	3.6E+01	1.1E+01	5.9E+00	8.2E-01	2.6E-01	1.5E-01	1.5E+01	4.6E+00	2.4E+00		4.2E-02	1.3E-02	6.7E-03
Pesticides													
4,4'-DDD	2.4E-01	6.1E-02	2.1E-02	4.2E-03	1.5E-03	6.7E-04	1.9E-01	7.3E-02	3.5E-02	2.5E-05	2.7E-04	7.0E-05	2.4E-05
4,4'-DDE	7.2E-01	1.0E-01	2.7E-02	9.5E-03	2.2E-03	8.0E-04	1.4E+00	2.5E-01	7.9E-02	3.0E-05	8.2E-04	1.2E-04	3.1E-05
4,4'-DDT	1.9E+00	2.4E-01	5.7E-02	2.0E-02	4.2E-03	1.4E-03	2.3E+00	3.9E-01	1.1E-01	3.9E-05	2.2E-03	2.8E-04	6.5E-05
Aldrin	2.2E-03	4.2E-04	2.2E-04	3.4E-06	6.6E-07	3.5E-07	1.8E+01	3.5E+00	1.8E+00	2.4E-05	2.5E-06	4.8E-07	2.6E-07
alpha-BHC	1.9E-03	3.6E-04	1.9E-04	7.0E-05	1.3E-05	7.1E-06	1.8E-01	3.3E-02	1.8E-02	-	2.2E-06	4.1E-07	2.2E-07
alpha-chlordane	-	-	-	-	-	-	-	-	-	7.0E-05	-	-	-
gamma-chlordane	-	-	-	-	-	-	-	-	-	7.7E-05	-	-	-
beta-BHC	5.4E-03	1.9E-03	1.2E-03	1.9E-04	6.7E-05	4.1E-05	5.3E-01	1.9E-01	1.1E-01	-	6.2E-06	2.1E-06	1.3E-06
delta-BHC	9.5E-04	2.5E-04	1.2E-04	2.2E-05	5.8E-06	2.9E-06	1.7E-01	4.3E-02	2.2E-02	-	1.1E-06	2.8E-07	1.4E-07
gamma-BHC	9.8E-04	2.6E-04	1.3E-04	4.0E-05	1.1E-05	5.3E-06	7.9E-02	2.1E-02	1.1E-02	-	1.1E-06	3.0E-07	1.5E-07
Methoxychlor	6.3E-02	7.9E-03	4.7E-03	8.9E-04	1.1E-04	6.6E-05	2.3E+01	2.9E+00	1.7E+00	4.6E-05	7.2E-05	9.1E-06	5.4E-06
Dieldrin	1.2E-01	2.7E-02	7.7E-03	7.4E-03	1.6E-03	4.8E-04	2.8E-01	6.3E-02	1.8E-02	9.0E-05	1.4E-04	3.1E-05	8.9E-06
Alpha-Endosulfan	7.3E-03	1.1E-03	6.2E-04	3.8E-04	5.9E-05	3.2E-05	4.2E-01	6.6E-02	3.6E-02	-	8.3E-06	1.3E-06	7.1E-07
Beta-Endosulfan	1.5E-02	3.1E-03	1.8E-03	7.0E-04	1.5E-04	8.5E-05	9.9E-01	2.0E-01	1.2E-01	-	1.7E-05	3.5E-06	2.1E-06
Endosulfan Sulfate	2.2E-02	3.6E-03	2.4E-03	9.8E-04	1.6E-04	1.1E-04	1.6E+00	2.5E-01	1.7E-01	-	2.5E-05	4.1E-06	2.8E-06
Heptachlor	8.9E-03	9.0E-04	3.7E-04	6.5E-05	6.6E-06	2.7E-06	5.1E-01	5.2E-02	2.1E-02	4.6E-06	1.0E-05	1.0E-06	4.2E-07
Heptachlor Epoxide	8.3E-03	3.6E-03	2.3E-03	8.7E-05	3.7E-05	2.4E-05	4.6E+00	2.0E+00	1.3E+00	4.6E-06	9.5E-06	4.1E-06	2.6E-06
Endrin Aldehyde	2.3E-02	6.4E-03	3.7E-03	2.2E-04	6.3E-05	3.6E-05	1.4E+01	3.9E+00	2.2E+00	-	2.6E-05	7.3E-06	4.2E-06
Endrin Ketone	4.1E-02	9.4E-03	5.1E-03	-	-	-	-	-	-	-	4.7E-05	1.1E-05	5.8E-06
Endrin	2.4E-02	4.5E-03	2.4E-03	2.1E-04	3.9E-05	2.1E-05	1.7E+01	3.2E+00	1.7E+00	-	2.7E-05	5.1E-06	2.8E-06
Toxaphene	-	-	-	-	-	-	-	-	-	4.9E-04	-	-	-
Dioxins/Furans													
2,3,7,8-TCDD Equivalents (Mammals)	2.6E-04	-	6.2E-05	2.2E-07	-	5.2E-08	4.1E-04	-	9.9E-05	2.4E-09	2.9E-07	-	7.1E-08

Parameter	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Max Dose: Invertebrate Exposure	95% Dose: Invertebrate Exposure	Mean Dose: Invertebrate Exposure	Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		NOAEL HQs			LOAEL HQs		
													Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																		
Aluminum	1.8E+00	1.2E+00	1.1E+00	3.8E+02	2.6E+02	2.5E+02	3.1E+00	4.1E+02	2.8E+02	2.6E+02	1.9E+00	1.9E+01	**2.1E+02**	**1.5E+02**	**1.4E+02**	**2.1E+01**	**1.5E+01**	**1.4E+01**
Antimony	1.1E-02	2.0E-03	1.6E-03	2.2E-01	3.5E-02	2.6E-02	-	2.5E-01	4.0E-02	3.0E-02	5.9E-02	5.9E-01	**4.2E+00**	6.8E-01	5.1E-01	4.2E-01	6.8E-02	5.1E-02
Arsenic	1.4E-02	7.3E-03	6.6E-03	2.4E-02	1.5E-02	1.4E-02	3.3E-03	6.4E-02	3.4E-02	3.1E-02	1.0E+00	1.7E+00	6.2E-02	3.2E-02	3.0E-02	3.9E-02	2.0E-02	1.9E-02
Barium	2.6E+00	8.8E-01	5.4E-01	9.5E-01	3.2E-01	2.0E-01	1.1E-01	4.7E+00	1.5E+00	9.3E-01	5.2E+01	8.3E+01	9.0E-02	3.0E-02	1.8E-02	5.6E-02	1.9E-02	1.1E-02
Beryllium	2.5E-01	5.9E-02	2.3E-02	3.6E-02	5.1E-03	1.4E-03	2.1E-04	3.6E-01	7.5E-02	2.8E-02	5.3E-01	6.3E-01	6.7E-01	1.4E-01	5.2E-02	5.7E-01	1.2E-01	4.4E-02
Cadmium	3.8E-02	1.9E-02	1.4E-02	5.3E-01	1.9E-01	1.2E-01	9.9E-04	5.8E-01	2.1E-01	1.3E-01	1.0E+00	1.0E+01	5.8E-01	2.1E-01	1.3E-01	5.8E-02	2.1E-02	1.3E-02
Chromium	1.1E-01	4.7E-02	4.1E-02	5.2E-01	2.2E-01	1.9E-01	1.0E-02	8.0E-01	3.3E-01	2.9E-01	2.4E+00	9.6E+00	3.3E-01	1.4E-01	1.2E-01	8.3E-02	3.5E-02	3.1E-02
Cobalt	2.3E-02	4.4E-03	2.1E-03	2.3E-01	4.5E-02	2.1E-02	-	4.4E-01	8.4E-02	4.0E-02	7.3E+00	1.9E+01	6.0E-02	1.1E-02	5.4E-03	2.3E-02	4.4E-03	2.1E-03
Copper	1.4E+00	6.7E-01	4.1E-01	6.6E+01	9.4E+00	2.7E+00	2.1E-02	7.9E+01	1.2E+01	3.6E+00	5.6E+00	9.3E+00	**1.4E+01**	**2.1E+00**	6.5E-01	**8.5E+00**	**1.3E+00**	3.9E-01
Iron	9.6E+00	2.0E+00	1.6E+00	3.3E+03	6.8E+02	5.4E+02	9.0E+00	3.6E+03	7.2E+02	5.8E+02	-	-	-	-	-	-	-	-
Lead	5.6E-01	1.6E-01	1.4E-01	8.3E+00	1.3E+00	1.1E+00	4.7E-02	1.4E+01	2.0E+00	1.7E+00	4.7E+00	5.0E+00	**2.9E+00**	4.3E-01	3.6E-01	**2.7E+00**	4.0E-01	3.4E-01
Manganese	1.5E+01	2.5E+00	1.1E+00	2.8E+00	8.5E-01	4.7E-01	3.1E-01	2.9E+01	5.3E+00	2.3E+00	5.2E+01	1.5E+02	5.7E-01	1.0E-01	4.6E-02	2.0E-01	3.6E-02	1.6E-02
Mercury	2.9E-02	8.1E-03	6.5E-03	2.8E-02	7.7E-03	6.2E-03	1.5E-04	6.5E-02	1.8E-02	1.4E-02	1.3E+01	-	4.9E-03	1.4E-03	1.1E-03	-	-	-
Nickel	4.5E-01	1.2E-01	5.3E-02	1.7E+01	2.9E+00	9.7E-01	1.1E-02	1.9E+01	3.2E+00	1.1E+00	1.7E+00	2.7E+00	**1.1E+01**	**1.9E+00**	6.5E-01	**6.9E+00**	**1.2E+00**	4.1E-01
Selenium	1.1E-02	6.1E-03	4.2E-03	1.8E-02	1.1E-02	7.6E-03	-	3.1E-02	1.8E-02	1.2E-02	1.4E-01	1.5E-01	2.1E-01	1.2E-01	8.6E-02	2.1E-01	1.2E-01	8.5E-02
Silver	1.5E-03	5.0E-04	2.4E-04	1.3E-01	4.6E-02	2.2E-02	1.8E-04	1.4E-01	4.9E-02	2.3E-02	6.0E+00	6.0E+01	2.4E-02	8.1E-03	3.9E-03	2.4E-03	8.1E-04	3.9E-04
Thallium	2.4E-05	-	-	5.3E-03	-	-	-	5.6E-03	-	-	7.4E-03	7.4E-02	7.6E-01	-	-	7.6E-02	-	-
Vanadium	7.9E-03	4.5E-03	4.3E-03	4.3E-02	2.5E-02	2.3E-02	9.5E-03	1.6E-01	8.4E-02	7.9E-02	4.2E+00	5.1E+00	3.8E-02	2.0E-02	1.9E-02	3.1E-02	1.7E-02	1.6E-02
Zinc	2.1E+01	8.1E+00	4.5E+00	2.6E+01	1.5E+01	1.0E+01	1.1E-01	6.7E+01	2.6E+01	1.6E+01	7.5E+01	7.4E+02	8.8E-01	3.5E-01	2.1E-01	9.0E-02	3.6E-02	2.2E-02
VOCs																		
Acetone	2.9E-02	-	5.3E-03	1.1E-04	-	2.0E-05	-	2.9E-02	-	5.4E-03	1.0E+01	5.0E+01	2.9E-03	-	5.4E-04	5.9E-04	-	1.1E-04
SVOC																		
Acetophenone	8.1E-03	-	7.4E-03	9.4E-03	-	8.6E-03	-	1.8E-02	-	1.6E-02	-	-	-	-	-	-	-	-
Atrazine	-	-	-	-	-	-	3.6E-04	3.6E-04	3.6E-04	3.6E-04	5.0E+01	1.0E+02	7.2E-06	7.2E-06	7.2E-06	3.6E-06	3.6E-06	3.6E-06
Biphenyl	9.0E-03	7.7E-04	4.0E-04	2.6E+01	2.2E+00	1.2E+00	-	2.6E+01	2.2E+00	1.2E+00	1.0E+01	1.0E+02	**2.6E+00**	2.2E-01	1.2E-01	2.6E-01	2.2E-02	1.2E-02
Bis(2-Ethylhexyl) Phthalate	1.0E-03	2.3E-04	1.6E-04	1.4E+02	3.1E+01	2.1E+01	-	1.4E+02	3.1E+01	2.1E+01	1.8E+01	1.8E+02	**7.6E+00**	**1.7E+00**	**1.2E+00**	7.6E-01	1.7E-01	1.2E-01
4-Bromophenyl-phenylether	-	-	-	-	-	-	3.6E-04	3.6E-04	3.6E-04	3.6E-04	-	-	-	-	-	-	-	-
Butylbenzyl Phthalate	1.3E-03	-	-	3.8E+01	-	-	-	3.8E+01	-	-	-	-	-	-	-	-	-	-
Carbazole	2.1E-03	6.3E-04	4.6E-04	2.4E+00	7.1E-01	5.3E-01	-	2.4E+00	7.1E-01	5.3E-01	-	-	-	-	-	-	-	-
Dibenzofuran	4.7E-03	4.0E-04	2.5E-04	1.9E+01	1.6E+00	1.0E+00	-	1.9E+01	1.6E+00	1.0E+00	-	-	-	-	-	-	-	-
Dimethyl Phthalate	3.7E-02	-	4.6E-03	4.5E-02	-	5.8E-03	-	8.2E-02	-	1.0E-02	3.5E+03	-	2.4E-05	-	3.0E-06	-	-	-
Di-N-Octyl Phthalate	5.8E-05	4.1E-06	1.4E-06	4.5E+06	3.2E+05	1.1E+05	-	4.5E+06	3.2E+05	1.1E+05	9.8E+03	-	**4.6E+02**	**3.3E+01**	**1.2E+01**	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	3.6E-04	3.6E-04	3.6E-04	3.6E-04	1.0E+02	1.3E+02	3.6E-06	3.6E-06	3.6E-06	2.9E-06	2.9E-06	2.9E-06
Hexachlorobutadiene	-	-	-	-	-	-	3.6E-04	3.6E-04	3.6E-04	3.6E-04	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	1.9E-05	-	-	9.9E-01	-	-	-	9.9E-01	-	-	4.5E+01	-	2.2E-02	-	-	-	-	-
N-Nitrosodiphenylamine	5.1E-04	-	-	8.7E-02	-	-	-	8.8E-02	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	3.6E-04	3.6E-04	3.6E-04	3.6E-04	2.4E-01	2.4E+00	1.5E-03	1.5E-03	1.5E-03	1.5E-04	1.5E-04	1.5E-04
Phenol	2.3E-02	-	5.8E-03	1.8E-02	-	4.6E-03	-	4.1E-02	-	1.0E-02	4.0E+01	5.3E+01	1.0E-03	-	2.6E-04	7.6E-04	-	2.0E-04
Total Low Molecular Weight PAHS	2.8E-02	1.2E-02	6.9E-03	1.5E+00	2.2E-01	7.0E-02	-	1.6E+00	2.3E-01	7.9E-02	6.6E+01	1.1E+02	2.4E-02	3.6E-03	1.2E-03	1.4E-02	2.1E-03	7.2E-04
Total High Molecular Weight PAHs	1.1E-01	3.4E-02	1.9E-02	1.1E+00	3.5E-01	1.8E-01	-	1.3E+00	3.9E-01	2.1E-01	6.2E-01	3.1E+00	**2.1E+00**	6.4E-01	3.4E-01	4.2E-01	1.3E-01	6.8E-02
Pesticides																		
4,4'-DDD	5.4E-04	1.9E-04	8.6E-05	1.4E-02	5.5E-03	2.6E-03	4.8E-06	1.5E-02	5.8E-03	2.7E-03	1.5E-01	2.7E-01	1.0E-01	3.9E-02	1.9E-02	5.5E-02	2.1E-02	1.0E-02
4,4'-DDE	1.2E-03	2.8E-04	1.0E-04	1.1E-01	1.9E-02	6.0E-03	5.7E-06	1.1E-01	2.0E-02	6.1E-03	1.5E-01	2.7E-01	7.5E-01	1.3E-01	4.1E-02	4.0E-01	7.2E-02	2.2E-02
4,4'-DDT	2.5E-03	5.4E-04	1.8E-04	1.8E-01	3.0E-02	8.4E-03	7.4E-06	1.8E-01	3.1E-02	8.6E-03	1.5E-01	2.7E-01	**1.2E+00**	2.1E-01	5.9E-02	6.6E-01	1.1E-01	3.1E-02
Aldrin	4.4E-07	8.5E-08	4.5E-08	1.4E+00	2.6E-01	1.4E-01	-	1.4E+00	2.6E-01	1.4E-01	2.0E-01	1.0E+00	**6.8E+00**	**1.3E+00**	7.0E-01	**1.4E+00**	2.6E-01	1.4E-01
alpha-BHC	9.1E-06	1.7E-06	9.1E-07	1.3E-02	2.5E-03	1.3E-03	-	1.3E-02	2.5E-03	1.3E-03	1.6E+00	3.2E+00	8.3E-03	1.6E-03	8.4E-04	4.2E-03	7.9E-04	4.2E-04
alpha-chlordane	-	-	-	-	-	-	1.3E-05	1.3E-05	1.3E-05	1.3E-05	4.6E+00	9.2E+00	2.9E-06	2.9E-06	2.9E-06	1.4E-06	1.4E-06	1.4E-06
gamma-chlordane	-	-	-	-	-	-	1.5E-05	1.5E-05	1.5E-05	1.5E-05	4.6E+00	9.2E+00	3.2E-06	3.2E-06	3.2E-06	1.6E-06	1.6E-06	1.6E-06
beta-BHC	2.5E-05	8.6E-06	5.3E-06	4.0E-02	1.4E-02	8.7E-03	-	4.0E-02	1.4E-02	8.7E-03	4.0E-01	2.0E+00	1.0E-01	3.5E-02	2.2E-02	2.0E-02	7.0E-03	4.3E-03
delta-BHC	2.9E-06	7.5E-07	3.8E-07	1.3E-02	3.3E-03	1.7E-03	-	1.3E-02	3.3E-03	1.7E-03	1.6E+00	3.2E+00	7.9E-03	2.0E-03	1.0E-03	4.0E-03	1.0E-03	5.2E-04
gamma-BHC	5.1E-06	1.4E-06	6.9E-07	6.0E-03	1.6E-03	8.1E-04	-	6.0E-03	1.6E-03	8.1E-04	8.0E+00	-	7.5E-04	2.0E-04	1.0E-04	-	-	-
Methoxychlor	1.1E-04	1.4E-05	8.6E-06	1.7E+00	2.2E-01	1.3E-01	8.7E-06	1.7E+00	2.2E-01	1.3E-01	4.0E+00	8.0E+00	4.3E-01	5.5E-02	3.3E-02	2.2E-01	2.7E-02	1.6E-02
Dieldrin	9.5E-04	2.1E-04	6.1E-05	2.1E-02	4.8E-03	1.4E-03	1.7E-05	2.2E-02	5.0E-03	1.5E-03	1.5E-02	3.0E-02	**1.5E+00**	3.4E-01	9.8E-02	7.5E-01	1.7E-01	4.9E-02
Alpha-Endosulfan	4.9E-05	7.6E-06	4.1E-06	3.2E-02	5.0E-03	2.7E-03	-	3.2E-02	5.0E-03	2.7E-03	1.5E-01	-	2.1E-01	3.3E-02	1.8E-02	-	-	-
Beta-Endosulfan	9.1E-05	1.9E-05	1.1E-05	7.5E-02	1.5E-02	9.0E-03	-	7.5E-02	1.5E-02	9.0E-03	1.5E-01	-	5.0E-01	1.0E-01	6.0E-02	-	-	-
Endosulfan Sulfate	1.3E-04	2.0E-05	1.4E-05	1.2E-01	1.9E-02	1.3E-02	-	1.2E-01	1.9E-02	1.3E-02	1.5E-01	-	7.9E-01	1.3E-01	8.8E-02	-	-	-
Heptachlor	8.4E-06	8.5E-07	3.5E-07	3.9E-02	3.9E-03	1.6E-03	8.7E-07	8.7E-07	8.7E-07	8.7E-07	1.0E-01	1.0E+00	8.7E-06	8.7E-06	8.7E-06	8.7E-07	8.7E-07	8.7E-07
Heptachlor Epoxide	1.1E-05	4.8E-06	3.1E-06	3.5E-01	1.5E-01	9.7E-02	8.7E-07	3.5E-01	1.5E-01	9.7E-02	1.0E-01	1.0E+00	**3.5E+00**	**1.5E+00**	9.7E-01	3.5E-01	1.5E-01	9.7E-02
Endrin Aldehyde	2.9E-05	8.1E-06	4.6E-06	1.1E+00	3.0E-01	1.7E-01	-	1.1E+00	3.0E-01	1.7E-01	9.2E-02	9.2E-01	**1.2E+01**	**3.2E+00**	**1.8E+00**	**1.2E+00**	3.2E-01	1.8E-01
Endrin Ketone	-	-	-	-	-	-	-	4.7E-05	1.1E-05	5.8E-06	9.2E-02	9.2E-01	5.1E-04	1.2E-04	6.3E-05	5.1E-05	1.2E-05	6.3E-06
Endrin	2.7E-05	5.0E-06	2.7E-06	1.3E+00	2.5E-01	1.3E-01	-	1.3E+00	2.5E-01	1.3E-01	9.2E-02	9.2E-01	**1.4E+01**	**2.7E+00**	**1.4E+00**	**1.4E+00**	2.7E-01	1.4E-01
Toxaphene	-	-	-	-	-	-	9.2E-05	9.2E-05	9.2E-05	9.2E-05	8.0E+00	-	1.2E-05	1.2E-05	1.2E-05	-	-	-
Dioxins/Furans																		
2,3,7,8-TCDD Equivalents (Mammals)	2.8E-08	-	6.7E-09	3.1E-05	-	7.5E-06	4.5E-10	3.1E-05	-	7.5E-06	2.0E-06	2.0E-05	**1.6E+01**	-	**3.8E+00**	**1.6E+00**	-	3.8E-01

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Table 8-8.2
Hazard Quotient Estimation for Short-tailed Shrew - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.0173	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0015	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.0096	kg/day	Table 8-5
Fraction of Diet Comprised of Invertebrates	P_f^i	1	unitless	Table 8-5
Fraction soil ingestion	P_s	0.03	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.0039	kg/day	Table 8-3.1
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-5
Invertebrate Concentration	C_f^i	Chemical-specific	mg/kg	Table 8-6
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-6
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-5

																				NOAEL HQs			LOAEL HQs		
	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Invertebrate Exposure	95% Dose: Invertebrate Exposure	Mean Dose: Invertebrate Exposure	Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.3E+04	1.6E+04	1.5E+04	5.0E+03	3.5E+03	3.2E+03	1.6E+01	5.9E+01	4.1E+01	3.8E+01	2.8E+03	1.9E+03	1.8E+03	3.7E+00	2.8E+03	2.0E+03	1.8E+03	1.9E+00	1.9E+01	**1.5E+03**	**1.0E+03**	**9.5E+02**	**1.5E+02**	**1.0E+02**	**9.5E+01**
Antimony	1.8E+01	2.9E+00	2.1E+00	2.9E+00	4.6E-01	3.4E-01	-	4.7E-02	7.4E-03	5.5E-03	1.6E+00	2.5E-01	1.9E-01	-	1.6E+00	2.6E-01	1.9E-01	5.9E-02	5.9E-01	**2.8E+01**	**4.4E+00**	**3.3E+00**	**2.8E+00**	4.4E-01	3.3E-01
Arsenic	2.0E+01	1.0E+01	9.1E+00	3.2E-01	2.0E-01	1.8E-01	1.7E-02	5.2E-02	2.6E-02	2.4E-02	1.8E-01	1.1E-01	1.0E-01	3.9E-03	2.3E-01	1.4E-01	1.3E-01	1.0E+00	1.7E+00	2.2E-01	1.3E-01	1.2E-01	1.4E-01	8.4E-02	7.8E-02
Barium	8.6E+02	2.9E+02	1.8E+02	1.3E+01	4.2E+00	2.6E+00	5.9E-01	2.2E+00	7.6E-01	4.6E-01	7.0E+00	2.4E+00	1.4E+00	1.3E-01	9.4E+00	3.2E+00	2.0E+00	5.2E+01	8.3E+01	1.8E-01	6.3E-02	3.9E-02	1.1E-01	3.9E-02	2.5E-02
Beryllium	6.6E+01	9.4E+00	2.6E+00	4.8E-01	6.8E-02	1.9E-02	1.1E-03	1.7E-01	2.4E-02	6.9E-03	2.6E-01	3.8E-02	1.1E-02	2.5E-04	4.4E-01	6.2E-02	1.8E-02	5.3E-01	6.3E-01	8.2E-01	1.2E-01	3.3E-02	6.9E-01	9.9E-02	2.8E-02
Cadmium	8.1E+00	2.2E+00	1.2E+00	7.0E+00	2.5E+00	1.6E+00	5.2E-03	2.1E-02	5.8E-03	3.2E-03	3.9E+00	1.4E+00	8.7E-01	1.2E-03	3.9E+00	1.4E+00	8.8E-01	1.0E+00	1.0E+01	**3.9E+00**	**1.4E+00**	8.8E-01	3.9E-01	1.4E-01	8.8E-02
Chromium	1.4E+02	5.9E+01	5.2E+01	6.9E+00	2.9E+00	2.6E+00	5.4E-02	3.6E-01	1.5E-01	1.4E-01	3.8E+00	1.6E+00	1.4E+00	1.2E-02	4.2E+00	1.8E+00	1.6E+00	2.4E+00	9.6E+00	**1.7E+00**	7.4E-01	6.5E-01	4.3E-01	1.8E-01	1.6E-01
Cobalt	1.6E+02	3.0E+01	1.4E+01	3.1E+00	5.9E-01	2.8E-01	-	4.1E-01	7.9E-02	3.8E-02	1.7E+00	3.3E-01	1.6E-01	-	2.1E+00	4.1E-01	1.9E-01	7.3E+00	1.9E+01	2.9E-01	5.6E-02	2.6E-02	1.1E-01	2.2E-02	1.0E-02
Copper	1.1E+04	1.5E+03	4.4E+02	8.7E+02	1.2E+02	3.6E+01	1.1E-01	2.7E+01	3.9E+00	1.1E+00	4.8E+02	6.9E+01	2.0E+01	2.5E-02	5.1E+02	7.3E+01	2.1E+01	5.6E+00	9.3E+00	**9.1E+01**	**1.3E+01**	**3.8E+00**	**5.4E+01**	**7.8E+00**	**2.3E+00**
Iron	2.0E+05	4.1E+04	3.3E+04	4.4E+04	8.9E+03	7.2E+03	4.7E+01	5.2E+02	1.1E+02	8.5E+01	2.4E+04	5.0E+03	4.0E+03	1.1E+01	2.5E+04	5.1E+03	4.1E+03	-	-	-	-	-	-	-	-
Lead	4.3E+03	4.4E+02	3.6E+02	1.1E+02	1.8E+01	1.5E+01	2.5E-01	1.1E+01	1.2E+00	9.5E-01	6.1E+01	9.8E+00	8.3E+00	5.5E-02	7.2E+01	1.1E+01	9.3E+00	4.7E+00	5.0E+00	**1.5E+01**	**2.3E+00**	**2.0E+00**	**1.4E+01**	**2.2E+00**	**1.9E+00**
Manganese	9.8E+03	1.7E+03	7.0E+02	3.7E+01	1.1E+01	6.2E+00	1.6E+00	2.5E+01	4.3E+00	1.8E+00	2.1E+01	6.2E+00	3.5E+00	3.7E-01	4.7E+01	1.1E+01	5.6E+00	5.2E+01	1.5E+02	9.0E-01	2.1E-01	1.1E-01	3.2E-01	7.5E-02	3.9E-02
Mercury	6.7E+00	1.9E+00	1.5E+00	3.6E-01	1.0E-01	8.1E-02	7.8E-04	1.7E-02	4.9E-03	3.9E-03	2.0E-01	5.6E-02	4.5E-02	1.8E-04	2.2E-01	6.1E-02	4.9E-02	1.3E+01	-	1.7E-02	4.6E-03	3.7E-03	-	-	-
Nickel	1.3E+03	2.2E+02	7.6E+01	2.2E+02	3.8E+01	1.3E+01	5.8E-02	3.4E+00	5.8E-01	2.0E-01	1.2E+02	2.1E+01	7.1E+00	1.3E-02	1.3E+02	2.2E+01	7.3E+00	1.7E+00	2.7E+00	**7.4E+01**	**1.3E+01**	**4.3E+00**	**4.6E+01**	**8.0E+00**	**2.7E+00**
Selenium	1.1E+00	6.5E-01	4.6E-01	2.4E-01	1.4E-01	1.0E-01	-	2.9E-03	1.7E-03	1.2E-03	1.3E-01	7.9E-02	5.6E-02	-	1.4E-01	8.1E-02	5.7E-02	1.4E-01	1.5E-01	9.6E-01	5.6E-01	4.0E-01	9.5E-01	5.6E-01	3.9E-01
Silver	5.4E+00	1.9E+00	8.9E-01	1.8E+00	6.1E-01	2.9E-01	9.4E-04	1.4E-02	4.8E-03	2.3E-03	9.8E-01	3.4E-01	1.6E-01	2.1E-04	9.9E-01	3.4E-01	1.6E-01	6.0E+00	6.0E+01	1.7E-01	5.7E-02	2.7E-02	1.7E-02	5.7E-03	2.7E-03
Thallium	3.2E-01	-	-	6.9E-02	-	-	-	8.2E-04	-	-	3.8E-02	-	-	-	3.9E-02	-	-	7.4E-03	7.4E-02	**5.3E+00**	-	-	5.3E-01	-	-
Vanadium	8.4E+01	4.8E+01	4.5E+01	5.7E-01	3.2E-01	3.1E-01	5.0E-02	2.2E-01	1.3E-01	1.2E-01	3.1E-01	1.8E-01	1.7E-01	1.1E-02	5.4E-01	3.2E-01	3.0E-01	4.2E+00	5.1E+00	1.3E-01	7.6E-02	7.2E-02	1.1E-01	6.2E-02	5.8E-02
Zinc	1.8E+04	3.2E+03	1.1E+03	3.4E+02	1.9E+02	1.4E+02	5.7E-01	4.6E+01	8.3E+00	2.8E+00	1.9E+02	1.1E+02	7.5E+01	1.3E-01	2.3E+02	1.2E+02	7.8E+01	7.5E+01	7.4E+02	**3.1E+00**	**1.5E+00**	**1.0E+00**	3.1E-01	1.6E-01	1.1E-01
VOCs																									
Acetone	2.9E-02	-	5.3E-03	1.5E-03	-	2.6E-04	-	7.5E-05	-	1.4E-05	8.0E-04	-	1.5E-04	-	8.8E-04	-	1.6E-04	1.0E+01	5.0E+01	8.8E-05	-	1.6E-05	1.8E-05	-	3.2E-06
SVOCs																									
Acetophenone	8.8E-02	-	8.1E-02	1.2E-01	-	1.1E-01	-	2.3E-04	-	2.1E-04	6.9E-02	-	6.3E-02	-	6.9E-02	-	6.3E-02	-	-	-	-	-	-	-	-
Atrazine	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-03	-	-		5.0E+01	1.0E+02	-	-	-	-	-	-
Biphenyl	2.5E+00	2.1E-01	1.1E-01	3.4E+02	2.9E+01	1.5E+01	-	6.5E-03	5.6E-04	2.9E-04	1.9E+02	1.6E+01	8.5E+00	-	1.9E+02	1.6E+01	8.5E+00	1.0E+01	1.0E+02	**1.9E+01**	**1.6E+00**	8.5E-01	**1.9E+00**	1.6E-01	8.5E-02
Bis(2-Ethylhexyl) Phthalate	1.4E+00	3.1E-01	2.1E-01	1.8E+03	4.1E+02	2.8E+02	-	3.6E-03	8.1E-04	5.5E-04	1.0E+03	2.3E+02	1.5E+02	-	1.0E+03	2.3E+02	1.5E+02	1.8E+01	1.8E+02	**5.6E+01**	**1.2E+01**	**8.5E+00**	**5.6E+00**	**1.2E+00**	8.5E-01
4-Bromophenyl-phenylether	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-03	-			-	-	-	-	-	-	-	-
Butylbenzyl Phthalate	9.4E-01	-	-	5.0E+02	-	-	-	2.4E-03	-		2.8E+02	-	-	-	2.8E+02	-	-	-	-	-	-	-	-	-	-
Carbazole	4.0E-01	1.2E-01	8.8E-02	3.2E+01	9.4E+00	7.0E+00	-	1.0E-03	3.1E-04	2.3E-04	1.8E+01	5.2E+00	3.9E+00	-	1.8E+01	5.2E+00	3.9E+00	-	-	-	-	-	-	-	-
Dibenzofuran	1.5E+00	1.3E-01	7.9E-02	2.5E+02	2.1E+01	1.3E+01	-	3.9E-03	3.3E-04	2.1E-04	1.4E+02	1.2E+01	7.4E+00	-	1.4E+02	1.2E+01	7.4E+00	-	-	-	-	-	-	-	-
Dimethyl Phthalate	4.1E-01	-	5.2E-02	6.0E-01	-	7.6E-02	-	1.1E-03	-	1.4E-04	3.3E-01	-	4.2E-02	-	3.3E-01	-	4.2E-02	3.5E+03	-	9.5E-05	-	1.2E-05	-	-	-
Di-N-Octyl Phthalate	1.9E+01	1.4E+00	4.8E-01	5.9E+07	4.2E+06	1.5E+06	-	4.9E-02	3.5E-03	1.2E-03	3.3E+07	2.3E+06	8.3E+05	-	3.3E+07	2.3E+06	8.3E+05	9.8E+03	-	**3.4E+03**	**2.4E+02**	**8.5E+01**	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-03	-			1.0E+02	1.3E+02	-			-		
Hexachlorobutadiene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-03	-			-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.3E+01	-	-	-	4.6E-05	-	-	7.2E+00	-	-	-	7.2E+00	-	-	4.5E+01	-	1.6E-01	-	-	-	-	-
N-Nitrosodiphenylamine	4.4E-02	-	-	1.2E+00	-	-	-	1.1E-04	-	-	6.4E-01	-	-	-	6.4E-01	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-03	-			2.4E-01	2.4E+00	-			-		
Phenol	2.1E-01	5.6E-02	5.4E-02	2.4E-01	6.3E-02	6.1E-02	-	5.5E-04	1.5E-04	1.4E-04	1.3E-01	3.5E-02	3.4E-02	-	1.3E-01	3.5E-02	3.4E-02	4.0E+01	5.3E+01	3.3E-03	8.8E-04	8.5E-04	2.5E-03	6.6E-04	6.4E-04
Total Low Molecular Weight PAHS	4.0E+01	5.8E+00	1.9E+00	2.0E+01	2.8E+00	9.2E-01	-	1.0E-01	1.5E-02	4.9E-03	1.1E+01	1.6E+00	5.1E-01	-	1.1E+01	1.6E+00	5.1E-01	6.6E+01	1.1E+02	1.7E-01	2.4E-02	7.8E-03	1.0E-01	1.4E-02	4.7E-03
Total High Molecular Weight PAHs	3.6E+01	1.1E+01	5.9E+00	1.5E+01	4.6E+00	2.4E+00	-	9.5E-02	2.8E-02	1.5E-02	8.4E+00	2.5E+00	1.4E+00	-	8.5E+00	2.6E+00	1.4E+00	6.2E-01	3.1E+00	**1.4E+01**	**4.2E+00**	**2.2E+00**	**2.8E+00**	8.3E-01	4.5E-01
Pesticides																									
4,4'-DDD	2.4E-01	6.1E-02	2.1E-02	1.9E-01	7.3E-02	3.5E-02	2.5E-05	6.2E-04	1.6E-04	5.5E-05	1.0E-01	4.0E-02	1.9E-02	5.6E-06	1.1E-01	4.1E-02	1.9E-02	1.5E-01	2.7E-01	7.2E-01	2.8E-01	1.3E-01	3.8E-01	1.5E-01	7.0E-02
4,4'-DDE	7.2E-01	1.0E-01	2.7E-02	1.4E+00	2.5E-01	7.9E-02	3.0E-05	1.9E-03	2.6E-04	7.0E-05	7.9E-01	1.4E-01	4.4E-02	6.8E-06	7.9E-01	1.4E-01	4.4E-02	1.5E-01	2.7E-01	**5.4E+00**	9.6E-01	3.0E-01	**2.9E+00**	5.2E-01	1.6E-01
4,4'-DDT	1.9E+00	2.4E-01	5.7E-02	2.3E+00	3.9E-01	1.1E-01	3.9E-05	4.9E-03	6.4E-04	1.5E-04	1.3E+00	2.2E-01	6.1E-02	8.8E-06	1.3E+00	2.2E-01	6.1E-02	1.5E-01	2.7E-01	**8.9E+00**	**1.5E+00**	4.2E-01	**4.8E+00**	8.0E-01	2.2E-01
Aldrin	2.2E-03	4.2E-04	2.2E-04	1.8E+01	3.5E+00	1.8E+00	2.4E-05	5.7E-06	1.1E-06	5.8E-07	1.0E+01	1.9E+00	1.0E+00	-	1.0E+01	1.9E+00	1.0E+00	2.0E-01	1.0E+00	**5.0E+01**	**9.6E+00**	**5.1E+00**	**1.0E+01**	**1.9E+00**	**1.0E+00**
alpha-BHC	1.9E-03	3.6E-04	1.9E-04	1.8E-01	3.3E-02	1.8E-02	-	4.9E-06	9.3E-07	5.0E-07	9.7E-02	1.8E-02	9.8E-03	-	9.7E-02	1.8E-02	9.8E-03	1.6E+00	3.2E+00	6.1E-02	1.2E-02	6.1E-03	3.0E-02	5.8E-03	3.1E-03
alpha-chlordane	-	-	-	-	-	-	7.0E-05	-	-	-	-	-	-	1.6E-05	1.6E-05	1.6E-05	1.6E-05	4.6E+00	9.2E+00	3.4E-06	3.4E-06	3.4E-06	1.7E-06	1.7E-06	1.7E-06
gamma-chlordane	-	-	-	-	-	-	7.7E-05	-	-	-	-	-	-	1.7E-05	1.7E-05	1.7E-05	1.7E-05	4.6E+00	9.2E+00	3.8E-06	3.8E-06	3.8E-06	1.9E-06	1.9E-06	1.9E-06
beta-BHC	5.4E-03	1.9E-03	1.2E-03	5.3E-01	1.9E-01	1.1E-01	-	1.4E-05	4.9E-06	3.0E-06	3.0E-01	1.0E-01	6.3E-02	-	3.0E-01	1.0E-01	6.3E-02	4.0E-01	2.0E+00	7.4E-01	2.6E-01	1.6E-01	1.5E-01	5.1E-02	3.2E-02
delta-BHC	9.5E-04	2.5E-04	1.2E-04	1.7E-01	4.3E-02	2.2E-02	-	2.5E-06	6.4E-07	3.2E-07	9.3E-02	2.4E-02	1.2E-02	-	9.3E-02	2.4E-02	1.2E-02	1.6E+00	3.2E+00	5.8E-02	1.5E-02	7.6E-03	2.9E-02	7.5E-03	3.8E-03
gamma-BHC	9.8E-04	2.6E-04	1.3E-04	7.9E-02	2.1E-02	1.1E-02	-	2.5E-06	6.8E-07	3.4E-07	4.4E-02	1.2E-02	5.9E-03	-	4.4E-02	1.2E-02	5.9E-03	8.0E+00	-	5.5E-03	1.5E-03	7.4E-04	-	-	-
Methoxychlor	6.3E-02	7.9E-03	4.7E-03	2.3E+01	2.9E+00	1.7E+00	4.6E-05	1.6E-04	2.1E-05	1.2E-05	1.3E+01	1.6E+00	9.5E-01	-	1.3E+01	1.6E+00	9.5E-01	4.0E+00	8.0E+00	**3.2E+00**	4.0E-01	2.4E-01	**1.6E+00**	2.0E-01	1.2E-01
Dieldrin	1.2E-01	2.7E-02	7.7E-03	2.8E-01	6.3E-02	1.8E-02	9.0E-05	3.1E-04	7.0E-05	2.0E-05	1.6E-01	3.5E-02	1.0E-02	2.0E-05	1.6E-01	3.5E-02	1.0E-02	1.5E-02	3.0E-02	**1.0E+01**	**2.3E+00**	6.8E-01	**5.2E+00**	**1.2E+00**	3.4E-01
Alpha-Endosulfan	7.3E-03	1.1E-03	6.2E-04	4.2E-01	6.6E-02	3.6E-02	-	1.9E-05	3.0E-06	1.6E-06	2.3E-01	3.6E-02	2.0E-02	-	2.3E-01	3.6E-02	2.0E-02	1.5E-01	-	**1.6E+00**	2.4E-01	1.3E-01	-	-	-
Beta-Endosulfan	1.5E-02	3.1E-03	1.8E-03	9.9E-01	2.0E-01	1.2E-01	-	3.9E-05	8.0E-06	4.7E-06	5.5E-01	1.1E-01	6.6E-02	-	5.5E-01	1.1E-01	6.6E-02	1.5E-01	-	**3.7E+00**	7.5E-01	4.4E-01	-	-	-
Endosulfan Sulfate	2.2E-02	3.6E-03	2.4E-03	1.6E+00	2.5E-01	1.7E-01	-	5.7E-05	9.3E-06	6.4E-06	8.7E-01	1.4E-01	9.7E-02	-	8.7E-01	1.4E-01	9.7E-02	1.5E-01	-	**5.8E+00**	9.4E-01	6.4E-01	-	-	-
Heptachlor	8.9E-03	9.0E-04	3.7E-04	5.1E-01	5.2E-02	2.1E-02	4.6E-06	2.3E-05	2.3E-06	9.6E-07	2.9E-01	2.9E-02	1.2E-02	1.0E-06	2.9E-01	2.9E-02	1.2E-02	1.0E-01	1.0E+00	**2.9E+00**	2.9E-01	1.2E-01	2.9E-01	2.9E-02	1.2E-02
Heptachlor Epoxide	8.3E-03	3.6E-03	2.3E-03	4.6E+00	2.0E+00	1.3E+00	4.6E-06	2.2E-05	9.3E-06	6.0E-06	2.6E+00	1.1E+00	7.1E-01	1.0E-06	2.6E+00	1.1E+00	7.1E-01	1.0E-01	1.0E+00	**2.6E+01**	**1.1E+01**	**7.1E+00**	**2.6E+00**	**1.1E+00**	7.1E-01
Endrin Aldehyde	2.3E-02	6.4E-03	3.7E-03	1.4E+01	3.9E+00	2.2E+00	-	6.0E-05	1.7E-05	9.5E-06	7.8E+00	2.2E+00	1.2E+00	-	7.8E+00	2.2E+00	1.2E+00	9.2E-02	9.2E-01	**8.5E+01**	**2.4E+01**	**1.3E+01**	**8.5E+00**	**2.4E+00**	**1.3E+00**
Endrin Ketone	4.1E-02	9.4E-03	5.1E-03	-	-	-	-	1.1E-04	2.4E-05	1.3E-05	-	-	-	-	1.1E-04	2.4E-05	1.3E-05	9.2E-02	9.2E-01	1.2E-03	2.7E-04	1.4E-04	1.2E-04	2.7E-05	1.4E-05
Endrin	2.4E-02	4.5E-03	2.4E-03	1.7E+01	3.2E+00	1.7E+00	-	6.2E-05	1.2E-05	6.3E-06	9.7E+00	1.8E+00	9.7E-01	-	9.7E+00	1.8E+00	9.7E-01	9.2E-02	9.2E-01	**1.0E+02**	**2.0E+01**	**1.1E+01**	**1.0E+01**	**2.0E+00**	**1.1E+00**
Toxaphene	-	-	-	-	-	-	4.9E-04	-	-	-	-	-	-	1.1E-04	1.1E-04	1.1E-04	1.1E-04	8.0E+00	-	1.4E-05	1.4E-05	1.4E-05	-	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Mammals)	2.6E-04	-	6.2E-05	4.1E-04	-	9.9E-05	2.4E-09	6.7E-07	-	1.6E-07	2.3E-04	-	5.5E-05	5.3E-10	2.3E-04	-	5.5E-05	2.2E-06	2.2E-05	**1.0E+02**	-	**2.5E+01**	**1.0E+01**	-	**2.5E+00**

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Golder Associates

Table 8-8.3
Hazard Quotient Estimation for Meadow Vole - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.037	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0018	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.012	kg/day	Table 8-5
Fraction of Diet Comprised of Plants	P_f^p	1	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.0078	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.1
Fraction soil ingestion	P_s	0.024	unitless	Table 8-5
Plant Concentration	C_f^p	Chemical-specific	mg/kg	Table 8-6
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-6
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-5

																				NOAEL HQs			LOAEL HQs		
	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{pmean}	CwMax	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.3E+04	1.6E+04	1.5E+04	1.4E+01	9.5E+00	8.8E+00	1.6E+01	2.7E+01	1.8E+01	1.7E+01	4.4E+00	3.1E+00	2.9E+00	3.4E+00	3.4E+01	2.5E+01	2.4E+01	1.9E+00	1.9E+01	**1.8E+01**	**1.3E+01**	**1.2E+01**	**1.8E+00**	**1.3E+00**	**1.2E+00**
Antimony	1.8E+01	2.9E+00	2.1E+00	8.9E-02	1.6E-02	1.2E-02	-	2.1E-02	3.3E-03	2.5E-03	2.9E-02	5.1E-03	3.9E-03	-	5.0E-02	8.5E-03	6.4E-03	5.9E-02	5.9E-01	8.4E-01	1.4E-01	1.1E-01	8.4E-02	1.4E-02	1.1E-02
Arsenic	2.0E+01	1.0E+01	9.1E+00	1.1E-01	5.7E-02	5.1E-02	1.7E-02	2.3E-02	1.2E-02	1.1E-02	3.6E-02	1.8E-02	1.7E-02	3.7E-03	6.3E-02	3.4E-02	3.1E-02	1.0E+00	1.7E+00	6.1E-02	3.2E-02	3.0E-02	3.8E-02	2.0E-02	1.9E-02
Barium	8.6E+02	2.9E+02	1.8E+02	2.0E+01	6.8E+00	4.2E+00	5.9E-01	1.0E+00	3.4E-01	2.1E-01	6.6E+00	2.2E+00	1.3E+00	1.2E-01	7.7E+00	2.7E+00	1.7E+00	5.2E+01	8.3E+01	1.5E-01	5.2E-02	3.2E-02	9.3E-02	3.2E-02	2.0E-02
Beryllium	6.6E+01	9.4E+00	2.6E+00	1.9E+00	4.6E-01	1.8E-01	1.1E-03	7.7E-02	1.1E-02	3.1E-03	6.2E-01	1.5E-01	5.8E-02	2.3E-04	6.9E-01	1.6E-01	6.1E-02	5.3E-01	6.3E-01	**1.3E+00**	3.0E-01	1.2E-01	**1.1E+00**	2.5E-01	9.8E-02
Cadmium	8.1E+00	2.2E+00	1.2E+00	2.9E-01	1.4E-01	1.0E-01	5.2E-03	9.5E-03	2.6E-03	1.4E-03	9.5E-02	4.7E-02	3.4E-02	1.1E-03	1.1E-01	5.1E-02	3.7E-02	1.0E+00	1.0E+01	1.1E-01	5.1E-02	3.7E-02	1.1E-02	5.1E-03	3.7E-03
Chromium	1.4E+02	5.9E+01	5.2E+01	8.6E-01	3.6E-01	3.2E-01	5.4E-02	1.6E-01	6.9E-02	6.1E-02	2.8E-01	1.2E-01	1.0E-01	1.1E-02	4.5E-01	2.0E-01	1.8E-01	2.4E+00	9.6E+00	1.9E-01	8.3E-02	7.4E-02	4.7E-02	2.1E-02	1.8E-02
Cobalt	1.6E+02	3.0E+01	1.4E+01	1.8E-01	3.4E-02	1.6E-02	-	1.8E-01	3.5E-02	1.7E-02	5.8E-02	1.1E-02	5.3E-03	-	2.4E-01	4.7E-02	2.2E-02	7.3E+00	1.9E+01	3.3E-02	6.3E-03	3.0E-03	1.3E-02	2.5E-03	1.2E-03
Copper	1.1E+04	1.5E+03	4.4E+02	1.1E+01	5.2E+00	3.2E+00	1.1E-01	1.2E+01	1.8E+00	5.1E-01	3.6E+00	1.7E+00	1.0E+00	2.3E-02	1.6E+01	3.5E+00	1.6E+00	5.6E+00	9.3E+00	**2.8E+00**	6.2E-01	2.8E-01	**1.7E+00**	3.7E-01	1.7E-01
Iron	2.0E+05	4.1E+04	3.3E+04	7.5E+01	1.5E+01	1.2E+01	4.7E+01	2.3E+02	4.7E+01	3.8E+01	2.4E+01	4.9E+00	4.0E+00	9.9E+00	2.7E+02	6.2E+01	5.2E+01	-	-	-	-	-	-	-	-
Lead	4.3E+03	4.4E+02	3.6E+02	4.3E+00	1.2E+00	1.1E+00	2.5E-01	5.0E+00	5.2E-01	4.2E-01	1.4E+00	3.9E-01	3.5E-01	5.2E-02	6.4E+00	9.6E-01	8.3E-01	4.7E+00	5.0E+00	**1.4E+00**	2.1E-01	1.8E-01	**1.3E+00**	1.9E-01	1.7E-01
Manganese	9.8E+03	1.7E+03	7.0E+02	1.2E+02	2.0E+01	8.3E+00	1.6E+00	1.1E+01	1.9E+00	8.2E-01	3.8E+01	6.4E+00	2.7E+00	3.4E-01	4.9E+01	8.7E+00	3.9E+00	5.2E+01	1.5E+02	9.6E-01	1.7E-01	7.5E-02	3.4E-01	5.9E-02	2.6E-02
Mercury	6.7E+00	1.9E+00	1.5E+00	2.3E-01	6.3E-02	5.0E-02	7.8E-04	7.8E-03	2.2E-03	1.7E-03	7.3E-02	2.0E-02	1.6E-02	1.6E-04	8.1E-02	2.3E-02	1.8E-02	1.3E+01	-	6.2E-03	1.7E-03	1.4E-03	-	-	-
Nickel	1.3E+03	2.2E+02	7.6E+01	3.5E+00	9.3E-01	4.1E-01	5.8E-02	1.5E+00	2.6E-01	8.8E-02	1.1E+00	3.0E-01	1.3E-01	1.2E-02	2.7E+00	5.7E-01	2.3E-01	1.7E+00	2.7E+00	**1.6E+00**	3.4E-01	1.4E-01	9.8E-01	2.1E-01	8.7E-02
Selenium	1.1E+00	6.5E-01	4.6E-01	8.5E-02	4.7E-02	3.2E-02	-	1.3E-03	7.6E-04	5.4E-04	2.7E-02	1.5E-02	1.0E-02	-	2.9E-02	1.6E-02	1.1E-02	1.4E-01	1.5E-01	2.0E-01	1.1E-01	7.7E-02	2.0E-01	1.1E-01	7.6E-02
Silver	5.4E+00	1.9E+00	8.9E-01	1.1E-02	3.9E-03	1.9E-03	9.4E-04	6.3E-03	2.2E-03	1.0E-03	3.7E-03	1.3E-03	6.0E-04	2.0E-04	1.0E-02	3.6E-03	1.8E-03	6.0E+00	6.0E+01	1.7E-03	6.0E-04	3.1E-04	1.7E-04	6.0E-05	3.1E-05
Thallium	3.2E-01	-	-	1.9E-04	-	-	-	3.7E-04	-	-	6.1E-05	-	-	-	4.3E-04	-	-	7.4E-03	7.4E-02	5.8E-02	-	-	5.8E-03	-	-
Vanadium	8.4E+01	4.8E+01	4.5E+01	6.1E-02	3.5E-02	3.3E-02	5.0E-02	9.8E-02	5.6E-02	5.3E-02	2.0E-02	1.1E-02	1.1E-02	1.1E-02	1.3E-01	7.8E-02	7.4E-02	4.2E+00	5.1E+00	3.1E-02	1.9E-02	1.8E-02	2.5E-02	1.5E-02	1.5E-02
Zinc	1.8E+04	3.2E+03	1.1E+03	1.6E+02	6.3E+01	3.5E+01	5.7E-01	2.0E+01	3.7E+00	1.3E+00	5.3E+01	2.0E+01	1.1E+01	1.2E-01	7.3E+01	2.4E+01	1.3E+01	7.5E+01	7.4E+02	9.7E-01	3.2E-01	1.7E-01	9.9E-02	3.3E-02	1.7E-02
VOCs																									
Acetone	2.9E-02	-	5.3E-03	2.3E-01	-	4.1E-02	-	3.4E-05	-	6.2E-06	7.3E-02	-	1.3E-02	-	7.3E-02	-	1.3E-02	1.0E+01	5.0E+01	7.3E-03	-	1.3E-03	1.5E-03	-	2.7E-04
SVOCs																									
Acetophenone	8.8E-02	-	8.1E-02	6.2E-02	-	5.7E-02	-	1.0E-04	-	9.4E-05	2.0E-02	-	1.9E-02	-	2.0E-02	-	1.9E-02	-	-	-	-	-	-	-	-
Atrazine	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	4.0E-04	4.0E-04	4.0E-04	-	5.0E+01	1.0E+02	8.0E-06	8.0E-06	-	4.0E-06	4.0E-06	-
Biphenyl	2.5E+00	2.1E-01	1.1E-01	7.0E-02	6.0E-03	3.1E-03	-	2.9E-03	2.5E-04	1.3E-04	2.3E-02	1.9E-03	1.0E-03	-	2.6E-02	2.2E-03	1.1E-03	1.0E+01	1.0E+02	2.6E-03	2.2E-04	1.1E-04	2.6E-04	2.2E-05	1.1E-05
Bis(2-Ethylhexyl) Phthalate	1.4E+00	3.1E-01	2.1E-01	8.0E-03	1.8E-03	1.2E-03	-	1.6E-03	3.7E-04	2.5E-04	2.6E-03	5.8E-04	3.9E-04	-	4.2E-03	9.4E-04	6.4E-04	1.8E+01	1.8E+02	2.3E-04	5.2E-05	3.5E-05	2.3E-05	5.2E-06	3.5E-06
4-Bromophenyl-phenylether	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	4.0E-04	4.0E-04	4.0E-04	4.0E-04	-	-	-	-	-	-	-	-
Butylbenzyl Phthalate	9.4E-01	-	-	1.0E-02	-	-	-	1.1E-03	-	-	3.3E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	4.0E-01	1.2E-01	8.8E-02	1.6E-02	4.9E-03	3.6E-03	-	4.7E-04	1.4E-04	1.0E-04	5.3E-03	1.6E-03	1.2E-03	-	5.8E-03	1.7E-03	1.3E-03	-	-	-	-	-	-	-	-
Dibenzofuran	1.5E+00	1.3E-01	7.9E-02	3.6E-02	3.1E-03	1.9E-03	-	1.8E-03	1.5E-04	9.3E-05	1.2E-02	1.0E-03	6.2E-04	-	1.3E-02	1.1E-03	7.1E-04	-	-	-	-	-	-	-	-
Dimethyl Phthalate	4.1E-01	-	5.2E-02	2.8E-01	-	3.6E-02	-	4.8E-04	-	6.1E-05	9.2E-02	-	1.2E-02	-	9.2E-02		1.2E-02	3.5E+03	-	2.6E-05		3.3E-06	-	-	-
Di-N-Octyl Phthalate	1.9E+01	1.4E+00	4.8E-01	4.5E-04	3.2E-05	1.1E-05	-	2.2E-02	1.6E-03	5.6E-04	1.5E-04	1.0E-05	3.6E-06	-	2.2E-02	1.6E-03	5.6E-04	9.8E+03	-	2.3E-06	1.6E-07	5.7E-08	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	4.0E-04	4.0E-04	4.0E-04	4.0E-04	1.0E+02	1.3E+02	4.0E-06	4.0E-06	4.0E-06	3.2E-06	3.2E-06	3.2E-06
Hexachlorobutadiene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	4.0E-04	4.0E-04	4.0E-04	4.0E-04	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.5E-04	-	-	-	2.0E-05	-	-	4.8E-05	-	-	-	-	-	-	4.5E+01	-	-	-	-	-	-	-
N-Nitrosodiphenylamine	4.4E-02	-	-	4.0E-03	-	-	-	5.1E-05	-	-	1.3E-03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	4.0E-04	4.0E-04	4.0E-04	4.0E-04	2.4E-01	2.4E+00	1.7E-03	1.7E-03	1.7E-03	1.7E-04	1.7E-04	1.7E-04
Phenol	2.1E-01	1.0E-01	2.7E-02	1.7E-01	4.7E-02	4.5E-02	-	2.5E-04	1.2E-04	3.1E-05	5.7E-02	1.5E-02	1.5E-02	-	5.7E-02	1.5E-02	1.5E-02	4.0E+01	5.3E+01	1.4E-03	3.8E-04	3.7E-04	1.1E-03	2.9E-04	2.7E-04
Total Low Molecular Weight PAHS	4.0E+01	5.8E+00	1.9E+00	2.1E-01	8.9E-02	5.3E-02	-	4.7E-02	6.8E-03	2.2E-03	7.0E-02	2.9E-02	1.7E-02	-	1.2E-01	3.6E-02	2.0E-02	6.6E+01	1.1E+02	1.8E-03	5.5E-04	3.0E-04	1.1E-03	3.3E-04	1.8E-04
Total High Molecular Weight PAHs	3.6E+01	1.1E+01	5.9E+00	8.2E-01	2.6E-01	1.5E-01	-	4.2E-02	1.3E-02	6.8E-03	2.7E-01	8.6E-02	4.7E-02	-	3.1E-01	9.8E-02	5.4E-02	6.2E-01	3.1E+00	5.0E-01	1.6E-01	8.8E-02	1.0E-01	3.2E-02	1.8E-02
Pesticides																									
4,4'-DDD	2.4E-01	6.1E-02	2.1E-02	4.2E-03	1.5E-03	6.7E-04	2.5E-05	2.8E-04	7.2E-05	2.5E-05	1.3E-03	4.8E-04	2.2E-04	5.3E-06	1.6E-03	5.6E-04	2.5E-04	1.5E-01	2.7E-01	1.1E-02	3.8E-03	1.7E-03	6.0E-03	2.0E-03	9.0E-04
4,4'-DDE	7.2E-01	1.0E-01	2.7E-02	9.5E-03	2.2E-03	8.0E-04	3.0E-05	8.4E-04	1.2E-04	3.1E-05	3.1E-03	7.1E-04	2.6E-04	6.3E-06	3.9E-03	8.3E-04	3.0E-04	1.5E-01	2.7E-01	2.7E-02	5.7E-03	2.0E-03	1.4E-02	3.0E-03	1.1E-03
4,4'-DDT	1.9E+00	2.4E-01	5.7E-02	2.0E-02	4.2E-03	1.4E-03	3.9E-05	2.2E-03	2.9E-04	6.6E-05	6.4E-03	1.4E-03	4.5E-04	8.2E-06	8.6E-03	1.7E-03	5.3E-04	1.5E-01	2.7E-01	5.9E-02	1.1E-02	3.6E-03	3.1E-02	6.1E-03	1.9E-03
Aldrin	2.2E-03	4.2E-04	2.2E-04	3.4E-06	6.6E-07	3.5E-07	2.4E-05	2.6E-06	4.9E-07	2.6E-07	1.1E-06	2.1E-07	1.1E-07	5.1E-06	8.7E-06	5.8E-06	5.4E-06	2.0E-01	1.0E+00	4.4E-05	2.9E-05	2.7E-05	8.7E-06	5.8E-06	5.4E-06
alpha-BHC	1.9E-03	3.6E-04	1.9E-04	7.0E-05	1.3E-05	7.1E-06	-	2.2E-06	4.2E-07	2.2E-07	2.3E-05	4.3E-06	2.3E-06	-	2.5E-05	4.7E-06	2.5E-06	1.6E+00	3.2E+00	1.6E-05	3.0E-06	1.6E-06	7.8E-06	1.5E-06	7.8E-07
alpha-chlordane	-	-	-	-	-	-	7.0E-05	-	-	-	-	-	-	1.5E-05	1.5E-05	1.5E-05	1.5E-05	4.6E+00	9.2E+00	3.2E-06	3.2E-06	3.2E-06	1.6E-06	1.6E-06	1.6E-06
gamma-chlordane	-	-	-	-	-	-	7.7E-05	-	-	-	-	-	-	1.6E-05	1.6E-05	1.6E-05	1.6E-05	4.6E+00	9.2E+00	3.5E-06	3.5E-06	3.5E-06	1.8E-06	1.8E-06	1.8E-06
beta-BHC	5.4E-03	1.9E-03	1.2E-03	1.9E-04	6.7E-05	4.1E-05	-	6.3E-06	2.2E-06	1.4E-06	6.2E-05	2.2E-05	1.3E-05	-	6.8E-05	2.4E-05	1.5E-05	4.0E-01	2.0E+00	1.7E-04	5.9E-05	3.7E-05	3.4E-05	1.2E-05	7.3E-06
delta-BHC	9.5E-04	2.5E-04	1.2E-04	2.2E-05	5.8E-06	2.9E-06	-	1.1E-06	2.9E-07	1.5E-07	7.2E-06	1.9E-06	9.5E-07	-	8.4E-06	2.2E-06	1.1E-06	1.6E+00	3.2E+00	5.2E-06	1.4E-06	6.9E-07	2.6E-06	6.8E-07	3.4E-07
gamma-BHC	9.8E-04	2.6E-04	1.3E-04	4.0E-05	1.1E-05	5.3E-06	-	1.1E-06	3.0E-07	1.5E-07	1.3E-05	3.4E-06	1.7E-06	-	1.4E-05	3.7E-06	1.9E-06	8.0E+00	-	1.8E-06	4.7E-07	2.4E-07	-	-	-
Methoxychlor	6.3E-02	7.9E-03	4.7E-03	8.9E-04	1.1E-04	6.6E-05	4.6E-05	7.4E-05	9.3E-06	5.5E-06	2.9E-04	3.6E-05	2.2E-05	9.6E-06	3.7E-04	5.5E-05	3.7E-05	4.0E+00	8.0E+00	9.3E-05	1.4E-05	9.2E-06	4.6E-05	6.9E-06	4.6E-06
Dieldrin	1.2E-01	2.7E-02	7.7E-03	7.4E-03	1.6E-03	4.8E-04	9.0E-05	1.4E-04	3.1E-05	9.0E-06	2.4E-03	5.3E-04	1.5E-04	1.9E-05	2.6E-03	5.9E-04	1.8E-04	1.5E-02	3.0E-02	1.7E-01	3.9E-02	1.2E-02	8.5E-02	2.0E-02	6.1E-03
Alpha-Endosulfan	7.3E-03	1.1E-03	6.2E-04	3.8E-04	5.9E-05	3.2E-05	-	8.5E-06	1.3E-06	7.2E-07	1.2E-04	1.9E-05	1.0E-05	-	1.3E-04	2.0E-05	1.1E-05	1.5E-01	-	8.7E-04	1.4E-04	7.4E-05	-	-	-
Beta-Endosulfan	1.5E-02	3.1E-03	1.8E-03	7.0E-04	1.5E-04	8.5E-05	-	1.8E-05	3.6E-06	2.1E-06	2.3E-04	4.7E-05	2.8E-05	-	2.5E-04	5.1E-05	3.0E-05	1.5E-01	-	1.6E-03	3.4E-04	2.0E-04	-	-	-
Endosulfan Sulfate	2.2E-02	3.6E-03	2.4E-03	9.8E-04	1.6E-04	1.1E-04	-	2.6E-05	4.2E-06	2.9E-06	3.2E-04	5.2E-05	3.5E-05	-	3.4E-04	5.6E-05	3.8E-05	1.5E-01	-	2.3E-03	3.7E-04	2.5E-04	-	-	-
Heptachlor	8.9E-03	9.0E-04	3.7E-04	6.5E-05	6.6E-06	2.7E-06	4.6E-06	1.0E-05	1.0E-06	4.3E-07	2.1E-05	2.1E-06	8.8E-07	9.6E-07	3.3E-05	4.1E-06	2.3E-06	1.0E-01	1.0E+00	3.3E-04	4.1E-05	2.3E-05	3.3E-05	4.1E-06	2.3E-06
Heptachlor Epoxide	8.3E-03	3.6E-03	2.3E-03	8.7E-05	3.7E-05	2.4E-05	4.6E-06	9.7E-06	4.2E-06	2.7E-06	2.8E-05	1.2E-05	7.8E-06	9.6E-07	3.9E-05	1.7E-05	1.1E-05	1.0E-01	1.0E+00	3.9E-04	1.7E-04	1.1E-04	3.9E-05	1.7E-05	1.1E-05
Endrin Aldehyde	2.3E-02	6.4E-03	3.7E-03	2.2E-04	6.3E-05	3.6E-05	-	2.7E-05	7.5E-06	4.3E-06	7.3E-05	2.0E-05	1.2E-05	-	1.0E-04	2.8E-05	1.6E-05	9.2E-02	9.2E-01	1.1E-03	3.0E-04	1.7E-04	1.1E-04	3.0E-05	1.7E-05
Endrin Ketone	4.1E-02	9.4E-03	5.1E-03	-	-	-	-	4.8E-05	1.1E-05	5.9E-06	-	-	-	-	4.8E-05	1.1E-05	5.9E-06	9.2E-02	9.2E-01	5.2E-04	1.2E-04	6.4E-05	5.2E-05	1.2E-05	6.4E-06
Endrin	2.4E-02	4.5E-03	2.4E-03	2.1E-04	3.9E-05	2.1E-05	-	2.8E-05	5.2E-06	2.8E-06	6.7E-05	1.3E-05	6.8E-06	-	9.5E-05	1.8E-05	9.6E-06	9.2E-02	9.2E-01	1.0E-03	1.9E-04	1.0E-04	1.0E-04	1.9E-05	1.0E-05
Toxaphene	-	-	-	-	-	-	4.9E-04	-	-	-	-	-	-	1.0E-04	1.0E-04	1.0E-04	1.0E-04	8.0E+00	-	1.3E-05	1.3E-05	1.3E-05	-	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Mammals)	2.6E-04	-	6.2E-05	2.2E-07	-	5.2E-08	2.4E-09	3.0E-07	-	7.2E-08	7.0E-08	-	1.7E-08	5.0E-10	3.7E-07	-	9.0E-08	1.7E-06	1.7E-05	2.2E-01	-	5.3E-02	2.2E-02	-	5.3E-03

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Golder Associates

Table 8-8.4
Hazard Quotient Estimation for Red Fox - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	4.54	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.1	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.313	kg/day	Table 8-5
Fraction of Diet Comprised of Small Mammals	P_f^{sm}	1	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.386	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.1
Fraction soil ingestion	P_s	0.028	unitless	Table 8-5
Small Mammal Concentration	C_f^p	Chemical-specific	mg/kg	Table 8-6
Seed Concentration	C_f^{seeds}	Chemical-specific	mg/kg	Table 8-6
Invertebrate Concentration	C_f^i	Chemical-specific	mg/kg	Table 8-6
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-6
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-5

	C_s^{max}	$C_s^{95\%}$	C_s^{Mean}	C_f^{smmax}	$C_f^{sm95\%}$	C_f^{smMean}	CwMax	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Small Mammal Exposure	95% Dose: Small Mammal Exposure	Mean Dose: Small Mammal Exposure	Max Dose: Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		NOAEL HQs: Max Hazard Quotient	NOAEL HQs: 95% Hazard Quotient	NOAEL HQs: Mean Hazard Quotient	LOAEL HQs: Max Hazard Quotient	LOAEL HQs: 95% Hazard Quotient	LOAEL HQs: Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.3E+04	1.6E+04	1.5E+04	-	-	-	1.6E+01	1.4E+01	9.7E+00	9.1E+00	-	-	-	1.4E+00	1.5E+01	1.1E+01	1.0E+01	1.9E+00	1.9E+01	**8.0E+00**	**5.8E+00**	**5.4E+00**	8.0E-01	5.8E-01	5.4E-01
Antimony	1.8E+01	2.9E+00	2.1E+00	1.4E-03	2.5E-04	1.9E-04	-	1.1E-02	1.8E-03	1.3E-03	9.8E-05	1.7E-05	1.3E-05	-	1.1E-02	1.8E-03	1.3E-03	5.9E-02	5.9E-01	1.9E-01	3.0E-02	2.3E-02	1.9E-02	3.0E-03	2.3E-03
Arsenic	2.0E+01	1.0E+01	9.1E+00	2.9E-02	1.7E-02	1.5E-02	1.7E-02	1.2E-02	6.2E-03	5.6E-03	2.0E-03	1.1E-03	1.1E-03	1.5E-03	1.6E-02	8.8E-03	8.1E-03	1.0E+00	1.7E+00	1.5E-02	8.5E-03	7.8E-03	9.5E-03	5.3E-03	4.9E-03
Barium	8.6E+02	2.9E+02	1.8E+02	4.9E-02	1.6E-02	1.0E-02	5.9E-01	5.3E-01	1.8E-01	1.1E-01	3.3E-03	1.1E-03	6.9E-04	5.0E-02	5.9E-01	2.3E-01	1.6E-01	5.2E+01	8.3E+01	1.1E-02	4.4E-03	3.1E-03	7.1E-03	2.8E-03	1.9E-03
Beryllium	6.6E+01	9.4E+00	2.6E+00	3.0E-02	7.3E-03	2.9E-03	1.1E-03	4.1E-02	5.8E-03	1.6E-03	2.1E-03	5.0E-04	2.0E-04	9.4E-05	4.3E-02	6.4E-03	1.9E-03	5.3E-01	6.3E-01	8.1E-02	1.2E-02	3.6E-03	6.8E-02	1.0E-02	3.1E-03
Cadmium	8.1E+00	2.2E+00	1.2E+00	2.4E-01	1.3E-01	1.0E-01	5.2E-03	5.0E-03	1.4E-03	7.6E-04	1.7E-02	9.2E-03	6.9E-03	4.4E-04	2.2E-02	1.1E-02	8.2E-03	1.0E+00	1.0E+01	2.2E-02	1.1E-02	8.2E-03	2.2E-03	1.1E-03	8.2E-04
Chromium	1.4E+02	5.9E+01	5.2E+01	2.8E+00	1.5E+00	1.4E+00	5.4E-02	8.6E-02	3.7E-02	3.2E-02	1.9E-01	1.0E-01	9.3E-02	4.6E-03	2.8E-01	1.4E-01	1.3E-01	2.4E+00	9.6E+00	1.2E-01	6.0E-02	5.4E-02	2.9E-02	1.5E-02	1.4E-02
Cobalt	1.6E+02	3.0E+01	1.4E+01	2.7E+00	3.2E-01	1.2E-01	-	9.7E-02	1.9E-02	8.9E-03	1.9E-01	2.2E-02	8.3E-03	-	2.9E-01	4.1E-02	1.7E-02	7.3E+00	1.9E+01	3.9E-02	5.5E-03	2.3E-03	1.5E-02	2.2E-03	9.1E-04
Copper	1.1E+04	1.5E+03	4.4E+02	9.4E+00	7.1E+00	5.9E+00	1.1E-01	6.5E+00	9.3E-01	2.7E-01	6.5E-01	4.9E-01	4.1E-01	9.4E-03	7.1E+00	1.4E+00	6.9E-01	5.6E+00	9.3E+00	**1.3E+00**	2.5E-01	1.2E-01	7.6E-01	1.5E-01	7.4E-02
Iron	2.0E+05	4.1E+04	3.3E+04	-	-	-	4.7E+01	1.2E+02	2.5E+01	2.0E+01	-	-	-	4.0E+00	1.3E+02	2.9E+01	2.4E+01	-	-	-	-	-	-	-	-
Lead	4.3E+03	4.4E+02	3.6E+02	1.4E+01	5.1E+00	4.7E+00	2.5E-01	2.6E+00	2.7E-01	2.2E-01	9.6E-01	3.5E-01	3.2E-01	2.1E-02	3.6E+00	6.5E-01	5.7E-01	4.7E+00	5.0E+00	7.7E-01	1.4E-01	1.2E-01	7.2E-01	1.3E-01	1.1E-01
Manganese	9.8E+03	1.7E+03	7.0E+02	6.4E+01	1.1E+01	4.6E+00	1.6E+00	6.0E+00	1.0E+00	4.3E-01	4.4E+00	7.5E-01	3.2E-01	1.4E-01	1.1E+01	1.9E+00	8.9E-01	5.2E+01	1.5E+02	2.1E-01	3.7E-02	1.7E-02	7.2E-02	1.3E-02	6.1E-03
Mercury	6.7E+00	1.9E+00	1.5E+00	2.6E-04	7.1E-05	5.7E-05	7.8E-04	4.1E-03	1.2E-03	9.2E-04	1.8E-05	4.9E-06	3.9E-06	6.6E-05	4.2E-03	1.2E-03	9.9E-04	1.3E+01	-	3.2E-04	9.3E-05	7.5E-05	-	-	-
Nickel	1.3E+03	2.2E+02	7.6E+01	7.1E+00	3.1E+00	1.9E+00	5.8E-02	8.0E-01	1.4E-01	4.7E-02	4.9E-01	2.1E-01	1.3E-01	4.9E-03	1.3E+00	3.6E-01	1.8E-01	1.7E+00	2.7E+00	7.6E-01	2.1E-01	1.1E-01	4.8E-01	1.3E-01	6.7E-02
Selenium	1.1E+00	6.5E-01	4.6E-01	2.2E-01	1.8E-01	1.6E-01	-	6.8E-04	4.0E-04	2.8E-04	1.5E-02	1.2E-02	1.1E-02	-	1.6E-02	1.3E-02	1.1E-02	1.4E-01	1.5E-01	1.1E-01	8.9E-02	7.8E-02	1.1E-01	8.8E-02	7.7E-02
Silver	5.4E+00	1.9E+00	8.9E-01	6.9E-03	2.4E-03	1.1E-03	9.4E-04	3.3E-03	1.1E-03	5.5E-04	4.8E-04	1.6E-04	7.8E-05	8.0E-05	3.9E-03	1.4E-03	7.1E-04	6.0E+00	6.0E+01	6.5E-04	2.3E-04	1.2E-04	6.5E-05	2.3E-05	1.2E-05
Thallium	3.2E-01	-	-	-	-	-	-	1.9E-04	-	-	-	-	-	-	1.9E-04	-	-	7.4E-03	7.4E-02	2.6E-02	-	-	2.6E-03	-	-
Vanadium	8.4E+01	4.8E+01	4.5E+01	3.3E-01	1.9E-01	1.8E-01	5.0E-02	5.2E-02	3.0E-02	2.8E-02	2.3E-02	1.3E-02	1.2E-02	4.3E-03	7.9E-02	4.7E-02	4.5E-02	4.2E+00	5.1E+00	1.9E-02	1.1E-02	1.1E-02	1.5E-02	9.2E-03	8.7E-03
Zinc	1.8E+04	3.2E+03	1.1E+03	5.0E+01	4.4E+01	4.1E+01	5.7E-01	1.1E+01	2.0E+00	6.7E-01	3.5E+00	3.1E+00	2.8E+00	4.8E-02	1.4E+01	5.1E+00	3.6E+00	7.5E+01	7.4E+02	1.9E-01	6.7E-02	4.7E-02	1.9E-02	6.8E-03	4.8E-03
VOCs																									
Acetone	2.9E-02	-	5.3E-03	1.5E-11	-	2.7E-12	-	1.8E-05	-	3.3E-06	1.0E-12	-	1.8E-13	-	1.8E-05	-	3.3E-06	1.0E+01	5.0E+01	1.8E-06	-	3.3E-07	3.6E-07	-	6.5E-08
SVOCs																									
Acetophenone	8.8E-02	-	8.1E-02	2.6E-10	-	2.4E-10	-	5.4E-05	-	5.0E-05	1.8E-11	-	1.6E-11	-	5.4E-05	-	5.0E-05	-	-	-	-	-	-	-	-
Atrazine	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.6E-04	1.6E-04	1.6E-04	1.6E-04	5.0E+01	1.0E+02	3.2E-06	3.2E-06	3.2E-06	1.6E-06	1.6E-06	1.6E-06
Biphenyl	2.5E+00	2.1E-01	1.1E-01	3.0E-08	7.0E-09	3.7E-09	-	1.5E-03	1.3E-04	6.9E-05	2.0E-09	4.8E-10	2.5E-10	-	1.5E-03	1.3E-04	6.9E-05	1.0E+01	1.0E+02	1.5E-04	1.3E-05	6.9E-06	1.5E-05	1.3E-06	6.9E-07
Bis(2-Ethylhexyl) Phthalate	1.4E+00	3.1E-01	2.1E-01	1.8E-07	4.1E-08	2.8E-08	-	8.6E-04	1.9E-04	1.3E-04	1.3E-08	2.8E-09	1.9E-09	-	8.6E-04	1.9E-04	1.3E-04	1.8E+01	1.8E+02	4.7E-05	1.1E-05	7.2E-06	4.7E-06	1.1E-06	7.2E-07
4-Bromophenyl-phenylether	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.6E-04	1.6E-04	1.6E-04	1.6E-04	-	-	-	-	-	-	-	-
Butylbenzyl Phthalate	9.4E-01	-	-	6.8E-08	-	-	-	5.8E-04	-	-	4.7E-09	-	-	-	5.8E-04	-	-	-	-	-	-	-	-	-	-
Carbazole	4.0E-01	1.2E-01	8.8E-02	9.7E-09	2.9E-09	2.1E-09	-	2.5E-04	7.3E-05	5.4E-05	6.7E-10	2.0E-10	1.5E-10	-	2.5E-04	7.3E-05	5.4E-05	-	-	-	-	-	-	-	-
Dibenzofuran	1.5E+00	1.3E-01	7.9E-02	5.5E-08	4.7E-09	2.9E-09	-	9.3E-04	7.8E-05	4.9E-05	3.8E-09	3.2E-10	2.0E-10	-	9.3E-04	7.8E-05	4.9E-05	-	-	-	-	-	-	-	-
Dimethyl Phthalate	4.1E-01	-	5.2E-02	1.2E-09	-	1.5E-10	-	2.5E-04	-	3.2E-05	8.4E-11	-	1.1E-11	-	2.5E-04	-	3.2E-05	3.5E+03	-	7.2E-08	-	9.2E-09	-	-	-
Di-N-Octyl Phthalate	1.9E+01	1.4E+00	4.8E-01	7.9E-03	5.7E-04	2.0E-04	-	1.2E-02	8.3E-04	2.9E-04	5.5E-04	3.9E-05	1.4E-05	-	1.2E-02	8.7E-04	3.1E-04	9.8E+03	-	1.3E-06	8.9E-08	3.1E-08	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.6E-04	1.6E-04	1.6E-04	1.6E-04	1.0E+02	1.3E+02	1.6E-06	1.6E-06	1.6E-06	1.3E-06	1.3E-06	1.3E-06
Hexachlorobutadiene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.6E-04	1.6E-04	1.6E-04	1.6E-04	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.6E-09	-	-	-	1.1E-05	-	-	1.1E-10	-	-	-	1.1E-05	-	-	4.5E+01	-	2.4E-07	-	-	-	-	-
N-Nitrosodiphenylamine	4.4E-02	-	-	5.9E-10	-	-	-	2.7E-05	-	-	4.1E-11	-	-	-	2.7E-05	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.6E-04	1.6E-04	1.6E-04	1.6E-04	2.4E-01	2.4E+00	6.7E-04	6.7E-04	6.7E-04	6.7E-05	6.7E-05	6.7E-05
Phenol	2.1E-01	5.6E-02	5.4E-02	5.5E-10	1.5E-10	1.4E-10	-	1.3E-04	3.5E-05	3.3E-05	3.8E-11	1.0E-11	9.7E-12	-	1.3E-04	3.5E-05	3.3E-05	4.0E+01	5.3E+01	3.2E-06	8.7E-07	8.4E-07	2.4E-06	6.5E-07	6.3E-07
Total Low Molecular Weight PAHS	4.0E+01	5.8E+00	1.9E+00	-	-	-	-	2.5E-02	3.6E-03	1.2E-03	-	-	-	-	2.5E-02	3.6E-03	1.2E-03	6.6E+01	1.1E+02	3.8E-04	5.5E-05	1.8E-05	2.3E-04	3.3E-05	1.1E-05
Total High Molecular Weight PAHs	3.6E+01	1.1E+01	5.9E+00	-	-	-	-	2.2E-02	6.8E-03	3.6E-03	-	-	-	-	2.2E-02	6.8E-03	3.6E-03	6.2E-01	3.1E+00	3.6E-02	1.1E-02	5.9E-03	7.3E-03	2.2E-03	1.2E-03
Pesticides																									
4,4'-DDD	2.4E-01	6.1E-02	2.1E-02	6.5E-07	2.3E-07	1.0E-07	2.5E-05	1.5E-04	3.8E-05	1.3E-05	4.5E-08	1.6E-08	6.9E-09	2.1E-06	1.5E-04	4.0E-05	1.5E-05	1.5E-01	2.7E-01	1.0E-03	2.7E-04	1.0E-04	5.5E-04	1.5E-04	5.5E-05
4,4'-DDE	7.2E-01	1.0E-01	2.7E-02	2.1E-06	4.6E-07	1.6E-07	3.0E-05	4.4E-04	6.3E-05	1.7E-05	1.4E-07	3.2E-08	1.1E-08	2.6E-06	4.5E-04	6.5E-05	1.9E-05	1.5E-01	2.7E-01	3.0E-03	4.4E-04	1.3E-04	1.6E-03	2.4E-04	7.0E-05
4,4'-DDT	1.9E+00	2.4E-01	5.7E-02	2.9E-06	5.9E-07	1.9E-07	3.9E-05	1.2E-03	1.5E-04	3.5E-05	2.0E-07	4.1E-08	1.3E-08	3.3E-06	1.2E-03	1.5E-04	3.8E-05	1.5E-01	2.7E-01	8.0E-03	1.0E-03	2.6E-04	4.3E-03	5.6E-04	1.4E-04
Aldrin	2.2E-03	4.2E-04	2.2E-04	1.2E-09	2.3E-10	1.2E-10	2.4E-05	1.4E-06	2.6E-07	1.4E-07	8.3E-11	1.6E-11	8.4E-12	2.0E-06	3.4E-06	2.3E-06	2.2E-06	2.0E-01	1.0E+00	1.7E-05	1.2E-05	1.1E-05	3.4E-06	2.3E-06	2.2E-06
alpha-BHC	1.9E-03	3.6E-04	1.9E-04	5.0E-11	9.5E-12	5.0E-12	-	1.2E-06	2.2E-07	1.2E-07	3.5E-12	6.5E-13	3.5E-13	-	1.2E-06	2.2E-07	1.2E-07	1.6E+00	3.2E+00	7.3E-07	1.4E-07	7.4E-08	3.7E-07	6.9E-08	3.7E-08
alpha-chlordane	-	-	-	-	-	-	7.0E-05	-	-	-	-	-	-	6.0E-06	6.0E-06	6.0E-06	6.0E-06	4.6E+00	9.2E+00	1.3E-06	1.3E-06	1.3E-06	6.5E-07	6.5E-07	6.5E-07
gamma-chlordane	-	-	-	-	-	-	7.7E-05	-	-	-	-	-	-	6.5E-06	6.5E-06	6.5E-06	6.5E-06	4.6E+00	9.2E+00	1.4E-06	1.4E-06	1.4E-06	7.1E-07	7.1E-07	7.1E-07
beta-BHC	5.4E-03	1.9E-03	1.2E-03	1.5E-10	5.1E-11	3.2E-11	-	3.3E-06	1.2E-06	7.2E-07	1.0E-11	3.5E-12	2.2E-12	-	3.3E-06	1.2E-06	7.2E-07	4.0E-01	2.0E+00	8.3E-06	2.9E-06	1.8E-06	1.7E-06	5.8E-07	3.6E-07
delta-BHC	9.5E-04	2.5E-04	1.2E-04	3.6E-11	9.3E-12	4.7E-12	-	5.9E-07	1.5E-07	7.7E-08	2.5E-12	6.4E-13	3.2E-13	-	5.9E-07	1.5E-07	7.7E-08	1.6E+00	3.2E+00	3.7E-07	9.5E-08	4.8E-08	1.8E-07	4.7E-08	2.4E-08
gamma-BHC	9.8E-04	2.6E-04	1.3E-04	2.4E-11	6.4E-12	3.2E-12	-	6.0E-07	1.6E-07	8.1E-08	1.7E-12	4.4E-13	2.2E-13	-	6.0E-07	1.6E-07	8.1E-08	8.0E+00	-	7.6E-08	2.0E-08	1.0E-08	-	-	-
Methoxychlor	6.3E-02	7.9E-03	4.7E-03	3.6E-09	4.6E-10	2.7E-10	4.6E-05	3.9E-05	4.9E-06	2.9E-06	2.5E-10	3.2E-11	1.9E-11	3.9E-06	4.3E-05	8.8E-06	6.8E-06	4.0E+00	8.0E+00	1.1E-05	2.2E-06	1.7E-06	5.3E-06	1.1E-06	8.5E-07
Dieldrin	1.2E-01	2.7E-02	7.7E-03	1.5E-07	3.4E-08	9.8E-09	9.0E-05	7.4E-05	1.7E-05	4.8E-06	1.1E-08	2.4E-09	6.8E-10	7.7E-06	8.2E-05	2.4E-05	1.2E-05	1.5E-02	3.0E-02	5.4E-03	1.6E-03	8.3E-04	2.7E-03	8.1E-04	4.1E-04
Alpha-Endosulfan	7.3E-03	1.1E-03	6.2E-04	1.5E-10	2.3E-11	1.3E-11	-	4.5E-06	7.0E-07	3.8E-07	1.0E-11	1.6E-12	8.7E-13	-	4.5E-06	7.0E-07	3.8E-07	1.5E-01	-	3.0E-05	4.7E-06	2.5E-06	-	-	-
Beta-Endosulfan	1.5E-02	3.1E-03	1.8E-03	3.3E-10	6.8E-11	4.0E-11	-	9.3E-06	1.9E-06	1.1E-06	2.3E-11	4.7E-12	2.7E-12	-	9.3E-06	1.9E-06	1.1E-06	1.5E-01	-	6.2E-05	1.3E-05	7.4E-06	-	-	-
Endosulfan Sulfate	2.2E-02	3.6E-03	2.4E-03	5.0E-10	8.2E-11	5.6E-11	-	1.4E-05	2.2E-06	1.5E-06	3.5E-11	5.6E-12	3.9E-12	-	1.4E-05	2.2E-06	1.5E-06	1.5E-01	-	9.0E-05	1.5E-05	1.0E-05	-	-	-
Heptachlor	8.9E-03	9.0E-04	3.7E-04	3.1E-11	3.1E-12	1.3E-12	4.6E-06	5.5E-06	5.5E-07	2.3E-07	2.1E-12	2.2E-13	8.9E-14	3.9E-07	5.9E-06	9.4E-07	6.1E-07	1.0E-01	1.0E+00	5.9E-05	9.4E-06	6.1E-06	5.9E-06	9.4E-07	6.1E-07
Heptachlor Epoxide	8.3E-03	3.6E-03	2.3E-03	6.2E-10	2.7E-10	1.7E-10	4.6E-06	5.1E-06	2.2E-06	1.4E-06	4.2E-11	1.8E-11	1.2E-11	3.9E-07	5.5E-06	2.6E-06	1.8E-06	1.0E-01	1.0E+00	5.5E-05	2.6E-05	1.8E-05	5.5E-06	2.6E-06	1.8E-06
Endrin Aldehyde	2.3E-02	6.4E-03	3.7E-03	1.8E-09	5.1E-10	2.9E-10	-	1.4E-05	4.0E-06	2.3E-06	1.2E-10	3.5E-11	2.0E-11	-	1.4E-05	4.0E-06	2.3E-06	9.2E-02	9.2E-01	1.5E-04	4.3E-05	2.4E-05	1.5E-05	4.3E-06	2.4E-06
Endrin Ketone	4.1E-02	9.4E-03	5.1E-03	-	-	-	-	2.5E-05	5.8E-06	3.1E-06	-	-	-	-	2.5E-05	5.8E-06	3.1E-06	9.2E-02	9.2E-01	2.7E-04	6.3E-05	3.4E-05	2.7E-05	6.3E-06	3.4E-06
Endrin	2.4E-02	4.5E-03	2.4E-03	2.1E-09	3.9E-10	2.1E-10	-	1.5E-05	2.8E-06	1.5E-06	1.5E-10	2.7E-11	1.5E-11	-	1.5E-05	2.8E-06	1.5E-06	9.2E-02	9.2E-01	1.6E-04	3.0E-05	1.6E-05	1.6E-05	3.0E-06	1.6E-06
Toxaphene	-	-	-	-	-	-	4.9E-04	-	-	-	-	-	-	4.1E-05	4.1E-05	4.1E-05	4.1E-05	8.0E+00	-	5.2E-06	5.2E-06	5.2E-06	-	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Mammals)	2.6E-04	-	6.2E-05	3.2E-10	-	7.7E-11	2.4E-09	1.6E-07	-	3.8E-08	2.2E-11	-	5.3E-12	2.0E-10	1.6E-07	-	3.8E-08	5.0E-07	5.3E-06	3.2E-01	-	7.7E-02	3.0E-02	-	7.3E-03

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Table 8-8.5
Hazard Quotient Estimation for American Robin - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.077	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0106	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.0685	kg/day	Table 8-5
Fraction of Diet Comprised of Plants	P_f^p	0.625	unitless	Table 8-5
Fraction of Diet Comprised of Invertebrates	P_f^i	0.375	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.011	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.1
Fraction soil ingestion	P_s	0.151	unitless	Table 8-5
Plant Concentration	C_f^p	Chemical-specific	mg/kg	Table 8-6
Invertebrate Concentration	C_f^i	Chemical-specific	mg/kg	Table 8-6
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-6
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-11
Area Use Factor	AUF	1	unitless	Table 8-5

	C_s^{max}	$C_s^{95\%}$	C_{sMean}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{pmean}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Max Dose: Invertebrate Exposure	95% Dose: Invertebrate Exposure	Mean Dose: Invertebrate Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		NOAEL HQs: Max Hazard Quotient	NOAEL HQs: 95% Hazard Quotient	NOAEL HQs: Mean Hazard Quotient	LOAEL HQs: Max Hazard Quotient	LOAEL HQs: 95% Hazard Quotient	LOAEL HQs: Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day		mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day		mg/kg/day	mg/kg/day	mg/kg/day		NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																															
Aluminum	2.3E+04	1.6E+04	1.5E+04	1.4E+01	9.5E+00	8.8E+00	5.0E+03	3.5E+03	3.2E+03	1.6E+01	4.7E+02	3.3E+02	3.1E+02	7.6E+00	5.3E+00	4.9E+00	1.7E+03	1.2E+03	1.1E+03	2.3E+00	2.1E+03	1.5E+03	1.4E+03	1.1E+02	-	**2.0E+01**	**1.4E+01**	**1.3E+01**	-	-	-
Antimony	1.8E+01	2.9E+00	2.1E+00	8.9E-02	1.6E-02	1.2E-02	2.9E+00	4.6E-01	3.4E-01	-	3.7E-01	5.9E-02	4.4E-02	4.9E-02	8.8E-03	6.7E-03	9.6E-01	1.5E-01	1.1E-01	-	1.4E+00	2.2E-01	1.6E-01	-	-	-	-	-	-	-	-
Arsenic	2.0E+01	1.0E+01	9.1E+00	1.1E-01	5.7E-02	5.1E-02	3.2E-01	2.0E-01	1.8E-01	1.7E-02	4.1E-01	2.1E-01	1.9E-01	6.2E-02	3.1E-02	2.8E-02	1.1E-01	6.6E-02	6.1E-02	2.5E-03	5.8E-01	3.1E-01	2.8E-01	2.2E+00	3.6E+00	2.6E-01	1.4E-01	1.3E-01	1.6E-01	8.7E-02	7.9E-02
Barium	8.6E+02	2.9E+02	1.8E+02	2.0E+01	6.8E+00	4.2E+00	1.3E+01	4.2E+00	2.6E+00	5.9E-01	1.8E+01	6.1E+00	3.7E+00	1.1E+01	3.8E+00	2.3E+00	4.2E+00	1.4E+00	8.6E-01	8.4E-02	3.3E+01	1.1E+01	6.9E+00	-	-	-	-	-	-	-	-
Beryllium	6.6E+01	9.4E+00	2.6E+00	1.9E+00	4.6E-01	1.8E-01	4.8E-01	6.8E-02	1.9E-02	1.1E-03	1.4E+00	2.0E-01	5.5E-02	1.1E+00	2.5E-01	1.0E-01	1.6E-01	2.3E-02	6.3E-03	1.6E-04	2.6E+00	4.7E-01	1.6E-01	-	-	-	-	-	-	-	-
Cadmium	8.1E+00	2.2E+00	1.2E+00	2.9E-01	1.4E-01	1.0E-01	7.0E+00	2.5E+00	1.6E+00	5.2E-03	1.7E-01	4.6E-02	2.6E-02	1.6E-01	8.0E-02	5.8E-02	2.3E+00	8.4E-01	5.2E-01	7.4E-04	2.7E+00	9.6E-01	6.1E-01	1.5E+00	2.0E+01	**1.8E+00**	6.7E-01	4.2E-01	1.3E-01	4.8E-02	3.0E-02
Chromium	1.4E+02	5.9E+01	5.2E+01	8.6E-01	3.6E-01	3.2E-01	6.9E+00	2.9E+00	2.6E+00	5.4E-02	2.9E+00	1.2E+00	1.1E+00	4.8E-01	2.0E-01	1.8E-01	2.3E+00	9.7E-01	8.5E-01	7.7E-03	5.7E+00	2.4E+00	2.1E+00	2.7E+00	2.8E+00	**2.1E+00**	9.1E-01	8.0E-01	**2.0E+00**	8.7E-01	7.6E-01
Cobalt	1.6E+02	3.0E+01	1.4E+01	1.8E-01	3.4E-02	1.6E-02	3.1E+00	5.9E-01	2.8E-01	-	3.3E+00	6.3E-01	3.0E-01	9.9E-02	1.9E-02	9.0E-03	1.0E+00	2.0E-01	9.4E-02	-	4.4E+00	8.5E-01	4.0E-01	7.6E+00	1.8E+01	5.8E-01	1.1E-01	5.3E-02	2.4E-01	4.6E-02	2.2E-02
Copper	1.1E+04	1.5E+03	4.4E+02	1.1E+01	5.2E+00	3.2E+00	8.7E+02	1.2E+02	3.6E+01	1.1E-01	2.2E+02	3.1E+01	9.1E+00	6.2E+00	2.9E+00	1.8E+00	2.9E+02	4.1E+01	1.2E+01	1.6E-02	5.1E+02	7.5E+01	2.3E+01	4.1E+00	4.7E+00	**1.3E+02**	**1.9E+01**	**5.6E+00**	**1.1E+02**	**1.6E+01**	**4.9E+00**
Iron	2.0E+05	4.1E+04	3.3E+04	7.5E+01	1.5E+01	1.2E+01	4.4E+04	8.9E+03	7.2E+03	4.7E+01	4.1E+03	8.4E+02	6.8E+02	4.1E+01	8.5E+00	6.8E+00	1.5E+04	3.0E+03	2.4E+03	6.7E+00	1.9E+04	3.8E+03	3.1E+03	-	-	-	-	-	-	-	-
Lead	4.3E+03	4.4E+02	3.6E+02	4.3E+00	1.2E+00	1.1E+00	1.1E+02	1.8E+01	1.5E+01	2.5E-01	8.9E+01	9.2E+00	7.6E+00	2.4E+00	6.8E-01	6.0E-01	3.6E+01	5.9E+00	5.0E+00	3.5E-02	1.3E+02	1.6E+01	1.3E+01	1.6E+00	1.9E+00	**7.8E+01**	**9.7E+00**	**8.1E+00**	**6.6E+01**	**8.2E+00**	**6.8E+00**
Manganese	9.8E+03	1.7E+03	7.0E+02	1.2E+02	2.0E+01	8.3E+00	3.7E+01	1.1E+01	6.2E+00	1.6E+00	2.0E+02	3.5E+01	1.5E+01	6.4E+01	1.1E+01	4.6E+00	1.3E+01	3.7E+00	2.1E+00	2.3E-01	2.8E+02	4.9E+01	2.2E+01	1.8E+02	3.8E+02	**1.6E+00**	2.8E-01	1.2E-01	7.4E-01	1.3E-01	5.7E-02
Mercury	6.7E+00	1.9E+00	1.5E+00	2.3E-01	6.3E-02	5.0E-02	3.6E-01	1.0E-01	8.1E-02	7.8E-04	1.4E-01	3.9E-02	3.1E-02	1.3E-01	3.5E-02	2.8E-02	1.2E-01	3.4E-02	2.7E-02	1.1E-04	3.9E-01	1.1E-01	8.6E-02	4.5E-01	9.0E-01	8.6E-01	2.4E-01	1.9E-01	4.3E-01	1.2E-01	9.6E-02
Nickel	1.3E+03	2.2E+02	7.6E+01	3.5E+00	9.3E-01	4.1E-01	2.2E+02	3.8E+01	1.3E+01	5.8E-02	2.7E+01	4.6E+00	1.6E+00	1.9E+00	5.2E-01	2.3E-01	7.3E+01	1.3E+01	4.3E+00	8.2E-03	1.0E+02	1.8E+01	6.1E+00	6.7E+00	1.2E+01	**1.5E+01**	**2.7E+00**	9.1E-01	**8.9E+00**	**1.5E+00**	5.3E-01
Selenium	1.1E+00	6.5E-01	4.6E-01	8.5E-02	4.7E-02	3.2E-02	2.4E-01	1.4E-01	1.0E-01	-	2.3E-02	1.3E-02	9.5E-03	4.7E-02	2.6E-02	1.8E-02	8.1E-02	4.7E-02	3.4E-02	-	1.5E-01	8.7E-02	6.1E-02	2.9E-01	3.7E-01	5.2E-01	3.0E-01	2.1E-01	4.1E-01	2.4E-01	1.7E-01
Silver	5.4E+00	1.9E+00	8.9E-01	1.1E-02	3.9E-03	1.9E-03	1.8E+00	6.1E-01	2.9E-01	9.4E-04	1.1E-01	3.9E-02	1.8E-02	6.3E-03	2.2E-03	1.0E-03	5.9E-01	2.0E-01	9.7E-02	1.3E-04	7.1E-01	2.4E-01	1.2E-01	2.0E+00	2.0E+01	3.5E-01	1.2E-01	5.8E-02	3.5E-02	1.2E-02	5.8E-03
Thallium	3.2E-01	-	-	1.9E-04	-	-	6.9E-02	-	-	-	6.5E-03	-	-	1.1E-04	-	-	2.3E-02	-	-	-	3.0E-02	-	-	4.7E-01	-	6.3E-02	-	-	-	-	-
Vanadium	8.4E+01	4.8E+01	4.5E+01	6.1E-02	3.5E-02	3.3E-02	5.7E-01	3.2E-01	3.1E-01	5.0E-02	1.8E+00	1.0E+00	9.4E-01	3.4E-02	2.0E-02	1.8E-02	1.9E-01	1.1E-01	1.0E-01	7.1E-03	2.0E+00	1.1E+00	1.1E+00	3.4E-01	4.1E-01	**5.8E+00**	**3.3E+00**	**3.1E+00**	**4.8E+00**	**2.8E+00**	**2.6E+00**
Zinc	1.8E+04	3.2E+03	1.1E+03	1.6E+02	6.3E+01	3.5E+01	3.4E+02	1.9E+02	1.4E+02	5.7E-01	3.6E+02	6.6E+01	2.2E+01	9.0E+01	3.5E+01	1.9E+01	1.1E+02	6.4E+01	4.5E+01	8.1E-02	5.7E+02	1.7E+02	8.7E+01	6.6E+01	1.5E+02	**8.6E+00**	**2.5E+00**	1.3E+00	**3.7E+00**	1.1E+00	5.6E-01
VOCs																															
Acetone	2.9E-02	-	5.3E-03	2.3E-01	-	4.1E-02	1.5E-03	-	2.6E-04	-	6.0E-04	-	1.1E-04	1.3E-01	-	2.3E-02	4.8E-04	-	8.8E-05	-	1.3E-01	-	2.3E-02	-	-	-	-	-	-	-	-
SVOCs																															
Acetophenone	8.8E-02	-	8.1E-02	6.2E-02	-	5.7E-02	1.2E-01	-	1.1E-01	-	1.8E-03	-	1.7E-03	3.5E-02	-	3.2E-02	4.1E-02	-	3.8E-02	-	7.8E-02	-	7.1E-02			-	-	-	-	-	-
Atrazine	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	-	-	-	2.7E-04	2.7E-04	2.7E-04	2.7E-04	5.0E+01	2.5E+02	5.4E-06	5.4E-06	5.4E-06	1.1E-06	1.1E-06	1.1E-06
Biphenyl	2.5E+00	2.1E-01	1.1E-01	7.0E-02	6.0E-03	3.1E-03	3.4E+02	2.9E+01	1.5E+01	-	5.2E-02	4.4E-03	2.3E-03	3.9E-02	3.3E-03	1.7E-03	1.1E+02	9.8E+00	5.1E+00	-	1.1E+02	9.8E+00	5.1E+00			-	-	-	-	-	-
Bis(2-Ethylhexyl) Phthalate	1.4E+00	3.1E-01	2.1E-01	8.0E-03	1.8E-03	1.2E-03	1.8E+03	4.1E+02	2.8E+02	-	2.9E-02	6.5E-03	4.4E-03	4.4E-03	9.9E-04	6.8E-04	6.1E+02	1.4E+02	9.3E+01	-	6.1E+02	1.4E+02	9.3E+01	1.1E+00	-	**5.6E+02**	**1.2E+02**	**8.5E+01**	-	-	-
4-Bromophenyl-phenylether	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	-	-	-	2.7E-04	2.7E-04	2.7E-04	2.7E-04			-	-	-	-	-	-
Butylbenzyl Phthalate	9.4E-01	-	-	1.0E-02	-	-	5.0E+02	-	-	-	2.0E-02	-	-	5.6E-03	-	-	1.7E+02	-	-	-	1.7E+02	-	-			-	-	-	-	-	-
Carbazole	4.0E-01	1.2E-01	8.8E-02	1.6E-02	4.9E-03	3.6E-03	3.2E+01	9.4E+00	7.0E+00	-	8.3E-03	2.5E-03	1.8E-03	9.1E-03	2.7E-03	2.0E-03	1.1E+01	3.1E+00	2.3E+00	-	1.1E+01	3.1E+00	2.3E+00			-	-	-	-	-	-
Dibenzofuran	1.5E+00	1.3E-01	7.9E-02	3.6E-02	3.1E-03	1.9E-03	2.5E+02	2.1E+01	1.3E+01	-	3.1E-02	2.6E-03	1.6E-03	2.0E-02	1.7E-03	1.1E-03	8.5E+01	7.2E+00	4.5E+00	-	8.5E+01	7.2E+00	4.5E+00			-	-	-	-	-	-
Dimethyl Phthalate	4.1E-01	-	5.2E-02	2.8E-01	-	3.6E-02	6.0E-01	-	7.6E-02	-	8.5E-03	-	-	1.6E-01	-	2.0E-02	2.0E-01	-	2.5E-02	-	3.7E-01	-	-			-	-	-	-	-	-
Di-N-Octyl Phthalate	1.9E+01	1.4E+00	4.8E-01	4.5E-04	3.2E-05	1.1E-05	5.9E+07	4.2E+06	1.5E+06	-	3.9E-01	2.8E-02	9.9E-03	2.5E-04	1.8E-05	6.2E-06	2.0E+07	1.4E+06	5.0E+05	-	2.0E+07	1.4E+06	5.0E+05			-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	-	-	-	2.7E-04	2.7E-04	2.7E-04	2.7E-04			-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	-	-	-	2.7E-04	2.7E-04	2.7E-04	2.7E-04			-	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.5E-04	-	-	1.3E+01	-	-	-	3.6E-04	-	-	8.2E-05	-	-	4.3E+00	-	-	-	4.3E+00	-	-			-	-	-	-	-	-
N-Nitrosodiphenylamine	4.4E-02	-	-	4.0E-03	-	-	1.2E+00	-	-	-	9.1E-04	-	-	2.2E-03	-	-	3.8E-01	-	-	-	3.9E-01	-	-			-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	-	-	-	2.7E-04	2.7E-04	2.7E-04	2.7E-04			-	-	-	-	-	-
Phenol	2.1E-01	5.6E-02	5.4E-02	1.7E-01	4.7E-02	4.5E-02	2.4E-01	6.3E-02	6.1E-02	-	4.4E-03	1.2E-03	1.1E-03	9.7E-02	2.6E-02	2.5E-02	7.9E-02	2.1E-02	2.0E-02	-	1.8E-01	4.8E-02	4.6E-02			-	-	-	-	-	-
Total Low Molecular Weight PAHs	4.0E+01	5.8E+00	1.9E+00	2.1E-01	8.9E-02	5.3E-02	2.0E+01	2.8E+00	9.2E-01	-	8.4E-01	1.2E-01	3.9E-02	1.2E-01	5.0E-02	3.0E-02	6.5E+00	9.5E-01	3.1E-01	-	7.5E+00	1.1E+00	3.8E-01	-	-	-	-	-	-	-	-
Total High Molecular Weight PAHs	3.6E+01	1.1E+01	5.9E+00	8.2E-01	2.6E-01	1.5E-01	1.5E+01	4.6E+00	2.4E+00	-	7.6E-01	2.3E-01	1.2E-01	4.6E-01	1.5E-01	8.1E-02	5.0E+00	1.5E+00	8.1E-01	-	6.3E+00	1.9E+00	1.0E+00	-	-	-	-	-	-	-	-
Pesticides																															
4,4'-DDD	2.4E-01	6.1E-02	2.1E-02	4.2E-03	1.5E-03	6.7E-04	1.9E-01	7.3E-02	3.5E-02	2.5E-05	5.0E-03	1.3E-03	4.4E-04	2.3E-03	8.3E-04	3.7E-04	6.3E-02	2.4E-02	1.2E-02	3.6E-06	7.0E-02	2.6E-02	1.2E-02	2.3E-01	2.8E-01	3.1E-01	1.2E-01	5.4E-02	2.5E-01	9.4E-02	4.4E-02
4,4'-DDE	7.2E-01	1.0E-01	2.7E-02	9.5E-03	2.2E-03	8.0E-04	1.4E+00	2.5E-01	7.9E-02	3.0E-05	1.5E-02	2.1E-03	5.6E-04	5.3E-03	1.2E-03	4.4E-04	4.8E-01	8.5E-02	2.6E-02	4.3E-06	5.0E-01	8.8E-02	2.7E-02	2.3E-01	2.8E-01	**2.2E+00**	3.9E-01	1.2E-01	**1.8E+00**	3.1E-01	9.7E-02
4,4'-DDT	1.9E+00	2.4E-01	5.7E-02	2.0E-02	4.2E-03	1.4E-03	2.3E+00	3.9E-01	1.1E-01	3.9E-05	3.9E-02	5.1E-03	1.2E-03	1.1E-02	2.3E-03	7.8E-04	7.8E-01	1.3E-01	3.7E-02	5.6E-06	8.3E-01	1.4E-01	3.9E-02	2.3E-01	2.8E-01	**3.7E+00**	6.1E-01	1.7E-01	**3.0E+00**	4.9E-01	1.4E-01
Aldrin	2.2E-03	4.2E-04	2.2E-04	3.4E-06	6.6E-07	3.5E-07	1.8E+01	3.5E+00	1.8E+00	2.4E-05	4.6E-05	8.8E-06	4.6E-06	1.9E-06	3.6E-07	1.9E-07	6.0E+00	1.2E+00	6.1E-01	3.4E-06	6.0E+00	1.2E+00	6.1E-01	-	-	-	-	-	-	-	-
alpha-BHC	1.9E-03	3.6E-04	1.9E-04	7.0E-05	1.3E-05	7.1E-06	1.8E-01	3.3E-02	1.8E-02	-	3.9E-05	7.5E-06	4.0E-06	3.9E-05	7.4E-06	3.9E-06	5.9E-02	1.1E-02	5.9E-03	-	5.9E-02	1.1E-02	5.9E-03	5.6E-01	2.3E+00	1.0E-01	2.0E-02	1.1E-02	2.6E-02	4.9E-03	2.6E-03
alpha-chlordane	-	-	-	-	-	-	-	-	-	7.0E-05	-	-	-	-	-	-	-	-	-	1.0E-05	1.0E-05	1.0E-05	1.0E-05	2.1E+00	1.1E+01	4.7E-06	4.7E-06	4.7E-06	9.3E-07	9.3E-07	9.3E-07
gamma-chlordane	-	-	-	-	-	-	-	-	-	7.7E-05	-	-	-	-	-	-	-	-	-	1.1E-05	1.1E-05	1.1E-05	1.1E-05	2.1E+00	1.1E+01	5.1E-06	5.1E-06	5.1E-06	1.0E-06	1.0E-06	1.0E-06
beta-BHC	5.4E-03	1.9E-03	1.2E-03	1.9E-04	6.7E-05	4.1E-05	5.3E-01	1.9E-01	1.1E-01	-	1.1E-04	3.9E-05	2.4E-05	1.1E-04	3.7E-05	2.3E-05	1.8E-01	6.2E-02	3.8E-02	-	1.8E-01	6.2E-02	3.8E-02	5.6E-01	2.3E+00	3.2E-01	1.1E-01	6.8E-02	7.9E-02	2.7E-02	1.7E-02
delta-BHC	9.5E-04	2.5E-04	1.2E-04	2.2E-05	5.8E-06	2.9E-06	1.7E-01	4.3E-02	2.2E-02	-	2.0E-05	5.1E-06	2.6E-06	1.2E-05	3.2E-06	1.6E-06	5.6E-02	1.4E-02	7.3E-03	-	5.6E-02	1.4E-02	7.3E-03	5.6E-01	2.3E+00	9.9E-02	2.6E-02	1.3E-02	2.5E-02	6.4E-03	3.3E-03
gamma-BHC	9.8E-04	2.6E-04	1.3E-04	4.0E-05	1.1E-05	5.3E-06	7.9E-02	2.1E-02	1.1E-02	-	2.0E-05	5.4E-06	2.7E-06	2.2E-05	5.9E-06	3.0E-06	2.7E-02	7.1E-03	3.6E-03	-	2.7E-02	7.1E-03	3.6E-03	2.0E+00	2.0E+01	1.3E-02	3.5E-03	1.8E-03	1.3E-03	3.5E-04	1.8E-04
Methoxychlor	6.3E-02	7.9E-03	4.7E-03	8.9E-04	1.1E-04	6.6E-05	2.3E+01	2.9E+00	1.7E+00	4.6E-05	1.3E-03	1.7E-04	9.8E-05	4.9E-04	6.2E-05	3.7E-05	7.6E+00	9.6E-01	5.7E-01	6.5E-06	7.7E+00	9.7E-01	5.7E-01	-	-	-	-	-	-	-	-
Dieldrin	1.2E-01	2.7E-02	7.7E-03	7.4E-03	1.6E-03	4.8E-04	2.8E-01	6.3E-02	1.8E-02	9.0E-05	2.5E-03	5.6E-04	1.6E-04	4.1E-03	9.2E-04	2.6E-04	9.4E-02	2.1E-02	6.1E-03	1.3E-05	1.0E-01	2.3E-02	6.5E-03	7.1E-02	1.8E-01	1.4E+00	3.2E-01	9.2E-02	5.6E-01	1.3E-01	3.6E-02
Alpha-Endosulfan	7.3E-03	1.1E-03	6.2E-04	3.8E-04	5.9E-05	3.2E-05	4.2E-01	6.6E-02	3.6E-02	-	1.5E-04	2.4E-05	1.3E-05	2.1E-04	3.3E-05	1.8E-05	1.4E-01	2.2E-02	1.2E-02	-	1.4E-01	2.2E-02	1.2E-02	1.0E+01	1.0E+02	1.4E-02	2.2E-03	1.2E-03	1.4E-03	2.2E-04	1.2E-04
Beta-Endosulfan	1.5E-02	3.1E-03	1.8E-03	7.0E-04	1.5E-04	8.5E-05	9.9E-01	2.0E-01	1.2E-01	-	3.1E-04	6.4E-05	3.8E-05	3.9E-04	8.1E-05	4.7E-05	3.3E-01	6.8E-02	4.0E-02	-	3.3E-01	6.8E-02	4.0E-02	1.0E+01	1.0E+02	3.3E-02	6.8E-03	4.0E-03	3.3E-03	6.8E-04	4.0E-04
Endosulfan Sulfate	2.2E-02	3.6E-03	2.4E-03	9.8E-04	1.6E-04	1.1E-04	1.6E+00	2.5E-01	1.7E-01	-	4.6E-04	7.4E-05	5.1E-05	5.4E-04	8.8E-05	6.1E-05	5.2E-01	8.5E-02	5.8E-02	-	5.2E-01	8.5E-02	5.8E-02	1.0E+01	1.0E+02	5.2E-02	8.5E-03	5.8E-03	5.2E-03	8.5E-04	5.8E-04
Heptachlor	8.9E-03	9.0E-04	3.7E-04	6.5E-05	6.6E-06	2.7E-06	5.1E-01	5.2E-02	2.1E-02	4.6E-06	1.9E-04	1.9E-05	7.7E-06	3.6E-05	3.7E-06	1.5E-06	1.7E-01	1.7E-02	7.1E-03	6.5E-07	1.7E-01	1.7E-02	7.1E-03	4.2E+01	-	4.1E-03	4.2E-04	1.7E-04	-	-	-
Heptachlor Epoxide	8.3E-03	3.6E-03	2.3E-03	8.7E-05	3.7E-05	2.4E-05	4.6E+00	2.0E+00	1.3E+00	4.6E-06	1.7E-04	7.4E-05	4.8E-05	4.8E-05	2.1E-05	1.3E-05	1.5E+00	6.6E-01	4.3E-01	6.5E-07	1.5E+00	6.6E-01	4.3E-01	2.6E+00	2.6E+01	5.9E-01	2.5E-01	1.6E-01	5.9E-02	2.5E-02	1.6E-02
Endrin Aldehyde	2.3E-02	6.4E-03	3.7E-03	2.2E-04	6.3E-05	3.6E-05	1.4E+01	3.9E+00	2.2E+00	-	4.8E-04	1.3E-04	7.6E-05	1.2E-04	3.5E-05	2.0E-05	4.7E+00	1.3E+00	7.4E-01	-	4.7E+00	1.3E+00	7.4E-01	1.0E-02	1.0E-01	**4.7E+02**	**1.3E+02**	**7.4E+01**	**4.7E+01**	**1.3E+01**	**7.4E+00**
Endrin Ketone	4.1E-02	9.4E-03	5.1E-03	-	-	-	-	-	-	-	8.5E-04	2.0E-04	1.1E-04	-	-	-	-	-	-	-	8.5E-04	2.0E-04	1.1E-04	1.0E-02	1.0E-01	8.5E-02	2.0E-02	1.1E-02	8.5E-03	2.0E-03	1.1E-03
Endrin	2.4E-02	4.5E-03	2.4E-03	2.1E-04	3.9E-05	2.1E-05	1.7E+01	3.2E+00	1.7E+00	-	5.0E-04	9.3E-05	5.0E-05	1.2E-04	2.2E-05	1.2E-05	5.8E+00	1.1E+00	5.8E-01	-	5.8E+00	1.1E+00	5.8E-01	1.0E-02	1.0E-01	**5.8E+02**	**1.1E+02**	**5.8E+01**	**5.8E+01**	**1.1E+01**	**5.8E+00**
Toxaphene	-	-	-	-	-	-	-	-	-	4.9E-04	-	-	-	-	-	-	-	-	-	6.9E-05	6.9E-05	6.9E-05	6.9E-05	4.0E-01	-	1.7E-04	1.7E-04	1.7E-04	-	-	-
Dioxins/Furans																															
2,3,7,8-TCDD Equivalents (Avian)	1.0E-04	-	3.1E-05	8.8E-08	-	2.6E-08	1.7E-04	-	4.9E-05	2.4E-09	2.2E-06	-	6.4E-07	4.9E-08	-	1.4E-08	5.6E-05	-	1.6E-05	3.4E-10	5.8E-05	-	1.7E-05	1.4E-05	1.4E-04	**4.1E+00**	-	1.2E+00	4.1E-01	-	1.2E-01

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Table 8-8.6
Hazard Quotient Estimation for Northern Bobwhite - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site
Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.157	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0018	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.0122	kg/day	Table 8-5
Fraction of Diet Comprised of Plants	P_f^p	1	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.018	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.1
Fraction soil ingestion	P_s	0.139	unitless	Table 8-5
Plant Concentration	C_f^p	Chemical-specific	mg/kg	Table 8-6
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-6
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-11
Area Use Factor	AUF	1	unitless	Table 8-5

	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{pmean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		NOAEL HQs: Max Hazard Quotient	NOAEL HQs: 95% Hazard Quotient	NOAEL HQs: Mean Hazard Quotient	LOAEL HQs: Max Hazard Quotient	LOAEL HQs: 95% Hazard Quotient	LOAEL HQs: Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.3E+04	1.6E+04	1.5E+04	1.4E+01	9.5E+00	8.8E+00	1.6E+01	3.6E+01	2.5E+01	2.3E+01	1.1E+00	7.3E-01	6.9E-01	1.9E+00	3.9E+01	2.8E+01	2.6E+01	1.1E+02	-	3.6E-01	2.5E-01	2.4E-01	-	-	-
Antimony	1.8E+01	2.9E+00	2.1E+00	8.9E-02	1.6E-02	1.2E-02	-	2.9E-02	4.5E-03	3.4E-03	6.9E-03	1.2E-03	9.4E-04	-	3.5E-02	5.8E-03	4.3E-03	-	-	-	-	-	-	-	-
Arsenic	2.0E+01	1.0E+01	9.1E+00	1.1E-01	5.7E-02	5.1E-02	1.7E-02	3.2E-02	1.6E-02	1.4E-02	8.7E-03	4.4E-03	4.0E-03	2.0E-03	4.2E-02	2.2E-02	2.0E-02	2.2E+00	3.6E+00	1.9E-02	1.0E-02	9.1E-03	1.2E-02	6.3E-03	5.7E-03
Barium	8.6E+02	2.9E+02	1.8E+02	2.0E+01	6.8E+00	4.2E+00	5.9E-01	1.4E+00	4.6E-01	2.8E-01	1.6E+00	5.3E-01	3.2E-01	6.7E-02	3.0E+00	1.1E+00	6.7E-01	-	-	-	-	-	-	-	-
Beryllium	6.6E+01	9.4E+00	2.6E+00	1.9E+00	4.6E-01	1.8E-01	1.1E-03	1.1E-01	1.5E-02	4.2E-03	1.5E-01	3.5E-02	1.4E-02	1.3E-04	2.5E-01	5.1E-02	1.8E-02	-	-	-	-	-	-	-	-
Cadmium	8.1E+00	2.2E+00	1.2E+00	2.9E-01	1.4E-01	1.0E-01	5.2E-03	1.3E-02	3.6E-03	2.0E-03	2.3E-02	1.1E-02	8.2E-03	6.0E-04	3.6E-02	1.5E-02	1.1E-02	1.5E+00	2.0E+01	2.5E-02	1.1E-02	7.4E-03	1.8E-03	7.7E-04	5.4E-04
Chromium	1.4E+02	5.9E+01	5.2E+01	8.6E-01	3.6E-01	3.2E-01	5.4E-02	2.2E-01	9.4E-02	8.3E-02	6.7E-02	2.8E-02	2.5E-02	6.2E-03	3.0E-01	1.3E-01	1.1E-01	2.7E+00	2.8E+00	1.1E-01	4.8E-02	4.3E-02	1.1E-01	4.6E-02	4.1E-02
Cobalt	1.6E+02	3.0E+01	1.4E+01	1.8E-01	3.4E-02	1.6E-02	-	2.5E-01	4.8E-02	2.3E-02	1.4E-02	2.7E-03	1.3E-03	-	2.7E-01	5.1E-02		7.6E+00	1.8E+01	3.5E-02	6.7E-03		1.5E-02	2.8E-03	
Copper	1.1E+04	1.5E+03	4.4E+02	1.1E+01	5.2E+00	3.2E+00	1.1E-01	1.7E+01	2.4E+00	7.0E-01	8.7E-01	4.1E-01	2.5E-01	1.3E-02	1.8E+01	2.8E+00	9.5E-01	4.1E+00	4.7E+00	**4.4E+00**	6.9E-01	2.3E-01	**3.8E+00**	6.0E-01	2.0E-01
Iron	2.0E+05	4.1E+04	3.3E+04	7.5E+01	1.5E+01	1.2E+01	4.7E+01	3.2E+02	6.5E+01	5.2E+01	5.8E+00	1.2E+00	9.5E-01	5.4E+00	3.3E+02	7.1E+01	5.8E+01	-	-	-	-	-	-	-	-
Lead	4.3E+03	4.4E+02	3.6E+02	4.3E+00	1.2E+00	1.1E+00	2.5E-01	6.8E+00	7.1E-01	5.8E-01	3.4E-01	9.4E-02	8.4E-02	2.8E-02	7.2E+00	8.3E-01	6.9E-01	1.6E+00	1.9E+00	**4.4E+00**	5.1E-01	4.2E-01	**3.7E+00**	4.3E-01	3.6E-01
Manganese	9.8E+03	1.7E+03	7.0E+02	1.2E+02	2.0E+01	8.3E+00	1.6E+00	1.6E+01	2.6E+00	1.1E+00	9.0E+00	1.5E+00	6.5E-01	1.9E-01	2.5E+01	4.4E+00	2.0E+00	1.8E+02	3.8E+02	1.4E-01	2.4E-02	1.1E-02	6.6E-02	1.2E-02	5.2E-03
Mercury	6.7E+00	1.9E+00	1.5E+00	2.3E-01	6.3E-02	5.0E-02	7.8E-04	1.1E-02	3.0E-03	2.4E-03	1.8E-02	4.9E-03	3.9E-03	8.9E-05	2.8E-02	8.0E-03	6.4E-03	4.5E-01	9.0E-01	6.3E-02	1.8E-02	1.4E-02	3.1E-02	8.8E-03	7.1E-03
Nickel	1.3E+03	2.2E+02	7.6E+01	3.5E+00	9.3E-01	4.1E-01	5.8E-02	2.1E+00	3.6E-01	1.2E-01	2.7E-01	7.2E-02	3.2E-02	6.6E-03	2.3E+00	4.3E-01	1.6E-01	6.7E+00	1.2E+01	3.5E-01	6.5E-02	2.4E-02	2.0E-01	3.8E-02	1.4E-02
Selenium	1.1E+00	6.5E-01	4.6E-01	8.5E-02	4.7E-02	3.2E-02	-	1.8E-03	1.0E-03	7.3E-04	6.6E-03	3.7E-03	2.5E-03	-	8.3E-03	4.7E-03	3.2E-03	2.9E-01	3.7E-01	2.9E-02	1.6E-02	1.1E-02	2.3E-02	1.3E-02	8.8E-03
Silver	5.4E+00	1.9E+00	8.9E-01	1.1E-02	3.9E-03	1.9E-03	9.4E-04	8.6E-03	3.0E-03	1.4E-03	8.8E-04	3.0E-04	1.4E-04	1.1E-04	9.6E-03	3.4E-03	1.7E-03	2.0E+00	2.0E+01	4.7E-03	1.7E-03	8.2E-04	4.7E-04	1.7E-04	8.2E-05
Thallium	3.2E-01	-	-	1.9E-04	-	-	-	5.0E-04	-	-	1.5E-05	-	-	-	5.2E-04	-	-	4.7E-01	-	1.1E-03	-	-	-	-	-
Vanadium	8.4E+01	4.8E+01	4.5E+01	6.1E-02	3.5E-02	3.3E-02	5.0E-02	1.3E-01	7.7E-02	7.2E-02	4.8E-03	2.7E-03	2.6E-03	5.7E-03	1.4E-01	8.5E-02	8.1E-02	3.4E-01	4.1E-01	4.2E-01	2.5E-01	2.3E-01	3.5E-01	2.1E-01	2.0E-01
Zinc	1.8E+04	3.2E+03	1.1E+03	1.6E+02	6.3E+01	3.5E+01	5.7E-01	2.8E+01	5.1E+00	1.7E+00	1.3E+01	4.9E+00	2.7E+00	6.5E-02	4.1E+01	1.0E+01	4.5E+00	6.6E+01	1.5E+02	6.1E-01	1.5E-01	6.8E-02	2.6E-01	6.5E-02	2.9E-02
VOCs																									
Acetone	2.9E-02	-	5.3E-03	2.3E-01	-	4.1E-02	-	4.6E-05	-	8.4E-06	1.8E-02	-	3.2E-03	-	1.8E-02	-	3.2E-03	-	-	-	-	-	-	-	-
SVOCs																									
Acetophenone	8.8E-02	-	8.1E-02	6.2E-02	-	5.7E-02	-	1.4E-04	-	1.3E-04	4.9E-03	-	4.4E-03	-	5.0E-03	-	4.6E-03			-	-	-	-	-	-
Atrazine	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	2.2E-04	2.2E-04	2.2E-04	2.2E-04	5.0E+01	2.5E+02	4.4E-06	4.4E-06	4.4E-06	8.7E-07	8.7E-07	8.7E-07
Biphenyl	2.5E+00	2.1E-01	1.1E-01	7.0E-02	6.0E-03	3.1E-03	-	4.0E-03	3.4E-04	1.8E-04	5.4E-03	4.6E-04	2.4E-04	-	9.4E-03	8.0E-04	4.2E-04			-	-	-	-	-	-
Bis(2-Ethylhexyl) Phthalate	1.4E+00	3.1E-01	2.1E-01	8.0E-03	1.8E-03	1.2E-03	-	2.2E-03	5.0E-04	3.4E-04	6.2E-04	1.4E-04	9.4E-05	-	2.9E-03	6.4E-04	4.3E-04	1.1E+00	-	2.6E-03	5.8E-04	3.9E-04	-	-	-
4-Bromophenyl-phenylether	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	2.2E-04	2.2E-04	2.2E-04	2.2E-04			-	-	-	-	-	-
Butylbenzyl Phthalate	9.4E-01	-	-	1.0E-02	-	-	-	1.5E-03	-	-	7.8E-04	-	-	-	2.3E-03	-	-			-	-	-	-	-	-
Carbazole	4.0E-01	1.2E-01	8.8E-02	1.6E-02	4.9E-03	3.6E-03	-	6.4E-04	1.9E-04	1.4E-04	1.3E-03	3.8E-04	2.8E-04	-	1.9E-03	5.7E-04	4.2E-04			-	-	-	-	-	-
Dibenzofuran	1.5E+00	1.3E-01	7.9E-02	3.6E-02	3.1E-03	1.9E-03	-	2.4E-03	2.0E-04	1.3E-04	2.8E-03	2.4E-04	1.5E-04	-	5.2E-03	4.4E-04	2.8E-04			-	-	-	-	-	-
Dimethyl Phthalate	4.1E-01	-	5.2E-02	2.8E-01	-	3.6E-02	-	6.5E-04	-	8.3E-05	2.2E-02	-	2.8E-03	-	2.3E-02	-	2.9E-03			-	-	-	-	-	-
Di-N-Octyl Phthalate	1.9E+01	1.4E+00	4.8E-01	4.5E-04	3.2E-05	1.1E-05	-	3.0E-02	2.2E-03	7.6E-04	3.5E-05	2.5E-06	8.7E-07	-	3.0E-02	2.2E-03	7.6E-04			-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	2.2E-04	2.2E-04	2.2E-04	2.2E-04			-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	2.2E-04	2.2E-04	2.2E-04	2.2E-04			-	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.5E-04	-	-	-	2.8E-05	-	-	1.2E-05	-	-	-	3.9E-05	-	-			-	-	-	-	-	-
N-Nitrosodiphenylamine	4.4E-02	-	-	4.0E-03	-	-	-	7.0E-05	-	-	3.1E-04	-	-	-	3.8E-04	-	-			-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	2.2E-04	2.2E-04	2.2E-04	2.2E-04			-	-	-	-	-	-
Phenol	2.1E-01	5.6E-02	5.4E-02	1.7E-01	4.7E-02	4.5E-02	-	3.3E-04	9.0E-05	8.6E-05	1.4E-02	3.6E-03	3.5E-03	-	1.4E-02	3.7E-03	3.6E-03			-	-	-	-	-	-
Total Low Molecular Weight PAHS	4.0E+01	5.8E+00	1.9E+00	2.1E-01	8.9E-02	5.3E-02	-	6.4E-02	9.3E-03	3.0E-03	1.7E-02	6.9E-03	4.2E-03	-	8.1E-02	1.6E-02	7.2E-03	-	-	-	-	-	-	-	-
Total High Molecular Weight PAHs	3.6E+01	1.1E+01	5.9E+00	8.2E-01	2.6E-01	1.5E-01	-	5.8E-02	1.7E-02	9.3E-03	6.4E-02	2.0E-02	1.1E-02	-	1.2E-01	3.8E-02	2.1E-02	-	-	-	-	-	-	-	-
Pesticides																									
4,4'-DDD	2.4E-01	6.1E-02	2.1E-02	4.2E-03	1.5E-03	6.7E-04	2.5E-05	3.8E-04	9.8E-05	3.4E-05	3.2E-04	1.2E-04	5.2E-05	2.9E-06	7.1E-04	2.2E-04	8.8E-05	2.3E-01	2.8E-01	3.1E-03	9.5E-04	3.9E-04	2.5E-03	7.7E-04	3.1E-04
4,4'-DDE	7.2E-01	1.0E-01	2.7E-02	9.5E-03	2.2E-03	8.0E-04	3.0E-05	1.1E-03	1.6E-04	4.3E-05	7.4E-04	1.7E-04	6.2E-05	3.4E-06	1.9E-03	3.3E-04	1.1E-04	2.3E-01	2.8E-01	8.3E-03	1.5E-03	4.8E-04	6.7E-03	1.2E-03	3.8E-04
4,4'-DDT	1.9E+00	2.4E-01	5.7E-02	2.0E-02	4.2E-03	1.4E-03	3.9E-05	3.0E-03	3.9E-04	9.0E-05	1.5E-03	3.3E-04	1.1E-04	4.5E-06	4.6E-03	7.2E-04	2.0E-04	2.3E-01	2.8E-01	2.0E-02	3.2E-03	9.0E-04	1.6E-02	2.6E-03	7.3E-04
Aldrin	2.2E-03	4.2E-04	2.2E-04	3.4E-06	6.6E-07	3.5E-07	2.4E-05	3.5E-06	6.7E-07	3.6E-07	2.7E-07	5.1E-08	2.7E-08	2.8E-06	6.5E-06	3.5E-06	3.1E-06	-	-	-	-	-	-	-	-
alpha-BHC	1.9E-03	3.6E-04	1.9E-04	7.0E-05	1.3E-05	7.1E-06	-	3.0E-06	5.7E-07	3.0E-07	5.5E-06	1.0E-06	5.5E-07	-	8.5E-06	1.6E-06	8.5E-07	5.6E-01	2.3E+00	1.5E-05	2.9E-06	1.5E-06	3.8E-06	7.1E-07	3.8E-07
alpha-chlordane	-	-	-	-	-	-	7.0E-05	-	-	-	-	-	-	8.0E-06	8.0E-06	8.0E-06	8.0E-06	2.1E+00	1.1E+01	3.8E-06	3.8E-06	3.8E-06	7.5E-07	7.5E-07	7.5E-07
gamma-chlordane	-	-	-	-	-	-	7.7E-05	-	-	-	-	-	-	8.8E-06	8.8E-06	8.8E-06	8.8E-06	2.1E+00	1.1E+01	4.1E-06	4.1E-06	4.1E-06	8.3E-07	8.3E-07	8.3E-07
beta-BHC	5.4E-03	1.9E-03	1.2E-03	1.9E-04	6.7E-05	4.1E-05	-	8.6E-06	3.0E-06	1.8E-06	1.5E-05	5.2E-06	3.2E-06	-	2.3E-05	8.2E-06	5.0E-06	5.6E-01	2.3E+00	4.2E-05	1.5E-05	9.0E-06	1.0E-05	3.6E-06	2.2E-06
delta-BHC	9.5E-04	2.5E-04	1.2E-04	2.2E-05	5.8E-06	2.9E-06	-	1.5E-06	3.9E-07	2.0E-07	1.7E-06	4.5E-07	2.3E-07	-	3.2E-06	8.4E-07	4.3E-07	5.6E-01	2.3E+00	5.8E-06	1.5E-06	7.6E-07	1.4E-06	3.7E-07	1.9E-07
gamma-BHC	9.8E-04	2.6E-04	1.3E-04	4.0E-05	1.1E-05	5.3E-06	-	1.6E-06	4.2E-07	2.1E-07	3.1E-06	8.2E-07	4.2E-07	-	4.7E-06	1.2E-06	6.3E-07	2.0E+00	2.0E+01	2.3E-06	6.2E-07	3.1E-07	2.3E-07	6.2E-08	3.1E-08
Methoxychlor	6.3E-02	7.9E-03	4.7E-03	8.9E-04	1.1E-04	6.6E-05	4.6E-05	1.0E-04	1.3E-05	7.5E-06	6.9E-05	8.7E-06	5.2E-06	5.2E-06	1.7E-04	2.7E-05	1.8E-05	-	-	-	-	-	-	-	-
Dieldrin	1.2E-01	2.7E-02	7.7E-03	7.4E-03	1.6E-03	4.8E-04	9.0E-05	1.9E-04	4.3E-05	1.2E-05	5.7E-04	1.3E-04	3.7E-05	1.0E-05	7.8E-04	1.8E-04	6.0E-05	7.1E-02	1.8E-01	1.1E-02	2.6E-03	8.4E-04	4.3E-03	1.0E-03	3.3E-04
Alpha-Endosulfan	7.3E-03	1.1E-03	6.2E-04	3.8E-04	5.9E-05	3.2E-05	-	1.2E-05	1.8E-06	9.9E-07	2.9E-05	4.6E-06	2.5E-06	-	4.1E-05	6.4E-06	3.5E-06	1.0E+01	1.0E+02	4.1E-06	6.4E-07	3.5E-07	4.1E-07	6.4E-08	3.5E-08
Beta-Endosulfan	1.5E-02	3.1E-03	1.8E-03	7.0E-04	1.5E-04	8.5E-05	-	2.4E-05	4.9E-06	2.9E-06	5.5E-05	1.1E-05	6.6E-06	-	7.9E-05	1.6E-05	9.5E-06	1.0E+01	1.0E+02	7.9E-06	1.6E-06	9.5E-07	7.9E-07	1.6E-07	9.5E-08
Endosulfan Sulfate	2.2E-02	3.6E-03	2.4E-03	9.8E-04	1.6E-04	1.1E-04	-	3.5E-05	5.7E-06	3.9E-06	7.6E-05	1.2E-05	8.5E-06	-	1.1E-04	1.8E-05	1.2E-05	1.0E+01	1.0E+02	1.1E-05	1.8E-06	1.2E-06	1.1E-06	1.8E-07	1.2E-07
Heptachlor	8.9E-03	9.0E-04	3.7E-04	6.5E-05	6.6E-06	2.7E-06	4.6E-06	1.4E-05	1.4E-06	5.9E-07	5.1E-06	5.1E-07	2.1E-07	5.2E-07	2.0E-05	2.5E-06	1.3E-06	4.2E+01	-	4.8E-07	5.9E-08	3.2E-08	-	-	-
Heptachlor Epoxide	8.3E-03	3.6E-03	2.3E-03	8.7E-05	3.7E-05	2.4E-05	4.6E-06	1.3E-05	5.7E-06	3.7E-06	6.7E-06	2.9E-06	1.9E-06	5.2E-07	2.0E-05	9.1E-06	6.1E-06	2.6E+00	2.6E+01	7.9E-06	3.5E-06	2.3E-06	7.9E-07	3.5E-07	2.3E-07
Endrin Aldehyde	2.3E-02	6.4E-03	3.7E-03	2.2E-04	6.3E-05	3.6E-05	-	3.7E-05	1.0E-05	5.8E-06	1.7E-05	4.9E-06	2.8E-06	-	5.4E-05	1.5E-05	8.6E-06	1.0E-02	1.0E-01	5.4E-03	1.5E-03	8.6E-04	5.4E-04	1.5E-04	8.6E-05
Endrin Ketone	4.1E-02	9.4E-03	5.1E-03	-	-	-	-	6.5E-05	1.5E-05	8.1E-06	-	-	-	-	6.5E-05	1.5E-05	8.1E-06	1.0E-02	1.0E-01	6.5E-03	1.5E-03	8.1E-04	6.5E-04	1.5E-04	8.1E-05
Endrin	2.4E-02	4.5E-03	2.4E-03	2.1E-04	3.9E-05	2.1E-05	-	3.8E-05	7.1E-06	3.8E-06	1.6E-05	3.0E-06	1.6E-06	-	5.4E-05	1.0E-05	5.5E-06	1.0E-02	1.0E-01	5.4E-03	1.0E-03	5.5E-04	5.4E-04	1.0E-04	5.5E-05
Toxaphene	-	-	-	-	-	-	4.9E-04	-	-	-	-	-	-	5.6E-05	5.6E-05	5.6E-05	5.6E-05	4.0E-01	-	1.4E-04	1.4E-04	1.4E-04	-	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Avian)	1.0E-04	-	3.1E-05	8.8E-08	-	2.6E-08	2.4E-09	1.7E-07	-	4.9E-08	6.9E-09	-	2.0E-09	2.7E-10	1.7E-07	-	5.1E-08	1.4E-05	1.4E-04	1.2E-02	-	3.7E-03	1.2E-03	-	3.7E-04

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

G:\PROJECTS\2002 Projects\023-6134 Folcroft\RI Report\2018 Revised RIR\Tables\SLERA - Section 8\SLERA Tables 8-4 - 8-8-rev FLAT.xlsx
5/16/2018

Golder Associates

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.197	kg	Table 8-4
Dry Weight Food Ingestion Rate	IR_{dw}	0.024	kg/day	Table 8-4
Wet Weight Food Ingestion Rate	IR_{ww}	0.152	kg/day	Table 8-4
Fraction of Diet Comprised of Invertebrates	P_i	1	unitless	Table 8-4
Surface Water Ingestion Rate	C_w^{Max}	0.0197	kg/day	Table 8-4
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-2.1
Fraction soil ingestion	P_s	0.104	unitless	Table 8-4
Invertebrate Concentration	C_f^i	Chemical-specific	mg/kg	Table 8-5
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-5
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-4

	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Invertebrate Exposure	95% Dose: Invertebrate Exposure	Mean Dose: Invertebrate Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		NOAEL HQs: Max Hazard Quotient	NOAEL HQs: 95% Hazard Quotient	NOAEL HQs: Mean Hazard Quotient	LOAEL HQs: Max Hazard Quotient	LOAEL HQs: 95% Hazard Quotient	LOAEL HQs: Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg DW	mg/kg DW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.3E+04	1.6E+04	1.5E+04	5.0E+03	3.5E+03	3.2E+03	1.6E+01	2.9E+02	2.0E+02	1.9E+02	3.9E+03	2.7E+03	2.5E+03	1.6E+00	4.1E+03	2.9E+03	2.7E+03	1.1E+02	-	**3.8E+01**	**2.6E+01**	**2.5E+01**	-	-	-
Antimony	1.8E+01	2.9E+00	2.1E+00	2.9E+00	4.6E-01	3.4E-01	-	2.3E-01	3.6E-02	2.7E-02	2.2E+00	3.5E-01	2.6E-01	-	2.4E+00	3.9E-01	2.9E-01	-	-	-	-	-	-	-	-
Arsenic	2.0E+01	1.0E+01	9.1E+00	3.2E-01	2.0E-01	1.8E-01	1.7E-02	2.5E-01	1.3E-01	1.1E-01	2.5E-01	1.5E-01	1.4E-01	1.7E-03	5.0E-01	2.8E-01	2.6E-01	2.2E+00	3.6E+00	2.2E-01	1.3E-01	1.2E-01	1.4E-01	7.9E-02	7.3E-02
Barium	8.6E+02	2.9E+02	1.8E+02	1.3E+01	4.2E+00	2.6E+00	5.9E-01	1.1E+01	3.7E+00	2.3E+00	9.7E+00	3.3E+00	2.0E+00	5.9E-02	2.1E+01	7.0E+00	4.3E+00	-	-	-	-	-	-	-	-
Beryllium	6.6E+01	9.4E+00	2.6E+00	4.8E-01	6.8E-02	1.9E-02	1.1E-03	8.4E-01	1.2E-01	3.3E-02	3.7E-01	5.2E-02	1.5E-02	1.1E-04	1.2E+00	1.7E-01	4.8E-02	-	-	-	-	-	-	-	-
Cadmium	8.1E+00	2.2E+00	1.2E+00	7.0E+00	2.5E+00	1.6E+00	5.2E-03	1.0E-01	2.8E-02	1.6E-02	5.4E+00	1.9E+00	1.2E+00	5.2E-04	5.5E+00	2.0E+00	1.2E+00	1.5E+00	2.0E+01	**3.8E+00**	**1.4E+00**	8.5E-01	2.7E-01	9.8E-02	6.1E-02
Chromium	1.4E+02	5.9E+01	5.2E+01	6.9E+00	2.9E+00	2.6E+00	5.4E-02	1.8E+00	7.5E-01	6.6E-01	5.3E+00	2.2E+00	2.0E+00	5.4E-03	7.1E+00	3.0E+00	2.6E+00	2.7E+00	2.8E+00	**2.7E+00**	**1.1E+00**	9.9E-01	**2.5E+00**	**1.1E+00**	9.5E-01
Cobalt	1.6E+02	3.0E+01	1.4E+01	3.1E+00	5.9E-01	2.8E-01	-	2.0E+00	3.8E-01	1.8E-01	2.4E+00	4.6E-01	2.2E-01	-	4.4E+00	8.4E-01	4.0E-01	7.6E+00	1.8E+01	5.8E-01	1.1E-01	5.3E-02	2.4E-01	4.6E-02	2.2E-02
Copper	1.1E+04	1.5E+03	4.4E+02	8.7E+02	1.2E+02	3.6E+01	1.1E-01	1.3E+02	1.9E+01	5.5E+00	6.7E+02	9.6E+01	2.8E+01	1.1E-02	8.0E+02	1.1E+02	3.3E+01	4.1E+00	4.7E+00	**2.0E+02**	**2.8E+01**	**8.2E+00**	**1.7E+02**	**2.4E+01**	**7.1E+00**
Iron	2.0E+05	4.1E+04	3.3E+04	4.4E+04	8.9E+03	7.2E+03	4.7E+01	2.5E+03	5.1E+02	4.1E+02	3.4E+04	6.9E+03	5.5E+03	4.7E+00	3.6E+04	7.4E+03	6.0E+03	-	-	-	-	-	-	-	-
Lead	4.3E+03	4.4E+02	3.6E+02	1.1E+02	1.8E+01	1.5E+01	2.5E-01	5.4E+01	5.6E+00	4.6E+00	8.4E+01	1.4E+01	1.2E+01	2.5E-02	1.4E+02	1.9E+01	1.6E+01	1.6E+00	1.9E+00	**8.5E+01**	**1.2E+01**	**9.9E+00**	**7.1E+01**	**9.9E+00**	**8.4E+00**
Manganese	9.8E+03	1.7E+03	7.0E+02	3.7E+01	1.1E+01	6.2E+00	1.6E+00	1.2E+02	2.1E+01	8.9E+00	2.9E+01	8.6E+00	4.8E+00	1.6E-01	1.5E+02	3.0E+01	1.4E+01	1.8E+02	3.8E+02	8.5E-01	1.7E-01	7.7E-02	4.1E-01	7.9E-02	3.7E-02
Mercury	6.7E+00	1.9E+00	1.5E+00	3.6E-01	1.0E-01	8.1E-02	7.8E-04	8.5E-02	2.4E-02	1.9E-02	2.8E-01	7.8E-02	6.3E-02	7.8E-05	3.7E-01	1.0E-01	8.2E-02	4.5E-01	9.0E-01	8.1E-01	2.3E-01	1.8E-01	4.1E-01	1.1E-01	9.1E-02
Nickel	1.3E+03	2.2E+02	7.6E+01	2.2E+02	3.8E+01	1.3E+01	5.8E-02	1.6E+01	2.8E+00	9.6E-01	1.7E+02	2.9E+01	9.9E+00	5.8E-03	1.9E+02	3.2E+01	1.1E+01	6.7E+00	1.2E+01	**2.8E+01**	**4.8E+00**	**1.6E+00**	**1.6E+01**	**2.8E+00**	9.4E-01
Selenium	1.1E+00	6.5E-01	4.6E-01	2.4E-01	1.4E-01	1.0E-01	-	1.4E-02	8.2E-03	5.8E-03	1.9E-01	1.1E-01	7.8E-02	-	2.0E-01	1.2E-01	8.4E-02	2.9E-01	3.7E-01	6.9E-01	4.1E-01	2.9E-01	5.5E-01	3.2E-01	2.3E-01
Silver	5.4E+00	1.9E+00	8.9E-01	1.8E+00	6.1E-01	2.9E-01	9.4E-04	6.8E-02	2.3E-02	1.1E-02	1.4E+00	4.7E-01	2.2E-01	9.4E-05	1.4E+00	4.9E-01	2.4E-01	2.0E+00	2.0E+01	7.1E-01	2.4E-01	1.2E-01	7.1E-02	2.4E-02	1.2E-02
Thallium	3.2E-01	-	-	6.9E-02	-	-	-	4.0E-03	-	-	5.3E-02	-	-	-	5.7E-02	-	-	4.7E-01	-	1.2E-01	-	-	-	-	-
Vanadium	8.4E+01	4.8E+01	4.5E+01	5.7E-01	3.2E-01	3.1E-01	5.0E-02	1.1E+00	6.1E-01	5.8E-01	4.4E-01	2.5E-01	2.4E-01	5.0E-03	1.5E+00	8.7E-01	8.2E-01	3.4E-01	4.1E-01	**4.4E+00**	**2.5E+00**	**2.4E+00**	**3.7E+00**	**2.1E+00**	**2.0E+00**
Zinc	1.8E+04	3.2E+03	1.1E+03	3.4E+02	1.9E+02	1.4E+02	5.7E-01	2.2E+02	4.0E+01	1.4E+01	2.6E+02	1.5E+02	1.0E+02	5.7E-02	4.8E+02	1.9E+02	1.2E+02	6.6E+01	1.5E+02	**7.3E+00**	**2.9E+00**	**1.8E+00**	**3.1E+00**	**1.2E+00**	7.7E-01
VOCs																									
Acetone	2.9E-02	-	5.3E-03	1.5E-03	-	2.6E-04	-	3.7E-04	-	6.7E-05	1.1E-03	-	2.0E-04	-	1.5E-03	-	2.7E-04	-	-	-	-	-	-	-	-
SVOCs																									
Acetophenone	8.8E-02	-	8.1E-02	1.2E-01	-	1.1E-01	-	1.1E-03	-	1.0E-03	9.5E-02	-	8.7E-02	-	9.7E-02	-	8.8E-02			-	-	-	-	-	-
Atrazine	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-04	1.9E-04	1.9E-04	1.9E-04	5.0E+01	2.5E+02	3.8E-06	3.8E-06	3.8E-06	7.6E-07	7.6E-07	7.6E-07
Biphenyl	2.5E+00	2.1E-01	1.1E-01	3.4E+02	2.9E+01	1.5E+01	-	3.2E-02	2.7E-03	1.4E-03	2.7E+02	2.3E+01	1.2E+01	-	2.7E+02	2.3E+01	1.2E+01			-	-	-	-	-	-
Bis(2-Ethylhexyl) Phthalate	1.4E+00	3.1E-01	2.1E-01	1.8E+03	4.1E+02	2.8E+02	-	1.8E-02	4.0E-03	2.7E-03	1.4E+03	3.2E+02	2.2E+02	-	1.4E+03	3.2E+02	2.2E+02	1.1E+00	-	**1.3E+03**	**2.9E+02**	**2.0E+02**	-	-	-
4-Bromophenyl-phenylether	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-04	1.9E-04	1.9E-04	1.9E-04			-	-	-	-	-	-
Butylbenzyl Phthalate	9.4E-01	-	-	5.0E+02	-	-	-	1.2E-02	-	-	3.9E+02	-	-	-	3.9E+02	-	-			-	-	-	-	-	-
Carbazole	4.0E-01	1.2E-01	8.8E-02	3.2E+01	9.4E+00	7.0E+00	-	5.1E-03	1.5E-03	1.1E-03	2.5E+01	7.3E+00	5.4E+00	-	2.5E+01	7.3E+00	5.4E+00			-	-	-	-	-	-
Dibenzofuran	1.5E+00	1.3E-01	7.9E-02	2.5E+02	2.1E+01	1.3E+01	-	1.9E-02	1.6E-03	1.0E-03	2.0E+02	1.7E+01	1.0E+01	-	2.0E+02	1.7E+01	1.0E+01			-	-	-	-	-	-
Dimethyl Phthalate	4.1E-01	-	5.2E-02	6.0E-01	-	7.6E-02	-	5.2E-03	-	6.6E-04	4.6E-01	-	5.9E-02	-	4.7E-01	-	5.9E-02			-	-	-	-	-	-
Di-N-Octyl Phthalate	1.9E+01	1.4E+00	4.8E-01	5.9E+07	4.2E+06	1.5E+06	-	2.4E-01	1.7E-02	6.0E-03	4.6E+07	3.3E+06	1.1E+06	-	4.6E+07	3.3E+06	1.1E+06			-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-04	1.9E-04	1.9E-04	1.9E-04			-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-04	1.9E-04	1.9E-04	1.9E-04			-	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.3E+01	-	-	-	2.2E-04	-	-	1.0E+01	-	-	-	1.0E+01	-	-			-	-	-	-	-	-
N-Nitrosodiphenylamine	4.4E-02	-	-	1.2E+00	-	-	-	5.6E-04	-	-	8.9E-01	-	-	-	8.9E-01	-	-			-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.9E-04	1.9E-04	1.9E-04	1.9E-04			-	-	-	-	-	-
Phenol	2.1E-01	5.6E-02	5.4E-02	2.4E-01	6.3E-02	6.1E-02	-	2.7E-03	7.1E-04	6.9E-04	1.8E-01	4.9E-02	4.7E-02	-	1.8E-01	4.9E-02	4.8E-02			-	-	-	-	-	-
Total Low Molecular Weight PAHS	4.0E+01	5.8E+00	1.9E+00	2.0E+01	2.8E+00	9.2E-01	-	5.1E-01	7.4E-02	2.4E-02	1.5E+01	2.2E+00	7.1E-01	-	1.6E+01	2.3E+00	7.3E-01	-	-	-	-	-	-	-	-
Total High Molecular Weight PAHs	3.6E+01	1.1E+01	5.9E+00	1.5E+01	4.6E+00	2.4E+00	-	4.6E-01	1.4E-01	7.4E-02	1.2E+01	3.5E+00	1.9E+00	-	1.2E+01	3.7E+00	2.0E+00	-	-	-	-	-	-	-	-
Pesticides																									
4,4'-DDD	2.4E-01	6.1E-02	2.1E-02	1.9E-01	7.3E-02	3.5E-02	2.5E-05	3.0E-03	7.8E-04	2.7E-04	1.5E-01	5.6E-02	2.7E-02	2.5E-06	1.5E-01	5.7E-02	2.7E-02	2.3E-01	2.8E-01	6.6E-01	2.5E-01	1.2E-01	5.3E-01	2.0E-01	9.6E-02
4,4'-DDE	7.2E-01	1.0E-01	2.7E-02	1.4E+00	2.5E-01	7.9E-02	3.0E-05	9.1E-03	1.3E-03	3.4E-04	1.1E+00	2.0E-01	6.1E-02	3.0E-06	1.1E+00	2.0E-01	6.1E-02	2.3E-01	2.8E-01	**4.9E+00**	8.7E-01	2.7E-01	**3.9E+00**	7.0E-01	2.2E-01
4,4'-DDT	1.9E+00	2.4E-01	5.7E-02	2.3E+00	3.9E-01	1.1E-01	3.9E-05	2.4E-02	3.1E-03	7.2E-04	1.8E+00	3.0E-01	8.5E-02	3.9E-06	1.8E+00	3.1E-01	8.6E-02	2.3E-01	2.8E-01	**8.1E+00**	**1.4E+00**	3.8E-01	**6.5E+00**	**1.1E+00**	3.1E-01
Aldrin	2.2E-03	4.2E-04	2.2E-04	1.8E+01	3.5E+00	1.8E+00	2.4E-05	2.8E-05	5.3E-06	2.8E-06	1.4E+01	2.7E+00	1.4E+00	2.4E-06	1.4E+01	2.7E+00	1.4E+00	-	-	-	-	-	-	-	-
alpha-BHC	1.9E-03	3.6E-04	1.9E-04	1.8E-01	3.3E-02	1.8E-02	-	2.4E-05	4.5E-06	2.4E-06	1.4E-01	2.6E-02	1.4E-02	-	1.4E-01	2.6E-02	1.4E-02	5.6E-01	2.3E+00	2.4E-01	4.6E-02	2.4E-02	6.0E-02	1.1E-02	6.0E-03
alpha-chlordane	-	-	-	-	-	-	7.0E-05	-	-	-	-	-	-	7.0E-06	7.0E-06	7.0E-06	7.0E-06	2.1E+00	1.1E+01	3.3E-06	3.3E-06	3.3E-06	6.5E-07	6.5E-07	6.5E-07
gamma-chlordane	-	-	-	-	-	-	7.7E-05	-	-	-	-	-	-	7.7E-06	7.7E-06	7.7E-06	7.7E-06	2.1E+00	1.1E+01	3.6E-06	3.6E-06	3.6E-06	7.2E-07	7.2E-07	7.2E-07
beta-BHC	5.4E-03	1.9E-03	1.2E-03	5.3E-01	1.9E-01	1.1E-01	-	6.8E-05	2.4E-05	1.5E-05	4.1E-01	1.4E-01	8.8E-02	-	4.1E-01	1.4E-01	8.8E-02	5.6E-01	2.3E+00	7.3E-01	2.6E-01	1.6E-01	1.8E-01	6.4E-02	3.9E-02
delta-BHC	9.5E-04	2.5E-04	1.2E-04	1.7E-01	4.3E-02	2.2E-02	-	1.2E-05	3.1E-06	1.6E-06	1.3E-01	3.3E-02	1.7E-02	-	1.3E-01	3.3E-02	1.7E-02	5.6E-01	2.3E+00	2.3E-01	6.0E-02	3.0E-02	5.7E-02	1.5E-02	7.5E-03
gamma-BHC	9.8E-04	2.6E-04	1.3E-04	7.9E-02	2.1E-02	1.1E-02	-	1.2E-05	3.3E-06	1.7E-06	6.1E-02	1.6E-02	8.2E-03	-	6.1E-02	1.6E-02	8.2E-03	2.0E+00	2.0E+01	3.1E-02	8.2E-03	4.1E-03	3.1E-03	8.2E-04	4.1E-04
Methoxychlor	6.3E-02	7.9E-03	4.7E-03	2.3E+01	2.9E+00	1.7E+00	4.6E-05	8.0E-04	1.0E-04	6.0E-05	1.8E+01	2.2E+00	1.3E+00	4.6E-06	1.8E+01	2.2E+00	1.3E+00	-	-	-	-	-	-	-	-
Dieldrin	1.2E-01	2.7E-02	7.7E-03	2.8E-01	6.3E-02	1.8E-02	9.0E-05	1.5E-03	3.4E-04	9.8E-05	2.2E-01	4.9E-02	1.4E-02	9.0E-06	2.2E-01	4.9E-02	1.4E-02	7.1E-02	1.8E-01	**3.1E+00**	6.9E-01	2.0E-01	**1.2E+00**	2.7E-01	7.9E-02
Alpha-Endosulfan	7.3E-03	1.1E-03	6.2E-04	4.2E-01	6.6E-02	3.6E-02	-	9.2E-05	1.4E-05	7.9E-06	3.3E-01	5.1E-02	2.8E-02	-	3.3E-01	5.1E-02	2.8E-02	1.0E+01	1.0E+02	3.3E-02	5.1E-03	2.8E-03	3.3E-03	5.1E-04	2.8E-04
Beta-Endosulfan	1.5E-02	3.1E-03	1.8E-03	9.9E-01	2.0E-01	1.2E-01	-	1.9E-04	3.9E-05	2.3E-05	7.6E-01	1.6E-01	9.2E-02	-	7.6E-01	1.6E-01	9.2E-02	1.0E+01	1.0E+02	7.6E-02	1.6E-02	9.2E-03	7.6E-03	1.6E-03	9.2E-04
Endosulfan Sulfate	2.2E-02	3.6E-03	2.4E-03	1.6E+00	2.5E-01	1.7E-01	-	2.8E-04	4.5E-05	3.1E-05	1.2E+00	2.0E-01	1.3E-01	-	1.2E+00	2.0E-01	1.3E-01	1.0E+01	1.0E+02	1.2E-01	2.0E-02	1.3E-02	1.2E-02	2.0E-03	1.3E-03
Heptachlor	8.9E-03	9.0E-04	3.7E-04	5.1E-01	5.2E-02	2.1E-02	4.6E-06	1.1E-04	1.1E-05	4.7E-06	4.0E-01	4.0E-02	1.6E-02	4.6E-07	4.0E-01	4.0E-02	1.6E-02	4.2E+01	-	9.5E-03	9.6E-04	4.0E-04	-	-	-
Heptachlor Epoxide	8.3E-03	3.6E-03	2.3E-03	4.6E+00	2.0E+00	1.3E+00	4.6E-06	1.1E-04	4.5E-05	2.9E-05	3.6E+00	1.5E+00	9.9E-01	4.6E-07	3.6E+00	1.5E+00	9.9E-01	2.6E+00	2.6E+01	**1.4E+00**	5.9E-01	3.8E-01	1.4E-01	5.9E-02	3.8E-02
Endrin Aldehyde	2.3E-02	6.4E-03	3.7E-03	1.4E+01	3.9E+00	2.2E+00	-	2.9E-04	8.1E-05	4.6E-05	1.1E+01	3.0E+00	1.7E+00	-	1.1E+01	3.0E+00	1.7E+00	1.0E-02	1.0E-01	**1.1E+03**	**3.0E+02**	**1.7E+02**	**1.1E+02**	**3.0E+01**	**1.7E+01**
Endrin Ketone	4.1E-02	9.4E-03	5.1E-03	-	-	-	-	5.2E-04	1.2E-04	6.4E-05	-	-	-	-	5.2E-04	1.2E-04	6.4E-05	1.0E-02	1.0E-01	5.2E-02	1.2E-02	6.4E-03	5.2E-03	1.2E-03	6.4E-04
Endrin	2.4E-02	4.5E-03	2.4E-03	1.7E+01	3.2E+00	1.7E+00	-	3.0E-04	5.7E-05	3.1E-05	1.3E+01	2.5E+00	1.3E+00	-	1.3E+01	2.5E+00	1.3E+00	1.0E-02	1.0E-01	**1.3E+03**	**2.5E+02**	**1.3E+02**	**1.3E+02**	**2.5E+01**	**1.3E+01**
Toxaphene	-	-	-	-	-	-	4.9E-04	-	-	-	-	-	-	4.9E-05	4.9E-05	4.9E-05	4.9E-05	4.0E-01	-	1.2E-04	1.2E-04	1.2E-04	-	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Avian)	1.0E-04	-	3.1E-05	1.7E-04	-	4.9E-05	2.4E-09	1.3E-06	-	3.9E-07	1.3E-04	-	3.8E-05	2.4E-10	1.3E-04	-	3.8E-05	1.4E-05	1.4E-04	**9.3E+00**	-	**2.7E+00**	9.3E-01	-	2.7E-01

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Table 8-8.8
Hazard Quotient Estimation for Red-tailed Hawk - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	1.134	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0337	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.105	kg/day	Table 8-5
Fraction of Diet Comprised of Small Mammals	P_f^p	1	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.065	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.1
Fraction soil ingestion	P_s	0.057	unitless	Table 8-5
Small Mammal Concentration	C_f^p	Chemical-specific	mg/kg	Table 8-6
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-6
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-11
Area Use Factor	AUF	1	unitless	Table 8-5

																				NOAEL HQs			LOAEL HQs		
	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{smmax}	$C_f^{sm95\%}$	C_f^{smmean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Small Mammal Exposure	95% Dose: Small Mammal Exposure	Mean Dose: Small Mammal Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.3E+04	1.6E+04	1.5E+04	-	-	-	1.6E+01	3.8E+01	2.7E+01	2.5E+01	-	-	-	9.3E-01	3.9E+01	2.8E+01	2.6E+01	1.1E+02	-	3.6E-01	2.5E-01	2.4E-01	-	-	-
Antimony	1.8E+01	2.9E+00	2.1E+00	1.4E-03	2.5E-04	1.9E-04	-	3.0E-02	4.8E-03	3.6E-03	1.3E-04	2.3E-05	1.8E-05	-	3.0E-02	4.9E-03	3.6E-03	-	-	-	-	-	-	-	-
Arsenic	2.0E+01	1.0E+01	9.1E+00	2.9E-02	1.7E-02	1.5E-02	1.7E-02	3.4E-02	1.7E-02	1.5E-02	2.7E-03	1.5E-03	1.4E-03	1.0E-03	3.7E-02	2.0E-02	1.8E-02	2.2E+00	3.6E+00	1.7E-02	8.7E-03	7.9E-03	1.0E-02	5.5E-03	5.0E-03
Barium	8.6E+02	2.9E+02	1.8E+02	4.9E-02	1.6E-02	1.0E-02	5.9E-01	1.5E+00	4.9E-01	3.0E-01	4.5E-03	1.5E-03	9.2E-04	3.4E-02	1.5E+00	5.3E-01	3.4E-01	-	-	-	-	-	-	-	-
Beryllium	6.6E+01	9.4E+00	2.6E+00	3.0E-02	7.3E-03	2.9E-03	1.1E-03	1.1E-01	1.6E-02	4.5E-03	2.8E-03	6.7E-04	2.7E-04	6.3E-05	1.1E-01	1.7E-02	4.8E-03	-	-	-	-	-	-	-	-
Cadmium	8.1E+00	2.2E+00	1.2E+00	2.4E-01	1.3E-01	1.0E-01	5.2E-03	1.4E-02	3.8E-03	2.1E-03	2.3E-02	1.2E-02	9.3E-03	3.0E-04	3.7E-02	1.6E-02	1.2E-02	1.5E+00	2.0E+01	2.5E-02	1.1E-02	8.1E-03	1.8E-03	8.2E-04	5.9E-04
Chromium	1.4E+02	5.9E+01	5.2E+01	2.8E+00	1.5E+00	1.4E+00	5.4E-02	2.4E-01	1.0E-01	8.8E-02	2.6E-01	1.4E-01	1.3E-01	3.1E-03	5.0E-01	2.4E-01	2.2E-01	2.7E+00	2.8E+00	1.9E-01	9.1E-02	8.2E-02	1.8E-01	8.7E-02	7.8E-02
Cobalt	1.6E+02	3.0E+01	1.4E+01	2.7E+00	3.2E-01	1.2E-01	-	2.7E-01	5.1E-02	2.4E-02	2.5E-01	2.9E-02	1.1E-02	-	5.2E-01	8.1E-02	3.6E-02	7.6E+00	1.8E+01	6.9E-02	1.1E-02	4.7E-03	2.9E-02	4.4E-03	1.9E-03
Copper	1.1E+04	1.5E+03	4.4E+02	9.4E+00	7.1E+00	5.9E+00	1.1E-01	1.8E+01	2.5E+00	7.4E-01	8.7E-01	6.6E-01	5.5E-01	6.3E-03	1.9E+01	3.2E+00	1.3E+00	4.1E+00	4.7E+00	**4.6E+00**	7.9E-01	3.2E-01	**4.0E+00**	6.9E-01	2.8E-01
Iron	2.0E+05	4.1E+04	3.3E+04	-	-	-	4.7E+01	3.4E+02	6.9E+01	5.5E+01	-	-	-	2.7E+00	3.4E+02	7.1E+01	5.8E+01	-	-	-	-	-	-	-	-
Lead	4.3E+03	4.4E+02	3.6E+02	1.4E+01	5.1E+00	4.7E+00	2.5E-01	7.2E+00	7.5E-01	6.2E-01	1.3E+00	4.7E-01	4.3E-01	1.4E-02	8.5E+00	1.2E+00	1.1E+00	1.6E+00	1.9E+00	**5.2E+00**	7.6E-01	6.5E-01	**4.4E+00**	6.4E-01	5.5E-01
Manganese	9.8E+03	1.7E+03	7.0E+02	6.4E+01	1.1E+01	4.6E+00	1.6E+00	1.7E+01	2.8E+00	1.2E+00	5.9E+00	1.0E+00	4.3E-01	9.3E-02	2.3E+01	3.9E+00	1.7E+00	1.8E+02	3.8E+02	1.3E-01	2.2E-02	9.5E-03	6.0E-02	1.0E-02	4.5E-03
Mercury	6.7E+00	1.9E+00	1.5E+00	2.6E-04	7.1E-05	5.7E-05	7.8E-04	1.1E-02	3.2E-03	2.5E-03	2.4E-05	6.6E-06	5.3E-06	4.5E-05	1.1E-02	3.2E-03	2.6E-03	4.5E-01	9.0E-01	2.5E-02	7.1E-03	5.7E-03	1.3E-02	3.6E-03	2.9E-03
Nickel	1.3E+03	2.2E+02	7.6E+01	7.1E+00	3.1E+00	1.9E+00	5.8E-02	2.2E+00	3.8E-01	1.3E-01	6.5E-01	2.9E-01	1.7E-01	3.3E-03	2.9E+00	6.7E-01	3.1E-01	6.7E+00	1.2E+01	4.3E-01	1.0E-01	4.6E-02	2.5E-01	5.8E-02	2.7E-02
Selenium	1.1E+00	6.5E-01	4.6E-01	2.2E-01	1.8E-01	1.6E-01	-	1.9E-03	1.1E-03	7.8E-04	2.0E-02	1.7E-02	1.5E-02	-	2.2E-02	1.8E-02	1.5E-02	2.9E-01	3.7E-01	7.6E-02	6.1E-02	5.3E-02	6.0E-02	4.8E-02	4.2E-02
Silver	5.4E+00	1.9E+00	8.9E-01	6.9E-03	2.4E-03	1.1E-03	9.4E-04	9.1E-03	3.1E-03	1.5E-03	6.4E-04	2.2E-04	1.1E-04	5.4E-05	9.8E-03	3.4E-03	1.7E-03	2.0E+00	2.0E+01	4.9E-03	1.7E-03	8.2E-04	4.9E-04	1.7E-04	8.2E-05
Thallium	3.2E-01	-	-	-	-	-	-	5.3E-04	-	-	-	-	-	-	5.3E-04	-	-	4.7E-01	-	1.1E-03	-	-	-	-	-
Vanadium	8.4E+01	4.8E+01	4.5E+01	3.3E-01	1.9E-01	1.8E-01	5.0E-02	1.4E-01	8.2E-02	7.7E-02	3.1E-02	1.8E-02	1.7E-02	2.9E-03	1.8E-01	1.0E-01	9.6E-02	3.4E-01	4.1E-01	5.1E-01	3.0E-01	2.8E-01	4.3E-01	2.5E-01	2.3E-01
Zinc	1.8E+04	3.2E+03	1.1E+03	5.0E+01	4.4E+01	4.1E+01	5.7E-01	3.0E+01	5.4E+00	1.8E+00	4.6E+00	4.1E+00	3.8E+00	3.3E-02	3.4E+01	9.5E+00	5.7E+00	6.6E+01	1.5E+02	5.2E-01	1.4E-01	8.6E-02	2.2E-01	6.2E-02	3.7E-02
VOCs																									
Acetone	2.9E-02	-	5.3E-03	1.5E-11	-	2.7E-12	-	4.9E-05	-	9.0E-06	1.4E-12	-	2.5E-13	-	4.9E-05	-	9.0E-06	-	-	-	-	-	-	-	-
SVOCs																									
Acetophenone	8.8E-02	-	8.1E-02	2.6E-10	-	2.4E-10	-	1.5E-04	-	1.4E-04	2.4E-11	-	2.2E-11	-	1.5E-04	-	1.4E-04			-	-	-	-	-	-
Atrazine	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.1E-04	1.1E-04	1.1E-04	1.1E-04	5.0E+01	2.5E+02	2.2E-06	2.2E-06	2.2E-06	4.4E-07	4.4E-07	4.4E-07
Biphenyl	2.5E+00	2.1E-01	1.1E-01	3.0E-08	7.0E-09	3.7E-09	-	4.2E-03	3.6E-04	1.9E-04	2.7E-09	6.5E-10	3.4E-10	-	4.2E-03	3.6E-04	1.9E-04			-	-	-	-	-	-
Bis(2-Ethylhexyl) Phthalate	1.4E+00	3.1E-01	2.1E-01	1.8E-07	4.1E-08	2.8E-08	-	2.4E-03	5.3E-04	3.6E-04	1.7E-08	3.8E-09	2.6E-09	-	2.4E-03	5.3E-04	3.6E-04	1.1E+00	-	2.2E-03	4.8E-04	3.3E-04	-	-	-
4-Bromophenyl-phenylether	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.1E-04	1.1E-04	1.1E-04	1.1E-04			-	-	-	-	-	-
Butylbenzyl Phthalate	9.4E-01	-	-	6.8E-08	-	-	-	1.6E-03	-	-	6.3E-09	-	-	-	1.6E-03	-	-			-	-	-	-	-	-
Carbazole	4.0E-01	1.2E-01	8.8E-02	9.7E-09	2.9E-09	2.1E-09	-	6.8E-04	2.0E-04	1.5E-04	9.0E-10	2.7E-10	2.0E-10	-	6.8E-04	2.0E-04	1.5E-04			-	-	-	-	-	-
Dibenzofuran	1.5E+00	1.3E-01	7.9E-02	5.5E-08	4.7E-09	2.9E-09	-	2.5E-03	2.2E-04	1.3E-04	5.1E-09	4.3E-10	2.7E-10	-	2.5E-03	2.2E-04	1.3E-04			-	-	-	-	-	-
Dimethyl Phthalate	4.1E-01	-	5.2E-02	1.2E-09	-	1.5E-10	-	6.9E-04	-	8.8E-05	1.1E-10	-	1.4E-11	-	6.9E-04	-	8.8E-05			-	-	-	-	-	-
Di-N-Octyl Phthalate	1.9E+01	1.4E+00	4.8E-01	7.9E-03	5.7E-04	2.0E-04	-	3.2E-02	2.3E-03	8.1E-04	7.4E-04	5.2E-05	1.8E-05	-	3.3E-02	2.3E-03	8.3E-04			-	-	-	-	-	-
Hexachlorobenzene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.1E-04	1.1E-04	1.1E-04	1.1E-04			-	-	-	-	-	-
Hexachlorobutadiene	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.1E-04	1.1E-04	1.1E-04	1.1E-04			-	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.6E-09	-	-	-	3.0E-05	-	-	1.4E-10	-	-	-	3.0E-05	-	-			-	-	-	-	-	-
N-Nitrosodiphenylamine	4.4E-02	-	-	5.9E-10	-	-	-	7.5E-05	-	-	5.5E-11	-	-	-	7.5E-05	-	-			-	-	-	-	-	-
Pentachlorophenol	-	-	-	-	-	-	1.9E-03	-	-	-	-	-	-	1.1E-04	1.1E-04	1.1E-04	1.1E-04			-	-	-	-	-	-
Phenol	2.1E-01	5.6E-02	5.4E-02	5.5E-10	1.5E-10	1.4E-10	-	3.6E-04	9.5E-05	9.2E-05	5.1E-11	1.4E-11	1.3E-11	-	3.6E-04	9.5E-05	9.2E-05			-	-	-	-	-	-
Total Low Molecular Weight PAHS	4.0E+01	5.8E+00	1.9E+00	-	-	-	-	6.8E-02	9.9E-03	3.2E-03	-	-	-	-	6.8E-02	9.9E-03	3.2E-03	-	-	-	-	-	-	-	-
Total High Molecular Weight PAHs	3.6E+01	1.1E+01	5.9E+00	-	-	-	-	6.2E-02	1.9E-02	9.9E-03	-	-	-	-	6.2E-02	1.9E-02	9.9E-03	-	-	-	-	-	-	-	-
Pesticides																									
4,4'-DDD	2.4E-01	6.1E-02	2.1E-02	6.5E-07	2.3E-07	1.0E-07	2.5E-05	4.1E-04	1.0E-04	3.6E-05	6.1E-08	2.1E-08	9.3E-09	1.4E-06	4.1E-04	1.1E-04	3.7E-05	2.3E-01	2.8E-01	1.8E-03	4.6E-04	1.6E-04	1.5E-03	3.8E-04	1.3E-04
4,4'-DDE	7.2E-01	1.0E-01	2.7E-02	2.1E-06	4.6E-07	1.6E-07	3.0E-05	1.2E-03	1.7E-04	4.5E-05	1.9E-07	4.2E-08	1.5E-08	1.7E-06	1.2E-03	1.7E-04	4.7E-05	2.3E-01	2.8E-01	5.4E-03	7.7E-04	2.1E-04	4.3E-03	6.2E-04	1.7E-04
4,4'-DDT	1.9E+00	2.4E-01	5.7E-02	2.9E-06	5.9E-07	1.9E-07	3.9E-05	3.2E-03	4.1E-04	9.6E-05	2.7E-07	5.4E-08	1.8E-08	2.2E-06	3.2E-03	4.2E-04	9.8E-05	2.3E-01	2.8E-01	1.4E-02	1.8E-03	4.3E-04	1.1E-02	1.5E-03	3.5E-04
Aldrin	2.2E-03	4.2E-04	2.2E-04	1.2E-09	2.3E-10	1.2E-10	2.4E-05	3.7E-06	7.1E-07	3.8E-07	1.1E-10	2.1E-11	1.1E-11	1.4E-06	5.1E-06	2.1E-06	1.8E-06	-	-	-	-	-	-	-	-
alpha-BHC	1.9E-03	3.6E-04	1.9E-04	5.0E-11	9.5E-12	5.0E-12	-	3.2E-06	6.1E-07	3.2E-07	4.6E-12	8.8E-13	4.7E-13	-	3.2E-06	6.1E-07	3.2E-07	5.6E-01	2.3E+00	5.7E-06	1.1E-06	5.8E-07	1.4E-06	2.7E-07	1.4E-07
alpha-chlordane	-	-	-	-	-	-	7.0E-05	-	-	-	-	-	-	4.0E-06	4.0E-06	4.0E-06	4.0E-06	2.1E+00	1.1E+01	1.9E-06	1.9E-06	1.9E-06	3.7E-07	3.7E-07	3.7E-07
gamma-chlordane	-	-	-	-	-	-	7.7E-05	-	-	-	-	-	-	4.4E-06	4.4E-06	4.4E-06	4.4E-06	2.1E+00	1.1E+01	2.1E-06	2.1E-06	2.1E-06	4.1E-07	4.1E-07	4.1E-07
beta-BHC	5.4E-03	1.9E-03	1.2E-03	1.5E-10	5.1E-11	3.2E-11	-	9.1E-06	3.2E-06	2.0E-06	1.4E-11	4.8E-12	2.9E-12	-	9.1E-06	3.2E-06	2.0E-06	5.6E-01	2.3E+00	1.6E-05	5.7E-06	3.5E-06	4.1E-06	1.4E-06	8.7E-07
delta-BHC	9.5E-04	2.5E-04	1.2E-04	3.6E-11	9.3E-12	4.7E-12	-	1.6E-06	4.2E-07	2.1E-07	3.3E-12	8.6E-13	4.4E-13	-	1.6E-06	4.2E-07	2.1E-07	5.6E-01	2.3E+00	2.9E-06	7.4E-07	3.8E-07	7.2E-07	1.9E-07	9.4E-08
gamma-BHC	9.8E-04	2.6E-04	1.3E-04	2.4E-11	6.4E-12	3.2E-12	-	1.7E-06	4.4E-07	2.2E-07	2.2E-12	5.9E-13	3.0E-13	-	1.7E-06	4.4E-07	2.2E-07	2.0E+00	2.0E+01	8.3E-07	2.2E-07	1.1E-07	8.3E-08	2.2E-08	1.1E-08
Methoxychlor	6.3E-02	7.9E-03	4.7E-03	3.6E-09	4.6E-10	2.7E-10	4.6E-05	1.1E-04	1.3E-05	8.0E-06	3.4E-10	4.2E-11	2.5E-11	2.6E-06	1.1E-04	1.6E-05	1.1E-05	-	-	-	-	-	-	-	-
Dieldrin	1.2E-01	2.7E-02	7.7E-03	1.5E-07	3.4E-08	9.8E-09	9.0E-05	2.0E-04	4.5E-05	1.3E-05	1.4E-08	3.2E-09	9.1E-10	5.2E-06	2.1E-04	5.1E-05	1.8E-05	7.1E-02	1.8E-01	2.9E-03	7.1E-04	2.6E-04	1.2E-03	2.8E-04	1.0E-04
Alpha-Endosulfan	7.3E-03	1.1E-03	6.2E-04	1.5E-10	2.3E-11	1.3E-11	-	1.2E-05	1.9E-06	1.1E-06	1.4E-11	2.1E-12	1.2E-12	-	1.2E-05	1.9E-06	1.1E-06	1.0E+01	1.0E+02	1.2E-06	1.9E-07	1.1E-07	1.2E-07	1.9E-08	1.1E-08
Beta-Endosulfan	1.5E-02	3.1E-03	1.8E-03	3.3E-10	6.8E-11	4.0E-11	-	2.5E-05	5.2E-06	3.1E-06	3.0E-11	6.3E-12	3.7E-12	-	2.5E-05	5.2E-06	3.1E-06	1.0E+01	1.0E+02	2.5E-06	5.2E-07	3.1E-07	2.5E-07	5.2E-08	3.1E-08
Endosulfan Sulfate	2.2E-02	3.6E-03	2.4E-03	5.0E-10	8.2E-11	5.6E-11	-	3.7E-05	6.0E-06	4.1E-06	4.7E-11	7.6E-12	5.2E-12	-	3.7E-05	6.0E-06	4.1E-06	1.0E+01	1.0E+02	3.7E-06	6.0E-07	4.1E-07	3.7E-07	6.0E-08	4.1E-08
Heptachlor	8.9E-03	9.0E-04	3.7E-04	3.1E-11	3.1E-12	1.3E-12	4.6E-06	1.5E-05	1.5E-06	6.3E-07	2.9E-12	2.9E-13	1.2E-13	2.6E-07	1.5E-05	1.8E-06	8.9E-07	4.2E+01	-	3.7E-07	4.3E-08	2.1E-08	-	-	-
Heptachlor Epoxide	8.3E-03	3.6E-03	2.3E-03	6.2E-10	2.7E-10	1.7E-10	4.6E-06	1.4E-05	6.1E-06	3.9E-06	5.7E-11	2.5E-11	1.6E-11	2.6E-07	1.4E-05	6.3E-06	4.2E-06	2.6E+00	2.6E+01	5.5E-06	2.4E-06	1.6E-06	5.5E-07	2.4E-07	1.6E-07
Endrin Aldehyde	2.3E-02	6.4E-03	3.7E-03	1.8E-09	5.1E-10	2.9E-10	-	3.9E-05	1.1E-05	6.2E-06	1.7E-10	4.7E-11	2.7E-11	-	3.9E-05	1.1E-05	6.2E-06	1.0E-02	1.0E-01	3.9E-03	1.1E-03	6.2E-04	3.9E-04	1.1E-04	6.2E-05
Endrin Ketone	4.1E-02	9.4E-03	5.1E-03	-	-	-	-	6.9E-05	1.6E-05	8.6E-06	-	-	-	-	6.9E-05	1.6E-05	8.6E-06	1.0E-02	1.0E-01	6.9E-03	1.6E-03	8.6E-04	6.9E-04	1.6E-04	8.6E-05
Endrin	2.4E-02	4.5E-03	2.4E-03	2.1E-09	3.9E-10	2.1E-10	-	4.1E-05	7.6E-06	4.1E-06	2.0E-10	3.6E-11	2.0E-11	-	4.1E-05	7.6E-06	4.1E-06	1.0E-02	1.0E-01	4.1E-03	7.6E-04	4.1E-04	4.1E-04	7.6E-05	4.1E-05
Toxaphene	-	-	-	-	-	-	4.9E-04	-	-	-	-	-	-	2.8E-05	2.8E-05	2.8E-05	2.8E-05	4.0E-01	-	7.0E-05	7.0E-05	7.0E-05	-	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Avian)	1.0E-04	-	3.1E-05	1.3E-10	-	3.8E-11	2.4E-09	1.8E-07	-	5.2E-08	1.2E-11	-	3.5E-12	1.4E-10	1.8E-07	-	5.2E-08	1.4E-05	1.4E-04	1.3E-02	-	3.7E-03	1.3E-03	-	3.7E-04

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Golder Associates

Table 8-9.1
Hazard Quotient Estimation for Deer Mouse - Annex
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.021	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0012	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.0043	kg/day	Table 8-5
Fraction of Diet Comprised of Plants	P_f^P	0.63	unitless	Table 8-5
Fraction of Diet Comprised of Invertebrates	P_f^I	0.37	unitless	Table 8-5
Fraction soil ingestion	P_s	0.02	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.004	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.2
Plant Concentration	C_f^P	Chemical-specific	mg/kg	Table 8-7
Invertebrate Concentration	C_f^I	Chemical-specific	mg/kg	Table 8-7
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-7
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-5

																										NOAEL HQs			LOAEL HQs		
	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{pmean}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Max Dose: Invertebrate Exposure	95% Dose: Invertebrate Exposure	Mean Dose: Invertebrate Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																															
Aluminum	2.8E+04	1.8E+04	1.5E+04	1.7E+01	1.1E+01	9.2E+00	6.2E+03	3.9E+03	3.4E+03	3.1E+01	3.2E+01	2.0E+01	1.8E+01	2.2E+00	1.4E+00	1.2E+00	4.7E+02	3.0E+02	2.6E+02	5.9E+00	5.1E+02	3.3E+02	2.8E+02	1.9E+00	1.9E+01	**2.6E+02**	**1.7E+02**	**1.5E+02**	**2.6E+01**	**1.7E+01**	**1.5E+01**
Antimony	3.7E+00	1.5E+00	1.2E+00	2.0E-02	8.8E-03	7.2E-03	5.9E-01	2.4E-01	2.0E-01	3.2E-03	4.2E-03	1.7E-03	1.4E-03	2.6E-03	1.1E-03	9.3E-04	4.5E-02	1.8E-02	1.5E-02	6.1E-04	5.2E-02	2.2E-02	1.8E-02	5.9E-02	5.9E-01	8.9E-01	3.7E-01	3.0E-01	8.9E-02	3.7E-02	3.0E-02
Arsenic	9.5E+01	2.9E+01	1.2E+01	5.3E-01	1.7E-01	6.5E-02	9.6E-01	4.2E-01	2.2E-01	3.8E-02	1.1E-01	3.4E-02	1.3E-02	6.9E-02	2.1E-02	8.4E-03	7.3E-02	3.2E-02	1.7E-02	7.2E-03	2.6E-01	9.4E-02	4.5E-02	1.0E+00	1.7E+00	2.5E-01	9.0E-02	4.4E-02	1.6E-01	5.7E-02	2.7E-02
Barium	4.7E+02	2.5E+02	1.8E+02	1.1E+01	5.8E+00	4.3E+00	6.8E+00	3.6E+00	2.7E+00	9.4E-01	5.4E-01	2.9E-01	2.1E-01	1.4E+00	7.5E-01	5.5E-01	5.2E-01	2.8E-01	2.0E-01	1.8E-01	2.7E+00	1.5E+00	1.1E+00	5.2E+01	8.3E+01	5.1E-02	2.9E-02	2.2E-02	3.2E-02	1.8E-02	1.4E-02
Cadmium	3.7E+00	1.2E+00	8.0E-01	1.9E-01	1.1E-01	8.2E-02	3.7E+00	1.6E+00	3.3E-02	3.4E-03	4.2E-03	1.4E-03	9.1E-04	2.5E-02	1.4E-02	1.1E-02	2.8E-01	1.2E-01	2.5E-03	6.5E-04	3.1E-01	1.4E-01	1.5E-02	1.0E+00	1.0E+01	3.1E-01	1.4E-01	1.5E-02	3.1E-02	1.4E-02	1.5E-03
Chromium	2.0E+02	5.7E+01	4.5E+01	1.2E+00	3.5E-01	2.8E-01	9.9E+00	2.8E+00	2.2E+00	7.8E-02	2.3E-01	6.6E-02	5.1E-02	1.6E-01	4.6E-02	3.5E-02	7.5E-01	2.1E-01	1.7E-01	1.5E-02	1.2E+00	3.4E-01	2.7E-01	2.4E+00	9.6E+00	4.8E-01	1.4E-01	1.1E-01	1.2E-01	3.5E-02	2.8E-02
Cobalt	2.0E+01	1.1E+01	9.8E+00	7.4E-03	4.3E-03	3.7E-03	2.4E+00	1.4E+00	1.2E+00	2.6E-02	2.2E-02	1.3E-02	1.1E-02	9.5E-04	5.5E-04	4.7E-04	1.8E-01	1.1E-01	9.1E-02	4.9E-03	2.1E-01	1.2E-01	1.1E-01	7.3E+00	1.9E+01	2.9E-02	1.7E-02	1.5E-02	1.1E-02	6.5E-03	5.7E-03
Copper	2.3E+02	6.9E+01	5.1E+01	2.5E+00	1.6E+00	1.4E+00	1.9E+01	5.7E+00	6.2E-01	1.1E-01	2.7E-01	7.9E-02	5.8E-02	3.2E-01	2.0E-01	1.8E-01	1.4E+00	4.3E-01	4.7E-02	2.1E-02	2.1E+00	7.3E-01	3.0E-01	5.6E+00	9.3E+00	3.7E-01	1.3E-01	5.4E-02	2.2E-01	7.9E-02	3.3E-02
Iron	4.1E+04	2.9E+04	2.6E+04	1.5E+01	1.1E+01	9.8E+00	9.0E+03	6.5E+03	5.7E+03	5.2E+01	4.7E+01	3.4E+01	3.0E+01	2.0E+00	1.4E+00	1.3E+00	6.8E+02	4.9E+02	4.3E+02	9.9E+00	7.4E+02	5.4E+02	4.7E+02	-	-	-	-	-	-	-	-
Lead	2.9E+02	1.2E+02	7.8E+01	9.6E-01	5.7E-01	4.6E-01	1.3E+01	5.9E+00	8.4E-01	3.7E-01	3.3E-01	1.3E-01	8.9E-02	1.2E-01	7.4E-02	5.9E-02	9.5E-01	4.5E-01	6.3E-02	7.0E-02	1.5E+00	7.2E-01	2.8E-01	4.7E+00	5.0E+00	3.2E-01	1.5E-01	6.0E-02	3.0E-01	1.4E-01	5.6E-02
Manganese	1.2E+03	4.5E+02	3.6E+02	1.4E+01	5.3E+00	4.3E+00	3.4E+00	1.8E+00	1.4E+00	1.3E+00	1.3E+00	5.1E-01	4.1E-01	1.8E+00	6.8E-01	5.5E-01	2.6E-01	1.4E-01	1.1E-01	2.5E-01	3.7E+00	1.6E+00	1.3E+00	5.2E+01	1.5E+02	7.1E-02	3.1E-02	2.5E-02	2.5E-02	1.1E-02	9.0E-03
Mercury	8.8E-01	3.1E-01	2.2E-01	3.0E-02	1.0E-02	7.3E-03	4.8E-02	1.7E-02	1.3E-02	1.2E-03	1.0E-03	3.5E-04	2.5E-04	3.8E-03	1.3E-03	9.4E-04	3.6E-03	1.3E-03	9.9E-04	2.3E-04	8.7E-03	3.2E-03	2.4E-03	1.3E+01	-	6.6E-04	2.4E-04	1.8E-04	-	-	-
Nickel	9.2E+01	3.7E+01	3.1E+01	4.8E-01	2.4E-01	2.1E-01	1.6E+01	6.2E+00	4.3E-01	7.5E-02	1.1E-01	4.2E-02	3.5E-02	6.2E-02	3.1E-02	2.7E-02	1.2E+00	4.7E-01	3.3E-02	1.4E-02	1.4E+00	5.6E-01	1.1E-01	1.7E+00	2.7E+00	8.0E-01	3.3E-01	6.4E-02	5.0E-01	2.1E-01	4.0E-02
Selenium	4.2E+00	1.1E+00	7.1E-01	3.7E-01	8.7E-02	5.2E-02	9.2E-01	2.5E-01	1.6E-01	-	4.8E-03	1.3E-03	8.1E-04	4.8E-02	1.1E-02	6.8E-03	7.0E-02	1.9E-02	1.2E-02	-	1.2E-01	3.1E-02	1.9E-02	1.4E-01	1.5E-01	8.6E-01	2.2E-01	1.4E-01	8.5E-01	2.2E-01	1.3E-01
Silver	2.4E+00	6.2E-01	3.8E-01	5.0E-03	1.3E-03	8.0E-04	7.9E-01	2.0E-01	1.2E-01	1.7E-03	2.7E-03	7.1E-04	4.3E-04	6.5E-04	1.7E-04	1.0E-04	5.9E-02	1.5E-02	9.4E-03	3.2E-04	6.3E-02	1.7E-02	1.0E-02	6.0E+00	6.0E+01	1.1E-02	2.8E-03	1.7E-03	1.1E-03	2.8E-04	1.7E-04
Thallium	1.0E+00	-	-	6.0E-04	-	-	2.2E-01	-	-	-	1.1E-03	-	-	7.7E-05	-	-	1.7E-02	-	-	-	1.8E-02	-	-	7.4E-03	7.4E-02	**2.4E+00**	-	-	2.4E-01	-	-
Vanadium	1.0E+02	6.6E+01	5.7E+01	7.4E-02	4.8E-02	4.1E-02	6.9E-01	4.4E-01	3.8E-01	9.5E-02	1.2E-01	7.5E-02	6.5E-02	9.6E-03	6.2E-03	5.3E-03	5.2E-02	3.3E-02	2.9E-02	1.8E-02	2.0E-01	1.3E-01	1.2E-01	4.2E+00	5.1E+00	4.7E-02	3.2E-02	2.8E-02	3.8E-02	2.6E-02	2.3E-02
Zinc	1.5E+03	3.1E+02	1.8E+02	4.2E+01	1.7E+01	1.3E+01	1.5E+02	9.0E+01	7.5E+01	5.8E-01	1.8E+00	3.5E-01	2.1E-01	5.5E+00	2.2E+00	1.7E+00	1.2E+01	6.8E+00	5.7E+00	1.1E-01	1.9E+01	9.4E+00	7.6E+00	7.5E+01	7.4E+02	2.5E-01	1.2E-01	1.0E-01	2.5E-02	1.3E-02	1.0E-02
VOCs																															
Acetone	1.3E-02	6.6E-03	-	1.0E-01	5.2E-02	-	6.5E-04	3.3E-04	-	-	1.5E-05	7.6E-06	-	1.3E-02	6.7E-03	-	4.9E-05	2.5E-05	-	-	1.3E-02	6.7E-03	-	1.0E+01	5.0E+01	1.3E-03	6.7E-04	-	2.6E-04	1.3E-04	-
SVOCs																															
Atrazine	-	-	-	-	-	-	-	-	-	2.0E-03	-	-	-	-	-	-	-	-	-	3.8E-04	3.8E-04	-	-	5.0E+01	1.0E+02	7.6E-06	-	-	3.8E-06	-	-
Bis(2-Ethylhexyl) Phthalate	1.8E-01	6.2E-02	5.1E-02	1.0E-03	3.6E-04	2.9E-04	2.4E+02	8.2E+01	6.6E+01	-	2.1E-04	7.1E-05	5.8E-05	1.3E-04	4.6E-05	3.7E-05	1.8E+01	6.2E+00	5.0E+00	-	1.8E+01	6.2E+00	5.0E+00	1.8E+01	1.8E+02	9.8E-01	3.4E-01	2.7E-01	9.8E-02	3.4E-02	2.7E-02
Butylbenzyl Phthalate	1.9E-01	-	-	2.0E-03	-	-	1.0E+02	-	-	-	2.2E-04	-	-	2.6E-04	-	-	7.7E+00	-	-	-	7.7E+00	-	-	-	-	-	-	-	-	-	-
Carbazole	1.5E-01	5.8E-02	4.3E-02	6.2E-03	2.4E-03	1.8E-03	1.2E+01	4.6E+00	3.4E+00	-	1.7E-04	6.6E-05	4.9E-05	8.0E-04	3.1E-04	2.3E-04	9.0E-01	3.5E-01	2.6E-01	-	9.1E-01	3.5E-01	2.6E-01	-	-	-	-	-	-	-	-
Di-N-Octyl Phthalate	1.2E-01	-	-	2.8E-06	-	-	3.8E+05	-	-	-	1.4E-04	-	-	3.6E-07	-	-	2.8E+04	-	-	-	2.8E+04	-	-	9.8E+03	-	**2.9E+00**	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.5E-04	-	-	1.3E+01	-	-	-	2.0E-05	-	-	1.9E-05	-	-	9.9E-01	-	-	-	9.9E-01	-	-	4.5E+01	-	2.2E-02	-	-	-	-	-
N-Nitrosodiphenylamine	4.5E-02	-	-	4.0E-03	-	-	1.2E+00	-	-	-	5.1E-05	-	-	5.2E-04	-	-	8.8E-02	-	-	-	8.9E-02	-	-	-	-	-	-	-	-	-	-
Phenol	1.5E-01	-	-	1.2E-01	-	-	1.7E-01	-	-	-	1.7E-04	-	-	1.6E-02	-	-	1.3E-02	-	-	-	2.9E-02	-	-	4.0E+01	5.3E+01	7.3E-04	-	-	5.4E-04	-	-
Total Low Molecular Weight PAHS	1.2E+00	4.1E-01	2.8E-01	4.4E-02	2.7E-02	2.2E-02	5.9E-01	2.0E-01	1.3E-01	5.0E-03	1.4E-03	4.7E-04	3.1E-04	5.6E-03	3.5E-03	2.9E-03	4.5E-02	1.5E-02	1.0E-02	9.5E-04	5.3E-02	2.0E-02	1.4E-02	6.6E+01	1.1E+02	8.0E-04	3.1E-04	2.2E-04	4.8E-04	1.8E-04	1.3E-04
Total High Molecular Weight PAHs	7.4E+00	2.7E+00	1.9E+00	1.8E-01	7.0E-02	4.9E-02	3.1E+00	1.1E+00	7.8E-01	-	8.4E-03	3.1E-03	2.1E-03	2.3E-02	9.1E-03	6.4E-03	2.3E-01	8.6E-02	5.9E-02	-	2.6E-01	9.8E-02	6.7E-02	6.2E-01	3.1E+00	4.3E-01	1.6E-01	1.1E-01	8.6E-02	3.2E-02	2.2E-02
PCBs																															
Aroclor-1248	3.9E+00	-	1.9E-03	1.1E-02	-	5.2E-06	5.6E+00	-	2.9E-04		4.5E-03	-	2.1E-06	1.4E-03	-	6.7E-07	4.2E-01	-	2.2E-05		4.3E-01	-	2.5E-05	3.9E-02	3.9E-01	**1.1E+01**	-	6.3E-04	**1.1E+00**	-	6.4E-05
Aroclor-1254	1.4E+00	1.9E-01	7.8E-02	2.1E-03	2.9E-04	1.2E-04	1.5E+00	1.1E-01	3.5E-02		1.6E-03	2.2E-04	8.9E-05	2.7E-04	3.7E-05	1.5E-05	1.1E-01	8.7E-03	2.7E-03		1.1E-01	8.9E-03	2.8E-03	6.1E-02	6.1E-01	**1.9E+00**	1.5E-01	4.6E-02	1.9E-01	1.5E-02	4.6E-03
Aroclor-1260	4.0E-01	9.3E-02	5.4E-02	1.7E-04	4.0E-05	2.3E-05	2.9E-01	4.4E-02	2.2E-02		4.6E-04	1.1E-04	6.1E-05	2.2E-05	5.2E-06	3.0E-06	2.2E-02	3.4E-03	1.7E-03		2.3E-02	3.5E-03	1.7E-03	2.8E+01	2.8E+02	8.2E-04	1.2E-04	6.2E-05	8.2E-05	1.2E-05	6.2E-06
Pesticides																															
4,4'-DDD	6.5E-02	1.0E-02	4.4E-03	1.6E-03	3.8E-04	2.0E-04	7.6E-02	2.1E-02	1.2E-02	3.3E-05	7.4E-05	1.1E-05	5.0E-06	2.0E-04	4.9E-05	2.6E-05	5.8E-03	1.6E-03	8.8E-04	6.3E-06	6.0E-03	1.6E-03	9.2E-04	1.5E-01	2.7E-01	4.1E-02	1.1E-02	6.2E-03	2.2E-02	5.9E-03	3.3E-03
4,4'-DDE	1.9E-02	5.8E-03	3.8E-03	6.2E-04	2.5E-04	1.8E-04	5.8E-02	2.0E-02	1.4E-02	2.1E-05	2.2E-05	6.6E-06	4.4E-06	8.0E-05	3.3E-05	2.4E-05	4.4E-03	1.6E-03	1.1E-03	4.0E-06	4.5E-03	1.6E-03	1.1E-03	1.5E-01	2.7E-01	3.1E-02	1.1E-02	7.5E-03	1.6E-02	5.8E-03	4.0E-03
4,4'-DDT	5.5E-02	8.9E-03	4.7E-03	1.4E-03	3.5E-04	2.1E-04	1.1E-01	2.2E-02	1.7E-02	9.0E-06	6.3E-05	1.0E-05	5.3E-06	1.8E-04	4.5E-05	2.8E-05	8.2E-03	1.7E-03	1.3E-03	1.7E-06	8.4E-03	1.7E-03	1.3E-03	1.5E-01	2.7E-01	5.7E-02	1.2E-02	8.9E-03	3.1E-02	6.3E-03	4.8E-03
Aldrin	1.3E-03	4.1E-04	1.8E-04	2.0E-06	6.4E-07	2.8E-07	1.1E+01	3.4E+00	1.5E+00	-	1.5E-06	4.7E-07	2.1E-07	2.6E-07	8.2E-08	3.7E-08	8.1E-01	2.5E-01	1.1E-01	-	8.1E-01	2.5E-01	1.1E-01	2.0E-01	1.0E+00	**4.0E+00**	**1.3E+00**	5.7E-01	8.1E-01	2.5E-01	1.1E-01
alpha-BHC	1.3E-03	3.8E-04	1.7E-04	4.8E-05	1.4E-05	6.3E-06	1.2E-01	3.5E-02	1.6E-02	-	1.5E-06	4.3E-07	2.0E-07	6.2E-06	1.8E-06	8.2E-07	9.1E-03	2.7E-03	1.2E-03	-	9.1E-03	2.7E-03	1.2E-03	1.6E+00	3.2E+00	5.7E-03	1.7E-03	7.5E-04	2.8E-03	8.3E-04	3.7E-04
beta-BHC	1.5E-02	2.5E-03	1.3E-03	5.3E-04	9.0E-05	4.5E-05	1.5E+00	2.5E-01	1.2E-01	-	1.7E-05	2.9E-06	1.4E-06	6.8E-05	1.2E-05	5.8E-06	1.1E-01	1.9E-02	9.5E-03	-	1.1E-01	1.9E-02	9.5E-03	4.0E-01	2.0E+00	2.8E-01	4.8E-02	2.4E-02	5.6E-02	9.5E-03	4.7E-03
gamma-BHC	1.3E-03	3.5E-04	1.5E-04	5.3E-05	1.4E-05	6.2E-06	1.1E-01	2.8E-02	1.2E-02	-	1.5E-06	3.9E-07	1.7E-07	6.8E-06	1.8E-06	8.0E-07	8.0E-03	2.1E-03	9.3E-04	-	8.0E-03	2.1E-03	9.4E-04	8.0E+00	-	1.0E-03	2.7E-04	1.2E-04	-	-	-
Methoxychlor	2.9E-02	-	2.0E-03	4.1E-04	-	2.8E-05	1.1E+01	-	7.4E-01	-	3.3E-05	-	2.3E-06	5.3E-05	-	3.7E-06	8.0E-01	-	5.6E-02	-	8.0E-01	-	5.6E-02	4.0E+00	8.0E+00	2.0E-01	-	1.4E-02	1.0E-01	-	7.0E-03
Dieldrin	2.2E-02	5.1E-03	2.9E-03	1.4E-03	3.2E-04	1.8E-04	5.2E-02	1.2E-02	6.8E-03	-	2.5E-05	5.9E-06	3.3E-06	1.7E-04	4.1E-05	2.3E-05	3.9E-03	9.1E-04	5.1E-04	-	4.1E-03	9.6E-04	5.4E-04	1.5E-02	3.0E-02	2.7E-01	6.4E-02	3.6E-02	1.4E-01	3.2E-02	1.8E-02
Alpha-Endosulfan	1.1E-03	3.5E-04	1.6E-04	5.7E-05	1.8E-05	8.2E-06	6.4E-02	2.0E-02	9.2E-03	-	1.3E-06	4.0E-07	1.8E-07	7.3E-06	2.3E-06	1.1E-06	4.8E-03	1.5E-03	6.9E-04	-	4.8E-03	1.5E-03	7.0E-04	1.5E-01	-	3.2E-02	1.0E-02	4.6E-03	-	-	-
Beta-Endosulfan	1.4E-03	5.4E-04	2.6E-04	6.6E-05	2.6E-05	1.2E-05	9.2E-02	3.6E-02	1.7E-02	-	1.6E-06	6.2E-07	3.0E-07	8.5E-06	3.3E-06	1.6E-06	7.0E-03	2.7E-03	1.3E-03	-	7.0E-03	2.7E-03	1.3E-03	1.5E-01	-	4.7E-02	1.8E-02	8.7E-03	-	-	-
Endosulfan Sulfate	2.0E-03	6.8E-04	3.2E-04	8.9E-05	3.0E-05	1.4E-05	1.4E-01	4.8E-02	2.2E-02	-	2.3E-06	7.7E-07	3.6E-07	1.1E-05	3.9E-06	1.8E-06	1.1E-02	3.6E-03	1.7E-03	-	1.1E-02	3.6E-03	1.7E-03	1.5E-01	-	7.2E-02	2.4E-02	1.1E-02	-	-	-
Heptachlor	1.1E-03	-	1.8E-04	8.1E-06	-	1.3E-06	6.4E-02	-	1.0E-02	-	1.3E-06	-	2.1E-07	1.0E-06	-	1.7E-07	4.8E-03	-	7.9E-04	-	4.8E-03	-	7.9E-04	1.0E-01	1.0E+00	4.8E-02	-	7.9E-03	4.8E-03	-	7.9E-04
Heptachlor Epoxide	4.0E-03	1.2E-03	5.8E-04	4.2E-05	1.2E-05	6.0E-06	2.2E+00	6.4E-01	3.2E-01	-	4.6E-06	1.3E-06	6.6E-07	5.4E-06	1.6E-06	7.8E-07	1.7E-01	4.8E-02	2.4E-02	-	1.7E-01	4.8E-02	2.4E-02	1.0E-01	1.0E+00	**1.7E+00**	4.8E-01	2.4E-01	1.7E-01	4.8E-02	2.4E-02
Endrin Aldehyde	7.8E-03	1.5E-03	7.0E-04	7.6E-05	1.4E-05	6.8E-06	4.8E+00	9.0E-01	4.3E-01	-	8.9E-06	1.7E-06	8.0E-07	9.8E-06	1.9E-06	8.8E-07	3.6E-01	6.8E-02	3.2E-02	-	3.6E-01	6.8E-02	3.2E-02	9.2E-02	9.2E-01	**3.9E+00**	7.4E-01	3.5E-01	3.9E-01	7.4E-02	3.5E-02
Endrin Ketone	1.6E-02	2.6E-03	1.1E-03	-	-	-	-	-	-	-	1.8E-05	2.9E-06	1.2E-06	-	-	-	-	-	-	-	-	-	-	9.2E-02	9.2E-01	-	-	-	-	-	-
Endrin	8.9E-03	1.6E-03	7.3E-04	7.7E-05	1.4E-05	6.3E-06	6.4E+00	1.1E+00	5.3E-01	-	1.0E-05	1.8E-06	8.3E-07	9.9E-06	1.7E-06	8.1E-07	4.9E-01	8.6E-02	4.0E-02	-	4.9E-01	8.6E-02	4.0E-02	9.2E-02	9.2E-01	**5.3E+00**	9.3E-01	4.3E-01	5.3E-01	9.3E-02	4.3E-02
gamma-chlordane	-	-	-	-	-	-	-	-	-	1.1E-05	-	-	-	-	-	-	-	-	-	2.1E-06	2.1E-06	-	-	4.6E+00	9.2E+00	4.6E-07	-	-	2.3E-07	-	-
Dioxins/Furans																															
2,3,7,8-TCDD Equivalents (Mammals)	1.9E-05	-	4.9E-06	1.6E-08	-	4.1E-09	3.1E-05	-	7.7E-06	2.7E-05	2.2E-08	-	5.6E-09	2.1E-09	-	5.3E-10	2.3E-06	-	5.9E-07	5.1E-06	7.5E-06	-	5.7E-06	2.0E-06	2.0E-05	**3.7E+00**	-	**2.9E+00**	3.7E-01	-	2.9E-01

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Golder Associates

Hazard Quotient Estimation for Short-tailed Shrew - Annex
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.0173	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0015	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.0096	kg/day	Table 8-5
Fraction of Diet Comprised of Invertebrates	P_i^I	1	unitless	Table 8-5
Fraction soil ingestion	P_s	0.03	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.0039	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.2
Invertebrate Concentration	C_i^I	Chemical-specific	mg/kg	Table 8-7
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-7
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-5

																				NOAEL HQs			LOAEL HQs		
	C_s^{max}	$C_s^{95\%}$	C_{smean}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Invertebrate Exposure	95% Dose: Invertebrate Exposure	Mean Dose: Invertebrate Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.8E+04	1.8E+04	1.5E+04	6.2E+03	3.9E+03	3.4E+03	3.1E+01	7.3E+01	4.7E+01	4.0E+01	3.4E+03	2.2E+03	1.9E+03	7.0E+00	3.5E+03	2.2E+03	1.9E+03	1.9E+00	1.9E+01	**1.8E+03**	**1.2E+03**	**1.0E+03**	**1.8E+02**	**1.2E+02**	**1.0E+02**
Antimony	3.7E+00	1.5E+00	1.2E+00	5.9E-01	2.4E-01	2.0E-01	3.2E-03	9.6E-03	4.0E-03	3.2E-03	3.3E-01	1.3E-01	1.1E-01	7.2E-04	3.4E-01	1.4E-01	1.1E-01	5.9E-02	5.9E-01	**5.7E+00**	**2.4E+00**	**1.9E+00**	5.7E-01	2.4E-01	1.9E-01
Arsenic	9.5E+01	2.9E+01	1.2E+01	9.6E-01	4.2E-01	2.2E-01	3.8E-02	2.5E-01	7.6E-02	3.0E-02	5.3E-01	2.3E-01	1.2E-01	8.5E-03	7.9E-01	3.2E-01	1.6E-01	1.0E+00	1.7E+00	7.6E-01	3.1E-01	1.5E-01	4.8E-01	1.9E-01	9.6E-02
Barium	4.7E+02	2.5E+02	1.8E+02	6.8E+00	3.6E+00	2.7E+00	9.4E-01	1.2E+00	6.5E-01	4.7E-01	3.8E+00	2.0E+00	1.5E+00	2.1E-01	5.2E+00	2.9E+00	2.2E+00	5.2E+01	8.3E+01	1.0E-01	5.6E-02	4.2E-02	6.3E-02	3.5E-02	2.6E-02
Cadmium	3.7E+00	1.2E+00	8.0E-01	3.7E+00	1.6E+00	3.3E-02	3.4E-03	9.6E-03	3.2E-03	2.1E-03	2.1E+00	8.8E-01	1.8E-02	7.7E-04	2.1E+00	8.8E-01	2.1E-02	1.0E+00	1.0E+01	**2.1E+00**	8.8E-01	2.1E-02	2.1E-01	8.8E-02	2.1E-03
Chromium	2.0E+02	5.7E+01	4.5E+01	9.9E+00	2.8E+00	2.2E+00	7.8E-02	5.3E-01	1.5E-01	1.2E-01	5.5E+00	1.6E+00	1.2E+00	1.8E-02	6.1E+00	1.7E+00	1.3E+00	2.4E+00	9.6E+00	**2.5E+00**	7.2E-01	5.6E-01	6.3E-01	1.8E-01	1.4E-01
Cobalt	2.0E+01	1.1E+01	9.8E+00	2.4E+00	1.4E+00	1.2E+00	2.6E-02	5.1E-02	3.0E-02	2.6E-02	1.3E+00	7.7E-01	6.6E-01	5.8E-03	1.4E+00	8.1E-01	7.0E-01	7.3E+00	1.9E+01	1.9E-01	1.1E-01	9.5E-02	7.3E-02	4.3E-02	3.7E-02
Copper	2.3E+02	6.9E+01	5.1E+01	1.9E+01	5.7E+00	6.2E-01	1.1E-01	6.0E-01	1.8E-01	1.3E-01	1.1E+01	3.2E+00	3.4E-01	2.4E-02	1.1E+01	3.4E+00	5.0E-01	5.6E+00	9.3E+00	**2.0E+00**	6.0E-01	9.0E-02	**1.2E+00**	3.6E-01	5.4E-02
Iron	4.1E+04	2.9E+04	2.6E+04	9.0E+03	6.5E+03	5.7E+03	5.2E+01	1.1E+02	7.7E+01	6.8E+01	5.0E+03	3.6E+03	3.2E+03	1.2E+01	5.1E+03	3.7E+03	3.3E+03	-	-	-	-	-	-	-	-
Lead	2.9E+02	1.2E+02	7.8E+01	1.3E+01	5.9E+00	8.4E-01	3.7E-01	7.6E-01	3.0E-01	2.0E-01	7.0E+00	3.3E+00	4.6E-01	8.2E-02	7.8E+00	3.7E+00	7.5E-01	4.7E+00	5.0E+00	**1.7E+00**	7.8E-01	1.6E-01	**1.6E+00**	7.3E-01	1.5E-01
Manganese	1.2E+03	4.5E+02	3.6E+02	3.4E+00	1.8E+00	1.4E+00	1.3E+00	3.1E+00	1.2E+00	9.3E-01	1.9E+00	1.0E+00	7.7E-01	2.9E-01	5.3E+00	2.5E+00	2.0E+00	5.2E+01	1.5E+02	1.0E-01	4.8E-02	3.9E-02	3.6E-02	1.7E-02	1.4E-02
Mercury	8.8E-01	3.1E-01	2.2E-01	4.8E-02	1.7E-02	1.3E-02	1.2E-03	2.3E-03	7.9E-04	5.6E-04	2.7E-02	9.2E-03	7.3E-03	2.7E-04	2.9E-02	1.0E-02	8.1E-03	1.3E+01	-	2.2E-03	7.8E-04	6.1E-04	-	-	-
Nickel	9.2E+01	3.7E+01	3.1E+01	1.6E+01	6.2E+00	4.3E-01	7.5E-02	2.4E-01	9.6E-02	7.9E-02	8.7E+00	3.5E+00	2.4E-01	1.7E-02	8.9E+00	3.6E+00	3.4E-01	1.7E+00	2.7E+00	**5.3E+00**	**2.1E+00**	2.0E-01	**3.3E+00**	**1.3E+00**	1.2E-01
Selenium	4.2E+00	1.1E+00	7.1E-01	9.2E-01	2.5E-01	1.6E-01	-	1.1E-02	2.9E-03	1.9E-03	5.1E-01	1.4E-01	8.7E-02	-	5.2E-01	1.4E-01	8.9E-02	1.4E-01	1.5E-01	**3.7E+00**	9.8E-01	6.2E-01	**3.6E+00**	9.7E-01	6.1E-01
Silver	2.4E+00	6.2E-01	3.8E-01	7.9E-01	2.0E-01	1.2E-01	1.7E-03	6.2E-03	1.6E-03	9.9E-04	4.4E-01	1.1E-01	6.9E-02	3.8E-04	4.4E-01	1.2E-01	7.0E-02	6.0E+00	6.0E+01	7.3E-02	1.9E-02	1.2E-02	7.3E-03	1.9E-03	1.2E-03
Thallium	1.0E+00	-	-	2.2E-01	-	-	-	2.6E-03	-	-	1.2E-01	-	-	-	1.2E-01	-	-	7.4E-03	7.4E-02	**1.7E+01**	-	-	**1.7E+00**	-	-
Vanadium	1.0E+02	6.6E+01	5.7E+01	6.9E-01	4.4E-01	3.8E-01	9.5E-02	2.7E-01	1.7E-01	1.5E-01	3.8E-01	2.5E-01	2.1E-01	2.1E-02	6.7E-01	4.4E-01	3.8E-01	4.2E+00	5.1E+00	1.6E-01	1.1E-01	9.2E-02	1.3E-01	8.6E-02	7.5E-02
Zinc	1.5E+03	3.1E+02	1.8E+02	1.5E+02	9.0E+01	7.5E+01	5.8E-01	4.0E+00	8.0E-01	4.7E-01	8.4E+01	5.0E+01	4.2E+01	1.3E-01	8.8E+01	5.1E+01	4.2E+01	7.5E+01	7.4E+02	**1.2E+00**	6.7E-01	5.6E-01	1.2E-01	6.8E-02	5.7E-02
VOCs																									
Acetone	1.3E-02	6.6E-03	-	6.5E-04	3.3E-04	-	-	3.4E-05	1.7E-05	-	3.6E-04	1.8E-04	-	-	3.9E-04	2.0E-04	-	1.0E+01	5.0E+01	3.9E-05	2.0E-05	-	7.9E-06	4.0E-06	-
SVOCs																									
Atrazine	-	-	-	-	-	-	2.0E-03	-	-	-	-	-	-	4.5E-04	4.5E-04	-	-	5.0E+01	1.0E+02	9.0E-06	-	-	4.5E-06	-	-
Bis(2-Ethylhexyl) Phthalate	1.8E-01	6.2E-02	5.1E-02	2.4E+02	8.2E+01	6.6E+01	-	4.7E-04	1.6E-04	1.3E-04	1.3E+02	4.5E+01	3.7E+01	-	1.3E+02	4.5E+01	3.7E+01	1.8E+01	1.8E+02	**7.1E+00**	**2.5E+00**	**2.0E+00**	7.1E-01	2.5E-01	2.0E-01
Butylbenzyl Phthalate	1.9E-01	-	-	1.0E+02	-	-	-	4.9E-04	-	-	5.6E+01	-	-	-	5.6E+01	-	-	-	-	-	-	-	-	-	-
Carbazole	1.5E-01	5.8E-02	4.3E-02	1.2E+01	4.6E+00	3.4E+00	-	3.9E-04	1.5E-04	1.1E-04	6.6E+00	2.6E+00	1.9E+00	-	6.6E+00	2.6E+00	1.9E+00	-	-	-	-	-	-	-	-
Di-N-Octyl Phthalate	1.2E-01	-	-	3.8E+05	-	-	-	3.1E-04	-	-	2.1E+05	-	-	-	2.1E+05	-	-	9.8E+03	-	**2.1E+01**	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.3E+01	-	-	-	4.6E-05	-	-	7.2E+00	-	-	-	7.2E+00	-	-	4.5E+01	-	1.6E-01	-	-	-	-	-
N-Nitrosodiphenylamine	4.5E-02	-	-	1.2E+00	-	-	-	1.2E-04	-	-	6.5E-01	-	-	-	6.5E-01	-	-	-	-	-	-	-	-	-	-
Phenol	1.5E-01	-	-	1.7E-01	-	-	-	3.9E-04	-	-	9.3E-02	-	-	-	9.4E-02	-	-	4.0E+01	5.3E+01	2.3E-03	-	-	1.8E-03	-	-
Total Low Molecular Weight PAHS	1.2E+00	4.1E-01	2.8E-01	5.9E-01	2.0E-01	1.3E-01	5.0E-03	3.1E-03	1.1E-03	7.2E-04	3.3E-01	1.1E-01	7.4E-02	1.1E-03	3.3E-01	1.1E-01	7.6E-02	6.6E+01	1.1E+02	5.0E-03	1.7E-03	1.2E-03	3.0E-03	1.0E-03	6.9E-04
Total High Molecular Weight PAHs	7.4E+00	2.7E+00	1.9E+00	3.1E+00	1.1E+00	7.8E-01	-	1.9E-02	7.1E-03	4.9E-03	1.7E+00	6.3E-01	4.3E-01	-	1.7E+00	6.3E-01	4.4E-01	6.2E-01	3.1E+00	**2.8E+00**	**1.0E+00**	7.1E-01	5.6E-01	2.1E-01	1.4E-01
PCBs																									
Aroclor-1248	3.9E+00	-	1.9E-03	5.6E+00	-	2.9E-04		1.0E-02	-	4.9E-06	3.1E+00	-	1.6E-04		3.1E+00	-	1.7E-04	4.3E-02	4.3E-01	**7.2E+01**	-	3.8E-03	**7.2E+00**	-	3.9E-04
Aroclor-1254	1.4E+00	1.9E-01	7.8E-02	1.5E+00	1.1E-01	3.5E-02		3.6E-03	5.0E-04	2.0E-04	8.2E-01	6.3E-02	2.0E-02		8.2E-01	6.4E-02	2.0E-02	6.7E-02	6.7E-01	**1.2E+01**	9.5E-01	3.0E-01	**1.2E+00**	9.6E-02	3.0E-02
Aroclor-1260	4.0E-01	9.3E-02	5.4E-02	2.9E-01	4.4E-02	2.2E-02		1.0E-03	2.4E-04	1.4E-04	1.6E-01	2.5E-02	1.2E-02		1.6E-01	2.5E-02	1.2E-02	2.9E+01	*2.9E+02*	5.6E-03	8.5E-04	4.2E-04	5.6E-04	8.5E-05	4.2E-05
Pesticides																									
4,4'-DDD	6.5E-02	1.0E-02	4.4E-03	7.6E-02	2.1E-02	1.2E-02	3.3E-05	1.7E-04	2.6E-05	1.1E-05	4.2E-02	1.1E-02	6.4E-03	7.4E-06	4.2E-02	1.1E-02	6.4E-03	1.5E-01	2.7E-01	2.9E-01	7.8E-02	4.4E-02	1.5E-01	4.2E-02	2.4E-02
4,4'-DDE	1.9E-02	5.8E-03	3.8E-03	5.8E-02	2.0E-02	1.4E-02	2.1E-05	4.9E-05	1.5E-05	9.9E-06	3.2E-02	1.1E-02	7.8E-03	4.7E-06	3.2E-02	1.1E-02	7.9E-03	1.5E-01	2.7E-01	2.2E-01	7.7E-02	5.3E-02	1.2E-01	4.2E-02	2.9E-02
4,4'-DDT	5.5E-02	8.9E-03	4.7E-03	1.1E-01	2.2E-02	1.7E-02	9.0E-06	1.4E-04	2.3E-05	1.2E-05	6.0E-02	1.2E-02	9.4E-03	2.0E-06	6.0E-02	1.2E-02	9.4E-03	1.5E-01	2.7E-01	4.1E-01	8.3E-02	6.4E-02	2.2E-01	4.5E-02	3.4E-02
Aldrin	1.3E-03	4.1E-04	1.8E-04	1.1E+01	3.4E+00	1.5E+00	-	3.4E-06	1.1E-06	4.7E-07	5.9E+00	1.9E+00	8.3E-01	-	5.9E+00	1.9E+00	8.3E-01	2.0E-01	1.0E+00	**3.0E+01**	**9.3E+00**	**4.1E+00**	**5.9E+00**	**1.9E+00**	8.3E-01
alpha-BHC	1.3E-03	3.8E-04	1.7E-04	1.2E-01	3.5E-02	1.6E-02	-	3.4E-06	9.9E-07	4.5E-07	6.7E-02	1.9E-02	8.8E-03	-	6.7E-02	1.9E-02	8.8E-03	1.6E+00	3.2E+00	4.2E-02	1.2E-02	5.5E-03	2.1E-02	6.1E-03	2.7E-03
beta-BHC	1.5E-02	2.5E-03	1.3E-03	1.5E+00	2.5E-01	1.2E-01	-	3.9E-05	6.6E-06	3.3E-06	8.2E-01	1.4E-01	6.9E-02	-	8.2E-01	1.4E-01	6.9E-02	4.0E-01	2.0E+00	**2.0E+00**	3.5E-01	1.7E-01	4.1E-01	7.0E-02	3.5E-02
gamma-BHC	1.3E-03	3.5E-04	1.5E-04	1.1E-01	2.8E-02	1.2E-02	-	3.4E-06	9.0E-07	4.0E-07	5.8E-02	1.6E-02	6.8E-03	-	5.8E-02	1.6E-02	6.8E-03	8.0E+00	-	7.3E-03	1.9E-03	8.6E-04	-	-	-
Methoxychlor	2.9E-02	-	2.0E-03	1.1E+01	-	7.4E-01	-	7.5E-05	-	5.3E-06	5.9E+00	-	4.1E-01	-	5.9E+00	-	4.1E-01	4.0E+00	8.0E+00	**1.5E+00**	-	1.0E-01	7.3E-01	-	5.1E-02
Dieldrin	2.2E-02	5.1E-03	2.9E-03	5.2E-02	1.2E-02	6.8E-03	-	5.7E-05	1.3E-05	7.5E-06	2.9E-02	6.7E-03	3.8E-03	-	2.9E-02	6.7E-03	3.8E-03	1.5E-02	3.0E-02	**1.9E+00**	4.5E-01	2.5E-01	9.6E-01	2.2E-01	1.3E-01
Alpha-Endosulfan	1.1E-03	3.5E-04	1.6E-04	6.4E-02	2.0E-02	9.2E-03	-	2.9E-06	9.1E-07	4.1E-07	3.5E-02	1.1E-02	5.1E-03	-	3.5E-02	1.1E-02	5.1E-03	1.5E-01	-	2.3E-01	7.4E-02	3.4E-02	-	-	-
Beta-Endosulfan	1.4E-03	5.4E-04	2.6E-04	9.2E-02	3.6E-02	1.7E-02	-	3.6E-06	1.4E-06	6.8E-07	5.1E-02	2.0E-02	9.5E-03	-	5.1E-02	2.0E-02	9.5E-03	1.5E-01	-	3.4E-01	1.3E-01	6.3E-02	-	-	-
Endosulfan Sulfate	2.0E-03	6.8E-04	3.2E-04	1.4E-01	4.8E-02	2.2E-02	-	5.2E-06	1.8E-06	8.2E-07	7.9E-02	2.7E-02	1.2E-02	-	7.9E-02	2.7E-02	1.2E-02	1.5E-01	-	5.3E-01	1.8E-01	8.3E-02	-	-	-
Heptachlor	1.1E-03	-	1.8E-04	6.4E-02	-	1.0E-02	-	2.9E-06	-	4.7E-07	3.5E-02	-	5.8E-03	-	3.5E-02	-	5.8E-03	1.0E-01	1.0E+00	3.5E-01	-	5.8E-02	3.5E-02	-	5.8E-03
Heptachlor Epoxide	4.0E-03	1.2E-03	5.8E-04	2.2E+00	6.4E-01	3.2E-01	-	1.0E-05	3.0E-06	1.5E-06	1.2E+00	3.6E-01	1.8E-01	-	1.2E+00	3.6E-01	1.8E-01	1.0E-01	1.0E+00	**1.2E+01**	**3.6E+00**	**1.8E+00**	**1.2E+00**	3.6E-01	1.8E-01
Endrin Aldehyde	7.8E-03	1.5E-03	7.0E-04	4.8E+00	9.0E-01	4.3E-01	-	2.0E-05	3.9E-06	1.8E-06	2.6E+00	5.0E-01	2.4E-01	-	2.6E+00	5.0E-01	2.4E-01	9.2E-02	9.2E-01	**2.9E+01**	**5.5E+00**	**2.6E+00**	**2.9E+00**	5.5E-01	2.6E-01
Endrin Ketone	1.6E-02	2.6E-03	1.1E-03	-	-	-	-	4.2E-05	6.7E-06	2.7E-06	-	-	-	-	4.2E-05	6.7E-06	2.7E-06	9.2E-02	9.2E-01	4.5E-04	7.3E-05	3.0E-05	4.5E-05	7.3E-06	3.0E-06
Endrin	8.9E-03	1.6E-03	7.3E-04	6.4E+00	1.1E+00	5.3E-01	-	2.3E-05	4.1E-06	1.9E-06	3.6E+00	6.3E-01	2.9E-01	-	3.6E+00	6.3E-01	2.9E-01	9.2E-02	9.2E-01	**3.9E+01**	**6.8E+00**	**3.2E+00**	**3.9E+00**	6.8E-01	3.2E-01
gamma-Chlordane	-	-	-	-	-	-	1.1E-05	-	-	-	-	-	-	2.5E-06	2.5E-06	-	-	4.6E+00	9.2E+00	5.4E-07	-	-	2.7E-07	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Mammals)	1.9E-05	-	4.9E-06	3.1E-05	-	7.7E-06	2.7E-05	5.0E-08	-	1.3E-08	1.7E-05	-	4.3E-06	2.5E-06	2.0E-05	-	6.8E-06	2.2E-06	2.2E-05	**8.9E+00**	-	**3.1E+00**	8.9E-01	-	3.1E-01

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Table 8-9.3
Hazard Quotient Estimation for Meadow Vole - Annex
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.037	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0018	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.012	kg/day	Table 8-5
Fraction of Diet Comprised of Plants	P_f^p	1	unitless	Table 8-5
Fraction soil ingestion	P_s	0.024	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.0078	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.2
Plant Concentration	C_f^p	Chemical-specific	mg/kg	Table 8-7
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-7
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-5

	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{pmean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		NOAEL HQs: Max Hazard Quotient	NOAEL HQs: 95% Hazard Quotient	NOAEL HQs: Mean Hazard Quotient	LOAEL HQs: Max Hazard Quotient	LOAEL HQs: 95% Hazard Quotient	LOAEL HQs: Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.8E+04	1.8E+04	1.5E+04	1.7E+01	1.1E+01	9.2E+00	3.1E+01	3.3E+01	2.1E+01	1.8E+01	5.5E+00	3.5E+00	3.0E+00	6.6E+00	4.5E+01	3.1E+01	2.8E+01	1.9E+00	1.9E+01	**2.3E+01**	**1.6E+01**	**1.4E+01**	**2.3E+00**	**1.6E+00**	**1.4E+00**
Antimony	3.7E+00	1.5E+00	1.2E+00	2.0E-02	8.8E-03	7.2E-03	3.2E-03	4.3E-03	1.8E-03	1.4E-03	6.5E-03	2.8E-03	2.3E-03	6.7E-04	1.2E-02	5.3E-03	4.4E-03	5.9E-02	5.9E-01	2.0E-01	9.0E-02	7.5E-02	2.0E-02	9.0E-03	7.5E-03
Arsenic	9.5E+01	2.9E+01	1.2E+01	5.3E-01	1.7E-01	6.5E-02	3.8E-02	1.1E-01	3.4E-02	1.4E-02	1.7E-01	5.4E-02	2.1E-02	7.9E-03	2.9E-01	9.6E-02	4.3E-02	1.0E+00	1.7E+00	2.8E-01	9.2E-02	4.1E-02	1.8E-01	5.8E-02	2.6E-02
Barium	4.7E+02	2.5E+02	1.8E+02	1.1E+01	5.8E+00	4.3E+00	9.4E-01	5.5E-01	2.9E-01	2.1E-01	3.6E+00	1.9E+00	1.4E+00	2.0E-01	4.3E+00	2.4E+00	1.8E+00	5.2E+01	8.3E+01	8.3E-02	4.6E-02	3.5E-02	5.2E-02	2.9E-02	2.2E-02
Cadmium	3.7E+00	1.2E+00	8.0E-01	1.9E-01	1.1E-01	8.2E-02	3.4E-03	4.3E-03	1.5E-03	9.3E-04	6.2E-02	3.4E-02	2.7E-02	7.2E-04	6.7E-02	3.6E-02	2.8E-02	1.0E+00	1.0E+01	6.7E-02	3.6E-02	2.8E-02	6.7E-03	3.6E-03	2.8E-03
Chromium	2.0E+02	5.7E+01	4.5E+01	1.2E+00	3.5E-01	2.8E-01	7.8E-02	2.4E-01	6.7E-02	5.2E-02	4.0E-01	1.1E-01	8.9E-02	1.6E-02	6.6E-01	2.0E-01	1.6E-01	2.4E+00	9.6E+00	2.7E-01	8.3E-02	6.6E-02	6.8E-02	2.1E-02	1.6E-02
Cobalt	2.0E+01	1.1E+01	9.8E+00	7.4E-03	4.3E-03	3.7E-03	2.6E-02	2.3E-02	1.3E-02	1.1E-02	2.4E-03	1.4E-03	1.2E-03	5.4E-03	3.1E-02	2.0E-02	1.8E-02	7.3E+00	1.9E+01	4.2E-03	2.7E-03	2.5E-03	1.6E-03	1.1E-03	9.6E-04
Copper	2.3E+02	6.9E+01	5.1E+01	2.5E+00	1.6E+00	1.4E+00	1.1E-01	2.7E-01	8.1E-02	6.0E-02	8.1E-01	5.0E-01	4.5E-01	2.3E-02	1.1E+00	6.1E-01	5.3E-01	5.6E+00	9.3E+00	2.0E-01	1.1E-01	9.5E-02	1.2E-01	6.5E-02	5.7E-02
Iron	4.1E+04	2.9E+04	2.6E+04	1.5E+01	1.1E+01	9.8E+00	5.2E+01	4.8E+01	3.4E+01	3.0E+01	5.0E+00	3.6E+00	3.2E+00	1.1E+01	6.4E+01	4.9E+01	4.5E+01	-	-	-	-	-	-	-	-
Lead	2.9E+02	1.2E+02	7.8E+01	9.6E-01	5.7E-01	4.6E-01	3.7E-01	3.4E-01	1.3E-01	9.1E-02	3.1E-01	1.8E-01	1.5E-01	7.7E-02	7.3E-01	4.0E-01	3.2E-01	4.7E+00	5.0E+00	1.6E-01	8.4E-02	6.7E-02	1.5E-01	7.9E-02	6.3E-02
Manganese	1.2E+03	4.5E+02	3.6E+02	1.4E+01	5.3E+00	4.3E+00	1.3E+00	1.4E+00	5.2E-01	4.2E-01	4.5E+00	1.7E+00	1.4E+00	2.7E-01	6.2E+00	2.5E+00	2.1E+00	5.2E+01	1.5E+02	1.2E-01	4.9E-02	4.0E-02	4.2E-02	1.7E-02	1.4E-02
Mercury	8.8E-01	3.1E-01	2.2E-01	3.0E-02	1.0E-02	7.3E-03	1.2E-03	1.0E-03	3.6E-04	2.5E-04	9.6E-03	3.3E-03	2.4E-03	2.5E-04	1.1E-02	3.9E-03	2.9E-03	1.3E+01	-	8.3E-04	3.0E-04	2.2E-04	-	-	-
Nickel	9.2E+01	3.7E+01	3.1E+01	4.8E-01	2.4E-01	2.1E-01	7.5E-02	1.1E-01	4.3E-02	3.6E-02	1.6E-01	7.8E-02	6.8E-02	1.6E-02	2.8E-01	1.4E-01	1.2E-01	1.7E+00	2.7E+00	1.6E-01	8.1E-02	7.0E-02	1.0E-01	5.0E-02	4.4E-02
Selenium	4.2E+00	1.1E+00	7.1E-01	3.7E-01	8.7E-02	5.2E-02	-	4.9E-03	1.3E-03	8.3E-04	1.2E-01	2.8E-02	1.7E-02	-	1.3E-01	2.9E-02	1.8E-02	1.4E-01	1.5E-01	8.8E-01	2.1E-01	1.2E-01	8.7E-01	2.0E-01	1.2E-01
Silver	2.4E+00	6.2E-01	3.8E-01	5.0E-03	1.3E-03	8.0E-04	1.7E-03	2.8E-03	7.3E-04	4.4E-04	1.6E-03	4.2E-04	2.6E-04	3.6E-04	4.8E-03	1.5E-03	1.1E-03	6.0E+00	6.0E+01	8.0E-04	2.5E-04	1.8E-04	8.0E-05	2.5E-05	1.8E-05
Thallium	1.0E+00	-	-	6.0E-04	-	-	-	1.2E-03	-	-	1.9E-04	-	-	-	1.4E-03	-	-	7.4E-03	7.4E-02	1.8E-01	-	-	1.8E-02	-	-
Vanadium	1.0E+02	6.6E+01	5.7E+01	7.4E-02	4.8E-02	4.1E-02	9.5E-02	1.2E-01	7.7E-02	6.6E-02	2.4E-02	1.6E-02	1.3E-02	2.0E-02	1.6E-01	1.1E-01	1.0E-01	4.2E+00	5.1E+00	3.9E-02	2.7E-02	2.4E-02	3.2E-02	2.2E-02	2.0E-02
Zinc	1.5E+03	3.1E+02	1.8E+02	4.2E+01	1.7E+01	1.3E+01	5.8E-01	1.8E+00	3.6E-01	2.1E-01	1.4E+01	5.6E+00	4.2E+00	1.2E-01	1.6E+01	6.1E+00	4.5E+00	7.5E+01	7.4E+02	2.1E-01	8.1E-02	6.0E-02	2.1E-02	8.2E-03	6.1E-03
VOCs																									
Acetone	1.3E-02	6.6E-03	-	1.0E-01	5.2E-02	-	-	1.5E-05	7.7E-06	-	3.3E-02	1.7E-02	-	-	3.3E-02	1.7E-02	-	1.0E+01	5.0E+01	3.3E-03	1.7E-03	-	6.6E-04	3.4E-04	-
SVOCs																									
Atrazine	-	-	-	-	-	-	2.0E-03	-	-	-	-	-	-	4.2E-04	4.2E-04	-	-	5.0E+01	1.0E+02	8.4E-06	-	-	4.2E-06	-	-
Bis(2-Ethylhexyl) Phthalate	1.8E-01	6.2E-02	5.1E-02	1.0E-03	3.6E-04	2.9E-04	-	2.1E-04	7.3E-05	5.9E-05	3.3E-04	1.2E-04	9.4E-05	-	5.4E-04	1.9E-04	1.5E-04	1.8E+01	1.8E+02	3.0E-05	1.0E-05	8.4E-06	3.0E-06	1.0E-06	8.4E-07
Butylbenzyl Phthalate	1.9E-01	-	-	2.0E-03	-	-	-	2.2E-04	-	-	6.6E-04	-	-	-	8.8E-04	-	-	-	-	-	-	-	-	-	-
Carbazole	1.5E-01	5.8E-02	4.3E-02	6.2E-03	2.4E-03	1.8E-03	-	1.8E-04	6.8E-05	5.0E-05	2.0E-03	7.7E-04	5.7E-04	-	2.2E-03	8.4E-04	6.2E-04	-	-	-	-	-	-	-	-
Di-N-Octyl Phthalate	1.2E-01	-	-	2.8E-06	-	-	-	1.4E-04	-	-	9.2E-07	-	-	-	1.4E-04	-	-	9.8E+03	-	1.4E-08	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.5E-04	-	-	-	2.0E-05	-	-	4.8E-05	-	-	-	6.9E-05	-	-	4.5E+01	-	1.5E-06	-	-	-	-	-
N-Nitrosodiphenylamine	4.5E-02	-	-	4.0E-03	-	-	-	5.2E-05	-	-	1.3E-03	-	-	-	1.4E-03	-	-	-	-	-	-	-	-	-	-
Phenol	1.5E-01	-	-	1.2E-01	-	-	-	1.8E-04	-	-	4.0E-02	-	-	-	4.1E-02	-	-	4.0E+01	5.3E+01	1.0E-03	-	-	7.6E-04	-	-
Total Low Molecular Weight PAHS	1.2E+00	4.1E-01	2.8E-01	4.4E-02	2.7E-02	2.2E-02	5.0E-03	1.4E-03	4.8E-04	3.2E-04	1.4E-02	8.7E-03	7.2E-03	1.1E-03	1.7E-02	1.0E-02	8.6E-03	6.6E+01	1.1E+02	2.5E-04	1.6E-04	1.3E-04	1.5E-04	9.3E-05	7.8E-05
Total High Molecular Weight PAHs	7.4E+00	2.7E+00	1.9E+00	1.8E-01	7.0E-02	4.9E-02	-	8.6E-03	3.2E-03	2.2E-03	5.9E-02	2.3E-02	1.6E-02	-	6.7E-02	2.6E-02	1.8E-02	6.2E-01	3.1E+00	1.1E-01	4.2E-02	3.0E-02	2.2E-02	8.5E-03	5.9E-03
PCBs																									
Aroclor-1248	3.9E+00	-	1.9E-03	1.1E-02	-	5.2E-06		4.6E-03	-	2.2E-06	3.5E-03	-	1.7E-06		8.0E-03	-	3.9E-06	3.3E-02	3.3E-01	2.4E-01	-	1.2E-04	2.5E-02	-	1.2E-05
Aroclor-1254	1.4E+00	1.9E-01	7.8E-02	2.1E-03	2.9E-04	1.2E-04		1.6E-03	2.2E-04	9.1E-05	6.8E-04	9.4E-05	3.8E-05		2.3E-03	3.2E-04	1.3E-04	5.1E-02	5.1E-01	4.5E-02	6.2E-03	2.5E-03	4.5E-03	6.2E-04	2.5E-04
Aroclor-1260	4.0E-01	9.3E-02	5.4E-02	1.7E-04	4.0E-05	2.3E-05		4.7E-04	1.1E-04	6.3E-05	5.6E-05	1.3E-05	7.6E-06		5.2E-04	1.2E-04	7.0E-05	2.4E+01	2.4E+02	2.2E-05	5.0E-06	2.9E-06	2.2E-06	5.0E-07	2.9E-07
Pesticides																									
4,4'-DDD	6.5E-02	1.0E-02	4.4E-03	1.6E-03	3.8E-04	2.0E-04	3.3E-05	7.6E-05	1.2E-05	5.1E-06	5.0E-04	1.2E-04	6.6E-05	7.0E-06	5.9E-04	1.4E-04	7.8E-05	1.5E-01	2.7E-01	4.0E-03	9.7E-04	5.3E-04	2.1E-03	5.2E-04	2.9E-04
4,4'-DDE	1.9E-02	5.8E-03	3.8E-03	6.2E-04	2.5E-04	1.8E-04	2.1E-05	2.2E-05	6.8E-06	4.4E-06	2.0E-04	8.2E-05	6.0E-05	4.4E-06	2.3E-04	9.3E-05	6.9E-05	1.5E-01	2.7E-01	1.5E-03	6.3E-04	4.7E-04	8.3E-04	3.4E-04	2.5E-04
4,4'-DDT	5.5E-02	8.9E-03	4.7E-03	1.4E-03	3.5E-04	2.1E-04	9.0E-06	6.4E-05	1.0E-05	5.5E-06	4.5E-04	1.1E-04	7.0E-05	1.9E-06	5.1E-04	1.2E-04	7.7E-05	1.5E-01	2.7E-01	3.5E-03	8.5E-04	5.2E-04	1.9E-03	4.6E-04	2.8E-04
Aldrin	1.3E-03	4.1E-04	1.8E-04	2.0E-06	6.4E-07	2.8E-07	-	1.5E-06	4.8E-07	2.1E-07	6.6E-07	2.1E-07	9.2E-08	-	2.2E-06	6.8E-07	3.0E-07	2.0E-01	1.0E+00	1.1E-05	3.4E-06	1.5E-06	2.2E-06	6.8E-07	3.0E-07
alpha-BHC	1.3E-03	3.8E-04	1.7E-04	4.8E-05	1.4E-05	6.3E-06	-	1.5E-06	4.4E-07	2.0E-07	1.6E-05	4.5E-06	2.1E-06	-	1.7E-05	5.0E-06	2.3E-06	1.6E+00	3.2E+00	1.1E-05	3.1E-06	1.4E-06	5.3E-06	1.6E-06	7.0E-07
beta-BHC	1.5E-02	2.5E-03	1.3E-03	5.3E-04	9.0E-05	4.5E-05	-	1.8E-05	3.0E-06	1.5E-06	1.7E-04	2.9E-05	1.5E-05	-	1.9E-04	3.2E-05	1.6E-05	4.0E-01	2.0E+00	4.7E-04	8.0E-05	4.0E-05	9.5E-05	1.6E-05	8.0E-06
gamma-BHC	1.3E-03	3.5E-04	1.5E-04	5.3E-05	1.4E-05	6.2E-06	-	1.5E-06	4.0E-07	1.8E-07	1.7E-05	4.5E-06	2.0E-06	-	1.9E-05	4.9E-06	2.2E-06	8.0E+00	-	2.3E-06	6.2E-07	2.7E-07	-	-	-
Methoxychlor	2.9E-02	-	2.0E-03	4.1E-04	-	2.8E-05	-	3.4E-05	-	2.4E-06	1.3E-04	-	9.2E-06	-	1.7E-04	-	1.2E-05	4.0E+00	8.0E+00	4.2E-05	-	2.9E-06	2.1E-05	-	1.4E-06
Dieldrin	2.2E-02	5.1E-03	2.9E-03	1.4E-03	3.2E-04	1.8E-04	-	2.6E-05	6.0E-06	3.4E-06	4.4E-04	1.0E-04	5.7E-05	-	4.6E-04	1.1E-04	6.1E-05	1.5E-02	3.0E-02	3.1E-02	7.2E-03	4.0E-03	1.5E-02	3.6E-03	2.0E-03
Alpha-Endosulfan	1.1E-03	3.5E-04	1.6E-04	5.7E-05	1.8E-05	8.2E-06	-	1.3E-06	4.1E-07	1.9E-07	1.8E-05	5.8E-06	2.7E-06	-	2.0E-05	6.2E-06	2.8E-06	1.5E-01	-	1.3E-04	4.1E-05	1.9E-05	-	-	-
Beta-Endosulfan	1.4E-03	5.4E-04	2.6E-04	6.6E-05	2.6E-05	1.2E-05	-	1.6E-06	6.4E-07	3.0E-07	2.1E-05	8.3E-06	4.0E-06	-	2.3E-05	8.9E-06	4.3E-06	1.5E-01	-	1.5E-04	5.9E-05	2.8E-05	-	-	-
Endosulfan Sulfate	2.0E-03	6.8E-04	3.2E-04	8.9E-05	3.0E-05	1.4E-05	-	2.3E-06	7.9E-07	3.7E-07	2.9E-05	9.8E-06	4.6E-06	-	3.1E-05	1.1E-05	4.9E-06	1.5E-01	-	2.1E-04	7.0E-05	3.3E-05	-	-	-
Heptachlor	1.1E-03	-	1.8E-04	8.1E-06	-	1.3E-06	-	1.3E-06	-	2.1E-07	2.6E-06	-	4.3E-07	-	3.9E-06	-	6.4E-07	1.0E-01	1.0E+00	3.9E-05	-	6.4E-06	3.9E-06	-	6.4E-07
Heptachlor Epoxide	4.0E-03	1.2E-03	5.8E-04	4.2E-05	1.2E-05	6.0E-06	-	4.7E-06	1.3E-06	6.7E-07	1.4E-05	3.9E-06	1.9E-06	-	1.8E-05	5.3E-06	2.6E-06	1.0E-01	1.0E+00	1.8E-04	5.3E-05	2.6E-05	1.8E-05	5.3E-06	2.6E-06
Endrin Aldehyde	7.8E-03	1.5E-03	7.0E-04	7.6E-05	1.4E-05	6.8E-06	-	9.1E-06	1.7E-06	8.2E-07	2.5E-05	4.7E-06	2.2E-06	-	3.4E-05	6.4E-06	3.0E-06	9.2E-02	9.2E-01	3.7E-04	7.0E-05	3.3E-05	3.7E-05	7.0E-06	3.3E-06
Endrin Ketone	1.6E-02	2.6E-03	1.1E-03	-	-	-	-	1.9E-05	3.0E-06	1.2E-06	-	-	-	-	-	-	-	9.2E-02	9.2E-01	-	-	-	-	-	-
Endrin	8.9E-03	1.6E-03	7.3E-04	7.7E-05	1.4E-05	6.3E-06	-	1.0E-05	1.8E-06	8.5E-07	2.5E-05	4.4E-06	2.0E-06	-	3.5E-05	6.2E-06	2.9E-06	9.2E-02	9.2E-01	3.8E-04	6.8E-05	3.1E-05	3.8E-05	6.8E-06	3.1E-06
gamma-Chlordane	-	-	-	-	-	-	1.1E-05	-	-	-	-	-	-	2.3E-06	2.3E-06	-	-	4.6E+00	9.2E+00	5.0E-07	-	-	2.5E-07	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Mammals)	1.9E-05	-	4.9E-06	1.6E-08	-	4.1E-09	2.7E-05	2.3E-08	-	5.7E-09	5.3E-09	-	1.3E-09	5.7E-06	5.7E-06	-	5.7E-06	1.7E-06	1.7E-05	**3.4E+00**	-	**3.3E+00**	3.4E-01	-	3.4E-01

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Golder Associates

Table 8-9.4
Hazard Quotient Estimation for Red Fox - Annex
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site
- Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	4.54	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.1	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.313	kg/day	Table 8-5
Fraction of Diet Comprised of Small Mammals	P_f^p	1	unitless	Table 8-5
Fraction soil ingestion	P_s	0.028	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.386	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.2
Small Mammal Concentration	C_{fsm}	Chemical-specific	mg/kg	Table 8-7
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-7
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-5

																				NOAEL HQs			LOAEL HQs		
	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_{fsm}^{max}	$C_{fsm}^{95\%}$	$C_{fsmmean}$	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Small Mammal Exposure	95% Dose: Small Mammal Exposure	Mean Dose: Small Mammal Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	LOAEL	NOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.8E+04	1.8E+04	1.5E+04	-	-	-	3.1E+01	1.7E+01	1.1E+01	9.5E+00	-	-	-	2.6E+00	2.0E+01	1.4E+01	1.2E+01	1.9E+00	1.9E+01	**1.0E+01**	**7.1E+00**	**6.3E+00**	**1.0E+00**	7.1E-01	6.3E-01
Antimony	3.7E+00	1.5E+00	1.2E+00	3.2E-04	1.4E-04	1.1E-04	3.2E-03	2.3E-03	9.4E-04	7.6E-04	2.2E-05	9.7E-06	7.9E-06	2.7E-04	2.6E-03	1.2E-03	1.0E-03	5.9E-02	5.9E-01	4.4E-02	2.1E-02	1.8E-02	4.4E-03	2.1E-03	1.8E-03
Arsenic	9.5E+01	2.9E+01	1.2E+01	1.0E-01	4.0E-02	1.9E-02	3.8E-02	5.9E-02	1.8E-02	7.2E-03	7.2E-03	2.8E-03	1.3E-03	3.2E-03	6.9E-02	2.4E-02	1.2E-02	1.0E+00	1.7E+00	6.6E-02	2.3E-02	1.1E-02	4.2E-02	1.4E-02	7.0E-03
Barium	4.7E+02	2.5E+02	1.8E+02	2.6E-02	1.4E-02	1.0E-02	9.4E-01	2.9E-01	1.5E-01	1.1E-01	1.8E-03	9.7E-04	7.1E-04	8.0E-02	3.7E-01	2.3E-01	1.9E-01	5.2E+01	8.3E+01	7.2E-03	4.5E-03	3.7E-03	4.5E-03	2.8E-03	2.3E-03
Cadmium	3.7E+00	1.2E+00	8.0E-01	1.7E-01	1.0E-01	8.2E-02	3.4E-03	2.3E-03	7.7E-04	4.9E-04	1.2E-02	7.0E-03	5.6E-03	2.9E-04	1.4E-02	8.0E-03	6.4E-03	1.0E+00	1.0E+01	1.4E-02	8.0E-03	6.4E-03	1.4E-03	8.0E-04	6.4E-04
Chromium	2.0E+02	5.7E+01	4.5E+01	3.7E+00	1.5E+00	1.2E+00	7.8E-02	1.3E-01	3.5E-02	2.8E-02	2.5E-01	1.0E-01	8.3E-02	6.6E-03	3.8E-01	1.4E-01	1.2E-01	2.4E+00	9.6E+00	1.6E-01	5.9E-02	4.9E-02	4.0E-02	1.5E-02	1.2E-02
Cobalt	2.0E+01	1.1E+01	9.8E+00	1.8E-01	8.8E-02	7.3E-02	2.6E-02	1.2E-02	7.0E-03	6.1E-03	1.2E-02	6.1E-03	5.0E-03	2.2E-03	2.7E-02	1.5E-02	1.3E-02	7.3E+00	1.9E+01	3.6E-03	2.1E-03	1.8E-03	1.4E-03	8.1E-04	7.0E-04
Copper	2.3E+02	6.9E+01	5.1E+01	5.4E+00	4.5E+00	4.4E+00	1.1E-01	1.4E-01	4.3E-02	3.2E-02	3.7E-01	3.1E-01	3.0E-01	9.2E-03	5.3E-01	3.7E-01	3.4E-01	5.6E+00	9.3E+00	9.4E-02	6.5E-02	6.1E-02	5.6E-02	3.9E-02	3.6E-02
Iron	4.1E+04	2.9E+04	2.6E+04	-	-	-	5.2E+01	2.5E+01	1.8E+01	1.6E+01	-	-	-	4.4E+00	3.0E+01	2.3E+01	2.0E+01	-	-	-	-	-	-	-	-
Lead	2.9E+02	1.2E+02	7.8E+01	4.3E+00	2.8E+00	2.4E+00	3.7E-01	1.8E-01	7.1E-02	4.8E-02	2.9E-01	1.9E-01	1.6E-01	3.1E-02	5.1E-01	3.0E-01	2.4E-01	4.7E+00	5.0E+00	1.1E-01	6.3E-02	5.2E-02	1.0E-01	5.9E-02	4.8E-02
Manganese	1.2E+03	4.5E+02	3.6E+02	7.7E+00	2.9E+00	2.4E+00	1.3E+00	7.3E-01	2.8E-01	2.2E-01	5.3E-01	2.0E-01	1.6E-01	1.1E-01	1.4E+00	5.9E-01	4.9E-01	5.2E+01	1.5E+02	2.7E-02	1.1E-02	9.6E-03	9.4E-03	4.0E-03	3.4E-03
Mercury	8.8E-01	3.1E-01	2.2E-01	3.4E-05	1.2E-05	8.2E-06	1.2E-03	5.4E-04	1.9E-04	1.3E-04	2.3E-06	8.0E-07	5.7E-07	1.0E-04	6.5E-04	2.9E-04	2.4E-04	1.3E+01	-	4.9E-05	2.2E-05	1.8E-05	-	-	-
Nickel	9.2E+01	3.7E+01	3.1E+01	2.1E+00	1.3E+00	1.2E+00	7.5E-02	5.7E-02	2.3E-02	1.9E-02	1.4E-01	9.2E-02	8.5E-02	6.4E-03	2.1E-01	1.2E-01	1.1E-01	1.7E+00	2.7E+00	1.2E-01	7.1E-02	6.5E-02	7.6E-02	4.5E-02	4.1E-02
Selenium	4.2E+00	1.1E+00	7.1E-01	3.6E-01	2.2E-01	1.9E-01	-	2.6E-03	6.9E-04	4.4E-04	2.5E-02	1.5E-02	1.3E-02	-	2.8E-02	1.6E-02	1.3E-02	1.4E-01	1.5E-01	1.9E-01	1.1E-01	9.3E-02	1.9E-01	1.1E-01	9.1E-02
Silver	2.4E+00	6.2E-01	3.8E-01	3.1E-03	8.0E-04	4.9E-04	1.7E-03	1.5E-03	3.8E-04	2.3E-04	2.1E-04	5.5E-05	3.3E-05	1.4E-04	1.8E-03	5.8E-04	4.1E-04	6.0E+00	6.0E+01	3.1E-04	9.7E-05	6.8E-05	3.1E-05	9.7E-06	6.8E-06
Thallium	1.0E+00	-	-	-	-	-	-	6.2E-04	-	-	-	-	-	-	6.2E-04	-	-	7.4E-03	7.4E-02	8.3E-02	-	-	8.3E-03	-	-
Vanadium	1.0E+02	6.6E+01	5.7E+01	4.0E-01	2.6E-01	2.2E-01	9.5E-02	6.3E-02	4.1E-02	3.5E-02	2.8E-02	1.8E-02	1.5E-02	8.1E-03	9.9E-02	6.6E-02	5.9E-02	4.2E+00	5.1E+00	2.4E-02	1.6E-02	1.4E-02	1.9E-02	1.3E-02	1.1E-02
Zinc	1.5E+03	3.1E+02	1.8E+02	4.2E+01	3.8E+01	3.6E+01	5.8E-01	9.5E-01	1.9E-01	1.1E-01	2.9E+00	2.6E+00	2.5E+00	4.9E-02	3.9E+00	2.8E+00	2.7E+00	7.5E+01	7.4E+02	5.2E-02	3.8E-02	3.5E-02	5.3E-03	3.8E-03	3.6E-03
VOCs																									
Acetone	1.3E-02	6.6E-03	-	-	-	-	-	8.0E-06	4.1E-06	-	-	-	-	-	8.0E-06	4.1E-06	-	1.0E+01	5.0E+01	8.0E-07	4.1E-07	-	1.6E-07	8.2E-08	-
SVOCs																									
Atrazine	-	-	-	-	-	-	2.0E-03	-	-	-	-	-	-	1.7E-04	1.7E-04	-	-	5.0E+01	1.0E+02	3.4E-06	-	-	1.7E-06	-	-
Bis(2-Ethylhexyl) Phthalate	1.8E-01	6.2E-02	5.1E-02	2.3E-08	8.1E-09	6.6E-09	-	1.1E-04	3.8E-05	3.1E-05	1.6E-09	5.6E-10	4.5E-10	-	1.1E-04	3.8E-05	3.1E-05	1.8E+01	1.8E+02	6.1E-06	2.1E-06	1.7E-06	6.1E-07	2.1E-07	1.7E-07
Butylbenzyl Phthalate	1.9E-01	-	-	1.4E-08	-	-	-	1.2E-04	-	-	9.5E-10	-	-	-	1.2E-04	-	-	-	-	-	-	-	-	-	-
Carbazole	1.5E-01	5.8E-02	4.3E-02	3.6E-09	1.4E-09	1.0E-09	-	9.3E-05	3.6E-05	2.6E-05	2.5E-10	9.7E-11	7.1E-11	-	9.3E-05	3.6E-05	2.6E-05	-	-	-	-	-	-	-	-
Di-N-Octyl Phthalate	1.2E-01	-	-	5.0E-05	-	-	-	7.4E-05	-	-	3.5E-06	-	-	-	7.7E-05	-	-	9.8E+03	-	7.9E-09	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.6E-09	-	-	-	1.1E-05	-	-	1.1E-10	-	-	-	1.1E-05	-	-	4.5E+01	-	2.4E-07	-	-	-	-	-
N-Nitrosodiphenylamine	4.5E-02	-	-	6.0E-10	-	-	-	2.7E-05	-	-	4.1E-11	-	-	-	2.7E-05	-	-	-	-	-	-	-	-	-	-
Phenol	1.5E-01	-	-	3.9E-10	-	-	-	9.3E-05	-	-	2.7E-11	-	-	-	9.3E-05	-	-	4.0E+01	5.3E+01	2.3E-06	-	-	1.7E-06	-	-
Total Low Molecular Weight PAHS	1.2E+00	4.1E-01	2.8E-01	-	-	-	5.0E-03	7.5E-04	2.5E-04	1.7E-04	-	-	-	4.3E-04	1.2E-03	6.8E-04	5.9E-04	6.6E+01	1.1E+02	1.8E-05	1.0E-05	9.1E-06	1.1E-05	6.2E-06	5.4E-06
Total High Molecular Weight PAHs	7.4E+00	2.7E+00	1.9E+00	-	-	-	-	4.5E-03	1.7E-03	1.2E-03	-	-	-	-	4.5E-03	1.7E-03	1.2E-03	6.2E-01	3.1E+00	7.4E-03	2.7E-03	1.9E-03	1.5E-03	5.5E-04	3.8E-04
PCBs																									
Aroclor-1248	3.9E+00	-	3.0E-01	1.1E-06	-	5.2E-10		2.4E-03	-	1.9E-04	7.4E-08	-	3.6E-11		2.4E-03	-	1.9E-04	1.0E-02	1.0E-01	2.4E-01	-	1.9E-02	2.3E-02	-	1.8E-03
Aroclor-1254	1.4E+00	1.9E-01	2.5E-01	8.0E-07	1.1E-07	4.4E-08		8.6E-04	1.2E-04	1.5E-04	5.5E-08	7.6E-09	3.1E-09		8.6E-04	1.2E-04	1.5E-04	9.6E-02	4.7E-01	9.0E-03	1.2E-03	1.6E-03	1.8E-03	2.5E-04	3.2E-04
Aroclor-1260	4.0E-01	9.3E-02	1.9E+00	1.3E-06	3.1E-07	1.8E-07		2.5E-04	5.7E-05	1.2E-03	9.1E-08	2.1E-08	1.2E-08		2.5E-04	5.7E-05	1.2E-03	7.3E+00	*7.3E+01*	3.4E-05	7.9E-06	1.6E-04	3.4E-06	7.9E-07	1.6E-05
Pesticides																									
4,4'-DDD	6.5E-02	1.0E-02	4.4E-03	2.4E-07	5.7E-08	3.0E-08	3.3E-05	4.0E-05	6.2E-06	2.7E-06	1.6E-08	3.9E-09	2.1E-09	2.8E-06	4.3E-05	9.0E-06	5.5E-06	1.5E-01	2.7E-01	2.9E-04	6.1E-05	3.7E-05	1.6E-04	3.3E-05	2.0E-05
4,4'-DDE	1.9E-02	5.8E-03	3.8E-03	1.3E-07	5.1E-08	3.7E-08	2.1E-05	1.2E-05	3.6E-06	2.3E-06	8.7E-09	3.5E-09	2.6E-09	1.8E-06	1.4E-05	5.4E-06	4.1E-06	1.5E-01	2.7E-01	9.2E-05	3.7E-05	2.8E-05	4.9E-05	2.0E-05	1.5E-05
4,4'-DDT	5.5E-02	8.9E-03	4.7E-03	1.9E-07	4.6E-08	2.8E-08	9.0E-06	3.4E-05	5.5E-06	2.9E-06	1.3E-08	3.2E-09	1.9E-09	7.7E-07	3.5E-05	6.2E-06	3.6E-06	1.5E-01	2.7E-01	2.4E-04	4.2E-05	2.5E-05	1.3E-04	2.3E-05	1.3E-05
Aldrin	1.3E-03	4.1E-04	1.8E-04	7.1E-10	2.2E-10	9.9E-11	-	8.0E-07	2.5E-07	1.1E-07	4.9E-11	1.5E-11	6.8E-12	-	8.0E-07	2.5E-07	1.1E-07	2.0E-01	1.0E+00	4.0E-06	1.3E-06	5.6E-07	8.0E-07	2.5E-07	1.1E-07
alpha-BHC	1.3E-03	3.8E-04	1.7E-04	3.4E-11	1.0E-11	4.5E-12	-	8.0E-07	2.3E-07	1.1E-07	2.4E-12	6.9E-13	3.1E-13	-	8.0E-07	2.3E-07	1.1E-07	1.6E+00	3.2E+00	5.0E-07	1.5E-07	6.6E-08	2.5E-07	7.3E-08	3.3E-08
beta-BHC	1.5E-02	2.5E-03	1.3E-03	4.1E-10	7.0E-11	3.5E-11	-	9.3E-06	1.6E-06	7.8E-07	2.8E-11	4.8E-12	2.4E-12	-	9.3E-06	1.6E-06	7.8E-07	4.0E-01	2.0E+00	2.3E-05	3.9E-06	2.0E-06	4.6E-06	7.9E-07	3.9E-07
gamma-BHC	1.3E-03	3.5E-04	1.5E-04	3.2E-11	8.5E-12	3.7E-12	-	8.0E-07	2.1E-07	9.4E-08	2.2E-12	5.8E-13	2.6E-13	-	8.0E-07	2.1E-07	9.4E-08	8.0E+00	-	1.0E-07	2.7E-08	1.2E-08	-	-	-
Methoxychlor	2.9E-02	-	2.0E-03	1.7E-09	-	1.2E-10	-	1.8E-05	-	1.2E-06	1.1E-10	-	8.0E-12	-	1.8E-05	-	1.2E-06	4.0E+00	8.0E+00	4.5E-06	-	3.1E-07	2.2E-06	-	1.6E-07
Dieldrin	2.2E-02	5.1E-03	2.9E-03	2.8E-08	6.5E-09	3.7E-09	-	1.4E-05	3.2E-06	1.8E-06	1.9E-09	4.5E-10	2.5E-10	-	1.4E-05	3.2E-06	1.8E-06	1.5E-02	3.0E-02	9.0E-04	2.1E-04	1.2E-04	4.5E-04	1.1E-04	5.9E-05
Alpha-Endosulfan	1.1E-03	3.5E-04	1.6E-04	2.2E-11	7.1E-12	3.2E-12	-	6.8E-07	2.1E-07	9.8E-08	1.6E-12	4.9E-13	2.2E-13	-	6.8E-07	2.1E-07	9.8E-08	1.5E-01	-	4.5E-06	1.4E-06	6.5E-07	-	-	-
Beta-Endosulfan	1.4E-03	5.4E-04	2.6E-04	3.1E-11	1.2E-11	5.7E-12	-	8.6E-07	3.4E-07	1.6E-07	2.1E-12	8.2E-13	3.9E-13	-	8.6E-07	3.4E-07	1.6E-07	1.5E-01	-	5.8E-06	2.2E-06	1.1E-06	-	-	-
Endosulfan Sulfate	2.0E-03	6.8E-04	3.2E-04	4.6E-11	1.5E-11	7.2E-12	-	1.2E-06	4.2E-07	1.9E-07	3.2E-12	1.1E-12	5.0E-13	-	1.2E-06	4.2E-07	1.9E-07	1.5E-01	-	8.2E-06	2.8E-06	1.3E-06	-	-	-
Heptachlor	1.1E-03	-	1.8E-04	3.8E-12	-	6.3E-13	-	6.8E-07	-	1.1E-07	2.7E-13	-	4.3E-14	-	6.8E-07	-	1.1E-07	1.0E-01	1.0E+00	6.8E-06	-	1.1E-06	6.8E-07	-	1.1E-07
Heptachlor Epoxide	4.0E-03	1.2E-03	5.8E-04	3.0E-10	8.6E-11	4.3E-11	-	2.5E-06	7.1E-07	3.6E-07	2.0E-11	5.9E-12	2.9E-12	-	2.5E-06	7.1E-07	3.6E-07	1.0E-01	1.0E+00	2.5E-05	7.1E-06	3.6E-06	2.5E-06	7.1E-07	3.6E-07
Endrin Aldehyde	7.8E-03	1.5E-03	7.0E-04	6.1E-10	1.2E-10	5.5E-11	-	4.8E-06	9.1E-07	4.3E-07	4.2E-11	8.0E-12	3.8E-12	-	4.8E-06	9.1E-07	4.3E-07	9.2E-02	9.2E-01	5.2E-05	9.9E-06	4.7E-06	5.2E-06	9.9E-07	4.7E-07
Endrin Ketone	1.6E-02	2.6E-03	1.1E-03	-	-	-	-	9.9E-06	1.6E-06	6.5E-07	-	-	-	-	9.9E-06	1.6E-06	6.5E-07	9.2E-02	9.2E-01	1.1E-04	1.7E-05	7.1E-06	1.1E-05	1.7E-06	7.1E-07
Endrin	8.9E-03	1.6E-03	7.3E-04	7.8E-10	1.4E-10	6.4E-11	-	5.5E-06	9.7E-07	4.5E-07	5.4E-11	9.5E-12	4.4E-12	-	5.5E-06	9.7E-07	4.5E-07	9.2E-02	9.2E-01	6.0E-05	1.0E-05	4.9E-06	6.0E-06	1.0E-06	4.9E-07
gamma-Chlordane	-	-	-	-	-	-	1.1E-05	-	-	-	-	-	-	9.4E-07	9.4E-07	-	-	4.6E+00	9.2E+00	2.0E-07	-	-	1.0E-07	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Mammals)	1.9E-05	-	4.9E-06	2.4E-11	-	6.0E-12	2.7E-05	1.2E-08	-	3.0E-09	1.7E-12	-	4.2E-13	2.3E-06	2.3E-06	-	2.3E-06	5.0E-07	5.3E-06	**4.6E+00**	-	**4.6E+00**	4.3E-01	-	4.3E-01

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Golder Associates

Table 8-9.5
Hazard Quotient Estimation for American Robin - Annex
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.077	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0107	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.0688	kg/day	Table 8-5
Fraction of Diet Comprised of Plants	P_f^P	0.5225	unitless	Table 8-5
Fraction of Diet Comprised of Invertebrates	P_f^I	0.4775	unitless	Table 8-5
Fraction soil ingestion	P_s	0.151	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.011	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.2
Plant Concentration	C_f^P	Chemical-specific	mg/kg	Table 8-7
Invertebrate Concentration	C_f^I	Chemical-specific	mg/kg	Table 8-7
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-7
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-10
Area Use Factor	AUF	1	unitless	Table 8-5

	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{pmean}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	C_w^{Max}
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW
Inorganics										
Aluminum	2.8E+04	1.8E+04	1.5E+04	1.7E+01	1.1E+01	9.2E+00	6.2E+03	3.9E+03	3.4E+03	3.1E+01
Antimony	3.7E+00	1.5E+00	1.2E+00	2.0E-02	8.8E-03	7.2E-03	5.9E-01	2.4E-01	2.0E-01	3.2E-03
Arsenic	9.5E+01	2.9E+01	1.2E+01	5.3E-01	1.7E-01	6.5E-02	9.6E-01	4.2E-01	2.2E-01	3.8E-02
Barium	4.7E+02	2.5E+02	1.8E+02	1.1E+01	5.8E+00	4.3E+00	6.8E+00	3.6E+00	2.7E+00	9.4E-01
Cadmium	3.7E+00	1.2E+00	8.0E-01	1.9E-01	1.1E-01	8.2E-02	3.7E+00	1.6E+00	3.3E-02	3.4E-03
Chromium	2.0E+02	5.7E+01	4.5E+01	1.2E+00	3.5E-01	2.8E-01	9.9E+00	2.8E+00	2.2E+00	7.8E-02
Cobalt	2.0E+01	1.1E+01	9.8E+00	7.4E-03	4.3E-03	3.7E-03	2.4E+00	1.4E+00	1.2E+00	2.6E-02
Copper	2.3E+02	6.9E+01	5.1E+01	2.5E+00	1.6E+00	1.4E+00	1.9E+01	5.7E+00	6.2E-01	1.1E-01
Iron	4.1E+04	2.9E+04	2.6E+04	1.5E+01	1.1E+01	9.8E+00	9.0E+03	6.5E+03	5.7E+03	5.2E+01
Lead	2.9E+02	1.2E+02	7.8E+01	9.6E-01	5.7E-01	4.6E-01	1.3E+01	5.9E+00	8.4E-01	3.7E-01
Manganese	1.2E+03	4.5E+02	3.6E+02	1.4E+01	5.3E+00	4.3E+00	3.4E+00	1.8E+00	1.4E+00	1.3E+00
Mercury	8.8E-01	3.1E-01	2.2E-01	3.0E-02	1.0E-02	7.3E-03	4.8E-02	1.7E-02	1.3E-02	1.2E-03
Nickel	9.2E+01	3.7E+01	3.1E+01	4.8E-01	2.4E-01	2.1E-01	1.6E+01	6.2E+00	4.3E-01	7.5E-02
Selenium	4.2E+00	1.1E+00	7.1E-01	3.7E-01	8.7E-02	5.2E-02	9.2E-01	2.5E-01	1.6E-01	-
Silver	2.4E+00	6.2E-01	3.8E-01	5.0E-03	1.3E-03	8.0E-04	7.9E-01	2.0E-01	1.2E-01	1.7E-03
Thallium	1.0E+00	-	-	6.0E-04	-	-	2.2E-01	-	-	-
Vanadium	1.0E+02	6.6E+01	5.7E+01	7.4E-02	4.8E-02	4.1E-02	6.9E-01	4.4E-01	3.8E-01	9.5E-02
Zinc	1.5E+03	3.1E+02	1.8E+02	4.2E+01	1.7E+01	1.3E+01	1.5E+02	9.0E+01	7.5E+01	5.8E-01
VOCs										
Acetone	1.3E-02	6.6E-03	-	1.0E-01	5.2E-02	-	6.5E-04	3.3E-04	-	-
SVOCs										
Atrazine	-	-	-	-	-	-	-	-	-	2.0E-03
Bis(2-Ethylhexyl) Phthalate	1.8E-01	6.2E-02	5.1E-02	1.0E-03	3.6E-04	2.9E-04	2.4E+02	8.2E+01	6.6E+01	-
Butylbenzyl Phthalate	1.9E-01	-	-	2.0E-03	-	-	1.0E+02	-	-	-
Carbazole	1.5E-01	5.8E-02	4.3E-02	6.2E-03	2.4E-03	1.8E-03	1.2E+01	4.6E+00	3.4E+00	-
Di-N-Octyl Phthalate	1.2E-01	-	-	2.8E-06	-	-	3.8E+05	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.5E-04	-	-	1.3E+01	-	-	-
N-Nitrosodiphenylamine	4.5E-02	-	-	4.0E-03	-	-	1.2E+00	-	-	-
Phenol	1.5E-01	-	-	1.2E-01	-	-	1.7E-01	-	-	-
Total Low Molecular Weight PAHS	1.2E+00	4.1E-01	2.8E-01	4.4E-02	2.7E-02	2.2E-02	5.9E-01	2.0E-01	1.3E-01	5.0E-03
Total High Molecular Weight PAHs	7.4E+00	2.7E+00	1.9E+00	1.8E-01	7.0E-02	4.9E-02	3.1E+00	1.1E+00	7.8E-01	-
PCBs										
Aroclor-1248	3.9E+00	-	1.9E-03	1.1E-02	-	5.2E-06	5.6E+00	-	2.9E-04	
Aroclor-1254	1.4E+00	1.9E-01	7.8E-02	2.1E-03	2.9E-04	1.2E-04	1.5E+00	1.1E-01	3.5E-02	
Aroclor-1260	4.0E-01	9.3E-02	5.4E-02	1.7E-04	4.0E-05	2.3E-05	2.9E-01	4.4E-02	2.2E-02	
Pesticides										
4,4'-DDD	6.5E-02	1.0E-02	4.4E-03	1.6E-03	3.8E-04	2.0E-04	7.6E-02	2.1E-02	1.2E-02	3.3E-05
4,4'-DDE	1.9E-02	5.8E-03	3.8E-03	6.2E-04	2.5E-04	1.8E-04	5.8E-02	2.0E-02	1.4E-02	2.1E-05
4,4'-DDT	5.5E-02	8.9E-03	4.7E-03	1.4E-03	3.5E-04	2.1E-04	1.1E-01	2.2E-02	1.7E-02	9.0E-06
Aldrin	1.3E-03	4.1E-04	1.8E-04	2.0E-06	6.4E-07	2.8E-07	1.1E+01	3.4E+00	1.5E+00	-
alpha-BHC	1.3E-03	3.8E-04	1.7E-04	4.8E-05	1.4E-05	6.3E-06	1.2E-01	3.5E-02	1.6E-02	-
beta-BHC	1.5E-02	2.5E-03	1.3E-03	5.3E-04	9.0E-05	4.5E-05	1.5E+00	2.5E-01	1.2E-01	-
gamma-BHC	1.3E-03	3.5E-04	1.5E-04	5.3E-05	1.4E-05	6.2E-06	1.1E-01	2.8E-02	1.2E-02	-
Methoxychlor	2.9E-02	-	2.0E-03	4.1E-04	-	2.8E-05	1.1E+01	-	7.4E-01	-
Dieldrin	2.2E-02	5.1E-03	2.9E-03	1.4E-03	3.2E-04	1.8E-04	5.2E-02	1.2E-02	6.8E-03	-
Alpha-Endosulfan	1.1E-03	3.5E-04	1.6E-04	5.7E-05	1.8E-05	8.2E-06	6.4E-02	2.0E-02	9.2E-03	-
Beta-Endosulfan	1.4E-03	5.4E-04	2.6E-04	6.6E-05	2.6E-05	1.2E-05	9.2E-02	3.6E-02	1.7E-02	-
Endosulfan Sulfate	2.0E-03	6.8E-04	3.2E-04	8.9E-05	3.0E-05	1.4E-05	1.4E-01	4.8E-02	2.2E-02	-
Heptachlor	1.1E-03	-	1.8E-04	8.1E-06	-	1.3E-06	6.4E-02	-	1.0E-02	-
Heptachlor Epoxide	4.0E-03	1.2E-03	5.8E-04	4.2E-05	1.2E-05	6.0E-06	2.2E+00	6.4E-01	3.2E-01	-
Endrin Aldehyde	7.8E-03	1.5E-03	7.0E-04	7.6E-05	1.4E-05	6.8E-06	4.8E+00	9.0E-01	4.3E-01	-
Endrin Ketone	1.6E-02	2.6E-03	1.1E-03	-	-	-	-	-	-	-
Endrin	8.9E-03	1.6E-03	7.3E-04	7.7E-05	1.4E-05	6.3E-06	6.4E+00	1.1E+00	5.3E-01	-
gamma-Chlordane	-	-	-	-	-	-	-	-	-	1.1E-05
Dioxins/Furans										
2,3,7,8-TCDD Equivalents (Avian)	3.0E-05	-	7.2E-06	2.5E-08	-	6.0E-09	4.8E-05	-	1.1E-05	2.7E-05

	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure	Max Dose: Invertebrate Exposure	95% Dose: Invertebrate Exposure	Mean Dose: Invertebrate Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		NOAEL HQs: Max Hazard Quotient	NOAEL HQs: 95% Hazard Quotient	NOAEL HQs: Mean Hazard Quotient	LOAEL HQs: Max Hazard Quotient	LOAEL HQs: 95% Hazard Quotient	LOAEL HQs: Mean Hazard Quotient
	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day		NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																					
Aluminum	5.9E+02	3.8E+02	3.2E+02	7.9E+00	5.0E+00	4.3E+00	2.6E+03	1.7E+03	1.4E+03	4.4E+00	3.2E+03	2.1E+03	1.8E+03	1.1E+02	-	**3.0E+01**	**1.9E+01**	**1.6E+01**	-	-	-
Antimony	7.8E-02	3.2E-02	2.6E-02	9.4E-03	4.1E-03	3.3E-03	2.5E-01	1.0E-01	8.4E-02	4.6E-04	3.4E-01	1.4E-01	1.1E-01	-	-	-	-	-	-	-	-
Arsenic	2.0E+00	6.2E-01	2.4E-01	2.5E-01	7.7E-02	3.1E-02	4.1E-01	1.8E-01	9.3E-02	5.4E-03	2.7E+00	8.8E-01	3.7E-01	2.2E+00	3.6E+00	**1.2E+00**	3.9E-01	1.7E-01	7.5E-01	2.5E-01	1.0E-01
Barium	9.9E+00	5.2E+00	3.8E+00	5.1E+00	2.7E+00	2.0E+00	2.9E+00	1.5E+00	1.1E+00	1.3E-01	1.8E+01	9.6E+00	7.1E+00	-	-	-	-	-	-	-	-
Cadmium	7.8E-02	2.6E-02	1.7E-02	8.9E-02	4.9E-02	3.8E-02	1.6E+00	6.7E-01	1.4E-02	4.9E-04	1.8E+00	7.5E-01	7.0E-02	1.5E+00	2.0E+01	**1.2E+00**	5.2E-01	4.8E-02	8.8E-02	3.7E-02	3.5E-03
Chromium	4.3E+00	1.2E+00	9.4E-01	5.8E-01	1.6E-01	1.3E-01	4.2E+00	1.2E+00	9.3E-01	1.1E-02	9.1E+00	2.6E+00	2.0E+00	2.7E+00	2.8E+00	**3.4E+00**	9.7E-01	7.6E-01	**3.3E+00**	9.3E-01	7.2E-01
Cobalt	4.1E-01	2.4E-01	2.1E-01	3.4E-03	2.0E-03	1.7E-03	1.0E+00	5.9E-01	5.1E-01	3.7E-03	1.4E+00	8.4E-01	7.2E-01	7.6E+00	1.8E+01	1.9E-01	1.1E-01	9.5E-02	7.9E-02	4.6E-02	3.9E-02
Copper	4.9E+00	1.5E+00	1.1E+00	1.2E+00	7.3E-01	6.4E-01	8.2E+00	2.4E+00	2.7E-01	1.5E-02	1.4E+01	4.6E+00	2.0E+00	4.1E+00	4.7E+00	**3.5E+00**	**1.1E+00**	4.9E-01	**3.0E+00**	9.9E-01	4.3E-01
Iron	8.6E+02	6.2E+02	5.5E+02	7.2E+00	5.2E+00	4.6E+00	3.8E+03	2.8E+03	2.4E+03	7.4E+00	4.7E+03	3.4E+03	3.0E+03	-	-	-	-	-	-	-	-
Lead	6.1E+00	2.4E+00	1.6E+00	4.5E-01	2.7E-01	2.1E-01	5.4E+00	2.5E+00	3.6E-01	5.2E-02	1.2E+01	5.3E+00	2.3E+00	1.6E+00	1.9E+00	**7.4E+00**	**3.2E+00**	**1.4E+00**	**6.2E+00**	**2.7E+00**	**1.2E+00**
Manganese	2.5E+01	9.4E+00	7.5E+00	6.5E+00	2.5E+00	2.0E+00	1.5E+00	7.7E-01	5.9E-01	1.8E-01	3.3E+01	1.3E+01	1.0E+01	1.8E+02	3.8E+02	1.8E-01	7.1E-02	5.8E-02	8.7E-02	3.4E-02	2.7E-02
Mercury	1.8E-02	6.4E-03	4.5E-03	1.4E-02	4.8E-03	3.4E-03	2.0E-02	7.1E-03	5.6E-03	1.7E-04	5.3E-02	1.8E-02	1.4E-02	4.5E-01	9.0E-01	1.2E-01	4.1E-02	3.0E-02	5.9E-02	2.1E-02	1.5E-02
Nickel	1.9E+00	7.7E-01	6.4E-01	2.2E-01	1.1E-01	9.8E-02	6.7E+00	2.7E+00	1.8E-01	1.1E-02	8.8E+00	3.6E+00	9.3E-01	6.7E+00	1.2E+01	**1.3E+00**	5.3E-01	1.4E-01	7.7E-01	3.1E-01	8.1E-02
Selenium	8.8E-02	2.4E-02	1.5E-02	1.7E-01	4.1E-02	2.4E-02	3.9E-01	1.1E-01	6.7E-02	-	6.6E-01	1.7E-01	1.1E-01	2.9E-01	3.7E-01	**2.3E+00**	5.9E-01	3.7E-01	**1.8E+00**	4.6E-01	2.9E-01
Silver	5.0E-02	1.3E-02	8.0E-03	2.4E-03	6.1E-04	3.7E-04	3.4E-01	8.7E-02	5.3E-02	2.4E-04	3.9E-01	1.0E-01	6.1E-02	2.0E+00	2.0E+01	1.9E-01	5.0E-02	3.0E-02	1.9E-02	5.0E-03	3.0E-03
Thallium	2.1E-02	-	-	2.8E-04	-	-	9.4E-02	-	-	-	1.2E-01	-	-	4.7E-01	-	2.4E-01	-	-	-	-	-
Vanadium	2.1E+00	1.4E+00	1.2E+00	3.5E-02	2.2E-02	1.9E-02	2.9E-01	1.9E-01	1.6E-01	1.4E-02	2.5E+00	1.6E+00	1.4E+00	3.4E-01	4.1E-01	**7.2E+00**	**4.7E+00**	**4.0E+00**	**6.0E+00**	**3.9E+00**	**3.4E+00**
Zinc	3.2E+01	6.5E+00	3.8E+00	2.0E+01	8.1E+00	6.0E+00	6.5E+01	3.8E+01	3.2E+01	8.2E-02	1.2E+02	5.3E+01	4.2E+01	6.6E+01	1.5E+02	**1.8E+00**	8.0E-01	6.4E-01	7.6E-01	3.4E-01	2.7E-01
VOCs																					
Acetone	2.7E-04	1.4E-04	-	4.7E-02	2.4E-02	-	2.8E-04	1.4E-04	-	-	4.8E-02	2.4E-02	-	-	-	-	-	-	-	-	-
SVOCs																					
Atrazine	-	-	-	-	-	-	-	-	-	2.9E-04	2.9E-04	-	-	5.0E+01	2.5E+02	5.7E-06	-	-	1.1E-06	-	-
Bis(2-Ethylhexyl) Phthalate	3.8E-03	1.3E-03	1.1E-03	4.8E-04	1.7E-04	1.3E-04	1.0E+02	3.5E+01	2.8E+01	-	1.0E+02	3.5E+01	2.8E+01	1.1E+00	-	**9.1E+01**	**3.2E+01**	**2.6E+01**	-	-	-
Butylbenzyl Phthalate	4.0E-03	-	-	9.5E-04	-	-	4.3E+01	-	-	-	4.3E+01	-	-	-	-	-	-	-	-	-	-
Carbazole	3.1E-03	1.2E-03	8.9E-04	2.9E-03	1.1E-03	8.2E-04	5.1E+00	2.0E+00	1.4E+00	-	5.1E+00	2.0E+00	1.4E+00	-	-	-	-	-	-	-	-
Di-N-Octyl Phthalate	2.5E-03	-	-	1.3E-06	-	-	1.6E+05	-	-	-	1.6E+05	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	3.7E-04	-	-	6.9E-05	-	-	5.6E+00	-	-	-	5.6E+00	-	-	-	-	-	-	-	-	-	-
N-Nitrosodiphenylamine	9.3E-04	-	-	1.9E-03	-	-	5.0E-01	-	-	-	5.0E-01	-	-	-	-	-	-	-	-	-	-
Phenol	3.1E-03	-	-	5.8E-02	-	-	7.2E-02	-	-	-	1.3E-01	-	-	-	-	-	-	-	-	-	-
Total Low Molecular Weight PAHS	2.5E-02	8.7E-03	5.8E-03	2.0E-02	1.3E-02	1.0E-02	2.5E-01	8.6E-02	5.7E-02	7.1E-04	3.0E-01	1.1E-01	7.3E-02	-	-	-	-	-	-	-	-
Total High Molecular Weight PAHs	1.5E-01	5.7E-02	3.9E-02	8.5E-02	3.3E-02	2.3E-02	1.3E+00	4.8E-01	3.3E-01	-	1.5E+00	5.7E-01	3.9E-01	-	-	-	-	-	-	-	-
PCBs																					
Aroclor-1248	8.2E-02	-	3.9E-05	5.0E-03	-	2.4E-06	2.4E+00	-	1.2E-04		2.5E+00	-	1.7E-04	1.0E-01	1.0E+00	**2.5E+01**	-	1.7E-03	**2.5E+00**	-	1.7E-04
Aroclor-1254	2.9E-02	4.0E-03	1.6E-03	9.8E-04	1.3E-04	5.4E-05	6.3E-01	4.9E-02	1.5E-02		6.6E-01	5.3E-02	1.7E-02	1.8E-01	1.8E+00	**3.7E+00**	2.9E-01	9.3E-02	3.7E-01	2.9E-02	9.3E-03
Aroclor-1260	8.4E-03	1.9E-03	1.1E-03	8.1E-05	1.9E-05	1.1E-05	1.3E-01	1.9E-02	9.4E-03		1.3E-01	2.1E-02	1.1E-02	2.2E+00	2.2E+01	6.2E-02	9.7E-03	4.9E-03	6.2E-03	9.7E-04	4.9E-04
Pesticides																					
4,4'-DDD	1.4E-03	2.1E-04	9.2E-05	7.3E-04	1.8E-04	9.6E-05	3.2E-02	8.8E-03	4.9E-03	4.7E-06	3.4E-02	9.2E-03	5.1E-03	2.3E-01	2.8E-01	1.5E-01	4.0E-02	2.3E-02	1.2E-01	3.3E-02	1.8E-02
4,4'-DDE	4.0E-04	1.2E-04	8.0E-05	2.9E-04	1.2E-04	8.6E-05	2.5E-02	8.7E-03	6.0E-03	3.0E-06	2.5E-02	9.0E-03	6.2E-03	2.3E-01	2.8E-01	1.1E-01	4.0E-02	2.7E-02	9.1E-02	3.2E-02	2.2E-02
4,4'-DDT	1.2E-03	1.9E-04	9.8E-05	6.4E-04	1.6E-04	1.0E-04	4.6E-02	9.4E-03	7.2E-03	1.3E-06	4.8E-02	9.8E-03	7.4E-03	2.3E-01	2.8E-01	2.1E-01	4.3E-02	3.3E-02	1.7E-01	3.5E-02	2.6E-02
Aldrin	2.7E-05	8.6E-06	3.8E-06	9.5E-07	3.0E-07	1.3E-07	4.6E+00	1.4E+00	6.4E-01	-	4.6E+00	1.4E+00	6.4E-01	-	-	-	-	-	-	-	-
alpha-BHC	2.7E-05	8.0E-06	3.6E-06	2.2E-05	6.5E-06	3.0E-06	5.1E-02	1.5E-02	6.8E-03	-	5.1E-02	1.5E-02	6.8E-03	5.6E-01	2.3E+00	9.2E-02	2.7E-02	1.2E-02	2.3E-02	6.6E-03	3.0E-03
beta-BHC	3.1E-04	5.3E-05	2.7E-05	2.5E-04	4.2E-05	2.1E-05	6.3E-01	1.1E-01	5.3E-02	-	6.3E-01	1.1E-01	5.3E-02	5.6E-01	2.3E+00	**1.1E+00**	1.9E-01	9.5E-02	2.8E-01	4.8E-02	2.4E-02
gamma-BHC	2.7E-05	7.2E-06	3.2E-06	2.5E-05	6.5E-06	2.9E-06	4.5E-02	1.2E-02	5.3E-03	-	4.5E-02	1.2E-02	5.3E-03	2.0E+00	2.0E+01	2.3E-02	6.0E-03	2.6E-03	2.3E-03	6.0E-04	2.6E-04
Methoxychlor	6.1E-04	-	4.2E-05	1.9E-04	-	1.3E-05	4.5E+00	-	3.1E-01	-	4.5E+00	-	3.1E-01	-	-	-	-	-	-	-	-
Dieldrin	4.6E-04	1.1E-04	6.0E-05	6.3E-04	1.5E-04	8.3E-05	2.2E-02	5.1E-03	2.9E-03	-	2.3E-02	5.4E-03	3.0E-03	7.1E-02	1.8E-01	3.3E-01	7.6E-02	4.3E-02	1.3E-01	3.0E-02	1.7E-02
Alpha-Endosulfan	2.3E-05	7.3E-06	3.3E-06	2.6E-05	8.4E-06	3.8E-06	2.7E-02	8.6E-03	3.9E-03	-	2.7E-02	8.6E-03	3.9E-03	1.0E+01	1.0E+02	2.7E-03	8.6E-04	3.9E-04	2.7E-04	8.6E-05	3.9E-05
Beta-Endosulfan	2.9E-05	1.1E-05	5.4E-06	3.1E-05	1.2E-05	5.7E-06	3.9E-02	1.5E-02	7.3E-03	-	3.9E-02	1.5E-02	7.3E-03	1.0E+01	1.0E+02	3.9E-03	1.5E-03	7.3E-04	3.9E-04	1.5E-04	7.3E-05
Endosulfan Sulfate	4.2E-05	1.4E-05	6.6E-06	4.2E-05	1.4E-05	6.6E-06	6.1E-02	2.1E-02	9.6E-03	-	6.1E-02	2.1E-02	9.6E-03	1.0E+01	1.0E+02	6.1E-03	2.1E-03	9.6E-04	6.1E-04	2.1E-04	9.6E-05
Heptachlor	2.3E-05	-	3.8E-06	3.8E-06	-	6.2E-07	2.7E-02	-	4.4E-03	-	2.7E-02	-	4.4E-03	4.2E+01	-	6.5E-04	-	1.1E-04	-	-	-
Heptachlor Epoxide	8.4E-05	2.4E-05	1.2E-05	1.9E-05	5.6E-06	2.8E-06	9.5E-01	2.7E-01	1.4E-01	-	9.5E-01	2.7E-01	1.4E-01	2.6E+00	2.6E+01	3.6E-01	1.1E-01	5.2E-02	3.6E-02	1.1E-02	5.2E-03
Endrin Aldehyde	1.6E-04	3.1E-05	1.5E-05	3.6E-05	6.8E-06	3.2E-06	2.0E+00	3.9E-01	1.8E-01	-	2.0E+00	3.9E-01	1.8E-01	1.0E-02	1.0E-01	**2.0E+02**	**3.9E+01**	**1.8E+01**	**2.0E+01**	**3.9E+00**	**1.8E+00**
Endrin Ketone	3.4E-04	5.4E-05	2.2E-05	-	-	-	-	-	-	-	3.4E-04	5.4E-05	2.2E-05	1.0E-02	1.0E-01	3.4E-02	5.4E-03	2.2E-03	3.4E-03	5.4E-04	2.2E-04
Endrin	1.9E-04	3.3E-05	1.5E-05	3.6E-05	6.3E-06	2.9E-06	2.8E+00	4.8E-01	2.2E-01	-	2.8E+00	4.8E-01	2.2E-01	1.0E-02	1.0E-01	**2.8E+02**	**4.8E+01**	**2.2E+01**	**2.8E+01**	**4.8E+00**	**2.2E+00**
gamma-Chlordane	-	-	-	-	-	-	-	-	-	1.6E-06	1.6E-06	-	-	2.1E+00	1.1E+01	7.3E-07	-	-	1.5E-07	-	-
Dioxins/Furans																					
2,3,7,8-TCDD Equivalents (Avian)	6.4E-07	-	1.5E-07	1.2E-08	-	2.8E-09	2.1E-05	-	4.9E-06	3.8E-06	2.5E-05	-	8.9E-06	1.4E-05	1.4E-04	**1.8E+00**	-	6.3E-01	1.8E-01	-	6.3E-02

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.157	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0018	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.0122	kg/day	Table 8-5
Fraction of Diet Comprised of Plants	P_f^p	1	unitless	Table 8-5
Fraction soil ingestion	P_s	0.139	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.018	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.2
Plant Concentration	C_f^p	Chemical-specific	mg/kg	Table 8-7
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-7
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-11
Area Use Factor	AUF	1	unitless	Table 8-5

	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{pmax}	$C_f^{p95\%}$	C_f^{pmean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Plant Exposure	95% Dose: Plant Exposure	Mean Dose: Plant Exposure
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day
Inorganics													
Aluminum	2.8E+04	1.8E+04	1.5E+04	1.7E+01	1.1E+01	9.2E+00	3.1E+01	4.5E+01	2.9E+01	2.5E+01	1.3E+00	8.3E-01	7.2E-01
Antimony	3.7E+00	1.5E+00	1.2E+00	2.0E-02	8.8E-03	7.2E-03	3.2E-03	5.9E-03	2.4E-03	2.0E-03	1.6E-03	6.8E-04	5.6E-04
Arsenic	9.5E+01	2.9E+01	1.2E+01	5.3E-01	1.7E-01	6.5E-02	3.8E-02	1.5E-01	4.7E-02	1.8E-02	4.2E-02	1.3E-02	5.1E-03
Barium	4.7E+02	2.5E+02	1.8E+02	1.1E+01	5.8E+00	4.3E+00	9.4E-01	7.5E-01	4.0E-01	2.9E-01	8.5E-01	4.5E-01	3.3E-01
Cadmium	3.7E+00	1.2E+00	8.0E-01	1.9E-01	1.1E-01	8.2E-02	3.4E-03	5.9E-03	2.0E-03	1.3E-03	1.5E-02	8.2E-03	6.4E-03
Chromium	2.0E+02	5.7E+01	4.5E+01	1.2E+00	3.5E-01	2.8E-01	7.8E-02	3.2E-01	9.2E-02	7.1E-02	9.7E-02	2.7E-02	2.1E-02
Cobalt	2.0E+01	1.1E+01	9.8E+00	7.4E-03	4.3E-03	3.7E-03	2.6E-02	3.1E-02	1.8E-02	1.6E-02	5.7E-04	3.3E-04	2.9E-04
Copper	2.3E+02	6.9E+01	5.1E+01	2.5E+00	1.6E+00	1.4E+00	1.1E-01	3.7E-01	1.1E-01	8.2E-02	1.9E-01	1.2E-01	1.1E-01
Iron	4.1E+04	2.9E+04	2.6E+04	1.5E+01	1.1E+01	9.8E+00	5.2E+01	6.5E+01	4.7E+01	4.1E+01	1.2E+00	8.6E-01	7.6E-01
Lead	2.9E+02	1.2E+02	7.8E+01	9.6E-01	5.7E-01	4.6E-01	3.7E-01	4.7E-01	1.8E-01	1.2E-01	7.5E-02	4.4E-02	3.6E-02
Manganese	1.2E+03	4.5E+02	3.6E+02	1.4E+01	5.3E+00	4.3E+00	1.3E+00	1.9E+00	7.1E-01	5.7E-01	1.1E+00	4.1E-01	3.3E-01
Mercury	8.8E-01	3.1E-01	2.2E-01	3.0E-02	1.0E-02	7.3E-03	1.2E-03	1.4E-03	4.9E-04	3.4E-04	2.3E-03	8.0E-04	5.7E-04
Nickel	9.2E+01	3.7E+01	3.1E+01	4.8E-01	2.4E-01	2.1E-01	7.5E-02	1.5E-01	5.9E-02	4.9E-02	3.7E-02	1.9E-02	1.6E-02
Selenium	4.2E+00	1.1E+00	7.1E-01	3.7E-01	8.7E-02	5.2E-02	-	6.7E-03	1.8E-03	1.1E-03	2.9E-02	6.8E-03	4.1E-03
Silver	2.4E+00	6.2E-01	3.8E-01	5.0E-03	1.3E-03	8.0E-04	1.7E-03	3.8E-03	9.9E-04	6.0E-04	3.9E-04	1.0E-04	6.2E-05
Thallium	1.0E+00	-	-	6.0E-04	-	-	-	1.6E-03	-	-	4.7E-05	-	-
Vanadium	1.0E+02	6.6E+01	5.7E+01	7.4E-02	4.8E-02	4.1E-02	9.5E-02	1.6E-01	1.0E-01	9.1E-02	5.8E-03	3.7E-03	3.2E-03
Zinc	1.5E+03	3.1E+02	1.8E+02	4.2E+01	1.7E+01	1.3E+01	5.8E-01	2.5E+00	4.9E-01	2.9E-01	3.3E+00	1.3E+00	1.0E+00
VOCs													
Acetone	1.3E-02	6.6E-03	-	1.0E-01	5.2E-02	-	-	2.1E-05	1.1E-05	-	7.9E-03	4.0E-03	-
SVOCs													
Atrazine	-	-	-	-	-	-	2.0E-03	-	-	-	-	-	-
Bis(2-Ethylhexyl) Phthalate	1.8E-01	6.2E-02	5.1E-02	1.0E-03	3.6E-04	2.9E-04	-	2.9E-04	9.9E-05	8.1E-05	8.0E-05	2.8E-05	2.2E-05
Butylbenzyl Phthalate	1.9E-01	-	-	2.0E-03	-	-	-	3.0E-04	-	-	1.6E-04	-	-
Carbazole	1.5E-01	5.8E-02	4.3E-02	6.2E-03	2.4E-03	1.8E-03	-	2.4E-04	9.3E-05	6.8E-05	4.8E-04	1.9E-04	1.4E-04
Di-N-Octyl Phthalate	1.2E-01	-	-	2.8E-06	-	-	-	1.9E-04	-	-	2.2E-07	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.5E-04	-	-	-	2.8E-05	-	-	1.2E-05	-	-
N-Nitrosodiphenylamine	4.5E-02	-	-	4.0E-03	-	-	-	7.1E-05	-	-	3.1E-04	-	-
Phenol	1.5E-01	-	-	1.2E-01	-	-	-	2.4E-04	-	-	9.7E-03	-	-
Total Low Molecular Weight PAHS	1.2E+00	4.1E-01	2.8E-01	4.4E-02	2.7E-02	2.2E-02	5.0E-03	1.9E-03	6.6E-04	4.4E-04	3.4E-03	2.1E-03	1.7E-03
Total High Molecular Weight PAHs	7.4E+00	2.7E+00	1.9E+00	1.8E-01	7.0E-02	4.9E-02	-	1.2E-02	4.3E-03	3.0E-03	1.4E-02	5.5E-03	3.8E-03
PCBs													
Aroclor-1248	3.9E+00	-	1.9E-03	1.1E-02	-	5.2E-06		6.2E-03	-	3.0E-06	8.4E-04	-	4.0E-07
Aroclor-1254	1.4E+00	1.9E-01	7.8E-02	2.1E-03	2.9E-04	1.2E-04		2.2E-03	3.1E-04	1.2E-04	1.6E-04	2.2E-05	9.0E-06
Aroclor-1260	4.0E-01	9.3E-02	5.4E-02	1.7E-04	4.0E-05	2.3E-05		6.4E-04	1.5E-04	8.6E-05	1.3E-05	3.1E-06	1.8E-06
Pesticides													
4,4'-DDD	6.5E-02	1.0E-02	4.4E-03	1.6E-03	3.8E-04	2.0E-04	3.3E-05	1.0E-04	1.6E-05	7.0E-06	1.2E-04	3.0E-05	1.6E-05
4,4'-DDE	1.9E-02	5.8E-03	3.8E-03	6.2E-04	2.5E-04	1.8E-04	2.1E-05	3.0E-05	9.3E-06	6.1E-06	4.8E-05	2.0E-05	1.4E-05
4,4'-DDT	5.5E-02	8.9E-03	4.7E-03	1.4E-03	3.5E-04	2.1E-04	9.0E-06	8.8E-05	1.4E-05	7.4E-06	1.1E-04	2.7E-05	1.7E-05
Aldrin	1.3E-03	4.1E-04	1.8E-04	2.0E-06	6.4E-07	2.8E-07	-	2.1E-06	6.5E-07	2.9E-07	1.6E-07	4.9E-08	2.2E-08
alpha-BHC	1.3E-03	3.8E-04	1.7E-04	4.8E-05	1.4E-05	6.3E-06	-	2.1E-06	6.0E-07	2.7E-07	3.7E-06	1.1E-06	4.9E-07
beta-BHC	1.5E-02	2.5E-03	1.3E-03	5.3E-04	9.0E-05	4.5E-05	-	2.4E-05	4.1E-06	2.0E-06	4.1E-05	7.0E-06	3.5E-06
gamma-BHC	1.3E-03	3.5E-04	1.5E-04	5.3E-05	1.4E-05	6.2E-06	-	2.1E-06	5.5E-07	2.4E-07	4.1E-06	1.1E-06	4.8E-07
Methoxychlor	2.9E-02	-	2.0E-03	4.1E-04	-	2.8E-05	-	4.6E-05	-	3.2E-06	3.2E-05	-	2.2E-06
Dieldrin	2.2E-02	5.1E-03	2.9E-03	1.4E-03	3.2E-04	1.8E-04	-	3.5E-05	8.2E-06	4.6E-06	1.1E-04	2.5E-05	1.4E-05
Alpha-Endosulfan	1.1E-03	3.5E-04	1.6E-04	5.7E-05	1.8E-05	8.2E-06	-	1.8E-06	5.5E-07	2.5E-07	4.4E-06	1.4E-06	6.4E-07
Beta-Endosulfan	1.4E-03	5.4E-04	2.6E-04	6.6E-05	2.6E-05	1.2E-05	-	2.2E-06	8.7E-07	4.1E-07	5.1E-06	2.0E-06	9.5E-07
Endosulfan Sulfate	2.0E-03	6.8E-04	3.2E-04	8.9E-05	3.0E-05	1.4E-05	-	3.2E-06	1.1E-06	5.0E-07	6.9E-06	2.3E-06	1.1E-06
Heptachlor	1.1E-03	-	1.8E-04	8.1E-06	-	1.3E-06	-	1.8E-06	-	2.9E-07	6.3E-07	-	1.0E-07
Heptachlor Epoxide	4.0E-03	1.2E-03	5.8E-04	4.2E-05	1.2E-05	6.0E-06	-	6.4E-06	1.8E-06	9.2E-07	3.2E-06	9.4E-07	4.7E-07
Endrin Aldehyde	7.8E-03	1.5E-03	7.0E-04	7.6E-05	1.4E-05	6.8E-06	-	1.2E-05	2.4E-06	1.1E-06	5.9E-06	1.1E-06	5.3E-07
Endrin Ketone	1.6E-02	2.6E-03	1.1E-03	-	-	-	-	2.5E-05	4.1E-06	1.7E-06	-	-	-
Endrin	8.9E-03	1.6E-03	7.3E-04	7.7E-05	1.4E-05	6.3E-06	-	1.4E-05	2.5E-06	1.2E-06	6.0E-06	1.1E-06	4.9E-07
gamma-Chlordane	-	-	-	-	-	-	1.1E-05	-	-	-	-	-	-
Dioxins/Furans													
2,3,7,8-TCDD Equivalents (Avian)	3.0E-05	-	7.2E-06	2.5E-08	-	6.0E-09	2.7E-05	4.8E-08	-	1.1E-08	2.0E-09	-	4.7E-10

	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		NOAEL HQs			LOAEL HQs		
							Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics												
Aluminum	3.6E+00	5.0E+01	3.3E+01	2.9E+01	1.1E+02	-	4.5E-01	3.0E-01	2.6E-01	-	-	-
Antimony	3.7E-04	7.8E-03	3.5E-03	2.9E-03	-	-	-	-	-	-	-	-
Arsenic	4.3E-03	2.0E-01	6.4E-02	2.8E-02	2.2E+00	3.6E+00	8.8E-02	2.9E-02	1.2E-02	5.6E-02	1.8E-02	7.9E-03
Barium	1.1E-01	1.7E+00	9.6E-01	7.3E-01	-	-	-	-	-	-	-	-
Cadmium	3.9E-04	2.1E-02	1.1E-02	8.1E-03	1.5E+00	2.0E+01	1.5E-02	7.3E-03	5.6E-03	1.1E-03	5.3E-04	4.0E-04
Chromium	9.0E-03	4.3E-01	1.3E-01	1.0E-01	2.7E+00	2.8E+00	1.6E-01	4.8E-02	3.8E-02	1.5E-01	4.6E-02	3.7E-02
Cobalt	2.9E-03	3.5E-02	2.1E-02	1.9E-02	7.6E+00	1.8E+01	4.6E-03	2.8E-03	2.5E-03	1.9E-03	1.2E-03	1.0E-03
Copper	1.2E-02	5.8E-01	2.4E-01	2.0E-01	4.1E+00	4.7E+00	1.4E-01	6.0E-02	5.0E-02	1.2E-01	5.2E-02	4.3E-02
Iron	6.0E+00	7.2E+01	5.4E+01	4.8E+01	-	-	-	-	-	-	-	-
Lead	4.2E-02	5.8E-01	2.7E-01	2.0E-01	1.6E+00	1.9E+00	3.6E-01	1.7E-01	1.2E-01	3.0E-01	1.4E-01	1.0E-01
Manganese	1.5E-01	3.1E+00	1.3E+00	1.1E+00	1.8E+02	3.8E+02	1.7E-02	7.1E-03	5.9E-03	8.3E-03	3.4E-03	2.8E-03
Mercury	1.4E-04	3.8E-03	1.4E-03	1.0E-03	4.5E-01	9.0E-01	8.6E-03	3.2E-03	2.3E-03	4.3E-03	1.6E-03	1.2E-03
Nickel	8.6E-03	1.9E-01	8.6E-02	7.4E-02	6.7E+00	1.2E+01	2.9E-02	1.3E-02	1.1E-02	1.7E-02	7.5E-03	6.4E-03
Selenium	-	3.6E-02	8.5E-03	5.2E-03	2.9E-01	3.7E-01	1.2E-01	2.9E-02	1.8E-02	9.7E-02	2.3E-02	1.4E-02
Silver	1.9E-04	4.4E-03	1.3E-03	8.6E-04	2.0E+00	2.0E+01	2.2E-03	6.4E-04	4.3E-04	2.2E-04	6.4E-05	4.3E-05
Thallium	-	1.6E-03	-	-	4.7E-01	-	3.5E-03	-	-	-	-	-
Vanadium	1.1E-02	1.8E-01	1.2E-01	1.0E-01	3.4E-01	4.1E-01	5.2E-01	3.5E-01	3.0E-01	4.3E-01	2.9E-01	2.5E-01
Zinc	6.6E-02	5.8E+00	1.9E+00	1.4E+00	6.6E+01	1.5E+02	8.8E-02	2.9E-02	2.1E-02	3.8E-02	1.2E-02	8.8E-03
VOCs												
Acetone	-	7.9E-03	4.0E-03	-	-	-	-	-	-	-	-	-
SVOCs												
Atrazine	2.3E-04	2.3E-04	-	-	5.0E+01	2.5E+02	4.6E-06	-	-	9.2E-07	-	-
Bis(2-Ethylhexyl) Phthalate	-	3.7E-04	1.3E-04	1.0E-04	1.1E+00	-	3.3E-04	1.2E-04	9.4E-05	-	-	-
Butylbenzyl Phthalate	-	4.6E-04	-	-	-	-	-	-	-	-	-	-
Carbazole	-	7.2E-04	2.8E-04	2.0E-04	-	-	-	-	-	-	-	-
Di-N-Octyl Phthalate	-	1.9E-04	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	-	3.9E-05	-	-	-	-	-	-	-	-	-	-
N-Nitrosodiphenylamine	-	3.8E-04	-	-	-	-	-	-	-	-	-	-
Phenol	-	9.9E-03	-	-	-	-	-	-	-	-	-	-
Total Low Molecular Weight PAHS	5.7E-04	5.3E-03	2.7E-03	2.2E-03	-	-	-	-	-	-	-	-
Total High Molecular Weight PAHs	-	2.6E-02	9.8E-03	6.8E-03	-	-	-	-	-	-	-	-
PCBs												
Aroclor-1248		7.1E-03	-	3.4E-06	1.0E-01	1.0E+00	7.1E-02	-	3.4E-05	7.1E-03	-	3.4E-06
Aroclor-1254		2.4E-03	3.3E-04	1.3E-04	1.8E-01	1.8E+00	1.3E-02	1.8E-03	7.4E-04	1.3E-03	1.8E-04	7.4E-05
Aroclor-1260		6.5E-04	1.5E-04	8.7E-05	2.2E+00	2.2E+01	3.0E-04	7.0E-05	4.1E-05	3.0E-05	7.0E-06	4.1E-06
Pesticides												
4,4'-DDD	3.8E-06	2.3E-04	4.9E-05	2.7E-05	2.3E-01	2.8E-01	1.0E-03	2.2E-04	1.2E-04	8.1E-04	1.8E-04	9.5E-05
4,4'-DDE	2.4E-06	8.1E-05	3.1E-05	2.0E-05	2.3E-01	2.8E-01	3.6E-04	1.4E-04	9.0E-05	2.9E-04	1.1E-04	7.2E-05
4,4'-DDT	1.0E-06	2.0E-04	4.2E-05	2.4E-05	2.3E-01	2.8E-01	8.6E-04	1.9E-04	1.1E-04	7.0E-04	1.5E-04	8.6E-05
Aldrin	-	2.2E-06	7.0E-07	3.1E-07	-	-	-	-	-	-	-	-
alpha-BHC	-	5.8E-06	1.7E-06	7.7E-07	5.6E-01	2.3E+00	1.0E-05	3.0E-06	1.4E-06	2.6E-06	7.5E-07	3.4E-07
beta-BHC	-	6.5E-05	1.1E-05	5.5E-06	5.6E-01	2.3E+00	1.2E-04	2.0E-05	9.8E-06	2.9E-05	4.9E-06	2.4E-06
gamma-BHC	-	6.2E-06	1.6E-06	7.2E-07	2.0E+00	2.0E+01	3.1E-06	8.2E-07	3.6E-07	3.1E-07	8.2E-08	3.6E-08
Methoxychlor	-	7.8E-05	-	5.4E-06	-	-	-	-	-	-	-	-
Dieldrin	-	1.4E-04	3.3E-05	1.8E-05	7.1E-02	1.8E-01	2.0E-03	4.6E-04	2.6E-04	7.8E-04	1.8E-04	1.0E-04
Alpha-Endosulfan	-	6.2E-06	1.9E-06	8.9E-07	1.0E+01	1.0E+02	6.2E-07	1.9E-07	8.9E-08	6.2E-08	1.9E-08	8.9E-09
Beta-Endosulfan	-	7.3E-06	2.9E-06	1.4E-06	1.0E+01	1.0E+02	7.3E-07	2.9E-07	1.4E-07	7.3E-08	2.9E-08	1.4E-08
Endosulfan Sulfate	-	1.0E-05	3.4E-06	1.6E-06	1.0E+01	1.0E+02	1.0E-06	3.4E-07	1.6E-07	1.0E-07	3.4E-08	1.6E-08
Heptachlor	-	2.4E-06	-	3.9E-07	4.2E+01	-	5.7E-08	-	9.4E-09	-	-	-
Heptachlor Epoxide	-	9.6E-06	2.8E-06	1.4E-06	2.6E+00	2.6E+01	3.7E-06	1.1E-06	5.3E-07	3.7E-07	1.1E-07	5.3E-08
Endrin Aldehyde	-	1.8E-05	3.5E-06	1.6E-06	1.0E-02	1.0E-01	1.8E-03	3.5E-04	1.6E-04	1.8E-04	3.5E-05	1.6E-05
Endrin Ketone	-	2.5E-05	4.1E-06	1.7E-06	1.0E-02	1.0E-01	2.5E-03	4.1E-04	1.7E-04	2.5E-04	4.1E-05	1.7E-05
Endrin	-	2.0E-05	3.5E-06	1.6E-06	1.0E-02	1.0E-01	2.0E-03	3.5E-04	1.6E-04	2.0E-04	3.5E-05	1.6E-05
gamma-Chlordane	1.3E-06	1.3E-06	-	-	2.1E+00	1.1E+01	5.9E-07	-	-	1.2E-07	-	-
Dioxins/Furans												
2,3,7,8-TCDD Equivalents (Avian)	3.1E-06	3.1E-06	-	3.1E-06	1.4E-05	1.4E-04	2.2E-01	-	2.2E-01	2.2E-02	-	2.2E-02

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by; SLJ

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	0.197	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.024	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.152	kg/day	Table 8-5
Fraction of Diet Comprised of Invertebrates	P_f^i	1	unitless	Table 8-5
Fraction soil ingestion	P_s	0.104	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.0197	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.2
Invertebrate Concentration	C_f^i	Chemical-specific	mg/kg	Table 8-7
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-7
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-11
Area Use Factor	AUF	1	unitless	Table 8-5

																				NOAEL HQs			LOAEL HQs		
	C_s^{max}	$C_s^{95\%}$	C_s^{mean}	C_f^{imax}	$C_f^{i95\%}$	C_f^{imean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Invertebrate Exposure	95% Dose: Invertebrate Exposure	Mean Dose: Invertebrate Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day		mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	NOAEL	LOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.8E+04	1.8E+04	1.5E+04	6.2E+03	3.9E+03	3.4E+03	3.1E+01	3.6E+02	2.3E+02	2.0E+02	4.8E+03	3.0E+03	2.6E+03	3.1E+00	5.1E+03	3.3E+03	2.8E+03	1.1E+02	-	**4.7E+01**	**3.0E+01**	**2.6E+01**	-	-	-
Antimony	3.7E+00	1.5E+00	1.2E+00	5.9E-01	2.4E-01	2.0E-01	3.2E-03	4.7E-02	1.9E-02	1.6E-02	4.6E-01	1.9E-01	1.5E-01	3.2E-04	5.0E-01	2.1E-01	1.7E-01	-	-	-	-	-	-	-	-
Arsenic	9.5E+01	2.9E+01	1.2E+01	9.6E-01	4.2E-01	2.2E-01	3.8E-02	1.2E+00	3.7E-01	1.5E-01	7.4E-01	3.2E-01	1.7E-01	3.8E-03	1.9E+00	7.0E-01	3.2E-01	2.2E+00	3.6E+00	8.7E-01	3.1E-01	1.4E-01	5.5E-01	2.0E-01	9.0E-02
Barium	4.7E+02	2.5E+02	1.8E+02	6.8E+00	3.6E+00	2.7E+00	9.4E-01	6.0E+00	3.2E+00	2.3E+00	5.3E+00	2.8E+00	2.0E+00	9.4E-02	1.1E+01	6.1E+00	4.4E+00	-	-	-	-	-	-	-	-
Cadmium	3.7E+00	1.2E+00	8.0E-01	3.7E+00	1.6E+00	3.3E-02	3.4E-03	4.7E-02	1.6E-02	1.0E-02	2.9E+00	1.2E+00	2.5E-02	3.4E-04	2.9E+00	1.2E+00	3.6E-02	1.5E+00	2.0E+01	**2.0E+00**	8.5E-01	2.5E-02	1.5E-01	6.2E-02	1.8E-03
Chromium	2.0E+02	5.7E+01	4.5E+01	9.9E+00	2.8E+00	2.2E+00	7.8E-02	2.6E+00	7.3E-01	5.7E-01	7.7E+00	2.2E+00	1.7E+00	7.8E-03	1.0E+01	2.9E+00	2.3E+00	2.7E+00	2.8E+00	**3.9E+00**	**1.1E+00**	8.5E-01	**3.7E+00**	**1.0E+00**	8.1E-01
Cobalt	2.0E+01	1.1E+01	9.8E+00	2.4E+00	1.4E+00	1.2E+00	2.6E-02	2.5E-01	1.4E-01	1.2E-01	1.8E+00	1.1E+00	9.2E-01	2.6E-03	2.1E+00	1.2E+00	1.1E+00	7.6E+00	1.8E+01	2.8E-01	1.6E-01	1.4E-01	1.1E-01	6.7E-02	5.7E-02
Copper	2.3E+02	6.9E+01	5.1E+01	1.9E+01	5.7E+00	6.2E-01	1.1E-01	2.9E+00	8.8E-01	6.5E-01	1.5E+01	4.4E+00	4.8E-01	1.1E-02	1.8E+01	5.3E+00	1.1E+00	4.1E+00	4.7E+00	**4.4E+00**	**1.3E+00**	2.8E-01	**3.8E+00**	**1.1E+00**	2.4E-01
Iron	4.1E+04	2.9E+04	2.6E+04	9.0E+03	6.5E+03	5.7E+03	5.2E+01	5.2E+02	3.7E+02	3.3E+02	6.9E+03	5.0E+03	4.4E+03	5.2E+00	7.5E+03	5.4E+03	4.8E+03	-	-	-	-	-	-	-	-
Lead	2.9E+02	1.2E+02	7.8E+01	1.3E+01	5.9E+00	8.4E-01	3.7E-01	3.7E+00	1.5E+00	9.9E-01	9.7E+00	4.6E+00	6.5E-01	3.7E-02	1.3E+01	6.1E+00	1.7E+00	1.6E+00	1.9E+00	**8.3E+00**	**3.7E+00**	**1.0E+00**	**6.9E+00**	**3.1E+00**	8.6E-01
Manganese	1.2E+03	4.5E+02	3.6E+02	3.4E+00	1.8E+00	1.4E+00	1.3E+00	1.5E+01	5.7E+00	4.6E+00	2.6E+00	1.4E+00	1.1E+00	1.3E-01	1.8E+01	7.2E+00	5.8E+00	1.8E+02	3.8E+02	9.9E-02	4.0E-02	3.2E-02	4.7E-02	1.9E-02	1.5E-02
Mercury	8.8E-01	3.1E-01	2.2E-01	4.8E-02	1.7E-02	1.3E-02	1.2E-03	1.1E-02	3.9E-03	2.7E-03	3.7E-02	1.3E-02	1.0E-02	1.2E-04	4.8E-02	1.7E-02	1.3E-02	4.5E-01	9.0E-01	1.1E-01	3.7E-02	2.9E-02	5.4E-02	1.9E-02	1.4E-02
Nickel	9.2E+01	3.7E+01	3.1E+01	1.6E+01	6.2E+00	4.3E-01	7.5E-02	1.2E+00	4.7E-01	3.9E-01	1.2E+01	4.8E+00	3.3E-01	7.5E-03	1.3E+01	5.3E+00	7.3E-01	6.7E+00	1.2E+01	**2.0E+00**	7.9E-01	1.1E-01	**1.2E+00**	4.6E-01	6.3E-02
Selenium	4.2E+00	1.1E+00	7.1E-01	9.2E-01	2.5E-01	1.6E-01	-	5.3E-02	1.4E-02	9.0E-03	7.1E-01	1.9E-01	1.2E-01	-	7.7E-01	2.1E-01	1.3E-01	2.9E-01	3.7E-01	**2.6E+00**	7.1E-01	4.5E-01	**2.1E+00**	5.6E-01	3.5E-01
Silver	2.4E+00	6.2E-01	3.8E-01	7.9E-01	2.0E-01	1.2E-01	1.7E-03	3.0E-02	7.9E-03	4.8E-03	6.1E-01	1.6E-01	9.6E-02	1.7E-04	6.4E-01	1.7E-01	1.0E-01	2.0E+00	2.0E+01	3.2E-01	8.2E-02	5.0E-02	3.2E-02	8.2E-03	5.0E-03
Thallium	1.0E+00	-	-	2.2E-01	-	-	-	1.3E-02	-	-	1.7E-01	-	-	-	1.8E-01	-	-	4.7E-01	-	3.8E-01	-	-	-	-	-
Vanadium	1.0E+02	6.6E+01	5.7E+01	6.9E-01	4.4E-01	3.8E-01	9.5E-02	1.3E+00	8.3E-01	7.2E-01	5.3E-01	3.4E-01	2.9E-01	9.5E-03	1.8E+00	1.2E+00	1.0E+00	3.4E-01	4.1E-01	**5.3E+00**	**3.4E+00**	**3.0E+00**	**4.4E+00**	**2.9E+00**	**2.5E+00**
Zinc	1.5E+03	3.1E+02	1.8E+02	1.5E+02	9.0E+01	7.5E+01	5.8E-01	2.0E+01	3.9E+00	2.3E+00	1.2E+02	6.9E+01	5.8E+01	5.8E-02	1.4E+02	7.3E+01	6.1E+01	6.6E+01	1.5E+02	**2.1E+00**	**1.1E+00**	9.2E-01	8.9E-01	4.7E-01	3.9E-01
VOCs																									
Acetone	1.3E-02	6.6E-03	-	6.5E-04	3.3E-04	-	-	1.6E-04	8.4E-05	-	5.0E-04	2.6E-04	-	-	6.7E-04	3.4E-04	-	-	-	-	-	-	-	-	-
SVOCs																									
Atrazine	-	-	-	-	-	-	2.0E-03	-	-	-	-	-	-	2.0E-04	2.0E-04	-	-	5.0E+01	2.5E+02	4.0E-06	-	-	8.0E-07	-	-
Bis(2-Ethylhexyl) Phthalate	1.8E-01	6.2E-02	5.1E-02	2.4E+02	8.2E+01	6.6E+01	-	2.3E-03	7.9E-04	6.4E-04	1.8E+02	6.3E+01	5.1E+01	-	1.8E+02	6.3E+01	5.1E+01	1.1E+00	-	**1.7E+02**	**5.7E+01**	**4.7E+01**	-	-	-
Butylbenzyl Phthalate	1.9E-01	-	-	1.0E+02	-	-	-	2.4E-03	-	-	7.8E+01	-	-	-	7.8E+01	-	-	-	-	-	-	-	-	-	-
Carbazole	1.5E-01	5.8E-02	4.3E-02	1.2E+01	4.6E+00	3.4E+00	-	1.9E-03	7.4E-04	5.4E-04	9.2E+00	3.6E+00	2.6E+00	-	9.2E+00	3.6E+00	2.6E+00	-	-	-	-	-	-	-	-
Di-N-Octyl Phthalate	1.2E-01	-	-	3.8E+05	-	-	-	1.5E-03	-	-	2.9E+05	-	-	-	2.9E+05	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.3E+01	-	-	-	2.2E-04	-	-	1.0E+01	-	-	-	1.0E+01	-	-	-	-	-	-	-	-	-	-
N-Nitrosodiphenylamine	4.5E-02	-	-	1.2E+00	-	-	-	5.6E-04	-	-	9.0E-01	-	-	-	9.0E-01	-	-	-	-	-	-	-	-	-	-
Phenol	1.5E-01	-	-	1.7E-01	-	-	-	1.9E-03	-	-	1.3E-01	-	-	-	1.3E-01	-	-	-	-	-	-	-	-	-	-
Total Low Molecular Weight PAHS	1.2E+00	4.1E-01	2.8E-01	4.4E-02	2.7E-02	1.3E-01	5.0E-03	1.5E-02	5.2E-03	3.5E-03	3.4E-02	2.1E-02	1.0E-01	5.0E-04	5.0E-02	2.6E-02	1.1E-01	-	-	-	-	-	-	-	-
Total High Molecular Weight PAHs	7.4E+00	2.7E+00	1.9E+00	1.8E-01	7.0E-02	7.8E-01	-	9.3E-02	3.4E-02	2.4E-02	1.4E-01	5.4E-02	6.0E-01	-	2.3E-01	8.9E-02	6.2E-01	-	-	-	-	-	-	-	-
PCBs																									
Aroclor-1248	3.9E+00	-	1.9E-03	5.6E+00	-	2.9E-04		4.9E-02	-	2.4E-05	4.3E+00	-	2.2E-04		4.3E+00	-	2.5E-04	1.0E-01	1.0E+00	**4.3E+01**	-	2.5E-03	**4.3E+00**	-	2.5E-04
Aroclor-1254	1.4E+00	1.9E-01	7.8E-02	1.5E+00	1.1E-01	3.5E-02		1.8E-02	2.4E-03	9.8E-04	1.1E+00	8.8E-02	2.7E-02		1.2E+00	9.1E-02	2.8E-02	1.8E-01	1.8E+00	**6.4E+00**	5.0E-01	1.6E-01	6.4E-01	5.0E-02	1.6E-02
Aroclor-1260	4.0E-01	9.3E-02	5.4E-02	2.9E-01	4.4E-02	2.2E-02		5.1E-03	1.2E-03	6.8E-04	2.3E-01	3.4E-02	1.7E-02		2.3E-01	3.5E-02	1.8E-02	2.2E+00	2.2E+01	1.1E-01	1.7E-02	8.2E-03	1.1E-02	1.7E-03	8.2E-04
Pesticides																									
4,4'-DDD	6.5E-02	1.0E-02	4.4E-03	7.6E-02	2.1E-02	1.2E-02	3.3E-05	8.2E-04	1.3E-04	5.6E-05	5.9E-02	1.6E-02	8.9E-03	3.3E-06	5.9E-02	1.6E-02	9.0E-03	2.3E-01	2.8E-01	2.6E-01	7.1E-02	4.0E-02	2.1E-01	5.7E-02	3.2E-02
4,4'-DDE	1.9E-02	5.8E-03	3.8E-03	5.8E-02	2.0E-02	1.4E-02	2.1E-05	2.4E-04	7.4E-05	4.8E-05	4.5E-02	1.6E-02	1.1E-02	2.1E-06	4.5E-02	1.6E-02	1.1E-02	2.3E-01	2.8E-01	2.0E-01	7.0E-02	4.8E-02	1.6E-01	5.7E-02	3.9E-02
4,4'-DDT	5.5E-02	8.9E-03	4.7E-03	1.1E-01	2.2E-02	1.7E-02	9.0E-06	7.0E-04	1.1E-04	5.9E-05	8.3E-02	1.7E-02	1.3E-02	9.0E-07	8.4E-02	1.7E-02	1.3E-02	2.3E-01	2.8E-01	3.7E-01	7.5E-02	5.8E-02	3.0E-01	6.1E-02	4.7E-02
Aldrin	1.3E-03	4.1E-04	1.8E-04	1.1E+01	3.4E+00	1.5E+00	-	1.6E-05	5.2E-06	2.3E-06	8.2E+00	2.6E+00	1.2E+00	-	8.2E+00	2.6E+00	1.2E+00	-	-	-	-	-	-	-	-
alpha-BHC	1.3E-03	3.8E-04	1.7E-04	1.2E-01	3.5E-02	1.6E-02	-	1.6E-05	4.8E-06	2.2E-06	9.3E-02	2.7E-02	1.2E-02	-	9.3E-02	2.7E-02	1.2E-02	5.6E-01	2.3E+00	1.7E-01	4.8E-02	2.2E-02	4.1E-02	1.2E-02	5.4E-03
beta-BHC	1.5E-02	2.5E-03	1.3E-03	1.5E+00	2.5E-01	1.2E-01	-	1.9E-04	3.2E-05	1.6E-05	1.1E+00	1.9E-01	9.6E-02	-	1.1E+00	1.9E-01	9.6E-02	5.6E-01	2.3E+00	**2.0E+00**	3.5E-01	1.7E-01	5.1E-01	8.6E-02	4.3E-02
gamma-BHC	1.3E-03	3.5E-04	1.5E-04	1.1E-01	2.8E-02	1.2E-02	-	1.6E-05	4.4E-06	1.9E-06	8.1E-02	2.2E-02	9.5E-03	-	8.1E-02	2.2E-02	9.5E-03	2.0E+00	2.0E+01	4.1E-02	1.1E-02	4.8E-03	4.1E-03	1.1E-03	4.8E-04
Methoxychlor	2.9E-02	-	2.0E-03	1.1E+01	-	7.4E-01	-	3.7E-04	-	2.6E-05	8.1E+00	-	5.7E-01	-	8.1E+00	-	5.7E-01	-	-	-	-	-	-	-	-
Dieldrin	2.2E-02	5.1E-03	2.9E-03	5.2E-02	1.2E-02	6.8E-03	-	2.8E-04	6.5E-05	3.6E-05	4.0E-02	9.3E-03	5.2E-03	-	4.0E-02	9.4E-03	5.3E-03	7.1E-02	1.8E-01	5.7E-01	1.3E-01	7.4E-02	2.2E-01	5.2E-02	2.9E-02
Alpha-Endosulfan	1.1E-03	3.5E-04	1.6E-04	6.4E-02	2.0E-02	9.2E-03	-	1.4E-05	4.4E-06	2.0E-06	4.9E-02	1.6E-02	7.1E-03	-	4.9E-02	1.6E-02	7.1E-03	1.0E+01	1.0E+02	4.9E-03	1.6E-03	7.1E-04	4.9E-04	1.6E-04	7.1E-05
Beta-Endosulfan	1.4E-03	5.4E-04	2.6E-04	9.2E-02	3.6E-02	1.7E-02	-	1.8E-05	6.9E-06	3.3E-06	7.1E-02	2.8E-02	1.3E-02	-	7.1E-02	2.8E-02	1.3E-02	1.0E+01	1.0E+02	7.1E-03	2.8E-03	1.3E-03	7.1E-04	2.8E-04	1.3E-04
Endosulfan Sulfate	2.0E-03	6.8E-04	3.2E-04	1.4E-01	4.8E-02	2.2E-02	-	2.5E-05	8.6E-06	4.0E-06	1.1E-01	3.7E-02	1.7E-02	-	1.1E-01	3.7E-02	1.7E-02	1.0E+01	1.0E+02	1.1E-02	3.7E-03	1.7E-03	1.1E-03	3.7E-04	1.7E-04
Heptachlor	1.1E-03	-	1.8E-04	6.4E-02	-	1.0E-02	-	1.4E-05	-	2.3E-06	4.9E-02	-	8.0E-03	-	4.9E-02	-	8.0E-03	4.2E+01	-	1.2E-03	-	1.9E-04	-	-	-
Heptachlor Epoxide	4.0E-03	1.2E-03	5.8E-04	2.2E+00	6.4E-01	3.2E-01	-	5.1E-05	1.5E-05	7.3E-06	1.7E+00	4.9E-01	2.5E-01	-	1.7E+00	4.9E-01	2.5E-01	2.6E+00	2.6E+01	6.6E-01	1.9E-01	9.5E-02	6.6E-02	1.9E-02	9.5E-03
Endrin Aldehyde	7.8E-03	1.5E-03	7.0E-04	4.8E+00	9.0E-01	4.3E-01	-	9.9E-05	1.9E-05	8.9E-06	3.7E+00	7.0E-01	3.3E-01	-	3.7E+00	7.0E-01	3.3E-01	1.0E-02	1.0E-01	**3.7E+02**	**7.0E+01**	**3.3E+01**	**3.7E+01**	**7.0E+00**	**3.3E+00**
Endrin Ketone	1.6E-02	2.6E-03	1.1E-03	-	-	-	-	2.0E-04	3.3E-05	1.3E-05	-	-	-	-	2.0E-04	3.3E-05	1.3E-05	1.0E-02	1.0E-01	2.0E-02	3.3E-03	1.3E-03	2.0E-03	3.3E-04	1.3E-04
Endrin	8.9E-03	1.6E-03	7.3E-04	6.4E+00	1.1E+00	5.3E-01	-	1.1E-04	2.0E-05	9.2E-06	5.0E+00	8.8E-01	4.1E-01	-	5.0E+00	8.8E-01	4.1E-01	1.0E-02	1.0E-01	**5.0E+02**	**8.8E+01**	**4.1E+01**	**5.0E+01**	**8.8E+00**	**4.1E+00**
gamma-Chlordane	-	-	-	-	-	-	1.1E-05	-	-	-	-	-	-	1.1E-06	1.1E-06	-	-	2.1E+00	1.1E+01	5.1E-07	-	-	1.0E-07	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Avian)	3.0E-05	-	7.2E-06	4.8E-05	-	1.1E-05	2.7E-05	3.8E-07	-	9.1E-08	3.7E-05	-	8.8E-06	2.7E-06	4.0E-05	-	1.2E-05	1.4E-05	1.4E-04	**2.9E+00**	-	8.3E-01	2.9E-01	-	8.3E-02

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Golder Associates

Table 8-9.8
Hazard Quotient Estimation for Red-tailed Hawk - Annex
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Parameter	Symbol	Value	Units	Reference
Body Weight	BW	1.134	kg	Table 8-5
Dry Weight Food Ingestion Rate	IR_{dw}	0.0337	kg/day	Table 8-5
Wet Weight Food Ingestion Rate	IR_{ww}	0.105	kg/day	Table 8-5
Fraction of Diet Comprised of Small Mammals	P_f^p	1	unitless	Table 8-5
Fraction soil ingestion	P_s	0.057	unitless	Table 8-5
Surface Water Ingestion Rate	C_w^{Max}	0.065	kg/day	Table 8-5
Surface Water Concentration	C_w^{Max}	Chemical-specific	mg/l	Table 8-3.2
Small Mammal Concentration	C_f^p	Chemical-specific	mg/kg	Table 8-7
Soil Concentration (C_S)	C_s	Chemical-specific	mg/kg	Table 8-7
Toxicity Reference Value	TRV	Chemical-specific	mg/kg/day	Table 8-11
Area Use Factor	AUF	1	unitless	Table 8-5

																				NOAEL HQs			LOAEL HQs		
	C_s^{max}	$C_s^{95\%}$	C_s^{Mean}	C_{fsm}^{max}	$C_{fsm}^{95\%}$	C_{fsm}^{mean}	C_w^{Max}	Max Dose: Soil Exposure	95% Dose: Soil Exposure	Mean Dose: Soil Exposure	Max Dose: Small Mammal Exposure	95% Dose: Small Mammal Exposure	Mean Dose: Small Mammal Exposure	Max Dose:Surface Water Exposure	Max Total Dose	95% Total Dose	Mean Total Dose	TRV mg/kg/day		Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient	Max Hazard Quotient	95% Hazard Quotient	Mean Hazard Quotient
	mg/kg DW	mg/kg DW	mg/kg DW	mg/kg WW	mg/kg WW	mg/kg WW	mg/l WW	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	mg/kg/day	LOAEL	NOAEL	unitless	unitless	unitless	unitless	unitless	unitless
Inorganics																									
Aluminum	2.8E+04	1.8E+04	1.5E+04	-	-	-	3.1E+01	4.8E+01	3.0E+01	2.6E+01	-	-	-	1.8E+00	4.9E+01	3.2E+01	2.8E+01	1.1E+02	-	4.5E-01	2.9E-01	2.5E-01	-	-	-
Antimony	3.7E+00	1.5E+00	1.2E+00	3.2E-04	1.4E-04	1.1E-04	3.2E-03	6.3E-03	2.6E-03	2.1E-03	3.0E-05	1.3E-05	1.1E-05	1.8E-04	6.5E-03	2.8E-03	2.3E-03	-	-	-	-	-	-	-	-
Arsenic	9.5E+01	2.9E+01	1.2E+01	1.0E-01	4.0E-02	1.9E-02	3.8E-02	1.6E-01	5.0E-02	2.0E-02	9.7E-03	3.7E-03	1.7E-03	2.2E-03	1.7E-01	5.6E-02	2.4E-02	2.2E+00	3.6E+00	7.7E-02	2.5E-02	1.1E-02	4.9E-02	1.6E-02	6.6E-03
Barium	4.7E+02	2.5E+02	1.8E+02	2.6E-02	1.4E-02	1.0E-02	9.4E-01	8.0E-01	4.2E-01	3.1E-01	2.4E-03	1.3E-03	9.5E-04	5.4E-02	8.5E-01	4.8E-01	3.6E-01	-	-	-	-	-	-	-	-
Cadmium	3.7E+00	1.2E+00	8.0E-01	1.7E-01	1.0E-01	8.2E-02	3.4E-03	6.3E-03	2.1E-03	1.3E-03	1.6E-02	9.4E-03	7.6E-03	1.9E-04	2.2E-02	1.2E-02	9.1E-03	1.5E+00	2.0E+01	1.5E-02	8.0E-03	6.3E-03	1.1E-03	5.8E-04	4.6E-04
Chromium	2.0E+02	5.7E+01	4.5E+01	3.7E+00	1.5E+00	1.2E+00	7.8E-02	3.4E-01	9.7E-02	7.6E-02	3.4E-01	1.3E-01	1.1E-01	4.5E-03	6.9E-01	2.4E-01	1.9E-01	2.7E+00	2.8E+00	2.6E-01	8.9E-02	7.2E-02	2.5E-01	8.5E-02	6.9E-02
Cobalt	2.0E+01	1.1E+01	9.8E+00	1.8E-01	8.8E-02	7.3E-02	2.6E-02	3.3E-02	1.9E-02	1.7E-02	1.7E-02	8.2E-03	6.7E-03	1.5E-03	5.1E-02	2.9E-02	2.5E-02	7.6E+00	1.8E+01	6.7E-03	3.8E-03	3.3E-03	2.8E-03	1.6E-03	1.4E-03
Copper	2.3E+02	6.9E+01	5.1E+01	5.4E+00	4.5E+00	4.4E+00	1.1E-01	3.9E-01	1.2E-01	8.7E-02	5.0E-01	4.2E-01	4.0E-01	6.2E-03	9.0E-01	5.4E-01	5.0E-01	4.1E+00	4.7E+00	2.2E-01	1.3E-01	1.2E-01	1.9E-01	1.2E-01	1.1E-01
Iron	4.1E+04	2.9E+04	2.6E+04	-	-	-	5.2E+01	6.9E+01	5.0E+01	4.4E+01	-	-	-	3.0E+00	7.2E+01	5.3E+01	4.7E+01	-	-	-	-	-	-	-	-
Lead	2.9E+02	1.2E+02	7.8E+01	4.3E+00	2.8E+00	2.4E+00	3.7E-01	5.0E-01	2.0E-01	1.3E-01	3.9E-01	2.6E-01	2.2E-01	2.1E-02	9.1E-01	4.8E-01	3.7E-01	1.6E+00	1.9E+00	5.6E-01	2.9E-01	2.3E-01	4.7E-01	2.5E-01	1.9E-01
Manganese	1.2E+03	4.5E+02	3.6E+02	7.7E+00	2.9E+00	2.4E+00	1.3E+00	2.0E+00	7.6E-01	6.1E-01	7.2E-01	2.7E-01	2.2E-01	7.4E-02	2.8E+00	1.1E+00	9.0E-01	1.8E+02	3.8E+02	1.6E-02	6.1E-03	5.0E-03	7.4E-03	2.9E-03	2.4E-03
Mercury	8.8E-01	3.1E-01	2.2E-01	3.4E-05	1.2E-05	8.2E-06	1.2E-03	1.5E-03	5.2E-04	3.7E-04	3.1E-06	1.1E-06	7.6E-07	6.9E-05	1.6E-03	5.9E-04	4.4E-04	4.5E-01	9.0E-01	3.5E-03	1.3E-03	9.7E-04	1.7E-03	6.5E-04	4.8E-04
Nickel	9.2E+01	3.7E+01	3.1E+01	2.1E+00	1.3E+00	1.2E+00	7.5E-02	1.6E-01	6.2E-02	5.2E-02	1.9E-01	1.2E-01	1.1E-01	4.3E-03	3.5E-01	1.9E-01	1.7E-01	6.7E+00	1.2E+01	5.2E-02	2.8E-02	2.5E-02	3.1E-02	1.7E-02	1.5E-02
Selenium	4.2E+00	1.1E+00	7.1E-01	3.6E-01	2.2E-01	1.9E-01	-	7.1E-03	1.9E-03	1.2E-03	3.4E-02	2.0E-02	1.7E-02	-	4.1E-02	2.2E-02	1.8E-02	2.9E-01	3.7E-01	1.4E-01	7.7E-02	6.3E-02	1.1E-01	6.1E-02	5.0E-02
Silver	2.4E+00	6.2E-01	3.8E-01	3.1E-03	8.0E-04	4.9E-04	1.7E-03	4.1E-03	1.1E-03	6.4E-04	2.8E-04	7.4E-05	4.5E-05	9.7E-05	4.4E-03	1.2E-03	7.8E-04	2.0E+00	2.0E+01	2.2E-03	6.1E-04	3.9E-04	2.2E-04	6.1E-05	3.9E-05
Thallium	1.0E+00	-	-	-	-	-	-	1.7E-03	-	-	-	-	-	-	1.7E-03	-	-	4.7E-01	-	3.6E-03	-	-	-	-	-
Vanadium	1.0E+02	6.6E+01	5.7E+01	4.0E-01	2.6E-01	2.2E-01	9.5E-02	1.7E-01	1.1E-01	9.6E-02	3.7E-02	2.4E-02	2.1E-02	5.5E-03	2.2E-01	1.4E-01	1.2E-01	3.4E-01	4.1E-01	6.3E-01	4.1E-01	3.6E-01	5.2E-01	3.4E-01	3.0E-01
Zinc	1.5E+03	3.1E+02	1.8E+02	4.2E+01	3.8E+01	3.6E+01	5.8E-01	2.6E+00	5.2E-01	3.1E-01	3.9E+00	3.5E+00	3.4E+00	3.3E-02	6.5E+00	4.0E+00	3.7E+00	6.6E+01	1.5E+02	9.9E-02	6.1E-02	5.6E-02	4.3E-02	2.6E-02	2.4E-02
VOCs																									
Acetone	1.3E-02	6.6E-03	-	-	-	-	-	2.2E-05	1.1E-05	-	-	-	-	-	2.2E-05	1.1E-05	-	-	-	-	-	-	-	-	-
SVOCs																									
Atrazine	-	-	-	-	-	-	2.0E-03	-	-	-	-	-	-	1.1E-04	1.1E-04	-	-	5.0E+01	2.5E+02	2.3E-06	-	-	4.6E-07	-	-
Bis(2-Ethylhexyl) Phthalate	1.8E-01	6.2E-02	5.1E-02	2.3E-08	8.1E-09	6.6E-09	-	3.0E-04	1.1E-04	8.6E-05	2.2E-09	7.5E-10	6.1E-10	-	3.0E-04	1.1E-04	8.6E-05	1.1E+00	-	2.8E-04	9.6E-05	7.8E-05	-	-	-
Butylbenzyl Phthalate	1.9E-01	-	-	1.4E-08	-	-	-	3.2E-04	-	-	1.3E-09	-	-	-	3.2E-04	-	-	-	-	-	-	-	-	-	-
Carbazole	1.5E-01	5.8E-02	4.3E-02	3.6E-09	1.4E-09	1.0E-09	-	2.5E-04	9.8E-05	7.2E-05	3.4E-10	1.3E-10	9.6E-11	-	2.5E-04	9.8E-05	7.2E-05	-	-	-	-	-	-	-	-
Di-N-Octyl Phthalate	1.2E-01	-	-	5.0E-05	-	-	-	2.0E-04	-	-	4.6E-06	-	-	-	2.1E-04	-	-	-	-	-	-	-	-	-	-
Hexachlorocyclopentadiene	1.8E-02	-	-	1.6E-09	-	-	-	3.0E-05	-	-	1.4E-10	-	-	-	3.0E-05	-	-	-	-	-	-	-	-	-	-
N-Nitrosodiphenylamine	4.5E-02	-	-	6.0E-10	-	-	-	7.5E-05	-	-	5.5E-11	-	-	-	7.5E-05	-	-	-	-	-	-	-	-	-	-
Phenol	1.5E-01	-	-	3.9E-10	-	-	-	2.5E-04	-	-	3.6E-11	-	-	-	2.5E-04	-	-	-	-	-	-	-	-	-	-
Total Low Molecular Weight PAHS	1.2E+00	4.1E-01	2.8E-01	-	-	-	5.0E-03	2.0E-03	7.0E-04	4.7E-04	-	-	-	2.9E-04	2.3E-03	7.0E-04	4.7E-04	-	-	-	-	-	-	-	-
Total High Molecular Weight PAHs	7.4E+00	2.7E+00	1.9E+00	-	-	-	-	1.2E-02	4.6E-03	3.2E-03	-	-	-	-	1.2E-02	4.6E-03	3.2E-03	-	-	-	-	-	-	-	-
PCBs																									
Aroclor-1248	3.9E+00	-	1.9E-03	1.1E-06	-	5.2E-10		6.6E-03	-	3.2E-06	1.0E-07	-	4.8E-11		6.6E-03	-	3.2E-06	1.0E-01	1.0E+00	6.6E-02	-	3.2E-05	6.6E-03	-	3.2E-06
Aroclor-1254	1.4E+00	1.9E-01	7.8E-02	8.0E-07	1.1E-07	4.4E-08		2.4E-03	3.3E-04	1.3E-04	7.4E-08	1.0E-08	4.1E-09		2.4E-03	3.3E-04	1.3E-04	1.8E-01	1.8E+00	1.3E-02	1.8E-03	7.3E-04	1.3E-03	1.8E-04	7.3E-05
Aroclor-1260	4.0E-01	9.3E-02	5.4E-02	1.3E-06	3.1E-07	1.8E-07		6.8E-04	1.6E-04	9.1E-05	1.2E-07	2.8E-08	1.6E-08		6.8E-04	1.6E-04	9.1E-05	2.2E+00	2.2E+01	3.2E-04	7.3E-05	4.2E-05	3.2E-05	7.3E-06	4.2E-06
Pesticides																									
4,4'-DDD	6.5E-02	1.0E-02	4.4E-03	2.4E-07	5.7E-08	3.0E-08	3.3E-05	1.1E-04	1.7E-05	7.4E-06	2.2E-08	5.3E-09	2.8E-09	1.9E-06	1.1E-04	1.9E-05	9.3E-06	2.3E-01	2.8E-01	4.9E-04	8.3E-05	4.1E-05	4.0E-04	6.7E-05	3.3E-05
4,4'-DDE	1.9E-02	5.8E-03	3.8E-03	1.3E-07	5.1E-08	3.7E-08	2.1E-05	3.2E-05	9.8E-06	6.4E-06	1.2E-08	4.7E-09	3.4E-09	1.2E-06	3.3E-05	1.1E-05	7.7E-06	2.3E-01	2.8E-01	1.5E-04	4.9E-05	3.4E-05	1.2E-04	3.9E-05	2.7E-05
4,4'-DDT	5.5E-02	8.9E-03	4.7E-03	1.9E-07	4.6E-08	2.8E-08	9.0E-06	9.3E-05	1.5E-05	7.9E-06	1.7E-08	4.2E-09	2.6E-09	5.2E-07	9.4E-05	1.6E-05	8.4E-06	2.3E-01	2.8E-01	4.1E-04	6.8E-05	3.7E-05	3.3E-04	5.5E-05	3.0E-05
Aldrin	1.3E-03	4.1E-04	1.8E-04	7.1E-10	2.2E-10	9.9E-11	-	2.2E-06	6.9E-07	3.1E-07	6.6E-11	2.1E-11	9.2E-12	-	2.2E-06	6.9E-07	3.1E-07	-	-	-	-	-	-	-	-
alpha-BHC	1.3E-03	3.8E-04	1.7E-04	3.4E-11	1.0E-11	4.5E-12	-	2.2E-06	6.4E-07	2.9E-07	3.2E-12	9.3E-13	4.2E-13	-	2.2E-06	6.4E-07	2.9E-07	5.6E-01	2.3E+00	3.9E-06	1.1E-06	5.2E-07	9.8E-07	2.9E-07	1.3E-07
beta-BHC	1.5E-02	2.5E-03	1.3E-03	4.1E-10	7.0E-11	3.5E-11	-	2.5E-05	4.3E-06	2.1E-06	3.8E-11	6.4E-12	3.2E-12	-	2.5E-05	4.3E-06	2.1E-06	5.6E-01	2.3E+00	4.5E-05	7.7E-06	3.8E-06	1.1E-05	1.9E-06	9.5E-07
gamma-BHC	1.3E-03	3.5E-04	1.5E-04	3.2E-11	8.5E-12	3.7E-12	-	2.2E-06	5.8E-07	2.6E-07	3.0E-12	7.8E-13	3.5E-13	-	2.2E-06	5.8E-07	2.6E-07	2.0E+00	2.0E+01	1.1E-06	2.9E-07	1.3E-07	1.1E-07	2.9E-08	1.3E-08
Methoxychlor	2.9E-02	-	2.0E-03	1.7E-09	-	1.2E-10	-	4.9E-05	-	3.4E-06	1.5E-10	-	1.1E-11	-	4.9E-05	-	3.4E-06	-	-	-	-	-	-	-	-
Dieldrin	2.2E-02	5.1E-03	2.9E-03	2.8E-08	6.5E-09	3.7E-09	-	3.7E-05	8.7E-06	4.9E-06	2.6E-09	6.0E-10	3.4E-10	-	3.7E-05	8.7E-06	4.9E-06	7.1E-02	1.8E-01	5.3E-04	1.2E-04	6.9E-05	2.1E-04	4.9E-05	2.7E-05
Alpha-Endosulfan	1.1E-03	3.5E-04	1.6E-04	2.2E-11	7.1E-12	3.2E-12	-	1.9E-06	5.9E-07	2.7E-07	2.1E-12	6.6E-13	3.0E-13	-	1.9E-06	5.9E-07	2.7E-07	1.0E+01	1.0E+02	1.9E-07	5.9E-08	2.7E-08	1.9E-08	5.9E-09	2.7E-09
Beta-Endosulfan	1.4E-03	5.4E-04	2.6E-04	3.1E-11	1.2E-11	5.7E-12	-	2.4E-06	9.2E-07	4.4E-07	2.8E-12	1.1E-12	5.3E-13	-	2.4E-06	9.2E-07	4.4E-07	1.0E+01	1.0E+02	2.4E-07	9.2E-08	4.4E-08	2.4E-08	9.2E-09	4.4E-09
Endosulfan Sulfate	2.0E-03	6.8E-04	3.2E-04	4.6E-11	1.5E-11	7.2E-12	-	3.4E-06	1.1E-06	5.3E-07	4.2E-12	1.4E-12	6.7E-13	-	3.4E-06	1.1E-06	5.3E-07	1.0E+01	1.0E+02	3.4E-07	1.1E-07	5.3E-08	3.4E-08	1.1E-08	5.3E-09
Heptachlor	1.1E-03	-	1.8E-04	3.8E-12	-	6.3E-13	-	1.9E-06	-	3.0E-07	3.6E-13	-	5.8E-14	-	1.9E-06	-	3.0E-07	4.2E+01	-	4.5E-08	-	7.3E-09	-	-	-
Heptachlor Epoxide	4.0E-03	1.2E-03	5.8E-04	3.0E-10	8.6E-11	4.3E-11	-	6.8E-06	2.0E-06	9.8E-07	2.7E-11	7.9E-12	4.0E-12	-	6.8E-06	2.0E-06	9.8E-07	2.6E+00	2.6E+01	2.6E-06	7.5E-07	3.8E-07	2.6E-07	7.5E-08	3.8E-08
Endrin Aldehyde	7.8E-03	1.5E-03	7.0E-04	6.1E-10	1.2E-10	5.5E-11	-	1.3E-05	2.5E-06	1.2E-06	5.7E-11	1.1E-11	5.1E-12	-	1.3E-05	2.5E-06	1.2E-06	1.0E-02	1.0E-01	1.3E-03	2.5E-04	1.2E-04	1.3E-04	2.5E-05	1.2E-05
Endrin Ketone	1.6E-02	2.6E-03	1.1E-03	-	-	-	-	2.7E-05	4.4E-06	1.8E-06	-	-	-	-	2.7E-05	4.4E-06	1.8E-06	1.0E-02	1.0E-01	2.7E-03	4.4E-04	1.8E-04	2.7E-04	4.4E-05	1.8E-05
Endrin	8.9E-03	1.6E-03	7.3E-04	7.8E-10	1.4E-10	6.4E-11	-	1.5E-05	2.7E-06	1.2E-06	7.2E-11	1.3E-11	5.9E-12	-	1.5E-05	2.7E-06	1.2E-06	1.0E-02	1.0E-01	1.5E-03	2.7E-04	1.2E-04	1.5E-04	2.7E-05	1.2E-05
gamma-Chlordane	-	-	-	-	-	-	1.1E-05	-	-	-	-	-	-	6.3E-07	6.3E-07	-	-	2.1E+00	1.1E+01	2.9E-07	-	-	5.9E-08	-	-
Dioxins/Furans																									
2,3,7,8-TCDD Equivalents (Avian)	3.0E-05	-	7.2E-06	3.8E-11	-	8.9E-12	2.7E-05	5.1E-08	-	1.2E-08	3.5E-12	-	8.2E-13	1.5E-06	1.6E-06	-	1.6E-06	1.4E-05	1.4E-04	1.1E-01	-	1.1E-01	1.1E-02	-	1.1E-02

Notes:
Blank cells indicate value not available.
- indicates HQ could not be calculated due to lack of adequate toxicity data.
Bold COPC names indicate an HQ exceeding 1.0.

Checked by: SLJ

Golder Associates

Table 8-10
TRVs for Detected Bioaccumulative Compounds in Mammals
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Bioaccumulative Compound	TEST SPECIES Toxicological Reference Values		Test Species	Form	Endpoint	Reference	Red Fox TRV		Meadow Vole TRV		Short-tailed Shrew TRV		Deer Mouse TRV	
	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day					NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day
Inorganics														
Aluminum	1.93	19.3	Mouse	Aluminum chloride	Reproduction	a	1.93	19.3	1.93	19.3	1.93	19.3	1.93	19.3
Antimony	0.059	0.59	Rat	Antimony trichloride	Reproduction/ Growth	c	0.059	0.59	0.059	0.59	0.059	0.59	0.059	0.59
Arsenic	1.04	1.66	Dog		Growth	c	1.04	1.66	1.04	1.66	1.04	1.66	1.04	1.66
Barium	51.8	82.7	Rat/Mouse	Various	Reproduction/ Growth	c	51.8	82.7	51.8	82.7	51.8	82.7	51.8	82.7
Beryllium	0.532	0.63	Rat	Beryllium Sulfate	Survival/ Growth	c	0.532	0.63	0.532	0.63	0.532	0.63	0.532	0.63
Cadmium	1	10	Rat	Cadmium Chloride	Reproduction	a	1	10	1	10	1	10	1	10
Chromium	2.4	9.62	Various/ Mouse		Various	c	2.4	9.62	2.4	9.62	2.4	9.62	2.4	9.62
Cobalt	7.33	18.9	Various		Reproduction/ Growth	c	7.33	18.9	7.33	18.9	7.33	18.9	7.33	18.9
Copper	5.6	9.34	Pig		Growth Survival	c	5.6	9.34	5.6	9.34	5.6	9.34	5.6	9.34
Iron														
Lead	4.7	5	Rat		Growth	c	4.7	5	4.7	5	4.7	5	4.7	5
Manganese	51.5	146	Various		Reproduction/ Growth	c	51.5	146	51.5	146	51.5	146	51.5	146
Mercury	13.2	-	Mouse	Mercuric Sulfate	Reproduction	a	13.2	-	13.2	-	13.2	-	13.2	-
Nickel	1.7	2.71	Mouse		Reproduction	c	1.7	2.71	1.7	2.71	1.7	2.71	1.7	2.71
Selenium	0.143	0.145	Pig		Growth	c	0.143	0.145	0.143	0.145	0.143	0.145	0.143	0.145
Silver	6.02	60.2	Pig	Silver	Growth	c	6.02	60.2	6.02	60.2	6.02	60.2	6.02	60.2
Thallium	0.0074	0.074	Rat	Thallium Sulfate	Reproduction	a	0.0074	0.074	0.0074	0.074	0.0074	0.074	0.0074	0.074
Vanadium	4.16	5.11	Rat/Mouse		Growth	c	4.16	5.11	4.16	5.11	4.16	5.11	4.16	5.11
Zinc	75.4	741	Geometric Mean		Reproduction, Growth, and Survival	c	75.4	741	75.4	741	75.4	741	75.4	741
VOCs														
Acetone	10	50	Rat		Liver/kidney	a	10	50	10	50	10	50	10	50

Checked by SLJ

Table 8-10
TRVs for Detected Bioaccumulative Compounds in Mammals
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Bioaccumulative Compound	TEST SPECIES Toxicological Reference Values		Test Species	Form	Endpoint	Reference	Red Fox TRV		Meadow Vole TRV		Short-tailed Shrew TRV		Deer Mouse TRV	
	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day					NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day
SVOCs														
Acetophenone	NO TOXICITY DATA FOUND													
Atrazine	50	100	Mouse		Growth	d	50	100	50	100	50	100	50	100
Biphenyl	10	100	Mouse		Genotox	d	10	100	10	100	10	100	10	100
Bis(2-Ethylhexyl) Phthalate	18.3	183	Mouse		Reproduction	a	18.3	183	18.3	183	18.3	183	18.3	183
4-Bromophenyl-phenylether	NO TOXICITY DATA FOUND													
Butylbenzyl Phthalate	NO TOXICITY DATA FOUND													
Carbazole	NO TOXICITY DATA FOUND													
Dibenzofuran	NO TOXICITY DATA FOUND													
Dimethyl Phthalate	3500	-	Mouse		Growth	d	3500	-	3500	-	3500	-	3500	-
Di-N-Octyl Phthalate	9780	-	Mouse		Growth	d	9780	-	9780	-	9780	-	9780	-
Hexachlorobenzene	100	125	Mouse		Growth	d	100	125	100	125	100	125	100	125
Hexachlorobutadiene	NO TOXICITY DATA FOUND													
Hexachlorocyclopentadiene	45	-	Mouse		Reproduction	d	45.0	-	45	-	45	-	45	-
N-Nitrosodiphenylamine	NO TOXICITY DATA FOUND													
Pentachlorophenol	0.2	2.4	Rat		Reproduction	a	0.2	2.4	0.2	2.4	0.2	2.4	0.2	2.4
Phenol	40	53.3	Rat		Reproduction	d	40	53.3	40	53.3	40	53.3	40	53.3
Total Low Molecular Weight PAHs	65.6	110	Rat/Mouse		Growth	c	65.6	110	65.6	110	65.6	110	65.6	110
Total High Molecular Weight PAHs	0.615	3.07				c	0.615	3.07	0.615	3.07	0.615	3.07	0.615	3.07
Pesticides														
4,4'-DDD	0.147	0.274	Rat		Reproduction	c	0.147	0.274	0.147	0.274	0.147	0.274	0.147	0.274
4,4'-DDE	0.147	0.274	Rat		Reproduction	c	0.147	0.274	0.147	0.274	0.147	0.274	0.147	0.274
4,4'-DDT	0.147	0.274	Rat		Reproduction	c	0.147	0.274	0.147	0.274	0.147	0.274	0.147	0.274
Aldrin	0.2	1	Rat	n/a	Reproduction	a	0.2	1	0.2	1	0.2	1	0.2	1
alpha-BHC	1.6	3.2	Rat	BHC-mixed isomers	Reproduction	a	1.6	3.2	1.6	3.2	1.6	3.2	1.6	3.2
alpha-chlordane	4.6	9.2	Mouse	chlordane	Reproduction	a	4.6	9.2	4.6	9.2	4.6	9.2	4.6	9.2
beta-BHC	0.4	2	Rat	n/a	Growth	a	0.4	2	0.4	2	0.4	2	0.4	2
delta-BHC	1.6	3.2	Rat	BHC-mixed isomers	Reproduction	a	1.6	3.2	1.6	3.2	1.6	3.2	1.6	3.2
gamma-BHC	8	-	Rat	Gamma-BHC	Reproduction	a	8	-	8	-	8	-	8	-
Methoxychlor	4	8	Rat	n/a	Reproduction	a	4	8	4	8	4	8	4	8
Dieldrin	0.015	0.03	Rat	n/a	Reproduction	c	0.015	0.03	0.015	0.03	0.015	0.03	0.015	0.03
Alpha-Endosulfan	0.15	-	Rat	Endosulfan	Reproduction	a	0.15	-	0.15	-	0.15	-	0.15	-
Beta-Endosulfan	0.15	-	Rat	Endosulfan	Reproduction	a	0.15	-	0.15	-	0.15	-	0.15	-
Endosulfan Sulfate	0.15	-	Rat	Endosulfan	Reproduction	a	0.15	-	0.15	-	0.15	-	0.15	-
Heptachlor	0.1	1	Mink	n/a	Reproduction	a	0.1	1	0.1	1	0.1	1	0.1	1
Heptachlor Epoxide	0.1	1	Mink	Heptachlor	Reproduction	a	0.1	1	0.1	1	0.1	1	0.1	1
Endrin	0.092	0.92	Mouse	n/a	Reproduction	a	0.092	0.92	0.092	0.92	0.092	0.92	0.092	0.92

Checked by SLJ

Golder Associates

Table 8-10
TRVs for Detected Bioaccumulative Compounds in Mammals
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Bioaccumulative Compound	TEST SPECIES Toxicological Reference Values		Test Species	Form	Endpoint	Reference	Red Fox TRV		Meadow Vole TRV		Short-tailed Shrew TRV		Deer Mouse TRV	
	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day					NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day
Endrin Aldehyde	0.092	0.92	Mouse	Endrin	Reproduction	a	0.092	0.92	0.092	0.92	0.092	0.92	0.092	0.92
Endrin Ketone	0.092	0.92	Mouse	Endrin	Reproduction	a	0.092	0.92	0.092	0.92	0.092	0.92	0.092	0.92
gamma-Chlordane	4.6	9.2	Mouse	chlordane	Reproduction	a	4.6	9.2	4.6	9.2	4.6	9.2	4.6	9.2
Toxaphene	8	-	Rat		Reproduction	a	8	-	8	-	8	-	8	-
PCBs														
Aroclor-1248	0.01	0.1	Monkey	n/a		a	0.01	0.1	0.01	0.1	0.01	0.1	0.01	0.1
Aroclor-1254 (carnivorous)	0.14	0.69	mink	n/a		a	0.14	0.69	0.14	0.69	0.14	0.69	0.14	0.69
Aroclor-1254 (all other)	0.068	0.68	mouse	n/a		a	0.068	0.68	0.068	0.68	0.068	0.68	0.068	0.68
Aroclor-1260	13.8	-	Rat	n/a	Off-spring Survival	b	13.8	-	13.8	-	13.8	-	13.8	-
Dioxins/Furans														
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.000001	0.00001	Rat	n/a	Survival	a	0.000001	0.00001	1.00E-06	1.00E-05	1.00E-06	1.00E-05	1.00E-06	1.00E-05
2,3,7,8-Tetrachlorodibenzofuran	0.0000033	-	Guinea Pig	n/a	Survival	a	0.0000033	-	3.30E-06	-	3.30E-06	-	3.30E-06	-

a. Sample, et. al. 1996. Toxicological Benchmarks for Wildlife. ES/ER/TM-86/R3

b. Linder, R. E., Gaines, T. B., and Kimbrough, R. D. The effect of apolychlorinated biphenyl on rat reproduction. Food Cosmet. Toxicol. 12: 63-77 (1974).

c. Compound-specific Ecological Soil Screening Level. Arsenic: March 2005; Chromium: April 2008; Copper: February 2007; DDT and metabolites: April 2007; Dieldrin: April 2007; Lead: March 2005; Nickel: March 2007; PAHs: June 2007; Selenium: July 2007; Silver: September 2006; Zinc: June 2007.

d. ECOTOX database. Available at (https://cfpub.epa.gov/ecotox/quick_query.htm)

Checked by SLJ

Table 8-11
TRVs for Detected Bioaccumulative Compounds in Birds
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Bioaccumulative Compound	Toxicological Reference Values		Test Species	Form	Endpoint	Reference	Red-Tailed Hawk		America Robin		Northern Woodcock		Nothern Bobwhite	
	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day					NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day	NOAEL mg/kgBW-day	LOAEL mg/kgBW-day
Inorganics														
Aluminum	109.7	-	Ringed Dove	Aluminum sulfate	Reproduction	a	109.7	-	109.7	-	109.7	-	109.7	-
Antimony	EPA ECO-SSL INDICATES INSUFFICIENT TOXICITY DATA FOR TRV DETERMINATION													
Arsenic	2.24	3.55	Chicken		Growth	b	2.24	3.55	2.24	3.55	2.24	3.55	2.24	3.55
Barium	EPA ECO-SSL INDICATES INSUFFICIENT TOXICITY DATA FOR TRV DETERMINATION													
Beryllium	EPA ECO-SSL INDICATES INSUFFICIENT TOXICITY DATA FOR TRV DETERMINATION													
Cadmium	1.45	20	Mallard	cadmium chloride	Reproduction	a	1.45	20	1.45	20	1.45	20	1.45	20
Chromium	2.66	2.78	Geometric Mean	Various	Various	b	2.66	2.78	2.66	2.78	2.66	2.78	2.66	2.78
Cobalt	7.61	18.3	Geometric Mean		Growth	b	7.61	18.3	7.61	18.3	7.61	18.3	7.61	18.3
Copper	4.05	4.68	Chicken		Reproduction	b	4.05	4.68	4.05	4.68	4.05	4.68	4.05	4.68
Iron	EPA ECO-SSL INDICATES INSUFFICIENT TOXICITY DATA FOR TRV DETERMINATION													
Lead	1.63	1.94	Chicken		Reproduction	b	1.63	1.94	1.63	1.94	1.63	1.94	1.63	1.94
Manganese	179	377	Geometric Mean		Growth	b	179	377	179	377	179	377	179	377
Mercury	0.45	0.9	Japanese Quail	mercuric chloride	Reproduction	a	0.45	0.9	0.45	0.9	0.45	0.9	0.45	0.9
Nickel	6.71	11.5	Geometric Mean		Reproduction and Growth	b	6.71	11.5	6.71	11.5	6.71	11.5	6.71	11.5
Selenium	0.29	0.368	Chicken		Survival	b	0.29	0.368	0.29	0.368	0.29	0.368	0.29	0.368
Silver	2.02	20.2	Turkey		Growth	b	2.02	20.2	2.02	20.2	2.02	20.2	2.02	20.2
Thallium	0.474	-	Pheasant		LD50	d	0.474	-	0.474	-	0.474	-	0.474	-
Vanadium	0.344	0.413	Chicken		Growth	b	0.344	0.413	0.344	0.413	0.344	0.413	0.344	0.413
Zinc	66.1	154	Geometric Mean		Reproduction and Growth	b	66.1	154	66.1	154	66.1	154	66.1	154
VOCs														
Acetone	NO TOXICITY DATA FOUND													
PAHs														
Acetophenone	NO TOXICITY DATA FOUND													
Atrazine	50	250	Quail		Growth	d	50	250	50	250	50	250	50	250
Biphenyl	NO TOXICITY DATA FOUND													
Bis(2-Ethylhexyl) Phthalate	1.1	-	Ringed Dove		Reproduction	a	1.1	-	1.1	-	1.1	-	1.1	-
4-Bromophenyl-phenylether	NO TOXICITY DATA FOUND													
Butylbenzyl Phthalate	NO TOXICITY DATA FOUND													
Carbazole	NO TOXICITY DATA FOUND													
Dibenzofuran	NO TOXICITY DATA FOUND													
Dimethyl Phthalate	NO TOXICITY DATA FOUND													
Di-N-Octyl Phthalate	NO TOXICITY DATA FOUND													
Hexachlorobenzene	NO TOXICITY DATA FOUND													
Hexachlorobutadiene	NO TOXICITY DATA FOUND													
Hexachlorocyclopentadiene	NO TOXICITY DATA FOUND													
N-Nitrosodiphenylamine	NO TOXICITY DATA FOUND													
Pentachlorophenol	NO TOXICITY DATA FOUND													
Phenol	NO TOXICITY DATA FOUND													
Total Low Molecular Weight PAHs	EPA ECO-SSL INDICATES INSUFFICIENT TOXICITY DATA FOR TRV DETERMINATION													
Total High Molecular Weight PAHs	EPA ECO-SSL INDICATES INSUFFICIENT TOXICITY DATA FOR TRV DETERMINATION													

Checked by: SLJ

Table 8-11
TRVs for Detected Bioaccumulative Compounds in Birds
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

Bioaccumulative Compound	**Toxicological Reference Values**		**Test Species**	**Form**	**Endpoint**	**Reference**	**Red-Tailed Hawk**		**America Robin**		**Northern Woodcock**		**Nothern Bobwhite**	
	NOAEL mg/kgBW-day	**LOAEL mg/kgBW-day**					**NOAEL mg/kgBW-day**	**LOAEL mg/kgBW-day**	**NOAEL mg/kgBW-day**	**LOAEL mg/kgBW-day**	**NOAEL mg/kgBW-day**	**LOAEL mg/kgBW-day**	**NOAEL mg/kgBW-day**	**LOAEL mg/kgBW-day**
Pesticides														
4,4'-DDD	0.227	0.281	Chicken	DDT	Growth	b	0.227	0.281	0.227	0.281	0.227	0.281	0.227	0.281
4,4'-DDE	0.227	0.281	Chicken	DDT	Growth	b	0.227	0.281	0.227	0.281	0.227	0.281	0.227	0.281
4,4'-DDT	0.227	0.281	Chicken	DDT	Growth	b	0.227	0.281	0.227	0.281	0.227	0.281	0.227	0.281
Aldrin	NO TOXICITY DATA FOUND													
alpha-BHC	0.56	2.25	Japenese Quail	BHC-mixed isomers		a	0.56	2.25	0.56	2.25	0.56	2.25	0.56	2.25
alpha-chlordane	2.14	10.7	Redwinged Blackbird	Chlordane		a	2.14	10.7	2.14	10.7	2.14	10.7	2.14	10.7
beta-BHC	0.56	2.25	Japenese Quail	BHC-mixed isomers		a	0.56	2.25	0.56	2.25	0.56	2.25	0.56	2.25
delta-BHC	0.56	2.25	Japenese Quail	BHC-mixed isomers		a	0.56	2.25	0.56	2.25	0.56	2.25	0.56	2.25
gamma-BHC	2	20	Mallard	Gamma-BHC		a	2	*20*	2	*20*	2	*20*	2	*20*
Methoxychlor	NO TOXICITY DATA FOUND													
Dieldrin	0.0709	0.179	Mallard		Growth and Survival	b	0.0709	0.179	0.0709	0.179	0.0709	0.179	0.0709	0.179
Alpha-Endosulfan	10	-	Gray Partridge	Endosulfan		a	10	*100*	10	*100*	10	*100*	10	*100*
Beta-Endosulfan	10	-	Gray Partridge	Endosulfan		a	10	*100*	10	*100*	10	*100*	10	*100*
Endosulfan Sulfate	10	-	Gray Partridge	Endosulfan		a	10	*100*	10	*100*	10	*100*	10	*100*
Heptachlor	41.6	-	Mallard Duck	n/a	LD50	d	41.6	-	41.6	-	41.6	-	41.6	-
Heptachlor Epoxide	*2.6*	-	Quail	n/a	Acute LOAEL	b	2.6	26	2.6	26	2.6	26	2.6	26
Endrin	0.01	0.1	Screech Owl	n/a		a	0.01	0.1	0.01	0.1	0.01	0.1	0.01	0.1
Endrin Aldehyde	0.01	0.1	Screech Owl	Endrin		a	0.01	0.1	0.01	0.1	0.01	0.1	0.01	0.1
Endrin Ketone	0.01	0.1	Screech Owl	Endrin		a	0.01	0.1	0.01	0.1	0.01	0.1	0.01	0.1
gamma-Chlordane	2.14	10.7	Redwinged Blackbird	Chlordane		a	2.14	10.7	2.14	10.7	2.14	10.7	2.14	10.7
Toxaphene	0.40	-	Grouse	n/a	LD50	d	0.40	-	0.40	-	0.40	-	0.40	-
PCBs														
Aroclor-1248	0.1	-	White Leghorn Hen	n/a		b	0.1	-	0.1	-	0.1	-	0.1	-
Aroclor-1254	0.18	1.8	ring-necked pheasant	n/a		a	0.18	1.8	0.18	1.8	0.18	1.8	0.18	1.8
Aroclor-1260	2.15	-	Mallard Duck, Ring-necked Pheasant, Bobwhite Quail, Japanese Quail	n/a		c	2.15	-	2.15	-	2.15	-	2.15	-
Dioxins/Furans														
2,3,7,8-Tetrachlorodibenzo-p-dioxin	0.000014	0.00014	ring-necked pheasant	n/a		a	0.000014	0.00014	0.000014	0.00014	0.000014	0.00014	0.000014	0.00014
2,3,7,8-Tetrachlorodibenzofuran	0.000001	0.00001	Chick	n/a		a	0.000001	0.00001	0.000001	0.00001	0.000001	0.00001	0.000001	0.00001

a. Sample, et. al. 1996. Toxicological Benchmarks for Wildlife. ES/ER/TM-86/R3

b. Compound-specific Ecological Soil Screening Level. Arsenic: March 2005; Chromium: April 2008; Copper: February 2007; DDT and metabolites: April 2007; Dieldrin: April 2007; Lead: March 2005; Nickel: March 2007; PAHs: June 2007; Selenium: July 2007; Silver: September 2006; Zinc: June 2007.

c. Hill, EF and MB Camardese. 1986. Lethal Dietary Toxicities of Environmental Contaminants and Pesticides to Coturnix. United States Fish And Wildlife Service: Fish and Wildlife Tech Rep 2 (NTIS PB86-176914). Laurel, MD. 154 pp.

d. ECOTOX database. Available at (https://cfpub.epa.gov/ecotox/quick_query.htm)

Checked by: SLJ

Table 8-12
Summary of Potential Ecological Risks - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

RECEPTOR	COPEC	NOAEL MAX CONC.	NOAEL 95% UCL CONC.	NOAEL MEAN CONC.	LOAEL MAX CONC.	LOAEL 95% UCL CONC.	LOAEL MEAN CONC.
Deer Mouse	Aluminum HQ=	**200**	**100**	**100**	**20**	**10**	**10**
	Antimony HQ=	**4**	1	1	**4**	1	1
	Copper HQ=	**10**	**2**	1	**8**	1	0.4
	Lead HQ=	**3**	0.4	0.4	**3**	0.4	0.3
	Nickel HQ=	**10**	**2**	1	**7**	1	0.4
	Biphenyl HQ=	**3**	0.2	0.1	0.3	0.02	0.01
	Bis(2-Ethylhexyl) Phthalate HQ=	**8**	**2**	1	1	0.2	0.1
	Di-N-Octyl Phthalate HQ=	**500**	**30**	**10**	-	-	-
	Total High Molecular Weight PAHS HQ=	**2**	1	0.3	0.4	0.1	0.1
	4,4'-DDT HQ=	1	0.2	0.1	1	0.1	0.03
	Aldrin HQ=	**7**	1	1	1	0.3	0.1
	Dieldrin HQ=	1	0.3	0.1	1	0.2	0.1
	Heptachlor Epoxide HQ=	**3**	**2**	1	0.3	0.2	0.1
	Endrin Aldehyde HQ=	**10**	**3**	**2**	1	0.3	0.2
	Endrin HQ=	**10**	**3**	1	1	0.3	0.1
	2,3,7,8-TCDD Equivalents (Mammals) HQ=	**20**	-	**4**	**2**	-	0.4
Short-tailed Shrew	Aluminum HQ=	**1000**	**1000**	**1000**	**100**	**100**	**100**
	Antimony HQ=	**30**	**4**	**3**	**30**	**4**	**3**
	Cadmium HQ=	**4**	1	1	0.4	0.1	0.1
	Chromium HQ=	**2**	1	1	0.4	0.2	0.2
	Copper HQ=	**90**	**10**	**4**	**50**	**8**	**2**
	Lead HQ=	**20**	**2**	**2**	**10**	**2**	**2**
	Nickel HQ=	**70**	**10**	**4**	**50**	**8**	**3**
	Thallium HQ=	**5**	-	-	1	-	-
	Zinc HQ=	**3**	**2**	1	0.3	0.2	0.1
	Biphenyl HQ=	**20**	**2**	1	**2**	0.2	0.1
	Bis(2-Ethylhexyl) Phthalate HQ=	**60**	**10**	**8**	**6**	1	1
	Di-N-Octyl Phthalate HQ=	**3000**	**200**	**80**	-	-	-
	Total High Molecular Weight PAHs HQ=	**10**	**4**	**2**	**3**	1	0.4
	4,4'-DDE HQ=	**5**	1	0.3	**3**	1	0.2
	4,4'-DDT HQ=	**9**	1	0.4	**5**	1	0.2
	Aldrin HQ=	**50**	**10**	**5**	**10**	**2**	1
	Methoxychlor HQ=	**3**	0.4	0.2	**2**	0.2	0.1
	Dieldrin HQ=	**10**	**2**	1	**5**	1	0.3
	Alpha-Endosulfan HQ=	**2**	0.2	0.1	-	-	-
	Beta-Endosulfan HQ=	**4**	1	0.4	-	-	-
	Endosulfan Sulfate HQ=	**6**	1	1	-	-	-
	Heptachlor HQ=	**3**	0.3	0.1	0.3	0.03	0.01
	Heptachlor Epoxide HQ=	**30**	**10**	**7**	**3**	1	1
	Endrin Aldehyde HQ=	**80**	**20**	**10**	**8**	**2**	1
	Endrin HQ=	**100**	**20**	**10**	**10**	**2**	1
	2,3,7,8-TCDD Equivalents (Mammals) HQ=	**100**	-	**20**	**10**	-	**2**
Meadow Vole	Aluminum HQ=	**20**	**10**	**10**	**2**	1	1
	Beryllium HQ=	1	0.3	0.1	1	0.3	0.1
	Copper HQ=	**3**	1	0.3	**2**	0.4	0.2
	Lead HQ=	1	0.2	0.2	1	0.2	0.2
	Nickel HQ=	**2**	0.3	0.1	1	0.2	0.1
Red Fox	Aluminum HQ=	**8**	**6**	**5**	1	1	1
	Copper HQ=	1	0.3	0.1	1	0.2	0.1

Table 8-12
Summary of Potential Ecological Risks - Landfill
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

RECEPTOR	COPEC	NOAEL			LOAEL		
		MAX CONC.	95% UCL CONC.	MEAN CONC.	MAX CONC.	95% UCL CONC.	MEAN CONC.
American Robin	Aluminum HQ=	**20**	**10**	**10**	-	-	-
	Cadmium HQ=	**2**	1	0.4	0.1	0.1	0.03
	Chromium HQ=	**2**	1	1	**2**	1	1
	Cobalt HQ=	1	0.1	0.1	0.2	0.1	0.02
	Copper HQ=	**100**	**20**	**6**	**100**	**20**	**5**
	Lead HQ=	**80**	**10**	**8**	**70**	**8**	**7**
	Manganese HQ=	**2**	0.3	0.1	1	0.1	0.1
	Nickel HQ=	**20**	**3**	1	**9**	**2**	1
	Zinc HQ=	**9**	**3**	1	**4**	1	1
	Bis(2-Ethylhexyl) Phthalate HQ=	**600**	**100**	**80**	-	-	-
	4,4'-DDE HQ=	**2**	0.4	0.1	**2**	0.3	0.1
	4,4'-DDT HQ=	**4**	1	0.2	**3**	1	0.1
	Dieldrin HQ=	1	0.3	0.1	1	0.1	0.04
	Endrin Aldehyde HQ=	**500**	**100**	**70**	**50**	**10**	**7**
	Endrin HQ=	**600**	**100**	**60**	**60**	**10**	**6**
	2,3,7,8-TCDD Equivalents (Avian) HQ=	**4**	-	1	0.4	-	0.1
Northern Bobwhite	Copper HQ = HQ=	**4**	1	0.2	**4**	1	0.2
	Lead HQ = HQ=	**4**	1	0.4	**4**	0.4	0.4
American Woodcock	Aluminum HQ=	**40**	**30**	**20**	-	-	-
	Cadmium HQ=	**4**	1	1	0.3	0.1	0.1
	Chromium HQ=	**3**	1	1	**3**	1	1
	Copper HQ=	**200**	**30**	**8**	**200**	**20**	**7**
	Lead HQ=	**80**	**10**	**10**	**70**	**10**	**8**
	Nickel HQ=	**30**	**5**	**2**	**20**	**3**	1
	Vanadium HQ=	**4**	**3**	**2**	**4**	**2**	**2**
	Zinc HQ=	**7**	**3**	**2**	**3**	1	1
	Bis(2-Ethylhexyl) Phthalate HQ=	**1000**	**300**	**200**	-	-	-
	4,4'-DDE HQ=	**5**	1	0.3	**4**	1	0.2
	4,4'-DDT HQ=	**8**	1	0.4	**7**	1	0.3
	Heptachlor Epoxide HQ=	1	1	0.4	0.1	0.1	0.04
	Endrin Aldehyde HQ=	**1000**	**300**	**200**	**100**	**30**	**20**
	Endrin HQ=	**1000**	**300**	**100**	**100**	**30**	**10**
	2,3,7,8-TCDD Equivalents (Avian) HQ=	**9**	-	**3**	1	-	0.3
Red-tailed Hawk	Copper HQ=	**5**	1	0.3	**4**	1	0.3
	Lead HQ=	**5**	1	1	**4**	1	1

Notes:
HQ = hazard quotient
Bolded values indicate HQ greater than 1
Summary HQs taken from Tables 8-8.1 through 8-8.9 and expressed to 1 significant figure.

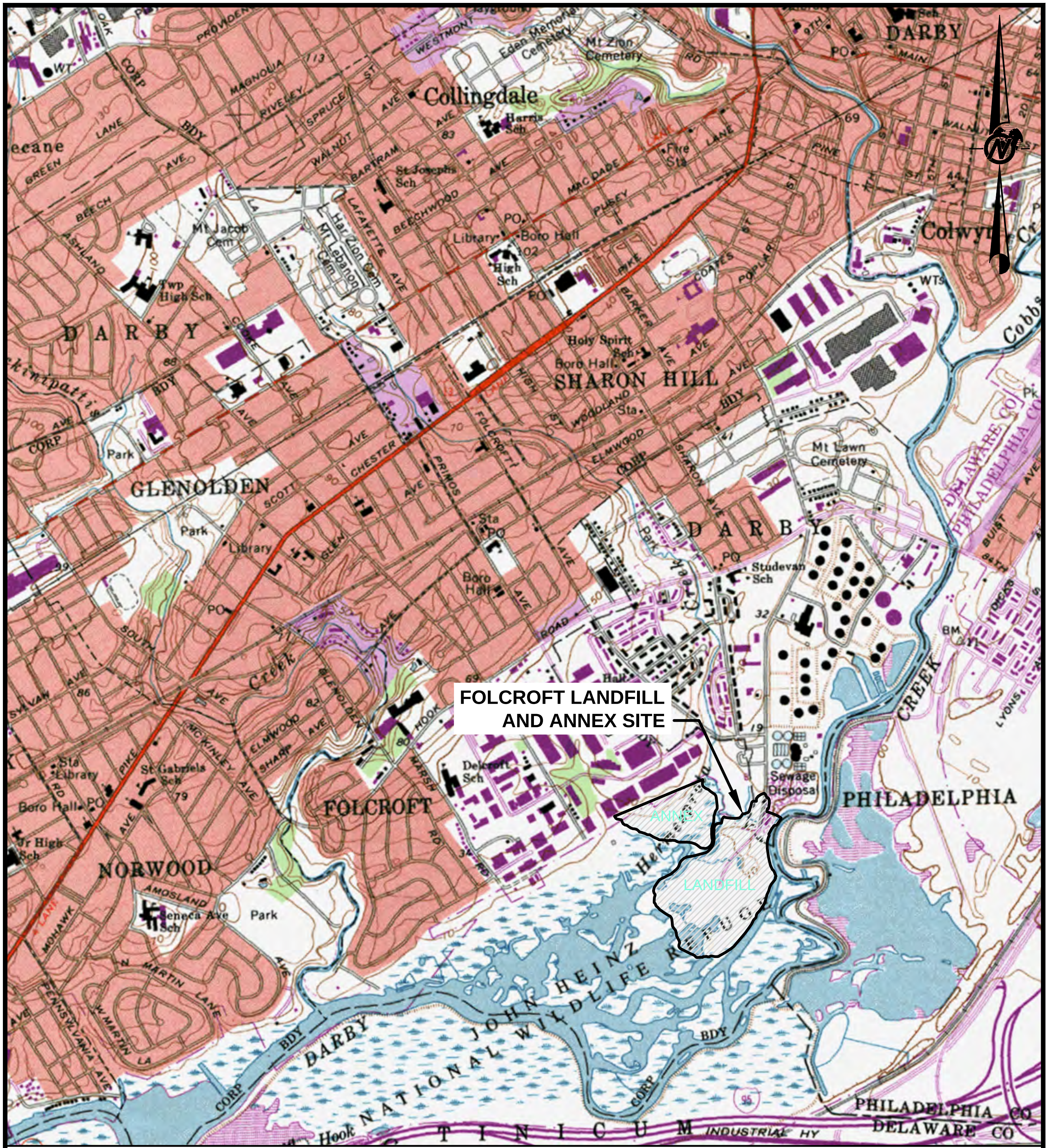
Table 8-13
Summary of Potential Ecological Risks - Annex
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

RECEPTOR	COPEC		NOAEL			LOAEL		
			MAX CONC.	95% UCL CONC.	MEAN CONC.	MAX CONC.	95% UCL CONC.	MEAN CONC.
Deer Mouse	Aluminum	HQ =	**300**	**200**	**100**	**30**	**20**	**10**
	Thallium	HQ =	**2**	-	-	0.2	-	-
	Bis(2-Ethylhexyl) Phthalate	HQ =	1	0.3	0.3	0.1	0.03	0.03
	Di-N-Octyl Phthalate	HQ =	**3**	-	-	-	-	-
	Aroclor-1248	HQ =	**10**	-	0.0	1	-	0.0001
	Aroclor-1254	HQ =	**2**	0.1	0.1	0.2	0.01	0.005
	Aldrin	HQ =	**4**	1	0.6	0.8	0.3	0.1
	Heptachlor Epoxide	HQ =	**2**	0.5	0.2	0.2	0.1	0.02
	Endrin Aldehyde	HQ =	**4**	0.7	0.4	0.4	0.1	0.04
	Endrin	HQ =	**5**	0.9	0.4	0.5	0.1	0.04
	2,3,7,8-TCDD Equivalents (Mammals)	HQ =	**4**	-	**3.0**	0.4	-	0.30
Short-tailed Shrew	Aluminum	HQ =	**2000**	**1000**	**1000**	**200**	**100**	**100**
	Antimony	HQ =	**6**	**2**	**2**	**6**	**2**	**2**
	Cadmium	HQ =	**2**	0.9	0.02	0.2	0.1	0.002
	Chromium	HQ =	**3**	0.7	0.2	1	0.2	0.1
	Copper	HQ =	**2**	0.6	0.1	1	0.4	0.1
	Lead	HQ =	**2**	0.8	0.2	**2**	0.7	0.1
	Nickel	HQ =	**5**	**2**	0.2	**3**	1	0.1
	Selenium	HQ =	**4**	1	0.6	**4**	1	0.6
	Thallium	HQ =	**20**	-	-	**2**	-	-
	Zinc	HQ =	1	0.7	0.6	0.1	0.1	0.1
	Bis(2-Ethylhexyl) Phthalate	HQ =	**7**	**2**	**2**	1	0.2	0.2
	Di-N-Octyl Phthalate	HQ =	**20**	-	-	-	-	-
	Aroclor-1248	HQ =	**70**	-	0.004	**7**	-	0.0004
	Aroclor-1254	HQ =	**10**	1	0.3	1	0.1	0.03
	Aldrin	HQ =	**30**	**9**	**4**	**6**	**2**	0.8
	beta-BHC	HQ =	**2**	0.3	0.2	0.4	0.1	0.03
	Methoxychlor	HQ =	1	-	0.1	1	-	0.1
	Dieldrin	HQ =	**2**	0.4	0.3	1	0.2	0.1
	Heptachlor Epoxide	HQ =	**10**	**4**	**2**	1	0.4	0.2
	Endrin Aldehyde	HQ =	**30**	**5**	**3**	**3**	0.5	0.3
	Endrin	HQ =	**40**	**7**	**3**	**4**	0.7	0.3
	2,3,7,8-TCDD Equivalents (Mammals)	HQ =	**9**	-	**3**	0.9	-	0.3
Meadow Vole	Aluminum	HQ =	**20**	**20**	**10**	**2**	**2**	1
Red Fox	Aluminum	HQ =	**10**	**7.0**	**6.0**	1	0.7	0.6
American Robin	Aluminum	HQ =	**30**	**20**	**20**	-	-	-
	Arsenic	HQ =	1	0.4	0.2	0.7	0.2	0.1
	Cadmium	HQ =	1	0.5	0.1	0.1	0.04	0.003
	Chromium	HQ =	**3**	1	0.5	**3**	0.9	0.5
	Copper	HQ =	**4**	1	0.5	**3**	1	0.4
	Lead	HQ =	**7**	**3**	1	**6**	**3**	1
	Nickel	HQ =	1	0.5	0.1	0.8	0.3	0.1
	Selenium	HQ =	**2**	0.6	0.4	**2**	0.5	0.3
	Vanadium	HQ =	**7**	**5**	**4**	**6**	**4**	**3**
	Zinc	HQ =	**2**	0.8	0.6	0.8	0.3	0.3
	Bis(2-Ethylhexyl) Phthalate	HQ =	**90**	**30**	**30**	-	-	-
	Aroclor-1248	HQ =	**20**	-	0.002	**2**	-	0.0002
	Aroclor-1254	HQ =	**4**	0.3	0.1	0.4	0.03	0.01
	beta-BHC	HQ =	1	0.2	0.1	0.3	0.1	0.02
	Endrin Aldehyde	HQ =	**200**	**40**	**20**	**20**	**4**	**2**
	Endrin	HQ =	**300**	**50**	**20**	**30**	**5**	**2**
	2,3,7,8-TCDD Equivalents (Avian)	HQ =	**2**	-	0.6	0.2	-	0.06
Northern Bobwhite	None							

Table 8-13
Summary of Potential Ecological Risks - Annex
Remedial Investigation/Feasibility Study
Folcroft Landfill and Annex Site - Folcroft, PA

RECEPTOR	COPEC		NOAEL MAX CONC.	NOAEL 95% UCL CONC.	NOAEL MEAN CONC.	LOAEL MAX CONC.	LOAEL 95% UCL CONC.	LOAEL MEAN CONC.
American Woodcock	Aluminum	HQ =	**50**	**30**	**30**	-	-	-
	Cadmium	HQ =	**2**	0.9	0.02	0.1	0.1	0.002
	Chromium	HQ =	**4**	1	0.4	**4**	1	0.4
	Copper	HQ =	**4**	1	0.3	**4**	1	0.2
	Lead	HQ =	**8**	**4**	1	**7**	**3**	0.9
	Nickel	HQ =	**2**	0.8	0.1	1	0.5	0.1
	Selenium	HQ =	**3**	0.7	0.4	**2**	0.6	0.4
	Vanadium	HQ =	**5**	**3**	**3**	**4**	**3**	**2**
	Zinc	HQ =	**2**	1.0	0.9	0.9	0.5	0.4
	Bis(2-Ethylhexyl) Phthalate		**200**	**60**	**50**	-	-	-
	Aroclor-1248	HQ =	**40**	-	0.002	**4**	-	0.0002
	Aroclor-1254	HQ =	**6**	0.5	0.2	0.6	0.1	0.02
	beta-BHC	HQ =	**2**	0.3	0.2	0.5	0.1	0.04
	Endrin Aldehyde	HQ =	**400**	**70**	**30**	**40**	**7**	**3**
	Endrin	HQ =	**500**	**90**	**40**	**50**	**9**	**4**
	2,3,7,8-TCDD Equivalents (Avian)	HQ =	**3**	-	0.8	0.3	-	0.1
Red-tailed Hawk	None							

Notes:
HQ = hazard quotient
Bolded values indicate HQ greater than 1
Summary HQs taken from Tables 8-9.1 through 8-9.8 and expressed to 1 significant figure.



REFERENCE

1.) BASE MAP TAKEN FROM 7.5 MINUTE U.S.G.S. QUADRANGLE OF LANSDOWNE, PENNSYLVANIA, DATED 1967, PHOTOREVISED 1994.

NOTE

1.) SITE BOUNDARIES ARE APPROXIMATE.

2000 0 2000

SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

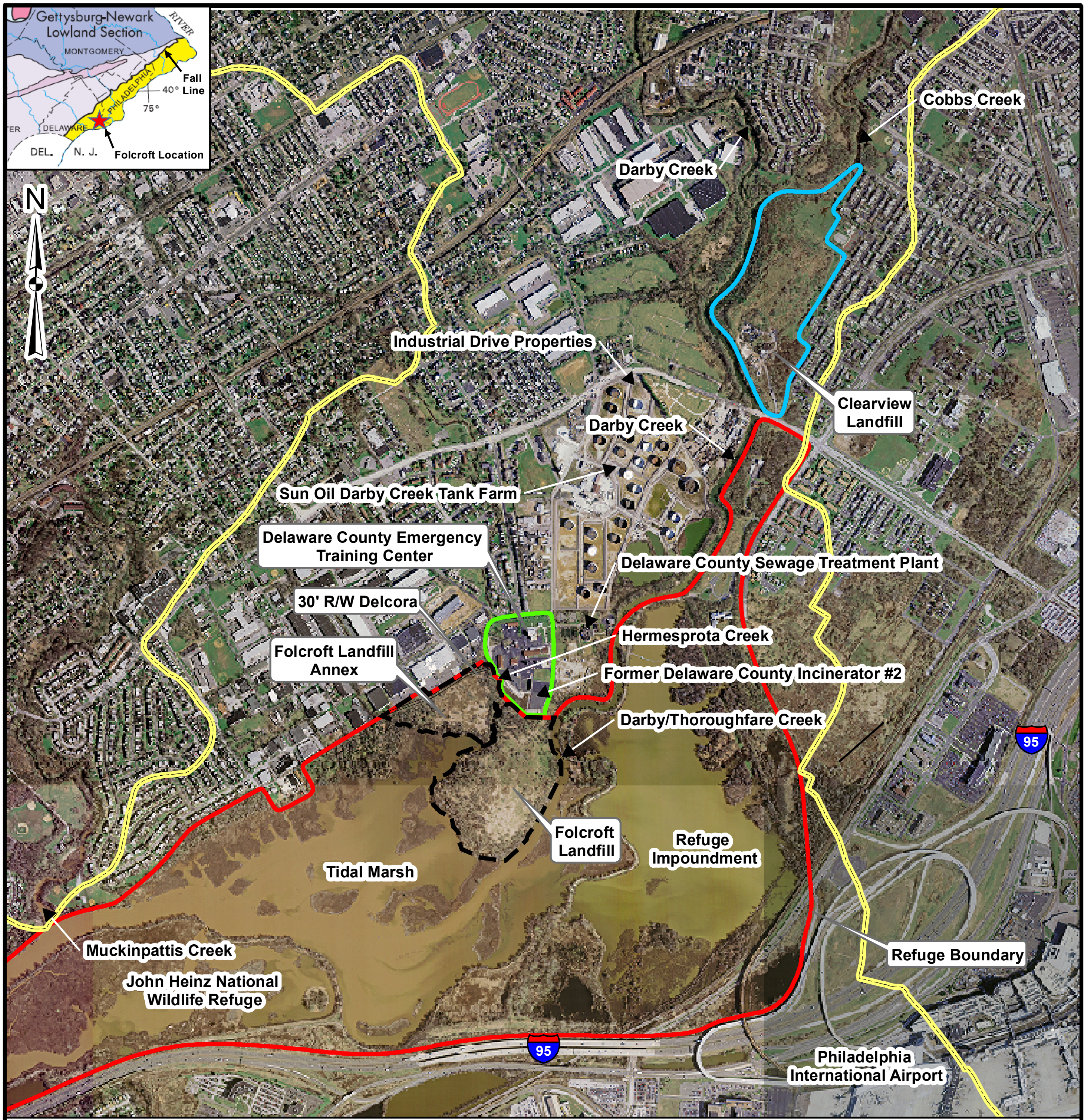
TITLE

SITE LOCATION MAP

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.		023-6134	FILE No.	0236134N009
DESIGN	BAR	05/19/17	SCALE AS SHOWN	REV. 0
CADD	RG	05/19/17	**FIGURE 1-1**	
CHECK	BAR	05/19/17		
REVIEW	JBG	05/19/17		

Drawing file: C:\Users\RGrams\Desktop\Folescroft\N - 2017 Remedial Investigation Report\Active\0236134N009.dwg May 19, 2017 - 1:14pm



LEGEND

WATERSHED BOUNDARY

APPROXIMATE SITE BOUNDARIES

REFUGE BOUNDARY

DELAWARE COUNTY EMERGENCY TRAINING CENTER BOUNDARY

CLEARVIEW LANDFILL BOUNDARY

REFERENCES

1.) AERIAL PHOTOGRAPHY 2003-2006 DOWNLOADED FROM PASDA WEBSITE AT http://maps.pasda.psu.edu.

2.) The Pennsylvania Department of Conservation and Natural Resources (DCNR), MAP 13, 2000.

REV.	DATE	DES	REVISION DESCRIPTION	GIS	CHK	RVW
1	05/18/18	BAR	ADDED TIDAL MARSH AND REFUGE IMPOUNDMENT LABELS	RG	BAR	MSK

PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PA

TITLE

LOWER DARBY CREEK AREA (LDCA)

Golder Associates

PROJECT No.		023-6134
DESIGN	BAR	05/19/17
GIS	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No. 0236134N019

SCALE: AS SHOWN REV. 1

FIGURE 1-2

Map Document: V:\Projects\2002\023-6134\MXD\0236134F010.mxd / Modified 3/12/2010 2:41:20 PM / Plotted 5/21/2010 3:53:18 PM by AMorales

Drawing file: 0236134N010-Rev1.dwg May 16, 2018 - 1:34pm

LEGEND

- EASEMENT OR RIGHT-OF-WAY
- APPROXIMATE SITE BOUNDARIES
- MONITORING WELL LOCATION
- ADDITIONAL GW INVESTIGATION WELL LOCATION
- PHASE I UPGRADIENT WELL LOCATION
- PHASE I SCREENING LOCATION
- REFUGE WELL LOCATION
- UPPER BEDROCK WELL LOCATION
- STAFF GAUGE

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES. MONITORING WELLS MW-21 AND MW-22 SURVEYED ON JULY 17, 2015 BY VARGO ASSOCIATES. MONITORING WELL MW-20B WAS SURVEYED ON NOVEMBER 5, 2015 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	05/18/18	BAR	ADDED TIDAL MARSH LABEL	RG	BAR	MSK

PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

CURRENT SITE CONDITIONS

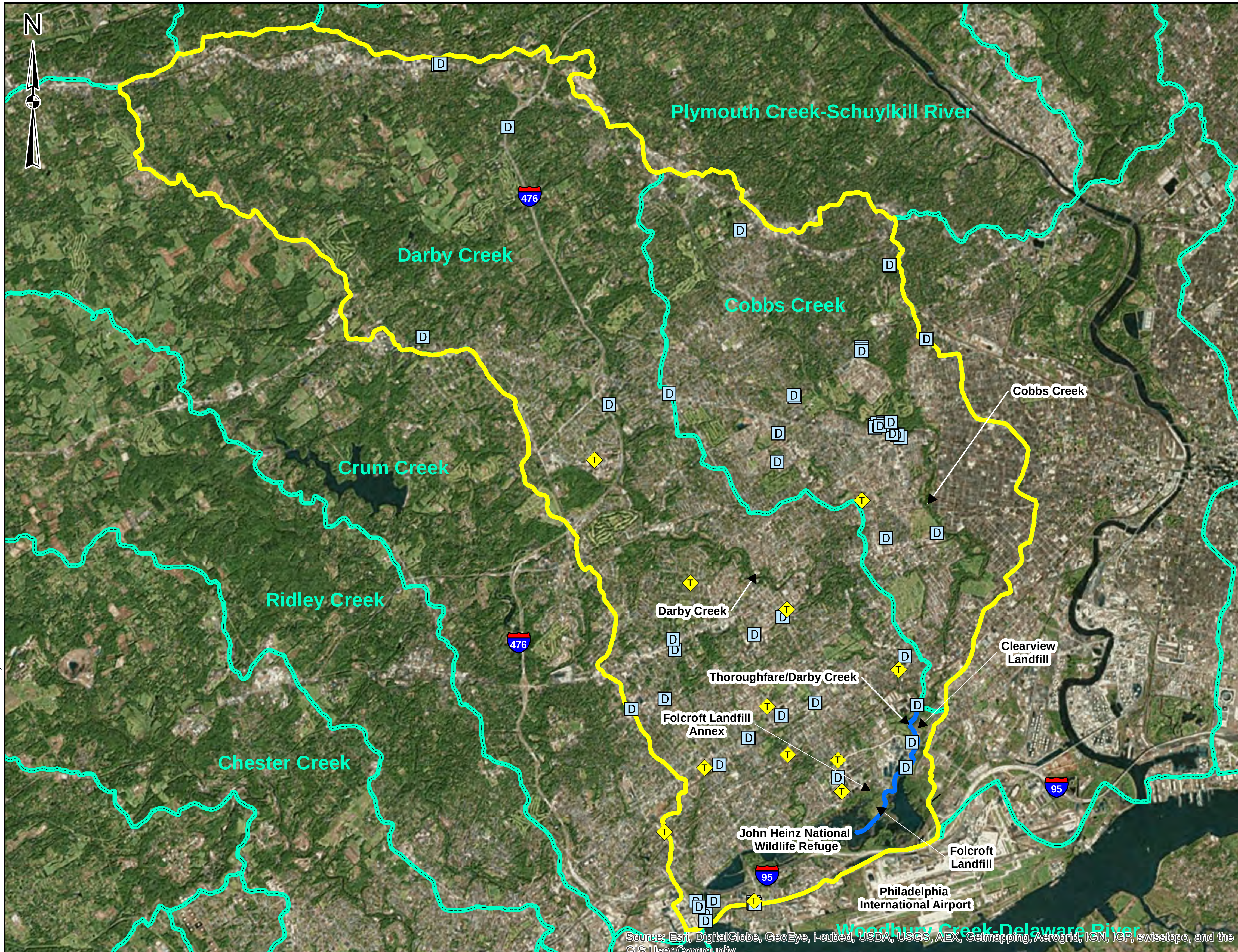
NJ Authorization #24GA28029100

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.		023-6134
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No. 0236134N010
SCALE AS SHOWN | REV. 1

FIGURE 2-1



LEGEND

- T Toxic Release Inventory Site
- D Permitted Treatment Facility or Discharge Point
- Thoroughfare/Darby Creek
- Subshed Boundary
- Darby Creek Watershed Boundary

REFERENCES

1) WORLD IMAGERY SERVICE PUBLISHED BY ESRI AND DOWNLOADED VIA THE ARCGIS GET ONLINE RESOURCE TOOL ON APRIL 8, 2010

2) PERMITTED TREATMENT FACILITY AND DISCHARGE POINTS DOWNLOADED FROM PENNSYLVANIA SPATIAL DATA ACCESS (PASDA) WEB SITE ON APRIL 21, 2010.

3) TOXIC RELEASE INVENTORY SITES DOWNLOADED FROM PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL PROTECTION WEB SITE VIA eMapPA TOOL ON APRIL 20, 2010.

0 4,050 8,100 16,200
Feet

Golder Associates

SCALE	AS SHOWN
DATE	05/19/17
DESIGN	BAR
GIS	RG
CHECK	BAR
REVIEW	JBG

FILE No. 0236134N020

PROJECT No. 023-6134 REV. 0

DARBY-COBBS CREEK WATERSHED

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE FOLCROFT, PA

FIGURE 2-2

Map Document: 0236134F040_6000.mxd / Modified 4/29/2010 4:33:40 PM / Plotted 5/20/2010 3:06:00 PM by Divanov

LEGEND

APPROXIMATE SITE BOUNDARIES

PROPERTY LINES

EASEMENT OR RIGHT-OF-WAY

REFERENCES

1.) 2004 AERIAL PHOTOGRAPHY PROVIDED BY MAPMART.COM.

2.) TRACT LINES FROM DIGITAL CAD FILE FOLCROFT.DWG ENTITLED "PLAN OF SURVEY," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART.

400 0 400
SCALE FEET

May 19, 2017 - 1:18pm
Drawing file: 0236134N011.dwg

NJ Authorization #24GA28029100
Golder Associates
Mt. Laurel, New Jersey

SCALE	AS SHOWN	TITLE	SITE BOUNDARY INFORMATION
DATE	05/19/17		
DESIGN	BAR		
CADD	RG		
FILE No. 0236134N011	CHECK	BAR	
PROJECT No. 023-6134 REV. 0	REVIEW	JBG	FOLCROFT LANDFILL AND ANNEX SITE — FIGURE 2-3

Drawing file: 0236134N012.dwg May 19, 2017 - 1:19pm

REFERENCE

1.) AERIAL PHOTOS PROVIDED BY E DATA RESOURCES (EDR) INC.

TITLE

HISTORICAL SITE CONDITIONS

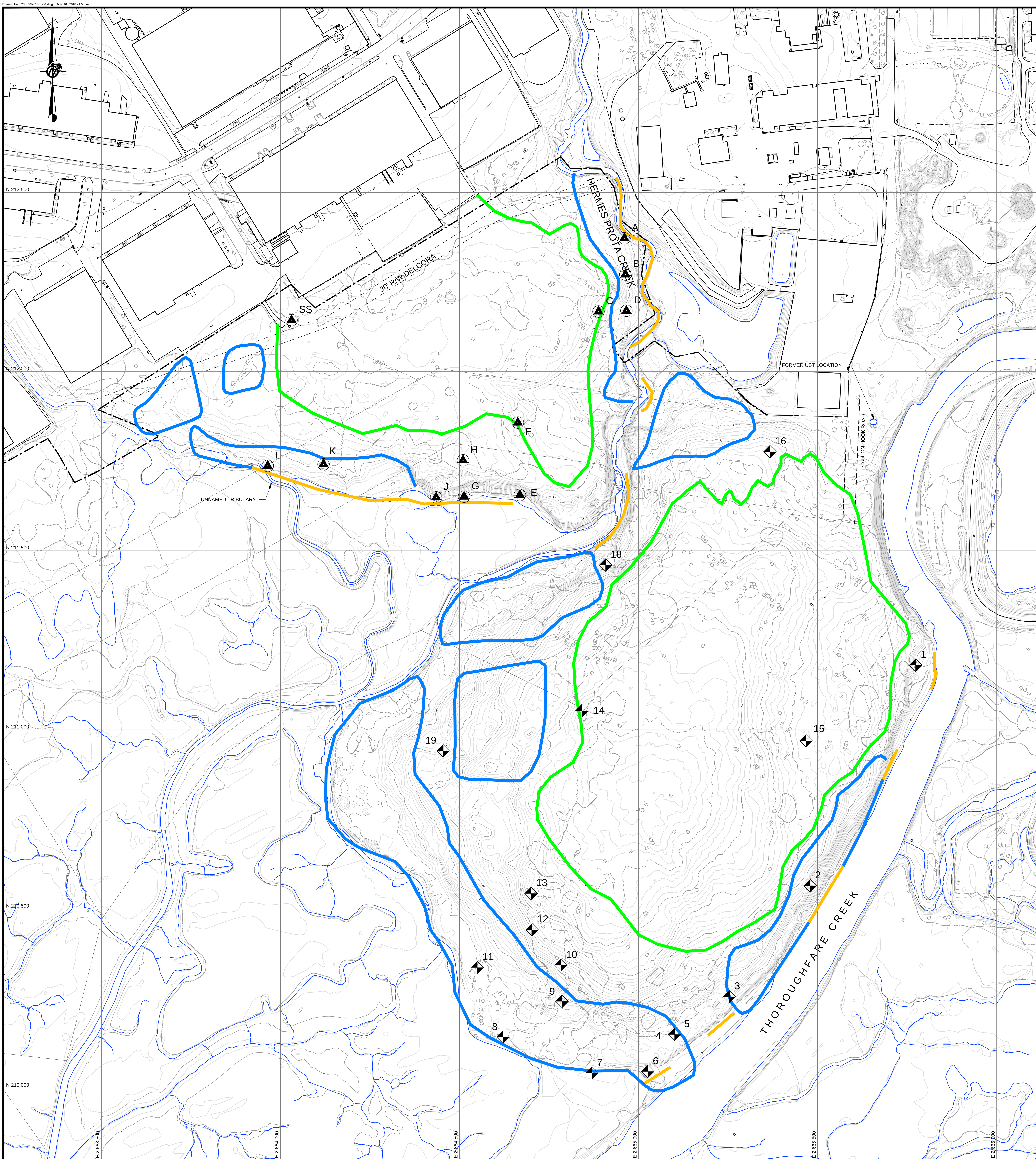
PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	023-6134	
FILE No.	0236134N012	
REV. 0	SCALE	AS SHOWN
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FIGURE 2-4



LEGEND

PROPERTY LINE

EASEMENT OR RIGHT-OF-WAY

EDGE OF ROAD

APPROXIMATE SITE RECONNAISSANCE AREAS (ANNEX)

APPROXIMATE SITE RECONNAISSANCE AREAS (LANDFILL)

OBSERVED INTERTIDAL SEEPS OR STAINED SOIL

AREAS WITH OBSERVED WASTE/DEBRIS AT THE SURFACE

AREAS WITH DENSE VEGETATIVE GROWTH AND NO WASTE/DEBRIS OBSERVED ON THE SURFACE

NOTE

1.) THE AREAS BETWEEN THE BLUE AND GREEN CONTOURED AREAS DO NOT HAVE WASTE AT THE SURFACE AND DO NOT HAVE DENSE VEGETATIVE GROWTH.

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) MAP BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) APPROXIMATE SITE RECONNAISSANCE AREAS LOCATED WITH HAND-HELD GLOBAL POSITIONING SYSTEM (GPS) DEVICE DURING INVESTIGATION WORK.

100 0 100 200
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	05/18/18	BAR	ADDED NOTE 1	RG	BAR	MSK

PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

PRELIMINARY COVER AND PERIMETER SURVEY RESULTS

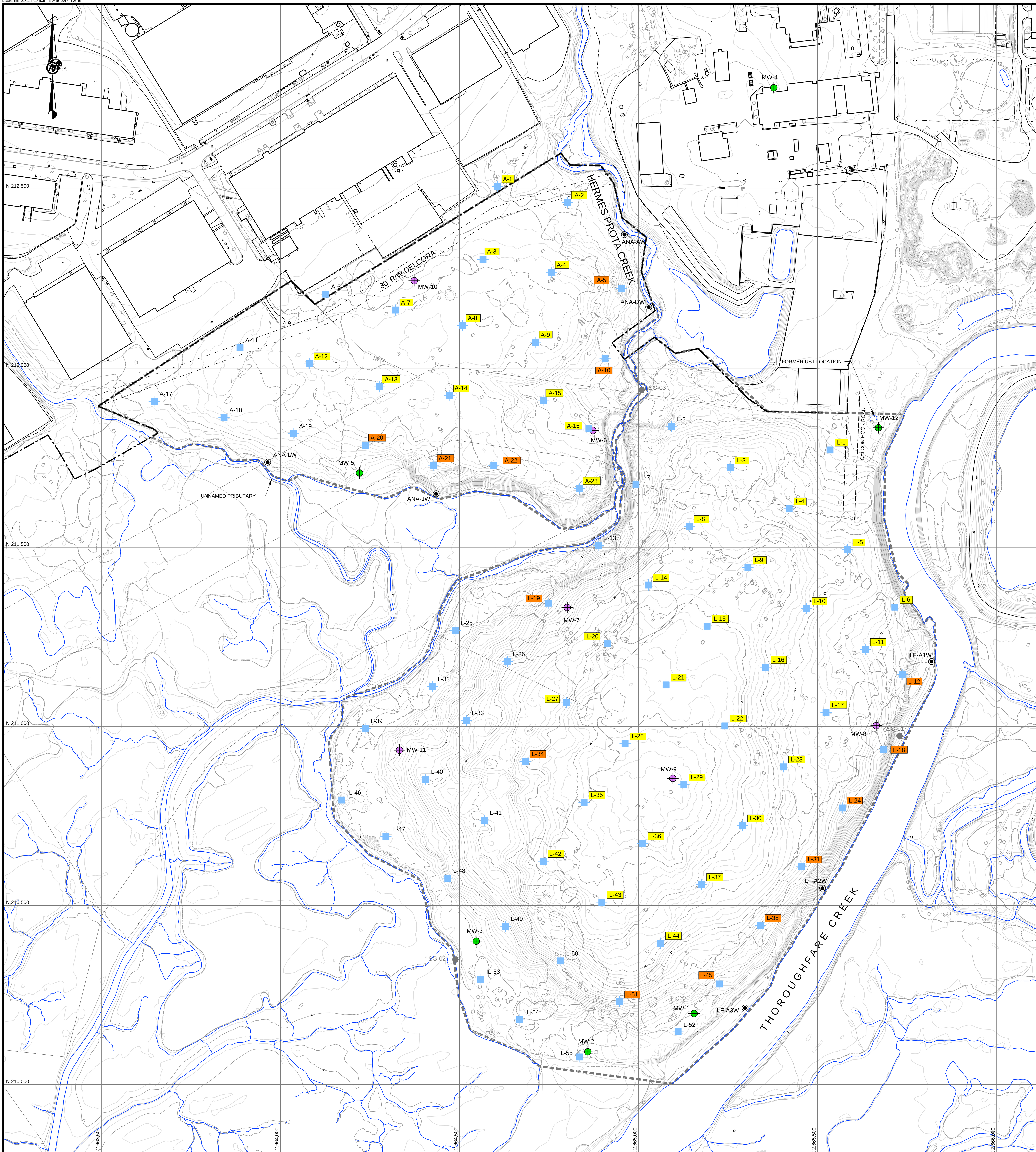
Golder Associates
Mt. Laurel, New Jersey

PROJECT No.		023-6134
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No. 0236134N014
SCALE AS SHOWN | REV. 1

FIGURE 3-1

Drawing file: 0236134N015.dwg May 19, 2017 - 1:36pm



LEGEND

- PROPERTY LINE
- EASEMENT OR RIGHT-OF-WAY
- EDGE OF ROAD
- APPROXIMATE SITE BOUNDARIES
- LANDFILL COVER INVESTIGATION, SOIL SAMPLING, AND AMBIENT AIR MEASUREMENT LOCATIONS
- HISTORIC MONITORING WELL
- NEW MONITORING WELL
- SEEP SAMPLING LOCATION
- STAFF GAUGE
- INDICATES INITIAL PROPOSED SOIL BORING LOCATION
- INDICATES SOIL BORING LOCATIONS ADDED BY EPA

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) MAP BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) MONITORING WELLS MW-1 THROUGH MW-12 AND STAFF GAUGES SG-1 THROUGH SG-3 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007.

5.) SOIL BORING LOCATIONS STAKED OUT BY JAMES M. STEWART, DECEMBER 13-15, 2006.

6.) APPROXIMATE SEEP AREA SAMPLING LOCATIONS DETERMINED WITH HAND-HELD GLOBAL POSITIONING SYSTEM (GPS) DEVICE DURING INVESTIGATION WORK.

100 0 100 200
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

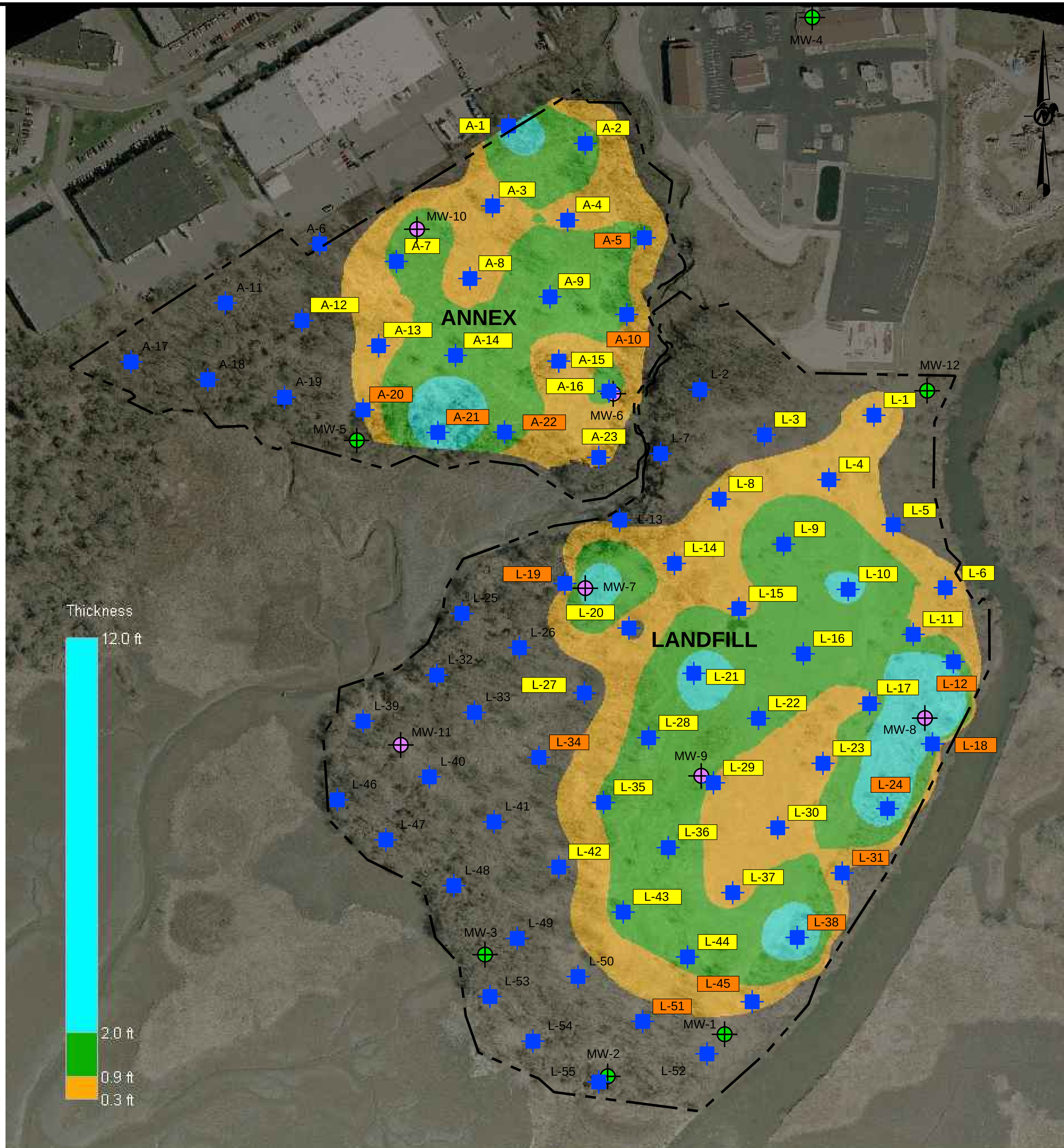
RI FIELD SAMPLING LOCATIONS

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	023-6134	
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No.	0236134N015
SCALE	AS SHOWN
REV.	0

FIGURE 3-2



LEGEND

- APPROXIMATE SITE BOUNDARY
- LANDFILL COVER INVESTIGATION, SOIL SAMPLING, AND AMBIENT AIR MEASUREMENT LOCATIONS
- HISTORIC MONITORING WELL
- NEW MONITORING WELL
- INDICATES INITIAL PROPOSED SOIL BORING LOCATION
- INDICATES SOIL BORING LOCATIONS ADDED BY EPA

NOTE

1.) PROJECTED COVER THICKNESS BASED ON OBSERVATIONS DURING COVER INVESTIGATION (TABLE 3-4) AND MONITORING WELL INSTALLATION (TABLE 3-7).

REFERENCES

1.) 2004 AERIAL PHOTOGRAPHY PROVIDED BY MAPMART.COM.

2.) MONITORING WELLS MW-1 THROUGH MW-12 AND STAFF GAUGES SG-1 THROUGH SG-3 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007.

3.) SOIL BORING LOCATIONS STAKED OUT BY JAMES M. STEWART, DECEMBER 13-15, 2006.

Golder Associates
Mt. Laurel, New Jersey

PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

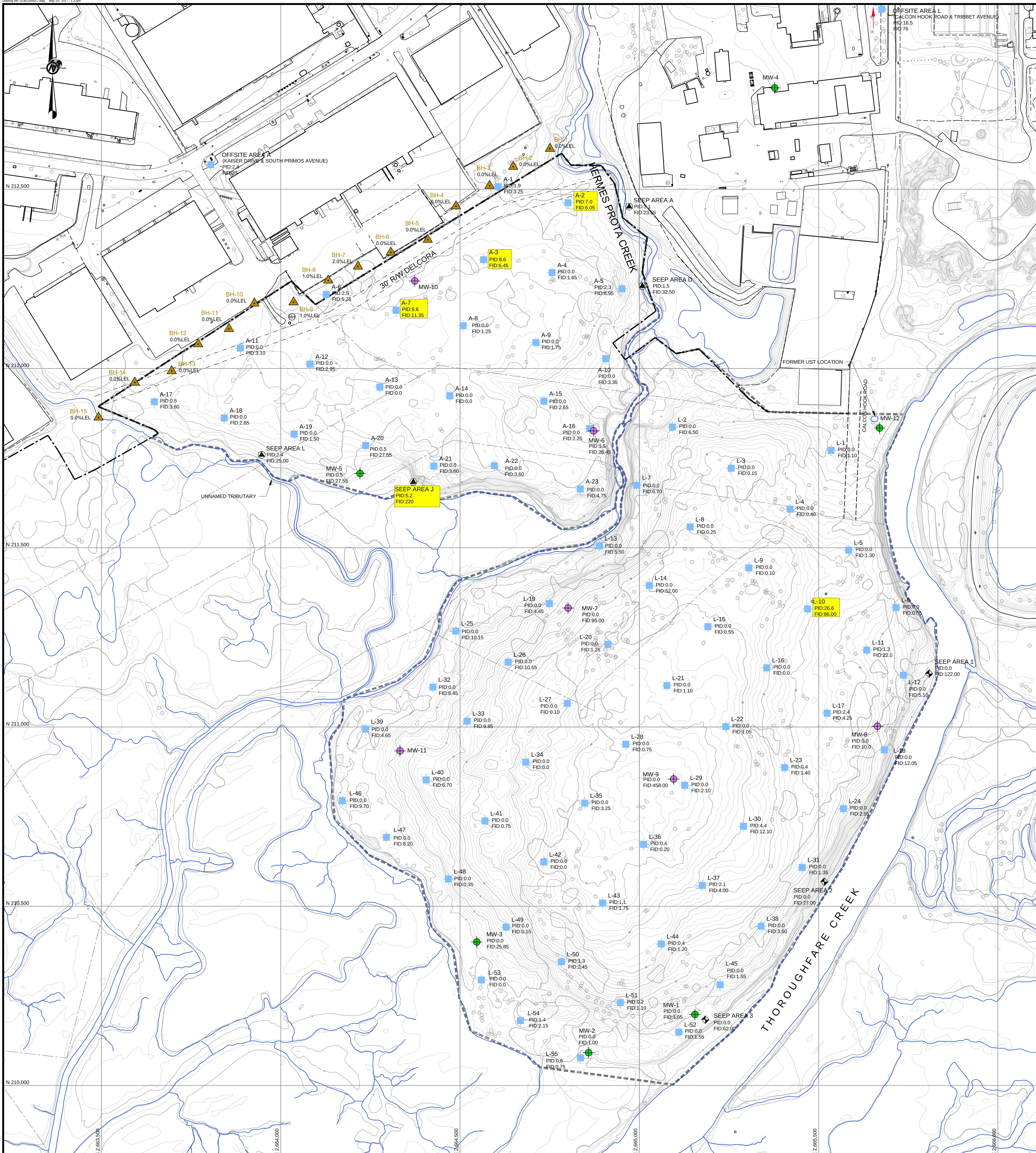
TITLE
PROJECTED COVER GREATER THAN 0.3 FEET

PROJECT No.		023-6134
FILE No.		0236134N016
REV. 0	SCALE	N.T.S.
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FIGURE 3-3

Drawing file: 0236134N016.dwg May 19, 2017 - 1:33pm

Drawing file: 0236134N017.dwg May 19, 2017 - 1:37pm



LEGEND

- PROPERTY LINE
- EASEMENT OR RIGHT-OF WAY
- EDGE OF ROAD
- APPROXIMATE SITE BOUNDARIES
- LANDFILL GAS BARHOLE PROBE
- SOIL SAMPLING GRID / AMBIENT AIR MONITORING LOCATIONS
- HISTORIC MONITORING WELL
- NEW MONITORING WELL
- APPROXIMATE SEEPAGE LOCATIONS (ANNEX)
- APPROXIMATE SEEPAGE LOCATIONS (LANDFILL)
- AREAS FOR ADDITIONAL MONITORING

NOTES

1.) LANDFILL GAS SURVEY PERFORMED ON 12/19/2006.

2.) AMBIENT AIR MONITORING PERFORMED AT LANDFILL ON 9/25 - 9/26/2007 AND AT ANNEX ON 9/27/2007.

3.) LANDFILL GAS READINGS IN PERCENT LOWER EXPLOSIVE LIMIT (LEL) OF METHANE.

4.) FLAME IONIZATION DETECTOR (FID) AND PHOTOIONIZATION DETECTOR (PID) READINGS IN PARTS PER MILLION (PPM).

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) MAP BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) MONITORING WELLS MW-1 THROUGH MW-12 AND STAFF GAUGES SG-1 THROUGH SG-3 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007.

5.) SOIL BORING LOCATIONS STAKED OUT BY JAMES M. STEWART, DECEMBER 13-15, 2006.

6.) APPROXIMATE SEEP AREA SAMPLING LOCATIONS DETERMINED WITH HAND-HELD GLOBAL POSITIONING SYSTEM (GPS) DEVICE DURING INVESTIGATION WORK.

PID LIMIT

BACKGROUND READING +5.0 ppm

FID LIMIT (METHANE)

HIGHER OF TWO CRITERIA
1.) BACKGROUND READING X2

2.) 25% OF METHANE LEL
METHANE LEL=5.0%=50,000 ppm
25% LEL= 12,500 ppm

100 0 100 200
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE
LANDFILL GAS SURVEY AND INITIAL AMBIENT AIR MONITORING RESULTS

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	023-6134		FILE No.	0236134N017
DESIGN	BAR	05/19/17	SCALE AS SHOWN	REV. 0
CADD	RG	05/19/17	FIGURE 3-4	
CHECK	BAR	05/19/17		
REVIEW	JBG	05/19/17		

Drawing file: 0236134N036-Rev1.dwg May 16, 2018 - 2:03pm

LEGEND

- EASEMENT OR RIGHT-OF-WAY
- APPROXIMATE SITE BOUNDARIES
- MONITORING WELL LOCATION
- ADDITIONAL GW INVESTIGATION WELL LOCATION
- PHASE I UPGRADIENT WELL LOCATION
- PHASE I SCREENING LOCATION
- REFUGE WELL LOCATION
- UPPER BEDROCK WELL LOCATION
- STAFF GAUGE

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES. MONITORING WELLS MW-21 AND MW-22 SURVEYED ON JULY 17, 2015 BY VARGO ASSOCIATES. MONITORING WELL MW-20B WAS SURVEYED ON NOVEMBER 5, 2015 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	05/18/18	BAR	ADDED TIDAL MARSH LABEL	RG	BAR	MSK

PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

OFF-SITE GROUNDWATER INVESTIGATION LOCATIONS

NJ Authorization #24GA28029100

Golder Associates
Mt. Laurel, New Jersey

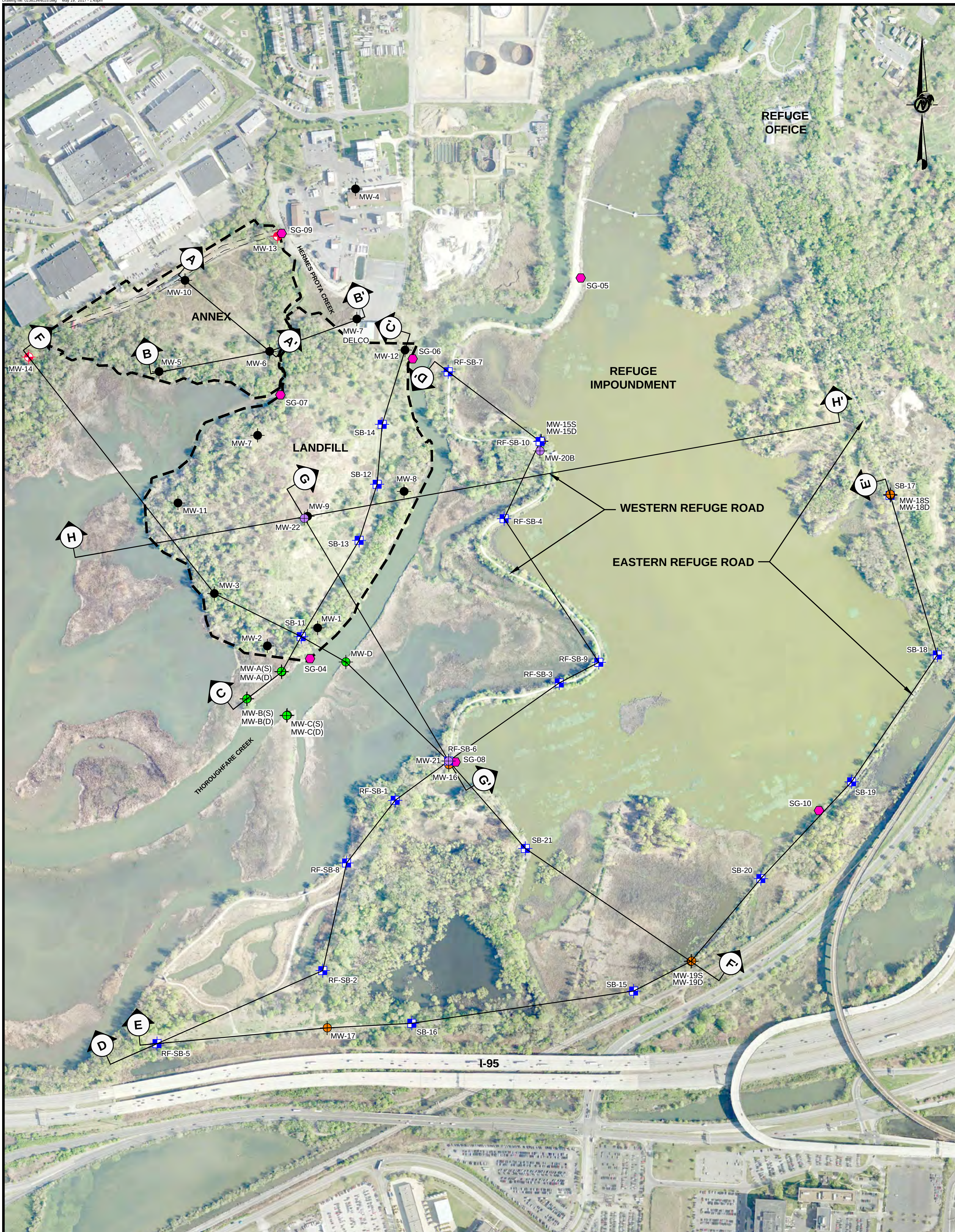
PROJECT No.		023-6134
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No. 0236134N036

SCALE AS SHOWN | REV. 1

FIGURE 3-5

Drawing file: 0236134N025.dwg May 19, 2017 - 1:45pm



LEGEND

	EASEMENT OR RIGHT-OF-WAY
	APPROXIMATE SITE BOUNDARIES
	MONITORING WELL LOCATION
	ADDITIONAL GW INVESTIGATION WELL LOCATION
	PHASE I UPGRADIENT WELL LOCATION
	PHASE I SCREENING LOCATION
	REFUGE WELL LOCATION
	UPPER BEDROCK WELL LOCATION
	STAFF GAUGE

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES. MONITORING WELLS MW-21 AND MW-22 SURVEYED ON JULY 17, 2015 BY VARGO ASSOCIATES. MONITORING WELL MW-20B WAS SURVEYED ON NOVEMBER 5, 2015 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

CROSS-SECTION LOCATION MAP

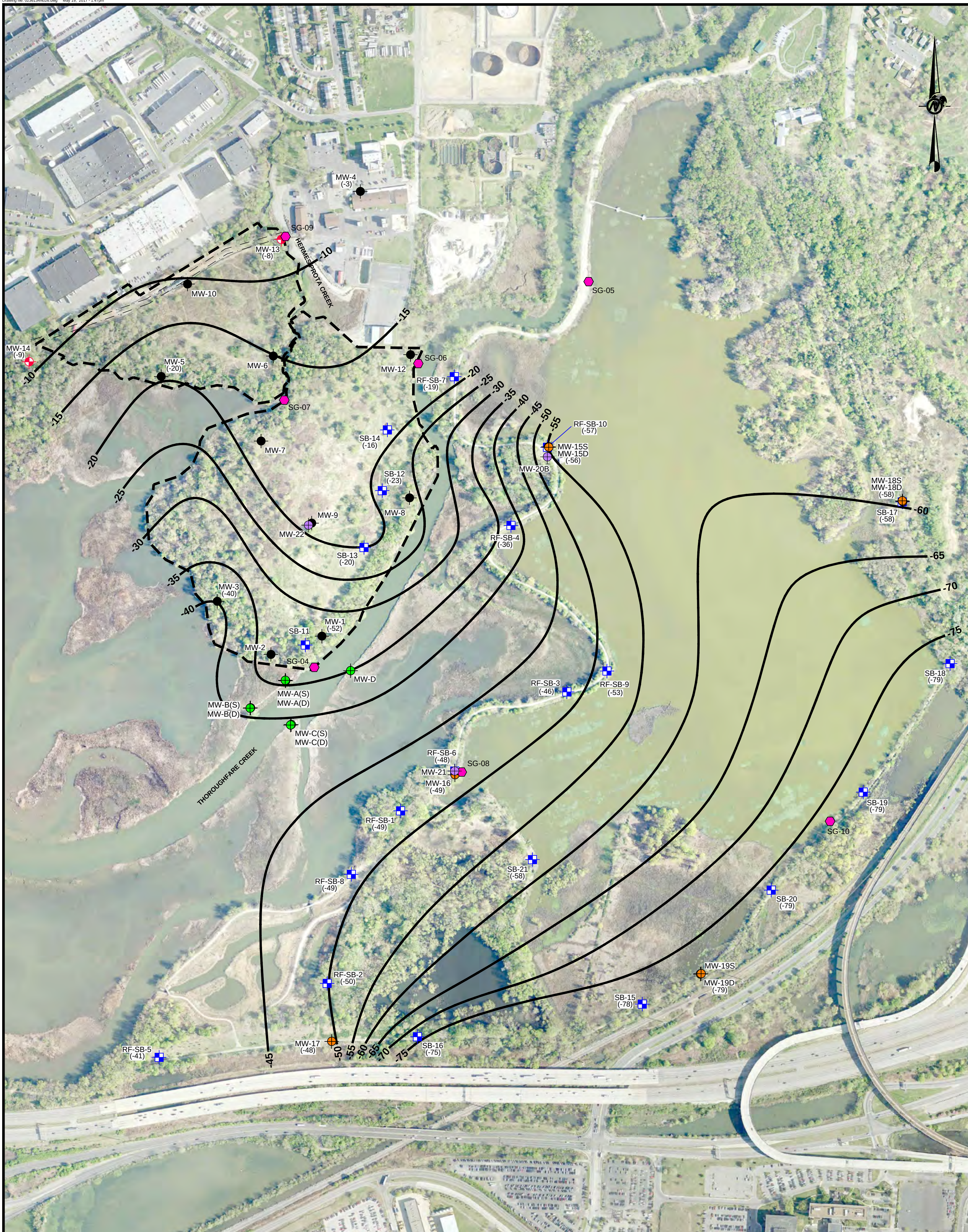
NJ Authorization #24GA28029100

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.		023-6134	FILE No.	0236134N025
DESIGN	BAR	05/19/17	SCALE AS SHOWN	REV. 0
CADD	RG	05/19/17		
CHECK	BAR	05/19/17		
REVIEW	JBG	05/19/17		

FIGURE 4-1

Drawing file: 0236134N026.dwg May 19, 2017 - 1:47pm



LEGEND

— · — · —	EASEMENT OR RIGHT-OF-WAY
– – – –	APPROXIMATE SITE BOUNDARIES
●	MONITORING WELL LOCATION
⊕ (green)	ADDITIONAL GW INVESTIGATION WELL LOCATION
⊕ (red)	PHASE I UPGRADIENT WELL LOCATION
⊞ (blue)	PHASE I SCREENING LOCATION
⊕ (orange)	REFUGE WELL LOCATION
⊕ (purple)	UPPER BEDROCK WELL LOCATION
⬢	STAFF GAUGE
-40	BEDROCK CONTOUR
(-50)	BEDROCK ELEVATION - FEET NAVD88

NOTE

1.) MW-1 BEDROCK ELEVATION NOT USED BECAUSE OF MISSING INFORMATION IN BORING LOG.

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES. MONITORING WELLS MW-21 AND MW-22 SURVEYED ON JULY 17, 2015 BY VARGO ASSOCIATES. MONITORING WELL MW-20B WAS SURVEYED ON NOVEMBER 5, 2015 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

TOP OF BEDROCK ELEVATIONS CONTOUR MAP

NJ Authorization #24GA28029100

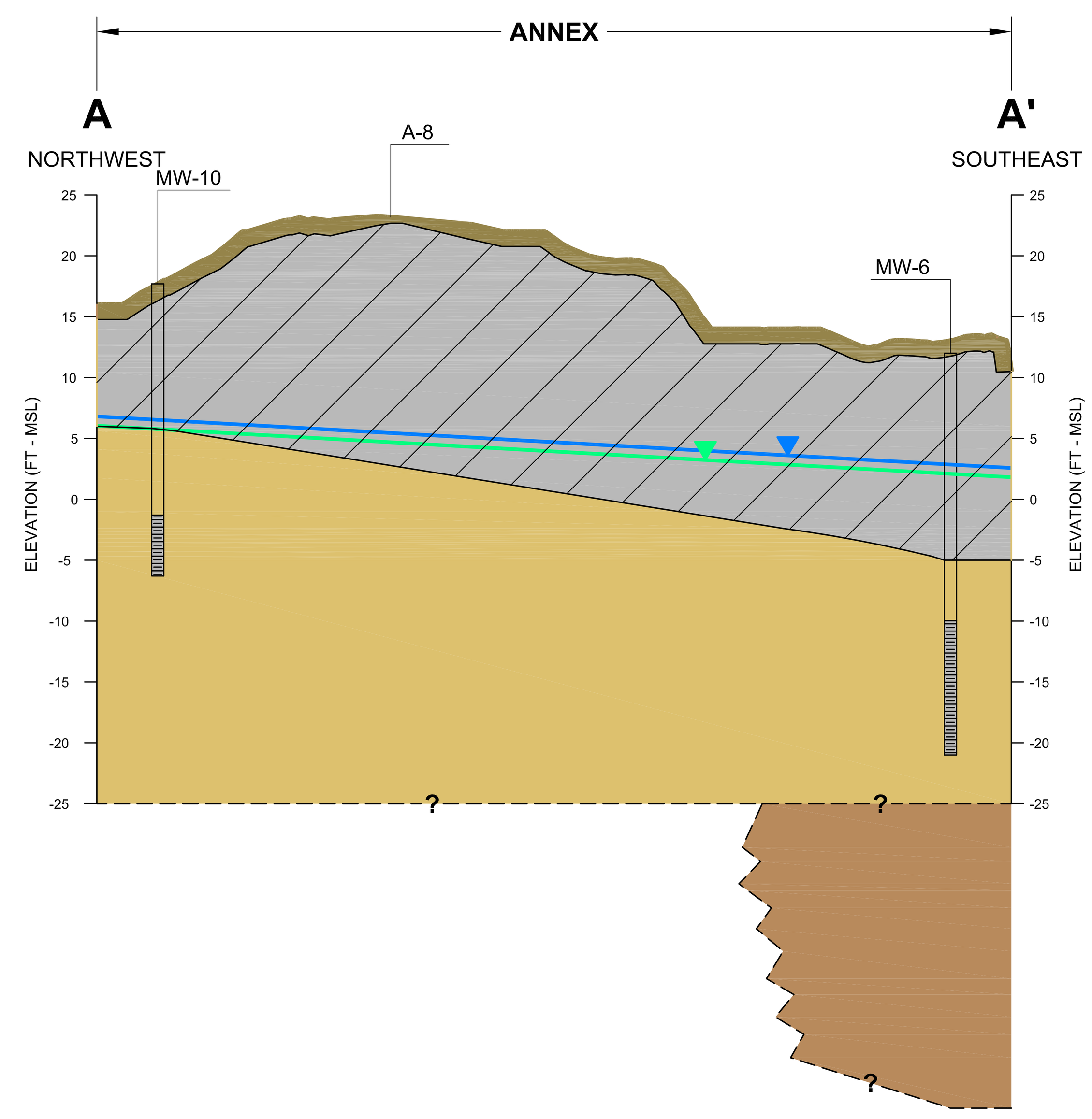
Golder Associates
Mt. Laurel, New Jersey

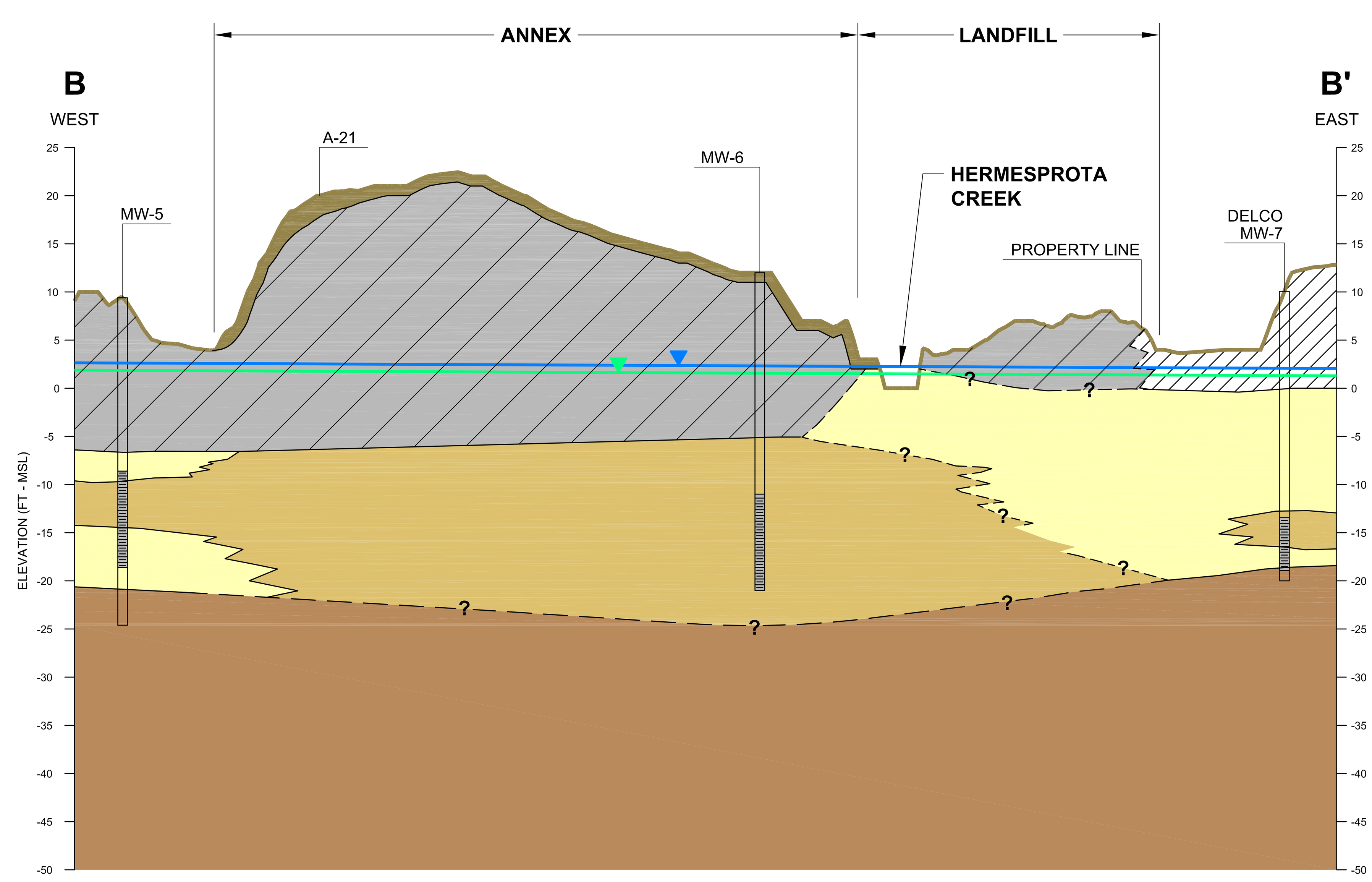
PROJECT No.		023-6134	
DESIGN	BAR	05/19/17	
CADD	RG	05/19/17	
CHECK	BAR	05/19/17	
REVIEW	JBG	05/19/17	

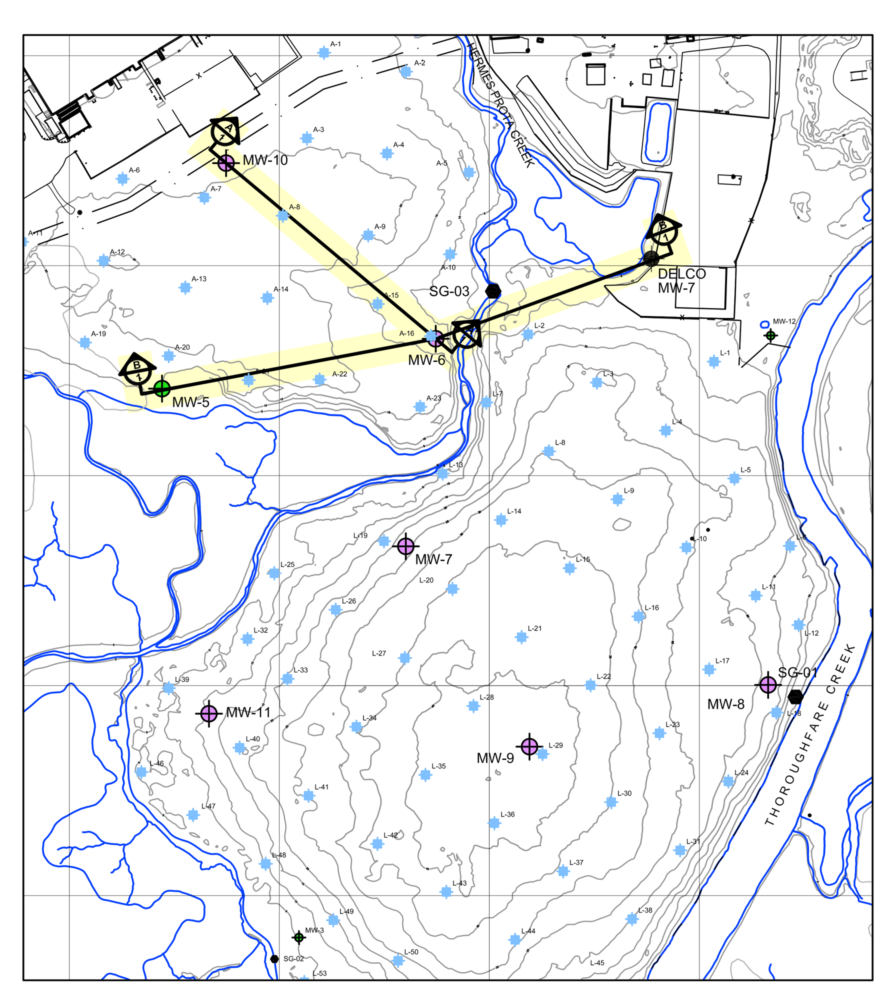
FILE No. 0236134N026

SCALE AS SHOWN REV. 0

FIGURE 4-2







CROSS SECTION LOCATIONS

LEGEND

MW-9 — LOCATION LABEL

TOP OF BOREHOLE

TOP OF SCREENED INTERVAL

BOTTOM OF SCREENED INTERVAL

EXISTING GROUND SURFACE

GROUNDWATER SURFACE (HIGH TIDE)

GROUNDWATER SURFACE (LOW TIDE)

WATER LEVEL

COVER SOIL / FILL: BROWN TO GREY SANDS AND SILTS

FILL / WASTE MATERIAL: PLASTICS, MUNICIPAL WASTE, CONSTRUCTION DEBRIS

SILTS: BROWN TO GREY, WITH TRACE SANDS

SANDS: BROWN FINE TO COARSE SAND WITH TRACE SILTS AND GRAVELS

GRAVEL WITH SANDS

BEDROCK (WISSAHICKON SCHIST)

FILL

NOTES

1.) MONITORING WELLS MW-5 AND DELCO MW-7 WERE INSTALLED BY OTHERS.

2.) GEOLOGIC CONTACTS DASHED WHERE INFERRED.

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) MONITORING WELLS MW-1 THROUGH MW-12 AND STAFF GAUGES SG-1 THROUGH SG-3 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007.

5.) SOIL BORING LOCATIONS STAKED OUT BY JAMES M. STEWART, DECEMBER 13-15, 2006.

100 0 100 200
HORIZONTAL SCALE FEET

10 0 10 20
VERTICAL SCALE FEET

VERTICAL EXAGGERATION 10x

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

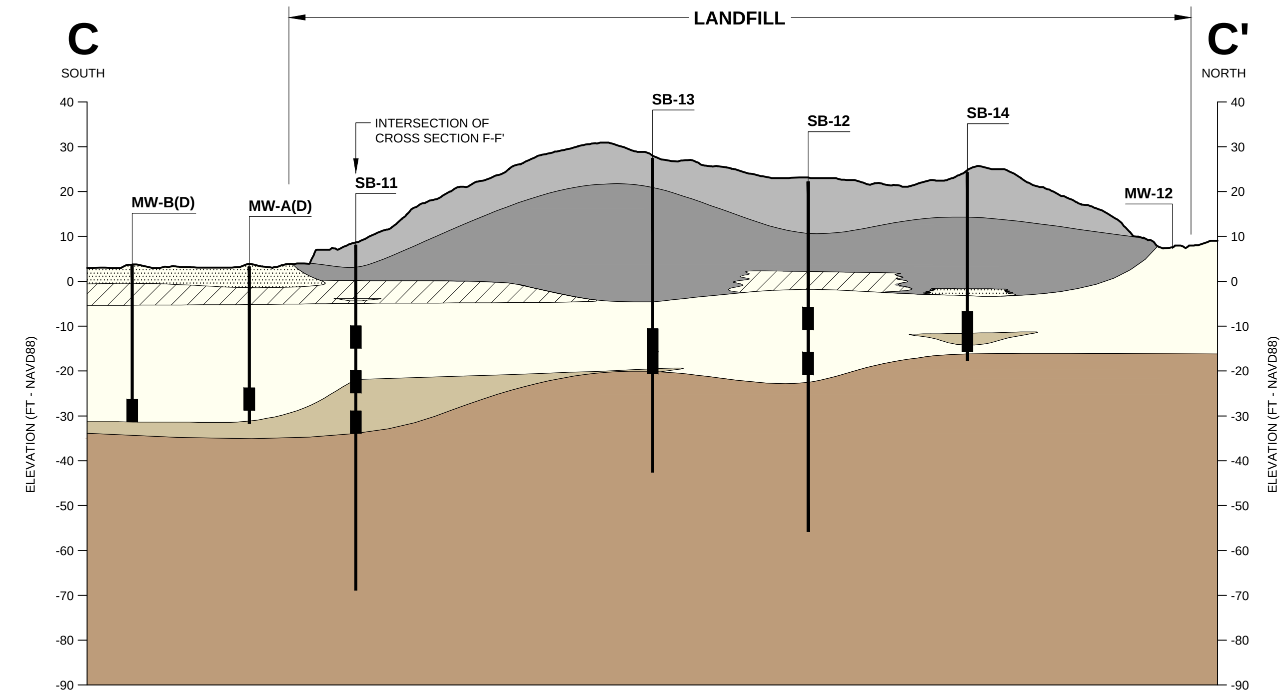
TITLE
ANNEX
CROSS SECTIONS A-A' AND B-B'

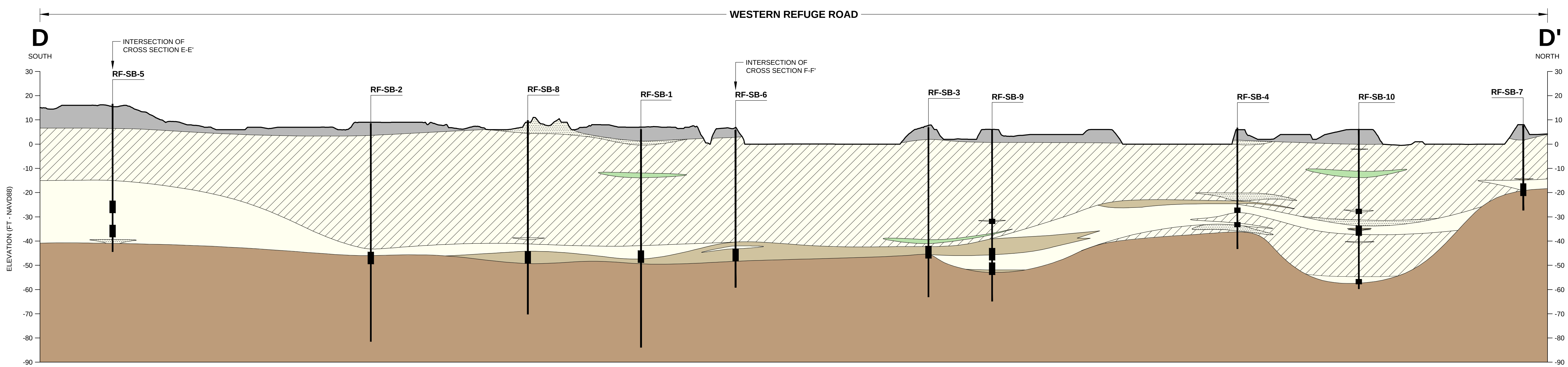
NJ Authorization #24GA28029100
Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	023-6134	
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No. 0236134N018
SCALE AS SHOWN REV. 0

FIGURE 4-3





200 0 200 400
HORIZONTAL SCALE FEET

20 0 20 40
VERTICAL SCALE FEET

VERTICAL EXAGGERATION 10x

LEGEND

SB-11 ← WELL/BORING LOCATION ID

SAMPLING/WELL SCREEN INTERVAL

COVER SOIL / FILL

FILL / WASTE MATERIAL

CLAY

PEAT

SILT

SAND

SAND AND GRAVEL

BEDROCK (WISSAHICKON SCHIST)

NOTE

1.) THE LATERAL EXTENT OF INTERPRETED INTERBEDDED UNITS ARE APPROXIMATE AND MAY EXTEND MORE OR LESS THAN SHOWN.

REFERENCES

1.) TOPOGRAPHIC BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES.

3.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

4.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

INTERPRETED CROSS-SECTIONS
C-C' AND D-D'

NJ Authorization #24GA28029100

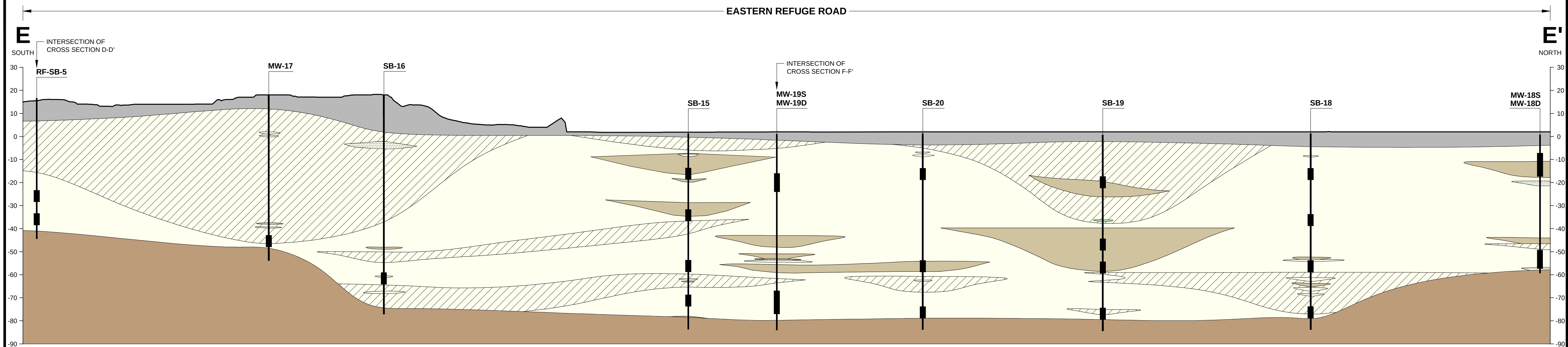
Golder Associates
Mt Laurel, New Jersey

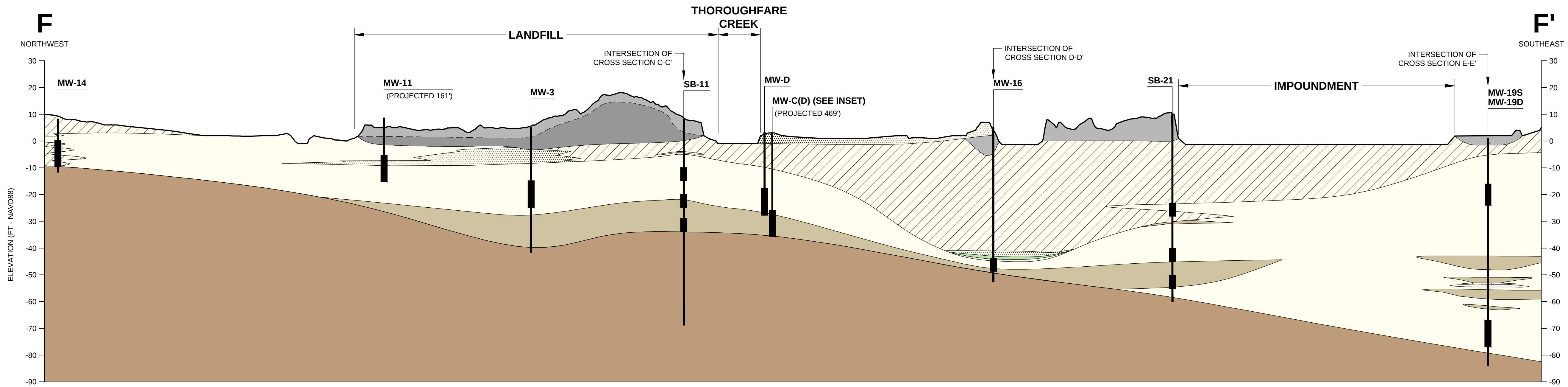
PROJECT No.		023-6134
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No.	0236134N027	
SCALE	AS SHOWN	REV. 0

FIGURE 4-4

Drawing file: 0236134N027.dwg May 19, 2017 - 1:49pm





LEGEND

SB-11 — WELL/BORING LOCATION ID

SAMPLING/WELL SCREEN INTERVAL

TOPSOIL / FILL / ROADBASE

FILL / WASTE MATERIAL

CLAY

PEAT

SILT

SAND

SAND AND GRAVEL

BEDROCK (WISSAHICKON SCHIST)

NOTES

1.) THE LATERAL EXTENT OF INTERPRETED INTERBEDDED UNITS ARE APPROXIMATE AND MAY EXTEND MORE OR LESS THAN SHOWN.

2.) MW-C(D)'s LOCATION IS PRESENTED IN CROSS SECTION D-D'. MW-C(D)'s OBSERVED GEOLOGIC INTERVALS ARE PRESENTED IN AN INSET BELOW CROSS SECTION D-D'.

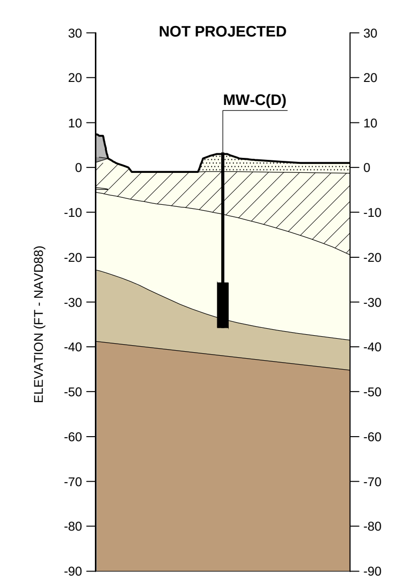
REFERENCES

1.) TOPOGRAPHIC BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES.

3.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

4.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.



HORIZONTAL SCALE: 200 0 200 400 FEET

VERTICAL SCALE: 20 0 20 40 FEET

VERTICAL EXAGGERATION 10x

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

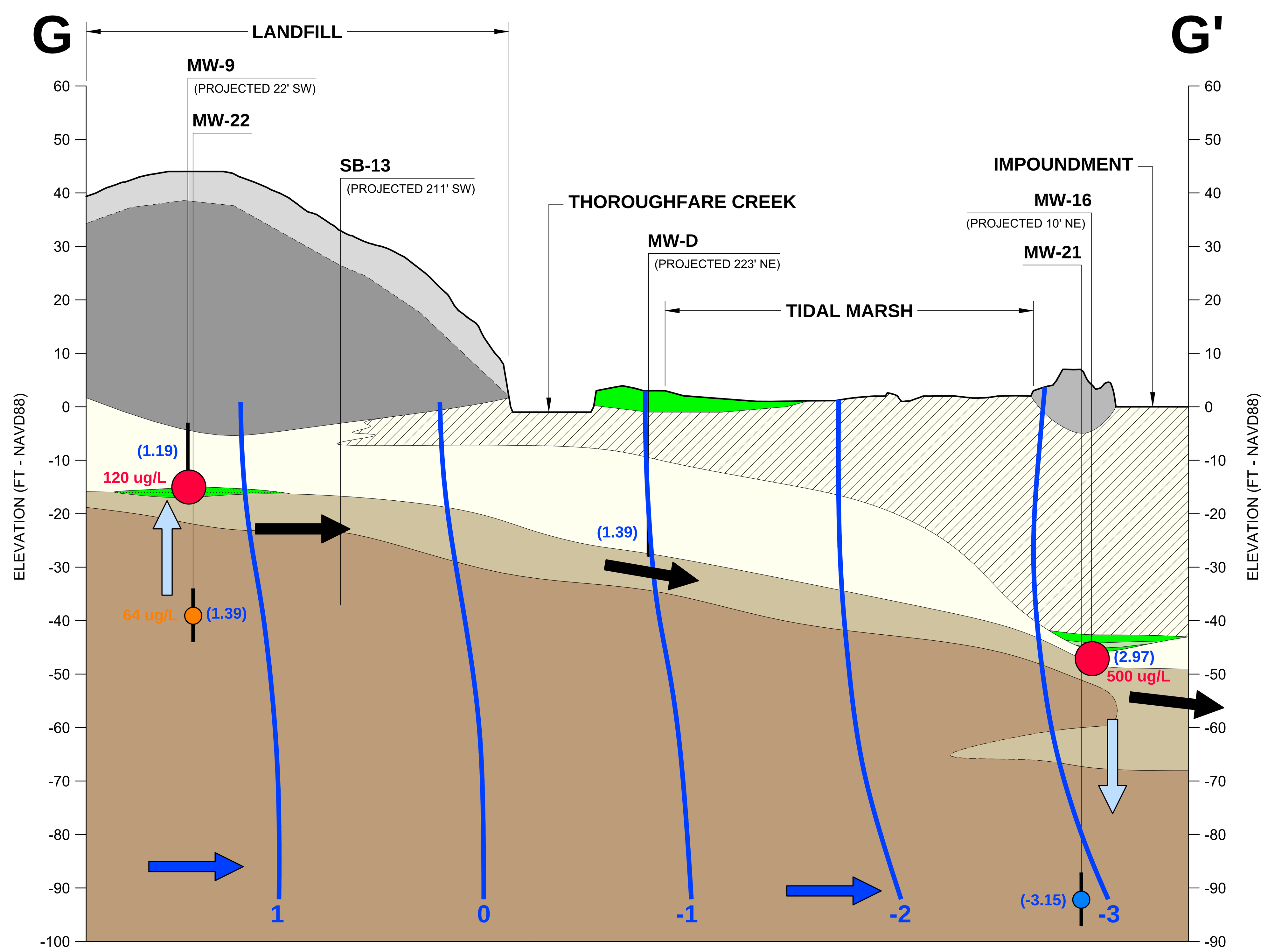
PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE
INTERPRETED CROSS-SECTIONS E-E' AND F-F'

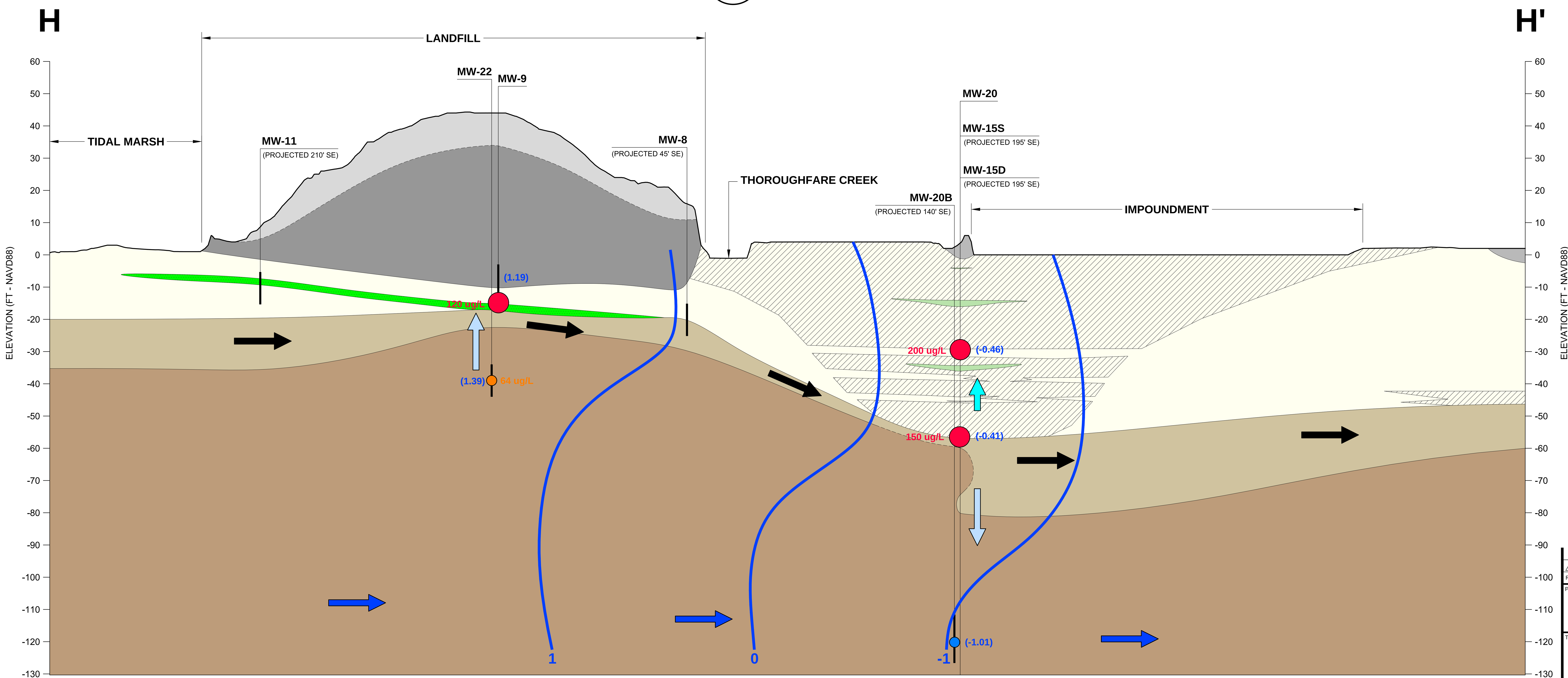
Golder Associates
Mt Laurel, New Jersey
NJ Authorization #24GA28029100

PROJECT No.		023-6134	FILE No.	0236134N028
DESIGN	BAR	05/19/17	SCALE AS SHOWN	REV. 0
CADD	RG	05/19/17		
CHECK	BAR	05/19/17		
REVIEW	JBG	05/19/17		

FIGURE 4-5

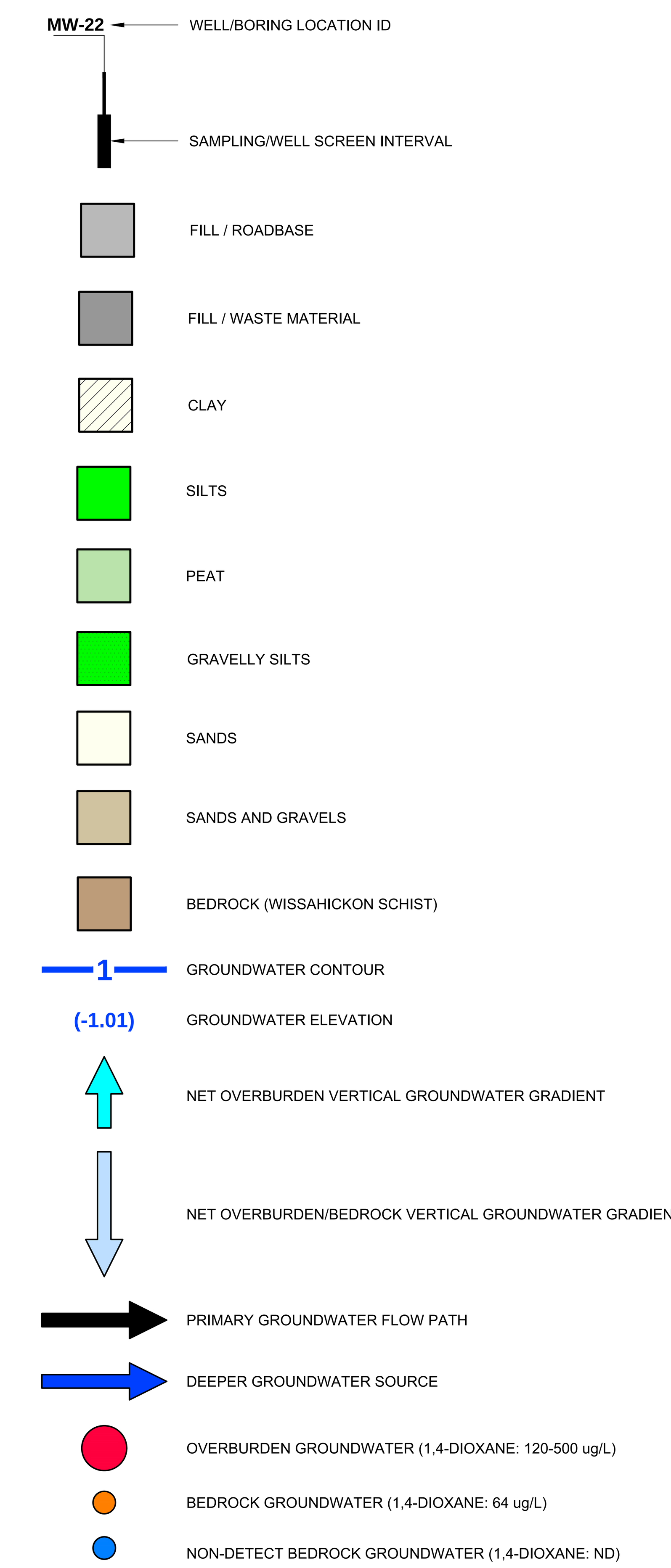


G 4-6 CROSS-SECTION G-G'



H 4-6 CROSS-SECTION H-H'

LEGEND



NOTES

1.) MW-20 WAS NOT PROFESSIONALLY SURVEYED. IT IS LOCATED IN A SIMILAR PROXIMITY TO WELL LOCATIONS MW-15S/D. DEPTHS ARE APPROXIMATE.

2.) THE HORIZONTAL EXTENT OF THE BEDROCK LEDGE ENCOUNTERED AT WELL LOCATION MW-20 IS APPROXIMATE.

3.) THE HORIZONTAL EXTENT OF THE BEDROCK LEDGE ENCOUNTERED AT WELL LOCATION MW-16 IS APPROXIMATE.

4.) GEOLOGIC CONTACTS DASHED WHERE INFERRED.

5.) THE GROUNDWATER ELEVATIONS PRESENTED ARE AVERAGE ELEVATIONS CALCULATED OVER THE MONITORING PERIOD FROM NOVEMBER 13 THROUGH 20, 2015.

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES. MONITORING WELLS MW-21 AND MW-22 SURVEYED ON JULY 17, 2015 BY VARGO ASSOCIATES. MONITORING WELL MW-20B WAS SURVEYED ON NOVEMBER 5, 2015 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

150 0 150 300
HORIZONTAL SCALE FEET

15 0 15 30
VERTICAL SCALE FEET

VERTICAL EXAGGERATION 10x

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	05/18/18	BAR	ADDED NOTE 5 AND TIDAL MARSH LABELS	RG	BAR	MSK

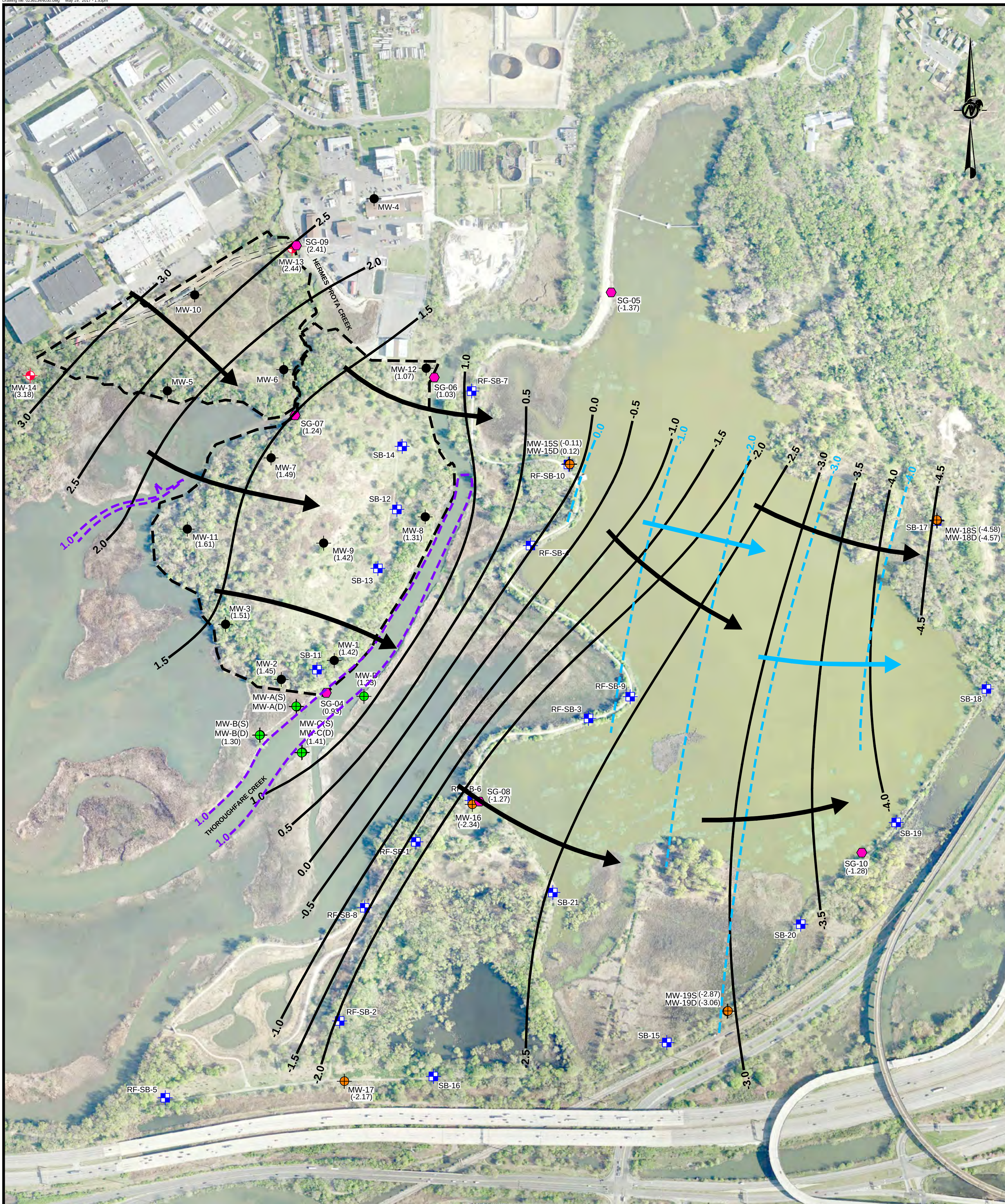
PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE
GENERAL HYDROGEOLOGIC CROSS-SECTIONS G-G' AND H-H'

Golder Associates
Mt. Laurel, New Jersey
NJ Authorization #24GA28029100

PROJECT No.		023-6134	FILE No.	0236134N029
DESIGN	BAR	05/19/17	SCALE AS SHOWN	REV. 1
CADD	RG	05/19/17		
CHECK	BAR	05/19/17	FIGURE 4-6	
REVIEW	JBG	05/19/17		

Drawing file: 0236134N030.dwg May 19, 2017 - 1:53pm



LEGEND

— · — · —	EASEMENT OR RIGHT-OF-WAY
— — —	APPROXIMATE SITE BOUNDARIES
	MONITORING WELL LOCATION
	ADDITIONAL GW INVESTIGATION WELL LOCATION
	PHASE I UPGRADIENT WELL LOCATION
	PHASE I SCREENING LOCATION
	REFUGE WELL LOCATION
	STAFF GAUGE
1.0	SURFACE WATER CONTOUR
2.0	SHALLOW SEMI-CONFINED GROUNDWATER CONTOUR
2.0	DEEP SEMI-CONFINED GROUNDWATER CONTOUR
(1.42)	GROUNDWATER ELEVATION
	SHALLOW SEMI-CONFINED GROUNDWATER FLOW DIRECTION
	DEEP SEMI-CONFINED GROUNDWATER FLOW DIRECTION

NOTES

1.) AVERAGE GROUNDWATER CONDITIONS BASED ON LONG TERM GROUNDWATER MONITORING STUDY RESULTS.

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

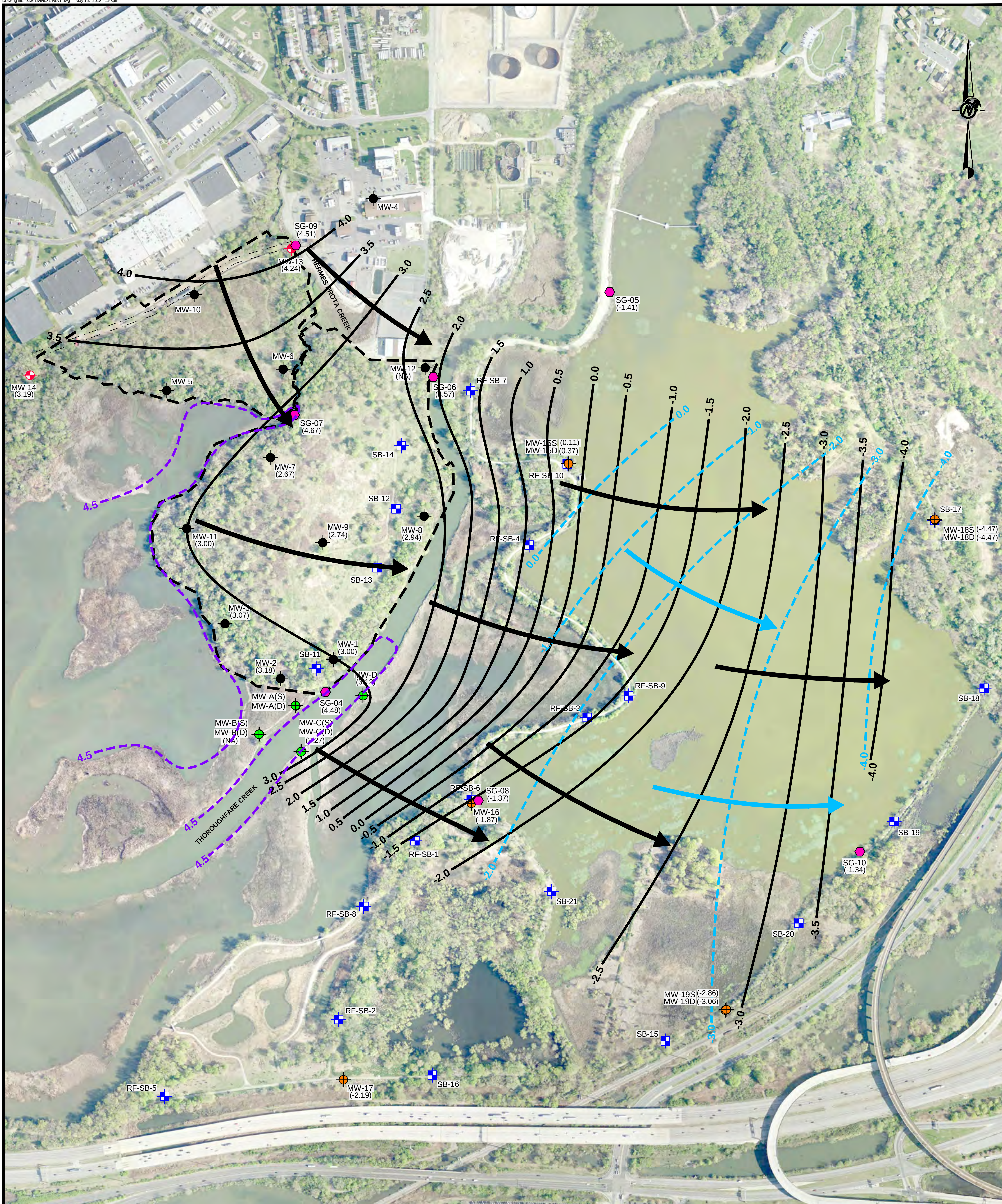
AVERAGE GROUNDWATER ELEVATIONS (OVERBURDEN)

NJ Authorization #24GA28029100

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.		023-6134	FILE No.	0236134N030
DESIGN	BAR	05/19/17	SCALE AS SHOWN	REV. 0
CADD	RG	05/19/17		
CHECK	BAR	05/19/17	FIGURE 4-7	
REVIEW	JBG	05/19/17		

Drawing file: 0236134N031-Rev1.dwg May 16, 2018 - 1:53pm



LEGEND

— · — · —	EASEMENT OR RIGHT-OF-WAY
— — —	APPROXIMATE SITE BOUNDARIES
	MONITORING WELL LOCATION
	ADDITIONAL GW INVESTIGATION WELL LOCATION
	PHASE I UPGRADIENT WELL LOCATION
	PHASE I SCREENING LOCATION
	REFUGE WELL LOCATION
	STAFF GAUGE
1.0	SURFACE WATER CONTOUR
2.0	SHALLOW SEMI-CONFINED GROUNDWATER CONTOUR
2.0	DEEP SEMI-CONFINED GROUNDWATER CONTOUR
(1.42)	GROUNDWATER ELEVATION
	SHALLOW SEMI-CONFINED GROUNDWATER FLOW DIRECTION
	DEEP SEMI-CONFINED GROUNDWATER FLOW DIRECTION

NOTES

1.) MAXIMUM HIGH TIDE CONDITIONS (JULY 13, 2014 AT 02:44).

2.) GROUNDWATER ELEVATIONS FOR MW-12 WERE NOT INCLUDED WITH THIS INTERPRETATION BECAUSE RESULTS OF THE GROUNDWATER LEVEL MONITORING SUGGEST THAT MW-12 IS IN DIRECT COMMUNICATION WITH THOROUGHFARE CREEK AND THEREFORE NOT REPRESENTATIVE OF GROUNDWATER.

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	05/18/18	BAR	ADDED NOTE 2	RG	BAR	MSK

PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE
HIGH TIDE GROUNDWATER ELEVATIONS (OVERBURDEN)

NJ Authorization #24GA28029100

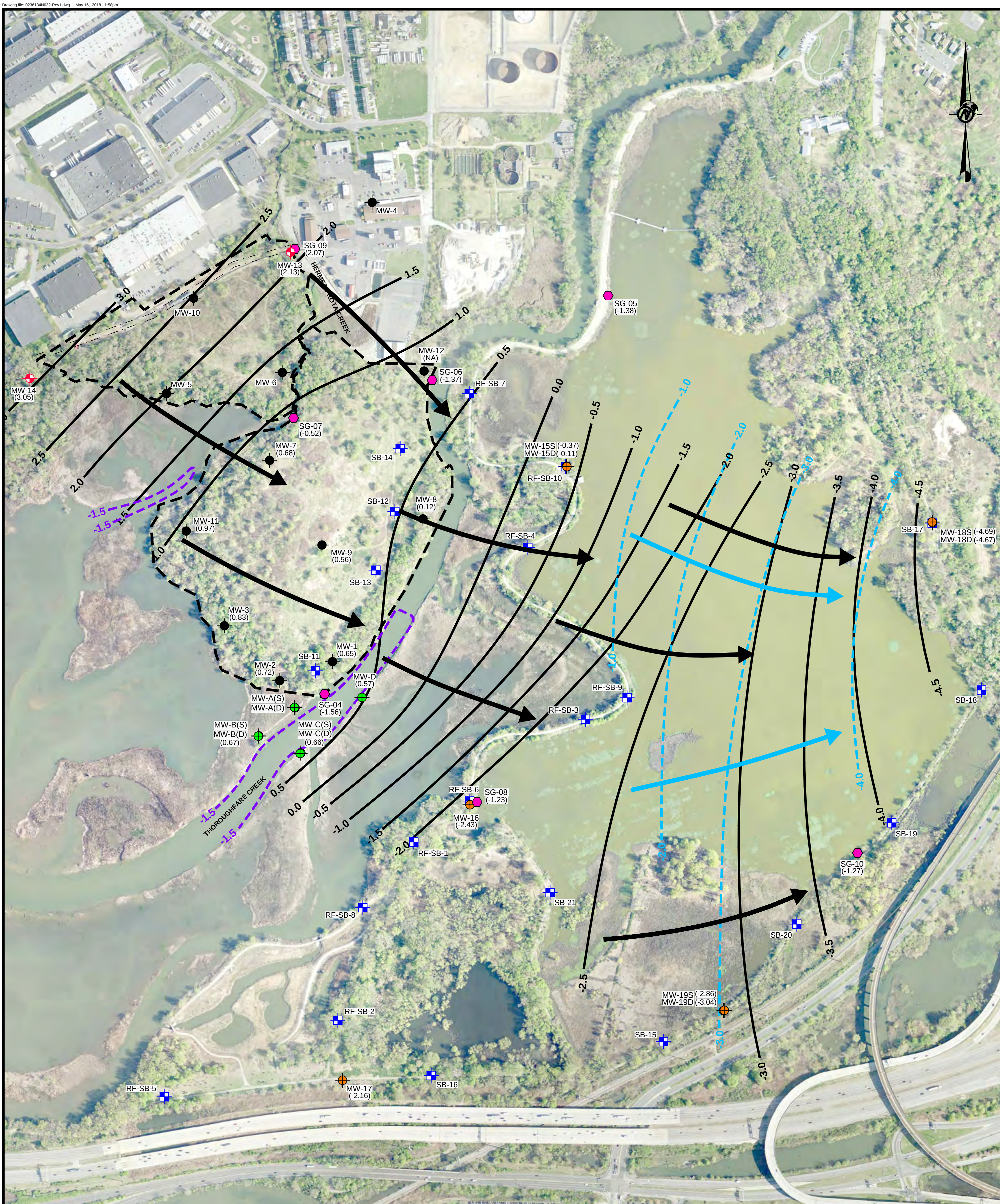
Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	023-6134	
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No. 0236134N031
SCALE AS SHOWN REV. 1

FIGURE 4-8

Drawing file: 0236134N032-Rev1.dwg May 16, 2018 - 1:58pm



270 0 270 540
SCALE FEET

LEGEND

EASEMENT OR RIGHT-OF-WAY

APPROXIMATE SITE BOUNDARIES

MONITORING WELL LOCATION

ADDITIONAL GW INVESTIGATION WELL LOCATION

PHASE I UPGRADIENT WELL LOCATION

PHASE I SCREENING LOCATION

REFUGE WELL LOCATION

STAFF GAUGE

1.0 SURFACE WATER CONTOUR

2.0 SHALLOW SEMI-CONFINED GROUNDWATER CONTOUR

2.0 DEEP SEMI-CONFINED GROUNDWATER CONTOUR

(1.42) GROUNDWATER ELEVATION

SHALLOW SEMI-CONFINED GROUNDWATER FLOW DIRECTION

DEEP SEMI-CONFINED GROUNDWATER FLOW DIRECTION

NOTES

1.) MINIMUM LOW TIDE CONDITIONS (AUGUST 6, 2014 AT 17:20).

2.) GROUNDWATER ELEVATIONS FOR MW-12 WERE NOT INCLUDED WITH THIS INTERPRETATION BECAUSE RESULTS OF THE GROUNDWATER LEVEL MONITORING SUGGEST THAT MW-12 IS IN DIRECT COMMUNICATION WITH THOROUGHFARE CREEK AND THEREFORE NOT REPRESENTATIVE OF GROUNDWATER.

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
2	05/18/18	BAR	ADDED NOTE 2	RG	BAR	MSK

PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE
LOW TIDE GROUNDWATER ELEVATIONS (OVERBURDEN)

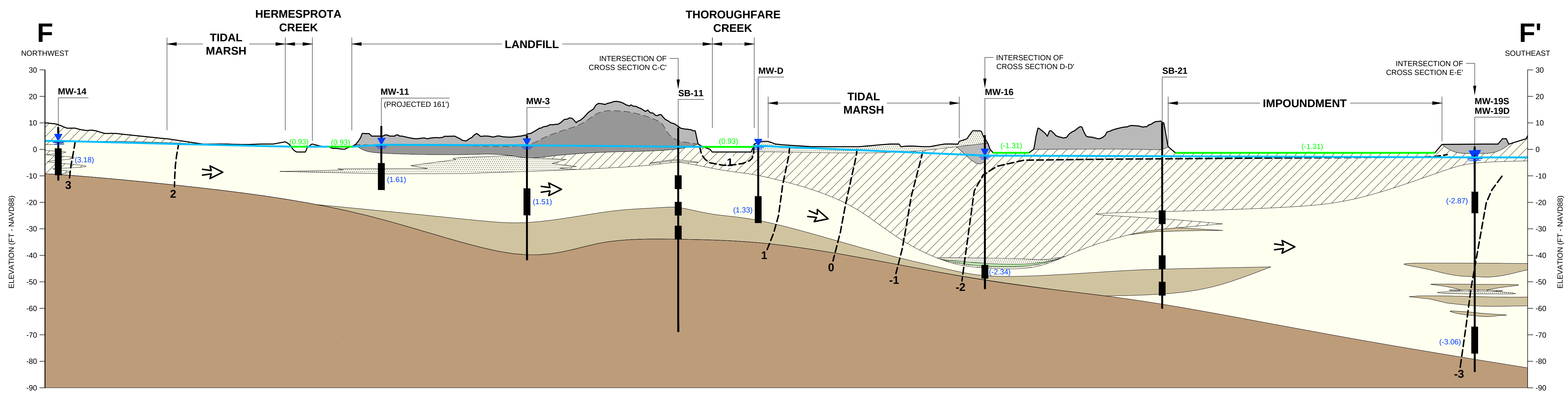
NJ Authorization #24GA28029100

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.		023-6134
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No. 0236134N032
SCALE AS SHOWN REV. 1

FIGURE 4-9



200 0 200 400

HORIZONTAL SCALE FEET

20 0 20 40

VERTICAL SCALE FEET

VERTICAL EXAGGERATION 10x

LEGEND

MW-14 — WELL/BORING LOCATION ID

SAMPLING/WELL SCREEN INTERVAL

2 — GROUNDWATER ISO-PRESSURE CONTOUR

AVERAGE SURFACE WATER ELEVATION

AVERAGE GROUNDWATER ELEVATION

WATER LEVEL

(0.93) AVERAGE GROUNDWATER ELEVATION

TOPSOIL / FILL / ROADBASE

FILL / WASTE MATERIAL

CLAY

PEAT

SILT

SAND

SAND AND GRAVEL

BEDROCK (WISSAHICKON SCHIST)

NOTE

1.) THE LATERAL EXTENT OF INTERPRETED INTERBEDDED UNITS ARE APPROXIMATE AND MAY EXTEND MORE OR LESS THAN SHOWN.

REFERENCES

1.) TOPOGRAPHIC BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES.

3.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

4.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW
1	05/18/18	BAR	ADDED TIDAL MARSH AND HERMESPROTA CREEK LABELS	RG	BAR	MSK

PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

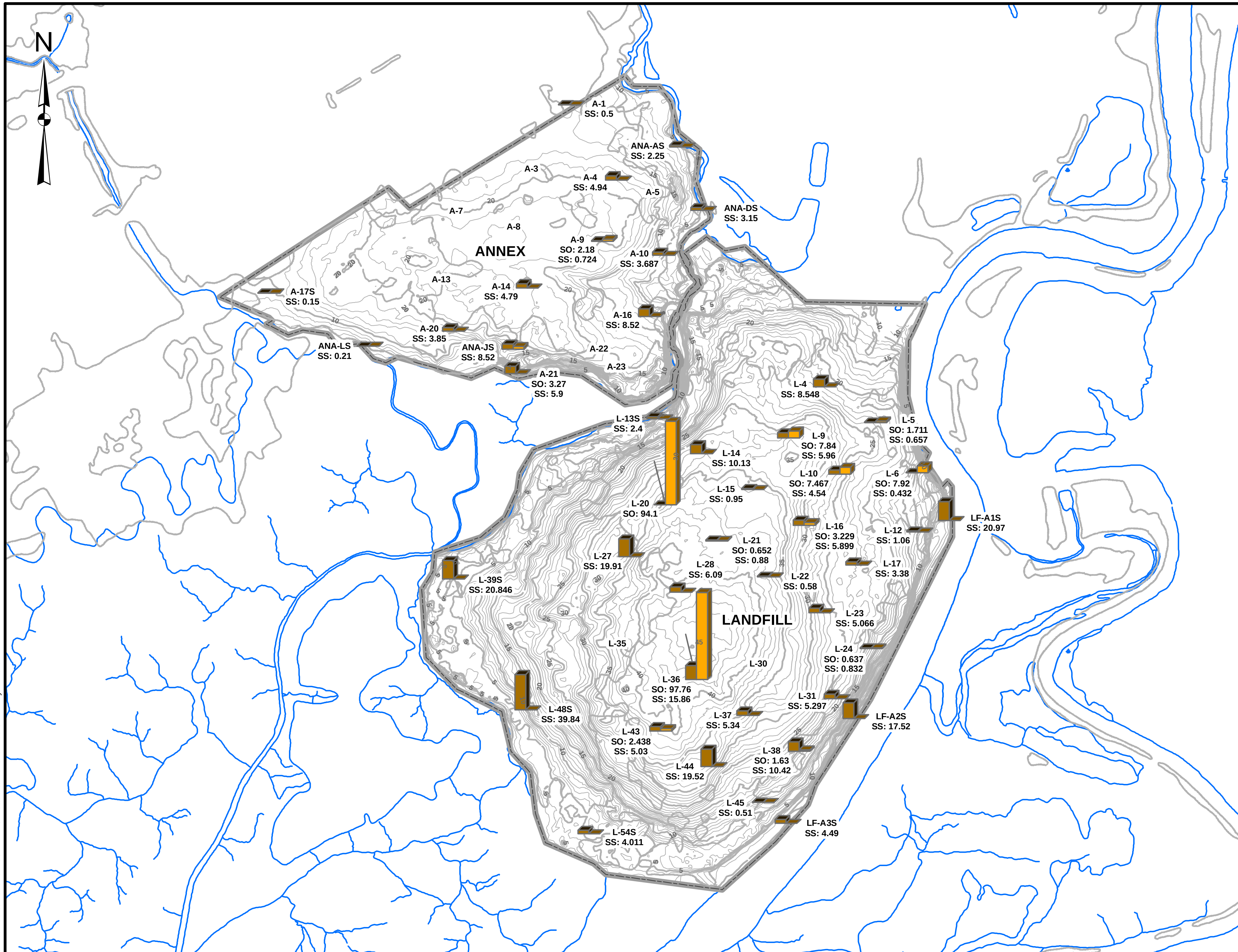
TITLE

HYDROSECTION AVERAGE GROUNDWATER FLOW CONDITIONS (OVERBURDEN)

Golder Associates
Mt Laurel, New Jersey
NJ Authorization #24GA28029100

PROJECT No.	023-6134		FILE No.	0236134N033
DESIGN	BAR	05/19/17	SCALE AS SHOWN	REV. 1
CADD	RG	05/19/17		
CHECK	BAR	05/19/17		
REVIEW	JBG	05/19/17		

FIGURE 4-10



LEGEND

Soil Data Distribution

- Surface Soil
- Subsurface Soil
- Treeline
- Approximate Site Boundaries
- Water

Topography

- 1 FT
- 5 FT

NOTE

1.) UNITS = mg/kg

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

0 175 350 700
Feet

Golder Associates

FILE No.	0236134N021		
PROJECT No.	0236134	REV.	0

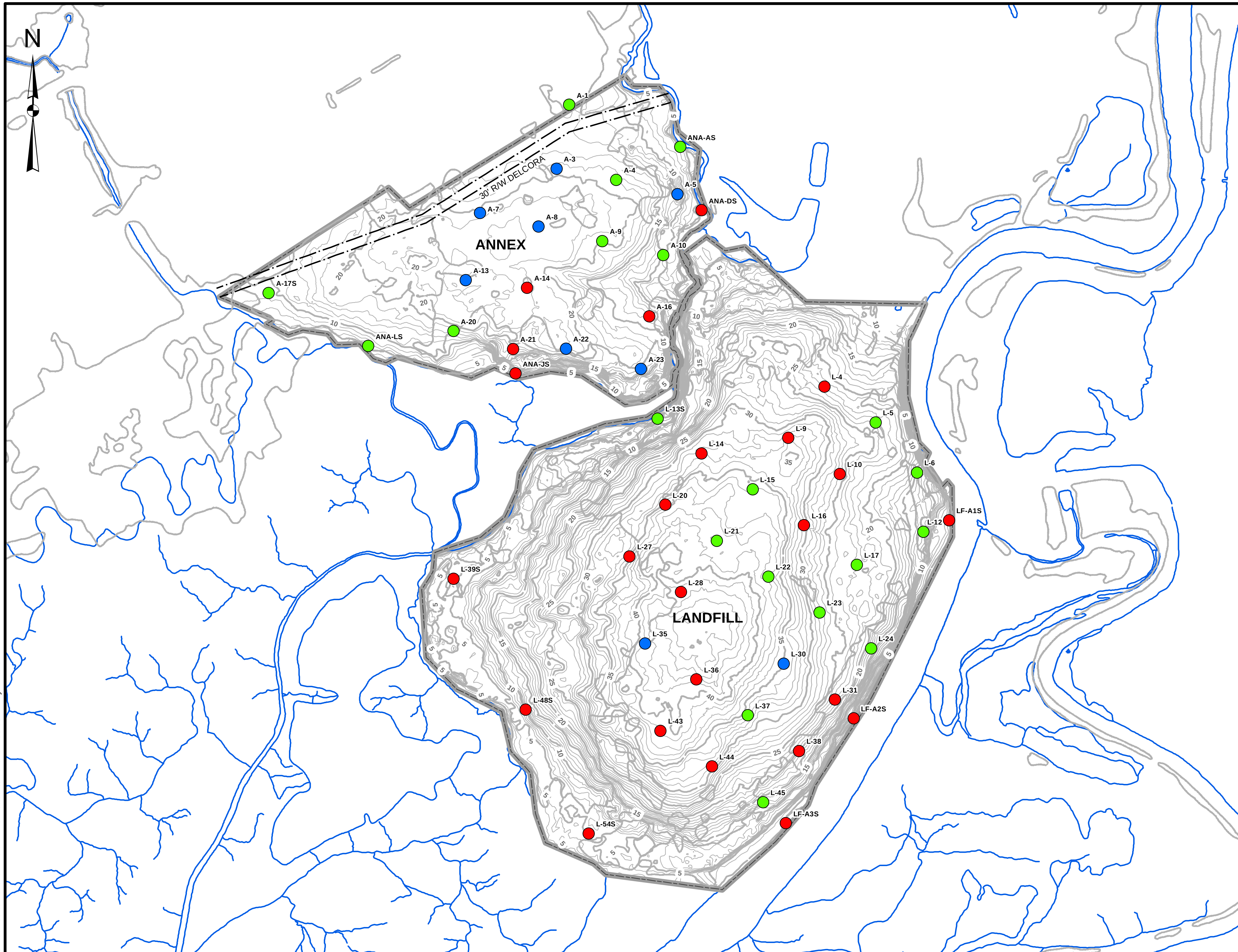
SCALE	AS SHOWN
DATE	05/19/17
DESIGN	BAR
GIS	RG
CHECK	BAR
REVIEW	JBG

SOIL DATA DISTRIBUTION - TOTAL SVOCs

REMEDIAL INVESTIGATION/FEASIBILITY STUDY. FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

FIGURE 5-1A

Map Document: 0236134F011.mxd / Modified 5/21/2010 1:03:24 PM / Plotted 5/21/2010 2:39:52 PM by DIvanov



LEGEND

Screening Criteria - Industrial Regional Screening Levels (RSLs)

- NOT DETECTED
- SURFACE OR SUBSURFACE DETECTION AT OR BELOW RSL
- EXCEEDS RSL
- DELCORA RIGHT-OF-WAY
- Treeline
- Approximate Site Boundaries
- Water

Topography

- 1 FT
- 5 FT

NOTES

1.) UNITS = mg/kg

2.) ANALYTES SCREENED AGAINST USEPA REGIONAL SCREENING LEVELS, INDUSTRIAL, MAY 2016.

REFERENCE

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

0 175 350 700
Feet

Golder Associates

SCALE	AS SHOWN
DATE	05/19/17
DESIGN	BAR
GIS	RG
CHECK	BAR
REVIEW	JBG

FILE No. 0236134N001

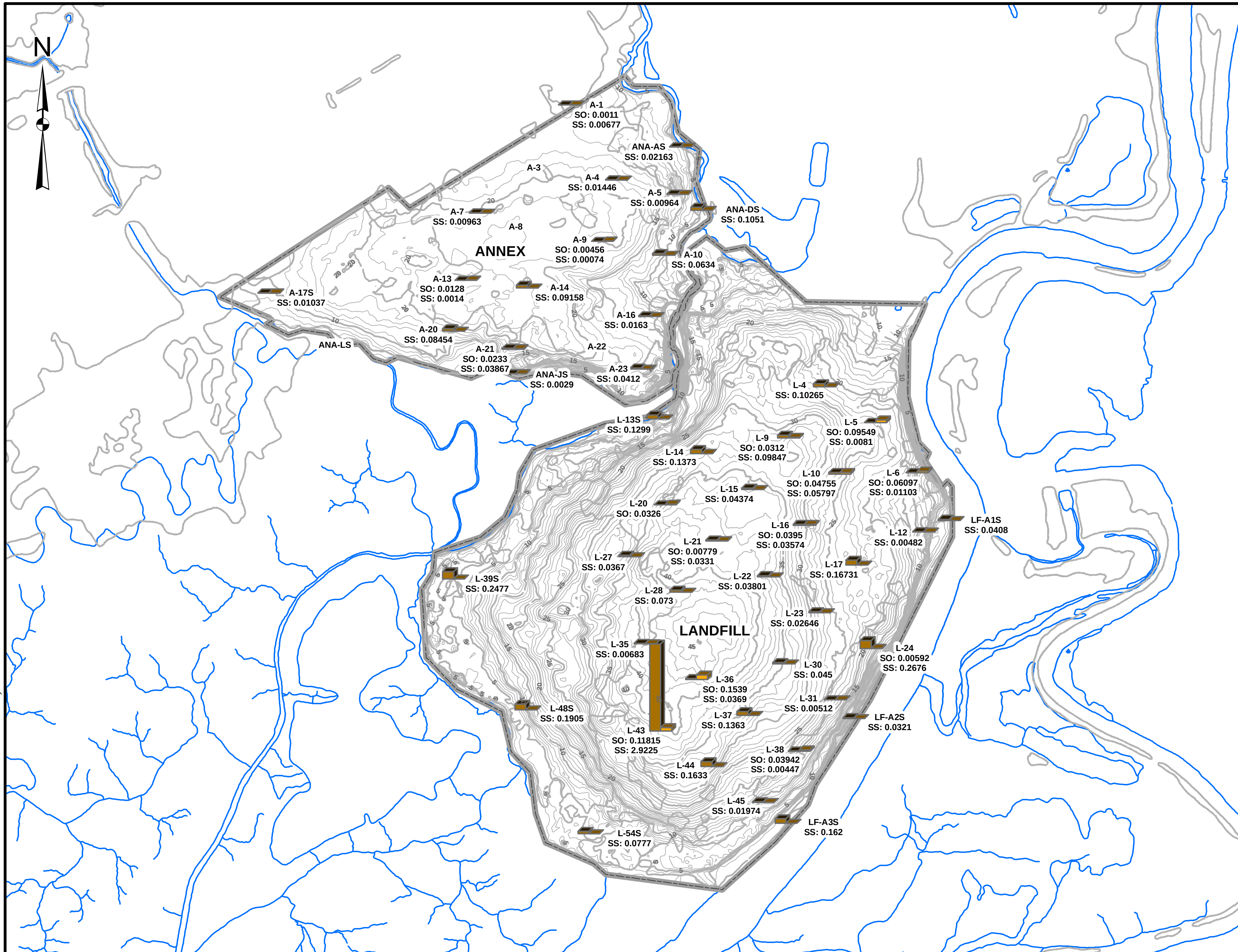
PROJECT No. 0236134 REV. 0

SOIL EXCEEDANCES OF SCREENING CRITERIA - SVOCs

REMEDIAL INVESTIGATION/FEASIBILITY STUDY. FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

FIGURE 5-1B

Map Document: 0236134F014.mxd / Modified 5/21/2010 2:26:04 PM / Plotted 5/21/2010 2:36:33 PM by DIvanov



LEGEND

Soil Data Distribution

- Surface Soil
- Subsurface Soil
- Treeline
- Approximate Site Boundaries
- Water

Topography

- 1 FT
- 5 FT

NOTE

1.) UNITS = mg/kg

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

Golder Associates

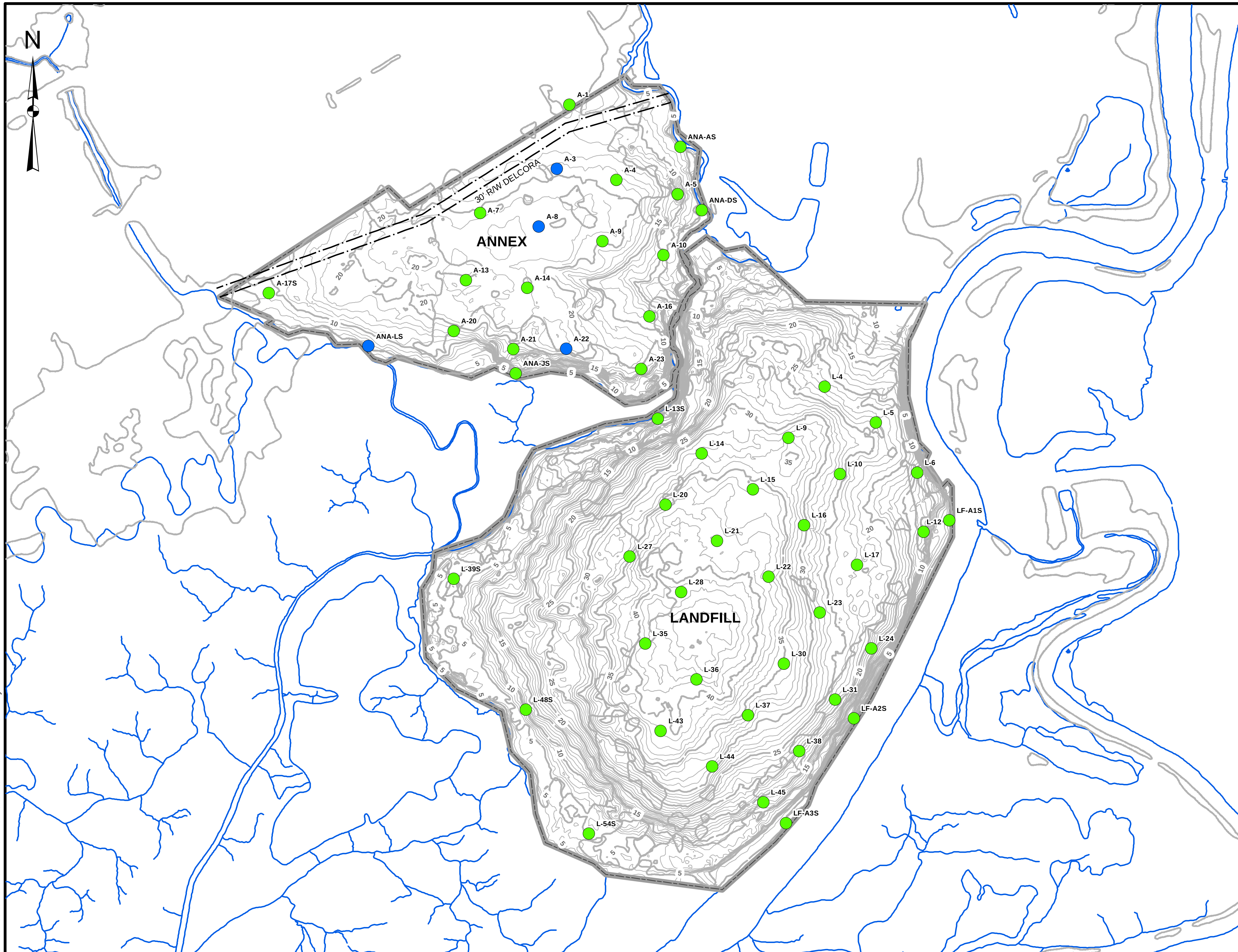
FILE No.	0236134N022
PROJECT No.	0236134
REV.	0
SCALE	AS SHOWN
DATE	05/19/17
DESIGN	BAR
GIS	RG
CHECK	BAR
REVIEW	JBG

SOIL DATA DISTRIBUTION - TOTAL PESTICIDES

REMEDIAL INVESTIGATION/FEASIBILITY STUDY. FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

FIGURE 5-2A

Map Document: 0236134F012.mxd / Modified 5/21/2010 2:22:13 PM / Plotted 5/21/2010 2:38:43 PM by DIvanov



LEGEND

Screening Criteria - Industrial Regional Screening Levels (RSLs)

- NOT DETECTED
- SURFACE OR SUBSURFACE DETECTION AT OR BELOW RSL
- DELCORA RIGHT-OF-WAY
- Treeline
- Approximate Site Boundaries
- Water

Topography

- 1 FT
- 5 FT

NOTES

1.) UNITS = mg/kg

2.) ANALYTES SCREENED AGAINST USEPA REGIONAL SCREENING LEVELS, INDUSTRIAL, MAY 2016.

REFERENCE

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

0 175 350 700
Feet

Golder Associates

FILE No.	0236134N002
PROJECT No.	0236134
REV.	0

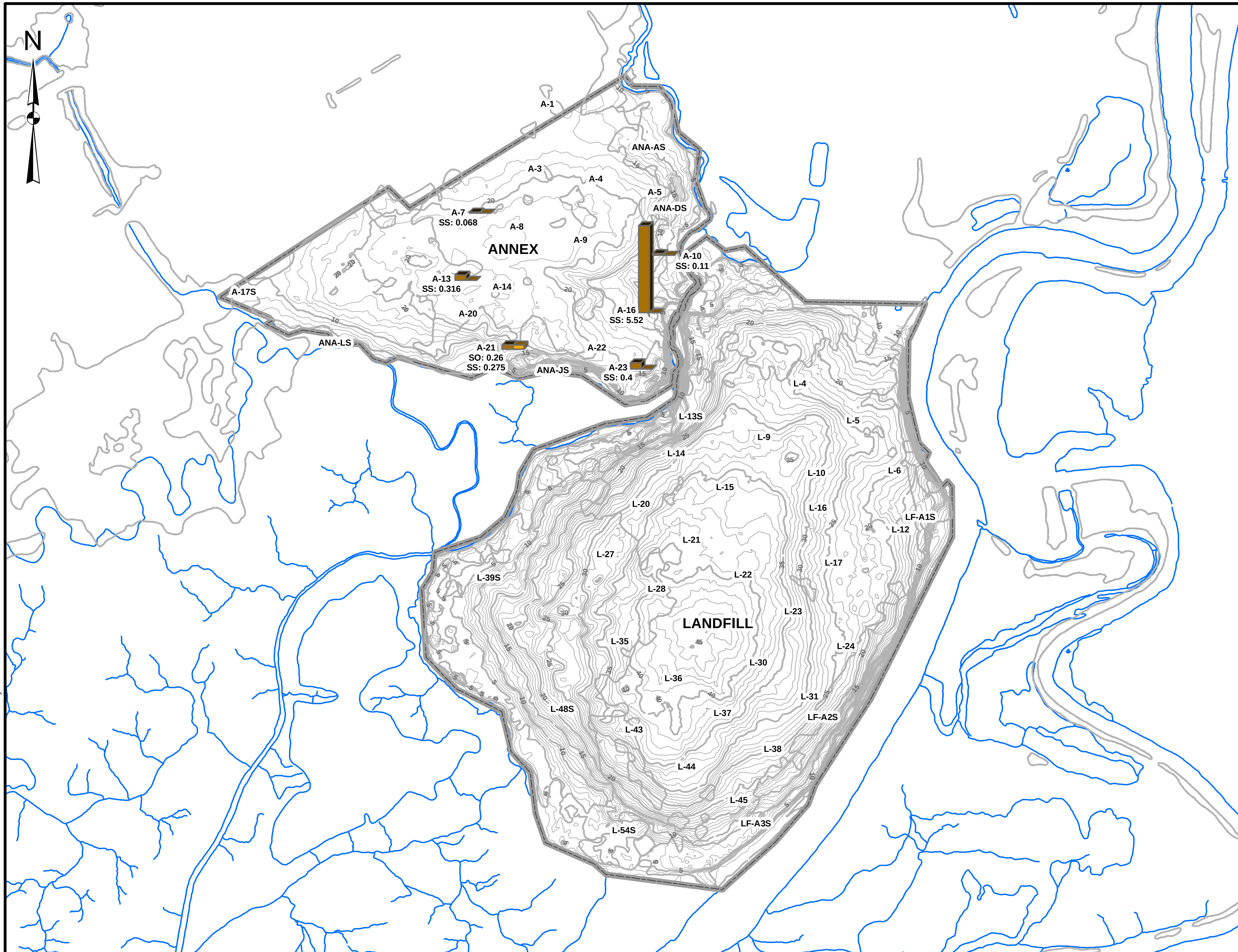
SCALE	AS SHOWN
DATE	05/19/17
DESIGN	BAR
GIS	RG
CHECK	BAR
REVIEW	JBG

SOIL EXCEEDANCES OF SCREENING CRITERIA - PESTICIDES

REMEDIAL INVESTIGATION/FEASIBILITY STUDY. FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

FIGURE 5-2B

Map Document: 0236134F015.mxd / Modified 5/21/2010 2:27:20 PM / Plotted 5/21/2010 2:35:26 PM by DIvanov



LEGEND

Soil Data Distribution

- Surface Soil
- Subsurface Soil
- Treeline
- Approximate Site Boundaries
- Water

Topography

- 1 FT
- 5 FT

NOTE

1.) UNITS = mg/kg

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

0 175 350 700 Feet

Golder Associates

SCALE	AS SHOWN
DATE	05/19/17
DESIGN	BAR
GIS	RG
CHECK	BAR
REVIEW	JBG

FILE No. 0236134N023

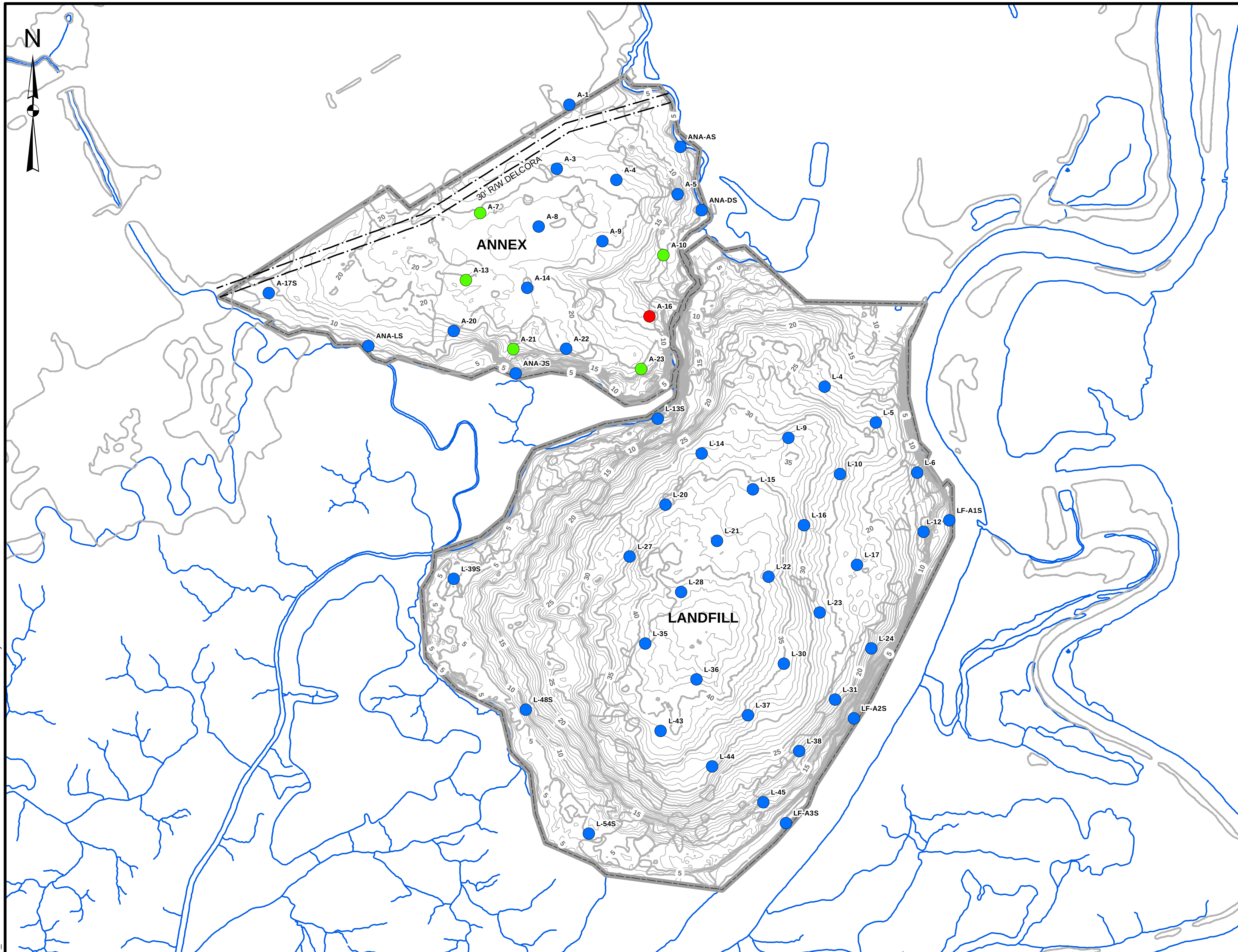
PROJECT No. 0236134 REV. 0

SOIL DATA DISTRIBUTION - TOTAL PCBs

REMEDIAL INVESTIGATION/FEASIBILITY STUDY. FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

FIGURE 5-3A

Map Document: 0236134F013.mxd / Modified 5/21/2010 2:24:13 PM / Plotted 5/21/2010 2:37:38 PM by DIvanov



LEGEND

Screening Criteria - Industrial Regional Screening Levels (RSLs)

- NOT DETECTED
- SURFACE OR SUBSURFACE DETECTION AT OR BELOW RSL
- EXCEEDS RSL
- DELCORA RIGHT-OF-WAY
- Treeline
- Approximate Site Boundaries
- Water

Topography

- 1 FT
- 5FT

NOTES

1.) UNITS = mg/kg

2.) ANALYTES SCREENED AGAINST USEPA REGIONAL SCREENING LEVELS, INDUSTRIAL, MAY 2016.

REFERENCE

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

0 175 350 700
Feet

Golder Associates

SCALE	AS SHOWN
DATE	05/19/17
DESIGN	BAR
GIS	RG
CHECK	BAR
REVIEW	JBG

FILE No. 0236134N003

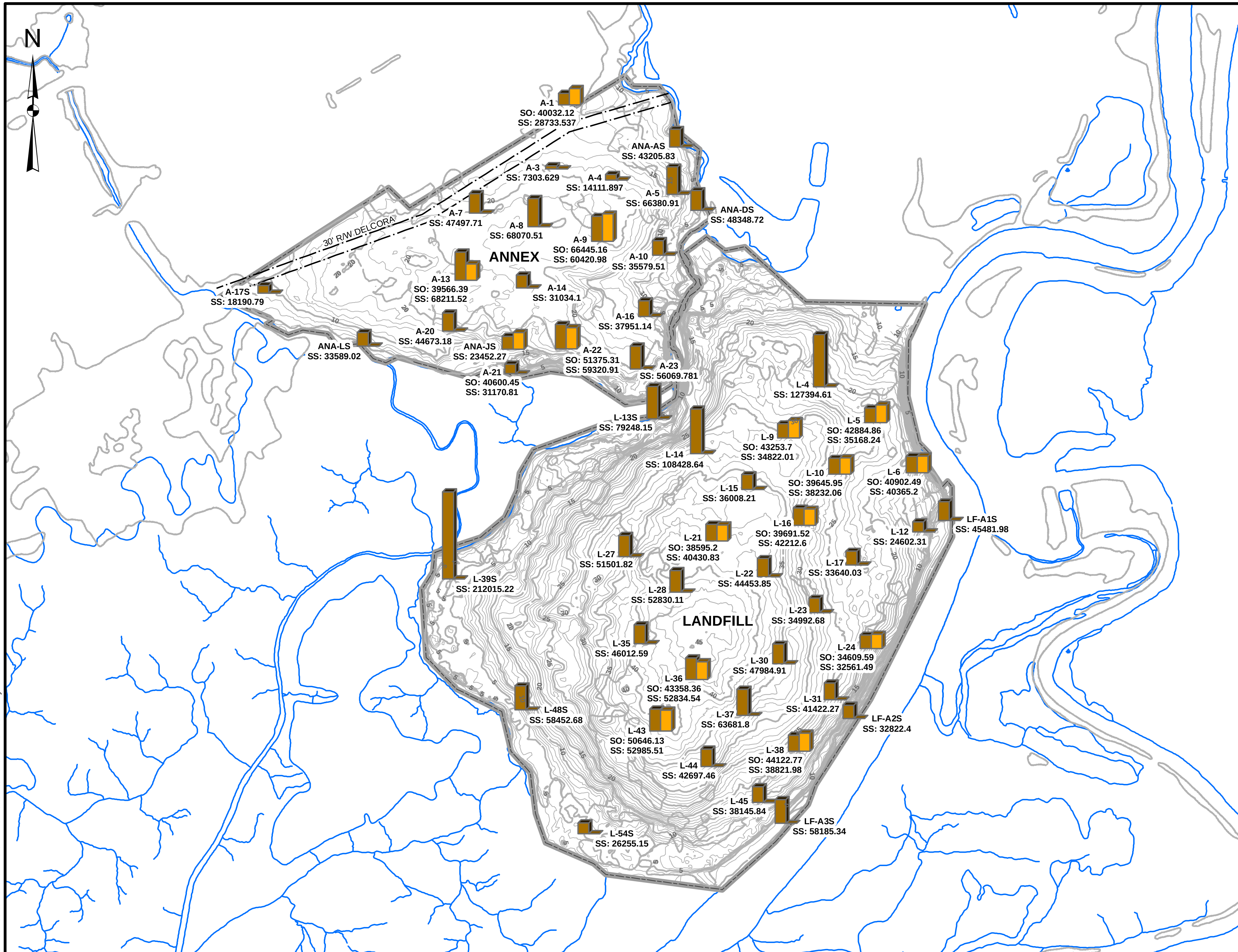
PROJECT No. 0236134 REV. 0

SOIL EXCEEDANCES OF SCREENING CRITERIA - PCBs

REMEDIAL INVESTIGATION/FEASIBILITY STUDY. FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

FIGURE 5-3B

Map Document: Soil_Industrial_RSL_PCB.mxd / Modified 5/17/2010 4:24:55 PM / Plotted 5/19/2010 2:47:03 PM by Divanov



LEGEND

Soil Data Distribution

SURFACE SOIL
SUBSURFACE SOIL
DELCORA RIGHT-OF-WAY
Treeline
Approximate Site Boundaries
Water

Topography

1 FT
5 FT

NOTE

1.) UNITS = mg/kg

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

0 175 350 700
Feet

Golder Associates

SCALE	AS SHOWN
DATE	05/19/17
DESIGN	BAR
GIS	RG
CHECK	BAR
REVIEW	JBG

FILE No. 0236134N004

PROJECT No. 0236134 REV. 0

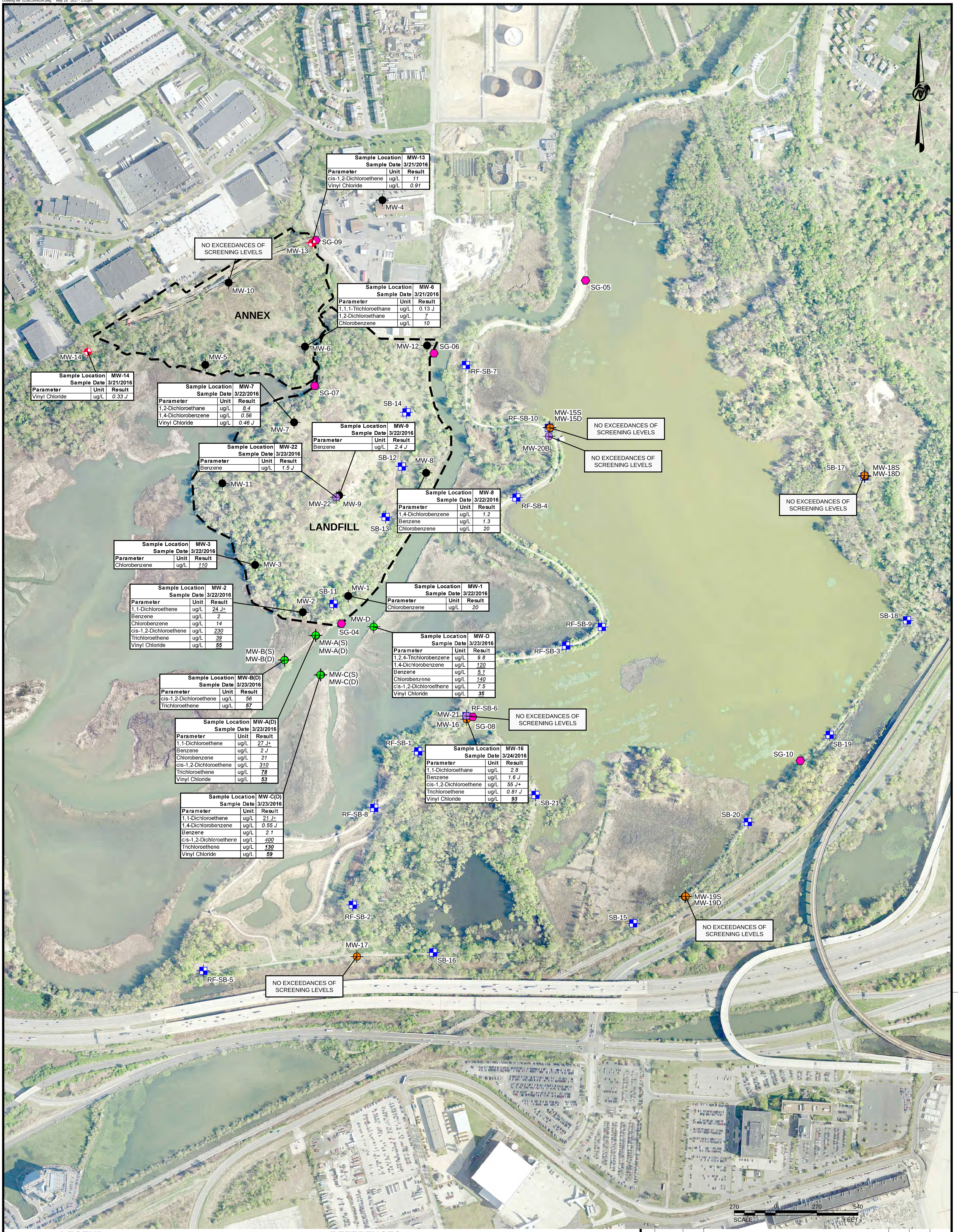
SOIL DATA DISTRIBUTION - TAL METALS

REMEDIAL INVESTIGATION/FEASIBILITY STUDY. FOLCROFT LANDFILL AND ANNEX SITE - FOLCROFT, PA

FIGURE 5-4

Map Document: 0236134F017.mxd / Modified 5/21/2010 2:29:51 PM / Plotted 5/21/2010 2:32:59 PM by DIvanov

Drawing file: 0236134N034.dwg May 19, 2017 - 2:01pm



Sample Location		MW-13
Sample Date		3/21/2016
Parameter	Unit	Result
cis-1,2-Dichloroethene	ug/L	11
Vinyl Chloride	ug/L	0.91

Sample Location		MW-6
Sample Date		3/21/2016
Parameter	Unit	Result
1,1,1-Trichloroethane	ug/L	0.13 J
1,2-Dichloroethane	ug/L	7
Chlorobenzene	ug/L	10

Sample Location		MW-14
Sample Date		3/21/2016
Parameter	Unit	Result
Vinyl Chloride	ug/L	0.33 J

Sample Location		MW-7
Sample Date		3/22/2016
Parameter	Unit	Result
1,2-Dichloroethane	ug/L	8.4
1,4-Dichlorobenzene	ug/L	0.56
Vinyl Chloride	ug/L	0.46 J

Sample Location		MW-9
Sample Date		3/22/2016
Parameter	Unit	Result
Benzene	ug/L	2.4 J

Sample Location		MW-22
Sample Date		3/23/2016
Parameter	Unit	Result
Benzene	ug/L	1.5 J

Sample Location		MW-8
Sample Date		3/22/2016
Parameter	Unit	Result
1,4-Dichlorobenzene	ug/L	1.2
Benzene	ug/L	1.3
Chlorobenzene	ug/L	20

Sample Location		MW-3
Sample Date		3/22/2016
Parameter	Unit	Result
Chlorobenzene	ug/L	110

Sample Location		MW-2
Sample Date		3/22/2016
Parameter	Unit	Result
1,1-Dichloroethene	ug/L	24 J+
Benzene	ug/L	2
Chlorobenzene	ug/L	14
cis-1,2-Dichloroethene	ug/L	230
Trichloroethene	ug/L	39
Vinyl Chloride	ug/L	55

Sample Location		MW-1
Sample Date		3/22/2016
Parameter	Unit	Result
Chlorobenzene	ug/L	20

Sample Location		MW-D
Sample Date		3/23/2016
Parameter	Unit	Result
1,2,4-Trichlorobenzene	ug/L	9.8
1,4-Dichlorobenzene	ug/L	120
Benzene	ug/L	5.1
Chlorobenzene	ug/L	140
cis-1,2-Dichloroethene	ug/L	7.5
Vinyl Chloride	ug/L	35

Sample Location		MW-B(D)
Sample Date		3/23/2016
Parameter	Unit	Result
cis-1,2-Dichloroethene	ug/L	56
Trichloroethene	ug/L	57

Sample Location		MW-A(D)
Sample Date		3/23/2016
Parameter	Unit	Result
1,1-Dichloroethene	ug/L	27 J+
Benzene	ug/L	2 J
Chlorobenzene	ug/L	21
cis-1,2-Dichloroethene	ug/L	310
Trichloroethene	ug/L	78
Vinyl Chloride	ug/L	53

Sample Location		MW-16
Sample Date		3/24/2016
Parameter	Unit	Result
1,1-Dichloroethane	ug/L	2.8
Benzene	ug/L	1.6 J
cis-1,2-Dichloroethene	ug/L	55 J+
Trichloroethene	ug/L	0.81 J
Vinyl Chloride	ug/L	93

Sample Location		MW-C(D)
Sample Date		3/23/2016
Parameter	Unit	Result
1,1-Dichloroethene	ug/L	21 J+
1,4-Dichlorobenzene	ug/L	0.55 J
Benzene	ug/L	2.1
cis-1,2-Dichloroethene	ug/L	400
Trichloroethene	ug/L	130
Vinyl Chloride	ug/L	59

LEGEND

- EASEMENT OR RIGHT-OF-WAY
- APPROXIMATE SITE BOUNDARIES
- MONITORING WELL LOCATION
- ADDITIONAL GW INVESTIGATION WELL LOCATION
- PHASE I UPGRADIENT WELL LOCATION
- PHASE I SCREENING LOCATION
- REFUGE WELL LOCATION
- SHALLOW BEDROCK WELL LOCATION
- STAFF GAUGE

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES. MONITORING WELLS MW-21 AND MW-22 SURVEYED ON JULY 17, 2015 BY VARGO ASSOCIATES. MONITORING WELL MW-20B WAS SURVEYED ON NOVEMBER 5, 2015 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

VOC GROUNDWATER EXCEEDANCES (2016)

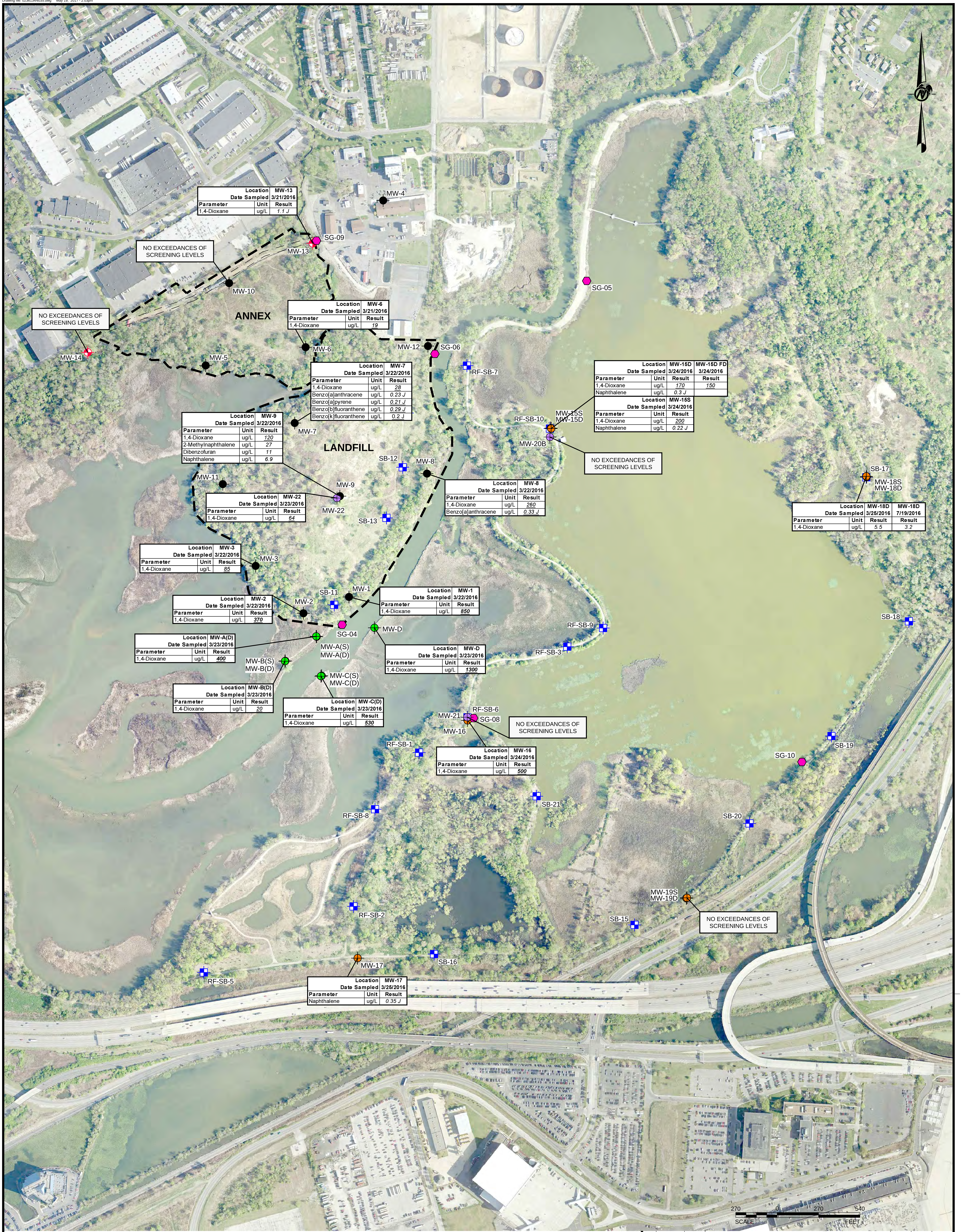
Golder Associates
Mt. Laurel, New Jersey
NJ Authorization #24GA28029100

PROJECT No.		023-6134
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No. 0236134N034
SCALE AS SHOWN REV. 0

FIGURE 5-5

Drawing file: 0236134N035.dwg May 19, 2017 - 2:03pm



LEGEND

- EASEMENT OR RIGHT-OF-WAY
- APPROXIMATE SITE BOUNDARIES
- MONITORING WELL LOCATION
- ADDITIONAL GW INVESTIGATION WELL LOCATION
- PHASE I UPGRADIENT WELL LOCATION
- PHASE I SCREENING LOCATION
- REFUGE WELL LOCATION
- SHALLOW BEDROCK WELL LOCATION
- STAFF GAUGE

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) EASEMENTS AND ROW TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) AERIAL PHOTO LICENSED FROM ARCGIS ONLINE.

5.) MONITORING WELLS MW-1 THROUGH MW-12 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007. MONITORING WELLS MW-1, MW-2, MW-3, MW-7, MW-8, MW-9, MW-11, AND MW-12 WERE RESURVEYED SEPTEMBER 24, 2014 BY VARGO ASSOCIATES. MONITORING WELLS MW-21 AND MW-22 SURVEYED ON JULY 17, 2015 BY VARGO ASSOCIATES. MONITORING WELL MW-20B WAS SURVEYED ON NOVEMBER 5, 2015 BY VARGO ASSOCIATES.

6.) MONITORING WELLS MW-A(S), MW-A(D), MW-B(S), MW-B(D), MW-C(S), MW-C(D), AND MW-D SURVEYED BY GILMORE AND ASSOCIATES, INC., APRIL 26, 2012.

7.) SCREENING BORINGS, STAFF GAUGES SG-04 THROUGH SG-10, AND MONITORING WELLS MW-13 THROUGH MW-19 WERE SURVEYED BY VARGO ASSOCIATES.

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT

REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

SVOC GROUNDWATER EXCEEDANCES (2016)

Golder Associates
Mt. Laurel, New Jersey

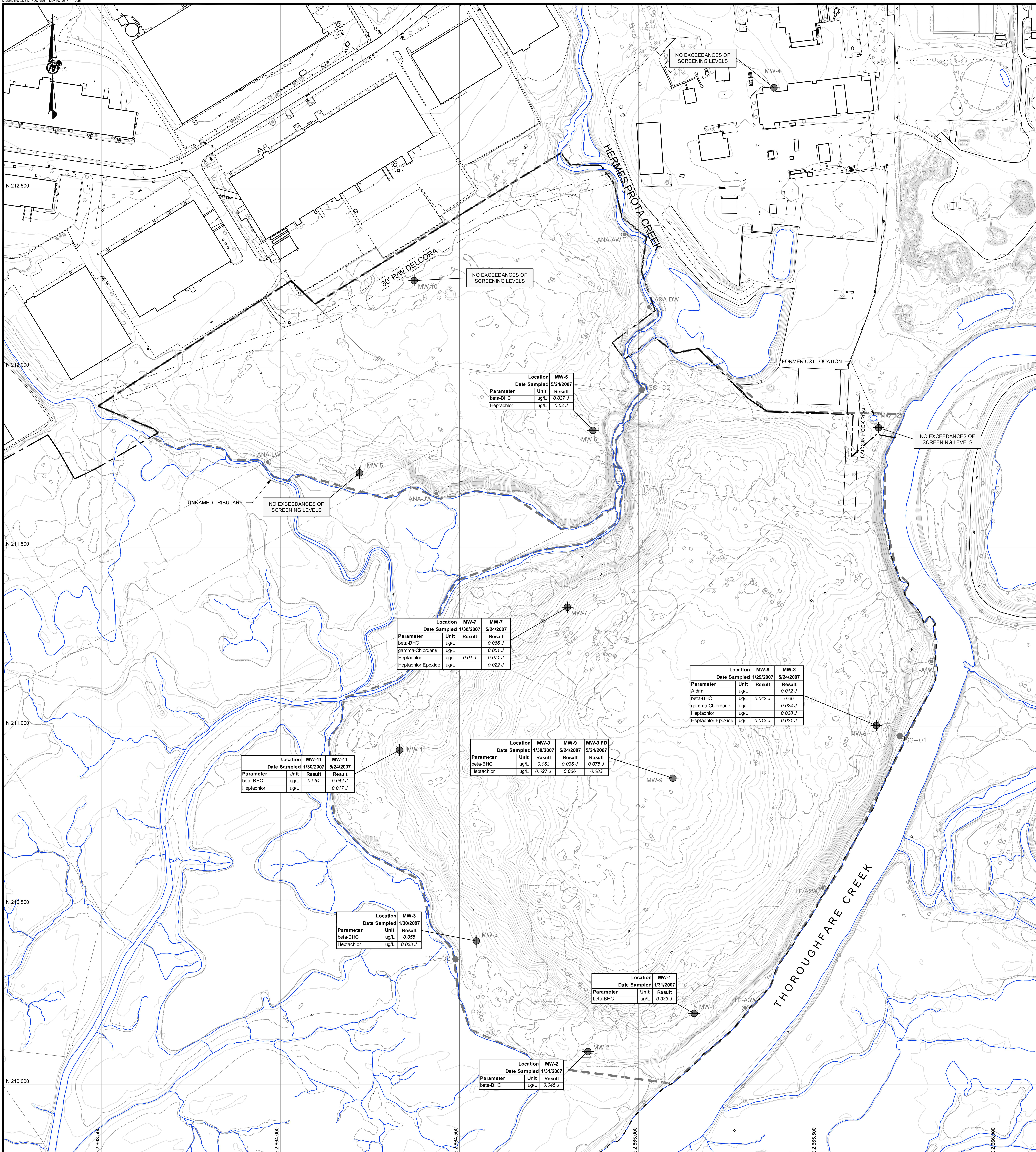
NJ Authorization #24GA28029100

PROJECT No.	023-6134	
DESIGN	BAR	05/19/17
CADD	RG	05/19/17
CHECK	BAR	05/19/17
REVIEW	JBG	05/19/17

FILE No.	0236134N035		
SCALE	AS SHOWN	REV.	0

FIGURE 5-6

Drawing file: 0236134N007.dwg   May 19, 2017 - 1:10pm



Location		MW-6
Date Sampled		5/24/2007
Parameter	Unit	Result
beta-BHC	ug/L	*0.027 J*
Heptachlor	ug/L	*0.02 J*

Location		MW-7	MW-7
Date Sampled		1/30/2007	5/24/2007
Parameter	Unit	Result	Result
beta-BHC	ug/L		*0.066 J*
gamma-Chlordane	ug/L		*0.051 J*
Heptachlor	ug/L	*0.01 J*	*0.071 J*
Heptachlor Epoxide	ug/L		*0.022 J*

Location		MW-8	MW-8
Date Sampled		1/29/2007	5/24/2007
Parameter	Unit	Result	Result
Aldrin	ug/L		*0.012 J*
beta-BHC	ug/L	*0.042 J*	0.06
gamma-Chlordane	ug/L		*0.024 J*
Heptachlor	ug/L		*0.038 J*
Heptachlor Epoxide	ug/L	*0.013 J*	*0.021 J*

Location		MW-11	MW-11
Date Sampled		1/30/2007	5/24/2007
Parameter	Unit	Result	Result
beta-BHC	ug/L	0.054	*0.042 J*
Heptachlor	ug/L		*0.017 J*

Location		MW-9	MW-9	MW-9 FD
Date Sampled		1/30/2007	5/24/2007	5/24/2007
Parameter	Unit	Result	Result	Result
beta-BHC	ug/L	0.063	*0.036 J*	*0.075 J*
Heptachlor	ug/L	*0.027 J*	0.066	0.083

Location		MW-3
Date Sampled		1/30/2007
Parameter	Unit	Result
beta-BHC	ug/L	0.055
Heptachlor	ug/L	*0.023 J*

Location		MW-1
Date Sampled		1/31/2007
Parameter	Unit	Result
beta-BHC	ug/L	*0.033 J*

Location		MW-2
Date Sampled		1/31/2007
Parameter	Unit	Result
beta-BHC	ug/L	*0.045 J*

LEGEND

- PROPERTY LINE
- EASEMENT OR RIGHT-OF-WAY
- EDGE OF ROAD
- APPROXIMATE SITE BOUNDARIES
- MONITORING WELL (SEE NOTE 3)
- STAFF GAUGE
- SEEP SAMPLING LOCATION

NOTES

1.) ANALYTES TABULATED AND SHOWN IN ITALICS ARE THOSE WHICH EXCEED USEPA REGIONAL SCREENING LEVELS FOR TAP WATER MAY 2016 THQ=0.1 UPDATE.

2.) ANALYTES THAT EXCEED THE PADEP USED AQUIFER (TDS<=2500) RESIDENTIAL MEDIUM SPECIFIC CONCENTRATIONS FOR ORGANIC AND INORGANIC REGULATED SUBSTANDES IN GROUNDWATER, UPDATED AUGUST 2016, ARE SHOWN UNDERLINED. ANALYTES THAT EXCEED THE PADEP NONUSE AQUIFER NON-RESIDENTIAL SPECIFIC CONCENTRATIONS FOR ORGANIC AND INORGANIC REGULATED SUBSTANCES IN GROUNDWATER, UPDATED AUGUST 2016, ARE SHOWN IN **BOLD**.

3.) MONITORING WELLS MW-1 THROUGH MW-5 AND MW-12 (HISTORIC MONITORING WELLS) WERE INSTALLED BY OTHERS. ALL OTHER WERE INSTALLED BY GOLDER (NEW MONITORING WELLS).

4.) USEPA REGION III QUALIFIERS
- J= ESTIMATED RESULT
- K= BIASED HIGH
- L= BIASED LOW

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) MONITORING WELLS MW-1 THROUGH MW-12 AND STAFF GAUGES SG-1 THROUGH SG-3 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007.

100 0 100 200
SCALE FEET

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

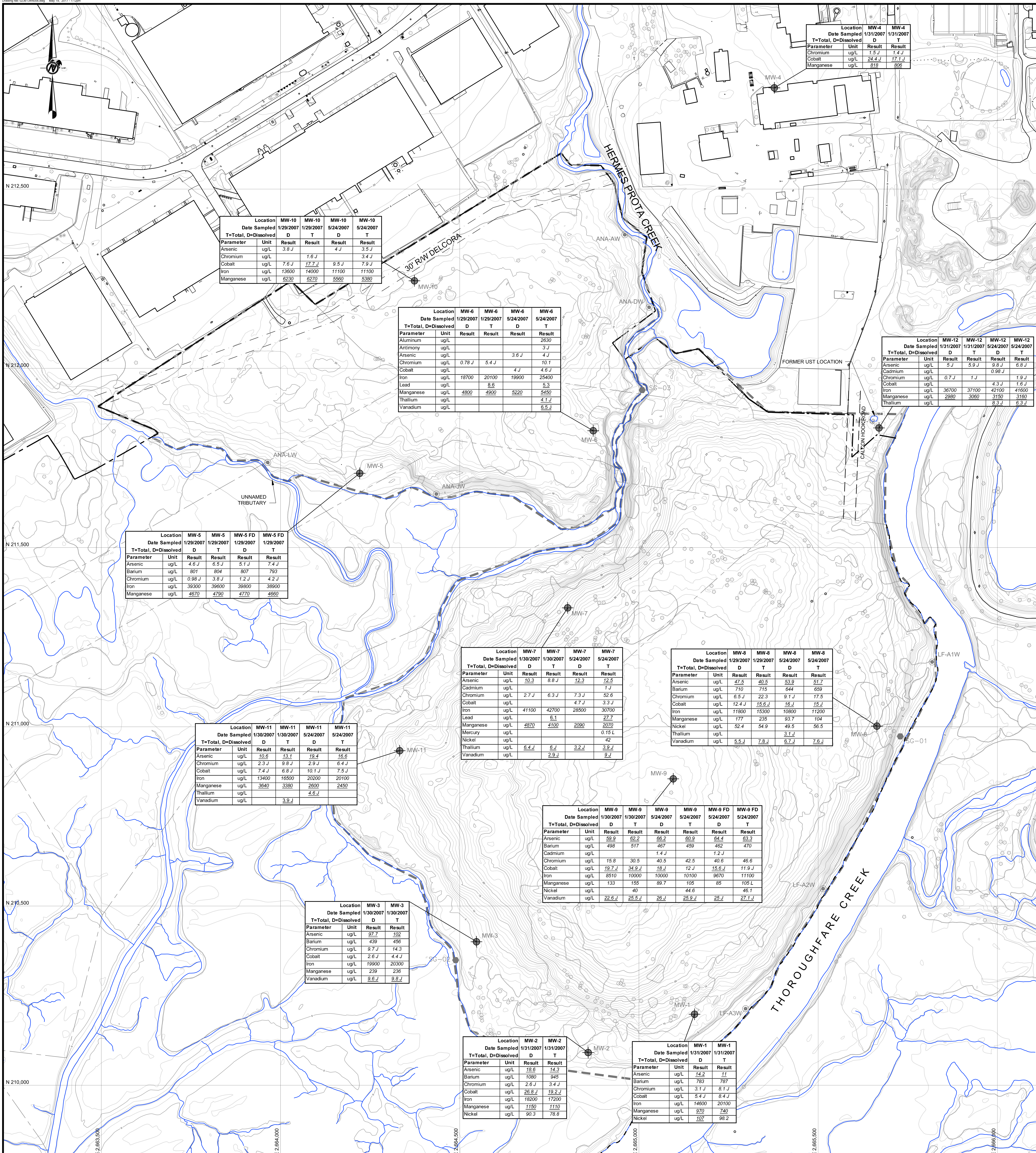
PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE
PESTICIDES IN GROUNDWATER

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	023-6134		FILE No.	0236134N007
DESIGN	BAR	05/19/17	SCALE AS SHOWN	REV. 0
CADD	RG	05/19/17		
CHECK	BAR	05/19/17	**FIGURE 5-7**	
REVIEW	JBG	05/19/17		

Drawing file: 0236134N008.dwg May 19, 2017 - 1:12pm



Location		MW-4	MW-4
Date Sampled		1/31/2007	1/31/2007
T=Total, D=Dissolved		D	T
Parameter	Unit	Result	Result
Chromium	ug/L	1.5 J	1.4 J
Cobalt	ug/L	24.4 J	17.1 J
Manganese	ug/L	818	806

Location		MW-10	MW-10	MW-10	MW-10
Date Sampled		1/29/2007	1/29/2007	5/24/2007	5/24/2007
T=Total, D=Dissolved		D	T	D	T
Parameter	Unit	Result	Result	Result	Result
Arsenic	ug/L	3.8 J		4 J	3.5 J
Chromium	ug/L		1.6 J		3.4 J
Cobalt	ug/L	7.6 J	17.7 J	9.5 J	7.9 J
Iron	ug/L	13600	14000	11100	11100
Manganese	ug/L	6230	6270	5560	5380

Location		MW-6	MW-6	MW-6	MW-6
Date Sampled		1/29/2007	1/29/2007	5/24/2007	5/24/2007
T=Total, D=Dissolved		D	T	D	T
Parameter	Unit	Result	Result	Result	Result
Aluminum	ug/L				2630
Antimony	ug/L				3 J
Arsenic	ug/L			3.6 J	4 J
Chromium	ug/L	0.78 J	5.4 J		10.1
Cobalt	ug/L			4 J	4.6 J
Iron	ug/L	18700	20100	19900	25400
Lead	ug/L		8.6		5.3
Manganese	ug/L	4800	4900	5220	5450
Thallium	ug/L				4.1 J
Vanadium	ug/L				6.5 J

Location		MW-12	MW-12	MW-12	MW-12
Date Sampled		1/31/2007	1/31/2007	5/24/2007	5/24/2007
T=Total, D=Dissolved		D	T	D	T
Parameter	Unit	Result	Result	Result	Result
Arsenic	ug/L	5 J	5.9 J	9.8 J	6.8 J
Cadmium	ug/L			0.98 J	
Chromium	ug/L	0.7 J	1 J		1.9 J
Cobalt	ug/L			4.3 J	1.6 J
Iron	ug/L	36700	37100	42100	41600
Manganese	ug/L	2980	3060	3150	3160
Thallium	ug/L			8.3 J	6.3 J

Location		MW-5	MW-5	MW-5 FD	MW-5 FD
Date Sampled		1/29/2007	1/29/2007	1/29/2007	1/29/2007
T=Total, D=Dissolved		D	T	D	T
Parameter	Unit	Result	Result	Result	Result
Arsenic	ug/L	4.6 J	6.5 J	5.1 J	7.4 J
Barium	ug/L	801	804	807	793
Chromium	ug/L	0.98 J	3.8 J	1.2 J	4.2 J
Iron	ug/L	39300	39600	39800	38900
Manganese	ug/L	4670	4790	4770	4660

Location		MW-7	MW-7	MW-7	MW-7
Date Sampled		1/30/2007	1/30/2007	5/24/2007	5/24/2007
T=Total, D=Dissolved		D	T	D	T
Parameter	Unit	Result	Result	Result	Result
Arsenic	ug/L	10.3	8.8 J	12.3	12.5
Cadmium	ug/L				1 J
Chromium	ug/L	2.7 J	6.3 J	7.3 J	52.6
Cobalt	ug/L			4.7 J	3.3 J
Iron	ug/L	41100	42700	28500	30700
Lead	ug/L		6.1		27.7
Manganese	ug/L	4870	4100	2090	2070
Mercury	ug/L				0.15 L
Nickel	ug/L				42
Thallium	ug/L	6.4 J	6 J	3.2 J	3.9 J
Vanadium	ug/L		2.9 J		9 J

Location		MW-8	MW-8	MW-8	MW-8
Date Sampled		1/29/2007	1/29/2007	5/24/2007	5/24/2007
T=Total, D=Dissolved		D	T	D	T
Parameter	Unit	Result	Result	Result	Result
Arsenic	ug/L	47.5	40.5	53.9	51.7
Barium	ug/L	710	715	644	659
Chromium	ug/L	6.5 J	22.3	9.1 J	17.5
Cobalt	ug/L	12.4 J	15.6 J	16 J	15 J
Iron	ug/L	11800	15300	10800	11200
Manganese	ug/L	177	235	93.7	104
Nickel	ug/L	52.4	54.9	49.5	56.5
Thallium	ug/L			3.1 J	
Vanadium	ug/L	5.5 J	7.8 J	6.7 J	7.6 J

Location		MW-11	MW-11	MW-11	MW-11
Date Sampled		1/30/2007	1/30/2007	5/24/2007	5/24/2007
T=Total, D=Dissolved		D	T	D	T
Parameter	Unit	Result	Result	Result	Result
Arsenic	ug/L	10.6	13.1	19.4	16.6
Chromium	ug/L	2.3 J	9.8 J	2.9 J	6.4 J
Cobalt	ug/L	7.4 J	6.8 J	10.1 J	7.5 J
Iron	ug/L	13400	16500	20200	20100
Manganese	ug/L	3640	3380	2600	2450
Thallium	ug/L			4.6 J	
Vanadium	ug/L		3.9 J		

Location		MW-9	MW-9	MW-9	MW-9	MW-9 FD	MW-9 FD
Date Sampled		1/30/2007	1/30/2007	5/24/2007	5/24/2007	5/24/2007	5/24/2007
T=Total, D=Dissolved		D	T	D	T	D	T
Parameter	Unit	Result	Result	Result	Result	Result	Result
Arsenic	ug/L	59.9	62.2	66.2	60.9	64.4	63.3
Barium	ug/L	498	517	467	459	462	470
Cadmium	ug/L			1.4 J		1.2 J	
Chromium	ug/L	15.8	30.5	40.5	42.5	40.6	46.6
Cobalt	ug/L	19.7 J	34.9 J	18 J	12 J	15.6 J	11.9 J
Iron	ug/L	8510	10000	10000	10100	9670	11100
Manganese	ug/L	133	155	89.7	105	85	105 L
Nickel	ug/L		40		44.6		46.1
Vanadium	ug/L	22.6 J	25.5 J	26 J	25.9 J	25 J	27.1 J

Location		MW-3	MW-3
Date Sampled		1/30/2007	1/30/2007
T=Total, D=Dissolved		D	T
Parameter	Unit	Result	Result
Arsenic	ug/L	97.7	102
Barium	ug/L	439	456
Chromium	ug/L	9.7 J	14.3
Cobalt	ug/L	2.6 J	4.4 J
Iron	ug/L	19900	20300
Manganese	ug/L	239	236
Vanadium	ug/L	9.6 J	9.8 J

Location		MW-2	MW-2
Date Sampled		1/31/2007	1/31/2007
T=Total, D=Dissolved		D	T
Parameter	Unit	Result	Result
Arsenic	ug/L	18.6	14.3
Barium	ug/L	1080	945
Chromium	ug/L	2.6 J	3.4 J
Cobalt	ug/L	26.8 J	19.2 J
Iron	ug/L	18200	17200
Manganese	ug/L	1150	1110
Nickel	ug/L	90.3	78.8

Location		MW-1	MW-1
Date Sampled		1/31/2007	1/31/2007
T=Total, D=Dissolved		D	T
Parameter	Unit	Result	Result
Arsenic	ug/L	14.2	11
Barium	ug/L	783	787
Chromium	ug/L	3.1 J	8.1 J
Cobalt	ug/L	5.4 J	8.4 J
Iron	ug/L	14600	20100
Manganese	ug/L	970	740
Nickel	ug/L	107	98.2

LEGEND

- PROPERTY LINE
- EASEMENT OR RIGHT-OF-WAY
- EDGE OF ROAD
- APPROXIMATE SITE BOUNDARIES
- MONITORING WELL (SEE NOTE 3)
- STAFF GAUGE
- SEEP SAMPLING LOCATION

NOTES

1.) ANALYTES TABULATED AND SHOWN IN ITALICS ARE THOSE WHICH EXCEED USEPA REGIONAL SCREENING LEVELS FOR TAP WATER MAY 2016 THQ=0.1 UPDATE.

2.) ANALYTES THAT EXCEED THE PADEP USED AQUIFER (TDS<=2500) RESIDENTIAL MEDIUM SPECIFIC CONCENTRATIONS FOR ORGANIC AND INORGANIC REGULATED SUBSTANCES IN GROUNDWATER, UPDATED AUGUST 2016, ARE SHOWN UNDERLINED. ANALYTES THAT EXCEED THE PADEP NONUSE AQUIFER NON-RESIDENTIAL SPECIFIC CONCENTRATIONS FOR ORGANIC AND INORGANIC REGULATED SUBSTANCES IN GROUNDWATER, UPDATED AUGUST 2016, ARE SHOWN IN **BOLD**.

3.) MONITORING WELLS MW-1 THROUGH MW-5 AND MW-12 (HISTORIC MONITORING WELLS) WERE INSTALLED BY OTHERS. ALL OTHER WERE INSTALLED BY GOLDER (NEW MONITORING WELLS).

4.) USEPA REGION III QUALIFIERS
- J= ESTIMATED RESULT
- K= BIASED HIGH
- L= BIASED LOW

REFERENCES

1.) BASE MAP PROVIDED IN DIGITAL FORM BY USEPA, MARCH 2003.

2.) HORIZONTAL DATUM IS THE PENNSYLVANIA STATE PLANE COORDINATE SYSTEM OF 1983 (NAD 83).

3.) PROPERTY BOUNDARY, EASEMENTS AND R/W TAKEN FROM DIGITAL CAD FILE FOLCROFT.DWG, TITLED "FOLCROFT LANDFILL & ANNEX TRACTS 14D, 16, 16B, 27 & 27A," DATED JUNE 1, 2006, PROVIDED BY JAMES M. STEWART, INC.

4.) MONITORING WELLS MW-1 THROUGH MW-12 AND STAFF GAUGES SG-1 THROUGH SG-3 SURVEYED BY JAMES M. STEWART, MARCH 20, 2007.

100 0 100 200
SCALE FEET

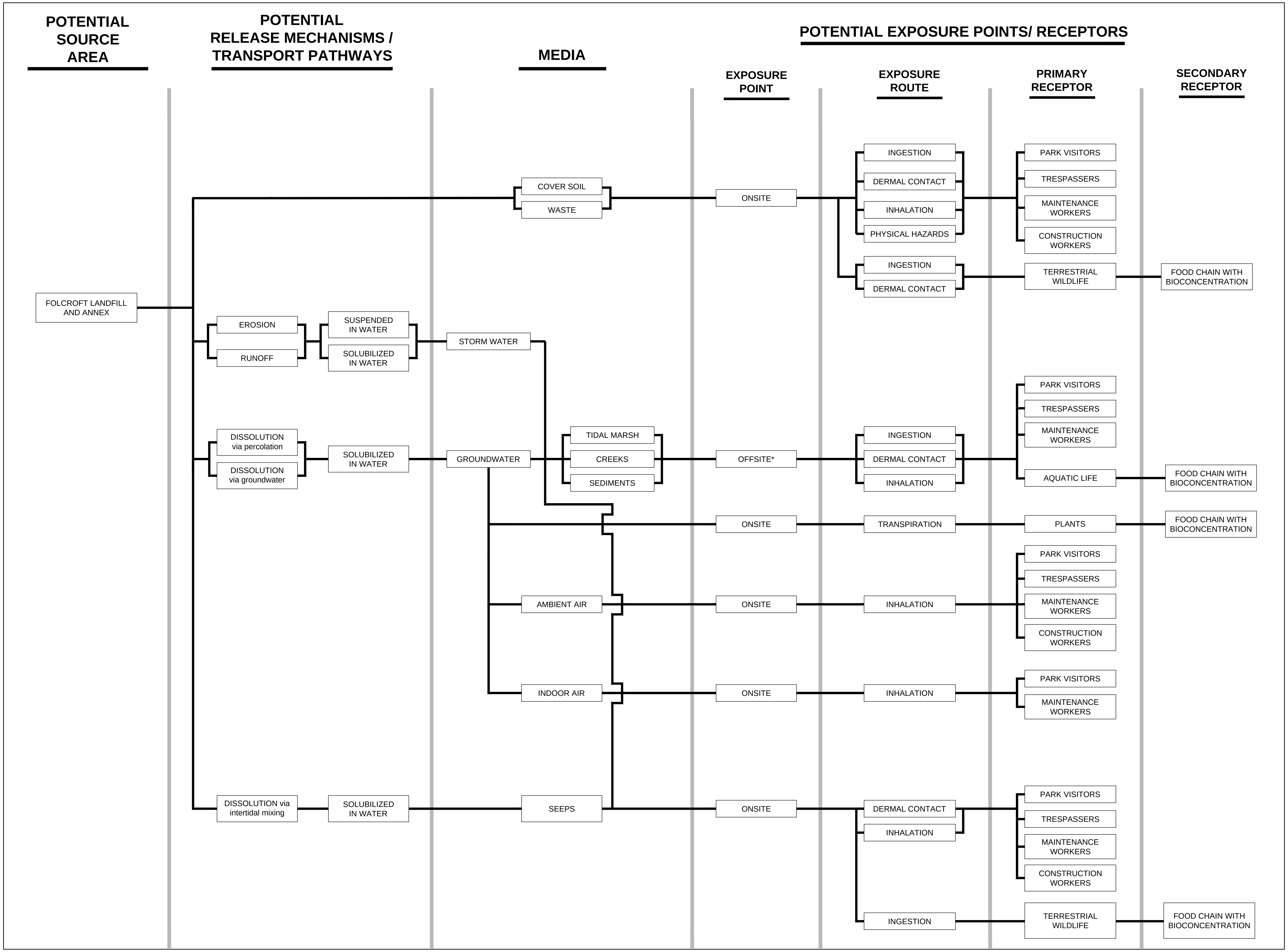
REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE
METALS IN GROUNDWATER

Golder Associates
Mt. Laurel, New Jersey

PROJECT No.	023-6134		FILE No.	0236134N008	
DESIGN	BAR	05/19/17	SCALE	AS SHOWN	REV. 0
CADD	RG	05/19/17			
CHECK	BAR	05/19/17	FIGURE 5-8		
REVIEW	JBG	05/19/17			



* OFF-SITE RISK TO BE INVESTIGATED BY OTHERS

REV	DATE	DES	REVISION DESCRIPTION	CADD	CHK	RVW

PROJECT REMEDIAL INVESTIGATION/FEASIBILITY STUDY
FOLCROFT LANDFILL AND ANNEX SITE
FOLCROFT, PENNSYLVANIA

TITLE

UPDATED CONCEPTUAL SITE MODEL

Golder Associates
Mt. Laurel, New Jersey
NJ Authorization #24GA28029100

PROJECT No.		023-6134	FILE No.	0236134N024
DESIGN	JBG	05/19/17	SCALE AS SHOWN	REV. 0
CADD	RG	05/19/17	**FIGURE 7-1**	
CHECK	BAR	05/19/17		
REVIEW	JBG	05/19/17		

Drawing file: 0236134N024.dwg May 19, 2017 - 1:43pm

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 55 21 3095 9500

solutions@golder.com
www.golder.com

Golder Associates Inc.

200 Century Parkway, Suite C

Mt. Laurel, NJ 08054 USA

Tel: (856) 793-2005