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FINAL

FEASIBILITY STUDY REPORT
CAMP GEORGETOWN
GEORGETOWN, NEW YORK

DEC Site No. 7-27-010

Shaw Project No. 830271

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LIST OF ACRONYMS:

APEG	Alkali Polyethylene Glycolate
ARARS	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
ATSDR	Agency for Toxic Substances and Disease Registry
BCF	Bioconcentration Factor
bgs	Below Ground Surface
BDL	Below Detection Limits
CAA	Clean Air Act
CCA	Chromated Copper Arsenate
CDD	Chlorinated Dibenzo-p-dioxin
CDF	Chlorinated Dibenzofuran
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COPC	Contaminants of Potential Concern
CWA	Clean Water Act
FRTR	Federal Remediation Technologies Roundtable
FS	Feasibility Study
FWIA	Fish and Wildlife Impact Assessment
GAC	Granular Activated Carbon
GRA	General Response Action
HASP	Health and Safety Plan
HRC	Hydrogen Release Compound
HTTD	High Temperature Thermal Desorption
ISTD	In-Situ Thermal Desorption
kg	Kilogram
L	Liter
LDR	Land Disposal Restriction
LPCS	Low Permeability Cover System
LTTD	Low Temperature Thermal Desorption
µg	Micrograms
mg	Milligrams
NCP	National Contingency Plan
NFESC	Naval Facilities Engineering Service Center
ng	Nanogram
NYSDCS	New York State Department of Correctional Services
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSECL	New York State Environmental Conservation Law
OSHA	Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Poly Chlorinated Biphenols
PCP	Pentachlorophenol
PI	Preliminary Investigation
ppb	Parts per Billion (µg/L), (µg/kg)
PPE	Personal Protective Equipment

ppm	Parts per Million (mg/L), (mg/kg)
ppt	Parts per Trillion (ng/L), (ng/kg)
QEA	Qualitative Human Health Exposure Assessment
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
Registry	New York State Registry of Inactive Hazardous Waste Disposal Sites
RI	Remedial Investigation
SCG	Standards, Criteria and Guidelines
SDWA	Safe Drinking Water Act
Shaw	Shaw Environmental and Infrastructure Engineering of New York, P.C.
SVOC	Semivolatile Organic Compound
TAGM 4046	Technical and Administrative Guidance Memorandum
TOGS 1.1.1	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
UTS	Universal Treatment Standards
VOC	Volatile Organic Compound

1.0 INTRODUCTION

Shaw Environmental and Infrastructure Engineering of New York, P.C. (Shaw) has prepared this Feasibility Study (FS) on behalf of the New York State Department of Environmental Conservation (NYSDEC) for Camp Georgetown New York State Superfund Site (Site # 7-27-010), Georgetown, New York. Camp Georgetown (the Site) is a state owned crew headquarters and incarceration facility located in the Town of Georgetown, Madison County, New York (**Figure 1**).

The submittal of this FS represents the completion of activities set forth in the Remedial Investigation and Feasibility Study (RI/FS) Work Plan for the Site (Shaw, September 2001). The conclusions and recommendations presented within this FS are based on the characterization of the Site as presented in the *Preliminary Investigation Report* (PI) (NYSDEC, May 1999) and the *Remedial Investigation Report* (RI) (Shaw, April 2003).

1.1 Purpose and Organization

The purpose of this FS is to develop and evaluate potential remedial options that reduce, to the maximum extent practicable, potential risks to human health and the environment attributable to the occurrence of regulated substances at the Site and to allow for the future development and/or continued use of the property.

This FS report is designed to provide the reader with a summary of the remedial investigation and exposure assessment and guide the reader through the development of the Remedial Action Objectives (RAOs) and evaluation of the remedial alternatives to address these RAOs. To that purpose this FS is divided into the following sections:

- **Section 1.0** introduces and describes the organization of the FS and summarizes the data generated during historic site assessment activities. These activities were carried out to characterize the nature and extent of soil and groundwater impacts (including the delineation of “source areas”, residual materials and to identify potential migration pathways both on and off-site). **Section 1.5** identifies chemicals of potential concern at the Site and assesses the risk to human health associated with current and future activities at the Site based upon existing soil and groundwater quality data.

- **Section 2.0** identifies RAOs at the Site. **Section 2.1** discusses pertinent Federal and State guidelines for site remediation. **Section 2.2** identifies areas of the Site requiring remedial action according to media type and presents qualitative and quantitative RAOs for each media.
- **Section 3.0** identifies and evaluates technologies that have the potential to remediate contaminants at the Site. **Section 3.1** discusses general, media-specific actions that satisfy the RAOs identified in **Section 2.2**. **Section 3.2** describes specific technologies that could be used to address impacted media at the Site and assesses them according to technical effectiveness and implementability. Technologies that were determined to be technically effective and implementable are further evaluated with respect to effectiveness and cost in **Section 3.3**.
- **Section 4.0** combines the technologies retained from the previous section into remedial alternatives. **Sections 4.1** through **4.7** describe the process options involved in each alternative and assesses them with regard to effectiveness, implementability, and cost.
- **Section 5.0** presents a detailed analysis of each retained alternative with respect to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) screening criteria: overall protection of human health and the environment; compliance with Applicable or Relevant and Appropriate Requirements (ARARs); long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; short-term effectiveness; implementability; and cost.
- **Section 6.0** provides a comparative analysis of the alternatives retained from **Section 5.0** with respect to overall protection of human health and the environment; compliance with ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; short-term effectiveness; implementability; and cost.
- **Section 7.0** lists references utilized in the development of this document.

1.2 Background Information

1.2.1 Site Description

The Site, an incarceration facility, is located in the Town of Georgetown, Madison County, New York (**Figure 1**). The facility is operated by the New York State Department of Correctional Services (NYSDCS), but is located on property managed by the NYSDEC. The NYSDCS occupies the property north of Crumb Hill Road and the NYSDEC occupies the property south of Crumb Hill Road. The area of investigation occupies an area of approximately 6.6 acres located south of Crumb Hill Road (**Figure 2**). This study area is bordered on the northeast by Crumb Hill Road, on the south by private property, and west by State Reforestation Land.

Based on the results of the RI, the entire Site is considered an area of concern with specific areas requiring remediation which include the former treatment building, former aboveground storage tank (AST) location, and former outdoor staging areas for treated lumber.

A mature and eroded plateau that is dissected by a series of valleys several hundred feet deep typifies the area around the Site. This plateau has a rolling, rugged appearance. Approximately 45 percent of Madison County is classified as commercial forest that is comprised primarily of white and red pine, oak, elm, ash, red maple, maple, beech, birch, and aspen. Wildlife is a valuable resource in the county. Average temperatures in Madison County range from 18 to 63 degrees Fahrenheit. The county receives an average of 37.84 inches of precipitation and 110.3 inches of snow. Surface water from the Site drains into Mann Brook, which flows into the Otselic River and eventually the Susquehanna River. No State Wetlands exist within a one-mile radius of Camp Georgetown. In addition to State Reforestation Land, the area surrounding the Site is rural, used for residential and agricultural purposes. Potable water is provided in the region by wells, which are often screened in bedrock.

1.2.2 Site History

Camp Georgetown is a large complex of NYSDEC crew headquarters and a NYSDCS active incarceration facility. The incarceration facility is operated by the NYSDCS but is located on property managed by the NYSDEC. One of the work activities formerly performed by the inmates at Camp Georgetown was a sawmill and wood treatment facility. Wood treatment operations were conducted from approximately 1970 until 1991. The pole treatment building was operated from approximately 1970 to 1983 as a dip tank process using the chemical biocide pentachlorophenol (PCP). From 1983 until 1991 the treatment building was operated using a chromated copper arsenate (CCA) process.

A review of state owned lands formerly used for wood treatment was initiated by the Division of Operations in the summer of 1997. In October 1997 the Division of Operations recommended that the NYSDEC perform an environmental investigation at the Site. As a result of that request, the NYSDEC Division of Remediation initiated a preliminary site investigation. This preliminary investigative work identified PCP and dioxins as the two primary contaminants of potential concern (COPCs) in soil and groundwater. Petroleum related compounds and metals were also detected at the Site. Based on these findings, the NYSDEC concluded that the Site should be added to the State's Registry of Inactive Hazardous Waste Disposal Sites (Registry). In December of 1999, the Site was listed on the Registry as a Class 2 site, meaning that it represents a significant threat to public health and/or the environment.

Based on the findings of the PI, it was concluded that further investigation was warranted at the Site. An RI was conducted by Shaw. The results of the PI and subsequent RI are summarized below in **Section 1.3**.

1.3 Summary of Investigations

1.3.1 Historical Site Assessments/Investigations

As discussed in **Section 1.2.2**, the NYSDEC conducted a PI at the Site. The results of the PI Report (NYSDEC, 1999) are summarized below:

- PCP and dioxin were present in soil beneath the former treatment building at concentrations above pertinent screening values,
- PCP was detected above guidance values in surface soil samples collected in the former AST area as well as west of the former treatment building,
- PCP was also detected above guidance values in subsurface test pit soils in the former AST area, former drip pad area, former treated lumber storage area and the area west of the former treatment building,
- Dioxin was detected in all eight monitoring wells above the guidance value,
- PCP was detected in five of the eight monitoring wells above the guidance value,
- The results of the PI determined that more investigation was necessary to further delineate contamination observed at the Site.

As discussed in **Section 1.2.2,** Shaw conducted a RI at the Site.

Shaw prepared a RI/FS Work Plan for the Site dated September 20, 2001 (Shaw Environmental, 2001) and conducted field activities between October 2001 and December 2001. Additional field activities were conducted between October 2002 and November 2002. This RI was required to collect sufficient data to further characterize site conditions, identify and determine the lateral and vertical distribution of the COPCs, accurately evaluate the potential risk to human health and/or the environment, and to determine the potential need for remedial action. Data collected during the RI were detailed in the RI Report (Shaw, 2003) and are summarized in the remaining portions of this section.

1.3.2 Geology and Hydrogeology

Regional Geology

The southern half of Madison County is located on a plateau known as the Appalachian Uplands. The plateau is mature and eroded, and is dissected by a series of valleys that are several hundred feet deep. The major valleys on the plateau have a north south orientation. Large, rounded bedrock controlled hills and ridges characterize the high plateau in the extreme southern part of the county near the location of the Site. The nearly level hilltops are at a similar elevation. This reflects the nearly horizontal character of the underlying bedrock. Because of stream dissection and deepening of the valleys by glacial scour, the plateau uplands have a rugged, rolling appearance. The rounded shoulders of the hills and the steep lower valley sides also are indications of glacial modification.

Regional bedrock consists of Upper Devonian Formations which include the Tully Limestone, Ithaca Siltstone and Sandstone, and Geneseo Shales. The bedrock lies nearly flat, except that it has a slight regional dip to the south of about 50 feet per mile. (US Department of Agriculture, Soil Conservation Service, Madison County, New York, March 1981).

Site Specific Geology

Depending on the location within the Site, the top foot of overburden consists of weathered, broken gray shale (i.e., soil and unconsolidated rock fragments) with a size range from gravel to boulders mixed with grey silt and sand or brown sandy topsoil. This overburden is considered to be fill material most likely originating from a shale quarry located northwest of the Site. Underlying the fill material is glacial lodgment till consisting of a silty till with thin sand lenses and beneath a clay till with thin sand lenses. Both till layers are very dense and vary in color across the Site from grey, tan and brown. Glacial till was observed to a depth of 45.8 feet below ground surface (bgs) which is the maximum depth of drilling during monitoring well installation during the PI activities. The till is very dense as evidenced by high blow counts and difficult drilling conditions. Vertical fractures were observed within the till material. Observations during drilling confirm that the upper 15 feet of the till unit contains numerous thin lenses of more permeable sands and fine gravel that may or may not be interconnected.

According to the PI Report, a drinking water well installed in 1991 north of Crumb Hill Road near the Department of Correctional Services softball field. The well was drilled to a total depth of 400 feet and bedrock was encountered at 220 feet bgs. Stratigraphy was not logged during installation of this well.

Regional Hydrogeology

The Camp Georgetown property is located approximately 4 miles from the Otselic River, which is the nearest discharge zone for Mann Brook. Regionally, groundwater would be anticipated to flow toward the Otselic River. Shallow groundwater in the area of the Site is typically found in coarser-grained glacially-derived sediments or as perched water over deposits of fine-grained sediments of lower permeability.

Site Specific Hydrogeology

Depth to groundwater across the Site ranged between two to five feet bgs during the groundwater sampling events. Gauging data indicates that groundwater flow appears to be in a southwesterly direction, generally following the topography and groundwater appears to eventually discharge into Mann Brook.

Recharge of the water table is likely provided by precipitation infiltrating areas of the Site. Shallow groundwater accumulates in the more permeable sandy lenses found within the till and then likely disperses slowly into the regional groundwater flow regime. Groundwater recovery rates witnessed during well development and purging activities indicated that the hydraulic conductivity for the till unit appeared to be very low with recharge occurring primarily through the vertical fractures observed within this unit.

1.3.3 Nature and Extent of Contamination

This section presents the analytical results from the surface, sediment, seep, subsurface soils, biota samples, and groundwater samples collected at the Site. For screening and discussion purposes only, these results are compared to published New York State standards and/or screening criteria.

Soil criteria from the NYSDEC's *Division Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels HWR 4046* (TAGM 4046) was used for comparison of the soil Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOC) analytical results. TAGM 4046 and site background levels was used for analytical comparison of metals. TAGM 4046 does not include soil cleanup objectives for dioxins and furans. Therefore, for the purposes of this report, and to be consistent with the PI Report for the Site, 1 part per billion (ppb) 2,3,7,8-TCDD equivalence has been used as the soil screening level. The NYSDEC, however, has used 1 ppb 2,3,7,8-TCDD equivalence as a remediation goal at other hazardous waste sites.

The soil cleanup objective listed in TAGM 4046 for PCP is 1 Parts per Million (ppm) for protection of groundwater. Consistent with the PI Report prepared for this Site, this value has been adopted as a groundwater protection screening level for soil.

To determine whether the groundwater contains contamination at levels of concern, data from the investigation were compared to The *Division of Water Technical and Operational Guidance Series 1.1.1* (TOGS 1.1.1). The groundwater standard for total phenolic compounds listed in TOGS 1.1.1 is 1.0 ppb. Here again, to be consistent with the PI Report, and because PCP is the only phenolic compound detected in the groundwater at the Site, a groundwater screening level of 1.0 ppb (µg/l) has been used.

6NYCRR Part 700-705 lists a groundwater standard of 0.0007 ng/l (parts per trillion) for 2,3,7,8-TCDD. This value has been adopted as the groundwater screening level, with the other forms of dioxins and furans normalized to 2,3,7,8-TCDD using the USEPA's toxicity equivalence factors (TEFs).

The NYSDEC TAGM 4046 was used for screening sediments. This document offers guidelines to calculate site specific guidance values for PCP and dioxin based on total organic carbon results.

Biota samples were screened for dioxins by comparing 2,2,7,8-TCDD equivalences. The 2,3,7,8-TCDD fish concentration data was compared to risk calculations which evaluate possible effects on wildlife through the consumption of fish contained in the *NYSDEC's Division of Fish, Wildlife and Marine Resources Technical Guidance for Screening Contaminated Sediments* which is based on *The Niagara River Biota Contamination Project: Fish Flesh Criteria for Pisccivorous Wildlife, A.J. Newell et al., July 1987, NYSDEC Technical Report 87-3*.

1.3.3.1 Surface Soil Results

A total of 88 surface soil samples were collected during the PI and RI and sent to the contract laboratory for SVOC, metals and dioxin analysis. A summary of the analytical results from the PI and RI is presented in **Table 1** and **Figure 3**.

Seventy-four (74) surface soil samples out of 88 were analyzed for PCP only (PI immunoassay results) or total SVOCs. PCP was the only SVOC detected above a TAGM 4046 guidance value of 1.0 ppm in all surface soil samples sent for laboratory analysis. The PCP guidance value was exceeded in surface soil sample locations GSS-1, GSS-17, GSS-20, GSS-21, GSS-22 (which were immunoassay results from the PI), SS-5, SS-7 and SS-8. The concentrations ranged from 1 ppm in GSS-21 to 130 ppm in GSS-17. GSS-1 is located southwest of the former treatment building, GSS-17 is located from the exit of a footer drain from the former treatment building, GSS-12 through GSS-22 (**Figure 3**) are located east of the former treatment plant in a grid adjacent to the former AST location. SS-5, SS-7 and SS-8 were collected from the drip pad area.

PCP was also detected (at estimated values) in several additional surface soil samples collected in the drip pad area, the former Aboveground Storage Tank (AST) area, and the area southwest of the former treatment building at levels well below the TAGM 4046 guidance value. PCP was not detected in any of the other surface soils collected from across the Site. One potential explanation for the relatively low concentrations of PCP in surface soils is that PCP will readily breakdown by photochemical processes when exposed to the ultraviolet radiation in sunlight.

The highest concentrations of total SVOCs (5,048 ppb) were observed in surface soil sample SS-19. This sample was collected from an apparent drainage area southwest of the former Post Peeler building.

A total of 40 of the 88 surface soil samples that were collected from "on-site" locations (located within the study area) were sent to the laboratory for analysis of metals. Additionally, 10 samples were collected from "background" areas (areas selected by the NYSDEC where former treatment operations did not appear to have existed). For discussion purposes, the results from the "on-site" samples were compared to the average value for each metal from the background samples or to the TAGM 4046 guidance value for metals. Results from the "on-site" samples that exceeded the metal guidance value are shaded on **Table 1**. When the data was evaluated by this method, all 40 surface soil samples exceeded at least one guidance value. Calcium and zinc were the analytes that most frequently exceeded the guidance values. Surface soil samples SS-10 and SS-11 (collected from the eastern portion of the Site) contained the greatest number of metal analytes above their respective guidance value (14 of the 23 metals reported by the analysis at each location). Of the three metals of concern (chromium, copper, arsenic), 1 out of 40 surface soil samples across the Site exhibited chromium concentrations above background levels; 2 out of 40 surface soil samples analyzed for metals showed copper at concentrations above background; and 27 out of 40 soil samples analyzed for metals possessed arsenic above the average background concentrations. Four (4) surface soil samples were collected from the shooting range area and sent for laboratory analysis of lead only. All four samples exceeded background averages for lead.

Calcium and zinc, although typically encountered above TAGM 4046 levels, are not considered to be site-specific contaminants of concern for several reasons. First, the concentrations observed were typically consistent across the Site (statistically speaking) and within background concentrations observed in other samples. Additionally, increased calcium or zinc concentrations did not occur concurrently in those samples with the highest chromium, copper or arsenic compounds, known constituents of concern, seemingly indicative that neither zinc nor calcium was used in the treatment process. Finally, elevated calcium levels are common in glaciated terrains as glacial debris/till is encrusted by caliche “caps”, a calcium carbonate “rind” that forms around the sediments, typically in response to water flow within the till.

In addition, 39 of the 88 surface soil samples were also sent for analysis of dioxins. Dioxins and furans were detected at low concentrations in all the samples; only two (2) samples (SS-5 and SS-8) contained 2,3,7,8-TCDD equivalence above the 1.0 ppb guidance value. The two samples having PCP concentrations of 1.09 ppb and 1.16 ppb, respectively, were collected from the former drip pad area.

1.3.3.2 Seep Soil Results

Two (2) soil samples (SEEP-1 and SEEP-2) were collected from a seep that was located south (downgradient) of the former treatment building. Both samples were sent for analysis of SVOCs and dioxins. The analytical results are summarized in **Table 1** and shown on **Figure 3**.

PCP was detected above the 1.0 ppb TAGM 4046 guidance value in SEEP-1. No PCP was detected in SEEP-2.

The two seep samples were also analyzed for dioxins. These results are also included in **Table 1**. SEEP-1 possessed a 2,3,7,8-TCDD equivalence of 3.29 ppb, while sample SEEP-2 possessed a 2,3,7,8-TCDD equivalence of 2.18 ppb. Both of these values were above the Site screening level of 1.0 ppb.

1.3.3.3 Sediment Results

Four (4) sediment samples (SED-1, SED-2, SED-Up and SED-Down) were collected from Mann Brook and sent for analysis of SVOCs and dioxins. The analytical results are summarized in **Table 2** and shown on **Figure 4**.

No SVOCs (including PCP) were detected in any of the four sediment samples collected above the NYSDEC *"Technical Guidance for Screening Contaminated Sediments*" guidance document.

Several dioxin and furan congeners were detected in each sample, however, the total 2,3,7,8-TCDD equivalence concentrations were well below the location specific benchmark.

1.3.3.4 Soil Boring Results

A total of sixty-eight (68) soil samples were collected from 34 soil borings across the Site during the PI and RI.

Sixty-eight (68) samples were analyzed for SVOCs, 34 of 68 samples were analyzed for dioxins and 11 of 68 samples were analyzed for metals. The results of the laboratory analysis are included on **Table 3** and **Figure 5**.

PCP was detected in GB-1, GB-2, GB-5 through GB-10, GB-12 and GB-13B above the 1.0 ppm TAGM 4046 guidance value. These borings are located under the former treatment building and are based on immunoassay results from the PI. The samples were collected from 1-6 feet bgs. PCP was also detected in GSB02-1 (2-4' bgs), GSB02–3 (2-4', 6-8' and 8-10' bgs), GSB02-4 (6-8' bgs) and GSB02-8 (1-2' and 7-8' bgs) above the 1.0 ppm TAGM 4046 guidance value. These soil borings were installed in the area immediately surrounding the former treatment plant, including the former drip pad area, and former AST area.

Dioxins were analyzed in 34 out of the 68 samples collected. While several cogeners were detected across the Site only GSB02-1 (2-4' bgs) exhibited a 2,3,7,8-TCDD equivalence concentration (2.4951 ppb) higher than the 1.0 ppb screening level. GSB02-1 is located in the former drip pad area and the dioxin concentration is consistent with elevated PCP concentrations associated with that area.

Samples collected from GB-1 through GB-11 were also analyzed for metals. Results from the samples were compared to the average value for each metal from "background" samples or to the TAGM 4046 guidance value. Of the three metals of concern, One (1) out of 11 borings exceeded the metal guidance value for chromium. Two (2) exceeded the metal guidance value for copper, and seven (7) exceeded the metal guidance value for arsenic. All eleven borings are located under the former treatment building.

1.3.3.5 Test Pit Results

Forty-seven (47) samples were collected from test pits installed during the PI and the RI. These results are summarized on **Table 4** and **Figure 5**.

Fill material was present in several test pits and appeared to be wide spread across the Site. This is consistent with reports of shale derived from the western portion of the Site being used as a fill material.

PCP was detected above the 1.0 ppm TAGM 4046 guidance value in GTP-1, GTP-4, GTP-5, GTP-11, GTP-13, GTP-16 and GTP-17. Test pits GTP-1, GTP-4 and GTP-5 are located near the former treatment building, GTP-11 and GTP-13 are located southwest of the former treatment plant within a grid of surface soil samples collected during the PI. GTP-16 and GTP-17 are located west of Drying Shed #1. These samples were collected during the PI and are based on immunoassay results.

While several SVOCs were detected in samples collected from the test pits during the RI, none exceeded TAGM 4046 guidance values (including PCP).

Dioxins were analyzed in 20 of the 47 samples collected. Several congeners were detected across the Site and ranged from below detection limits (BDL) to 0.12243 ppb in TP-19NE wall; however, no sample exceeded the 2,3,7,8-TCDD equivalence concentration.

Eight out of 47 test pit samples were analyzed for metals. The concentrations were compared to the established background average. The three metals of concern are directly from the CCA process used on-site. Copper and chromium were not detected above the metal guidance values in any of the 8 analyzed samples. Arsenic was detected slightly above the guidance value in TP-24 which is located on the southeast portion of the Site, near MW-12.

Excavated soils observed in TP-8 had a pale brown to purple discoloration, with some concrete fill material at 2 feet bgs. The concrete is similar to that found in TP-4 and according to NYSDEC operations staff, it is the remnants of the former drip pad. Samples were taken from this depth and sent for laboratory analysis. Test pit TP-16, located on the northwest side of the treatment facility, had a 4 inch layer of gray-brown discoloration at 1.5 feet bgs. The source of this discoloration could not be determined.

1.3.4 Groundwater

Groundwater samples were collected from three separate sampling events. The following sections describe the results.

PI Groundwater Results

Samples were collected from MW-1 through MW-8 and were analyzed for SVOCs, VOCs, pesticides/PCBs, metals and dioxins during the groundwater sampling event conducted during the PI in 1998. The PI groundwater results are summarized on **Table 5** and **Figure 6**.

No pesticides or PCBs were detected in any of the groundwater samples.
Estimated concentrations of xylene and ethylbenzene below TOGS 1.1.1 guidance values were observed in MW-7.

PCP was detected in MW-2, MW-3, MW-4, MW-5 and MW-7 above the 1.0 ppb TOGS 1.1.1 guidance value during the PI sampling event.
Dioxins were detected above the 0.0007 parts per trillion (ppt) 2,3,7,8-TCDD equivalence guidance value in all wells (except MW-7) during the PI sampling event.

Chromium was the only metal related to wood treatment activities detected above TOGS 1.1.1 guidance values. Chromium concentrations above guidance values were detected in MW-2 through MW-5. Copper was detected in every well, however, it didn't exceed the 0.2 ppb guidance value in any sample analyzed. Arsenic was detected at concentrations below guidance values in MW-6.

RI Groundwater Results 2001

A second round of groundwater samples were collected in December 2001. The wells (MW-1 through MW-8) that were installed during the PI were analyzed for fuel oil, SVOCs and dioxins.

Newly installed wells (MW-9 through MW-17) were analyzed for pesticides/PCBs, VOCs and SVOCs. Dioxins were not analyzed in this groundwater sampling event. The analytical results from the 2001 sampling event are summarized on **Table 6** and **Figure 6**.

Fuel components, including diesel fuel, were not detected in any of the eight previously installed monitoring wells that were sampled.

Groundwater from all 17 monitoring wells was sampled and sent for analysis of SVOCs.
Several SVOC analytes, including benzoic acid (1 sample) phthalates (5 samples), PCP (5

samples) and 2,6-dinitrotoluene (1 sample) were detected. Benzoic acid and phthalates are believed to be laboratory artifacts.

PCP was detected above NYSDEC TOGS 1.1.1 guidance values for water in MW-4 (85 ppb), MW-5 (44 ppb), MW-6 (920 ppb), MW-7 (160 ppb) and MW-11 (540 ppb). TOGS 1.1.1 lists a groundwater guidance value for 2,3,7,8-TCDD as $7x10^{-7}$ ppb or 0.0007 ppt. This had been adopted as the groundwater screening level, with the concentrations of other forms of dioxins and furans normalized to 2,3,7,8-TCDD using the toxicity equivalence factors (TEFs).

Concentrations of dioxins were found in five of the wells sampled (MW-4 through MW-8). However only three wells, MW-4 (0.020725 ppt), MW-6 (0.001184 ppt) and MW-7 (1.6694 ppt) exhibited a 2,3,7,8-TCDD equivalence concentration over the 0.0007 ppt TOGS 1.1.1 guidance value. These wells are located radially around the former drip pad area and were known to have dioxins from previous investigations. All water dioxin results are reported in parts per trillion (ppt). Concentrations ranged from 0.000009 ppt (MW-5) to 1.6694 ppt (MW-7).

The PCB aroclor 1254 was found in three of the nine wells sampled. Concentrations of Aroclor 1254 in MW-9 (15 ppb), MW-12 (1.7 ppb), and MW-15 (2.7 ppb) were above NYSDEC TOGS 1.1.1 guidance values. Aroclor 1254 concentrations were randomly distributed across the Site; MW-9 is north and upgradient, MW-12 is located downgradient to the southeast, and MW-15 is downgradient to the southwest. PCBs are not known to be a site-related contaminant of concern. No pesticides were detected in any of the monitoring wells sampled.

Estimated concentrations of acetone were detected in MW-13 (8.5 ppb), MW-16 (8.2 ppb), and MW-17 (4.8 ppb) respectively. The presence of acetone was at a level lower than the guidance value of 50 ppb and is suspected to be a laboratory artifact.

RI Groundwater Results 2002

A third round of groundwater samples were collected in November 2002. The results of this sampling event are summarized on **Table 7** and **Figure 6**. Unfiltered samples were collected from 19 wells for analysis of SVOCs, fuel oil, dioxins and pesticides/PCBs. Six (6) of the 19 wells were filtered and analyzed for the same parameters in an attempt to determine if high turbidity in groundwater was a contributing factor in elevated concentrations of contaminants. Groundwater from MW-5, MW-9, MW-12, MW-15, MW-18 and MW-19 was filtered via a 0.45 micron in-line filter. These results were inconclusive, showing no substantive difference in groundwater quality between the filtered and unfiltered samples.

No PCBs were detected in any of the monitoring wells. Bis(2-ethylhexyl)phthalate was detected above the TOGS 1.1.1 0.6 ppb guidance value in all samples collected except MW-15 (filtered). Bis(2-ethylhexyl)phthalate is believed to be a laboratory artifact.

PCP was detected above the 1.0 ppb TOGS 1.1.1 guidance value in MW-2, MW-3, MW-4, MW-5, MW-5 filtered, MW-6, MW-7 and MW-11. Concentrations ranged from 1 ppb (MW-2 and MW-3) to 370 ppb (MW-11).

Fuel oil components were detected in MW-4, MW-6 and MW-7.

Groundwater samples collected from MW-4, MW-7 and MW-8 exhibited 2.3.7,8-TCDD equivalence concentrations above the 0.0007 ppt TOGS 1.1.1 guidance value. Concentrations ranged from 0.00087987 ppb in MW-8 to 0.0214887 in MW-4 ppb.

1.3.5 Biota Sampling Results

A total of 22 fish samples were collected from various locations within Mann Brook located west and downgradient of the Site as depicted on **Figure 4**. Fish samples were collected by electroshock sampling methods as described in the RI and were submitted for laboratory analysis of dioxins. The results are summarized in **Table 8**.

Eleven of the fish samples were collected upstream of the Site (US-1 through US-11). The other eleven samples were collected downstream (DS-1 through DS-11) of the Site.

2,3,7,8-TCDD equivalence concentrations are reported as wet weight concentrations and ranged from BDL to 0.784 ppt. No samples collected exceeded the appointed guidance value.

1.4 Summary of Site Conditions

Soil, sediment, groundwater and biota data generated during several phases of site investigative activities indicate the following:

- Overburden at the Site consists of fill and sandy soil underlain by glacial lodgment till interspersed with sand lenses. The till is bisected in places by vertical fractures.
- The overburden soils are very dense and don’t readily transmit water based upon observed hydraulic conductivity values. This low conductivity, combined with little to no lateral recharge of groundwater (all recharge originates as rainwater/snowmelt that

virtually recharges the overburden) precludes the widespread migration of groundwater within the overburden sediments.

- Depth to groundwater ranges between two (2) and five (5) feet bgs,
- Recharge of the water table is likely provided by precipitation infiltrating areas of the Site, moving downward through the observed vertical fractures.
- Soils beneath the treatment building are impacted with PCP to a depth of at least 6 feet bgs,
- The area of the former drip pad area is impacted with PCP and dioxin to a depth of at least 10 feet bgs,
- Soils within the area of former ASTs is impacted with PCP to a depth of at least 10 feet bgs,
- Several isolated small areas are impacted with PCP to a depth of 0-5 feet bgs,
- The sediments collected from Mann Brook were shown to not have been impacted by historical wood treatment operations,
- Four (4) out of 22 Biota (trout) samples possessed 2,3,7,8-TCDD equivalence concentrations greater than the 0.0003 ppb guidance value (Newell, 1987),
- Several monitoring wells (MW-2 through MW- 7 and MW-11) possessed PCP concentrations greater than the 1.0 ppb guidance value during the latest round of groundwater sampling,
- Three monitoring wells (MW-4, MW-7 and MW-8) possessed 2,3,7,8-TCDD equivalence concentrations above the 0.0007 ppb guidance value.
- Groundwater across the Site is generally not impacted except in those areas where it remains in contact with impacted soils.
- Groundwater is not ubiquitous across the Site, occurring primarily within the more porous sand lenses or as perched water above the impermeable clay layers.

Consequently, existing soil data indicates that the primary impacted areas on-site include areas beneath the former treatment building, the former drip pad area, the former AST area, and several isolated areas of the Site. These areas are shown on **Figure 7**.

Widespread groundwater impacts were not observed at the Site. The primary impacts were observed within monitoring well MW-11, MW-6, and in Seep samples 1 and 2. These impacts are isolated in nature and occur within or immediately adjacent the area of impacted soils.

From the data collected during the PI and the RI, the impacted areas on-site are primarily observed within soils beneath the former treatment building, the former drip pad area, the former AST area, and several small isolated areas on-site. These areas are shown on **Figure 7**.

1.5 Summary of Qualitative Human Health Exposure Assessment

The Qualitative Human Health Exposure Assessment (QEA) (Shaw, 2002) was used to determine the current and potential future exposure pathways associated with current or unremediated (baseline) site conditions (**Appendix A**). The QEA identified COPCs and complete exposure pathways (mechanisms by which receptors may come into contact with site-related contaminants). The risk to receptors via complete pathways were then assessed based on comparison to screening levels in the context of current and reasonably foreseeable site exposures. The role of completed, ongoing and proposed remedial activities at the Site in mitigating exposures was addressed where appropriate. The QEA used data from the PI (NYSDEC, 1999) and the RI (Shaw, 2003).

The QEA process was derived from the guidance set forth in the United States Environmental Protection Agency's (USEPA) Risk Assessment Guidance for Superfund (RAGS; 1989, 1991).

1.5.1 Chemicals of Potential Concern

The following media were addressed during investigative activities: sediment, surface soils (0-1 foot below grade), subsurface soils and groundwater. Samples were collected for each medium and laboratory analysis was performed to determine chemicals present in the samples during site assessment activities (Shaw, 2001-2003). Chemicals present in the samples were compared to NYSDEC TAGM and NYSDEC Ambient Groundwater Quality Standards values to determine COPCs. The following substances were identified as COPCs:

- Dioxin
- Pentachlorophenol (PCP)
- Fuel Oil
- Copper
- Chromium
- Arsenic

Table 9 lists each COPC and identifies the maximum concentration of each chemical detected at the Site.

PCP and dioxin are considered to pose the greatest risk to human health and the environment. The constituents of fuel oil are relatively stable, immobile, and pose little risk to human health and the environment. Metals related to the wood treatment process CCA are not volatile and tend to bind to soil and/or sediment particles. Elevated concentrations of these metals are generally limited to the former treatment areas.

1.5.2 Exposure Assessment

An exposure assessment is defined as the measurement or estimation of the amount or concentration of a chemical(s) coming into contact with the body at potential sites of entry. The objectives of an exposure assessment are to:

- Identify a contaminant source;
- Specify a mechanism for release, retention, or transport within a given medium;
- Identify a point of human contact with the medium (i.e. exposure point);
- Identify a plausible receptor and route of exposure at the exposure point; and
- Estimate the magnitude, duration, and frequency of exposure.

Contaminant Sources

Between 1970 and 1983, PCP was the principal chemical biocide used in treating lumber at Camp Georgetown. During the treatment process, poles were placed in the dip tanks, which were then filled with a mixture of PCP and No. 2 fuel oil. After treatment, poles were hoisted from the tank and allowed to drip over the tank for a period of time, and then moved to the drip pad. Poles were finally moved to a designated “treated material storage area”. Use of PCP was discontinued in 1983; the treatment building then operated using a CCA process until 1991. The CCA solution was more controlled than the PCP process, involving the soaking of lumber in the CCA solution under pressure. The solution was pumped out and the lumber was allowed to dry in the vessel, and then moved to the drip pad. At that time, runoff from the drip pad was collected and reused. As a result of these wood treatment operations, sources of contamination exist at the Site and are associated with historical releases of wood treatment products (PCP, CCA, and fuel oil) to site soils.

Release Mechanisms

The probable release mechanism(s) for the chemicals to soil include deposition onto surface soil and infiltration and percolation through the soil into the subsurface soil and groundwater. Hence, the principal on-site media impacted by the historic wood treatment operations are surface and subsurface soils.

Fate and Transport

Contaminant release and transport mechanisms may carry contaminants from the source to points where individuals may be exposed. Chemical migration between media such as soil and groundwater is influenced by chemical parameters such as water solubility or molecular size or shape, in addition to the chemical and physical characteristics particular to a site’s media. This section discusses information about the fate and transport of the source chemicals present at the Site.

PCP and Dioxin

PCP is a moderately acidic substance, and thus its fate is strongly influenced by pH. At a neutral pH it is almost completely found in the ionized form, the pentachlorophenate anion, which is much more mobile than PCP (Agency for Toxic Substances and Disease Registry (ATSDR), 2000)). PCP has a low water solubility and a strong tendency to adsorb onto soil or sediment particles in the environment. Adsorption to soils and sediments is dependent on pH and organic content. Adsorption at a given pH increases with increasing organic content of soil or sediment. No adsorption occurs at pH values above 6.8 (ATSDR, 2000; Howard, 1991). Since it is expected that soils at the Site are acidic (less than 7.0) based on soil type (no pH data is available) and soils are low in organic content (TOC is 7.06% in SED-2) some adsorption is likely to occur.

The ionized form of PCP may be rapidly photolyzed by sunlight; PCP may also undergo biodegradation by microorganisms, animals, and plants, although degradation is generally slow (Howard, 1991). Given that at expected pH conditions a portion of PCP will be present in the ionized form, photolysis may be an important degradation pathway at this Site in shallow soils.

PCP has an octanol-water partition coefficient (K_{ow}) of 100,000 (Howard, 1991), which indicates that it is lipid-soluble and therefore has a tendency to bioaccumulate in organisms. Bioaccumulation is largely pH-dependent, with considerable variation among species. Bioconcentration Factors (BCFs) for PCP in aquatic organisms are generally under 1,000, but some studies have reported BCFs up to 10,000. BCFs, however, for earthworms in soil were 3.4-13 (ATSDR, 2000). Significant biomagnification of PCP in either terrestrial or aquatic foodchains, however, has not been demonstrated (ATSDR, 2000).

PCP products often contain chlorophenols, dioxins, and furans which may also be formed through the degradation of PCP. Once released to the environment, chlorinated dibenzo-p-dioxins (CDDs) and chlorinated dibenzofurans (CDFs) are persistent and generally adsorb to soil or sediment particles due to their low water solubility's. Adsorption is generally the predominate fate process affecting these chemicals, with the potential for adsorption related to the organic carbon content. CDDs and CDFs may undergo degradation through biological action or by photolysis, with a half-life ranging from weeks to months. Photolysis and hydrolysis are generally not significant processes, however, these compounds persist in the adsorbed phase (USEPA, 2002).

Due to their high adsorption rate, CDDs are not expected to leach from soil, although some leaching of disassociated forms of the compound may occur, especially at lower pHs (USEPA, 2002). Since the pH of site soils are not known but are not expected to be highly acidic, leaching of CDDs and CDFs is unlikely. Migration of CDD-contaminated soil may occur through erosion and surface runoff. Upon reaching surface waters, additional adsorption may occur due to the typically higher levels of organic matter content of sediments as compared to surface soils (ATSDR 2000). Volatilization from either subsurface soil or water is not expected to be a major transport pathway, although it may occur from surface soils (ATSDR, 2000). As with PCP and other lipophilic pesticides, CDDs and CDFs tend to bioaccumulate in exposed organisms, with BCFs for aquatic organisms ranging from 5,000 to 10,000 (Montgomery, 1996). Uptake from soil by plants can occur, although it is limited by the strong adsorption of these compounds to soils. BCFs in plants have been measured to be 0.0002, with most accumulation occurring in the roots with little translocated to the foliage (ATSDR, 2000). Terrestrial organisms may accumulate CDDs and CDFs as a result of direct ingestion and contact with soils.

At the Georgetown Site, PCP is expected to be adsorbed to soil organic matter content, although limited leaching may occur due to the expected pH (slightly acidic) and low organic matter content in site soils, (TOC is 7.06% in SED-2). Some photolysis of PCP from surface soils can be expected. Uptake of PCP from soil by plants or terrestrial organisms may occur, but biomagnification is not expected. CDDs and CDFs are expected to be strongly sorbed to soil, as well as persistent. Leaching of these compounds is likely to be limited. Accumulation of these compounds in plants as a result of root uptake is unlikely to be significant.

Fuel Oil

At the Site, PCP was mixed with No. 2 fuel oil for wood treatment application. Fuel oils are mixtures of numerous aliphatic and aromatic hydrocarbons. Individual components of fuel oil include n-alkanes, branched alkanes, benzene and alkylbenzenes, naphthalenes, and polycyclic aromatic hydrocarbons (PAHs) (ATSDR, 2000). Primary constituents identified in soil and/or groundwater at the Site are PAHs. Soil adsorption, volatilization to air, and leaching potential depend on a PAH's individual chemical characteristics; however, as a class of compounds, they are generally insoluble in water, with a strong tendency to bind to soil or sediment particles. Some of the lighter-weight PAHs (such as naphthalene, acenaphthene, and phenanthrene) may volatilize from soil or groundwater into the air. Degradation may occur through photolysis, oxidation, biological action, and other mechanisms. Microbial degradation appears to be a major degradation pathway in soil (ATSDR, 2000).

As nonpolar, organic compounds, PAHs may be accumulated in aquatic organisms from water, soil, sediments, and food. BCFs vary among PAHs and receptor species, but in general, bioconcentration is greater for the higher molecular weight compounds than for the lower molecular weight compounds (ATSDR, 2000). BCFs for accumulation of PAHs by plants from soil are low, with values of 0.001 to 0.18 reported for total PAHs (ATSDR, 2000). Accumulation of PAHs from soil by terrestrial organisms is also limited, with BCF values for voles of 12 reported for phenanthrene and 31 for acenapthene.

At this Site, PAHs, the primary fuel oil constituents of interest, are expected to be adsorbed to soil, with limited potential for leaching. Microbial degradation may occur, with other degradation processes less important in soil. Uptake of PAHs from soil by terrestrial organisms or plants may occur, but bioconcentration is expected to be limited.

Chromated Copper Arsenate

CCA is a preservative used at Camp Georgetown and was reportedly comprised of 23.75% chromic acid, 17% arsenic pentoxide, 9.25% cupric oxide and 50% water.

CCA is not a volatile substance; however, as it is water based, it readily enters the soil. Metals such as arsenic, copper and chromium are known to be persistent and mobile in soil and water, and leaching is a significant migration pathway, especially in acidic conditions. These metals, however, tend to bind to soil and/or sediment particles in an insoluble form; therefore, any leaching usually results in transportation over only short distances in soil (ASTDR, 2000). Soil analytical results show that most metal concentrations at the Site are within background levels, with the exception of arsenic, chromium, lead, and zinc. Elevated concentrations of these metals are generally limited to the former treatment areas.

A fraction of the more soluble forms of metals in the environment may be taken up by plants and animals (ASTDR, 2000; Howard, 1991). Terrestrial plants may bioaccumulate metals through root uptake or by absorption of airborne metals, which may be deposited on the leaves. None of these metals have shown the potential for significant biomagnification through the food chain (ASTDR, 2000).

Exposure Points

The impacted surface soils currently act as potential exposure points because they may be contacted directly. It is possible for chemical constituents in subsurface soil to be excavated and redistributed onto the surface to become mixed with surface soil. Excavation activities may also cause the generation of dust and the volatilization of chemical constituents from soil and groundwater, resulting in air being considered a secondarily impacted medium.

Routes of Exposure

Routes for exposure to chemical constituents include ingestion and absorption through direct contact with the soil and groundwater and inhalation of dust and vapors under existing and future site conditions (assuming that no remediation is completed).

Potential Receptors

Current land use at Camp Georgetown and the immediate vicinity is institutional (prison), commercial, and wooded area. Soil and vegetation cover the majority of the Site, but a portion is covered with asphalt, concrete, and other impervious structures. The property would be expected to remain an incarceration facility in the future and impacted soils will be removed, capped, or covered, eliminating the risk of potential receptors coming into contact with the impacted soils.

Potential exposure pathways and receptors were evaluated for both current use/current site conditions as well as hypothetical future use/future site conditions. The mixing of surface and subsurface soils were evaluated for future receptors to account for potential excavation and redistribution of soils that may occur during redevelopment. Current receptors include adult inmates, facility personnel, authorized visitors, industrial/commercial workers and wildlife; potential future receptors include adult inmates, facility personnel, authorized visitors, industrial/commercial workers, construction workers, and wildlife.

- Adult Inmates/Facility Personnel/Authorized Visitors: These receptors may be exposed to surface soils (provided that they are not capped or covered). Incidental ingestion of soil, dermal contact, inhalation of fugitive dust from soil, and inhalation of volatiles from soil and/or groundwater were identified as potential pathways for exposure to be considered provided that a direct exposure pathway remains to surface soils.
- Industrial/Commercial Workers (Authorized Visitors and Facility Personnel): Workers are defined as individuals that are employed at an industrial commercial facility and have unlimited access to media at the Site. These workers include employees of Camp Georgetown (facility personnel) and workers contracted by Camp Georgetown (authorized visitors). Workers are assumed to be exposed daily (5-day workweek) to site media.

  Industrial/commercial workers represent the most likely receptors. These receptors may be exposed to surface and subsurface soils as well as groundwater if below grade construction activities occur at the Site in the area of the impacted soils. Incidental ingestion of soil and/or groundwater, dermal contact, and inhalation of fugitive dust from soil were identified as potential pathways for exposure to be considered. Inhalation of volatiles from soil and/or groundwater were identified as potential pathways for exposure to be considered if they work bgs (i.e. in a basement).

- Construction Workers: In addition to the workers described above, hypothetical construction workers may also be exposed to media in the future. The difference between industrial/commercial workers and construction workers is that construction workers have the potential to be more highly exposed than other workers do, but over a shorter period of time (i.e. the duration of construction activity). However, they will be informed of the risks and would be required to use pertinent health and safety protocols for below grade excavation and earthwork activities.

  Construction workers are also likely receptors. These receptors may be exposed to surface and subsurface soils as well as groundwater. Incidental ingestion of soil and/or groundwater, dermal contact, inhalation of fugitive dust from soil, and inhalation of volatiles from soil and/or groundwater were identified as potential pathways for exposure to be considered.

- Wildlife: The perimeter of the Site is not fenced so it is possible that wildlife may obtain access to the property. These receptors may be exposed to surface soils (provided that they are not capped or covered). Incidental ingestion of soil, dermal contact, inhalation of fugitive dust from soil, and inhalation of volatiles from soil and/or groundwater were identified as potential pathways for exposure to be considered provided that a direct exposure pathway remains to surface soils.

  There is some potential for the uptake of site contaminants by terrestrial organisms that may then be consumed as game species. Terrestrial game likely to be hunted in this area would include species such as white-tailed deer and turkey. Both species consume vegetation; additionally, turkeys are opportunistic feeders that will also include invertebrates to their diet. Uptake by plants from soil is not expected to result in significant bioaccumulation in plants. In addition, the area of impact is small relative to the expected home range of these two species. White-tailed deer have a home range of 120 to 400 acres (Burnett et al. 2002), while turkey can have a home range of 1000 acres or more (North Caroline State University 1995). Any contribution of site-related contaminants to the body burden of these species is, therefore, expected to be insignificant.

1.6 Fish and Wildlife Impact Assessment

A Step I and Step IIA Fish and Wildlife Impact Analysis (FWIA) was prepared by a Shaw Scientist/Risk Assessor to determine if potential impacts to fish and wildlife resources exist at the Site from the former wood treatment operations. The FWIA consisted of the following steps:

- **Step I**: Site Description
- **Step IIA**: Pathway Analysis

The complete FWIA report is included as **Appendix B**. The following sections present a brief summary of the pertinent results of the report.

1.6.1 Site Description

Several streams and wetland areas were identified as significant resource areas within a 2-mile radius from the Site, including:

- Mann Brook and associated tributaries
- Muller Brook
- Bucks Brook
- Ashbell Brook
- A freshwater wetland (approximately 2 miles from the Site)

The topography of the Site tends towards the southwest and southeast, with surface runoff from precipitation and seeps discharging to Mann Brook. Mann Brook converges with the Otselic River approximately 3 miles southeast from the Site.

1.6.2 Fish and Wildlife Resources

A Site reconnaissance to observe habitat conditions and collect information on the species anticipated to be present was conducted on January 23, 2002. Approximately 1.5 feet of snow cover existed and most flora were dormant or under snow. Dormant flora noted included goldenrod, Queen Ann's Lace, briars, quaking aspen, honey locust, and yellow birch. Upland Forest consisting of mixed evergreen and deciduous species covered most of the general area. The Site itself contained extensive red pine plantings. Hawks, crows, a small nest indicative of a small songbird, and coyote tracks were also observed. The major subsystems associated with the Site and surrounding area included:

- Terrestrial Cultural
- Open Upland
- Forested Upland
- Riverine

1.6.3 Environmental Impacts

Chemical analyses have indicated that impacts exist across the Site as a result of past practices. As vegetation at the Site was dormant and covered with snow at the time of the Site visit, it was difficult to determine whether signs of physical stress existed. Vegetative growth in undisturbed or revegetated areas appeared to be varied and dense, and the presence of wildlife species representative of various trophic levels indicated that overall community structure is likely complete. However, it was uncertain whether population-level effects were present due to surficial soil and stream impacts.

1.6.4 Value of Resources

Overall, the area provides significant foraging, resting, roosting, and breeding cover for wildlife. The chemical impacts detected at the Site are most likely not a limiting factor to overall community structure. The lack of species observed during the Site visit was likely due to the winter conditions and the presence of humans rather than chemical impacts.

1.6.5 Contaminant-Specific Impact Assessment

Site conditions indicate that: 1) various species of fish and wildlife are likely to be present at the Site; 2) compounds that are mobile, persistent, or have the potential to bioaccumulate have been documented on the Site; and 3) these compounds exist at or near the surface of soil, and have the potential to be taken up by plants and animals. Therefore, the following pathways of chemical movement and exposure to fish and wildlife were considered possible:

- Dermal contact with chemicals present in the surface soil and groundwater (at seep areas),
- Ingestion of chemicals in surface soil, groundwater, and food sources,
- Direct uptake of chemicals in soil, or groundwater by terrestrial and aquatic plants

1.6.6 Conclusions

Given the nature of the chemicals present at the Site (i.e., dioxins, phenols, PAHs, and heavy metals) and the distribution of impact, complete exposure pathways were identified for terrestrial and aquatic receptors. Based on visual field observations, there was no overt evidence of stressed vegetation, and community structure does not appear to be impaired. However, due to the limited observations that could be made during the Site visit, it is inconclusive at this time whether significant ecological impact exists due to site-associated releases to the environment.

Additional observation of terrestrial vegetation and wildlife conducted during the growing season are recommended.

2.0 IDENTIFICATION OF REMEDIAL ACTION OBJECTIVES

The purpose of this FS is to evaluate and focus upon remedial response actions that may be applicable for the reduction of potential future risks to human health and the environment at the Site. RAOs are goals developed to protect human health and the environment. This section of the FS describes the development of RAOs for impacted media identified during recent site assessment activities (Shaw, 2001-2002), and how the RAOs will be used to evaluate potentially applicable remedial alternatives within this FS. The general requirements for this work are described in relevant guidance, including the NYSDEC TAGM 4030 (NYSDEC, 1990) and USEPA (USEPA, 1988) guidance for developing remedial actions.

RAOs consist of medium-specific (i.e., soil, groundwater, etc.) goals for protecting human health and the environment (USEPA, 1988). The process of developing RAOs includes the identification of:

- COPCs at the Site;
- Exposure routes and receptors of potential concern;
- Qualitative and quantitative goals for COPC cleanup in each medium that may require treatment.

The COPCs, exposure routes, and receptors of potential concern were discussed in **Sections 1.5.1** and **1.5.2** of this report.

2.1 Applicable or Relevant and Appropriate Requirements

Regulations and guidance for New York State's Inactive Hazardous Waste Disposal Site Remedial Program, 6 NYCRR Part 375 (NYSDEC, 1992) were promulgated to promote the orderly and efficient administration of Article 27, Title 13 of the New York State Environmental Conservation Law (NYS ECL). The scope, nature, and content of an inactive hazardous waste site remedial program performed in accordance with this statute are to be determined on a site-specific basis. Specifically, Part 375 pertains to the development and implementation of remedial programs under authority of ECL Article 27. Subpart 375-1.10(c)(1) states that “due consideration” must be given to "standards, criteria and guidelines" (SCGs) when evaluating remedial alternatives for Class 2 inactive hazardous waste disposal sites. The regulation states that such “consideration” should be given to guidance “determined, after the exercise of engineering judgment, to be applicable on a case-specific basis” (6 NYCRR 375.1-10(c)(1)(ii)).

SCGs include both New York State's criteria applicable to cleanup of contaminated media and federal ARARs that may be more stringent than the State's criteria. As part of this FS, SCGs were evaluated for site applicability to develop the medium-specific RAOs. SCGs may be chemical-specific, location-specific, or action-specific. Chemical-specific SCGs were evaluated to establish appropriate action levels for impacted site media (i.e., soil standards). Action-specific SCGs were evaluated to establish acceptable standards for the management of impacted media (i.e., minimum technology standards for treatment of specific wastes such as stormwater and erosion control during construction). Location-specific SCGs were evaluated to establish acceptable actions with respect to location and/or the presence of specific Site conditions (i.e., protection of waters). A complete list of SCGs and ARARs identified for the surface soils, subsurface soils and groundwater is presented in **Table 10**.

The New York State SCGs and federal ARARs that were considered during the development of this FS include:

- Federal Resource Conservation and Recovery Act (RCRA) requirements apply to soil, groundwater, or other material removed from the Site that is categorized as hazardous. These materials may be subject to all RCRA standards including the 40 Code of Federal Regulations (CFR) 268 land disposal regulations. All RCRA wastes would be disposed at RCRA-permitted facilities where land disposal restrictions (LDRs) would apply. RCRA is not applicable for determining remedial action levels.
- The Clean Air Act (CAA) regulates air emissions of certain hazardous air pollutants. The CAA would not be applicable during site remediation unless treatment technologies creating air emissions are used. Any future particulate or volatile emissions from the Site would be controlled by risk-based standards, which are more protective than CAA standards. As a result, CAA standards would be fully addressed by the more stringent risk-based standards.
- The Clean Water Act (CWA) regulates the discharge of pollutants into the waters of the United States. No discharges will be made directly to any body of water or to the ground surface at the Site.
- The Safe Drinking Water Act (SDWA) was created to protect the quality of drinking water in the United States. This law focuses on all waters actually or potentially designed for drinking use, whether from above ground or underground sources. Water will not be discharged directly to any potable water source or to the ground surface. Camp Georgetown is an active incarceration facility that uses an unimpacted bedrock aquifer as a public potable water supply.

- The New York State standards for groundwater quality promulgated under 6NYCRR Part 703 and set forth in NYSDEC guidance (e.g. TOGS 1.1.1) were considered.
- The New York State Technical Administrative Guidance Memorandum – Technical Manual (NYSDEC, February 8, 1993) was required in regards to on-site containment of hazardous waste. This manual provides the NYSDEC definition of "Active Waste Management" as it pertains to hazardous waste land disposal.
- The primary guidance for soil cleanup values under Part 375 remedial actions is derived in the TAGM 4046 on Determination of Soil Cleanup Objectives and Cleanup Levels HWR-94-4046, commonly referred to as TAGM 4046 (NYSDEC 1994). This guidance provides a basis for determining generic soil cleanup values that essentially ensures that all significant threats to human health and/or the environment posed by an inactive hazardous waste site are eliminated. For organic contaminants, the recommendation for an appropriate cleanup objective is based on the following criteria:
    - Health-based levels that correspond to excess lifetime cancer risks of 1 in 1 million for Class A and B carcinogens, or 1 in 100,000 for Class C carcinogens.
    - Human health-based levels for systemic toxicants, calculated from Reference Doses (RfDs).
    - Environmental concentrations protective of groundwater/drinking water quality.

The generic guidance values listed in TAGM 4046 were used in screening the COPCs for each media and were used in the development of remedial actions, as required by the NYSDEC.

- New York State effluent standards for discharge to groundwater would apply to potential discharges. Potential discharges may arise from the dewatering process used to treat the excavated soil and the decontamination process.
- New York State solid waste regulations guide the disposal of newly generated solid waste (6NYCRR Part 360). Each solid waste landfill will have specific acceptance criteria for individual chemical constituents.
- New York State air emission guidelines would not be applicable unless treatment technologies creating air emissions are used. Applicable guidance for short-term emissions during construction activities is contained in TAGM-4031.

The quantitative criteria retained from the review of SCGs for the COPCs identified in each medium at the Site are discussed in the following section.

2.2 Remedial Action Objectives

As described in **Section 1.5** of this FS, the *Qualitative Exposure Assessment* (Shaw, 2002) evaluated human health risks from potential on-site exposures to COPCs under current conditions and hypothetical future land-use scenarios. According to USEPA (1988) guidance, RAOs for protecting human receptors should express a remediation goal for COPCs in association with an exposure route (e.g. soil, groundwater, etc.), because protection may be achieved by reducing exposure (such as capping an area or limiting access,) as well as by reducing COPC levels. The COPCs identified at the Site in the RI and QEA are discussed in **Section 1.5.1**. The concentrations and spatial distribution of COPCs across the Site were also evaluated in the context of potentially complete exposure pathways associated with current land-use during the QEA. The potentially complete exposure pathways and potential receptors for these land uses are discussed in **Section 1.5.2**.

This section summarizes the qualitative and quantitative RAOs developed for the Site by medium. The criteria discussed in **Section 2.0** of this FS (SCGs and ARARs) are presented in this section relative to each impacted medium and relevant exposure pathway. According to USEPA guidance, RAOs are required to specify:

- The contaminants of concern;
- The media of concern;
- Exposure routes and receptors;
- The acceptable contaminant levels for each exposure route.

These stipulations have been provided to address protection of human health that may be achieved through exposure reductions. Exposure reduction may be achieved through barriers to contact and/or institutional controls, or by removal actions and/or treatment. NYSDEC's regulations state that the goal of the remedial program for a specific site is "to restore that site to pre-disposal conditions, to the extent feasible and authorized by law" (6 NYCRR § 375.1-10(b)). At a minimum, the remedy must "eliminate or mitigate all significant threats" to human health or the environment through the "proper application of scientific and engineering principles."

In accordance with USEPA (1988) guidance, RAOs were developed for each medium and potential exposure route. Surface and subsurface soils were the areas identified as requiring remedial action in this FS. Qualitative and quantitative RAOs are summarized in **Table 11** and are discussed in **Sections 2.2.1** and **2.2.2**. In the ensuing sections of this FS, each alternative will be evaluated relative to its effectiveness in achieving these goals by either limiting exposures to media containing COPCs exceeding these numeric criteria or by removal of and treatment or off-site disposal of the media.

2.2.1 Remedial Action Objectives for Soil

Analytical data gathered during the PI and RI identified COPCs across the Site at varying concentrations. Therefore, the Site is considered an Area of Concern. Analytical results from within the Area of Concern have been identified contaminants in the soil above TAGM 4046 guidance values. A detailed discussion of the soil impacts is presented in **Sections 1.3.3.1** through **1.3.3.5**.

Summarily, as described in **Sections 1.3.3.1** through **1.3.3.3** and shown on **Figure 1-3**, surface soil impacts above guidance values were observed in the following vicinities:

- Southwest of the former Treatment Building (GSS-1);
- Near the southeast corner of the former Treatment Building (GSS-17);
- Adjacent to and southeast of the former AST location (GSS-20, GSS-21 and GSS-22);
- The former Drip Pad (SS-5, SS-7 and SS-8); and
- The Seep (SEEP-1 and SEEP-2).

Summarily, as described in **Sections 1.3.3.4** and **1.3.3.5** and shown in **Figure 1-5**, subsurface soil impacts above guidance values were observed in the following vicinities:

- Beneath the former Treatment Building (GB-1, GB-2, GB-5 through GB-10, GB-12, and GB-13B);
- Beneath the former AST location (GSB02-3, GSB02-8, GTP-4, and GTP-5);
- Adjacent to and southeast of the former AST location (GSB02-4);
- The former Drip Pad (GSB02-1 and GTP-1);
- Southwest portion of the Site (TP-19);
- Southwest of the former Treatment Building (GTP-11 and GTP-13);
- West of former Drying Shed #1 (GTP-16 and GTP-17);
- The drainage pathway from the SW corner of the former Treatment Building to the Seep; and

- The drainage pathway from the SE corner of the former Treatment Building to the Footer Drain.

Accordingly, these areas (within the AOC) described above require remediation.

The quantitative RAOs for soils are given in **Table 11**. The qualitative RAOs for soils at the Site are to eliminate or reduce to the extent practicable:

- Exposures of persons at or around the Site to PCP and dioxin in soils;
- Environmental exposures of flora or fauna to PCP and dioxin in soils;
- The release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and
- The release of contaminants from soil into surface water, indoor air, ambient air, through storm water erosion, soil vapor, or wind borne dust.

2.2.2 Remedial Action Objectives for Groundwater

Analytical results from samples collected across the Site indicate that contaminants have been identified in groundwater above TOGS 1.1.1 guidance values. A detailed discussion of groundwater impacts is given in **Section 1.3.4**. Summarily, groundwater impacts above guidance values were observed in the vicinities of monitoring wells MW-1 through MW-8. As discussed in **Section 1.4** groundwater impacts at the Site are more localized, rather than in the form of a plume and have been observed primarily in those areas where it remains in contact with impacted soils. Groundwater is not ubiquitous across the Site, occurring primarily within the more porous sand lenses or as perched water above the impermeable clay layers. The overburden soils are very dense and don’t readily transmit water based upon the observed hydraulic conductivity measurements. This low conductivity, combined with little to no lateral recharge of groundwater, prevents the widespread migration of groundwater within the overburden sediments. Consequently, groundwater should not be considered as an AOC due to these technical reasons. The isolated dissolved impacts will be addressed as part of the Site-wide soil remedy. The efficiency of the remedy will be confirmed by post-closure groundwater monitoring as discussed in **Section 4.0**.

3.0 IDENTIFICATION AND SCREENING OF REMEDIAL ACTION TECHNOLOGIES

This section considers technologies that can be employed to meet the qualitative and quantitative RAOs as presented in **Section 2.2** for the Site cleanup. General Response Actions (GRAs) are listed in **Section 3.1**. Technology types and process options for each GRA are screened to select the most applicable technologies to meet the RAOs for each medium of concern in **Section 3.2**. Technology types that are deemed applicable and technically implementable are retained for detailed evaluation in **Section 3.3**. In **Section 4.0** Site-specific remedial alternatives are assembled and evaluated relative to their effectiveness in addressing the identified areas of impacted media and the RAOs. A detailed analysis of each retained alternative is presented in **Section 5.0**. In **Section 6.0** the retained alternatives are contrasted with one another with regards to the satisfaction of CERCLA criteria, including overall protection of human health and the environment, cost, implementability, effectiveness, and reduction of toxicity, mobility, and volume.

3.1 Identification and Screening of General Response Actions

GRAs are media-specific actions that satisfy the RAOs. The process of developing GRAs to address impacted media is consistent with guidance for implementing the National Contingency Plan (NCP) under CERCLA (USEPA, 1988) and NYSDEC (NYSDEC, 1990). The process also ensures that a wide range of potential responses are considered during the development of remedial alternatives for the Site.

GRAs were developed to address the RAOs for surface and subsurface soil.

GRAs that could be applied to impacted soil include:

- No Action
- Institutional and/or Engineering Controls
- Containment
- Excavation
- Disposal
- In-situ Treatment
- Ex-situ Treatment

Some GRAs are not applicable to the Site as a whole because of site-specific conditions. The application of specific GRAs is discussed in the following sections.

3.1.1 No Action

The "No Action" category serves as a baseline against which other response actions can be compared. The "No Action" category can include activities such as periodic soil sampling, groundwater monitoring, or air quality monitoring to identify changes in site conditions. Pursuant to the NCP and USEPA Guidance for conducting RI/FS Investigations the "No Action" response must be developed and examined as a baseline by which other remedial alternatives shall be compared.

3.1.2 Institutional and/or Engineering Controls

Under this response category, measures would be taken to restrict access and/or control specified activities at the Site. Physical and/or legal controls could be employed to restrict Site access. Physical controls include access restrictions such as fencing, postings, warning signs, and other barriers. Legal controls include zoning restrictions and restrictions attached to the title, as well as the classification of the Site within the New York State Registry of Inactive Hazardous Waste Disposal Sites (Registry) so that future property uses consider the Site's limitations specified by those documents.

3.1.3 Containment

The containment category refers to the use of natural or engineered barriers on-site to minimize potential direct contact with, or migration of, contaminated media. Technologies within the containment response category may include contact barriers, capping, and surface controls (i.e., drainage/grading), or combinations thereof.

3.1.4 Excavation

This GRA refers to the excavation of impacted soils at the Site. Removal operations at the Site could require the use of both common and specialized excavation equipment, depending upon the location of the impacted soil with respect to ground surface and groundwater. Excavated soils may be conditioned for subsequent transportation to an off-site disposal facility and/or treated on-site or off-site to meet LDR treatment standards, if applicable. Excavations below the water table would require dewatering.

3.1.5 Disposal

This GRA refers to disposal of impacted media after excavation and/or treatment. Both on-site and off-site disposal options will be evaluated as GRAs. This option may be required to follow LDRs.

3.1.6 In-situ Treatment

In-situ treatment GRAs refer to appropriate technologies used to treat impacted soil without bringing it to the surface or physically removing the soils. Available technologies include enhanced biodegradation, stabilization, vitrification, and thermal desorption.

3.1.7 Ex-situ Treatment

Ex-situ treatment GRAs refer to appropriate technologies used to treat excavated soils on-site. Available technologies include bioremediation, stabilization, dechlorination, soil washing, and thermal desorption.

3.2 Identification and Preliminary Screening of Technology Types and Process Options

This section identifies and describes potentially applicable technology types for each GRA and presents the preliminary screening of each technology and process option. During this preliminary screening, process options and entire technology types may be eliminated from further consideration on the basis of technical effectiveness or implementability. Three factors, which are specified in the USEPA guidance for conducting RI/FS investigations (USEPA, 1988) to evaluate and screen out technologies or process options are the:

- Nature of the contaminants;
- Specific media of concern at the Site; and
- Physical characteristics of the Site, including geology and hydrogeology.

3.2.1 No Action

Pursuant to the NCP and USEPA guidance for conducting RI/FS investigations the “No Action” response must be developed and examined as a baseline by which other remedial alternatives will be compared. The “No Action” category can include activities such as periodic soil sampling, groundwater monitoring, or air quality monitoring to identify changes in Site conditions. This response is easily implementable.

Further screening of this response/alternative is not required. It is retained as a general option for the later assembly of alternatives (**Section 4.0**) and for comparative purposes in the detailed analysis (**Section 5.0**) and comparative analysis (**Section 6.0**).

3.2.2 Institutional and/or Engineering Controls

Institutional and/or engineering controls are physical or legal measures taken to prevent direct exposure to impacted media. Institutional controls are not technologies; however, they can be used to enhance the long-term effectiveness and permanence of a remedial action. Potentially executable institutional controls include access restrictions, title restrictions, and zoning restrictions that prevent exposure to soil.

Implementation of any institutional controls would require negotiated agreement between the current property owner (New York State) and local and state government agencies. Institutional controls would enhance the effectiveness of other technologies and will be retained for further consideration.

Physical Mechanisms

Access restrictions could include fencing, alarm systems, security gates and patrols, and other physical barriers that restrict access to the Site. These measures are currently being utilized at Camp Georgetown (as a whole) as part of daily operations (i.e., it is an incarceration facility). However, the Site area is located on the south side of Crumb Hill Road, outside the incarceration facility, and direct access to the Site is not restricted by any means.

Other measures to control specific activities could be employed as dictated by future land use. For example, workers engaged in activities potentially exposing them to impacted media would require Occupational Safety and Health Administration (OSHA) training and certification (29 CFR 1910.120), medical fitness testing, and/or other appropriate documentation, including an approved Health and Safety Plan (HASP) and requirements. These plans would stipulate appropriate protective measures to prevent worker exposures during the completion of work on-site. In addition, a written summary of work performed or completed, documenting compliance with all established administrative controls, would be a customary requirement for work completed in "hazardous" environments. Future land-use activities may require control measures such as mandatory periodic training or signed compliance agreements prohibiting specified activities for on-site employees.

Legal Mechanisms
Restrictions placed in the title file may be used to impose specific legal restrictions for future land use or to require training programs or specific actions designed to prevent exposure to impacted media. The NYSDEC would place an official record in the title file prohibiting actions that may increase the risk of exposure to on-site contaminants. For example, prohibitions on excavation or construction in capped areas can be stated in the record, and maintenance of a cap or other remedial control structures can be required. Future Site remedial actions can also be specified in this record, such as requiring that subsurface soil exposed by future construction be handled in a specified manner or that a newly exposed area be capped. Access restriction controls can also be included in the title file.

Zoning restrictions are similar to title restrictions and could be used for the same purposes described above. Re-zoning would require working closely with the Town of Georgetown to develop a special zoning district with specific building limitations or prohibitions, although this may not be practical given the use of the property. Approval would require a public hearing and/or a public participation process. This option would limit future exposure through property-use restrictions. The "layering" of this form of property use restriction in addition to title covenants would provide a more effective control mechanism than either of these actions completed individually.

Under New York State's Inactive Hazardous Waste Disposal Sites Remedial Program, limitations are placed on physical alterations or substantial change in use of sites included in the Registry. These limitations would effectively limit significant changes in the exposure pathways present at portions of the Site included in the Registry, and require notification and NYSDEC approval prior to the implementation of these changes.

Institutional controls and/or engineering controls would enhance the effectiveness of other technologies and will be retained for further consideration.

3.2.3 Containment
Containment of impacted media would prevent potential receptors from directly contacting these media or impede potential migration of impacted media off-site. Technology types identified to achieve containment of the soil include surface controls and capping.

Surface Controls

Surface controls can be used to divert surface water away from impacted areas, minimize infiltration, or prevent erosion. Several measures, including diversion channels, grading, revegetation, or collection drains and basins can accomplish the control of surface water run-on/run-off. Surface controls reduce the amount of water that infiltrates and percolates into and out of impacted soils, thus decreasing the potential for exposure. Surface controls will be retained for further consideration.

Capping

Containment can be accomplished through the use of a capping system that reduces potential exposures by preventing direct contact with impacted media and collection of gases generated during the degradation of contaminants if necessary. Capping can also reduce or eliminate the amount of precipitation that infiltrates and percolates into and out of impacted soils.

In accordance with USEPA Guidance (July 1989) and the TAGM Technical Manual, in-place capping does not constitute placement of a hazardous waste and therefore is not restricted under the LDRs. LDRs are discussed in greater detail under on-site disposal in **Section 3.3.5**.

Capping process options include permeable soil covers, low permeability cover systems (LPCS), asphalt/concrete caps, and multi layered caps.

- Permeable Soil Covers: Permeable soil covers typically consist of 1 to 2 feet of locally available, inexpensive earthen materials and a 6-inch layer of topsoil for vegetative support. A permeable soil cover would reduce the risk of direct contact with impacted surface soils and prevent the potential erosion and transport of exposed impacted soils. However, a permeable soil cover will not prevent the infiltration of precipitation through the impacted soils which may cause COPCs to migrate to the groundwater. For this reason, this technology will not be retained for further consideration.
- Low Permeability Cover System: A LPCS typically consists of 1 to 2 feet of compacted clay and a 6-inch layer of topsoil for vegetative support. The clay must have a maximum remolded coefficient of permeability of 1×10^{-7} cm/s throughout its thickness. A LPCS would reduce the potential for direct contact with impacted media and prevent the potential erosion of exposed surface soils. A LPCS would also reduce the infiltration of precipitation into the impacted media. This technology will be retained for further consideration.
- Asphalt/Concrete Caps: Both asphalt and concrete are considered to be good cap materials that effectively reduce surface erosion. By altering the asphalt mix (decreasing the aggregate grain size and adding extra asphalt), permeability of typically less than 10^{-7} cm/s, and sometimes as low as 10^{-11} cm/s, can be achieved. These mixtures are known as dense-grade or hydraulic-grade asphalts (Asphalt Institute, 1989) and have been approved for use in environmental caps and pond liners (Asphalt Magazine, Winter 1991/1992). They cannot withstand heavy design loads, but they are resistant to erosion and are more durable than highway asphalt. Asphalt/concrete cap systems

should be engineered/constructed with suitable surface water drainage controls such that internal, downward drainage of precipitation does not occur. Although the treatment building is expected to be demolished prior to the commencement of remedial activities, if the building foundation is left in place it may not require modification in order to implement this process option. The integrity of this area would have to be evaluated prior to designing an asphalt/concrete cap system. This technology will be retained for further consideration.

- Multi Layered Caps: A multi layered cap system is a more sophisticated technology than a soil cap and involves layers of compacted soil underlying and overlying a synthetic liner. These caps are most appropriately used in cases where a low-permeability cap must be constructed to prevent infiltrating water from leaching through the waste. A multi layered cap meeting the performance requirements of 6NYCCR Part 360 would be practicable and is a proven isolation technology. This technology will be retained for further consideration.

3.2.4 Excavation

This process option involves the excavation of contaminated material and on-site treatment or transport to a permitted off-site facility for treatment and/or disposal. Due to the range of concentrations detected at the Site, pretreatment of the contaminated media may be required to meet LDRs. Treatment and disposal issues are further evaluated in the ensuing sections of this FS report.

The effectiveness of excavation would depend upon the location and depth of the impacted media to be excavated. Excavations greater than 4 feet deep may require bracing and/or sloping to stabilize the sidewalls of the excavation. Groundwater is first encountered on-site at depths ranging from 2 to 5 feet bgs. Depending on the depth to groundwater in the vicinity of the excavation and the area of the Site, water may or may not be encountered. If groundwater is encountered, water management technologies will be utilized. Excavation water will be treated and discharged on-site or containerized and shipped off-site for treatment and disposal. Excavation will be retained for further consideration.

3.2.5 Disposal

The GRA evaluation of disposal retained on-site and off-site disposal options. The requirements for disposal (on-site and off-site) are dependent upon the nature of the contamination and the concentrations of the COPCs. All disposal options considered below would effectively limit exposure to potential receptors; however, these options would not reduce, but rather transfer or contain, the volume and toxicity of the waste.

On-Site Disposal

On-site disposal includes the on-site consolidation of waste material into an engineered area of consolidation. This area would effectively limit long-term COC exposure to potential receptors, however an increased short-term risk would occur while the excavated material was transported and placed within the area of consolidation.

Because the area of consolidation and the waste material that would be placed within the area are both located within the same area of concern, LDRs under 40 CFR 268.49 are not applicable. Further discussion of LDRs is provided in **Section 3.3.1**. This option has been retained for further evaluation.

Off-Site Disposal

Depending on the nature of the contamination and its concentrations, the waste material may be disposed of off-site as hazardous or non-hazardous at an appropriate facility. This disposal process would be effective in removing COPCs from the Site and limiting long-term exposure to potential receptors; however, an increased short-term risk of exposure would be posed to workers during excavation and to potential receptors along the transportation route. This process would result in reductions in waste volume, toxicity, and mobility at the Site through the transfer of this waste to a secure, approved, off-site solid waste disposal or treatment building. All disposal and waste management practices will comply with applicable LDRs which are discussed in detail in **Section 3.3.5**. Transfer to a disposal facility, however, would not result in an ultimate reduction in toxicity or volume. Waste mobility would be reduced by placement of the waste within a secured landfill off-site.

The staging, loading, and transportation processes of excavation materials would be considered practicable. Depending on the quantities and characteristics of material to be excavated and transported, the result of health risks may exceed those posed by leaving the material in place on-site. This process will be retained for further consideration.

3.2.6 In-situ Treatment

Enhanced Biodegradation

Enhanced biodegradation microbiological processes accelerate the degradation or transformation of contaminants into innocuous end products. Hydrogen Release Compound (HRC) can be used to stimulate rapid degradation of chlorinated contaminants in groundwater and saturated soil. The process by which HRC operates has both chemical and biological constituents. Upon coming into contact with subsurface moisture the HRC slowly releases lactic acid for a period of one to two years. As indigenous anaerobic microbes metabolize the lactic acid they produce consistent low concentrations of dissolved hydrogen. Other subsurface microbes use the hydrogen to strip the solvent molecules of their chlorine atoms and allow for further biological degradation. HRC has been shown to effectively stimulate the degradation of chlorinated compounds, such as PCP, as well as heavy metals, such as chromium and arsenic. Screening studies have demonstrated that 2,3,7,8-TCDD, the most toxic form of dioxin, is generally resistant to biodegradation (Spectrum, 2003). Regenesis, the primary vendor for HRC, does not currently have data demonstrating the effectiveness of HRC in treating dioxins. Consequently, enhanced biodegradation using HRC will not be retained for further consideration.

Stabilization

The goal of the stabilization process is to limit the leaching of contaminants. Stabilization techniques limit the solubility or mobility of contaminants, even though the physical characteristics of the waste may not be changed or improved. To accomplish this, stabilizing agents, which chemically react with the contaminants and reduce their mobility, are added and blended with the soil. Types of stabilizing agents include Portland cement, bitumen, and fly ash.

Soil stabilization techniques are accomplished either in-situ or ex-situ. In-situ techniques involve the injection of a stabilizing agent into the soil. Auger/caisson systems and injector head systems are techniques used to apply the stabilizing agents to the soil. Auger/caisson systems involve using an auger equipped with a nozzle to inject the agents into the subsurface while simultaneously drilling into and mixing the soil. Injector head systems involve using high pressure to force stabilizing agents into the soil pore spaces through pipes.

Stabilization is a proven method for reducing the mobility of inorganic compounds. Pilot studies employing amendments such as granular activated carbon (GAC) to immobilize organic constituents have been performed ex-situ. GAC removes contaminants by sorption; it attracts and adsorbs organic molecules, as well as certain metal and inorganic molecules, until available active sites are occupied. Carbon is "activated" for this purpose by being thermally processed to create porous particles with a large internal surface area. However, there is a lack of overall demonstrated effectiveness of this technique, particularly in in-situ situations. Consequently, in-situ stabilization will not be retained for further consideration.

Vitrification

Vitrification of soils is a thermal treatment process that converts contaminated soil into a chemically inert, stable glass and crystalline product. In-situ vitrification is a relatively complex, high-energy technology requiring a high degree of skill and training. An array of electrodes is inserted into the ground to the desired treatment depth. An electrical current heats the soil to approximately 2,000 °C, well above the initial melting temperature (i.e., fusion) of soils. The pyrolyzed byproducts migrate to the surface of the vitrified zone, where they combust in the presence of oxygen. A vacuum hood placed over the treated area collects off gases, which are treated before release. The off-gas treatment system consists typically of a glycol cooling system, a wet scrubbing system and condenser, and carbon filters. In-situ vitrification is effective in the unsaturated zone, thus groundwater suppression pumps will need to be employed. In-situ vitrification is currently considered an innovative technology in the pilot stage of development. Implementation of this technology requires intensive site preparation, special equipment, and significant electrical supplies. These implementation issues and the high capital costs associated with vitrification cannot be justified in comparison to other process options. This technology will not be retained for further consideration.

Thermal Desorption

In-situ thermal desorption (ISTD) has successfully treated a broad range of volatile and SVOCs, including PAHs, dioxins, and chlorinated solvents. Depending on the depth of the impacted zone, ISTD can be applied via thermal blankets or thermal wells. Thermal blankets are only effective up to depths of approximately two feet bgs, while thermal wells can be used to treat deeper impacts. Since the majority of soil impacts exist at depths greater than 2 feet bgs, thermal wells would be employed at the Site.

ISTD using thermal wells involves the installation of vertical boreholes, spaced five to 20 feet apart, at the required depth. ISTD can be applied to a variety of soil types, both above and below the water table. The dense soils at the Site will most likely cause the borehole spacing to be closer to five feet on center. Heaters are placed in the boreholes, causing contaminants in the soil to be vaporized. Heterogeneity does not generally limit heat flow through the soil formation. A significant feature of the ISTD process is the creation of a zone of very high temperature (>1000°F) near the heaters, which oxidizes most of the contaminants before they exit the soil (Terra Therm, 2003). A vacuum is then applied to draw the vaporized contaminants into an off-gas treatment system, which may consist of thermal oxidizers, activated carbon, etc. Metals that may be volatilized by the process and drawn into the vacuum will complicate off-gas treatment. After a cooling period, amendments may be introduced to the soil to rejuvenate its fertility and the Site would be returned to use.

Terra Therm is the sole vendor for this technology, which may bias information on ISTD and leads to non-competitive pricing. Further, the tight soils, which require decreased well spacing, and the separate areas of impact at the Site will likely be cost-prohibitive to the implementation of this technology. Consequently, ISTD will not be retained for further consideration.

3.2.7 Ex-situ Treatment

All ex-situ process options assume that soil has been excavated prior to implementation of these treatment technologies.

Bioremediation

As in in-situ bioremediation, ex-situ bioremediation uses a process in which indigenous or inoculated microorganisms (i.e., fungi, bacteria, and other microbes) degrade (i.e., metabolize) organic contaminants found in soil and/or groundwater. In the presence of sufficient oxygen (aerobic conditions), microorganisms will ultimately convert many organic contaminants to

carbon dioxide, water, and microbial cell mass. In the absence of oxygen (anaerobic conditions), the contaminants will be ultimately metabolized to methane and carbon dioxide. Ex-situ bioremediation typically uses tilling or continuously mixed slurries to apply oxygen and nutrients, and is performed in a prepared bed (liners and aeration) or reactor. Ex-situ bioremediation requires a relatively large area of land for an extended period of time, rendering the land unavailable for other purposes. Hence, ex-situ bioremediation will not be retained for further evaluation.

Stabilization

The goal of the stabilization process is to limit the leaching of contaminants. Stabilization techniques limit the solubility or mobility of contaminants, even though the physical characteristics of the waste may not be changed or improved. To accomplish this, stabilizing agents, which chemically react with the contaminants and reduce their mobility, are added and blended with the soil. Types of stabilizing agents include Portland cement, bitumen, and fly ash.

Soil stabilization techniques are accomplished either in-situ or ex-situ. Ex-situ stabilization involves excavating the impacted materials, machine-mixing them with a stabilizing formula in a pug mill or rotating drum mixer, and depositing the treated soil in a designated area.

The stabilization of inorganic compounds is a mature remediation technology, while the stabilization of organic compounds is innovative. Pilot studies employing amendments such as GAC to immobilize organic constituents have been performed ex-situ. GAC removes contaminants by sorption; it attracts and adsorbs organic molecules, as well as certain metal and inorganic molecules, until available active sites are occupied. Carbon is "activated" for this purpose by being thermally processed to create porous particles with a large internal surface area. However, there is a lack of overall demonstrated effectiveness of this technique.

Since ex-situ stabilization is not a proven method for reducing the mobility of organic compounds, the principal contaminants at the Site, it will not be retained for further consideration as a primary treatment technology. However, it is important to note that ex-situ stabilization may supplement another technology, as it is effective in reducing the mobility of inorganic compounds.

Dechlorination

Although not yet considered a fully proven technology by USEPA, dechlorination does have some track record of success for the treatment of the dioxin, furan, and PCP contaminants often found at wood-treatment sites. Dechlorination will not, however, be useful for treating PAHs, which do not contain chlorine. Dechlorination is one of very few techniques that are capable of destroying dioxins. The USEPA data show that wood-treatment site wastes containing dioxins and furans treated with alkali polyethylene glycolate (APEG) for 45 minutes at 160°F showed greater than 99 percent destruction of the dioxins and furans. However, there is some concern that incomplete dechlorination of the heavily chlorinated dioxins typically found at wood treating sites (containing up to 8 chlorine atoms) could result in the production of much more toxic forms of dioxins, including the most toxic, 2,3,7,8-tetrachloro-p-dioxin. Dechlorination will not be retained because the process may form more toxic forms of dioxin.

Soil Washing

Soil washing is an ex-situ volume reduction process that separates fine soil particles from the larger grained soil. The concept of reducing soil contamination through the use of particle size separation is based on the finding that most organic and inorganic contaminants tend to bind, either chemically or physically, to clay, silt, and organic soil particles. The fines in turn are attached to the larger sands and gravel by physical processes such as compaction and adhesion. Washing the soil separates the fines from the sand and gravel and effectively separates and concentrates the contaminants into a smaller volume of fine material. Chemical additives may be added to the soil washing process to aid in the desorption and solubilization of contaminants that are present in the fines, thus further reducing the level contamination present in the fines. Although used for various organic compounds, it is not a proven technology for the treatment of wood treatment contaminants. The cost of this technology can be relatively high, depending on the volume of wash water and additive and percentage of fines that are generated. For these reasons, soil washing will not be retained for further consideration.

Thermal Desorption

Thermal desorption is a physical separation process that aims to volatilize contaminants. In this process, soil is heated and agitated in a chamber, causing water and organic contaminants to be vaporized. A gas or vacuum system transports the volatilized water and organic contaminants to a gas treatment system.

Three types of thermal desorption are available:

- Direct Fired: Fire is applied directly upon the surface of contaminated media. The main purpose of the fire is to desorb contaminants from the soil, though some contaminants may be thermally oxidized during the treatment process (Federal Remediation Technologies Roundtable (FRTR), 2002).
- Indirect Fired: A direct fired rotary dryer heats an air stream, which, by direct contact, desorbs water and organic contaminants from the soil (FRTR, 2002).
- Indirect Heated: An externally fired rotary dryer volatilizes the water and organics from the contaminated media into an inert carrier gas stream. The carrier gas is later treated to remove or recover the contaminants (FRTR, 2002).

Two common thermal desorption designs are the rotary dryer and thermal screw.

- Rotary Dryers: Horizontal cylinders, normally inclined and rotated, that can be indirect or direct fired.
- Thermal Screw: Screw conveyors or hollow augers are used to transport the medium through an enclosed trough while hot oil or steam circulates through the auger to indirectly heat the medium.

All thermal desorption systems require off-gas treatment. Condensers, activated carbon, wet scrubbers, and/or fabric filters may be employed to remove particulates and contaminants. The thermal desorption processes can be categorized into two groups based upon the operating temperature of the desorber:

- Low temperature thermal desorption (LTTD): Wastes are heated to 90-320 °C (200-600 °F). The target contaminant groups for LTTD systems are nonhalogenated VOCs and fuels; it can be used, but is less effective, in treating SVOCs.
- High temperature thermal desorption (HTTD): Wastes are heated to 320-560 °C (600-1,000 °F). The target contaminants for HTTD are SVOCs, PAHs, PCBs, and pesticides; VOCs and fuels also may be treated, but treatment may be less cost-effective.

HTTD would need to be implemented to treat the primary COPCs at the Site. One disadvantage of HTTD is that organic components in the soil would be damaged, causing treated soil to lose the ability to support future biological activity. Accordingly, amendments may be introduced to the soil after treatment to rejuvenate biological activity.

It is also important to note that metals in the feed will affect the thermal desorption process. Volatile metals will be managed as part of the off-gas stream; inorganics complicate off-gas treatment. The majority of metals will be retained in the treated residue and may require further treatment prior to disposal.

Thermal desorption will be retained for further consideration.

3.3 Evaluation of Retained Technologies

In **Section 3.2** technologies were presented and evaluated primarily with respect to applicability and technical implementability. In this Section remedial action technologies deemed applicable, implementable and retained for further consideration at the Site are evaluated in greater detail. The technologies are evaluated in terms of effectiveness, implementability (primarily constructability and administrative feasibility), and relative cost in accordance with USEPA guidance (USEPA, 1988).

Effectiveness
The retained technologies are further evaluated based upon their effectiveness relative to other processes within the same technology type. This evaluation focuses on:

- The potential effectiveness of the process option in handling the estimated areas or volumes of media and meeting the RAOs.
- How proven and reliable the process is, with respect to site contaminants and conditions, in meeting the RAOs from **Section 2.2**.

Implementability
Process options are evaluated for institutional implementability; technical implementability was evaluated during the preliminary evaluation. Institutional implementability includes the ability to obtain permits and approvals for on-site and off-site actions, the availability of disposal facilities (if required), and the availability of necessary equipment and skilled workers.

Cost
Process options are evaluated for relative cost. Options are eliminated if they are an order of magnitude or greater in cost and do not offer greater effectiveness, reliability, or environmental protection than other options. Costs are discussed only when the screening process is affected.

At this stage, in accordance with USEPA guidance (USEPA, 1988), the evaluation focuses on effectiveness factors, with less emphasis on implementability and cost evaluation. Additionally, a greater emphasis is placed on the institutional aspects of implementability rather than the construction aspects.

3.3.1 No Action

The “No Action” technology provides a baseline from which to evaluate the effectiveness of other alternatives in reducing the toxicity, mobility, or volume of COPCs, or potential exposure pathways to COPCs at the Site. The “No Action” technology would be readily implementable as previously discussed. Costs associated with the “No Action” technology include annual costs for maintenance and repair of paved surfaces, maintenance of fencing, site security operations, and costs associated with sample collection, laboratory analyses, and reporting of results.

Pursuant to the NCP and USEPA guidance for conducting RI/FS investigations, the “No Action” alternative must be developed and examined as a baseline of comparison for other remedial alternatives. This technology will be retained for further consideration.

3.3.2 Institutional and/or Engineering Controls

Institutional and/or engineering controls are physical or legal measures taken to deter Site access or direct exposure with impacted soil. Potentially implementable institutional controls include access restrictions, zoning restrictions, and site use limitations under the NYS ECL. Specific control measures are evaluated below.

Access Restrictions

Access restrictions effectively minimize the potential for direct contact with soil. Access restrictions include fencing and site security operations.

Currently, access to Camp Georgetown is limited to adult inmates, facility personnel, and authorized visitors. Visitors must register at the gate and be accompanied by authorized personnel while at the facility. However, access to the Remedial Area is not restricted by any means. Chain-link fencing would be installed around the entire Remedial Area to limit access to impacted media. Postings regarding site activities or access to the Site would also be feasible and appropriate.

Costs cannot be accurately assessed at this point in this FS report because measures to restrict site access with respect to specific remedial alternatives are not defined; however, on an order-of-magnitude basis, the anticipated costs for access restrictions would be reasonable. Access restrictions will be retained for further consideration.

Restrictions Placed in the Title File

Restrictions placed in the title file can be used to effectively convey information regarding the remedial action. The NYSDEC would place an official record in the title file to regulate future site activities, thus controlling potential exposures to impacted media. These notifications could be placed on the title and all subsequent plot plans for the Site. This option could be implemented provided the appropriate legal actions are taken to prepare a negotiated agreement between the current property owner and local and state government agencies.

Since the State of New York is the current property owner, this is a readily achievable action.

Costs cannot be accurately assessed at this time, but on an order-of-magnitude basis, the anticipated costs for a record to be place in the title file would be reasonable. Restrictions placed in the title file are potentially applicable and will be retained for further consideration.

Zoning and Land Use Restrictions

Zoning restrictions could be used to regulate future site activity and thus control potential exposures to impacted media.

This option could be implemented at the local level; appropriate zoning actions would have to be adopted by local government agencies. Zoning restrictions may be more difficult to implement than title restrictions due to the local government approval process, which may require the creation of a special zoning district with specific building restrictions or prohibitions. Once created, this zoning district would require plan review and approval prior to any changes in site conditions that may impact potential exposures. This process creates an additional level of inspection and enforcement to maintain the effectiveness of the implemented remedy. Therefore, zoning restrictions will be retained for further consideration.

Costs cannot be accurately assessed at this time, but on an order-of-magnitude basis, the anticipated costs for implementing land use restrictions would be considered minimal relative to the overall estimated remedial costs.

3.3.3 Containment

As previously discussed, containment technologies determined to be technically implementable at the Site include surface water controls and capping.

Surface Controls

Surface controls are generally effective in minimizing erosion caused by surface water run-on and run-off. Surface controls would be used in conjunction with other remedial measures, depending on topography and other factors. The use of surface controls (vegetated areas, retention ponds, diversion channels, etc.) must be consistent with present site conditions and future land use scenarios. These options would employ standard construction practices, be effective when employed properly, and be relatively easy to implement.

The costs associated with surface controls vary depending upon the type and application of the controls. Surface controls will be integrated into any remedial alternative that involves regrading site topography. Specific controls will be identified in the remedial design.

Capping

The majority of the Site is not covered by impervious structures, however the treatment building currently covers a portion of the Site and could serve to limit potential direct contact with impacted media and infiltration of rainwater into the subsurface. It may be possible to incorporate this building foundation into the design of a cap.

It is also important to note that while caps impede the vertical entry of precipitation into the impacted area, they do not prevent the horizontal flow of groundwater through the impacted area. However, the horizontal flow of groundwater through the impacted zone is not significant due to the low transmissivity of the soils at the Site.

Capping process options retained for further consideration based upon their technical implementability include a LPCS asphalt/concrete caps and multi layered caps.

- Low Permeability Cover System: The LPCS would consist of 1 to 2 feet of compacted clay (maximum remolded coefficient of permeability of 1 x 10^{-7} cm/s throughout its thickness) and a 6-inch layer of topsoil for vegetative support. Construction of a LPCS is readily implementable. A LPCS would effectively prevent direct contact with impacted soils and the migration of contaminants due to erosion. It would also prevent infiltration of precipitation into the impacted media. As with other containment options, the installation of a LPCS would be restrictive to some future land uses. Additionally, environmental stresses, settling, and erosion may lessen the effectiveness of a LPCS and render it susceptible to cracking. Thus, LPCSs require long-term maintenance and inspection. Institutional controls would be necessary to prevent damage to the cover. This process option will be retained for further consideration.
- Asphalt/Concrete Caps: Asphalt/concrete caps would be effective in preventing the erosion of surface soils, exposure to impacted media.

  The Site's impacted areas could be covered with asphalt or concrete using conventional construction practices. Construction of an asphalt or concrete cap is readily implementable and available. The use of an asphalt/concrete cap would have to be carefully integrated with long-range development plans for the Site because caps may be restrictive for some future land uses. Institutional controls would be required to prevent damage to the cap. As with other capping options, asphalt/concrete caps require long-term maintenance. Asphalt/concrete caps would provide a degree of containment similar to an LPCS, but at a substantially increased cost. Thus, this process option will not be retained for further consideration.
- Multi Layered Caps: Multi layered cap systems are effective and are commonly used for capping hazardous waste landfills. A multi layered system meeting the substantive performance requirements of 6NYCCR Part 360 would effectively prevent direct contact with impacted soil and the migration of contaminants due to erosion. One of the primary objectives of a multi layered cap is to prevent infiltration of rainwater through the subsurface soils.

  An impermeable multi layered cap system incorporating a synthetic liner, an overlying compacted soil layer, and an underlying drainage soil layer could be installed at the Site.

Substantial design and construction engineering, site preparation, quality control, and long-term maintenance would be inherent to the use of a multi layered cap.

This solution would be similar to implement as an asphalt or concrete cap, but there are technical benefits of using an impermeable multi layered cap rather than an asphalt or concrete. Multi layered caps are less susceptible to cracking than asphalt/concrete caps as well as LPCS and the multiple layers provide several opportunities to impede infiltration of precipitation. As with other capping options, a multi layered cap would have to be carefully integrated with the long-range development plans for the Site. Institutional controls would be required to prevent damage to a multi layered system.

The cost of a multi layered system would be similar to an asphalt/concrete cap, however, multi layered caps provide a higher degree of containment. Multi layered caps will be retained for further consideration.

3.3.4 Excavation

The effectiveness of source removal would depend upon the location and depth of the impacted soil to be removed by excavation. Excavated materials could either be treated on-site or transported off-site for subsequent treatment/disposal. Treatment and disposal issues are further evaluated in disposal **Section 3.3.5**.

Excavations greater than 4 feet deep may require bracing and/or sloping to stabilize the sidewalls of the excavation. Groundwater is first encountered at the Site at depths ranging from 2 to 5 feet bgs. Depending on the depth to groundwater in the vicinity of the excavation, water may or may not be encountered.

Three zones were considered when evaluating the possibility of excavating materials at the Site: shallow excavations not requiring bracing, excavations above the water table requiring bracing, and excavations below the water table requiring bracing and control of water.

Shallow Excavations

Shallow excavations would be conducted in the top 1-foot of soil at the Site. They would not require bracing to complete and would be effective in removing impacted surface soils. Shallow excavations would not encounter water; therefore, no dewatering/water treatment-disposal-provisions were considered.

Labor crews trained and certified in accordance with OSHA Standard 1910.120 would perform shallow excavations with standard construction equipment. In accordance with 29 CFR Part 1926 Subpart P, a Competent Person with the authority and knowledge to make decisions regarding health and safety issues must be designated on-site.

Shallow excavation costs would depend upon the volume of material to be excavated from a given area and the presence/absence of underground utilities in the vicinity of the excavation. Shallow excavations would be the least costly of the excavation process options evaluated in this FS. Shallow excavations will be retained for further consideration.

Engineering Controls Employed Above the Water Table
Braced or sloped excavations above the water table can be completed with standard excavation and shoring equipment labor crews trained and certified in accordance with OSHA Standard 1910.120. In accordance with 29 CFR Part 1926 Subpart P of OSHA, a Competent Person with the authority and knowledge to make decisions regarding health and safety issues must be designated on-site. Excavation costs will be directly related to the depth of the excavation and the presence/absence of underground utilities and obstructions. Braced or sloped excavations above the water table will be retained for further consideration.

Engineering Controls Employed Below the Water Table
Braced and/or sloped excavations below the water table would be regarded as an effective method for removing impacted soil from the subsurface, however, several technical challenges associated with this category of excavations must be overcome to use this technology. These challenges are enumerated below and include:

- The risk of exposing construction workers, facility personnel, and authorized visitors to contaminants would be greater the deeper the excavation. The exposures are greater when compared to other remedial alternatives. Additionally, increased health and safety and engineering oversite will be required during these excavations processes.
- The act of dewatering for deep excavation may result in a large volume of water requiring treatment and disposal.

It is believed that the technical challenges associated with this option can be overcome, but with a decrease in effectiveness and an exponential increase in cost. Braced excavations below the water table will be retained for further consideration.

3.3.5 Disposal
Land disposal of waste material (on-site or off-site) is governed by its classification as hazardous or non-hazardous waste. In NYS, materials containing listed hazardous constituents are considered hazardous waste as well as wastes that are hazardous by virtue of their toxicity characteristics (as determined by pertinent testing standards). NYCRR Part 371 defines the contaminated soils at the Site as F032 waste, which is described as “waste waters, process residue, preservative drippings, and spent formulations from wood preserving processes

generated at plants currently or previously using PCP". As such, all waste soils from the Site are considered listed waste and must be disposed of as a hazardous listed waste.

On-Site Disposal

On-site disposal includes on-site consolidation of waste material from the Site into an engineered area of consolidation located within the remedial area. To dispose of a restricted waste on-site, LDRs must be addressed. 40 CFR 268.48 and 6NYCRR370-376 defines active waste management when placement of a hazardous or restricted material occurs. Under these regulatory requirements, placement occurs when a restricted waste is moved from an area of concern into or onto a land disposal unit. Placement does not occur when restricted waste is treated in-situ, capped in place, or consolidated within an area of concern. If placement occurs, LDRs are applicable and must be addressed.

Because the entire Site is considered an area of concern, placement would not occur under this option, therefore, LDRs are not applicable.

Although this option would not reduce the volume or toxicity of the material, it would provide containment and effectively limit exposure to potential receptors. On-site disposal costs would depend on the volume of waste that would require excavation and consolidation, and the design of the area of consolidation. In general, on-site disposal in an engineered cell is less costly than off-site disposal at a hazardous waste landfill.

Off-Site Disposal

Off-site disposal would include the transportation and disposal of the waste material in an appropriate facility. As described above, the waste material from the Site is a listed hazardous waste and therefore must be disposed of in an appropriate hazardous waste landfill. Prior to disposal, the soil may require treatment to meet LDR standards. The alternative LDR treatment standards for contaminated soil are addressed in 40 CFR 268.49. In general, 40 CFR 268.49(c) requires that soil impacted with regulated constituents must be treated to a level 10 times the Universal Treatment Standards (UTS) or until 90% reduction is achieved, whichever is met first, prior to land disposal. The UTS for regulated constituents is given 40 CFR 268.48. Based on the data collected to date, the regulated constituent concentrations at the Site are below the 10 times UTS, with the exception of PCP. PCP was detected in a few localized areas at concentrations greater than 74 ppm which is the 10 times UTS for PCP.

As the overall concentrations of regulated constituents in the soil that requires disposal are not expected to exceed the 10 times UTS, with the exception of localized areas, no treatment of the soil is expected prior to disposal.

This disposal process would be effective in removing the COPCs from the Site and would limit long-term exposure to potential receptors, an increased short-term risk of exposure may be posed to the workers during excavation and to potential receptors along the transportation route. Depending on the quantities of material to be transported, the result of health risks may exceed those posed by leaving the material in place or disposing of it on-site.

Disposal costs of hazardous wastes are significantly higher than off-site disposal as non-hazardous or on-site disposal. Costs for transportation, treatment to LDR standards (LDR standards define the level to which soils must be treated prior to land disposal), and disposal can range from approximately $350 to $600 per ton. Off-site disposal will be retained for further consideration.

Also of note, water generated during dewatering of the excavation will be transported off-site for subsequent treatment and disposal. Depending on the overall quantity of groundwater requiring treatment, it may be worthwhile to construct a temporary treatment system on-site which utilizes carbon or similar methodology.

3.3.6 Ex-Situ Treatment

Thermal Desorption

Thermal desorption is a physical separation process that volatilizes contaminants. In this process, soil is heated and agitated in a chamber, causing water and organic contaminants to be vaporized. A gas or vacuum system transports the volatilized water and organic contaminants to a gas treatment system.

Factors that may limit the applicability or effectiveness of thermal desorption include:

- Treated soil may no longer be able to support biological activity;
- High clay, humic material, or moisture content may increase reaction time as a result of binding of contaminants;
- Dust and organic matter in the soil increases the difficulty of treating off-gas;
- Dewatering may be necessary to achieve acceptable soil moisture content levels;
- High abrasive feed may damage the processor unit; and
- Debris greater than 60 mm in diameter typically must be removed prior to processing.

As indicated in **Section 3.2.7**, some metals in the feed will be carried over into the off-gas treatment system, while the majority of metals will be retained in the treated soil. With regard to metals in the off-gas, a material balance for metals should be conducted by bench scale testing to determine if the concentrations will exceed regulated stack emission values, as well as to facilitate successful design of the off-gas treatment and handling system. Wet scrubbers can be utilized to capture the volatilized metals so that they can be removed and disposed of properly in solid form.

With regard to metals in the treated soil, if the total or leachable concentrations in the treated soil exceed regulatory limits, backfilling or disposal at a landfill may not be an option unless further treatment is performed. TCLP testing would be performed to determine if further treatment of the soil is necessary, though, based on observed concentrations, failure is not anticipated. Further treatment typically involves using stabilization techniques to chemically immobilize the inorganics to prevent leaching.

The operation and maintenance duration depends on the processing rate of the thermal treatment unit and the volume of soil. The processing rate is dependent upon the contaminant type and soil characteristics. The throughput of a typical mobile unit ranges from 50 to 400 cubic yards per day (2002, NFESC); the dense soils at the Site will likely cause the average daily throughput to be on the low end of this range. Additionally, the COPCs at the Site may require longer treatment times. Costs for a mobile thermal treatment unit typically range from $95 to $195 per cubic yard (2002, NFESC).

While thermal desorption is capable of treating the principal contaminants, there are several limitations that render this technology unsuitable for this particular Site. The dense, clay soil found at the Site is not favorable to ex-situ thermal desorption, as it is more difficult to break apart and requires a longer retention time. Metals in the soil will complicate off-gas treatment. Further, it will be difficult to obtain a power source at the Site. The overall expense associated with this technology will be significantly greater than several of the other options, which will provide comparable protection of human health and the environment. Consequently, ex-situ thermal desorption will not be retained for further consideration.

3.4 Summary

In this section, a wide range of potentially applicable remedial technologies for each GRA were developed, screened, and evaluated for the Site based upon their effectiveness, implementability, and cost. These technologies include an assemblage of the most widely used processes for the COPCs and impacted media identified in the RAOs for the Site. Technologies that were retained from this evaluation for assemblage into site-wide remedial alternatives are summarized in **Table 12**.

4.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

In this section, the technologies retained in **Section 3.3** are assembled into remedial alternatives designed to achieve the RAOs discussed in **Section 2.2**. The RAOs are goals developed to protect human health and the environment. The remedial alternatives, presented here in, are assembled primarily to address the soil at the Site.

The range of alternatives for the Site has been developed within the framework of the regulatory guidelines outlined in the RI/FS Guidance Document (USEPA 1988).

A brief discussion of the alternatives developed, as well as the rationale behind their development, is presented in the following sections. The detailed evaluation of the retained alternatives is presented in **Section 5.0**. A comparative analysis of retained alternatives is presented in **Section 6.0**.

4.1 Alternative 1 – No Action

The No Action alternative has been included, under the NCP requirements, to provide a baseline by which to compare other alternatives. Under this alternative soil would not be actively treated and the Site conditions would remain the same. Property maintenance (security, fence repairs, etc.) currently exists and would continue to exist as part of the daily operations of Camp Georgetown as an incarceration facility. However, access restrictions and security operations do not currently exist at the Site to prevent contact with impacted media. Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years.

4.2 Alternative 2 – Limited Action

Under this alternative institutional and engineering controls would be used to address soil impacts at the Site. An initial round of groundwater sampling of all wells would be completed to establish base line groundwater parameters. Property maintenance currently exists and would continue to exist as part of the daily operations of Camp Georgetown as an incarceration facility. A 6-foot high chain-link fence and gate would be placed around the perimeter of the impacted area, specifically to restrict access to impacted media. Easements and official records would be placed in the title file that would limit future land use or prohibit activities that may increase risk of exposure to site contaminants by the NYSDEC. Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years.

Effectiveness

Currently, access to Camp Georgetown is limited to inmates, facility personnel, and authorized visitors. However, the contaminated area is not presently restricted by any means. Under this alternative a 6-foot high chain-link fence would be installed to impede persons and animals from directly contacting contaminated media. This alternative would not specifically address soil COPC contamination; however, natural attenuation of the COPCs would ultimately reduce contaminant concentrations in the soil.

Implementability

This alternative is easily implemented. Institutional controls regarding site access are readily implementable and, as site ownership belongs to the State of New York, title restrictions and easements would be easily attained.

Cost

For the purposes of alternative screening, the net present worth of this alternative was estimated to be equal to Alternative 1 and within one order of magnitude as 4A, 4B, 5A, and 5B and two orders of magnitude of Alternative 3.

Conclusion

Although this alternative does not actively address site contamination, it is retained as a possible remedial action.

4.3 Alternative 3 – Excavation and Off-site Disposal

In this treatment alternative, the PCP and dioxin impacts in the soil would be addressed by excavation and off-site disposal. Specifically, the source areas delineated in **Figure 8** would be excavated using conventional methods and equipment. Since the treatment building is expected to be demolished as part of remedial activities, no access restrictions are foreseen at this time.

The nature and extent of soil impacts was described in **Section 1.3.3** and the areas requiring remedial action were identified in **Section 2.2.1**. In some cases, the areas of surface and subsurface soil impacts overlap. Consequently, as illustrated in **Figure 8**, soils would be excavated as follows to remove the impacted soils above TAGM 4046 guidance values.

Area	Vicinity of Impact	Depth (feet bgs)	Approximate Volume (cubic yards)
A	GTP-16 and GTP-17	10	1,050
B	Former AST Location	12	1,340
C	Adjacent to and Southeast of Former AST Location	1	50
D	Former Treatment Building	10	2,290
E	Former Drip Pad	5	350
F	Southwest of Former Treatment Building	10	700
G	TP-19	10	300
H	Seep	1	60
I	Drainage path from SW corner of Former Treatment Bldg to Seep	5	40
J	Drainage path from SE corner of Former Treatment Bldg to Footer Drain (MW-11)	5	90

The total estimated removal volume is approximately 6,270 cubic yards of soil, measured in place. A 20% bulking factor yields roughly 7,530 cubic yards of soil to be managed. Additionally, stabilization of saturated soils would be necessary (estimated 30% by volume), which would require approximately 1,520 cubic yards of ash or similar product. The slab under the former treatment building would also be removed and crushed as part of this remedial alternative. The slab would produce roughly 180 cubic yards of waste that would require disposal. Consequently, the total volume of material that would require disposal is approximately 9,230 cubic yards.

Dewatering operations may be required during excavation operations as the water table typically occurs between 2 to 5 feet bgs. Site geologic conditions indicate that groundwater does not occur as a well-defined aquifer or water-bearing zone across the Site, but rather typically occurs within sediments and sand lenses in the overburden sediments with some degree of interconnectedness. The discontinuous nature of water makes it difficult to accurately estimate the volume of water expected to be generated. Water generated during excavation activities could be managed with a submersible pump and either 1) transferred to frac tanks for storage and transported off-site for subsequent treatment and disposal or 2) treated on-site (using carbon or similar treatment methodology) and discharged, with the approval of the NYSDEC. Alternatively, groundwater recharge (and ultimately groundwater flow through the excavation area) could be reduced through the installation of a properly sized diversion channel around the upgradient portion of the excavation to redirect surface and groundwater flow around the areas requiring excavation.

The excavation would be performed in phases to minimize exposure and construction hazards. Construction workers would wear adequate personal protective equipment (PPE). No sheeting, shoring, or bracing is expected to be required due to the dense soils at the Site and the manageable size of the excavation areas; however, the excavations would be benched. Excavated materials would be transported to a permitted off-site treatment and disposal facility. The excavated areas would be backfilled with clean fill from an off-site source.

NYCRR Part 371 defines the contaminated soils as hazardous (F032) waste. As such, soils would have to be disposed of in an appropriate hazardous waste landfill and may require treatment prior to disposal. The alternative LDR treatment standards for contaminated soil are addressed in 40 CFR 268.49. In general, according to 40 CFR 268.49 (c), soils impacted with regulated constituents must be treated to a level of 10 times the Universal Treatment Standard (UTS) or until 90% reduction is achieved, whichever is met first, prior to land disposal. The UTS for regulated constituents is given in 40 CFR 268.48. Based on the data collected from the Site to date, regulated constituent concentrations are below 10 times the UTS, with the exception of PCP, which exceeded 74 ppm (10 times the UTS for PCP) in a few localized areas of the Site and Chromium, which exceeded 120 ppm (10 times the UTS for Chromium) in one surface soil sample. No treatment of soils prior to land disposal is expected to be necessary based upon existing soil quality data, as the overall concentrations of regulated constituents in the materials to be disposed are not expected to exceed 10 times the UTS (although the potential to encounter a hot spot does exist).

Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years. Institutional controls would remain in effect to limit site access and usage.

Effectiveness

This alternative would provide an effective and long-term remedy for the removal and treatment of PCP and dioxin impacts observed at the Site. Based on the PI data and the RI data, PCP and dioxin source areas would be excavated as depicted on **Figure 8**. The excavation and off-site disposal of the impacted soils would remove the on-site volume and address the toxicity and mobility of the COPCs.

Implementability

This alternative could be implemented using conventional construction equipment and construction practices. Limitations to this alternative could include:

- Geotechnically unstable soil - No sheeting, shoring, or bracing is expected to be required due to the dense soils at the Site and the manageable size of the excavation areas; the excavations would be benched as a precautionary measure.
- Subsurface Obstructions – Subsurface obstructions (such as construction debris, boulders, etc.) may be encountered. If this limitation does exist, it is manageable.
- Building or foundation structures – The slab under the former treatment building would be removed and disposed as part of this remedial alternative. Similar structures are not expected to impede excavation and disposal operations.
- Groundwater management – Some type of dewatering of the excavation areas would likely be necessary, as the groundwater table exists at 2 to 5 feet bgs across the Site. Groundwater recharge to the Site is variable and seasonal. If a sand lens is encountered during excavation operations, it could yield significant amounts of groundwater that would require storage, treatment, and disposal. Management of substantial amounts of groundwater is achievable, but at decreased efficiency. As an alternative to dewatering, a diversion trench could be placed upgradient of the excavation areas to redirect surface and ground water around the excavation areas.
- Hydrostatic failure of the excavation – Artesian pressure and other variables that could cause a hydrostatic failure within the excavation are not likely to exist at the Site.
- Storage piles – Excavation may also be limited by the need to stage and characterize material prior to transport to various facilities based on contaminant concentration. If this limitation does exist, it is manageable.

Excavation and transport equipment, clean fill, and other items associated with this alternative are readily accessible. This alternative is implementable.

Cost

For the purposes of alternative screening, the net present worth of this alternative was estimated to be at least one order of magnitude greater than Alternatives 1, 2, 4A, 4B, 5A, and 5B.

Conclusion

This is an effective and practicable alternative. Excavation and off-site disposal will be retained for further consideration.

4.4 Alternative 4A – Excavation and On-site Consolidation with a Multi Layer Geomembrane Cap

In this alternative, the PCP and dioxin impacts to soil would be addressed through excavation and on-site consolidation within the remedial area. The nature and extent of soil impacts was described in **Section 1.3.3** and the areas requiring remedial action were identified in **Section 2.2.1**. Under excavation and on-site consolidation, Areas A and F through J would be excavated and contained in an area of consolidation located over Areas B - E, which would be contained in place (refer to **Figure 9**).

Since the treatment building is expected to be demolished as part of remedial activities, no access restrictions are foreseen at this time. The slab under the former treatment building would remain in place.

As illustrated in **Figure 9**, soil would be excavated as follows:

Area	Vicinity of Impact	Depth (feet bgs)	Approximate Volume (cubic yards)
A	GTP-16 and GTP-17	10	1050
F	Southwest of Former Treatment Building	10	700
G	TP-19	10	300
H	Seep	1	60
I	Drainage path from SW corner of Former Treatment Bldg to Seep	5	40
Portion of J	Drainage path from SE corner of Former Treatment Bldg to Footer Drain (MW-11)	5	40

The total estimated removal volume is approximately 2,190 cubic yards of soil, measured in place. A 20% bulking factor yields roughly 2,630 cubic yards of soil to be contained. Additionally, stabilization of saturated soil would be necessary (estimated 30% by volume), which would require approximately 530 cubic yards of ash or similar product. Consequently, the total volume of material that would be placed in the area of consolidation is approximately 3,160 cubic yards.

The excavation would be performed in phases in order to minimize exposure and construction hazards. Construction workers would wear adequate PPE. No sheeting, shoring, or bracing is expected to be required due to the dense soil at the Site and the manageable size of the excavation areas; however, the excavations would be benched. The excavated areas would be backfilled with clean fill from an off-site source.

Groundwater management issues pertinent to Alternative 3 (refer to **Section 4.3**) would also be relevant to this alternative, but to a lesser degree, since fewer areas would be excavated under this alternative. Furthermore, monitoring wells MW-4 (Area G) and MW-6 (Area F) exhibited low recharge and could typically be purged dry using low-flow sampling techniques. The poor yield and low recharge of these wells indicates that water management would not likely be an issue within these excavations.

A preliminary design of the area of consolidation, as depicted in **Figure 10**, was performed. The design determined that the top of material elevation would be approximately 1,011 feet, with sideslopes of approximately 5%.

A multi layer geomembrane cap would be installed over the area of consolidation (**Figure 9**). A multi layer geomembrane cap would eliminate the potential for direct contact with impacted media and prevent rainwater infiltration into the consolidation areas. Multi layer geomembrane caps typically consist of the following layers and as shown on **Figure 10**:

- Vegetative Layer – approximately 6 inches of topsoil that serves to reduce erosion and infiltration of precipitation;
- Drainage Layer – approximately 24 inches of porous material (sand) that enhances lateral drainage of any precipitation that infiltrates through the vegetative layer and minimizes liquid head build-up on the geomembrane (synthetic barrier); the vegetative and drainage layers help protect the underlying barrier layers from the environmental stresses of wetting/drying and freezing/thawing;
- Synthetic Barrier – low permeability geomembrane (at least 40 mil thickness) that represents the final impedance to precipitation infiltration; and
- Low Permeability Layer – a geosynthetic clay liner consisting of sodium bentonite bound between two layers of needle-punched geotextile to prevent infiltration into the impacted media in the event that the synthetic barrier develops a leak or tear.

All future Site development would account for the requirements of the area of consolidation in their design. Institutional controls would be implemented to limit site access and usage. Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years.

Effectiveness

This alternative would provide an effective and long-term remedy for the PCP and dioxin impacts observed at the Site. PCP and dioxin source areas would be excavated, consolidated and capped on-site as depicted on **Figure 9**. This alternative reduces the area of the Site that possesses soil above TAGM guidance. Consolidation would effectively prevent direct exposures with impacted media. It would also serve to impede the potential for transport of COPCs into groundwater because migration would not be encouraged by infiltration of precipitation, which has been shown to be the primary recharge mechanism at the Site. The cap would prevent the vertical entry of precipitation into the area of consolidation, it would not prevent the horizontal flow of groundwater through the impacted areas. However, the horizontal flow of groundwater through the impacted zones is minimal due to the low transmissivity of the soil at the Site.

Implementability

This alternative can be implemented using conventional construction equipment and construction practices. Special care would have to be given from a construction quality assurance/quality control standpoint to ensure that proper installation and testing procedures are followed. Additionally, the limitations discussed in **Section 4.3** regarding the implementation of excavation operations would also apply to this alternative. However, groundwater management issues would be less of a concern for this alternative, in comparison to Alternative 3. Since fewer areas would be excavated, less groundwater would likely be generated during excavation activities that would require storage, treatment, and disposal. Further, historic groundwater monitoring and sampling activities indicate poor yield and low recharge of monitoring wells correlating to Areas F and G.

As in all consolidation options, the area of consolidation would have to be carefully integrated into the long-range development plans for the Site, as it would limit future land use. Long-term maintenance and monitoring would be necessary to ensure the integrity and effectiveness of the area of consolidation. Institutional controls would be implemented to limit land use activities that may compromise the condition of the area of consolidation. Areas of consolidation with shallower designs, such as this, would be easier to construct and maintain in terms of equipment stability, turf care, and less potential for erosion in comparison to those with sideslopes greater than 25%. Vegetation that has tendency for deep root penetration would have to be eliminated from the area of consolidation.

Cost

For the purposes of alternative screening, the net present worth of this alternative was estimated to be one order of magnitude less than Alternative 3, within the same order of magnitude as Alternative 4B, and one order of magnitude greater than Alternatives 1 and 2.

Conclusion

This alternative is an efficacious and cost efficient option. Excavation and on-site consolidation with a Multi Layer Geomembrane Cap will be retained for further consideration.

4.5 Alternative 4B – Excavation and On-Site Consolidation with a Low Permeability Covers System

In this alternative, the PCP and dioxin impacts to soil would be addressed through excavation and on-site consolidation. The nature and extent of soil impacts was described in **Section 1.3.3** and the areas requiring remedial action were identified in **Section 2.2.1**. This alternative would involve the same components described in **Section 4.4**, with the exception that a LPCS would be installed in place of multi layer geomembrane cap over the area of consolidation (**Figure 9**). An LPCS typically consists of the following layers:

- Vegetative Layer – approximately 6 inches of topsoil that serves to reduce erosion and infiltration of precipitation;
- Protective Layer – approximately 24 inches of soil that serves to reduce erosion and infiltration of precipitation as well as to protect the low permeability layer from the environmental stresses of wetting/drying and freezing/thawing;
- Low Permeability Layer – approximately 18 inches of compacted clay (maximum remolded coefficient of permeability of 1×10^{-7} cm/s throughout its thickness) to prevent infiltration into the impacted media.

This LPCS would prevent direct contact with PCP and dioxin and, due to its low permeability, would prevent infiltration into the consolidation areas. An engineered pavement system may be considered as an alternative LPCS.

All future Site development would account for the requirements of the area of consolidation in their design. Institutional controls would be implemented to limit site access and usage. Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years.

Effectiveness

An LPCS has the potential to be as effective as a multi layer geomembrane cap in protection human health and the environment. Special care must be given from a construction quality assurance/ quality control standpoint to ensure that the proper installation and testing procedures are followed in order to achieve the desired maximum permeability of the low permeability layer. Assuming proper installation and testing procedures are followed, this alternative would provide an effective and long-term remedy for the PCP and dioxin impacts observed at the Site. PCP and dioxin source areas would be excavated and contained on-site as depicted on **Figure 9**. This alternative reduces the area of the Site that possesses soil above TAGM guidance. Consolidation would effectively prevent direct exposures with impacted media. It would also serve to impede the potential for transport of COPCs into groundwater because migration would not be encouraged by infiltration of precipitation, which has been shown to be the primary recharge mechanism at the Site. While the LPCS would prevent the vertical entry of precipitation into the area of consolidation, it would not prevent the horizontal flow of groundwater through the impacted areas. However, the horizontal flow of groundwater through the impacted zones is minimal due to the observed low transmissivity of the soil at the Site.

Implementability
This alternative can be implemented using conventional construction equipment and construction practices. The limitations discussed in **Section 4.3** regarding the implementation of excavation operations would also apply to this alternative. In addition, finding a suitable source for the low permeability layer material may be cost prohibitive, depending on the source location. However, groundwater management issues would be less of a concern for this alternative, in comparison to Alternative 3. Since fewer areas would be excavated, less groundwater would likely be generated during excavation activities that would require storage, treatment, and disposal. Further, historic groundwater monitoring and sampling activities indicate poor yield and low recharge of monitoring wells correlating to Areas F and G.

As in all consolidation options, the area of consolidation would have to be carefully integrated into the long-range development plans for the Site, as it would limit future land use. Long-term maintenance and monitoring would be necessary to ensure the integrity and effectiveness of the area of consolidation. Institutional controls would be implemented to limit land use activities that may compromise the condition of the area of consolidation. Areas of consolidation with shallower designs, such as this, would be easier to construct and maintain in terms of equipment stability, turf care, and less potential for erosion in comparison to those with sideslopes greater than 25%. Vegetation that has tendency for deep root penetration must be eliminated from the consolidation areas.

Cost
For the purposes of alternative screening, the net present worth of this alternative was estimated to be one order of magnitude less than Alternative 3, within the same order of magnitude as Alternative 4A, and an order of magnitude greater than Alternatives 1 and 2.

Conclusion

This alternative is an effective and cost efficient option. Excavation and on-site consolidation with a LPCS will be retained for further consideration.

5.0 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

In this section, the five alternatives introduced and retained for further consideration in **Section 4.0** are evaluated using the seven criteria recommended by NYSDEC TAGM 4030 and the NCP (USEPA, 1988). The five alternatives that will be evaluated in this section are:

- Alternative 1 – No Action
- Alternative 2 – Limited Action
- Alternative 3 – Excavation and off-site disposal
- Alternative 4A – Excavation and on-site consolidation with a Multi Layer Geomembrane Cap
- Alternative 4B – Excavation and on-site consolidation with a LPCS

This evaluation provides information to facilitate the comparison of the alternatives and the selection of a final remedy. The following criteria are used in the detailed analysis:

- Overall Protection of Human Health and the Environment – This criterion is concerned with the overall protection of human health and the environment, which would be achieved by eliminating, reducing, or controlling site risks posed through the exposure pathways. This criterion includes direct contact risks, inhalation risks, and potential risks to ecosystems.
- Compliance with SCGs, ARARs and Other Regulations – This criterion evaluates the compliance of each alternative with SCGs, ARARs, and other regulations. The three regulatory categories that will be considered are chemical specific, location-specific, and action-specific SCGs and ARARs. These regulations are discussed in detail in **Section 2.1**.
- Short-term Effectiveness – The effectiveness of an alternative in protecting human health and the environment during construction and implementation of the remedial alternative is assessed under short-term effectiveness. This criterion encompasses concerns about short-term impacts, as well as the length of time required to implement the alternative. Factors such as cross-media impacts, the need to transport impacted material through populated areas, current site operations, and the potential disruption of neighborhoods and ecosystems may be pertinent. Due to the affinity of COPCs to preferentially adsorb to soil organics, excavation remedies that release dust could create potential short-term risks through the inhalation pathway. The health and safety issues associated with the implementation of any remedial action involving excavation and transport of soil are included under this criterion.
- Long-term Effectiveness and Permanence – The long-term effectiveness of a remedial alternative is evaluated under this criterion with particular focus on the residual contamination remaining in a particular medium after completion of the

selected alternative and the degree to which a remedial measure provides a permanent remedy for the Site. The long-term integrity of containment options is also evaluated.

- Reduction in Mobility, Toxicity, and Volume – This criterion evaluates contaminant reductions with respect to concentration and/or mass based on a percentage or generalized estimate and the mass of contaminants or the volume of impacted media that will be destroyed or contained through treatment. This criterion also addresses potential decreased risks associated with changes in the mobility, toxicity, and volume. For this Site, the current potential risk levels are low for all impacted media. However, the alternatives have been designed to further reduce potential risk and to meet remedial objectives.
- Implementability – This criterion involves an evaluation of the alternative with respect to performance, reliability, and technical implementability. Performance and reliability focus on the ability of the alternative to meet specific goals or remedial levels. The technical implementability of an alternative addresses construction and operation with regard to site-specific conditions, including the operational impact of the existing on-site activities and the ability to safely implement the alternative. Administrative implementability focuses on the time and effort required in obtaining appropriate approvals and addressing other administrative issues.
- Cost – Estimated costs are included for each alternative. These costs may include design and construction costs, remedial action O&M costs, other capital and short term costs, and costs of field and project management associated with the implementation of the remedial alternatives. Estimates of permitting costs have also been included where appropriate. Costs are also calculated on a present worth basis, assuming a 5-year or 30-year period and a discount rate of 5%, as directed by the NYSDEC. Detailed cost estimates for each alternative evaluated are provided in **Appendix C**.

The detailed analysis is three tiered. The first tier is comprised of threshold factors 1) overall protection of human health and the environment, and 2) compliance with SCGs, ARARs and other regulations. Any selected remedy must result in overall protection of human health and the environment. Similarly, the SCGs, ARARs, and other regulations must be complied with unless there is an overriding reason why compliance is not possible. The second tier is comprised of the remaining five criteria from the list above. The relative merits and problems associated with meeting these factors must be balanced in arriving at a remedy. The issues associated with each of these seven criteria are briefly described below. The third tier is comprised of modifying criteria; agency and community acceptance. Satisfaction of these criteria will be determined after submittal of this report; community acceptance will be addressed following the submittal of this report during the public comment period for the proposed plan. Thus, these criteria are not evaluated in this section.

5.1 Alternative 1 – No Action

The No Action alternative has been included, under the NCP requirements, to provide a baseline by which to compare other alternatives. Under this alternative soil would not be actively treated and the Site conditions would remain the same. Property maintenance (security, fence repairs, etc.) currently exists and would continue to exist as part of the daily operations of Camp Georgetown as an incarceration facility. However, access restrictions and security operations do not currently exist at the Site to prevent contact with impacted media. Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years.

5.1.1 Overall Protection of Human Health and the Environment

This alternative would not reduce potential risks to human health or the environment for future use scenarios.

5.1.2 Compliance with ARARs

Under this alternative, soil with concentrations exceeding SCGs would remain available for direct contact. Site cleanup objectives would not be achieved for future use scenarios.

5.1.3 Short-term Effectiveness

Minimal disturbance to the Site would occur under this alternative. Disturbances would occur primarily during sampling activities, thus presenting a limited short-term risk to personnel collecting, transporting, and analyzing the samples. Since no construction activities would be performed, no short-term risks to inmates, facility personnel, authorized visitors, the community, or the environment would be presented as a result of such activities.

5.1.4 Long-term Effectiveness and Permanence

The long-term risk of direct contact with the impacted soil is not reduced under this alternative. Redevelopment of the Site and changes in its usage scenario could present an increased potential for risks to human health and the environment.

5.1.5 Reduction of Toxicity, Mobility, and Volume

The toxicity of impacted media would gradually decrease over an extended period of time through natural degradation and attenuation of PCP; however, dioxin would not be degraded. Although the rate of PCP degradation at the Site has not been modeled, based on the available data it is reasonable to expect that this process may take longer than 30 years, which is often used as the time frame of comparison for CERCLA remedies. This alternative provides no reduction in the mobility of COPCs or the volume of impacted media.

5.1.6 Implementability

This alternative would be readily implementable at the Site. This technology would require minimal planned or implemented activities. Suppliers and materials to complete groundwater monitoring are widely available with no anticipated delays in implementation.

5.1.7 Cost

The estimated present worth of this remedial alternative is approximately **$450,257**. A breakdown of the cost estimate for this alternative is included in **Appendix C**.

5.1.8 Summary

Under this alternative, the Site would be left in its present condition. The major shortcoming of this alternative is that it does not address the RAOs nor is it compatible with possible future development uses at the Site. Pursuant to the revised (NCP, 1990) and USEPA guidance (USEPA, 1988), the No Action alternative must be developed and assessed as a potential remedial action. The No Action alternative constitutes the baseline by which the other remedial alternatives are compared; therefore, this alternative will be retained, for comparative purposes, throughout the remainder of this FS report.

5.2 Alternative 2 – Limited Action

Under this alternative institutional and engineering controls would be used to address soil impacts at the Site. An initial round of groundwater sampling of all wells would be completed to establish base line groundwater parameters. Property maintenance currently exists and would continue to exist as part of the daily operations of Camp Georgetown as an incarceration facility. A 6-foot high chain-link fence and gate would be placed around the perimeter of the impacted area, specifically to restrict access to impacted media. Easements and official records would be placed in the title file to limit future land use or prohibit activities that may increase risk of exposure to site contaminants would be implemented by the NYSDEC. Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years.

5.2.1 Overall Protection of Human Health and the Environment

Current institutional controls (limited site access, as well as the procedures outlined in the HASP) would remain in place and be augmented as necessary to prohibit direct contact exposures to impacted soil. This alternative would not contain the impacted soils. Migration, toxicity and mobility of PCP would be slowly reduced, over a period of several years, but dioxin concentrations would be unaffected. The potential for receptors to come into contact with impacted soil would continue.

5.2.2 Compliance with ARARs

Under this alternative institutional controls would be implemented and/or enhanced. However, soil with concentrations exceeding SCGs would remain available for direct contact. Site cleanup objectives would not be achieved for future use scenarios.

5.2.3 Short-term Effectiveness

Minimal disturbance to the Site would occur under this alternative. Disturbances would primarily occur during sampling activities, thus presenting a limited short-term risk to personnel collecting, transporting, and analyzing the samples. Minimal short-term risks to inmates, facility personnel, authorized visitors, the community, or the environment would be presented as a result of installing the fence.

5.2.4 Long-term Effectiveness and Permanence

The long-term risk of direct contact with the impacted soil would be reduced through the installation of a fence surrounding the area of concern. Redevelopment of the Site and changes in its usage scenario could present an increased potential for risks to human health and the environment.

5.2.5 Reduction of Toxicity, Mobility, and Volume

The toxicity of impacted media would gradually decrease over an extended period of time through natural degradation and attenuation of PCP; however, dioxin would not be degraded.

Although the rate of PCP degradation at the Site has not been modeled, based on the available data it is reasonable to expect that this process may take longer than 30 years, which is often used as the time frame of comparison for CERCLA remedies. This alternative provides no reduction in the mobility of COPCs or the volume of impacted media.

5.2.6 Implementability

This alternative would be readily implementable. It would require minimal planned or implemented activities. Suppliers and materials to complete fence installation and groundwater monitoring are widely available. Institutional controls regarding site access are readily implementable and, as site ownership belongs to the State of New York, title restrictions and easements would be easily attained.

5.2.7 Cost

The estimated present worth of this remedial alternative is approximately **$614,682**. A breakdown of the cost estimate for this alternative is included in **Appendix C**.

5.2.8 Summary

Under this alternative, the Site would be left in its present condition. The major shortcoming of this alternative is that it does not address the RAOs, nor is it compatible with possible future development uses at the Site. This alternative will not be retained for further consideration.

5.3 Alternative 3 – Excavation and Off-Site Disposal

In this treatment alternative, the PCP and dioxin impacts in the soil would be addressed by excavation and off-site disposal. Specifically, the source areas delineated in **Figure 8** would be excavated using conventional methods and equipment. Since the treatment building is expected to be demolished as part of remedial activities, no access restrictions are foreseen at this time.

The nature and extent of soil impacts was described in **Section 1.3.3** and the areas requiring remedial action were identified in **Section 2.2.1**. In some cases, the areas of surface and subsurface soil impacts overlap. Consequently, as illustrated in **Figure 8**, soils would be excavated as follows to remove the impacted soils above TAGM 4046 guidance values.

Area	Vicinity of Impact	Depth (feet bgs)	Approximate Volume (cubic yards)
A	GTP-16 and GTP-17	10	1,050
B	Former AST Location	12	1,340
C	Adjacent to and Southeast of Former AST Location	1	50
D	Former Treatment Building	10	2,290
E	Former Drip Pad	5	350
F	Southwest of Former Treatment Building	10	700
G	TP-19	10	300
H	Seep	1	60
I	Drainage path from SW corner of Former Treatment Bldg to Seep	5	40
J	Drainage path from SE corner of Former Treatment Bldg to Footer Drain (MW-11)	5	90

The total estimated removal volume is approximately 6,270 cubic yards of soil, measured in place. A 20% bulking factor yields roughly 7,530 cubic yards of soil to be managed. Additionally, stabilization of saturated soils would be necessary (estimated 30% by volume), which would require approximately 1,520 cubic yards of ash or similar product. The slab under the former treatment building would also be removed and crushed as part of this remedial alternative. The slab would produce roughly 180 cubic yards of waste that would require disposal. Consequently, the total volume that would require disposal is approximately 9,230 cubic yards.

Dewatering operations may be required during excavation operations as the water table typically occurs between 2 to 5 feet bgs. Site geologic conditions indicate that groundwater does not occur as a well-defined aquifer or water-bearing zone across the Site, but rather typically occurs within sediments and sand lenses in the overburden sediments with some degree of interconnectedness. The discontinuous nature of water makes it difficult to accurately estimate the volume of water expected to be generated. Water generated during excavation activities could be managed with a submersible pump and either 1) transferred to frac tanks for storage and transported off-site for subsequent treatment and disposal or 2) treated on-site (using carbon or similar treatment methodology) and discharged, with the approval of the NYSDEC. Alternatively, groundwater recharge (and ultimately groundwater flow through the excavation area) could be reduced through the installation of a properly sized diversion channel around the upgradient portion of the excavation to redirect surface and groundwater flow around the areas requiring excavation.

The excavation would be performed in phases to minimize exposure and construction hazards. Construction workers would wear adequate PPE. No sheeting, shoring, or bracing is expected to be required due to the dense soils at the Site and the manageable size of the excavation areas; however, the excavations would be benched. Excavated materials would be transported to a permitted off-site treatment and disposal facility. The excavated areas would be backfilled with clean fill from an off-site source.

NYCRR Part 371 defines the contaminated soils as hazardous (F032) waste. As such, soils would have to be disposed of in an appropriate hazardous waste landfill and may require treatment prior to disposal. The alternative LDR treatment standards for contaminated soil are addressed in 40 CFR 268.49. In general, according to 40 CFR 268.49 (c), soils impacted with regulated constituents must be treated to a level of 10 times the Universal Treatment Standard (UTS) or until 90% reduction is achieved, whichever is met first, prior to land disposal. The UTS for regulated constituents is given in 40 CFR 268.48. Based on the data collected from the Site to date, regulated constituent concentrations are below 10 times the UTS, with the exception of PCP, which exceeded 74 ppm (10 times the UTS for PCP) in a few localized areas of the Site and Chromium, which exceeded 120 ppm (10 times the UTS for Chromium) in one surface soil sample. No treatment of soils prior to land disposal is expected to be necessary based upon existing soil quality data, as the overall concentrations of regulated constituents in the materials to be disposed are not expected to exceed 10 times the UTS (although the potential to encounter a hot spot does exist).

Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years. Institutional controls would remain in effect to limit site access and usage.

5.3.1 Overall Protection of Human Health and the Environment

This alternative would provide overall protection of human health and the environment by removing the potential for exposures to surface soil above the SCGs and would help prevent potential exposures to subsurface soils above the SCGs.

5.3.2 Compliance with ARARs

This alternative would eliminate exposure to impacted soils exceeding the SCGs through the excavation and off-site disposal of soils exceeding the SCGs for PCP and dioxin. During excavation and backfilling, air pollution regulations would be complied with by controlling fugitive dust and emissions. Disposals of the contaminated soil at a hazardous waste landfill would be in compliance with all LDR requirements. However, prior to disposal, alternative LDR treatment standards would need to be met. In general, this alternative actively addresses the primary sources of soil contamination, and hence, is consistent with SCGs that regulate soil quality.

5.3.3 Short-Term Effectiveness

Minimal short-term risks to the communities surrounding the transportation routes exist during the excavation and transportation of waste and clean soil by trucks. During the implementation of this remedial alternative, an increased risk of exposure would be posed to on-site construction workers and the community. Even with proper engineering controls, short-term mobility of COPCs would be increased through vapor and dust inhalation pathways. Air monitoring would be performed and dust generation emissions would be controlled by utilizing engineering measures, such as periodic water spray or the application of foam. Truck traffic on the local roads would increase due to construction vehicles entering and leaving the Site. Traffic control measures (i.e., signage and construction entrances) would be implemented as needed to limit and manage of the increased traffic.

Risks to workers performing remedial and monitoring activities under this alternative can be controlled and mitigated by the implementation of proper health and safety measures, including air monitoring and use of PPE, in accordance with OSHA 1910.120.

Risks to the environment resulting from implementation of this alternative include the potential for dust generation and sediment transport during excavation of the contaminated soil. Appropriate use of erosion and sediment control measures, such as silt fence/hay bale barriers, tarpaulins over material stockpiles, and dust suppression actions would mitigate these risks.

5.3.4 Long-Term Effectiveness

This remedial alternative provides a permanent and effective solution to soil contamination exceeding the SCGs. Soil at the Site that exceeds the SCGs would be removed from the Site and transported to a secured, permitted waste disposal facility. The excavation and off-site disposal of impacted soils above SCGs would reduce the on-site volume and address the toxicity and mobility of the COPCs.

5.3.5 Reduction of Toxicity, Mobility, and Volume

This remedial alternative relies on excavation and removal of COPCs at the Site instead of treatment. There is no expected reduction in the volume, toxicity, or mobility of the COPCs excavated and disposed of off-site. Excavation would reduce the on-site volume and address the toxicity and mobility of the soil containing COPCs.

5.3.6 Implementability

This alternative could be implemented using conventional construction equipment and construction practices. Limitations to this alternative could include:

- Geotechnically unstable soil - No sheeting, shoring, or bracing is expected to be required due to the dense soils at the Site and the manageable size of the excavation areas; the excavations would be benched as a precautionary measure.
- Subsurface Obstructions – Subsurface obstructions (such as construction debris, boulders, etc.) may be encountered. If this limitation does exist, it is manageable.
- Building or foundation structures – The slab under the former treatment building would be removed and disposed as part of this remedial alternative. Similar structures are not expected to impede excavation and disposal operations.
- Groundwater management – Some type of dewatering of the excavation areas would likely be necessary, as the groundwater table exists at 2 to 5 feet bgs across the Site. Groundwater recharge to the Site is variable and seasonal. If a sand lens is encountered during excavation operations, it could yield significant amounts of groundwater that would require storage, treatment, and disposal. Management of substantial amounts of groundwater is achievable, but at decreased efficiency. As an alternative to dewatering, a diversion trench could be placed upgradient of the excavation areas to redirect surface and ground water around the excavation areas.
- Hydrostatic failure of the excavation – Artesian pressure and other variables that could cause a hydrostatic failure within the excavation are not likely to exist at the Site.
- Storage piles – Excavation may also be limited by the need to stage and characterize material prior to transport to various facilities based on contaminant concentration. If this limitation does exist, it is manageable.

Excavation and transport equipment, clean fill, and other items associated with this alternative are readily accessible. This alternative is implementable.

5.3.7 Cost

Costs associated with this alternative include the equipment, labor, oversight, and transport and disposal fees. The estimated net present worth of this remedial alternative is approximately **$13,125,039**. A breakdown of the cost estimate for this alternative is provided in **Appendix C**.

5.3.8 Summary

Excavation and off-site disposal of PCP and dioxin impacted soils may pose some technical challenges, while also posing some short-term risk to the construction workers and surrounding occupants of the facility. However, this remedy provides an effective long-term remedy for PCP and dioxin contamination in the soil and would reduce on-site mobility, toxicity, and volume of PCP and dioxins. The major shortcomings of this alternative are that disposal fees for F032 class wastes are significant and that significant quantities of impacted water could be generated that would require storage, treatment, and disposal. This remedial alternative will be retained for further consideration because it achieves all of the RAOs and the short-term risks associated with its implementation are manageable.

5.4 Alternative 4A – Excavation and On-Site Consolidation with a Multi Layer Geomembrane Cap

In this alternative, the PCP and dioxin impacts to soil would be addressed through excavation and on-site consolidation within the remedial area. The nature and extent of soil impacts was described in **Section 1.3.3** and the areas requiring remedial action were identified in **Section 2.2.1**. Under Excavation and On-site Consolidation, Areas A and F through J would be excavated and contained in an area of consolidation located over Areas B - E, which would be contained in place (refer to **Figure 9**).

Since the treatment building is expected to be demolished as part of remedial activities, no access restrictions are foreseen at this time. The slab under the former treatment building would remain in place.

As illustrated in **Figure 9**, soil would be excavated as follows:

Area	Vicinity of Impact	Depth (feet bgs)	Approximate Volume (cubic yards)
A	GTP-16 and GTP-17	10	1050
F	Southwest of Former Treatment Building	10	700
G	TP-19	10	300
H	Seep	1	60
I	Drainage path from SW corner of Former Treatment Bldg to Seep	5	40
Portion of J	Drainage path from SE corner of Former Treatment Bldg to Footer Drain (MW-11)	5	40

The total estimated removal volume is approximately 2,190 cubic yards of soil, measured in place. A 20% bulking factor yields roughly 2,630 cubic yards of soil to be contained. Additionally, stabilization of saturated soil would be necessary (estimated 30% by volume), which would require approximately 530 cubic yards of ash or similar product. Consequently, the total volume of material that would be placed in the area of consolidation is approximately 3,160 cubic yards.

The excavation would be performed in phases in order to minimize exposure and construction hazards. Construction workers would wear adequate PPE. No sheeting, shoring, or bracing is expected to be required due to the dense soil at the Site and the manageable size of the excavation areas; however, the excavations would be benched. The excavated areas would be backfilled with clean fill from an off-site source.

Groundwater management issues pertinent to Alternative 3 (refer to **Section 4.3**) would also be relevant to this alternative, but to a lesser degree, since fewer areas would be excavated under this alternative. Furthermore, monitoring wells MW-4 (Area G) and MW-6 (Area F) exhibited low recharge and could typically be purged dry using low-flow sampling techniques. The poor yield and low recharge of these wells indicates that water management would not likely be an issue within these excavations.

A preliminary design of the area of consolidation, as depicted in **Figure 10**, was performed. The design determined that the top of material elevation would be approximately 1,011 feet, with side slopes of approximately 5%.

A multi layer geomembrane cap would be installed over the area of consolidation (**Figure 9**). A multi layer geomembrane cap would eliminate the potential for direct contact with impacted media and prevent rainwater infiltration into the consolidation areas. Multi layer geomembrane caps typically consist of the following layers and as shown on **Figure 10**:

- Vegetative Layer – approximately 6 inches of topsoil that serves to reduce erosion and infiltration of precipitation;
- Drainage Layer – approximately 24 inches of porous material (sand) that enhances lateral drainage of any precipitation that infiltrates through the vegetative layer and minimizes liquid head build-up on the geomembrane (synthetic barrier); the vegetative and drainage layers help protect the underlying barrier layers from the environmental stresses of wetting/drying and freezing/thawing;
- Synthetic Barrier – low permeability geomembrane (at least 40 mil thickness) that represents the final impedance to precipitation infiltration; and
- Low Permeability Layer – a geosynthetic clay liner consisting of sodium bentonite bound between two layers of needle-punched geotextile to prevent infiltration into the impacted media in the event that the synthetic barrier develops a leak or tear.

All future site development would account for the requirements of the area of consolidation in their design. Institutional controls would be implemented to limit site access and usage. Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years.

5.4.1 Overall Protection of Human Health and the Environment

This alternative would provide overall protection of human health and the environment by mitigating the potential for exposures to surface and subsurface soil above the SCGs. It would also serve to impede the potential for transport of COPCs into groundwater because migration would not be encouraged by infiltration of precipitation, which appears to be the primary transport mechanism at the Site.

5.4.2 Compliance with ARARs

This alternative would eliminate exposure to contaminated soil exceeding the SCGs through consolidation and capping of soil exceeding the SCGs for PCP and dioxin. During construction activities, air pollution regulations would be complied with by controlling fugitive dust emissions through the use of periodic water spray or similar measures. Since the excavated soil would be consolidated and contained on-site (i.e., within the area of concern), placement of a hazardous waste would not occur. Consequently, LDRs would not be applicable to this remedial alternative. In general, this alternative actively addresses the primary sources of soil and potential groundwater contamination, and hence, is consistent with SCGs that regulate soil and groundwater quality.

5.4.3 Short-Term Effectiveness

During the implementation of this remedial alternative, an increased risk of exposure would be posed to on-site construction workers and the community. Risks to workers performing remedial and monitoring activities under this alternative could be controlled and mitigated by the implementation of proper health and safety measures, including engineering controls (periodic water spray or the application of foam), air monitoring and use of PPE, in accordance with OSHA 1910.120. Even with proper engineering controls, short-term mobility of COPCs would be increased through vapor and dust inhalation pathways.

Truck traffic on the local roads would increase due to construction vehicles entering and leaving the Site. Traffic control measures (e.g., signage and construction entrances) would be implemented as needed to limit and manage the increased traffic.

Risks to the environment resulting from implementation of this alternative include the potential for dust generation and sediment transport during excavation of the contaminated soil. Appropriate use of erosion and sediment control measures, such as silt fence/hay bale barriers, tarpaulins over material stockpiles, and dust suppression actions would mitigate these risks.

5.4.4 Long-Term Effectiveness

This remedial alternative would provide an effective and long-term solution to soil impacts exceeding the SCGs. It would serve to impede the potential for transport of COPCs into groundwater because migration would not be encouraged by infiltration of precipitation, which appears to be the primary transport mechanism at the Site. The long-term effectiveness of the area of consolidation would be ensured through routine inspection and maintenance of the cap and monitoring of groundwater.

5.4.5 Reduction of Toxicity, Mobility, and Volume

Consolidation and capping of impacted soil would not lessen the toxicity or volume of hazardous wastes. It would, however, impede migration by preventing infiltration and transport of COPCs.

5.4.6 Implementability

This alternative would be implemented using conventional construction equipment and construction practices. The limitations discussed in **Section 5.3.6** with regard to excavation would also apply to this alternative, but to a slighter degree, since a lesser amount of soil would be excavated.

Quality assurance/quality control parameters would have to be adhered to during construction (of the area of consolidation) to ensure its effectiveness. The area of consolidation would have to be carefully integrated into the long-range development plans for the Site, as it would limit future land uses. Institutional controls would be implemented to limit land use activities that may compromise the condition of the area of consolidation. Vegetation that has tendency for deep root penetration would have to be eliminated from the vicinity of the area of consolidation. Long-term maintenance and monitoring would be necessary to ensure the integrity and effectiveness of the area of consolidation. Institutional controls and restrictions to land usage would also be implemented.

Excavation and transport equipment, clean fill, synthetic liner materials, and other items associated with this alternative would be readily accessible. Suppliers and materials to complete groundwater monitoring would be widely available. This alternative is implementable.

5.4.7 Cost

This alternative would involve the construction of an on-site area of consolidation to contain the soil at the Site that exceeds the SCGs. Costs associated with this alternative include the equipment, labor, oversight, and construction and maintenance of an area of consolidation. Long-term inspection and maintenance of the area of consolidation for at least 30 years would increase post-closure costs. The duration of inspection and maintenance would be dependent on deep-rooted vegetation and burrowing animals, settling of the area of consolidation, and erosion. For the purposes of alternative screening, the net present worth of this alternative was estimated to be approximately **$2,286,758**. A breakdown of the cost estimate for this alternative is included in **Appendix C**.

5.4.8 Summary

This alternative would provide an effective, long-term remedy for PCP and dioxin impacts in the soil. The capped area of consolidation would effectively prevent direct contact with impacted soil. It would also serve to impede the potential for transport of COPCs into groundwater because migration would not be encouraged by infiltration of precipitation, which has been shown to the primary recharge mechanism at the Site. Significant quantities of impacted water could be generated during excavation activities that would require storage, treatment, and disposal.

Excavation activities and construction of the area of consolidation may pose some technical challenges, while also posing some short-term risk to the construction workers and surrounding occupants of the facility. Short-term risks to workers could be mitigated through the utilization of engineering controls, air monitoring equipment, and PPE. Institutional controls would be implemented at the Site to ensure the integrity of the area of consolidation.

This remedial alternative will be retained for further consideration because it achieves all of the RAOs and the short-term risks associated with its implementation are manageable.

5.5 Alternative 4B – Excavation and On-Site Consolidation with a Low Permeability Cover System

In this alternative, the PCP and dioxin impacts to soil would be addressed through excavation and on-site consolidation. The nature and extent of soil impacts was described in **Section 1.3.3** and the areas requiring remedial action were identified in **Section 2.2.1**. This alternative would involve the same components described in **Section 5.4**, with the exception that an LPCS would be installed in place of multi layer geomembrane cap over the area of consolidation (**Figure 9**). An LPCS typically consists of the following layers:

- Vegetative Layer – approximately 6 inches of topsoil that serves to reduce erosion and infiltration of precipitation;
- Protective Layer – approximately 24 inches of soil that serves to reduce erosion and infiltration of precipitation as well as to protect the low permeability layer from the environmental stresses of wetting/drying and freezing/thawing;
- Low Permeability Layer – approximately 18 inches of compacted clay (maximum remolded coefficient of permeability of 1×10^{-7} cm/s throughout its thickness) to prevent infiltration into the impacted media.

This LPCS would prevent direct contact with PCP and dioxin and, due to its low permeability, would prevent infiltration into the consolidation areas. An engineered pavement system may be considered as an alternative LPCS.

All future site development would account for the requirements of the area of consolidation in their design. Institutional controls would be implemented to limit site access and usage.

Groundwater monitoring would occur annually for five years. Based on the results, further groundwater monitoring would continue either annually or biannually for an additional 25 years.

5.5.1 Overall Protection of Human Health and the Environment

This alternative would provide overall protection of human health and the environment by mitigating the potential for exposures to surface and subsurface soil above the SCGs. It would also serve to impede the potential for transport of COPCs into groundwater because migration would not be encouraged by infiltration of precipitation, which appears to be the primary transport mechanism at the Site.

5.5.2 Compliance with ARARs

This alternative would eliminate exposure to contaminated soil exceeding the SCGs through consolidation and capping of soil exceeding the SCGs for PCP and dioxin. This alternative would eliminate exposure to impacted soil exceeding the SCGs. During construction activities, air pollution regulations would be complied with by controlling fugitive dust emissions through the use of periodic water spray or similar measures. Since the excavated soil would be consolidated and contained on-site (i.e., within the area of concern), placement of a hazardous waste would not occur. Consequently, LDRs would not be applicable to this remedial alternative. In general, this alternative actively addresses the primary sources of soil and potential groundwater contamination, and hence, is consistent with SCGs that regulate soil and groundwater quality.

5.5.3 Short-Term Effectiveness

During the implementation of this remedial alternative, an increased risk of exposure would be posed to on-site construction workers and the community. Risks to workers performing remedial and monitoring activities under this alternative could be controlled and mitigated by the implementation of proper health and safety measures, including engineering controls (periodic water spray or the application of foam), air monitoring and use of PPE, in accordance with OSHA 1910.120. Even with proper engineering controls, short-term mobility of COPCs would be increased through vapor and dust inhalation pathways.

Truck traffic on the local roads would increase due to construction vehicles entering and leaving the Site. Traffic control measures (e.g., signage and construction entrances) would be implemented as needed to limit and manage the increased traffic.

Risks to the environment resulting from implementation of this alternative include the potential for dust generation and sediment transport during excavation of the contaminated soil. Appropriate use of erosion and sediment control measures, such as silt fence/hay bale barriers, tarpaulins over material stockpiles, and dust suppression actions would mitigate these risks.

5.5.4 Long-Term Effectiveness

This remedial alternative would provide an effective and long-term solution to soil impacts exceeding the SCGs. It would serve to impede the potential for transport of COPCs into groundwater because migration would not be encouraged by infiltration of precipitation, which appears to be the primary transport mechanism at the Site. The long-term effectiveness of the area of consolidation would be ensured through routine inspection and maintenance of the LPCS and monitoring of groundwater.

5.5.5 Reduction of Toxicity, Mobility, and Volume

Consolidation and capping of impacted soil would not lessen the toxicity or volume of hazardous wastes. It would, however, impede migration by preventing infiltration and transport of COPCs.

5.5.6 Implementability

This alternative would be implemented using conventional construction equipment and construction practices. The limitations discussed in **Section 5.3.6** with regard to excavation would also apply to this alternative, but to a slighter degree, since a lesser amount of soil would be excavated.

Quality assurance/quality control parameters would have to be adhered to during construction (of the area of consolidation) to ensure its effectiveness. The area of consolidation would have to be carefully integrated into the long-range development plans for the Site, as it would limit future land uses. Institutional controls would be implemented to limit land use activities that may compromise the condition of the area of consolidation. Vegetation that has tendency for deep root penetration would have to be eliminated from the vicinity of the area of consolidation. Long-term maintenance and monitoring would be necessary to ensure the integrity and effectiveness of the area of consolidation. Institutional controls and restrictions to land usage would also be implemented.

Excavation and transport equipment, clean fill, and other items associated with this alternative would be readily accessible, with the exception that it may be cost prohibitive to locate a suitable source of clay. Suppliers and materials to complete groundwater monitoring would be widely available. This alternative is implementable.

5.5.7 Cost

This alternative would involve the construction of an on-site area of consolidation to contain the soil at the Site that exceeds the SCGs. Costs associated with this alternative include the equipment, labor, oversight, and construction and maintenance of an area of consolidation. Long-term inspection and maintenance of the area of consolidation for at least 30 years would increase post-closure costs. The duration of inspection and maintenance would be dependent on deep-rooted vegetation and burrowing animals, settling of the area of consolidation, and erosion. For the purposes of alternative screening, the net present worth of this alternative was estimated to be approximately **$2,329,528**. A breakdown of the cost estimate for this alternative is included in **Appendix C**.

5.5.8 Summary

This alternative would provide an effective, long-term remedy for PCP and dioxin impacts in the soil. The area of consolidation would effectively prevent direct contact with impacted soil. It would also serve to impede the potential for transport of COPCs into groundwater because migration would not be encouraged by infiltration of precipitation, which has been shown to the primary recharge mechanism at the Site. Significant quantities of impacted water could be generated during excavation activities that would require storage, treatment, and disposal.

Excavation activities and construction of the area of consolidation may pose some technical challenges, while also posing some short-term risk to the construction workers and surrounding occupants of the facility. Short-term risks to workers could be mitigated through the utilization of engineering controls, air monitoring equipment, and PPE. Institutional controls would be implemented at the Site to ensure the integrity of the area of consolidation.

This remedial alternative will be retained for further consideration because it achieves all of the RAOs and the short-term risks associated with its implementation are manageable.

6.0 COMPARATIVE ANALYSIS

This section compares the relative performance of each of the remedial alternatives retained for further detailed analysis in **Section 5.0**, using the specific evaluation criteria identified therein.

Comparisons are presented in a qualitative manner in order to identify substantive differences between the alternatives. As with the detailed analysis, the following criteria were used for the comparative analysis:

- Overall Protection of Human Health and the Environment
- Compliance with SCGs, ARARs, and Other Regulations
- Short-Term Effectiveness
- Long-Term Effectiveness and Permanence
- Reduction in Mobility, Toxicity, and Volume
- Implementability
- Cost

The qualitative comparison is outlined in the following sections.

6.1 Comparative Analysis of Retained Remedial Alternatives

The retained remedial alternatives are:

- Alternative 1 – No Action
- Alternative 3 – Excavation and off-site disposal
- Alternative 4A – Excavation and on-site consolidation with a Multi Layer Geomembrane Cap
- Alternative 4B – Excavation and on-site consolidation with a LPCS

6.1.1 Overall Protection of Human Health and the Environment

The comparative evaluation of overall protection of human health and the environment evaluates attainment of SCGs, as well as the analysis of other criteria evaluated for each alternative (specifically, short- and long-term effectiveness). The evaluation of this criteria focuses on such factors as the manner in which the remedial alternatives achieve protection over time, the degree to which site risks would be reduced, and the manner in which the source of COPCs would be eliminated, reduced, or controlled.

Alternative 1 (No Action) would not be protective of human health and the environment.

Alternatives 3, 4A, and 4B would involve the excavation and off-site disposal / on-site consolidation of surface and subsurface soil exceeding the SCGs. Alternative 3 would involve the placement of excavated soil in a secured, permitted, off-site hazardous waste landfill, which would effectively mitigate the potential for exposure to soil exceeding the SCGs and the potential for contaminant transport into groundwater. Under on-site consolidation (Alternatives 4A and 4B), the cap/cover would also effectively mitigate the potential for exposure to soil exceeding the SCGs and would impede contaminant migration by minimizing infiltration of precipitation into the impacted zone. Short-term impacts to both human health and the environment during the implementation of Alternatives 3, 4A, and 4B would be minimal and easily managed. Alternatives 3, 4A, and 4B are considered effective measures to protect against potential long-term human health risks and environmental impacts.

6.1.2 Compliance with SCGs and ARARs

The comparative evaluation of the compliance of each alternative focuses on the following criteria:

- Published NYSDEC SCGs
- Other federal ARARs

Alternative 1 (No Action) would not comply with the SCGs and ARARs. The other alternatives under evaluation in the section would comply with SCGs and ARARs via the excavation and off-site disposal (Alternative 3) or by on-site consolidation (Alternatives 4A and 4B) of surface and subsurface soil that exceed the SCGs. LDR guidelines would be applicable to Alternatives 3 because it involves the transport of impacted materials off-site (i.e., outside the area of concern) for disposal. Alternatives 4A and 4B would not prompt these restrictions because containment of materials in an on-site (i.e., within the area of concern) area of consolidation would not constitute placement. All remedial actions would be completed in a manner compliant with action-specific standards and regulatory requirements.

6.1.3 Short-Term Effectiveness

The short-term effectiveness comparison includes the evaluation of the relative potential for impacts to the nearby communities, site worker exposures, environmental impacts, and the time frame for implementation of the alternatives.

The implementation of Alternative 1 (No Action) would result in the least short-term impact, because minimal action would be taken to disturb the impacted media at the Site. Alternatives 3, 4A, and 4B would all involve an increased short-term risk of exposures to on-site construction workers, the community, and the environment during construction activities. These risks could be managed through the appropriate utilization of erosion and sediment controls and health and safety measures, including engineering controls, air monitoring, and use of PPE, in accordance with OSHA 1910.120. Of the alternatives that would achieve the SCGs, Alternative 3 would pose the greatest short-term risks to human health and the environment because it would involve the off-site transport of impacted materials. The time requirement for the implementation of Alternative 4B is slightly greater than that of Alternative 4A (i.e., impacted soil would remain uncontained for a greater period of time under Alternative 4B). Thus, Alternative 4A is more effective in the short-term than Alternative 4B.

6.1.4 Long-Term Effectiveness

The comparative evaluation of long-term effectiveness focuses on the reduction of residual risk and the adequacy and reliability of controls provided by each alternative.

Alternative 1 (No Action) would not reduce the risk of direct contact with impacted media. Therefore, it would not be a permanent or effective remedy.

Alternatives 3, 4A, and 4B would provide an effective and long-term solution to soil impacts exceeding the SCGs. Each of these alternatives would effectively mitigate the potential for exposure to soil exceeding the SCGs and contaminant transport into groundwater. The long-term effectiveness of the area of consolidation (Alternatives 4A and 4B) would be ensured through routine inspection and maintenance of the cap/cover and the implementation of institutional controls and restrictions on land usage. Alternative 3 is anticipated to have the greatest long-term effectiveness because soil exceeding the SCGs would be physically removed from the Site and placed in a secured, permitted, off-site hazardous waste landfill and residual on-site impacts would be minimal.

Groundwater monitoring would be performed under all alternatives. Alternatives 3, 4A, and 4B are considered effective measures to protect against potential long-term human health risks and environmental impacts.

6.1.5 Reduction of Toxicity, Mobility, and Volume

The comparative evaluation of the reduction of mobility, toxicity, and volume focuses on the ability of the alternative to address the impacted material on-site, the mass of material destroyed or treated, the irreversibility of the process employed, and the nature of the impacted materials after the implementation of the alternative.

Under Alternative 1 (No Action) the volume and toxicity of soil impacted with PCP would gradually decrease over time through natural degradation; dioxin concentrations would remain unaffected. Impacted soil would remain a potential source of contamination to the groundwater, as the infiltration of precipitation, which appears to be the primary mechanism of COPC transport at the Site, would not be impeded.

Alternative 3 would reduce the on-site volume, toxicity, and mobility of COPCs through the excavation and off-site disposal of impacted soil exceeding the SCGs; however, there would not be any expected reduction in the volume, toxicity, or mobility of the COPCs disposed of off-site. On-site consolidation (Alternatives 4A and 4B) of impacted soil would not lessen the toxicity or volume of hazardous materials on-site. The cap/cover would impede contaminant migration by minimizing infiltration of precipitation into the impacted zone and the erosion of surface soils.

6.1.6 Implementability

The comparative evaluation of implementability focuses on the feasibility of construction and operation of each alternative, the administrative feasibility, the availability or required disposal facilities, technical and service personnel, and contractors.

Alternative 1 (No Action) would require minimal planned or implemented activities.

Alternatives 3, 4A, and 4B could be implemented using standard construction equipment and practices. Less excavation is involved in Alternatives 4A and 4B in comparison to Alternative 3. Consequently, there is a greater likelihood of encountering difficulties during excavation operations under Alternative 3. Management of risks associated with the off-site transport and disposal of impacted soil would also cause Alternative 3 to be more difficult to implement. Under Alternatives 4A and 4B quality assurance/quality control parameters would have to be adhered to during construction of the area of consolidation to ensure their effectiveness. The area of consolidation would have to be carefully integrated into the long-range development plans for the Site. The long-term effectiveness of the area of consolidation would be ensured through routine inspection and maintenance of the cap/cover as well as the implementation of institutional controls and restrictions on land usage. Alternative 4B may be more difficult to implement in comparison to Alternative 4A because is may be cost prohibitive to locate a suitable source of clay.

Excavation and transport equipment, clean fill, synthetic liner materials, materials to complete groundwater monitoring, and other items associated with these alternatives are readily available.

6.1.7 Cost

The comparative evaluation of the cost of remediation is based on the net present worth of each alternative. The total capital, annual O&M and present value costs for all Alternatives are presented in **Appendix C**. The approximate cost associated with each Alternative is as follows:

- Alternative 1 – No Action: **$450,257**
- Alternative 3 – Excavation and off-site disposal: **$13,125,039**
- Alternative 4A – Excavation and on-site consolidation with a Multi Layer Geomembrane Cap: **$2,286,758**
- Alternative 4B – Excavation and on-site consolidation with a LPCS: **$2,329,528**

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TABLES

Table 1
Surface Soil Analytical Results
Camp Georgetown

Analyte	TAGM (4046)	GSS-1	GSS-2	GSS-3	GSS-4	GSS-5	GSS-6	GSS-7	GSS-8	GSS-9	GSS-10	GSS-11	GSS-12	GSS-13	GSS-14	GSS-15
SVOCs (mg/kg)																
Anthracene	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo{a}anthracene	0.224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo{b}fluoranthene	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo{k}fluoranthene	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo{g,h,i}perylene	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo (a) Pyrene	0.061	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzoic Acid	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis (2-Ethylhexyl) Phthalate	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dimethyl Phthlate	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diethyl Phthalate	7.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-butyl Phthalate	8.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-octyl Phthalte	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno (1,2,3) pyrene	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	1	**2.53***	ND	ND	ND	ND	ND	**0.2***	**0.24***	ND	ND	ND	**0.1***	ND	ND	ND
Phenanthrene	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total SVOC		**2.53***	ND	ND	ND	ND	ND	**0.2***	**0.24***	ND	ND	ND	**0.1***	ND	ND	ND
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**GSS-1**	**GSS-2**	**GSS-3**	**GSS-4**	**GSS-5**	**GSS-6**	**GSS-7**	**GSS-8**	**GSS-9**	**GSS-10**	**GSS-11**	**GSS-12**	**GSS-13**	**GSS-14**	**GSS-15**
Aluminum	NV or **14340**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	NV or **0.487**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	7.5 or **8.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	**300** or 38.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Berillium	0.16 or **0.427**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	**10** or 0.029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	NV or **309.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	**50** or 16.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	**30** or 8.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	**25** or 11.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	2000 or **25770**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	**400** or 12.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	NV or **2893**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	NV or **319.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	13 or **17.77**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	NV or **714.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	**2** or 1.322	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	**0.1** or 0.082375	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	NV or **41.52222**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	**150** or 20.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	20 or **51.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dioxins (ug/kg)	**TEFs**	**GSS-1**	**GSS-2**	**GSS-3**	**GSS-4**	**GSS-5**	**GSS-6**	**GSS-7**	**GSS-8**	**GSS-9**	**GSS-10**	**GSS-11**	**GSS-12**	**GSS-13**	**GSS-14**	**GSS-15**
Total TCDF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total PeCDF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TotalHxCDF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total HpCDF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total TCDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total PeCDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total HxCDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total HpCDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,7,8-TCDD	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-PeCDD	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HxCDD	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HxCDD	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HxCDD	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HpCDD	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCDD	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,7,8-TCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-PeCDF	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,4,7,8-PeCDF	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,4,6,7,8-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HpCDF	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8,9-HpCDF	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCDF	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,7,8-TCDD Equivalence	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
Only analytes detected at or above laboratory method detection limits included on table
*PCP results from PIR Immunoassay Results
Bold Text=Analyte detected above laboratory method detection limi
Shaded Text=Exceedence of TAGM 4046 soil cleanup objectives
BDL=Below laboratory method detection limi
ND=Non Detect

Dioxin Data Qualifiers:
All results in ug/kg or parts per billion
D=Result obtained from dilution
J=Estimated result, result is less than the reporting limit
E=Estimated result, result exceeds calibration range
CON=Confirmation analysis

SVOC Data Qualifiers:
All results in mg/kg or parts per million
< = Analyte was not detected above laboratory detection limits
J=Estimated Value

Metal Data Qualifiers:
All results in mg/kg or parts per million
B=Indicates a value greater than or equal to the instrument detection limit but less than the quantitation limit
J=Estimated result, result is less than the reporting limit
NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 1
Surface Soil Analytical Results
Camp Georgetown

Analyte	TAGM (4046)	GSS-16	GSS-17	GSS-18	GSS-19	GSS-20	GSS-21	GSS-22	GSS-23	GSS-24	GSS-25	GSS-26	SS-1	SS-2	SS-3	SS-4
SVOCs (mg/kg)																
Anthracene	50	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Benzo{a}anthracene	0.224	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Benzo{b}fluoranthene	1.1	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Benzo{k}fluoranthene	1.1	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Benzo{g,h,i}perylene	50	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Benzo (a) Pyrene	0.061	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Benzoic Acid	2.7	-	<1.6 J	-	-	-	-	-	-	-	-	-	<1.6 J	<1.6 J	<1.6 J	<1.6 J
Bis (2-Ethylhexyl) Phthalate	50	-	**68 JB**	-	-	-	-	-	-	-	-	-	<0.33 J	**0.082 J**	<0.58 J	<0.33 J
Chrysene	0.4	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Dimethyl Phthlate	2	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Diethyl Phthalate	7.1	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.33 J	<0.33 J
Di-n-butyl Phthalate	8.1	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Di-n-octyl Phthalte	120	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58	<0.33 J
Fluoranthene	50	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Indeno (1,2,3) pyrene	3.2	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Pentachlorophenol	1	ND	**130 J**	**0.12***	**0.64***	**2.8***	**1***	**5.28***	ND	**0.14***	ND	**0.1***	<1.6 J	**0.078 J**	<1.6J	**0.028 J**
Phenanthrene	50	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Pyrene	50	-	<0.33 J	-	-	-	-	-	-	-	-	-	<0.33 J	<0.33 J	<0.58 J	<0.33 J
Total SVOC		ND	**198 JB**	**0.12***	**0.64***	**2.8***	**1***	**5.28***	ND	**0.14***	ND	**0.1***	BDL	**0.160 J**	BDL	**0.028 J**
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**GSS-16**	**GSS-17**	**GSS-18**	**GSS-19**	**GSS-20**	**GSS-21**	**GSS-22**	**GSS-23**	**GSS-24**	**GSS-25**	**GSS-26**	**SS-1**	**SS-2**	**SS-3**	**SS-4**
Aluminum	NV or **14340**	-	**12000**	-	-	-	-	-	-	-	-	-	**12000**	-	**9750**	**13200**
Antimony	NV or **0.487**	-	**0.23 B**	-	-	-	-	-	-	-	-	-	**0.66 B**	-	**1.2 B**	**1.3 B**
Arsenic	7.5 or **8.2**	-	**10.7**	-	-	-	-	-	-	-	-	-	**11.6**	-	**6.4**	**11.8**
Barium	**300** or 38.49	-	**51.2**	-	-	-	-	-	-	-	-	-	**69.1 J**	-	**39.9 J**	**114 J**
Berillium	0.16 or **0.427**	-	**0.68 B**	-	-	-	-	-	-	-	-	-	**0.44 B**	-	**0.40 B**	**0.51 B**
Cadmium	**10** or 0.029	-	**0.1 B**	-	-	-	-	-	-	-	-	-	<0.03	-	<0.04	<0.03
Calcium	NV or **309.96**	-	**3600**	-	-	-	-	-	-	-	-	-	**12500**	-	**36900**	**3470**
Chromium	**50** or 16.58	-	**21.8**	-	-	-	-	-	-	-	-	-	**17.3**	-	**20.5**	**17.9**
Cobalt	**30** or 8.31	-	**12.3**	-	-	-	-	-	-	-	-	-	**10.9 J**	-	**8.9 J**	**13.8 J**
Copper	**25** or 11.83	-	**22.3**	-	-	-	-	-	-	-	-	-	**14.7**	-	**18**	**18.1**
Iron	2000 or **25770**	-	**29700**	-	-	-	-	-	-	-	-	-	**25900**	-	**22500**	**30000**
Lead	**400** or 12.58	-	**19.2**	-	-	-	-	-	-	-	-	-	**11.2**	-	**66.3**	**9.5**
Magnesium	NV or **2893**	-	**4770**	-	-	-	-	-	-	-	-	-	**4690 J**	-	**5000 J**	**4760 J**
Manganese	NV or **319.3**	-	**498**	-	-	-	-	-	-	-	-	-	**449**	-	**429**	**583**
Nickel	13 or **17.77**	-	**33**	-	-	-	-	-	-	-	-	-	**24.4**	-	**23.2**	**27.5**
Potassium	NV or **714.8**	-	**810**	-	-	-	-	-	-	-	-	-	**766**	-	**859**	**876**
Selenium	**2** or 1.322	-	**0.59 B**	-	-	-	-	-	-	-	-	-	**1.2 J**	-	**0.94 J**	**1.1 J**
Silver	NV or **ND**	-	**0.29 B**	-	-	-	-	-	-	-	-	-	<0.10 J	-	<0.11 J	<0.10 J
Mercury	**0.1** or 0.082375	-	NS	-	-	-	-	-	-	-	-	-	<0.011 J	-	<0.012 J	**0.022 BJ**
Sodium	NV or **41.52222**	-	**153 B**	-	-	-	-	-	-	-	-	-	**44.2 B**	-	**65.6 B**	**38.2 B**
Thallium	NV or **ND**	-	**2.2**	-	-	-	-	-	-	-	-	-	<0.58 J	-	<0.62 J	<0.57 J
Vanadium	**150** or 20.15	-	**14.9**	-	-	-	-	-	-	-	-	-	**15.5**	-	**18.8**	**15.6**
Zinc	20 or **51.96**	-	**92.7**	-	-	-	-	-	-	-	-	-	**77.1**	-	**101**	**69.8**
Dioxins (ug/kg)	**TEFs**	**GSS-16**	**GSS-17**	**GSS-18**	**GSS-19**	**GSS-20**	**GSS-21**	**GSS-22**	**GSS-23**	**GSS-24**	**GSS-25**	**GSS-26**	**SS-1**	**SS-2**	**SS-3**	**SS-4**
Total TCDF	-	-	-	-	-	-	-	-					**0.016**	**0.0077**	**0.00095**	**0.019**
Total PeCDF	-	-	-	-	-	-	-	-	-	-	-	-	**0.25**	**0.1**	**0.013**	**0.3**
TotalHxCDF	-	-	-	-	-	-	-	-	-	-	-	-	**3.9**	**1.6**	**0.19**	**4.5**
Total HpCDF	-	-	-	-	-	-	-	-	-	-	-	-	**14**	**8.1**	**1**	**17**
Total TCDD	-	-	-	-	-	-	-	-	-	-	-	-	**0.012**	**0.0079**	**0.00062**	**0.011**
Total PeCDD	-	-	-	-	-	-	-	-	-	-	-	-	**0.11**	**0.041**	**0.0061**	**0.093**
Total HxCDD	-	-	-	-	-	-	-	-	-	-	-	-	**1.8**	**0.84**	**0.16**	**2.1**
Total HpCDD	-	-	-	-	-	-	-	-	-	-	-	-	**25**	**12**	**1.5**	**29**
2,3,7,8-TCDD	1	-	-	-	-	-	-	-	-	-	-	-	**0.0031**	**0.0012**	<0.00052	**0.0024**
1,2,3,7,8-PeCDD	0.5	-	-	-	-	-	-	-	-	-	-	-	**0.049**	**0.025**	**0.0061**	**0.048**
1,2,3,4,7,8-HxCDD	0.1	-	-	-	-	-	-	-	-	-	-	-	**0.1**	**0.056**	**0.011**	**0.1**
1,2,3,6,7,8-HxCDD	0.1	-	-	-	-	-	-	-	-	-	-	-	**0.58**	**0.26**	**0.042**	**0.74**
1,2,3,7,8,9-HxCDD	0.1	-	-	-	-	-	-	-	-	-	-	-	**0.25**	**0.14**	**0.031**	**0.29**
1,2,3,4,6,7,8-HpCDD	0.01	-	-	-	-	-	-	-	-	-	-	-	**17 D**	**7.9 D**	**1**	**20 D**
OCDD	0.0001	-	-	-	-	-	-	-	-	-	-	-	**91 D**	**47 D**	**6.2 EJ**	**130 DEJ**
2,3,7,8-TCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	**0.0019 CON**	**0.00079 CON J**	<0.00056	**0.002 CON**
1,2,3,7,8-PeCDF	0.05	-	-	-	-	-	-	-	-	-	-	-	**0.015**	**0.0052 J**	<0.00091	**0.02**
2,3,4,7,8-PeCDF	0.5	-	-	-	-	-	-	-	-	-	-	-	**0.013**	**0.0046 J**	<0.0012	**0.019**
1,2,3,4,7,8-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	**0.11**	**0.045**	**0.006**	**0.15**
1,2,3,6,7,8-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	**0.073**	**0.034**	**0.0053 J**	**0.068**
2,3,4,6,7,8-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	**0.061**	**0.024**	**0.0048 J**	**0.071**
1,2,3,7,8,9-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	**0.0054 J**	<0.0019	<0.00044	**0.012**
1,2,3,4,6,7,8-HpCDF	0.01	-	-	-	-	-	-	-	-	-	-	-	**3.5 D**	**1.8**	**0.26**	**3.8 D**
1,2,3,4,7,8,9-HpCDF	0.01	-	-	-	-	-	-	-	-	-	-	-	**0.30 D**	**0.12**	**0.017**	**0.34 D**
OCDF	0.0001	-	-	-	-	-	-	-	-	-	-	-	**16 D**	**11 D**	**1.2 J**	**19 D**
2,3,7,8-TCDD Equivalence	1.0	-	-	-	-	-	-	-	-	-	-	-	**0.37168 CONDJ**	**0.176239 CONJ**	**0.02657 JE**	**0.4365 CONDEJ**

Notes:
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All results in mg/kg or parts per million
< = Analyte was not detected above laboratory detection limits
J=Estimated Value

Metal Data Qualifiers:
All results in mg/kg or parts per million
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NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 1
Surface Soil Analytical Results
Camp Georgetown

Analyte	TAGM (4046)	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12	SS-13	SS-14	SS-15	SS-16	SS-17	SS-18	SS-19
SVOCs (mg/kg)																
Anthracene	50	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.046 J
Benzo{a}anthracene	0.224	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.36
Benzo{b}fluoranthene	1.1	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.32 J
Benzo{k}fluoranthene	1.1	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.2 J
Benzo{g,h,i}perylene	50	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.061 J
Benzo (a) Pyrene	0.061	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.29 J
Benzoic Acid	2.7	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6	<1.6 J	2 J
Bis (2-Ethylhexyl) Phthalate	50	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	0.038 J	<0.41 J	<0.33 J	<0.33 J
Chrysene	0.4	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.34 J
Dimethyl Phthlate	2	<0.33 J	<0.53 J	<0.33 J	0.061 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	<0.33 J
Diethyl Phthalate	7.1	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	0.33 J	<0.41 J	<0.33 J	<0.33 J
Di-n-butyl Phthalate	8.1	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	0.038 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	0.041 J	0.68 J
Di-n-octyl Phthalte	120	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	<0.33 J
Fluoranthene	50	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.56 J
Indeno (1,2,3) pyrene	3.2	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.063 J
Pentachlorophenol	1	1.9 J	<1.6 J	3.2 J	4.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J
Phenanthrene	50	<0.33 J	<0.53 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.19 J
Pyrene	50	<0.33 J	<0.53 J	<0.33 J	0.033 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.41 J	<0.33 J	0.55 J
Total SVOC		1.9 J	BDL	3.2 J	4.694 J	BDL	BDL	0.038 J	BDL	BDL	BDL	BDL	0.038 J	BDL	0.041 J	5.66
Metals (mg/kg)	TAGM (4046) or SiteBackground Average	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12	SS-13	SS-14	SS-15	SS-16	SS-17	SS-18	SS-19
Aluminum	NV or 14340	-	8400	-	-	11900	14400	20900 J	-	-	14500 J	-	13900 J	11600 J	17400 J	16400 J
Antimony	NV or 0.487	-	3.0 B	-	-	1.1 B	1.1 BJ	2.3 BJ	-	-	0.69 BJ	-	1.3 BJ	1.4 BJ	1.1 BJ	1.5 BJ
Arsenic	7.5 or 8.2	-	104	-	-	12.5	8.7 J	13.3 J	-	-	6.4 J	-	23.0 J	6.9 J	8.5 J	17.7 N
Barium	300 or 38.49	-	34.4 J	-	-	67.2 J	44.8 J	85.9 J	-	-	38.6 J	-	76.7 J	41.7 J	70.0 J	133 J
Berillium	0.16 or 0.427	-	0.34 B	-	-	0.45 B	0.54 B	0.84 B	-	-	0.42 B	-	0.55 J	0.43 B	0.55 B	0.63 B
Cadmium	10 or 0.029	-	0.10 B	-	-	<0.03	0.09 B	<0.07	-	-	<0.04	-	<0.03	<0.04	<0.05	0.29 B
Calcium	NV or 309.96	-	9840	-	-	3510	2680 J	7000 J	-	-	9940 J	-	1370 J	17400 J	1480 J	3420 J
Chromium	50 or 16.58	-	171	-	-	22.1	18.8 J	32.1 J	-	-	16.6 J	-	28.0 J	16.1 J	16.5 J	19.3 J
Cobalt	30 or 8.31	-	8.1 J	-	-	12.1 J	11.7	18.8 J	-	-	9.4 J	-	18.7 J	9.7 J	8.8 J	22.7 J
Copper	25 or 11.83	-	59.5	-	-	16.6	19.9 J	33.8	-	-	9.7	-	24.4	18.9	10.1	17.2
Iron	2000 or 25770	-	19300	-	-	26100	27500	45900 J	-	-	24400 J	-	33200 J	25900 J	27800 J	33600 J
Lead	400 or 12.58	-	65.9	-	-	19.5	18.6 J	26.6 J	-	-	8.2 J	-	19.3 J	17.3 J	21.8 J	23.2 J
Magnesium	NV or 2893	-	3760 J	-	-	4130 J	3940	7230 J	-	-	3690 J	-	4760 J	4480 J	2260 J	2740 J
Manganese	NV or 319.3	-	312	-	-	407	478	858	-	-	295 J	-	551 J	364 J	394 J	2640 J
Nickel	13 or 17.77	-	20.8	-	-	25.6	24.9 J	47.1 J	-	-	23.6 J	-	32.3 J	25.3 J	15.0 J	20.7 J
Potassium	NV or 714.8	-	668	-	-	695	862	1520J	-	-	708 J	-	865 J	858	764 J	990 BJ
Selenium	2 or 1.322	-	0.72 J	-	-	1.1 J	2.1 J	2	-	-	1.5	-	1.3	0.59 B	2.1	2.1
Silver	NV or ND	-	<0.10 J	-	-	<0.10 J	<0.12	<0.20	-	-	<0.11	-	0.10 B	<0.11	<0.14	<0.19
Mercury	0.1 or 0.082375	-	0.010 BJ	-	-	<0.012 J	0.020 B	0.035 B	-	-	0.039 B	-	0.025 B	0.018 B	0.112	0.100 B
Sodium	NV or 41.52222	-	50.8 B	-	-	43.6	108 B	71.5 B	-	-	41.2 B	-	<31.5	76.9 B	<41.0	<56.7
Thallium	NV or ND	-	<0.55 J	-	-	<0.60 J	4.7	1.1 U	-	-	<0.62	-	<0.60	<0.66	<0.78	<1.1
Vanadium	150 or 20.15	-	16.8	-	-	15.8	19.7 J	29.0 J	-	-	17.8 J	-	16.6 J	15.7 J	25.4 J	24.7 J
Zinc	20 or 51.96	-	75.2	-	-	59	66.5	146 J	-	-	59.3 J	-	117 J	66.7 J	62.4 J	150 J
Dioxins (ug/kg)	TEFs	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12	SS-13	SS-14	SS-15	SS-16	SS-17	SS-18	SS-19
Total TCDF	-	0.044	0.032	0.019	0.039	0.0058	-	-	<0.00049	<0.00036	-	<0.00058	-	<0.00041	0.005	-
Total PeCDF	-	0.57	0.011	0.35	0.63	0.11	-	-	<0.0029	<0.00067	-	0.018	-	<0.00070	<0.0023	-
TotalHxCDF	-	14	0.18	5	14	2.9	-	-	0.11	<0.00053	-	0.28	-	0.0085	<0.0036	-
Total HpCDF	-	95	0.93	20	80	21	-	-	0.58	<0.0028	-	1	-	0.034	0.024	-
Total TCDD	-	0.035	<0.00098	0.0095	0.044	0.0062	-	-	<0.00080	<0.00069	-	<0.00053	-	<0.00044	<0.00060	-
Total PeCDD	-	0.13	<0.0027	0.065	0.16	0.03	-	-	<0.0026	<0.002	-	0.0046	-	<0.00058	<0.00072	-
Total HxCDD	-	3.9	0.099	2.2	4.4	1.3	-	-	0.08	<0.00097	-	0.24	-	0.017	0.01	-
Total HpCDD	-	74	1.3	41	82	26	-	-	0.91	0.0091	-	2.5	-	0.11	0.067	-
2,3,7,8-TCDD	1	0.0023	<0.00098	0.0018	0.0036	0.0015	-	-	<0.0007	<0.00069	-	<0.00036	-	<0.00044	<0.00060	-
1,2,3,7,8-PeCDD	0.5	0.069	<0.0027	0.036	0.08	0.023	-	-	<0.0026	<0.0012	-	0.0046 J	-	<0.00058	<0.00072	-
1,2,3,4,7,8-HxCDD	0.1	0.18	0.0047 J	0.089	0.2	0.06	-	-	0.0043 J	<0.00059	-	0.012	-	<0.0015	<0.0011	-
1,2,3,6,7,8-HxCDD	0.1	1.6	0.031	0.91	1.8	0.5	-	-	0.022	<0.00065	-	0.059	-	0.0035 J	<0.0021	-
1,2,3,7,8,9-HxCDD	0.1	0.48	0.014	0.22	0.5	0.18	-	-	0.013	<0.00058	-	0.037	-	<0.0030	<0.0023	-
1,2,3,4,6,7,8-HpCDD	0.01	51 D	0.88	27 D	56 D	18 D	-	-	0.61	0.0059	-	1.7	-	0.065	0.039	-
OCDD	0.0001	300 DEJ	6 E	220 DEJ	330 DEJ	110 DEJ	-	-	4.4	0.035	-	11 EJ	-	0.4	0.21	-
2,3,7,8-TCDF	0.1	0.0042 CON	<0.00035	0.0037 CON	0.0067 CON	0.0012 CON	-	-	<0.00049	<0.00036	-	<0.00058	-	<0.00041	0.00078 CON J	-
1,2,3,7,8-PeCDF	0.05	0.035	<0.0012	0.032	0.053	0.01	-	-	<0.00083	<0.00061	-	<0.0018	-	<0.00037	<0.00064	-
2,3,4,7,8-PeCDF	0.5	0.029	<0.0012	0.026	0.043	0.084	-	-	<0.00080	<0.00060	-	<0.0016	-	<0.00036	<0.00085	-
1,2,3,4,7,8-HxCDF	0.1	0.31	0.0057 J	0.19	0.35	0.078	-	-	0.0040 J	<0.00045	-	0.012	-	<0.00085	<0.0022	-
1,2,3,6,7,8-HxCDF	0.1	0.17	0.0036 J	0.087	0.19	0.051	-	-	<0.0032	<0.00042	-	0.0095	-	<0.00055	<0.00082	-
2,3,4,6,7,8-HxCDF	0.1	0.13	0.0033 J	0.071	0.14	0.048	-	-	<0.0027	<0.00046	-	0.0068	-	<0.00048	<0.0013	-
1,2,3,7,8,9-HxCDF	0.1	0.015	<0.0010	0.012	0.021	0.0059	-	-	<0.00076	<0.0005	-	<0.0012	-	<0.00050	<0.00072	-
1,2,3,4,6,7,8-HpCDF	0.01	18 D	0.22	4.2 D	16 D	4.3 D	-	-	0.14	<0.0014	-	0.3	-	0.013	0.011	-
1,2,3,4,7,8,9-HpCDF	0.01	0.84	0.014	0.38 D	0.75 D	0.26 D	-	-	0.012	<0.00048	-	0.024	-	<0.00081	<0.00085	-
OCDF	0.0001	150 D	1.3 J	22 D	150 D	31 D	-	-	0.69	<0.0040	-	1.1	-	0.028	0.024	-
2,3,7,8-TCDD Equivalence	1.0	1.08537 CONDEJ	0.0181 J	0.5327 CONDEJ	1.16402 CONDEJ	0.38761 CONDEJ	-	-	0.01246 J	0.0000625	-	0.03738 EJ	-	0.00117 J	0.0006 JCON	-

Notes:
Only analytes detected at or above laboratory method detection limits included on table
*PCP results from PIR Immunoassay Results
Bold Text=Analyte detected above laboratory method detection limi
Shaded Text=Exceedence of TAGM 4046 soil cleanup objectives
BDL=Below laboratory method detection limi
ND=Non Detect

Dioxin Data Qualifiers:
All results in ug/kg or parts per billion
D=Result obtained from dilution
J=Estimated result, result is less than the reporting limit
E=Estimated result, result exceeds calibration range
CON=Confirmation analysis

SVOC Data Qualifiers:
All results in mg/kg or parts per million
< = Analyte was not detected above laboratory detection limits
J=Estimated Value

Metal Data Qualifiers:
All results in mg/kg or parts per million
B=Indicates a value greater than or equal to the instrument detection limit but less than the quantitation lim
J=Estimated result, result is less than the reporting limit
NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 1
Surface Soil Analytical Results
Camp Georgetown

Analyte	TAGM (4046)	SS-20	SS-21	SS-22	SS-23	SS-24	SS-25	SS-26	SS-27	SS-28	SS-29	SS-30	SS-31	SS-32	SS-33	SS-34
SVOCs (mg/kg)																
Anthracene	50	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Benzo(a)anthracene	0.224	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Benzo(b)fluoranthene	1.1	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Benzo(k)fluoranthene	1.1	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Benzo(g,h,i)perylene	50	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Benzo (a) Pyrene	0.061	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Benzoic Acid	2.7	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6	<1.6	<1.2	<2.0	<2.1	<2.1	<1.5	<1.2	<1.6	<1.4
Bis (2-Ethylhexyl) Phthalate	50	<0.33 J	<0.33 J	**0.029 J**	<0.33 J	<0.33 J	**0.035 J**	**0.044 J**	<0.49	<0.79	<0.83	**0.057 J**	**0.041 J**	**0.046 J**	<0.64	**0.033 J**
Chrysene	0.4	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Dimethyl Phthlate	2	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Diethyl Phthalate	7.1	<0.33 J	<0.33 J	<0.33J	<0.33	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Di-n-butyl Phthalate	8.1	<0.33 J	<0.33 J	<0.33 J	**0.090 J**	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	**0.035 J**	<0.48	<0.64	<0.57
Di-n-octyl Phthalte	120	<0.33 J	<0.33 J	**0.023 J**	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Fluoranthene	50	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Indeno (1,2,3) pyrene	3.2	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Pentachlorophenol	1	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6	<1.6	<1.2	<2.0	<2.1	<2.1	<1.5	<1.2	<1.6	<1.4
Phenanthrene	50	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Pyrene	50	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.64	<0.62	<0.49	<0.79	<0.83	<0.86	<0.60	<0.48	<0.64	<0.57
Total SVOC		BDL	BDL	**0.052 J**	**0.090 J**	BDL	**0.035 J**	**0.044 J**	BDL	BDL	BDL	**0.057 J**	**0.076 J**	**0.046 J**	BDL	**0.033 J**
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**SS-20**	**SS-21**	**SS-22**	**SS-23**	**SS-24**	**SS-25**	**SS-26**	**SS-27**	**SS-28**	**SS-29**	**SS-30**	**SS-31**	**SS-32**	**SS-33**	**SS-34**
Aluminum	NV or **14340**	-	-	**13800 J**	**12300**	**11800**	**15900**	**21000**	**18200**	**16100**	**1290**	**23000**	**17300**	**13900**	**15200**	**18600**
Antimony	NV or **0.487**	-	-	**0.98 BJ**	**0.99 BJ**	**1.2 BJ**	<0.45	<0.65	<0.42	<0.81	<0.85	<0.810	<0.620	<0.43	<0.62	<0.58
Arsenic	7.5 or **8.2**	-	-	**10.7 J**	**8.8 J**	**6.5 J**	**8.2**	**8.3**	**7.8**	**6.1**	**5**	**7.7**	**7.9**	**9.7**	**9.5**	**9.9**
Barium	**300** or 38.49	-	-	**46.0 J**	**36.0 J**	**42.9 J**	**83.7**	**86.9**	**62.2**	**80.1**	**67.9**	**85.4**	**82.6**	**46.1**	**64.7**	**83.7**
Berillium	0.16 or **0.427**	-	-	**0.61 B**	**0.6**	**0.43 B**	**0.69**	**1.1**	**0.6**	**0.84**	**0.58**	**1.0**	**0.77**	**0.28**	**0.47**	**0.74**
Cadmium	**10** or 0.029	-	-	<0.04	**0.07 B**	**0.15 B**	**0.44**	**0.27**	**0.16**	**0.44**	**0.57**	**0.60**	**0.50**	**0.22**	**0.19**	**0.41**
Calcium	NV or **309.96**	-	-	**1660 J**	**15500 J**	**2570 J**	**1580**	**1580**	**1020**	**1820**	**27.4**	**1960**	**1240**	**529**	**1290**	**2130**
Chromium	**50** or 16.58	-	-	**20.8 J**	**18.7 J**	**13.8 J**	**17.3**	**21.9**	**18.5**	**16.6**	**14.1**	**22.7**	**18.7**	**13.9**	**16.7**	**21.6**
Cobalt	**30** or 8.31	-	-	**14.9 J**	**13.5**	**9.5**	**13.6**	**35.1**	**8.7**	**18.6**	**12.5**	**38.4**	**17.6**	**3.4**	**12.1**	**26.6**
Copper	**25** or 11.83	-	-	**15.5**	**14.4 J**	**13.1 J**	**8**	**10.2**	**8.5**	**10.1**	**11.2**	**12.8**	**9.6**	**9.4**	**9.7**	**12.6**
Iron	2000 or **25770**	-	-	**31700**	**27500**	**21200**	**24900**	**27400**	**28200**	**17400**	**17100**	**23800**	**22200**	**27700**	**22400**	**27800**
Lead	**400** or 12.58	-	-	**22.3 J**	**19.4 J**	**19.4 J**	**20.1**	**34.8**	**17**	**25.9**	**24.2**	**33**	**24.1**	**21.2**	**20.2**	**28.3**
Magnesium	NV or **2893**	-	-	**5020 J**	**14000**	**2660**	**2660**	**2700**	**2670**	**2260**	**2520**	**3000**	**2590**	**1520**	**2330**	**2590**
Manganese	NV or **319.3**	-	-	**435 J**	**377**	**347**	**1620**	**1640**	**374**	**432**	**416**	**503**	**1200**	**236**	**583**	**2310**
Nickel	13 or **17.77**	-	-	**32.8 J**	**30.3 J**	**18.9 J**	**15.8**	**19.6**	**14.8**	**14.5**	**17.8**	**22.5**	**17.3**	**9.1**	**13**	**15.6**
Potassium	NV or **714.8**	-	-	**1070 J**	**752**	**686**	**933**	**978**	**709**	**986**	**868**	**1100**	**919**	**778**	**1030**	**1100**
Selenium	**2** or 1.322	-	-	**1.4**	**1.2 J**	**1.6 J**	**0.89**	**1.8**	**1.1**	**1.5**	**1.6**	**1.2**	**1.2**	**1.5**	**1.3**	<0.69
Silver	NV or **ND**	-	-	**0.11 B**	<0.10	<0.11	<0.14	<0.20	<0.13	<0.25	<0.27	<0.25	<0.19	<0.14	<0.20	<0.18
Mercury	**0.1** or 0.082375	-	-	**0.022 B**	<0.012	**0.031**	**0.12**	**0.17**	**0.09**	**0.11**	**0.08**	**0.14**	**0.12**	**0.13**	**0.11**	**0.13**
Sodium	NV or **41.52222**	-	-	**72.8 B**	**153 B**	**135 B**	**51.4**	**57.9**	**52.7**	**63.2**	**67.2**	**64**	**56.1**	**32.4**	**44.7**	**56.1**
Thallium	NV or **ND**	-	-	<0.64	**3.3**	**3.7**	<0.86	<1.2	<0.79	<1.5	<1.6	**1.5**	**1.2**	<0.82	<1.20	<1.1
Vanadium	**150** or 20.15	-	-	**18.6 J**	**15.5 J**	**16.9 J**	**25.6**	**27.1**	**28.2**	**24.3**	**17.5**	**30.7**	**25.6**	**26.9**	**26**	**27.8**
Zinc	20 or **51.96**	-	-	**64.3 J**	**50.6**	**50.9**	**74.8**	**92.3**	**62.5**	**78.3**	**79.1**	**104**	**77.9**	**49.3**	**57.6**	**82.8**
Dioxins (ug/kg)	**TEFs**	**SS-20**	**SS-21**	**SS-22**	**SS-23**	**SS-24**	**SS-25**	**SS-26**	**SS-27**	**SS-28**	**SS-29**	**SS-30**	**SS-31**	**SS-32**	**SS-33**	**SS-34**
Total TCDF	-	<0.00025	-	-	-	-	<0.04	<0.02	<0.03	<0.05	<0.03	<0.03	<0.02	<0.03	<0.03	<0.03
Total PeCDF	-	<0.00035	-	-	-	-	<0.13	<0.05	<0.05	<0.22	<0.12	<0.11	<0.16	<0.20	<0.17	<0.18
TotalHxCDF	-	<0.0015	-	-	-	-	<0.08	<0.04	<0.05	<0.09	<0.06	<0.09	**0.53 J**	<0.04	<0.04	<0.04
Total HpCDF	-	**0.012**	-	-	-	-	<0.09	<0.04	<0.11	<0.11	<0.06	<0.09	**2.3**	<0.06	<0.09	<0.08
Total TCDD	-	<0.00030	-	-	-	-	<0.06	<0.03	<0.04	<0.07	<0.04	<0.05	<0.03	<0.04	<0.04	<0.04
Total PeCDD	-	<0.00048	-	-	-	-	<0.13	<0.05	<0.09	<0.13	<0.08	<0.10	<0.05	<0.06	<0.05	<0.14
Total HxCDD	-	**0.0027**	-	-	-	-	<0.11	<0.07	<0.08	<0.14	<0.09	<0.09	<0.10	<0.10	<0.08	<0.07
Total HpCDD	-	**0.042**	-	-	-	-	<0.14	<0.08	<0.10	<0.17	<0.11	<0.12	**3.8**	<0.09	<0.09	<0.09
2,3,7,8-TCDD	1	<0.00030	-	-	-	-	<0.06	<0.03	<0.04	<0.07	<0.04	<0.05	<0.03	<0.04	<0.04	<0.04
1,2,3,7,8-PeCDD	0.5	<0.00048	-	-	-	-	<0.13	<0.05	<0.09	<0.13	<0.08	<0.10	<0.05	<0.06	<0.05	<0.14
1,2,3,4,7,8-HxCDD	0.1	<0.00044	-	-	-	-	<0.11	<0.07	<0.08	<0.14	<0.09	<0.09	<0.10	<0.10	<0.08	<0.07
1,2,3,6,7,8-HxCDD	0.1	<0.0012	-	-	-	-	<0.09	<0.05	<0.07	<0.11	<0.07	<0.07	<0.08	<0.08	<0.07	<0.06
1,2,3,7,8,9-HxCDD	0.1	<0.00099	-	-	-	-	<0.09	<0.05	<0.07	<0.11	<0.07	<0.07	<0.08	<0.08	<0.07	<0.06
1,2,3,4,6,7,8-HpCDD	0.01	**0.026**	-	-	-	-	<0.14	<0.08	<0.10	<0.17	<0.11	<0.12	**2.7**	<0.09	<0.09	<0.09
OCDD	0.0001	**0.15**	-	-	-	-	**0.37 JS**	**0.14 JS**	<0.09	<0.13	<0.12	**0.24 JS**	**12**	<0.08	**0.78 J**	<0.10
2,3,7,8-TCDF	0.1	<0.00025	-	-	-	-	<0.04	<0.02	<0.03	<0.05	<0.03	<0.03	<0.02	<0.03	<0.03	<0.03
1,2,3,7,8-PeCDF	0.05	<0.00025	-	-	-	-	<0.13	<0.05	<0.05	<0.22	<0.12	<0.11	<0.16	<0.20	<0.17	<0.18
2,3,4,7,8-PeCDF	0.5	<0.00024	-	-	-	-	<0.13	<0.05	<0.05	<0.21	<0.12	<0.11	<0.16	<0.20	<0.17	<0.18
1,2,3,4,7,8-HxCDF	0.1	<0.00033	-	-	-	-	<0.08	<0.04	<0.05	<0.09	<0.06	<0.09	<0.04	<0.04	<0.04	<0.04
1,2,3,6,7,8-HxCDF	0.1	<0.00031	-	-	-	-	<0.07	<0.03	<0.04	<0.08	<0.05	<0.08	<0.03	<0.04	<0.04	<0.04
2,3,4,6,7,8-HxCDF	0.1	<0.00035	-	-	-	-	<0.08	<0.04	<0.05	<0.09	<0.06	<0.09	<0.04	<0.04	<0.04	<0.04
1,2,3,7,8,9-HxCDF	0.1	<0.00037	-	-	-	-	<0.07	<0.03	<0.04	<0.08	<0.05	<0.08	<0.04	<0.04	<0.04	<0.04
1,2,3,4,6,7,8-HpCDF	0.01	**0.0046 J**	-	-	-	-	<0.07	<0.04	<0.09	<0.09	<0.05	<0.07	**0.59 J**	<0.05	<0.07	<0.07
1,2,3,4,7,8,9-HpCDF	0.01	<0.00027	-	-	-	-	<0.09	<0.04	<0.11	<0.11	<0.06	<0.09	<0.09	<0.06	0.09	<0.08
OCDF	0.0001	**0.012**	-	-	-	-	<0.09	<0.19	<0.07	<0.29	<0.08	<0.23	**2.6**	<0.06	**0.18 JS**	<0.06
2,3,7,8-TCDD Equivalence	1.0	**0.00032 J**	-	-	-	-	**0.000037 JS**	**0.000014 JS**	BDL	BDL	BDL	**0.000024 JS**	**0.03436 J**	BDL	**0.000096 JS**	BDL

Notes:
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Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 1
Surface Soil Analytical Results
Camp Georgetown

Analyte	TAGM (4046)	SS-35	SS-36	SS-37	SS-38	SS-39	SS-40	SS-41	SS-42	SS-43	SS-44	SS-45	SS-46	SS-47	SS-48	SS-49
SVOCs (mg/kg)																
Anthracene	50	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Benzo{a}anthracene	0.224	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Benzo{b}fluoranthene	1.1	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Benzo{k}fluoranthene	1.1	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Benzo{g,h,i}perylene	50	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Benzo (a) Pyrene	0.061	<0.53	<0.77	<0.51	<3.8	<2.9	<0.620	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Benzoic Acid	2.7	<1.3	<1.9	<1.3	<9.4	<7.3	<1.600	<1.6	<1.2	<1.10	<1.0	<0.97	<1.1	<1.1	<1.3	-
Bis (2-Ethylhexyl) Phthalate	50	**0.028 J**	**0.61 J**	<0.51	<3.8	<2.9	**0.032 J**	**0.045 J**	**0.024 J**	<0.44	**0.032 J**	<0.39	<0.44	<0.43	**0.030 J**	-
Chrysene	0.4	<0.53	<0.77	<0.51	<3.8	<2.9	<0.620	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Dimethyl Phthlate	2	<0.53	<0.77	<0.51	<3.8	<2.9	<0.620	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Diethyl Phthalate	7.1	<0.53	<0.77	<0.51	**0.36 J**	**0.46 J**	**0.18 J**	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Di-n-butyl Phthalate	8.1	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Di-n-octyl Phthalte	120	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Fluoranthene	50	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	**0.033 J**	<0.48	**0.024 J**	<0.40	<0.39	<0.44	<0.43	<0.52	-
Indeno (1,2,3) pyrene	3.2	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Pentachlorophenol	1	<1.3	<1.9	<1.3	<9.4	<7.3	<1.6	<1.6	<1.2	<1.1	<1.0	<0.97	<1.1	<1.1	<1.3	-
Phenanthrene	50	<0.53	<0.77	<0.51	<3.8	<2.9	<0.62	<0.66	<0.48	<0.44	<0.40	<0.39	<0.44	<0.43	<0.52	-
Pyrene	50	<0.53	<0.77	<0.51	<3.8	<2.9	**0.033 J**	**0.039 J**	<0.48	**0.029 J**	<0.40	<0.39	<0.44	<0.43	<0.52	-
Total SVOC		**0.028 J**	**0.61 J**	BDL	**0.36 J**	**0.46 J**	**0.245 J**	**0.117 J**	**0.024 J**	**0.053 J**	**0.032 J**	BDL	BDL	BDL	**0.030 J**	-
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**SS-35**	**SS-36**	**SS-37**	**SS-38**	**SS-39**	**SS-40**	**SS-41**	**SS-42**	**SS-43**	**SS-44**	**SS-45**	**SS-46**	**SS-47**	**SS-48**	**SS-49**
Aluminum	NV or **14340**	15000	18700	21100	6570	10500	13300	9940	9500	14500	14900	14300	13000	14200	16300	-
Antimony	NV or **0.487**	<0.55	<0.79	<0.52	<0.77	<0.59	0.67	<0.62	<0.46	<0.44	<0.36	<0.38	<0.30	<0.45	<0.54	-
Arsenic	7.5 or **8.2**	10.6	8.3	8.2	8.6	7.7	10.9	9.7	6	8.9	9.5	8.4	7.4	11.4	9.1	-
Barium	**300** or 38.49	39.7	81.6	23.1	41.7	22.3	28.6	23.8	30.7	61.7	54.9	58.4	55.9	60.2	74.3	-
Berillium	0.16 or **0.427**	0.39	0.79	0.29	0.17	0.16	0.19	0.12	0.14	0.5	0.52	0.49	0.44	0.5	0.58	-
Cadmium	**10** or 0.029	0.1	0.71	<0.04	0.6	0.15	0.07	0.1	0.09	0.12	0.08	0.05	0.07	0.1	0.23	-
Calcium	NV or **309.96**	216	26.4	90	601	165	176	166	738	1790	1700	1990	1510	1560	2660	-
Chromium	**50** or 16.58	14.2	19.7	20.5	7.8	9.4	14	9.7	9	21.1	23.5	18	17	31.3	25.4	-
Cobalt	**30** or 8.31	5.2	17.4	5.4	1.5	2.1	2.6	1.2	1.4	10.6	12	9.9	9.8	11.5	12	-
Copper	**25** or 11.83	10.9	13.1	8.0	15.5	10.4	9.7	10.1	9	15.2	16.4	13.6	14.7	18.7	17.1	-
Iron	2000 or **25770**	28300	22000	31200	11600	14300	28800	14600	19000	26000	27900	25300	23900	29100	30400	-
Lead	**400** or 12.58	16.8	26.1	13	73.3	50.9	42.2	69.2	16.8	13.2	14.9	10.4	10.8	14	16.4	146
Magnesium	NV or **2893**	1750	2720	2530	456	1060	1370	757	831	3390	3590	3380	3190	3560	3860	-
Manganese	NV or **319.3**	301	1030	286	30.6	103	200	66.6	108	655	629	519	597	756	815	-
Nickel	13 or **17.77**	10.4	19.8	13.4	6.7	8.1	8.4	5.3	4.5	23.6	25.3	22.8	21.8	24.5	25.5	-
Potassium	NV or **714.8**	696	1200	506	557	491	732	589	563	1050	820	10.9	850	953	1200	-
Selenium	**2** or 1.322	1.7	1.4	1.7	2.7	2.7	2.3	2.1	1.2	0.97	0.43	0.59	0.51	<0.53	0.78	-
Silver	NV or **ND**	<0.17	<0.25	<0.16	<0.24	<0.18	<0.20	<0.19	<0.15	<0.14	<0.11	<0.12	<0.09	<0.14	<0.17	-
Mercury	**0.1** or 0.082375	0.15	0.15	0.12	0.21	0.17	0.17	0.15	0.09	0.04	0.04	0.04	0.03	0.04	0.04	-
Sodium	NV or **41.52222**	34	67.9	34.7	37.6	27.5	35.8	33.1	31.8	40.3	36.5	44.7	34.8	44.7	49.1	-
Thallium	NV or **ND**	<1.0	<1.5	<0.98	1.4	<1.1	<1.2	<1.2	<0.87	<0.84	<0.68	<0.71	<0.56	<0.85	<1.0	-
Vanadium	**150** or 20.15	25.3	25.5	28.9	21.4	16.5	30.7	28.8	24.1	20.5	20.5	20.3	18.5	21.7	23.5	-
Zinc	20 or **51.96**	48.1	95.5	50.6	46.2	35.6	62.1	36.2	28.5	75.3	71.5	63.7	66.9	72.7	86.6	-
Dioxins (ug/kg)	**TEFs**	**SS-35**	**SS-36**	**SS-37**	**SS-38**	**SS-39**	**SS-40**	**SS-41**	**SS-42**	**SS-43**	**SS-44**	**SS-45**	**SS-46**	**SS-47**	**SS-48**	**SS-49**
Total TCDF	-	<0.02	<0.15	<0.02	<0.44	<0.03	<0.03	<0.03	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	-
Total PeCDF	-	<0.11	<0.15	<0.10	<0.44	<0.11	<0.21	<0.16	<0.06	<0.03	<0.09	<0.08	<0.08	**0.05 JS**	<0.13	-
TotalHxCDF	-	<0.04	<0.05	<0.03	<0.08	**0.40 JS**	<0.04	<0.07	<0.03	**0.09 JS**	**0.27 J**	**0.08 JS**	**0.16 JS**	**0.59 J**	**0.68 JS**	-
Total HpCDF	-	<0.07	<0.09	<0.05	<0.15	**0.14 JS**	<0.07	<0.08	<0.04	**0.44 J**	**1.4**	**0.86**	**1.0**	**3.2**	**3.3**	-
Total TCDD	-	<0.03	<0.04	<0.03	<0.10	<0.04	<0.04	<0.05	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-
Total PeCDD	-	<0.07	<0.09	<0.04	<0.09	<0.25	<0.06	<0.06	<0.09	<0.07	<0.07	<0.03	<0.08	<0.03	<0.09	-
Total HxCDD	-	<0.06	<0.08	<0.06	<0.21	<0.09	<0.11	<0.11	<0.05	<0.05	**0.03 JS**	<0.04	<0.04	**0.29 JS**	**0.22 JS**	-
Total HpCDD	-	**0.06 J**	**0.19 J**	<0.06	<0.21	**0.27 JS**	<0.09	<0.11	<0.12	**0.51 J**	**1.8**	**1.0**	**1.3**	**3.3**	**3.7**	-
2,3,7,8-TCDD	1	<0.03	<0.04	<0.03	<0.10	<0.04	<0.04	<0.05	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-
1,2,3,7,8-PeCDD	0.5	<0.07	<0.09	<0.04	<0.09	<0.25	<0.06	<0.06	<0.09	<0.07	<0.07	<0.03	<0.08	<0.03	<0.09	-
1,2,3,4,7,8-HxCDD	0.1	<0.06	<0.08	<0.06	<0.21	<0.09	<0.11	<0.11	<0.05	<0.05	<0.03	<0.04	<0.04	<0.05	<0.09	-
1,2,3,6,7,8-HxCDD	0.1	<0.04	<0.07	<0.04	<0.17	<0.07	<0.08	<0.08	<0.04	<0.04	**0.03 JS**	<0.03	<0.03	**0.07 JS**	<0.07	-
1,2,3,7,8,9-HxCDD	0.1	<0.05	<0.07	<0.04	<0.17	<0.07	<0.09	<0.08	<0.04	<0.04	<0.02	<0.03	<0.03	**0.05 JS**	<0.07	-
1,2,3,4,6,7,8-HpCDD	0.01	**0.06 J**	**0.19 J**	<0.06	<0.21	**0.27 JS**	<0.09	<0.11	<0.12	**0.35 J**	**1.2**	**0.70**	**0.87**	**2.2**	**2.5**	-
OCDD	0.0001	**0.35 J**	**1.2 J**	<0.05	**0.46 JS**	**0.31 JS**	<0.07	<0.08	**0.23 JS**	**1.7**	**5.8**	**3.6**	**3.9**	**10.5**	**10.8**	-
2,3,7,8-TCDF	0.1	<0.02	<0.15	<0.02	<0.44	<0.03	<0.03	<0.03	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	-
1,2,3,7,8-PeCDF	0.05	<0.11	<0.15	<0.10	<0.44	<0.11	<0.21	<0.16	<0.06	<0.03	<0.09	<0.08	<0.08	<0.06	<0.13	-
2,3,4,7,8-PeCDF	0.5	<0.11	<0.15	<0.10	<0.44	<0.11	<0.21	<0.15	<0.06	<0.03	<0.09	<0.07	<0.08	<0.06	<0.12	-
1,2,3,4,7,8-HxCDF	0.1	<0.03	<0.05	<0.03	<0.08	<0.09	<0.04	<0.06	<0.03	<0.03	<0.02	<0.02	<0.02	<0.02	<0.04	-
1,2,3,6,7,8-HxCDF	0.1	<0.03	<0.04	<0.03	<0.07	<0.06	<0.04	<0.06	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03	-
2,3,4,6,7,8-HxCDF	0.1	<0.04	<0.05	<0.03	<0.08	<0.09	<0.04	<0.07	<0.03	<0.03	<0.02	<0.02	<0.02	<0.02	<0.04	-
1,2,3,7,8,9-HxCDF	0.1	<0.03	<0.04	<0.03	<0.07	<0.08	<0.04	<0.06	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03	-
1,2,3,4,6,7,8-HpCDF	0.01	<0.05	<0.07	<0.04	<0.11	**0.14 JS**	<0.05	<0.06	<0.03	**0.12 J**	**0.37 J**	**0.21 J**	**0.25 J**	**1.0**	**1.0**	-
1,2,3,4,7,8,9-HpCDF	0.01	<0.07	<0.09	<0.05	<0.15	<0.21	<0.07	<0.08	<0.04	<0.03	<0.03	<0.04	<0.03	**2.3**	<0.04	-
OCDF	0.0001	**0.11 JS**	**0.19 J**	<0.04	<0.12	<0.05	<0.10	<0.07	<0.04	**0.54 J**	**1.7**	**1.1**	**1.2**	**4.3**	**3.9**	-
2,3,7,8-TCDD Equivalence	1.0	**0.000646 JS**	**0.002039 J**	BDL	**0.000046 JS**	**0.004131 JS**	BDL	BDL	**0.000023 JS**	**0.004924 JS**	**0.01945 JS**	**0.00957 JS**	**0.01171 JS**	**0.06848 JS**	**0.03647 JS**	-

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Table 1
Surface Soil Analytical Results
Camp Georgetown

Analyte	TAGM (4046)	SS-50A	SS-51	SS-52A	Seep-1	Seep-2	BGM-1	BGM-2	BGM-3	BGM-4	BGM-5	BGM-6	BGM-7	BGM-8	BGM-9	BGM-10
SVOCs (mg/kg)																
Anthracene	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo{a}anthracene	0.224	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo{b}fluoranthene	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo{k}fluoranthene	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzo{g,h,i}perylene	50	-	-	-	0.21 J	<0.33	-	-	-	-	-	-	-	-	-	-
Benzo (a) Pyrene	0.061	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Benzoic Acid	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bis (2-Ethylhexyl) Phthalate	50	-	-	-	<0.33	<0.33	-	-	-	-	-	-	-	-	-	-
Chrysene	0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dimethyl Phthlate	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diethyl Phthalate	7.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-butyl Phthalate	8.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-octyl Phthalte	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fluoranthene	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indeno (1,2,3) pyrene	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	1	-	-	-	4.2	<1.6	-	-	-	-	-	-	-	-	-	-
Phenanthrene	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyrene	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total SVOC		-	-	-	4.41 J	BDL	-	-	-	-	-	-	-	-	-	-
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**SS-50A**	**SS-51**	**SS-52A**	**Seep-1**	**Seep-2**	**BGM-1**	**BGM-2**	**BGM-3**	**BGM-4**	**BGM-5**	**BGM-6**	**BGM-7**	**BGM-8**	**BGM-9**	**BGM-10**
Aluminum	NV or **14340**	-	-	-	-	-	13600	13900	13500	13500	13100	13600	15700	16100	14800	15600
Antimony	NV or **0.487**	-	-	-	-	-	1.1 B	0.84 B	1.0 B	0.93 B	1.0 B	<0.46	<0.52	<0.49	<0.52	<0.40
Arsenic	7.5 or **8.2**	-	-	-	-	-	12.3	8	7.9	6.7	5.3	7.8	8.5	9.4	8.6	7.5
Barium	**300** or 38.49	-	-	-	-	-	41.1 J	59.3 J	37.3 J	27.2 J	39.2 J	34.5	39.6	35.8	34.9	36
Berillium	0.16 or **0.427**	-	-	-	-	-	0.59	0.49 B	0.39 B	0.38	0.40 B	0.36	0.43	0.43	0.38	0.42
Cadmium	**10** or 0.029	-	-	-	-	-	<0.03	<0.03	<0.03	<0.04	<0.04	0.11	0.09	0.04	<0.04	0.05
Calcium	NV or **309.96**	-	-	-	-	-	643	575 B	78.5 B	646	208 B	295	224	189	148	93.1
Chromium	**50** or 16.58	-	-	-	-	-	23.9	17.1	16.3	15.4	14.5	14.1	16	17.1	15.9	15.5
Cobalt	**30** or 8.31	-	-	-	-	-	11.5 J	13.6 J	10.6 J	7.0 J	6.0 BJ	6.9	7.5	6.8	6.1	7.1
Copper	**25** or 11.83	-	-	-	-	-	21.4	15.4	13	8.4	8.4	10.4	10.5	14.2	9.2	7.4
Iron	2000 or **25770**	-	-	-	-	-	29300	26700	26600	24700	23000	22400	23900	28100	27400	25600
Lead	**400** or 12.58	157	30.9	45.6	-	-	15.6	9.5	12.3	7.6	7.1	17	19.6	16	11.6	9.5
Magnesium	NV or **2893**	-	-	-	-	-	4450 J	4000 J	3640 J	3070 J	2500 J	1970	2270	2720	2360	1950
Manganese	NV or **319.3**	-	-	-	-	-	287	457	350	195	202	374	316	301	341	370
Nickel	13 or **17.77**	-	-	-	-	-	28.5	27.3	22.8	19.3	16.8	11.2	13	15.6	12.9	10.3
Potassium	NV or **714.8**	-	-	-	-	-	720	788	659	474 B	492 B	755	883	805	744	828
Selenium	**2** or 1.322	-	-	-	-	-	1.4 J	1.3 J	1.1 J	1.3 J	1.4 J	1.3	2.1	1.1	1.3	0.92
Silver	NV or **ND**	-	-	-	-	-	<0.10 J	<0.1 J	<0.10 J	<0.11 J	<0.13 J	<0.14	<0.16	<0.15	<0.13	<0.12
Mercury	**0.1** or 0.082375	-	-	-	-	-	<0.011 J	<0.012 J	0.018 BJ	0.034 BJ	0.027 BJ	0.13	0.15	0.12	0.1	0.08
Sodium	NV or **41.52222**	-	-	-	-	-	41.8 B	<31.8	41.4 B	41.8 B	66.7 B	32.2	48.6	34.5	30.8	35.9
Thallium	NV or **ND**	-	-	-	-	-	<0.59 J	<0.61	<0.60	<0.63 J	<0.73 J	<0.87	<0.97	<0.92	<0.97	<0.75
Vanadium	**150** or 20.15	-	-	-	-	-	17	16.3	17	18.1	19	20.2	23.6	24.1	23	23.2
Zinc	20 or **51.96**	-	-	-	-	-	57.4	57.8	54.1	52.6	46.4	48	57.8	53.8	47.3	44.4
Dioxins (ug/kg)	**TEFs**	**SS-50A**	**SS-51**	**SS-52A**	**Seep-1**	**Seep-2**	**BGM-1**	**BGM-2**	**BGM-3**	**BGM-4**	**BGM-5**	**BGM-6**	**BGM-7**	**BGM-8**	**BGM-9**	**BGM-10**
Total TCDF	-	-	-	-	0.096	0.063	-	-	-	-	-	<0.02	<0.03	<0.03	<0.03	<0.02
Total PeCDF	-	-	-	-	2.8	0.93	-	-	-	-	-	<0.06	<0.16	<0.10	<0.07	<0.06
TotalHxCDF	-	-	-	-	90	18	-	-	-	-	-	<0.03	<0.05	<0.05	<0.05	<0.03
Total HpCDF	-	-	-	-	49	91	-	-	-	-	-	<0.05	<0.07	<0.08	<0.06	<0.03
Total TCDD	-	-	-	-	0.11	0.11	-	-	-	-	-	<0.02	<0.05	<0.04	<0.04	<0.02
Total PeCDD	-	-	-	-	1.2	0.82	-	-	-	-	-	<0.05	<0.07	<0.10	<0.09	<0.06
Total HxCDD	-	-	-	-	42	13	-	-	-	-	-	<0.05	<0.09	<0.09	<0.08	<0.04
Total HpCDD	-	-	-	-	61	150	-	-	-	-	-	<0.06	<0.12	<0.10	<0.10	<0.05
2,3,7,8-TCDD	1	-	-	-	0.023	0.01	-	-	-	-	-	<0.02	<0.05	<0.04	<0.04	<0.02
1,2,3,7,8-PeCDD	0.5	-	-	-	0.58	0.27	-	-	-	-	-	<0.05	<0.07	<0.10	<0.09	<0.06
1,2,3,4,7,8-HxCDD	0.1	-	-	-	2.7 J	0.71 J	-	-	-	-	-	<0.05	<0.09	<0.09	<0.08	<0.04
1,2,3,6,7,8-HxCDD	0.1	-	-	-	16 EJ	3.5	-	-	-	-	-	<0.04	<0.07	<0.07	<0.06	<0.03
1,2,3,7,8,9-HxCDD	0.1	-	-	-	4.9	1.9	-	-	-	-	-	<0.04	<0.08	<0.07	<0.07	<0.03
1,2,3,4,6,7,8-HpCDD	0.01	-	-	-	43	100 D	-	-	-	-	-	<0.06	<0.12	<0.10	<0.10	<0.05
OCDD	0.0001	-	-	-	220 EJ	730 DEJ	-	-	-	-	-	<0.04	<0.08	<0.07	<0.11	<0.07
2,3,7,8-TCDF	0.1	-	-	-	0.037 CON	0.0069 CON	-	-	-	-	-	<0.02	<0.03	<0.03	<0.03	<0.02
1,2,3,7,8-PeCDF	0.05	-	-	-	0.3	0.051	-	-	-	-	-	<0.06	<0.16	<0.10	<0.07	<0.06
2,3,4,7,8-PeCDF	0.5	-	-	-	0.24	0.046	-	-	-	-	-	<0.06	<0.15	<0.10	<0.07	<0.06
1,2,3,4,7,8-HxCDF	0.1	-	-	-	2.5	0.42	-	-	-	-	-	<0.03	<0.05	<0.05	<0.05	<0.03
1,2,3,6,7,8-HxCDF	0.1	-	-	-	1.1	0.31	-	-	-	-	-	<0.02	<0.05	<0.04	<0.04	<0.02
2,3,4,6,7,8-HxCDF	0.1	-	-	-	0.95	0.23	-	-	-	-	-	<0.03	<0.05	<0.05	<0.05	<0.03
1,2,3,7,8,9-HxCDF	0.1	-	-	-	0.18	0.024	-	-	-	-	-	<0.02	<0.05	<0.04	<0.04	<0.02
1,2,3,4,6,7,8-HpCDF	0.01	-	-	-	7.9	20 D	-	-	-	-	-	<0.04	<0.06	<0.06	<0.05	<0.02
1,2,3,4,7,8,9-HpCDF	0.01	-	-	-	<0.59	0.980 D	-	-	-	-	-	<0.05	<0.07	<0.08	<0.06	<0.03
OCDF	0.0001	-	-	-	65	170 D	-	-	-	-	-	<0.03	<0.09	<0.10	<0.11	<0.04
2,3,7,8-TCDD Equivalence	1.0	-	-	-	3.8222ECON	2.18 CONDE	-	-	-	-	-	BDL	BDL	BDL	BDL	BDL

Notes:
Only analytes detected at or above laboratory method detection limits included on table
*PCP results from PIR Immunoassay Results
Bold Text=Analyte detected above laboratory method detection limi
Shaded Text=Exceedence of TAGM 4046 soil cleanup objectives
BDL=Below laboratory method detection limi
ND=Non Detect

Dioxin Data Qualifiers:
All results in ug/kg or parts per billion
D=Result obtained from dilution
J=Estimated result, result is less than the reporting limit
E=Estimated result, result exceeds calibration range
CON=Confirmation analysis

SVOC Data Qualifiers:
All results in mg/kg or parts per million
< = Analyte was not detected above laboratory detection limits
J=Estimated Value

Metal Data Qualifiers:
All results in mg/kg or parts per million
B=Indicates a value greater than or equal to the instrument detection limit but less than the quantitation lim
J=Estimated result, result is less than the reporting limit
NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 2
Sediment Analytical Results
Camp Georgetown

Analyte	**Sediment Criteria**	**SED-1**	**SED-2**	**SED-UP**	**SED-DOWN**
SVOCs (mg/kg)					
Phenanthrene	84410.6	<0.33 J	<0.33 J	**0.15 J**	**0.028 J**
Anthracene	84410.6	<0.33 J	<0.33 J	**0.04 J**	<0.39
Carbazole	NA	<0.33 J	<0.33 J	**0.028 J**	<0.39
Fluoranthrene	463870.6	<0.33 J	<0.33 J	**0.18 J**	**0.038 J**
Pyrene	625744.2	<0.33 J	<0.33 J	**0.16 J**	**0.035 J**
Benzo(a) anthracene	48.8	<0.33 J	<0.33 J	**0.095 J**	<0.39
Chrysene	NA	<0.33 J	<0.33 J	**0.099 J**	<0.39
Benzo (k) fluoranthene	NA	<0.33 J	<0.33 J	**0.082 J**	<0.39
Benzo (a) fluoranthene	NA	<0.33 J	<0.33 J	**0.072 J**	<0.39
Benzo (a) pyrene	0	<0.33 J	<0.33 J	**0.079 J**	<0.39
Indeno (1,2,3-cd) pyrene	NA	<0.33 J	<0.33 J	**0.043 J**	<0.39
Benzo(ghi) perylene	NA	<0.33 J	<0.33 J	**0.049 J**	<0.39
Bis(2-ethylhexyl) phthalate	11951.6	<0.33 J	<0.33 J	<0.55	**0.024 J**
Pentachlorophenol	11980.0	<1.6 J	<1.6 J	<1.4	<0.97
Total SVOCs	-	**BDL**	**BDL**	**1.077 J**	**0.125 J**
Dioxins (ug/kg)	**TEF**	**SED-1**	**SED-2**	**SED-UP**	**SED-DOWN**
Total TCDF	-	<0.00087	<0.00026	<0.02	<0.01
Total PeCDF	-	<0.0024	<0.00058	<0.04	<0.05
TotalHxCDF	-	**0.041**	**0.0098**	<0.05	<0.02
Total HpCDF	-	**0.24**	**0.05**	<0.06	<0.03
Total TCDD	-	<0.00058	<0.0003	<0.03	<0.02
Total PeCDD	-	<0.0012	<0.00062	<0.04	<0.04
Total HxCDD	-	**0.034**	**0.0072**	<0.05	<0.05
Total HpCDD	-	**0.4**	**0.1**	<0.07	<0.07
2,3,7,8-TCDD	1	<0.00058	<0.0003	<0.03	<0.02
1,2,3,7,8-PeCDD	0.14	<0.0012	<0.00062	<0.04	<0.05
1,2,3,4,7,8-HxCDD	0.0048	<0.0027 J	<0.00071 J	<0.05	<0.04
1,2,3,6,7,8-HxCDD	0.0016	**0.011**	**0.0032 J**	<0.04	<0.03
1,2,3,7,8,9-HxCDD	0.0016	<0.0047	<0.0012	<0.04	<0.03
1,2,3,4,6,7,8-HpCDD	0.000032	**0.27**	**0.066**	<0.07	<0.05
OCDD	0.000000025	**1.6**	**0.32**	**0.13 JS**	**0.21 J**
2,3,7,8-TCDF	0.25	<0.00087	<0.00026	<0.03	<0.01
1,2,3,7,8-PeCDF	0.010	<0.00064	<0.00035	<0.10	<0.05
2,3,4,7,8-PeCDF	0.80	<0.00087	<0.00034	<0.10	<0.04
1,2,3,4,7,8-HxCDF	0.0025	<0.0036	<0.00052	<0.05	<0.02
1,2,3,6,7,8-HxCDF	0.0063	<0.002	<0.00049	<0.04	<0.02
2,3,4,6,7,8-HxCDF	0.022	<0.002	<0.00054	<0.05	<0.02
1,2,3,7,8,9-HxCDF	0.019	<0.00079	<0.00057	<0.04	<0.02
1,2,3,4,6,7,8-HpCDF	0.000010	**0.066**	**0.014**	<0.05	<0.02
1,2,3,4,7,8,9-HpCDF	0.00040	<0.0042	<0.00065	<0.05	<0.03
OCDF	0.000000032	**0.32**	**0.053**	<0.04	<0.03
2,3,7,8-TCDD Equivalence	-	**0.000027 J**	**0.0000074 J**	**3.20E-09**	**5.2E-09**
Total Organic Carbon %	-	0.57	7.06	5.99	2.44
Site Specific Benchmark	-	0.00114	0.01412	0.01198	0.00488

Notes:
Only analytes detected at or above laboratory method detection limits included on tables
Results compared to the NYSDEC Technical Guidance for Screening Contaminated Sediments January 1999
< = Analyte was not detected above laboratory Method Detection Limits
SVOC results in mg/kg or parts per million
Dioxin results in ug/kg or parts per billion
Bold Text=Analyte was detected above laboratory Method Detection Limits
Shaded Text=Analyte exceeded screening criteria
J=Estimated Value
S=Signal to noise ratio of the confirmation ion does not meet 2.5 S/N requirement, but peak was determined to be positive in the judgement of the GC/MS analyst.

Table 3
Soil Boring Analytical Results
Camp Georgetown

Analyte / SVOCs (mg/kg)	TAGM	GB-1 0-6'	GB-2 0-4'	GB-3 0-2'	GB-4 0-2'	GB-5 2-5'	GB-6 2-4'	GB-7 4-6'	GB-8 0-6'	GB-9 0-6'	GB-10 0-4'	GB-11 0-6'	GB-12 0-2'	GB-13A 0-2'	GB-13B 2-4'
Bis (2-ethylhexyl) phthalate	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-butyl phthalate	8.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	36.4	-	-	-	-	-	-	-	-	16 D	-	-	-	-	-
Naphthalene	13	-	-	-	-	-	-	-	-	1.7 JD	-	-	-	-	-
Pentachlorophenol	1	1.52*	4.98*	0.77*	ND	123*	10.8*	1.97*	25*	58*	1.1*	0.34*	8*	0.94*	9.4*
Phenanthrene	50	-	-	-	-	-	-	-	-	4 D	-	-	-	-	-
Pyrene	50	-	-	-	-	-	-	-	-	1.1 JD	-	-	-	-	-
Total SVOCs		1.52	4.98	0.77	ND	123	10.8	1.97	25	80.8	1.1	0.34	8	0.94*	9.4*
Dioxins (ug/kg)	**TEF**	**GB-1**	**GB-2**	**GB-3**	**GB-4**	**GB-5**	**GB-6**	**GB-7**	**GB-8**	**GB-9**	**GB-10**	**GB-11**	**GB-12**	**GB-13A**	**GB-13B**
Total TCDF	-	-	0.00129	ND	-	0.00798	-	-	-	-	-	ND	0.0066	-	-
Total PeCDF	-	-	0.0288	ND	-	0.0409	-	-	-	-	-	ND	0.0151	-	-
TotalHxCDF	-	-	1.27	0.0138	-	2.81	-	-	-	-	-	0.0474	0.63	-	-
Total HpCDF	-	-	7.47	0.451	-	48.7	-	-	-	-	-	0.672	9.26	-	-
Total TCDD	-	-	ND	ND	-	0.128	-	-	-	-	-	ND	0.00473	-	-
Total PeCDD	-	-	0.005	ND	-	0.22	-	-	-	-	-	ND	0.0361	-	-
Total HxCDD	-	-	0.774	0.0246	-	6.3	-	-	-	-	-	0.1	1.28	-	-
Total HpCDD	-	-	13.1	0.115	-	27.9	-	-	-	-	-	0.482	6.53	-	-
2,3,7,8-TCDD	1	-	ND	ND	-	ND	-	-	-	-	-	ND	ND	-	-
1,2,3,7,8-PeCDD	0.5	-	0.00369	ND	-	0.00664	-	-	-	-	-	ND	0.00795	-	-
1,2,3,4,7,8-HxCDD	0.1	-	0.0224	ND	-	0.0383	-	-	-	-	-	ND	0.0334	-	-
1,2,3,6,7,8-HxCDD	0.1	-	0.221	0.005	-	1.11	-	-	-	-	-	0.0142	0.202	-	-
1,2,3,7,8,9-HxCDD	0.1	-	0.0635	ND	-	0.157	-	-	-	-	-	0.00638	0.0687	-	-
1,2,3,4,6,7,8-HpCDD	0.01	-	8.5	0.257	-	28.7	-	-	-	-	-	0.435	6.11	-	-
OCDD	0.0001	-	60.2	4.72	-	330	-	-	-	-	-	3.41	52.9	-	-
2,3,7,8-TCDF	0.1	-	0.00053	ND	-	0.00377	-	-	-	-	-	ND	0.00064	-	-
1,2,3,7,8-PeCDF	0.05	-	0.00291	ND	-	0.0284	-	-	-	-	-	ND	0.00372	-	-
2,3,4,7,8-PeCDF	0.5	-	0.00269	ND	-	0.0248	-	-	-	-	-	ND	0.0322	-	-
1,2,3,4,7,8-HxCDF	0.1	-	0.0235	ND	-	0.182	-	-	-	-	-	0.00176	0.032	-	-
1,2,3,6,7,8-HxCDF	0.1	-	0.009	ND	-	0.0587	-	-	-	-	-	0.00167	0.0152	-	-
2,3,4,6,7,8-HxCDF	0.1	-	ND	ND	-	ND	-	-	-	-	-	ND	ND	-	-
1,2,3,7,8,9-HxCDF	0.1	-	0.00762	ND	-	0.0646	-	-	-	-	-	ND	0.0124	-	-
1,2,3,4,6,7,8-HpCDF	0.01	-	1.22	ND	-	4.65	-	-	-	-	-	0.114	1.28	-	-
1,2,3,4,7,8,9-HpCDF	0.01	-	0.0869	ND	-	0.305	-	-	-	-	-	0.00948	0.104	-	-
OCDF	0.0001	-	10.2	ND	-	333	-	-	-	-	-	0.902	10.6	-	-
2,3,7,8-TCDD Equivalence	1.0	-	0.207	0.0098	-	0.878	-	-	-	-	-	0.0132	0.181	-	-
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**GB-1**	**GB-2**	**GB-3**	**GB-4**	**GB-5**	**GB-6**	**GB-7**	**GB-8**	**GB-9**	**GB-10**	**GB-11**	**GB-12**	**GB-13A**	**GB-13B**
Aluminum	NV or 14340	12000	12500	14200	12900	12000	14100	12000	11400	11800	13000	11900	-	-	-
Antimony	NV or 0.487	0.23 B	ND	ND	0.023 B	ND	0.23 B	0.4 B	0.03 B	ND	ND	0.18 B	-	-	-
Arsenic	7.5 or 8.2	8.6	33	8.1	8.6	9.7	9.6	9.8	8	8.7	6.5	7.7	-	-	-
Barium	300 or 38.49	68.3	59.9	78.9	52.9	98.6	84.1	63.5	72	62.4	79.6	85.7	-	-	-
Berillium	0.16 or 0.427	0.62	0.7	0.78	0.72	0.67	0.83	0.71	0.64	0.66	0.76	0.75	-	-	-
Cadmium	10 or 0.029	0.011 B	0.1 B	0.12 B	0.1 B	0.04 B	0.09 B	0.07 B	0.1 B	0.09 B	0.09 B	0.09 B	-	-	-
Calcium	NV or 309.96	55700	13700	6070	20000	2180	2000	4550	3690	5720	920	1680	-	-	-
Chromium	50 or 16.58	17.8	68.1	19.3	17.1	18.2	21.1	18.3	17.1	16.7	17.3	18	-	-	-
Cobalt	30 or 8.31	10.5	13.1	13.1	10.9	12.7	14.9	14.7	18.1	11.2	12.8	12.6	-	-	-
Copper	25 or 11.83	23.1	22.5	19.6	19.6	30.8	24.2	23	21.2	15	32.4	19.6	-	-	-
Iron	2000 or 25770	24600	28000	29200	301000	28300	32400	28000	25600	22100	27600	27500	-	-	-
Lead	400 or 12.58	10.7	13.2	12.9	13.3	13.7	19	16.5	12.4	11.3	12.6	13.7	-	-	-
Magnesium	NV or 2893	30600	6300	5020	7640	4410	5050	4770	4550	4630	4010	4210	-	-	-
Manganese	NV or 319.3	471	487	433	650	483	488	423	412	390	604	365	-	-	-
Nickel	13 or 17.77	0.15	0.14	0.19	0.16	0.15	0.08 B	0.08 B	0.07	0.13	0.13	0.08 B	-	-	-
Potassium	NV or 714.8	25.5	29.3	30.3	26.7	29.7	34.9	31.8	28.2	24.6	29.1	30.2	-	-	-
Selenium	2 or 1.322	980	984	861	838	915	998	946	905	813	635	615	-	-	-
Silver	NV or ND	ND	ND	0.45 B	0.19 B	0.17 B	0.19 B	ND	ND	ND	0.24 B	0.22 B	-	-	-
Mercury	0.1 or 0.082375	0.43 B	0.26 B	0.22 B	0.28 B	0.13 B	0.21 B	0.17 B	0.12 B	0.04 B	0.15 B	0.15 B	-	-	-
Sodium	NV or 41.52222	229 B	144 B	151 B	171 B	148 B	143 B	141 B	136 B	42.9 B	156 B	127 B	-	-	-
Thallium	NV or ND	0.45 B	1.9	1.8	1.6	1.8	2	1.9	2	3.5	1 B	2.1	-	-	-
Vanadium	150 or 20.15	13.3	14.1	15.6	15.5	15.2	16	13.9	13.2	14.3	15	13.1	-	-	-
Zinc	20 or 51.96	58.8	67.6	66.8	65.4	61.9	69.6	62.6	61	53.5	66.1	59.2	-	-	-

Notes:
Only analytes detected at or above laboratory method detection limits included on tables
*PCP results from PIR Immunoassay Results
Bold Text=Analyte detected above laboratory method detection limit
Shaded Text=Exceedence of TAGM 4046 soil cleanup objectives
BDL=Below laboratory method detection limit
ND=Non Detect

Dioxin Data Qualifiers:
All results in ug/kg or parts per billion
D=Result obtained from dilution
J=Estimated result, result is less than the reporting limit
E=Estimated result, result exceeds calibration range
CON=Confirmation analysis

SVOC Data Qualifiers:
All results in mg/kg or parts per million
< = Analyte was not detected above laboratory detection limits
J=Estimated Value

Metal Data Qualifiers:
All results in mg/kg or parts per million
B=Indicates a value greater than or equal to the instrument detection limit but less than the quantitation limit
J=Estimated result, result is less than the reporting limit
NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 3
Soil Boring Analytical Results
Camp Georgetown

Analyte	TAGM	MW-9							MW-10			MW-11	MW-12	MW-13	MW-14						
SVOCs (mg/kg)		**0-2**	**2-4'**	**4-6'**	**6-8'**	**8-10'**	**10-12'**	**12-14'**	**0-2'**	**2-4'**	**10-12'**	**2-4'**	**2-4'**	**2-4'**	**0-2'**	**2-4'**	**4-6'**	**6-8'**	**8-10'**	**12-14'**	**14-16'**
Bis (2-ethylhexyl) phthalate	50	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	**0.038 J**	**0.037 J**	**0.029 J**	**0.130 J**	<0.33 J	<0.33 J	<0.33 J
Di-n-butyl phthalate	8.1	<0.33	<0.33	**0.046 J**	<0.33	<0.33	<0.33	<0.045 J	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33 J	<0.33 J	**0.025 J**	**0.064 J**	<0.33 J	<0.33 J	<0.33 J
2-Methylnaphthalene	36.4	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J
Naphthalene	13	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J
Pentachlorophenol	1	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J
Phenanthrene	50	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J
Pyrene	50	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J
Total SVOCs		BDL	BDL	**0.046 J**	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**0.038 J**	**0.037 J**	**0.054 J**	**0.194 J**	BDL	BDL	BDL
Dioxins (ug/kg)	**TEF**	**MW-9**							**MW-10**			**MW-11**	**MW-12**	**MW-13**	**MW-14**						
Total TCDF	-	-	<0.00021	-	-	-	-	-	-	<0.00021 R	<0.036	<0.22	<0.00041	<0.0002	-	<0.00054	-	-	-	-	-
Total PeCDF	-	-	<0.00039	-	-	-	-	-	-	<0.00032 R	<0.13	<0.073	<0.00053	<0.00027	-	<0.00086	-	-	-	-	-
TotalHxCDF	-	-	<0.00039	-	-	-	-	-	-	<0.00075 R	<0.046	<0.11	<0.00061	<0.00031	-	<0.00072	-	-	-	-	-
Total HpCDF	-	-	<0.00037	-	-	-	-	-	-	**0.0034 R**	<0.21	<0.077	<0.00046	<0.00037	-	<0.00084	-	-	-	-	-
Total TCDD	-	-	<0.00033	-	-	-	-	-	-	<0.00069 R	<0.046	<0.03	**0.0046**	<0.00027	-	**0.0027**	-	-	-	-	-
Total PeCDD	-	-	<0.00058	-	-	-	-	-	-	<0.0027 R	<0.18	<0.13	**0.0039**	<0.00064	-	**0.0042**	-	-	-	-	-
Total HxCDD	-	-	<0.00043	-	-	-	-	-	-	<0.0014 R	<0.051	<0.043	<0.0011	<0.00044	-	<0.002	-	-	-	-	-
Total HpCDD	-	-	<0.0006	-	-	-	-	-	-	**0.012 R**	<0.31	<0.10	<0.00034	<0.00037	-	<0.0011	-	-	-	-	-
2,3,7,8-TCDD	1	-	<0.00033	-	-	-	-	-	-	<0.00027 R	<0.046	<0.03	<0.00055	<0.00027	-	<0.00055	-	-	-	-	-
1,2,3,7,8-PeCDD	0.5	-	<0.00058	-	-	-	-	-	-	<0.00066 R	<0.18	<0.13	<0.0012	<0.00064	-	<0.0014	-	-	-	-	-
1,2,3,4,7,8-HxCDD	0.1	-	<0.00041	-	-	-	-	-	-	<0.00053 R	<0.054	<0.045	<0.00054	<0.00042	-	<0.0008	-	-	-	-	-
1,2,3,6,7,8-HxCDD	0.1	-	<0.00043	-	-	-	-	-	-	<0.00055 R	<0.058	<0.048	<0.00059	<0.00044	-	<0.0089	-	-	-	-	-
1,2,3,7,8,9-HxCDD	0.1	-	<0.00039	-	-	-	-	-	-	<0.00049 R	<0.051	<0.043	<0.00054	<0.0004	-	<0.00079	-	-	-	-	-
1,2,3,4,6,7,8-HpCDD	0.01	-	<0.0006	-	-	-	-	-	-	**0.0079 R**	<0.31	<0.10	<0.00034	<0.00037	-	<0.0092	-	-	-	-	-
OCDD	0.0001	-	<0.0035	-	-	-	-	-	-	**0.037 R**	**0.81 J**	**0.6**	<0.0017	<0.0026	-	**0.012 J**	-	-	-	-	-
2,3,7,8-TCDF	0.1	-	<0.00021	-	-	-	-	-	-	<0.00021 R	<0.036	<0.22	<0.00041	<0.0002	-	<0.00054	-	-	-	-	-
1,2,3,7,8-PeCDF	0.05	-	<0.00032	-	-	-	-	-	-	<0.00032 R	<0.14	<0.077	<0.00053	<0.00026	-	<0.00073	-	-	-	-	-
2,3,4,7,8-PeCDF	0.5	-	<0.00031	-	-	-	-	-	-	<0.00032 R	<0.13	<0.073	<0.00052	<0.00024	-	<0.00072	-	-	-	-	-
1,2,3,4,7,8-HxCDF	0.1	-	<0.00035	-	-	-	-	-	-	<0.00035 R	<0.046	<0.11	<0.00054	<0.00028	-	<0.00064	-	-	-	-	-
1,2,3,6,7,8-HxCDF	0.1	-	<0.00033	-	-	-	-	-	-	<0.00031 R	<0.047	<0.11	<0.00052	<0.00027	-	<0.00061	-	-	-	-	-
2,3,4,6,7,8-HxCDF	0.1	-	<0.00036	-	-	-	-	-	-	<0.00034 R	<0.05	<0.12	<0.00056	<0.00029	-	<0.00067	-	-	-	-	-
1,2,3,7,8,9-HxCDF	0.1	-	<0.00039	-	-	-	-	-	-	<0.00035 R	<0.05	<0.12	<0.00061	<0.00031	-	<0.00072	-	-	-	-	-
1,2,3,4,6,7,8-HpCDF	0.01	-	<0.00037	-	-	-	-	-	-	<0.0025 R	<0.21	<0.077	<0.00039	<0.00033	-	<0.00071	-	-	-	-	-
1,2,3,4,7,8,9-HpCDF	0.01	-	<0.00031	-	-	-	-	-	-	<0.00062 R	<0.24	<0.088	<0.00046	<0.00037	-	<0.00084	-	-	-	-	-
OCDF	0.0001	-	<0.00067	-	-	-	-	-	-	**0.0082 JR**	<0.36	<0.12	<0.0016	<0.00057	-	<0.0014	-	-	-	-	-
2,3,7,8-TCDD Equivalence	1.0	-	BDL	-	-	-	-	-	-	**0.0000835 JR**	**0.000081 J**	**0.00006**	BDL	BDL	-	**0.0000012 J**	-	-	-	-	-
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**MW-9**							**MW-10**			**MW-11**	**MW-12**	**MW-13**	**MW-14**						
Aluminum	NV or **14340**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	NV or **0.487**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	7.5 or **8.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	**300** or 38.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Berillium	0.16 or **0.427**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	**10** or 0.029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	NV or **309.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	**50** or 16.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	**30** or 8.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	**25** or 11.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	2000 or **25770**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	**400** or 12.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	NV or **2893**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	NV or **319.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	13 or **17.77**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	NV or **714.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	**2** or 1.322	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	**0.1** or 0.082375	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	NV or **41.52222**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	**150** or 20.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	20 or **51.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
Only analytes detected at or above laboratory method detection limits included on table
*PCP results from PIR Immunoassay Results
Bold Text=Analyte detected above laboratory method detection limit
Shaded Text=Exceedence of TAGM 4046 soil cleanup objectives
BDL=Below laboratory method detection limit
ND=Non Detect

Dioxin Data Qualifiers:
All results in ug/kg or parts per billion
D=Result obtained from dilution
J=Estimated result, result is less than the reporting limit
E=Estimated result, result exceeds calibration range
CON=Confirmation analysis

SVOC Data Qualifiers:
All results in mg/kg or parts per million
< = Analyte was not detected above laboratory detection limits
J=Estimated Value

Metal Data Qualifiers:
All results in mg/kg or parts per million
B=Indicates a value greater than or equal to the instrument detection limit but less than the quantitation limit
J=Estimated result, result is less than the reporting limit
NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 3
Soil Boring Analytical Results
Camp Georgetown

Analyte	TAGM	MW-15	MW-16							MW-17							MW-18	MW-19
SVOCs (mg/kg)		**2-4'**	**0-2'**	**2-4'**	**4-6'**	**6-8'**	**8-10'**	**10-12'**	**12-14'**	**0-2'**	**2-4'**	**4-6'**	**6-8'**	**8-10'**	**10-12'**	**12-14'**	**6-8'**	**0-2'**
Bis (2-ethylhexyl) phthalate	50	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<1.6 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	**0.89 JB**	**0.086 J**
Di-n-butyl phthalate	8.1	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<1.6 J	<0.33 J	<0.33 J	<0.33 J	**0.074 J**	**0.028 J**	**0.042 J**	<0.42	<0.37
2-Methylnaphthalene	36.4	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<1.6 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.42	<0.37
Naphthalene	13	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<1.6 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.42	<0.37
Pentachlorophenol	1	<1.6	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<8.0 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	<1.6 J	**0.12 J**	<0.93
Phenanthrene	50	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<1.6 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.42	<0.37
Pyrene	50	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<1.6 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.42	<0.37
Total SVOCs		BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	**0.074 J**	**0.028 J**	**0.042 J**	**1.01JB**	**0.086 J**
Dioxins (ug/kg)	**TEF**	**MW-15**	**MW-16**							**MW-17**							**MW-18**	**MW-19**
Total TCDF	-	<0.00018	-	<0.00049	-	-	-	-	-	-	<0.00038	-	-	-	-	-	<0.04	<0.02
Total PeCDF	-	<0.00049	-	<0.0016	-	-	-	-	-	-	<0.00066	-	-	-	-	-	<0.17	<0.14
TotalHxCDF	-	<0.0019	-	<0.0012	-	-	-	-	-	-	<0.000763	-	-	-	-	-	<0.06	<0.03
Total HpCDF	-	**0.0012**	-	**0.0037**	-	-	-	-	-	-	<0.0013	-	-	-	-	-	<0.10	<0.11
Total TCDD	-	<0.0029	-	<0.0007	-	-	-	-	-	-	<0.00053	-	-	-	-	-	<0.06	<0.03
Total PeCDD	-	<0.0062	-	<0.0026	-	-	-	-	-	-	<0.0013	-	-	-	-	-	<0.18	<0.04
Total HxCDD	-	<0.0017	-	<0.0014	-	-	-	-	-	-	<0.0008	-	-	-	-	-	<0.11	<0.06
Total HpCDD	-	**0.03**	-	**0.01**	-	-	-	-	-	-	<0.0015	-	-	-	-	-	<0.13	<0.08
2,3,7,8-TCDD	1	<0.00029	-	<0.00061	-	-	-	-	-	-	<0.00053	-	-	-	-	-	<0.06	<0.03
1,2,3,7,8-PeCDD	0.5	<0.00044	-	<0.0026	-	-	-	-	-	-	<0.00089	-	-	-	-	-	<0.18	<0.04
1,2,3,4,7,8-HxCDD	0.1	<0.00035	-	<0.0013	-	-	-	-	-	-	<0.00072	-	-	-	-	-	<0.11	<0.06
1,2,3,6,7,8-HxCDD	0.1	<0.001	-	<0.0014	-	-	-	-	-	-	<0.0008	-	-	-	-	-	<0.09	<0.05
1,2,3,7,8,9-HxCDD	0.1	<0.00073	-	<0.0013	-	-	-	-	-	-	<0.00072	-	-	-	-	-	<0.09	<0.05
1,2,3,4,6,7,8-HpCDD	0.01	**0.019**	-	**0.0064**	-	-	-	-	-	-	<0.0015	-	-	-	-	-	<0.13	<0.08
OCDD	0.0001	**0.091**	-	**0.031**	-	-	-	-	-	-	**0.012 J**	-	-	-	-	-	<0.13	**0.60 J**
2,3,7,8-TCDF	0.1	<0.00018	-	<0.00049	-	-	-	-	-	-	<0.00038	-	-	-	-	-	<0.04	<0.02
1,2,3,7,8-PeCDF	0.05	<0.00026	-	<0.0014	-	-	-	-	-	-	<0.00061	-	-	-	-	-	<0.17	<0.14
2,3,4,7,8-PeCDF	0.5	<0.00026	-	<0.0014	-	-	-	-	-	-	<0.0006	-	-	-	-	-	<0.16	<0.14
1,2,3,4,7,8-HxCDF	0.1	<0.00061	-	<0.0011	-	-	-	-	-	-	<0.00065	-	-	-	-	-	<0.06	<0.03
1,2,3,6,7,8-HxCDF	0.1	<0.00023	-	<0.001	-	-	-	-	-	-	<0.00062	-	-	-	-	-	<0.05	<0.03
2,3,4,6,7,8-HxCDF	0.1	<0.00029	-	<0.0011	-	-	-	-	-	-	<0.00067	-	-	-	-	-	<0.06	<0.03
1,2,3,7,8,9-HxCDF	0.1	<0.00027	-	<0.0012	-	-	-	-	-	-	<0.00073	-	-	-	-	-	<0.06	<0.03
1,2,3,4,6,7,8-HpCDF	0.01	**0.0045 J**	-	<0.0018	-	-	-	-	-	-	<0.00058	-	-	-	-	-	<0.08	<0.07
1,2,3,4,7,8,9-HpCDF	0.01	<0.00061	-	<0.0009	-	-	-	-	-	-	<0.0007	-	-	-	-	-	<0.10	<0.10
OCDF	0.0001	**0.013**	-	**0.0059 J**	-	-	-	-	-	-	<0.002 J	-	-	-	-	-	<0.08	**0.08 J**
2,3,7,8-TCDD Equivalence	1.0	**0.000245 J**	-	**0.0000677 J**	-	-	-	-	-	-	**0.0000012 J**	-	-	-	-	-	BDL	**0.000068 J**
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**MW-15**	**MW-16**							**MW-17**							**MW-18**	**MW-19**
Aluminum	NV or **14340**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	NV or **0.487**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	7.5 or **8.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	**300** or 38.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Berillium	0.16 or **0.427**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	**10** or 0.029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	NV or **309.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	**50** or 16.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	**30** or 8.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	**25** or 11.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	2000 or **25770**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	**400** or 12.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	NV or **2893**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	NV or **319.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	13 or **17.77**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	NV or **714.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	**2** or 1.322	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	**0.1** or 0.082375	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	NV or **41.52222**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	**150** or 20.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	20 or **51.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
Only analytes detected at or above laboratory method detection limits included on table
*PCP results from PIR Immunoassay Results
Bold Text=Analyte detected above laboratory method detection limit
Shaded Text=Exceedence of TAGM 4046 soil cleanup objectives
BDL=Below laboratory method detection limit
ND=Non Detect

Dioxin Data Qualifiers:
All results in ug/kg or parts per billion
D=Result obtained from dilution
J=Estimated result, result is less than the reporting limit
E=Estimated result, result exceeds calibration range
CON=Confirmation analysis

SVOC Data Qualifiers:
All results in mg/kg or parts per million
< = Analyte was not detected above laboratory detection limits
J=Estimated Value

Metal Data Qualifiers:
All results in mg/kg or parts per million
B=Indicates a value greater than or equal to the instrument detection limit but less than the quantitation limit
J=Estimated result, result is less than the reporting limit
NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 3
Soil Boring Analytical Results
Camp Georgetown

Analyte	TAGM	GSB02-1			GSB02-2	GSB02-3			GSB02-4		GSB02-5	GSB02-6		GSB02-7		GSB02-8		GSB02-9
SVOCs (mg/kg)		**2-4'**	**4-6'**	**8-10'**	**4-6'**	**2-4'**	**6-8'**	**8-10'**	**4-6'**	**6-8'**	**2-4'**	**2-4'**	**8-10'**	**2-4'**	**6-8'**	**1-2'**	**7-8'**	
Bis (2-ethylhexyl) phthalate	50	<8.0	**0.054 JB**	**0.025 JB**	**0.067 JB**	**0.21 JB**	**0.019 JB**	**0.077 JB**	<0.37	**0.03 JB**	**0.029 JB**	**0.025 JB**	**0.33 JB**	**0.025 JB**	**0.20 JB**	<2.0	**0.044 JB**	**0.033 JB**
Di-n-butyl phthalate	8.1	<8.0	<0.38	<0.40	<0.38	<3.7	<0.37	<1.1	<0.37	<0.37	<0.38	<0.41	<0.37	<0.38	<0.37	<2.0	<0.37	<0.43
2-Methylnaphthalene	36.4	<8.0	<0.38	<0.40	<0.38	<3.8	**0.04 JB**	**2.20**	**0.18 J**	<0.37	<0.38	<0.41	<0.37	<0.38	<0.37	<2.0	**3.0 D**	<0.43
Naphthalene	13	<8.0	<0.38	<0.40	<0.38	<3.7	<0.37	<1.1	<0.37	<0.37	<0.38	<0.41	<0.37	<0.38	<0.37	<2.0	**0.49**	<0.43
Pentachlorophenol	1	**36.0**	**0.63 J**	**0.51 J**	**0.13 J**	**25.0**	**1.6**	**4.3**	**0.81 J**	**1.5**	<0.94	<1.0	<0.93	<0.95	<0.94	**4.3 J**	**2.4**	<0.43
Phenanthrene	50	<8.0	<0.38	<0.40	<0.38	**0.19 J**	<0.37	<1.1	<0.37	<0.37	<0.38	<0.41	<0.37	<0.38	<0.37	<2.0	**1**	<0.43
Pyrene	50	<8.0	<0.38	<0.40	<0.38	<3.7	<0.37	<1.1	<0.37	<0.37	<0.38	<0.41	<0.37	<0.38	<0.37	<2.0	**0.08 J**	<0.43
Total SVOCs		**36.0**	**0.684JB**	**0.535 JB**	**0.197 JB**	**25.4 JB**	**1.659 JB**	**6.577 JB**	**0.99 J**	**1.53 JB**	**0.029 JB**	**0.025 JB**	**0.33 JB**	**0.025 JB**	**0.200 JB**	**4.3 J**	**7.014**	**0.033 JB**
Dioxins (ug/kg)	**TEF**	**GSB02-1**			**GSB02-2**	**GSB02-3**			**GSB02-4**		**GSB02-5**	**GSB02-6**		**GSB02-7**		**GSB02-8**		**GSB02-9**
Total TCDF	-	<0.09	<0.02	<0.02	<0.03	<0.02	<0.01	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.01	<0.02
Total PeCDF	-	**1.2 S**	<0.12	<0.09	<0.08	<0.08	<0.12	<0.08	<0.07	<0.23	<0.04	<0.09	<0.07	<0.08	<0.07	**0.36 JS**	<0.07	<0.10
TotalHxCDF	-	**33**	<0.03	<0.04	<0.05	**1.5**	<0.02	**0.78**	**0.19 JS**	<0.04	<0.03	<0.04	<0.05	<0.03	<0.02	**15**	**0.88**	<0.04
Total HpCDF	-	**292**	**0.51 J**	<0.09	<0.10	**17**	<0.04	**5.9**	**1.8**	<0.06	<0.03	<0.04	<0.09	<0.07	<0.03	**117**	**4.8**	<0.06
Total TCDD	-	**0.10 J**	<0.03	<0.03	<0.04	<0.02	<0.01	<0.02	<0.03	<0.03	<0.02	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03
Total PeCDD	-	<0.07	<0.05	<0.07	<0.09	<0.04	<0.02	<0.04	<0.08	<0.05	<0.03	<0.06	<0.06	<0.05	<0.06	<0.09	<0.11	<0.07
Total HxCDD	-	**8.1**	<0.06	<0.08	<0.07	**0.27 JS**	<0.03	**0.13 J**	<0.12	<0.06	<0.06	<0.06	<0.05	<0.04	<0.05	**5.2**	**0.28 JS**	<0.06
Total HpCDD	-	**181**	**0.30 JS**	<0.06	<0.09	**16**	**0.19 JS**	**7.8**	**2.3**	<0.05	<0.05	<0.06	<0.05	<0.05	<0.05	**55**	**10**	<0.05
2,3,7,8-TCDD	1	**0.10 J**	<0.03	<0.03	<0.04	<0.02	<0.01	<0.02	<0.03	<0.03	<0.02	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.03
1,2,3,7,8-PeCDD	0.5	<0.07	<0.05	<0.07	<0.09	<0.04	<0.02	<0.04	<0.08	<0.05	<0.03	<0.06	<0.06	<0.05	<0.06	<0.09	<0.11	<0.07
1,2,3,4,7,8-HxCDD	0.1	**0.28 J**	<0.06	<0.08	<0.07	<0.08	<0.03	<0.05	<0.12	<0.08	<0.06	<0.06	<0.06	<0.04	<0.05	**2.6**	<0.05	<0.06
1,2,3,6,7,8-HxCDD	0.1	**2.9**	<0.05	<0.06	<0.06	**0.27 JS**	<0.03	**0.13 JS**	<0.10	<0.06	<0.04	<0.04	<0.04	<0.04	<0.04	<0.03	**0.15 JS**	<0.05
1,2,3,7,8,9-HxCDD	0.1	**0.67**	<0.05	<0.07	<0.06	<0.06	<0.03	<0.04	<0.10	<0.06	<0.04	<0.04	<0.04	<0.04	<0.04	<0.03	<0.04	<0.05
1,2,3,4,6,7,8-HpCDD	0.01	**131**	**0.22 JS**	<0.06	<0.09	**12**	**0.13 JS**	**5.6**	**1.6**	<0.05	<0.05	<0.06	<0.05	<0.05	<0.05	**40**	**7.3**	<0.05
OCDD	0.0001	**549**	**1.2**	**0.29 J**	<0.08	**70**	**1.2**	**36**	**12**	<0.06	**0.08 JS**	<0.07	**0.05 JS**	<0.04	<0.04	**750**	**41**	**0.17 J**
2,3,7,8-TCDF	0.1	<0.09	<0.02	<0.02	<0.03	<0.02	<0.01	<0.03	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.01	<0.02
1,2,3,7,8-PeCDF	0.05	<0.07	<0.12	<0.09	<0.08	<0.08	<0.12	<0.08	<0.07	<0.23	<0.04	<0.09	<0.07	<0.08	<0.07	<0.14	<0.07	<0.10
2,3,4,7,8-PeCDF	0.5	<0.07	<0.12	<0.09	<0.08	<0.08	<0.12	<0.08	<0.07	<0.23	<0.04	<0.09	<0.07	<0.08	<0.07	<0.14	<0.07	<0.10
1,2,3,4,7,8-HxCDF	0.1	**0.66**	<0.03	<0.04	<0.05	<0.06	<0.02	<0.05	<0.03	<0.03	<0.02	<0.04	<0.05	<0.03	<0.02	**0.32 JS**	<0.03	<0.04
1,2,3,6,7,8-HxCDF	0.1	**0.23 J**	<0.02	<0.03	<0.04	**1.5**	<0.01	**0.63**	**0.19 JS**	<0.03	<0.02	<0.03	<0.04	<0.03	<0.02	<0.03	**0.65**	<0.03
2,3,4,6,7,8-HxCDF	0.1	**0.63**	<0.03	<0.04	<0.05	<0.06	<0.02	<0.05	<0.04	<0.04	<0.03	<0.04	<0.05	<0.03	<0.02	**0.20 JS**	<0.03	<0.04
1,2,3,7,8,9-HxCDF	0.1	**0.23 JS**	<0.03	<0.04	<0.04	<0.06	<0.01	<0.04	<0.03	<0.03	<0.02	<0.03	<0.05	<0.03	<0.02	**0.08 JS**	<0.03	<0.03
1,2,3,4,6,7,8-HpCDF	0.01	**40**	<0.03	<0.08	<0.08	**1.9**	<0.03	**0.89**	**0.28 JS**	<0.05	<0.03	<0.03	<0.07	<0.06	<0.02	**13**	**0.74**	<0.05
1,2,3,4,7,8,9-HpCDF	0.01	**2.0**	<0.04	<0.09	<0.10	<0.14	<0.04	<0.06	<0.10	<0.06	<0.03	<0.04	<0.09	<0.07	<0.03	**1.7**	**0.07 J**	<0.06
OCDF	0.0001	**502**	**1.2**	**0.25 JS**	<0.07	**16**	**0.19 J**	**7.4**	**2.4**	<0.04	<0.04	<0.04	<0.04	<0.04	<0.03	**172**	**5.2**	<0.03
2,3,7,8-TCDD Equivalence	1.0	**2.4951 JS**	**0.00244 JS**	**0.000054 JS**	BDL	**0.3246 JS**	**0.001439 JS**	**0.14524 JS**	**0.03924 JS**	BDL	**0.000008 JS**	BDL	**0.000005 JS**	BDL	BDL	**0.9992 JS**	**0.16562 JS**	**0.000017 J**
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**GSB02-1**			**GSB02-2**	**GSB02-3**			**GSB02-4**		**GSB02-5**	**GSB02-6**		**GSB02-7**		**GSB02-8**		**GSB02-9**
Aluminum	NV or **14340**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	NV or **0.487**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	7.5 or **8.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	**300** or 38.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Berillium	0.16 or **0.427**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	**10** or 0.029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	NV or **309.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	**50** or 16.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	**30** or 8.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	**25** or 11.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	2000 or **25770**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	**400** or 12.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	NV or **2893**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	NV or **319.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	13 or **17.77**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	NV or **714.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	**2** or 1.322	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	**0.1** or 0.082375	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	NV or **41.52222**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	**150** or 20.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	20 or **51.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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BDL=Below laboratory method detection limit
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Dioxin Data Qualifiers:
All results in ug/kg or parts per billion
D=Result obtained from dilution
J=Estimated result, result is less than the reporting limit
E=Estimated result, result exceeds calibration range
CON=Confirmation analysis

SVOC Data Qualifiers:
All results in mg/kg or parts per million
< = Analyte was not detected above laboratory detection limits
J=Estimated Value

Metal Data Qualifiers:
All results in mg/kg or parts per million
B=Indicates a value greater than or equal to the instrument detection limit but less than the quantitation limit
J=Estimated result, result is less than the reporting limit
NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 4
Test Pit Analytical Results
Camp Georgetown

Analyte **SVOCs (mg/kg)**	**TAGM**	**GTP-1 8'x2'x5'**	**GTP-2 10'x2'x8'**	**GTP-3A 11'x2'x7.5'**	**GTP-3B 11'x2'x7.5'**	**GTP-4 9'x2'x6'**	**GTP-5 11'x2'x7'**	**GTP-6 19'x2'x6'**	**GTP-7 19'x2'x5'**	**GTP-8 11'x2'x3'**	**GTP-9 11'x2'x3'**	**GTP-10 11'x2'x8'**	**GTP-11 10'x2'x5'**	**GTP-12 9'x2'x7'**	**GTP-13 9'x2'x3'**	**GTP-14 8'x2'x3'**	**GTP-15 10'x2'x5'**
Bis (2-ethylhexyl) phthalate	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-butyl phthalate	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Di-n-octyl phthalate	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalate	36	-	-	-	-	-	-	**22 D**	-	-	-	-	**1.1 JD**	-	-	-	-
Pentachlorophenol	1	**30***	ND	**0.18***	**0.71***	**13***	**9***	**0.36***	**0.51***	ND	ND	ND	**14***	**0.18***	**89***	**0.39***	**0.43***
Phenanthrene	50	-	-	-	-	-	-	**10 D**	-	-	-	-	**0.64 JD**	-	-	-	-
Total SVOC	-	**30**	ND	**0.18**	**0.71**	**13**	**9**	**33.36**	**1**	ND	ND	ND	**15.74**	**0.18**	**89**	**0.39**	**0.43**
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**GTP-1**	**GTP-2**	**GTP-3A**	**GTP-3B**	**GTP-4**	**GTP-5**	**GTP-6**	**GTP-7**	**GTP-8**	**GTP-9**	**GTP-10**	**GTP-11**	**GTP-12**	**GTP-13**	**GTP-14**	**GTP-15**
Aluminum	NV or **14340**	-	-	-	-	-	-	**7220**	-	-	-	-	**9640**	-	-	-	-
Antimony	NV or **0.487**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	7.5 or **8.2**	-	-	-	-	-	-	**7.2**	-	-	-	-	**7.9**	-	-	-	-
Barium	**300** or 38.49	-	-	-	-	-	-	**40.9**	-	-	-	-	**79.6**	-	-	-	-
Berillium	0.16 or **0.427**	-	-	-	-	-	-	**0.66**	-	-	-	-	**0.56**	-	-	-	-
Cadmium	**10** or 0.029	-	-	-	-	-	-	**0.05 B**	-	-	-	-	**0.05 B**	-	-	-	-
Calcium	NV or **309.96**	-	-	-	-	-	-	**47800**	-	-	-	-	**61700**	-	-	-	-
Chromium	**50** or 16.58	-	-	-	-	-	-	**14.5**	-	-	-	-	**13.4**	-	-	-	-
Cobalt	**30** or 8.31	-	-	-	-	-	-	**9.3**	-	-	-	-	**7.7**	-	-	-	-
Copper	**25** or 11.83	-	-	-	-	-	-	**25.5**	-	-	-	-	**19.8**	-	-	-	-
Iron	2000 or **25770**	-	-	-	-	-	-	**16100**	-	-	-	-	**17000**	-	-	-	-
Lead	**400** or 12.58	-	-	-	-	-	-	**10.3**	-	-	-	-	**11.5**	-	-	-	-
Magnesium	NV or **2893**	-	-	-	-	-	-	**12100**	-	-	-	-	**4150**	-	-	-	-
Manganese	NV or **319.3**	-	-	-	-	-	-	**512**	-	-	-	-	**396**	-	-	-	-
Nickel	13 or **17.77**	-	-	-	-	-	-	**19.8**	-	-	-	-	**15.8**	-	-	-	-
Potassium	NV or **714.8**	-	-	-	-	-	-	**813**	-	-	-	-	**495**	-	-	-	-
Selenium	**2** or 1.322	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	NV or **ND**	-	-	-	-	-	-	**0.45 B**	-	-	-	-	**0.29 B**	-	-	-	-
Mercury	**0.1** or 0.082375	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	NV or **41.52222**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	NV or **ND**	-	-	-	-	-	-	**1.3**	-	-	-	-	**1.7**	-	-	-	-
Vanadium	**150** or 20.15	-	-	-	-	-	-	**9.4**	-	-	-	-	**10.6**	-	-	-	-
Zinc	20 or **51.96**	-	-	-	-	-	-	**65.8**	-	-	-	-	**53.2**	-	-	-	-
Dioxins (ug/kg)	**TEFs**	**GTP-1**	**GTP-2**	**GTP-3A**	**GTP-3B**	**GTP-4**	**GTP-5**	**GTP-6**	**GTP-7**	**GTP-8**	**GTP-9**	**GTP-10**	**GTP-11**	**GTP-12**	**GTP-13**	**GTP-14**	**GTP-15**
Total TCDF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total PeCDF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total HxCDF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total HpCDF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total TCDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total PeCDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total HxCDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total HpCDD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,7,8-TCDD	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-PeCDD	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HxCDD	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HxCDD	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HxCDD	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HpCDD	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCDD	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,7,8-TCDF	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8-PeCDF	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,4,7,8-PeCDF	0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,4,6,7,8-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HxCDF	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HpCDF	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8,9-HpCDF	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OCDF	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2,3,7,8- TCDD Equivalence	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
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The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
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Table 4
Test Pit Analytical Results
Camp Georgetown

Analyte **SVOCs (mg/kg)**	**TAGM**	**GTP-16 9'x2'x3.5'**	**GTP-17 11'x2'x6'**	**GTP-18 10'x2'x6.5'**	**GTP-19 11'x2'x8'**	**GTP-20 10'x2'x7'**	**GTP-21 10'x2'x6'**	**GTP-22 10'x2'x6'**	**TP-1 2.5'x15'x2.3'**	**TP-2 2.5'x15'x3'**	**TP-3 2.5'x15'x4'**	**TP-4 2.5'x15'x7'**	**TP-5 2.5'x15'x8.5'**	**TP-6 2.5'x15'x7'**	**TP-7 2.5'x15'x7'**	**TP-8 NA**	**TP-9 2'x15'x9.5'**
Bis (2-ethylhexyl) phthalate	50	-	-	-	-	-	-	-	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	**0.043 J**	<0.33
Di-n-butyl phthalate	8	-	-	-	-	-	-	-	**0.077 J**	<0.33	<0.33	<0.33	**0.058 J**	<0.33	<0.33	<0.33	<0.33
Di-n-octyl phthalate	120	-	-	-	-	-	-	-	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
2-Methylnaphthalate	36	-	-	-	-	-	-	-	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Pentachlorophenol	1	**135***	**1.86***	**0.13***	ND	ND	ND	ND	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<1.6
Phenanthrene	50	-	-	-	-	-	-	-	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33
Total SVOC	-	**135**	**1.86**	**0.13**	ND	ND	ND	ND	**0.077 J**	BDL	BDL	BDL	**0.058 J**	BDL	BDL	**0.043 J**	BDL
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**GTP-16**	**GTP-17**	**GTP-18**	**GTP-19**	**GTP-20**	**GTP-21**	**GTP-22**	**TP-1**	**TP-2**	**TP-3**	**TP-4**	**TP-5**	**TP-6**	**TP-7**	**TP-8**	**TP-9**
Aluminum	NV or **14340**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	NV or **0.487**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	7.5 or **8.2**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	**300** or 38.49	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Berillium	0.16 or **0.427**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	**10** or 0.029	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	NV or **309.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	**50** or 16.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	**30** or 8.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	**25** or 11.83	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	2000 or **25770**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	**400** or 12.58	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	NV or **2893**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	NV or **319.3**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	13 or **17.77**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	NV or **714.8**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	**2** or 1.322	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	**0.1** or 0.082375	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	NV or **41.52222**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	NV or **ND**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	**150** or 20.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	20 or **51.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dioxins (ug/kg)	**TEFs**	**GTP-16**	**GTP-17**	**GTP-18**	**GTP-19**	**GTP-20**	**GTP-21**	**GTP-22**	**TP-1**	**TP-2**	**TP-3**	**TP-4**	**TP-5**	**TP-6**	**TP-7**	**TP-8**	**TP-9**
Total TCDF	-	-	-	-	-	-	-	-	**0.015**	**0.0024**	<0.00025	<0.00044	-	-	-	**0.0052 R**	<0.0005
Total PeCDF	-	-	-	-	-	-	-	-	**0.15**	**0.011**	<0.00042	<0.00091	-	-	-	**0.0041 R**	<0.001
Total HxCDF	-	-	-	-	-	-	-	-	**1.7**	**0.24**	<0.00043	<0.00078	-	-	-	**0.0076 R**	<0.0008
Total HpCDF	-	-	-	-	-	-	-	-	**6.2**	**1.1**	<0.0018	<0.0020	-	-	-	**0.032 R**	**0.011**
Total TCDD	-	-	-	-	-	-	-	-	**0.0099**	<0.00039	<0.00045	<0.0005	-	-	-	<0.00052 R	<0.0004
Total PeCDD	-	-	-	-	-	-	-	-	**0.092**	<0.0021	<0.00098	<0.0013	-	-	-	<0.0012 R	<0.0009
Total HxCDD	-	-	-	-	-	-	-	-	**1.1**	**0.069**	<0.00062	<0.00081	-	-	-	**0.007 R**	<0.0007
Total HpCDD	-	-	-	-	-	-	-	-	**11**	**0.68**	<0.0027	**0.011**	-	-	-	**0.074 R**	<0.002
2,3,7,8-TCDD	1	-	-	-	-	-	-	-	**0.0022**	<0.00039	<0.00045	<0.0005	-	-	-	<0.00027 R	<0.0005
1,2,3,7,8-PeCDD	0.5	-	-	-	-	-	-	-	**0.028**	<0.0021	<0.00088	<0.0013	-	-	-	<0.00073 R	<0.001
1,2,3,4,7,8-HxCDD	0.1	-	-	-	-	-	-	-	**0.065**	**0.0034 J**	<0.00058	<0.00073	-	-	-	<0.0010 R	<0.0007
1,2,3,6,7,8-HxCDD	0.1	-	-	-	-	-	-	-	**0.28**	**0.02**	<0.00062	<0.00077	-	-	-	<0.0026 R	<0.0007
1,2,3,7,8,9-HxCDD	0.1	-	-	-	-	-	-	-	**0.18**	**0.0091**	<0.00057	<0.0007	-	-	-	<0.0028 R	<0.0007
1,2,3,4,6,7,8-HpCDD	0.01	-	-	-	-	-	-	-	**7.2 EJ**	**0.44**	<0.0027	**0.0062 J**	-	-	-	**0.047 R**	**0.006**
OCDD	0.0001	-	-	-	-	-	-	-	**50 EJ**	**2.4**	**0.015**	**0.039**	-	-	-	**0.23 R**	**0.039**
2,3,7,8-TCDF	0.01	-	-	-	-	-	-	-	**0.0018 CON**	<0.0004	<0.00025	<0.00044	-	-	-	<0.00076 CONR	<0.0004
1,2,3,7,8-PeCDF	0.05	-	-	-	-	-	-	-	**0.0062 J**	<0.00087	<0.00041	<0.00051	-	-	-	<0.00079 R	<0.0005
2,3,4,7,8-PeCDF	0.5	-	-	-	-	-	-	-	**0.0058 J**	<0.00082	<0.0004	<0.0005	-	-	-	<0.0012 R	<0.0005
1,2,3,4,7,8-HxCDF	0.1	-	-	-	-	-	-	-	**0.046**	**0.0061**	<0.0004	<0.00071	-	-	-	<0.0021 R	<0.0007
1,2,3,6,7,8-HxCDF	0.1	-	-	-	-	-	-	-	**0.039**	**0.005 J**	<0.00037	<0.00067	-	-	-	<0.0014 R	<0.0006
2,3,4,6,7,8-HxCDF	0.1	-	-	-	-	-	-	-	**0.034**	**0.0052 J**	<0.00041	<0.00073	-	-	-	<0.0014 R	<0.0007
1,2,3,7,8,9-HxCDF	0.1	-	-	-	-	-	-	-	<0.0014	<0.00062	<0.00043	<0.00078	-	-	-	<0.00043 R	<0.0007
1,2,3,4,6,7,8-HpCDF	0.01	-	-	-	-	-	-	-	**1.7**	**0.31**	<0.00081	<0.002	-	-	-	**0.014 R**	<0.0007
1,2,3,4,7,8,9-HpCDF	0.01	-	-	-	-	-	-	-	**0.079**	**0.013**	<0.00038	<0.00044	-	-	-	<0.0011 R	<0.002
OCDF	0.0001	-	-	-	-	-	-	-	**7.3 EJ**	**1.8**	<0.0034	<0.0049	-	-	-	**0.041 R**	<0.004
2,3,7,8- TCDD Equivalence	1.0	-	-	-	-	-	-	-	**0.1793 CON J**	**0.01293 J**	**0.000002**	**0.00007J**	-	-	-	**0.0006 CONR**	**0.00006**

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NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 4
Test Pit Analytical Results
Camp Georgetown

Analyte **SVOCs (mg/kg)**	**TAGM**	**TP-10 2'x15'x9.2'**	**TP-11 2'x15'x10'**	**TP-12 2'x15'x10'**	**TP-13 2'x15'x10'**	**TP-14 2.5'x20'x9'**	**TP-15 2.5'x15'x8'**	**TP-16 2'x15'x2'**	**TP-17 2'x15'x5'**	**TP-18 2'x15'x5'**	**TP-19NE Wall 2'x17'x4'**	**TP-19SW Wall 2'x17'x4'**	**TP-20 2'x12.5'x3.5'**	**TP-21 2'x15'x1.5'**	**TP-22 2'x15'x1.5'**	**TP-23 3'x15'x3'**	**TP-24 2'x15'x2'**
Bis (2-ethylhexyl) phthalate	50	<0.33	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	-	<0.65 J	<0.40	<0.36	<0.42	<0.39	<0.51	<0.56
Di-n-butyl phthalate	8	<0.33	<0.33 J	<0.33 J	**0.043 J**	<0.33 J	**0.048 J**	<0.33 J	<0.33 J	-	<0.65 J	<0.40	<0.36	<0.42	<0.39	<0.51	<0.56
Di-n-octyl phthalate	120	<0.33	<0.33 J	**0.028 J**	<0.33 J	<0.33 J	<0.33 J	<0.33 J	<0.33 J	-	<0.65 J	<0.40	<0.36	<0.42	<0.39	<0.51	<0.56
2-Methylnaphthalate	36	<0.33	<0.33 J	<0.33 J	<0.33 J	**0.10 J**	<0.33 J	<0.33 J	<0.33 J	-	<0.65 J	<0.40	<0.36	<0.42	<0.39	<0.51	<0.56
Pentachlorophenol	1	<0.16	<0.16 J	<0.16 J	<0.16 J	**0.78 J**	<0.16 J	<0.16 J	<0.16 J	-	<0.79 J	**0.19 J**	**0.17 J**	<1.1	**0.17 J**	<1.3	<1.4
Phenanthrene	50	<0.33	<0.33 J	<0.33 J	<0.33 J	**0.091 J**	<0.33 J	<0.33 J	<0.33 J	-	<0.65 J	<0.40	<0.36	<0.42	<0.39	<0.51	<0.56
Total SVOC	-	BDL	BDL	**0.028 J**	**0.043 J**	**0.971 J**	**0.048 J**	BDL	BDL	-	BDL	**0.19 J**	**0.17 J**	BDL	**0.17 J**	BDL	BDL
Metals (mg/kg)	**TAGM (4046) or SiteBackground Average**	**TP-10**	**TP-11**	**TP-12**	**TP-13**	**TP-14**	**TP-15**	**TP-16**	**TP-17**	**TP-18**	**TP-19NE Wall**	**TP-19SW Wall**	**TP-20**	**TP-21**	**TP-22**	**TP-23**	**TP-24**
Aluminum	NV or **14340**	-	-	-	-	-	-	-	-	**13200 J**	**10500**	**11200**	**5810**	**13300**	**13300**	**14100**	**19800**
Antimony	NV or **0.487**	-	-	-	-	-	-	-	-	**1.2 B**	<0.61	<0.28	<0.38	<0.35	<0.40	<0.52	<0.54
Arsenic	7.5 or **8.2**	-	-	-	-	-	-	-	-	**5.5**	**4.3**	**4**	**4.6**	**5.5**	**8**	**7.6**	**8.4**
Barium	**300** or 38.49	-	-	-	-	-	-	-	-	**92.0 J**	**130**	**26.6**	**28.3**	**40**	**38.4**	**24.5**	**76**
Berillium	0.16 or **0.427**	-	-	-	-	-	-	-	-	**0.52 B**	**0.31**	**0.28**	**0.29**	**0.39**	**0.42**	**0.28**	**0.7**
Cadmium	**10** or 0.029	-	-	-	-	-	-	-	-	<0.04	**0.31**	**0.05**	**0.06**	**0.07**	**0.05**	**0.06**	**0.11**
Calcium	NV or **309.96**	-	-	-	-	-	-	-	-	**1120 J**	**3500**	**503**	**101000**	**166**	**1320**	**94.7**	**946**
Chromium	**50** or 16.58	-	-	-	-	-	-	-	-	**15.6 J**	**10.9**	**12.7**	**9.6**	**13.8**	**16.3**	**14.7**	**19.5**
Cobalt	**30** or 8.31	-	-	-	-	-	-	-	-	**11.4**	**3.9**	**6.9**	**4.7**	**5.8**	**10.1**	**4.5**	**13.2**
Copper	**25** or 11.83	-	-	-	-	-	-	-	-	**8.5**	**15.3**	**5.4**	**10.4**	**7.9**	**11.4**	**6.8**	**11.1**
Iron	2000 or **25770**	-	-	-	-	-	-	-	-	**25800 J**	**12200**	**16500**	**14000**	**19100**	**24900**	**25800**	**24500**
Lead	**400** or 12.58	-	-	-	-	-	-	-	-	**10.1**	**25.8**	**5.2**	**5.7**	**7.4**	**10.8**	**8.6**	**10.6**
Magnesium	NV or **2893**	-	-	-	-	-	-	-	-	**3220**	**1460**	**2620**	**7380**	**2230**	**3620**	**2360**	**3000**
Manganese	NV or **319.3**	-	-	-	-	-	-	-	-	**584 J**	**167**	**124**	**385**	**234**	**362**	**148**	**477**
Nickel	13 or **17.77**	-	-	-	-	-	-	-	-	**20.9**	**9**	**15.4**	**14.1**	**15.7**	**22.1**	**13**	**26.2**
Potassium	NV or **714.8**	-	-	-	-	-	-	-	-	**590 B**	**1010**	**566**	**573**	**672**	**774**	**571**	**928**
Selenium	**2** or 1.322	-	-	-	-	-	-	-	-	**1.6**	**1.1**	**0.38**	<0.45	**0.84**	**0.91**	**1.0**	**0.89**
Silver	NV or **ND**	-	-	-	-	-	-	-	-	-	<0.19	<0.09	<0.12	<0.11	<0.13	<0.16	<0.17
Mercury	**0.1** or 0.082375	-	-	-	-	-	-	-	-	**0.053 B**	**0.08**	**0.03**	<0.02	**0.05**	**0.02**	**0.07**	**0.12**
Sodium	NV or **41.52222**	-	-	-	-	-	-	-	-	**50.3 B**	**77**	**38.1**	**90.8**	**46.6**	**45**	**30.6**	**54.3**
Thallium	NV or **ND**	-	-	-	-	-	-	-	-	-	<1.2	<0.53	<0.72	<0.67	<0.75	<0.99	<1.0
Vanadium	**150** or 20.15	-	-	-	-	-	-	-	-	**16.5 J**	**18.5**	**15.2**	**8.5**	**18.3**	**17.8**	**23.3**	**21.8**
Zinc	20 or **51.96**	-	-	-	-	-	-	-	-	**56.5 J**	**67**	**40.3**	**40.4**	**53.8**	**55.7**	**41.3**	**105**
Dioxins (ug/kg)	**TEFs**	**TP-10**	**TP-11**	**TP-12**	**TP-13**	**TP-14**	**TP-15**	**TP-16**	**TP-17**	**TP-18**	**TP-19NE Wall**	**TP-19SW Wall**	**TP-20**	**TP-21**	**TP-22**	**TP-23**	**TP-24**
Total TCDF	-	<0.00011	<0.00034	-	<0.00047	**0.04**	-	<0.00065	<0.00029	<0.00038	<0.04	<0.03	<0.02	<0.02	<0.02	<0.03	<0.03
Total PeCDF	-	<0.00011	<0.00066	-	<0.00078	**0.034**	-	<0.00098	<0.00044	<0.00034	**0.13 J**	<0.10	<0.08	<0.10	<0.06	<0.12	<0.09
Total HxCDF	-	<0.00012	<0.00048	-	**0.0038**	**0.85**	-	<0.0017	**0.0038**	**0.011**	**2.6**	<0.04	**0.40 JS**	<0.03	**0.36 JS**	<0.08	<0.05
Total HpCDF	-	<0.00017	**0.0039**	-	**0.034**	**6**	-	**0.0033**	**0.023**	**0.076**	**6.7**	**0.11 J**	**2.4**	<0.04	**2.2**	<0.07	<0.11
Total TCDD	-	<0.00017	<0.00034	-	<0.00044	**0.0011**	-	<0.00061	<0.0003	<0.00044	<0.05	<0.03	<0.03	<0.03	<0.03	<0.04	<0.04
Total PeCDD	-	<0.00023	<0.0011	-	<0.0014	<0.0011	-	<0.0017	<0.00062	<0.00054	<0.09	<0.04	<0.06	<0.08	<0.04	<0.07	<0.09
Total HxCDD	-	<0.00016	<0.00062	-	<0.002	**0.32**	-	<0.002	<0.0022	**0.0066**	**0.65 JS**	<0.06	<0.06	<0.07	<0.07	<0.09	<0.09
Total HpCDD	-	<0.00019	**0.015**	-	**0.057**	**9.3**	-	**0.0051**	**0.05**	**0.13**	**11.9**	**0.30 J**	**3.0**	<0.07	**3.1**	<0.11	<0.11
2,3,7,8-TCDD	1	<0.0001	<0.00034	-	<0.00044	<0.00031	-	<0.00061	<0.0003	<0.00044	<0.05	<0.03	<0.03	<0.03	<0.03	<0.04	<0.04
1,2,3,7,8-PeCDD	0.5	<0.00023	<0.0011	-	<0.0014	<0.00059	-	<0.0017	<0.00062	<0.00054	<0.09	<0.04	<0.06	<0.08	<0.04	<0.07	<0.09
1,2,3,4,7,8-HxCDD	0.1	<0.00014	<0.00055	-	<0.00071	<0.0013	-	<0.0018	<0.00032	<0.00045	<0.12	<0.06	<0.06	<0.07	<0.07	<0.09	<0.09
1,2,3,6,7,8-HxCDD	0.1	<0.00026	<0.00062	-	<0.0015	**0.18**	-	<0.002	<0.0018	**0.0030 J**	**0.31 JS**	<0.04	<0.05	<0.05	<0.05	<0.07	<0.07
1,2,3,7,8,9-HxCDD	0.1	<0.00014	<0.00055	-	**0.00092**	**0.0074**	-	<0.0018	<0.00087	<0.0012	<0.09	<0.04	<0.05	<0.05	<0.05	<0.07	<0.07
1,2,3,4,6,7,8-HpCDD	0.01	<0.00014	**0.008**	-	**0.038**	**6.4 D**	-	**0.0051 J**	**0.0033**	**0.091**	**7.4**	**0.30 J**	**2.1**	<0.07	**2.1**	<0.11	<0.11
OCDD	0.0001	<0.001	**0.077**	-	**0.25**	**53 D**	-	**0.029 J**	**0.21**	**0.6**	**30.5**	**1.8**	**12.8**	<0.06	**10.2**	<0.08	<0.11
2,3,7,8-TCDF	0.01	<0.0001	<0.00034	-	<0.00047	<0.00051	-	<0.00065	<0.00029	<0.00038	<0.04	<0.03	<0.02	<0.02	<0.02	<0.03	<0.03
1,2,3,7,8-PeCDF	0.05	<0.0001	<0.00056	-	<0.00074	**0.004 J**	-	<0.00087	<0.00031	<0.00034	<0.11	<0.10	<0.08	<0.10	<0.06	<0.12	<0.09
2,3,4,7,8-PeCDF	0.5	<0.0001	<0.00055	-	<0.00071	**0.0033 J**	-	<0.00086	<0.0003	<0.00033	<0.11	<0.10	<0.08	<0.10	<0.06	<0.12	<0.08
1,2,3,4,7,8-HxCDF	0.1	<0.0001	<0.00042	-	<0.00057	**0.027**	-	<0.0015	<0.00044	<0.00076	<0.08	<0.04	<0.07	<0.03	<0.04	<0.08	<0.05
1,2,3,6,7,8-HxCDF	0.1	<0.0001	<0.0004	-	<0.00053	**0.0086**	-	<0.0015	<0.00031	<0.00044	<0.07	<0.04	<0.06	<0.03	<0.03	<0.07	<0.05
2,3,4,6,7,8-HxCDF	0.1	<0.0001	<0.00043	-	<0.00058	**0.0088**	-	<0.0016	<0.00034	<0.00039	<0.08	<0.04	<0.07	<0.03	<0.04	<0.08	<0.05
1,2,3,7,8,9-HxCDF	0.1	<0.00014	<0.00048	-	<0.00063	<0.0014	-	<0.0017	<0.00036	<0.00041	<0.07	<0.04	<0.06	<0.03	<0.03	<0.07	<0.05
1,2,3,4,6,7,8-HpCDF	0.01	<0.0001	<0.0011	-	**0.0095**	**0.950 D**	-	<0.0014	**0.0097**	**0.02**	**1.4**	**0.11 J**	**0.50 J**	<0.03	**0.46 J**	<0.05	<0.08
1,2,3,4,7,8,9-HpCDF	0.01	<0.0002	<0.00042	-	<0.00063	**0.095 D**	-	<0.0015	<0.0007	<0.0015	<0.09	<0.05	<0.08	<0.04	<0.07	<0.07	<0.11
OCDF	0.0001	<0.0002	<0.0051	-	**0.045**	**7.4 D**	-	**0.0056 J**	**0.048**	**0.1**	**3.8**	**0.51 J**	**2.8**	<0.04	**2.2**	<0.06	<0.07
2,3,7,8- TCDD Equivalence	1.0	**BDL**	**0.0000877**	-	**0.0006**	**0.10552 DJ**	-	**0.00005 J**	**0.00016**	**0.00148 J**	**0.12243 JS**	**0.00433 J**	**0.0276 JS**	BDL	**0.02684 JS**	BDL	BDL

Notes:
Only analytes detected at or above laboratory method detection limits included on tables
*PCP results from PIR Immunoassay Results
Bold Text=Analyte detected above laboratory method detection limit
Shaded Text=Exceedence of TAGM 4046 soil cleanup objectives
BDL=Below laboratory method detection limit
ND=Non Detect

Dioxin Data Qualifiers:
All results in ug/kg or parts per billion
D=Result obtained from dilution
J=Estimated result, result is less than the reporting limit
E=Estimated result, result exceeds calibration range
CON=Confirmation analysis

SVOC Data Qualifiers:
All results in mg/kg or parts per million
< = Analyte was not detected above laboratory detection limits
J=Estimated Value

Metal Data Qualifiers:
All results in mg/kg or parts per million
B=Indicates a value greater than or equal to the instrument detection limit but less than the quantitation limit
J=Estimated result, result is less than the reporting limit
NV=Indicates TAGM recommened soil clean-up objective is site background
Metals SCGs used for comparison were either TAGM 4046 or Site Background average, which ever is higher
Bold Text=SCG used for Regulatory Comparison
The SCG for Cadmium (10 ppm) and Chromium (50 ppm) are generally accepted clean-up levels
The SCG for Lead (400 ppm) was adopted from the EPA

Table 5
Preliminary Investigation Groundwater Analytical Results
Camp Georgetown

Analyte	TOGs	MW-1	MW-2	MW-2D	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
VOC (ug/L) ppb										
(M+P) Xylenes	5	ND	ND	-	ND	ND	ND	ND	2.9 J	ND
Ethylbenzen	5	ND	ND	-	ND	ND	ND	ND	2 J	ND
O-Xylene	5	ND	ND	-	ND	ND	ND	ND	2.9 J	ND
SVOCs (ug/L) ppb										
Acenaphthene	20	ND	ND	-	ND	ND	ND	ND	1.8 J	ND
2,4-Dichlorophenol	5	ND	ND	-	ND	ND	ND	ND	2.6 J	ND
Flourene	50	ND	ND	-	ND	ND	ND	ND	2.3 J	ND
2-Methylnaphthalene	NA	ND	ND	-	ND	ND	ND	ND	3.2 J	ND
Naphthalene	10	ND	ND	-	ND	ND	ND	ND	2.3 J	ND
Bis(2-ethylhexyl)phthalate	5	1 J	ND	-	ND	ND	ND	ND	ND	ND
Pentachlorophenol	1	ND	370 D	-	120 D	30	1700	ND	370 D	ND
2,3,5-Trichloropenol	NA	ND	ND	-	ND	ND	ND	ND	4.4 J	ND
Total SVOCs		1 J	370 D	-	120 D	30	1700	ND	386.6	ND
Metals (mg/L) ppm		MW-1	MW-2	MW-2D	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
Aluminum	0.1	16.6	31.3	-	96.4	91.4	40.3	17.9	21	-
Arsenic	0.025	ND	ND	-	ND	ND	ND	0.0124	ND	-
Barium	1	0.161	0.246	-	0.504	0.59	0.292	0.321	0.262	-
Beryllium	0.003	0.00528	ND	-	ND	ND	ND	0.00548	ND	-
Calcium	NA	46	73.6	-	102	55	90.1	87.6	22.6	-
Chromium	0.05	0.0245	0.0536	-	0.155	0.148	0.0628	0.0307	0.0371	-
Colbalt	NA	ND	ND	-	0.0765	0.0767	ND	ND	ND	-
Copper	0.2	0.02	0.0401	-	0.106	0.111	0.0567	0.0242	0.0364	-
Iron	0.3	30.8	58.2	-	167	166	80	31.6	59.2	-
Lead	0.025	0.00797	0.0283	-	0.0841	0.0632	0.0356	0.0108	0.0147	-
Magnisium	35	13.8	25.5	-	39.5	36.6	26.4	23.5	12.8	-
Manganese	0.3	0.524	1.03	-	2.78	5.44	1.47	4.32	11.6	-
Nickel	0.1	ND	0.0663	-	0.159	0.174	0.0753	ND	0.0426	-
Potassium	NA	3.06	6.25	-	11.1	8.45	4.16	3	3.2	-
Sodium	20	7.96	14.6	-	15.6	27	12.5	18.3	17.2	-
Thallium	0.0005	0.016	0.0134	-	ND	ND	0.0151	ND	ND	-
Vanadium	NA	ND	ND	-	0.127	0.118	0.0545	ND	ND	-
Zinc	2	0.0816	0.12	-	0.398	0.338	0.184	0.0691	0.0879	-
Dioxins (ng/L) or ppt	TEFs	MW-1	MW-2	MW-2D	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8
Total TCDF	-	0.51	0.69	ND 0.19	2.17	ND 0.21	ND 0.15	ND 0.16	ND 0.30	ND 0.10
Total PeCDF	-	?	ND 0.17	ND 0.18	26.2	0.3	5.4	3.39	7.28	0.96
Total HxCDF	-	3.25	ND 0.25	0.85	496	29.3	120	117	146	13.3
Total HpCDF	-	38.1	36.8	ND 0.32	5020	335	1680	1460	1880	126
Total TCDD	-	2.14	11.6	ND 0.15	28.7	3.59	48.9	5.82	9	14.6
Total PecDD	-	0.89	ND 0.12	ND 0.12	48.4	3.13	10.6	28.2	11.22	0.71
Total HxCDD	-	4.01	7.35	ND 0.18	819	47.5	225	405	191	7.99
Total HpCDD	-	12.6	26.9	ND 0.35	2180	189	1080	921	891	36.7
2,3,7,8-TCDD	1	0.51	ND 0.17	ND 0.19	0.49 EMPC	ND 0.21	.40 EMPC	0.14 EMPC	0.51 EMPC	0.17 EMPC
1,2,3,7,8-PeCDD	0.5	0.57 EMPC	0.31 EMPC	ND 0.18	9.35	0.3	1.77	0.93	1.60 EMPC	0.68
1,2,3,4,7,8-HxCDD	0.1	1.26 EMPC	ND 0.25	ND 0.14	0.11	1.78	5.9	2,17	4.85	0.66
1,2,3,6,7,8-HxCDD	0.1	2.08 EMPC	1.1 EMPC	0.85	119	7.06	33.6	47.8	32.2	2.35
1,2,3,7,8,9-HxCDD	0.1	1.63	1.06 EMPC	0.98 EMPC	72.6	4.23	17.5	11.2	12.2	1.93
1,2,3,4,6,7,8-HpCDD	0.01	21.9	72.5 EMPC	9.09 EMPC	3340	202	1130	896	1180	83.5
OCDD	0.0001	188	620	77.6 EMPC	20900	1770	10190	8220	9910	768
2,3,7,8-TCDF	0.1	2.14	2.06	2.15 EMPC	1.84	1.16	1.38	2.77	4.13	1.79
1,2,3,7,8-PeCDF	0.05	0.69 EMPC	.59 EMPC	ND 0.12	2.75	0.33	0.67	2.24	0.77	0.62 EMPC
2,3,4,7,8-PeCDF	0.5	0.67	0.57 EMPC	0.60 EMPC	2.60 EMPC	0.35	0.71	2.09	1.56	0.71
1,2,3,4,7,8-HxCDF	0.1	1.35	1.22	0.52 EMPC	25	2.3	7.07	13.6	5.28 EMPC	.93 EMPC
1,2,3,6,7,8-HxCDF	0.1	0.79	0.72	ND 0.18	18.1	1.18	4.07 EMPC	5.70 EMPC	ND 3.17	.60 EMPC
1,2,3,7,8,9-HxCDF	0.1	1.21	.85 EMPC	0.70 EMPC	ND 3.43	ND 1.11	ND 1.33	ND 4.47	ND 3.17	0.67
2,3,4,6,7,8-HxCDF	0.1	0.74 EMPC	ND 0.33	ND 0.18	11.8	ND 1.11	3.84 EMPC	4.96	ND 3.17	0.5
1,2,3,4,6,7,8-HpCDF	0.01	5.25	8.82 EMPC	1.65 EMPC	631	47.8	252	251	185	9.87
1,2,3,4,7,8,9-HpCDF	0.01	1.39	1.49 EMPC	ND 0.35	61.7	5.7	38.2	18.5	20.7	1.34 EMPC
OCDF	0.0001	21.5	54.6	16.6 EMPC	2450	278	2060	1130	1390	60.5
2,3,7,8-TCDD Equivalence	0.0007	0.00224	0.00137	0.00188	0.00091	0.01221	0.00091	0.00308	0.00017	0.00391

Notes:
Data on this table was taken directly from the NYSDEC Preliminary Investigation Report

Table 6
Groundwater Analytical Results 2001
Camp Georgetown

Analyte	TOGS	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	MW-11	MW-12	MW-13	MW-14	MW-15	MW-16	MW-17
Fuel Oil (ug/L)		<5000	<5000	<5000	<5000	<5000	<5000	<5000	<5000	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOC (ug/L)																		
Acetone	50	-	-	-	-	-	-	-	-	<25	<25	<25	<25	**8.5 J**	<25	<25	**8.2 J**	**4.8 J**
SVOCs (ug/L)																		
Benzoic Acid	-	<50	<50	<50	<50	<50	<50	<50	<50	**35 J**	<50	<50	<50	<50	<50	<50	<50	<50
Bis (2-ethylhexyl) phthalate	0.6	<10	<10	<10	<10	<10	**1 J**	<10	<10	**36**	<10	<10	**38**	**8 J**	**1 J**	<10	<50	<10
Di-n-butyl phthalte	50	<10	<10	<10	**0.8 J**	<10	<10	**2 J**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Diethyl phthalate	50	<10	**0.6 J**	<10	<10	<10	<10	**1 J**	<10	<10	<10	**2 J**	<10	<10	<10	<10	<10	<10
Di-n-octyl phthalate	50	<10	<10	<10	<10	<10	<10	<10	<10	**0.7 J**	**0.6 J**	<10	<10	<10	<10	<10	<10	<10
2,6-Dinitrotoluene	0.07	<10	<10	<10	<10	<10	<10	**2 J**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Naphthalene	10	<10	<10	<10	<10	<10	<10	**3 J**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	1*	<50	<50	<50	**85**	**44 J**	**920 D**	**160**	<50	<50	<50	**540 D**	<50	<50	<50	<50	<50	<50
2,4,5-Trichlorophenol	1*	<10	<10	<10	<10	<10	<10	**0.6 J**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
2,4,6-Trichlorophenol	1*	<10	<10	<10	<10	<10	<10	**0.7 J**	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total SVOCs		**BDL**	**0.6 J**	**BDL**	**85.8 J**	**44 J**	**921 J**	**169.3 J**	**BDL**	**71.7**	**0.6 J**	**542 JD**	**38**	**8 J**	**1 J**	**BDL**	**BDL**	**BDL**
Dioxins (ng/L)	**TEFs**	**MW-1**	**MW-2**	**MW-3**	**MW-4**	**MW-5**	**MW-6**	**MW-7**	**MW-8**	**MW-9**	**MW-10**	**MW-11**	**MW-12**	**MW-13**	**MW-14**	**MW-15**	**MW-16**	**MW-17**
Total TCDF	-	<0.0008	<0.00075	<0.001	<0.0010	<0.0011	**0.039**	**0.13**	<0.0018	-	-	-	-	-	-	-	-	-
Total PeCDF	-	<0.0022	<0.0014	<0.002	<0.0020	<0.0012	<0.0017	**1.9**	<0.0034	-	-	-	-	-	-	-	-	-
Total HxCDF	-	<0.0012	<0.0019	<0.0018	**0.21**	<0.00089	<0.0096	**31**	<0.0045	-	-	-	-	-	-	-	-	-
Total HpCDF	-	<0.0024	<0.0020	<0.0027	**0.55**	<0.0380	**0.07**	**53**	**0.038**	-	-	-	-	-	-	-	-	-
Total TCDD	-	<0.0010	<0.0011	<0.0012	0.0062	<0.0069	<0.0015	**0.015**	<0.0029	-	-	-	-	-	-	-	-	-
Total PecDD	-	<0.0078	<0.0072	<0.0073	<0.0011	<0.0044	<0.0065	<0.0015	<0.0075	-	-	-	-	-	-	-	-	-
Total HxCDD	-	<0.0018	<0.0015	<0.002	**0.13**	<0.0012	<0.0050	**9.1**	<0.0051	-	-	-	-	-	-	-	-	-
Total HpCDD	-	<0.0048	<0.0015	<0.0048	**1.5**	<0.0083	**0.16**	**110**	**0.099**	-	-	-	-	-	-	-	-	-
2,3,7,8 TCDD	1	<0.001	<0.001	<0.0012	<0.0013	<0.00069	<0.0015	<0.0014	<0.0029	-	-	-	-	-	-	-	-	-
1,2,3,7,8 PeCDD	0.5	<0.0028	<0.0026	<0.004	<0.0033	<0.0019	<0.0033	<0.015	<0.0075	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HxCDD	0.1	<0.0016	<0.0014	<0.0018	<0.0074	<0.0011	<0.0017	**.029 J**	<0.0048	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HxCDD	0.1	<0.0017	<0.0015	<0.002	**0.063**	<0.0012	<0.0050	**4.9**	<0.0051	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HxCDD	0.1	<0.0015	<0.0014	<0.0018	**0.024 J**	<0.0011	<0.0022	**0.22**	<0.0046	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HpCDD	0.01	<0.0027	<0.0026	<0.0048	**1**	<0.0083	**0.11**	**71 D**	**0.063**	-	-	-	-	-	-	-	-	-
OCDD	0.0001	<0.0069	<0.0017	<0.021	**5.2**	**.059 J**	**0.82**	**330 D**	**.039 D**	-	-	-	-	-	-	-	-	-
2,3,7,8-TCDF	0.1	<0.00075	<0.00075	<0.001	<0.0013	<0.00066	<0.00088	**.016 CON**	<0.0018	-	-	-	-	-	-	-	-	-
1,2,3,7,8-PeCDF	0.05	<0.0011	<0.00096	<0.0018	<0.0019	<0.00090	<0.0017	**0.18**	<0.0028	-	-	-	-	-	-	-	-	-
2,3,4,7,8-PeCDF	0.5	<0.0010	<0.00093	<0.0018	<0.0019	<0.00088	<0.0017	**0.15**	<0.0027	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8-HxCDF	0.1	<0.0011	<0.0019	<0.0016	<0.012	<0.00081	<0.0020	**1.1**	<0.0036	-	-	-	-	-	-	-	-	-
1,2,3,6,7,8-HxCDF	0.1	<0.0011	<0.0010	<0.0015	<0.0096	<0.00077	<0.0020	**0.38**	<0.0034	-	-	-	-	-	-	-	-	-
2,3,4,6,7,8-HxCDF	0.1	<0.0012	<0.0011	<0.0016	<0.0066	<0.00082	<0.0019	**0.45**	<0.0036	-	-	-	-	-	-	-	-	-
1,2,3,7,8,9-HxCDF	0.1	<0.0012	<0.0011	<0.0018	<0.0029	<0.00089	<0.0020	**0.057**	<0.0039	-	-	-	-	-	-	-	-	-
1,2,3,4,6,7,8-HpCDF	0.01	<0.0020	<0.0017	<0.0022	**0.15**	<0.0016	<0.0022	**12**	<0.0098	-	-	-	-	-	-	-	-	-
1,2,3,4,7,8,9-HpCDF	0.01	<0.0024	<0.0020	<0.0027	<0.013	<0.0019	<0.0019	**0.69**	<0.0032	-	-	-	-	-	-	-	-	-
OCDF	0.0001	<0.00028	<0.00023	<0.0043	**0.051**	<0.00089	**0.015**	**3 D**	<0.0057	-	-	-	-	-	-	-	-	-
2,3,7,8-TCDD Equivilance	0.0007	**BDL**	**BDL**	**BDL**	**0.0207251**	**0.0000059**	**0.0011835**	**1.6694 JDCON**	**0.0006339 D**	-	-	-	-	-	-	-	-	-
PCBs (ug/L)																		
Aroclor 1254	.009**	-	-	-	-	-	-	-	-	**15**	<0.59	<0.50	**1.7**	<0.50	<0.50	**2.7**	<0.50	<0.50

Notes:
Only analytes detected at or above laboratory method detection limits included on tables
Dioxin results in ng/L or parts per trillion, all other results in ug/L or parts per billion
<=Analyte was not detected above laboratory detection limits
Bold Text=Analyte detected above laboratory method detection limit
Shaded Text=Exceedence of TOGS 1.1.1 guidance values
BDL=Below laboratory method detection limit
CON=Confirmation analysis
D=Result obtained from dilution
J=Estimated result, result is less than the reporting limit
* Applies to the sum of all phenolic compounds
** Applies to the sum of all PCB isomers

Table 7
Groundwater Analytical Results 2002
Camp Georgetown

Analyte **SVOCs (ug/L)**	**TOGS**	**MW-1**	**MW-2**	**MW-3**	**MW-4**	**MW-5**	**MW-5(F)**	**MW-6**	**MW-7**	**MW-8**	**MW-9**	**MW-9(F)**	**MW-10**
Acenaphthene	20	<10	<10	<10	<20	**1 J**	**1 J**	<210	**1 J**	<10	<10	<10	<10
Bis (2-ethylhexyl) phthalate	0.6	**9 JB**	**11 B**	**7 JB**	**1 J**	**38**	**6 J**	**55 JB**	**7 JB**	**55 B**	**17 B**	**7 JB**	**2 J**
Diethylphthalate	50	<10	**0.6 J**	<10	<20	**0.8 J**	**0.8 J**	<210	**0.8 J**	<10	<10	**0.6 J**	<10
Di-n-butylphthalate	50	<10	**0.6 J**	**0.6 J**	<20	<10	<10	<210	<10	**0.5 JB**	**1 J**	<10	<10
Napthalene	10	<10	<10	<10	<20	<10	<10	<210	**0.7 J**	<10	<10	<10	<10
Pentachlorophenol	1*	<25	**1 J**	**1 J**	**130**	**27**	**41**	**690**	**13 J**	<25	<25	<25	<26
Phenol	1*	<10	<10	<10	**1 J**	<10	<10	<210	<10	<10	<10	<10	<10
Fuel Oil Compounds		**MW-1**	**MW-2**	**MW-3**	**MW-4**	**MW-5**	**MW-5(F)**	**MW-6**	**MW-7**	**MW-8**	**MW-9**	**MW-9(F)**	**MW-10**
Diesel Range Organics	-	<306	<306	<303	**730**	<303	<303	**720**	**810**	<303	<300	<309	<312
Motor Oil	-	<306	<306	<303	<309	<303	<303	<312	<309	<303	<300	<309	<312
Dioxins (ng/L)	**TEFs**	**MW-1**	**MW-2**	**MW-3**	**MW-4**	**MW-5**	**MW-5(F)**	**MW-6**	**MW-7**	**MW-8**	**MW-9**	**MW-9(F)**	**MW-10**
Total TCDF	-	<0.00005	<0.00010	<0.00009	<0.00005	<0.00005	<0.00003	<0.00008	<0.00008	<0.00010	<0.00007	<0.00007	<0.00007
Total PeCDF	-	<0.00007	<0.00011	**0.00158 J**	**0.00324 J**	<0.00008	<0.00007	<0.00009	<0.00007	<0.00008	<0.00009	<0.00005	<0.00009
Total HxCDF	-	<0.00004	<0.00006	<0.00006	**0.091 J**	<0.00005	<0.00003	<0.00005	**0.0162 J**	<0.0004	<0.00006	<0.00005	<0.00006
Total HpCDF	-	<0.00021	**0.00156 J**	**0.00752 J**	**0.212**	<0.00007	<0.00008	**0.007 J**	**0.203**	**0.0158 J**	<0.00010	<0.00008	<0.00007
Total TCDD	-	<0.00009	<0.00008	<0.00015	<0.00005	<0.00006	<0.00006	<0.00009	<0.00010	<0.00011	<0.00010	<0.00008	<0.00010
Total HxCDD	-	<0.00009	<0.00006	<0.00008	**0.096 J**	<0.00005	<0.00004	<0.00005	<0.00008	<0.00005	<0.00005	<0.00005	<0.00008
Total HpCDD	-	<0.00011	<0.00008	**0.0183 J**	**1.0**	**0.0184 J**	<0.00006	**0.0318 J**	**0.935**	**0.0654**	**0.00596 J**	<0.00006	**0.0045 J**
2,3,7,8-TCDD	1	<0.00009	<0.00008	<0.00015	<0.00005	<0.00006	<0.00006	<0.00009	<0.00010	<0.00011	<0.00010	<0.00008	<0.00010
1,2,3,7,8-PeCDD	0.5	<0.00009	<0.00014	<0.00012	<0.00008	<0.00008	<0.00007	<0.00010	<0.00012	<0.00008	<0.00011	<0.00012	<0.00009
1,2,3,4,7,8-HxCDD	0.1	<0.00013	<0.00008	<0.00010	<0.000021	<0.00008	<0.00006	<0.00006	<0.00010	<0.00006	<0.00006	<0.00007	<0.00011
1,2,3,6,7,8-HxCDD	0.1	<0.00008	<0.00006	<0.00007	**0.0798**	<0.00005	<0.00004	<0.00004	**0.0733**	<0.00005	<0.00004	<0.00005	<0.00007
1,2,3,7,8,9-HxCDD	0.1	<0.00008	<0.00006	<0.00007	**0.0162 J**	<0.00005	<0.00004	<0.00004	<0.00008	<0.00005	<0.00005	<0.00005	<0.00007
1,2,3,4,6,7,8-HpCDD	0.01	<0.00011	<0.00008	**0.0183 J**	1.000	**0.0184 J**	<0.00006	**0.02 J**	**0.94**	**0.0654**	**0.00596 J**	<0.00006	**0.0045 J**
OCDD	0.0001	<0.00010	**0.0214 J**	**0.0912**	**4.68**	**0.148**	**0.00360 J**	**0.136**	**4.78**	**0.582**	**0.0418 J**	**0.023 J**	**0.0108 J**
2,3,7,8-TCDF	0.1	<0.00005	<0.00010	<0.00009	<0.00005	<0.00005	<0.00003	<0.00008	<0.00008	<0.00010	<0.00007	<0.00007	<0.00007
1,2,3,7,8-PeCDF	0.05	<0.00007	<0.00010	**0.00158 J**	**0.00324 J**	<0.00005	<0.00003	<0.00009	<0.00007	<0.00010	<0.00009	<0.00005	<0.00005
2,3,4,7,8-PeCDF	0.5	<0.00007	<0.00011	<0.00011	<0.00008	<0.00006	<0.00003	<0.00010	<0.00007	<0.00011	<0.00009	<0.00005	<0.00006
1,2,3,4,7,8-HxCDF	0.1	<0.00004	<0.00006	<0.00006	**0.0267 J**	<0.00005	<0.00003	<0.00005	<0.00008	<0.00004	<0.00005	<0.00005	<0.00005
1,2,3,6,7,8-HxCDF	0.1	<0.00004	<0.00006	<0.00006	**0.0459 J**	<0.00005	<0.00002	<0.00004	**0.0162 J**	<0.00003	<0.00005	<0.00004	<0.00005
2,3,4,6,7,8-HxCDF	0.1	<0.00004	<0.00007	<0.00007	<0.00020	<0.00006	<0.00003	<0.00005	<0.00009	<0.00004	<0.00006	<0.00005	<0.00006
1,2,3,7,8,9-HxCDF	0.1	<0.00005	<0.00007	<0.00007	**0.0184 J**	<0.00006	<0.00003	<0.00006	<0.00009	<0.00004	<0.00006	<0.00006	<0.00006
1,2,3,4,6,7,8-HpCDF	0.01	<0.00018	**0.00156 J**	**0.00752 J**	**0.187**	<0.00006	<0.00007	**0.007 J**	**0.188**	**0.0158 J**	<0.00009	<0.00007	<0.00006
1,2,3,4,7,8,9-HpCDF	0.01	<0.00025	<0.00009	<0.00014	**0.0252**	<0.00009	<0.00010	<0.00009	**0.015 J**	<0.00014	<0.00012	<0.00009	<0.00008
OCDF	0.0001	<0.00019	**0.00154 J**	**0.0196 J**	**0.367**	<0.00011	<0.00007	**0.0318 J**	**0.48**	**0.0967**	<0.00024	<0.00015	**0.00396 J**
2,3,7,8-TCDD Equivilance	0.0007	BDL	**0.000017894 J**	**0.00034828**	**0.0214887**	**0.0001988 J**	**0.00000036 J**	**0.00028678 J**	**0.020856 J**	**0.00087987 J**	**0.00006378 J**	**0.0000023 J**	**0.000046476 J**

Notes:
Only analytes detected at or above laboratory method detection limits included on tables
Dioxin results in ng/L or parts per trillion, all other results in ug/L or parts per billion
<=Analyte was not detected above laboratory detection limits
Bold Text=Analyte detected above laboratory method detection limit
Shaded Text=Exceedence of TOGS 1.1.1 guidance values
BDL=Below laboratory method detection limit
ND=Not Detected
B=Indicates a value greater than or equal to the instrument detection limit but less than the quantitation limit
J=Estimated result, result is less than the reporting limit
NA=not analyzed due to laboratory accident
* Applies to the sum of all phenolic compounds
(F) - Represents the groundwater was a filtered sample

Table 7
Groundwater Analytical Results 2002
Camp Georgetown

Analyte **SVOCs (ug/L)**	**TOGS**	**MW-11**	**MW-12**	**MW-12(F)**	**MW-13**	**MW-14**	**MW-15**	**MW-15(F)**	**MW-16**	**MW-17**	**MW-18**	**MW-18(F)**	**MW-19**	**MW-19(F)**
Acenaphthene	20	<52	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Bis (2-ethylhexyl) phthalate	0.6	**3 J**	**52 B**	**9 JB**	**21 B**	**2 JB**	**0.9 JB**	<10	**1 JB**	**1 JB**	**3 J**	**3 J**	**1 JB**	**1 JB**
Diethylphthalate	50	<52	**0.5 J**	<10	<10	<10	**0.6 J**	<10	<10	<10	<10	<10	<10	<10
Di-n-butylphthalate	50	<52	<10	**0.8 J**	**0.8 J**	**0.6 JB**	<10	<10	**0.6 JB**	**0.8 JB**	<10	<10	**0.9 J**	**0.5 J**
Napthalene	10	<52	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	1*	**370**	<25	<25	<25	<26	<26	<25	<26	<26	<26	<25	<25	<25
Phenol	1*	<52	<10	<10	<10	<10	<10	**0.7 J**	<10	<10	<10	<10	<10	<10
Fuel Oil Compounds		**MW-11**	**MW-12**	**MW-12(F)**	**MW-13**	**MW-14**	**MW-15**	**MW-15(F)**	**MW-16**	**MW-17**	**MW-18**	**MW-18(F)**	**MW-19**	**MW-19(F)**
Diesel Range Organics	-	<309	<306	<309	<309	<303	<309	<303	<309	<303	<309	<306	<303	<303
Motor Oil	-	<309	<306	<309	<309	<303	<309	<303	<309	<303	<309	<306	<303	<303
Dioxins (ng/L)	**TEFs**	**MW-11**	**MW-12**	**MW-12(F)**	**MW-13**	**MW-14**	**MW-15**	**MW-15(F)**	**MW-16**	**MW-17**	**MW-18**	**MW-18(F)**	**MW-19**	**MW-19(F)**
Total TCDF	-	<0.00005	NA	<0.00005	<0.00004	<0.00005	<0.00004	<0.00003	<0.00004	<0.00004	<0.00004	<0.00004	<0.00006	<0.00009
Total PeCDF	-	<0.00009	NA	<0.00004	<0.00006	<0.00005	<0.00003	<0.00004	<0.00003	<0.00004	<0.00005	<0.00003	<0.00007	<0.00012
Total HxCDF	-	<0.00007	NA	<0.00004	<0.00003	<0.00003	<0.00002	<0.00003	<0.00002	<0.00003	<0.00003	<0.00004	<0.00006	<0.00008
Total HpCDF	-	<0.00010	NA	<0.00007	<0.00024	<0.00004	<0.00007	<0.00007	<0.00008	<0.00008	<0.00022	<0.00011	<0.00012	<0.00016
Total TCDD	-	<0.00007	NA	<0.00006	<0.00008	<0.00006	<0.00007	<0.00007	<0.00005	<0.00006	<0.00006	<0.00003	<0.00009	<0.00013
Total HxCDD	-	<0.00006	NA	<0.00006	<0.00007	<0.00004	<0.00006	<0.00006	<0.00004	**0.00768 J**	<0.00006	<0.00007	<0.00006	<0.00007
Total HpCDD	-	**0.0451**	NA	<0.00010	<0.00007	<0.00009	<0.00011	<0.00006	<0.00006	<0.00007	**0.00248 J**	<0.00007	<0.00010	<0.00015
2,3,7,8-TCDD	1	<0.00007	NA	<0.00006	<0.00008	<0.00006	<0.00007	<0.00007	<0.00005	<0.00006	<0.00006	<0.00005	<0.00009	<0.00013
1,2,3,7,8-PeCDD	0.5	<0.00009	NA	<0.00007	<0.00009	<0.00005	<0.00008	<0.00008	<0.00009	<0.00008	<0.00007	<0.00005	<0.00015	<0.00014
1,2,3,4,7,8-HxCDD	0.1	<0.00009	NA	<0.00009	<0.00010	<0.00006	<0.00008	<0.00008	<0.00005	<0.00008	<0.00008	<0.00010	<0.00008	<0.00009
1,2,3,6,7,8-HxCDD	0.1	<0.00005	NA	<0.00005	<0.00006	<0.00004	<0.00005	<0.00005	<0.00003	<0.00005	<0.00005	<0.00006	<0.00006	<0.00006
1,2,3,7,8,9-HxCDD	0.1	<0.00006	NA	<0.00006	<0.00006	<0.00004	<0.00005	<0.00005	<0.00003	<0.00005	<0.00005	<0.00006	<0.00006	<0.00007
1,2,3,4,6,7,8-HpCDD	0.01	**0.0451**	NA	<0.00010	<0.00011	<0.00009	<0.00011	<0.00006	<0.00006	**0.00768 J**	**0.00248 J**	<0.00007	<0.00010	<0.00015
OCDD	0.0001	**0.257**	NA	**0.0232 J**	**0.00978 J**	<0.00008	**0.038 J**	<0.00006	**0.0147 J**	**0.0383 J**	**0.0129 J**	**0.013 J**	**0.0262 J**	**0.0148 J**
2,3,7,8-TCDF	0.1	<0.00005	NA	<0.00005	<0.00004	<0.00005	<0.00004	<0.00003	<0.00004	<0.00004	<0.00004	<0.00004	<0.00006	<0.00009
1,2,3,7,8-PeCDF	0.05	<0.00007	NA	<0.00004	<0.00005	<0.00004	<0.00003	<0.00004	<0.00003	<0.00004	<0.00004	<0.00003	<0.00007	<0.00011
2,3,4,7,8-PeCDF	0.5	<0.00007	NA	<0.00004	<0.00006	<0.00005	<0.00003	<0.00004	<0.00003	<0.00004	<0.00005	<0.00004	<0.00007	<0.00012
1,2,3,4,7,8-HxCDF	0.1	<0.00007	NA	<0.00004	<0.00003	<0.00003	<0.00002	<0.00003	<0.00002	<0.00003	<0.00003	<0.00004	<0.00006	<0.00007
1,2,3,6,7,8-HxCDF	0.1	<0.00006	NA	<0.00004	<0.00003	<0.00002	<0.00002	<0.00002	<0.00002	<0.00003	<0.00002	<0.00003	<0.00005	<0.00007
2,3,4,6,7,8-HxCDF	0.1	<0.00008	NA	<0.00005	<0.00004	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00003	<0.00004	<0.00006	<0.00008
1,2,3,7,8,9-HxCDF	0.1	<0.00008	NA	<0.00005	<0.00004	<0.00003	<0.00003	<0.00003	<0.00003	<0.00004	<0.00003	<0.00004	<0.00007	<0.00009
1,2,3,4,6,7,8-HpCDF	0.01	<0.00009	NA	<0.00006	<0.00020	<0.00004	<0.00006	<0.00006	<0.00007	<0.00007	<0.00019	<0.00009	<0.00011	<0.00014
1,2,3,4,7,8,9-HpCDF	0.01	<0.00012	NA	<0.00008	<0.00028	<0.00005	<0.00008	<0.00009	<0.00009	<0.00010	<0.00026	<0.00013	<0.00014	<0.000018
OCDF	0.0001	**0.0389 J**	NA	<0.00009	<0.00010	<0.00009	<0.00011	**0.00064 J**	<0.00005	<0.00015	<0.00013	<0.00010	**0.0062 J**	**0.00354 J**
2,3,7,8-TCDD Equivilance	0.0007	**0.00048059 J**	NA	**0.00000232 J**	**0.000000978 J**	BDL	**0.0000038 J**	**0.000000064 J**	**0.00000147 J**	**0.00008063 J**	**0.00002609 J**	**0.0000013 J**	**0.00000324 J**	**0.000001834 J**

Notes:
Only analytes detected at or above laboratory method detec
Dioxin results in ng/L or parts per trillion, all other results in u
<=Analyte was not detected above laboratory detection limit
Bold Text=Analyte detected above laboratory method detec
Shaded Text=Exceedence of TOGS 1.1.1 guidance values
BDL=Below laboratory method detection limit
ND=Not Detected
B=Indicates a value greater than or equal to the instrument
J=Estimated result, result is less than the reporting limit
NA=not analyzed due to laboratory accident
* Applies to the sum of all phenolic compounds
(F) - Represents the groundwater was a filtered sample

Table 8
Biota Analytical Results
Camp Georgetown

Sample Location		**DS-1**	**DS-2**	**DS-3**	**DS-4**	**DS-5**	**DS-6**	**DS-7**	**DS-8**	**DS-9**	**DS-10**	**DS-11**
Sample Species		Brook Trout	Black-Nose Dace	Brook Trout	Brook Trout	Brook Trout	Brook Trout	Sculpin	Brook Trout	Brook Trout	Creek Chub	White Sucker
Individual Fish/Composite		Individual Fish	Composite	Individual Fish	Individual Fish	Individual Fish	Individual Fish	Composite	Composite	Composite	Composite	Composite
Number of Fish in Composite		NA	30	NA	NA	NA	NA	34	4	3	11	9
Sample Length (mm)		255	45-73	224	213	244	242	42-81	456	427	1389	2013
Sample Weight (g)		168	66	94	90	138	120	126	58	77	195	254
Analyte	**TEFs**											
Dioxins (pg/g or ppt)												
Total TCDF	-	<0.08	<0.11	<0.11	<0.10	<0.10	<0.09	<0.06	<0.10	<0.08	<0.09	<0.07
Total PeCDF	-	<0.12	<0.19	<0.14	<0.14	<0.11	<0.14	<0.11	<0.13	<0.14	<0.13	<0.09
Total HxCDF	-	<0.07	<0.17	<0.12	**7.17**	**2.15**	<0.13	<0.11	<0.11	<0.11	<0.05	**1.61 J**
Total HpCDF	-	<0.14	<1.42	<1.91	<1.29	<0.10	<1.6	<0.36	**3.05**	<0.32	<0.32	<1.09
Total TCDD	-	<0.12	<0.011	<0.08	<0.9	<0.21	<0.07	<0.09	<0.11	<0.08	<0.10	<0.11
Total PeCDD	-	**1.43 J**	<0.14	<0.17	<0.17	<0.13	<0.17	<0.18	<0.16	<0.12	<0.17	<0.11
Total HxCDD	-	<0.18	<0.16	<0.12	**7.04**	**6.12**	<0.15	<0.12	<0.12	<0.14	<0.06	**1.61 J**
Total HpCDD	-	<0.10	<0.36	<0.24	<0.7	<0.37	<0.12	<0.18	<0.30	<0.14	<0.11	<0.16
2,3,7,8-TCDD	1	<0.12	<0.11	<0.08	<0.09	<0.13	<0.07	<0.09	<0.11	<0.08	<0.10	<0.11
1,2,3,7,8-PeCDD	0.5	<0.18	<0.14	<0.17	<0.17	<0.16	<0.17	<0.18	<0.16	<0.12	<0.17	<0.11
1,2,3,4,7,8-HxCDD	0.1	<0.11	<0.19	<0.15	<0.19	<0.18	<0.19	<0.15	<0.14	<0.18	<0.09	<0.14
1,2,3,6,7,8-HxCDD	0.1	<0.07	<0.14	<0.11	**7.17**	**2.15**	<0.14	<0.11	<0.10	<0.13	<0.05	<0.08
1,2,3,7,8,9-HxCDD	0.1	<0.07	<0.15	<0.11	<0.14	<0.13	<0.14	<0.11	<0.11	<0.13	<0.06	<0.09
1,2,3,4,6,7,8-HpCDD	0.01	<0.10	<0.36	<0.24	<0.17	<0.37	<0.12	<0.18	**3.05**	<0.14	<0.11	**1.61 J**
OCDD	0.0001	**15.0**	<0.83	**3.16**	**7.94**	**2.49**	**1.81**	<0.96	**9.20**	**1.61**	**3.09 J**	**1.35**
2,3,7,8-TCDF	0.1	<0.08	<0.11	<0.11	<0.10	<0.10	<0.09	<0.06	<0.10	<0.08	<0.09	<0.07
1,2,3,7,8-PeCDF	0.05	<0.12	<0.18	<0.13	<0.14	<0.11	<0.14	<0.11	<0.13	<0.14	<0.12	<0.08
2,3,4,7,8-PeCDF	0.5	<0.12	<0.19	<0.14	<0.14	<0.12	<0.15	<0.11	<0.14	<0.15	<0.13	<0.09
1,2,3,4,7,8-HxCDF	0.1	<0.07	<0.16	<0.12	<0.11	<0.10	<0.12	<0.11	<0.11	<0.10	<0.05	<0.07
1,2,3,6,7,8-HxCDF	0.1	**1.43 J**	<0.15	<0.10	**7.04**	**6.12**	<0.11	<0.10	<0.10	<0.09	<0.04	**1.61 J**
1,2,3,7,8,9-HXxCDF	0.1	<0.07	<0.18	<0.13	<0.12	<0.11	<0.13	<0.12	<0.12	<0.11	<0.05	<0.07
2,3,4,6,7,8-HxCDF	0.1	<0.08	<0.19	<0.14	<0.13	<0.12	<0.14	<0.12	<0.13	<0.12	<0.05	<0.07
1,2,3,4,6,7,8-HpCDF	0.01	<1.01	<1.26	<1.70	<1.15	<0.19	<1.42	<0.32	<0.57	<0.29	<0.28	<0.94
1,2,3,4,7,8,9-HpCDF	0.01	<1.38	<1.62	<2.18	<1.48	<0.24	<1.82	<0.41	<0.73	<0.37	<0.38	<1.29
OCDF	0.0001	<0.19	<0.64	<0.45	<0.49	<0.42	<0.40	<0.34	<0.33	<0.22	<0.16	**2.08 J**
2,3,7,8- TCDD Equivalence	3.0*	**0.158**	BDL	**0.0316**	**0.784**	**0.852**	**0.0181**	BDL	**0.0397**	**0.0161**	**0.00309**	**0.193**

Dioxin Data Qualifiers:
All results in pg/g or ppt
Concentrations represent wet weight concentrations
J=Estimated result, result is less than the reporting limit
BDL= Below Laboratory Method Detection Limit
DS-1 through DS-11 were collected downstream of the site
US-1 through US-11 were collected upstream of the site
NA = Not applicable
Shaded = Sample possessed a 2,3,7,8-TCDD equivalence concentration greater than guidance value.
*2,3,7,8 TCDD Equivalence compared to NYSDEC's Division of Fish, Wildlife and Marine Resources Technical Guidance for Screening Contaminated based on the Niagara River Biota Contamination Project (1987).

Table 8
Biota Analytical Results
Camp Georgetown

Sample Location		**US-1**	**US-2**	**US-3**	**US-4**	**US-5**	**US-6**	**US-7**	**US-8**	**US-9**	**US-10**	**US-11**
Sample Species		Brook Trout	Brook Trout	Brook Trout	Brook Trout	Brook Trout	Brook Trout	Brook Trout	Creek Chub	White Sucker	White Sucker	Black-Nose Dace
Individual Fish/Composite		Individual Fish	Individual Fish	Individual Fish	Individual Fish	Individual Fish	Composite	Composite	Composite	Composite	Composite	Composite
Number of Fish in Composite		NA	NA	NA	NA	NA	3	4	3	6	70	83
Sample Length (mm)		215	215	197	179	192	418	490	382	852	28-99	28-69
Sample Weight (g)		92	80	68	57	55	72	73	73	161	229	123
Analyte	**TEFs**											
Dioxins (ng/L or ppt)												
Total TCDF	-	<0.08	<0.05	<0.05	<0.04	<0.05	<0.06	<0.07	<0.08	<0.07	<0.05	<0.07
Total PeCDF	-	<0.11	<0.06	<0.06	<0.09	<0.10	<0.08	<0.09	<0.07	<0.07	<0.04	<0.06
Total HxCDF	-	<0.31	<0.07	**2.55 J**	<0.06	<0.06	<0.08	<0.06	**3.65 J**	<0.06	**0.904 J**	<0.07
Total HpCDF	-	**1.22**	<0.53	<0.11	**6.47 J**	<0.54	<0.24	**1.69 J**	<0.39	**0.140 J**	**0.434 J**	<0.57
Total TCDD	-	<0.06	<0.05	**1.62 J**	<0.44	<0.05	<0.07	<0.08	<0.11	<0.12	<0.06	<0.06
Total PeCDD	-	<0.10	<0.07	<0.08	<0.06	<0.08	<0.09	**0.16**	<0.14	<0.16	<0.05	<0.09
Total HxCDD	-	**4.55**	<0.09	<0.07	**1.56 J**	<0.07	**2.95**	<0.08	<0.09	<0.10	<0.04	<0.09
Total HpCDD	-	<0.18	<0.14	<0.13	<0.15	<0.12	<0.04	<0.15	<0.12	<0.15	<0.05	<0.14
2,3,7,8-TCDD	1	<0.06	<0.05	<0.06	<0.06	<0.05	<0.07	<0.08	<0.11	<0.12	<0.06	<0.06
1,2,3,7,8-PeCDD	0.5	<0.10	<0.07	<0.08	<0.07	<0.08	<0.09	<0.14	<0.14	<0.16	<0.05	<0.09
1,2,3,4,7,8-HxCDD	0.1	<0.10	<0.11	<0.08	<0.10	<0.09	<0.12	<0.11	<0.13	<0.14	<0.06	<0.11
1,2,3,6,7,8-HxCDD	0.1	<0.07	<0.08	**2.55 J**	<0.07	<0.06	<0.09	<0.06	<0.08	<0.09	**0.390 J**	<0.08
1,2,3,7,8,9-HxCDD	0.1	<0.08	<0.08	<0.06	<0.08	<0.07	<0.09	<0.07	**0.365 J**	<0.09	**0.514 J**	<0.09
1,2,3,4,6,7,8-HpCDD	0.01	**1.22**	<0.14	<0.13	**6.47 J**	<0.12	<0.14	<0.15	<0.12	**0.140 J**	**0.434 J**	<0.14
OCDD	0.0001	**7.35**	<0.32	<0.00023	**0.968 J**	<0.43	<0.31	**1.69 J**	<0.11	**0.852 J**	**2.73 J**	**2.36 J**
2,3,7,8-TCDF	0.1	<0.08	<0.05	**1.62 J**	<0.04	<0.05	<0.06	<0.07	<0.08	<0.07	<0.05	<0.07
1,2,3,7,8-PeCDF	0.05	<0.11	<0.06	<0.06	<0.09	<0.09	<0.08	<0.08	<0.06	<0.07	<0.04	<0.06
2,3,4,7,8-PeCDF	0.5	<0.11	<0.06	<0.06	<0.10	<0.10	<0.08	<0.09	<0.07	<0.07	<0.05	<0.06
1,2,3,4,7,8-HxCDF	0.1	<0.30	<0.07	<0.05	<0.06	<0.06	<0.07	<0.06	<0.\06	<0.06	<0.03	<0.07
1,2,3,6,7,8-HxCDF	0.1	**4.55**	<0.06	<0.05	**1.56 J**	<0.06	**2.95**	**1.01**	<0.05	<0.05	<0.02	<0.06
1,2,3,7,8,9-HXxCDF	0.1	<0.33	<0.08	<0.06	<0.06	<0.07	<0.08	<0.07	<0.07	<0.06	<0.03	<0.07
2,3,4,6,7,8-HxCDF	0.1	<0.36	<0.08	<0.06	<0.07	<0.07	<0.09	**0.16000**	<0.07	<0.06	<0.03	<0.08
1,2,3,4,6,7,8-HpCDF	0.01	<0.219	<0.47	<0.10	<0.39	<0.48	<0.21	<0.21	<0.34	<0.13	<0.04	<0.51
1,2,3,4,7,8,9-HpCDF	0.01	<2.82	<0.61	<0.13	<0.50	<0.61	<0.27	<0.29	<0.46	<0.18	<0.05	<0.65
OCDF	0.0001	**1.94**	<0.33	<0.19	<0.20	<0.33	<0.31	**9.79 J**	<0.13	<0.18	**1.6 J**	<0.30
2,3,7,8- TCDD Equivalence	3.0	**0.476**	BDL	**0.0417**	**0.158**	BDL	**0.295**	**0.120**	**0.0365**	**0.00225**	**0.0992**	**0.00236**

Dioxin Data Qualifiers:
All results in ng/L or ppt
Concentrations represent wet weight concentrations
J=Estimated result, result is less than the reporting limit
BDL= Below Laboratory Method Detection Limit
DS-1 through DS-11 were collected downstream of the site
US-1 through US-11 were collected upstream of the site
NA = Not applicable
Shaded = Sample possessed a 2,3,7,8-TCDD equivalence concentration greater than the 0.0003 ppb guidance value.

Table 9 - Identification of Contaminants of Potential Concern				
Camp Georgetown, Georgetown, New York				
Chemical of Potential Concern	CASRN [1]	Concentration [2] in Surface Soil	Concentration [2] in Subsurface Soil	Concentration [2] in Groundwater
Pentachlorophenol	87-86-5	130 ppm [3]	135 ppm	1700 ppb
2,3,7,8-TCDD equivalent	NA [4]	3.8222 ppb [5]	2.4951 ppb	1.6694 ppt [6]
Fuel Oil	NA	NA	NA	810 ppb
Copper	7440-50-8	59.5 ppm	32.4 ppm	0.111 ppm
Chromium	NA	171 ppm	68.1 ppm	0.155 ppm
Arsenic	7440-38-2	104 ppm	33 ppm	0.0124 ppm

NOTES
1 Chemical Abstracts Service Registry Number
2 Maximum detected concentration at the Site
3 ppm = Parts per Million (equivalent to mg/kg soil or mg/L water)
4 NA = Not Applicable
5 ppb = Parts per Billion (equivalent to ug/kg soil or ug/L water)
6 ppt = Parts per Trillion (equivalent to ng/kg soil or ng/L water)

Table 10 - Standards, Criteria and Guidelines Evaluation				
Camp Georgetown, Georgetown, New York				
Requirements/Criteria	**Citation**	**Description**	**Evaluation**	**Evaluation Comment**
FEDERAL				
Resource Conservation and Recovery Act (RCRA)	**40 U.S.C. 6901-6987**			
Identification and Listing of Hazardous Wastes	40 CFR Part 261-265	Outlines criteria determining whether solid waste is a hazardous waste after generation and is subject to regulation under 40 CFR Parts 260-266. Does not address cleanup action levels.	Applicable to removed media only.	These regulations would only apply to media removed from the site as part of a remedial action.
Land Disposal Restrictions	40 CFR Part 268	Established constituent-specific standards to which hazardous wastes must be treated prior to land disposal. Only applies to newly generated solid wastes.	Applicable to removed media only.	These requirements would be applicable to media removed from the site which are determined to be hazardous wastes that are land disposed off site as part of a remedial action.
Clean Air Act (CAA)	**42 U.S.C. 7401-7642**			
National Primary and Secondary Ambient Air Quality Standards	40 CFR Part 50	Establishes ambient air quality standards for protection of public health.	Applicable.	NAAQS may be applicable in evaluating whether there are air impacts at a site prior to remediation, or during long-term remediation programs. Due to the site conditions, air emissions would not be a significant issue.
Clean Water Act (CWA)	**33 U.S.C. 251-1376**			
Ambient Ground Water Quality Criteria Guidelines	40 CFR Part 141	Establishes maximum contaminant levels (MCLs) for treatment of groundwater for public potable water supplies.	Not Applicable.	Camp Georgetown is an active incarceration facility that uses an unimpacted bedrock aquifer as a public potable water supply.

Table 10 - Standards, Criteria and Guidelines Evaluation				
Camp Georgetown, Georgetown, New York				
Requirements/Criteria	**Citation**	**Description**	**Evaluation**	**Evaluation Comment**
Safe Drinking Water Act (SDWA)	**40 U.S.C.300**			
National Primary Drinking Water Standards	40 CFR Part 141	Establishes maximum contaminant levels or MCLs, which are health-based standards for public water systems.	Not Applicable.	Water will not be discharged directly to any potable water source. Camp Georgetown is an active incarceration facility that uses an unimpacted bedrock aquifer as a public potable water supply.
National Secondary Drinking Water Standards	40 CFR Part 132	Non-enforceable health goals for public water systems that relate to aesthetic quality.	Not Applicable.	Water will not be discharged directly to any potable water source. Camp Georgetown is an active incarceration facility that uses an unimpacted bedrock aquifer as a public potable water supply.
STATE				
New York State Environmental Conservation Law	**Chapter 10 Articles 15, 17**			
New York State Pollution Discharge Elimination System	15 NYCRR 750-758	Defines permitting requirements for discharges.	Relevant and Appropriate.	The regulations would be applicable only for alternatives that include discharge to surface water.
Ambient Water Quality Standards and Guidance Values	6 NYCRR 700-705	Establishes quality standards for groundwater and incorporates federal MCLs and standards from other state regulations.	Applicable.	The regulations would be applicable only for alternatives that include discharge to surface water and groundwater.
Ambient Water Quality Standards and Guidance Values	TOGS 1.1.1	Establishes quality standards for groundwater in New York State and incorporates federal MCLs.	Applicable.	The regulations would be applicable only for alternatives that include discharge to surface water and groundwater.
Technical Guidance for Screening Contaminated Sediments		Describes the methodology used by the Division of Fish and Wildlife and the Division of Marine Resources for establishing criteria for the purpose of identifying contaminated sediments.	Not Applicable.	Relevant for sedimentation control.

Table 10 - Standards, Criteria and Guidelines Evaluation				
Camp Georgetown, Georgetown, New York				
Requirements/Criteria	**Citation**	**Description**	**Evaluation**	**Evaluation Comment**
Groundwater Effluent Standards	6 NYCRR 700-705	Establishes effluent standards and/or limitations for discharges to groundwater.	Applicable.	The regulations would be applicable only for alternatives that include discharge to surface water and groundwater.
New York State Environmental Conservation Law	**Article 27**			
Determination of Soil Clean-Up Objectives and Clean-Up Levels	TAGM HWR-94-4046	Establishes general clean-up goals for environmental media.	Applicable.	Widely used as a guidance document for calculating soil cleanup levels.
Identification and Listing of Hazardous Wastes	6 NYCRR 371	Outlines criteria determining whether solid waste is a hazardous waste and is subject to regulation under 6 NYCRR Parts 370-376.	Applicable.	Applies to material generated from the site for off-site disposal and determined to be hazardous waste.
Solid Waste Management	6 NYCRR 360	Includes solid waste disposal requirements.	Applicable.	These regulations would only be applicable to the off site disposal of non-hazardous waste.
New York State Environmental Conservation Law	**Article 19**			
New York State Air Guide 1	6 NYCRR 750-758	Provides guidance for permitting emissions from new or existing sources.	Applicable but not relevant.	No air emissions are being considered.
Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites	TAGM HWR 89-4031	Provides guidance for fugitive dust suppression and particulate monitoring at inactive hazardous waste sites.	Relevant and appropriate.	This guidance provides a basis for developing and implementing a fugitive dust suppression and particulate monitoring program as an element of a hazardous waste site's health and safety program.

Table 11 - Remedial Action Objectives for Soil			
Camp Georgetown, Georgetown, New York			
Chemical of Potential Concern	SCGs/ARARs		Qualitative Remedial Action Objectives
	TAGM 4046 [1] Generic Soil Cleanup Values	TAGM 4046 Soil Cleanup Values for Groundwater Protection	
Pentachlorophenol	1 ppm [2] or MDL [3]	1 ppm	Eliminate or reduce to the extent practicable: 1. Exposures of persons at or around the Site to PCP and dioxin in soils; 2. Environmental exposures of flora or fauna to PCP and dioxin in soils; 3. The release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and 4. The release of contaminants from soil into surface water, indoor air, ambient air, through storm water erosion, soil vapor, or wind borne dust.
2,3,7,8 TCDD equivalent	NA [4]	1 ppb [5,6]	
Fuel Oil	NV [7]	NV	
Copper	25 ppm or SB [8]	NA	
Chromium	10 ppm or SB	NA	
Arsenic	7.5 ppm or SB	NA	

NOTES

1 Division Technical and Administrative Guidance Memorandum (TAGM) 4046: Determination of Soil Cleanup Objectives and Cleanup Levels (1994)
2 ppm = parts per million (equivalent to milligrams per kilogram)
3 MDL = Method Detection Limit
4 NA = Not Available
5 ppb = parts per billion (equivalent to micrograms per kilogram)
6 TAGM 4046 does not include a soil cleanup objective for dioxins and furans, but a value of 1 ppb has been used as a cleanup goal at hazardous waste sites and this value has been adopted as a screening concentration for Camp Georgetown.
7 NV = No value is listed in TAGM 4046 for this COPC
8 SB = Site Background

Table 12 - Technology Evaluation Summary for Soil						
Camp Georgetown, Georgetown, New York						
General Response Actions	**Remedial Technology Type**	**Process Options**	**Effectiveness**	**Implementability**	**Cost**	**Retained**
No Action	None	Not Applicable	Does not achieve remedial action objectives	Readily implementable	Negligible	Yes
Limited Action	Monitored Natural Attenuation	Monitored Natural Attenuation	Effective, dependent on contaminant behavior	Easily implementable	High maintenance	Yes
	Institutional and/or Engineering Controls	Access Restrictions	Depends upon continued future implementation	Readily implementable	Negligible	Yes
		Notice of Covenant on Deed Transfers	Depends upon continued future implementation	Appropriate legal actions required	Negligible	Yes
		Zoning Restrictions	Depends upon continued future implementation	Approval of local government required	Negligible	Yes
Containment	Surface Controls	Diversion Channels, Revegetation, Grading	Effective in preventing erosion	Implementable	Low capital and maintenance	Yes
	Capping	Permeable Soil Cover	Not effective in containing VOCs and SVOCs	Implementable, restricts future land use	Moderate capital and maintenance	No
		Low Permeability Soil Cover	Effective, susceptible to cracking	Implementable, restricts future land use	Moderate capital and maintenance	Yes
		Asphalt / Concrete Cap	Effective, susceptible to cracking	Implementable, restricts future land use	Moderate capital and maintenance	No
		Multi Layered Cap	Effective	Implementable, restricts future land use	High capital and maintenance	Yes
Removal	Shallow Excavation	Not Braced	Effective in reducing on-site volume and toxicity	Implementable	Moderate capital	Yes
	Deep Excavation	Engineering Controls Employed Above Water Table	Effective in reducing on-site volume and toxicity, however, mobility may be increased during implementation of deeper excavations	Implementable, dependent on subsurface characteristics	Moderate to high capital	Yes
		Engineering Controls Employed Below Water Table	Effective in reducing on-site volume and toxicity, however, mobility may be increased during implementation of deeper excavations	Implementable, dependent on subsurface characteristics	High capital	Yes

Table 12 - Technology Evaluation Summary for Soil						
Camp Georgetown, Georgetown, New York						
General Response Actions	Remedial Technology Type	Process Options	Effectiveness	Implementability	Cost	Retained
Disposal	Disposal	On-site Disposal	Effective in reducing contaminant mobility	Requires construction and maintenance of a containment cell, which may limit site use	Moderate capital and high maintenance	Yes
		Off-site Disposal	Effective in reducing contaminant mobility	Implementable	Moderate capital	Yes
In-situ Treatment	In-situ Biological Treatment	Enhanced Biodegradation	No data available showing effectiveness of HRC in treating dioxins	Implementable	Moderate capital and low maintenance	No
	In-situ Physical / Chemical Treatment	Stabilization	Lack of overall demonstrated effectiveness in treating organic constituents	Implementable, dense soils hinder process	Moderate capital and low maintenance	No
		Vitrification	Effective; innovative technology	Implementation requires intensive site preparation, special equipment, and significant electrical supplies	High capital and low maintenance	No
	In-situ Thermal Treatment	Thermal Desorption	Effective; innovative technology	Requires off-gas treatment; dense soils and separate areas of impact hinder implementation	High capital and low maintenance; sole vendor leads to non-competitive pricing; implementation issues increase costs	No
Ex-situ Treatment (assuming excavation)	Ex-situ Biological Treatment	Bioremediation	Effective	Requires large area of land for an extended period of time	Moderate capital and high maintenance	No
	Ex-situ Physical / Chemical Treatment	Stabilization	Effective in reducing inorganic contaminant mobility; treatment of organics is innovative	Implementable	Moderate capital and low maintenance	No
		Dechlorination	More toxic forms of dioxin may be generated	Implementable	High capital and low maintenance	No
		Soil Washing	Lack of overall demonstrated effectiveness	Implementable, produces large volumes of washwater and requires extensive equipment and off-gas treatment	High capital and low maintenance	No
	Ex-situ Thermal Treatment	Thermal Desorption	Effective in treating organic compounds	Requires off-gas treatment; dense soils hinder process; power soure required	High capital and low maintenance	No

FIGURES

APPENDIX A

QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

APPENDIX A

QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT for the CAMP GEORGETOWN SITE GEORGETOWN, NEW YORK

DEC Site No. 7-27-010

April 8, 2003

Prepared for:
New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233-7015

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1.0 BACKGROUND

Exposure assessment is the process of identifying potential current and future receptors, and characterizing the nature of their contact with a chemical. A qualitative exposure assessment was performed for the Camp Georgetown site to determine potential exposure pathways associated with current site conditions and to evaluate their potential significance.

A qualitative exposure assessment results in the creation of site-specific exposure profiles that provide the narrative description of the mechanisms by which exposure to contaminants may occur at the site. Chemical, physical, and toxicological parameters for the chemicals of potential concern are also identified and taken into account when developing the exposure profiles. The potential significance of the identified exposures is evaluated in a qualitative manner.

2.0 EXPOSURE SETTING

The exposure setting was evaluated with respect to both current and future land uses of the site and surrounding area to aid in the identification of potential receptors, exposure points and exposure pathways.

Camp Georgetown is a large complex of NYSDEC crew headquarters and an active NYDCS incarceration facility, situated in Georgetown, Madison County, New York. The surrounding area is rural, generally consisting of farmland and undeveloped forest. The area of concern occupies approximately 6.6 acres, and includes the former pole treatment plant, former above ground storage tank (AST) location, and former outdoor staging areas for treated lumber.

3.0 IDENTIFICATION OF EXPOSURE PATHWAYS

For identified receptors to be exposed to a chemical of potential concern at the site, an exposure pathway must be established leading from the source to the receptor. The exposure pathway is the route that the chemical takes from the source of the material to the receptor of concern. An exposure pathway has five elements:

- a contaminant source
- contaminant release and transport mechanisms
- a point of exposure
- a route of exposure
- a potential receptor

An exposure pathway is complete when all five elements of an exposure pathway are documented; a potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway is not documented, but is likely. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future.

3.1 Source of Contamination

Between 1970 and 1983, pentachlorophenol (PCP) was the principle chemical biocide used in treating lumber at Camp Georgetown. During the treatment process, poles were placed in the dip tanks, which were then filled with a mixture of PCP and No. 2 fuel oil. After treatment, poles were hoisted from the tank and allowed to drip over the tank for a period of time, and then moved to the drip pad. Poles were finally moved to a designated "treated material storage area". Use of PCP was discontinued in 1983; the treatment plant then operated using a chromated copper arsenate (CCA) process until 1991. The CCA solution was comprised of chromic acid, arsenic pentoxide, cupric oxide, and water. This process was more controlled than the PCP process, involving the soaking of lumber in the CCA solution under pressure. The solution was pumped out and the lumber allowed to dry in the vessel, and then moved to the drip pad. At that time, runoff from the drip pad was collected and reused. As a result of these wood treatment operations, sources of contamination exist at the site and are associated with historical releases of wood treatment products (PCP, CCA, and fuel oil) to site soils.

3.2 Fate and Transport

Contaminant release and transport mechanisms carry contaminants from the source to points where individuals may be exposed. Chemical migration between media such as soil and groundwater is influenced by chemicals parameters such as water solubility or molecular size or shape, in addition to the chemical and physical characteristics particular to a site's media. This section discusses information about the fate and transport of the source chemicals present at the site.

Pentachlorophenol

Pentachlorophenol is a moderately acidic substance, and thus its fate is strongly influenced by pH. At a neutral pH it is almost completely found in the ionized form, the pentachlorophenate anion, which is much more mobile than PCP (ATSDR, 2000). PCP has a low water solubility and a strong tendency to adsorb onto soil or sediment particles in the environment. Adsorption to soils and sediments is dependent on pH and organic content. Adsorption at a given pH increases with increasing organic content of soil or sediment. No adsorption occurs at pH values above 6.8 (ATSDR, 2000; Howard, 1991). It is expected that soils in this area are acidic (less than 7.0) based on soil type (no pH data is available) and soils are low in organic content, (TOC is 7.06% in SED-2) therefore, some adsorption is likely to occur, but it may be limited.

The ionized form of pentachlorophenol may be rapidly photolyzed by sunlight; PCP may also undergo biodegradation by microorganisms, animals, and plants although degradation is generally slow (Howard, 1991). Given that at expected pH conditions a portion of PCP will be present in the ionized form, photolysis may be an important degradation pathway at this site in shallow soils.

PCP has an octanol-water partition coefficient (Kow) of 100,000 (Howard, 1991), which indicates that it is lipid-soluble and therefore has a tendency to bioaccumulate in organisms. Bioaccumulation is largely pH-dependent, with considerable variation among species. Bioconcentration factors (BCFs) for PCP in aquatic organisms are generally under 1,000, but some studies have reported BCFs up to 10,000. BCFs, however, for earthworms in soil were 3.4-13 (ATSDR, 2000). Significant biomagnification of PCP in either terrestrial or aquatic foodchains, however, has not been demonstrated (ATSDR, 2000).

Pentachlorophenol products often contain chlorophenols, dioxins, and furans. Once released to the environment, these compounds are persistent and generally adsorb to soil or sediment particles, due to their low water solubilities. Adsorption is generally the predominate fate process affecting these chemicals, with the potential for adsorption related to the organic carbon content. CDDs and CDFs may undergo degradation through biological action or by photolysis, with a half-life ranging from weeks to months. Photolysis and hydrolysis are generally not significant processes, however, as these compounds persist in the adsorbed phase (USEPA, 2002).

Due to their high adsorption rate, CDDs are not expected to leach from soil, although some leaching of disassociated forms of the compound may occur, especially at lower pHs (USEPA, 2002). Since pH of site soils are not known but are not expected to be highly acidic leaching of CDDs and CDFs is unlikely. Migration of CDD-contaminated soil may occur through erosion and surface runoff. Upon reaching surface waters, additional adsorption may occur due to the typically higher levels of organic matter content of sediments as compared to surface soils (ATSDR 2000). Volatilization from either subsurface soil or water is not expected to be a major transport pathway, although it may occur from surface soils (ATSDR, 2000). As with PCP and other lipophilic pesticides, CDDs and CDFs tend to bioaccumulate in exposed organisms, with BCFs for aquatic organisms ranging from 5,000 to 10,000 (Montgomery, 1996). Uptake from soil by plants can occur, although it is limited by the strong adsorption of these compounds to soils. BCFs in plants have been measured to be 0.0002, with most accumulation occurring in the roots with little translocated to the foliage (ATSDR, 2000). Terrestrial organisms may accumulate CDDs and CDFs as a result of direct ingestion and contact with soils.

At the Georgetown site, PCP is expected to be adsorbed to soil organic matter content, although limited leaching may occur due to the expected pH (slightly acidic) and low organic matter content in site soils (TOC 7.06% in SED-2) Some photolysis of PCP from surface soils can be expected. Uptake of PCP from soil by plants or terrestrial organisms may occur, but biomagnification is not expected. CDDs and CDFs are expected to be strongly sorbed to soil, as well as persistent. Leaching of these compounds is likely to be limited. Accumulation of these compounds in plants as a result of root uptake is unlikely to be significant.

Fuel Oil

At the site, PCP was mixed with No. 2 fuel oil for wood treatment application. Fuel oils are mixtures of numerous aliphatic and aromatic hydrocarbons. Individual components of fuel oil include n-alkanes, branched alkanes, benzene and alkylbenzenes, naphthalenes, and PAHs (ATSDR, 2000). Primary constituents identified in soil and/or groundwater at the site are PAHs. Soil adsorption, volatilization to air, and leaching potential depend on a PAH's individual chemical characteristics; however, as a class of compounds, they are generally insoluble in water, with a strong tendency to bind to soil or sediment particles. Some of the lighter-weight PAHs (such as naphthalene, acenaphthene, and phenanthrene) may volatilize from soil or groundwater into the air. Degradation may occur through photolysis, oxidation, biological action, and other mechanisms. Microbial degradation appears to be a major degradation pathway in soil (ATSDR, 2000).

As nonpolar, organic compounds, PAHs may be accumulated in aquatic organisms from water, soil, sediments, and food. BCFs vary among PAHs and receptor species, but in general, bioconcentration is greater for the higher molecular weight compounds than for the lower molecular weight compounds (ATSDR, 2000). BCFs for accumulation of PAHs by plants from soil are low, with values of 0.001 to 0.18 reported for total PAHs (ATSDR, 2000). Accumulation of PAHs from soil by terrestrial organisms is also limited, with BCF values for voles of 12 reported for phenanthrene and 31 for acenapthene.

At this site, PAHs, the primary fuel oil constituents of interest, are expected to be adsorbed to soil, with limited potential for leaching. Microbial degradation may occur, with other degradation processes less important in soil. Uptake of PAHs from soil by terrestrial organisms or plants may occur, but bioconcentration is expected to be limited.

Chromated Copper Arsenate

CCA is a preservative that was used at Camp Georgetown and was reportedly comprised of 23.75% chronic acid, 17% arsenic pentoxide, 9.25% copric oxide and 50% water.

CCA is not a volatile substance; however, as it is water-based, it readily enters the soil. Metals such as arsenic, copper, and chromium are known to be persistent and mobile in soil and water, and leaching is a significant migration pathway, especially in acid conditions. These metals, however, tend to bind to soil and/or sediment particles in an insoluble form; therefore, any leaching usually results in transportation over only short distances in soil (ATSDR, 2000). Soil analytical results show that most metals concentrations at the site are within the normal range of background levels, with the exception of arsenic, chromium, copper, lead, and zinc. Elevated concentrations of these metals are generally limited to the former treatment areas.

A fraction of the more soluble forms of metals in the environment may be taken up by plants and animals (ATSDR, 2000; Howard, 1991). Terrestrial plants may bioaccumulate metals through root uptake or by absorption of airborne metals which may be deposited on the leaves. None of these metals have shown the potential for significant biomagnification through the food chain (ATSDR, 2000).

3.3 Points of Exposure

The exposure point is a location where actual or potential human contact with a contaminated medium may occur. Analytical results for samples collected at Camp Georgetown indicate that soil and groundwater have been impacted by numerous contaminants, including the following:

- PCP;

- Polychlorinated dioxins (CDDs) and dibenzofurans (CDFs);
- Polycyclic aromatic hydrocarbons (PAHs); and
- Metals, including arsenic, chromium, copper, lead, and zinc.

Analytical results from samples collected across the site indicate that contaminants have been identified in surficial soil (i.e., 0-2 inches below grade). The highest soil and groundwater concentrations of dioxins and metals were found in samples collected by the former treatment building.

3.4 Potential Receptors and Exposure Routes

Exposure assessment includes a description of the potentially exposed persons who live, work, play, visit, or otherwise come to the site or surrounding environment. Consideration is given to the characteristics of the current populations (including sensitive subpopulations) as well as those of any potential future populations that may be exposed under any reasonable foreseeable future site activities and uses.

Camp Georgetown is currently used as a NYSDEC maintenance facility and as a NYSDCS correctional facility, located in a heavily wooded, rural area. Inmates at Camp Georgetown occasionally visit the impacted area, although the prison is located across the street. There are currently no deed restrictions on the property that would restrict future land use. Therefore, the following receptors have been identified for the site under current and reasonable foreseeable future land use scenarios:

Current Use
- Adult inmates and staff at Camp Georgetown (infrequent);

Future Use
- NYSDEC workers performing maintenance and/or operation activities;
- Construction workers performing excavation activities

The route of exposure is the manner in which a contaminant actually enters or contacts the body (i.e., ingestion, inhalation, dermal absorption). Based on the nature of the chemicals of potential concern, the types of media impacted at the site, and land use scenarios, the following exposure routes were identified:

- Direct contact with exposed surficial soil. Exposure routes include incidental ingestion of, dermal contact with, and inhalation of volatile or particulate-bound contaminants.

- Direct contact with groundwater used as a future drinking water source. Routes of exposure include ingestion, dermal contact, and inhalation of volatiles. Currently, groundwater in the impacted areas is not used as a drinking water source. Several drinking water wells are located north of Crumb Hill road, and one well is on Ridge Road; each is upgradient of the site. Past analyses have not demonstrated any site-associated impacts in these wells.

There is some potential for the uptake of site contaminants (PCP, dioxins, and PAHs) by terrestrial organisms that may then be consumed as game species. Terrestrial game likely to be hunted in this area would include species such as white-tailed deer and turkey. Both species consume vegetation; additionally, turkeys are opportunistic feeders that will also include invertebrates to their diet. As discussed above, uptake by plants from soil is not expected to result in significant bioaccumulation in plants. In addition, the area of impact is small relative to the expected home range of these two species. White-tailed deer have a home range of 120 to 400 acres (Burnett et al. 2002), while turkey can have a home range of 1000 acres or more (North Caroline State University 1995). Any contribution of site-related contaminants to the body burden of these species is, therefore, expected to be insignificant.

4.0 CONCLUSIONS

Complete exposure pathways have been identified for potential current and future human receptors based on exposure to contaminated soil, groundwater, and sediment.

Under current conditions, prison inmates, NYSDEC and NYSDCS staff may visit impacted areas of Camp Georgetown, although infrequently. The most heavily contaminated areas are in the vicinity of the former treatment shed; however, residual low-level contamination may be found at various points throughout the site in surficial soil. In comparison to NYSDEC soil standards (NYSDEC, 1995), concentrations of PCP under the building and in the drip pad area are above the Soil Cleanup Objective to Protect Groundwater Quality (1 mg/kg), but only one sample had a concentration above the concentration to protect human health (20 mg/kg), as recommended by NYSDOH. Boring GB-9 taken in the drip pad area during the Preliminary Investigation contained concentrations of 30 mg/kg PCP in a sample taken from 0-6 feet below grade. Concentrations of dioxins are below the applicable standards with exception of surficial samples SS-5 and SS-8, both located by the treatment shed, and two seep areas. Concentrations of most metals are consistent with background concentrations. Sampling points with metals concentrations exceeding both background and soil standards are located in former treatment areas. Most detectable concentrations of PAHs at levels exceeding soil standards are likewise co-located in the treatment area.

Given the limited potential for exposure and the relatively small size of the areas where concentrations exceed standards, potential site exposures are unlikely to pose a significant risk to human health under current use. In addition, the soil standards are based on long-term exposure on a frequent basis. Actual exposures at this site are very infrequent, and not likely to occur over an extended period of time. Site concentrations may pose a significant risk in the future if site use were to change, resulting in increased exposure to the area of concern.

While groundwater concentrations of PCP and CDDs and CDFs at the site exceed groundwater standards for the protection of human health, these standards are based on drinking water exposures. Analyses of private wells in the area, as well as the NYSDEC well, have shown no evidence of site-related impacts. Therefore, site groundwater does not currently pose a significant risk to human health. Site groundwater concentrations may pose a significant risk in the future if shallow groundwater at the site were to be used for drinking water purposes.

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APPENDIX B

FISH AND WILDLIFE IMPACT ASSESSMENT
STEP I and STEP IIA

APPENDIX B

FISH AND WILDLIFE IMPACT ANALYSIS
STEP I and STEP IIA
CAMP GEORGETOWN
GEORGETOWN, NEW YORK

DEC Site No. 7-27-010

April 8, 2003

Prepared for:
New York State Department of Environmental Conservation
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APPENDIX

1.0 INTRODUCTION

This report presents the fish and wildlife impact analysis (FWIA) completed for the Camp Georgetown site located in Georgetown, New York (**Figure 1**). This FWIA identifies resource areas and associated fish and wildlife at, and within, the vicinity of the site, and potential site-related impact to these resources. The FWIA consists of the following steps:

- **Step I**: Site Description
- **Step IIA**: Pathway Analysis

This FWIA was prepared in conformance with the New York Department of Environmental Conservation (NYSDEC) document titled *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites* (NYSDEC, October 1994a). Step I of the FWIA describes the site's physical characteristics, identifies the fish and wildlife resources in the vicinity of the site that could be affected by site-related chemicals, and identifies any evidence of stress that could be related to chemical migration through the environment.

Step IIA of the FWIA is a Contaminant-Specific Impact Assessment that evaluates potential exposure pathways for fish and wildlife resources. This step involves reviewing data concerning existing fish, wildlife, and natural communities on-site, the physical characteristics of the site, and the type and extent of chemical impacts documented at the site. Based on this review, potential affected wildlife receptors and complete pathways of exposure are identified.

2.0 SITE DESCRIPTION

Camp Georgetown is a large complex of NYSDEC crew headquarters and a New York State Department of Correctional Services (NYSDCS) active incarceration facility, located in a New York State Reforestation Area known as Proposal D. The incarceration facility is operated by NYSDCS, but is located on property managed by NYSDEC. NYSDCS occupies the property north of Crumb Hill Road and NYSDEC occupies the property south of Crumb Hill Road. The areas of concern occupy approximately 6.6 acres south of Crumb Hill Road. The areas of concern include the former treatment plant, former aboveground storage tank (AST) location, and outdoor staging areas once used for treated lumber.

Site soils predominantly consist of dispersed pockets of fill overlying a tan silty till that overlies a gray, tight clayey till.

3.0 SITE MAPS

The site location is shown in **Figure 1**. Several streams and wetland areas were identified as significant resource areas present within a 2-mile radius of the site. These include the following:

- Mann Brook and associated tributaries; located on the western border of the site
- Muller Brook; located approximately 1.75 miles to the northeast of the site
- Bucks Brook; headwaters originate from a freshwater wetland approximately 1 mile south of the site
- Ashbell Brook; located approximately 2 miles southwest of the site
- A freshwater wetland; located approximately 2 miles west-northwest of the site

Figure 2 depicts the natural covertypes encountered within a 0.5 mile radius of the subject site. This figure was based on information collected during a site walk-over and area drive-by conducted on January 23, 2002, in addition to review of United States Geological Survey (U.S.G.S.) aerial photographs and topographic maps. Descriptions of each covertype are provided in **Section 4.0** of this report.

A site drainage map that shows site topography and direction of surface water drainage is provided as **Figure 3**. Approximately one-third of the property is developed, consisting of a paved driveway, several storage sheds, and two permanent buildings situated on cleared and maintained land. Impervious areas are limited to the footprint of each building and the driveway, and in total occupy a relatively small percentage of the total area of the site. There are no known catch basins located on-site; however, there is one drainage ditch located along the northern boundary of the site by Ridge Road. There are several small seeps located in the wooded slope on the southwestern side of the site. Topography tends toward the southwest and southeast, with surface runoff from precipitation and seeps discharging to Mann Brook.

Surface water from the site drains into Mann Brook, which is located on the southwestern border of the site. Mann Brook converges with the Otselic River approximately 3 miles southeast of the site, eventually discharging to the Susquehanna River.

4.0 DESCRIPTION OF FISH AND WILDLIFE RESOURCES

A site reconnaissance was conducted on January 23, 2002. At the time of the site visit, approximately 1.5 feet of snowpack existed on the ground, and most flora were dormant or under snow. Likewise, fauna present at the site were limited to species typically active in the area during winter. Conclusions about the fish and wildlife resources present at the site throughout the year were therefore based on visual observations, habitat conditions, and information on species anticipated to be present during other times of the year.

The site and surrounding area can be best described as a mature and eroded plateau divided by deep ravines. Most of the area is covered by upland forest consisting of mixed evergreen and deciduous species. The subject site itself is a NYSDEC reforestation area, and there are extensive red pine plantings across the property. Much of the land in the surrounding area remains as undeveloped forest, although a portion is also used for agricultural and residential purposes.

Covertypes were classified according to the system developed by the New York Natural Heritage Program system, described in Edinger et al. (2002). Major systems present at and near the site include terrestrial and riverine communities.

As shown on **Figure 2**, the following major subsystems associated with the site and immediate surrounding area have been identified:

- Terrestrial Cultural
- Open Upland
- Forested Upland
- Riverine

Descriptions of each subsystem are provided below.

Terrestrial Cultural: Terrestrial cultural systems are habitats that have either been created or modified by human activities such that the physical and/or biological composition of the community has been significantly altered from the community as it existed prior to human influence (Edinger et al., 2002). Such changes are evident at the Camp Georgetown complex. Currently, the site is partially developed, with several buildings and sheds and a paved driveway located on the site. Additionally, a large mowed lawn is maintained on the property.

A portion of the Camp Georgetown complex is maintained as a reforestation area managed by

NYSDEC; much of the cleared land has since been planted with red pine (*Pinus resinosa*). This pine plantation mostly consists of mature, 60-80 foot trees which provide about 90% canopy cover, although a small percentage of pine seedlings, briars, and several types of young deciduous trees (such as beech (*Fagus grandifolia*)) comprise the understory.

Open Upland: successional old field borders the western side of the driveway, with vegetative growth consisting of grasses and other pioneer woody and non-woody herbaceous species. Although snow covered this area at the time of the site visit, dormant flora noted included goldenrod (*Solidago* spp.), Queen Anne's Lace (*Daucus corota*), briars, beech, quaking aspen (*Populus tremuloides*), honey locust (*Gleditsia triacanthos*), and yellow birch (*Betula alleghaniensis*) saplings.

Three large hawks (species unidentified) and the common crow (*Corvus brachyrhyncos*) were observed flying across the field. A small nest indicative of some type of small songbird, such as a field sparrow, was also observed in the brush. Other bird species anticipated to thrive in this type of community would include birds of prey, songbirds, ruffed grouse, bluebirds, and wild turkey.

Coyote tracks were observed in the snow, although overt evidence of other mammals was not present. Mammals characteristic of old field communities may include rodents (such as field mice, voles, chipmunks and rats), rabbits, woodchucks, and fox. White-tailed deer may also browse on vegetation in this habitat.

Forested Upland generally has greater than 60% canopy cover. On the western side of the red pine plantation, topography slopes steeply down to Mann Brook. This narrow band is covered by a mixed spruce-northern hardwood forest, including tree species such as red spruce (*Picea rubens*), hemlock (*Tsuga canadensis*), pine (*Pinus* sp.), oak (*Quercus* sp.), and beech. Plants characteristic of undergrowth in this habitat may include various fern and moss species, bluebead lily (*Clintonia borealis*), bunchberry (*Cornus canadensis*), Canada mayflower (*Maianthemum canadense*), and wild sarsaparilla (*Aralia nudicaulis*).

Birds anticipated to frequent this habitat include woodpeckers (pileated, downy), songbirds, blue jays, gray jays, chickadees, and turkey. Mammalian species may include river otter, mink, white-tailed deer, fox, black bear, red or grey squirrels, and raccoon. Potential amphibians and reptiles may include various species of snakes, newts, frogs, and toads.

Riverine: Mann Brook is a first-order natural stream that abuts the western portion of the site. Headwaters originate approximately 1 mile north of the site. It is a relatively narrow, shallow,

perennial stream with a moderate flow rate in the sections adjacent to the site. The stream substrate could potentially support rock bottom specialists such as caddisfly, stonefly, mayfly, dragonfly, blackfly, and midge larvae, and crayfish. Fish species likely to frequent these waterbodies include brook trout, dace and sculpin. Within pools and along banks, various amphibians such as green frog and salamander may be found, in addition to some emergent or floating plant species. According to a letter from the NYSDEC NHP addressed to J. Santacroce dated February 26, 2002, there is no data indicating that the sites or the immediate vicinity of the site, are known habitats for rare species (**Appendix A**).

5.0 EVIDENCE OF ENVIRONMENTAL IMPACTS

As previously mentioned, the NYSDCS established a conservation/correction camp at Georgetown in 1961. One of the work projects at Camp Georgetown was the operation of a wood treatment facility and sawmill that provided lumber for NYSDEC construction and maintenance projects. Untreated poles would first be stored in a drying shed, then later moved into the treatment building. Poles would be placed in the bottom of a dip tank, which would be filled with a treatment solution.

Between 1970 and 1983, pentachlorophenol (PCP) was the principle chemical biocide used in treating lumber at Camp Georgetown. During the treatment process, PCP and No. 2 fuel oil were combined in the dip tanks. Use of PCP was discontinued in 1983; the treatment plant then operated using a chromated copper arsenate (CCA) process until 1991. The CCA solution was comprised of chromic acid, arsenic pentoxide, cupric oxide, and water.

As a result of past practices soil and groundwater at the site have been impacted by numerous contaminants, including the following:

- Pentachlorophenol;
- Polychlorinated dioxins and dibenzofurans;
- Polycyclic aromatic hydrocarbons; and
- Metals, including arsenic, chromium, copper, lead, and zinc.

Analytical results from samples collected across the site indicate that contaminants have been identified in surficial soil (i.e., 0-2 feet below grade). The highest soil concentrations of dioxins and metals were found in samples collected by the former treatment building (**Figure 3**). Additionally, contaminants have also been detected in groundwater.

As vegetation at the site was dormant and covered with snow at the time of the site visit, it was difficult to determine whether signs of physical stress were apparent. Vegetative growth in undisturbed or revegetated areas appeared to be varied and dense, and the presence of wildlife species representative of various trophic levels indicated that overall community structure is likely complete. However, it was uncertain whether population-level effects were present due to surficial soil and stream impacts.

6.0 VALUE OF FISH AND WILDLIFE RESOURCES

A variety of covertypes at and surrounding the site provide significant habitat for fish and wildlife species. Developed land at the site contributes only a relatively small percentage to total land coverage, and the contiguous nature of undeveloped land allows an unbroken wildlife corridor with the surrounding area. Overall, the area provides significant foraging, resting, roosting, and breeding cover for wildlife. Chemical impact from past releases has been identified in a relatively small area of the subject site, and is most likely not a limiting factor to overall community structure. Few species were observed during the site visit; however, this is likely due to winter conditions and human presence rather than chemical impact. Based on the general appearance of the various types of habitat, there is no reason to believe that wildlife density or diversity would be significantly impaired.

With regard to the site's resource value to humans, the area itself may provide the opportunity for recreational uses. Given the rural setting, it is anticipated that outdoor recreational activities such as hunting or fishing may take place in the areas surrounding the site, as the area would adequately support viable populations of game species such as deer or turkey. Likewise, Mann Brook and its receiving waters are fishable, and may provide important spawning habitat for recreational fish species. The area may also provide the opportunity for wildlife observation.

7.0 IDENTIFICATION OF APPLICABLE FISH AND WILDLIFE REGULATORY CRITERIA

Contaminant-specific and site-specific criteria were identified, based on resource areas present at the site and in the surrounding area. These criteria need to be considered prior to and during any potential site remediation.

7.1 Contaminant-Specific Criteria

The State of New York has developed water quality criteria based on the classification of surface water and groundwater and the type of exposure. These values also vary by water classification and exposure type. Water in Mann Brook and its receiving waterbodies has been classified as Class A, suitable for drinking, culinary or food processing purposes; primary and secondary contact recreation; fishing; and fish propagation and survival, or consumption (6 NYCRR Part 701). Groundwater at the site is classified as GA, which means that groundwater is a source of fresh, potable water. Specific criteria for biological, physical, and chemical parameters have been promulgated for such waters (6 NYCRR Part 703).

Chemical-specific sediment criteria have also been established by NYSDEC for non-polar, organic compounds and select metals. An exceedance of any of these criteria may indicate potential adverse effects to aquatic ecosystems. These criteria are provided in NYSDEC, 1994b.

7.2 Site-specific Criteria

Mann Brook and Otselic River are considered “waters of the United States” and therefore are regulated at the federal level under Sections 401 and 404 of the Clean Water Act (33 U.S.C. 1344) and at the state level under 6 NYCRR Part 608.7. NYSDEC is responsible for issuing Section 401 Water Quality Certification for any activities requiring a federal license or permit to discharge fill into a water of the United States. Under Section 404, a permit is required from the U.S. Army Corp of Engineers to discharge dredged or fill material into a water of the United States.

New York State passed the Freshwater Wetlands Act with the intent to preserve, protect and conserve freshwater wetlands and their benefits. Certain activities that could have an adverse impact on wetlands are regulated; a permit is required prior to conducting any regulated activity in a protected wetland or its adjacent area. As wetlands located in the vicinity of the site are not associated with Mann Brook, they would not be impacted by site-associated releases.

Section 7 of the federal Endangered Species Act directs federal agencies to determine if any action they authorize, fund, or conduct may affect listed species or critical habitat. According to a letter from the NYSDEC NHP addressed to J. Santacroce dated February 26, 2002, there is no data indicating that the sites or the immediate vicinity of the site, are known habitats for rare species (**Appendix A**).

8.0 STEP IIA: CONTAMINANT-SPECIFIC IMPACT ASSESSMENT

Step IIA of the FWIA is a Contaminant-Specific Impact Assessment that evaluates potential exposure pathways for fish and wildlife resources. This step involves reviewing data concerning existing fish, wildlife, and natural communities on-site, the physical characteristics of the site, and the type and extent of chemical impacts documented at the site. Based on this review, potential affected wildlife receptors and complete pathways of exposure are identified.

Pathways of chemical movement and exposure are determined based on information concerning sources, transport media, chemical-specific environmental fate, exposure points, routes of exposure, and potentially exposed populations. A complete exposure pathway consists of 1) a chemical release from a source, 2) an exposure point where contact with an organism can occur, and 3) a route of exposure (oral, dermal, and inhalation) through which the chemical can be taken into an organism.

8.1 Potential Receptors

As described in **Section 4.0**, the site is dominated by Forested Upland and successional Old Field, and supports a variety of common wildlife species. The adjacent Mann Brook may support a diverse assemblage of aquatic wildlife species. It can be assumed, therefore, that a variety of fish and wildlife (both resident and transient) have the potential to be present on, or adjacent to, the site. Potential environmental receptors at the site include plants, terrestrial wildlife, such as insects, birds, and mammals; and aquatic wildlife, such as benthic invertebrates and fish.

8.2 Chemical Migration

As discussed in **Section 5.0**, environmental sampling and analysis have determined that soil, sediment, and groundwater at the site have been impacted by past releases into the environment from wood processing and treatment practices. Chemicals of potential concern at the site include organic compounds such as PCP, chlorinated dioxins and dibenzofurans, and heavy metals such as arsenic, copper, chromium, lead, and zinc. There are impacts in surficial soil at the site, although the highest areas of contamination remain in the vicinity of the former treatment building. Impacted groundwater appears to be limited to the central and southern portions of the site.

Pentachlorophenol has a low water solubility and a strong tendency to adsorb onto soil or sediment particles in the environment. Adsorption to soils and sediments is highly pH-dependent, and is more likely to occur under acidic conditions than under neutral or basic conditions; no adsorption occurs above pH 6.8 (ATSDR 2000; Howard, 1991). Disassociated forms of pentachlorophenol may be rapidly photolyzed by sunlight; PCP may also undergo biodegradation by microorganisms, animals, and plants (Howard, 1991). PCP has an octanol-water partition coefficient (Kow) of 100,000 (Howard, 1991), which indicates that it is lipid-soluble and therefore has a tendency to bioaccumulate in organisms. Bioaccumulation is largely pH-dependent, with considerable variation among species. Bioconcentration factors (BCFs) for PCP are generally under 1,000, but some studies have reported BCFs up to 10,000. Significant biomagnification of PCP in either terrestrial or aquatic foodchains, however, has not been demonstrated (ATSDR, 2000).

Pentachlorophenol products often contain chlorophenols, dioxins, and furans. Once released to the environment, chlorinated dibenzo-p-dioxins (CDDs) and dibenzofurans (CDFs) adsorb to soil or sediment particles due to their low water solubilities. CDDs and CDFs may undergo degradation through biological action or by photolysis, with a half-life ranging from weeks to months. Photolysis and hydrolysis are generally not significant processes, however, as these compounds persist in the adsorbed phase (USEPA, 2002). Soil or sediment adsorption is highly dependent on pH (Howard, 1991). CDDs are not expected to leach from soil, but some leaching of disassociated forms of the compound may occur, especially at lower pHs (USEPA, 2002). Volatilization from either subsurface soil or water is not expected to be a major transport pathway (ATSDR, 2000). As with PCP and other lipophilic pesticides, CDDs and CDFs tend to bioaccumulate in exposed organisms, with BCFs reported up to approximately 10,000 (Montgomery, 1996). There is ambiguity, however, regarding potential biomagnification of these compounds through the food chain (Kamrin and Rodgers, 1985).

Metals such as arsenic, copper, and chromium are known to be persistent and mobile in soil and water. Heavy metals have also been found to move through the food chain and bioaccumulate in organisms at higher trophic levels (Howard, 1991; Merian, 1991).

Organic humus and soil cover may immobilize organic chemicals detected in subsurface media at the site, thereby limiting direct exposure to fish and wildlife. However, elevated chemical concentrations were found in surficial soils, making them potentially accessible to many species, especially those that either forage on the ground or burrow beneath the ground surface.

Drainage patterns at the site indicate that much of the surface flow moves toward to Mann Brook, which suggests that this waterbody may receive some surface water run-off and eroded material from impacted areas of the site following storm events. Sediment data from Mann Brook indicate that chemical migration into this waterbody has indeed occurred through overland flow.

Most of the site is well-vegetated by woody and herbaceous plant species. Vegetation on the site reduces (but does not eliminate) chemical migration via dust emissions, soil erosion, volatilization, and infiltrating precipitation. However, the vegetation can also take up certain compounds such as heavy metals that can then be passed on to wildlife that feed on the foliage and fruit of these plants. Since no sampling of plant tissue has been conducted, it is not known if any of the compounds documented in soil have been taken up by terrestrial or aquatic vegetation. Most of the metals documented on-site are known to be taken up by plants (Howard, 1989; Merian, 1991).

Likewise, the more lipophilic compounds like dioxins may be readily adsorbed by terrestrial or aquatic animals. Studies have demonstrated that tissue levels of TCDD, for example, are directly related to the organism's contact with soil; benthic-dwelling species, filter- or bottom-feeders, or species that live underground, burrow, or groom extensively generally will have the highest body burdens (Kamrin and Rodgers, 1988). Biota (trout) samples were collected from Mann Brook and analyzed for dioxins. Four (2 upstream and 2 downstream) samples out of 22 exceeded the 0.0003 ppb 2,3,7,8-TCDD equivalence concentration. Concentrations of the 22 samples collected ranged from below detection limits to 0.101 ppb.

8.3 Pathways of Chemical Movement and Exposure

Site conditions indicate that: 1) various species of fish and wildlife are likely to be present at and adjacent to the site; 2) compounds that are mobile, persistent, and have the potential to bioaccumulate have been documented on the site; and 3) these compounds exist at or near the surface of soil, and have the potential to be taken up by plants and animals. Therefore, the following pathways of chemical movement and exposure to fish and wildlife are considered possible:

- Dermal contact with chemicals present in the surface soil and groundwater;
- Ingestion of chemicals in surface soil, groundwater and food sources; and
- Direct uptake of chemicals in soil or groundwater by terrestrial and aquatic plants.

Future remedial activities could also result in chemical exposure to terrestrial organisms through the inhalation of volatiles from or direct contact with disturbed soil.

9.0 CONCLUSIONS

A Step I and Step IIA FWIA was prepared for the Camp Georgetown site. Camp Georgetown is a partially developed property located in a rural setting. Chemical impacts have been identified in soil, groundwater, and sediment. Various terrestrial and rivertine ecosystems are found at the site and within the surrounding area. Potential biological receptors include the fish and wildlife species indigenous to the area.

Given the nature of the chemicals present at the site (i.e., dioxins, phenols, PAHs, and heavy metals) and the distribution of impact, complete exposure pathways were identified for terrestrial and aquatic receptors. Based on visual field observations, there was no overt evidence of stressed vegetation, and community structure does not appear to be impaired. However, due to the limited observations that could be made during the site visit, it is inconclusive at this time whether significant ecological impact exists due to site-associated releases to the environment. Additional observation of terrestrial vegetation and wildlife conducted during the growing season are recommended.

10.0 REFERENCES

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Kamrin, M.A. and P.W. Rodgers. 1985. *Dioxins in the Environment*. Hemisphere Publishing Corporation, Washington.

Merian, E. 1991. *Metals and their Compounds in the Environment: Occurrence, Analysis and Biological Relevance.* VCH Verlagsgesellschaft mbH. Weinham, Federal Republic of Germany.

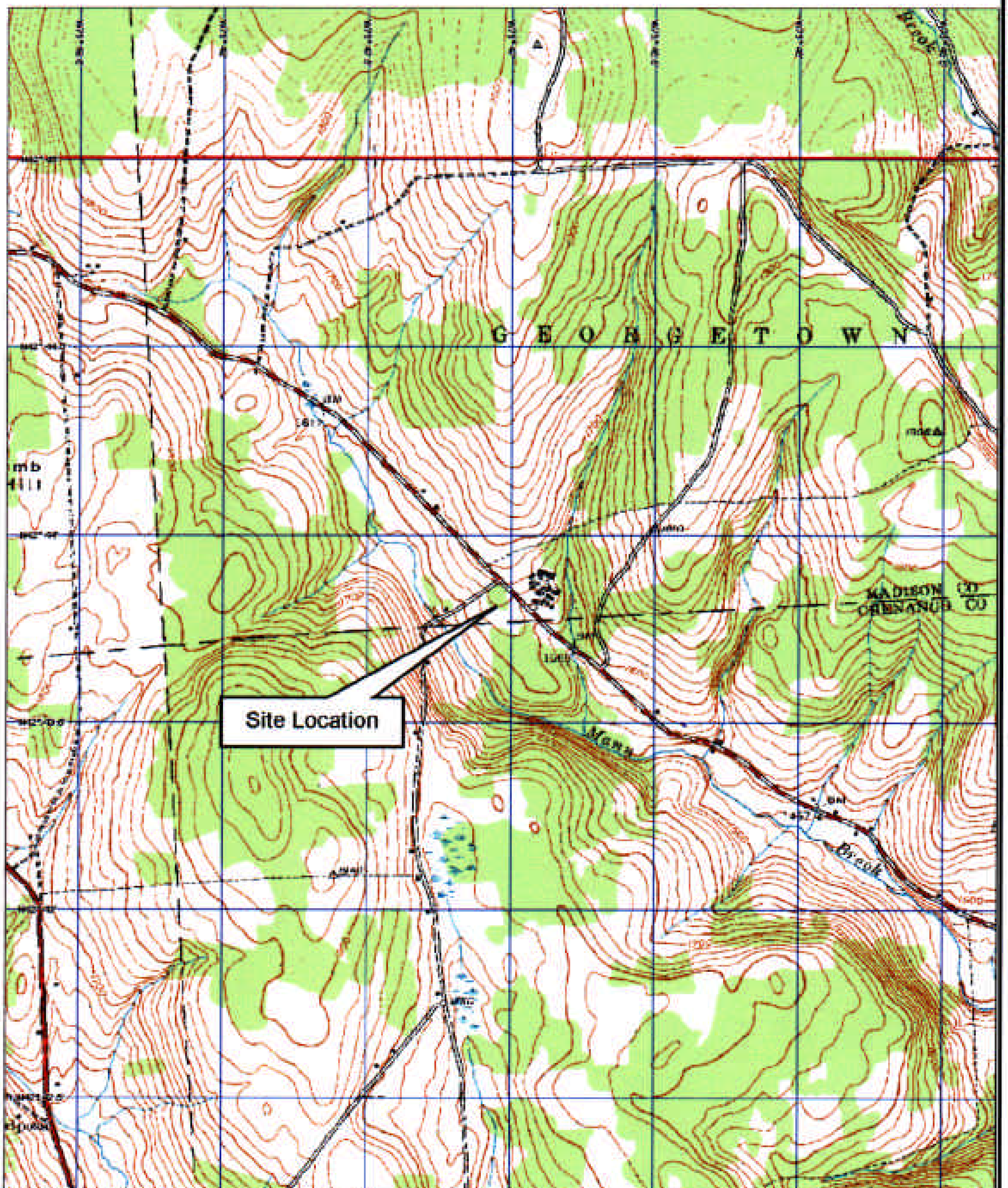
Montgomery, J.H. 1996. *Groundwater Chemicals Desk Reference, 2nd Edition.* Lewis Publishers, Boca Raton.

New York State Department of Environmental Conservation (NYSDEC). 1994a. *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites.* Division of Fish and Wildlife, Albany, NY.

New York State Department of Environmental Conservation (NYSDEC). 1994b. *Technical Guidance for Screening Contaminated Sediments.* Division of Fish and Wildlife, Division of Marine Resources, Albany, NY.

United States Environmental Protection Agency. 2002. Technical Drinking Water and Health Contaminant Specific Fact Sheets: Dioxin (2,3,7,8-TCDD). Office of Water online publication: http://www.epa.gov/OGWDW/dwh/t-soc/dioxin.html.

FIGURES



Scale: 1:24,000

Reference:
DeLorme 3-D Topo Quads, 1999
Yarmouth, Me.
Datum WGS84

Shaw Environmental, Inc.

NYSDEC

Figure 1
Site Location Map
Camp Georgetown

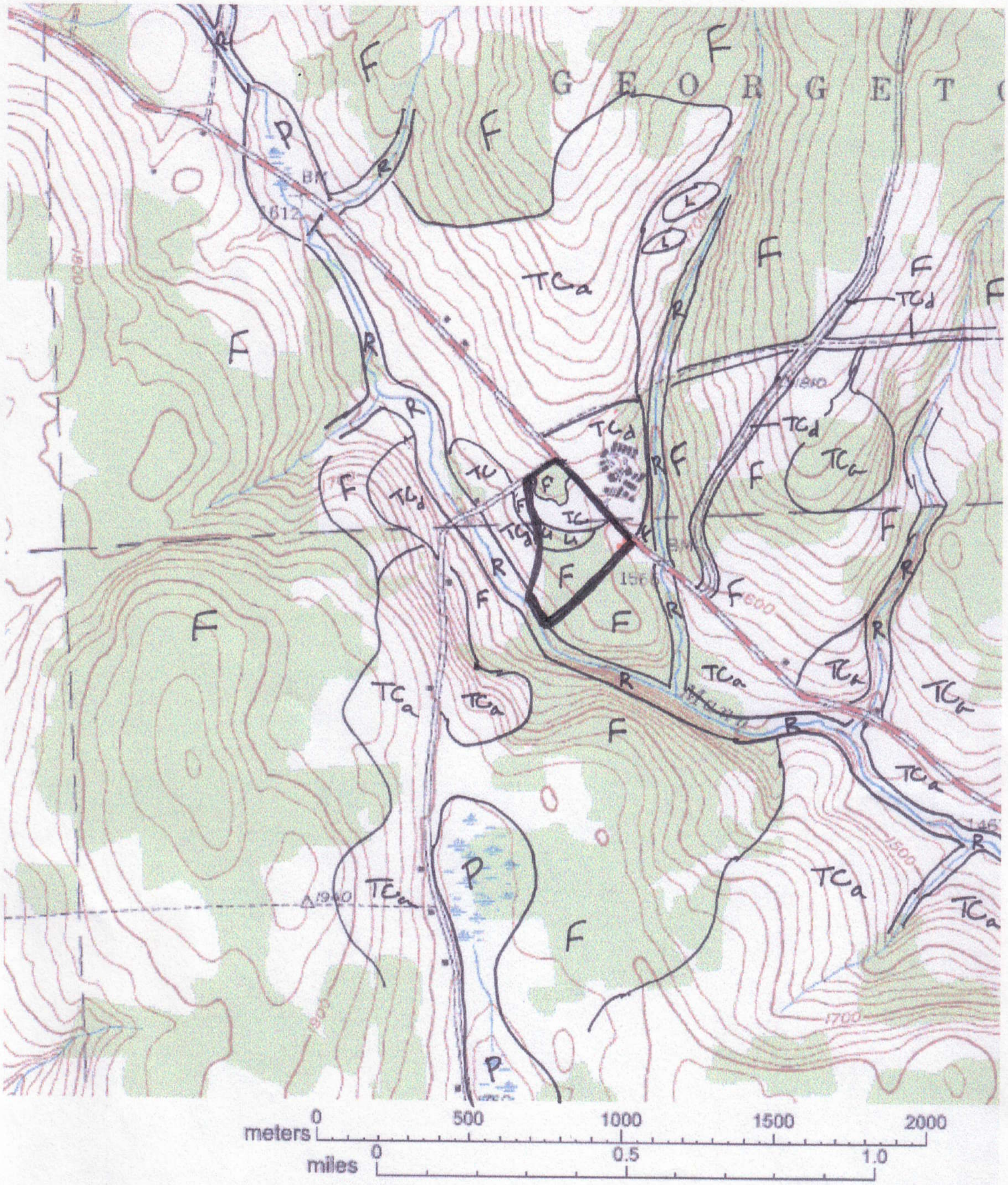


Figure 2: Covertype Map

Legend:

P	Palustrine	L	Lacustrine
R	Riverine	TCa	Terrestrial Cultural-agricultural
U	Open Upland	TCd	Terrestrial Cultural-developed
F	Forested Upland		

--------- Covertype boundary

--------- Site boundary

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DRAWN BY	S. SHKOLNIK 01-14-02
OFFICE	ALBANY, NY

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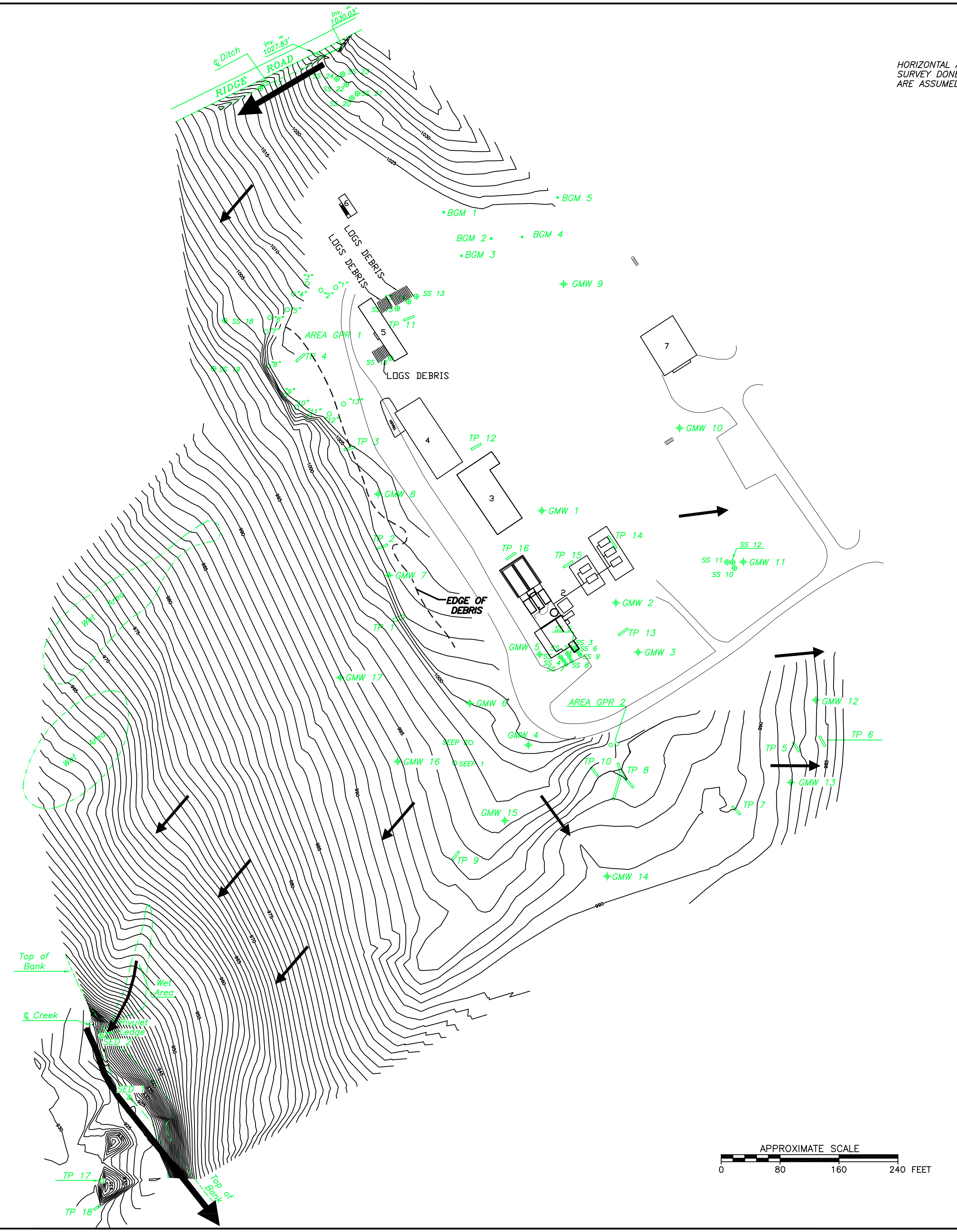

NOTE:

HORIZONTAL AND VERTICAL DATUMS ARE BASED ON A PREVIOUS SURVEY DONE BY MODI ENGINEERS AND LAND SURVEYORS, AND ARE ASSUMED.

LEGEND:

- SURFACE SOIL SAMPLES
- FLAGS IN GPR AREAS
- MONITORING WELL
- SEEP SAMPLES
- BGM 1 — SOIL CONTROL SAMPLES
- TEST PIT
- SED 1 — SEDIMENT SAMPLE
- CENTERLINE
- **DIRECTION OF OVERLAND FLOW / DRAINAGE**

TABLE OF ELEVATIONS FOR MONITORING WELLS

WELL NUMBER	ELEVATION AT WELL	ELEVATION ON GROUND
9	1018.41'	1018.16'
10	1001.12'	1000.91'
11	995.98'	993.42'
12	989.21'	986.13'
13	991.05'	988.07'
14	987.44'	990.82'
15	998.95'	997.41'
16	997.07'	993.80'
17	995.89'	992.84'

APPROXIMATE SCALE

0 80 160 240 FEET

REFERENCE:

BASE MAP SOURCE: SUSAN M. ANACKER
NY STATE LOCENSE #50321.

Shaw Environmental, Inc.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FIGURE 3
SITE INFORMATION MAP

CAMP GEORGETOWN
MADISON COUNTY, NEW YORK

APPENDIX A

National Heritage Letter

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, 5th floor, Albany, New York 12233-4757
Phone: (518) 402-8935 • **FAX:** (518) 402-8925
Website: www.dec.state.ny.us

RECEIVED
Route To: ____
FEB 2_
Proj: ____
File Order: ____

Erin M. Crotty
Commissioner

February 26, 2002

John Santacroce
The IT Group
13 British American Blvd
Latham, NY 12110-1405

Dear Mr. Santacroce:

In response to your recent request, we have reviewed the New York Natural Heritage Program databases with respect to the proposed Remedial Investigation and Feasibility Study for the Camp Georgetown Site, area as indicated on the map you provided, located in the Town of Georgetown, Madison County.

> We have no records of <u>known</u> occurrences of rare or state-listed animals or plants, significant natural communities, or other significant habitats, on or in the immediate vicinity of your site.

The absence of data does not necessarily mean that rare or endangered elements, natural communities or other significant habitats do not exist on or adjacent to the proposed site, but rather that our files currently do not contain any information which indicates the presence. For most sites, comprehensive field surveys have not been conducted. For these reasons, we cannot provide a definitive statement on the presence or absence of rare or state-listed species, or of significant natural communities. This information should not be substituted for on-site surveys that may be required for environmental assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

This response applies only to known occurrences of rare or state-listed animals and plants, signicant natural communities and other significant habitats maintained in the Natural Heritage Databases. Your project may require additional review or permits; for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, at the enclosed address.

Sincerely,

Heidi Krahling

Heidi J. Krahling, Information Services
NY Natural Heritage Program

Enc.
cc: Reg. 7, Wildlife Mgr.
Reg. 7, Fisheries Mgr.

APPENDIX C

REMEDIAL ALTERNATIVE COST ESTIMATES

COST ESTIMATE SUMMARY ALTERNATIVE 1 - NO ACTION					
Site: Camp Georgetown **Location:** Georgetown, NY **Phase: Feasibility Study (-30% - +50%)** **Date:** February, 2004	**Description:** No further action would be taken to address the presence of COPCs at the Site.				
DESCRIPTION	**QTY**	**UNIT**	**UNIT COST**	**TOTAL COST**	**NOTES**
CAPITAL COSTS (Year 0)					
Site Monitoring					
Groundwater Sampling Labor	40	HR	$65.00	$2,600	
Groundwater Sampling Equipment	1	LS	$400.00	$400	
Groundwater Laboratory Analysis	1	LS	$17,850.00	$17,850	
SUBTOTAL				$20,850	
Scope Contingency	10%			$2,085	
SUBTOTAL				$22,935	
Bid Contingency	5%			$1,043	
SUBTOTAL				$23,978	
Project Management	10%			$2,398	
TOTAL CAPITAL COST				**$26,375**	
O&M COSTS (Year 1-30)					
Site Monitoring					
Groundwater Sampling Labor	40	HR	$65.00	$2,600	annual groundwater monitoring was assumed for cost estimating purposes.
Groundwater Sampling Equipment	1	LS	$400.00	$400	
Groundwater Laboratory Analysis	1	LS	$17,850.00	$17,850	
TOTAL CAPITAL COST				$20,850	
Scope Contingency	10%			$2,085	
O&M COSTS (Year 1-30)				$22,935	
Bid Contingency	5%			$1,043	
SUBTOTAL				$23,978	
Project Management	5%			$1,199	
Technical Support	10%			$2,398	
TOTAL ANNUAL O&M COST				**$27,574**	
TOTAL O&M COST				**$827,224**	
Discount Factor	15.372				
PRESENT VALUE OF TOTAL O&M COST				**$423,882**	
GRAND TOTAL				**$450,257**	

COST ESTIMATE SUMMARY ALTERNATIVE 1 - NO ACTION	
Site: Camp Georgetown **Location:** Georgetown, NY **Phase: Feasibility Study (-30% - +50%)** **Date:** February, 2004	**Description:** No further action would be taken to address the presence of COPCs at the Site.

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude cost estimate that is expected to be within -30% to +50% of the actual project cost.

Discount Factor = $\frac{(1+i)^n - 1}{i\,(1+i)^n}$ where i = 5% and n = 30 years

A discount rate (i) of 5% was directed by the NYSDEC.

Sources / References:

A Guide to Developing and Documenting Cost Estimates During the Feasibility Study , USEPA, July 2000.
Building Construction Cost Data , RS Means, 2002.
Environmental Cost Data - Unit Price , RS Means, 2002.

COST ESTIMATE SUMMARY
ALTERNATIVE 2 - LIMITED ACTION

Site: Camp Georgetown
Location: Georgetown, NY
Phase: Feasibility Study (-30% - +50%)
Date: February, 2004

Description: Institutional and engineering controls would be used in conjunction with groundwater monitoring. A chain-link fence would be installed around the perimeter of the impacted area as a whole to impede direct contact with impacted media.

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST	NOTES
CAPITAL COSTS (Year 0)					
Site Monitoring					
Groundwater Sampling Labor	40	HR	$65.00	$2,600	
Groundwater Sampling Equipment	1	LS	$400.00	$400	
Groundwater Laboratory Analysis	1	LS	$17,850.00	$17,850	
SUBTOTAL				$20,850	
Scope Contingency	10%			$2,085	
Access Restrictions					
6' High Chain Link Fencing	2,120	LF	$19.74	$41,849	
Corner Posts	4	EA	$105.28	$422	
Gate	1	EA	$279.18	$280	
SUBTOTAL				$42,551	
Scope Contingency	10%			$4,255	
SUBTOTAL				$69,741	
Bid Contingency	5%			$3,170	
SUBTOTAL				$72,911	
Project Management	10%			$7,291	
Remedial Design	20%			$14,582	
Construction Management	15%			$10,937	
TOTAL CAPITAL COST				**$105,721**	
O&M COSTS (Year 1-30)					
Site Monitoring					
Groundwater Sampling Labor	40	HR	$65.00	$2,600	annual groundwater monitoring was assumed for cost estimating purposes.
Groundwater Sampling Equipment	1	LS	$400.00	$400	
Groundwater Laboratory Analysis	1	LS	$17,850.00	$17,850	
SUBTOTAL				$20,850	
Scope Contingency	10%			$2,085	
Site Maintenance					
Repairs to Fence	212	LF	$19.74	$4,185	10% of total perimeter
SUBTOTAL				$4,185	
Scope Contingency	10%			$418	
SUBTOTAL				$27,538	
Bid Contingency	5%			$1,252	
SUBTOTAL				$28,790	
Project Management	5%			$1,440	
Technical Support	10%			$2,879	

COST ESTIMATE SUMMARY ALTERNATIVE 2 - LIMITED ACTION					
Site: Camp Georgetown **Location:** Georgetown, NY **Phase**: Feasibility Study (-30% - +50%) **Date:** February, 2004	**Description:** Institutional and engineering controls would be used in conjunction with groundwater monitoring. A chain-link fence would be installed around the perimeter of the impacted area as a whole to impede direct contact with impacted media.				
DESCRIPTION	**QTY**	**UNIT**	**UNIT COST**	**TOTAL COST**	**NOTES**
TOTAL ANNUAL O&M COST				**$33,109**	
TOTAL O&M COST				**$993,259**	
Discount Factor	15.372				
PRESENT VALUE OF TOTAL O&M COST				**$508,961**	
GRAND TOTAL				**$614,682**	

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude cost estimate that is expected to be within -30% to +50% of the actual project cost.

Discount Factor = $\frac{(1+i)^n - 1}{i\,(1+i)^n}$ where i = 5% and n = 30 years

A discount rate (i) of 5% was directed by the NYSDEC.

Sources / References:

A Guide to Developing and Documenting Cost Estimates During the Feasibility Study , USEPA, July 2000.
Building Construction Cost Data , RS Means, 2002.
Environmental Cost Data - Unit Price , RS Means, 2002.

COST ESTIMATE SUMMARY
ALTERNATIVE 3 - EXCAVATION AND OFF-SITE DISPOSAL

Site: Camp Georgetown
Location: Georgetown, NY
Phase: Feasibility Study (-30% - +50%)
Date: February, 2004

Description: Soil impacts would be addressed via the excavation of approximately 7,530 cubic yards of soil. Excavated soils would be transported to a permitted off-site facility for treatment/disposal.

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST	NOTES
CAPITAL COSTS (Year 0)					
Mobilization/Demobilization					
Construction Equipment & Facilities	1	LS	$37,490.05	$37,491	represents 5% of construction costs, not including transport and disposal
Submittals/Implementation Plans	1	LS	$25,000.00	$25,000	
Temporary Facilities & Utilities	1	LS	$1,500.00	$1,500	
Post-Construction Submittals	1	LS	$25,000.00	$25,000	
SUBTOTAL				$88,991	
Scope Contingency	15%			$13,349	
Site Work					
Demolition of Treatment Building	4,600	SF	$4.23	$19,458	
Grading and Seeding	2,230	SY	$2.11	$4,706	
SUBTOTAL				$24,164	
Scope Contingency	15%			$3,625	
Excavation and Backfilling (assuming no sheeting, shoring, or bracing required)					
Erosion and Sediment Controls	2,280	LF	$3.16	$7,205	
Removal and Crushing of Slab	180	CY	$25.00	$4,500	
Excavation of Soil	7,530	CY	$12.00	$90,360	
Stabilization of Saturated Soil	2,280	TON	$8.46	$19,289	
Confirmatory Sidewall Samples	72	EA	$560.00	$40,320	
Backfilling w/ Clean Soil & Compaction	7,530	CY	$22.92	$172,588	
SUBTOTAL				$334,262	
Scope Contingency	55%			$183,844	
Dewatering of Excavation					
Trash Pump, 300 GPM	2	EA	$69.16	$139	
Frac Tank, Delivery and Pickup	3	EA	$912.00	$2,736	
Frac Tank, Rental	90	DAY	$30.00	$2,700	cost for 3 tanks for 30 days each
Transport & Disposal	1,115,060	GAL	$1.72	$1,917,904	providing no pretreatment required
SUBTOTAL				$1,923,479	
Scope Contingency	35%			$673,218	
Transport & Disposal of Excavated Soils - Hazardous Waste					
Testing of Excavated Fill Samples	630	EA	$560.00	$352,800	1 sample per 22 tons
Transport & Disposal	13,850	TON	$375.00	$5,193,750	providing no pretreatment required
SUBTOTAL				$5,546,550	
Scope Contingency	15%			$831,983	
Decontamination					
PPE	30	DAY	$100.00	$3,000	
Equipment	1	LS	$20,000.00	$20,000	
Stormwater Controls	1	LS	$10,000.00	$10,000	
SUBTOTAL				$33,000	
Scope Contingency	15%			$4,950	
SUBTOTAL				$9,661,414	
Bid Contingency	15%			$1,192,567	
SUBTOTAL				$10,853,980	
Project Management	5%			$542,699	
Remedial Design	6%			$651,239	
Construction Management	6%			$651,239	

COST ESTIMATE SUMMARY ALTERNATIVE 3 - EXCAVATION AND OFF-SITE DISPOSAL					
Site: Camp Georgetown **Location:** Georgetown, NY **Phase:** Feasibility Study (-30% - +50%) **Date:** February, 2004	**Description:** Soil impacts would be addressed via the excavation of approximately 7,530 cubic yards of soil. Excavated soils would be transported to a permitted off-site facility for treatment/disposal.				
DESCRIPTION	**QTY**	**UNIT**	**UNIT COST**	**TOTAL COST**	**NOTES**
Institutional Controls	1	LS	$2,000.00	$2,000	
TOTAL CAPITAL COST				**$12,701,157**	
O&M COSTS (Year 1-5)					
Site Monitoring					
Groundwater Sampling Labor	40	HR	$65.00	$2,600	annual groundwater monitoring was assumed for cost estimating purposes.
Groundwater Sampling Equipment	1	LS	$400.00	$400	
Groundwater Laboratory Analysis	1	LS	$17,850.00	$17,850	
SUBTOTAL				$20,850	
Scope Contingency	10%			$2,085	
SUBTOTAL				$22,935	
Bid Contingency	5%			$1,043	
SUBTOTAL				$23,978	
Project Management	5%			$1,199	
Technical Support	10%			$2,398	
TOTAL ANNUAL O&M COST				**$27,574**	
TOTAL O&M COST				**$137,871**	
Discount Factor	15.372				
PRESENT VALUE OF TOTAL O&M COST				**$423,882**	
GRAND TOTAL				**$13,125,039**	

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude cost estimate that is expected to be within -30% to +50% of the actual project cost.

Discount Factor = $\frac{(1+i)^n - 1}{i(1+i)^n}$ where i = 5% and n = 30 years

A discount rate (i) of 5% was directed by the NYSDEC.

Sources / References:

A Guide to Developing and Documenting Cost Estimates During the Feasibility Study , USEPA, July 2000.
Building Construction Cost Data , RS Means, 2002.
Environmental Cost Data - Unit Price , RS Means, 2002.

COST ESTIMATE SUMMARY
ALTERNATIVE 4A - EXCAVATION AND ON-SITE CONSOLIDATION WITH A MULTI LAYER GEOMEMBRANE CAP

Site: Camp Georgetown
Location: Georgetown, NY
Phase: Feasibility Study (-30% - +50%)
Date: February, 2004

Description: Soil impacts would be addressed through excavation and on-site consolidation. Areas A and F - J would be excavated and contained in an area of consolidation located over Areas B - E, which would remain in place.

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST	NOTES
CAPITAL COSTS (Year 0)					
Mobilization/Demobilization					
Construction Equipment & Facilities	1	LS	$19,783.00	$19,783	represents 5% of construction costs
Submittals/Implementation Plans	1	LS	$15,000.00	$15,000	
Temporary Facilities & Utilities	1	LS	$1,500.00	$1,500	
Post-Construction Submittals	1	LS	$10,000.00	$10,000	
SUBTOTAL				$46,283	
Scope Contingency	15%			$6,942	
Site Work					
Demolition of Treatment Building	4,600	SF	$4.23	$19,458	
Grading and Seeding	4,460	SY	$2.11	$9,411	
SUBTOTAL				$28,869	
Scope Contingency	15%			$4,330	
Excavation and Backfilling (assuming no sheeting, shoring, or bracing required), Areas A and F-J					
Erosion and Sediment Controls	1,850	LF	$3.16	$5,846	
Excavation of Soil	2,630	CY	$12.00	$31,560	
Stabilization of Saturated Soil	790	TON	$8.46	$6,684	
Placement of Soil in Area of Consolidation	3,160	CY	$3.97	$12,546	
Confirmatory Sidewall Samples	40	EA	$560.00	$22,400	
Backfilling w/ Clean Soil & Compaction	2,630	CY	$22.92	$60,280	
SUBTOTAL				$139,316	
Scope Contingency	55%			$76,624	
Dewatering of Excavation					
Trash Pump, 300 GPM	2	EA	$69.16	$139	
Frac Tank, Delivery and Pickup	3	EA	$912.00	$2,736	
Frac Tank, Rental	90	DAY	$30.00	$2,700	cost for 3 tanks for 30 days each
Transport & Disposal	318,610	GAL	$1.72	$548,010	providing no pretreatment required
SUBTOTAL				$553,585	
Scope Contingency	35%			$193,755	
Multi Layer Geomembrane Cap					
Vegetative Layer	610	CY	$42.98	$26,218	6 inches of topsoil
Drainage Layer	2,430	CY	$42.98	$104,442	24 inches of sand
High Density Polyethylene Liner	3,640	SY	$7.00	$25,480	40 mil
Geosynthetic Clay Liner	3,640	SY	$9.00	$32,760	
SUBTOTAL				$188,900	
Scope Contingency	20%			$37,780	
Decontamination					
PPE	30	DAY	$100.00	$3,000	
Equipment	1	LS	$20,000.00	$20,000	
Stormwater Controls	1	LS	$10,000.00	$10,000	
SUBTOTAL				$33,000	
Scope Contingency	15%			$4,950	
SUBTOTAL				$1,314,334	
Bid Contingency	15%			$148,493	
SUBTOTAL				$1,462,827	

COST ESTIMATE SUMMARY ALTERNATIVE 4A - EXCAVATION AND ON-SITE CONSOLIDATION WITH A MULTI LAYER GEOMEMBRANE CAP					
Site: Camp Georgetown **Location:** Georgetown, NY **Phase:** Feasibility Study (-30% - +50%) **Date:** February, 2004	**Description:** Soil impacts would be addressed through excavation and on-site consolidation. Areas A and F - J would be excavated and contained in an area of consolidation located over Areas B - E, which would remain in place.				
DESCRIPTION	**QTY**	**UNIT**	**UNIT COST**	**TOTAL COST**	**NOTES**
Project Management	6%			$87,770	
Remedial Design	12%			$175,539	
Construction Management	8%			$117,026	
Institutional Controls	1	LS	$2,000.00	$2,000	
TOTAL CAPITAL COST				**$1,845,162**	
O&M COSTS (Year 1-30)					
Site Monitoring					
Groundwater Sampling Labor	40	HR	$65.00	$2,600	annual groundwater monitoring was assumed for cost estimating purposes.
Groundwater Sampling Equipment	1	LS	$400.00	$400	
Groundwater Laboratory Analysis	1	LS	$17,850.00	$17,850	
SUBTOTAL				$20,850	
Scope Contingency	10%			$2,085	
Site Maintenance					
Maintenance of Cap	1	LS	$500.00	$500	
SUBTOTAL				$500	
Scope Contingency	10%			$50	
SUBTOTAL				$23,485	
Bid Contingency	5%			$1,068	
SUBTOTAL				$24,553	
Project Management	7%			$1,719	
Technical Support	10%			$2,455	
TOTAL ANNUAL O&M COST				**$28,726**	
TOTAL O&M COST				**$861,793**	
Discount Factor	15.372				
PRESENT VALUE OF TOTAL O&M COST				**$441,596**	
GRAND TOTAL				**$2,286,758**	

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude cost estimate that is expected to be within -30% to +50% of the actual project cost.

Discount Factor = $\frac{(1+i)^n - 1}{i(1+i)^n}$ where i = 5% and n = 30 years

A discount rate (i) of 5% was directed by the NYSDEC.

Sources / References:

A Guide to Developing and Documenting Cost Estimates During the Feasibility Study , USEPA, July 2000.
Building Construction Cost Data , RS Means, 2002.
Environmental Cost Data - Unit Price , RS Means, 2002.

COST ESTIMATE SUMMARY
ALTERNATIVE 4B - EXCAVATION AND ON-SITE CONSOLIDATION WITH A LOW PERMEABILITY COVER SYSTEM

Site: Camp Georgetown
Location: Georgetown, NY
Phase: Feasibility Study (-30% - +50%)
Date: February, 2004

Description: Soil impacts would be addressed through excavation and on-site consolidation. Areas A and F - J would be excavated and contained in an area of consolidation located over Areas B - E, which would remain in place.

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST	NOTES
CAPITAL COSTS (Year 0)					
Mobilization/Demobilization					
Construction Equipment & Facilities	1	LS	$20,982.40	$20,983	represents 5% of construction costs
Submittals/Implementation Plans	1	LS	$15,000.00	$15,000	
Temporary Facilities & Utilities	1	LS	$1,500.00	$1,500	
Post-Construction Submittals	1	LS	$10,000.00	$10,000	
SUBTOTAL				$47,483	
Scope Contingency	15%			$7,122	
Site Work					
Demolition of Treatment Building	4,600	SF	$4.23	$19,458	
Grading and Seeding	4,460	SY	$2.11	$9,411	
SUBTOTAL				$28,869	
Scope Contingency	15%			$4,330	
Excavation and Backfilling (assuming no sheeting, shoring, or bracing required), Areas A and F-J					
Erosion and Sediment Controls	1,850	LF	$3.16	$5,846	
Excavation of Soil	2,630	CY	$12.00	$31,560	
Stabilization of Saturated Soil	790	TON	$8.46	$6,684	
Placement of Soil in Area of Consolidation	3,160	CY	$3.97	$12,546	
Confirmatory Sidewall Samples	40	EA	$560.00	$22,400	
Backfilling w/ Clean Soil & Compaction	2,630	CY	$22.92	$60,280	
SUBTOTAL				$139,316	
Scope Contingency	55%			$76,624	
Dewatering of Excavation					
Trash Pump, 300 GPM	2	EA	$69.16	$139	
Frac Tank, Delivery and Pickup	3	EA	$912.00	$2,736	
Frac Tank, Rental	90	DAY	$30.00	$2,700	cost for 3 tanks for 30 days each
Transport & Disposal	318,610	GAL	$1.72	$548,010	providing no pretreatment required
SUBTOTAL				$553,585	
Scope Contingency	35%			$193,755	
Low Permeability Cover System					
Vegetative Layer	610	CY	$42.98	$26,218	6 inches of topsoil
Protective Layer	2,430	CY	$42.98	$104,442	24 inches of sand
Low Permeability Layer	1,820	CY	$45.18	$82,228	18 inches of clay
SUBTOTAL				$212,888	
Scope Contingency	20%			$42,578	
Decontamination					
PPE	30	DAY	$100.00	$3,000	
Equipment	1	LS	$20,000.00	$20,000	
Stormwater Controls	1	LS	$10,000.00	$10,000	
SUBTOTAL				$33,000	
Scope Contingency	15%			$4,950	
SUBTOTAL				$1,344,500	
Bid Contingency	15%			$152,271	
SUBTOTAL				$1,496,771	
Project Management	6%			$89,806	
Remedial Design	12%			$179,613	

COST ESTIMATE SUMMARY ALTERNATIVE 4B - EXCAVATION AND ON-SITE CONSOLIDATION WITH A LOW PERMEABILITY COVER SYSTEM					
Site: Camp Georgetown **Location:** Georgetown, NY **Phase:** Feasibility Study (-30% - +50%) **Date:** February, 2004	**Description:** Soil impacts would be addressed through excavation and on-site consolidation. Areas A and F - J would be excavated and contained in an area of consolidation located over Areas B - E, which would remain in place.				
DESCRIPTION	**QTY**	**UNIT**	**UNIT COST**	**TOTAL COST**	**NOTES**
Construction Management	8%			$119,742	
Institutional Controls	1	LS	$2,000.00	$2,000	
TOTAL CAPITAL COST				**$1,887,932**	
O&M COSTS (Year 1-30)					
Site Monitoring					
Groundwater Sampling Labor	40	HR	$65.00	$2,600	annual groundwater monitoring was assumed for cost estimating purposes.
Groundwater Sampling Equipment	1	LS	$400.00	$400	
Groundwater Laboratory Analysis	1	LS	$17,850.00	$17,850	
SUBTOTAL				$20,850	
Scope Contingency	10%			$2,085	
Site Maintenance					
Maintenance of Cover	1	LS	$500.00	$500	
SUBTOTAL				$500	
Scope Contingency	10%			$50	
SUBTOTAL				$23,485	
Bid Contingency	5%			$1,068	
SUBTOTAL				$24,553	
Project Management	7%			$1,719	
Technical Support	10%			$2,455	
TOTAL ANNUAL O&M COST				**$28,726**	
TOTAL O&M COST				**$861,793**	
Discount Factor	15.372				
PRESENT VALUE OF TOTAL O&M COST				**$441,596**	
GRAND TOTAL				**$2,329,528**	

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. This is an order-of-magnitude cost estimate that is expected to be within -30% to +50% of the actual project cost.

Discount Factor = $\frac{(1+i)^n - 1}{i(1+i)^n}$ where i = 5% and n = 30 years

A discount rate (i) of 5% was directed by the NYSDEC.

Sources / References:

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